TOLAY LAKE REGIONAL PARK
MASTER PLAN

Draft EIR Appendices

JANUARY 2017

State Clearinghouse Number
2015062084

Prepared for
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403

Prepared by
MIG, Inc.
800 Hearst Avenue
Berkeley, CA 94710

Photo credit: Regional Parks staff

Appendix A

Notice of Preparation and Scoping Comments

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT

SONOMA COUNTY REGIONAL PARKS 2300 COUNTY CENTER DRIVE, SUITE 120a SANTA ROSA, CA 95403
PHONE: (707) 565-2041 FAX: (707) 565-3642

June 29, 2015

The Sonoma County Regional Parks Department (Regional Parks) is preparing an Environmental Impact Report for the proposed:

TOLAY LAKE REGIONAL PARK MASTER PLAN PROJECT

Introduction

Regional Parks is requesting comments from responsible and trustee agencies, property owners in the project vicinity, and other interested parties regarding the scope and content of the Environmental Impact Report (EIR). Responsible and trustee agencies are requested to provide comments regarding the scope and content of the environmental information which is germane to that agency's statutory responsibilities in relation to the proposed project. Regional Parks is also interested in comments from property owners and other interested parties regarding environmental topics and areas of concern for study in the EIR. Regional Parks' staff will prepare the EIR in accordance with the provisions of the California Environmental Quality Act (CEQA) and the State CEQA Guidelines. An EIR is an analysis of a proposed project's potentially significant environmental effects regarding construction, operation, and maintenance of the proposed project. After the EIR is prepared, Regional Parks will submit the document to the State Clearinghouse, the Sonoma County Environmental Review Committee (ERC), and the public for a 45-day public review period. Regional Parks will solicit public and agency comments during the 45-day public review period. These comments will be considered and responded to in the Final EIR.

Notice of Preparation Comment Period

Please send written comments on the scope of the environmental analysis to Karen Davis-Brown, Park Planner II, in care of the Sonoma County Regional Parks Department, at the address listed above. The comment period for the Notice of Preparation will close at 5:00 p.m. on July 29th, 2015, which is 30 days after mailing of this document. Please note that while the comment period for the Notice of Preparation has a closing date, interested parties are encouraged to contact Regional Parks' staff at any time during the process to receive an update of the process, to ask questions, and share information.

Public Scoping Meeting

Regional Parks will host a Public Scoping Meeting regarding the proposed project. The Public Scoping Meeting is a required part of the CEQA process. Regional Parks' staff will present an overview of the preliminary Master Plan for the Tolay Lake Regional Park Master Plan Project and the environmental review process for the project. Public comment can be provided at the meeting via verbal or written comment cards. The public is also welcome to submit comments in writing to the address above during the 30-day public review period. The Public Scoping Meeting is scheduled as follows:

Tuesday, July, 21st 2015; 6:00 – 8:00 pm
Petaluma Community Center
Lucchesi Park320 N McDowell Blvd Petaluma, CA 94954

Regional Parks Contact Persons

Please call Karen Davis-Brown at (707) 565-2041 if you have questions regarding this Notice of Preparation.

PROJECT INFORMATION

Project Purpose

The purpose of the proposed project is to develop the proposed Tolay Lake Regional Park (Park) with a variety of recreation and education uses while protecting natural and cultural resources.

Project Location

Tolay Lake Regional Park is located at 5869 Cannon Lane in Sonoma County, approximately five miles southeast of the City of Petaluma (see Figure 1: Project Location). Tolay Lake Regional Park is comprised of two properties: a 1,737-acre area with primary access from Cannon Lane, a County-maintained road off Lakeville Highway, and the approximately 1,665-acre Tolay Creek Ranch, currently owned by the Sonoma County Land Trust (SLT). The Tolay Creek Ranch property abuts the southern boundary of the current Tolay Lake Regional Park property on the north, and Highway 121 on the south.

Existing Site Conditions

Tolay Lake Park is named for the approximately 200-acre shallow seasonal lake in the center of the valley. Streams and artificial ponds form other water features on site. Several types of roads and trails connect the site to the surrounding community and provide a circulation network within the site. This circulation network coupled with various pastures includes associated features such as gates, fences, and bridges which relate primarily to the site's agricultural use.

The Cardoza Ranch; including homes, barns, and corrals; is located in the northwest corner of the Park just west of Tolay Lake (Figure 2). The Tolay Creek Ranch property is fenced and used for limited grazing. The Tolay Creek Ranch includes 2.5 miles of Tolay Creek, which flows into San Pablo Bay. The SLT will transfer the Tolay Creek Ranch to Regional Parks pending completion of several restoration projects (Figure 3).

PROJECT BACKGROUND

The two properties comprising Tolay Lake Regional Park are relatively recent acquisitions. The Cardoza portion of the Park is currently open to limited public access through the Day-Use Permit Program, as outlined in the 2008 Interim Plan. The Tolay Creek Ranch portion of the Park is managed by the SLT and is not subject to the Day-Use Permit Program.

Once the Master Plan is completed and approved, Regional Parks will open the Park to public access and undertake park improvements.

Project Description

The proposed project includes development of a new open space regional park facility to serve the residents of Sonoma County. The proposed Tolay Lake Regional Park will provide day use activities and permit camping and other overnight uses on a year round basis.

The Master Plan includes recreational improvement recommendations for multi-use and hiking-only trails; equestrian facilities; a park center that includes a visitor center with interpretive and educational facilities; as well as improved restrooms and parking. Additionally, the Master Plan includes improvements to park access, a new ranger residence, and water supply and wastewater facilities. The Master Plan provides recommendations for habitat restoration focusing on the restoration of Tolay Lake to maximize and improve the lake ecology for native species, and restoration of 4.5 miles of Tolay Creek in the Park.

The Master Plan defines the anticipated equestrian concessions, provides resource management recommendations for continued cattle operations, as well as improvements in fencing, boundaries, and exclusion zones for sensitive habitats. In addition, the Master Plan provides recommendations for the protection and interpretation of the significant cultural and historical resources of the property.

The types of recreational activities proposed for the site include; nature study and outdoor educational programs, hiking, docent led walks, horseback riding, mountain biking, group and family picnicking, birdwatching and other types of passive recreation, and overnight hike-in individual and group camping on a permit basis.

The preferred conceptual site plan for the Park's Northern Core area is shown in Figure 4, and for the remainder of the Park in Figure 5.

Areas of Potential Environmental Effect

The EIR will analyze the potential environmental impacts associated with construction, operation, and maintenance of the proposed project. Specific areas of analysis will include: aesthetics, agricultural and forest resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gases, hazards, hydrology and water quality, land use, energy and mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities and service systems. These resource categories are included in Appendix G to the State CEQA Guidelines.

Jurisdictional, Permitting, and Regulatory Agencies

The following agencies may have jurisdiction associated with development of the proposed Tolay Lake Regional Park:

- United States Army Corps of Engineers
- United States Fish and Wildlife Service
- California Department of Fish and Wildlife
- California Regional Water Quality Control Board, North Coast Region
- Northern Sonoma County Air Pollution Control District
- Marin - Sonoma Mosquito and Vector Control District
- Sonoma County Agricultural Preservation and Open Space District
- Sonoma County Permit and Resource Management Department

PUBLICATION AND MAILING DATE: June 29th, 2015
SENT TO OFFICE OF RESEARCH AND PLANNING: June 26th, 2015

X [signature] Date: 6/23/15

Karen Davis-Brown
Tolay Lake Regional Park Master Plan Project Manager

Figure 1
Project Location

Project Site
Water Feature/Wetlands
Grasslands and Wildflower Fields
Powerlines
2' contour
10' contour

0 100 200 Feet

Northern Park Core Area

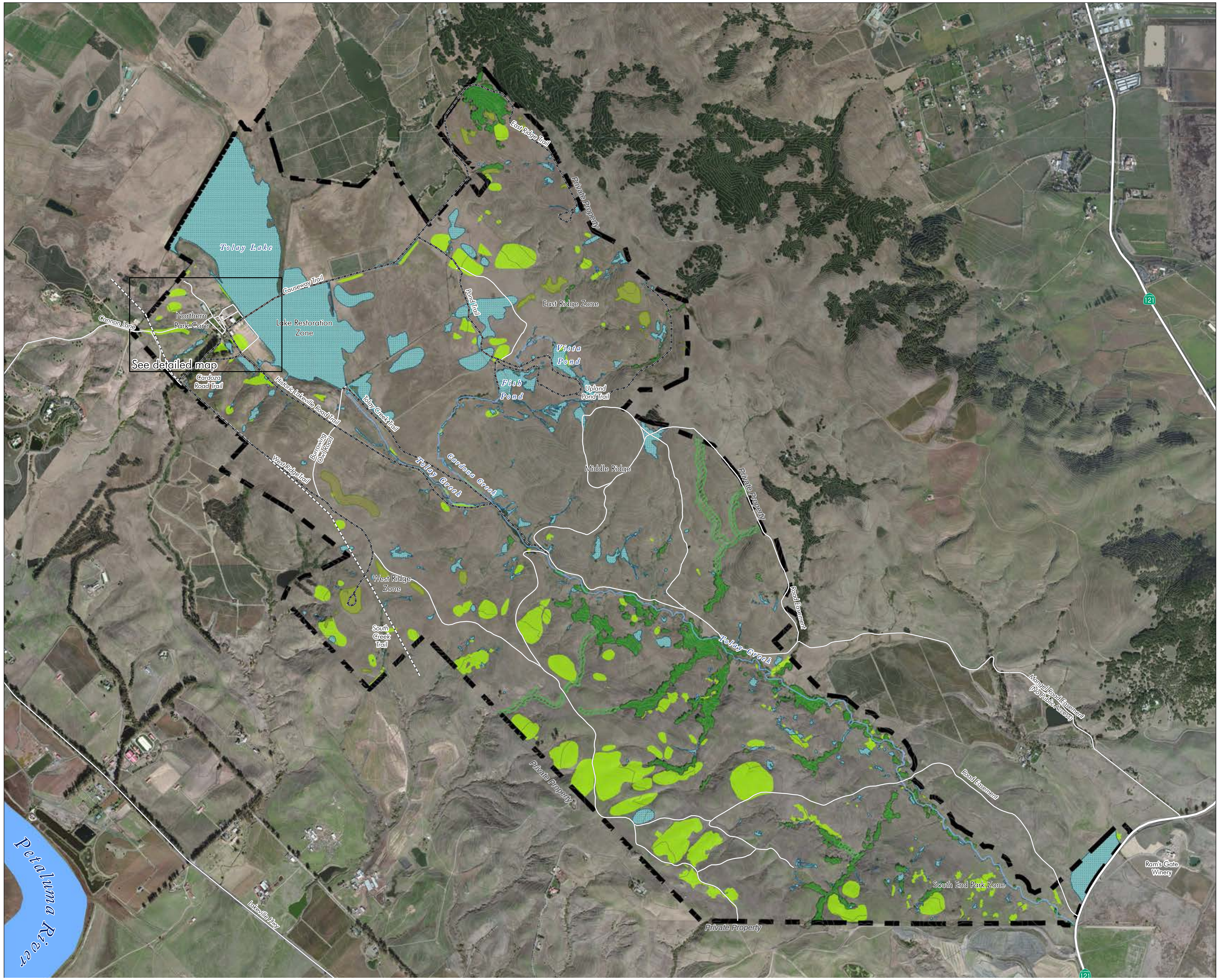
Building Key

1 - Cottage / Julie's House / Little Green House
2 - Bunkhouse/Ranger Residence
3 - John Cardoza Sr. House/Ranger Residence
4 - George & Vera Cardoza / Green House
5 - John Jr. & Beatrice Cardoza / Yellow House/Park Office
6 - Hay Barn / Old Stone Floor Barn
7 - Old Dairy Barn
8 - Creamery / Wine Storage
9 - Granary / Museum
10 - Line Shack
12 - Old Shop / Work Shop
13 - Tractor Barn / Equipment Barn
14 - Storage Shed / Equipment Shed
15 - Slaughterhouse
16 - *Building has been removed*
17 - Modern Barn
18 - Cattle Scale
19 - Marvin's Garden
20 - Corrals

Data Sources:
Sonoma County Parks, LSA, WRA, 2013 Cultural Landscapes Inventory, 2012 Historic Structures Report for Cardoza Ranch, 2013 Field Visits by MIG, Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 2
Existing Conditions and Facilities in the Northern Core Area

Overall Project Area



Data Sources:
Sonoma County Parks, LSA, WRA, 2013 Cultural Landscapes Inventory, 2012 Historic Structures Report for Cardoza Ranch, 2013 Field Visits by MIG, Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

0 0.25 0.5 Miles

Figure 3
Existing Conditions and Facilities in the Park Interior

Northern Park Core Area

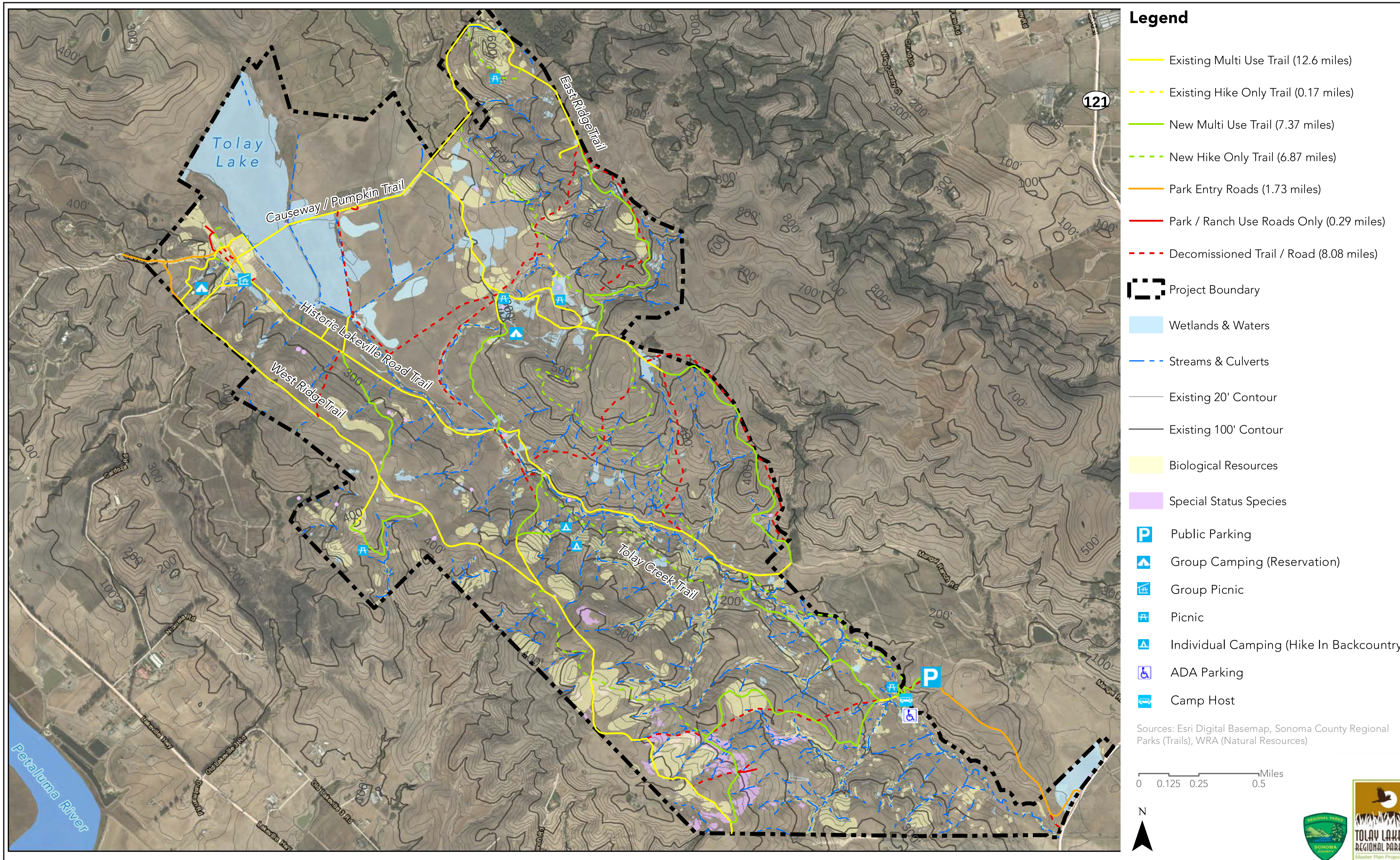
Existing Elements

1 - Cottage / Julie's House / Little Green House
2 - Bunkhouse / Ranger Residence
3 - John Cardoza Sr. House / Ranger Residence
4 - DEMO George & Vera Cardoza / Green House
5 - John Jr. & Beatrice Cardoza / Yellow House
6 - Hay Barn / Old Stone Floor Barn
7 - Old Dairy Barn
8 - Creamery / Wine Storage
9 - Granary / Museum
12 - Old Shop / Work Shop
13 - Tractor Barn / Equipment Barn
14 - Storage Shed / Equipment Shed
15 - Slaughter House
17 - Modern Barn
19 - Historical Garden
20 - Corrals
21 - Picnic Site / Group
22 - Platform
* Building numbers correspond to Historic Structures Report

Proposed Elements

A - Cultural Gathering Area
B - Viewpoint
C - New Equipment Shed
D - Screen Plantings
E - Ranch Manager Residence
F - Entry Road Improvements
G - Group Camping by Permit
H - Overflow Parking
I - Animal Pen
J - Move Historical Corral
K - Visitor Center
L - Preserve and Interpret
M - New Bunk House
N - Park Office
O - Group Picnic
P - Functioning Ranch Operations
Q - Culinary Ethno Garden
R - Temporary Residence (Artist, etc.)
S - Sales/Group Picnic Shelter
T - New Ranger Residence
U - Showers
V - Restroom
W - Riparian/Wetland Restoration
X - Kitchen and Dining
Y - Potential Spray Irrigation Area
Z - Equestrian Parking
AA - Boardwalk
BB - Outdoor Class / Stage

Figure 4
Preferred Conceptual Site Plan for Northern Core Area



MIG Tolay Lake Regional Park Master Plan
Sonoma County, CA

Figure 5
Preferred Conceptual Site Plan for Park Interior

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH
STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

Notice of Preparation

June 29, 2015

To: Reviewing Agencies

Re: Tolay Lake Regional Park Master Plan
SCH# 2015062084

Attached for your review and comment is the Notice of Preparation (NOP) for the Tolay Lake Regional Park Master Plan draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Karen Davis-Brown
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# **2015062084**
Project Title Tolay Lake Regional Park Master Plan
Lead Agency Sonoma County

Type **NOP** Notice of Preparation

Description The Master Plan includes recreational improvement recommendations for multi-use and hiking-only trails; equestrian facilities; a park center that includes a visitor center with interpretive and educational facilities; as well as improved restrooms and parking. Additionally, the Master Plan includes improvements to park access, a new ranger residence, and water supply and wastewater facilities. The Master Plan provides recommendations for habitat restoration focusing on the restoration of Tolay Lake to maximize and improve the lake ecology for native species, and restoration of 4.5 miles of Tolay Creek in the Park. The Master Plan includes recreational improvement recommendations for multi-use and hiking-only trails; equestrian facilities; a park center that includes a visitor center with interpretive and educational facilities; as well as improved restrooms and parking.

Lead Agency Contact

Name Karen Davis-Brown
Agency Sonoma County Regional Parks
Phone 707 565 2041 ***Fax***
email
Address 2300 County Center Drive, Suite 120a
City Santa Rosa ***State*** CA ***Zip*** 95403

Project Location

County Sonoma
City Petaluma
Region
Cross Streets Lakeville Hwy / Cannon Lane
Lat / Long 38° 12' 18.76" N / 122° 31' 15.75" W
Parcel No. 068-060-057 & 058, 068-070-004, 005
Township 4N ***Range*** 7W ***Section*** ***Base*** MDB&M

Proximity to:

Highways Hwy 121, 37, 116
Airports
Railways
Waterways Tolay, North, South, Cardoza, Eagle Creeks
Schools
Land Use Agricultural/Intensive, Extensive Agriculture

Project Issues

Reviewing Agencies Resources Agency; Cal Fire; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Wildlife, Region 3; Native American Heritage Commission; California Highway Patrol; Caltrans, District 4; Air Resources Board; State Water Resources Control Board, Division of Drinking Water; Regional Water Quality Control Board, Region 2

Date Received 06/29/2015 ***Start of Review*** 06/29/2015 ***End of Review*** 07/28/2015

Note: Blanks in data fields result from insufficient information provided by lead agency.

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # 2015062084

Project Title: Tolay Lake Regional Park Master Plan

Lead Agency: Sonoma County Regional Parks
Contact Person:
Mailing Address: 2300 County Center Drive, Suite 120a
Phone: 707-565-2041
City: Santa Rosa
Zip: 95403
County: Sonoma County

Project Location: County: Sonoma County
City/Nearest Community: Petaluma
Cross Streets: Lakeville Hwy/Cannon Lane
Zip Code: 94954
Longitude/Latitude (degrees, minutes and seconds): 38 ° 12 ′ 18.76″ N / 122 ° 31 ′ 15.75″ W
Total Acres: 3,402
Assessor's Parcel No.: 068-060-057&058, 068-070-004&00
Section: N/A
Twp.: 4N
Range: 7W
Base: Mount Di
Within 2 Miles: State Hwy #: 121, 37, and 116
Waterways: Tolay, North, South, Cardoza, Eagle creeks
Airports:
Railways:
Schools:

RECEIVED
JUN 29 2015
STATE CLEARING HOUSE

Document Type:

CEQA: [X] NOP [ ] Early Cons [ ] Neg Dec [ ] Mit Neg Dec [X] Draft EIR [ ] Supplement/Subsequent EIR (Prior SCH No.) Other:

NEPA: [ ] NOI [ ] EA [ ] Draft EIS [ ] FONSI

Other: [ ] Joint Document [ ] Final Document [ ] Other:

Local Action Type:

[ ] General Plan Update
[ ] General Plan Amendment
[ ] General Plan Element
[ ] Community Plan
[ ] Specific Plan
[X] Master Plan
[ ] Planned Unit Development
[ ] Site Plan
[ ] Rezone
[ ] Prezone
[ ] Use Permit
[ ] Land Division (Subdivision, etc.)
[ ] Annexation
[ ] Redevelopment
[ ] Coastal Permit
[ ] Other:

Development Type:

[ ] Residential: Units ___ Acres ___
[ ] Office: Sq.ft. ___ Acres ___ Employees ___
[ ] Commercial: Sq.ft. ___ Acres ___ Employees ___
[ ] Industrial: Sq.ft. ___ Acres ___ Employees ___
[ ] Educational:
[X] Recreational: Regional Park
[ ] Water Facilities: Type ___ MGD ___
[ ] Transportation: Type
[ ] Mining: Mineral
[ ] Power: Type ___ MW ___
[ ] Waste Treatment: Type ___ MGD ___
[ ] Hazardous Waste: Type
[ ] Other:

Project Issues Discussed in Document:

[X] Aesthetic/Visual
[X] Agricultural Land
[X] Air Quality
[X] Archeological/Historical
[X] Biological Resources
[ ] Coastal Zone
[X] Drainage/Absorption
[ ] Economic/Jobs
[ ] Fiscal
[X] Flood Plain/Flooding
[X] Forest Land/Fire Hazard
[X] Geologic/Seismic
[X] Minerals
[X] Noise
[X] Population/Housing Balance
[X] Public Services/Facilities
[X] Recreation/Parks
[X] Schools/Universities
[X] Septic Systems
[ ] Sewer Capacity
[X] Soil Erosion/Compaction/Grading
[X] Solid Waste
[X] Toxic/Hazardous
[X] Traffic/Circulation
[X] Vegetation
[X] Water Quality
[X] Water Supply/Groundwater
[X] Wetland/Riparian
[X] Growth Inducement
[X] Land Use
[X] Cumulative Effects
[ ] Other:

Present Land Use/Zoning/General Plan Designation:

Agriculture/Intensive, Extensive Agriculture

Project Description: *(please use a separate page if necessary)*

The Master Plan includes recreational improvement recommendations for multi-use and hiking-only trails; equestrian facilities; a park center that includes a visitor center with interpretive and educational facilities; as well as improved restrooms and parking. Additionally, the Master Plan includes improvements to park access, a new ranger residence, and water supply and wastewater facilities. The Master Plan provides recommendations for habitat restoration focusing on the restoration of Tolay Lake to maximize and improve the lake ecology for native species, and restoration of 4.5 miles of Tolay Creek in the Park. The Master Plan includes recreational improvement recommendations for multi-use and hiking-only trails; equestrian facilities; a park center that includes a visitor center with interpretive and educational facilities; as well as improved restrooms and parking.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X".
If you have already sent your document to the agency please denote that with an "S".

____ Air Resources Board	X Office of Historic Preservation
____ Boating & Waterways, Department of	____ Office of Public School Construction
____ California Emergency Management Agency	X Parks & Recreation, Department of
X California Highway Patrol	____ Pesticide Regulation, Department of
X Caltrans District #4	X Public Utilities Commission
____ Caltrans Division of Aeronautics	X Regional WQCB #2
____ Caltrans Planning	____ Resources Agency
____ Central Valley Flood Protection Board	____ Resources Recycling and Recovery, Department of
____ Coachella Valley Mtns. Conservancy	X S.F. Bay Conservation & Development Comm.
____ Coastal Commission	____ San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____ Colorado River Board	____ San Joaquin River Conservancy
X Conservation, Department of	____ Santa Monica Mtns. Conservancy
____ Corrections, Department of	____ State Lands Commission
____ Delta Protection Commission	____ SWRCB: Clean Water Grants
____ Education, Department of	____ SWRCB: Water Quality
____ Energy Commission	____ SWRCB: Water Rights
X Fish & Game Region #3	____ Tahoe Regional Planning Agency
____ Food & Agriculture, Department of	____ Toxic Substances Control, Department of
X Forestry and Fire Protection, Department of	X Water Resources, Department of
____ General Services, Department of	
____ Health Services, Department of	____ Other: ____
____ Housing & Community Development	____ Other: ____
X Native American Heritage Commission	

Local Public Review Period (to be filled in by lead agency)

Starting Date June 29, 2015 Ending Date July 29, 2015

Lead Agency (Complete if applicable):

Consulting Firm: MIG	Applicant:
Address: 800 Hearst Avenue	Address:
City/State/Zip: Berkeley, CA 94710	City/State/Zip:
Contact: Katrina Hardt-Holoch	Phone:
Phone: 5108457549	

Signature of Lead Agency Representative: [signature] **Date:** 6/23/15

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

2015062084

NOP Distrib[illegible]on List County: Yuma SCH#

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  Denise Peterson
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Lisa Johansen
- [ ] **Dept. of Conservation**
  Elizabeth Carpenter
- [ ] **California Energy Commission**
  Eric Knight
- [x] **Cal Fire**
  Dan Foster
- [ ] **Central Valley Flood Protection Board**
  James Herota
- [x] **Office of Historic Preservation**
  Ron Parsons
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **California Department of Resources, Recycling & Recovery**
  Sue O'Leary
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou

Fish and Game

- [ ] **Depart. of Fish & Wildlife**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Wildlife Region 1**
  Curt Babcock
- [ ] **Fish & Wildlife Region 1E**
  Laurie Harnsberger
- [ ] **Fish & Wildlife Region 2**
  Jeff Drongesen
- [x] **Fish & Wildlife Region 3**
  Charles Armor
- [ ] **Fish & Wildlife Region 4**
  Julie Vance
- [ ] **Fish & Wildlife Region 5**
  Leslie Newton-Reed
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6**
  Tiffany Ellis
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6 I/M**
  Heidi Calvert
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Wildlife M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Sandra Schubert
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Anna Garbeff
  Environmental Services Section
- [ ] **Delta Stewardship Council**
  Kevan Samsam
- [ ] **Housing & Comm. Dev.**
  CEQA Coordinator
  Housing Policy Division

Independent Commissions, Boards

- [ ] **Delta Protection Commission**
  Michael Machado
- [ ] **OES (Office of Emergency Services)**
  Marcia Scully
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Supervisor
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [ ] **State Lands Commission**
  Jennifer Deleong
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Cal State Transportation Agency CalSTA

- [ ] **Caltrans - Division of Aeronautics**
  Philip Crimmins
- [ ] **Caltrans – Planning HQ LD-IGR**
  Terri Pencovic
- [x] **California Highway Patrol**
  Suzann Ikeuchi
  Office of Special Projects

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Eric Federicks – South
  Susan Zanchi - North
- [x] **Caltrans, District 4**
  Patricia Maurice
- [ ] **Caltrans, District 5**
  Larry Newland
- [ ] **Caltrans, District 6**
  Michael Navarro
- [ ] **Caltrans, District 7**
  Dianna Watson
- [ ] **Caltrans, District 8**
  Mark Roberts
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Maureen El Harake

Cal EPA

Air Resources Board

- [x] All Other Projects
  Cathi Slaminski
  - [ ] Transportation Projects
    Nesamani Kalandiyur
  - [ ] Industrial/Energy Projects
    Mike Tollstrup
- [ ] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [x] **State Water Resources Control Board**
  Karen Larsen
  Division of Drinking Water
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Phil Crader
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [x] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** ____________

- [ ] ____________
  Conservancy

Tolay Lake Regional Park Master Plan
Workshop #3 - Comment Card

Please write your comments regarding the Tolay Lake Regional Park Master Plan below:

As an equestrian in Sonoma County I am interested in Tolay as a trail riding opportunity. I would recommend looking at Shiloh as an example of a multi-use park that is heavily used as a trailering-in horse riding area. One thing that really works there is that the trailer parking area is not welcoming for car parking by being farther from the restrooms, not paved, and off the main paved entrance. This works. What doesn't work so well is, for example, the parking lot for the Laguna trail off hyw. 12. The horse trailer parking is not well marked, and frequently is filled with cars.
– And – don't worry about putting in hitching rails – everyone just uses their trailers. But horse troughs are much appreciated.

Optional:
Name: Ali Pearson
Email or Phone: ali@alumniexhibits.com
Please print
4/22/15

Please note that comments and information submitted become part of the public record.

Please turn in this card to a project team member at the end of the meeting.

Thank you for participating in the Tolay Lake Regional Park Master Plan process!

DRAFT ENVIRONMENTAL IMPACT REPORT
SCOPING MEETING
COMMENT CARD

(Please note that this document will be part of the public record. You will also be added to the project mailing list for future communications.)

Date: Tuesday, July 21, 2015 (6:00 to 8:00 PM)
Location: Petaluma Community Center
Luchessi Park, 320 N McDowell Boulevard, Petaluma, CA 94954
Project: Tolay Lake Regional Park Master Plan Project

Comments may be submitted at the Scoping Meeting or may be sent to:

ATNN: Karen Davis-Brown
Tolay Lake Regional Park Master Plan Project Manager
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403
(707) 565-2041
(707) 565-3642 (Fax)

Comments must be received no later than 5:00 p.m. on Wednesday, July 29, 2015.

Name (Please Print): ANDY LACASSE
Mailing Address: 660 FAIR AVE PETALUMA 94952-1241
Email Address: N/A
Comment (s): WONDERFUL PROPERTY, VERY RICH IN WILDLIFE RESOURCES MAMMALS, BIRDS, REPTILES AND NATIVE PLANTS, GREAT VIEWS SPECTACULAR IN WINTER WHEN THE LAKE IS FULL AND COVERED WITH MANY SPECIES OF OVER WINTERING WATERFOWL AND VISITING RAPTORS.

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 4
P.O. BOX 23660, MS-10D
OAKLAND, CA 94623-0660
PHONE (510) 286-5528
FAX (510) 286-5559
TTY 711
http://www.dot.ca.gov/dist4/

Serious Drought.
Help save water!

July 27, 2015

SONVAR173
SCH# 2015062084

Ms. Karen Davis-Brown
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403

Dear Ms. Davis-Brown:

Tolay Lake Regional Park Master Plan – Notice of Preparation (NOP)

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. The proposed project develops a Master Plan for the park to recommend improvements to recreational facilities. It would also improve park access, and provide a new ranger residence, and water supply and wastewater facilities. Tolay Lake Regional Park is located in southeastern Sonoma County, and is close to State Routes 116, 121, and 37, although it only abuts State Route 121.

Caltrans' new mission, vision, and goals signal a modernization of our approach to California's transportation system. We review this local development for impacts to the State Highway System in keeping with our mission, vision, and goals for sustainability/livability/economy, and safety/health. We provide these comments consistent with the State's smart mobility goals that support a vibrant economy, and build communities, not sprawl. The following comments are based on the NOP.

Mitigation Site
A portion of the property included in the Tolay Lake Regional Park Master Plan is under a contractual agreement with Sonoma Land Trust. This agreement was signed on 1/17/2013 and incorporates Caltrans mitigation requirements for the Marin-Sonoma Narrows HOV Widening Project. Mitigation requirements include but are not limited to planting, fence construction, repair of a grade control structure, control of invasive species, and maintenance of plantings for a period of ten years. Sonoma Land Trust is responsible for implementation of mitigation requirements and for providing oversight and administration of the work for the ten years following planting.

Per the agreement, Sonoma Land Trust must notify Caltrans in writing of any transfer of ownership, use, management, and maintenance responsibilities of Tolay Creek Ranch and shall ensure that any transfer of Tolay Creek Ranch provides for retention of any and all property rights and/or rights of entry required to implement the mitigation requirements, including rights for Caltrans and Federal Highway Administration personnel to enter the property.

Any proposed improvements in the portion of Tolay Creek Ranch covered by the contractual agreement should be aligned or constructed without impacts that would negatively affect the mitigation requirements, including the Archeological Monitoring Areas.

Encroachment Permit
Work that encroaches onto the state right of way (ROW) requires an encroachment permit that is issued by Caltrans. To apply, a completed encroachment permit application, environmental documentation, and five (5) sets of plans clearly indicating the state ROW must be submitted to: Office of Permits, California Department of Transportation, District 4, P.O. 23660, Oakland, CA 94623-0660. Traffic-related mitigation measures should be incorporated into the construction plans during the encroachment permit process. As soon as they are available, please forward one hard copy and one CD of the environmental document, along with the TIS including the Technical Appendices. See the website link below for more information.

http://www.dot.ca.gov/hq/traffops/developserv/permits/

Please feel free to call or email Greg Currey at (510) 286-5623 or gregory.currey@dot.ca.gov with any questions regarding this letter.

Sincerely,

PATRICIA MAURICE
District Branch Chief
Local Development – Intergovernmental Review

c: Scott Morgan, State Clearinghouse

July 18, 2015

Sonoma County Regional Parks

Tolay Park Project

Ms. Karen Davis-Brown

It has been brought to our attention that there have been recent planning meetings for Tolay Park, known of which we have been notified. It appears that there is a plan to re-establish the lake to pre-Cardoza specifications. Since the creation of this park, we have had increasingly slow draining of water on our property, just north of the park border, from the cessation of Cardoza's agriculture practices.

As an organic dairy, we need to maintain pasture for our cattle. Our gazing season begins in May on our flats, bordering Dr. Schaller's property. When the Cardoza's maintained the creek and drainage ditches along the valley floor, water was drained off our property (in March), Dr. Schaller's, and the Cardoza's allowing for tillage, planting, and grazing in the spring. This practice apparently has ceased and it is taking longer for the water to dissipate. The re-establishment of a lake up to Dr. Schaller's fence line will greatly impact our ability to access our fields.

We would appreciate being notified timely on meetings so that we may respond. Furthermore, we protest any plans that may impact our ability to utilize our land or decrease its value due to flooding/impacted access. Re-establishing past farming practices and creek/ditch maintenance would go a long way towards preserving the agricultural heritage of this area, one of the original premises of establishing the park.

Jim & Luci Mendoza, JLT Ranch

LMendoza

601 Stage Gulch Rd.

Petaluma, CA 94954

DRAFT ENVIRONMENTAL IMPACT REPORT
SCOPING MEETING
COMMENT CARD

(Please note that this document will be part of the public record. You will also be added to the project mailing list for future communications.)

Date: Tuesday, July 21, 2015 (6:00 to 8:00 PM)
Location: Petaluma Community Center
Luchessi Park, 320 N McDowell Boulevard, Petaluma, CA 94954
Project: Tolay Lake Regional Park Master Plan Project

Comments may be submitted at the Scoping Meeting or may be sent to:

ATNN: Karen Davis-Brown
Tolay Lake Regional Park Master Plan Project Manager
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403
(707) 565-2041
(707) 565-3642 (Fax)

Comments must be received no later than 5:00 p.m. on Wednesday, July 29, 2015.

Name (Please Print): LES GOLDNER

Mailing Address: 6533 LAKEVILLE HWY PETALUMA 94954

Email Address: LGOLD@QUANTUM-ASSOCIATES.COM

Comment (s): A MAJOR RECREATIONAL USE IS BIKE RIDING, YET THERE IS NO PLAN TO ENHANCE THE UPPER TRAIL, WITH ITS GREAT VIEWS FOR BIKES. CURRENTLY THE CATTLE MAKE THIS TRAIL TOTALLY UNUSABLE FOR BIKING. BAD DRAINAGE IS ALSO AN ISSUE. PLEASE MODIFY THE PLAN TO PAVE OR OTHERWISE ENHANCE THIS TRAIL (USING SOIL CEMENT, ETC).
I FEEL THIS IS MORE IMPORTANT THAN PROVIDING FANCY STAFF OFFICES & FACILITIES BECAUSE PARK USERS SHOULD TAKE HIGHER PREFERENCES.

DRAFT ENVIRONMENTAL IMPACT REPORT
SCOPING MEETING
COMMENT CARD

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(707) 565-3642 (Fax)

Comments must be received no later than 5:00 p.m. on Wednesday, July 29, 2015.

Name (Please Print): Lynn Cominsky
Mailing Address: 903 Mustang Ct Petaluma 94954
Email Address: lynnc@universe.sonoma.edu
Comment (s):
1) The trails as designed look great!
2) I appreciate the horse parking lot at the top of the hill
3) Too bad there is no room for horse camping in Lot Z with one's trailer
(I am too old for packing in)
4) Cannon Road improvements are needed and have been considered properly
5) Can't wait to ride on the SLT property!

DRAFT ENVIRONMENTAL IMPACT REPORT
SCOPING MEETING
COMMENT CARD

(Please note that this document will be part of the public record. You will also be added to the project mailing list for future communications.)

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Santa Rosa, CA 95403
(707) 565-2041
(707) 565-3642 (Fax)

Comments must be received no later than 5:00 p.m. on Wednesday, July 29, 2015.

Name (Please Print): Nancy Chien-Eriksen

Mailing Address: POB 750335, Pet. 94975

Email Address: chien-eriksen @ comcast.net

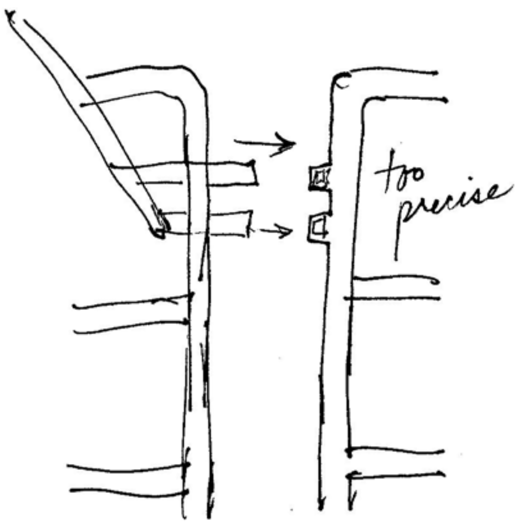
Comment (s): I like the plan for trails. Am particularly interested for equestrians.
Suggestions:
Overflow parking for horse trailers, with sufficient turning space (in case barn area is full).
Gates that are easier to open and close. The 12' gates are difficult in the wind. The latches would work better with more open receptors. [See drwg. on back.] Perhaps have 5' gates for horses? Also switch gate by vineyard so latch is not by downhill.
Have a picnic area near the big eucalyptus (?) tree near intersection of Pumpkin Trail and Vista Pond Trail. It's the only shade around there. Maybe a hitching rack? Maybe Back Country Horsemen would install it or one at top or by camping sites.

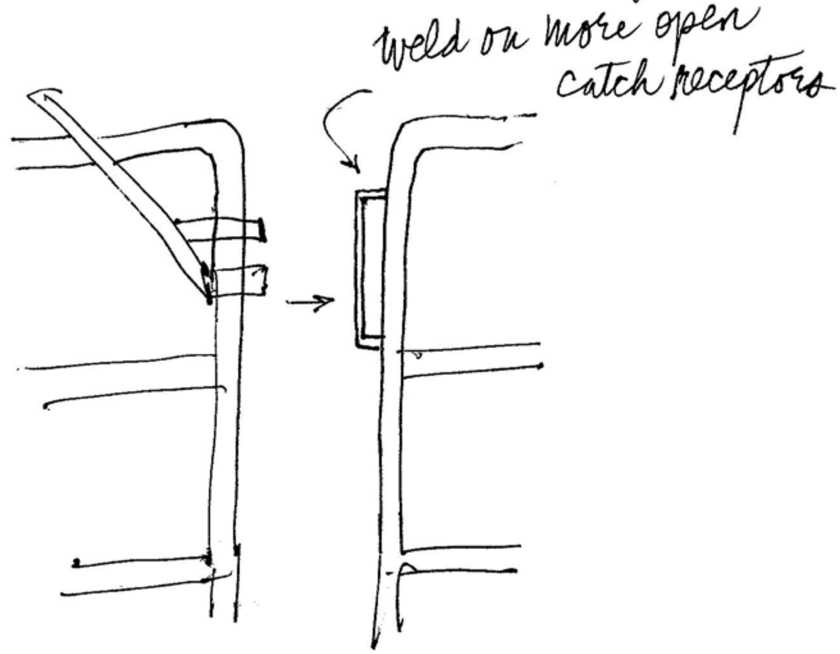
Thank-you!

See over

PS - Can we save money with a smaller visitor center? 7000 sf is huge and consumes parking area.

easier gate latch





Note: The weight of such long gates causes them to sag. Closing long gates on horseback is challenging in the wind.

(The gate by the vineyard would be easier if the latch were on the other side (right side of trail, facing uphill). Not very safe being so close to drop.)

Thomas A. Parilo & Associates
10320 Tillicum Way
Nevada City, CA 95959
(530) 265-6393
E-mail: taparilo@sbcglobal.net

Transmitted via e-mail

July 29, 2015

Karen Davis-Brown, Park Planner II
Sonoma County Regional Parks
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403

Subject: Comments on NOP for Tolay Lake Regional Park Master Plan

Dear Ms. Davis-Brown;

Thank you for giving us the opportunity to comment on the Notice of Preparation (NOP) for the Environmental Impact Report (EIR) for the Tolay Lake Regional Park Master Plan project. I am writing on behalf of Lee W. Schaller, adjoining property owner to the northwest of the proposed regional park.

My client has owned his 242-acre working farm since 1988. His land is used for hay growing, dairy cattle grazing and a vineyard. It is also under a Williamson Act contract with Sonoma County. Schaller was not opposed to the site acquisition for an agricultural and open space preserve when purchased by the Sonoma County Agricultural and Open Space District (SCAOSD) provided that the end use would be consistent with the 1990 Sonoma County voter approved Measures A and C that created the district and established the sales tax rate. It is apparent that with the transfer of ownership to the Sonoma County Regional Parks Department in 2006 that the site will not be used for agriculture any more. Instead, it is proposed to be used for a seven day per week, dawn to dusk, Regional Park.

There are many reasons why my client is opposed to the use of these lands for a regional park. Some of the reasons are outlined herein. The overwhelming size of the 3,850-acre regional park site is staggering particularly since the two primary ranches that have been acquired (Cardoza, 1,737 acres and Roche, 2,113 acres) are now taken off the tax rolls and will no longer be used as productive working ranches/farms. This fact alone will detract from Sonoma County’s rich agricultural heritage and rural character in the Petaluma and Sonoma valley environs. It is most ironic that the mission of the original purchaser is to preserve agricultural lands, but the reality is that approximately 3,850 acres have been removed from agriculture in southern Sonoma County.

The establishment of a regional park constitutes an unwelcome change for those landowners who have historically worked their land in conformance with the agricultural policies of the Sonoma County General Plan. These historic working ranches/farms have contributed to and maintained the open space character of southern Sonoma County while contributing property tax with minimal impact on county services. Most of these agriculturists have an expectation to continue their historic life-style without having to deal with new non-agricultural land uses that could impact their operations due to the establishment of commercial, non-farming operations. Instead, they now have a neighbor in the Sonoma County Regional Parks Department who has already abandoned agriculture and will no longer manage the Cardoza Ranch as a farming operation. Schaller is also concerned that the regional park will generate many visitors and park users on a daily basis, well beyond the activity levels common to the Cardoza Ranch. Into this area will come outside visitors who are unfamiliar with the day to day operations of a working ranch/farm.

My client has six primary concerns with the Master Plan. They include inconsistency of using lands for a regional park acquired through the Sonoma County Agricultural and Open Space District (SCAOSD) funds, lake water inundation on his land, the Right to Farm provisions of the Sonoma County Code of Ordinances, overuse of Cannon Lane (designated a "Local Road" on the 2020 Sonoma County General Plan), fuel breaks and mosquito abatement/West Nile virus concerns associated with the introduction of standing water bodies. Each topic is addressed below.

Inconsistency of using lands for a regional park acquired through SCAOSD funds

Schaller has gone on record since the March 2005 opposing the transfer of the Cardoza Ranch purchase by the SCAOSD to the Sonoma County Regional Parks Department for development and use of the ranch for a park. These comments are once again presented in order to preserve his legal standing in the process and to ensure that he has exhausted his administrative remedies. He also wants to preserve additional opportunities to raise issues and/or present comments dealing with project features that he is currently unaware of or that have not been forthcoming to date since a detailed project description is not yet completed. The following is one of many comments he made in his March 30, 2005, letter to Mr. Tim Smith, Chairman of the SCAOSD. :

1. The acquisition of this 1,737-acre Tolay Lake Ranch site for use as a regional park is inconsistent with Measures A and C as approved by the Sonoma County voters on November 6, 1990. Nowhere in the text of these two Measures, including the impartial analysis and the ballot arguments does it state that acquired open space and agricultural lands can be converted into parks of any type, let alone a regional park.

The Drat Environmental Impact Report should specifically include a project alternative that considers an agricultural use that fulfills the SCAOSD mission and the use of the funding from Measure C, as approved by the Sonoma County voters in 1990 and Measure F, which extended the funding again in 2006.

Impacts of lake water inundation

Since 2005, my client has raised concerns about inundation on his land due to the establishment of a virtual year round lake. He is most concerned that the "ad hoc" establishment of the virtual year round lake was not subject to environmental review, yet he has been directly impacted by extended inundation due to changed lake management. Schaller is also frustrated that, as the most impacted neighboring landowner, he has not heretofore been advised that the new lake management practices had been implemented. Had he been consulted, perhaps extended inundation on his land could have been avoided. My client also suspects that he is now being asked to accept the existing inundation conditions as part of the baseline conditions for this EIR. His worst fears have already come to fruition even before the Tolay Lake Master Plan has been adopted or has undergone formal CEQA review. Schaller is most concerned about the "formalizing" of a virtual year-round, approximately 93+-acre lake based on the "Preferred Lake Restoration Alternative Plan" that appears to reflect "Water Budget Alternative 5" and how it would affect the use of neighboring lands that have been historically used for a variety of farming activities. He is most concerned about the effectiveness of the "Preferred Lake Restoration Alternative Plan" to keep impounded waters from inundating his land.

In reviewing the preferred master plan maps, it appears that the "Preferred Lake Restoration Alternative Plan" could result in extended inundation on his land. He uses the meadow area adjoining the common property line and along both sides Tolay Creek for annual hay planting and harvesting. It is important to be clear about Schaller's interest and concern regarding the lake restoration plan. He has consistently stated (dated back to 2005) that he does not want any extended inundation and soil saturation on his land as a result of the lake restoration efforts or wetland enhancements on the county land. In 2005 and in 2007/08 when he submitted comments on the Interim Management Plan, he requested that a full EIR be prepared for the establishment of a park and most importantly for the conversion of a seasonal lake to a virtually permanent one. The county has continuously kicked the can down the road in addressing the development of a year round lake and inundation impacts on his land and NOW, without environmental review on the county's "ad hoc" establishment of a year round lake, he is experiencing those impacts. He can only imagine what those impacts might be with the establishment of the approximately 93+-acre lake based on the "Preferred Lake Restoration Alternative."

In recent years (all drought years) since the Regional Parks Department took over management of the lake, the yields from Schaller's annual hay crop have been ratcheted down significantly due to extended inundation. The Mendoza JLT Ranch, an upstream organic dairy rancher and neighbor along Tolay Creek has also observed extended inundation, as well. The JLT Ranch has sent a separate corroborating letter regarding the NOP. It is not known if greater vegetation growth and debris have served to create more back-up of water, but the conditions have clearly changed in the years since the Cardoza Ranch was acquired by the county. Under the Cardoza Family ownership of the ranch, they annually pumped out the lake and cleared the emergent vegetation with a backhoe and dragline following the end of the winter rains prior to planting annual crops in the lowlands adjoining Tolay Creek (see attached Tolay Lake 9-30-2002 aerial image). As a result, my client did not contend with standing water and soil saturation conditions. These yearly management practices allowed him to plant his annual hay crop in the fall, enabling him to harvest a significant hay crop each year.

Now, under the current ownership and management to establish a virtual permanent lake condition, he contends with extended inundation and soil saturation. Whether a permanent lake environment is to be established or not, Schaller would like the conditions re-established that existed on his land prior to the ownership/management of the Regional Parks Department.

Under the Cardoza Ranch management, annual inundation would generally occur from about December to February each winter. Now my client is contending with extended inundation and soil saturation from about December until late April or early May. See the attached aerial photograph from April 1, 2015, which shows the inundation and soil saturation conditions on my clients land extended well into the spring under the management of the Sonoma County Regional Parks Department.

According to the November 23, 2005, communication from Mary Burns, Director of the Sonoma County Regional Parks Department, Cardoza operated the ranch and lake until September, 2006, when their rental agreement and lease expired. Since 2006, with the change in management, the "ad hoc" year round lake was established by the Sonoma County Regional Parks Department. It became an "ad hoc" lake through the elimination of pumping and vegetation control. While my client is not necessarily opposed to the change in philosophy of lake management, he is most opposed to the extended inundation that he has gradually endured on his land that significantly impact his farming practices.

As noted throughout, my client and other upstream landowners have witnessed extended inundation on their lands since the ownership and management change of Tolay Lake lands. In a March 13, 2007, letter (attached) from Steve Ehret, Park Planner, in response to Schaller's inquiry regarding concerns over lake inundation on his farm, he represented that the county would conduct annual spring pumping of the lake during the Interim Management Plan in accordance with the management system used by the Cardoza Family ranch. An excerpt from Mr. Ehret's letter specifically stated (see attached) "*We are proposing to pump the lake down to our northerly property boundary in the spring during our lnterim Plan period.*" Whether that was ever done or not, my client has experienced extended inundation beyond normal winter conditions over the past four to five years. This extended inundation has resulted in lower oat hay yields since the onset of the current drought. In an e-mail correspondence from Karen Davis-Brown, Park Planner II, on July 15, 2015, in response to this concern, she reported that the county had ceased pumping during the drought years. Schaller would like to know when pumping took place, in what years and months the county pumped the lake, how that pumping occurred and who was retained to undertake the pumping.

My client respectfully requests that the EIR include an analysis of the means to prevent further or continuing inundation associated with the "Preferred Lake Restoration Alternative Plan." He simply wants the inundation conditions that resulted from the farming practices of the Cardoza Family Ranch operations restored. He, along with other neighbors upstream, has observed annual increases in the area and the length of time of inundation even during the drought. If this means that the high water level needs to be lowered below 215 feet to avoid extended inundation and sub-soil saturation, then it should be fully demonstrated in the EIR at what level inundation on his land beyond normal winter conditions would be avoided. Furthermore, the Sonoma County Right to Farm Ordinance gives protection to the farmer/rancher to use his/her land to promote and expand agriculture in Sonoma County. The change in use from agriculture to a non-agricultural use should give deference to and protect, rather than impact, the adjoining historic farming practices.

Schaller is also asking for some needed clarification and or explanation of the dynamics of the proposed hydrologic management system. The "Preferred Lake Restoration Alternative Plan" represents that there will be 10 culverts with their inverts at 215 feet placed in the causeway. It further represents that a single culvert will drain the lower basin and that outlet will be set at 215 feet. With neither of us being a hydrologist, it appears that there will be a tremendous back-up of water (similar to a funnel effect) going through a single culvert during peak run-off times. We question how the 10 culverts (sizes unspecified) flowing into the lower lake basin with only one culvert (size unspecified) discharging water from the entire system will function. What will the rate of discharge be from the lower basin culvert? Since the restoration plan encourages emergent vegetation growth, my client is concerned that aquatic vegetation and other debris will block or otherwise choke off the lower basin discharge culvert. The EIR should include measures to ensure that the normal flow through the lower basin culvert does not back up thereby creating upstream flooding or extended inundation on my clients land. These measures should include appropriate vegetation management including the removal of willows and other wetland or emergent plants in such a manner that does not impede flow-through drainage of the lower creek. The Cardoza Ranch would annually remove vegetation in the upper lake bed with a backhoe and dragline, thereby having the secondary benefit of drying out the Schaller lands along the lakebed and creek.

How many and what size culverts will be installed in the two location within the creek/lake basin? Would any outside waters be diverted or otherwise added to the natural water input from Tolay Creek? Please also explain the reason why the causeway will be elevated to a level of 222 feet. Is there a hydraulic reason for this or is it to improve emergency access onto the east side of the lake and creek area? We think it is the latter but request clarification. It would appear that a dike at 222 feet could cause extended back-up during 100-year and greater major storm events.

As noted throughout, the bottom line is that my client wants assurance that following the winter rains that he will not have to experience extended periods of inundation and soil saturation that would continue to result in progressively lower crop yields. Furthermore, he is highly concerned that the permanent retention and impoundment of Tolay Creek waters would create adverse water seepage problems and elevated ground water levels well into the dry season on his lower elevation lands adjoining Tolay Lake. Should this be an issue, the change in the hydraulic characteristics of the ground water on his land, due to the permanent impoundment of water and sub-soil saturation, will dramatically compromise his historic farming practices.

The introduction of elevated ground water levels has already occurred and will presumably continue with the "Preferred Lake Restoration Alternative Plan." Without proper mitigation, it will irreparably interfere with my client's historic farming practices. Before the "Preferred Lake Restoration Alternative Plan" is established, a long-term (at least 10 years to account for variable hydrologic cycles), detailed, ground water monitoring program and complete hydro-geological investigation is needed to demonstrate a no-impact condition. The analysis should include a fail-safe, protection factor to assure no damage due to extended inundation and elevated ground water conditions in the dry season. If ground water seepage occurs, he requests that a subterranean and/or surface drain be installed on the county property to direct such water away from his land to preserve both his historic farming practices in the meadow and creek bottom portions of his farm. Schaller also requests that annual funds be set aside to monitor, maintain and repair the many water features within the master plan to insure ongoing operations. He also is requesting groundwater monitoring on a continuous basis to assure that ground water seepage into his land is not occurring beyond the normal winter run-off season.

In a letter to Steve Ehret on April 11, 2007, I stated, "Dr. Schaller wants to go on record stating that he is unwilling to accept any additional inundation as a result of the lake restoration project." My letter goes onto state, "Dr. Schaller will not accept an inundation plan that will require physical improvements on his land or that will extend the wet season on his lower lands adjoining Tolay Creek." The letter further stated, "…Dr. Schaller will oppose any plan that results in extended inundation on his land." He is not willing to accept additional inundation that would prevent him from using his land for its historic farming practices. In light of this position, the EIR should demonstrate and only evaluate alternatives that maintain all lake improvements and extended inundation on the regional parkland. With the new management philosophy, my client respectfully requests that the county modify its "Preferred Lake Restoration Alternative Plan" to ensure that no extended inundation occurs on his lands. In short, Schaller correspondingly requests that the Cardoza Ranch management system be replicated with the operation of the proposed virtual, year-round lake as it affects his property. As noted above, that may entail lowering the high water level of the year round lake.

One of the project alternatives in the EIR should consider retention of the historic farming activities and lake management activities of the Cardoza Family Ranch. This option clearly falls within the mission of the Sonoma County Agricultural and Open Space District, the entity which acquired the property, and would be compatible with the mission and goals of the many partners to the acquisition.

Right to farm

The introduction of the regional park on approximately 3,850 acres of historic ranch/farm land in southern Sonoma County constitutes the introduction of a non-agricultural land use. Sonoma County has long-standing policies to encourage agriculture while protecting this important land use from encroachment with incompatible uses. The Agricultural Resources Element of the General Plan protects and strives to maintain agriculture. Chapter 30, Agriculture, Article II Right to Farm of the Sonoma County Codes of Ordinances requires notification of non-agricultural users, particularly residential and commercial uses that move into the "Intensive and Extensive" agricultural areas designated on the 2020 General Plan. The other major duty that the county has is to ensure that new uses "do no harm" to existing agricultural practices.

The introduction of a regional park with its attendant attractions is a non-agricultural, commercial use (requires user fees) that will bring non-farming visitors into the region on a daily basis. These visitors may be bothered with various annoyances (noise, dust, spraying, odors, traffic, etc.) that are common with ranching and farming practices. These annoyances could affect their park experience and result in complaints. Park visitors may also want to bring their dogs for a run in the park. Unattended dogs are known to harm cattle and other livestock. Dogs, other than seeing-eye dogs and canine companions, should be prohibited from park visitation.

My client requests that the EIR include a mitigation measure to require that park visitors be required to read and sign a statement that they accept all rules and requirements of the park before entering. The statement should also acknowledge that they have entered a region that is an active, productive, working agricultural landscape. The agricultural operations in the area are many and diverse, and there are a variety of annoyances and possible nuisances that visitors may commonly experience while visiting the regional park.

My client maintains, too, that the "Preferred Lake Restoration Alternative Plan," could interfere with his "right to farm" protections under Section 30-21(a), Findings, which states "It is the declared policy of this county to <u>conserve</u>, <u>protect</u>, <u>enhance</u>, and <u>encourage</u> (emphasis added) agricultural operations on agricultural land within the unincorporated area of the county." Schaller is, furthermore, requesting that his agricultural practices and uses of his land for the last 15 years be protected from harm. He is most concerned with the increased area of inundation and length of time of that inundation as evidenced over the last five years. He is most concerned that the active management program from the previous ranch operators are giving way to a more permanent lake condition. Simply stated, this "new normal" condition will have a detrimental impact on and harm his historic farming practices.

He also questions the change in the annual fall festival and pumpkin give away. The Cardoza's planted the pumpkins for the children to pick during the festival. Since their ownership and management, the Sonoma County Regional Parks Department buys pumpkins from a wholesaler for the children to take home. There appears to be very few, if any, remnants of the farming operation associated with the Cardoza family ranch that the public will get to see in the Regional Park.

<u>Cannon Lane Access</u>

It appears that the primary public access to the Tolay Lake Regional Park will be from Cannon Lane, a very narrow, two-lane, dead end, country road. Cannon Lane is approximately 1.2 miles in length and extends from Lakeville Highway to approximately 1,000 feet west of the western boundary of Tolay Lake Regional Park (former Cardoza Ranch). A 3,850 acre regional park should take its primary access directly from a regional transportation route such as a highway, arterial or collector road. Having this one primary public access point on a "Local Road" is contrary to the 2020 Sonoma County General Plan and violates the trust of those residents who use Cannon Lane. The regional park will be open seven days a week from dawn to dusk, thereby forever impacting and changing the character of this quiet, low-traffic volume, rural lane.

Cannon Lane has historically been a quiet country lane used by a handful of families to access Lakeville Highway. It was developed provide access to the former Cardoza Family ranch and to serve the private properties along Cannon Lane. It was not developed as a primary access for a regional park or other commercial endeavor. The Sonoma County Circulation and Transit Element does not designate Cannon Lane as one that can carry regional traffic. Using Cannon Lane to serve as the primary access to a regional park will forever change the character of Cannon Lane and conflict with historic, low-use, traffic generators, most of which are agricultural in nature.

Policy CT-4j of the Circulation and Transit Element of the 2020 Sonoma County General Plan establishes that Local Roads "…are intended to provide access to property and to carry local traffic to Collector Roads." In light of this clear policy direction, how can Sonoma County propose using a "Local Road" as a primary access to a use that attracts regional traffic? As stated clearly in Policy CT-4j (4), a "Local Road" is one to accommodate mostly residential and agricultural traffic generated from the lands that feed onto a collector road." In conclusion, a "Local Road" should not be used for anything other than local traffic generated from the residential and agricultural land uses that use that road and certainly not for a 3,850 acre regional park that is open 7 days a week from dawn to dusk.

The 2020 Sonoma County General Plan distinguishes a "Local Road" from all other road classifications through the descriptions of the primary road circulation classifications described in Policies CT-4h, CT-4i. These other roads are specifically intended to carry intercity and other local area traffic generated from Local Roads. While Policy CT-4j of the 2020 General Plan does not provide a "Road Classification" map exhibit showing the local roads (presumably because there are so many), it can be reasonably assumed that any road not specifically designated on the Roadway Classification map exhibits of the 2020 Sonoma County General Plan Circulation and Transit Element is a "Local Road." Figure CT-4h (Petaluma and Environs) Roadway Classification map exhibit specifically identified the following road types: Freeway, Urban Principal arterial, Urban Minor Arterial, Rural Principal Arterial, Rural Minor Arterial, Rural Major Collector and Rural Minor Collector roads. Cannon Lane is not classified as one of these road types so it can be assumed for basic road circulation planning purposes that Cannon Lane is a "Local Road." This assumption is further supported by the 2008 Interim Park Plan IS/MND as it described Cannon Lane as a "Local Road."

To our knowledge the Tolay Lake Regional Park Master Plan has not yet estimated the number of park visitors and vehicle trips per day that will be using Cannon Lane. Any estimates of visitors and traffic should take into consideration that Cannon Lane, a Local Road, is proposed as the primary, public, vehicular access to the park. The residents and users of Cannon Lane will experience a dramatic increase in vehicular traffic over present conditions and even more so compared to the traffic levels associated with the Cardoza Family Ranch as a result of the regional park. Due to the historic low volume of traffic on that road, it is unusual for residents or ranchers to encounter on-coming vehicles. The regional park will change all of that to the point where on-coming traffic and congestion will be the norm from dawn to dusk every day of the week. In addition, there are times during the year where slow moving, large, agricultural equipment will be using the road. There is no way to mitigate or maintain the current character of Cannon Lane by introducing and placing regional traffic on this road. The existing baseline traffic conditions used for the EIR should reflect those that were common to the Cardoza Ranch so a true picture of impact can be presented.

The EIR should also evaluate other access alternatives including the purchase of other lands so the park would have direct frontage on Lakeville Road or otherwise have its own dedicated exclusive access road into the park. The size of the proposed park has already grown significantly over the initial size of the Cardoza acquisition in 2006. This fact alone would further contribute to the need for a dedicated access road. Until a single purpose access road can be developed or acquired, the regional park use of Cannon Lane should be limited based on the historic traffic conditions at the Cardoza Ranch. The EIR should fully examine the lack of a single purpose, dedicated access road and recommend that full use of the park not occur until such time that a separate access road is developed.

Fuel Breaks

All of the farmers in the northern area of the regional park lands disc a fuel break very year along their property lines to reduce the hazards of grass fires spreading from one field to another. To date, the Sonoma County Regional Parks Department has not disced similar fuel breaks on their land adjoining their neighbors. A good neighbor policy would suggest that the Tolay Lake Regional Park land be similarly treated, as the regional park is proposed in the middle of an extensive and intensive farming area. Schaller is very concerned that park visitors will be allowed to smoke and that the careless disposal of cigarettes will result in a grass fire that could spread to adjoining lands. He also requests that no open fires of any kind be permitted during the declared fire season.

Mosquito/West Nile Virus and other Vector control program

According to the November 2, 2006, letter (attached) to Mr. Steve Ehret, from Erik Hawk, Special Projects Supervisor/Biologist of the Marin/Sonoma Mosquito and Vector Control District "Tolay Lake has the potential to become a significant source of mosquito production." The Cardoza Family ranch "…Tolay Lake was drained in March of each year and vegetation in the lake bottom was disced to facilitate planting of crops." The Tolay Lake Regional Park Master Plan proposes that a virtual year-round lake, along with emergent vegetation, be permanently established. The letter goes on to state that "the historical management of Tolay Lake did not provide the habitat necessary for significant and sustained mosquito production." All of that will change with the proposed master plan. This letter further states, "The historical practice of draining Tolay Lake most likely precluded production of mosquitoes in the genus *Culex*. If water management in Tolay Lake were to change and water was to be impounded beyond the month of March, *Culex tarsalis, Culex pipiens* and *Culex erythrothorax* mosquitoes would result. The previous mentioned *Culex* speices are the primary vectors of West Nile virus and are also vectors of Western Equine and Saint Louis encephalitis. If the duration of impounded water in Tolay Lake were to increase, the management of emergent and floating vegetation would also become increasingly important."

My client is most concerned about sustained mosquito production with a year-round permanent lake and emergent vegetation becoming a breeding ground for mosquitoes of all types and particularly with the heightened potential of those carrying West Nile Virus. He is also concerned that management practices requiring human systems to stay on top of vector suppression and eradication may not be adequate.

Concluding Comments

As can be realized from these comments, my client is concerned about the direct impacts of the establishment (continuation) of a permanent lake on his farming practices and the change in character that a regional park will bring to this long-time agricultural producing area of Sonoma

County. In addition to the concerns presented above, he requests that the following prohibitions be applied throughout the park:

a. Any kind of outdoor public announcement or broadcasting equipment
b. All types of watercraft
c. No organized night time activities (not including supervised organized small group camping) or park visitors
d. Dogs except for seeing eye assistance
e. No nighttime lighting except for security purposes
f. Prohibition of smoking of any type and open fires on park grounds

On behalf of my client, I thank you for the opportunity to submit these comments. My client has raised these concerns in the past and feels most frustrated that the Regional Parks Department has proceeded with the establishment of a year round lake to the detriment of his farming practices, without advising him and without first conducting detailed environmental analysis. In short, he feels that the Sonoma County Regional Parks Department is being given a pass and not being held to the same project and environmental review standards that a private developer would.

We look forward to and appreciate your careful consideration of these concerns. Please contact me should you have any questions or have a need for clarification.

Sincerely,

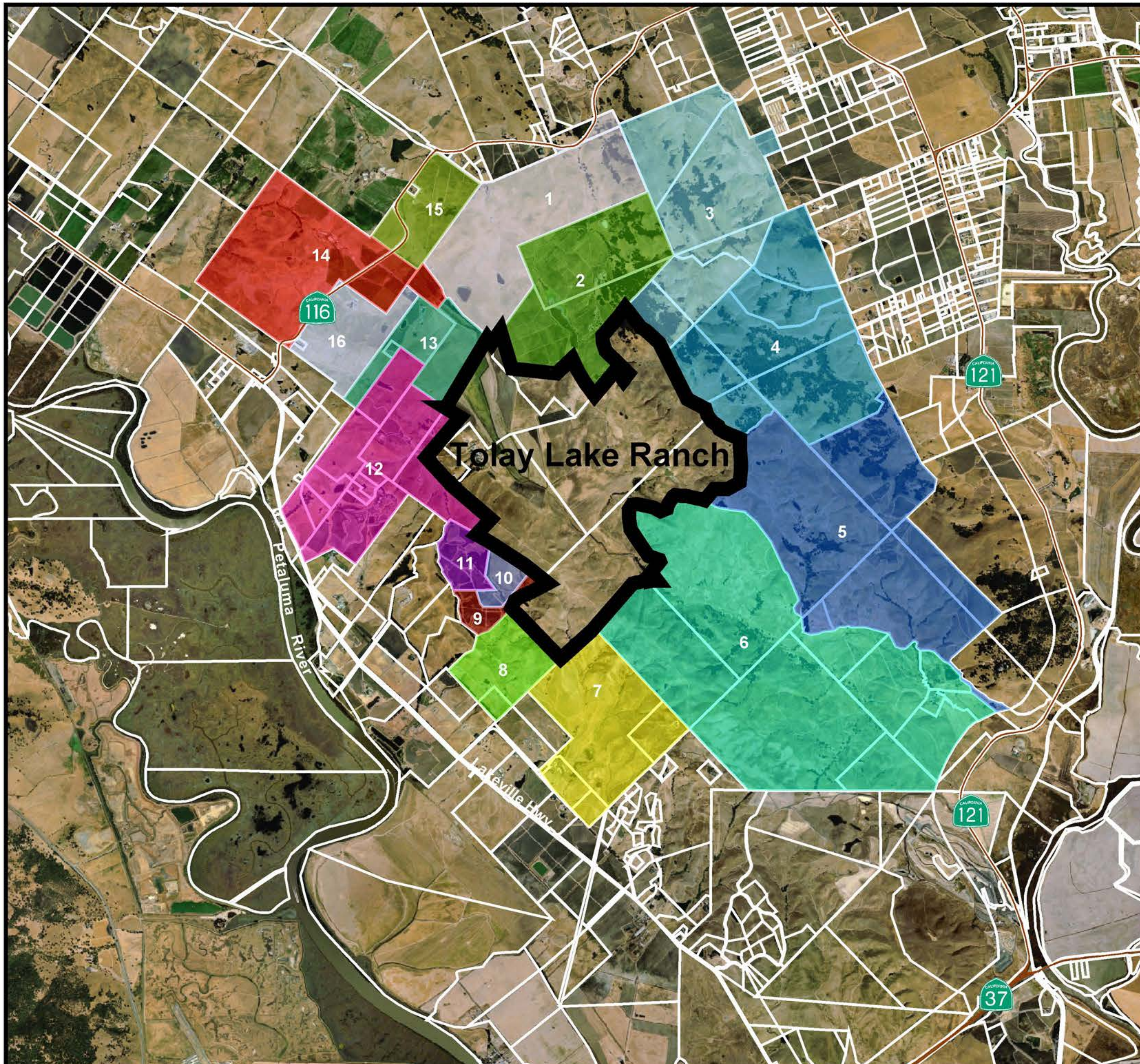
Thomas A. Parilo

Thomas A. Parilo, Principal

Attachments

Aerial maps—Tolay Lake 9-30-2002 and 4-1-2015
March 13, 2007, letter from Mr. Steve Ehret
November 2, 2006 letter from M/SMVCD

Tolay Lake
Adjacent Property Owners Map



1 - David Martinelli
APN 068-050-020 &, 068-053-001

2 - Fred Cline (Oxfoot Associates)
APN 068-050-012 & 27

3 - Sandra Donnell
APN 068-070-007, 142-111-007, 142-091-005, 6 & 11

4 - Bruce Donnell
APN 068-080-006, 068-070-005, 6, 142-091-003, 142-111-004 & 6

5 - Nancy Lilly (Donnell Family)
APN 068--090-010, 11, 12, 15, 142-111-003, & 068-080-005

6 - Genevieve & Joseph Roche
APN 068-090-001, 15, 16, 17, 18, 19, 20, 23, 068-080-002 & 3

7 - George & Margaret Gambonini
APN 068-110-037, 39, 42 & 43

8 - Allen Marcucci
068-110-016 & 17

9 - Paul & Marjorie Martin
APN 068-110-035

10 - Avid Modjtabai
APN 068-110-036

11 - Soroush Kaboli
APN 068-110-033

12 - Arturo Keller (Universal Portfolio & Financial Portfolios)
APN 068-060-044, 52, 53, 54, 56, 60, 61, 62, 63, 64, & 65

13 - Dr. Lee Schaller
APN 068-060-045, 46, & 55

14 - Joseph Mendoza
APN 068-020-011, 13, & 14

15 - Margaret Kullberg
APN 068-050-008 & 10

16 - Gloria Altenreuther
APN 068-020-017

REGIONAL PARKS SONOMA COUNTY

Feet 0 1,500 3,000 6,000 9,000 12,000

N W E S

June 2006

REGIONAL PARKS
SONOMA COUNTY

SONOMA COUNTY REGIONAL PARKS

MARY E. BURNS
DIRECTOR

2300
County Center Drive
Suite 120A
Santa Rosa
CA 95403
Tel: 707 565-2041
Fax: 707 579-8247
www.sonoma-county.org/parks

March 13, 2007

Thomas Parilo
10320 Tillicum Way
Nevada City, CA 95959

RE: Tolay Lake Regional Park

Dear Mr. Parilo:

Please find the attached copy of the Tolay Lake Interim Traffic Recommendations Report, a Baseline Report, and Conditions Report.

Thank you for taking the time to discuss Tolay Lake Regional Park planning issues last week and providing me the opportunity to update you on some of the details.

Most importantly, Dr. Schaller should be aware that we are proposing to pump the lake down to our northerly property boundary in the spring during our Interim Plan period. Although we still have written approvals to obtain before implementing this approach, California of Department of Fish & Game representatives have verbally agreed this would be acceptable to them. It is our intention to honor the restrictions of the conservation easements while maintaining the hydrologic patterns that allow Dr. Schaller to farm his land.

Secondarily, we are proposing all of the improvements necessary for lake restoration be contained within our property. Although the Ducks Unlimited Feasibility Study did consider one lake design alternative (Alternative 6, Figure 10) that would go beyond our property, Regional Parks is not in a position to pursue this option due to the legal complexity and deadlines associated with the Water Rights application.

As discussed, neighbor relationships are very important to Regional Parks. Regional Parks has included its neighbors in the following facets of planning Tolay Lake Regional Park: we have held neighbor meetings before and after the acquisition, involved the neighbors in the Technical Advisory Committee, and reiterated our understanding of neighbor concerns and our approach to addressing the concerns at nearly all public meetings. We are considering modifying our Interim Plan project goal to emphasize the importance of working with our neighbors and the local Native American tribe.

Please let me know if there is anything are other issues you would like to discuss or if I or someone else can provide you with any clarification regarding this letter or the project. Please contact Michelle Julene at 565-3962 or mjulene@sonoma-county.org for issues regarding the environmental document and process.

Sincerely,

Steve Ehret
Park Planner

cc: Dr. Lee Schaller
Jeff Glazer, North Fork Associates
Michelle Julene, Environmental Specialist
Patrice Cox, Park Planning Manager

Attachments:

- Baseline Report
- Conditions Report
- Interim Traffic Recommendations

MARIN / SONOMA
MOSQUITO AND VECTOR CONTROL DISTRICT

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TELEPHONE (707) 285-2200 FAX (707) 285-2210

Mr. Steve Ehret
Sonoma County Regional Parks
2300 County Center
November 2, 2006Drive, Suite 120A
Santa Rosa, 95403

Dear Mr. Ehret:

I would like to thank you for meeting with Jason Sequeira and me at Tolay Lake Regional Park on October 30, 2006 and for the information you provided in regard to the historical and future management of the site. During our site visit, Jason and I identified some potential mosquito related issues that the Marin/Sonoma Mosquito and Vector Control District (MSMVCD) and Sonoma County Regional Parks will need to discuss and work cooperatively on over the next several years.

Tolay Lake: Tolay Lake has the potential to become a significant source of mosquito production. Mosquito production in Tolay Lake would be dependent upon water and vegetation management. It is our understanding that Tolay Lake was drained in March of each year and vegetation in the lake bottom was disced to facilitate the planting of crops. The historical management of Tolay Lake did not provide the habitat necessary for significant and sustained mosquito production.

On October 30th we observed dense and abundant vegetation in the bottom of Tolay Lake and it is our understanding that discing of the lake bottom will cease. It is possible that production of mosquitoes in the genus *Culiseta* and *Aedes* could occur at the onset of the winter rains. While mosquitoes in the genus *Culiseta* and *Aedes* are not known to be major vectors of disease at this time, they can be aggressive and cause severe nuisance issues.

The management of water in Tolay Lake will be important relative to mosquito production in the spring and summer months. The historical practice of draining Tolay Lake in the month of March most likely precluded production of mosquitoes in the genus *Culex*. If water management in Tolay Lake were to change and water was to be impounded beyond the month of March, it is possible that production of *Culex tarsalis, Culex pipiens,* and *Culex erythrothorax* mosquitoes would result. The previously mentioned *Culex* species are the primary vectors of West Nile virus and are also vectors of Western Equine and Saint Louis encephalitis. If the duration of impounded. water in Tolay Lake were to increase, the management of emergent and floating vegetation would also become increasingly important.

Spring Fed and Upland Ponds: The management of emergent, floating, and potentially invasive vegetation in ponds is important in minimizing mosquito production. Vegetation management also allows for efficient and effective mosquito control operations when necessary.

Upland pond #1 and the spring fed willow pond did not appear to provide suitable habitat for mosquitoes at the time of our visit.

Upland pond #2 with its dense stand of cattails *(Typha* sp.) could potentially produce mosquitoes and provide challenges with respect to mosquito larviciding. MSMVCD would suggest that cattail growth be monitored in upland pond #2 to prevent an invasive situation.

The spring fed duck pond has been invaded by creeping water primrose *(Ludwigia* sp.) and has the potential to be a significant mosquito problem. *Ludwigia* provides excellent habitat for mosquitoes and can result in difficult and costly mosquito control operations.

Low Areas, Springs, Creeks, and Channels: The low areas, springs, creeks, and man made channels on the property could potentially provide habitat for mosquitoes during the winter, spring, and early summer months. As previously mentioned, mosquito species in the genus *Culiseta* and *Aedes* can be extremely aggressive nuisance species in the winter and spring months. Sonoma County Regional Parks and MSMVCD may need to discuss tolerance levels for park staff and visitors with regard to *Culiseta* and *Aedes* species if nuisance issues arise.

Mosquito Fish: There are many livestock water troughs within Tolay Lake Regional Park. Mosquito production may occur in water troughs and contribute substantially to mosquito populations in the park. The use of mosquito fish as a biological control mechanism is a viable option in the water troughs and could be potentially beneficial in the spring fed and upland ponds as well. Mosquito fish would be provided to park staff by MSMVCD.

Beginning in winter 2006/2007 MSMVCD will need to conduct mosquito surveillance at Tolay Lake Regional Park on a regular basis. Mosquito surveillance will provide MSMVCD with data on the distribution and abundance of larval and adult mosquitoes in the park. Larval mosquito surveillance is accomplished through the use of a twelve-ounce dipper cup attached to a broom handle and adult mosquito surveillance throe • h the use of dry ice baited traps.

Throughout the three to five year interim management phase of Tolay Lake Regional Park an adaptive management strategy will be important in working toward a management strategy for the Tolay Lake Regional Park Master Plan. It will also be important for MSMVCD and Regional Park staff to continue to communicate and work cooperatively throughout the Tolay Lake Project. MSMVCD staff and I look forward to working with you and Regional Park staff in the future.

Sincerely,

Erik Hawk
Special Projects Supervisor/Biologist

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

JUL 23 2015

In Reply Refer to
ATC: A30558

Karen Davis-Brown, Park Planner II
Sonoma County Regional Parks Department
2300 County Center Drive, Suite 120a
Santa Rosa, CA 95403

NOTICE OF PREPARATION OF ENVIRONMENTAL IMPACT REPORT (EIR) FOR THE TOLAY LAKE REGIONAL PARK MASTER PLAN PROJECT (PROJECT); WATER RIGHT APPLICATION 30558 OF SONOMA COUNTY TO APPROPRIATE WATER FROM TOLAY CREEK IN SONOMA COUNTY

Dear Ms. Davis-Brown:

On July 2, 2015, the State Water Resources Control Board (State Water Board), Division of Water Rights (Division) received your Notice of Preparation (NOP) for the project identified above. The NOP indicates that Sonoma County Regional Parks Department (Regional Parks), acting as Lead Agency under the California Environmental Quality Act (CEQA), intends to prepare an EIR for said project. The project will include recreational improvements for multi-use and hiking trails; equestrian facilities; park center with visitor center; water supply and wastewater facilities including various improvements to existing facilities. This project includes facilities that area currently being processed by the Division under water right Application No. 30558 filed on August 13, 1996. The Division previously commented on the on the project via letters dated October 13, 2006 and September 17, 2002. The comments provided on those letters remain applicable. Copies of these letters are included for your reference.

As a Responsible Agency under the California Environmental Quality Act (CEQA), the Division has the responsibility to evaluate impacts to the environment and public trust resources. Since the preparation of the Initial Study, the State Water Board adopted the Policy for Maintaining Instream Flows in Northern California Coastal Streams (policy) which became effective on February 4, 2014. The policy focuses on measures that protect native fish populations, with a particular focus on anadromous salmonids (e.g. steelhead trout, coho salmon, and Chinook salmon) and their habitat. The policy prescribes protective measures regarding the season of diversion, minimum bypass flow, and maximum cumulative diversion. Flow-related impacts are evaluated using a water availability analysis which includes (1) a water supply report that quantifies the amount of water remaining instream after senior diverters are accounted for, and (2) a cumulative diversion analysis that evaluates the effects the proposed project, in combination with existing diversions, on instream flows needed for fishery resources protection. The project is located within the geographic scope of the policy. In order for the Division to use the EIR in the processing of water right Application No. 30558, proper analysis of these impacts should be covered in the document. For more information about the policy, please visit this web site: http://www.waterboards.ca.gov/waterrights/water_issues/programs/instream_flows/

In addition to any consideration under CEQA, the Division must also consider the effect of the water right Application No. 30558 on public trust resources and avoid or minimize harm to those resources where feasible. This analysis may include but is not limited to, wildlife, fish, aquatic dependent species, streambeds, riparian areas, tidelands, and recreation.

If you require further assistance, I can be contacted at (916) 341-5352 or by email at angeles.caliso@waterboards.ca.gov. Written correspondence should be addressed as follows: State Water Resources Control Board, Division of Water Rights, Attn: Angeles Caliso, P.O. Box 2000, Sacramento, CA 95812-2000.

Sincerely,

Angeles Caliso
North Bay Unit
Division of Water Rights

Enclosures: Division letters dated October 13, 2006 and September 17, 2002.

cc: State Clearinghouse
P.O. Box 3044
1400 10th Street
Sacramento, CA 95812-3044

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor ♦ Sacramento, California 95814 ♦ 916.341.5300
P.O. Box 2000 ♦ Sacramento, California 95812-2000
Fax: 916.341.5400 ♦ www.waterrights.ca.gov

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

OCT 13 2006

Michelle Julene
Sonoma County Regional Parks
2300 County Center Drive, Suite 120A
Santa Rosa, CA 95403

Dear Ms. Julene:

REVIEW OF THE INITIAL STUDY FOR TOLAY LAKE REGIONAL PARK PROJECT, STATE CLEARINGHOUSE #2006092037

The State Water Resources Control Board (State Water Board), Division of Water Rights (Division) received your letter on September 15, 2006 requesting comments on the Initial Study to help focus the Environmental Impact Report (EIR) for the Tolay Lake Regional Park Project. The proposed project includes water right Application 30558, which was filed on August 21, 1996. Application 30558 was filed to collect 1,110 acre-feet per annum (afa) of water to storage into two existing onstream reservoirs and three proposed offstream reservoirs. A Petition for Change of the points of diversion, points of rediversion, and the purposes and places of use under Application 30558 was received on September 25, 2006. The petition requests modification of the points of diversion for the three proposed offstream reservoirs, to a single onstream reservoir to restore the historic Tolay Lake. The Petition for Change is currently under review by Division staff.

As a Responsible Agency under the California Environmental Quality Act (CEQA), the Division has a responsibility to evaluate the environmental and public trust impacts of the appropriation. All known and reasonably foreseeable impacts need to be evaluated. The impacts need to be evaluated as to whether or not the impacts are significant and an explanation needs to be based upon substantial evidence. If an impact is significant, then the EIR must describe feasible measures that could avoid or minimize the significant adverse impacts. The discussion should determine if the mitigation measures bring the impacts to a level of less than significant. If a significant impact cannot be avoided or minimized to a level that is less than significant then the implications of these impacts should be shown and an explanation of why the project is being proposed notwithstanding their effect should be provided. This is necessary since the State Water Board must make a Statement of Overriding Considerations weighing the benefits of the proposed project against the unavoidable adverse environmental impacts in order to make a decision to issue a water right permit.

The State Water Board must also consider if approval of the project is in the public interest and if the project design and proposed mitigation measures provide protection of public trust resources. The EIR should evaluate the potential impacts of all known and foreseeable future water development projects including but not limited to, riparian diversions, small domestic registrations, livestock stockpond registrations, and all pending applications to appropriate water.

In a letter dated September 17, 2002, (copy enclosed) the Division described to the applicant potential impacts of the project on environmental and public trust resources that need to be evaluated in order to proceed with the application. Although the proposed petition has modified the project since the letter was prepared, many of the potential impacts described in the letter still apply.

The comments in this letter are based upon the project as a whole, taking into account the existing water right application, the changes that are proposed in the Petition for Change, and the project description outlined in the Initial Study. These comments may repeat or elaborate on comments made in the September 2002 letter. In order for the EIR to meet the Division's needs as a responsible agency, the EIR needs to address, at a minimum, the potential impacts of the project to aquatic resources. However, the following comments are not meant as a complete list of potential impacts, as some impacts may surface when more information becomes available. Potential impacts that need to be evaluated include, but are not limited to:

The EIR should describe all potential impacts to fishery resources in Tolay Creek and Sonoma Creek. A biological survey should be conducted to determine the aquatic resources that exist or may have existed within the zone of influence of the proposed project. Emphasis should be placed on the potential for aquatic species that may be listed as threatened or endangered on the federal or state endangered species listings.

A Water Availability Analysis (WAA)/Cumulative Flow Impairment Index (CFII) Report should be prepared to determine if water is available for appropriation. The report can also serve as a basis for evaluating the cumulative impacts to instream aquatic downstream resources. Contact the California Department of Fish and Game (DFG) staff to select Points of Interest (POIs) for the WAA/CFII. A CFII is calculated at each POI. These CFII calculations are an important tool in determining the cumulative impacts of diversions to anadromous fish. For more information on preparing a WAA/CFII report, consult the enclosed example of a WAA/CFII report.

To examine cumulative impacts to anadromous fish refer to the Draft "Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams" (NMFS-DFG Draft Guidelines) updated on June 17, 2002. The National Marine Fisheries Service (NMFS) and DFG developed these draft guidelines for protecting fishery resources downstream of water diversions in the California coastal watersheds from the Mattole River to San Francisco and for coastal streams entering northern San Pablo Bay. Tolay Creek is within the geographical area referred to in the NMFS-DFG Draft Guidelines; and therefore, these guidelines can be used to examine impacts to instream flows for the protection of fishery resources for this project.

A wetland delineation should be conducted using protocols acceptable the U.S. Fish and Wildlife Service and DFG to determine the potential impacts to wetlands.

Examine the seasonal impacts of storing water in Tolay Lake and any proposed draining of the lake in early spring. This change to the hydrology can affect fish and wildlife species and may be different from what the species are accustomed. This can particularly have an effect on the migration of Steelhead.

The EIR should describe all the known water diversion and water storage facilities in the Tolay Creek watershed. The description should include the locations, amounts, and priority of all known water rights that may be impaired by the proposed project.

The EIR should also provide an evaluation of the proposed project and the pending water right application and Petition for Change to ensure consistency with the environmental impact analysis and the water rights process.

Enclosed is a copy of the most updated version of the NMFS-DFG Draft Guidelines, an example of a WAA/CFII report and a copy of the September 17, 2002 letter.

Thank you for the opportunity to provide comments on the Initial Study. We look forward to working with you during the EIR process. If you have any questions or would like additional information regarding any of these comments feel free to contact Joseph Bandel at (916) 552-9286 or via email at jbandel@waterboards.ca.gov.

Sincerely,

Steven Herrera

Steven Herrera, Chief
Water Right Permitting Section

Enclosures (3)

cc: State Clearinghouse
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

Winston H. Hickox
Secretary for
Environmental
Protection

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor • Sacramento, California 95814 • (916) 341-5300
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
FAX (916) 341-5400 • Web Site Address: http://www.waterrights.ca.gov

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SEP 17 2002

CERTIFIED

Cardoza Ranches 1830 2194 ✓RDC
c/o Ms. Kathy Cardoza
5869 Lakeville Highway
Petaluma, CA 94954

Dear Ms. Cardoza:

APPLICATION A030558 – CARDOZA RANCHES

The purpose of this letter is to discuss the status of your application for a water right permit and to describe activities that you must complete in order for the State Water Resources Control Board (SWRCB), Division of Water Rights (Division), to continue processing your application. Currently, the Division is faced with a shortage of technical staff and a backlog of pending applications and change petitions. As a result, the Division has implemented a new policy. The applicant will now be responsible for completing most technical activities that will be required in order for the Division to act on the application and issue a permit. This approach is similar to policies employed by most other government permitting agencies. A water right permit is a property right, similar to a building permit or an approved subdivision map. The water right permit attaches to the land and, in some cases, is of substantial value. Consequently, the cost of completing the major technical activities necessary to secure the permit should, appropriately, be borne by the person(s) realizing economic gain from the permit.

Because of previous cooperation between the Cardoza Ranches applicants and Mr. Joseph G. Roche (Application A030579) concerning preparation of a Water Availability Analysis assessing the combined effects on streamflow of your two proposed projects, a similar letter is also being sent to Mr. Roche.

Background Information

On August 21, 1996, you submitted an application requesting a water right permit that would authorize storage of 1,100 acre-feet per annum (afa). The proposed project would authorize storage in two existing, onstream (but unpermitted) 25 acre-foot reservoirs, plus storage in three additional offstream reservoirs (not yet constructed) with capacities of 500, 300 and 250 acre-feet. The proposed purposes of use include irrigation and frost protection for 1,500 acres of grapes, plus stockwatering, domestic and recreation purposes. Water would be diverted from Tolay Creek and unnamed tributaries of Tolay Creek in Sonoma County. The proposed season of diversion would be October 1 to May 15 of each year.

SURNAME DWR 540					
[signature] 09/11/2002	MJ [signature] 9/12/02	MFS for 2LB 9/12/02	Beringer 9/13/02 for HMS		

On December 12, 1997, the Division distributed a notice of your application to interested parties. Protests were submitted by several parties, including the California Sportfishing Protection Alliance (CSPA), Joseph G. Roche, Gamma Development Corporation, and Margaret Kullberg. Applicant has accepted protest dismissal conditions for Roche and Gamma Development. The CSPA and Kullberg protests are apparently unresolved at this time.

Potential Cumulative Impacts on Threatened and Endangered Species

The Central California Coast steelhead (*Onchorhynchus mykiss*) was federally listed by the National marine Fisheries Service (NMFS) as threatened under ESA (62 FR 43938, August 18, 1997). Division staff held a series of meetings with NMFS, Department of Fish and Game (DFG) and other interested parties to develop methods to assess potential site-specific and cumulative impacts of new water projects on anadromous fishery resources in coastal watersheds, including certain watersheds within San Francisco Bay. This assessment method is described in a document entitled *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams* [Draft], dated June 17, 2002, prepared by NMFS and DFG [copy enclosed]. This document will hereinafter be referred to as the Guidelines. As described in the Guidelines, NMFS and DFG are concerned that the proposed projects on Tolay Creek may have the potential to cause significant adverse impacts to anadromous fishery resources if the total <u>October 1 through March 31</u> diversion demand within the stream is greater than <u>five</u> percent of the average unimpaired <u>December 15 through March 31</u> seasonal runoff at any point downstream where fish are present. The specific locations of concern in the watershed are called the Points of Interest (POIs) and are selected by NMFS and DFG.

As a result of correspondence with Division staff in 1999, a report prepared by James C. Hanson was submitted to the Division in October 2000 on behalf of your and Mr. Roche's applications. This report presented the results of a preliminary Water Availability Analysis (WAA) for the Tolay Creek watershed, including all existing senior diverters plus your proposed project and that proposed by Mr. Roche. The report indicates that the combined projects will divert most of existing stream flow in average years, during the months of November, December and January. In dry years, the combined projects will essentially eliminate flows in Tolay Creek in nearly all months. It is unclear to what extent steelhead utilize Tolay Creek, including the tidal portion of the creek. It is also unclear to what extent the proposed projects will affect freshwater and tidal marshes in the lower reaches of Tolay Creek, with possible effects on listed species.

The environmental documents for the Santa Rosa Subregional Long-Term Wastewater Project (June 1996) also indicate the presence of California red-legged frog (*Rana aurora draytoni*) in the Tolay Creek watershed. The U.S. Fish and Wildlife Service (USFWS) has listed the red-legged frog as a threatened species in accordance with the ESA. The USFWS has also listed the California freshwater shrimp (*Syncaris pacifica*) as an endangered species; this species is known to be present in water bodies near Tolay Creek. Other listed species may also be affected by your proposed project.

SEP 17 2002

Request for Information

Before the Division can continue processing your application, you will need to make a specific showing that your project can be operated so as not to contribute to existing or potential significant cumulative impacts on steelhead, red-legged frog, freshwater shrimp, and other species in Tolay Creek. This will require that you hire a qualified consultant to develop recommendations for specific project modifications or other actions (mitigation measures) that could be taken to prevent your project from contributing to these significant cumulative impacts.

As part of this process you must determine whether the total diversion demand in Tolay Creek, including your proposed diversion, may cause a significant adverse impact to anadromous fishery resources, and prepare a Water Availability Analysis/Cumulative Flow Impairment Index Report (WAA/CFII Report). An example of how the WAA/CFII Report should be formatted is enclosed. Division staff has contacted NMFS and DFG, who have determined the appropriate POI for the WAA/CFII analysis. The NMFS and DFG should be contacted directly if the CFII at any POI is greater than five percent, since additional hydrologic or biological analysis may be required. Please consult the Guidelines for further information on when and how these further studies should be conducted.

The Hanson report discussed above was calculated using a different method than the method currently employed. Given the high percentage of streamflow predicted to be diverted by your and Mr. Roche's proposed projects, it may not be necessary to recalculate this WAA. Your calculation also used the same Point of Interest (POI) (the lower end of the non-tidal reach of Tolay Creek, east of the railroad tracks) which would be used in the Guidelines methodology. If you choose to recalculate the WAA, including calculating what effect your proposed project would have independent of Mr. Roche's, the new methodology should be used.

You should be aware that the issuance of a water right permit is a discretionary action, as defined by the California Environmental Quality Act (CEQA). CEQA requires that the SWRCB, as lead agency, prepare the appropriate environmental document. As the applicant, you are responsible for all costs related to the environmental evaluation and the preparation of the CEQA document.

In view of the above discussion, we request that you advise the Division whether you intend to continue the water right permit application process. Please submit your reply in writing within 30 days of the date of this letter. If you do not respond in writing within 30 days, we will assume that you no longer want to obtain a water right permit and the Division will proceed with the cancellation of your application, in accordance with section 1276 of the California Water Code.

If you want the Division to continue processing your application, you need to clearly demonstrate that you are taking significant steps to complete the water right process. Within 60 days of the date of this letter, you need to complete and sign a Memorandum of Understanding (MOU) with the SWRCB that clearly sets forth the roles of the (1) SWRCB, (2) you, the water right applicant, and (3) your consultant. (See enclosed list of environmental and engineering consultants who are familiar with the preparation of CEQA documents and the water rights process.) Upon receipt of a completed and signed MOU, we will return an executed copy to you.

A copy of the MOU template is enclosed.

Within 60 days of the date of the executed MOU, your consultant must submit a preliminary work plan that includes a description of the tasks to be performed, including the scope of the WAA/CFII analysis to be performed; the specific environmental studies to be performed; a list of permits required to construct and implement your project; and a schedule for consultation with DFG, NMFS and any local, state or federal agency from whom a permit may be required. Based on this preliminary work plan, Division staff and your consultant will then set a schedule for preparation of a final work plan and completion of tasks. The final work plan shall include detailed descriptions of, and a schedule of completion for, any biological, endangered species and archeological survey reports requested by the SWRCB, and a WAA/CFII Report as described above. It is important that the WAA/CFII Report be completed prior to starting the CEQA process, as the results could determine the scope and content of the CEQA document.

Failure to submit the above requested information by the final completion date may result in cancellation of your application and possible enforcement action by the Division concerning your two existing, unpermitted reservoirs. **Note: Even if you decide not to proceed with the entire proposed project, you are still required to obtain a water right permit for your two existing (unpermitted) reservoirs, unless you can demonstrate the such permits are not needed, based on evidence of a riparian right or a pre-1914 appropriative right.**

For Further Information
If you have questions regarding the Guidelines please contact:

NMFS, Dr. William Hearn Phone - (707) 575-6062 - E-Mail: William.Hearn@NOAA.gov
Dr. Stacy Li Phone - (707) 575-6082 - E-Mail: Stacy.Li@NOAA.gov
DFG, Ms. Linda Hanson Phone - (707) 944-5562 - E-Mail: Lhanson@dfg.ca.gov

Mailing addresses for the above contact persons are given below.

Please contact Mohammed Khan in the Applications Section at (916) 341-5243, or Jim Sutton in the Environmental Section at (916) 341-5388, if you have any questions or would like to discuss the requirements described in this letter.

Sincerely,

ORIGINAL SIGNED BY

Harry M. Schueller
Chief Deputy Director

Enclosures (5)

cc: See next page.

SEP 17 2002

cc: Dr. William Hearn
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6528

Dr. Stacy Li
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404-6528

Ms. Linda Hanson
Department of Fish and Game, Region 3
P.O. Box 47
Yountville, CA 94599

Mr. Robert W. Floerke, Regional Manager
Department of Fish and Game, Region 3
P.O. Box 47
Yountville, CA 94599

Mr. Larry Week, Chief
Native Anadromous Fish and Watershed Branch
Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Ms. Nancee Murray, Staff Counsel
Department of Fish and Game
Office of the General Counsel
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

bcc: MF, SRH, RAS, LLA, RSS, MK (w/o enclosures)

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Appendix B

Air Quality and GHG Modeling

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

Tolay Lake Master Plan Existing Operational Emissions

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	150.00	Acre	150.00	6,534,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2018
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Operational run for existing conditions at Tolay Lake Regional Park.

Land Use -

Vehicle Trips - PTG - Model to reflect 30 trips per day on weekdays and 60 trips per day on the weekend with a distance of 14.4 miles, as presented in the distribution of trips from TIA Phase A. All trips presumed to be primary trips due to the remote location.

Fleet Mix - PTG - Fleet mix updated to reflect what conditions would be in 2022, since fleet mix is presumed to stay approximately constant.

Table Name	Column Name	Default Value	New Value
tblFleetMix	HHD	0.02	0.00
tblFleetMix	LDA	0.57	0.61
tblFleetMix	LDT1	0.04	0.04
tblFleetMix	LDT2	0.19	0.19
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	5.3750e-003	5.3580e-003
tblFleetMix	MCY	6.0050e-003	5.8740e-003
tblFleetMix	MDV	0.12	0.11
tblFleetMix	MH	8.6400e-004	0.00
tblFleetMix	MHD	0.02	0.02
tblFleetMix	OBUS	2.4590e-003	0.00
tblFleetMix	SBUS	8.6800e-004	8.8700e-004
tblFleetMix	UBUS	2.6830e-003	0.00
tblVehicleTrips	CC_TL	7.30	14.40
tblVehicleTrips	CNW_TL	7.30	14.40
tblVehicleTrips	CW_TL	9.50	14.40
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PR_TP	66.00	100.00
tblVehicleTrips	ST_TR	22.75	0.40
tblVehicleTrips	SU_TR	16.74	0.40
tblVehicleTrips	WD_TR	1.89	0.20

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0178	0.0545	0.2801	8.3000e-004	0.0746	9.1000e-004	0.0755	0.0199	8.5000e-004	0.0208	0.0000	74.8469	74.8469	2.4400e-003	0.0000	74.9079
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.0794**	**0.0545**	**0.2815**	**8.3000e-004**	**0.0746**	**9.2000e-004**	**0.0755**	**0.0199**	**8.6000e-004**	**0.0208**	**2.6186**	**256.8227**	**259.4413**	**0.1654**	**1.7000e-003**	**264.0844**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0178	0.0545	0.2801	8.3000e-004	0.0746	9.1000e-004	0.0755	0.0199	8.5000e-004	0.0208	0.0000	74.8469	74.8469	2.4400e-003	0.0000	74.9079
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.0794**	**0.0545**	**0.2815**	**8.3000e-004**	**0.0746**	**9.2000e-004**	**0.0755**	**0.0199**	**8.6000e-004**	**0.0208**	**2.6186**	**256.8227**	**259.4413**	**0.1654**	**1.7000e-003**	**264.0844**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	12/23/2016	12/22/2016	5	220	
2	Building Construction	Building Construction	12/23/2016	12/22/2016	5	3100	
3	Demolition	Demolition	12/23/2016	12/22/2016	5	200	
4	Grading	Grading	12/23/2016	12/22/2016	5	310	
5	Paving	Paving	12/23/2016	12/22/2016	5	220	
6	Site Preparation	Site Preparation	12/23/2016	12/22/2016	5	120	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 775

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	1	549.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	2,744.00	1,071.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Architectural Coating - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Architectural Coating - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0178	0.0545	0.2801	8.3000e-004	0.0746	9.1000e-004	0.0755	0.0199	8.5000e-004	0.0208	0.0000	74.8469	74.8469	2.4400e-003	0.0000	74.9079
Unmitigated	0.0178	0.0545	0.2801	8.3000e-004	0.0746	9.1000e-004	0.0755	0.0199	8.5000e-004	0.0208	0.0000	74.8469	74.8469	2.4400e-003	0.0000	74.9079

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	30.00	60.00	60.00	202,176	202,176
Total	30.00	60.00	60.00	202,176	202,176

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	14.40	14.40	14.40	33.00	48.00	19.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.606102	0.039376	0.193723	0.112069	0.016317	0.005358	0.017943	0.000000	0.000000	0.000000	0.005874	0.000887	0.000000

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0616	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Unmitigated	0.0616	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Total	**0.0616**	**1.0000e-005**	**1.4000e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8600e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.4000e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Total	**0.0616**	**1.0000e-005**	**1.4000e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8600e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	181.9732	8.2300e-003	1.7000e-003	182.6862
Unmitigated	181.9732	8.2300e-003	1.7000e-003	182.6862

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.6186	0.1548	0.0000	6.4874
Unmitigated	2.6186	0.1548	0.0000	6.4874

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Operational Run 2022 - No Contingency

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	150.00	Acre	150.00	6,534,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2022
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Ops model run for 2022.

Land Use -

Vehicle Trips - PTG - updated to reflect trip distribution pertaining to the project.

Vehicle Emission Factors -

Fleet Mix - PTG - Fleet characteristics updated to exclude trips that would not be generated by the project.

Table Name	Column Name	Default Value	New Value
tblFleetMix	HHD	0.03	0.00
tblFleetMix	LDA	0.58	0.61
tblFleetMix	MH	7.6800e-004	0.00
tblFleetMix	OBUS	2.6140e-003	0.00
tblFleetMix	UBUS	2.2740e-003	0.00
tblProjectCharacteristics	OperationalYear	2018	2022
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblVehicleTrips	CC_TL	6.60	14.42
tblVehicleTrips	CNW_TL	6.60	14.42
tblVehicleTrips	CW_TL	14.70	14.42
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PR_TP	66.00	100.00
tblVehicleTrips	ST_TR	22.75	4.59
tblVehicleTrips	SU_TR	16.74	4.59
tblVehicleTrips	WD_TR	1.89	1.70

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1236	0.3388	1.9518	7.1500e-003	0.7333	5.1600e-003	0.7385	0.1960	4.7900e-003	0.2008	0.0000	649.7429	649.7429	0.0175	0.0000	650.1796
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.1852**	**0.3389**	**1.9532**	**7.1500e-003**	**0.7333**	**5.1600e-003**	**0.7385**	**0.1960**	**4.7900e-003**	**0.2008**	**2.6186**	**831.7188**	**834.3373**	**0.1805**	**1.7000e-003**	**839.3561**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1236	0.3388	1.9518	7.1500e-003	0.7333	5.1600e-003	0.7385	0.1960	4.7900e-003	0.2008	0.0000	649.7429	649.7429	0.0175	0.0000	650.1796
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.1852**	**0.3389**	**1.9532**	**7.1500e-003**	**0.7333**	**5.1600e-003**	**0.7385**	**0.1960**	**4.7900e-003**	**0.2008**	**2.6186**	**831.7188**	**834.3373**	**0.1805**	**1.7000e-003**	**839.3561**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	12/5/2016	12/4/2016	5	220	
2	Building Construction	Building Construction	12/5/2016	12/4/2016	5	3100	
3	Demolition	Demolition	12/5/2016	12/4/2016	5	200	
4	Grading	Grading	12/5/2016	12/4/2016	5	310	
5	Paving	Paving	12/5/2016	12/4/2016	5	220	
6	Site Preparation	Site Preparation	12/5/2016	12/4/2016	5	120	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 775

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	1	549.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	2,744.00	1,071.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	6	15.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Architectural Coating - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Architectural Coating - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Building Construction - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Demolition - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Grading - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Site Preparation - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1236	0.3388	1.9518	7.1500e-003	0.7333	5.1600e-003	0.7385	0.1960	4.7900e-003	0.2008	0.0000	649.7429	649.7429	0.0175	0.0000	650.1796
Unmitigated	0.1236	0.3388	1.9518	7.1500e-003	0.7333	5.1600e-003	0.7385	0.1960	4.7900e-003	0.2008	0.0000	649.7429	649.7429	0.0175	0.0000	650.1796

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	255.00	688.50	688.50	1,988,576	1,988,576
Total	255.00	688.50	688.50	1,988,576	1,988,576

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	14.42	14.42	14.42	33.00	48.00	19.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.606102	0.039376	0.193723	0.112069	0.016317	0.005358	0.017943	0.000000	0.000000	0.000000	0.005874	0.000887	0.000000

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0616	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Unmitigated	0.0616	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Total	**0.0616**	**1.0000e-005**	**1.3800e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8600e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.3800e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8600e-003
Total	**0.0616**	**1.0000e-005**	**1.3800e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8600e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	181.9732	8.2300e-003	1.7000e-003	182.6862
Unmitigated	181.9732	8.2300e-003	1.7000e-003	182.6862

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.6186	0.1548	0.0000	6.4874
Unmitigated	2.6186	0.1548	0.0000	6.4874

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Operational Run 2040 - No Contingency

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	150.00	Acre	150.00	6,534,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2040
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Ops model run for 2040.

Land Use -

Vehicle Trips - PTG - updated to reflect trip distribution pertaining to the project.

Vehicle Emission Factors -

Fleet Mix - PTG - Fleet characteristics updated to exclude trips that would not be generated by the project.

Table Name	Column Name	Default Value	New Value
tblFleetMix	HHD	0.03	0.00
tblFleetMix	LDA	0.59	0.62
tblFleetMix	MH	6.6300e-004	0.00
tblFleetMix	OBUS	2.7950e-003	0.00
tblFleetMix	UBUS	1.6200e-003	0.00
tblProjectCharacteristics	OperationalYear	2018	2040
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblVehicleTrips	CC_TL	6.60	14.59
tblVehicleTrips	CNW_TL	6.60	14.59
tblVehicleTrips	CW_TL	14.70	14.59
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PR_TP	66.00	100.00
tblVehicleTrips	ST_TR	22.75	6.13
tblVehicleTrips	SU_TR	16.74	6.13
tblVehicleTrips	WD_TR	1.89	2.27

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0827	0.2096	1.2611	6.6800e-003	0.9915	2.7900e-003	0.9943	0.2651	2.5800e-003	0.2677	0.0000	609.1689	609.1689	0.0120	0.0000	609.4690
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.1443**	**0.2096**	**1.2625**	**6.6800e-003**	**0.9915**	**2.7900e-003**	**0.9943**	**0.2651**	**2.5800e-003**	**0.2677**	**2.6186**	**791.1448**	**793.7633**	**0.1750**	**1.7000e-003**	**798.6455**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0616	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0827	0.2096	1.2611	6.6800e-003	0.9915	2.7900e-003	0.9943	0.2651	2.5800e-003	0.2677	0.0000	609.1689	609.1689	0.0120	0.0000	609.4690
Waste						0.0000	0.0000		0.0000	0.0000	2.6186	0.0000	2.6186	0.1548	0.0000	6.4874
Water						0.0000	0.0000		0.0000	0.0000	0.0000	181.9732	181.9732	8.2300e-003	1.7000e-003	182.6862
Total	**0.1443**	**0.2096**	**1.2625**	**6.6800e-003**	**0.9915**	**2.7900e-003**	**0.9943**	**0.2651**	**2.5800e-003**	**0.2677**	**2.6186**	**791.1448**	**793.7633**	**0.1750**	**1.7000e-003**	**798.6455**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	12/5/2016	12/4/2016	5	200	
2	Site Preparation	Site Preparation	12/5/2016	12/4/2016	5	120	
3	Grading	Grading	12/5/2016	12/4/2016	5	310	
4	Building Construction	Building Construction	12/5/2016	12/4/2016	5	3100	
5	Paving	Paving	12/5/2016	12/4/2016	5	220	
6	Architectural Coating	Architectural Coating	12/5/2016	12/4/2016	5	220	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 775

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Tolay Lake Operational Run 2040 - No Contingency - Bay Area AQMD Air District, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	1	549.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	2,744.00	1,071.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	6	15.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Demolition - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Demolition - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Site Preparation - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Grading - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Grading - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 Grading - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Construction - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Construction - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.5 Building Construction - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.6 Paving - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Architectural Coating - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Architectural Coating - 2016

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.7 Architectural Coating - 2016

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0827	0.2096	1.2611	6.6800e-003	0.9915	2.7900e-003	0.9943	0.2651	2.5800e-003	0.2677	0.0000	609.1689	609.1689	0.0120	0.0000	609.4690
Unmitigated	0.0827	0.2096	1.2611	6.6800e-003	0.9915	2.7900e-003	0.9943	0.2651	2.5800e-003	0.2677	0.0000	609.1689	609.1689	0.0120	0.0000	609.4690

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	340.50	919.50	919.50	2,686,865	2,686,865
Total	340.50	919.50	919.50	2,686,865	2,686,865

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	14.59	14.59	14.59	33.00	48.00	19.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.622242	0.035728	0.192384	0.105682	0.011547	0.005282	0.020653	0.000000	0.000000	0.000000	0.005545	0.000937	0.000000

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0616	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003
Unmitigated	0.0616	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003
Total	**0.0616**	**1.0000e-005**	**1.3700e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8500e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0614					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.3000e-004	1.0000e-005	1.3700e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.6800e-003	2.6800e-003	1.0000e-005	0.0000	2.8500e-003
Total	**0.0616**	**1.0000e-005**	**1.3700e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.6800e-003**	**2.6800e-003**	**1.0000e-005**	**0.0000**	**2.8500e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	181.9732	8.2300e-003	1.7000e-003	182.6862
Unmitigated	181.9732	8.2300e-003	1.7000e-003	182.6862

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 178.722	181.9732	8.2300e-003	1.7000e-003	182.6862
Total		**181.9732**	**8.2300e-003**	**1.7000e-003**	**182.6862**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.6186	0.1548	0.0000	6.4874
Unmitigated	2.6186	0.1548	0.0000	6.4874

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	12.9	2.6186	0.1548	0.0000	6.4874
Total		**2.6186**	**0.1548**	**0.0000**	**6.4874**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Regional Park - Grading

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Parking	1.00	User Defined Unit	2.00	87,120.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2019
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Model run for estimating grading for parking lots.

Land Use - PTG - Simple grading of a site.

Construction Phase - PTG - Grading presumed to take ~10 days.

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	0
tblConstructionPhase	NumDays	4.00	10.00
tblGrading	AcresOfGrading	5.00	2.00
tblLandUse	BuildingSpaceSquareFeet	0.00	87,120.00
tblLandUse	LandUseSquareFeet	0.00	87,120.00
tblLandUse	LotAcreage	0.00	2.00
tblProjectCharacteristics	OperationalYear	2018	2019
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0118	0.1310	0.0556	1.1000e-004	0.0316	6.5000e-003	0.0381	0.0168	5.9800e-003	0.0228	0.0000	9.9597	9.9597	2.9500e-003	0.0000	10.0334
Maximum	**0.0118**	**0.1310**	**0.0556**	**1.1000e-004**	**0.0316**	**6.5000e-003**	**0.0381**	**0.0168**	**5.9800e-003**	**0.0228**	**0.0000**	**9.9597**	**9.9597**	**2.9500e-003**	**0.0000**	**10.0334**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0118	0.1310	0.0556	1.1000e-004	0.0144	6.5000e-003	0.0209	7.6000e-003	5.9800e-003	0.0136	0.0000	9.9597	9.9597	2.9500e-003	0.0000	10.0334
Maximum	**0.0118**	**0.1310**	**0.0556**	**1.1000e-004**	**0.0144**	**6.5000e-003**	**0.0209**	**7.6000e-003**	**5.9800e-003**	**0.0136**	**0.0000**	**9.9597**	**9.9597**	**2.9500e-003**	**0.0000**	**10.0334**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**54.32**	**0.00**	**45.03**	**54.68**	**0.00**	**40.31**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2017**	**3-31-2017**	0.1327	0.1327
		Highest	0.1327	0.1327

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	7.4500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.4500e-003**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	7.4500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.4500e-003**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/1/2017	1/13/2017	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 2

Acres of Paving: 2

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37

<u>Trips and VMT</u>

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	4	10.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0312	0.0000	0.0312	0.0167	0.0000	0.0167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0116	0.1308	0.0539	1.0000e-004		6.4900e-003	6.4900e-003		5.9700e-003	5.9700e-003	0.0000	9.5807	9.5807	2.9400e-003	0.0000	9.6541
Total	**0.0116**	**0.1308**	**0.0539**	**1.0000e-004**	**0.0312**	**6.4900e-003**	**0.0377**	**0.0167**	**5.9700e-003**	**0.0226**	**0.0000**	**9.5807**	**9.5807**	**2.9400e-003**	**0.0000**	**9.6541**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.8000e-004	1.7700e-003	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3790	0.3790	1.0000e-005	0.0000	0.3793
Total	**2.3000e-004**	**1.8000e-004**	**1.7700e-003**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3790**	**0.3790**	**1.0000e-005**	**0.0000**	**0.3793**

3.2 Grading - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0140	0.0000	0.0140	7.5000e-003	0.0000	7.5000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0116	0.1308	0.0539	1.0000e-004		6.4900e-003	6.4900e-003		5.9700e-003	5.9700e-003	0.0000	9.5807	9.5807	2.9400e-003	0.0000	9.6541
Total	**0.0116**	**0.1308**	**0.0539**	**1.0000e-004**	**0.0140**	**6.4900e-003**	**0.0205**	**7.5000e-003**	**5.9700e-003**	**0.0135**	**0.0000**	**9.5807**	**9.5807**	**2.9400e-003**	**0.0000**	**9.6541**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.8000e-004	1.7700e-003	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3790	0.3790	1.0000e-005	0.0000	0.3793
Total	**2.3000e-004**	**1.8000e-004**	**1.7700e-003**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3790**	**0.3790**	**1.0000e-005**	**0.0000**	**0.3793**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Parking	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Parking	14.70	6.60	6.60	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Parking	0.570523	0.041853	0.194077	0.115893	0.018544	0.005373	0.016909	0.024079	0.002502	0.002562	0.005975	0.000872	0.000837

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	7.4500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	7.4500e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.8200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	5.6300e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**7.4500e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.8200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	5.6300e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**7.4500e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Parking	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Parking	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Parking	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Regional Park - Equipment Shop

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	4.00	1000sqft	0.09	4,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Model Run for the 4,000 sq ft Equipment Shop

Land Use -

Construction Phase -

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	0
tblConstructionPhase	PhaseEndDate	6/20/2018	6/20/2017
tblConstructionPhase	PhaseEndDate	6/6/2018	6/6/2017
tblConstructionPhase	PhaseEndDate	1/12/2018	1/13/2017
tblConstructionPhase	PhaseEndDate	1/17/2018	1/17/2017
tblConstructionPhase	PhaseEndDate	6/13/2018	6/13/2017
tblConstructionPhase	PhaseEndDate	1/15/2018	1/13/2017
tblConstructionPhase	PhaseStartDate	6/14/2018	6/14/2017
tblConstructionPhase	PhaseStartDate	1/18/2018	1/18/2017
tblConstructionPhase	PhaseStartDate	1/1/2018	1/1/2017
tblConstructionPhase	PhaseStartDate	1/16/2018	1/16/2017
tblConstructionPhase	PhaseStartDate	6/7/2018	6/7/2017
tblConstructionPhase	PhaseStartDate	1/13/2018	1/13/2017
tblProjectCharacteristics	OperationalYear	2018	2020
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0973	0.7441	0.4855	7.1000e-004	2.9500e-003	0.0496	0.0526	9.6000e-004	0.0458	0.0468	0.0000	65.6562	65.6562	0.0185	0.0000	66.1184
Maximum	**0.0973**	**0.7441**	**0.4855**	**7.1000e-004**	**2.9500e-003**	**0.0496**	**0.0526**	**9.6000e-004**	**0.0458**	**0.0468**	**0.0000**	**65.6562**	**65.6562**	**0.0185**	**0.0000**	**66.1184**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0973	0.7441	0.4855	7.1000e-004	2.3900e-003	0.0496	0.0520	7.2000e-004	0.0458	0.0466	0.0000	65.6562	65.6562	0.0185	0.0000	66.1183
Maximum	**0.0973**	**0.7441**	**0.4855**	**7.1000e-004**	**2.3900e-003**	**0.0496**	**0.0520**	**7.2000e-004**	**0.0458**	**0.0466**	**0.0000**	**65.6562**	**65.6562**	**0.0185**	**0.0000**	**66.1183**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**18.98**	**0.00**	**1.07**	**25.00**	**0.00**	**0.53**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0177	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Energy	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	15.4502	15.4502	5.5000e-004	2.0000e-004	15.5222
Mobile	7.6000e-003	0.0407	0.1026	3.6000e-004	0.0303	4.0000e-004	0.0307	8.1300e-003	3.7000e-004	8.5000e-003	0.0000	32.9837	32.9837	1.1800e-003	0.0000	33.0131
Waste						0.0000	0.0000		0.0000	0.0000	1.0068	0.0000	1.0068	0.0595	0.0000	2.4944
Water						0.0000	0.0000		0.0000	0.0000	0.2935	1.4561	1.7495	0.0302	7.3000e-004	2.7208
Total	**0.0259**	**0.0458**	**0.1070**	**3.9000e-004**	**0.0303**	**7.9000e-004**	**0.0311**	**8.1300e-003**	**7.6000e-004**	**8.8900e-003**	**1.3003**	**49.8900**	**51.1903**	**0.0914**	**9.3000e-004**	**53.7506**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0177	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Energy	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	15.4502	15.4502	5.5000e-004	2.0000e-004	15.5222
Mobile	7.6000e-003	0.0407	0.1026	3.6000e-004	0.0303	4.0000e-004	0.0307	8.1300e-003	3.7000e-004	8.5000e-003	0.0000	32.9837	32.9837	1.1800e-003	0.0000	33.0131
Waste						0.0000	0.0000		0.0000	0.0000	1.0068	0.0000	1.0068	0.0595	0.0000	2.4944
Water						0.0000	0.0000		0.0000	0.0000	0.2935	1.4561	1.7495	0.0302	7.3000e-004	2.7208
Total	**0.0259**	**0.0458**	**0.1070**	**3.9000e-004**	**0.0303**	**7.9000e-004**	**0.0311**	**8.1300e-003**	**7.6000e-004**	**8.8900e-003**	**1.3003**	**49.8900**	**51.1903**	**0.0914**	**9.3000e-004**	**53.7506**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/13/2017	5	10	
2	Site Preparation	Site Preparation	1/13/2017	1/13/2017	5	1	
3	Grading	Grading	1/16/2017	1/17/2017	5	2	
4	Building Construction	Building Construction	1/18/2017	6/6/2017	5	100	
5	Paving	Paving	6/7/2017	6/13/2017	5	5	
6	Architectural Coating	Architectural Coating	6/14/2017	6/20/2017	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 6,000; Non-Residential Outdoor: 2,000; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Tolay Lake Regional Park - Equipment Shop - Bay Area AQMD Air District, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	1.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Rubber Tired Dozers	1	1.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Building Construction	Cranes	1	4.00	231	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	130	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	2.00	1.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	0.00	0.00	0.00	10.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0500e-003	0.0525	0.0396	6.0000e-005		3.6600e-003	3.6600e-003		3.4900e-003	3.4900e-003	0.0000	5.3493	5.3493	1.0500e-003	0.0000	5.3755
Total	**6.0500e-003**	**0.0525**	**0.0396**	**6.0000e-005**		**3.6600e-003**	**3.6600e-003**		**3.4900e-003**	**3.4900e-003**	**0.0000**	**5.3493**	**5.3493**	**1.0500e-003**	**0.0000**	**5.3755**

3.2 Demolition - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.8000e-004	1.7700e-003	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3790	0.3790	1.0000e-005	0.0000	0.3793
Total	**2.3000e-004**	**1.8000e-004**	**1.7700e-003**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3790**	**0.3790**	**1.0000e-005**	**0.0000**	**0.3793**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0500e-003	0.0525	0.0396	6.0000e-005		3.6600e-003	3.6600e-003		3.4900e-003	3.4900e-003	0.0000	5.3492	5.3492	1.0500e-003	0.0000	5.3755
Total	**6.0500e-003**	**0.0525**	**0.0396**	**6.0000e-005**		**3.6600e-003**	**3.6600e-003**		**3.4900e-003**	**3.4900e-003**	**0.0000**	**5.3492**	**5.3492**	**1.0500e-003**	**0.0000**	**5.3755**

3.2 Demolition - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	1.8000e-004	1.7700e-003	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3790	0.3790	1.0000e-005	0.0000	0.3793
Total	**2.3000e-004**	**1.8000e-004**	**1.7700e-003**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3790**	**0.3790**	**1.0000e-005**	**0.0000**	**0.3793**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	5.2600e-003	2.1800e-003	0.0000		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	0.4534	0.4534	1.4000e-004	0.0000	0.4569
Total	**4.3000e-004**	**5.2600e-003**	**2.1800e-003**	**0.0000**	**2.7000e-004**	**2.4000e-004**	**5.1000e-004**	**3.0000e-005**	**2.2000e-004**	**2.5000e-004**	**0.0000**	**0.4534**	**0.4534**	**1.4000e-004**	**0.0000**	**0.4569**

3.3 Site Preparation - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0190
Total	**1.0000e-005**	**1.0000e-005**	**9.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0190**	**0.0190**	**0.0000**	**0.0000**	**0.0190**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	5.2600e-003	2.1800e-003	0.0000		2.4000e-004	2.4000e-004		2.2000e-004	2.2000e-004	0.0000	0.4534	0.4534	1.4000e-004	0.0000	0.4569
Total	**4.3000e-004**	**5.2600e-003**	**2.1800e-003**	**0.0000**	**1.2000e-004**	**2.4000e-004**	**3.6000e-004**	**1.0000e-005**	**2.2000e-004**	**2.3000e-004**	**0.0000**	**0.4534**	**0.4534**	**1.4000e-004**	**0.0000**	**0.4569**

3.3 Site Preparation - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	9.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0190	0.0190	0.0000	0.0000	0.0190
Total	**1.0000e-005**	**1.0000e-005**	**9.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0190**	**0.0190**	**0.0000**	**0.0000**	**0.0190**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2100e-003	0.0105	7.9200e-003	1.0000e-005		7.3000e-004	7.3000e-004		7.0000e-004	7.0000e-004	0.0000	1.0699	1.0699	2.1000e-004	0.0000	1.0751
Total	**1.2100e-003**	**0.0105**	**7.9200e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**7.0000e-004**	**1.1100e-003**	**0.0000**	**1.0699**	**1.0699**	**2.1000e-004**	**0.0000**	**1.0751**

3.4 Grading - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	4.0000e-005	3.5000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0758	0.0758	0.0000	0.0000	0.0759
Total	**5.0000e-005**	**4.0000e-005**	**3.5000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0758**	**0.0758**	**0.0000**	**0.0000**	**0.0759**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					3.4000e-004	0.0000	3.4000e-004	1.9000e-004	0.0000	1.9000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2100e-003	0.0105	7.9200e-003	1.0000e-005		7.3000e-004	7.3000e-004		7.0000e-004	7.0000e-004	0.0000	1.0699	1.0699	2.1000e-004	0.0000	1.0751
Total	**1.2100e-003**	**0.0105**	**7.9200e-003**	**1.0000e-005**	**3.4000e-004**	**7.3000e-004**	**1.0700e-003**	**1.9000e-004**	**7.0000e-004**	**8.9000e-004**	**0.0000**	**1.0699**	**1.0699**	**2.1000e-004**	**0.0000**	**1.0751**

3.4 Grading - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	4.0000e-005	3.5000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0758	0.0758	0.0000	0.0000	0.0759
Total	**5.0000e-005**	**4.0000e-005**	**3.5000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0758**	**0.0758**	**0.0000**	**0.0000**	**0.0759**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0641	0.6380	0.4035	5.7000e-004		0.0430	0.0430		0.0395	0.0395	0.0000	52.8851	52.8851	0.0162	0.0000	53.2902
Total	**0.0641**	**0.6380**	**0.4035**	**5.7000e-004**		**0.0430**	**0.0430**		**0.0395**	**0.0395**	**0.0000**	**52.8851**	**52.8851**	**0.0162**	**0.0000**	**53.2902**

3.5 Building Construction - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.8000e-004	6.7800e-003	1.9200e-003	1.0000e-005	3.0000e-004	6.0000e-005	3.6000e-004	9.0000e-005	6.0000e-005	1.4000e-004	0.0000	1.2264	1.2264	8.0000e-005	0.0000	1.2284
Worker	4.5000e-004	3.5000e-004	3.5300e-003	1.0000e-005	7.9000e-004	1.0000e-005	8.0000e-004	2.1000e-004	1.0000e-005	2.2000e-004	0.0000	0.7581	0.7581	2.0000e-005	0.0000	0.7587
Total	**7.3000e-004**	**7.1300e-003**	**5.4500e-003**	**2.0000e-005**	**1.0900e-003**	**7.0000e-005**	**1.1600e-003**	**3.0000e-004**	**7.0000e-005**	**3.6000e-004**	**0.0000**	**1.9845**	**1.9845**	**1.0000e-004**	**0.0000**	**1.9871**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0641	0.6380	0.4035	5.7000e-004		0.0430	0.0430		0.0395	0.0395	0.0000	52.8850	52.8850	0.0162	0.0000	53.2901
Total	**0.0641**	**0.6380**	**0.4035**	**5.7000e-004**		**0.0430**	**0.0430**		**0.0395**	**0.0395**	**0.0000**	**52.8850**	**52.8850**	**0.0162**	**0.0000**	**53.2901**

3.5 Building Construction - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.8000e-004	6.7800e-003	1.9200e-003	1.0000e-005	3.0000e-004	6.0000e-005	3.6000e-004	9.0000e-005	6.0000e-005	1.4000e-004	0.0000	1.2264	1.2264	8.0000e-005	0.0000	1.2284
Worker	4.5000e-004	3.5000e-004	3.5300e-003	1.0000e-005	7.9000e-004	1.0000e-005	8.0000e-004	2.1000e-004	1.0000e-005	2.2000e-004	0.0000	0.7581	0.7581	2.0000e-005	0.0000	0.7587
Total	**7.3000e-004**	**7.1300e-003**	**5.4500e-003**	**2.0000e-005**	**1.0900e-003**	**7.0000e-005**	**1.1600e-003**	**3.0000e-004**	**7.0000e-005**	**3.6000e-004**	**0.0000**	**1.9845**	**1.9845**	**1.0000e-004**	**0.0000**	**1.9871**

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6300e-003	0.0249	0.0184	3.0000e-005		1.5200e-003	1.5200e-003		1.4100e-003	1.4100e-003	0.0000	2.4610	2.4610	6.8000e-004	0.0000	2.4781
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.6300e-003**	**0.0249**	**0.0184**	**3.0000e-005**		**1.5200e-003**	**1.5200e-003**		**1.4100e-003**	**1.4100e-003**	**0.0000**	**2.4610**	**2.4610**	**6.8000e-004**	**0.0000**	**2.4781**

3.6 Paving - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-004	1.6000e-004	1.5900e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3411	0.3411	1.0000e-005	0.0000	0.3414
Total	**2.0000e-004**	**1.6000e-004**	**1.5900e-003**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3411**	**0.3411**	**1.0000e-005**	**0.0000**	**0.3414**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6300e-003	0.0249	0.0184	3.0000e-005		1.5200e-003	1.5200e-003		1.4100e-003	1.4100e-003	0.0000	2.4610	2.4610	6.8000e-004	0.0000	2.4781
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.6300e-003**	**0.0249**	**0.0184**	**3.0000e-005**		**1.5200e-003**	**1.5200e-003**		**1.4100e-003**	**1.4100e-003**	**0.0000**	**2.4610**	**2.4610**	**6.8000e-004**	**0.0000**	**2.4781**

3.6 Paving - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-004	1.6000e-004	1.5900e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3411	0.3411	1.0000e-005	0.0000	0.3414
Total	**2.0000e-004**	**1.6000e-004**	**1.5900e-003**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3411**	**0.3411**	**1.0000e-005**	**0.0000**	**0.3414**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0209					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6400
Total	**0.0217**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6400**

3.7 Architectural Coating - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0209					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6400
Total	**0.0217**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6400**

3.7 Architectural Coating - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	7.6000e-003	0.0407	0.1026	3.6000e-004	0.0303	4.0000e-004	0.0307	8.1300e-003	3.7000e-004	8.5000e-003	0.0000	32.9837	32.9837	1.1800e-003	0.0000	33.0131
Unmitigated	7.6000e-003	0.0407	0.1026	3.6000e-004	0.0303	4.0000e-004	0.0307	8.1300e-003	3.7000e-004	8.5000e-003	0.0000	32.9837	32.9837	1.1800e-003	0.0000	33.0131

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	27.88	5.28	2.72	81,354	81,354
Total	27.88	5.28	2.72	81,354	81,354

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.573139	0.040894	0.193976	0.114604	0.017740	0.005371	0.017133	0.024527	0.002545	0.002442	0.005942	0.000877	0.000812

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	9.7979	9.7979	4.4000e-004	9.0000e-005	9.8363
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	9.7979	9.7979	4.4000e-004	9.0000e-005	9.8363
NaturalGas Mitigated	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	5.6523	5.6523	1.1000e-004	1.0000e-004	5.6859
NaturalGas Unmitigated	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	5.6523	5.6523	1.1000e-004	1.0000e-004	5.6859

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	105920	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	5.6523	5.6523	1.1000e-004	1.0000e-004	5.6859
Total		**5.7000e-004**	**5.1900e-003**	**4.3600e-003**	**3.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**	**0.0000**	**5.6523**	**5.6523**	**1.1000e-004**	**1.0000e-004**	**5.6859**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	105920	5.7000e-004	5.1900e-003	4.3600e-003	3.0000e-005		3.9000e-004	3.9000e-004		3.9000e-004	3.9000e-004	0.0000	5.6523	5.6523	1.1000e-004	1.0000e-004	5.6859
Total		**5.7000e-004**	**5.1900e-003**	**4.3600e-003**	**3.0000e-005**		**3.9000e-004**	**3.9000e-004**		**3.9000e-004**	**3.9000e-004**	**0.0000**	**5.6523**	**5.6523**	**1.1000e-004**	**1.0000e-004**	**5.6859**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	33680	9.7979	4.4000e-004	9.0000e-005	9.8363
Total		**9.7979**	**4.4000e-004**	**9.0000e-005**	**9.8363**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	33680	9.7979	4.4000e-004	9.0000e-005	9.8363
Total		**9.7979**	**4.4000e-004**	**9.0000e-005**	**9.8363**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0177	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Unmitigated	0.0177	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.0900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0156					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Total	**0.0177**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.0900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0156					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Total	**0.0177**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.7495	0.0302	7.3000e-004	2.7208
Unmitigated	1.7495	0.0302	7.3000e-004	2.7208

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0.925 / 0	1.7495	0.0302	7.3000e-004	2.7208
Total		**1.7495**	**0.0302**	**7.3000e-004**	**2.7208**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0.925 / 0	1.7495	0.0302	7.3000e-004	2.7208
Total		**1.7495**	**0.0302**	**7.3000e-004**	**2.7208**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	1.0068	0.0595	0.0000	2.4944
Unmitigated	1.0068	0.0595	0.0000	2.4944

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	4.96	1.0068	0.0595	0.0000	2.4944
Total		**1.0068**	**0.0595**	**0.0000**	**2.4944**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	4.96	1.0068	0.0595	0.0000	2.4944
Total		**1.0068**	**0.0595**	**0.0000**	**2.4944**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Regional Park Master Plan - WWTP

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	15.00	1000sqft	0.34	15,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2029
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	0
tblProjectCharacteristics	OperationalYear	2018	2029

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2027	0.1124	0.3300	0.4274	7.3000e-004	4.9100e-003	0.0141	0.0190	1.4900e-003	0.0130	0.0145	0.0000	64.4281	64.4281	0.0183	0.0000	64.8863
Maximum	**0.1124**	**0.3300**	**0.4274**	**7.3000e-004**	**4.9100e-003**	**0.0141**	**0.0190**	**1.4900e-003**	**0.0130**	**0.0145**	**0.0000**	**64.4281**	**64.4281**	**0.0183**	**0.0000**	**64.8863**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2027	0.1124	0.3300	0.4274	7.3000e-004	4.3500e-003	0.0141	0.0185	1.2500e-003	0.0130	0.0143	0.0000	64.4280	64.4280	0.0183	0.0000	64.8862
Maximum	**0.1124**	**0.3300**	**0.4274**	**7.3000e-004**	**4.3500e-003**	**0.0141**	**0.0185**	**1.2500e-003**	**0.0130**	**0.0143**	**0.0000**	**64.4280**	**64.4280**	**0.0183**	**0.0000**	**64.8862**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**11.41**	**0.00**	**2.94**	**16.11**	**0.00**	**1.72**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2027**	**3-31-2027**	0.1959	0.1959
2	**4-1-2027**	**6-30-2027**	0.2482	0.2482
		Highest	0.2482	0.2482

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0664	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004
Energy	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	57.9382	57.9382	2.0700e-003	7.3000e-004	58.2082
Mobile	0.0145	0.0739	0.1755	8.0000e-004	0.0857	5.5000e-004	0.0863	0.0230	5.1000e-004	0.0235	0.0000	74.0468	74.0468	2.2700e-003	0.0000	74.1036
Waste						0.0000	0.0000		0.0000	0.0000	3.7756	0.0000	3.7756	0.2231	0.0000	9.3540
Water						0.0000	0.0000		0.0000	0.0000	1.1005	5.4602	6.5607	0.1133	2.7200e-003	10.2032
Total	**0.0831**	**0.0933**	**0.1920**	**9.2000e-004**	**0.0857**	**2.0300e-003**	**0.0878**	**0.0230**	**1.9900e-003**	**0.0250**	**4.8761**	**137.4455**	**142.3216**	**0.3408**	**3.4500e-003**	**151.8692**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0664	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004
Energy	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	57.9382	57.9382	2.0700e-003	7.3000e-004	58.2082
Mobile	0.0145	0.0739	0.1755	8.0000e-004	0.0857	5.5000e-004	0.0863	0.0230	5.1000e-004	0.0235	0.0000	74.0468	74.0468	2.2700e-003	0.0000	74.1036
Waste						0.0000	0.0000		0.0000	0.0000	3.7756	0.0000	3.7756	0.2231	0.0000	9.3540
Water						0.0000	0.0000		0.0000	0.0000	1.1005	5.4602	6.5607	0.1133	2.7200e-003	10.2032
Total	**0.0831**	**0.0933**	**0.1920**	**9.2000e-004**	**0.0857**	**2.0300e-003**	**0.0878**	**0.0230**	**1.9900e-003**	**0.0250**	**4.8761**	**137.4455**	**142.3216**	**0.3408**	**3.4500e-003**	**151.8692**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	6/16/2027	6/22/2027	5	5	
2	Building Construction	Building Construction	1/20/2027	6/8/2027	5	100	
3	Demolition	Demolition	1/1/2027	1/14/2027	5	10	
4	Grading	Grading	1/16/2027	1/19/2027	5	2	
5	Paving	Paving	6/9/2027	6/15/2027	5	5	
6	Site Preparation	Site Preparation	1/15/2027	1/15/2027	5	1	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 22,500; Non-Residential Outdoor: 7,500; Striped Parking Area: 0 (Architectural Coating – sqft)

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Cranes	1	4.00	231	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Site Preparation	Graders	1	8.00	187	0.41
Paving	Pavers	1	7.00	130	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	1.00	247	0.40
Grading	Rubber Tired Dozers	1	1.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	1	1.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	6.00	2.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Architectural Coating - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0782					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	2.8600e-003	4.5200e-003	1.0000e-005		1.3000e-004	1.3000e-004		1.3000e-004	1.3000e-004	0.0000	0.6383	0.6383	3.0000e-005	0.0000	0.6392
Total	**0.0787**	**2.8600e-003**	**4.5200e-003**	**1.0000e-005**		**1.3000e-004**	**1.3000e-004**		**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**3.0000e-005**	**0.0000**	**0.6392**

3.2 Architectural Coating - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	4.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0133	0.0133	0.0000	0.0000	0.0133
Total	**1.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0133**	**0.0133**	**0.0000**	**0.0000**	**0.0133**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0782					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	2.8600e-003	4.5200e-003	1.0000e-005		1.3000e-004	1.3000e-004		1.3000e-004	1.3000e-004	0.0000	0.6383	0.6383	3.0000e-005	0.0000	0.6392
Total	**0.0787**	**2.8600e-003**	**4.5200e-003**	**1.0000e-005**		**1.3000e-004**	**1.3000e-004**		**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**3.0000e-005**	**0.0000**	**0.6392**

3.2 Architectural Coating - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	4.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0133	0.0133	0.0000	0.0000	0.0133
Total	**1.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0133**	**0.0133**	**0.0000**	**0.0000**	**0.0133**

3.3 Building Construction - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0276	0.2741	0.3514	5.7000e-004		0.0121	0.0121		0.0111	0.0111	0.0000	50.1479	50.1479	0.0162	0.0000	50.5533
Total	**0.0276**	**0.2741**	**0.3514**	**5.7000e-004**		**0.0121**	**0.0121**		**0.0111**	**0.0111**	**0.0000**	**50.1479**	**50.1479**	**0.0162**	**0.0000**	**50.5533**

3.3 Building Construction - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.0000e-004	7.2800e-003	1.9700e-003	3.0000e-005	6.6000e-004	1.0000e-005	6.6000e-004	1.9000e-004	1.0000e-005	2.0000e-004	0.0000	2.4345	2.4345	1.0000e-004	0.0000	2.4369
Worker	6.4000e-004	3.5000e-004	4.2600e-003	2.0000e-005	2.3700e-003	1.0000e-005	2.3800e-003	6.3000e-004	1.0000e-005	6.4000e-004	0.0000	1.5915	1.5915	2.0000e-005	0.0000	1.5921
Total	**8.4000e-004**	**7.6300e-003**	**6.2300e-003**	**5.0000e-005**	**3.0300e-003**	**2.0000e-005**	**3.0400e-003**	**8.2000e-004**	**2.0000e-005**	**8.4000e-004**	**0.0000**	**4.0260**	**4.0260**	**1.2000e-004**	**0.0000**	**4.0290**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0276	0.2741	0.3514	5.7000e-004		0.0121	0.0121		0.0111	0.0111	0.0000	50.1478	50.1478	0.0162	0.0000	50.5533
Total	**0.0276**	**0.2741**	**0.3514**	**5.7000e-004**		**0.0121**	**0.0121**		**0.0111**	**0.0111**	**0.0000**	**50.1478**	**50.1478**	**0.0162**	**0.0000**	**50.5533**

3.3 Building Construction - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.0000e-004	7.2800e-003	1.9700e-003	3.0000e-005	6.6000e-004	1.0000e-005	6.6000e-004	1.9000e-004	1.0000e-005	2.0000e-004	0.0000	2.4345	2.4345	1.0000e-004	0.0000	2.4369
Worker	6.4000e-004	3.5000e-004	4.2600e-003	2.0000e-005	2.3700e-003	1.0000e-005	2.3800e-003	6.3000e-004	1.0000e-005	6.4000e-004	0.0000	1.5915	1.5915	2.0000e-005	0.0000	1.5921
Total	**8.4000e-004**	**7.6300e-003**	**6.2300e-003**	**5.0000e-005**	**3.0300e-003**	**2.0000e-005**	**3.0400e-003**	**8.2000e-004**	**2.0000e-005**	**8.4000e-004**	**0.0000**	**4.0260**	**4.0260**	**1.2000e-004**	**0.0000**	**4.0290**

3.4 Demolition - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.8700e-003	0.0255	0.0368	6.0000e-005		1.0500e-003	1.0500e-003		1.0000e-003	1.0000e-003	0.0000	5.2123	5.2123	9.3000e-004	0.0000	5.2357
Total	**2.8700e-003**	**0.0255**	**0.0368**	**6.0000e-005**		**1.0500e-003**	**1.0500e-003**		**1.0000e-003**	**1.0000e-003**	**0.0000**	**5.2123**	**5.2123**	**9.3000e-004**	**0.0000**	**5.2357**

3.4 Demolition - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	6.0000e-005	7.1000e-004	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.2652	0.2652	0.0000	0.0000	0.2653
Total	**1.1000e-004**	**6.0000e-005**	**7.1000e-004**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.2652**	**0.2652**	**0.0000**	**0.0000**	**0.2653**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.8700e-003	0.0255	0.0368	6.0000e-005		1.0500e-003	1.0500e-003		1.0000e-003	1.0000e-003	0.0000	5.2123	5.2123	9.3000e-004	0.0000	5.2357
Total	**2.8700e-003**	**0.0255**	**0.0368**	**6.0000e-005**		**1.0500e-003**	**1.0500e-003**		**1.0000e-003**	**1.0000e-003**	**0.0000**	**5.2123**	**5.2123**	**9.3000e-004**	**0.0000**	**5.2357**

3.4 Demolition - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	6.0000e-005	7.1000e-004	0.0000	4.0000e-004	0.0000	4.0000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.2652	0.2652	0.0000	0.0000	0.2653
Total	**1.1000e-004**	**6.0000e-005**	**7.1000e-004**	**0.0000**	**4.0000e-004**	**0.0000**	**4.0000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.2652**	**0.2652**	**0.0000**	**0.0000**	**0.2653**

3.5 Grading - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.7000e-004	5.1000e-003	7.3600e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.0425	1.0425	1.9000e-004	0.0000	1.0471
Total	**5.7000e-004**	**5.1000e-003**	**7.3600e-003**	**1.0000e-005**	**7.5000e-004**	**2.1000e-004**	**9.6000e-004**	**4.1000e-004**	**2.0000e-004**	**6.1000e-004**	**0.0000**	**1.0425**	**1.0425**	**1.9000e-004**	**0.0000**	**1.0471**

3.5 Grading - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0531	0.0531	0.0000	0.0000	0.0531
Total	**2.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0531**	**0.0531**	**0.0000**	**0.0000**	**0.0531**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					3.4000e-004	0.0000	3.4000e-004	1.9000e-004	0.0000	1.9000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.7000e-004	5.1000e-003	7.3600e-003	1.0000e-005		2.1000e-004	2.1000e-004		2.0000e-004	2.0000e-004	0.0000	1.0425	1.0425	1.9000e-004	0.0000	1.0471
Total	**5.7000e-004**	**5.1000e-003**	**7.3600e-003**	**1.0000e-005**	**3.4000e-004**	**2.1000e-004**	**5.5000e-004**	**1.9000e-004**	**2.0000e-004**	**3.9000e-004**	**0.0000**	**1.0425**	**1.0425**	**1.9000e-004**	**0.0000**	**1.0471**

3.5 Grading - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0531	0.0531	0.0000	0.0000	0.0531
Total	**2.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0531**	**0.0531**	**0.0000**	**0.0000**	**0.0531**

3.6 Paving - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4100e-003	0.0123	0.0176	3.0000e-005		5.5000e-004	5.5000e-004		5.1000e-004	5.1000e-004	0.0000	2.3502	2.3502	6.8000e-004	0.0000	2.3673
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4100e-003**	**0.0123**	**0.0176**	**3.0000e-005**		**5.5000e-004**	**5.5000e-004**		**5.1000e-004**	**5.1000e-004**	**0.0000**	**2.3502**	**2.3502**	**6.8000e-004**	**0.0000**	**2.3673**

3.6 Paving - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-004	5.0000e-005	6.4000e-004	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.2387	0.2387	0.0000	0.0000	0.2388
Total	**1.0000e-004**	**5.0000e-005**	**6.4000e-004**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.2387**	**0.2387**	**0.0000**	**0.0000**	**0.2388**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4100e-003	0.0123	0.0176	3.0000e-005		5.5000e-004	5.5000e-004		5.1000e-004	5.1000e-004	0.0000	2.3502	2.3502	6.8000e-004	0.0000	2.3673
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4100e-003**	**0.0123**	**0.0176**	**3.0000e-005**		**5.5000e-004**	**5.5000e-004**		**5.1000e-004**	**5.1000e-004**	**0.0000**	**2.3502**	**2.3502**	**6.8000e-004**	**0.0000**	**2.3673**

3.6 Paving - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-004	5.0000e-005	6.4000e-004	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.2387	0.2387	0.0000	0.0000	0.2388
Total	**1.0000e-004**	**5.0000e-005**	**6.4000e-004**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.2387**	**0.2387**	**0.0000**	**0.0000**	**0.2388**

3.7 Site Preparation - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2000e-004	2.4000e-003	1.9100e-003	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.4274	0.4274	1.4000e-004	0.0000	0.4309
Total	**2.2000e-004**	**2.4000e-003**	**1.9100e-003**	**0.0000**	**2.7000e-004**	**8.0000e-005**	**3.5000e-004**	**3.0000e-005**	**8.0000e-005**	**1.1000e-004**	**0.0000**	**0.4274**	**0.4274**	**1.4000e-004**	**0.0000**	**0.4309**

3.7 Site Preparation - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	4.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0133	0.0133	0.0000	0.0000	0.0133
Total	**1.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0133**	**0.0133**	**0.0000**	**0.0000**	**0.0133**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2000e-004	2.4000e-003	1.9100e-003	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	0.4274	0.4274	1.4000e-004	0.0000	0.4309
Total	**2.2000e-004**	**2.4000e-003**	**1.9100e-003**	**0.0000**	**1.2000e-004**	**8.0000e-005**	**2.0000e-004**	**1.0000e-005**	**8.0000e-005**	**9.0000e-005**	**0.0000**	**0.4274**	**0.4274**	**1.4000e-004**	**0.0000**	**0.4309**

3.7 Site Preparation - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	4.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0133	0.0133	0.0000	0.0000	0.0133
Total	**1.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0133**	**0.0133**	**0.0000**	**0.0000**	**0.0133**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0145	0.0739	0.1755	8.0000e-004	0.0857	5.5000e-004	0.0863	0.0230	5.1000e-004	0.0235	0.0000	74.0468	74.0468	2.2700e-003	0.0000	74.1036
Unmitigated	0.0145	0.0739	0.1755	8.0000e-004	0.0857	5.5000e-004	0.0863	0.0230	5.1000e-004	0.0235	0.0000	74.0468	74.0468	2.2700e-003	0.0000	74.1036

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	104.55	19.80	10.20	230,537	230,537
Total	104.55	19.80	10.20	230,537	230,537

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Light Industry	9.50	7.30	7.30	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.585310	0.036704	0.193678	0.106768	0.013058	0.005276	0.019312	0.028136	0.002690	0.001821	0.005648	0.000918	0.000682

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	36.7421	36.7421	1.6600e-003	3.4000e-004	36.8861
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	36.7421	36.7421	1.6600e-003	3.4000e-004	36.8861
NaturalGas Mitigated	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	21.1961	21.1961	4.1000e-004	3.9000e-004	21.3221
NaturalGas Unmitigated	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	21.1961	21.1961	4.1000e-004	3.9000e-004	21.3221

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	397200	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	21.1961	21.1961	4.1000e-004	3.9000e-004	21.3221
Total		**2.1400e-003**	**0.0195**	**0.0164**	**1.2000e-004**		**1.4800e-003**	**1.4800e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**21.1961**	**21.1961**	**4.1000e-004**	**3.9000e-004**	**21.3221**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	397200	2.1400e-003	0.0195	0.0164	1.2000e-004		1.4800e-003	1.4800e-003		1.4800e-003	1.4800e-003	0.0000	21.1961	21.1961	4.1000e-004	3.9000e-004	21.3221
Total		**2.1400e-003**	**0.0195**	**0.0164**	**1.2000e-004**		**1.4800e-003**	**1.4800e-003**		**1.4800e-003**	**1.4800e-003**	**0.0000**	**21.1961**	**21.1961**	**4.1000e-004**	**3.9000e-004**	**21.3221**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	126300	36.7421	1.6600e-003	3.4000e-004	36.8861
Total		**36.7421**	**1.6600e-003**	**3.4000e-004**	**36.8861**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Light Industry	126300	36.7421	1.6600e-003	3.4000e-004	36.8861
Total		**36.7421**	**1.6600e-003**	**3.4000e-004**	**36.8861**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0664	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004
Unmitigated	0.0664	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.8200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0586					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004
Total	**0.0664**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.7000e-004**	**2.7000e-004**	**0.0000**	**0.0000**	**2.9000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.8200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0586					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.7000e-004	2.7000e-004	0.0000	0.0000	2.9000e-004
Total	**0.0664**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.7000e-004**	**2.7000e-004**	**0.0000**	**0.0000**	**2.9000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	6.5607	0.1133	2.7200e-003	10.2032
Unmitigated	6.5607	0.1133	2.7200e-003	10.2032

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.46875 / 0	6.5607	0.1133	2.7200e-003	10.2032
Total		**6.5607**	**0.1133**	**2.7200e-003**	**10.2032**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	3.46875 / 0	6.5607	0.1133	2.7200e-003	10.2032
Total		**6.5607**	**0.1133**	**2.7200e-003**	**10.2032**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	3.7756	0.2231	0.0000	9.3540
Unmitigated	3.7756	0.2231	0.0000	9.3540

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	18.6	3.7756	0.2231	0.0000	9.3540
Total		**3.7756**	**0.2231**	**0.0000**	**9.3540**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	18.6	3.7756	0.2231	0.0000	9.3540
Total		**3.7756**	**0.2231**	**0.0000**	**9.3540**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Parks Master Plan (Phase 2 Causeway)

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	1.00	Acre	1.00	43,560.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2024
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - PTG - Restoration Activites Occuring in P2.

Land Use - PTG - basic model run to determine hauling emissions from restoration activites.

Construction Phase - PTG - model updated to reflect soil import over 42 days as opposed to 2 (two months).

Off-road Equipment - PTG - model updated to reflect equipment that may be used during soil import and distribution.

Grading - PTG - Soil for import added to raise the causeway.

Construction Off-road Equipment Mitigation -

Off-road Equipment - PTG - Model updated to reflect two backhoes and one grader used for the restoration activities.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	0
tblConstructionPhase	NumDays	100.00	60.00
tblConstructionPhase	NumDays	2.00	42.00
tblConstructionPhase	PhaseEndDate	1/19/2022	3/16/2022
tblConstructionPhase	PhaseStartDate	1/20/2022	3/17/2022
tblGrading	AcresOfGrading	15.75	1.00
tblGrading	AcresOfGrading	0.19	0.50
tblGrading	MaterialImported	0.00	6,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	UsageHours	8.00	3.00
tblOffRoadEquipment	UsageHours	8.00	6.00
tblProjectCharacteristics	OperationalYear	2018	2024

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0888	0.8483	0.6480	1.5300e-003	0.1102	0.0342	0.1444	0.0561	0.0324	0.0885	0.0000	133.5580	133.5580	0.0234	0.0000	134.1439
Maximum	**0.0888**	**0.8483**	**0.6480**	**1.5300e-003**	**0.1102**	**0.0342**	**0.1444**	**0.0561**	**0.0324**	**0.0885**	**0.0000**	**133.5580**	**133.5580**	**0.0234**	**0.0000**	**134.1439**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.0888	0.8483	0.6480	1.5300e-003	0.0574	0.0342	0.0916	0.0274	0.0324	0.0598	0.0000	133.5579	133.5579	0.0234	0.0000	134.1438
Maximum	**0.0888**	**0.8483**	**0.6480**	**1.5300e-003**	**0.0574**	**0.0342**	**0.0916**	**0.0274**	**0.0324**	**0.0598**	**0.0000**	**133.5579**	**133.5579**	**0.0234**	**0.0000**	**134.1438**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**47.92**	**0.00**	**36.56**	**51.21**	**0.00**	**32.47**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-3-2022**	**4-2-2022**	0.5416	0.5416
2	**4-3-2022**	**7-2-2022**	0.3804	0.3804
		Highest	0.5416	0.5416

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.4500e-003	6.5600e-003	0.0160	6.0000e-005	5.5500e-003	5.0000e-005	5.6000e-003	1.4900e-003	5.0000e-005	1.5400e-003	0.0000	5.5689	5.5689	1.9000e-004	0.0000	5.5737
Waste						0.0000	0.0000		0.0000	0.0000	0.0183	0.0000	0.0183	1.0800e-003	0.0000	0.0453
Water						0.0000	0.0000		0.0000	0.0000	0.0000	1.2132	1.2132	5.0000e-005	1.0000e-005	1.2179
Total	**1.8600e-003**	**6.5600e-003**	**0.0160**	**6.0000e-005**	**5.5500e-003**	**5.0000e-005**	**5.6000e-003**	**1.4900e-003**	**5.0000e-005**	**1.5400e-003**	**0.0183**	**6.7821**	**6.8003**	**1.3200e-003**	**1.0000e-005**	**6.8369**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.4500e-003	6.5600e-003	0.0160	6.0000e-005	5.5500e-003	5.0000e-005	5.6000e-003	1.4900e-003	5.0000e-005	1.5400e-003	0.0000	5.5689	5.5689	1.9000e-004	0.0000	5.5737
Waste						0.0000	0.0000		0.0000	0.0000	0.0183	0.0000	0.0183	1.0800e-003	0.0000	0.0453
Water						0.0000	0.0000		0.0000	0.0000	0.0000	1.2132	1.2132	5.0000e-005	1.0000e-005	1.2179
Total	**1.8600e-003**	**6.5600e-003**	**0.0160**	**6.0000e-005**	**5.5500e-003**	**5.0000e-005**	**5.6000e-003**	**1.4900e-003**	**5.0000e-005**	**1.5400e-003**	**0.0183**	**6.7821**	**6.8003**	**1.3200e-003**	**1.0000e-005**	**6.8369**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/3/2022	1/14/2022	5	10	
2	Site Preparation	Site Preparation	1/15/2022	1/17/2022	5	1	
3	Grading	Grading	1/18/2022	3/16/2022	5	42	
4	Building Construction	Building Construction	3/17/2022	6/8/2022	5	60	
5	Paving	Paving	6/9/2022	6/15/2022	5	5	
6	Architectural Coating	Architectural Coating	6/16/2022	6/22/2022	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 1

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Site Preparation	Graders	1	3.00	187	0.41
Site Preparation	Rubber Tired Dozers	0	7.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Graders	1	6.00	187	0.41
Grading	Rubber Tired Dozers	1	6.00	247	0.40
Grading	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	6.00	231	0.29
Building Construction	Forklifts	1	6.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building Construction	Welders	3	8.00	46	0.45
Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Paving	Pavers	1	6.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	3	8.00	0.00	750.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	18.00	7.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	4.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.4400e-003	0.0831	0.0698	1.2000e-004		4.1900e-003	4.1900e-003		3.9100e-003	3.9100e-003	0.0000	10.5388	10.5388	2.6900e-003	0.0000	10.6060
Total	**8.4400e-003**	**0.0831**	**0.0698**	**1.2000e-004**		**4.1900e-003**	**4.1900e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**10.5388**	**10.5388**	**2.6900e-003**	**0.0000**	**10.6060**

3.2 Demolition - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.9000e-004	1.2000e-004	1.3400e-003	0.0000	5.1000e-004	0.0000	5.2000e-004	1.4000e-004	0.0000	1.4000e-004	0.0000	0.4183	0.4183	1.0000e-005	0.0000	0.4185
Total	**1.9000e-004**	**1.2000e-004**	**1.3400e-003**	**0.0000**	**5.1000e-004**	**0.0000**	**5.2000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.4183**	**0.4183**	**1.0000e-005**	**0.0000**	**0.4185**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.4400e-003	0.0831	0.0698	1.2000e-004		4.1900e-003	4.1900e-003		3.9100e-003	3.9100e-003	0.0000	10.5388	10.5388	2.6900e-003	0.0000	10.6060
Total	**8.4400e-003**	**0.0831**	**0.0698**	**1.2000e-004**		**4.1900e-003**	**4.1900e-003**		**3.9100e-003**	**3.9100e-003**	**0.0000**	**10.5388**	**10.5388**	**2.6900e-003**	**0.0000**	**10.6060**

3.2 Demolition - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.9000e-004	1.2000e-004	1.3400e-003	0.0000	5.1000e-004	0.0000	5.2000e-004	1.4000e-004	0.0000	1.4000e-004	0.0000	0.4183	0.4183	1.0000e-005	0.0000	0.4185
Total	**1.9000e-004**	**1.2000e-004**	**1.3400e-003**	**0.0000**	**5.1000e-004**	**0.0000**	**5.2000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.4183**	**0.4183**	**1.0000e-005**	**0.0000**	**0.4185**

3.3 Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0000e-004	2.2400e-003	2.0000e-003	0.0000		1.0000e-004	1.0000e-004		9.0000e-005	9.0000e-005	0.0000	0.3140	0.3140	1.0000e-004	0.0000	0.3166
Total	**2.0000e-004**	**2.2400e-003**	**2.0000e-003**	**0.0000**	**2.7000e-004**	**1.0000e-004**	**3.7000e-004**	**3.0000e-005**	**9.0000e-005**	**1.2000e-004**	**0.0000**	**0.3140**	**0.3140**	**1.0000e-004**	**0.0000**	**0.3166**

3.3 Site Preparation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	8.0000e-005	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0257	0.0257	0.0000	0.0000	0.0258
Total	**1.0000e-005**	**1.0000e-005**	**8.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0257**	**0.0257**	**0.0000**	**0.0000**	**0.0258**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2000e-004	0.0000	1.2000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0000e-004	2.2400e-003	2.0000e-003	0.0000		1.0000e-004	1.0000e-004		9.0000e-005	9.0000e-005	0.0000	0.3140	0.3140	1.0000e-004	0.0000	0.3166
Total	**2.0000e-004**	**2.2400e-003**	**2.0000e-003**	**0.0000**	**1.2000e-004**	**1.0000e-004**	**2.2000e-004**	**1.0000e-005**	**9.0000e-005**	**1.0000e-004**	**0.0000**	**0.3140**	**0.3140**	**1.0000e-004**	**0.0000**	**0.3166**

3.3 Site Preparation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	8.0000e-005	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0257	0.0257	0.0000	0.0000	0.0258
Total	**1.0000e-005**	**1.0000e-005**	**8.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0257**	**0.0257**	**0.0000**	**0.0000**	**0.0258**

3.4 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0957	0.0000	0.0957	0.0522	0.0000	0.0522	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0228	0.2521	0.1247	3.0000e-004		0.0109	0.0109		9.9900e-003	9.9900e-003	0.0000	26.0010	26.0010	8.4100e-003	0.0000	26.2113
Total	**0.0228**	**0.2521**	**0.1247**	**3.0000e-004**	**0.0957**	**0.0109**	**0.1066**	**0.0522**	**9.9900e-003**	**0.0622**	**0.0000**	**26.0010**	**26.0010**	**8.4100e-003**	**0.0000**	**26.2113**

3.4 Grading - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7900e-003	0.0930	0.0212	2.9000e-004	6.3300e-003	2.7000e-004	6.6000e-003	1.7400e-003	2.6000e-004	2.0000e-003	0.0000	27.9840	27.9840	1.4100e-003	0.0000	28.0193
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.8000e-004	3.2000e-004	3.4600e-003	1.0000e-005	1.3300e-003	1.0000e-005	1.3400e-003	3.5000e-004	1.0000e-005	3.6000e-004	0.0000	1.0811	1.0811	2.0000e-005	0.0000	1.0816
Total	**3.2700e-003**	**0.0933**	**0.0246**	**3.0000e-004**	**7.6600e-003**	**2.8000e-004**	**7.9400e-003**	**2.0900e-003**	**2.7000e-004**	**2.3600e-003**	**0.0000**	**29.0651**	**29.0651**	**1.4300e-003**	**0.0000**	**29.1010**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0431	0.0000	0.0431	0.0235	0.0000	0.0235	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0228	0.2521	0.1247	3.0000e-004		0.0109	0.0109		9.9900e-003	9.9900e-003	0.0000	26.0010	26.0010	8.4100e-003	0.0000	26.2112
Total	**0.0228**	**0.2521**	**0.1247**	**3.0000e-004**	**0.0431**	**0.0109**	**0.0539**	**0.0235**	**9.9900e-003**	**0.0335**	**0.0000**	**26.0010**	**26.0010**	**8.4100e-003**	**0.0000**	**26.2112**

3.4 Grading - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.7900e-003	0.0930	0.0212	2.9000e-004	6.3300e-003	2.7000e-004	6.6000e-003	1.7400e-003	2.6000e-004	2.0000e-003	0.0000	27.9840	27.9840	1.4100e-003	0.0000	28.0193
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.8000e-004	3.2000e-004	3.4600e-003	1.0000e-005	1.3300e-003	1.0000e-005	1.3400e-003	3.5000e-004	1.0000e-005	3.6000e-004	0.0000	1.0811	1.0811	2.0000e-005	0.0000	1.0816
Total	**3.2700e-003**	**0.0933**	**0.0246**	**3.0000e-004**	**7.6600e-003**	**2.8000e-004**	**7.9400e-003**	**2.0900e-003**	**2.7000e-004**	**2.3600e-003**	**0.0000**	**29.0651**	**29.0651**	**1.4300e-003**	**0.0000**	**29.1010**

3.5 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0495	0.3751	0.3818	6.6000e-004		0.0177	0.0177		0.0171	0.0171	0.0000	54.4731	54.4731	9.4900e-003	0.0000	54.7103
Total	**0.0495**	**0.3751**	**0.3818**	**6.6000e-004**		**0.0177**	**0.0177**		**0.0171**	**0.0171**	**0.0000**	**54.4731**	**54.4731**	**9.4900e-003**	**0.0000**	**54.7103**

3.5 Building Construction - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.2000e-004	0.0208	5.1500e-003	6.0000e-005	1.3800e-003	4.0000e-005	1.4200e-003	4.0000e-004	4.0000e-005	4.4000e-004	0.0000	5.3928	5.3928	2.6000e-004	0.0000	5.3992
Worker	1.5400e-003	1.0300e-003	0.0111	4.0000e-005	4.2700e-003	3.0000e-005	4.2900e-003	1.1400e-003	3.0000e-005	1.1600e-003	0.0000	3.4749	3.4749	7.0000e-005	0.0000	3.4767
Total	**2.1600e-003**	**0.0218**	**0.0163**	**1.0000e-004**	**5.6500e-003**	**7.0000e-005**	**5.7100e-003**	**1.5400e-003**	**7.0000e-005**	**1.6000e-003**	**0.0000**	**8.8677**	**8.8677**	**3.3000e-004**	**0.0000**	**8.8759**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0495	0.3751	0.3818	6.6000e-004		0.0177	0.0177		0.0171	0.0171	0.0000	54.4730	54.4730	9.4900e-003	0.0000	54.7102
Total	**0.0495**	**0.3751**	**0.3818**	**6.6000e-004**		**0.0177**	**0.0177**		**0.0171**	**0.0171**	**0.0000**	**54.4730**	**54.4730**	**9.4900e-003**	**0.0000**	**54.7102**

3.5 Building Construction - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.2000e-004	0.0208	5.1500e-003	6.0000e-005	1.3800e-003	4.0000e-005	1.4200e-003	4.0000e-004	4.0000e-005	4.4000e-004	0.0000	5.3928	5.3928	2.6000e-004	0.0000	5.3992
Worker	1.5400e-003	1.0300e-003	0.0111	4.0000e-005	4.2700e-003	3.0000e-005	4.2900e-003	1.1400e-003	3.0000e-005	1.1600e-003	0.0000	3.4749	3.4749	7.0000e-005	0.0000	3.4767
Total	**2.1600e-003**	**0.0218**	**0.0163**	**1.0000e-004**	**5.6500e-003**	**7.0000e-005**	**5.7100e-003**	**1.5400e-003**	**7.0000e-005**	**1.6000e-003**	**0.0000**	**8.8677**	**8.8677**	**3.3000e-004**	**0.0000**	**8.8759**

3.6 Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.7200e-003	0.0169	0.0220	3.0000e-005		8.7000e-004	8.7000e-004		8.0000e-004	8.0000e-004	0.0000	2.9424	2.9424	9.3000e-004	0.0000	2.9657
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.7200e-003**	**0.0169**	**0.0220**	**3.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.9424**	**2.9424**	**9.3000e-004**	**0.0000**	**2.9657**

3.6 Paving - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	6.0000e-005	6.7000e-004	0.0000	2.6000e-004	0.0000	2.6000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2091	0.2091	0.0000	0.0000	0.2093
Total	**9.0000e-005**	**6.0000e-005**	**6.7000e-004**	**0.0000**	**2.6000e-004**	**0.0000**	**2.6000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.2091**	**0.2091**	**0.0000**	**0.0000**	**0.2093**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.7200e-003	0.0169	0.0220	3.0000e-005		8.7000e-004	8.7000e-004		8.0000e-004	8.0000e-004	0.0000	2.9424	2.9424	9.3000e-004	0.0000	2.9657
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.7200e-003**	**0.0169**	**0.0220**	**3.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.0000e-004**	**8.0000e-004**	**0.0000**	**2.9424**	**2.9424**	**9.3000e-004**	**0.0000**	**2.9657**

3.6 Paving - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	6.0000e-005	6.7000e-004	0.0000	2.6000e-004	0.0000	2.6000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2091	0.2091	0.0000	0.0000	0.2093
Total	**9.0000e-005**	**6.0000e-005**	**6.7000e-004**	**0.0000**	**2.6000e-004**	**0.0000**	**2.6000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.2091**	**0.2091**	**0.0000**	**0.0000**	**0.2093**

3.7 Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	3.5200e-003	4.5300e-003	1.0000e-005		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.6383	0.6383	4.0000e-005	0.0000	0.6394
Total	**5.1000e-004**	**3.5200e-003**	**4.5300e-003**	**1.0000e-005**		**2.0000e-004**	**2.0000e-004**		**2.0000e-004**	**2.0000e-004**	**0.0000**	**0.6383**	**0.6383**	**4.0000e-005**	**0.0000**	**0.6394**

3.7 Architectural Coating - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.1000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0644	0.0644	0.0000	0.0000	0.0644
Total	**3.0000e-005**	**2.0000e-005**	**2.1000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0644**	**0.0644**	**0.0000**	**0.0000**	**0.0644**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	3.5200e-003	4.5300e-003	1.0000e-005		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.6383	0.6383	4.0000e-005	0.0000	0.6394
Total	**5.1000e-004**	**3.5200e-003**	**4.5300e-003**	**1.0000e-005**		**2.0000e-004**	**2.0000e-004**		**2.0000e-004**	**2.0000e-004**	**0.0000**	**0.6383**	**0.6383**	**4.0000e-005**	**0.0000**	**0.6394**

3.7 Architectural Coating - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	2.0000e-005	2.1000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0644	0.0644	0.0000	0.0000	0.0644
Total	**3.0000e-005**	**2.0000e-005**	**2.1000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0644**	**0.0644**	**0.0000**	**0.0000**	**0.0644**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.4500e-003	6.5600e-003	0.0160	6.0000e-005	5.5500e-003	5.0000e-005	5.6000e-003	1.4900e-003	5.0000e-005	1.5400e-003	0.0000	5.5689	5.5689	1.9000e-004	0.0000	5.5737
Unmitigated	1.4500e-003	6.5600e-003	0.0160	6.0000e-005	5.5500e-003	5.0000e-005	5.6000e-003	1.4900e-003	5.0000e-005	1.5400e-003	0.0000	5.5689	5.5689	1.9000e-004	0.0000	5.5737

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	1.89	22.75	16.74	14,926	14,926
Total	1.89	22.75	16.74	14,926	14,926

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.580272	0.038274	0.193741	0.109917	0.015100	0.005324	0.018491	0.026678	0.002649	0.002134	0.005793	0.000896	0.000732

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.1000e-004**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.1000e-004**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.2132	5.0000e-005	1.0000e-005	1.2179
Unmitigated	1.2132	5.0000e-005	1.0000e-005	1.2179

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 1.19148	1.2132	5.0000e-005	1.0000e-005	1.2179
Total		**1.2132**	**5.0000e-005**	**1.0000e-005**	**1.2179**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 1.19148	1.2132	5.0000e-005	1.0000e-005	1.2179
Total		**1.2132**	**5.0000e-005**	**1.0000e-005**	**1.2179**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0183	1.0800e-003	0.0000	0.0453
Unmitigated	0.0183	1.0800e-003	0.0000	0.0453

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.09	0.0183	1.0800e-003	0.0000	0.0453
Total		**0.0183**	**1.0800e-003**	**0.0000**	**0.0453**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.09	0.0183	1.0800e-003	0.0000	0.0453
Total		**0.0183**	**1.0800e-003**	**0.0000**	**0.0453**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Tolay Lake Parks Master Plan (Causeway)

Bay Area AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	1.00	Acre	1.00	43,560.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	64
Climate Zone	4			**Operational Year**	2029
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - PTG - basic model run to determine hauling emissions from restoration activites.

Off-road Equipment - PTG - model updated to reflect equipment that may be used during soil import and distribution.

Construction Phase - PTG - model updated to reflect soil import over 42 days as opposed to 2 (two months).

Grading - PTG - Soil for import added to raise the causeway.

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	40	0
tblConstructionPhase	NumDays	2.00	42.00
tblConstructionPhase	PhaseEndDate	1/19/2027	3/16/2027
tblGrading	MaterialImported	0.00	6,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	UsageHours	7.00	6.00
tblOffRoadEquipment	UsageHours	6.00	3.00
tblProjectCharacteristics	OperationalYear	2018	2029

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2027	0.0870	0.7599	0.8443	1.8500e-003	0.0254	0.0261	0.0514	6.8700e-003	0.0249	0.0318	0.0000	159.8633	159.8633	0.0247	0.0000	160.4797
Maximum	**0.0870**	**0.7599**	**0.8443**	**1.8500e-003**	**0.0254**	**0.0261**	**0.0514**	**6.8700e-003**	**0.0249**	**0.0318**	**0.0000**	**159.8633**	**159.8633**	**0.0247**	**0.0000**	**160.4797**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2027	0.0870	0.7599	0.8443	1.8500e-003	0.0213	0.0261	0.0474	5.7800e-003	0.0249	0.0307	0.0000	159.8631	159.8631	0.0247	0.0000	160.4796
Maximum	**0.0870**	**0.7599**	**0.8443**	**1.8500e-003**	**0.0213**	**0.0261**	**0.0474**	**5.7800e-003**	**0.0249**	**0.0307**	**0.0000**	**159.8631**	**159.8631**	**0.0247**	**0.0000**	**160.4796**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**16.08**	**0.00**	**7.93**	**15.87**	**0.00**	**3.43**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2027	3-31-2027	0.5264	0.5264
2	4-1-2027	6-30-2027	0.3217	0.3217
		Highest	0.5264	0.5264

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.1300e-003	5.7200e-003	0.0122	5.0000e-005	5.5500e-003	4.0000e-005	5.5900e-003	1.4900e-003	3.0000e-005	1.5200e-003	0.0000	4.9101	4.9101	1.6000e-004	0.0000	4.9141
Waste						0.0000	0.0000		0.0000	0.0000	0.0183	0.0000	0.0183	1.0800e-003	0.0000	0.0453
Water						0.0000	0.0000		0.0000	0.0000	0.0000	1.2132	1.2132	5.0000e-005	1.0000e-005	1.2179
Total	**1.5400e-003**	**5.7200e-003**	**0.0123**	**5.0000e-005**	**5.5500e-003**	**4.0000e-005**	**5.5900e-003**	**1.4900e-003**	**3.0000e-005**	**1.5200e-003**	**0.0183**	**6.1233**	**6.1416**	**1.2900e-003**	**1.0000e-005**	**6.1773**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.1300e-003	5.7200e-003	0.0122	5.0000e-005	5.5500e-003	4.0000e-005	5.5900e-003	1.4900e-003	3.0000e-005	1.5200e-003	0.0000	4.9101	4.9101	1.6000e-004	0.0000	4.9141
Waste						0.0000	0.0000		0.0000	0.0000	0.0183	0.0000	0.0183	1.0800e-003	0.0000	0.0453
Water						0.0000	0.0000		0.0000	0.0000	0.0000	1.2132	1.2132	5.0000e-005	1.0000e-005	1.2179
Total	**1.5400e-003**	**5.7200e-003**	**0.0123**	**5.0000e-005**	**5.5500e-003**	**4.0000e-005**	**5.5900e-003**	**1.4900e-003**	**3.0000e-005**	**1.5200e-003**	**0.0183**	**6.1233**	**6.1416**	**1.2900e-003**	**1.0000e-005**	**6.1773**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2027	1/14/2027	5	10	
2	Site Preparation	Site Preparation	1/15/2027	1/15/2027	5	1	
3	Grading	Grading	1/16/2027	3/16/2027	5	42	
4	Building Construction	Building Construction	1/20/2027	6/8/2027	5	100	
5	Paving	Paving	6/9/2027	6/15/2027	5	5	
6	Architectural Coating	Architectural Coating	6/16/2027	6/22/2027	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 7.88

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Cranes	1	6.00	231	0.29
Building Construction	Forklifts	1	6.00	89	0.20
Site Preparation	Graders	1	8.00	187	0.41
Paving	Pavers	1	6.00	130	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Rubber Tired Dozers	0	6.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Graders	1	3.00	187	0.41
Paving	Paving Equipment	1	8.00	132	0.36
Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Building Construction	Welders	3	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	1	4.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	18.00	7.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	3	8.00	0.00	750.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Demolition - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.7000e-003	0.0645	0.0667	1.2000e-004		2.7300e-003	2.7300e-003		2.5500e-003	2.5500e-003	0.0000	10.5496	10.5496	2.6600e-003	0.0000	10.6161
Total	**6.7000e-003**	**0.0645**	**0.0667**	**1.2000e-004**		**2.7300e-003**	**2.7300e-003**		**2.5500e-003**	**2.5500e-003**	**0.0000**	**10.5496**	**10.5496**	**2.6600e-003**	**0.0000**	**10.6161**

3.2 Demolition - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	8.0000e-005	9.2000e-004	0.0000	5.1000e-004	0.0000	5.2000e-004	1.4000e-004	0.0000	1.4000e-004	0.0000	0.3448	0.3448	1.0000e-005	0.0000	0.3450
Total	**1.4000e-004**	**8.0000e-005**	**9.2000e-004**	**0.0000**	**5.1000e-004**	**0.0000**	**5.2000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.3448**	**0.3448**	**1.0000e-005**	**0.0000**	**0.3450**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.7000e-003	0.0645	0.0667	1.2000e-004		2.7300e-003	2.7300e-003		2.5500e-003	2.5500e-003	0.0000	10.5496	10.5496	2.6600e-003	0.0000	10.6161
Total	**6.7000e-003**	**0.0645**	**0.0667**	**1.2000e-004**		**2.7300e-003**	**2.7300e-003**		**2.5500e-003**	**2.5500e-003**	**0.0000**	**10.5496**	**10.5496**	**2.6600e-003**	**0.0000**	**10.6161**

3.2 Demolition - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	8.0000e-005	9.2000e-004	0.0000	5.1000e-004	0.0000	5.2000e-004	1.4000e-004	0.0000	1.4000e-004	0.0000	0.3448	0.3448	1.0000e-005	0.0000	0.3450
Total	**1.4000e-004**	**8.0000e-005**	**9.2000e-004**	**0.0000**	**5.1000e-004**	**0.0000**	**5.2000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.3448**	**0.3448**	**1.0000e-005**	**0.0000**	**0.3450**

3.3 Site Preparation - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.9000e-003	0.0000	2.9000e-003	1.4800e-003	0.0000	1.4800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	5.3000e-003	3.2200e-003	1.0000e-005		2.1000e-004	2.1000e-004		1.9000e-004	1.9000e-004	0.0000	0.7556	0.7556	2.4000e-004	0.0000	0.7617
Total	**5.1000e-004**	**5.3000e-003**	**3.2200e-003**	**1.0000e-005**	**2.9000e-003**	**2.1000e-004**	**3.1100e-003**	**1.4800e-003**	**1.9000e-004**	**1.6700e-003**	**0.0000**	**0.7556**	**0.7556**	**2.4000e-004**	**0.0000**	**0.7617**

3.3 Site Preparation - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	6.0000e-005	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0212	0.0212	0.0000	0.0000	0.0212
Total	**1.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0212**	**0.0212**	**0.0000**	**0.0000**	**0.0212**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.3000e-003	0.0000	1.3000e-003	6.6000e-004	0.0000	6.6000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	5.3000e-003	3.2200e-003	1.0000e-005		2.1000e-004	2.1000e-004		1.9000e-004	1.9000e-004	0.0000	0.7556	0.7556	2.4000e-004	0.0000	0.7617
Total	**5.1000e-004**	**5.3000e-003**	**3.2200e-003**	**1.0000e-005**	**1.3000e-003**	**2.1000e-004**	**1.5100e-003**	**6.6000e-004**	**1.9000e-004**	**8.5000e-004**	**0.0000**	**0.7556**	**0.7556**	**2.4000e-004**	**0.0000**	**0.7617**

3.3 Site Preparation - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	0.0000	6.0000e-005	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0212	0.0212	0.0000	0.0000	0.0212
Total	**1.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0212**	**0.0212**	**0.0000**	**0.0000**	**0.0212**

3.4 Grading - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.5200e-003	0.0000	4.5200e-003	5.0000e-004	0.0000	5.0000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.6100e-003	0.0693	0.0828	1.5000e-004		2.5800e-003	2.5800e-003		2.3700e-003	2.3700e-003	0.0000	13.2056	13.2056	4.2700e-003	0.0000	13.3123
Total	**6.6100e-003**	**0.0693**	**0.0828**	**1.5000e-004**	**4.5200e-003**	**2.5800e-003**	**7.1000e-003**	**5.0000e-004**	**2.3700e-003**	**2.8700e-003**	**0.0000**	**13.2056**	**13.2056**	**4.2700e-003**	**0.0000**	**13.3123**

3.4 Grading - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8200e-003	0.0571	0.0195	2.7000e-004	6.3400e-003	1.0000e-004	6.4400e-003	1.7400e-003	1.0000e-004	1.8400e-003	0.0000	26.1768	26.1768	1.2500e-003	0.0000	26.2081
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.6000e-004	2.0000e-004	2.3900e-003	1.0000e-005	1.3300e-003	1.0000e-005	1.3300e-003	3.5000e-004	1.0000e-005	3.6000e-004	0.0000	0.8912	0.8912	1.0000e-005	0.0000	0.8916
Total	**2.1800e-003**	**0.0573**	**0.0219**	**2.8000e-004**	**7.6700e-003**	**1.1000e-004**	**7.7700e-003**	**2.0900e-003**	**1.1000e-004**	**2.2000e-003**	**0.0000**	**27.0680**	**27.0680**	**1.2600e-003**	**0.0000**	**27.0997**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0300e-003	0.0000	2.0300e-003	2.3000e-004	0.0000	2.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.6100e-003	0.0693	0.0828	1.5000e-004		2.5800e-003	2.5800e-003		2.3700e-003	2.3700e-003	0.0000	13.2056	13.2056	4.2700e-003	0.0000	13.3123
Total	**6.6100e-003**	**0.0693**	**0.0828**	**1.5000e-004**	**2.0300e-003**	**2.5800e-003**	**4.6100e-003**	**2.3000e-004**	**2.3700e-003**	**2.6000e-003**	**0.0000**	**13.2056**	**13.2056**	**4.2700e-003**	**0.0000**	**13.3123**

3.4 Grading - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8200e-003	0.0571	0.0195	2.7000e-004	6.3400e-003	1.0000e-004	6.4400e-003	1.7400e-003	1.0000e-004	1.8400e-003	0.0000	26.1768	26.1768	1.2500e-003	0.0000	26.2081
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.6000e-004	2.0000e-004	2.3900e-003	1.0000e-005	1.3300e-003	1.0000e-005	1.3300e-003	3.5000e-004	1.0000e-005	3.6000e-004	0.0000	0.8912	0.8912	1.0000e-005	0.0000	0.8916
Total	**2.1800e-003**	**0.0573**	**0.0219**	**2.8000e-004**	**7.6700e-003**	**1.1000e-004**	**7.7700e-003**	**2.0900e-003**	**1.1000e-004**	**2.2000e-003**	**0.0000**	**27.0680**	**27.0680**	**1.2600e-003**	**0.0000**	**27.0997**

3.5 Building Construction - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0662	0.5206	0.6220	1.1000e-003		0.0196	0.0196		0.0189	0.0189	0.0000	90.8161	90.8161	0.0148	0.0000	91.1868
Total	**0.0662**	**0.5206**	**0.6220**	**1.1000e-003**		**0.0196**	**0.0196**		**0.0189**	**0.0189**	**0.0000**	**90.8161**	**90.8161**	**0.0148**	**0.0000**	**91.1868**

3.5 Building Construction - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0000e-004	0.0255	6.8900e-003	9.0000e-005	2.3000e-003	3.0000e-005	2.3200e-003	6.6000e-004	3.0000e-005	6.9000e-004	0.0000	8.5208	8.5208	3.4000e-004	0.0000	8.5292
Worker	1.9300e-003	1.0600e-003	0.0128	5.0000e-005	7.1100e-003	4.0000e-005	7.1500e-003	1.8900e-003	4.0000e-005	1.9300e-003	0.0000	4.7743	4.7743	7.0000e-005	0.0000	4.7762
Total	**2.6300e-003**	**0.0265**	**0.0197**	**1.4000e-004**	**9.4100e-003**	**7.0000e-005**	**9.4700e-003**	**2.5500e-003**	**7.0000e-005**	**2.6200e-003**	**0.0000**	**13.2951**	**13.2951**	**4.1000e-004**	**0.0000**	**13.3054**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0662	0.5206	0.6220	1.1000e-003		0.0196	0.0196		0.0189	0.0189	0.0000	90.8160	90.8160	0.0148	0.0000	91.1867
Total	**0.0662**	**0.5206**	**0.6220**	**1.1000e-003**		**0.0196**	**0.0196**		**0.0189**	**0.0189**	**0.0000**	**90.8160**	**90.8160**	**0.0148**	**0.0000**	**91.1867**

3.5 Building Construction - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0000e-004	0.0255	6.8900e-003	9.0000e-005	2.3000e-003	3.0000e-005	2.3200e-003	6.6000e-004	3.0000e-005	6.9000e-004	0.0000	8.5208	8.5208	3.4000e-004	0.0000	8.5292
Worker	1.9300e-003	1.0600e-003	0.0128	5.0000e-005	7.1100e-003	4.0000e-005	7.1500e-003	1.8900e-003	4.0000e-005	1.9300e-003	0.0000	4.7743	4.7743	7.0000e-005	0.0000	4.7762
Total	**2.6300e-003**	**0.0265**	**0.0197**	**1.4000e-004**	**9.4100e-003**	**7.0000e-005**	**9.4700e-003**	**2.5500e-003**	**7.0000e-005**	**2.6200e-003**	**0.0000**	**13.2951**	**13.2951**	**4.1000e-004**	**0.0000**	**13.3054**

3.6 Paving - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4300e-003	0.0133	0.0220	3.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	2.9434	2.9434	9.3000e-004	0.0000	2.9667
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4300e-003**	**0.0133**	**0.0220**	**3.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**2.9434**	**2.9434**	**9.3000e-004**	**0.0000**	**2.9667**

3.6 Paving - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	4.0000e-005	4.6000e-004	0.0000	2.6000e-004	0.0000	2.6000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.1724	0.1724	0.0000	0.0000	0.1725
Total	**7.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**2.6000e-004**	**0.0000**	**2.6000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.1724**	**0.1724**	**0.0000**	**0.0000**	**0.1725**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.4300e-003	0.0133	0.0220	3.0000e-005		6.2000e-004	6.2000e-004		5.7000e-004	5.7000e-004	0.0000	2.9434	2.9434	9.3000e-004	0.0000	2.9667
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4300e-003**	**0.0133**	**0.0220**	**3.0000e-005**		**6.2000e-004**	**6.2000e-004**		**5.7000e-004**	**5.7000e-004**	**0.0000**	**2.9434**	**2.9434**	**9.3000e-004**	**0.0000**	**2.9667**

3.6 Paving - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	4.0000e-005	4.6000e-004	0.0000	2.6000e-004	0.0000	2.6000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.1724	0.1724	0.0000	0.0000	0.1725
Total	**7.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**2.6000e-004**	**0.0000**	**2.6000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.1724**	**0.1724**	**0.0000**	**0.0000**	**0.1725**

3.7 Architectural Coating - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	2.8600e-003	4.5200e-003	1.0000e-005		1.3000e-004	1.3000e-004		1.3000e-004	1.3000e-004	0.0000	0.6383	0.6383	3.0000e-005	0.0000	0.6392
Total	**4.3000e-004**	**2.8600e-003**	**4.5200e-003**	**1.0000e-005**		**1.3000e-004**	**1.3000e-004**		**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**3.0000e-005**	**0.0000**	**0.6392**

3.7 Architectural Coating - 2027

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0531	0.0531	0.0000	0.0000	0.0531
Total	**2.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0531**	**0.0531**	**0.0000**	**0.0000**	**0.0531**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.3000e-004	2.8600e-003	4.5200e-003	1.0000e-005		1.3000e-004	1.3000e-004		1.3000e-004	1.3000e-004	0.0000	0.6383	0.6383	3.0000e-005	0.0000	0.6392
Total	**4.3000e-004**	**2.8600e-003**	**4.5200e-003**	**1.0000e-005**		**1.3000e-004**	**1.3000e-004**		**1.3000e-004**	**1.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**3.0000e-005**	**0.0000**	**0.6392**

3.7 Architectural Coating - 2027

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.4000e-004	0.0000	8.0000e-005	0.0000	8.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0531	0.0531	0.0000	0.0000	0.0531
Total	**2.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**8.0000e-005**	**0.0000**	**8.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0531**	**0.0531**	**0.0000**	**0.0000**	**0.0531**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Mitigated	1.1300e-003	5.7200e-003	0.0122	5.0000e-005	5.5500e-003	4.0000e-005	5.5900e-003	1.4900e-003	3.0000e-005	1.5200e-003	0.0000	4.9101	4.9101	1.6000e-004	0.0000	4.9141
Unmitigated	1.1300e-003	5.7200e-003	0.0122	5.0000e-005	5.5500e-003	4.0000e-005	5.5900e-003	1.4900e-003	3.0000e-005	1.5200e-003	0.0000	4.9101	4.9101	1.6000e-004	0.0000	4.9141

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	1.89	22.75	16.74	14,926	14,926
Total	1.89	22.75	16.74	14,926	14,926

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.585310	0.036704	0.193678	0.106768	0.013058	0.005276	0.019312	0.028136	0.002690	0.001821	0.005648	0.000918	0.000682

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	4.1000e-004	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.1000e-004**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.1000e-004**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.2132	5.0000e-005	1.0000e-005	1.2179
Unmitigated	1.2132	5.0000e-005	1.0000e-005	1.2179

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 1.19148	1.2132	5.0000e-005	1.0000e-005	1.2179
Total		**1.2132**	**5.0000e-005**	**1.0000e-005**	**1.2179**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 1.19148	1.2132	5.0000e-005	1.0000e-005	1.2179
Total		**1.2132**	**5.0000e-005**	**1.0000e-005**	**1.2179**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0183	1.0800e-003	0.0000	0.0453
Unmitigated	0.0183	1.0800e-003	0.0000	0.0453

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.09	0.0183	1.0800e-003	0.0000	0.0453
Total		**0.0183**	**1.0800e-003**	**0.0000**	**0.0453**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.09	0.0183	1.0800e-003	0.0000	0.0453
Total		**0.0183**	**1.0800e-003**	**0.0000**	**0.0453**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Cannon Road Construction Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	2.2	13.5	17.1	3.3	0.8	2.5	1.2	0.7	0.5	2,467.1
Grading/Excavation	5.4	32.2	50.0	4.9	2.4	2.5	2.7	2.2	0.5	6,514.1
Drainage/Utilities/Sub-Grade	0.2	2.5	0.8	2.6	0.1	2.5	0.6	0.0	0.5	834.9
Paving	2.4	15.7	16.3	1.0	1.0	-	0.9	0.9	-	2,696.3
Maximum (pounds/day)	5.4	32.2	50.0	4.9	2.4	2.5	2.7	2.2	0.5	6,514.1
Total (tons/construction project)	0.2	1.2	1.6	0.2	0.1	0.1	0.1	0.1	0.0	234.2

Notes: Project Start Year -> 2018
Project Length (months) -> 6
Total Project Area (acres) -> 5
Maximum Area Disturbed/Day (acres) -> 0
Total Soil Imported/Exported (yd^3/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Cannon Road Construction Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	1.0	6.1	7.8	1.5	0.4	1.1	0.6	0.3	0.2	1,121.4
Grading/Excavation	2.5	14.6	22.7	2.2	1.1	1.1	1.2	1.0	0.2	2,960.9
Drainage/Utilities/Sub-Grade	0.1	1.1	0.4	1.2	0.0	1.1	0.3	0.0	0.2	379.5
Paving	1.1	7.1	7.4	0.5	0.5	-	0.4	0.4	-	1,225.6
Maximum (kilograms/day)	2.5	14.6	22.7	2.2	1.1	1.1	1.2	1.0	0.2	2,960.9
Total (megagrams/construction project)	0.2	1.0	1.5	0.2	0.1	0.1	0.1	0.1	0.0	212.5

Notes: Project Start Year -> 2018
Project Length (months) -> 6
Total Project Area (hectares) -> 2
Maximum Area Disturbed/Day (hectares) -> 0
Total Soil Imported/Exported ($meters^3$/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Cannon Road Construction (600ft)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	1.5	9.2	15.1	3.2	0.7	2.5	1.1	0.6	0.5	1,849.5
Grading/Excavation	5.2	28.1	53.4	5.1	2.6	2.5	2.8	2.3	0.5	5,898.4
Drainage/Utilities/Sub-Grade	0.2	2.2	0.9	2.6	0.1	2.5	0.6	0.0	0.5	689.0
Paving	1.8	11.5	14.6	0.9	0.9	-	0.8	0.8	-	2,076.0
Maximum (pounds/day)	5.2	28.1	53.4	5.1	2.6	2.5	2.8	2.3	0.5	5,898.4
Total (tons/construction project)	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	34.1

Notes: Project Start Year -> 2017
Project Length (months) -> 1
Total Project Area (acres) -> 0
Maximum Area Disturbed/Day (acres) -> 0
Total Soil Imported/Exported (yd^3/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Cannon Road Construction (600ft)				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	0.7	4.2	6.9	1.4	0.3	1.1	0.5	0.3	0.2	840.7
Grading/Excavation	2.3	12.8	24.3	2.3	1.2	1.1	1.3	1.1	0.2	2,681.1
Drainage/Utilities/Sub-Grade	0.1	1.0	0.4	1.2	0.0	1.1	0.3	0.0	0.2	313.2
Paving	0.8	5.2	6.6	0.4	0.4	-	0.4	0.4	-	943.6
Maximum (kilograms/day)	2.3	12.8	24.3	2.3	1.2	1.1	1.3	1.1	0.2	2,681.1
Total (megagrams/construction project)	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	30.9

Notes: Project Start Year -> 2017
Project Length (months) -> 1
Total Project Area (hectares) -> 0
Maximum Area Disturbed/Day (hectares) -> 0
Total Soil Imported/Exported ($meters^3$/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Tolay Lake General Trail Construction Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	1.0	6.9	11.4	5.5	0.5	5.0	1.5	0.4	1.0	1,531.7
Grading/Excavation	3.8	21.8	40.8	6.9	1.9	5.0	2.7	1.7	1.0	4,788.3
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	3.8	21.8	40.8	6.9	1.9	5.0	2.7	1.7	1.0	4,788.3
Total (tons/construction project)	0.1	0.6	1.0	0.2	0.0	0.1	0.1	0.0	0.0	122.2

Notes:	
Project Start Year ->	2017
Project Length (months) ->	3
Total Project Area (acres) ->	3
Maximum Area Disturbed/Day (acres) ->	1
Total Soil Imported/Exported (yd^3/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Tolay Lake General Trail Construction Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	0.4	3.1	5.2	2.5	0.2	2.3	0.7	0.2	0.5	696.2
Grading/Excavation	1.7	9.9	18.5	3.1	0.8	2.3	1.2	0.8	0.5	2,176.5
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	1.7	9.9	18.5	3.1	0.8	2.3	1.2	0.8	0.5	2,176.5
Total (megagrams/construction project)	0.1	0.5	0.9	0.2	0.0	0.1	0.1	0.0	0.0	110.8

Notes:	
Project Start Year ->	2017
Project Length (months) ->	3
Total Project Area (hectares) ->	1
Maximum Area Disturbed/Day (hectares) ->	0
Total Soil Imported/Exported ($meters^3$/day)->	0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Road Construction Emissions Model, Version 7.1.5.1

Emission Estimates for -> Tolay Lake General Trail Construction P2+ Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	0.7	6.5	6.8	5.3	0.3	5.0	1.3	0.3	1.0	1,518.3
Grading/Excavation	2.4	20.7	22.4	6.0	1.0	5.0	2.0	0.9	1.0	4,772.7
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (pounds/day)	2.4	20.7	22.4	6.0	1.0	5.0	2.0	0.9	1.0	4,772.7
Total (tons/construction project)	0.1	0.5	0.6	0.1	0.0	0.1	0.0	0.0	0.0	121.7

Notes: Project Start Year -> 2022

Project Length (months) -> 3

Total Project Area (acres) -> 3

Maximum Area Disturbed/Day (acres) -> 1

Total Soil Imported/Exported (yd^3/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Tolay Lake General Trail Construction P2+ Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	Total PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	Total PM2.5 (kgs/day)	Exhaust PM2.5 (kgs/day)	Fugitive Dust PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	0.3	2.9	3.1	2.4	0.1	2.3	0.6	0.1	0.5	690.1
Grading/Excavation	1.1	9.4	10.2	2.7	0.5	2.3	0.9	0.4	0.5	2,169.4
Drainage/Utilities/Sub-Grade	-	-	-	-	-	-	-	-	-	-
Paving	-	-	-	-	-	-	-	-	-	-
Maximum (kilograms/day)	1.1	9.4	10.2	2.7	0.5	2.3	0.9	0.4	0.5	2,169.4
Total (megagrams/construction project)	0.1	0.5	0.5	0.1	0.0	0.1	0.0	0.0	0.0	110.4

Notes: Project Start Year -> 2022

Project Length (months) -> 3

Total Project Area (hectares) -> 1

Maximum Area Disturbed/Day (hectares) -> 0

Total Soil Imported/Exported ($meters^3$/day)-> 0

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

Appendix C

Phase I ESA

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

EBA ENGINEERING
CIVIL & ENVIRONMENTAL ENGINEERS

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O: File

September 8, 2004

Mr. Stuart Martin
Sonoma County Agricultural & Open Space District
747 Mendocino Avenue, Suite 100
Santa Rosa, California 95401

**SUBJECT: REPORT OF INVESTIGATION
TOLAY LAKE RANCH
PETALUMA, CALIFORNIA
EBA PROJECT NO. 03-1050 (8)**

Dear Mr. Martin:

The following presents the results of site investigation activities at the Tolay Lake Ranch located in Petaluma, California (Figure 1, Appendix A). The additional site investigation activities were initiated to supplement the findings and recommendations of the *Phase I Environmental Site Assessment* (EBA 2004) prepared for the project site. The following presents the scope of work conducted at the project site and our findings and recommendations.

SITE HISTORY

The Tolay Lake Ranch is a historic property in southern Sonoma County that has been occupied and used for agricultural purposes since the 1800's. The site appears to originally been part of the Petaluma Rancho. Between 1822 and 1846, more than 800 California land grants were made to individuals by the Mexican government and Rancho Petaluma was one of those grants. Rancho Petaluma originally consisted of about 44,000 acres and in 1844 was enlarged by an additional land grant to bring the total acreage to more than 66,000 acres. The rancho then stretched eastward from Petaluma Creek over the hills and down to Sonoma Creek, including all land that lay between those two waterways from the edge of San Francisco Bay to approximately the present site of Glen Ellen.

In the 1860's, the rancho started to be split into smaller land holdings. Historical evidence indicates the project site was in part created in the 1860's. Mr. Marvin Cardoza, the current property owner, indicated the project site was originally developed as the Fair Ranch that was over 10,000 acres in size. The property was later sold to the Donahue family who was involved with the Santa Rosa and Petaluma Railroad. In the late 1800's the Foster family purchased the

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Also in Southern California

property and held it for about 50 years. The Cardoza family then purchased the site in the early 1940's and has operated since that time as a working ranch and farm. The primary use of the project site has been for agricultural production which has included the application and use of agricultural chemicals.

The Phase I Environmental Site Investigation documented and recommended specific site investigation activities as follow-up measures to better determine if impacts to the project site have occurred from current and historic site uses.

SCOPE OF WORK

The following scope of work was implemented to investigate the project site:

- Collect soil samples from the agricultural areas of the property located within the Tolay Lake basin and selected drainage courses for chemical analysis for residual pesticides and herbicides.

- Collect water samples from the potable water system for the analysis of microscopic contaminants and general water quality constituents.

- Collect soil samples for the analysis of lead from the area of the project site formerly used for the hunting of waterfowl.

- Conduct a metal detection survey and collect soil samples for chemical samples in the area indicated as formerly having an underground fuel storage tank.

The following presents information specific information regarding the implementation of aforementioned scope of work and the protocols used for sample collection as well as analytical testing and analysis.

Soil Sampling – Agricultural Lands

Soil samples were collected from the areas of the project site currently or historically used for agricultural production and located within the expected seasonal high water zone of Tolay Lake. Soil samples were collected at a rate of one sample per 10 acres of land. A total of 50 soil samples were collected from the agricultural lands and composited 10 to 1 by the laboratory.

The soil samples were collected at depths of approximately six inches below the ground surface in laboratory supplied containers. Upon collection, the sample containers were capped, sealed, labeled and placed under refrigerated conditions pending transport to a North Coast Laboratories located in Arcata, California for chemical analysis.

At the time of soil collection, each location was geo-referenced to latitude and longitude coordinate basis using a Global Positioning System device. The GPS coordinates were then used to map each sampling location as shown on Figure 3, Appendix A.

Soil samples were transported under Chain-of-Custody procedures to North Coast Laboratories located in Arcata, California for the analysis of selected herbicides and pesticides including Carbamate and Urea Pesticides using EPA Test Method 632 Modified, Chlorinated Herbicides using EPA Test Method 8151A, Organophosphate Pesticides using EPA Test Method 8141A and Triazine Pesticides using EPA Test Method 619 Modified. The selection of the constituents of concern were based on agricultural chemicals observed at the project site during the Phase I Environmental Site Assessment investigation activities as well as pesticide use reports on file with the Sonoma County Agricultural Commissioners Office and those constituents recently disclosed as historically being used by the owners of the project site.

Agricultural Lands – Drainages

Discrete soil sediment samples were collected from five locations of the surface water drainage courses located within the project site. The soil sampling protocols and analytical testing requirements were consistent with those described in the agricultural lands section presented above. Please refer to Figure 4, Appendix A for the sampling locations.

Potable Water Sampling and Analysis

As documented in the Phase I Environmental Site Assessment, potable water at the project site is provided by two developed springs located on the eastern side of the project site. The collected spring water is transmitted through piping to a central concrete storage tank located on the western portion of the project site in the proximity of the houses and associated outbuildings. It is our understanding the collected water is used without treatment for all domestic use at the project site.

Water collected from the concrete storage tank was pumped through a laboratory-supplied filter for a Microscopic Particulate Analysis that included water contaminants including Cryptosporidium, Giardia and other water borne contaminants. The filter was enclosed within a sterile filter housing, pressure reducer and flow totalizer provided by the analytical laboratory. The filter was placed within the potable water system and left in place for approximately six hours of time in which a total of 539 gallons of water was run through the filter. Upon completion, the filter and housing were transported under Chain-of-Custody procedures to Biovir Laboratories located in Benicia, California for examination and analysis.

Potable water samples were also collected directly from the water supply stream feeding into the storage tank for the analysis of general water quality parameters including fecal and total coliform using EPA Test Method SM9223, nitrates using EPA Test Method 300.0, metals including iron, manganese and sodium using Test Method using EPA Test Method 200.7, and general chemistry parameters including hardness using EPA Test Method SM2340B, pH using EPA Test Method 150.1, specific conductance and total dissolved solids using EPA Test Method 120.1. The samples were collected in laboratory supplied sterile containers that were then sealed and placed under refrigerated conditions pending transport to Alpha Analytical Laboratory located in Ukiah, California for chemical analysis

Soil Sampling – Duck Hunting Area

A total of eight soil samples were collected from the constructed earthen pond located on the eastern portion of the project site for the analysis of lead. Please refer to Figure 5, Appendix A for the sampling locations. Soil samples were collected at depths of six to twelve inches below the ground surface in brass tubes. Upon collection, the samples were sealed, capped, labeled and placed under refrigerated conditions pending transport to Alpha Analytical Laboratories located in Ukiah, California for the analysis of total lead using EPA Test Method 6010.

Please note at the time of the sampling, the pond was dry. Mr. Marvin Cardoza indicated the pond had been used as a hunting club for approximately four years in the 1960's. A total of four soil samples were collected from within the pond area. Four additional samples were collected from the area surrounding the perimeter of the pond. In addition, one background soil sample was collected from the central portion of the project site as a background sample that was used as a background sample to compare the lead levels in and around the area of the pond.

Soil Sampling – Former UST Location

Recent disclosures by the current owners of the project site include a site survey dated 1944 that indicates many of the existing and historic buildings and structures located at the project site. The survey also includes a depiction of a gasoline pump and underground fuel storage tank (UST) located on the western side of the large barn located on the western side of the project site. Investigation activities and inspections conducted during the Phase I Environmental Site Assessment did not indicate the presence of a UST at the project site. In addition, no indication of a UST was indicated in regulatory agency records or a comprehensive review of Local, State and Federal environmental databases during the Phase I investigation. Lastly, Marvin Cardoza, the owner of the project site who has occupied the site for at least 40 years indicated that he had no knowledge of the use or presence of a UST at the project site.

Site investigation activities in the area of the former UST included performing a magnetic survey in the area indicated on the survey map as the location of the former UST. The surveyed area was extended approximately in a radius of 30 feet to each side of the location of the former UST and a magnetic survey was conducted on a grid pattern. Two locations within the area of investigation indicated positive detections of ferrous metal objects and were flagged or further investigation. Three areas were then explored using a power auger and hand auger including the area of the former UST and the two areas of positive detection of buried ferrous objects. Please refer to Figure 6, Appendix A for the sampling locations.

Three soil borings were extended to depths between six to seven feet below the ground surface for the purpose of observing soil conditions for the presence of petroleum hydrocarbons and the collection of soil samples for chemical analysis.

Two small buried metal objects consisting of an automotive spark plug and a piece of metal rebar were encountered at depths of less than two feet below the ground surface in the area surveyed. The area of the former UST did not indicate the presence of odors, soil staining or visible sheen indicative of petroleum hydrocarbon contamination in soil.

Three soil samples were collected from each boring at depths of six to seven feet below the ground surface in brass tubes. Upon collection, the samples were sealed, capped, labeled and placed under refrigerated conditions pending transport to Alpha Analytical Laboratories located in Ukiah, California for the analysis of petroleum hydrocarbons including Total Petroleum Hydrocarbons as gasoline (TPH-g), TPH as diesel (TPH-d), TPH as motor oil (TPH-mo) using EPA Test Method 8015 Modified and the constituents benzene, ethylbenzene, toluene and xylenes (BTEX) using EPA Test Method 8260B.

Upon completion, the borings were backfilled to grade with the soil removed from the borings.

FINDINGS

Findings from the site investigation activities are presented below.

Agricultural Lands – Soil Sampling

Soil samples collected and analyzed from the agricultural lands at the project site were all below the laboratory detection limit (ND) for all herbicides and pesticides tested. Tabulated analytical results of the soil sampling are presented in Table 1-5 in Appendix B. A copy of the certified analytical report is presented in Appendix C.

Agricultural Lands – Drainages

Soil samples collected and analyzed from the drainages located within the agricultural lands at the project site were ND for all herbicides and pesticides tested. Tabulated analytical results of the soil sampling are presented in Tables 6-10 in Appendix B. A copy of the certified analytical report is presented in Appendix C.

Potable Water Sampling and Analysis

The analysis of the potable water samples collected at the project site were ND for both Giardia and Cryptosporidium. Other primary microscopic contaminants including diatoms, algae, insect larvae, rotifers and plant debris were also not detected. Secondary microscopic contaminants including plant pollen, Crustacea, Amoeba, Cilliates and Flagellates, and other organisms were also not detected. Nematodes were detected at 12 particulates per 100 gallons of water tested.

Analytical results for bacteriological and general water quality parameters indicate the presence of both total and fecal coliform bacteria. General water parameters appear to be within applicable regulatory requirements as defined by Title 22 of the California Code of Regulations.

Tabulated analytical results of the soil sampling are presented in Table 11 in Appendix B. A copy of the certified analytical report is presented in Appendix C.

Soil Sampling – Duck Hunting Area

The eight soil samples collected from in and around the former waterfowl hunting area indicated total lead levels ranging from 11 to 20 milligrams to kilogram (mg/kg). The background soil sample collected from the outlying areas of the project site indicated total at 9 mg/kg. Tabulated analytical results of the soil sampling are presented in Table 12 in Appendix B. A copy of the certified analytical report is presented in Appendix C.

Soil Sampling – Former UST Location

Investigative activities performed in the area of the former UST did not indicate the current or historic presence of a UST at the project site. While two areas within the area investigated indicated the presence of ferrous objects, upon active investigation two small metal objects were encountered at relatively shallow depths. No other indications of buried ferrous objects were indicated during the field screening in the area investigated.

In addition, no indication of soil staining, odors or visible sheen were observed during the installation of three soil borings within the area of investigation. Further, soil samples collected from each of the three soil borings were all ND for all petroleum hydrocarbon constituents tested with the exception of TPH-mo at a level of 2.2 mg/kg in soil boring B-2@6.5 feet. Tabulated analytical results of the soil sampling are presented Table 13 in Appendix B. A copy of the certified analytical report is presented in Appendix C.

CONCLUSIONS

Based on the findings as presented in the previous sections of this report, it appears that minimal environmental impacts exist at the project site from previous and/or historic site uses. No indication of residual herbicides or pesticides were indicated from the collection of soil samples collected from the historically and current farmed areas or the drainage courses at the project site. In addition, total lead levels in the area of the former waterfowl hunting area appear to be generally low in concentration and within the range of the background lead level collected from other areas of the project site.

Water samples collected from the potable water system indicated the presence of both total and fecal coliform bacteria. As documented in the Phase I Environmental Site Assessment, a spring is a place on the earth's surface where groundwater emerges naturally. The water source of most springs is rainfall that seeps into the ground uphill from the spring outlet. Spring water moves downhill through soil or cracks in rock until it is forced out of the ground by natural pressure. Water obtained from springs is similar to water pumped from shallow groundwater wells. Like shallow wells, springs may be contaminated by surface water or other sources on or below the ground surface. Springs are susceptible to contamination because the water feeding them typically flows through the ground for only a short distance, limiting the amount of natural filtering that can occur. Based on the fact that the springs are located within portions of the project site that have are used for the grazing of cattle, it is probable that the bacterial contamination is the result of the livestock located within the watershed of the springs.

The investigation of the area of the project site depicted on the 1944 survey map as having had a UST did not indicate the presence of a UST nor the presence of petroleum hydrocarbons in soil samples collected for analytical testing. Mr. Marvin Cardoza has occupied the site since the mid 1950's indicated there was no UST in place at the site during his occupancy at the property. It appears the UST was likely removed sometime in the late 1940's or early 1950's. While there was a detection of low levels of TPH-mo at 2.2 mg/kg in one soil boring, it is probable the detection of this constituent is unrelated to the former UST. Based on the investigation activities performed in the area of the former UST at the project site, it appears the UST has been removed and impacts are not present.

RECOMMENDATIONS

Based on findings and conclusions from the environmental investigations performed at the project site, EBA recommends the following:

- Further investigation of the potable water system and specifically the source of the bacteriological contamination should be investigated and treated to ensure the suitability of the water for human consumption. Periodic testing should be performed to ensure the water system remains free of contaminants.

- No further investigation activities are recommended.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. No soil engineering or geotechnical references are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation. This report has been prepared solely for the client and any reliance on this report by third parties shall be at such party's sole risk.

EBA makes no warranty, expressed or implied, except that our services have been performed in accordance with generally accepted existing environmental engineering, health and safety principles, and applicable regulations at the time and location of the study. EBA has analyzed the available information using currently applicable engineering techniques.

Please be advised that the recommendations presented herein are based partly on information made available to EBA by others, and includes professional interpretations based on limited research and data. Based on these circumstances, the decision to conduct additional investigative work to substantiate the findings and conclusions presented herein is the sole responsibility of the Client.

REFERENCES

EBA Engineering - *Phase I Environmental Site Assessment – Tolay Lake Ranch, Petaluma, California.* Dated February 2004.

I trust this provides the information you require at this time. If you have any comments or questions, please call (707) 544-0784.

Sincerely,
EBA ENGINEERING

David Noren, Manager
Environmental Services

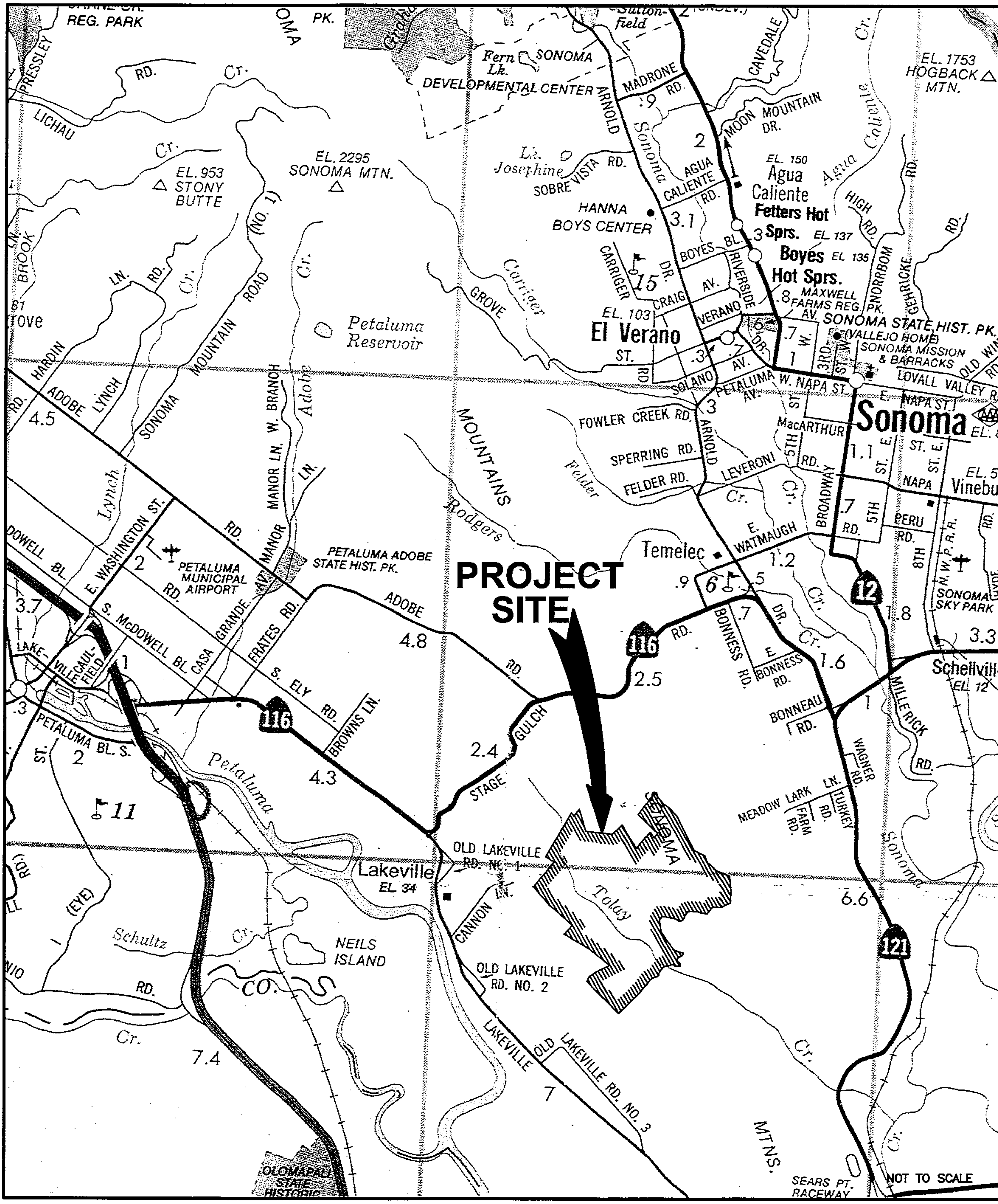
Reviewed by

Dale Solheim, P.E. #30888
Principal Engineer

Enclosures: Appendix A – Figures
Appendix B – Tables
Appendix C – Certified Analytical Reports

APPENDIX A

FIGURES



EBA

LOCATION MAP

TOLAY RANCH
PETALUMA, CALIFORNIA

FIGURE
1
01–1050

.1050\LOCATION.dwg, LOC, 09/10/2004 09:58:05 AM

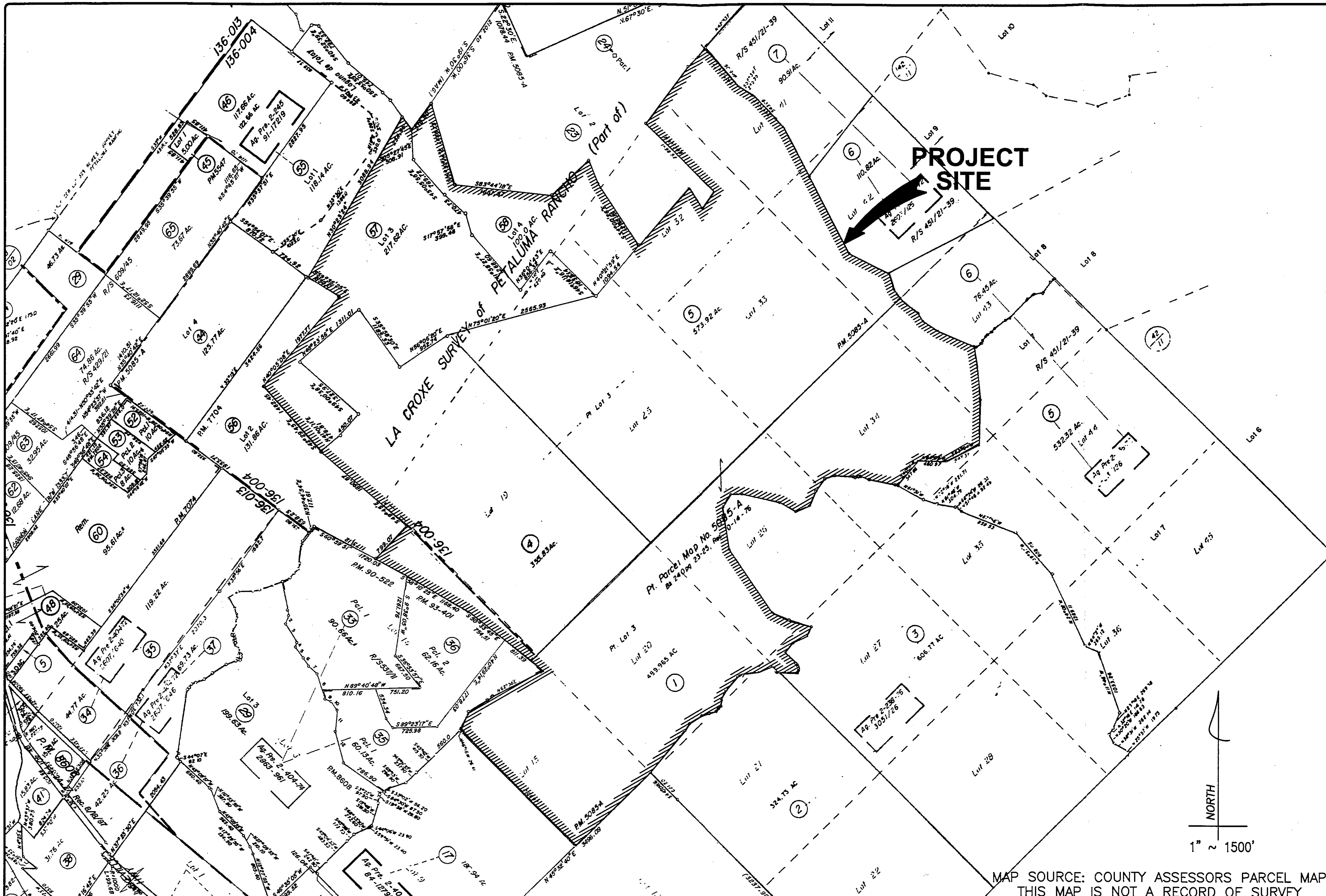


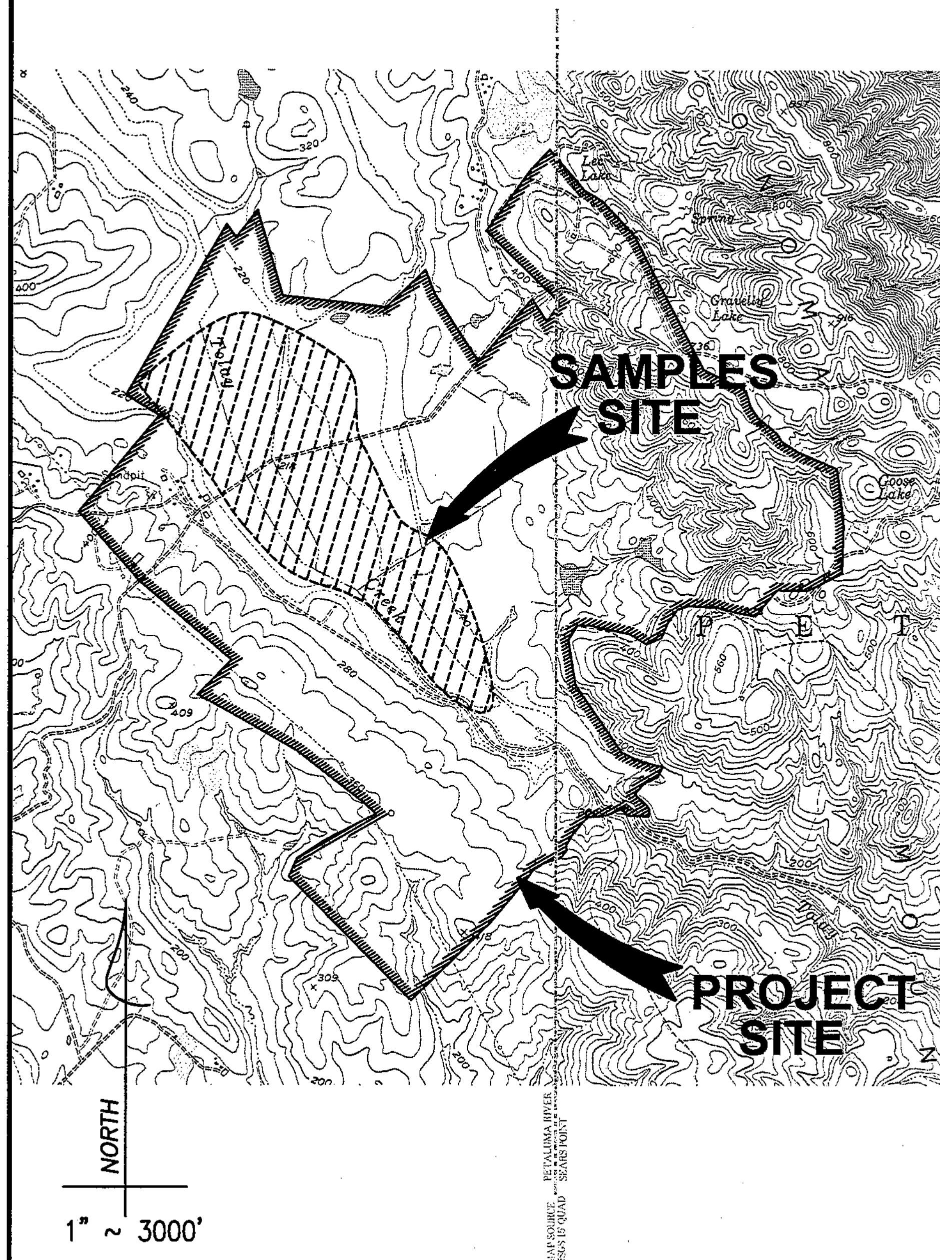
FIGURE 2

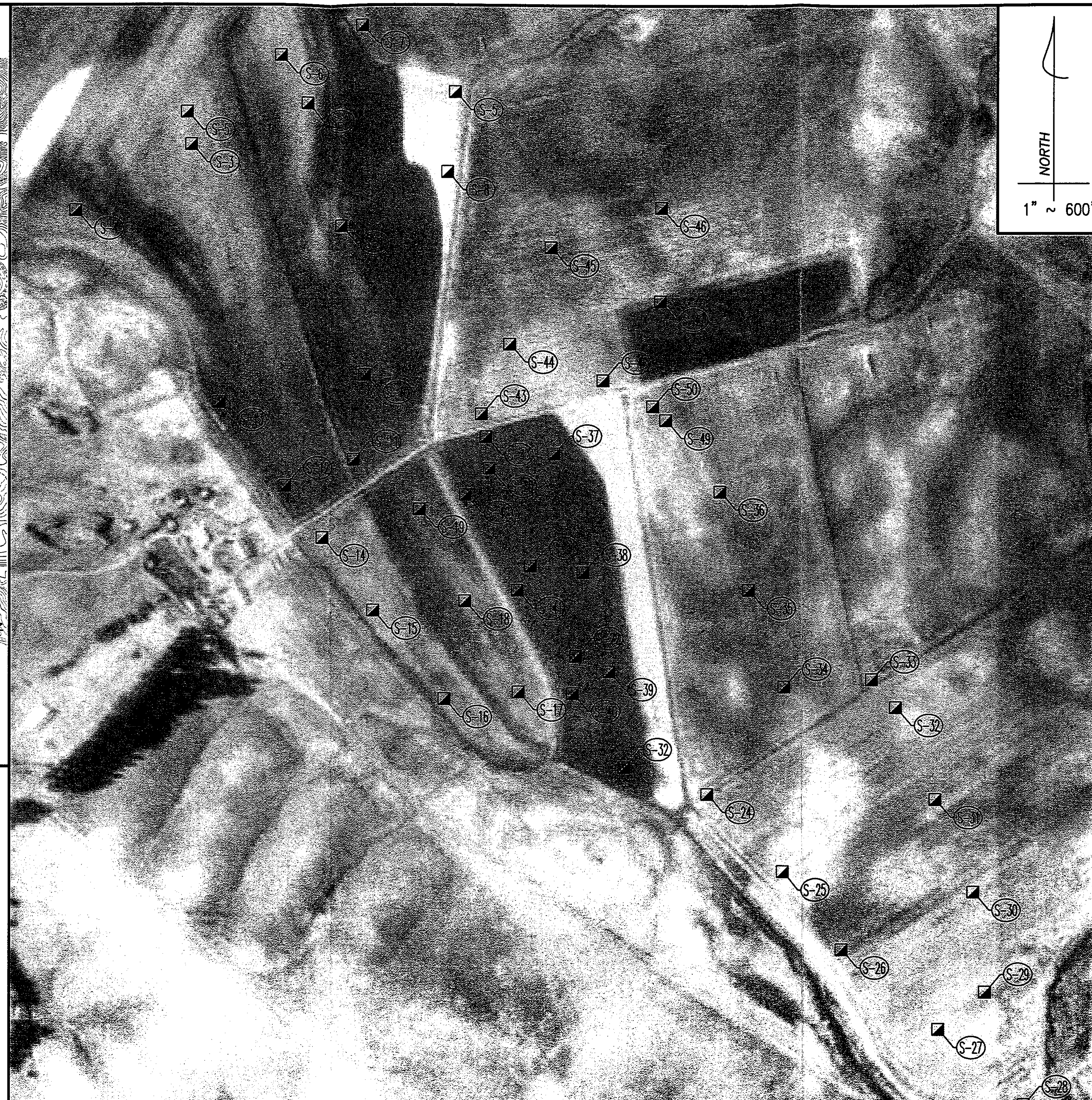
03-1050

SITE MAP

TOLAY LAKE RANCH

PETALUMA, CALIFORNIA





LEGEND

S-1 SAMPLE LOCATION

NOTE: AERIAL PHOTO DATED 7/10/93

FIGURE 3

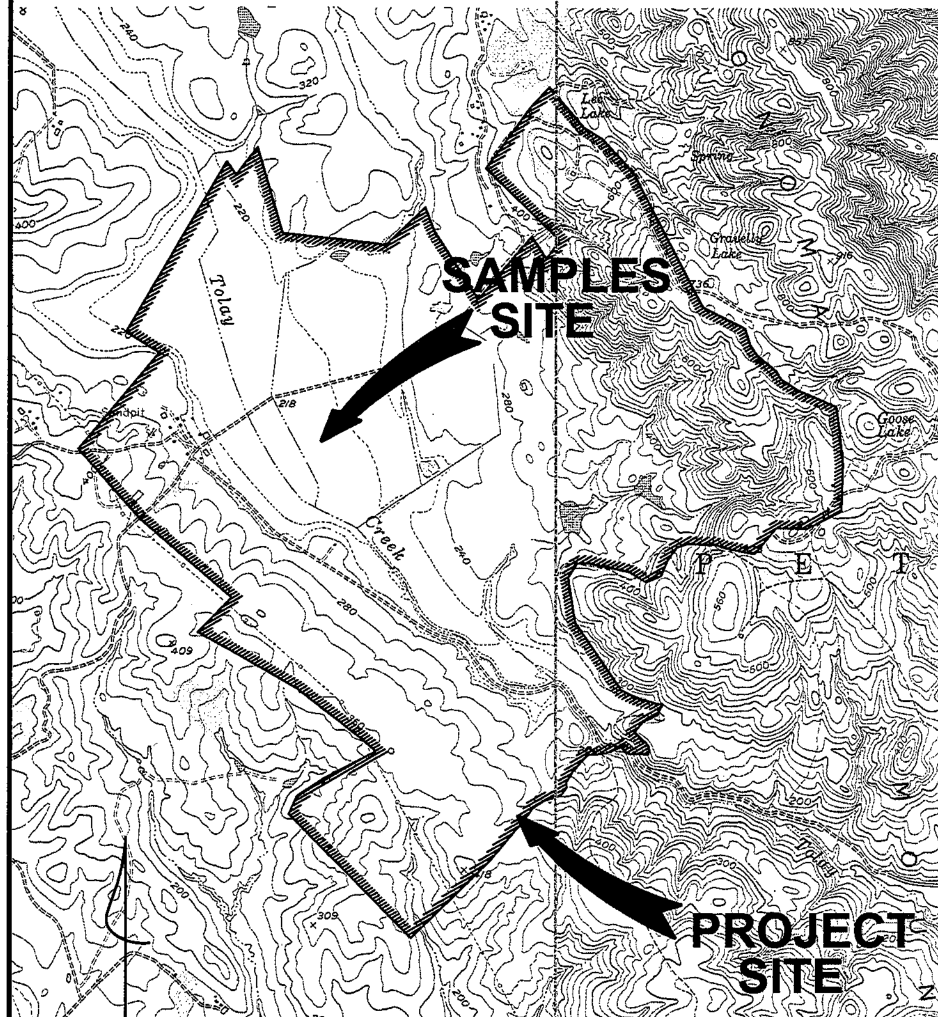
03-1050

AGRICULTURAL LANDS SOIL SAMPLE LOCATIONS

TOLAY LAKE RANCH
PETALUMA, CALIFORNIA

EBA

Q:\1050\ssoil samples.dwg, 11X17ENV (2), 09/10/2004 10:53:27 AM



LEGEND

D-1 SAMPLE LOCATION

NOTE: AERIAL PHOTO DATED 7/10/93

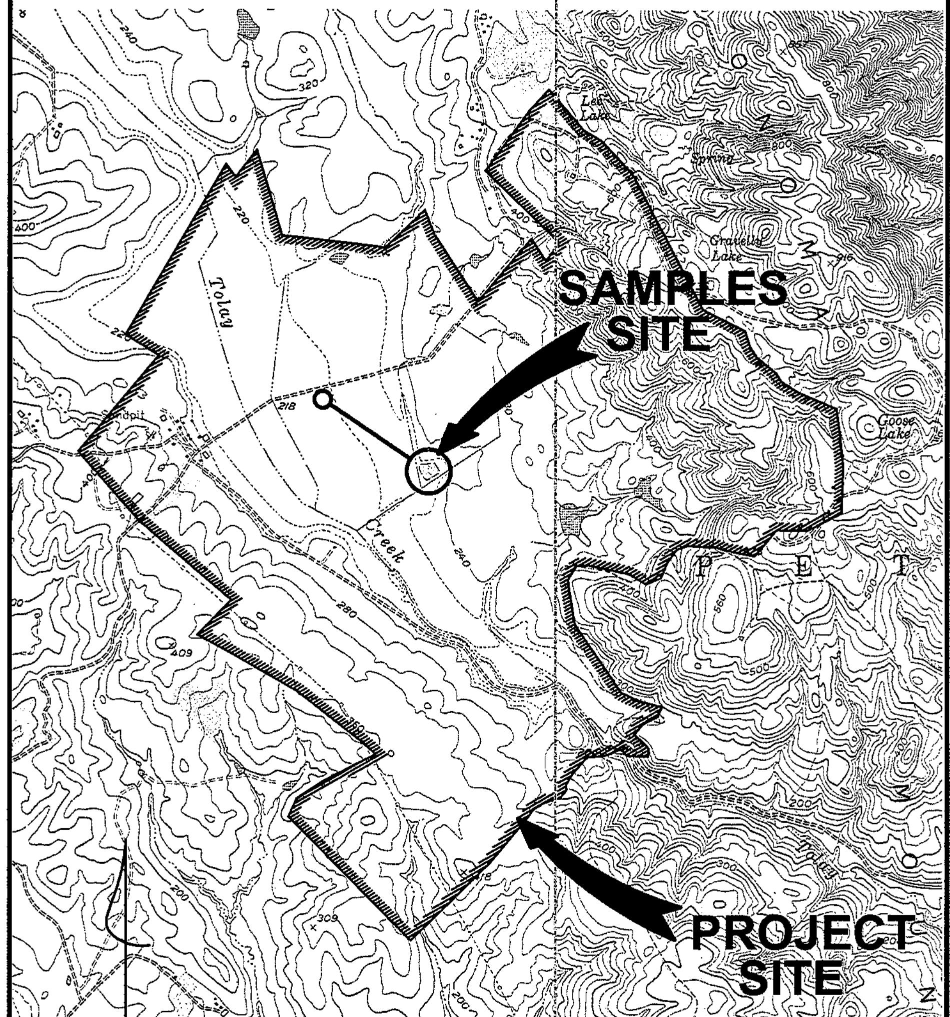
DITCH SAMPLE LOCATIONS

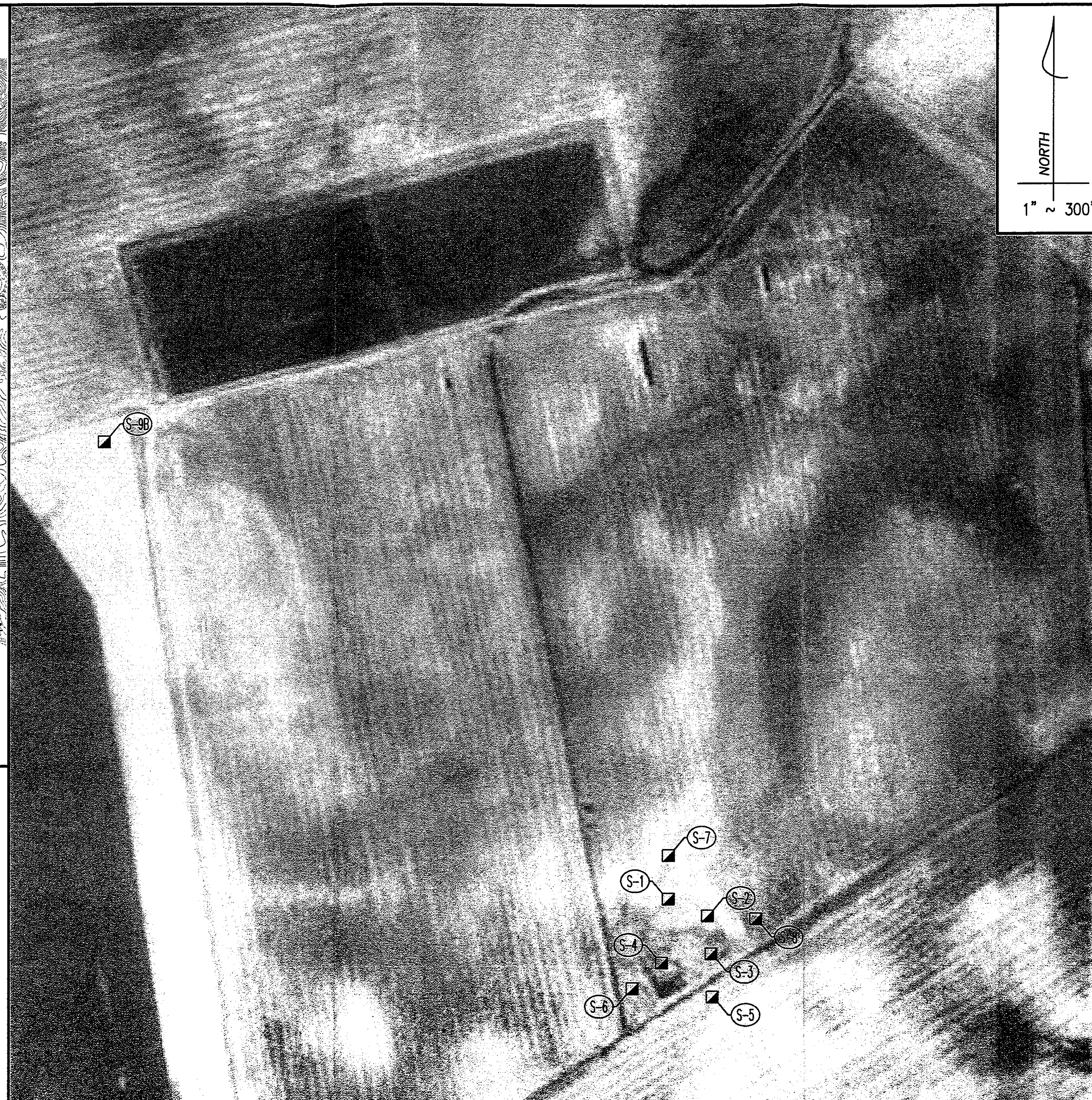
TOLAY LAKE RANCH
PETALUMA, CALIFORNIA

FIGURE 4
03-1050

EBA

Q:\1050\ssoil samples.dwg, 11X17ENV (4), 09/13/2004 12:29:10 PM





LEGEND

S-1 SAMPLE LOCATION

NOTE: AERIAL PHOTO DATED 7/10/93

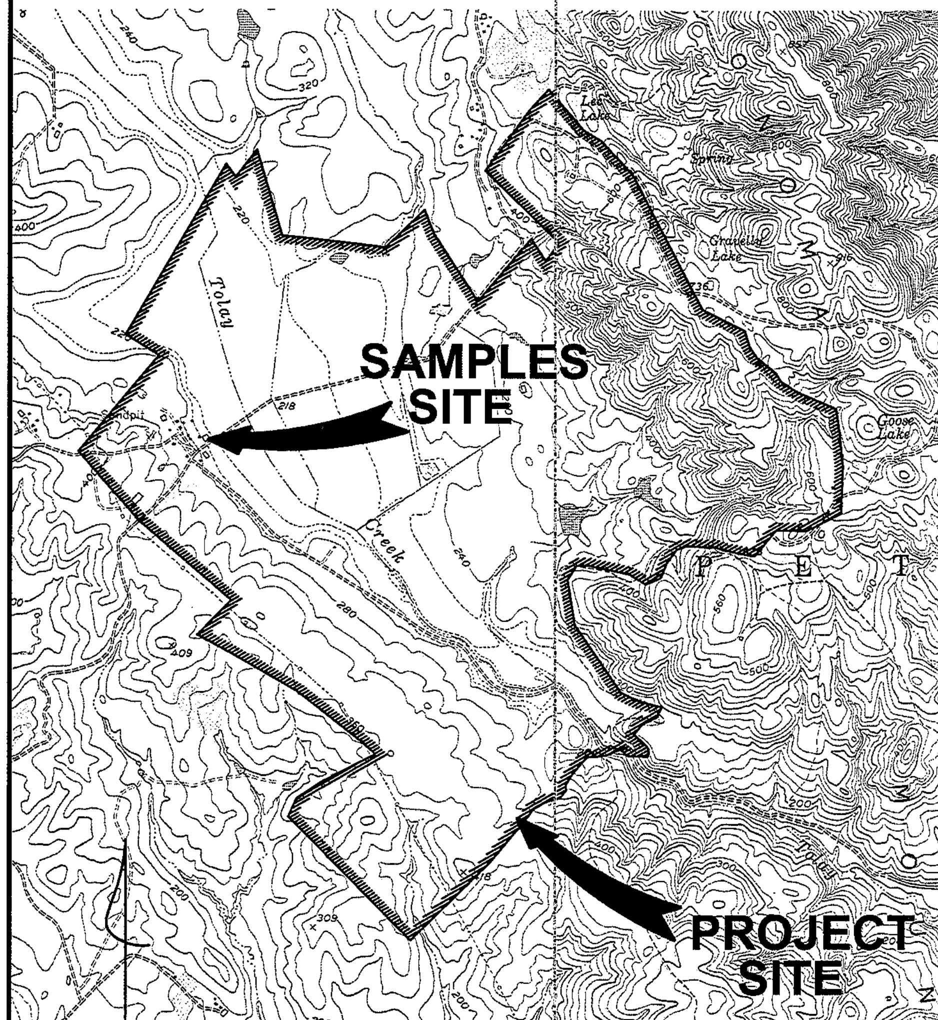
FIGURE 5

03-1050

LEAD SAMPLE LOCATIONS

TOLAY LAKE RANCH
PETALUMA, CALIFORNIA

EBA



LEGEND

B-1 SAMPLE LOCATION

NOTE: AERIAL PHOTO DATED 7/10/93

FIGURE 6

03-1050

UST SAMPLE LOCATIONS

TOLAY LAKE RANCH
PETALUMA, CALIFORNIA

EBA

APPENDIX B

TABULATED ANALYTICAL RESULTS

TABLE 1
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS
CARBAMATE AND UREA PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S1-S10	S11-S20	S21-S30	S31-S40	S41-S50
Carbaryl	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diruon	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 2
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS
CHLORINATED HERBICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S1-S10	S11-S20	S21-S30	S31-S40	S41-S50
Dalapon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dicamba	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dichloroprop	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4-D	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4,5-TP	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4,6-T	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4-DB	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dinoseb	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 3
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS
ORGANOPHOSPHATE PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S1-S10	S11-S20	S21-S30	S31-S40	S41-S50
Dichlorvos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Mevinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ethoprophos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Phorate	8/18/2004	ug/g	ND	ND	ND	ND	ND
Demeton-S	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diazinon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Disulfoton	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dimethoate	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ronnel	8/18/2004	ug/g	ND	ND	ND	ND	ND
Methyl Parathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Chlorpyrifos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Malathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Parathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Fenthion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Tetrachlovinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ethion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Fensulfothion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Azinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Coumaphos	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 4
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS
TRIAZINE PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S1-S10	S11-S20	S21-S30	S31-S40	S41-S50
Atraton	8/18/2004	ug/g	ND	ND	ND	ND	ND
Simazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Prometon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Atrazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Propazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Simetryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ametryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Prometryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Terbutryn	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 5
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS
CARBAMATE AND UREA PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S1-S10	S11-S20	S21-S30	S31-S40	S41-S50
Carbaryl	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diruon	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 6
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS - DRAINAGES
CARBAMATE AND UREA PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	D-1	D-2	D-3	D-4	D-5
Carbaryl	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diruon	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 7
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS - DRAINAGES
CHLORINATED HERBICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	D-1	D-2	D-3	D-4	D-5
Dalapon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dicamba	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dichloroprop	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4-D	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4,5-TP	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4,6-T	8/18/2004	ug/g	ND	ND	ND	ND	ND
2,4-DB	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dinoseb	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 8
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS - DRAINAGES
ORGANOPHOSPHATE PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	D-1	D-2	D-3	D-4	D-5
Dichlorvos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Mevinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ethoprophos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Phorate	8/18/2004	ug/g	ND	ND	ND	ND	ND
Demeton-S	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diazinon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Disulfoton	8/18/2004	ug/g	ND	ND	ND	ND	ND
Dimethoate	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ronnel	8/18/2004	ug/g	ND	ND	ND	ND	ND
Methyl Parathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Chlorpyrifos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Malathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Parathion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Fenthion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Tetrachlovinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ethion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Fensulfothion	8/18/2004	ug/g	ND	ND	ND	ND	ND
Azinphos	8/18/2004	ug/g	ND	ND	ND	ND	ND
Coumaphos	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 9
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS - DRAINAGES
TRIAZINE PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	D-1	D-2	D-3	D-4	D-5
Atraton	8/18/2004	ug/g	ND	ND	ND	ND	ND
Simazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Prometon	8/18/2004	ug/g	ND	ND	ND	ND	ND
Atrazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Propazine	8/18/2004	ug/g	ND	ND	ND	ND	ND
Simetryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Ametryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Prometryn	8/18/2004	ug/g	ND	ND	ND	ND	ND
Terbutryn	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 10
TABULATED ANALYTICAL RESULTS
AGRICULTURAL LANDS - DRAINAGES
CARBAMATE AND UREA PESTICIDES
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	D-1	D-2	D-3	D-4	D-5
Carbaryl	8/18/2004	ug/g	ND	ND	ND	ND	ND
Diruon	8/18/2004	ug/g	ND	ND	ND	ND	ND

ug/g = micrograms per gram
ND = Not detected above the laboratory detection limit

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TABLE 11
TABULATED ANALYTICAL RESULTS
POTABLE WATER SYSTEM
WATER QUALITY PARAMETERS
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Units	Date	Water Tank
Iron	mg/L	8/25/2004	ND
Manganese	mg/L	8/25/2004	ND
Sodium	mg/L	8/25/2004	22
Hardness, Total	mg/L	8/25/2004	140
pH	pH Units	8/25/2004	7.7
Specific Conductance	umhos/cm	8/25/2004	440
Total Dissolved Solids	mg/L	8/25/2004	220
Nitrate as NO3	mg/L	8/25/2004	13
Total Coliforms	Present/Absent	8/25/2004	Present
Fecal Coliforms	Present/Absent	8/25/2004	Present

mg/L = milligrams per Liter
ND = Not detected above the laboratory detection limit
umhos/cm = micromhos per centimeter

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TABLE 12
TABULATED ANALYTICAL RESULTS
FORMER WATERFOWL HUNTING AREA
TOTAL LEAD
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9B
Lead	8/25/2004	mg/kg	16	16	14	20	11	17	19	15	9

mg/kg = milligrams per kilogram
ND = Not detected above the laboratory detection limit

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TABLE 13
TABULATED ANALYTICAL RESULTS
FORMER UST LOCATION
PETROLEUM HYDROCARBONS & BTEX/MtBE
TOLAY LAKE PROPERTY
PETALUMA, CALIFORNIA

Analysis	Date	Units	TPH-gas	TPH-d	TPH-mo	Benzene	Toluene	Ethylbenzene	Xylenes
B-1@7'	8/25/2004	mg/kg	ND	ND	ND	ND	ND	ND	ND
B-2@6.5'	8/25/2004	mg/kg	ND	ND	2.2	ND	ND	ND	ND
B-3@6'	8/25/2004	mg/kg	ND	ND	ND	ND	ND	ND	ND

mg/kg = milligrams per kilogram
ND = Not detected above the laboratory detection limit

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APPENDIX C

CERTIFIED ANALYTICAL RESULTS

NORTH COAST LABORATORIES LTD.

September 13, 2004

EBA Engineering
825 Sonoma Avenue
Santa Rosa, CA 95404

Order No.: 0408484
Invoice No.: 44648
PO No.:
ELAP No. 1247-Expires July 2004

Attn: David Noren

RE: 03-1050, Tolay Lake Property

SAMPLE IDENTIFICATION

Fraction	Client Sample Description
01A	S-1,2,3,4,5,6,7,8,9,10 COMPOSITE
02A	S-11,12,13,14,15,16,17,18,19,20 COMPOSIT
03A	S-21,22,23,24,25,26,27,28,29,30 COMPOSIT
04A	S-31,32,33,34,35,36,37,38,39,40 COMPOSIT
05A	S-41,42,43,44,45,46,47,48,49,50 COMPOSIT
06A	D-1
07A	D-2
08A	D-3
09A	D-4
10A	D-5

ND = Not Detected at the Reporting Limit
Limit = Reporting Limit
All solid results are expressed on a wet-weight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s)

T. Sherman
QA Unit

Jesse G. Chaney, Jr.
Laboratory Director

5680 West End Road • Arcata California 95521-9202 • 707-822-4649 • FAX 707-822-6831

CLIENT:	EBA Engineering
Project:	03-1050, Tolay Lake Property
Lab Order:	0408484

CASE NARRATIVE

EPA 8151A:
The surrogate recoveries for all of the samples were outside of the acceptance limits. The surrogate recoveries for the quality control samples were within the acceptance limits. This indicates that the low surrogate recoveries may be due to matrix effects from the samples.

The matrix spike (MS) recoveries were outside of the acceptance limits for all of the analytes. The laboratory control sample/laboratory control sample duplicate (LCS/LCSD) recoveries were within the acceptance limits for all of the analytes indicating that the low recoveries may be due to matrix effects.

The reporting limits for all analytes were raised due to poor matrix spike and surrogate recoveries.

EPA 632:
Samples D-2, D-3 and D-5 were diluted due to matrix interference.

EPA 8081A:
The reporting limits were raised for samples S-41,42,43,44,45,46,47,48,49,50 COMPOSITE, D-3 and D-4 due to sample matrix.

Samples D-2 and D-5 were diluted and the surrogate recoveries were not quantifiable (NQ) due to the sample matrix.

The surrogate recovery for sample S-41,42,43,44,45,46,47,48,49,50 COMPOSITE was outside of the acceptance limits. The surrogate recoveries for the quality control samples were within acceptance limits. This indicates that the high surrogate recovery may be due to matrix effects from the sample.

Sample S-41,42,43,44,45,46,47,48,49,50 COMPOSITE was originally extracted within the 14 day holding time. Due to a laboratory error, the sample had to be re-exytracted. The sample was re-extracted 1 day past the 14 day holding time.

The LCS/LCSD, extracted on 9/2/04, have recoveries that were below the lower acceptance limits for several analytes. The reporting limits were raised for the sample associated with these LCS/LCSD.

EPA 619:
The relative percent difference (RPD) for the laboratory control samples was above the upper acceptance limit for simazine. This indicates that the results could be variable. Since there were no detectable levels of the analyte in the samples, the data were accepted.

EPA 8141A:
The surrogate recovery for the LCS extracted on 8/27/04 was below the lower acceptance limit. All of

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5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

the analyte recoveries were within the acceptance limits; therefore, the data were accepted.

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: S-1,2,3,4,5,6,7,8,9,10 COMPOSITE **Received:** 8/20/04 **Collected:** 8/18/04 0:00

Lab ID: 0408484-01A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	8/31/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	8/31/04
Surrogate: Simazine	66.9	52.3-119	% Rec	1.0	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	10.7	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.020	µg/g	1.0	8/30/04	9/3/04
beta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Lindane	ND	0.020	µg/g	1.0	8/30/04	9/3/04
delta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Heptachlor	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Aldrin	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Heptachlor Epoxide	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Endosulfan I	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Dieldrin	ND	0.020	µg/g	1.0	8/30/04	9/3/04
4,4´-DDE	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Endrin	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Endosulfan II	ND	0.020	µg/g	1.0	8/30/04	9/3/04
4,4´-DDD	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Endrin Aldehyde	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Endosulfan sulfate	ND	0.020	µg/g	1.0	8/30/04	9/3/04
4,4´-DDT	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Methoxychlor	ND	0.020	µg/g	1.0	8/30/04	9/3/04
Chlordane	ND	1.0	µg/g	1.0	8/30/04	9/3/04
Toxaphene	ND	10	µg/g	1.0	8/30/04	9/3/04
Surrogate: Chloroneb	81.3	27-160	% Rec	1.0	8/30/04	9/3/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	81.9	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	139	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: S-11,12,13,14,15,16,17,18,19,20 COMPOS **Received:** 8/20/04 **Collected:** 8/18/04 0:00

Lab ID: 0408484-02A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	9/1/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	9/1/04
Surrogate: Simazine	76.5	52.3-119	% Rec	1.0	8/26/04	9/1/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	11.1	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
beta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Lindane	ND	0.020	µg/g	1.0	8/30/04	9/7/04
delta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Heptachlor	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Aldrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Heptachlor Epoxide	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan I	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Dieldrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDE	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan II	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDD	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endrin Aldehyde	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan sulfate	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDT	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Methoxychlor	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Chlordane	ND	1.0	µg/g	1.0	8/30/04	9/7/04
Toxaphene	ND	10	µg/g	1.0	8/30/04	9/7/04
Surrogate: Chloroneb	58.9	27-160	% Rec	1.0	8/30/04	9/7/04

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WorkOrder: 0408484

ANALYTICAL REPORT

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	77.4	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	146	28.4-149	% Rec	1.0	8/27/04	9/2/04

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ANALYTICAL REPORT

Date: 13-Sep-04
WorkOrder: 0408484

Client Sample ID: S-21,22,23,24,25,26,27,28,29,30 COMPOS **Received:** 8/20/04 **Collected:** 8/18/04 0:00
Lab ID: 0408484-03A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	8/31/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	8/31/04
Surrogate: Simazine	70.8	52.3-119	% Rec	1.0	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	9.88	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
beta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Lindane	ND	0.020	µg/g	1.0	8/30/04	9/7/04
delta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Heptachlor	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Aldrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Heptachlor Epoxide	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan I	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Dieldrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDE	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endrin	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan II	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDD	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endrin Aldehyde	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Endosulfan sulfate	ND	0.020	µg/g	1.0	8/30/04	9/7/04
4,4´-DDT	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Methoxychlor	ND	0.020	µg/g	1.0	8/30/04	9/7/04
Chlordane	ND	1.0	µg/g	1.0	8/30/04	9/7/04
Toxaphene	ND	10	µg/g	1.0	8/30/04	9/7/04
Surrogate: Chloroneb	56.4	27-160	% Rec	1.0	8/30/04	9/7/04

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WorkOrder: 0408484

ANALYTICAL REPORT

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	66.3	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	139	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: S-31,32,33,34,35,36,37,38,39,40 COMPOS **Received:** 8/20/04 **Collected:** 8/18/04 0:00

Lab ID: 0408484-04A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	8/31/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	8/31/04
Surrogate: Simazine	74.5	52.3-119	% Rec	1.0	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	9.24	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
beta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Lindane	ND	0.020	µg/g	1.0	8/30/04	9/8/04
delta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Heptachlor	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Aldrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan I	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Dieldrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4´-DDE	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan II	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4´-DDD	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endrin Aldehyde	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan sulfate	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4´-DDT	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Methoxychlor	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Chlordane	ND	1.0	µg/g	1.0	8/30/04	9/8/04
Toxaphene	ND	10	µg/g	1.0	8/30/04	9/8/04
Surrogate: Chloroneb	79.1	27-160	% Rec	1.0	8/30/04	9/8/04

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Date: 13-Sep-04

ANALYTICAL REPORT

WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	80.5	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	135	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: S-41,42,43,44,45,46,47,48,49,50 COMPOS **Received:** 8/20/04 **Collected:** 8/18/04 0:00

Lab ID: 0408484-05A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	9/1/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	9/1/04
Surrogate: Simazine	75.4	52.3-119	% Rec	1.0	8/26/04	9/1/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	11.1	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.040	µg/g	1.0	9/2/04	9/8/04
beta-BHC	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Lindane	ND	0.040	µg/g	1.0	9/2/04	9/8/04
delta-BHC	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Heptachlor	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Aldrin	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Heptachlor Epoxide	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Endosulfan I	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Dieldrin	ND	0.040	µg/g	1.0	9/2/04	9/8/04
4,4'-DDE	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Endrin	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Endosulfan II	ND	0.040	µg/g	1.0	9/2/04	9/8/04
4,4'-DDD	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Endrin Aldehyde	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Endosulfan sulfate	ND	0.040	µg/g	1.0	9/2/04	9/8/04
4,4'-DDT	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Methoxychlor	ND	0.040	µg/g	1.0	9/2/04	9/8/04
Chlordane	ND	2.0	µg/g	1.0	9/2/04	9/8/04
Toxaphene	ND	20	µg/g	1.0	9/2/04	9/8/04
Surrogate: Chloroneb	190	27-160	% Rec	1.0	9/2/04	9/8/04

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Date: 13-Sep-04

ANALYTICAL REPORT

WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Mevinphos	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ethoprophos	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Phorate	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Demeton-S	ND	2.0	µg/g	1.0	8/27/04	9/2/04
Diazinon	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Disulfoton	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Dimethoate	ND	2.0	µg/g	1.0	8/27/04	9/2/04
Ronnel	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Malathion	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Parathion	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Fenthion	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Ethion	ND	0.50	µg/g	1.0	8/27/04	9/2/04
Fensulfothion	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Azinphos	ND	2.5	µg/g	1.0	8/27/04	9/2/04
Coumaphos	ND	2.5	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	73.9	29.9-137	% Rec	1.0	8/27/04	9/2/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	139	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04
WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: D-1 **Received:** 8/20/04 **Collected:** 8/18/04 17:05
Lab ID: 0408484-06A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	8/31/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	8/31/04
Surrogate: Simazine	81.0	52.3-119	% Rec	1.0	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	16.9	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
beta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Lindane	ND	0.020	µg/g	1.0	8/30/04	9/8/04
delta-BHC	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Heptachlor	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Aldrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan I	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Dieldrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4'-DDE	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endrin	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan II	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4'-DDD	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endrin Aldehyde	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Endosulfan sulfate	ND	0.020	µg/g	1.0	8/30/04	9/8/04
4,4'-DDT	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Methoxychlor	ND	0.020	µg/g	1.0	8/30/04	9/8/04
Chlordane	ND	1.0	µg/g	1.0	8/30/04	9/8/04
Toxaphene	ND	10	µg/g	1.0	8/30/04	9/8/04
Surrogate: Chloroneb	135	27-160	% Rec	1.0	8/30/04	9/8/04

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Date: 13-Sep-04

ANALYTICAL REPORT

WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	77.8	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	142	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04
WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: D-2 **Received:** 8/20/04 **Collected:** 8/18/04 17:15
Lab ID: 0408484-07A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	5.0	µg/g	10	8/26/04	8/31/04
Diuron	ND	2.0	µg/g	10	8/26/04	8/31/04
Surrogate: Simazine	65.5	52.3-119	% Rec	10	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	18.4	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
beta-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
Lindane	ND	0.40	µg/g	20	8/30/04	9/8/04
delta-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
Heptachlor	ND	0.40	µg/g	20	8/30/04	9/8/04
Aldrin	ND	0.40	µg/g	20	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan I	ND	0.40	µg/g	20	8/30/04	9/8/04
Dieldrin	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDE	ND	0.40	µg/g	20	8/30/04	9/8/04
Endrin	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan II	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDD	ND	0.40	µg/g	20	8/30/04	9/8/04
Endrin Aldehyde	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan sulfate	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDT	ND	0.40	µg/g	20	8/30/04	9/8/04
Methoxychlor	ND	0.40	µg/g	20	8/30/04	9/8/04
Chlordane	ND	20	µg/g	20	8/30/04	9/8/04
Toxaphene	ND	200	µg/g	20	8/30/04	9/8/04
Surrogate: Chloroneb	NQ	27-160	% Rec	20	8/30/04	9/8/04

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Date: 13-Sep-04

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WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	79.4	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	138	28.4-149	% Rec	1.0	8/27/04	9/2/04

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ANALYTICAL REPORT

Client Sample ID: D-3 **Received:** 8/20/04 **Collected:** 8/18/04 17:20
Lab ID: 0408484-08A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	5.0	µg/g	10	8/26/04	8/31/04
Diuron	ND	2.0	µg/g	10	8/26/04	8/31/04
Surrogate: Simazine	66.3	52.3-119	% Rec	10	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	16.0	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
beta-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Lindane	ND	0.040	µg/g	1.0	8/30/04	9/8/04
delta-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Heptachlor	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Aldrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan I	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Dieldrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4'-DDE	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan II	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4'-DDD	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endrin Aldehyde	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan sulfate	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4'-DDT	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Methoxychlor	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Chlordane	ND	2.0	µg/g	1.0	8/30/04	9/8/04
Toxaphene	ND	20	µg/g	1.0	8/30/04	9/8/04
Surrogate: Chloroneb	65.0	27-160	% Rec	1.0	8/30/04	9/8/04

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Date: 13-Sep-04

ANALYTICAL REPORT

WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	78.3	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/2/04
Surrogate: Triphenylphosphate	148	28.4-149	% Rec	1.0	8/27/04	9/2/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: D-4 **Received:** 8/20/04 **Collected:** 8/18/04 17:35

Lab ID: 0408484-09A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	0.50	µg/g	1.0	8/26/04	8/31/04
Diuron	ND	0.20	µg/g	1.0	8/26/04	8/31/04
Surrogate: Simazine	80.6	52.3-119	% Rec	1.0	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	8.59	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
beta-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Lindane	ND	0.040	µg/g	1.0	8/30/04	9/8/04
delta-BHC	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Heptachlor	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Aldrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan I	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Dieldrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4′-DDE	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endrin	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan II	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4′-DDD	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endrin Aldehyde	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Endosulfan sulfate	ND	0.040	µg/g	1.0	8/30/04	9/8/04
4,4′-DDT	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Methoxychlor	ND	0.040	µg/g	1.0	8/30/04	9/8/04
Chlordane	ND	2.0	µg/g	1.0	8/30/04	9/8/04
Toxaphene	ND	20	µg/g	1.0	8/30/04	9/8/04
Surrogate: Chloroneb	126	27-160	% Rec	1.0	8/30/04	9/8/04

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ANALYTICAL REPORT

Date: 13-Sep-04
WorkOrder: 0408484

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	80.0	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Surrogate: Triphenylphosphate	145	28.4-149	% Rec	1.0	8/27/04	9/3/04

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Date: 13-Sep-04
WorkOrder: 0408484

ANALYTICAL REPORT

Client Sample ID: D-5 **Received:** 8/20/04 **Collected:** 8/18/04 17:30
Lab ID: 0408484-10A

Test Name: Carbamate and Urea Pesticides **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Carbaryl	ND	5.0	µg/g	10	8/26/04	8/31/04
Diuron	ND	2.0	µg/g	10	8/26/04	8/31/04
Surrogate: Simazine	80.5	52.3-119	% Rec	10	8/26/04	8/31/04

Test Name: Chlorinated Herbicides **Reference:** EPA 8151A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dalapon	ND	10	µg/g	1.0	8/25/04	9/1/04
Dicamba	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Dichlorprop	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4-D	ND	10	µg/g	1.0	8/25/04	9/1/04
2,4,5-TP	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4,5-T	ND	1.0	µg/g	1.0	8/25/04	9/1/04
2,4-DB	ND	10	µg/g	1.0	8/25/04	9/1/04
Dinoseb	ND	2.0	µg/g	1.0	8/25/04	9/1/04
Surrogate: 2,3-D	11.6	44.2-99.9	% Rec	1.0	8/25/04	9/1/04

Test Name: Chlorsulfuron **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Chlorsulfuron	ND	0.10	µg/g	1.0	8/31/04	9/1/04

Test Name: Organochlorine Pesticides **Reference:** EPA 8081A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
alpha-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
beta-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
Lindane	ND	0.40	µg/g	20	8/30/04	9/8/04
delta-BHC	ND	0.40	µg/g	20	8/30/04	9/8/04
Heptachlor	ND	0.40	µg/g	20	8/30/04	9/8/04
Aldrin	ND	0.40	µg/g	20	8/30/04	9/8/04
Heptachlor Epoxide	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan I	ND	0.40	µg/g	20	8/30/04	9/8/04
Dieldrin	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDE	ND	0.40	µg/g	20	8/30/04	9/8/04
Endrin	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan II	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDD	ND	0.40	µg/g	20	8/30/04	9/8/04
Endrin Aldehyde	ND	0.40	µg/g	20	8/30/04	9/8/04
Endosulfan sulfate	ND	0.40	µg/g	20	8/30/04	9/8/04
4,4´-DDT	ND	0.40	µg/g	20	8/30/04	9/8/04
Methoxychlor	ND	0.40	µg/g	20	8/30/04	9/8/04
Chlordane	ND	20	µg/g	20	8/30/04	9/8/04
Toxaphene	ND	200	µg/g	20	8/30/04	9/8/04
Surrogate: Chloroneb	NQ	27-160	% Rec	20	8/30/04	9/8/04

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Date: 13-Sep-04

WorkOrder: 0408484

ANALYTICAL REPORT

Test Name: Organophosphorous Pesticides **Reference:** EPA 8141A

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Dichlorvos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Mevinphos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Ethoprophos	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Phorate	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Demeton-S	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Diazinon	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Disulfoton	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Dimethoate	ND	2.0	µg/g	1.0	8/25/04	8/28/04
Ronnel	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Methyl Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Chlorpyrifos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Malathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Parathion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fenthion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Tetrachlorvinphos	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Ethion	ND	0.50	µg/g	1.0	8/25/04	8/28/04
Fensulfothion	ND	1.0	µg/g	1.0	8/25/04	8/28/04
Azinphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Coumaphos	ND	2.5	µg/g	1.0	8/25/04	8/28/04
Surrogate: Triphenylphosphate	57.7	29.9-137	% Rec	1.0	8/25/04	8/28/04

Test Name: Oryzalin (surflan) **Reference:** EPA 632 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Oryzalin(Surflan)	ND	1.0	µg/g	1.0	8/26/04	8/31/04

Test Name: Triazine Pesticides **Reference:** EPA 619 Modified

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
Atraton	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Simazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Prometon	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Atrazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Propazine	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Simetryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Ametryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Prometryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Terbutryn	ND	1.0	µg/g	1.0	8/27/04	9/3/04
Surrogate: Triphenylphosphate	139	28.4-149	% Rec	1.0	8/27/04	9/3/04

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North Coast Laboratories, Ltd.

Date: 13-Sep-04

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Method Blank

Sample ID: **MB-12002** Batch ID: **12002** Test Code: **619S** Units: **µg/g** Analysis Date: **9/2/04 4:03:45 PM** Prep Date: **8/27/04**

Client ID: Run ID: **ORGC10_040902A** SeqNo: **446933**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Atraton	ND	1.0									
Simazine	ND	1.0									
Prometon	ND	1.0									
Atrazine	ND	1.0									
Propazine	ND	1.0									
Simetryn	ND	1.0									
Ametryn	0.1608	1.0									J
Prometryn	ND	1.0									
Terbutryn	ND	1.0									
Triphenylphosphate	1.16	0.10	1.00	0	116%	28	149	0			

Sample ID: **MB-11996** Batch ID: **11996** Test Code: **632S** Units: **µg/g** Analysis Date: **8/31/04 1:42:00 AM** Prep Date: **8/26/04**

Client ID: Run ID: **ORLC5_040830A** SeqNo: **446607**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Carbaryl	ND	0.50									
Diuron	ND	0.20									
Simazine	4.39	0.10	5.00	0	87.9%	52	119	0			

Qualifiers: ND - Not Detected at the Reporting Limit; J - Analyte detected below quantitation limits; S - Spike Recovery outside accepted recovery limits; R - RPD outside accepted recovery limits; B - Analyte detected in the associated Method Blank

CLIENT:	EBA Engineering		**QC SUMMARY REPORT**
Work Order:	0408484		
Project:	03-1050, Tolay Lake Property		Method Blank

Sample ID: MB-12011 | Batch ID: 12011 | Test Code: 8081S | Units: µg/g | Analysis Date: 9/2/04 11:02:32 PM | Prep Date: 8/30/04

Client ID: | Run ID: ORGC4_040902A | SeqNo: 448901

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	ND	0.020									
beta-BHC	ND	0.020									
Lindane	ND	0.020									
delta-BHC	ND	0.020									
Heptachlor	ND	0.020									
Aldrin	0.006778	0.020									J
Heptachlor Epoxide	ND	0.020									
Endosulfan I	ND	0.020									
Dieldrin	ND	0.020									
4,4´-DDE	ND	0.020									
Endrin	ND	0.020									
Endosulfan II	ND	0.020									
4,4´-DDD	ND	0.020									
Endrin Aldehyde	ND	0.020									
Endosulfan sulfate	ND	0.020									
4,4´-DDT	ND	0.020									
Methoxychlor	ND	0.020									
Chlordane	ND	1.0									J
Toxaphene	ND	10									J
Chloroneb	1.81	0.40	2.00	0	90.4%	27	160	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Method Blank

Sample ID: **MB-12047** Batch ID: **12047** Test Code: **8081S** Units: **µg/g** Analysis Date: **9/8/04 4:27:50 AM** Prep Date: **9/2/04**

Client ID: Run ID: **ORGC4_040902A** SeqNo: **448936**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	ND	0.020									
beta-BHC	ND	0.020									
Lindane	ND	0.020									
delta-BHC	ND	0.020									
Heptachlor	ND	0.020									
Aldrin	ND	0.020									
Heptachlor Epoxide	ND	0.020									
Endosulfan I	ND	0.020									
Dieldrin	ND	0.020									
4,4´-DDE	ND	0.020									
Endrin	ND	0.020									
Endosulfan II	ND	0.020									
4,4´-DDD	ND	0.020									
Endrin Aldehyde	ND	0.020									
Endosulfan sulfate	ND	0.020									
4,4´-DDT	ND	0.020									
Methoxychlor	ND	0.020									
Chlordane	ND	1.0									J
Toxaphene	ND	10									J
Chloroneb	1.27	0.40	2.00	0	63.7%	27	160	0			

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-11988** Batch ID: **11988** Test Code: **8140S** Units: **µg/g** Analysis Date: **8/28/04 11:50:28 AM** Prep Date: **8/25/04**

Client ID: Run ID: **ORGC13_040827A** SeqNo: **445609**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorvos	ND	0.50									
Mevinphos	ND	1.0									
Ethoprophos	ND	1.0									
Phorate	ND	1.0									
Demeton-S	ND	2.0									
Diazinon	ND	0.50									
Disulfoton	ND	0.50									
Dimethoate	ND	2.0									
Ronnel	ND	0.50									
Methyl Parathion	ND	0.50									
Chlorpyrifos	ND	0.50									
Malathion	ND	0.50									
Parathion	ND	0.50									
Fenthion	ND	0.50									
Tetrachlorvinphos	ND	0.50									
Ethion	ND	0.50									
Fensulfothion	ND	1.0									
Azinphos	ND	2.5									
Coumaphos	ND	2.5									
Triphenylphosphate	4.11	0.10	5.00	0	82.2%	30	137	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT:	EBA Engineering
Work Order:	0408484
Project:	03-1050, Tolay Lake Property

QC SUMMARY REPORT

Method Blank

Sample ID: **MB-12003** Batch ID: **12003** Test Code: **8140S** Units: **µg/g** Analysis Date: **9/2/04 10:08:14 PM** Prep Date: **8/27/04**

Client ID: Run ID: **ORGC13_040902A** SeqNo: **446959**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorvos	ND	0.50									
Mevinphos	ND	1.0									
Ethoprophos	ND	1.0									
Phorate	0.1741	1.0									J
Demeton-S	ND	2.0									
Diazinon	ND	0.50									
Disulfoton	ND	0.50									
Dimethoate	ND	2.0									
Ronnel	ND	0.50									
Methyl Parathion	ND	0.50									
Chlorpyrifos	ND	0.50									
Malathion	ND	0.50									
Parathion	ND	0.50									
Fenthion	ND	0.50									
Tetrachlorvinphos	ND	0.50									
Ethion	ND	0.50									
Fensulfothion	ND	1.0									
Azinphos	ND	2.5									
Coumaphos	ND	2.5									
Triphenylphosphate	4.23	0.10	5.00	0	84.5%	30	137	0			

Qualifiers:

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Method Blank

Sample ID: MB-11986 | Batch ID: 11986 | Test Code: 8150S | Units: µg/g | Analysis Date: 9/1/04 2:01:46 AM | Prep Date: 8/25/04
Client ID: | Run ID: ORGC4_040831A | SeqNo: 446542

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dalapon	ND	1.0									
Dicamba	ND	0.20									
Dichlorprop	ND	1.0									
2,4-D	ND	1.0									
2,4,5-TP	ND	0.10									
2,4,5-T	ND	0.10									
2,4-DB	ND	1.0									
Dinoseb	ND	0.20									
2,3-D	3.01	0.10	5.00	0	60.3%	44	100	0			

Sample ID: MB-12025 | Batch ID: 12025 | Test Code: CHLORSU | Units: µg/g | Analysis Date: 9/1/04 4:42:26 PM | Prep Date: 8/31/04
Client ID: | Run ID: ORLC2_040901A | SeqNo: 446752

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chlorsulfuron	ND	0.10									

Sample ID: MB-11995 | Batch ID: 11995 | Test Code: ORYZS | Units: µg/g | Analysis Date: 8/31/04 5:28:22 PM | Prep Date: 8/26/04
Client ID: | Run ID: ORLC2_040831A | SeqNo: 446125

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Oryzalin(Surflan)	ND	1.0									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

North Coast Laboratories, Ltd.

Date: 13-Sep-04

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike

Sample ID: **LCS-12002** Batch ID: **12002** Test Code: **619S** Units: **µg/g** Analysis Date: **9/2/04 4:44:38 PM** Prep Date: **8/27/04**
Client ID: Run ID: **ORGC10_040902A** SeqNo: **446934**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Atraton	3.465	1.0	5.00	0	69.3%	38	129	0			
Simazine	3.246	1.0	5.00	0	64.9%	12	131	0			
Prometon	3.365	1.0	5.00	0	67.3%	36	134	0			
Atrazine	3.844	1.0	5.00	0	76.9%	37	135	0			
Propazine	4.012	1.0	5.00	0	80.2%	42	130	0			
Simetryn	3.499	1.0	5.00	0	70.0%	41	133	0			
Ametryn	3.519	1.0	5.00	0	70.4%	41	134	0			
Prometryn	3.568	1.0	5.00	0	71.4%	41	132	0			
Terbutryn	3.582	1.0	5.00	0	71.6%	40	135	0			

Sample ID: **LCSD-12002** Batch ID: **12002** Test Code: **619S** Units: **µg/g** Analysis Date: **9/2/04 5:25:40 PM** Prep Date: **8/27/04**
Client ID: Run ID: **ORGC10_040902A** SeqNo: **446935**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Atraton	3.751	1.0	5.00	0	75.0%	38	129	3.46	7.95%	15	
Simazine	3.948	1.0	5.00	0	79.0%	12	131	3.25	19.5%	15	R
Prometon	3.600	1.0	5.00	0	72.0%	36	134	3.36	6.73%	15	
Atrazine	4.191	1.0	5.00	0	83.8%	37	135	3.84	8.65%	15	
Propazine	4.310	1.0	5.00	0	86.2%	42	130	4.01	7.18%	15	
Simetryn	3.715	1.0	5.00	0	74.3%	41	133	3.50	5.98%	15	
Ametryn	3.723	1.0	5.00	0	74.5%	41	134	3.52	5.65%	15	
Prometryn	3.780	1.0	5.00	0	75.6%	41	132	3.57	5.77%	15	
Terbutryn	3.726	1.0	5.00	0	74.5%	40	135	3.58	3.94%	15	

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike

Sample ID: LCS-11996 | Batch ID: 11996 | Test Code: 632S | Units: µg/g | Analysis Date: 8/31/04 2:48:37 AM | Prep Date: 8/26/04

Client ID: | Run ID: ORLC5_040830A | SeqNo: 446608

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Carbaryl	2.579	0.50	2.50	0	103%	80	108	0			
Diuron	0.8649	0.20	1.00	0	86.5%	74	105	0			
Simazine	4.56	0.10	5.00	0	91.1%	52	119	0			

Sample ID: LCSD-11996 | Batch ID: 11996 | Test Code: 632S | Units: µg/g | Analysis Date: 8/31/04 3:55:13 AM | Prep Date: 8/26/04

Client ID: | Run ID: ORLC5_040830A | SeqNo: 446609

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Carbaryl	2.659	0.50	2.50	0	106%	80	108	2.58	3.05%	10	
Diuron	0.8447	0.20	1.00	0	84.5%	74	105	0.865	2.37%	10	
Simazine	4.53	0.10	5.00	0	90.5%	52	119	4.56	0.621%	10	

Qualifiers:
ND - Not Detected at the Reporting Limit
S - Spike Recovery outside accepted recovery limits
B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits
R - RPD outside accepted recovery limits

CLIENT:	EBA Engineering		**QC SUMMARY REPORT**
Work Order:	0408484		Laboratory Control Spike
Project:	03-1050, Tolay Lake Property		

Sample ID: **LCS-12011** Batch ID: **12011** Test Code: **8081S** Units: **µg/g** Analysis Date: **9/2/04 11:47:34 PM** Prep Date: **8/30/04**

Client ID: Run ID: **ORGC4_040902A** SeqNo: **448902**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	0.08062	0.020	0.100	0	80.6%	56	119	0			
beta-BHC	0.1045	0.020	0.100	0	105%	63	112	0			
Lindane	0.07973	0.020	0.100	0	79.7%	56	118	0			
delta-BHC	0.09051	0.020	0.100	0	90.5%	63	115	0			
Heptachlor	0.1025	0.020	0.100	0	102%	59	120	0			
Aldrin	0.08577	0.020	0.100	0.00678	79.0%	44	109	0			
Heptachlor Epoxide	0.09111	0.020	0.100	0	91.1%	58	115	0			
Endosulfan I	0.09708	0.020	0.100	0	97.1%	56	111	0			
Dieldrin	0.09842	0.020	0.100	0	98.4%	56	118	0			
4,4´-DDE	0.09550	0.020	0.100	0	95.5%	70	120	0			
Endrin	0.09539	0.020	0.100	0	95.4%	60	183	0			
Endosulfan II	0.1204	0.020	0.100	0	120%	33	161	0			
4,4´-DDD	0.09591	0.020	0.100	0	95.9%	70	120	0			
Endrin Aldehyde	0.08092	0.020	0.100	0	80.9%	29	125	0			
Endosulfan sulfate	0.08568	0.020	0.100	0	85.7%	70	120	0			
4,4´-DDT	0.09207	0.020	0.100	0	92.1%	70	120	0			
Methoxychlor	0.1018	0.020	0.100	0	102%	70	120	0			
Chloroneb	1.74	0.40	2.00	0	86.8%	27	160	0			

Qualifiers: ND - Not Detected at the Reporting Limit; J - Analyte detected below quantitation limits; S - Spike Recovery outside accepted recovery limits; R - RPD outside accepted recovery limits; B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT
Laboratory Control Spike Duplicate

Sample ID: LCSD-12011 Batch ID: 12011 Test Code: 8081S Units: µg/g Analysis Date: 9/3/04 12:32:33 AM Prep Date: 8/30/04
Client ID: Run ID: ORGC4_040902A SeqNo: 448903

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	0.08187	0.020	0.100	0	81.9%	56	119	0.0806	1.54%	20	
beta-BHC	0.1089	0.020	0.100	0	109%	63	112	0.104	4.06%	20	
Lindane	0.08091	0.020	0.100	0	80.9%	56	118	0.0797	1.47%	55	
delta-BHC	0.09321	0.020	0.100	0	93.2%	63	115	0.0905	2.93%	20	
Heptachlor	0.1050	0.020	0.100	0	105%	59	120	0.102	2.44%	57	
Aldrin	0.09035	0.020	0.100	0.00678	83.6%	44	109	0.0858	5.20%	20	
Heptachlor Epoxide	0.09381	0.020	0.100	0	93.8%	58	115	0.0911	2.92%	20	
Endosulfan I	0.1005	0.020	0.100	0	100%	56	111	0.0971	3.45%	20	
Dieldrin	0.1025	0.020	0.100	0	102%	56	118	0.0984	4.05%	20	
4,4´-DDE	0.09875	0.020	0.100	0	98.8%	70	120	0.0955	3.35%	20	
Endrin	0.09775	0.020	0.100	0	97.8%	60	183	0.0954	2.44%	20	
Endosulfan II	0.1252	0.020	0.100	0	125%	33	161	0.120	3.88%	20	
4,4´-DDD	0.09933	0.020	0.100	0	99.3%	70	120	0.0959	3.51%	20	
Endrin Aldehyde	0.08446	0.020	0.100	0	84.5%	29	125	0.0809	4.28%	20	
Endosulfan sulfate	0.09006	0.020	0.100	0	90.1%	70	120	0.0857	4.98%	20	
4,4´-DDT	0.09808	0.020	0.100	0	98.1%	70	120	0.0921	6.32%	20	
Methoxychlor	0.1099	0.020	0.100	0	110%	70	120	0.102	7.61%	20	
Chloroneb	1.79	0.40	2.00	0	89.5%	27	160	1.74	3.02%	20	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT:	EBA Engineering		**QC SUMMARY REPORT**
Work Order:	0408484		Laboratory Control Spike
Project:	03-1050, Tolay Lake Property		

Sample ID: **LCS-12047** | Batch ID: **12047** | Test Code: **8081S** | Units: **µg/g** | Analysis Date: **9/8/04 5:13:35 AM** | Prep Date: **9/2/04**

Client ID: | Run ID: **ORGC4_040902A** | SeqNo: **448937**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	0.05789	0.020	0.100	0	57.9%	56	119	0			
beta-BHC	0.05538	0.020	0.100	0	55.4%	63	112	0			S
Lindane	0.05789	0.020	0.100	0	57.9%	56	118	0			
delta-BHC	0.05710	0.020	0.100	0	57.1%	63	115	0			S
Heptachlor	0.05908	0.020	0.100	0	59.1%	59	120	0			
Aldrin	0.05820	0.020	0.100	0	58.2%	44	109	0			
Heptachlor Epoxide	0.05640	0.020	0.100	0	56.4%	58	115	0			S
Endosulfan I	0.05662	0.020	0.100	0	56.6%	56	111	0			
Dieldrin	0.05800	0.020	0.100	0	58.0%	56	118	0			
4,4´-DDE	0.05631	0.020	0.100	0	56.3%	70	120	0			S
Endrin	0.05746	0.020	0.100	0	57.5%	60	183	0			S
Endosulfan II	0.07925	0.020	0.100	0	79.3%	33	161	0			
4,4´-DDD	0.06010	0.020	0.100	0	60.1%	70	120	0			S
Endrin Aldehyde	0.06038	0.020	0.100	0	60.4%	29	125	0			
Endosulfan sulfate	0.05657	0.020	0.100	0	56.6%	70	120	0			S
4,4´-DDT	0.05562	0.020	0.100	0	55.6%	70	120	0			S
Methoxychlor	0.06641	0.020	0.100	0	66.4%	70	120	0			S
Chloroneb	1.43	0.40	2.00	0	71.3%	27	160	0			

Qualifiers: ND - Not Detected at the Reporting Limit; J - Analyte detected below quantitation limits; S - Spike Recovery outside accepted recovery limits; R - RPD outside accepted recovery limits; B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike Duplicate

Sample ID: **LCSD-12047** Batch ID: **12047** Test Code: **8081S** Units: **µg/g** Analysis Date: **9/8/04 5:59:22 AM** Prep Date: **9/2/04**

Client ID: Run ID: **ORGC4_040902A** SeqNo: **448938**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
alpha-BHC	0.05723	0.020	0.100	0	57.2%	56	119	0.0579	1.16%	20	
beta-BHC	0.05609	0.020	0.100	0	56.1%	63	112	0.0554	1.28%	20	S
Lindane	0.05852	0.020	0.100	0	58.5%	56	118	0.0579	1.08%	55	
delta-BHC	0.05764	0.020	0.100	0	57.6%	63	115	0.0571	0.945%	20	S
Heptachlor	0.06021	0.020	0.100	0	60.2%	59	120	0.0591	1.90%	57	
Aldrin	0.05871	0.020	0.100	0	58.7%	44	109	0.0582	0.872%	20	
Heptachlor Epoxide	0.05731	0.020	0.100	0	57.3%	58	115	0.0564	1.60%	20	S
Endosulfan I	0.05973	0.020	0.100	0	59.7%	56	111	0.0566	5.35%	20	
Dieldrin	0.05908	0.020	0.100	0	59.1%	56	118	0.0580	1.86%	20	
4,4´-DDE	0.05764	0.020	0.100	0	57.6%	70	120	0.0563	2.33%	20	S
Endrin	0.05912	0.020	0.100	0	59.1%	60	183	0.0575	2.84%	20	S
Endosulfan II	0.08063	0.020	0.100	0	80.6%	33	161	0.0792	1.73%	20	
4,4´-DDD	0.05969	0.020	0.100	0	59.7%	70	120	0.0601	0.671%	20	S
Endrin Aldehyde	0.05645	0.020	0.100	0	56.5%	29	125	0.0604	6.72%	20	
Endosulfan sulfate	0.05761	0.020	0.100	0	57.6%	70	120	0.0566	1.84%	20	S
4,4´-DDT	0.05855	0.020	0.100	0	58.5%	70	120	0.0556	5.13%	20	S
Methoxychlor	0.06661	0.020	0.100	0	66.6%	70	120	0.0664	0.303%	20	S
Chloroneb	1.44	0.40	2.00	0	71.8%	27	160	1.43	0.580%	20	

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike

Sample ID: **LCS-11988** Batch ID: **11988** Test Code: **8140S** Units: **µg/g** Analysis Date: **8/28/04 12:27:38 PM** Prep Date: **8/25/04**

Client ID: Run ID: **ORGC13_040827A** SeqNo: **445610**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorvos	2.488	0.50	2.50	0	99.5%	46	145	0			
Mevinphos	3.737	1.0	5.00	0	74.7%	32	131	0			
Ethoprophos	3.492	1.0	5.00	0	69.8%	38	135	0			
Phorate	2.005	1.0	2.50	0	80.2%	39	146	0			
Demeton-S	7.347	2.0	10.0	0	73.5%	30	137	0			
Diazinon	1.910	0.50	2.50	0	76.4%	42	132	0			
Disulfoton	2.557	0.50	2.50	0	102%	37	139	0			
Dimethoate	7.659	2.0	10.0	0	76.6%	17	134	0			
Ronnel	1.794	0.50	2.50	0	71.8%	32	172	0			
Methyl Parathion	1.719	0.50	2.50	0	68.7%	27	141	0			
Chlorpyrifos	1.775	0.50	2.50	0	71.0%	37	150	0			
Malathion	1.740	0.50	2.50	0	69.6%	48	139	0			
Parathion	1.762	0.50	2.50	0	70.5%	28	152	0			
Fenthion	1.865	0.50	2.50	0	74.6%	37	137	0			
Tetrachlorvinphos	1.958	0.50	2.50	0	78.3%	44	135	0			
Ethion	1.961	0.50	2.50	0	78.4%	51	128	0			
Fensulfothion	4.528	1.0	5.00	0	90.6%	20	138	0			
Azinphos	10.47	2.5	12.5	0	83.8%	38	146	0			
Coumaphos	9.363	2.5	12.5	0	74.9%	39	143	0			
Triphenylphosphate	3.97	0.10	5.00	0	79.5%	30	137	0			

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike Duplicate

Sample ID: **LCSD-11988** Batch ID: **11988** Test Code: **8140S** Units: **µg/g** Analysis Date: **8/28/04 1:05:05 PM** Prep Date: **8/25/04**

Client ID: Run ID: **ORGC13_040827A** SeqNo: **445611**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorvos	2.461	0.50	2.50	0	98.5%	46	145	2.49	1.08%	43	
Mevinphos	3.692	1.0	5.00	0	73.8%	32	131	3.74	1.19%	35	
Ethoprophos	3.446	1.0	5.00	0	68.9%	38	135	3.49	1.33%	25	
Phorate	1.932	1.0	2.50	0	77.3%	39	146	2.00	3.69%	34	
Demeton-S	7.251	2.0	10.0	0	72.5%	30	137	7.35	1.31%	33	
Diazinon	1.883	0.50	2.50	0	75.3%	42	132	1.91	1.42%	58	
Disulfoton	2.547	0.50	2.50	0	102%	37	139	2.56	0.416%	33	
Dimethoate	7.579	2.0	10.0	0	75.8%	17	134	7.66	1.04%	56	
Ronnel	1.810	0.50	2.50	0	72.4%	32	172	1.79	0.890%	30	
Methyl Parathion	1.777	0.50	2.50	0	71.1%	27	141	1.72	3.33%	37	
Chlorpyrifos	1.771	0.50	2.50	0	70.8%	37	150	1.78	0.271%	34	
Malathion	1.735	0.50	2.50	0	69.4%	48	139	1.74	0.315%	36	
Parathion	1.767	0.50	2.50	0	70.7%	28	152	1.76	0.293%	28	
Fenthion	1.848	0.50	2.50	0	73.9%	37	137	1.86	0.885%	32	
Tetrachlorvinphos	1.962	0.50	2.50	0	78.5%	44	135	1.96	0.224%	28	
Ethion	1.934	0.50	2.50	0	77.4%	51	128	1.96	1.37%	35	
Fensulfothion	4.164	1.0	5.00	0	83.3%	20	138	4.53	8.38%	52	
Azinphos	10.72	2.5	12.5	0	85.7%	38	146	10.5	2.30%	32	
Coumaphos	9.314	2.5	12.5	0	74.5%	39	143	9.36	0.533%	32	
Triphenylphosphate	3.91	0.10	5.00	0	78.2%	30	137	3.97	1.53%	31	

Qualifiers: ND - Not Detected at the Reporting Limit | S - Spike Recovery outside accepted recovery limits | B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits | R - RPD outside accepted recovery limits

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike

Sample ID: **LCS-12003** Batch ID: **12003** Test Code: **8140S** Units: **µg/g** Analysis Date: **9/2/04 10:45:35 PM** Prep Date: **8/27/04**

Client ID: Run ID: **ORGC13_040902A** SeqNo: **446960**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorvos	1.996	0.50	2.50	0	79.8%	46	145	0			
Mevinphos	3.511	1.0	5.00	0	70.2%	32	131	0			
Ethoprophos	3.424	1.0	5.00	0	68.5%	38	135	0			
Phorate	1.277	1.0	2.50	0	51.1%	39	146	0			
Demeton-S	6.726	2.0	10.0	0	67.3%	30	137	0			
Diazinon	1.856	0.50	2.50	0	74.2%	42	132	0			
Disulfoton	2.066	0.50	2.50	0	82.6%	37	139	0			
Dimethoate	7.490	2.0	10.0	0	74.9%	17	134	0			
Ronnel	1.896	0.50	2.50	0	75.8%	32	172	0			
Methyl Parathion	1.926	0.50	2.50	0	77.1%	27	141	0			
Chlorpyrifos	1.812	0.50	2.50	0	72.5%	37	150	0			
Malathion	1.750	0.50	2.50	0	70.0%	48	139	0			
Parathion	1.806	0.50	2.50	0	72.3%	28	152	0			
Fenthion	1.924	0.50	2.50	0	77.0%	37	137	0			
Tetrachlorvinphos	1.978	0.50	2.50	0	79.1%	44	135	0			
Ethion	1.949	0.50	2.50	0	78.0%	51	128	0			
Fensulfothion	3.829	1.0	5.00	0	76.6%	20	138	0			
Azinphos	10.31	2.5	12.5	0	82.5%	38	146	0			
Coumaphos	9.861	2.5	12.5	0	78.9%	39	143	0			
Triphenylphosphate	0.311	0.10	5.00	0	6.23%	30	137	0			S

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT
Laboratory Control Spike

Sample ID: LCS-11986 Batch ID: 11986 Test Code: 8150S Units: µg/g Analysis Date: 9/1/04 2:48:30 AM Prep Date: 8/25/04
Client ID: Run ID: ORGC4_040831A SeqNo: 446543

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dalapon	3.239	1.0	5.00	0	64.8%	35	99	0			
Dicamba	0.8357	0.20	1.00	0	83.6%	36	102	0			
Dichlorprop	3.852	1.0	5.00	0	77.0%	41	98	0			
2,4-D	3.824	1.0	5.00	0	76.5%	38	104	0			
2,4,5-TP	0.3833	0.10	0.500	0	76.7%	38	101	0			
2,4,5-T	0.3672	0.10	0.500	0	73.4%	36	106	0			
2,4-DB	3.738	1.0	5.00	0	74.8%	40	101	0			
Dinoseb	0.2909	0.20	1.00	0	29.1%	4	73	0			
2,3-D	3.78	0.10	5.00	0	75.6%	44	100	0			

Sample ID: LCSD-11986 Batch ID: 11986 Test Code: 8150S Units: µg/g Analysis Date: 9/1/04 3:35:11 AM Prep Date: 8/25/04
Client ID: Run ID: ORGC4_040831A SeqNo: 446544

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dalapon	3.397	1.0	5.00	0	67.9%	35	99	3.24	4.77%	15	
Dicamba	0.8761	0.20	1.00	0	87.6%	36	102	0.836	4.73%	15	
Dichlorprop	4.051	1.0	5.00	0	81.0%	41	98	3.85	5.04%	15	
2,4-D	4.025	1.0	5.00	0	80.5%	38	104	3.82	5.13%	15	
2,4,5-TP	0.3954	0.10	0.500	0	79.1%	38	101	0.383	3.10%	15	
2,4,5-T	0.4233	0.10	0.500	0	84.7%	36	106	0.367	14.2%	15	
2,4-DB	3.831	1.0	5.00	0	76.6%	40	101	3.74	2.47%	15	
Dinoseb	0.2859	0.20	1.00	0	28.6%	4	73	0.291	1.72%	15	
2,3-D	3.91	0.10	5.00	0	78.3%	44	100	3.78	3.45%	15	

Sample ID: LCS-12025 Batch ID: 12025 Test Code: CHLORSU Units: µg/g Analysis Date: 9/1/04 5:00:38 PM Prep Date: 8/31/04
Client ID: Run ID: ORLC2_040901A SeqNo: 446753

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chlorsulfuron	0.5001	0.10	0.500	0	100%	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

CLIENT: EBA Engineering
Work Order: 0408484
Project: 03-1050, Tolay Lake Property

QC SUMMARY REPORT

Laboratory Control Spike Duplicate

Sample ID: **LCSD-12025** Batch ID: **12025** Test Code: **CHLORSU** Units: **µg/g** Analysis Date: **9/1/04 5:18:51 PM** Prep Date: **8/31/04**
Client ID: Run ID: **ORLC2_040901A** SeqNo: **446754**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chlorsulfuron	0.4185	0.10	0.500	0	83.7%	70	130	0.500	17.8%	20	

Sample ID: **LCS-11995** Batch ID: **11995** Test Code: **ORYZS** Units: **µg/g** Analysis Date: **8/31/04 5:46:15 PM** Prep Date: **8/26/04**
Client ID: Run ID: **ORLC2_040831A** SeqNo: **446126**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Oryzalin(Surflan)	5.086	1.0	5.00	0	102%	70	120	0			

Sample ID: **LCSD-11995** Batch ID: **11995** Test Code: **ORYZS** Units: **µg/g** Analysis Date: **8/31/04 6:04:08 PM** Prep Date: **8/26/04**
Client ID: Run ID: **ORLC2_040831A** SeqNo: **446127**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Oryzalin(Surflan)	5.175	1.0	5.00	0	103%	70	120	5.09	1.73%	20	

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

OC08484

WORK ORDER
CHAIN OF COSTODY RECORD

alpha

Alpha Analytical Laboratories Inc. • 208 Mason Street, Ukiah, CA 95482 • (707) 468-0401 • FAX (707) 468-5267

DATE 8/18/04 PAGE 1 OF 1

CLIENT'S NAME: EPA Engineering

STREET ADDRESS: 825 Sonoma Ave. CITY: SR STATE: CA ZIP: 95404

PROJECT NAME: Blay Lake Project

CONTRACT/PURCHASE ORDER/QUOTE NUMBER:

SIGNATURE OF PERSON AUTHORIZING WORK UNDER TERMS STATED ON REVERSE SIDE OF THIS FORM.

PROJECT MANAGER: David Norea

PHONE NUMBER: (707) 544-0784

FAX NUMBER: (707) 544-0866

SITE CONTACT:

SAMPLED BY: David Norea

ANALYSES: Organochlorine Pesticides; [illegible]; [illegible]; [illegible]; [illegible]

SAMPLE CONDITION ON RECEIPT:

COLD/ICED? ______

BUBBLES OR AIR SPACE? ______

WERE SAMPLES PRESERVED? ______

SAMPLE NUMBER/IDENTIFICATION	DATE	TIME	LAB SAMPLE NUMBER	LIQ	AIR	SOLID	COMP	GRAB	NO. OF CONTS.	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	EXPLAIN IRREGULARITIES BELOW
D-1	8/18/04	1705				X		X	1	X	X	X	X	X		
D-2	↓	1715				↓		↓	↓	↓	↓	↓	↓	↓		
D-3	↓	1720				↓		↓	↓	↓	↓	↓	↓	↓		
D-4	↓	1735				↓		↓	↓	↓	↓	↓	↓	↓		
D-5	↓	1730				↓		↓	↓	↓	↓	↓	↓	↓		

RELINQUISHED BY: (SIGNATURE) David Norea	RECEIVED BY: (SIGNATURE) K Thompson	DATE 8/20/04	TIME 1100
RELINQUISHED BY: (SIGNATURE)	RECEIVED BY: (SIGNATURE)	DATE	TIME
RELINQUISHED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY:	SAMPLE CONTROL OFFICER	
METHOD OF SHIPMENT	AUTHORIZED BY:		
SPECIAL INSTRUCTIONS			
DRIVING TIME	SITE TIME	TOTAL TIME	

TURN AROUND TIME REQUESTED

SAMPLE DESPOSITION:
1. STORAGE TIME REQUESTED ______ DAYS (SAMPLES WILL BE STORED FOR 30 DAYS WITHOUT ADDITIONAL CHARGES: THEREAFTER STORAGE CHARGES WILL BE BILLED AT THE PUBLISHED RATES.)
2. SAMPLE TO BE RETURNED TO CLIENT? ☐ YES ☐ NO

HAZARDOUS MATERIALS ARE THE PROPERTY OF THE CLIENT. THE CLIENT IS RESPONSIBLE FOR PROPER DISPOSAL OF HAZARDOUS WASTES. CLIENTS NOT PICKING UP HAZARDOUS WASTES MAY BE ASSESSED AN APPROPRIATE FEE.

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

0408484

LABORATORY NUMBER:

Attention: David Noren
Results & Invoice to: EBA Engineering
Address: 825 Sonoma Avenue
Santa Rosa, California 95404
Phone: (707) 544-0784
Copies of Report to:
Sampler (Sign & Print): David Noren

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day ☑ STD (2–3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☑ Verbal ☐ By: 1 d
Final Report: FAX ☐ Verbal ☐ By: hard copy

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

PROJECT INFORMATION

Project Number: 03-1050
Project Name: Tolay Lake Property
Purchase Order Number:

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	Organophosphates	Carbamate/Urea P	Chlorinated Herbs	Organochlorines	Triazine-Full Scan
PRESERVATIVE					—	—	—	✓	
CONTAINER					—	—	—	—	✓
S-1		8/18/04	1028	S	✓	✓	✓	✓	✓
S-2		↓	1038	↓	✓	✓	✓	✓	✓
S-3			1045		✓	✓	✓	✓	✓
S-4			1050		✓	✓	✓	✓	✓
S-5			1100		✓	✓	✓	✓	✓
S-6			1110		✓	✓	✓	✓	✓
S-7			1117		✓	✓	✓	✓	✓
S-8			1125		✓	✓	✓	✓	✓
S-9			1135		✓	✓	✓	✓	✓
S-10		↓	1140	↓	✓	✓	✓	✓	✓

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

Laboratory to composite 10:1

Cooler temp = 15.1C

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
David Noren		K. Thompson	8/20/04 1100

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

D408484

LABORATORY NUMBER:

Attention: David Noren
Results & Invoice to: EBA Engineering
Address: 825 Sonoma Avenue
Santa Rosa California 95404
Phone: (707) 544-0784
Copies of Report to:
Sampler (Sign & Print): David Noren

PROJECT INFORMATION

Project Number: 03-1050
Project Name: Tolay Lake Project
Purchase Order Number:

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day ☐ STD (2–3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☐ Verbal ☐ By: / /
Final Report: FAX ☐ Verbal ☐ By: / /

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

Preservative: —
Container: —

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	Organochlorine Pest	Carbamate/Urea	Chlorinated Herbs	Organo Phos	Triazine Full Scan
S-11		8/18/04	1235	S	✓	✓	✓	✓	✓
S-12			1240		✓	✓	✓	✓	✓
S-13			1245		✓	✓	✓	✓	✓
S-14			1300		✓	✓	✓	✓	✓
S-15			1305		✓	✓	✓	✓	✓
S-16			1310		✓	✓	✓	✓	✓
S-17			1315		✓	✓	✓	✓	✓
S-18			1320		✓	✓	✓	✓	✓
S-19			1325		✓	✓	✓	✓	✓
S-20		↓	1340	↓	✓	✓	✓	✓	✓

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

Lab to composite samples 10:1

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
David Noren		K. Thompson	8/20/04 1120

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

0408484

LABORATORY NUMBER:

Attention: David Noren
Results & Invoice to: EBA Engineering
Address: 825 Sonoma Avenue
Santa Rosa, California 95404
Phone: (707) 544-0784
Copies of Report to:
Sampler (Sign & Print): David Noren

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day ☐ STD (2–3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☐ Verbal ☐ By: __/__/__
Final Report: FAX ☐ Verbal ☐ By: __/__/__

PROJECT INFORMATION
Project Number: 03-1050
Project Name: Tolay Lake
Purchase Order Number:

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

ANALYSIS: Bromacil/sulfonates; Halosulfuron/Urea; Chlorinated Herbs; Organochlorines; Triazine • Full Scan

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	Analyses
521		8/18/04	1345	S	✓ all
522		"	1350	"	✓ all
523		"	1355	"	✓ all
524		"	1400	"	✓ all
525		"	1410	"	✓ all
526		"	1420	"	✓ all
527		"	1425	"	✓ all
528		"	1435	"	✓ all
529		"	1445	"	✓ all
530		"	1450	"	✓ all

SAMPLE CONDITION/SPECIAL INSTRUCTIONS
Laboratory to composite 10:1

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
David Noren		K. Thompson	8/20/04 1100

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

*MATRIX: DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

0408485

LABORATORY NUMBER:

Attention: David Noren
Results & Invoice to: FRA Engineering
Address: 835 Sonoma Avenue
Santa Rosa, CA 95404
Phone: (707) 544-0784
Copies of Report to:
Sampler (Sign & Print): David Noren

PROJECT INFORMATION

Project Number: 03-1050
Project Name: Tolay Lake Project
Purchase Order Number:

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day ☑ STD (2–3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☐ Verbal ☐ By: / /
Final Report: FAX ☐ Verbal ☐ By: / /

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

ANALYSIS: Organochlorine Pesticides; Carbamate Pesticides; Chlorinated Herbicides; Organophosphate Pesticides; Toxicity - Full Scan

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	Organochlorine Pesticides	Carbamate Pesticides	Chlorinated Herbicides	Organophosphate Pesticides	Toxicity - Full Scan
531		8/18/04	1500	S					
532		|	1505	|					
533		|	1510	|					
534		|	1515	|					
535		|	1520	|					
536		|	1530	|					
537		|	1545	|					
538		|	1550	|					
539		|	1555	|					
540		|	1600	|					

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

Laboratory to composite 10:1

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
David Noren		J. Thompson	8/20/04 1100

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

04084/84

LABORATORY NUMBER:

Attention: David Noren
Results & Invoice to: EBA Engineering
Address: 825 Sonoma Ave
Santa Rosa, CA
Phone: (707) 544-8784
Copies of Report to:
Sampler (Sign & Print): David Noren

PROJECT INFORMATION
Project Number: 83-1050
Project Name: Tolay Lake Project
Purchase Order Number:

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day ☐ STD (2–3 Wk) ☐ Other: ________
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☐ Verbal ☐ By: __/__/__
Final Report: FAX ☐ Verbal ☐ By: __/__/__

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

PRESERVATIVE: — (all analyses)
CONTAINER: — (all analyses)

ANALYSIS: Organochlorines; Carbamates & Urea; Chlorinated Herb; Organophosphates; Triazine - Full scan

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	Organochlorines	Carbamates & Urea	Chlorinated Herb	Organophosphates	Triazine - Full scan
541		8/18/04	1605	S					
542			1610						
543			1615						
544			1620						
545			1625						
546			1630						
547			1635						
548			1640						
549			1645						
550			1650						

(Date, matrix and all analysis columns marked with continuation lines down through all samples.)

SAMPLE CONDITION/SPECIAL INSTRUCTIONS
Laboratory to composite 10:1

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
David Noren		G. Thompson	8/20/04 1100

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

BioVir Laboratories, Inc.

685 Stone Road, Unit 6 · Benicia, CA 94510 · (707) 747-5906 · 1-800-GIARDIA · FAX (707) 747-1751 · WEB: www.biovir.com

REPORT OF SAMPLE EVALUATION

REPORT NO.: R041519A

CLIENT ADDRESS: EBA Engineering
825 Sonoma Avenue
Santa Rosa, CA 95404

CLIENT NO.: EBA001

SAMPLE INFORMATION:

Name of Sampler:	David Noren	Sample Date:	08/25/04
Sample Source:	Spring	Sample Time:	14:00
Sample ID / Location:	Water Storage Tank	Turbidity:	NA
Filter Type:	Parker Hannifan, M39R10A	Temperature:	NA
Sample Volume:	539 Gallons / 2040 Liters	pH:	NA
Comments:	Raw Drinking Water	P.O. #:	03-1050

Sample Received Date:	08/25/04
Sample Received Time:	15:33
Sample Check-in Temp.:	18.3 C

ASSAY RESULTS:

1. Giardia species Assay: (SM18;9711B; FA) — <0.0012 Giardia species cyst seen / Liter. (830.5 Liters Examined)
2. Cryptosporidium Assay: (SM18;9711B; FA) — <0.0012 Cryptosporidium oocyst seen / Liter. (830.5 Liters Examined)
3. Microscopic Particulate Analysis: See page 2 (EPA 910/9-92-029)

Commentary:
An aliquot representing 378.5 Liters was taken from the 2040 Liter sample concentrate for particulate analysis.

1 Gallon = 3.785 Liters

MICROSCOPIC PARTICULATE ANALYSIS

PRIMARY PARTICULATES (per 378.5 Liters)		SECONDARY PARTICULATES (per 378.5 Liters)	
Giardia:	NS	Plant Pollen:	NS
Cryptosporidium:	NS	Nematodes:	12
Diatoms:	NS	Crustacea:	NS
Other Algae:	NS	Amoeba:	NS
Insect/Larvae:	NS	Ciliates/Flagellates:	NS
Rotifers:	NS	Other Organisms:	NS
Plant Debris:	NS		

Key:

EH - extremely heavy
H - heavy
M - moderate
R - rare
NS - none seen

SAMPLE EVALUATION PERFORMANCE CRITERIA: The precise rates of recovery of organisms from environmental samples cannot be determined. BioVir Laboratories has analyzed your sample(s) in accordance with the method described with each analyte above, however, due to inherent limitations of these methods organisms may avoid detection. For additional information regarding the limitations of the method(s) referred to above please call us at 1-800-GIARDIA.

COMPANY IS NOT AN INSURER: BioVir Laboratories is not an insurer or guarantor of the quality and/or purity of water, wastewater, biosolid or other material from which the sample was taken. BioVir offers no express or implied warranties whatsoever concerning the quality or purity of any water, wastewater, biosolid or other material which is ultimately consumed, distributed, applied or otherwise disposed of.

8-28-04
COMPLETION DATE

Richard E Daniel
SIGNATURE/DATE
9-7-04

(519A)

BioVir LABORATORIES®

GIARDIA / CRYPTOSPORIDIUM / MPA ASSAY SAMPLE DATA SHEET

(Please fill out applicable areas, sign and return to BioVir with the sample.)

Phone: 1-800-GIARDIA Fax: 707-747-1751 WEB: www.biovir.com

COPY

Note: Please print using waterproof ink

NAME AND ADDRESS OF WATER COMPANY OR UTILITY: CB4 Engineering Attention: David Noren	SAMPLE DATE: August 25, 2004 SAMPLE TIME: 1400
NAME OF SAMPLER: David Noren	pH: / Water Temp (C):
SAMPLE SOURCE: Spring	TREATMENT CHARACTERISTICS (Check One): Raw Drinking Water ☑ Treated Drinking Water ☐ Wastewater ☐ Filtered Wastewater ☐
SAMPLE LOCATION: Water Storage Tank	DECHLORINATION/ DISINFECTANT NEUTRALIZATION (If Treated Water): Yes ~~~ (No) (circled)
SAMPLE VOLUME: (Meter #) Meter Start: 7975 Meter Stop: 8514	TURBIDITY (NTU): Begin: End: Total Volume: 539 Gallons ______ Liters

Client Sample ID #: Water Storage Tank	P.O. #: 03-1050

ASSAY REQUESTED: Please check one of the following

LT2 Samples: Special care should be taken for samples intended to satisfy the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule. Samples must be at least 10 Liters in volume (at least 22lbs. plus vessel for grab samples). Samples must arrive at BioVir between 0 to 8 degrees C (not frozen). Pre-chill samples during sampling or before shipment to adhere to this requirement.

METHOD 1623: Cryptosporidium and Giardia (EPA 821-R-01-025)	
	REGULAR SAMPLE
	MATRIX SPIKE SAMPLE -Required in addition to the first sample from a source and every 20 samples thereafter (e.g. 21st, 41st, etc.)
METHOD 1622: Cryptosporidium Only (EPA 821-R-01-026)	
	REGULAR SAMPLE
	MATRIX SPIKE SAMPLE -Required in addition to the first sample from a source and every 20 samples thereafter (e.g. 21st, 41st, etc.)
MICROSCOPIC PARTICULATE ANALYSIS (MPA)	
✓	Microscopic Particulate Analysis (MPA) - (EPA 910/9-92-029)
OTHER ANALYTES (Please indicate Analyte & Method)	

COMMENTS:

RELINQUISHED BY: David Noren (signature)	DATE / TIME:
RECEIVED BY: (signature)	DATE / TIME: 8/25/04 1533

SHIPPING ADDRESS: BIOVIR LABORATORIES, INC., 685 STONE ROAD, UNIT 6, BENICIA, CALIFORNIA 94510

WHITE = BIOVIR COPY YELLOW = CUSTOMER COPY

F:\WP\FORMS\Datasheets\DataSheets.G&C.MPA.wpd Rev. 10.24.03

BioVir LABORATORIES®

MICROSCOPIC PARTICULATE ANALYSIS

Primary Particulates

Numerical range of each primary bio-indicator based
on numbers counted per 378.5 Liters sampled

Surface Water	EH	H	M	R	NS
Giardia	**	**	**	**	None Seen
Coccidia	**	**	**	**	None Seen
Diatoms	>150	41-149	11-40	1-10	None Seen
Other Algae	>300	96-299	21-95	1-20	None Seen
Insects/Larvae	>100	31-99	16-30	1-15	None Seen
Rotifers	>150	61-149	21-60	1-20	None Seen
Plant Debris	>200	71-199	26-70	1-25	None Seen

Giardia lamblia	** Assayed by Immunofluorescent Method. The presence of any amount of these organisims represents a HIGH RISK to surface water contamination.
Giardia species	
Cryptosporidium	

Key:

EH	- extremely heavy	M	- moderate	NS	- none seen
H	- heavy	R	- rare		

SECONDARY PARTICULATES

Secondary bio-indicators are reported as a number based on relative concentration per 100 gallons sampled and should be used only to support information derived from the primary bio-indicator category.

BioVir Laboratories, Inc., 685 Stone Road, Benicia, California 94510
Phone: 1-800-GIARDIA (442-7342) Fax: 707-747-1751

1-800-GIARDIA

RELATIVE SURFACE WATER RISK FACTOR

Indicators of Surface Water	EH	H	M	R	NS
Giardia	40	30	25	20	0
Coccidia	35	30	25	20	0
Diatoms	16	13	11	6	0
Other Algae	14	12	9	4	0
Insects/Larvae	9	7	5	3	0
Rotifers	4	3	2	1	0
Plant Debris	3	2	1	0	0

Indicators of Surface Water:

According to EPA "Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources", March, 1991 ed.

Range of Indicators Key:

EH - extremely heavy

H - heavy

M - moderate

R - rare

NS - none seen

RISK OF SURFACE WATER CONTAMINATION

High Risk	=	20 or greater
Moderate Risk	=	10-19
Low Risk	=	9 or less

alpha
Alpha Analytical Laboratories Inc. 208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

31 August 2004

EBA Wastechnologies
Attn: David Noren
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
RE: Tolay Lake Project
Work Order: A408573

Enclosed are the results of analyses for samples received by the laboratory on 08/26/04 12:05. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sheri Speaks

Sheri L. Speaks
Project Manager

Alpha Analytical Laboratories Inc.
208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Water Tank	A408573-01	Water	08/25/04 13:30	08/26/04 12:05

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Sheri Speaks

Sheri L. Speaks
Project Manager

8/31/04

Alpha Analytical Laboratories Inc.
208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT	PQL	NOTE
Water Tank (A408573-01)		**Sample Type: Water**				**Sampled: 08/25/04 13:30**		
Metals by EPA 200 Series Methods								
Iron	EPA 200.7	AH42707	08/27/04	08/30/04	1	ND mg/l	0.10	
Manganese	"	"	"	"	"	ND "	0.020	
Sodium	"	"	"	"	"	**22 "**	**1.0**	
Conventional Chemistry Parameters by APHA/EPA Methods								
Hardness, Total	SM2340B	AH42707	"	08/30/04	1	**140 mg/l**	**5**	
pH	EPA 150.1	AH42622	08/26/04	08/26/04	"	**7.7 pH Units**	**1.0**	
Specific Conductance (EC)	EPA 120.1	"	"	"	"	**440 umhos/cm**	**20**	
Total Dissolved Solids	"	"	"	"	"	**220 mg/l**	**10**	
Anions by EPA Method 300.0								
Nitrate as NO3	EPA 300.0	AH42617	08/26/04	08/26/04	1	**13 mg/l**	**1.0**	
Total and fecal coliform by presence/absence								
Total Coliforms	SM9223	AH43003	08/26/04	08/27/04	1	Present	1	
Fecal Coliforms	"	"	"	"	"	Present "	1	

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Sheri Speaks

Sheri L. Speaks
Project Manager

8/31/04

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e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

SourceResult

Metals by EPA 200 Series Methods - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH42707 - EPA 200 Series										
Blank (AH42707-BLK1)				Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	ND	0.10	mg/l							
Manganese	ND	0.020	"							
Sodium	ND	1.0	"							
LCS (AH42707-BS1)				Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	2.23	0.10	mg/l	2.00		112	85-115			
Manganese	0.212	0.020	"	0.200		106	85-115			
Sodium	10.2	1.0	"	10.0		102	85-115			
LCS Dup (AH42707-BSD1)				Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	2.22	0.10	mg/l	2.00		111	85-115	0.449	20	
Manganese	0.213	0.020	"	0.200		106	85-115	0.471	20	
Sodium	10.4	1.0	"	10.0		104	85-115	1.94	20	
Duplicate (AH42707-DUP1)	**Source: A408479-01**			Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	0.0449	0.10	mg/l		ND				20	
Manganese	0.0139	0.020	"		ND				20	
Sodium	13.0	1.0	"		13			0.00	20	
Matrix Spike (AH42707-MS1)	**Source: A408479-01**			Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	2.32	0.10	mg/l	2.00	ND	114	70-130			
Manganese	0.229	0.020	"	0.200	ND	108	70-130			
Sodium	23.3	1.0	"	10.0	13	103	70-130			
Matrix Spike Dup (AH42707-MSD1)	**Source: A408479-01**			Prepared: 08/27/04 Analyzed: 08/30/04						
Iron	2.37	0.10	mg/l	2.00	ND	116	70-130	2.13	20	
Manganese	0.234	0.020	"	0.200	ND	110	70-130	2.16	20	
Sodium	23.1	1.0	"	10.0	13	101	70-130	0.862	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Sheri Speaks

Sheri L. Speaks
Project Manager

8/31/04

Alpha Analytical Laboratories Inc. 208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH42707 - EPA 200 Series										
Duplicate (AH42707-DUP1)	**Source: A408479-01**		Prepared: 08/27/04 Analyzed: 08/30/04							
Hardness, Total	9.00	5	mg/l		8			11.8	200	

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Sheri Speaks

Sheri L. Speaks
Project Manager

8/31/04

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CHEMICAL EXAMINATION REPORT

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Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

Anions by EPA Method 300.0 - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH42617 - General Preparation										
Blank (AH42617-BLK1)				Prepared & Analyzed: 08/26/04						
Nitrate as NO3	ND	1.0	mg/l							
LCS (AH42617-BS1)				Prepared & Analyzed: 08/26/04						
Nitrate as NO3	4.4	1.0	mg/l	4.43		99.3	90-110			
LCS Dup (AH42617-BSD1)				Prepared & Analyzed: 08/26/04						
Nitrate as NO3	4.4	1.0	mg/l	4.43		99.3	90-110	0.00	20	
Duplicate (AH42617-DUP1)	**Source: A408573-01**			Prepared & Analyzed: 08/26/04						
Nitrate as NO3	13	2.0	mg/l		13			0.00	200	
Matrix Spike (AH42617-MS1)	**Source: A408573-01**			Prepared & Analyzed: 08/26/04						
Nitrate as NO3	35	2.0	mg/l	22.2	13	99.1	80-120			
Matrix Spike Dup (AH42617-MSD1)	**Source: A408573-01**			Prepared & Analyzed: 08/26/04						
Nitrate as NO3	35	2.0	mg/l	22.2	13	99.1	80-120	0.00	20	

Sheri L. Speaks
Project Manager

8/31/04

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e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 08/31/04 10:17
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408573	08/26/2004 12:05	EBA	

Notes and Definitions

P	Present
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
PQL	Practical Quantitation Limit

WORK ORDER
CHAIN OF CUSTODY RECORD

Alpha Analytical Laboratories Inc. • 208 Mason Street, Ukiah, CA 95482 • (707) 468-0401 • FAX (707) 468-5267

DATE 8/25/04 PAGE 1 OF 1

CLIENT'S NAME: EBA Engineering
STREET ADDRESS / CITY / STATE / ZIP: 825 Sonoma Ave, Santa Rosa, CA
PROJECT NAME: Tolay Lake Project
CONTRACT/PURCHASE ORDER/QUOTE NUMBER: 03-1050
SIGNATURE OF PERSON AUTHORIZING WORK UNDER TERMS STATED ON REVERSE SIDE OF THIS FORM.

PROJECT MANAGER: David Noren
PHONE NUMBER: (707) 544-0784
FAX NUMBER: (707) 544-0866
SITE CONTACT: Marvin Cardosa
SAMPLED BY: David Noren

ANALYSES: TPH-gas/BTEX; Gen. Water Parameters; Total Fecal Coliforms; Nitrates

SAMPLE CONDITION ON RECEIPT: 9.2°C
COLD/ICED? yes
BUBBLES OR AIR SPACE? N/A
WERE SAMPLES PRESERVED? N/A

SAMPLE NUMBER/IDENTIFICATION	DATE	TIME	LAB SAMPLE NUMBER	LIQ	AIR	SOLID	COMP	GRAB	NO. OF CONTS.	TPH-gas/BTEX	Gen. Water Parameters	Total Fecal Coliforms	Nitrates		EXPLAIN IRREGULARITIES BELOW
B-1 @ 7.0'	8/25/04	1250				X		X	1	X					
B-2 @ 6.5'	↓	1245				↓		↓	↓	↓					
B-3 @ 6.0'	↓	1415				↓		↓	↓	↓					
B-4															
Water Tank	8/25/04	1320	A408573-01	X				X	4		X	X	X		

RELINQUISHED BY: (SIGNATURE) David Noren	RECEIVED BY: (SIGNATURE) T. Daly	DATE 8/26/04	TIME 1400	TURN AROUND TIME REQUESTED: 5 Days
RELINQUISHED BY: (SIGNATURE) T. Daly (1205)	RECEIVED BY: (SIGNATURE) [signature]	DATE 8/26/04	TIME 1205	SAMPLE CONTROL OFFICER
RELINQUISHED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY:			
METHOD OF SHIPMENT	AUTHORIZED BY:			

SPECIAL INSTRUCTIONS

DRIVING TIME | SITE TIME | TOTAL TIME

SAMPLE DESPOSITION:
1. STORAGE TIME REQUESTED ______ DAYS (SAMPLES WILL BE STORED FOR 30 DAYS WITHOUT ADDITIONAL CHARGES THEREAFTER STORAGE CHARGES WILL BE BILLED AT THE PUBLISHED RATES.
2. SAMPLE TO BE RETURNED TO CLIENT? ☐ YES ☐ NO

HAZARDOUS MATERIALS ARE THE PROPERTY OF THE CLIENT. THE CLIENT IS RESPONSIBLE FOR PROPER DISPOSAL OF HAZARDOUS WASTES. CLIENTS NOT PICKING UP HAZARDOUS WASTES MAY BE ASSESSED AN APPROPRIATE FEE

Alpha Analytical Laboratories Inc.
208 Mason Street, Ukiah, California 95482
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02 September 2004

EBA Wastechnologies
Attn: David Noren
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
RE: Tolay Lake Project
Work Order: A408579

Enclosed are the results of analyses for samples received by the laboratory on 08/26/04 12:05. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nena M. Burgess For Sheri L. Speaks
Project Manager

Alpha Analytical Laboratories Inc.
208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B-1 @ 7.0'	A408579-01	Soil	08/25/04 12:50	08/26/04 12:05
B-2 @ 6.5'	A408579-02	Soil	08/25/04 12:45	08/26/04 12:05
B-3 @ 6.0'	A408579-03	Soil	08/25/04 14:15	08/26/04 12:05

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager
9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT		PQL	NOTE
B-1 @ 7.0' (A408579-01)			**Sample Type: Soil**			**Sampled: 08/25/04 12:50**			
TPH as Diesel and Motor Oil by EPA Method 8015 Modified									
TPH as Diesel	8015DRO	AH43010	08/30/04	08/30/04	1	ND mg/kg		1.0	
TPH as Motor Oil	"	"	"	"	"	ND "		2.0	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*79.1 %*	*20-152*		
TPH as Gasoline by GCFID/5030									
TPH as Gasoline	8015GRO	AI40206	09/01/04	09/01/04	1	ND mg/kg		1.0	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*84.5 %*	*60-156*		
BTEX by EPA Method 8260B									
Benzene	EPA 8260B	AH43002	08/26/04	08/28/04	1	ND mg/kg		0.0050	
Toluene	"	"	"	"	"	ND "		0.0050	
Ethylbenzene	"	"	"	"	"	ND "		0.0050	
Xylenes (total)	"	"	"	"	"	ND "		0.0050	
Surrogate: Dibromofluoromethane	"	"	"	"		*84.4 %*	*61-121*		
Surrogate: Toluene-d8	"	"	"	"		*90.8 %*	*63-113*		
Surrogate: Bromofluorobenzene	"	"	"	"		*82.4 %*	*52-103*		
B-2 @ 6.5' (A408579-02)			**Sample Type: Soil**			**Sampled: 08/25/04 12:45**			
TPH as Diesel and Motor Oil by EPA Method 8015 Modified									
TPH as Diesel	8015DRO	AH43010	08/30/04	08/31/04	1	ND mg/kg		1.0	
TPH as Motor Oil	"	"	"	"	"	**2.2 "**		**2.0**	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*71.3 %*	*20-152*		

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

Alpha Analytical Laboratories Inc. 208 Mason Street, Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT		PQL	NOTE
B-2 @ 6.5' (A408579-02)		**Sample Type: Soil**			**Sampled: 08/25/04 12:45**				
TPH as Gasoline by GCFID/5030									
TPH as Gasoline	8015GRO	AI40206	09/01/04	09/01/04	1	ND mg/kg		1.0	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*98.5 %*	*60-156*		
BTEX by EPA Method 8260B									
Benzene	EPA 8260B	AH43002	08/26/04	08/28/04	1	ND mg/kg		0.0050	
Toluene	"	"	"	"	"	ND "		0.0050	
Ethylbenzene	"	"	"	"	"	ND "		0.0050	
Xylenes (total)	"	"	"	"	"	ND "		0.0050	
Surrogate: Dibromofluoromethane	"	"	"	"		*96.8 %*	*61-121*		
Surrogate: Toluene-d8	"	"	"	"		*97.6 %*	*63-113*		
Surrogate: Bromofluorobenzene	"	"	"	"		*88.0 %*	*52-103*		
B-3 @ 6.0' (A408579-03)		**Sample Type: Soil**			**Sampled: 08/25/04 14:15**				
TPH as Diesel and Motor Oil by EPA Method 8015 Modified									
TPH as Diesel	8015DRO	AH43010	08/30/04	08/31/04	1	ND mg/kg		1.0	
TPH as Motor Oil	"	"	"	"	"	ND "		2.0	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*78.4 %*	*20-152*		
TPH as Gasoline by GCFID/5030									
TPH as Gasoline	8015GRO	AI40206	09/01/04	09/01/04	1	ND mg/kg		1.0	
Surrogate: 1,4-Bromofluorobenzene	"	"	"	"		*94.5 %*	*60-156*		

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT		PQL	NOTE
B-3 @ 6.0' (A408579-03)			**Sample Type: Soil**			**Sampled: 08/25/04 14:15**			
BTEX by EPA Method 8260B									
Benzene	EPA 8260B	AH43002	08/26/04	08/28/04	1	ND mg/kg		0.0050	
Toluene	"	"	"	"	"	ND "		0.0050	
Ethylbenzene	"	"	"	"	"	ND "		0.0050	
Xylenes (total)	"	"	"	"	"	ND "		0.0050	
Surrogate: Dibromofluoromethane	"	"	"	"		*86.2 %*	*61-121*		
Surrogate: Toluene-d8	"	"	"	"		*90.0 %*	*63-113*		
Surrogate: Bromofluorobenzene	"	"	"	"		*82.8 %*	*52-103*		

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

SourceResult

TPH as Diesel and Motor Oil by EPA Method 8015 Modified - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH43010 - CA LUFT - orb shaker										
Blank (AH43010-BLK1)				Prepared & Analyzed: 08/30/04						
Surrogate: 1,4-Bromofluorobenzene	*10.1*		*mg/kg*	*13.9*		*72.7*	*20-152*			
TPH as Diesel	ND	1.0	"							
TPH as Motor Oil	ND	2.0	"							
LCS (AH43010-BS1)				Prepared & Analyzed: 08/30/04						
Surrogate: 1,4-Bromofluorobenzene	*12.1*		*mg/kg*	*13.9*		*87.1*	*20-152*			
TPH as Diesel	33.1	1.0	"	41.2		80.3	63-126			
TPH as Motor Oil	34.2	2.0	"	39.8		85.9	57-139			
Matrix Spike (AH43010-MS1)	**Source: A408423-01**			Prepared & Analyzed: 08/30/04						
Surrogate: 1,4-Bromofluorobenzene	*11.4*		*mg/kg*	*13.9*		*82.0*	*20-152*			
TPH as Diesel	31.7	1.0	"	41.2	ND	76.9	61-134			
TPH as Motor Oil	32.3	2.0	"	39.8	ND	81.2	61-126			
Matrix Spike Dup (AH43010-MSD1)	**Source: A408423-01**			Prepared & Analyzed: 08/30/04						
Surrogate: 1,4-Bromofluorobenzene	*13.0*		*mg/kg*	*13.9*		*93.5*	*20-152*			
TPH as Diesel	34.9	1.0	"	41.2	ND	84.7	61-134	9.61	20	
TPH as Motor Oil	35.3	2.0	"	39.8	ND	88.7	61-126	8.88	20	

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
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Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

TPH as Gasoline by GCFID/5030 - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AI40206 - EPA 5030 Soil GC										
Blank (AI40206-BLK1)				Prepared & Analyzed: 09/01/04						
Surrogate: 1,4-Bromofluorobenzene	*3.81*		*mg/kg*	*4.00*		*95.2*	*60-156*			
TPH as Gasoline	ND	1.0	"							
LCS (AI40206-BS1)				Prepared & Analyzed: 09/01/04						
Surrogate: 1,4-Bromofluorobenzene	*3.86*		*mg/kg*	*4.00*		*96.5*	*60-156*			
TPH as Gasoline	24.5	1.0	"	22.2		110	77-139			
LCS Dup (AI40206-BSD1)				Prepared & Analyzed: 09/01/04						
Surrogate: 1,4-Bromofluorobenzene	*3.84*		*mg/kg*	*4.00*		*96.0*	*60-156*			
TPH as Gasoline	21.7	1.0	"	22.2		97.7	77-139	12.1	20	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

BTEX by EPA Method 8260B - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH43002 - EPA 5035 GCMS										
Blank (AH43002-BLK1)				Prepared: 08/26/04 Analyzed: 08/27/04						
Surrogate: Dibromofluoromethane	*0.0250*		*mg/kg*	*0.0250*		*100*	*61-121*			
Surrogate: Toluene-d8	*0.0218*		*"*	*0.0250*		*87.2*	*63-113*			
Surrogate: Bromofluorobenzene	*0.0223*		*"*	*0.0250*		*89.2*	*52-103*			
Benzene	ND	0.0050	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.0050	"							
LCS (AH43002-BS1)				Prepared: 08/26/04 Analyzed: 08/27/04						
Surrogate: Dibromofluoromethane	*0.0211*		*mg/kg*	*0.0250*		*84.4*	*61-121*			
Surrogate: Toluene-d8	*0.0224*		*"*	*0.0250*		*89.6*	*63-113*			
Surrogate: Bromofluorobenzene	*0.0226*		*"*	*0.0250*		*90.4*	*52-103*			
Benzene	0.00469	0.0050	"	0.00500		93.8	72-123			
Toluene	0.00463	0.0050	"	0.00500		92.6	72-126			
Ethylbenzene	0.00460	0.0050	"	0.00500		92.0	71-125			
Xylenes (total)	0.0144	0.0050	"	0.0150		96.0	67-127			
LCS Dup (AH43002-BSD1)				Prepared: 08/26/04 Analyzed: 08/27/04						
Surrogate: Dibromofluoromethane	*0.0222*		*mg/kg*	*0.0250*		*88.8*	*61-121*			
Surrogate: Toluene-d8	*0.0220*		*"*	*0.0250*		*88.0*	*63-113*			
Surrogate: Bromofluorobenzene	*0.0223*		*"*	*0.0250*		*89.2*	*52-103*			
Benzene	0.00467	0.0050	"	0.00500		93.4	72-123	0.427	25	
Toluene	0.00479	0.0050	"	0.00500		95.8	72-126	3.40	25	
Ethylbenzene	0.00460	0.0050	"	0.00500		92.0	71-125	0.00	25	
Xylenes (total)	0.0147	0.0050	"	0.0150		98.0	67-127	2.06	25	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

Alpha Analytical Laboratories Inc.
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e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

BTEX by EPA Method 8260B - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH43002 - EPA 5035 GCMS										
Matrix Spike (AH43002-MS1)	**Source: A408468-03**			Prepared: 08/26/04 Analyzed: 08/27/04						
Surrogate: Dibromofluoromethane	*0.0212*		*mg/kg*	*0.0250*		*84.8*	*61-121*			
Surrogate: Toluene-d8	*0.0222*		*"*	*0.0250*		*88.8*	*63-113*			
Surrogate: Bromofluorobenzene	*0.0217*		*"*	*0.0250*		*86.8*	*52-103*			
Benzene	0.00481	0.0050	"	0.00500	ND	96.2	49-137			
Toluene	0.00495	0.0050	"	0.00500	ND	99.0	50-148			
Ethylbenzene	0.00457	0.0050	"	0.00500	ND	91.4	55-138			
Xylenes (total)	0.0142	0.0050	"	0.0150	ND	94.7	54-139			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Nena M. Burgess For Sheri L. Speaks
Project Manager

9/2/04

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 15:10
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408579	08/26/2004 12:05	EBA	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
PQL	Practical Quantitation Limit

WORK ORDER
CHAIN OF CUSTODY RECORD

Alpha Analytical Laboratories Inc. • 208 Mason Street, Ukiah, CA 95482 • (707) 468-0401 • FAX (707) 468-5267

DATE 8/25/04 PAGE 1 OF 1

CLIENT'S NAME: EBA Engineering

STREET ADDRESS / CITY / STATE / ZIP: 825 Sonoma Ave, Santa Rosa, CA

PROJECT NAME: Tolay Lake Project

CONTRACT/PURCHASE ORDER/QUOTE NUMBER: 03-1050

SIGNATURE OF PERSON AUTHORIZING WORK UNDER TERMS STATED ON REVERSE SIDE OF THIS FORM.

PROJECT MANAGER: David Noren

PHONE NUMBER: (707) 544-0784

FAX NUMBER: (707) 544-0866

SITE CONTACT: Marvin Cardoza

SAMPLED BY: David Noren

ANALYSES: TPH-all / BTEX; Atrazine / Herbicides; Total / Fecal Coliforms; Nitrates

SAMPLE CONDITION ON RECEIPT: 9.2°C

COLD/ICED? yes

BUBBLES OR AIR SPACE? N/A

WERE SAMPLES PRESERVED? N/A

SAMPLE NUMBER/IDENTIFICATION	DATE	TIME	LAB SAMPLE NUMBER	LIQ	AIR	SOLID	COMP	GRAB	NO. OF CONTS.	TPH-all BTEX	Atrazine Herbicides	Total/Fecal Coliforms	Nitrates		EXPLAIN IRREGULARITIES BELOW
B-1 @ 7.0'	8/25/04	1250				X		X	1	X					
B-2 @ 6.5'	↓	1045				↓		↓	↓	↓					
B-3 @ 6.0'	↓	1415				↓		↓	↓	↓					
B-4															
Water Tank	8/25/04	1330		X				X	4		X	X	X		

RELINQUISHED BY: (SIGNATURE)	RECEIVED BY: (SIGNATURE)	DATE	TIME
David Noren	J. Daly	8/26/04	1000
J. Daly (1205)	[signature]	8/26/04	1205
	RECEIVED FOR LABORATORY BY:		

TURN AROUND TIME REQUESTED: 5 Days

SAMPLE CONTROL OFFICER

METHOD OF SHIPMENT

AUTHORIZED BY:

SPECIAL INSTRUCTIONS

SAMPLE DESPOSITION:
1. STORAGE TIME REQUESTED ______ DAYS
(SAMPLES WILL BE STORED FOR 30 DAYS WITHOUT ADDITIONAL CHARGES: THEREAFTER STORAGE CHARGES WILL BE BILLED AT THE PUBLISHED RATES.)
2. SAMPLE TO BE RETURNED TO CLIENT? ☐ YES ☐ NO

HAZARDOUS MATERIALS ARE THE PROPERTY OF THE CLIENT. THE CLIENT IS RESPONSIBLE FOR PROPER DISPOSAL OF HAZARDOUS WASTES. CLIENTS NOT PICKING UP HAZARDOUS WASTES MAY BE ASSESSED AN APPROPRIATE FEE.

DRIVING TIME	SITE TIME	TOTAL TIME

Alpha Analytical Laboratories Inc.
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02 September 2004

EBA Wastechnologies
Attn: David Noren
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
RE: Tolay Lake Project
Work Order: A408571

Enclosed are the results of analyses for samples received by the laboratory on 08/26/04 12:05. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Karen Daly

Karen A. Daly For Sheri L. Speaks
Project Manager

Alpha Analytical Laboratories Inc.
208 Mason St. Ukiah, California 95482
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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 10:36
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408571	08/26/2004 12:05	EBA	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S-1	A408571-01	Soil	08/25/04 12:15	08/26/04 12:05
S-2	A408571-02	Soil	08/25/04 12:20	08/26/04 12:05
S-3	A408571-03	Soil	08/25/04 12:03	08/26/04 12:05
S-4	A408571-04	Soil	08/25/04 12:28	08/26/04 12:05
S-5	A408571-05	Soil	08/25/04 12:30	08/26/04 12:05
S-6	A408571-06	Soil	08/25/04 12:35	08/26/04 12:05
S-7	A408571-07	Soil	08/25/04 12:38	08/26/04 12:05
S-8	A408571-08	Soil	08/25/04 12:40	08/26/04 12:05
S-9-B	A408571-09	Soil	08/25/04 12:50	08/26/04 12:05

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Karen Daly

Karen A. Daly For Sheri L. Speaks
Project Manager

9/2/2004

Alpha Analytical Laboratories Inc.
208 Mason St. Ukiah, California 95482
e-mail: clientservices@alpha-labs.com • Phone: (707) 468-0401 • Fax: (707) 468-5267

CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 10:36
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408571	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT	PQL	NOTE
S-1 (A408571-01)			**Sample Type: Soil**			**Sampled: 08/25/04 12:15**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**16 mg/kg**	**5.0**	
S-2 (A408571-02)			**Sample Type: Soil**			**Sampled: 08/25/04 12:20**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**16 mg/kg**	**5.0**	
S-3 (A408571-03)			**Sample Type: Soil**			**Sampled: 08/25/04 12:03**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**14 mg/kg**	**5.0**	
S-4 (A408571-04)			**Sample Type: Soil**			**Sampled: 08/25/04 12:28**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**20 mg/kg**	**5.0**	
S-5 (A408571-05)			**Sample Type: Soil**			**Sampled: 08/25/04 12:30**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**11 mg/kg**	**5.0**	
S-6 (A408571-06)			**Sample Type: Soil**			**Sampled: 08/25/04 12:35**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**17 mg/kg**	**5.0**	
S-7 (A408571-07)			**Sample Type: Soil**			**Sampled: 08/25/04 12:38**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**19 mg/kg**	**5.0**	
S-8 (A408571-08)			**Sample Type: Soil**			**Sampled: 08/25/04 12:40**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**15 mg/kg**	**5.0**	
S-9-B (A408571-09)			**Sample Type: Soil**			**Sampled: 08/25/04 12:50**		

Karen Daly

Karen A. Daly For Sheri L. Speaks
Project Manager

9/2/2004

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CHEMICAL EXAMINATION REPORT

EBA Wastechnologies
825 Sonoma Ave. Suite C
Santa Rosa, CA 95404
Attn: David Noren

Report Date: 09/02/04 10:36
Project No: 03-1050
Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408571	08/26/2004 12:05	EBA	

Alpha Analytical Laboratories, Inc.

	METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT	POL	NOTE
S-9-B (A408571-09)		**Sample Type: Soil**				**Sampled: 08/25/04 12:50**		
Metals by EPA 6000/7000 Series Methods								
Lead	EPA 6010	AH42701	08/27/04	08/31/04	1	**9.0 mg/kg**	**5.0**	

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Karen A. Daly For Sheri L. Speaks
Project Manager

9/2/2004

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Project ID: Tolay Lake Project

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408571	08/26/2004 12:05	EBA	

Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte(s)	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch AH42701 - EPA 3051 Microwave										
Blank (AH42701-BLK1)				Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	ND	5.0	mg/kg							
LCS (AH42701-BS1)				Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	21.3	5.0	mg/kg	20.0		106	85-115			
LCS Dup (AH42701-BSD1)				Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	20.4	5.0	mg/kg	20.0		102	85-115	4.32	20	
Duplicate (AH42701-DUP1)	Source: A408571-01			Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	16.7	5.0	mg/kg		16			4.28	20	
Matrix Spike (AH42701-MS1)	Source: A408571-01			Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	35.6	5.0	mg/kg	20.0	16	98.0	70-130			
Matrix Spike Dup (AH42701-MSD1)	Source: A408571-01			Prepared: 08/27/04 Analyzed: 08/31/04						
Lead	34.6	5.0	mg/kg	20.0	16	93.0	70-130	2.85	20	

Karen Daly

Karen A. Daly For Sheri L. Speaks
Project Manager

9/2/2004

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Report Date: 09/02/04 10:36
Project No: 03-1050
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Order Number	Receipt Date/Time	Client Code	Client PO/Reference
A408571	08/26/2004 12:05	EBA	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
PQL	Practical Quantitation Limit

WORK ORDER
CHAIN OF CUSTODY RECORD

Alpha
Alpha Analytical Laboratories Inc. • 208 Mason Street, Ukiah, CA 95482 • (707) 468-0401 • FAX (707) 468-5267

DATE 8/25/04 PAGE 1 OF 1

CLIENT'S NAME: PJ Engineering
STREET ADDRESS / CITY / STATE / ZIP: 825 Sonoma Ave, SR, CA
PROJECT NAME: Tolay Lake Project
CONTRACT/PURCHASE ORDER/QUOTE NUMBER: 03-1050
SIGNATURE OF PERSON AUTHORIZING WORK UNDER TERMS STATED ON REVERSE SIDE OF THIS FORM.

PROJECT MANAGER: David Noren
PHONE NUMBER: (707) 544-8784
FAX NUMBER: (707) 544-0866
SITE CONTACT: Marvin Cardoza
SAMPLED BY: David Noren

ANALYSES: Total Lead

SAMPLE CONDITION ON RECEIPT: 8.2°C
COLD/ICED? yes
BUBBLES OR AIR SPACE? N/A
WERE SAMPLES PRESERVED? N/A

SAMPLE NUMBER/IDENTIFICATION	DATE	TIME	LAB SAMPLE NUMBER	LIQ	AIR	SOLID	COMP	GRAB	NO. OF CONTS.	Total Lead					EXPLAIN IRREGULARITIES BELOW
S-1	8/25/04	1215	AU08571-01			X		X	1	X					
S-2	↓	1220	2			↓		↓	↓	↓					
S-3	↓	1223	3			↓		↓	↓	↓					
S-4	↓	1228	4			↓		↓	↓	↓					
S-5	↓	1230	5			↓		↓	↓	↓					
S-6	↓	1235	6			↓		↓	↓	↓					
S-7	↓	1238	7			↓		↓	↓	↓					
S-8	↓	1240	8			↓		↓	↓	↓					
S-9-B	↓	1250	9			↓		↓	↓	↓					

RELINQUISHED BY: (SIGNATURE)	RECEIVED BY: (SIGNATURE)	DATE	TIME
David Noren	F. Daly	8/26/04	1000
F. Daly (1205)	[signature]	8/26/04	1205
	RECEIVED FOR LABORATORY BY:		

TURN AROUND TIME REQUESTED: 5 Day

SAMPLE CONTROL OFFICER

METHOD OF SHIPMENT

AUTHORIZED BY:

SPECIAL INSTRUCTIONS

DRIVING TIME | SITE TIME | TOTAL TIME

SAMPLE DESPOSITION:
1. STORAGE TIME REQUESTED ______ DAYS (SAMPLES WILL BE STORED FOR 30 DAYS WITHOUT ADDITIONAL CHARGES; THEREAFTER STORAGE CHARGES WILL BE BILLED AT THE PUBLISHED RATES.)
2. SAMPLE TO BE RETURNED TO CLIENT? ☐ YES ☐ NO

HAZARDOUS MATERIALS ARE THE PROPERTY OF THE CLIENT. THE CLIENT IS RESPONSIBLE FOR PROPER DISPOSAL OF HAZARDOUS WASTES. CLIENTS NOT PICKING UP HAZARDOUS WASTES MAY BE ASSESSED AN APPROPRIATE FEE.

Appendix D

Biological Reports

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

BIOLOGICAL RESOURCES STUDY
TOLAY LAKE REGIONAL PARK

SONOMA COUNTY, CALIFORNIA

Submitted to:

Sonoma Regional Parks Department
2300 County Center Drive #120A
Santa Rosa, California 95403

Prepared by:

LSA Associates, Inc.
157 Park Place
Point Richmond, California 94801
(510) 236-6810

LSA Project No. SOG0602

LSA

April 2009

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1.0 INTRODUCTION

1.1 PURPOSE

This report presents the results of a study of the biological resources of Tolay Lake Regional Park. It describes the vegetation, including wetlands, occurrences of special-status species, and occurrences of other sensitive biological resources at Tolay Lake Regional Park. This study was prepared in conjunction with the Rangeland Resources Study (LSA 2009), and both documents address erosion and non-native species control, and recommend restoration of sensitive habitats such as wetlands, native grasslands, and riparian areas. The recommendations of this report are also consistent with the Cultural Resources Study (LSA 2008) with respect to avoiding impacts to significant archaeological resources. This biological resources report specifically addresses those land management activities not related to grazing and range management, and both reports should be considered for purposes of habitat enhancement. The biological resources report also assesses impacts of park development and various management activities and proposes mitigation to ameliorate those impacts. Both reports will be used to develop the master plan for the park and the biological section of the CEQA analysis for the master plan.

1.2 LOCATION

Tolay Lake Regional Park is located in a valley of the Sonoma Mountains in southern Sonoma County. The Sonoma Creek watershed is to the east and the Petaluma Creek watershed is to the west of the park. Access to Tolay Lake Regional Park is from Cannon Lane, off Lakeville Road, 5.5 miles south of Petaluma. Figure 1 shows the regional location of Tolay Lake Regional Park and Figure 2 shows the location of the park on a USGS topographical map.

1.3 PROJECT DESCRIPTION

Tolay Lake Regional Park has recently been acquired by the Sonoma County Regional Parks Department, and they are currently in the process of developing a master plan for the park. They are proposing to open the park for visitation by the general public and implement several restoration projects. The master plan would include enhancing existing ranch roads and developing new trails. Providing visitation to Pond 1 and/or Pond 2, the riparian area along Tolay Creek, and to the oaks on the East Ridge, and providing picnicking opportunities are also components of the master plan. The restoration portion of the master plan includes restoring Tolay Lake, enhancing Pond 1, restoring riparian vegetation, restoring native grassland vegetation, and reducing erosion at the outlet of Pond 1 and possibly Pond 2.

1.4 REGULATORY CONTEXT

Biological resources on the site may fall under the jurisdiction of various regulatory agencies and be subject to regulations, as described below. In general, the greatest legal protections are provided for formally listed species. Informally listed species and habitats receive lesser legal protection.

1.4.1 Federal Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over federally listed threatened and endangered plant and animal species. The Federal Endangered Species Act (FESA) protects listed species from harm or "take," broadly defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." Any such activity can be defined as a "take" even if it is unintentional or accidental.

Section 9 of the FESA and its applicable regulations restrict certain activities with respect to endangered and threatened plants. Nevertheless, these restrictions are less stringent than those applicable to animal species. The provisions of the FESA prohibit the removal of, malicious damage to, or destruction of any listed plant species "from areas under federal jurisdiction." Furthermore, listed plants may not be cut, dug up, damaged or destroyed in, or removed from any other area (including private lands) in known violation of a state law or regulation.

An endangered species is one that is considered in danger of becoming extinct throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Federal agencies involved in permitting projects that may result in take of federally listed species (e.g., U.S. Army Corps of Engineers) are required under Section 7 of the FESA to consult with the USFWS prior to issuing such permits. Any activity that could result in the take of a federally listed species and is not authorized as part of a Section 7 consultation, requires an FESA Section 10 take permit from the USFWS.

In addition to endangered and threatened species, which are legally protected under the FESA, the USFWS has a list of proposed and candidate species. Proposed species are those for which a proposed rule to list them as endangered or threatened has been published in the Federal Register. A candidate species is one for which the USFWS currently has enough information to support a proposal to list it as a threatened or endangered species. Proposed species could be listed at any time, and many federal agencies protect them as if they already are listed. Candidate species are not afforded legal protection under the FESA.

1.4.2 Clean Water Act

The U.S. Army Corps of Engineers (Corps) is responsible under Section 404 of the Clean Water Act to regulate the discharge of fill material into waters of the United States. Waters of the U.S. and their lateral limits are defined in 33 CFR Part 328.3(a) and include streams that are tributaries to navigable waters and their adjacent wetlands. The lateral limits of jurisdiction for a non-tidal stream are measured at the line of the Ordinary High Water Mark (OHWM) (33 CFR Part 328.3[e]) or the limit of adjacent wetlands (33 CFR Part 328.3[b]). Any permanent extension of the limits of an existing water of the U.S., whether natural or man-made, results in a similar extension of Corps jurisdiction (33 CFR Part 328.5).

Waters of the U.S. fall into two broad categories: wetlands and other waters. Other waters include waterbodies and watercourses such as rivers, streams, lakes, springs, ponds, coastal waters, and estuaries. Wetlands include marshes, wet meadows, seeps, floodplains, basins, and other areas experiencing extended seasonal or permanent soil saturation. Seasonally or intermittently inundated features, such as seasonal ponds, ephemeral streams, and tidal marshes, are categorized as wetlands if they have hydric soils and support wetland plant communities. Seasonally inundated waterbodies or watercourses that do not exhibit wetland characteristics are classified as other waters of the U.S.

Wetlands and other waters that cannot trace a continuous hydrologic connection to a navigable water of the U.S. are not tributary to waters of the U.S. These are termed “isolated” wetlands and waters. Isolated wetlands and waters are jurisdictional when their destruction or degradation can affect interstate or foreign commerce (33 CFR Part 328.3[a]). The Corps may or may not take jurisdiction over isolated wetlands, depending on the specific circumstances.

In general, a Section 404 permit must be obtained from the Corps before filling or grading wetlands or other waters of the U.S. Certain projects may qualify for authorization under a Nationwide Permit (NWP). The purpose of the NWP program is to streamline the evaluation and approval process throughout the nation for certain types of activities that have only minimal impacts to the aquatic environment. Many NWPs are only authorized after the applicant has submitted a pre-construction notification (PCN) to the appropriate Corps office. The Corps is required to consult with the USFWS and/or NOAA-Fisheries under Section 7 of the ESA if the permitted activity may result in the take of federally listed species.

All Corps permits require state water quality certification under Section 401 of the Clean Water Act. This regulatory program for the park is administered by the San Francisco Bay Regional Water Quality Control Board (RWQCB). Projects that propose to fill wetlands or other waters of the U.S. must apply for water quality certification from the RWQCB. The RWQCB has adopted a policy requiring mitigation for any loss of wetland, streambed, or other waters of the U.S.

1.4.3 Porter-Cologne Water Quality Control Act

Under this Act (California Water Code Sections 13000–14920), the RWQCB is authorized to regulate the discharge of waste that could affect the quality of the State’s waters. Therefore, even if a project does not require a federal permit, it may still require review and approval by the RWQCB (e.g., for impacts to isolated wetlands and other waters). When reviewing applications, the RWQCB focuses on ensuring that projects do not adversely affect the “beneficial uses” associated with waters of the State. In most cases, the RWQCB seeks to protect these beneficial uses by requiring the integration of water quality control measures into projects that will require discharge into waters of the State. For most construction projects, the RWQCB requires the use of construction and post-construction Best Management Practices (BMPs).

1.4.4 Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) prohibits the taking, hunting, killing, selling, purchasing, etc. of migratory birds, parts of migratory birds, or their eggs and nests. As used in the

MBTA, the term "take" is defined as "to pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires." Most bird species native to North America are covered by this act.

1.4.5 California Endangered Species Act

The California Department of Fish and Game (CDFG) has jurisdiction over threatened or endangered species that are formally listed by the State under the California Endangered Species Act (CESA). The CESA is similar to the FESA both in process and substance; it is intended to provide additional protection to threatened and endangered species in California. The CESA does not supersede the FESA, but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both state and federal laws apply) or under only one act. A candidate species is one that the Fish and Game Commission has formally noticed as being under review by CDFG for addition to the State list. Candidate species are protected by the provisions of the CESA.

1.4.6 California Fish and Game Code

The CDFG is also responsible for enforcing the California Fish and Game Code, which contains several provisions potentially relevant to construction projects. For example, Section 1600 of the Fish and Game Code governs the issuance of Lake and Streambed Alteration Agreements by the CDFG. Lake and Streambed Alteration Agreements are required whenever project activities substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated as such by the CDFG.

The Fish and Game Code also lists animal species designated as Fully Protected, which may not be taken or possessed. The Fully Protected designation does not allow "incidental take" and is thus more restrictive than the CESA,. Fully Protected species are listed in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the Fish and Game Code, while protected amphibians and reptiles are listed in Chapter 5, Sections 41 and 42.

Section 3503 of the Fish and Game Code prohibits the take, possession, or needless destruction of the nest or eggs of any bird. Subsection 3503.5 specifically prohibits the take, possession, or destruction of any birds in the orders Falconiformes (hawks and eagles) or Strigiformes (owls) and their nests. These provisions, along with the federal MBTA, essentially serve to protect nesting native birds. Non-native species, including European starling and house sparrow, are not afforded any protection under the MBTA or California Fish and Game Code.

1.4.7 California Environmental Quality Act

The California Environmental Quality Act (CEQA) applies to "projects" proposed to be undertaken or requiring approval by State or local governmental agencies. Projects are defined as having the potential to have a physical impact on the environment. Under Section 15380 of CEQA, a species not included on any formal list "shall nevertheless be considered rare or endangered if the species can be shown by a local agency to meet the criteria" for listing. With sufficient documentation, a species could be shown to meet the definition of rare or endangered under CEQA, which would lower the threshold of significance for project impacts. .

The Oak Woodlands Conservation Act would require as part of their CEQA review, that counties determine, for projects that result in the conversion of oak woodlands, whether that conversion would have a significant effect on the environment. Conversion of oak woodland entails the removal of at least 30 percent of the canopy of the oak woodland. The Oak Woodlands Conservation Act requires each county to adopt an oak woodland management plan and to set mitigation standards. The Oak Woodlands Conservation Act would be implemented at the county level.

1.4.8 State Species of Special Concern and Special Plants List

The CDFG maintains an informal list of *species of special concern* (Jennings and Hayes 1994, Shuford and Gardali 2008, Williams 1986), *list of special vascular plants, bryophytes, and lichens* (CDFG 2007a), and *list of special animals* (CDFG 2007 b). These are broadly defined as species that are of concern to the CDFG because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California. These species are inventoried in the California Natural Diversity Data Base (CNDDB) regardless of their legal status. Impacts to s*pecies of special concern* and *special plants* may be considered significant under CEQA.

1.4.9 California Native Plant Society

The non-governmental California Native Plant Society (CNPS) has developed lists of plants of concern in California (CNPS 2001).

- A CNPS List 1A plant is a species, subspecies, or variety that is considered to be extinct.
- A List 1B plant is considered rare, threatened, or endangered in California and elsewhere.
- A List 2 plant is considered rare, threatened, or endangered in California but is more common elsewhere.
- A List 3 plant is potentially endangered but additional information on taxonomy, rarity, and endangerment is needed.
- A List 4 plant has a limited distribution but is presently not endangered. Impacts to List 1B and List 2 plants are frequently considered significant under CEQA, depending on the lead agency.

Plants on lists 1A, 1B, and 2 typically qualify for coverage under CEQA based on the policy of the lead agency. Plants on Lists 3 and 4 may be evaluated on a case-by-case basis to determine significance thresholds under CEQA.

Hydrophytic plant species are listed by the U.S. Fish and Wildlife Service in *National List of Plant Species That Occur in Wetlands* (Reed 1988). The *National List* identifies five categories of plants according to their frequency of occurrence in wetlands. The categories are:

Obligate wetland plants (OBL)	Plants that occur almost always in wetlands.
Facultative wetland plants (FACW)	Plants that usually occur in wetlands.
Facultative plants (FAC)	Plants that are equally likely to occur in wetlands or non-wetlands.
Facultative upland plants (FACU)	Plants that usually occur in uplands.
Obligate upland plants (UPL)	Plants that occur almost always in non-wetlands.

An area is considered to meet the hydrophytic vegetation criterion when more than 50 percent of the dominant species in each stratum (e.g., tree, shrub, and herb) present are in the obligate wetland, facultative wetland, or facultative categories.

Hydric soils are defined by criteria set forth by the National Technical Committee for Hydric Soils (NTCHS). These criteria are given in the *Wetlands Delineation Manual* (Environmental Laboratory 1987) and are based on depth and duration of soil saturation. Hydric soils are commonly identified in the field by using indirect indicators of saturated soil, technically known as redoximorphic features. These features are caused by anaerobic, reduced soil conditions that are brought about by prolonged soil saturation. The most common redoximorphic features are distinguished by soil color, which is strongly influenced by the frequency and duration of soil saturation. Hydric soils tend to have dark (low chroma) colors which are often accompanied by reddish mottles (iron mottles), reddish stains on root channels (oxidized rhizospheres), or gray colors (gleying).

Under natural conditions, development of hydrophytic vegetation and hydric soils are dependent on a third characteristic, wetland hydrology. The wetland hydrology criterion is met if the area experiences inundation or soil saturation to the surface for a period equal to at least 5 percent of the growing season (about 14 days in the project area) in a year of average rainfall. In most cases, this criterion can only be measured directly by monitoring of the site through an entire wet season. In practice, the hydrological status of a particular area is usually evaluated using indirect indicators. Some of the indicators that are commonly used to identify wetland hydrology include recent sediment deposits, surface scour, and oxidized rhizospheres around living roots.

2.2.2 Field Methodology

LSA surveyed the study areas on June 2, 5, and July 12, 13, and 16, 2006, to identify potential wetlands and other waters of the United States. A scale of 1 inch equals 200 feet aerial ortho-photo map of the property and a GPS unit with approximately 39-inch (1 meter) accuracy were used in the field for mapping purposes. Areas determined by LSA to meet Clean Water Act jurisdictional criteria are mapped on Figures 3a and 3b. It should be noted results may have been affected by the fact that

2.0 METHODS

2.1 PLANT SURVEYS

Prior to initiating field work, LSA reviewed the CDFG's California Natural Diversity Data Base (CNDDB) and relevant environmental documents (Parsons 1996) for records of special-status species in the area of Tolay Lake. Based on this review, a list of 30 special-status plant species was compiled for focusing survey efforts. This list documented blooming periods and habitat affinities of special-status plant species. Aerial photos and global positioning (GPS) technology were used for mapping vegetation types, habitats, and special-status species occurrences.

LSA botanists Clint Kellner, Greg Gallaugher, Tim Milliken, and Zoya Akulova participated in the botanical surveys of the Tolay Lake site. Early season surveys (March 22, 23, and 30, May 5, 8, and 24) were conducted by a team of three or four botanists and late season surveys (July 28, August 6, August 21, November 5, 2006, and January 19, 2007) were conducted by one or two botanists. Additional surveys were conducted on a single day in March 2007 and March 2008. The stand of fragrant fritillaries was checked on April 1 2008 by a team of 3 botanists. The surveys were conducted by walking 100 to 200-foot-wide transects in the core areas of the site and in areas that provided potentially suitable habitat for special-status plants. Areas outside of core areas were less intensively surveyed. Late season surveys were conducted by checking the habitats of late blooming special-status plant species such as pappose tarweed (*Centromadia parryi* ssp. *parryi*) and other species associated with seeps or wetlands.

The special-status fragrant fritillary (*Fritillaria liliacea*) often grows in association with the common Fremont's star lily (*Zigadenus fremontii*), and populations of the star lily were examined for fragrant fritillary. This included walking 20-foot wide transects through stands of Fremont's star lily.

Plants were identified using dichotomous keys in the Jepson Manual (Hickman 1993), and Flora of Sonoma County (Best et al.1996). Plants collected in the field were also identified by comparing them to images from Calphotos and Google Images, and pressed specimens housed at the UC Berkeley and Jepson herbaria.

2.2 WETLANDS

2.2.1 Wetland Identification Methodology

Field investigations of potential wetlands occurring on the property were conducted using the routine determination method given in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). This methodology entails examination of specific sample points within potential wetlands for hydrophytic vegetation, hydric soils, and wetland hydrology. By the federal definition, all three of these parameters must be present for an area to be considered a wetland. The amount of information collected at each sample point was sufficient to characterize the wetlands. Formal jurisdictional delineation data sheets were completed for selected sample points and were used to characterize the different types of wetlands at Tolay Lake Regional Park.

the previous year's rainfall was approximately 35 inches, approximately 7 inches above average. Rainfall in 2005 was unusually high and only rivaled that of 1982, 1986, 1995, and 1997. On the other hand, the area had not received significant rain since mid-April in 2006.

Prior to the wetland field survey, LSA reviewed aerial photographs, previous wetland characterization maps by Parsons (1996) and Circuit Rider Productions (2006, with field work completed in 2005), and field notes and maps from LSA's botanical field surveys of March and May 2006. Field surveys in June and July verified the 2006 wetland status of areas previously identified during LSA's botanical surveys of March and May. Some smaller seasonal wetlands, 0.1 acre or less, may have been missed.

Wetlands and other waters potentially subject to regulation were identified predominantly by the presence of basins, ditches or other depressed topographic features, and by the presence of hydrophytic vegetation. Sample points for potential wetland areas were not recorded on data sheets, but were investigated at multiple locations to establish the presence and boundaries of potential wetlands. The three routine determination criteria were investigated: the presence and wetland indicator category of hydrophytic plant species; wetland hydrology indicators such as surface water, saturated soil, oxidized rhizospheres, and matting from seasonal ponding; and hydric soil indicators such as oxidized rhizospheres, redoximorphic mottling, dark value, and low chroma. The diagnostic wetland indicators used for particular potential wetland locations were recorded in field notes.

Drainage features were considered to be potentially jurisdictional if they contained water at the time of the survey, exhibited scour, shelving, a low-flow channel, debris deposits at the side of the channel, or otherwise showed evidence of prolonged flow.

Potential wetland boundaries were mapped using three different methods: 1) by following vegetation and land forms; 2) tracing features on the aerial ortho-photo; and/or 3) using the GPS.

2.3 ANIMAL SURVEYS

LSA wildlife biologists Matt Ricketts and Rebecca Doubledee conducted reconnaissance-level surveys on March 23 (both), May 2 (Ricketts only), June 8 (Ricketts only), and August 29, 2006 (Doubledee only). Surveys consisted of traversing selected areas of the site by foot while recording animal observations in field notes and noting areas of particular habitat value on aerial photos. These selected areas included representative examples of the existing habitats (e.g., oak woodland, grassland, riparian woodland) of Tolay Lake Regional Park. Portions of the site covered on each survey date are summarized below.

The primary intent of the March 23 survey was to gather information on wintering waterbird use of Tolay Lake and to check the site's aquatic features for California red-legged frogs (*Rana draytonii*), western pond turtles (*Actinemys marmorata*), and other amphibians and reptiles. The waterbird use of Tolay Lake was surveyed with a spotting scope from the knoll off the northwestern corner of the lake. Other areas visited during the March 23 survey included the "Oak Grove" (i.e., the oak woodland on the East Ridge at the northeastern corner of the site), the Eagle Creek drainage, the pasture and isolated blue gum (*Eucalyptus globulus*) trees on the gently sloping area west of the East Ridge, the east-west drainage ditch, and the ornamental vegetation and large grove of blue gum trees in the Park Center.

During the March 23 visit, Ms. Doubledee surveyed the majority of the prominent water features on the property for California red-legged frogs, western pond turtles, and other wildlife species during daylight hours. The survey method included walking along the banks of each water feature first scanning the banks with binoculars, then surveying with the naked eye and listening for the sound of frogs jumping into the water. The main water features surveyed during the March 23 visit by Ms. Doubledee included the entire length of Tolay Creek on the property, the small Stock Pond at the southern portion of the West Ridge, Cardoza Creek between the confluence with Tolay Creek and Pond 1, Pond 1, Pond 2, the small pond that occurs in the eastern portion of the farmed area, the East-West Drainage Ditch that is tributary to Eagle Creek, the portion of Tolay Lake adjacent to the causeway, Willow Pond, and Duck Pond near the Park Center.

The May 2 survey focused on the riparian habitat along Tolay Creek, Cardoza Creek below Pond 2, and Pond 2. The survey also included the grasslands along the base of the West Ridge, grasslands north of Cardoza Creek, scattered rock outcrops near Cardoza Creek, and oak trees within Cardoza Creek.

The June 8 survey entailed re-examining Tolay Creek for riparian passerines (i.e., songbirds), checking the isolated blue gum trees on the gently sloping area west of the East Ridge for nesting raptors and surveying the West Ridge and the drainages in the southwestern site corner (e.g., South Creek) for wildlife.

The August 29 survey was also conducted only during daylight hours and focused on surveying for recently metamorphosed California red-legged frogs within waterbodies that remained inundated. Areas surveyed included South Creek, the small Stock Pond at the southern portion of the West Ridge, Tolay Creek east of the small Stock Pond, Cardoza Creek between the confluence with Tolay Creek and Pond 1, Pond 1, Pond 2, the small Irrigation Pond that occurs in the eastern portion of the farmed area and Pond 4 near the Park Center. In addition, an off-site farm pond just west of the southern portion of the West Ridge was surveyed with binoculars.

Volunteers from the Petaluma Wetlands Alliance have been conducting surveys of the birds of Tolay Lake Regional Park since April of 2006. They have conducted 28 surveys to date, and their information has been incorporated into this report. In addition, volunteers of the Raptor Project (Thiessen and Wilson 2007) have noted raptor activity on 4 days in 2007. Their results are also incorporated into this report. (These on-going survey efforts provide valuable data for park management.)

Nomenclature used in this report for amphibians and reptiles conforms to Crother (2008), while nomenclature for mammals conforms to Baker et al. (2003). Nomenclature for special-status species conforms to the CNDDB (2006). Scientific names of bird species are not provided in the text because English vernacular names are standardized in the American Ornithologists' Union (AOU) *Check-list of North American Birds* (AOU 1998).

3.0 VEGETATION AND WILDLIFE VALUES

3.1 WOODLAND

3.1.1 Botanical Values

Oak Woodland. Oak woodland occurs in a relatively large stand on the top of the East Ridge and in smaller stands in the draws (gullies) on the East Ridge (Figure 3a). This community is dominated by coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*) with scattered madrone (*Arbutus menziesii*) and black oak (*Quercus kellogii*). A number of large California bay trees also occur in the woodland on the East Ridge. The coast live oak trees on the East Ridge are very large with many trunk diameters averaging or exceeding 4 feet diameter at breast height (4.5 feet from ground). Tree height averages 30 feet or less. Main branches exceeding 2 feet in diameter have broken from some of the oak trees, while other trees have the intact round canopy of a mature tree.

Understory consists primarily of herbaceous species with few woody plants. Heavy levels of year-round cattle grazing, in the past, have likely eradicated most shrubs. Herbaceous species in the understory include miner's lettuce (*Claytonia perfoliata*), bedstraw (*Galium aparine*), Pacific sanicle (*Sanicula crassicaulis*), and nemophila (*Nemophila heterophylla*). Down wood and rocky substrate covers much of the surface in oak woodland on the East Ridge. Table A provides a list of the plant species observed within Tolay Lake Regional Park.

Buckeye Woodland. Buckeye woodland occurs in a small stand on a rock outcrop at the base of the West Ridge near Tolay Creek at the southern boundary of the park (Figure 3b). This woodland is dominated by California buckeye (*Aesculus californica*) with an understory of weedy plant species such as dwarf nettle (*Urtica urens*), Italian thistle (*Carduus pycnocephalus*), and yellow star-thistle (*Centaurea solstitialis*). Mistletoe (*Phoradendron villosum*) is common on the branches of the buckeye trees.

Blue Gum Trees. A grove of blue gum trees occurs in the Park Center area of Tolay Lake Regional Park (Figure 3b). A smaller stand occurs on the west-facing slope of the southern portion of the West Ridge, and isolated blue gum trees occur on the base of the East Ridge (Figure 3a). These trees are large and provide a complete canopy cover. The understory of these groves is largely absent because of heavy loads of litter (fallen branches and exfoliating bark).

The large eucalyptus stand near the Park Center is associated with the Cardoza Ranch and thus has historical significance. The historical significance is currently undetermined regarding the two large eucalyptus trees growing at the base of the East Ridge and the small stand of eucalyptus growing on the western edge of the West Ridge, because their association with the Cardoza Ranch is not known (LSA 2008).

3.1.2 Wildlife Values

Oak woodlands are one of the most species-rich wildlife habitats in California, primarily due to their production of acorns, which are an important food source for a variety of wildlife (CalPIF 2002). The ecological relationship between birds and oaks can often be reciprocal when species such as western scrub-jay and Steller's jay disperse acorns. Large oak trees also provide cover and nest sites for both cup-nesting and cavity-nesting birds, and are used as caching sites for the storage of acorns by acorn woodpeckers (CalPIF 2002). Such trees also provide nest sites for raptors. A pair of red-tailed hawks was seen by LSA performing courtship flights over the Oak Grove on March 23, and likely nest in the area. Behavior consistent with nesting red-tailed hawks was also observed at the eucalyptus grove near the Park Center. Figure 3b shows the estimated location of the nest.

Although not seen by LSA, a pair of golden eagles is also known to frequent the Oak Grove area of Tolay Lake Regional Park (Steve Ehret pers. comm.). Several bird species observed in the Oak Grove were not seen in other portions of the site, indicating its unique habitat value. Species in this category include band-tailed pigeon, Steller's jay, oak titmouse, brown creeper, winter wren, and spotted towhee. Table B provides a list of animal species observed by LSA at Tolay Lake Regional Park in 2006. For an in-depth analysis of the bird usage of Tolay Lake Regional Park, please see the Appendix where we analyze data collected by volunteers for the Petaluma Wetland Alliance (PWA).

Mature trees and snags provide potential roost sites for bat species known to occur in the region, although not detected by LSA. These species include Yuma myotis (*Myotis yumanensis*), little brown myotis (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), and pallid bat (*Antrozous pallidus*). Black-tailed deer (*Odocoileus hemionus*), while not restricted to oak woodlands, browse upon the foliage provided by the lower tree branches and take shelter there. Other mammal species likely to use this habitat include northern raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), and striped skunk (*Mephitis mephitis*). Feral pigs (*Sus scrofa*) are occasionally observed off-site in oak woodland adjacent to the East Ridge, but have not yet been observed on Tolay Lake Regional Park.

Oak woodlands typically occur on north-facing and east-facing slopes, where precipitation is concentrated and moisture is lost less rapidly to evaporation (Block and Morrison 1998). As a result of these relatively dense and moist conditions, salamanders often occur in oak woodlands on north-facing slopes. Although not detected by LSA, salamander species typically observed in oak woodlands within this region include California slender salamander (*Batrachoseps attenuatus*), and arboreal salamander (*Aneides lugubris*). Common reptiles expected within oak woodland include the western skink (*Plestiodon skiltonianus*), southern alligator lizard (*Elgaria multicaranata*), ring-necked snake (*Diadophis punctatus*), and sharp tailed snake (*Contia tenuis*). Down branches and rock outcrops provide cover for the animals inhabiting the oak woodland.

3.2 RIPARIAN VEGETATION

3.2.1 Botanical Values

Tolay Creek and Cardoza Creek support the most developed stands of riparian woodland at Tolay Lake Regional Park with the largest stands at the southern portion of the park along Tolay Creek (Figure 3b). Other watercourses support single willows or small stands composed of a few trees.

Riparian woodland is dominated by various combinations of arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yellow willow (*Salix lucida* ssp. *lasiandra*), and sandbar willow (*Salix exigua*), with scattered cottonwood (*Populus fremontii* ssp. *fremontii*), coast live oak, California bay, California buckeye, and non-native wild plums (*Prunus* sp).

Native shrubs are largely absent from the riparian woodland apparently due to heavy year-round browsing by cattle. Himalayan blackberry (*Rubus discolor*), an invasive non-native vine, which is resistant to cattle browsing, occurs in some riparian areas.

3.2.2 Wildlife Values

Riparian areas are generally recognized as an important wildlife habitat (Faber 2003) and have been identified as the most important habitats for landbirds in California (Manley and Davidson 1993, cited in RHJV 2004). Several species depend on riparian habitats for their entire breeding cycle (e.g., yellow warbler), while many others use them for roosting and foraging during the winter (e.g., yellow-rumped warblers) or during migration (e.g., western tanager).

Based on observations by LSA and volunteers from PWA, no riparian-obligate passerines (e.g., yellow-breasted chat) are currently known to breed in the riparian habitat on-site, despite the relatively well developed and extensive willow vegetation along Tolay and Cardoza creeks. Although the specific reasons for the lack of riparian-obligate birds are unknown, the on-site riparian corridors may be too narrow to support breeding populations of such species. Red-winged blackbirds and song sparrows were the two most abundant species along both creeks, with red-winged blackbirds occurring along the entire length of Tolay Creek.

LSA observed a single warbling vireo and orange-crowned warbler at Tolay Creek on May 2, and PWA volunteers observed three Wilson's warblers on May 7, 2007 and an orange-crowned warbler on April 21 and May 7, 2007. Although these species could possibly breed in the riparian vegetation, breeding has not been confirmed. PWA also observed yellow warblers and a willow flycatcher on September 17, 2006 but these birds were likely migrants. PWA observed a number of Bullock's orioles at Tolay Lake in 2007 and LSA observed a single Bullock's oriole on May 2 and June 8, 2006 in riparian habitat. Bullock's orioles nest in the eucalyptus at the base of the East Ridge.

Although no stick nests were found in 2006, the dense willows and occasional emergent cottonwood potentially provide nest sites for raptors. Other birds that use riparian woodland include mourning dove, Anna's hummingbird, downy woodpecker, northern flicker, black phoebe, tree swallow, bushtit, Bewick's wren, ruby-crowned kinglet (winter), hermit thrush (winter), American robin, yellow-rumped warbler (winter), spotted towhee, California towhee, white-crowned sparrow (winter), golden-crowned sparrow (winter), and house finch. Although most of these species also occur in non-riparian habitats, the dense foliage of riparian woodland provides particularly good habitat.

Riparian habitats also function as movement corridors and foraging habitat for mammals, including those mentioned in the oak woodland section above. Additional mammal species that may occur in riparian woodland include common gray fox (*Urocyon cinereoargenteus*) and Virginia opossum (*Didelphis virginiana*).

3.3 GRASSLANDS

3.3.1 Botanical Values

Native Grasslands. Native grasslands are sensitive biological resources because little of the original native California grassland remains in low elevation areas of California, including Tolay Lake Regional Park. Communities dominated by native grasses and graminoids that occur in Tolay Lake Regional Park (Figures 3a and b) include moist grasslands, and needlegrass grasslands.

Moist grasslands are noted as unique features in and around Tolay Lake (Goals Project 1999). Moist grasslands vary in species composition depending on moisture levels. The wettest areas (often meeting the criteria of jurisdictional wetlands) support California semaphore grass (*Pleuropogon californicus*), sedges (*Carex* spp.), and rushes (*Juncus* spp.). Other moist grasslands may not be saturated or inundated long enough to meet the wetland criterion, but support native grass species that require relatively high summer moisture levels such as creeping wildrye (*Leymus triticoides*), meadow barley (*Hordeum brachyantherum*), and California oatgrass (*Danthonia californica*).

For the purposes of this report, stands of meadow barley and California oat grass are considered a native grassland because of their characteristic “bunch” growth habit (that is characteristic of a native bunch grass) and because they grow in dryer areas than the majority of wetland plant species. Stands of sedges and rushes were mapped as wetlands because they grow in areas that are saturated or inundated for relatively long periods of time. Meadow barley, California oat grass, and a mosaic of meadow barley, California oat grass, sedges, and rushes were mapped as moist grasslands. Stands of California semaphore grass and areas dominated by both California semaphore grass and rushes were mapped as California semaphore grass wetland. Moist grasslands and California semaphore grass wetlands are common in the north central portion of the park east of Tolay Lake (Figure 3a).

A second native grass community occurs on slopes exhibiting the driest conditions. These occur as small stands of purple needlegrass (*Nassella pulchra*), often in association with California oat grass. Needlegrass grassland occurs in scattered small stands throughout Tolay Lake Regional Park, but more commonly in the south-eastern portion (Figure 3a).

Non-Native Grasslands. Non-native grasslands at Tolay Lake Regional Park are dominated by Italian ryegrass (*Lolium multiflorum*) and medusahead (*Taeniatherum caput-medusae*). Italian ryegrass is dominant in spring and early summer throughout the whole site. Later in summer, medusahead becomes dominant in large areas, especially on the West Ridge. Medusahead grows in less extensive stands on the East Ridge and central part of Tolay Lake Regional Park. Other non-native grass species include wild oats (*Avena fatua, Avena barbata*), barley (*Hordeum murinum* ssp. *leporinum*), ripgut brome (*Bromus diandrus*), and soft chess (*Bromus hordeacous*). Some non-native grass species occur sparsely in wetland areas, for instance, annual canary grass (*Phalaris paradoxa*) and swamp timothy (*Crypsis schoenoides*).

Non-native grasslands include many other weedy species including broad-leaf filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), common vetch (*Vicia sativa* ssp. *nigra*), geranium (*Geranium molle*), shepherd’s needle (*Scandix pecten-veneris*), rose clover (*Trifolium hirtum*), subterranean clover (*Trifolium subterraneum*), and milk thistle (*Silybum marianum*). These species do not form large stands but grow sparsely among the grasses. Small amounts of wheat (*Triticum aestivum*) continued to persist in some parts of the cultivated fields.

Non-native grasslands support numerous native wildflowers including Ithuriel's spears (*Triteleia laxa*), white brodiaea (*Triteleia hyacinthina*), Fremont's star lily, blue-eyed grass (*Sisyrinchum bellum*), California poppy (*Eschscholzia californica*), cream cups (*Platystemon californicus*), sun cups (*Camissonia ovata*), soap plant (*Chlorogalum pomeridianum*), California checker mallow (*Sidalcea malvaeflora*.), Johnny jump-up (*Viola pedunculata*), morning-glory (*Calystegia subacaulis*), false lupine (*Thermopsis macrophylla*), mule ears (*Wyethia angustifolia*), and yampah (*Perideridia kelloggii*.).

Invasive Plant Species. Medusahead, Italian thistle, bristly ox-tongue (*Picris echioides*), yellow star-thistle, and purple star-thistle (*Centaurea calcitrapa*) are the most common non-native invasive plants at Tolay Lake Regional Park. Large stands of these weeds occur throughout the site, especially in the central part (Figures 4a and 4b). Bristly ox-tongue covers large areas in the central part of the site, especially in the formerly cultivated areas east of Tolay Lake. From these formerly cultivated areas, bristly ox-tongue has colonized the adjacent grasslands. Milk thistle, another invasive species, is less common at Tolay Lake Regional Park. Other non-native weed species that are less invasive and grow relatively sparsely on the site include bull thistle (*Cirsium vulgare*), jointed charlock (*Raphanus raphanistrum*), and dandelion (*Taraxacum officinale*).

3.3.2 Wildlife Values

Grasslands constitute the most widespread habitat type at Tolay Lake Regional Park. In addition to common bird species such as western meadowlark, grasslands on the site are likely to support breeding grasshopper sparrows and horned larks judging by the observation of a pair of horned larks and singing male grasshopper sparrows (LSA obs.). Both of these species are more restricted in their distribution and together indicate high-quality, diverse grasslands with horned larks preferring short grass and bare areas while grasshopper sparrows preferring comparatively tall grass habitats. Grasslands also provide foraging habitat for raptor species such as red-tailed hawk, northern harrier, white-tailed kite, American kestrel, great horned owl, and barn owl, which feed on the small mammals that occur in grasslands (see below). Other local bird species that spend a large portion of their life cycle within or adjacent to grasslands include turkey vulture, loggerhead shrike, western kingbird, Say's phoebe, American crow, Savannah sparrow, and red-winged blackbird. Five swallow species (tree, violet-green, northern rough-winged, barn, and cliff) were observed on site in 2006, most of which were seen foraging over the grasslands on either side of the dirt road that parallels the eastern side of the West Ridge.

The grasslands of Tolay Lake Regional Park are likely to support several species of small mammals such as deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californica*), Botta's pocket gopher (*Thomomys bottae*), and western harvest mouse (*Reithrodontomys megalotis*). Grasslands also provide suitable foraging habitat for bat species, northern raccoon, and striped skunk. Skunks would forage in the grasslands while raccoon would forage in the ponds, seeps, and other wet areas of Tolay Lake Regional Park.

Black-tailed jackrabbit (*Lepus californicus*) and coyote (*Canis latrans*) are known to occur on the site, and spend the majority of their time foraging or resting in grasslands. The jackrabbit would comprise a major prey item for the carnivores that occur at Tolay Lake Regional Park. Brush rabbits (*Sylvilagus bachmani*) were not observed at the park. A limiting factor for this species is the small amount of shrubby cover. With additional cover, rabbit and other small mammals could occur on-site in greater numbers than currently and provide a greater prey base for the carnivores.

The California ground squirrel (*Spermophilus beecheyi*) creates burrows that are used by a wide variety of animals including reptiles, amphibians, insects, arachnids, and snails. Because of this and their importance as prey for foxes, coyotes, golden eagles, and other raptors, the California ground squirrel has a positive influence on the diversity of animal species in grasslands.

California ground squirrels experience natural fluctuations in their population numbers at Tolay Lake and the adjacent ranches according to Jenette Cardoza, the owner of the Cardoza Ranch (Steve Ehret pers. comm.). They were often observed on two areas of the West Ridge, and LSA observed a small number of holes and scat near a rock outcrop at the base of the East Ridge. Their current population numbers are very low at Tolay Lake Regional Park. Given the extensive suitable habitat for ground squirrels and the past favorable land management regime of intensive grazing, the scarcity of ground squirrels on the site could be the result of a low point of a natural population fluctuation and/or intense predation by a suite of predators.

Common reptiles typically found in grasslands in this region include western fence lizards (*Sceloporus occidentalis*), gophersnakes (*Pituophis catenifer*), and northern American racers (*Coluber constrictor*). Grassland areas adjacent to seasonal wetlands in this area could also support the sierran treefrog (*Pseudacris sierra*) [formerly Pacific treefrog], and western toad (*Anaxyrus boreas*).

3.4 TOLAY LAKE

Tolay Lake has been greatly altered in historic times by the removal of its natural dam, construction of drainage ditches, the straightening, widening, and deepening of Tolay Creek to drain Tolay Lake, diverting North Creek around Tolay Lake, and farming the bottom of Tolay Lake. These activities have reduced the size and duration of ponding of Tolay Lake and greatly altered the flora of the lake.

Review of Kammon Hydrology and Engineering (2003), Ducks Unlimited (2005), Hanson (1999), and the supplemental information included in the water rights application 30558 submitted to the State Water Resources Control Board provided background information on the amount of water contained in Tolay Lake. These accounts indicate that Tolay Lake was perennial during years of high rainfall and extended to Stage Gulch Road prior to the breaching of the dam sometime after 1859. Tolay Lake will still extend nearly to Stage Gulch Road in wet years, as it did in 2006.

Tolay Lake will become inundated any time between December and February in a typical year. Ponding remains until April or early May. The Cardoza's pumped water out of the lake in April or May to begin their farming operations. Some isolated pools in the lake bottom that were not connected to the channel of Tolay Creek, remained ponded longer.

A relatively large amount of water seems to have been passing through the Tolay Lake watershed based on these reports. The observation of water in Tolay Creek in August and November 2006 by LSA staff confirms that water is present nearly year-round, during wet years, in Tolay Creek despite a dry Tolay lakebed. Furthermore, Parsons (1996) indicates that 1 acre-foot of water is present in

Tolay Creek in the late summer during dry years and that 2 acre-feet are present in Tolay Creek during average years and wet years.

Tolay Lake is now a large, shallow basin divided by excavated drainages into a series of formerly cultivated agricultural fields. A mosaic of ponded areas, wetland vegetation, and upland areas occurs at the edge of Tolay Lake, and disturbance from former farming activities has made it difficult to determine the natural pattern of vegetation. Nevertheless, a slight break in the slope of the formerly cultivated field appears to indicate the historic shoreline along a portion of the eastern shore of Tolay Lake.

There have been several studies of the hydrology of Tolay Lake in preparation of developing plans for its restoration (Kamman 2003). A variety of lake alternative restoration scenarios have been developed, but the precise details of each of the alternatives have not yet been selected (Ducks Unlimited 2005).

3.4.1 Botanical Values

The lake bottom is bare of vegetation while ponded and is dominated by cultivated vegetation when it was farmed. Under fallow conditions it supports a variety of plant species as it dries. Native plant species that appear along the lakeshore in the late spring including slender popcorn flower (*Plagiobothrys stipitatus*), water-starwort (*Callitriche* sp.), purslane speedwell (*Veronica peregrina*), hyssop loosestrife (*Lythrum hyssopifolium*), and common monkey-flower (*Mimulus guttatus*). In the summer a variety of native and non-native weedy species emerge in the dry bottom of the lake. A dense monoculture of water smartweed (*Polygonum amphibium* ssp. *emersum*) occurrs in Tolay Lake south of the causeway. North of the causeway, water smartweed grew mixed with mayweed (*Anthemis cotula*), spearscale (*Atriplex triangularis*), willowherb (*Epilobium pygmaeum*), velvet-leaf (*Abutilon theophrastii*), devil's claw (*Proboscidea lutea*), swamp timothy, red ammannia (*Ammannia coccinea*), heliotrope (*Heliotropium curassavicum*), common purslane (*Portulaca oleracea*), and water plantain (*Alisma lanceolatum*).

Wetlands upslope of the ponded area of Tolay Lake are dominated by hyssop loosestrife, meadow barley, popcorn flower, and California semaphore grass. Common non-native species in this area include Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), spiny-fruit buttercup (*Ranunculus muricatus*), curly dock (*Rumex crispus*), field bindweed (*Convolvulus arvensis*), mustard (*Brassica* sp.), and charlock (*Sinapis arvensis*). Above a wrack line of flotsam deposited during the previous winter by the high water elevation in Tolay Lake, the vegetation shifts to dominance by Italian ryegrass and prickly ox-tongue, facultative species (occurring with equal probability in wetlands and uplands) that are common in the grasslands surrounding Tolay Lake.

3.4.2 Wildlife Values

Tolay Lake is a major wintering area for migratory waterfowl (Steve Ehret pers. comm.; LSA obs.). The large size and shallow depth of the lake attracts large numbers of dabbling ducks and other waterbirds. The accessible vegetation growing on the lake bottom provides forage for over-wintering waterfowl. Eleven duck species, eight of them dabblers, were observed by LSA and PWA volunteers in 2006. These species included gadwall, American widgeon, mallard, cinnamon teal, northern shoveler, northern pintail, green-winged teal, canvasback, greater scaup, bufflehead, and ruddy duck. Other water bird species observed on the lake include Canada goose, pied-billed grebe, double-crested cormorant, American coot, and Caspian tern. Wading birds such as great blue heron, great egret, and snowy egret forage along the lake margins as well as within the seasonally flooded fields adjacent to and east of the lake. These shallow wetlands also provide foraging habitat for wintering and migrating shorebirds such as killdeer, greater yellowlegs, least sandpiper, western sandpiper, and long-billed dowitcher.

Mammals primarily use Tolay Lake as a source of drinking water. Several of the common reptiles typically found in the surrounding grassland habitat may also use the lake for drinking water.

The importance of Tolay Lake as habitat for invertebrates is not known. The seasonal nature of the lake reduces macro-invertebrate diversity. Bats and swallows are likely to forage for adult insects flying over Tolay Lake. Tolay Lake also provides suitable breeding habitat for Pacific treefrogs and western toads. Due to the seasonal nature of the Lake, it is not suitable breeding habitat for American bullfrogs *(Lithobates catesbiana)* although bullfrogs probably travel to Tolay Lake from upstream reservoirs and adjacent areas. California red-legged frogs may be able to breed in protected areas of Tolay Lake if water remains until July.

3.5 SEEPS AND SPRINGS

3.5.1 Botanical Values

Seasonal to perennial wetland seeps and springs occur on many of the slopes within the study area. These areas do not have a significant surface watershed and show no evidence of being the result of surface runoff. The hydrology of these seeps and springs appears to be the result of groundwater flowing from cracks in the underlying bedrock or from the “daylighting” of water that is flowing down slope above the soil’s contact with bedrock. Some of these seeps and springs are extensive, especially those that occur near Pond 2 (Figure 3a). Permanent springs produce flowing surface water and support wetland vegetation including soft rush (*Juncus effusus*), iris-leaf rush (*Juncus xiphioides*), common monkey-flower, water cress (*Rorippa nasturtium-aquaticum*), spiny-fruit buttercup, and straight-beaked buttercup (*Ranunculus orthorhynchus* var. *bloomeri*). Permanent seeps support green vegetation during the dry season. Permanent seeps were dominated by brown-headed rush (*Juncus phaeocephalus*), common monkey-flower, and pennyroyal (*Mentha pulegium*). Seasonal seeps provide a relatively short wet season hydrology. Depending on the amount of rainfall, these seeps may dry by the end of May in a dry year and by the end of June in a wet year. Their dominant surface feature is the presence of brown-headed rush. Trampling by cattle has reduced the cover of some seeps and appears to have reduced the numbers of some species (such as straight-beaked buttercup) that grow in the seeps.

3.5.2 Wildlife Values

Birds, mammals, and reptiles would all be expected to frequent the seeps for drinking water. Cover would be provided within the dense growth of rushes and other vegetation. Shrews would be expected to occur within the seeps where they would conduct the majority of their foraging. Bird species such as killdeer, great egret, and Wilson's snipe are more likely to forage within the wet areas of seeps and springs than in the drier adjacent grassland habitats.

The use of seeps and springs by amphibians largely depends on the seasonal duration of the seep. Seasonal seeps that have relatively short wet season hydrology, may aid in the dispersal of adult frogs. Nevertheless, permanent seeps and springs are more useful to amphibians during the summer months and common amphibian species, such as Pacific treefrogs and western toads are likely to use these areas in the summer. Pacific treefrogs may breed in the livestock watering troughs that are fed by some of the springs. Trampling by cattle may reduce the wildlife value of the seeps by degrading the quality of water and reducing cover. Nevertheless, grazing by cattle may reduce the weed cover of seeps.

3.6 VERNAL POOLS AND SEASONAL WETLANDS

3.6.1 Botanical Values

Seasonal wetlands occur on the flat top of the West Ridge and on shallow slopes and swales of the East Ridge (Figures 3a and 3b). Hydrology of these features is provided by direct rainfall and run-off. The seasonal wetlands of the West Ridge occur on level, impermeable soils or a shallow soil over impermeable bedrock. Small seasonally wet areas above these impermeable substrates are dominated by armed coyote thistle (*Eryngium armatum*).

Two small and shallow vernal pools occur on the crest of the West Ridge near the southern boundary of the park (Figure 3b). Because they are shallow, they would be expected to dry sometime between March and May on any given year. Plant species include Mediterranean barley, armed coyote thistle, Lobb's aquatic buttercup (*Ranunculus lobbii*), and water-starwort.

Certain seeps have created conditions resulting in rotational land slumps. Soil water, along with some surface runoff, collects in seasonal ponds above these rotational land slumps. These seasonal ponds are dominated by rabbit's-foot grass, brown-headed rush, creeping spike rush (*Eleocharis macrostachya*), smooth rush, white water buttercup (*Ranunculus aquatilis*), Lobb's aquatic buttercup, and flowering quillwort (*Lilaea scillioides*). Annual miner's lettuce and spiny-fruit buttercup also occur in these seasonal ponds in the spring.

Several small seasonal wetlands occur on shallow slopes or swales on the East Ridge that appear to concentrate runoff sufficiently to saturate the soil and support hydrophytic plant species. These wetlands are interesting because their water source derives from both surface hydrology and seepage from groundwater. These habitats support soft rush, brown-headed rush, annual water miner's lettuce (*Montia fontana*), and common monkeyflower.

The relatively level portion of the site that is east of Tolay Lake that was formerly cultivated, supports large seasonal wetlands that are ponded in the spring and support California semaphore grass, meadow foam (*Limnanthes douglasii*), and white-tip clover (*Trifolium variegatum*). In summer, these areas become dry and are invaded by non-native grasses and weeds. Other types of California semaphore grass wetlands occur in areas where rushes are co-dominant. In these areas the California semaphore grass grows in saturated soils or where there are small ponded areas on the order of a few feet wide or less.

Seasonal wetlands occur in drainages that cross beneath Cannon Lane and in low areas located beside Lakeville Road (Figure 5). The wetlands near Lakeville Road are connected to salt marshes surrounding the Petaluma River and support saline-adapted species such as the non-native brass buttons (*Cotula coronopifolia*).

3.6.2 Wildlife Values

The wildlife values discussed in Section 3.5.2 (*Seeps and Springs*) are also relevant for vernal pools and seasonal wetlands. The large seasonal wetlands that remain ponded into the spring provide suitable breeding habitat for Pacific treefrogs and western toads. Common garter snakes (*Thamnophis sirtalis*) and terrestrial garter snakes (*Thamnophis elegans*) would also be expected to occur in and adjacent to seasonal wetlands. Garter snakes predominantly feed on fish, toads, frogs, salamanders, and their larvae. In wet years, portions of two large seasonal wetland areas on the eastern side of Tolay Creek, towards the southern edge of the property, retain enough ponded water to provide hydration habitat for bullfrogs. They can be expected to dry early in years of low rainfall.

3.7 PONDS

Ponds have been developed on Tolay Lake Regional Park for watering cattle, irrigating crops, and for other human uses. These ponds are located at the base of the West Ridge and at the base of the East Ridge (Figure 3a and 3b).

Two small reservoirs, Pond 1 and Pond 2, at the base of East Ridge are supplied by a combination of seasonal surface runoff and seasonal and perennial springs. Pond 1 receives runoff from a large area up-slope, from seeps, and from the headwaters of the Main Fork of Cardoza Creek. Pond 2 receives overflow from Pond 1, flow from the North Fork of Cardoza Creek, and water from two large seep/spring complexes.

The Willow Pond and Duck Pond, near the Park Center, are supplied by springs located in the eastern side of the park. Over a mile of pipes brings water to these ponds. Duck Pond receives overflow from Willow Pond. A small Stock Pond occurs at the southern portion of the West Ridge. A small Irrigation Pond at the base of the East Ridge receives water from a drainage ditch. The Old Duck Pond consists of a shallow basin surrounded by a low berm, where inundation is a result of direct rainfall and a seasonally elevated water table.

3.7.1 Botanical Values

The northeastern shoreline of Pond 2 supports a broad band of cattails and tules surrounded by a small but well developed riparian woodland. Wetland vegetation along the shore of Pond 1 includes prostrate amaranthus (*Amaranthus blitoides*), spiny clotbur (*Xanthium spinosum*), and strawberry clover (*Trifolium fragiferum*). The rapid drawdown of the water level in Pond 1 for irrigation likely precludes the establishment of substantial amounts of wetland vegetation.

The surface of Willow Pond is covered with duckweed (*Lemna* sp.). The vegetation of Duck Pond is dominated by the noxious weedy water primrose (*Ludwigia* sp.). The water primrose grows through the shallow portions of the pond and nearly reaches the middle of the pond by the middle of autumn.

The small Stock Pond supports several species of rush and short herbaceous species. The Irrigation Pond is ringed with a dense band of cattails and the Old Duck Pond supports a dense stand of creeping spikerush.

3.7.2 Wildlife Values

The habitat values of ponds are similar to those of seeps, springs, and seasonal wetlands, but are likely to receive more wildlife use by virtue of their greater size and presence of standing water. Pond 2, in particular, provides open water habitat for species such as American coot, pied-billed grebe, cinnamon teal, and mallard. Stands of cattails and tules at Pond 2 and the Irrigation Pond also provide habitat for passerines such as black phoebe, marsh wren, song sparrow, and Lincoln's sparrow.

The ponds on the property likely provide breeding habitat for native Pacific treefrogs and western toads, which also makes them likely habitat for common garter snakes and terrestrial garter snakes. Ponds 1 and 2, the Irrigation Pond in the eastern portion of the farmed area, and the Duck Pond are all perennial and contained introduced bullfrogs. Ponds 1 and 2 also contain non-native mosquito fish (*Gambusia affinis*). The Willow Pond is perennial but no bullfrogs were observed during the site visits. This pond is shaded and is dominated by duckweed making it less likely to support bullfrogs. The Old Duck Pond may be perennial during wet years and it supported bullfrogs in 2006. All of the ponds on the property could provide habitat for California red-legged frogs and western pond turtles, if the ponds were not occupied by bullfrogs or mosquito fish. The presence of introduced bullfrogs does not necessarily exclude the presence of these two species, but it can have a significant effect on their abundance.

3.8 STREAMS

3.8.1 Tolay Creek

Tolay Creek extends approximately 1.25 miles downstream of Tolay Lake before exiting the southern boundary of Tolay Lake Regional Park. South of Tolay Lake, Tolay Creek is contained within a defined, incised channel of 4 to 10 feet in depth with a channel width of 10 to 20 feet. Much of this channel appears to have been straightened or deepened by excavation for the purpose of draining Tolay Lake for agriculture. Berms of dredged spoils are visible at multiple locations along the channel. Most of the channel supports hydrophytic plants and flows all year. Portions of the channel contained standing or flowing water into early November 2006 although other portions dried by August. Tolay Creek typically dries completely in the dry season approximately 3 miles downstream from Tolay Lake Regional Park (LSA obs.).

The vegetation of Tolay Creek consists of water smartweed and small stands of cattails and tules that form a complete cover over the creek between Tolay Lake and the Farm Bridge, 700 feet downstream of the lake. Non-native poison hemlock (*Conium maculatum*) grows on the upper edge of the banks. This portion of Tolay Creek could potentially provide suitable habitat for California red-legged frogs and western pond turtles, although none were observed during the March or August surveys.

Downstream of the bridge, cattle graze in the channel of Tolay Creek resulting in a more diverse and open vegetation, including cattails, tules, water smartweed, curly dock, water cress, and various species of native rushes. Juvenile bullfrogs were observed in the portion of Tolay Creek, just above the confluence with Cardoza Creek. Arroyo willow and red willow occur as single individuals scattered 1,900 feet downstream of Tolay Lake. These willows merge into a narrow band about a half mile downstream from Tolay Lake. A relatively wide band of riparian vegetation grows along Tolay Creek beginning about a mile downstream from the lake. The southern most stretch of Tolay Creek on the property, downstream of the confluence with Cardoza Creek, supports the largest area of riparian woodland. A braided series of channels flows through willows and dense stands of Himalayan blackberries in this area. At least one California red-legged frog was previously recorded at this location (Parsons 1996), although none were observed during this study. This entire portion of Tolay Creek contains suitable habitat for California red-legged frogs. The dense riparian cover and cooler temperatures makes it less suitable for introduced bullfrogs and none were observed here during surveys. Nevertheless, one adult bullfrog was observed in a seep adjacent to Tolay Creek.

3.8.2 North Creek – Oak Grove Fork

The North Creek – Oak Grove Fork originates on the eastern slope of East Ridge and crosses the northern corner of the project site before leaving Tolay Lake Regional Park. North Creek later re-enters the site as a channelized ditch that flows along the eastern edge of Tolay Lake. The Oak Grove Fork starts as a slumped gully without wetland characteristics, and then flows through approximately 600-feet of channel with wetland vegetation and seeps, followed by an approximately 700-foot reach without wetland characteristics underneath the canopy of oak woodland. The channel of the Oak Grove Fork appears unmodified except for a small bridge crossing.

3.8.3 Cardoza Creek

The Main Fork of Cardoza Creek upstream of Pond 1 supports brown-headed rush in the channel and California figwort (*Scrophularia californica*), creeping snowberry (*Symphoricarpos mollis*), California coffeeberry (*Rhamnus californica*), poison oak (*Toxicodendron diversilobum*), and narrow horsetail (*Equisetum laevigatum*) on the banks. Scattered coast live oak and willow trees grow along the Main Fork of Cardoza Creek.

The North Fork of Cardoza Creek, upstream of the confluence of the channel draining Pond 1, does not support wetland vegetation. Scattered buckeye and bay trees grow along banks of the North Fork. The Pond 1 spillway is a deeply incised constructed channel that joins the north fork of Cardoza Creek upstream of Pond 2. The banks of this channel and the outfall of Pond 1 are actively eroding and are in need of repair to reduce downstream sedimentation.

The streambed between Pond 1 and Pond 2 has been bypassed due to the construction of the dam for Pond 1. This former streambed flows during winter and spring but is reduced to a large wetland seep during the summer. One adult bullfrog was observed in a plunge pool in the streambed between Pond 1 and Pond 2.

Pond 2 discharges onto a concrete-lined spillway that concentrates flows causing erosion of the channel several hundred yards downstream to the confluence with the Main Fork of Cardoza Creek. The end of the spillway is undercut and large chunks of the spillway have fallen into the deeply eroded channel. Old automobile bodies and large blocks of cement have been added to the banks of the eroded channel to prevent erosion. Large willow trees have grown along the banks emerging through the car bodies. Although the spillway is eroding, the channel bottom appears to be stabilized because it has attained a stable elevation upstream from the Main Fork of Cardoza Creek. The banks of the channel are overly steep and portions are actively eroding into the channel. The former Cardoza Creek channel upstream of the juncture with the Pond 2 spillway channel and below the dam to Pond 2 no longer shows evidence of wetland or stream characteristics but does support riparian woodland predominantly composed of sandbar willow.

3.8.4 Eagle Creek

The extreme headwaters of Eagle Creek are mapped as a series of seeps and channels supporting wetland vegetation including brown-headed rush and soft rush. A few coast live oak and bay trees occur along the upstream part of the creek. Eagle Creek contained standing water at its confluence with Tolay Creek as late as August in 2006, although this was an extraordinary wet year and not typical.

3.8.5 Un-named Streams

Numerous small drainages flow toward Tolay Lake and Tolay Creek from the West Ridge in the southwest portion of the project site. Many of these streams were flowing as late as August and November of 2006, but may flow less in dryer years. Channel characteristics of these streams range from relatively narrow segments without wetland characteristics to wider segments consisting of a defined channel with adjacent wetland vegetation dominated by brown-headed rush and common monkey-flower. These varying channel characteristics are caused by changes in gradient, underlying bedrock, and the occurrence of seeps.

3.9 ROCK OUTCROPS

Rock outcrops provide habitat for native plants and animals. Rock outcrops are often surrounded by shallow soils that support a higher proportion of native plant species than adjacent grasslands. Some of the rock outcrops, however, are heavily used by cattle for rubbing and support ruderal plants typical of disturbed areas. Rock outcrops of the East Ridge have the most diversity of native plant species including shooting star (*Dodecatheon hendersonii*), California polypody (*Polypodium californicum*), California maidenhair fern (*Adiantum jordanii*), clarkia (*Clarkia* sp.), phacelia (*Phacelia* sp.), and woodland star (*Lithophragma* sp.).

Rock outcrops have been used by the burrowing owl at Tolay Lake Regional Park. Other wildlife species are likely to use rock outcrops for dens or observation posts.

4.0 SPECIAL-STATUS SPECIES

A variety of special-status species and sensitive habitat types occur at Tolay Lake Regional Park. Special-status species observed during field work or otherwise known to occur on-site include fragrant fritillary, Lobb's aquatic buttercup, California linderiella (*Linderiella occidentalis*), California red-legged frog, western pond turtle, golden eagle, burrowing owl, and Grasshopper sparrows.

Habitat for several species of special-status insects occurs at Tolay Lake Regional Park. This habitat consists of cream cups, the food plant of Opler's longhorn moth (*Adela oplerella*), and ponds that could be used by Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*). Johnny jump-up, the food plant of an unnamed subspecies of zerene silverspot butterfly (*Speyeria zerene*), occurs at Tolay Lake Regional Park and the butterfly may also occur there.

Red-tailed hawks are not a special-status species, but their nest area at Tolay Lake Regional Park is considered sensitive. California horned larks were formerly a special-status species and have been recently placed on the CDFG watch list. Because this change is recent we include a write-up for them.

Sensitive habitats that occur at Tolay Lake Regional Park are oak woodlands, riparian woodlands, buckeye woodlands, native grasslands, wetlands, and rock outcrops (Figures 3a and 3b).

4.1 PLANTS

4.1.1 Known Occurrences of Special-status Plants

Two special-status plant species described below have been observed at Tolay Lake Regional Park. The fragrant fritillary and Lobb's aquatic buttercup should be avoided by park plans to the extent possible, especially because they only occur on-site in a few locations.

Fragrant Fritillary. Fragrant fritillary is a CNPS list 1B species and is on CDFG's list of Special Vascular Plants, Bryophytes and Lichens. It has no federal status. It occurs in two locations on the east-facing portion of the West Ridge. Approximately fifteen plants were observed with Fremont's star lily at a northern location (designated by two dots on Figure 3b) and a single plant grew with non-native annual grasses at a southern location (designated by one dot on Figure 3b) on March 22, 2006. Approximately 13 fragrant fritillary plants were observed in March of 2007 at the northern location and no fragrant fritillary plants were observed at the southern location. On April 1, 2008, hundreds of fragrant fritillary plants were observed at the northern location. Fragrant fritillary grows from a bulb and, along with Fremont's star lily, can be one of the first wildflowers to bloom in the spring beginning in February. Nevertheless, it appears that it blooms somewhat later at Tolay Lake Regional Park.

Lobb's Aquatic Buttercup. Lobb's aquatic buttercups is a CNPS list 4 species and is on CDFG's list of Special Vascular Plants, Bryophytes and Lichens. It has no federal status. It grows in shallow pools in the spring. Their white flowers and leaves float on the surface of the water. It was found in a seasonal pool at the base of a slump and a vernal pool on the top of the West Ridge.

Yampah. Gairdner's yampah, (*Perideridia gairdneri* ssp. *gairdneri*), a CNPS List 4 species potentially occurs at Tolay Lake Regional park. It looks very similar to and can grow with Kellogg's yampah (*Perideridia kelloggii*), a common species that grows on the West Ridge. Gairdner's yampah grows in moist grassland areas, adobe flats, and grassland areas beneath pine trees (Best et al. 1996). In Sonoma County, Gairdner's yampah occurs much west and north of Tolay Lake Regional Park mostly from the Laguna de Santa Rosa westward to the coast. Kellogg's yampah is common and grows in grassland including adobe flats and serpentine (Best et al. 1996).

4.1.2 Potential Occurrences of Special-status Plants

The following plant species are not known to occur within Tolay Lake Regional Park, but are known from the vicinity. They were not found during surveys and they are unlikely to occur within the park.

Franciscan onion. Franciscan onion (*Allium peninsulare* var. *franciscanum*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs on clay soils, often on serpentine, and on dry hillsides at an elevation between 330 and 1,000 feet. It is not likely to occur because serpentine is absent from Tolay Lake Regional Park and it was not found during surveys of suitable habitats.

Sonoma alopecurus. Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), federal endangered, CNPS List 1B, and CDFG Special Plant occurs in wet areas, vernal pools, marshes and riparian banks. It is not likely to occur within the site because it was not found during surveys in suitable habitats.

Napa false indigo. Napa false indigo (*Amorpha californica* var. *napensis*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in openings in forest, or woodland, and/or chaparral vegetation at an elevation between 500 and 6,500 feet. It is not likely to occur in the site because it was not found during surveys of openings within woodland habitats.

Bent-flowered fiddleneck. Bent-flowered fiddleneck (*Amsinckia lunaris*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in woodland and grassland habitats. It is not likely to occur within Tolay Lake Regional Park because it was not found during surveys.

Alkali milk-vetch. Alkali milk-vetch (*Astragalus tener* var. *tener*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs on alkali flats, flooded areas of annual grassland, in playas, or in vernal pools at an elevation between 1 and 550 feet. It is not likely to occur within Tolay Lake Regional Park because alkaline soils are absent and because it was not found during surveys.

Sonoma sunshine. Sonoma sunshine (*Blennosperma bakeri*), federal and State Endangered and CNPS List 1B, occurs in vernal pools and swales at an elevation between 30 and 330 feet. It is not likely to occur at Tolay Lake Regional Park because it was not found during surveys.

Narrow-anthered California brodiaea. Narrow-anthered California brodiaea (*Brodiaea californica* var. *leptandra*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in broad-leaved upland forest, chaparral, and lower montane coniferous forest at an elevation between 360 and 3,000 feet. Most of the observations were from areas beside scrub or chaparral (CNDDB 2006). It is not likely to occur on the site because it was not found during surveys within suitable habitats.

Round-leaved filaree. Round-leaved filaree (*California* (*Erodium*) *macrophyllum*), CNPS List 2, CDFG Special Plant, and no federal status, occurs in grasslands on clay soil between an elevation of 50 and 4,000 feet. It is not likely to occur on the site because it was not found during the surveys of the grassland areas.

Pappose tarplant. Pappose tarplant (*Centromadia parryi* ssp. *parryi*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in vernally mesic, often alkaline sites at an elevation between 6 and 1,400 feet. It is not likely to occur within Tolay Lake Regional Park because alkaline soils are absent and it was not found during surveys of other habitats.

Sonoma spineflower. Sonoma spineflower (*Chorizanthe valida*), federal and State endangered and CNPS List 1B, occurs in sandy soil at an elevation between 30 and 160 feet. It is not likely to occur within the site because sandy soils are absent.

Yellow larkspur. Yellow larkspur (*Delphinium luteum*), federal endangered, State rare, and CNPS List 1B, occurs on north-facing rocky slopes at an elevation up to 330 feet. It is not likely to occur on the site because suitable habitat appears to be missing.

Western leatherwood. Western leatherwood (*Dirca occidentalis*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs on brushy slopes and mesic sites; mostly in mixed evergreen and foothill woodland communities at an elevation between 100 and 1,800 feet. It is not likely to occur in the site because its mesic scrub habitat is absent and it was not observed during surveys.

Dwarf downingia. Dwarf downingia (*Downingia pusilla*), CNPS List 2, CDFG Special Plant, and no federal status, occurs in vernal lake and pool margins at an elevation between 1 and 1,600 feet. It is not likely to occur in the site because it was not found during surveys of vernal pools or other seasonally ponded areas.

Marin western flax. Marin western flax (*Hesperolinon congestum*), federal and State threatened and CNPS List 1B, occurs in serpentine barrens and serpentine grassland and chaparral at an elevation between 100 and 1,200 feet. It is not likely to occur at Tolay Lake Regional Park because serpentine is absent.

Burke's goldfields. Burke's goldfields (*Lastenia burkei*), federal and State endangered and CNPS List 1B, occurs in vernal pools and swales at an elevation between 50 and 1,900 feet. It is not likely to occur in the site because it was not found during surveys of ponded areas or the saturated soil of wetlands.

Contra Costa goldfields. Contra Costa goldfields (*Lastenia conjugens*), federal endangered, CNPS List 1B, and CDFG Special Plant, occurs in vernal pools, swales, low depressions, and open grassy areas at an elevation between 1 and 1,500 feet. It is not likely to occur in the site because it was not found during surveys of ponded areas or the saturated soils of wetlands.

Legenere. Legenere (*Legenere limosa*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in the beds of vernal pools at an elevation between 1 and 3,000 feet. It is not likely to occur in the site because it was not found during surveys of ponded areas.

Jepson's leptosiphon. Jepson's leptosiphon (*Leptosiphon jepsonii*), CNPS List 1B, CDFG Special Plant and no federal Status, occurs on grassy slopes of volcanic or serpentine substrates at an elevation between 300 and 1,600 feet. It is not likely to occur within the site because serpentine is absent and it was not found during surveys in suitable habitats.

Sebastopol meadowfoam. Sebastopol meadowfoam (*Limnanthes vinculans*), federal and State endangered and CNPS List 1B, occurs in swales, wet meadows, vernal pools, and marshy areas in valley oak savanna. Soil types include poorly drained soil of clay and sandy loam at an elevation between 50 and 400 feet. It is not likely to occur at Tolay Lake Regional Park because it was not observed during surveys of the vernal pools and other wet areas of the site.

Marsh microseris. Marsh microseris (*Microseris paludosa*), CNPS List 1B, CDFG Special Plant and no federal status, occurs in grassland areas between an elevation of 15 and 1,000 feet. It is not likely to occur within the site because it was not found during surveys in suitable habitats.

Baker's navarretia. Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*), CNPS List 1B, CDFG Special Plant and no federal status, occurs in vernal pools and swales on adobe or alkaline soils at an elevation between 15 and 3,000 feet. It is not likely to occur at Tolay Lake Regional Park because it was not found during surveys of vernal pools or other ponded and wet areas.

Marin County navarretia. Marin County navarretia (*Navarretia rosulata*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in dry open rocky places and sometimes on serpentine at an elevation between 600 and 2,000 feet. It is not likely to occur at Tolay Lake Regional Park because it was not observed during surveys of rocky areas. In addition, rocky areas were often trampled by cows and supported a weedy flora.

Petaluma popcorn-flower. Petaluma popcorn-flower (*Plagiobothrys mollis* var. *vestitus*), CNPS List 1A, CDFG Special Plant, and no federal status, is known from a single specimen collected in the late 1800s from Petaluma. It is thought to occur in wet sites in grasslands or the edges of coastal marshes at a probable elevation between 30 and 150 feet. It is not likely to occur because it was not found during surveys of wet areas of Tolay Lake Regional Park.

North Coast semaphore grass. North Coast semaphore grass (*Pleuropogon hooverianus*), State threatened, CNPS List 1B, and no federal status, occurs in wet, grassy, and usually shady areas, and sometimes in freshwater marshes at an elevation between 30 and 4,000 feet. It is not likely to occur on the site because it was not found during surveys of wet and ponded areas. A similar species, California semaphore grass was observed in a number of areas in the central portion of Tolay Lake Regional Park.

Point Reyes checkerbloom. Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *rhizomata*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs in freshwater marshes near the coast usually at an elevation between 15 and 240 feet. It is not likely to occur in the site because it was not observed during surveys of wet areas.

Marin checkerbloom. Marin checkerbloom (*Sidalcea hickmanii* ssp. *viridis*), CNPS List 1B, CDFG Special Plant, and no federal status, occurs on serpentine or volcanic soils and sometimes appears after burns. Its elevational range varies between sea level and 1,400 feet. It is not likely to occur on the site because serpentine soils are absent.

Oval-leaved viburnum. Oval-leaved viburnum (*Viburnum ellipticum*), CNPS List 2, CDFG Special Plant, and no federal status, occurs in chaparral, cismontane woodland, and lower montane coniferous forest at an elevation between 705 and 4,600 feet. It was not found during surveys and is therefore not likely to occur at Tolay Lake Regional Park.

4.2 INSECTS AND CRUSTACEANS

The special-status species of insects discussed below are not known from Tolay Lake Regional Park, but are known from nearby areas. The food plants for both species of lepidoptera occur at Tolay Lake Regional Park: cream cups (food plant for Opler's longhorn moth) and Johnny jump-up (food plant for an un-named subspecies of zerene silverspot butterfly). Ponds that could be used by Ricksecker's water scavenger beetle also occur at Tolay Lake Regional Park. The crustacean, California linderiella, is a species of fairy shrimp that has been observed in Tolay Lake.

4.2.1 Opler's Longhorn Moth

Opler's longhorn moth is on the CDFG Special Animal list but has no federal status. It feeds on the flowers of cream cups, and the adult moths are usually observed resting on the petals of cream cups. Opler's longhorn moth was observed on Sonoma Land Trust's Baylands Property, approximately 5 miles south. A large stand of cream cups grows mid-slope on the northern part of the East Ridge. Opler's longhorn moth could occur at Tolay Lake Regional Park because of the occurrence of its food plant.

4.2.2 Zerene Silverspot Subspecies

An un-named subspecies of the zerene silverspot occurs on the Baylands Property just south of Tolay Lake Regional Park. This taxon has no federal or State status. The larvae of the zerene silverspot feed upon violets. Johnny jump-up commonly grows on both the East and West ridges of Tolay Lake Regional Park. This un-named subspecies of silverspot butterfly is likely to be very uncommon and therefore a resource that should be protected. This butterfly could occur at Tolay Lake Regional Park because of the occurrence of its food plant and because it occurs nearby at the Baylands Property.

4.2.3 Ricksecker's Water Scavenger Beetle

Ricksecker's water scavenger beetle is on the CDFG Special Animal list but has no federal status. It is an aquatic insect that is known from only a few localities in the San Francisco Bay Area. The closest known locality to Tolay Lake Regional Park is approximately10 miles further north on Sonoma Mountain. Due to the limited amount of scientific information currently available on the status and distribution of the Ricksecker's water scavenger beetle, we are unable to assess its potential occurrence at Tolay Lake Regional Park. Ricksecker's water scavenger beetles occur in ponds where their predaceous larvae remain on vegetation near the shore. Little else is known regarding Ricksecker's water scavenger beetles. Habitat for Ricksecker's water scavenger beetles occurs in Tolay Lake, Pond 1, Pond 2, Duck Pond, Willow Pond, and the permanent and semi-permanent stock ponds within Tolay Lake Regional Park.

4.2.4 California Linderiella

California linderiella is on the CDFG Special Animal list but has no federal status. It is the most common fairy shrimp in California and is found in 39 locations in the Great Central Valley and in the Coast Range from Mendocino to Ventura counties (Eng et al. 1990, Erickson and Belk 1999). California linderiella was observed in Tolay Lake (Sam Bacchini pers. comm.).

California fairy shrimp inhabit clear to tea-colored, often vegetated ephemeral or temporary pools of lightly turbid fresh water (vernal pools) that form in the cool, wet months of the year (Helm 1998, Erickson and Belk 1999). The pools inhabited by California fairy shrimp range in size from one square meter in sandstone depressions to 40 hectares in Boggs Lake, but typically occupy reasonably large pools (Erickson and Belk 1999).

California fairy shrimp swim or glide upside down by means of beating movements that pass along their 11 pairs of swimming legs in a wave-like motion from head to tail. The diet of California fairy shrimp consists of algae, bacteria, protozoa, rotifers, and bits of organic detritus (Pennak 1989).

Female California fairy shrimp carry their eggs in an oval or elongate brood sac on their abdomen. Eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks (Federal Register 1994). Resting (summer) eggs are known as cysts and are capable of withstanding heat, cold, and prolonged dry periods. The cyst bank in the soil may be comprised of cysts from several years of breeding (Donald 1983). As the vernal pools refill with rainwater, in the same or subsequent seasons, some of the cysts may hatch and the cycle repeats itself.

4.3 AMPHIBIANS

4.3.1 California Red-Legged Frog

Legal Status. California red-legged frog was federally listed as threatened on May 23, 1996 (USFWS 1996) and is a CDFG species of special concern. The USFWS published a recovery plan (USFWS 2002) identifying core areas and priority watersheds for focused recovery efforts. Tolay Lake Regional Park falls within the Petaluma Creek-Sonoma Creek Core Recovery Area, which was designated because it currently supports frogs, may serve as a source of frogs that colonize adjacent areas, and provides connectivity to core recovery areas to the east and west. The conservation needs identified for this area include protecting existing populations, reducing impacts of urban development, and protecting, restoring, and creating breeding and dispersal habitat.

Pesticide Injunction. The Center for Biological Diversity (CBD) filed a lawsuit in Federal District Court for the Northern District of California, alleging that EPA failed to comply with section 7(a)(2) of the Endangered Species Act by not ensuring that its registration of 66 named pesticide active ingredients will not affect the California red-legged frog, a federally-listed Threatened species. The Court, EPA, and CBD agreed to a Stipulated Injunction that 1) establishes deadlines for the EPA to determine the effect of the 66 pesticides on the California red-legged frog, 2) affects the use of these pesticides in selected counties including Sonoma County, and 3) requires the drafting of a bilingual brochure on the California red-legged frog and pesticides.

The injunction applies to areas designated as critical habitat for CRLF and in specified areas outside of critical habitat. Tolay Lake Regional Park is not located within designated critical habitat but a small portion is located within one of the non-critical habitat areas covered by the injunction (Figure 6). The injunction is not a blanket ban on the use of these 66 pesticides (Table C) within the covered areas. The ban applies only to specified buffers in the portions of these areas which meet the definition of primary constituent habitat elements in the April 13, 2006 CRLF Critical Habitat designation published in the Federal Register. These are 1) Aquatic breeding habitat, 2) Non-breeding aquatic habitat, and 3) Upland habitat (natural areas within 200' of breeding and non-breeding aquatic habitat).

The injunction prohibits the use of these materials within 60 feet of these aquatic habitat areas. Beyond 60 feet out to a distance of 200 feet these pesticides may be used for localized spot treatments using a handheld device. Beyond 200 feet there are no restrictions on method of application.

Habitat Characterization. The habitat types that the California red-legged frog occupies are diverse and include ephemeral ponds, intermittent streams, seasonal wetlands, springs, seeps, permanent ponds, perennial creeks, constructed aquatic features, marshes, lagoons, riparian corridors, blackberry (*Rubus* spp.) thickets, non-native annual grasslands, and oak savannas (USFWS 2002), several of which occur within Tolay Lake Regional Park. Breeding occurs within ponds in streams, stock ponds, or other types of ponds. The egg and tadpole stages are limited to a variety of aquatic habitats.

Limiting Factors. The occurrence of introduced bullfrogs limits the suitability of aquatic habitat at Tolay Lake Regional Park for the California red-legged frog. Several researchers have attributed the decline and extirpation of California red-legged frogs throughout their range to the introduction of bullfrogs and predatory fishes (Hayes and Jennings 1986). The presence of California red-legged frogs has been negatively correlated with the presence of bullfrogs (Fisher and Shaffer 1996) and bullfrog adults have been observed preying on tadpole, juvenile, and adult California red-legged frogs. Bullfrogs were observed in all suitable aquatic habitat features listed above except in the small Stock Pond at the southern portion of the West Ridge and the southern portion of South Creek. The stock pond just beyond the western border of Tolay Lake Regional Park, with the historic California red-legged frog record, was surveyed with binoculars from the park boundary and was filled with several thousand juvenile bullfrogs in August 2006. Many of these juvenile bullfrogs will disperse onto Tolay Lake Regional Park.

Potential Habitat at the Park. Potential habitat for California red-legged frogs occurs in Tolay Creek (particularly the riparian vegetation along the southern portion of the creek), Pond 1, Pond 2, the small Stock Pond located at the southern portion of the West Ridge, the Irrigation Pond that occurs in the eastern portion of the farmed area, Duck Pond and potentially the southern portion of

South Creek, just before it exits Tolay Lake Regional Park. Nevertheless, the value of this habitat for California red-legged frogs is greatly reduced by the occurrence of bullfrogs throughout the park and by fish in Pond 1, Pond 2, and the Duck Pond.

Tolay Creek mostly varies between 3 and 6 feet wide and is mostly covered by an overstory of willow trees at its downstream end. It is perennial or nearly perennial in wet years only and provides 1) cover during both the rainy season and dry season, 2) hydration habitat, and 3) may provide breeding habitat in a few pools or areas of slowly flowing water.

South Creek is similar to Tolay Creek and provides similar potential habitat for California red-legged frogs. In years of low rainfall, these creeks may not provide habitat for breeding red-legged frogs. Pond 1 is a small reservoir that supports little shoreline vegetation. It provides hydration habitat and breeding habitat for California red-legged frogs although bullfrogs and mosquito fish also occur in Pond 1. Pond 2 is ringed by cattails and willow trees both of which would provide cover for California red-legged frogs. Pond 2 also provides hydration habitat for California red-legged frogs. Bullfrogs, sunfish, and mosquito fish occur in this pond which would limit breeding potential for California red-legged frogs.

The small Stock Pond is created by a dam across a small watercourse and is also fed by a seep. Cover is limited to stands of spikerush. This pond provides cover, hydration habitat, and breeding habitat for California red-legged frogs.

The Irrigation Pond supports a thick band of cattails at its edge that could provide cover for California red-legged frogs. This pond would also provide summer hydration habitat and breeding habitat for California red-legged frogs, although bullfrogs were observed there.

The Duck Pond appears to be permanently inundated and supports a dense growth of water primrose. Nevertheless, in years past, this pond was completely drained (Steve Ehret pers. comm.). This pond could support hydration and breeding habitat for California red-legged frog although bullfrogs were abundant.

Observations of California Red-legged Frog. California red-legged frogs have been observed on and adjacent to Tolay Lake Regional Park, in the riparian vegetation in Tolay Creek at the southern end of the park (Parsons 1996), and within Pond 1 and Pond 2 (Steve Ehret pers comm.). California red-legged frogs have also been noted within a stock pond and tributary to Tolay Creek within a half mile up-stream of the northern boundary of Tolay Lake Regional Park (CNDDB 2006). The frogs were actually observed at various locations within the tributary and could conceivably occur in Tolay Creek at the northern boundary of Tolay Lake Regional Park. California red-legged frogs are also known to occur in a stock pond beyond the western boundary of Tolay Lake Regional Park (Parsons 1996), and approximately 10 recently metamorphosed and 1 sub-adult California red-legged frogs were observed in ponds beneath riparian vegetation in Tolay Creek downstream from the park boundary (Sam Bacchini pers. comm.). These locations include the pond immediately downstream (south) of the boundary of Tolay Lake Regional Park.

No California red-legged frogs were observed during LSA's field visits. The surveys were conducted during the day when there is less chance of success of encountering California red-legged frogs, as compared to a combination of day-time and night-time surveys (Fellers and Kleeman 2006). California red-legged frogs appear to be sparse at Tolay Lake Regional Park, if not extirpated, and that is the most likely reason for not encountering them during surveys. Even with a robust survey effort, we may not observe California red-legged frogs at the park.

Although California red-legged frogs were not observed during surveys by LSA, they potentially occur at Tolay Lake Regional Park at a low density. They have been known from Tolay Lake Regional Park in the past and because habitat has not appeared to have changed, they potentially continue to occur there. Although bullfrogs significantly reduce the quality of habitat for California red-legged frogs, they are known to occur in areas with large numbers of bullfrogs. Because of these reasons, the USFWS is likely to consider the California red-legged frog to occupy habitat at Tolay Lake Regional Park.

Conclusion. LSA did not detect California red-legged frogs on our surveys, although the species is known from past surveys. This indicates that the species is currently either present in extremely low numbers or has become extirpated. Suitable physical habitat is present on the property to support California red-legged frogs. However, habitat suitability is substantially compromised by the presence of fish, which predate on the egg and larval stages of the California red-legged frog, the enormous population of bullfrogs, which predate on larvae and adults, and perennial waterbodies that provide breeding and hydration habitat for bullfrogs. More exhaustive surveys, than those conducted by LSA in 2006, could confirm the negative presence of California red-legged frogs or detect a remnant population.

Regardless of the results of even exhaustive surveys, if they were to be conducted and if no California red-legged frogs were detected, the USFWS would still likely consider California red-legged frogs present on the park property on the basis of past records and the continued presence of potentially suitable physical habitat. For management purposes, LSA recommends that the Regional Parks Department consider the California red-legged frog as a potentially present species.

4.4 REPTILES

4.4.1 Western Pond Turtle

Western pond turtle is a California species of special concern and has no federal status. Western pond turtles have been previously observed in Tolay Lake (Parsons 1996) and in a pond in Tolay Creek immediately downstream of the southern boundary of Tolay Lake Regional Park. They occur along the shore of waterbodies and on floating debris. Egg laying occurs in soft or sandy soil, often a considerable distance from any body of water. The limiting resources for the species are the aquatic and the egg-laying habitats.

Potentially suitable habitat includes Tolay Lake, Tolay Creek, Pond 1, Pond 2, the Irrigation Pond, Duck Pond, and Willow Pond. The occurrence of introduced bullfrogs limits the suitability of aquatic habitat at Tolay Lake Regional Park for the western pond turtles. Adult western pond turtles are frequently observed in ponds with introduced bullfrogs, but bullfrogs prey on juvenile turtles which can lead to population declines.

No pond turtles were observed during the LSA surveys. Based on previous sightings of turtles and the presence of potentially suitable habitat, western pond turtles are likely still present in low densities at Tolay Lake Regional Park.

4.5 BIRDS

4.5.1 White-tailed Kite

White-tailed kite is a state fully protected species and has no federal status. This species requires open habitats (e.g., grasslands, agricultural fields, marshes) for foraging and dense-topped trees or shrubs for nesting. The diet of white-tailed kites consists almost entirely of mice and voles (Peeters and Peeters 2005). Although no nests were found during our 2006 surveys, suitable nesting habitat is present and numerous white-tailed kites have been observed on site.

4.5.2 Golden Eagle

Golden eagles are a state fully protected species and have no federal Status. They nest in trees or cliffs and forage in grasslands. Major food items consist of the California ground squirrel and a variety of rabbit species. Golden eagles have been observed (Steve Ehret pers. comm.; LSA field observations) flying over and perching on the site. Although nesting was not observed by LSA, suitable nesting habitat is present in the eucalyptus and perhaps coast live oak trees.

Golden eagles are frequently observed (10 of 28 field visits by PWA volunteers) flying over Tolay Lake Regional Park. Five active nests of golden eagles apparently occur in the Tolay Lake area (Janet Thiessen pers. comm.), which may account for the frequent observations. They are often observed near the East Ridge. Because of the remote location of the East Ridge and because of the oak trees that grow within and beyond the property boundary of Tolay Lake Regional Park, the most likely location of a nest is in the vicinity of the East Ridge. Optimal nest locations appear to be in trees midway down a north- or east-facing slope or other areas that shelter the nest from strong wind. Golden eagles do not tend to nest on the tops of ridges (Peeters and Peeters 2005). The Oak Grove on the East Ridge extends from the top of the ridge down the west-facing slope and thus provides suitable nesting habitat, but nesting behavior was not observed by LSA.

Golden eagles usually build or repair a few nests prior to choosing one nest to use (Peeters and Peeters 2005). They may not use the same nest every year and will alternate use of several nests. Some pairs of golden eagles may not nest every year (Peeters and Peeters 2005). Golden eagles are thought to nest on an adjacent property to Tolay Lake Regional Park (Steve Ehret pers.comm) and based on our field observations, they do not appear to have nested this year at Tolay Lake Regional Park.

4.5.3 Burrowing Owl

Burrowing owls are a state species of special concern but have no federal status. They are known from the grasslands of Tolay Lake Regional Park (Steve Ehret pers. comm. and LSA obs.). Single individuals are regularly observed at rock outcrops during the winter and spring and occasionally summer indicating use by dispersing juvenile or over-wintering birds. The owls prefer short grass and respond well to areas that are regularly grazed. This species is dependent on burrows as nest sites and as year-round shelter. The owls typically use burrows created by small mammals, although the owls may subsequently modify the burrows for their own uses. The owls readily occupy constructed burrows. The sensitive period for nesting burrowing owls is between February and September 1.

4.5.4 California Horned Lark

California horned larks are on the CDFG watch list and have no federal Status. A pair had been observed (LSA obs.) on-site and most likely nest in grasslands at Tolay Lake Regional Park. California horned larks occur in grasslands with short grass. A suitable buffer should be developed for any nests encountered. Depending on the circumstances, buffers can range in width from 50 to 100 feet. Because California horned larks can occur in any portion of the grassland at Tolay Lake Regional Park, specific observations are not indicated on Figures 3a and 3b.

4.5.5 Grasshopper Sparrow

Grasshopper sparrows are considered a second priority state species of special concern (Unitt 2008). Grasshopper sparrows are uncommonly found nesting in the taller grass of grasslands. Because grasshopper sparrows can occur in any portion of the grassland at Tolay Lake Regional Park, specific observations are not indicated on Figures 3a and 3b.

4.5.6 Nesting Birds

Although they are not considered special-status species, almost all native birds and their nests are protected by the federal MBTA and the California Fish and Game Code. Species confirmed as nesting on the site include red-tailed hawk (nesting pair observed in the grove of blue gum trees in the Park Center) and western meadowlark (nest found while walking along Tolay Creek on May 2), although there are undoubtedly many more.

4.6 MAMMALS

4.6.1 American Badger

American badger is a state species of special concern that occurs in open areas, including dry grasslands. Because of its semifossorial habits, it requires friable soils in open, uncultivated ground suitable for burrowing. It also requires healthy populations of ground squirrels and pocket gophers, its two primary prey items (Jameson and Peeters 2004). Although there are no records of this species in the immediate vicinity of Tolay Lake, suitable habitat conditions are present in the hillier portions of the site, particularly along the East and West ridges and at the southern site corner. Large holes that could have been made by a badger were observed at Tolay Lake Regional Park (Steve Ehret pers. comm.).

4.6.2 Townsend's Big-Eared Bat

Townsend’s big-eared bat (*Corynorhinus townsendii*) is a state species of special concern. Although this species occurs in a wide variety of habitats throughout California (CNDDB 2006), it is extremely sensitive to human disturbance as it roosts in the open (i.e., from walls or ceilings of old buildings).

Nursery colonies have been found in caves, mine shafts, and buildings (Jameson and Peeters 2004). No roosts of this species are known from the immediate vicinity of Tolay Lake, but several old farm buildings on and in the vicinity of the site represent potential habitat. In addition, Townsend's big-eared bats roosting in the region may forage over the site at night.

4.6.3 Pallid Bat

Pallid bat (*Antrozous pallidus*) is a state species of special concern. It is somewhat more common than other special-status bats, occurring throughout most of California at elevations below 6,500 feet (Jameson and Peeters 2004). The pallid bat feeds mostly on flightless arthropods and they have been observed flying low (6 to 36 inches) to the ground searching for prey. After locating their prey, they will drop to the ground, grab the prey in their mouth, and fly to a feeding roost to consume the prey. (Texas Parks and Wildlife 1997). Roosting occurs in fissures in cliffs, abandoned buildings, bird boxes, and under bridges (Jameson and Peeters 2004). Several roosts of this species are known from the general vicinity of Tolay Lake (CNDDB 2006), and suitable roosting habitat (i.e., old farm buildings) is present on site. As such, this species has moderate potential to occur on the project site.

5.0 IMPACTS AND MITIGATION

5.1 RESTORATION OF TOLAY LAKE

Although specific objectives and methods for restoring Tolay Lake have not yet been defined, the overall goal is to increase the area and period of inundation. This would likely result in the establishment of riparian vegetation and freshwater marsh vegetation around the lakeshore. Restoration of Tolay Lake could result in the following potentially significant impacts to biological resources (beneficial and adverse). Implementation of the following mitigation measures would help achieve the goal of enhancing biological resources in the long-term.

5.1.1 Beneficial Impacts

Beneficial Impact 1: The restoration of Tolay Lake could increase the extent of freshwater marsh, seasonal wetland, and riparian habitat. The restoration of Tolay Lake is likely to create a body of water that is permanent or semi-permanent. This could potentially provide the hydrology necessary for maintaining cattails and tules, seasonal wetlands, and willow-cottonwood riparian woodland around the lakeshore. Such freshwater wetlands have been greatly reduced in California, and the creation of new ones would be a major benefit to general wildlife habitat values. Presumably California red-legged frogs and western pond turtles would benefit from the restoration of Tolay Lake because water would be retained in the lake for a longer duration than is the current situation. If water were to be retained into the middle of July (but preferably August or early September), then California red-legged frogs may breed in Tolay Lake. However, prolonging the period of inundation could also encourage bullfrogs, which eat both California red-legged frogs and small western pond turtles.

Beneficial Impact 2: The restoration of Tolay Lake would result in an increase in the quality of the water of Tolay Creek. The bottom of Tolay Lake has been regularly cultivated after water is pumped from the lakebed in April or May. The absence of disking will reduce the amount of suspended sediment and loose soil particles in Tolay Lake. With a reduction of sediment, the quality of the water in Tolay Lake would improve with a corresponding reduction of sedimentation of Tolay Creek and San Pablo Bay.

Beneficial Impact 3: The restoration of Tolay Lake would increase the recharging of ground water. Tolay Lake was typically inundated for half the year or less beginning anytime between December and February and lasting until April or early May when the lake was pumped dry. After pumping, those portions of Tolay Lake that were not connected to the channel of Tolay Creek, remained ponded until they evaporated or the ground water fell. Pumping would not occur under the current and proposed management of Tolay Lake Regional Park and the lake would remain inundated for a longer period of time. After restoration, the increased duration of inundation of Tolay Lake is likely to result in a greater amount of water infiltrating into the ground water table.

Filling in the drainage ditches, if that becomes part of the park plan, (both within and outside of Tolay Lake) is also likely to increase ground water recharge by retaining water on-site rather than draining it from the site. An increase in the recharging of the ground water table may result in an increase in the dry-season flow of Tolay Creek downstream from the lake.

An increase in the dry season flow of Tolay Creek is likely to benefit wildlife by providing a source of water later in the season. This water would be used for drinking and hydration habitat in the case of amphibians. If water were to be retained late in the season into July but preferably into August or early September, then breeding could occur by California red-legged frogs.

5.1.2 Adverse Impacts

Adverse Impact 1: Potential reduction of habitat available to foraging shorebirds. Shorebirds, or short-legged wading birds, overwinter on beaches, estuaries, and shallow bodies of water such as Tolay Lake. Shorebirds that have been observed using Tolay Lake include killdeer, long-billed dowitcher, greater yellowlegs, least sandpiper, and western sandpiper. These shorebirds forage at the shallow edges of Tolay Lake during the winter and during the spring and fall migration. Such foraging areas are important for shorebirds because much of their winter foraging habitat has been lost to urban and agricultural development. Foraging areas that are used during the spring and fall migrations are particularly important to allow the birds to rest and regain their fat stores prior to continuing the migration.

The proposed restoration of Tolay Lake will likely result in a large increase in shallow ponded areas. Portions of these shallow areas that remain wet for a substantial amount of time may become overgrown with cattails. The upper portion of the lake shore may not be ponded long enough for the growth of cattails and could be available for foraging by shorebirds. Shorebirds do not use areas dominated by cattails. Any loss of shorebird foraging habitat would be minor because data to date indicate that shorebird use is not substantial. With the exception of killdeer (and dowitcher for one observation), shorebird use has been limited to a few individuals of a few species.

> **Mitigation Measure 1.** If needed, new shorebird foraging habitat could be created in the nearly flat lower terrace areas east of Tolay Lake by restoring seasonal wetlands. These formerly cultivated fields become saturated and pond water during the rainy season. Grading could be used to create seasonal ponds that would provide wintering and migrating habitat for shorebirds.

Adverse Impact 2: Potential temporary increase in sediment during and immediately following construction. Earth-moving activities would be necessary for deepening Tolay Lake, creation of islands, restoration of the dam on Tolay Creek, realignment of the ditches that drain Tolay Lake, raising the causeway across Tolay Lake, and constructing the berm at the northern property line to avoid flooding private property upstream of Tolay Lake Regional Park.

Any earth-moving activity would remove vegetation and expose the surface of the soil, which could result in an increase of suspended sediment in Tolay Lake. This suspended sediment could become deposited in Tolay Creek once water leaves the lake and flows downstream. This would create a temporary adverse impact until vegetation covers the exposed soil surface.

Mitigation Measure 2. Best management practices should be implemented to reduce the amount of sediment generated. If more than a minor amount of sediment would be generated, based on the size and location of the construction, straw bales, silt fence, or curtain could be installed to contain the sediment within the construction area. Areas exposed to waves or surface flows could be mulched with straw and tackifer or covered with straw, coir, or jute erosion control blankets depending on the circumstances.

5.1.3 Impacts to Instream Uses

Adverse Impact 3: Potential adverse effects of Tolay Lake restoration on in-stream uses and associated wildlife, riparian vegetation, and wetland values. (See Section 3.4 - *Tolay Lake* and Section 3.8 - *Streams* of this report for existing conditions treated in greater detail than the summary presented below.) Adequate amounts of water and its persistence into the dry season are critical for the success of restoration of riparian vegetation and wildlife values to Tolay Creek. The effect of restoring the dam to Tolay Lake is not known on downstream flows of Tolay Creek. Flows may decrease because a restored dam prevents downstream flow in Tolay Creek, or flows may increase because of an increased height of the water table due to increased infiltration from a restored Tolay Lake. Nevertheless, summer flows would continue to enter Tolay Creek from Eagle Creek and the un-named watercourses of the West Ridge. Cardoza Creek, a major tributary to Tolay Creek, would join Tolay Creek downstream of the proposed dam. Its contribution to the hydrology of Tolay Creek is substantial and would be unaffected by the dam.

Water volumes appear to be adequate to support the enhancement and restoration of the vegetation and wildlife values of Tolay Creek after the restoration of Tolay Lake. Furthermore impacts are not anticipated to existing wildlife (including the California red-legged frog), riparian vegetation, and wetland values from the restoration of Tolay Lake for the following reason. Water will continue to enter Tolay Creek, at a minimum from tributaries. Willow trees currently grow in Cardoza Creek, which is dryer than Tolay Creek. Willow trees grow in streams dryer than Tolay Creek, and Tolay Creek would continue to be wetter than the dry creeks supporting willow trees. For these reasons, the restoration of Tolay Lake and the resultant alteration of flows in Tolay Creek would not appear to appreciably alter the opportunity to enhance the vegetation of Tolay Creek.

A salmonid fishery does not appear to be associated with Tolay Creek (Leidy et al. 2005a, b). Therefore impacts to salmonids would be nonexistent. Central California coast steelhead (*Oncorhynchus mykiss*), may utilize the lower reaches of Tolay Creek, but would not be able to access the creek above Highway 37 due to a barrier to fish passage.

Earthwork associated with the restoration of Tolay Lake could affect ground nesting birds.

Mitigation Measure 3. Several species of ground nesting birds could nest in the lake bed of Tolay Lake. Prior to construction during the nesting season (before July 31), preconstruction surveys should be conducted to ensure that nests are not damaged. If nesting birds are observed within 50 to 100 feet of the proposed grading, then construction should be diverted to areas beyond the buffer until the young birds have fledged. The width of this buffer could vary based on recommendations by a qualified wildlife biologist depending on the circumstances at the nest.

5.2 FACILITIES AT UPLAND RESERVOIRS

Adverse Impact 4: Potential direct adverse impact to wetlands and wildlife habitat depending on placement of picnic areas. Large perennial seeps occur in the vicinity of Pond 2 that provide habitat for a variety of wildlife. Locating picnic areas within or beside the seeps could directly remove wetland habitat and could result in the loss of cover for wildlife. Wetlands could be affected directly by construction of picnic areas and associated spur trails.

> **Mitigation Measure 4.** Picnic areas and trails at Ponds 1 and 2 should be located outside of wetlands to allow wildlife access. If it is not feasible to completely avoid wetlands, the footprint of these facilities should be minimized to the extent possible to reduce wetland impact.

Adverse Impact 5: Potential indirect impacts to wildlife at Pond 1 or 2 from an increased presence of people in picnic areas and fishing piers. The presence of people would affect common species of wildlife that are known and/or expected to occur at Ponds 1 and 2. People would access these ponds by one or more proposed fishing piers. Human disturbance would cause waterfowl to seek shelter or fly away. Repeated flushing of waterfowl could deplete energy reserves necessary for successful migration.

Both these ponds have bass and sunfish. Restocking the ponds with the non-native bass and sunfish is not proposed as part of the project. Fishing is not likely to affect the California red-legged frog at these ponds, because the existing fish in the ponds most likely prey on any existing California red-legged frogs, eggs, or tadpoles. This predation would result in, at best, a low density of California red-legged frogs, and the frogs do not tend to breed in lakes that contain fish.

> **Mitigation Measure 5.** Piers should be strategically sited (such as in clusters on one side of a pond) to allow for a portion of those ponds to be inaccessible to humans, thereby allowing for areas of refuge for waterfowl. Picnic areas should be located away from the ponds and on the same side as the fishing piers, if possible. Signage should be installed to educate the public regarding sensitive resources. Portions of the ponds and associated wetlands should be fenced off from public access or at least posted to ensure adequate undisturbed refuge for wildlife.

Adverse Impact 6: Potential unnatural increase in common predators that are attracted to left-overs. Common predators such as striped skunks, raccoons, and Virginia opossums are attracted to areas that accumulate leftover food. An increased number of these predators could result in an unnatural localized reduction of prey species.

> **Mitigation Measure 6.** Mitigation would entail placement of signs at the reservoirs and other destinations that would state that garbage should be packed out of the area. These signs would emphasize the importance of removing leftovers from these areas. Garbage receptacles, which would be serviced regularly by park staff, especially on weekends and holidays, would be located at the trail heads.

Adverse Impact 7: Potential direct adverse impact to wetland vegetation from the placement of fishing piers. The placement of fishing piers at the edge of Pond 1 and/or Pond 2 would result in the direct removal of wetland. Wetland would be permanently removed by the placement of the piers and temporary impacts to wetlands would occur from construction.

> **Mitigation Measure 7.** The proposed restoration of the wetlands at Tolay Lake Regional Park would more than compensate for the permanent and temporary impacts to wetland from the installation of fishing piers.

Adverse Impact 8: Potential increase in fishing-related trash that harms wildlife. Discarded fishing lines, hooks, and weights could harm wildlife that mistakenly ingest this trash or get caught by it.

> **Mitigation Measure 8.** Informational signs should be developed to inform the public of the risk of to wildlife and to urge them remove their trash. Park staff should regularly inspect and clean fishing areas.

5.3 SPILLWAY REPAIR

Prior land owners constructed two dams on Cardoza Creek creating two small reservoirs (Pond 1 and Pond 2). Flows were diverted by spillways below the dams from the historic watercourse of Cardoza Creek, and have cut new channels to the North Fork of Cardoza Creek (from Pond 1) and the Main Fork of Cardoza Creek (from Pond 2). These new channels are eroding the spillways and downcutting. This has left the banks overly steep and subject to mass wasting (a process in which entire sections of bank slough off into the bottom of the channel). Erosion of the spillways should be repaired to prevent instability of the dams. Proposed removal of concrete blocks, automobile bodies, and other objects that were placed for erosion control by previous landowners could accelerate erosion by clearing vegetation and disturbing soil.

Beneficial Impact 5: Potential beneficial impact from reduced erosion and downstream sedimentation. The existing dam outlet structures discharged water from Pond 1 and Pond 2 at the approximate level of the ponds, much higher than the natural channel bottom of Cardoza Creek. This caused the erosion of the outlets down to the elevation of the former channel. Although the channel bottom appears stable, these steep cuts at the discharge points of both ponds has caused downcutting and sloughing, which are sources of sediment into Cardoza Creek. Stabilizing the outlet structures and their downstream channels at Pond 1 and Pond 2 would result in a reduction of this sedimentation. This would improve the health of downstream habitat by reducing the amount of vegetation and channel bottom buried by sediment.

Adverse Impact 9: Temporary adverse impact to willow riparian habitat from repair of the spillway of Pond 1 and Pond 2, and from the removal of automobiles, riprap, and other debris from the channels. Willow vegetation will need to be removed for construction to stabilize the outlets of Pond 1 and Pond 2 and for removal of debris.

Mitigation Measure 9. Replacing the willow trees, or alternatively merely trimming them to the base, would mitigate the temporary impact to riparian vegetation from spillway repair and debris removal. Best management practices should be implemented to reduce the amount of sediment entering Cardoza Creek from these activities. The proposed restoration of riparian vegetation to

Tolay Lake Regional Park would more than mitigate for the temporary impact of willow removal at the spillways of Ponds 1 and 2.

5.4 PUBLIC USE TRAILS, PICNIC AREAS, AND VISTA AREAS

Potential impacts include the direct reduction of sensitive resources and indirect impacts to sensitive wildlife from the presence of people on trails, picnic areas, or vista areas.

Adverse Impact 10: Adverse impact to wetlands, watercourses, native grasslands, riparian woodland, buckeye woodland, and oak woodland from construction of recreational facilities. Construction of park facilities such as trails, vista areas, and picnic sites could result in the direct fill of wetlands and watercourses. Installation of these facilities could also indirectly impact wetlands by diverting or restricting water flows.

Construction of park facilities could also displace native grasslands and woodlands (riparian, oak, and buckeye). Construction could indirectly impact these habitats through alteration of hydrology or compaction of soils. The roots of oak trees could be particularly affected by compaction, resulting in increased susceptibility to attack by fungi and other pathogens.

> **Mitigation Measure 10.** Recreational facilities should be located to avoid impacts to sensitive habitats such as wetlands, native grasslands, riparian woodland, buckeye woodland, and oak woodland where possible. Trail crossings of these habitats should be designed to minimize impacts. Picnic and vista areas should be located away from sensitive resources, if possible, or should be reduced in size to lessen impacts. Unavoidable losses of acreage of native grasslands, riparian habitats, and wetlands should be replaced on a 2:1 basis through habitat creation. The proposed restoration program would most likely result in a large increase in native grasslands and wetlands, which would more than compensate for impacts from park facilities.
>
> Any trails in oak woodlands should be located outside of the root zone in a manner that avoids as much damage as possible. Trails within oak woodlands should also be designed without excavation to the extent possible to avoid damage to roots.

Adverse Impact 11: Removal of the farm bridge could result in the temporary generation of sediment into Tolay Creek. The Farm Bridge is likely to be removed in the course of restoring Tolay Lake. This removal could disturb the steep banks of Tolay Creek, resulting in bank erosion and increased sediment into Tolay Creek.

> **Mitigation Measure 11.** Best management practices should be used to reduce erosion and sedimentation for activities within the bed and banks of creeks.

Adverse Impact 12: Construction of park facilities could impact special-status plants and special-status butterfly/moth food plants. Fragrant fritillary at two locations on the West Ridge and Lobb's aquatic buttercup at two pools on the West Ridge could be affected by construction of park facilities. Cream cups (food plant of Opler's longhorn moth) and the Johnny jump-up (food plant of a rare subspecies of zerene fritillary butterfly) could also be affected by the installation of park facilities.

Mitigation Measure 12. Trails and other park facilities should be planned to avoid occurrences of fragrant fritillary, Lobb's aquatic buttercup, cream cups and Johnny jump-up to the extent possible.

Adverse Impact 13: Construction of trails, picnic areas, vista areas, and the retrofitting of bridges over Tolay Creek or other watercourses could directly affect special-status and other protected wildlife species. In addition to the removal of habitat, construction activities could directly result in mortality or injury to special-status and other protected wildlife species (such as birds protected by the MBTA).

The construction and human use of picnic facilities, trails, or viewing areas within ¼ mile of a nest is likely to disturb nesting golden eagles while nesting. Habitat use by California red-legged frogs, western pond turtles, burrowing owls, other raptors, California horned larks, grasshopper sparrows, and other birds could also be affected by park facilities. Construction and use of trails, roads, or other facilities within 300 feet of the red-tailed hawk nest in the blue gum grove near the Park Center could potentially cause stress and nest abandonment.

Mitigation Measure 13a-Golden eagle nest. Surveys should be conducted to determine the location of the eagle nest in order to more precisely assess impacts. If the nest is within ¼ mile of proposed park facilities, a seasonal closure of part of the East Ridge during nesting season may be appropriate. Nesting can occur between February and August but generally occurs some time between March and June or July. The specifics of this closure would depend on the distance of park facilities to the nest, the sensitivity of this particular pair of golden eagles to humans, and the presence of any cover or natural vegetation screen between the nest and park facilities.

Mitigation Measure 13b-California red-legged frog and western pond turtle. Picnic areas are proposed near Pond 1 and Pond 2 where there is an upland pond spring complex, seeps, and other types of wetlands. The picnic areas and spur trails should avoid these seeps, springs, and seasonal wetlands, which could be habitat of California red-legged frogs and western pond turtles in the vicinity of Ponds 1 and 2 and where the wetlands are extensive. Avoidance of wetlands elsewhere in Tolay Lake Regional Park is also recommended to protect potential frog and turtle habitat. Trail crossings should be designed to minimize disturbance to wetlands and watercourses.

Native shrubs could be planted in a manner such as to screen frogs and turtles from human disturbance and to discourage human entry into the wetlands. Preconstruction surveys, by a qualified biologist, should be conducted prior to trail construction in suitable California red-legged frog and western pond turtle habitat. Depending on the regulatory context and the potential for impacts to California red-legged frogs, consultation with the USFWS may be advised. Additional mitigation may require buffers, monitoring, fencing, and/or replacement of affected habitat. Habitat for California red-legged frogs and western pond turtles created as part of the restoration program for Tolay Lake Regional Park would also help mitigate impacts.

Mitigation Measure 13c-Burrowing owl. Trails and other park facilities should be located away from burrows occupied by burrowing owls. CDFG Guidelines (CDFG 1995) call for buffer widths of 250 feet during the breeding season (February – September 1) and 160 feet during the non-breeding season between disturbance and burrowing owl nests. Although no breeding activities were observed during this season, breeding could occur in the future. Prior to constructing trails, pre-construction surveys would be necessary to preclude impacts to burrowing owls and design mitigation measures.

Mitigation Measure 13d-Other bird species. California horned larks, grasshopper sparrows, and other ground nesting birds could nest virtually anywhere in the grassland areas of Tolay Lake Regional Park. Prior to constructing trails during the nesting season (before July 31), preconstruction surveys should be conducted to ensure that nests are not damaged. If nesting birds are observed within 50 to 100 feet of the proposed trail or park feature, then construction should be diverted to areas beyond the buffer until the young birds have fledged. The width of this buffer could vary based on recommendations by a qualified wildlife biologist depending on the circumstances at the nest.

Adverse Impact 14: Human use of trails, picnic areas, vista areas, and other park facilities could alter habitat use and movement by wildlife. Many species of wildlife are sensitive to the presence of humans. Locating trails and other facilities along riparian areas, at Pond 2, and other areas where there is cover used by wildlife could adversely affect wildlife use of those areas. Repeated use of trails or other park facilities in a particular area may reduce use of those areas by wildlife.

Riparian areas are known for their habitat value for migratory songbirds including use as nesting areas. Locating a trail within a songbird nesting area may result in disruption of breeding activity, and a reduction of the habitat value of the riparian woodlands.

Mitigation Measure 14a. Trails, picnic areas, and vista areas should be located to minimize disturbance to wildlife. Proposed restoration of a dense cover of shrubs would facilitate wildlife movement throughout the park, provide additional refuges for wildlife, increase wildlife use of the park, and increase the diversity of wildlife. This measure would offset impacts to wildlife that are dependent on cover provided by shrubs.

Mitigation Measure 14b. Impacts of trails in riparian habitat could be mitigated by habitat restoration at a minimum of 1:1 ratio. Widening and lengthening existing riparian habitat containing trails would further mitigate impacts.

5.5 PARK CENTER FACILITIES

Adverse Impact 15: Special-status species of bats may be affected by the upgrade of the facilities at the Park Center. Although bats were not observed at Tolay Lake Regional Park, several species of special-status bats are known from the general vicinity of the park and they could colonize existing buildings in the future. Bats, roosting in park buildings, could be killed or injured and roosting habitat adversely affected during renovation or demolition of park buildings .

Mitigation Measure 15. Surveys should be conducted for roosting bats prior to construction. If special-status bat species are found roosting in buildings that are proposed for construction or demolition, new roosting structures can be constructed and bats excluded from the existing roost.

Adverse Impact 16: Potential impacts to barn owls could occur during the upgrading of buildings at the Park Center. Barn owls occupy at least two structures at the Park Center and they remain present in the barn after being viewed by hundreds of visitors during the Fall Festival. Although nests were not observed, barn owls could nest there prior to the upgrade. Construction during the nesting season[1], at the Park Center could result in direct injury to eggs, young, or adult barn owls. Human activity close to an active nest could result in the abandoning of the nest. If an active nest is abandoned, then eggs and/or young would perish.

Mitigation Measure 16. Preconstruction surveys should be conducted in buildings suitable for roosting and nesting of barn owls. If barn owls are nesting, construction should be deferred on that structure until the young fledge.

5.6 CANNON LANE

Adverse Impact 17: Road widening and construction of a turning lane onto Lakeville Highway would result in losses of jurisdictional wetlands along Cannon Lane. Several watercourses cross Cannon Lane that support wetland vegetation. Road construction along Cannon Lane and Lakeville Highway would require filling of wetlands and watercourses. These could also cause addition of sediment into adjacent waterbodies and watercourses.

Mitigation Measure 17. The proposed restoration and creation of wetlands within Tolay Lake Regional Park may compensate for the loss of wetlands along Cannon Lane and Lakeville Road. In order to meet the "in kind" replacement regulatory requirement, creation of new watercourses may be required for some of the road improvement activities. Best management practices should be implemented during construction to minimize sedimentation.

Adverse Impact 18: Road construction would require the removal of several large blue gum trees growing beside Cannon Lane. The widening of Cannon Lane would result in the removal of blue gum trees which provide potential perching and nesting substrate for raptors. Removal of these trees during the nesting season could affect nesting birds.

Mitigation Measure 18. Proposed planting of native trees for oak and riparian woodland restoration would more than compensate for losses of non-native blue gum trees. Removal of the blue gum trees should be conducted outside of the nesting season of March through August, to avoid impacts to breeding birds.

[1] Note, barn owls can have a protracted breeding season.

5.7 FENCING AND GRAZING MANAGEMENT PROGRAM

Beneficial Impact 6: Implementing the grazing management plan would have a beneficial effect on biological resources. The grazing management plan will result in a beneficial impact to plants and wildlife because it is designed to enhance the biological resources of Tolay Lake Regional Park. Grazing will reduce thatch and weeds thereby encouraging native plants to compete with non-native species. The grazing management plan is also designed to enhance the wetlands by allowing grazing in the spring but excluding grazing in the summer, when cattle are attracted to wetlands. This would reduce the effects of trampling of the seeps and springs and improve the biological values of these wetlands. See the Rangeland Resources Study (LSA 2009) for more details.

Adverse Impact 19: Installing fences, watering troughs, and other infrastructure related to the management of grazing could adversely affect biological resources. Installing fences, water troughs, pipelines and other livestock facilities could impact native grasslands, wetlands, and special-status species. Impacts could include direct loss or displacement of habitat or indirect impacts due to livestock trampling.

> **Mitigation Measure 19.** Fences and water troughs should not be located in areas that would adversely affect biological resources. Water troughs should be located away from wetlands and other sensitive resources. See the Rangeland Resources Study (LSA 2009) for more details.

6.0 MANAGEMENT GUIDELINES AND RESTORATION RECOMMENDATIONS

The specific condition of the vegetation present at Tolay Creek Ranch prior to the arrival of Europeans is not known. Kuchler (1977) depicts the Tolay Lake region as grassland on the map of the *Natural Vegetation of California*. The current limited shrub and tree cover and the absence of stumps or logs at Tolay Lake Regional Park or Tolay Creek Ranch supports Kuchler (1977). In addition, Diablo Clay (underlain by calcareous fine-grained sandstone, clayey shale, and weathered siltstone) and Clearlake Clay (underlain by alluvium) are common soils of Tolay Lake Regional Park and primarily support grassland vegetation (USDA 1972). The Goulding-Toomes complex (underlain by metamorphosed basic igneous and weathered andesitic basalt for Goulding and andesitic basalt and volcanic breccia for Toomes) is less common than the Diablo soils, but also supports grassland (USDA 1972).

The woodland at Tolay Creek Ranch was probably never well developed and primarily, but not entirely, restricted to the drainages and rocky outcrop areas. For areas in the vicinity of Tolay Creek Ranch that formerly supported woodland, the loss of trees is likely the result of cutting and the subsequent grazing that reduce recruitment of new trees. Upon cessation of grazing, portions of the grasslands of Tolay Creek Ranch may become woodland as have portions of the East Bay hills. Nevertheless at Tolay Lake Regional Park oak woodland occurs along portions of Cardoza Creek and East Creek and at Tolay Creek Ranch, oak woodland occurs in the drainages and rocky outcrop areas. This pattern of oak woodland is characteristic of areas that had been formerly woodland and are currently heavily grazed. Upon cessation of grazing, the grasslands of Tolay Lake Regional Park may become woodland as have portions of the East Bay hills.

In particular, the shrub layer is most notably underdeveloped at the park due to historic land use practices of grazing and agriculture. Likewise the animals associated with mid-canopy and shrub habitats are least well represented at Tolay Lake Regional Park, compared to the presumably original natural condition. Planting sub-tree willow riparian corridors and creating the conditions for the regeneration of shrubs and other understory vegetation by release from grazing and/or prescribed grazing are the most immediate and practical restoration opportunities for Tolay Lake Regional Park, which would yield the greatest cost-to-benefit results. Restoration of this mid-level vegetation layer would produce substantial benefits in terms of native plant regeneration, enhancement of a large variety of wildlife dependent on shrub cover and foraging habitat, and aesthetic improvements.

Habitat restoration options can be categorized into short-term activities that can be implemented relatively rapidly and long-term activities that require detailed study and considerable financing. These short-term activities are those that tend to be relatively simple to implement and the long-term activities are those that are relatively complex.

Short-term restoration activities include the riparian plantings carried out by the volunteer group STRAW (Students and Teachers Restoring a Watershed) in two areas of the park. Restoration of the shrub component of the understory of riparian and oak woodlands, to provide cover for wildlife, is a short-term activity that could occur by planting shrubs or by fencing selected areas. Installation of fencing around riparian areas for grazing management is also a relatively simple restoration and management measure that can be accomplished in the short-term with minimal funding for fence materials and volunteer labor. The grazing lessee could also provide labor with the incentive of a reduction in grazing fees. Examples of long-term restoration activities at Tolay Lake Regional Park include designing and implementing a program for the restoration of moist grasslands, restoring the bed and bank, natural meanders, and natural vegetation to the channelized watercourses, and repairing the spillways of Ponds 1 and 2.

This section was designed in conjunction with the recommendations of the Rangeland Resources Study (LSA 2009). Coordination with the Rangeland Resource Study was necessary to develop an implementation strategy for the restoration program to ensure that the recommendations of both plans are compatible especially with regard to grassland restoration, enhancing the populations of special-status species, restoration of oak woodlands and riparian areas, and control of invasive species. Many of the restoration actions that are discussed below involve ground-disturbing activities be they use of earth-moving equipment to re-contour selected watercourses or use of a trowel to plant acorns. Any ground-disturbing activity could potentially disturb cultural resources and the Cultural Resource Study (LSA 2008) provides treatment options to avoid or minimize impacts. Ground-disturbing activities will be avoided on sites known to contain sensitive cultural resources.

Ground-disturbing activities may also promote the colonization of an area by non-native species. A challenge for the success of restoration is maintaining non-natives at a low density. This is especially important for Tolay Lake Regional Park because of the large amount of bristly ox-tongue and other invasive species. Control of invasive species should be a part of the restoration activities.

6.1 RESTORATION OF SELECTED HABITATS

6.1.1 Oak Woodland

The Oak Grove on the East Ridge and oak woodland along Cardoza Creek (Figure 3a) do not show evidence of recent regeneration judging from the absence of seedlings and saplings (Steve Ehret pers. comm., LSA obs.). Coast live oak has been documented as not adequately regenerating in some areas because of a combination of factors including livestock and wildlife herbivory and competition with dense stands of non-native grasses (McCreary 2001). In addition, oaks may establish seedlings and saplings only during years with unusual weather conditions of summer moisture.

It is likely that oak woodland was never very abundant at Tolay Lake Regional Park based on the presence of Diablo, Clear Lake, and Goulding-Toomes complex soil types that usually support grassland. The Langier soils are underlain by rhyolite or rhyolitic tuff and support oak woodlands on a small portion of the East Ridge and on areas just east of Tolay Lake Regional Park. Establishing oak woodland at Tolay Lake Regional Park should therefore be done on a very limited scale.

Regeneration of oak woodlands should be monitored, and oaks planted if monitoring shows an absence of natural regeneration of new oak stands in drainages. Oak trees may be planted on slopes above watercourses, such as the upper reaches of both forks of Cardoza Creek to reduce slope failure and reduce sedimentation (Figure 7a). Eagle Creek and a few un-named watercourses also present opportunities for oak woodland creation along with some of the draws on the mid slope of the East

Ridge (Figure 7a). Cardoza Creek and Eagle Creek were selected for the restoration of Oak Woodland because small stands of oaks already occur along these creeks. The upper reaches of some of the un-named watercourses of the East Ridge were also selected to provide an increase in cover for wildlife. The entire reaches of these watercourses were not selected for oak woodland restoration in order to provide open creek side habitat which is also valuable.

Planting could be done using container plants or acorns. Management of livestock grazing as discussed in the Rangeland Resources Study (LSA 2009) should be implemented to encourage oak regeneration.

Sudden oak death (*Phytophthora ramorum*) is known from southern Sonoma County and may possibly colonize Tolay Lake Regional Park at some point in the future. Coast live oak exhibiting symptoms of sudden oak death were observed along Tolay Creek on Tolay Creek Ranch south of Tolay Lake Regional Park. If the coast live oaks were to become infected by sudden oak death, restoration should include establishing single-species stands of coast live oak, without an understory. Current research indicates that coast live oaks acquire sudden oak death from other species of plants (M. Garbelletto, pers. comm.) and a mixed stand of oaks and bays would result in the more resistant bays providing a reservoir for the pathogen and providing a way for the pathogen to infect oaks. The sudden oak death pathogen does not appear to be able to infect coast live oak trees from nearby coast live oak trees. Other species of nearby trees and shrubs are required for the pathogen to infect coast live oak.

6.1.2 Watercourses and Riparian Woodlands

Some of the watercourses at Tolay Lake Regional Park have been straightened (North Creek, Eagle Creek, and the upper reach of Tolay Creek). Restoration options could include re-contouring the entire straightened reaches of these watercourses, re-contouring small portions of these watercourses, or leaving the watercourses as straight ditches. Planting willow and cottonwood trees could be conducted in conjunction with any of these options.

Riparian woodlands occur along both Tolay Creek and Cardoza Creek with the riparian woodland corridor reaching its widest extent along the lower reach of Tolay Creek. The ideal restoration scenario would be to establish riparian vegetation along the entire length of Tolay Creek to the same width as the lower reach. This would require widening the channel and laying back the banks to make them less steep. Restoration of riparian woodland and associated stream channels could be conducted in the short-term or in the long-term depending upon the amount of earthwork needed for re-creating sinuous channels. The Rangeland Resources Study (LSA 2009) also addresses restoration of riparian areas.

Short-Term Actions.

- **Riparian Nodes.** The short-term restoration approach would entail planting a series of “restoration nodes” along Eagle, North, Cardoza, and Tolay creeks (Figures 6a and 6b). These nodes would serve to provide habitat and as sources of propagules for colonization of the unvegetated portions of the watercourses.

For example, each node could consist of 10 seedlings or willow cuttings planted 10 feet apart at elevations appropriate for establishing hydrophytic vegetation along a 100-foot long reach of stream. The nodes would be spaced 200 or more feet apart. For maximum biological value, the restoration approach should keep portions of the watercourse free of woody riparian cover to provide edge and open water habitat. Fencing would be necessary to protect the plantings from cattle unless grazing could be deferred in that management unit to allow for establishment. Substantial benefit to wildlife values of Tolay Lake Regional Park would occur as a result of establishing riparian vegetation in these drainages.

LSA recommends planting of riparian nodes as a high priority restoration alternative. Planting may be done in a phased manner with installation of only a few nodes each year.

- **Willow Pole Installation.** Another short-term restoration activity would entail installing willow poles in the semi-permanent drainages of the West Ridge. Willow poles would be placed at the edge of the perennially moist soil of selected reaches of several of the drainages of the West Ridge. The entire length of some drainages and some reaches of selected drainages would remain open to provide valuable herbaceous wetland habitat (Figure 7b). Grazing would be managed to allow the willow to grow without severe browsing.

  LSA recommends this alternative as the highest priority short-term restoration action at Tolay Lake Regional Park. We believe that the restoration of the West Ridge drainages as shown on Figure 7b would yield the greatest benefit to aesthetics, native plant regeneration, and wildlife habitat enhancement for the least relative cost.

Long-Term Actions.

- **Laying-down Channelized Banks.** A longer-term approach would entail laying down the banks along the straightened portion of Eagle and Tolay creeks to simulate the meanders that formerly existed in these drainages. That is, the banks would be re-contoured at selected locations, but the channel would be left unaltered. The creek channels would not be rerouted.

  The majority of Eagle Creek had been straightened but only a 1,000-foot section of Tolay Creek below the Farm Bridge had been straightened. Downstream of the straightened portion, Tolay Creek has been deepened, although some meanders appear to remain. Laying back the banks of this portion of Tolay Creek would allow the establishment of a wider band of riparian vegetation. Implementing the long-term approach for Tolay and Eagle creeks would not preclude the short-term approach for Cardoza Creek, North Creek, and the un-straightened portions of Eagle and Tolay creeks.

  A benefit of re-contouring these creeks would be the ability to establish a greater width of riparian vegetation on the banks of these creeks. Currently the banks are steep and would support a narrow width of riparian vegetation. The long-term approach would require engineering design and permitting for grading activities. A storage area for the excavated fill would need to be designated. Riparian nodes could then be planted along the recreated creek channels as described above.

  Re-contouring would cause major short-term impacts in terms of removal of existing riparian vegetation, disruption of wildlife, aesthetic impacts associated with the construction project, compaction of soil from the introduction of heavy equipment, potential for the introduction of noxious weeds, pioneering of temporary construction access roads and lay-down areas, and down stream sedimentation.

- **Rerouting Straightened Channels.** The straightened creeks could be rerouting to approximate the original meanders. Careful consideration should be given to implementation of this restoration alternative in terms of costs and benefits. Alteration of existing channels is a major capital undertaking. This undertaking requires detailed hydrologic studies to determine design parameters and even to assess whether there would be hydrologic benefits as a result of the alterations.

  The environmental and financial costs of such an undertaking may not be justified by the benefits accrued. LSA recommends intermediate measures short of rerouting channels, particularly laying-down the banks of deeply incised streams but leaving the channel intact (above). There are major financial and environmental costs entailed in channel reconstruction. The alternative of only laying down the banks is less costly in all respects than channel reconstruction and would achieve comparable environmental benefits by extending the width of the riparian corridor.

- **Lake Shoreline Revegetation.** Riparian vegetation could also be planted along the Tolay Lake shoreline (Figure 7b). The western shore would be the best location for the trees because the steeper bank would allow the roots to be closer to water as the lake dries. Riparian species recommended for this area would be Fremont cottonwood, red willow, yellow willow, arroyo willow, sandbar willow, and California buckeye. The goal would be to establish a multi-layered canopy along the western edge of the lake. The top layer would consist of cottonwood trees, red and yellow willows would occupy the intermediate layer, and arroyo willow would compose the woody understory. Sandbar willow, arroyo willow, and California buckeye would also grow at the dryer edge of the riparian area. California blackberry and shrubs consisting of creeping snowberry, coffeeberry, and coyote brush would be planted as groundcover. Plantings should be discontinuous as shown on Figure 7b to allow for views of the lakes and to create a mosaic of habitat types for wildlife.

- **Fencing South Creek.** South Creek supports small but well developed stands of riparian vegetation although a shrubby understory is absent. Fencing the area around South Creek, from the rest of the West Ridge, will allow better management of grazing, thereby allowing the understory to become re-established.

6.1.3 Purple Needlegrass Grassland

Purple needlegrass grows in low density stands on the lower slopes of the West and East ridges. See the Rangeland Resources Study (LSA 2009) for details on restoration and management of these grasslands.

6.1.4 Moist Grasslands

Restoration of moist grasslands over much of the formerly cultivated low terraces east of the restored Tolay Lake shoreline would provide high value habitat, which is otherwise of limited extent, and would provide native cover to resist invasion by non-native weeds (Figures 6a and 6b). The wettest areas could be restored to semaphore grass, rushes, and sedges. Drier areas could be restored to creeping wildrye, meadow barley, and California oat grass. Existing wetlands and native grasslands that occur within the moist grassland creation area (Figures 6a and 6b) would be enhanced by control of non-native species by managing the grazing or other means.

Fill Drainage Ditches. Existing drainage ditches should be filled in conjunction with the restoration of the moist grasslands (Figures 6a and 6b). The ditches had been excavated to drain soils in preparation for tillage when the property was being farmed. An increase in the extent and duration of soil saturation would increase the likelihood of success of restoring the moist grasslands.

Bristly Ox-Tongue Control. The fallow ungrazed fields on the low terraces east of Tolay Lake now support a dense growth of bristly ox-tongue, a noxious and invasive weed. The high density of ox-tongue is a source of abundant seeds that facilitate its spread onto adjacent grazed areas. Prior to restoring moist grasslands, bristly-ox tongue and other invasive weeds should be controlled. The Rangeland Resources Study (LSA 2009) describes in greater detail control of these weeds and methods of restoring and managing moist grasslands. The Cultural Resources Study (LSA 2008) discusses mitigation measures for any impacts of these techniques on cultural resources.

Grazing Exclosures. The effects of grazing should be examined by establishing fenced grazing exclosures in selected areas. In this manner, the vegetation in grazed and ungrazed plots could be compared. Monitoring of the grazing regime will help inform management strategies. Grassland monitoring and adaptive management concepts are described in greater detail in the Rangeland Resources Study (LSA 2009).

6.2 WILDLIFE ENHANCEMENT

6.2.1 California Red-legged Frog

Bullfrog Control. The value of California red-legged frog habitat is substantially reduced at Tolay Lake Regional Park due to the occurrence of bullfrogs. Because of the complexity of the habitats within the park, the large size of the park, and existing off-site bullfrog sources for recolonization, bullfrog control throughout the entire park is not recommended at this time. Nevertheless, removal of bullfrogs on a trial basis, from isolated ponds such as the Irrigation Pond, Old Duck Pond, and possibly the Stock Pond could provide insight on the effectiveness of bullfrog control and resulting breeding by California red-legged frogs. If bullfrog control is successful on a trial basis, then it could be expanded and ponds designed to support breeding habitat of California red-legged frogs could be constructed. Bullfrogs would be monitored yearly and controlled as appropriate, unless experience dictates otherwise.

Habitat Enhancement. California red-legged frogs can breed in seasonal waterbodies whereas bullfrogs require permanent waterbodies. Breeding ponds for California red-legged frogs should be shallow and seasonally inundated. Ponds could be created in the fallow fields on the low terraces among restored moist grasslands. Selected ponds could also be created adjacent to existing springs near Pond 2 and on the East Ridge. Spike rush and other shoreline vegetation should be established on the breeding ponds to provide cover for the frogs. An alternative approach is to not create any more habitats that did not naturally occur at Tolay Lake Regional Park (such as artificial ponds) and enhance suitable existing ponds for the reproduction of California red-legged frogs.

Grazing could be used to manage the vegetation of these breeding ponds. Year-round heavy grazing can virtually eliminate freshwater marsh and riparian vegetation reducing cover for frogs and increasing the likelihood of predation. Elimination of grazing, on the other hand, can result in dense stands of cattails that reduce habitat diversity. The optimal condition for red-legged frogs is a mosaic of open water, freshwater marsh, and riparian vegetation. This condition can be created by managing the timing and intensity of livestock grazing as described in the *Tolay Lake Rangeland Resources Study* (LSA 2009).

Recommendation. While bullfrog control may be undertaken on an experimental basis in selected locations at Tolay Regional Park (above), we recommend that this action be given a low priority. The bullfrog population both on the park property and adjacent to the park is enormous. Even if all the bullfrogs were temporarily eliminated on the park property, Tolay Creek would provide a ready corridor for re-infestation from neighboring properties. In short, the costs of bullfrog control would be very high and the likelihood of success would be very low.

A substantially more cost effective approach to encouraging California red-legged frogs is habitat enhancement. California red-legged frogs can co-exist with bullfrogs if there is a mosaic of wetland habitat types, especially seasonal wetlands that provide sufficient cover for the former species. Habitat enhancement is also more assured of implementation success than bullfrog control and has great ancillary benefits to other wildlife and plants.

6.2.2 Western Pond Turtle

Western pond turtles would use the larger and more permanent bodies of water such as Pond 1 and Pond 2. They would also be expected to use the restored Tolay Lake. Providing rafts or logs for sunning in the center or at the margins of Pond 1, Pond 2, and the restored Tolay Lake would improve basking areas and be of benefit to western pond turtles. Western pond turtles were also observed in large pools of Tolay Creek immediately downstream of Tolay Lake Regional Park.

6.2.3 Burrowing Owl

A few burrowing owls are regularly observed at Tolay Lake Regional Park in the vicinity of rock outcrops suitable for refuge. The park does not appear to be optimal breeding habitat which is perhaps due to climatic factors. Burrows suitable for nesting by burrowing owls are limited in extent at the park, in part due to the small numbers of California ground squirrels. The burrowing owls can use the burrows of other types of animals besides ground squirrels (such as foxes), and burrowing owls have been observed using holes in rock outcrops at Tolay Lake Regional Park. Creation of artificial burrows suitable for nesting by burrowing owls could be considered in the short-term. In the long-term, proper range management may encourage an increase in the number of ground squirrels, which create burrows that are used by burrowing owls.

6.2.4 Mammals

Tolay Lake Regional Park consists of extensive areas of grasslands that provide little woody cover. The shrubby understory vegetation of the oak and riparian woodland is virtually absent due to past grazing practices. Cover is limited to a few stands of Himalayan blackberry and a limited amount of wetland vegetation in seeps, ditches, and ponds. Increasing cover would likely increase mammalian diversity and the abundance of raccoon, striped skunk, Virginia opossum, gray fox, and coyote. An increase of rabbits could also increase the numbers and diversity of predators at Tolay Lake Regional Park.

Increasing cover could be accomplished by fencing riparian to prevent grazing by cattle. The grazing program for the downstream portion of Tolay Creek, Cardoza Creek, Pond 1,Pond 2, and South Creek is designed to reduce channel erosion and increase woody understory and wetland vegetation (LSA 2009).

Tolay Lake Regional Park should be managed to allow the colonies of California ground squirrels to expand. This will increase the diversity of the grassland fauna that uses the squirrel burrows for refuge. California ground squirrels are also important prey species and may be important in maintaining predator diversity.

6.3 NON-NATIVE PLANT SPECIES CONTROL

A number of invasive non-native species occur in sufficient density at Tolay Lake Regional Park to warrant control. Target species are bristly ox-tongue, yellow star-thistle, purple star-thistle, medusahead grass, water smartweed, water primrose, Italian thistle, milk thistle, poison hemlock, and Himalayan blackberry. Of these noxious species, priority should be given to eradication of water primrose. In addition, both acacia and blue gum should be managed. Control of invasive species typical of grasslands (bristly ox-tongue, yellow and purple star-thistle, Italian thistle, milk thistle, and medusahead) are addressed in the Rangeland Resources Study (LSA 2009).

6.3.1 Water Primrose

Background. Water primrose is a perennial species that appears to grow only in the Duck and Willow ponds (Figure 7b). It began to grow in April or May and covered much of the surface of the Duck Pond by November 2006. In addition, it has recently colonized the Willow Pond (Ehret pers. comm.). Only a small area in the center of the Duck Pond remained free of vegetation. Water primrose is an emergent species with much of its biomass growing above the surface of the water.

Water primrose colonized the Duck Pond in 2004 (Marvin Cardoza pers. comm.). It should be controlled before it becomes inadvertently established in Tolay Creek and other areas of Tolay Lake Regional Park. It will displace native species and its decomposition will contribute to the eutrophication of waterbodies.

As an example at another location, the Laguna de Santa Rosa Foundation initiated a control program in 2005 in which they sprayed a glyphosate-based herbicide on water primrose (Sears et al. 2006, Laguna de Santa Rosa Foundation 2006). The treatment killed approximately 75 percent of the plants. The incomplete kill is believed in part to be due to incomplete application of the herbicide because of the dense growth of the plant. As a result, an earlier start date, June 15 instead of July 15 was scheduled for 2006 in order to treat the plant at a lesser density.

Herbicides were effective in areas of deep water and areas that had dried out. They were not effective in areas of shallow water (Meisler et al. 2008). In addition, mechanical equipment that was designed to scoop out the water primrose also proved to be an effective measure of control with spot spraying in areas where re-growth occurred.

Recommended Control Measures. Contol can be effected through mechanical or herbicidal means. The drawbacks of the mechanicl removal are the use of equipment in small and relatively shallow pools and the high cost of the mechanical equipment. The drawback of using herbicides is the uncertainty of the requirement for a permit from the North Coast Regional Water Quality Control Board (RWQCB). The RWQCB requires permits for application of certain herbicides in waters of the United States containing surface waters. It is unclear if permits are required when surface water is absent.

The input of spring water into the Duck Pond and Willow Ponds should be ceased until the water primrose is removed from the ponds. These two ponds should be allowed to naturally dry out. Pumping the ponds out may occur if surveys indicate that the California red-legged frog has not colonized either of these ponds. Once these ponds have dried, a survey for California red-legged frogs should be carried out if not previously completed.

The water primrose should be sprayed with a suitable herbicide after the ponds have thoroughly dried. Glyposhate and tryclopyr have been used in the Laguna de Santa Rosa (Meisler et al. 2008). Repeated treatments may need to occur to achieve complete control. The ponds should remain dry until control is achieved. If the water primrose were to reappear after the ponds are filled, then the ponds should be allowed to dry and treatments begun anew.

In conclusion, eradication of water primrose should be a high and immediate priority, because this plant is highly invasive and could spread beyond the Duck Pond to Tolay Creek. Once in the creek, it would be nearly impossible to control and would cause inestimable environmental damage. (See http://www.lagunadesantarosa.org/programs_rp_isc_lmp.shtml for the environmental damage water primrose is causing in the Laguna de Santa Rosa.)

6.3.2 Water Smartweed

Water smartweed is a perennial species that covered the surface of the dried bed of Tolay Lake when fallow in 2006 and Tolay Creek immediately below the lake (Figures 6a and 6b). It also occurs further downstream in Tolay Creek and upstream of Tolay Lake. Water smartweed grows from perennial roots in the late spring and is the dominant cover by the time that the lake is dry. It may grow so thickly as to inhibit the foraging of ducks in Tolay Lake.

Cultivation of the dried bed of Tolay Lake resulted in cutting the roots and spreading them throughout the lake bed. This contributed to the dominance of water smartweed within Tolay Lake. Because of its widespread distribution, it would be nearly impossible to remove water smartweed from Tolay Lake Regional Park.

Recommendations include monitoring the cover of water smartweed in Tolay Lake. If the cover of water smartweed impedes the use of the lake by wildlife, then treatment options should be considered. At least two options are available for control of water smartweed in Tolay Lake. The first option would entail grazing Tolay Lake. Cattle could be provided with seasonal access to Tolay Lake in order to reduce the density of water smartweed. If cattle do not provide sufficient control, then a glyphosate-based herbicide could be used (cf. Midwest AquaCare [2006] and Texas A&M University [2006]).

6.3.3 Poison Hemlock

Poison hemlock grows in relatively small stands along the upper banks of Tolay Creek, along the bank of Eagle Creek, and possibly in other areas of Tolay Lake Regional Park. Poison hemlock typically excludes other species from occurring within its dense single-species stands. This weed tends to grow in areas that have been previously disturbed.

Recommendations would be to control by cutting in late spring. Because poison hemlock is an annual plant, removal just before seed set should result in a nearly complete control of the current year’s growth. Follow-up control will be necessary until the residual seeds in the soil have been depleted.

6.3.4 Himalayan Blackberry

Himalayan blackberry grows most often in the understory of riparian areas where it forms an impenetrable stand among the lower branches and trunks of the willow trees. It also grows as compact stands in a few grassland areas and at the head of unvegetated watercourses. When in riparian situations, it dominates the understory, appears to spread, and may exclude other plant species. Himalayan blackberry, however, provides excellent cover for wildlife especially considering the relative absence of cover at Tolay Lake Regional Park.

Control could be by either hand removal or use of goats. Control should be phased such that alternative understory plant species would be established nearby prior to removal of a stand or portion of a stand of Himalayan blackberry. In this manner, cover would be maintained for wildlife. We recommend that control of Himalayan blackberry be given a low priority.

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7.3 PERSONAL COMMUNICATIONS

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Matteo Garbelotto, Plant Pathologist, expert on Sudden Oak Death, University of California, Berkeley

Janet Thiessen, volunteer for The Raptor Project

FIGURES

Figure 1: Regional Location
Figure 2: Project Location
Figure 3a: Tolay Lake Regional Park – Biological Resources – North
Figure 3b: Tolay Lake Regional Park – Biological Resources – South
Figure 4a: Location of Selected Weeds and Erosion – North
Figure 4b: Location of Selected Weeds and Erosion – South
Figure 5: Tolay Lake Regional Park – Biological Resources, Cannon Lane and Lakeville Road Areas
Figure 6: Project Location and CRLF Pesticide Injunction
Figure 7a: Tolay Lake Regional Park – Proposed Restoration Areas – North
Figure 7b: Tolay Lake Regional Park – Proposed Restoration Areas – South

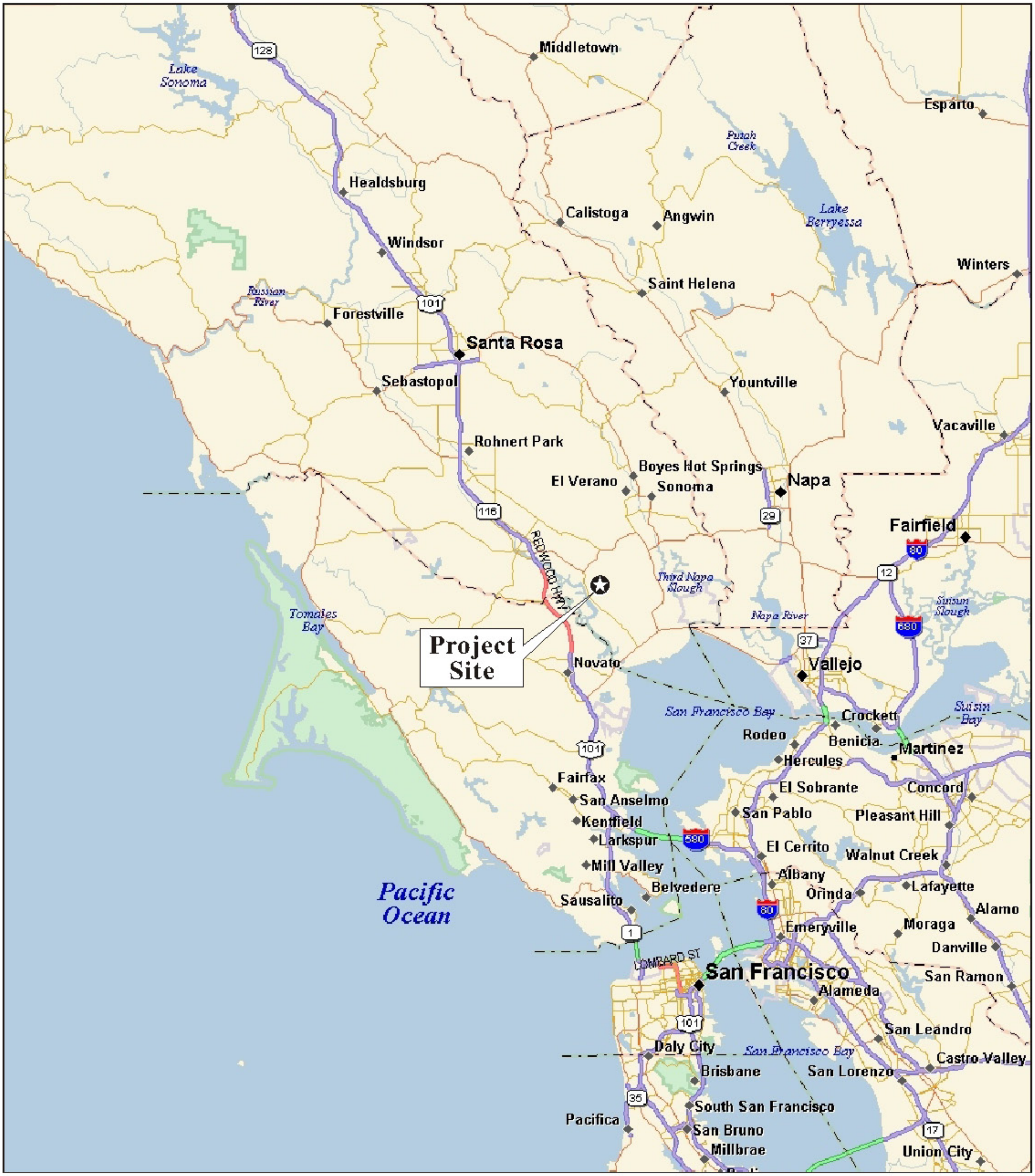

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FIGURE 1

Tolay Lake Regional Park

Regional Location

N

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MILES

SOURCE: ©2006 DeLORME. STREET ATLAS USA®2006.

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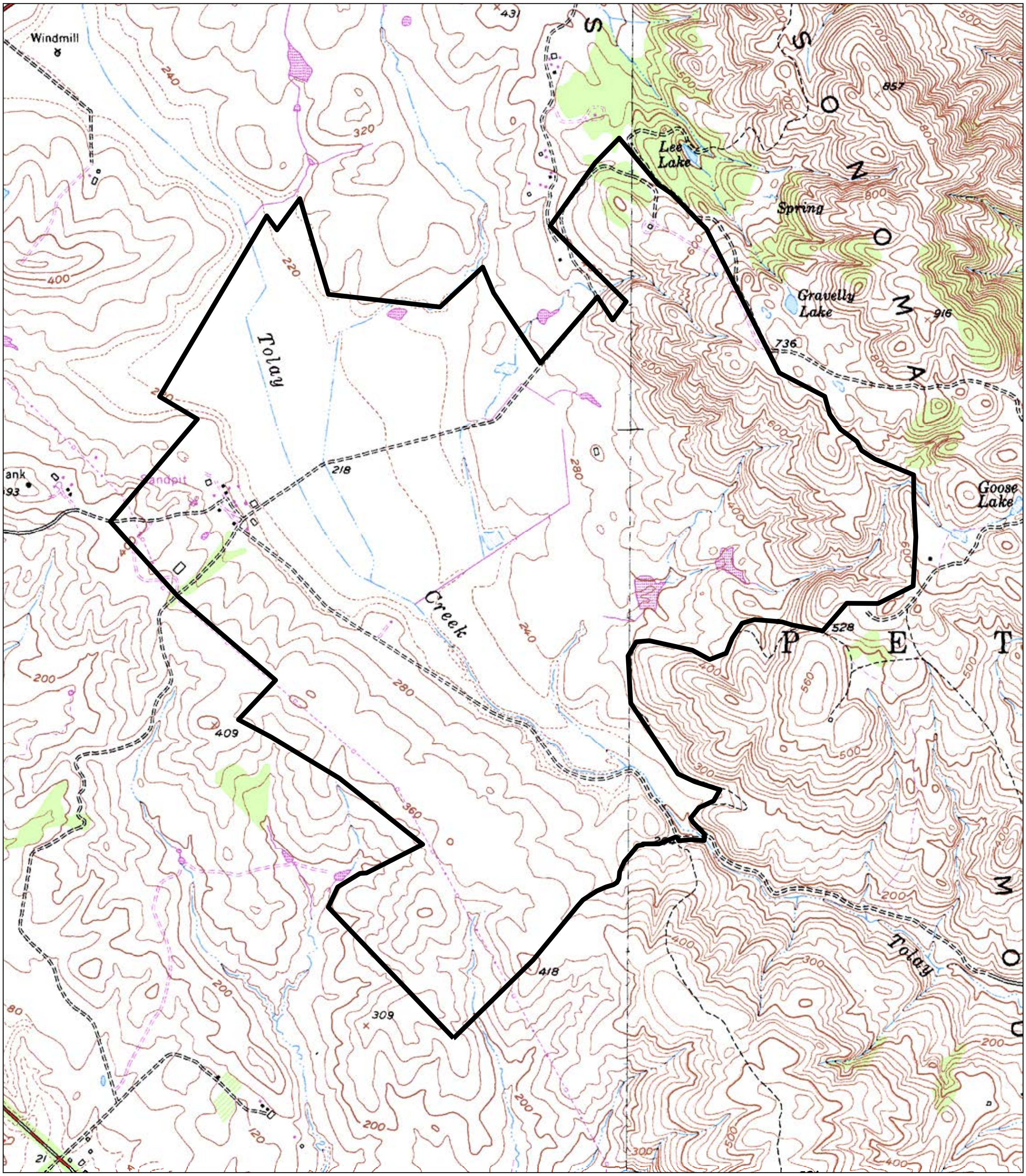

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FIGURE 2

Tolay Lake Regional Park

Project Location

0 500 1,000 2,000
FEET

SOURCE: USGS 7.5-minute Topos Petaluma (1980) and Sears Point (1968).

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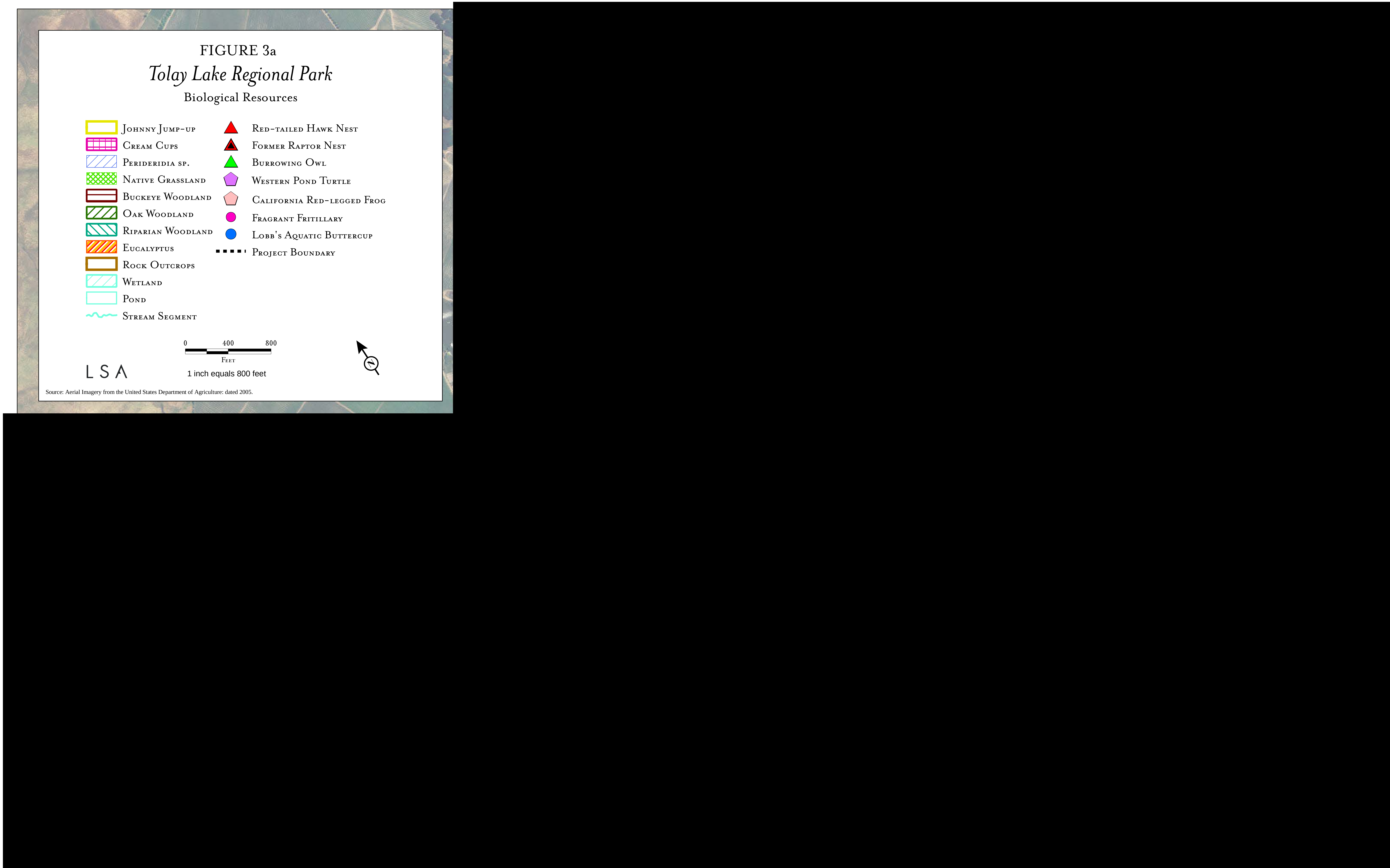
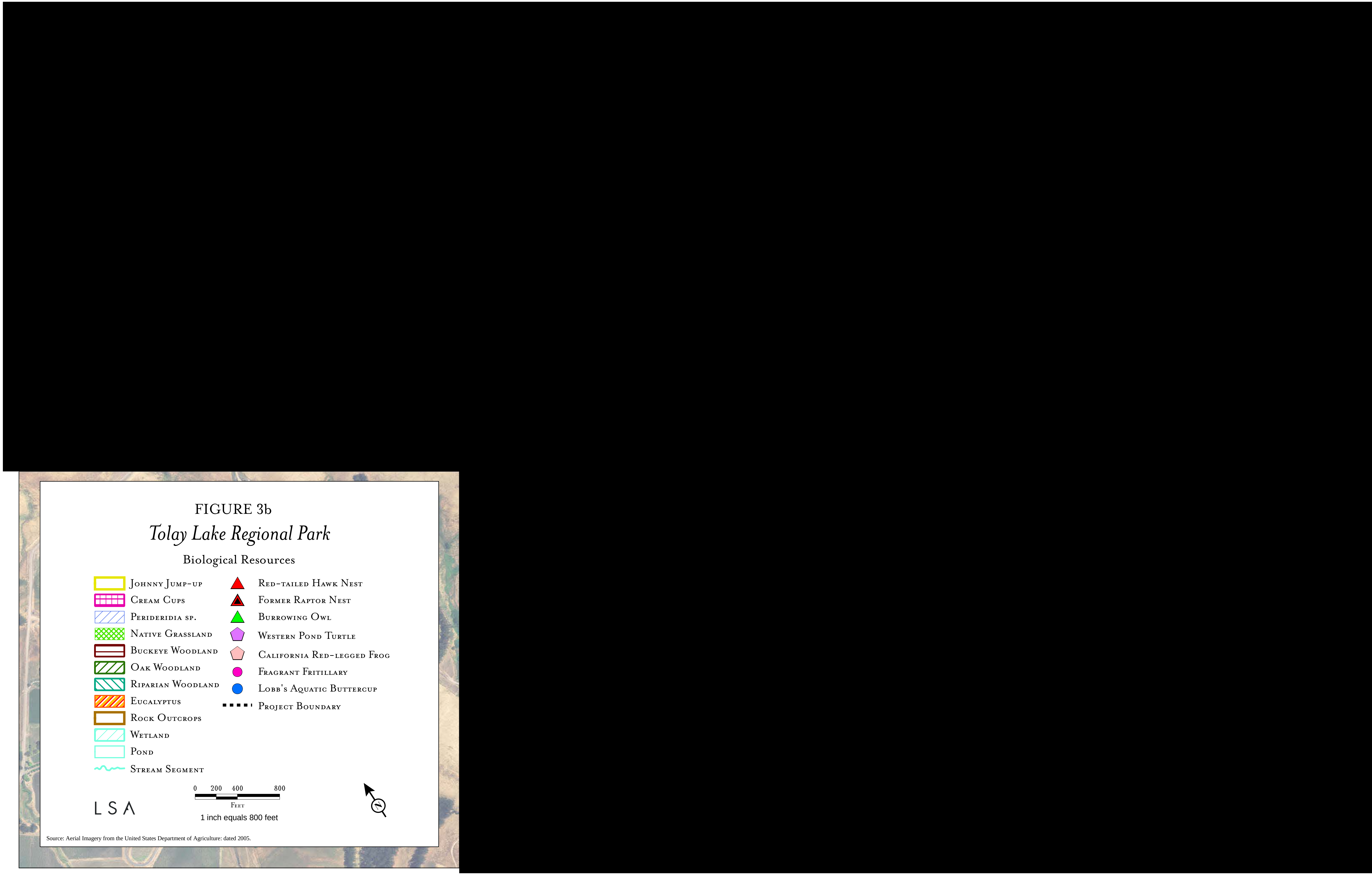


FIGURE 3a
Tolay Lake Regional Park
Biological Resources
Johnny Jump-up
Cream Cups
Perideridia sp.
Native Grassland
Buckeye Woodland
Oak Woodland
Riparian Woodland
Eucalyptus
Rock Outcrops
Wetland
Pond
Stream Segment
Red-tailed Hawk Nest
Former Raptor Nest
Burrowing Owl
Western Pond Turtle
California Red-legged Frog
Fragrant Fritillary
Lobb's Aquatic Buttercup
Project Boundary
0
400
800
Feet
1 inch equals 800 feet
LSA
Source: Aerial Imagery from the United States Department of Agriculture: dated 2005.

[redacted]



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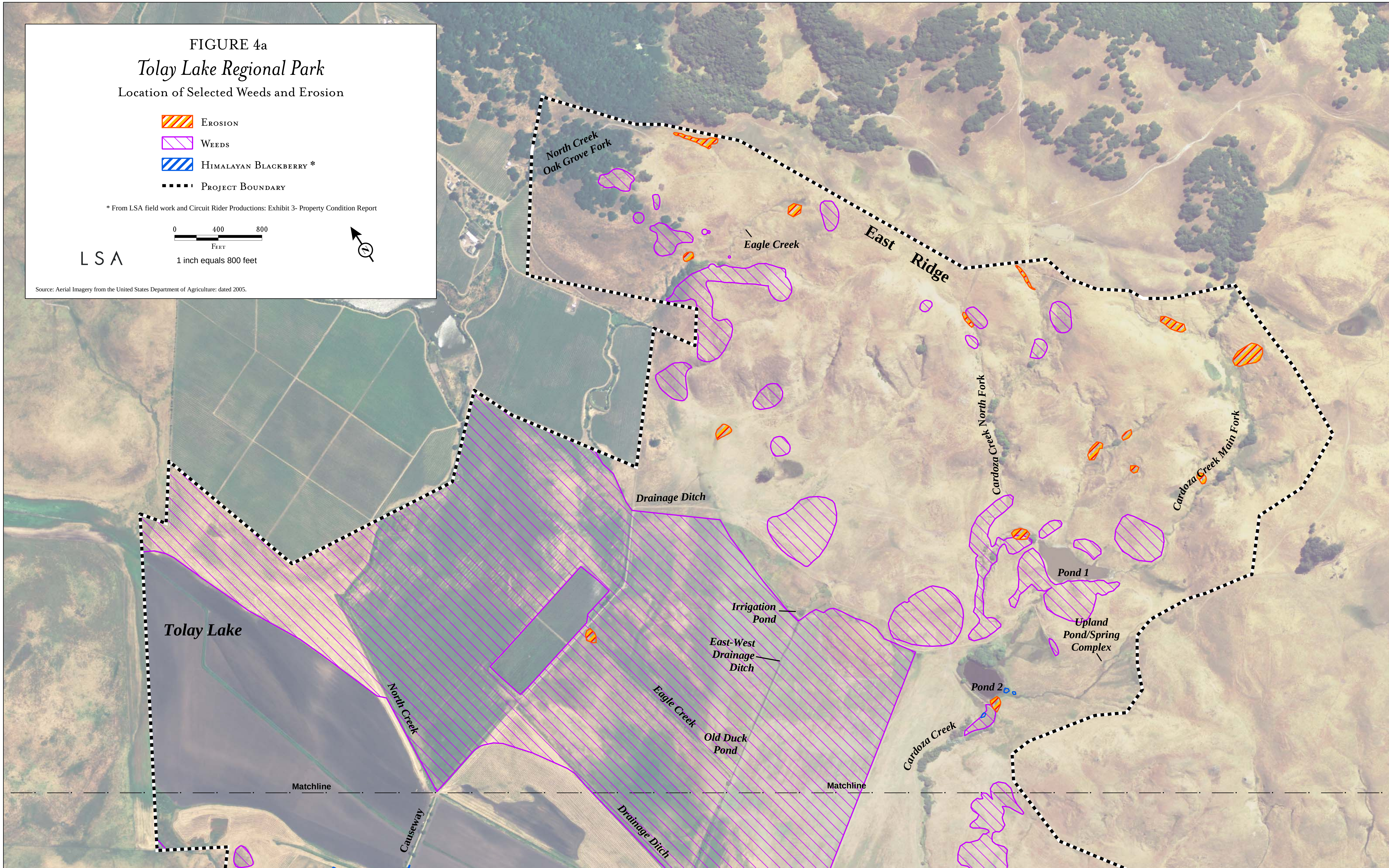

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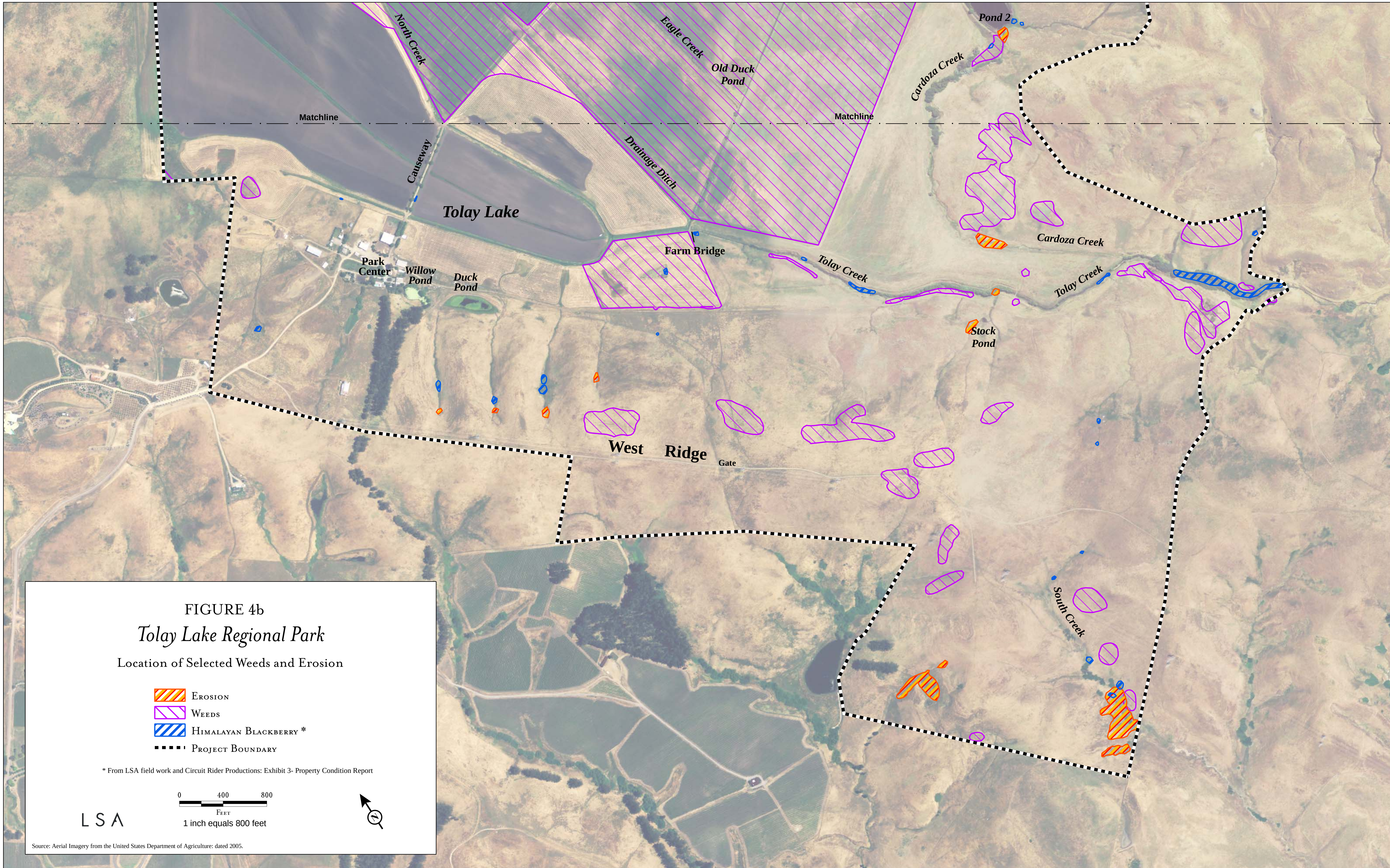

FIGURE 4b

Tolay Lake Regional Park

Location of Selected Weeds and Erosion

- Erosion
- Weeds
- Himalayan Blackberry *
- Project Boundary

* From LSA field work and Circuit Rider Productions: Exhibit 3- Property Condition Report

0 400 800
Feet
1 inch equals 800 feet

LSA

Source: Aerial Imagery from the United States Department of Agriculture: dated 2005.

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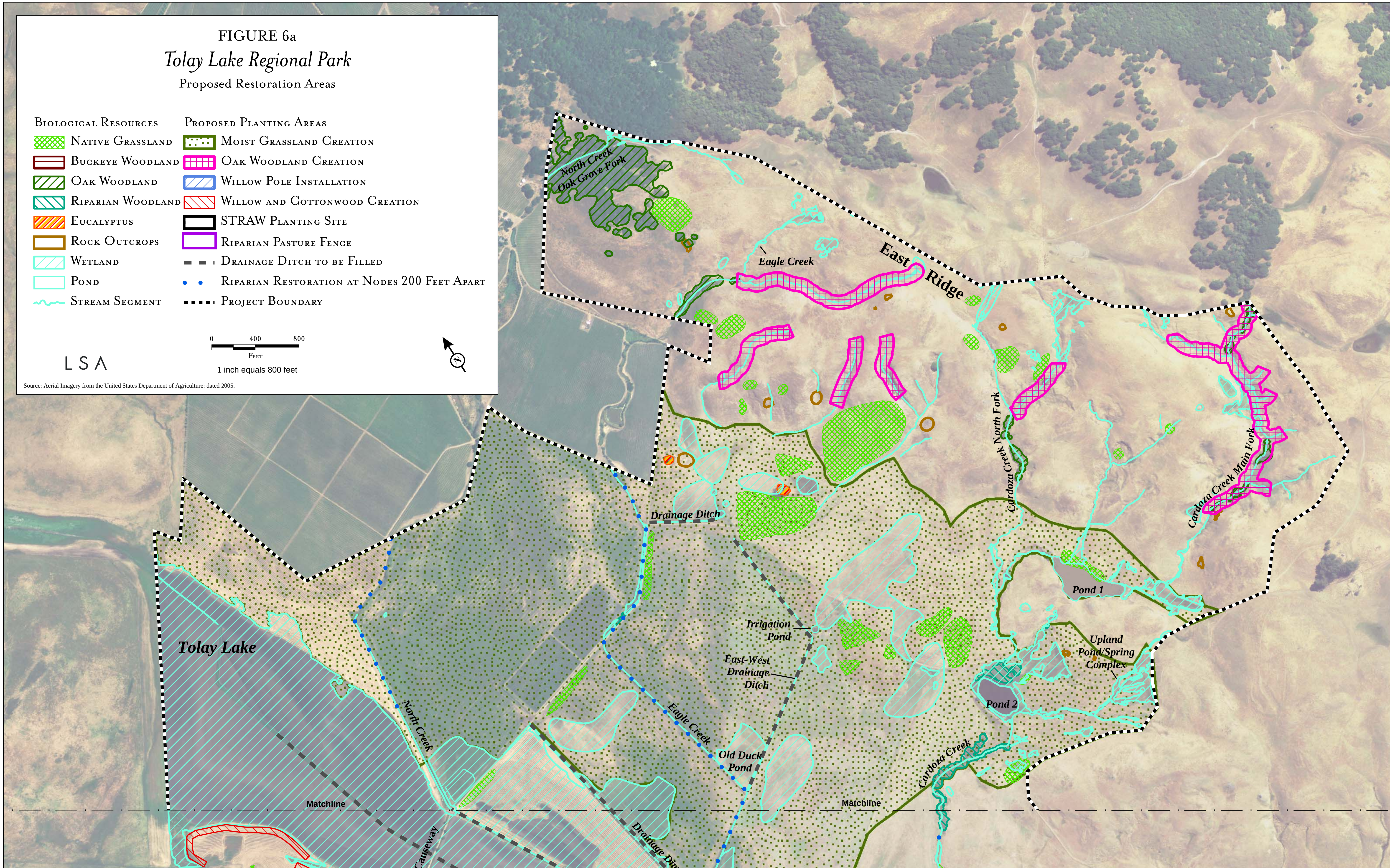
Pond
Salt Marsh Wetland
FIGURE 5
Tolay Lake Regional Park
Biological Resources, Cannon Lane
and Lakeville Road Areas
LEGEND
Cannon/Lakeville Survey Boundary
Tolay Lake Regional Park Boundary
POTENTIAL WETLAND FEATURES
Pond
Culvert
Stream Segment
0 125 250 500
FEET
1 inch equals 500 feet
LSA
N
Source: Aerial Imagery from GlobeXplorer: dated June 15, 2002.



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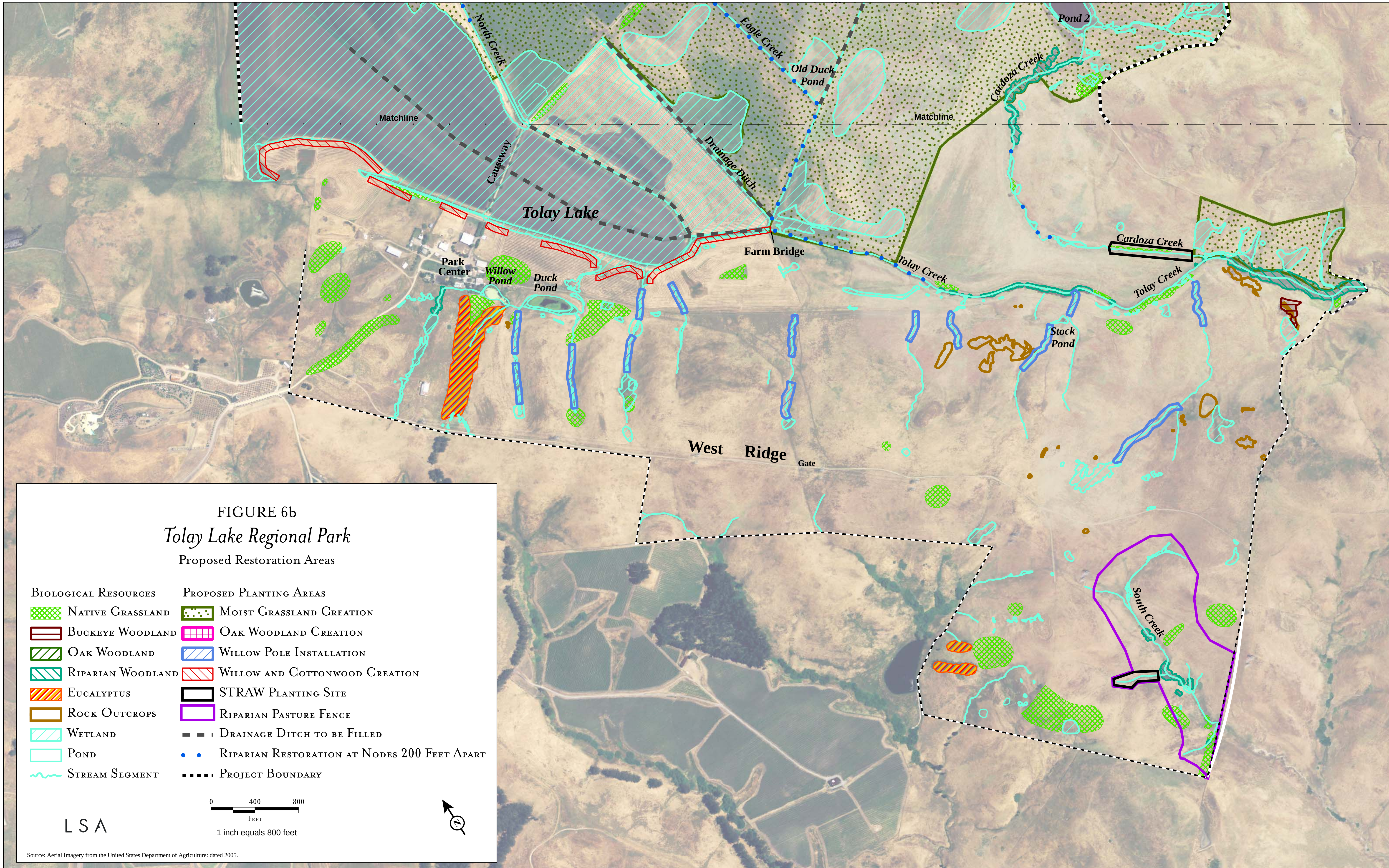

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TABLES

Table A: Plant Species Observed
Table B: Animal Species Observed
Table C: Active Ingredients Subject to the Pesticide Injunction

Table A: Plant Species Observed at Tolay Lake Regional Park by LSA Associates in 2006

Family	Scientific Name	Common Name	Origin*
Alismataceae	*Alisma lanceolatum*	Water plantain	N
Amaranthaceae	*Amaranthus blitoides*	Prostrate pigweed	N
Amaranthaceae	*Amaranthus retroflexus*	Pigweed	I
Anacardiaceae	*Toxicodendron diversilobum*	Poison oak	N
Apiaceae	*Conium maculatum*	Poison hemlock	I
Apiaceae	*Eryngium armatum*	Armed coyote thistle	N
Apiaceae	*Lomatium sp.*	Biscuitroot	N
Apiaceae	*Osmorrhiza chilensis*	Sweetroot	N
Apiaceae	*Sanicula bipinnatifida*	Purple sanicle	N
Apiaceae	*Sanicula crassicaulis*	Pacific sanicle	N
Apiaceae	*Scandix pecten-veneris*	Venus' needle	I
Apiaceae	*Torilis arvensis*	Japanese hedge-parsley	I
Apiaceae	*Torilis nodosus*	Hedge-parsley	I
Asclepiadaceae	*Asclepias fascicularis*	Narrow-leaf milkweed	N
Asteraceae	*Achillea millefolium*	Yarrow	N
Asteraceae	*Achyrachaena mollis*	Blow wives	N
Asteraceae	*Agoseris grandiflora*	Agoseris	N
Asteraceae	*Anthemis cotula*	Mayweed	I
Asteraceae	*Artemisia douglasiana*	Mugwort	N
Asteraceae	*Baccharis pilularis*	Coyote brush	N
Asteraceae	*Carduus pycnocephalus*	Italian thistle	I
Asteraceae	*Centaurea calcitrapa*	Purple star-thistle	I
Asteraceae	*Centaurea solstitialis*	Yellow star-thistle	I
Asteraceae	*Chamomilla suaveolens*	Pineapple weed	I
Asteraceae	*Cirsium vulgare*	Bull thistle	I
Asteraceae	*Cotula coronopifolia*	Brass-buttons	N
Asteraceae	*Gnaphalium luteo-album*	Cudweed	I
Asteraceae	*Grindelia camporum*	Gumplant	N
Asteraceae	*Hemizonia congesta* var. *congesta*	Hayfield tarweed	N
Asteraceae	*Hesperevax sparsiflora* var. *sparsiflora*	Erect dwarf-cudweed	N
Asteraceae	*Hypochaeris radicata*	Hairy cat's ear	I
Asteraceae	*Lactuca serriola*	Prickly lettuce	I
Asteraceae	*Lasthenia californica*	California goldfields	N
Asteraceae	*Lasthenia glaberrima*	Smoth goldfields	N
Asteraceae	*Layia gaillardioides*	Tidy tips	N
Asteraceae	*Madia sativa*	Coast tarweed	N
Asteraceae	*Microseris douglasii*	Douglas microseris	N
Asteraceae	*Picris echioides*	Bristly ox-tongue	I
Asteraceae	*Senecio vulgaris*	Common groundsel	I
Asteraceae	*Silybum marianum*	Milk thistle	I
Asteraceae	*Soliva sessilis*	South American soliva	I
Asteraceae	*Sonchus oleraceus*	Common sow thistle	I
Asteraceae	*Taraxacum officinale*	Dandelion	I
Asteraceae	*Tragopogon porrifolius*	Oyster plant	I
Asteraceae	*Wyethia angustifolia*	Mule's ears	N
Asteraceae	*Xanthium spinosum*	Spiny clotbur	N
Asteraceae	*Xanthium strumarium*	Cocklebur	N
Boraginaceae	*Amsinckia menziesii* var. *menziesii*	Fiddleneck	N
Boraginaceae	*Heliotropium curassavicum*	Heliotrope	N
Boraginaceae	*Plagiobothrys nothofulvus*	Rusty popcornflower	N
Boraginaceae	*Plagiobothrys stipitatus*	Slender popcornflower	N
Brassicaceae	*Brassica nigra*	Black mustard	I
Brassicaceae	*Capsella bursa-pastoris*	Shepherd's purse	I
Brassicaceae	*Cardamine californica* var. *californica*	Toothwort	N
Brassicaceae	*Cardamine oligosperma*	Bitter-cress	N

Table A: Plant Species Observed at Tolay Lake Regional Park by LSA Associates in 2006

Family	Scientific Name	Common Name	Origin*
Brassicaceae	*Lepidium nitidum*	Peppergrass	N
Brassicaceae	*Raphanus raphanistrum*	Jointed charlock	I
Brassicaceae	*Raphanus sativus*	Radish	I
Brassicaceae	*Rorippa curvisiliqua*	Winter cress	N
Brassicaceae	*Rorippa nasturtium-aquaticum*	Water cress	N
Brassicaceae	*Sinapis arvensis*	Charlock	I
Brassicaceae	*Sisymbrium officinale*	Hedge mustard	I
Callitrichaceae	*Callitriche sp.*	Water starwort	N
Caprifoliaceae	*Symphoricarpos mollis*	Creeping snowberry	N
Caryophyllaceae	*Cerastium fontanum* ssp.*vulgare*	Mouse-ear chickweed	I
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear chickweed	I
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved allseed	I
Caryophyllaceae	*Silene gallica*	Windmill pinks	I
Caryophyllaceae	*Spergularia rubra*	Sand-spurrey	I
Caryophyllaceae	*Stellaria media*	Common chickweed	I
Chenopodiaceae	*Atriplex triangularis*	Spearscale	N
Chenopodiaceae	*Chenopodium album*	Lamb's quarters	I
Convolvulaceae	*Calystegia subacaulis*	Morning-glory	N
Convolvulaceae	*Convolvulus arvensis*	Bindweed	I
Crassulaceae	*Crassula aquatica*	Pygmyweed	N
Crassulaceae	*Crassula connata*	Sand pygmyweed	N
Cucurbitaceae	*Marah fabaceus*	California man-root	N
Cuscutaceae	*Cuscuta* sp.	Dodder	N
Cyperaceae	*Carex* sp.	Sedge sp 1	N
Cyperaceae	*Carex* sp.	Sedge sp 2	N
Cyperaceae	*Cyperus eragrostis*	Nutsedge	N
Cyperaceae	*Eleocharis macrostachya*	Spikerush	N
Cyperaceae	*Scirpus acutus* var. *occidentalis*	Tule	N
Dipsacaceae	*Dipsacus fullonum*	Wild teasel	I
Driopteridiaceae	*Athyrium filix-femina*	Western lady-fern	N
Equisetaceae	*Equisetum arvense*	Common horsetail	N
Equisetaceae	*Equisetum laevigatum*	Narrow horsetail	N
Ericaceae	*Arbutus menziesii*	Madrone	N
Euphorbiaceae	*Chamaesyce* sp.	Rattlesnake weed	N
Euphorbiaceae	*Euphorbia peplus*	Petty spurge	I
Fabaceae	*Lathyrus* sp.	Wild pea	N
Fabaceae	*Lotus corniculatus*	Birdfoot trefoil	I
Fabaceae	*Lupinus nanus*	Sky lupine	N
Fabaceae	*Medicago polymorpha*	Californa burclover	I
Fabaceae	*Melilotus officinalis*	Yellow sweetclover	I
Fabaceae	*Melilotus indica*	Sourclover	I
Fabaceae	*Thermopsis macrophylla*	Yellow false lupine	N
Fabaceae	*Trifolium campestre*	Hop clover	I
Fabaceae	*Trifolium ciliolatum*	Tree clover	I
Fabaceae	*Trifolium depauperatum*	Dwarf sack clover	N
Fabaceae	*Trifolium dubium*	Little hop clover	I
Fabaceae	*Trifolium fragiferum*	Strawberry clover	I
Fabaceae	*Trifolium fucatum*	Sour clover	N
Fabaceae	*Trifolium hirtum*	Rose clover	I
Fabaceae	*Trifolium subterraneum*	Subterraneum clover	I
Fabaceae	*Trifolium variegatum*	Whitetip clover	N
Fabaceae	*Vicia sativa* ssp. *sativa*	Common vetch	I
Fagaceae	*Quercus agrifolia* var. *agrifolia*	Coast live oak	N
Fagaceae	*Quercus kelloggii*	Black oak	N
Gentianaceae	*Centaurium muehlenbergii*	Monterey centaury	N

Table A: Plant Species Observed at Tolay Lake Regional Park by LSA Associates in 2006

Family	Scientific Name	Common Name	Origin*
Geraniaceae	*Erodium botrys*	Broad-leaf filaree	I
Geraniaceae	*Erodium cicutarium*	Red-stem filaree	I
Geraniaceae	*Erodium moschatum*	White-stem filaree	I
Geraniaceae	*Geranium dissectum*	Cut-leaf geranium	I
Geraniaceae	*Geranium molle*	Dove's foot geranium	I
Hippocastanaceae	*Aesculus californica*	California buckeye	N
Hydrophyllaceae	*Nemophila heterophylla*	Variable-leaf nemophila	N
Hydrophyllaceae	*Phacelia* sp.	Phacelia	N
Iridaceae	*Sisyrinchium bellum*	Blue-eyed-grass	N
Juncaceae	*Juncus balticus*	Baltic rush	N
Juncaceae	*Juncus bufonius* var. *bufonius*	Toad rush	N
Juncaceae	*Juncus effusus*	Soft rush	N
Juncaceae	*Juncus mexicanus*	Mexican rush	N
Juncaceae	*Juncus phaeocephalus*	Brown-headed rush	N
Juncaginaceae	*Lilaea scillioides*	Flowering quillwort	N
Lamiaceae	*Lamium purpureum*	Red dead-nettle	I
Lamiaceae	*Mentha pulegium*	Pennyroyal	I
Lamiaceae	*Stachys ajugoides*	Hedge nettle	N
Lauraceae	*Umbellularia californica*	California bay	N
Lemnaceae	*Lemna* sp.	Duckweed	N
Liliaceae	*Brodiaea elegans*	Harvest brodiaea	N
Liliaceae	*Chlorogalum pomeridianum* var. *pomeridianum*	Soap plant	N
Liliaceae	*Dichelostemma capitatum*	Blue dicks	N
Liliaceae	*Fritillaria liliacea*	Fragrant fritillary	N
Liliaceae	*Muilla maritima*	Common muilla	N
Liliaceae	*Triteleia hyacinthina*	Hyacinth brodiaea	N
Liliaceae	*Triteleia laxa*	Ithuriel's spear	N
Liliaceae	*Zigadenus fremontii*	Fremont's star lily	N
Limnanthaceae	*Limnanthes douglasii*	Meadowfoam	N
Lythraceae	*Ammannia coccinea*	Red ammannia	N
Lythraceae	*Lythrum hyssopifolium*	Hyssop loosestrife	I
Malvaceae	*Abutilon theophrastii*	Velvet-leaf	I
Malvaceae	*Malva nicaeensis*	Bull mallow	I
Malvaceae	*Sidalcea malvaeflora*	California checker mallow	I
Martyniaceae	*Proboscidea lutea*	Devil's claw	I
Moraceae	*Ficus carica*	Edible fig	I
Myrtaceae	*Eucalyptus globulus*	Blue gum eucalyptus	I
Onagraceae	*Camissonia ovata*	Sun cup	N
Onagraceae	*Clarkia* sp.	Fairyfan	N
Onagraceae	*Epilobium brachycarpum*	Willow herb	N
Onagraceae	*Ludwigia* sp.	Water-primrose	I
Papaveraceae	*Eschscholzia californica*	California poppy	N
Papaveraceae	*Platystemon californicus*	Creamcups	N
Plantaginaceae	*Plantago lanceolata*	English plantain	I
Plantaginaceae	*Plantago subnuda*	Naked plantain	I
Poaceae	*Avena barbata*	Slender wildoats	
Poaceae	*Avena fatua*	Wild oats	I
Poaceae	*Briza minor*	Little quaking grass	I
Poaceae	*Bromus diandrus*	Ripgut brome	I
Poaceae	*Bromus hordeaceus*	Soft chess brome	I
Poaceae	*Crypsis schoenoides*	Prickle grass	I
Poaceae	*Cynosurus echinatus*	Hedgehog dogtail	I
Poaceae	*Danthonia californica*	California oatgrass	N
Poaceae	*Elymus glaucus*	Blue wildrye	N
Poaceae	*Gastridium ventricosum*	Nit grass	I

Table A: Plant Species Observed at Tolay Lake Regional Park by LSA Associates in 2006

Family	Scientific Name	Common Name	Origin*
Poaceae	*Holcus lanatus*	Common velvet grass	I
Poaceae	*Hordeum brachyantherum*	Meadow barley	N
Poaceae	*Hordeum marinum* var. *gussoneanum*	Mediterranian barley	I
Poaceae	*Hordeum murinum* ssp. *leporinum*	Hare barley	I
Poaceae	*Leymus triticoides*	Creeping wildrye	N
Poaceae	*Lolium multiflorum*	Italian ryegrass	I
Poaceae	*Nassella pulchra*	Purple needle-grass	N
Poaceae	*Paspalum dilatatum*	Dallis grass	I
Poaceae	*Phalaris aquatica*	Harding grass	I
Poaceae	*Phalaris paradoxa*	Canary grass	I
Poaceae	*Pleuropogon californicus*	Semaphore grass	N
Poaceae	*Poa annua*	Annual bluegrass	I
Poaceae	*Polypogon monspeliensis*	Annual beard grass	I
Poaceae	*Taeniatherum caput-medusae*	Medusa head	I
Poaceae	*Triticum aestivum*	Wheat	I
Poaceae	*Vulpia bromoides.*	Annual fescue	I
Poaceae	*Vulpia myuros*	Annual fescue	I
Polygonaceae	*Polygonum amphibium* ssp. *emersum*	Water smartweed	N
Polygonaceae	*Polygonum arenastrum*	Common knotweed	I
Polygonaceae	*Polygonum hydropiperoides*	Waterpepper	N
Polygonaceae	*Rumex acetosella*	Sheep sorrel	I
Polygonaceae	*Rumex conglomeratus*	Clustered dock	I
Polygonaceae	*Rumex crispus*	Curly dock	I
Polygonaceae	*Rumex pulcher*	Fiddle dock	I
Polypodiaceae	*Polypodium californicum*	California polypody	N
Portulacaceae	*Calandrinia ciliata*	Red maids	N
Portulacaceae	*Claytonia exigua*	Common montia	N
Portulacaceae	*Claytonia perfoliata*	Miner's lettuce	N
Portulacaceae	*Portulaca oleracea*	Common purslane	I
Primulaceae	*Anagalis arvensis*	Scarlet pimpernel	I
Primulaceae	*Centunculus minimus*	Chaffweed	N
Primulaceae	*Dodecatheon hendersonii*	Shooting star	N
Pteridiaceae	*Adiantum jordanii*	California maidenhair fern	N
Pteridiaceae	*Pentagramma triangularis*	Goldback fern	N
Ranunculaceae	*Ranunculus aquatilis*	Water buttercup	N
Ranunculaceae	*Ranunculus californicus*	California buttercup	N
Ranunculaceae	*Ranunculus lobbii*	Lobb's aquatic buttercup	N
Ranunculaceae	*Ranunculus muricatus*	Prickle-fruited buttercup	I
Ranunculaceae	*Ranunculus orthorhynchus* var.*bloomeri*	Strait-beaked buttercup	N
Rhamnaceae	*Rhamnus californica*	California coffeeberry	N
Rosaceae	*Aphanes occidentalis*	Western lady's mantle	N
Rosaceae	*Prunus* sp.	Ornamental plum	N
Rosaceae	*Rosa* sp.	Ornamental rose	N
Rosaceae	*Rubus discolor*	Himalayan blackberry	I
Rosaceae	*Rubus ursinus*	California blackberry	N
Rubiaceae	*Galium aparine*	Goose-grass	I
Rubiaceae	*Galium murale*	Tiny bedstraw	I
Rubiaceae	*Galium trifidum*	Sweet scented bedstraw	N
Rubiaceae	*Sherardia arvensis*	Field madder	I
Salicaceae	*Populus fremontii* ssp. *fremontii*	Fremont cottonwood	N
Salicaceae	*Salix exigua*	Narrow leaf willow	N
Salicaceae	*Salix laevigata*	Red willow	N
Salicaceae	*Salix lasiolepis*	Arroyo willow	N
Salicaceae	*Salix lucida* ssp. *lasiandra*	Yellow willow	N
Saxifragaceae	*Lithophragma* sp.	Woodland star	N

Table A: Plant Species Observed at Tolay Lake Regional Park by LSA Associates in 2006

Family	Scientific Name	Common Name	Origin*
Scrophulariaceae	*Bellardia trixago*	Bellardia	I
Scrophulariaceae	*Castilleja attenuata*	Valley-tassels	N
Scrophulariaceae	*Castilleja exerta*	Purple owl's clover	N
Scrophulariaceae	*Kickxia elatine*	Fluellin	I
Scrophulariaceae	*Mimulus aurantiacus*	Bush monkeyflower	N
Scrophulariaceae	*Mimulus guttatus*	Common monkey-flower	N
Scrophulariaceae	*Parentucellia viscosa*	Parentucellia	I
Scrophulariaceae	*Scrophularia californica* ssp. *californica*	California figwort	N
Scrophulariaceae	*Triphysaria eriantha* ssp. *eriantha*	Butter-and-eggs	N
Scrophulariaceae	*Triphysaria pusilla*	Dwarf owl's clover	N
Scrophulariaceae	*Triphysaria versicolor* ssp. *faucibarbata*	Smooth owl's clover	N
Scrophulariaceae	*Veronica peregrina*	Purslane speedweed	N
Scrophulariaceae	*Veronica persica*	Persian speedwell	I
Typhaceae	*Typha* sp.	Cattail	N
Urticaceae	*Urtica dioica* ssp. *holosericea*	Hoary nettle	N
Urticaceae	*Urtica urens*	Dwarf nettle	I
Verbenaceae	*Phyla nodiflora* var. *nodiflora*	Garden lippia	N
Violaceae	*Viola pedunculata*	Wild pansy	N
Viscaceae	*Phoradendron villosum*	Mistletoe	N

* Origin

N - Native Species

I - Introduced Species

Table B: Animal Species Observed at Tolay Lake Regional Park in 2006*

Common Name	Scientific Name
AMPHIBIANS	
Bullfrog	*Lithobates catesbeiana*
sierran treefrog	*Pseudacris sierra*
REPTILES	
Western fence lizard	*Sceloporus occidentalis*
Common garter snake	*Thamnophis sirtalis*
Ring-necked snake	*Diadophis punctatus*
BIRDS	
Canada goose	*Branta canadensis*
Gadwall	*Anas strepera*
American wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Cinnamon teal	*Anas cyanoptera*
Northern shoveler	*Anas clypeata*
Northern pintail	*Anas acuta*
Green-winged teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Greater scaup	*Aythya marila*
Bufflehead	*Bucephala albeola*
Ruddy duck	*Oxyura jamaicensis*
Wild turkey	*Meleagris gallopavo*
California quail	*Callipepla californica*
Pied-billed grebe	*Podilymbus podiceps*
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Snowy egret	*Egretta thula*
Turkey vulture	*Cathartes aura*
White-tailed kite	*Elanus leucurus*
Northern harrier	*Circus cyaneus*
Sharp-shinned hawk	*Accipiter striatus*
Cooper's hawk	*Accipiter cooperi*
Red-shouldered hawk	*Accipiter striatus*
Red-tailed hawk	*Buteo jamaicensis*
Golden eagle	*Aquila chrysaetos*
American kestrel	*Falco sparverius*
American coot	*Fulica americana*
Killdeer	*Charadrius vociferus*

Common Name	Scientific Name
Greater yellowlegs	*Tringa melanoleuca*
Western sandpiper	*Calidris mauri*
Least sandpiper	*Calidris minutilla*
Long-billed dowitcher	*Limnodromus scolopaceus*
Wilson's snipe	*Gallinago delicata*
Caspian tern	*Hydroprogne caspia*
Rock pigeon	*Columba livia*
Band-tailed pigeon	*Patagioenas fasciata*
Mourning dove	*Zenaida macroura*
Barn owl	*Tyto alba*
Great horned owl	*Bubo virginianus*
Burrowing owl	*Athene cunicularia*
Vaux's swift	*Chaetura vauxi*
Anna's hummingbird	*Calypte anna*
Rufous hummingbird	*Selasphorus rufus*
Allen's hummingbird	*Selasphorus sasin*
Nuttall's woodpecker	*Picoides nuttallii*
Downy woodpecker	*Picoides pubescens*
Northern flicker	*Colaptes auratus*
Willow flycatcher	*Empidonax traillii*
Black phoebe	*Sayornis nigricans*
Say's phoebe	*Sayornis saya*
Western kingbird	*Tyrannus verticalis*
Loggerhead shrike	*Lanius ludovicianus*
Hutton's vireo	*Vireo huttoni*
Warbling vireo	*Vireo gilvus*
Steller's jay	*Cyanocitta stelleri*
Western scrub-jay	*Aphelocoma californica*
American crow	*Corvus brachyrhynchos*
Common raven	*Corvus corax*
Horned lark	*Eremophila alpestris*
Tree swallow	*Tachycineta bicolor*
Violet-green swallow	*Tachycineta thalassina*
Northern rough-winged Swallow	*Stelgidopteryx serripennis*
Cliff swallow	*Petrochelidon pyrrhonata*
Barn swallow	*Hirundo rustica*
Chestnut-backed chickadee	*Poecile rufescens*
Oak titmouse	*Baeolophus inornatus*
Bushtit	*Psaltriparus minimus*
Brown creeper	*Certhia americana*

Common Name	**Scientific Name**
Bewick's wren	*Thryomanes bewickii*
House wren	*Troglodytes aedon*
Winter wren	*Troglodytes troglodytes*
Marsh wren	*Cistothorus palustris*
Ruby-crowned kinglet	*Regulus calendula*
Western bluebird	*Sialia mexicana*
Hermit thrush	*Catharus guttatus*
American robin	*Turdus migratorius*
Northern mockingbird	*Mimus polyglottos*
European starling	*Sturnus vulgaris*
Cedar waxwing	*Bombycilla cedrorum*
American pipit	*Anthus rubescens*
Orange-crowned warbler	*Vermivora celata*
Yellow warbler	*Dendroica petechia*
Yellow-rumped warbler	*Dendroica coronata*
Wilson's warbler	*Wilsonia pusilla*
Western tanager	*Piranga ludoviciana*
Spotted towhee	*Pipilo maculatus*
California towhee	*Pipilo crissalis*
Lark sparrow	*Chondestes grammacus*
Savannah sparrow	*Passerculus sandwichensis*
Grasshopper sparrow	*Ammodramus savannarum*
Fox sparrow	*Passerella iliaca*
Song sparrow	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
White-throated sparrow	*Zonotrichia albicollis*
White-crowned sparrow	*Zonotrichia leucophrys*
Golden-crowned sparrow	*Zonotrichia atricapilla*
Dark-eyed junco	*Junco hyemalis*
Red-winged blackbird	*Agelaius phoeniceus*
Tricolored blackbird	*Agelaius tricolor*
Western meadowlark	*Sturnella neglecta*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
House finch	*Carpodacus mexicanus*
Lesser goldfinch	*Carduelis psaltria*
American goldfinch	*Carduelis tristis*
House sparrow	*Passer domesticus*
MAMMALS	

Common Name	**Scientific Name**
Coyote	*Canis latrans*
Black-tailed deer	*Odocoileus hemionus*
California ground squirrel	*Spermophilis beecheyi*
California vole	*Microtus californicus*
Botta's pocket gopher	*Thomomys bottae*
Black-tailed jackrabbit	*Lepus californicus*

* <u>Observers</u> = LSA Associates & Petaluma Wetlands Alliance

Table C: Active Ingredients Subject to the Pesticide Injunction

2, 4-D	Metam sodium
Acephate	Methamidophos
Alachlor	Methidathion
Aldicarb	Methomyl
Atrazine	Methoprene
Azinphos-methyl	Methyl parathion
Bensulide	Metolachlor
Bromacil	Molinate
Captan	Myclobutanil
Carbaryl	Naled
Chloropicrin	Norflurazon
Chlorothalonil	Oryzalin
Chlorpyrifos	Oxamyl
DCPA	Oxydemeton-methyl
DEF	Oxyfluorfen
Diazinon	Paraquat dichloride
Dicofol	Pendimethalin
Diflubenzuron	Permethrin
Dimethoate	Phorate
Disulfoton	Phosmet
Diuron	Prometryn
Endosulfan	Pronamide
EPTC	Propanil
Esfenvalerate	Propargite
Fenamiphos	Rotenone
Glyphosate	Simazine
Hexazinone	Strychnine
Imazapyr	Telone (1,3-dichlorpropene)
Iprodione	Thiobencarb
Linuron	Triclopyr
Malathion	Trifluralin
Mancozeb	Vinclozolin
Maneb	Ziram

APPENDIX 1

BIRD SURVEY ANALYSIS, TOLAY LAKE REGIONAL PARK

BIRD SURVEY ANALYSIS, TOLAY LAKE REGIONAL PARK

A dedicated and technically proficient group of about a dozen volunteer birders associated with Petaluma Wetland Alliance have regularly surveyed the Tolay Lake Regional Park for birds starting on April 15, 2006. They have conducted 28 surveys as of February 21, 2009, having made visits in every month of the year except August over the nearly three-year period. On each visit, the survey covers most of the property, but not all. All birds are identified to species and the number of individuals is tallied. Data are also recorded regarding weather conditions. Although there is some variation in the coverage of each survey, methodologically the visits are roughly comparable and scientifically valid.

The quality of the data is excellent. With a year or two more of surveys, the accumulated data should be used to develop a checklist of bird species with seasonal frequency of abundance information. The data are also extremely useful for park planning and conservation purposes. For example, introductions of new species can be tracked, such as the observation of Eurasian collared dove on September 23, 2007, and again on April 19, 2008. Special-status species such as grasshopper sparrow can be monitored. The data can also be mined to see what ordinarily common species, such as hermit thrush, are under-represented at the park due to marginal habitat conditions that could be enhanced, particularly bird species requiring mature trees or developed underbrush.

Table A compiles the results of these bird surveys. Number of species observed on each survey varied from 34 to 75. Number of individual birds counted on each survey varied from 419 to 5,204. Cumulatively, 149 species and 23,050 individuals have been observed.

Table B aggregates the data by species to give the frequency of abundance of birds observed. The five most frequently observed species in order of abundance were red-winged blackbird, European starling, western meadowlark, house finch, and Savannah sparrow. All of these species are birds that primarily forage in grasslands and marshlands, which are the two most abundant habitat types on Tolay Lake Regional Park.

Table C aggregates the data by relative seasonal abundance and by guilds. For the relative seasonal abundance analysis, the months of the year were joined in pairs; e.g., December with January and so forth. Then the number of birds counted in each monthly pair was added together and divided by the number of counts in that monthly pair to create an index of relative abundance. The six pairs of months roughly correspond to the following phenologies in the annual cycles of birds: April-May is the nesting season; June-July is the fledgling season; August-September is the post breeding season/migration season; October-November is the peak of migration for many non-resident birds; December-January is the beginning of the winter resident season; and February-March is end of the winter resident season and the beginning of the migratory season. Of course, the phenologies of some individuals and even species will differ in particulars from this generalized pattern.

Table C also groups the birds observed at Tolay Lake Regional Park by guilds, which are groupings of species using the same or similar habitats. Table D presents a summary of the data contained in Table C. The groups are necessarily broad but are designed to illustrate the relative seasonal abundances. The following guilds are delineated:

- The **forest, riparian, and brush guild** is generally composed of birds that are dependent on woody habitat from shrubs to mature trees for important phases of their life cycle, particularly for foraging and nesting.

- The **grassland guild** is generally composed of birds that forage primarily in grasslands. Some of these species also nest in grasslands. All the swallows were placed in this guild, even though some forage over forest and marsh as well; none of them nest in grass.
- The **raptor guild** is the most taxonomically parsimonious grouping, composed of hawks and falcons along with the turkey vulture.
- The **waterbird guild** is broken into marsh birds such herons and egrets, shorebirds such as sandpipers and plovers, and waterfowl and allies. The latter category includes ducks and geese along with gulls, a tern species, grebes, American coot, and belted kingfisher.

With the exception of marsh birds and shorebirds, each of the guilds is broken into two or three of the following seasonal categories: breeding/summer resident, migratory/winter resident, and year-round resident. These seasonal categorizations are based on the findings of the *Birds of Sonoma County California* (Bolander and Parmeter 2000) for the part of Sonoma County where Tolay Lake Regional Park is located. Some species, such as the European starling and the western meadowlark, are year-round residents, nesting in the park. But in the winter their numbers are greatly enhanced by migratory conspecifics. In the case of the starling and meadowlark, winter abundance is so disproportionately greater than in the breeding season that these birds were treated as migratory/winter residents.

Figures 1-4 graph the relative abundances of the four guilds. Among the forest, riparian, and brush guild birds, the most abundant are the year-round residents, although their numbers drop considerably in the nesting season (Figure 1). This drop suggests that suitable nesting habitat may be limited for some of these birds, many of which require mature trees or developed brush habitat. The breeding/summer resident birds, using forest, riparian, and brush habitat, have very low relative abundance in the winter, early spring, and fall as would be expected. But their breeding season numbers are not especially strong either, suggesting a paucity of suitable habitat for this group, which is composed mainly of neotropical migrants (i.e., bird species that winter in the neotropics).

Figure 2 illustrates the relative abundances of birds that comprise the grassland guilds. The largest group are the migratory/winter resident species with large numbers of migratory European starlings, western meadowlarks, and white-crowned and golden-crowned sparrows. The sparrow species may nest in Sonoma County, but mainly along the coast (Bolander and Parmeter 2000). Resident grassland birds, such as Savannah sparrow and Brewer's blackbird, are present year-round in moderate numbers with a slight depression in numbers during the breeding season. The grassland breeding/summer resident species, mainly swallows, peak as expected in the breeding season and into the summer. However, their numbers may be limited by the lack of suitable nesting habitat on-site.

Figure 3 illustrates the relative abundances of raptors. Tolay Lake Regional Park has an exceptionally healthy population of year-round resident raptors. Many forage in the grasslands and nest in the riparian and oak woodlands. Their numbers peak in the late summer/early fall augmented by migratory conspecifics coming down from the north. The more strictly migratory species are found on-site in relatively low numbers in the winter, early spring, and fall. The relatively low abundance of migratory raptors likely reflects mainly that these top predators occur at naturally low numbers, rather than lack of suitable habitat.

Figure 4 illustrates the relative abundances of birds that comprise the waterbird guilds. Both migratory and year-round resident waterfowl peak in February/March, but are virtually absent the rest of the year, reflecting the hydration period of Tolay Lake. Augmentation of the seasonal hydration of Tolay Lake could significantly increase waterfowl presence on-site. Shorebirds, which are primarily migrants and winter residents, are present at low numbers primarily due to the limited amount of suitable habitat. The marsh bird group is dominated by the large number of red-winged blackbirds, especially in the fall and winter.

Figure 5 illustrates the relative abundance by season of all species and individuals. Both relative number of species and relative number of individuals track the same seasonal pattern at Tolay Lake Regional Park with high numbers in the winter, early spring, and fall and correspondingly low numbers in the latter part of the spring and through the summer, when the seasonal wetlands desiccate and many bird species migrate to the coast or to the north to breed.

Overall the data indicate a substantially rich avifauna at Tolay Lake Regional Park. Raptor populations are particularly strong. Waterfowl occur in large numbers when Tolay Lake is hydrated, but are limited by the seasonal nature of that waterbody. Enhancement of riparian, brush, and woody understory vegetation would likely increase the numbers of neotropical migrant breeding birds as well as year-round resident birds that use such habitat.

REFERENCE:

Bolander, G.L., and B.D. Parmeter. 2000. Birds of Sonoma County, California: An Annotated Checklist and Birding Gazetteer. Redwood Ornithological Society, Napa, CA. 155 pp.

Table A: Bird Species Observed, Number of Individuals and Dates, Tolay Lake Regional Park, Sonoma County, California

Species	Date of survey and number of birds observed by species																										
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Grebe, Horned								3																				
Grebe, Eared																	2	2										
Grebe, Pied-billed	2	4							1	1							2	2										1
Pelican, Am. White														14	5													
Cormorant, D.-cr.								3		2						2		1							13		3	1
Heron, Great Blue		1	3	1		2						1	1	1		4	1	1	1	1		1		2	2		2	1
Egret, Great			1		2	3	3	1		5	2			1	3	1	1		3	5	3	2	3	2	1		1	2
Heron, Green												1																
Heron, Bl.-cr. Night												1										4	1	1				
Goose, Canada	7	5	26	6		238	10	10		8					8	9	29	22		4						12	30	133
Goose, Gr. White-fr.						2																					4	8
Duck, Wood																4												
Mallard	9	12		1		5	18	11	4	14	1	7		14		6	12	22	14	18	1	5	5	5		11	21	40
Gadwall	10	7				5		3	2	6						4	18	3	3	4								38
Pintail, Northern	2							1									241	9	1								1	87
Wigeon, American	8																60	83	2								2	306
Shoveler, Northern	1	3						126		1							36	10										4
Teal, Cinnamon	2	1						4	3	4			1	1			3	13	6	8								9
Teal, Blue-winged														1														
Teal, Green-winged	2							12									19	27	2								1	38
Canvasback																	40										1	55
Scaup, Greater	2																5	1									6	
Scaup, Lesser														5		10												
Bufflehead	12	1						2								7	37	30									1	56
Merganser, Com.							1									4											2	2
Duck, Ring-necked																	100	2										21
Duck,Ruddy																	76	41										22
Vulture, Turkey	1	1	8	4	4	10		9	5	16	4	3	8	4	6	2	19	3	7	10	1	6	11	13	1	2	10	6
Harrier, Northern	0	0	3	4	4	6	3	1	1		1	3	10	8	8	8							3	3	5	4	7	2
Kite, White-tailed	0	0	2	7	4	5	7	5		1		12	25	7	17	5	4	3				2	1	6	3	4	4	3
Hawk, Sharp-shin.			2												2									1	2			

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Hawk, Cooper's									1	1					3	1	1				1		2		1	1	1	2
Hawk, Red-sh.	1	0		4		1		1			1	2	9	1	3	3		2			2		2	3	1		3	5
Hawk, Swainson's																			2									
Hawk, Red-tailed	2	1	7	3	9	6	3	4	4	11		2	15	12	11	6	6	7	4	4	1	10	10	7	6	9	10	6
Hawk, Ferruginous					1										1			1							1	2	1	
Hawk, Rough-leg.						1									1	1		1							2	2	2	1
Eagle, Golden								1				1		3	2	2	2				2		1		2		1	
Osprey							1																					
Merlin							1											2									1	1
Kestrel, American	1	2	6	6	7	6	9	1				7	9	5	6	11	4	4	3		1	4	7	5	5	8	9	4
Falcon, Prairie																								1			1	
Falcon, Peregrine					1	1			1									1			1			2				
Quail, California	0	9		16	6		8	19	20	15	12	14	26		4		8	13	11	20	18	15	2	20	66		37	6
Pheasant, Ring-n.										1																		
Turkey, Wild		1			1														7			3	15		10			
Moorhen, Common				1						2		3	2	1								3				1		
Coot, American	14	34				2		28	5	3		1	1	3		4	150	225	18					1				16
Sora																											1	
Killdeer	5	7	14	86	58	20	10	2	1	5	2	12	6	1	26	14	9	1	6	2	3	2	4	21	17	8	119	6
Yellowlegs, Greater	3	1						2	1								1	1	7									
Curlew, Long-billed						1		1	3							5										16	10	10
Sandpiper, West.		3																										
Sandpiper, Least		30																										
Dowitcher, Long-b.	5	119															9		15									14
Snipe, Wilson's								9									1	4	5							1	2	3
Gull, Glaucous-w.							1																					
Gull, California																										2	1	
Tern, Caspian		1																	1									
Dove, Mourning	4	0	3	4	14	2			7	18	19	18	1	1	2	2			7	19	16	16	4	5	11		4	2
Dove, Eurasian Co.														1						1								
Pigeon, Rock	8	8	14	15	9	2		12	7	3				2		1	14	4	3	7	7	1		13	12	1	7	3
Pigeon, Band-t.												1															1	
Owl, Barn	2	2	3	4	2	2	2			2	1	7	9	4	3	1	2	3	1		2	2	2	1	2		2	1
Owl, Great Horned	1		2	1			2	1	1	1		4				1		1		2		6	1	4	1	1	2	

Species	Date of survey and number of birds observed by species																										
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Swift, Vaux's			2											10														
Humming., Allen's	2	4						5	3		2	1						1	7	4		1						1
Humming., Rufous	1							1	4	1							1	1										
Humming., Anna's	7	12	2		1	1	7	16	5	2	1	2	1	2	2		5	3	7	1	2		2	5	2	3	7	2
Selasphorus sp.																		4										
Kingfisher, Belted												1					1						1					
Woodpecker, Acorn						1						1						3	1		4		2		4		5	4
Sapsucker, Red-br.																							1		1			1
Woodpeck., Downy			1	4							1		3	2		1			1		2	1	1	1				1
Woodpeck., Hairy																1						1						
Woodpeck., Nuttall's	2	1		1					1	3		2	4	3	3	1	1	2	5	2	4	2	9	2	1	1	4	2
Flicker, Northern					4	11	3	1				1		1	7	10	8	19	1	1	1		1	3	8	7	17	6
Flycatcher, Olive-s.										1																		
Wood-Pewee, W.																			1				1					
Flycatcher, Pac. S.										1				1							1		3					
Flycatcher, Willow			1	1									1										1					
Flycatcher, Least													1															
Phoebe, Black	3	2	11	10	6	6	2	6	4	2	12	6	16	5	14	9	1	1	5	4	4	29	10	22	7	2	10	3
Phoebe, Say's			10	10	11	4	2							9	8	10	5	1					3	12	5	4	7	2
Flycatcher, Ash-thr.												2							4		1	3						
Kingbird, Western	2	1						3		1	2	7	1						5	11	3	2						
Shrike, Loggerhead				5	1	2			1	2		2	2		1	3	2	1	2		2	4	1	3	4	4	2	2
Vireo, Warbling			1											1								2	1					
Vireo, Hutton's			1		1								2		1	1									1	1		
Jay, Steller's						5				5		8		2		3	3	3	2		2		5		5		12	4
Scrub-Jay, Western			2		5	8	5				4	5	9	1	3	9	3	3		4	5	5	3	4	3	2	6	2
Raven, Common	4	4	4	10	21	10	11	3	5	10	4	7	8	2	25	12	5	11	5	9	7	9	4	19	6	13	18	4
Crow, American	2	1	1	1	5	5	1	1		2		3		6	12	2		6	3	18	3			3	1	9	11	5
Lark, Horned												1																
Swallow, N. R.-w.	1	4												2														
Swallow, Violet-gr.	23	5	54	2				10	3	31	3	24		24			1		35		17	1	23	14				
Swallow, Tree	9	40	20			12		8	30	2	3	11					2	24	29	55	19	43	8			2		1
Swallow, Cliff	70	80							52	70	25	66							72	75	60	4						
Swallow, Barn		241	5	3	1			72	20	19	19	41	18	5					18	90	35	31	13					

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Titmouse, Oak												4		3		2	2	1	3		7				2		8	1
Chickadee, Ch.-b.										2			3				2		2		4	1	1		3			
Bushtit	1			15	45	3			5	4	7	5				20	21	2	3	16	1	3	20	25	24	7	59	5
Nuthatch, Wh.-br.						1										1	2	3	3		2		4		2		2	1
Creeper, Brown														1											2	2	4	1
Wren, Bewick's				1	3					1			2	1		1	2	2	4		2						4	2
Wren, House			1	2				1		2		12			1			1	3	3	3					2		
Wren, Marsh				2								1			1												1	
Kinglet, Golden-cr.																									1			
Kinglet, Ruby-cr.					6	6								1	2			3							6	2	1	2
Bluebird, Western	9	5	2	2	14	19	15		1	1		10	19	17	5		6	13	12	20	12	5	14	28	24	7	9	18
Robin, American	3	3				5	26		3			2	1		1	2	4	6	11	8	6	8			16	3	3	12
Varied Thrush																											30	22
Thrush, Hermit							2									1	1	2							1	1		
Mockingbird, N.	1	1	3	2	4			2		1		6	4		2			1		1			2	6			1	
Starling, European	15	12	9	63	64	978	169	27	12	15	24	6	21	47	4249	3	20	25	24	15	21	15	605	51	101	16	73	102
Pipit, American					1	1									94	7									25		5	
Waxwing, Cedar		16																										
Warbler, Or.-cr.				1					1	1									5									
Warbler, Yellow			3	2										1									3	1				
Warbler, Yellow-r.	6				11	6	4								12	3	3	11	3				3	1	12	2	5	11
Warbler, Towns.						1								3											1			
Warbler, MacGilliv.					1																							
Yellowthroat, C.														1														
Warbler, Wilson's			1	2						3			1															
Grosbeak, Black-h.													1															
Tanager, Western			1																				11					
Bunting, Lazuli												1																
Towhee, Spotted			1		3		1		1	6		2		2		2	3	2	6		6	2	4		8	1	11	8
Towhee, California	7	4	10	4	3	1	6	10	5	3	7	15	8	3	10	5	3	7	9	7	8	12	5	8	3	7	13	3
Sparrow, Grasshop.											1																	
Sparrow, Savannah			13	99	82	69	87	7	16	6	5	4	10	65	69	58	13	11	10	1			4	158	37	13	35	6
Sparrow, Lark			1	2						8		10		1					4		2							
Sparrow, Golden-cr.	2	1			21	22	77	21	5					1	5	21	4	22	14						8	21	47	37

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Sparrow, White-thr.	1						35	1																				
Sparrow, White-cr.	14		6	30	11	19		59	7					46	88	84	102	82	3					18	8	88	157	19
Sparrow, Fox															1											2	1	
Sparrow, Song	7	4	6	23	2		2	9	6	1	16	16	8	21	3	2	2	4	2	10	3	7	6	7	8	3	5	5
Sparrow, Lincoln's			3	4	5		1	7						2			2	4	3					7		5		1
Junco, Dark-eyed	5	8			5	69	54	5		12		6		10	31	22	75	24	6	1	42		21		59	25	199	79
Meadowlark, West.		1	29	62	81	110	211	6	15	29	8	47	26	20	176	150	65	193	17	40	2	17	26	53	37	96	150	43
Cowbird, Brown-h.	1	1						1	1		1								4	4	1			1				
Blackbird, Red-w.	152	243	285	296	3000	2034	153	137	113	269	263	164	45	214	157	167	67	258	182	490	59	25	950	522	110	235	120	125
Blackbird, Brewer's	25	23	1	6	14	2	20	13	15	11	5	17	12	25	59	7		41	16	23	17	13	14	13	10	116	31	15
Oriole, Bullock's	1	1						1		5	3	4							9	6	1							
Finch, Purple																			1									
Finch, House	11	64	24	21	1	22		10	12	19	22	32	49	62	19	9	18	17	22	40	41	108	94	106	31	6	16	6
Goldfinch, Lesser					4					5		5	19	4	3	25		44	16	4	2	2	3	64			19	
Goldfinch, American		2	7	25	3	64		4	6	15	8	26	86	16	28	7	50	30	16	21	26	54	9	57	30	6	16	16
Sparrow, House	7	2	2	2	2	4		9		1	6	2	3		1					1	5	2						
Total No. Counted	498	1,039	617	876	3,564	3,821	973	728	419	692	495	688	507	733	5,204	779	1,417	1,437	745	1,090	504	494	1,966	1,330	781	799	1,435	1,495
Number of Species	56	55	48	48	48	51	38	56	45	59	34	61	44	61	51	60	66	73	70	45	55	46	57	49	60	51	75	75

Table B: Birds Observed in Order of Frequency of Observation, 4/15/06 to 02/21/09
Tolay Lake Regional Park, Sonoma County, California

Species	Number	Species	Number
Blackbird, Red-winged	10,835	Warbler, Yellow-rumped	93
Starling, European	6,782	Scrub-Jay, Western	91
Meadowlark, Western	1,710	Harrier, Northern	84
Finch, House	882	Towhee, Spotted	69
Sparrow, Savannah	878	Owl, Barn	62
Sparrow, White-crowned	841	Jay, Steller's	59
Junco, Dark-eyed	758	Woodpecker, Nuttall's	56
Swallow, Barn	631	Teal, Cinnamon	55
Goldfinch, American	628	Thrush, Varied	52
Swallow, Cliff	574	Sparrow, House	49
Blackbird, Brewer's	564	Curlew, Long-billed	46
Goose, Canada	557	Shrike, Loggerhead	46
Coot, American	505	Egret, Great	45
Killdeer	467	Hawk, Red-shouldered	44
Wigeon, American	461	Sparrow, Lincoln's	44
Quail, California	365	Kingbird, Western	38
Pintail, Northern	342	Turkey, Wild	37
Sparrow, Golden-crowned	329	Mockingbird, Northern	37
Swallow, Tree	318	Sparrow, White-throated	37
Bushtit	291	Titmouse, Oak	33
Bluebird, Western	287	Owl, Great Horned	32
Swallow, Violet-green	270	Hummingbird, Allen's	31
Mallard	256	Wren, House	31
Raven, Common	250	Oriole, Bullock's	31
Goldfinch, Lesser	219	Sandpiper, Least	30
Phoebe, Black	212	Kinglet, Ruby-crowned	29
Sparrow, Song	188	Sparrow, Lark	28
Towhee, California	186	Heron, Great Blue	26
Shoveler, Northern	181	Cormorant, Double-crested	25
Dove, Mourning	179	Snipe, Wilson's (Common)	25
Hawk, Red-tailed	176	Woodpecker, Acorn	25
Vulture, Turkey	174	Wren, Bewick's	25
Dowitcher, Long-billed	162	Nuthatch, White-breasted	21
Pigeon, Rock	153	Pelican, American White	19
Bufflehead	146	Woodpecker, Downy	19
Duck, Ruddy	139	Chickadee, Chestnut-backed	18
Pipit, American	133	Eagle, Golden	17
Kestrel, American	130	Yellowlegs, Greater	16
Kite, White-tailed	127	Waxwing, Cedar	16
Duck, Ring-necked	123	Scaup, Lesser	15
Robin, American	123	Hawk, Cooper's	15
Flicker, Northern	110	Cowbird, Brown-headed	15
Gadwall	103	Goose, Greater White-fronted	14
Phoebe, Say's	103	Scaup, Greater	14
Teal, Green-winged	101	Grebe, Pied-billed	13
Crow, American	101	Moorhen, Common	13
Hummingbird, Anna's	100	Swift, Vaux's	12
Canvasback	96	Tanager, Western	12

Species	Number
Hawk, Rough-legged	11
Flycatcher, Ash-throated	10
Creeper, Brown	10
Warbler, Yellow	10
Merganser, Common	9
Hummingbird, Rufous	9
Vireo, Hutton's	8
Thrush, Hermit	8
Warbler, Orange-crowned	8
Heron, Black-crowned Night	7
Hawk, Sharp-shinned	7
Hawk, Ferruginous	7
Falcon, Peregrine	7
Swallow, N. Rough-winged	7
Warbler, Wilson's	7
Flycatcher, Pacific Slope	6
Merlin	5
Vireo, Warbling	5
Wren, Marsh	5
Warbler, Townsend's	5
Grebe, Eared	4
Duck, Wood	4
Selasphorus sp.	4
Flycatcher, Willow	4
Sparrow, Fox	4
Grebe, Horned	3
Sandpiper, Western	3
Gull, California	3
Kingfisher, Belted	3
Sapsucker, Red-breasted	3
Hawk, Swainson's	2
Falcon, Prairie	2
Tern, Caspian	2
Dove, Eurasian Collared	2
Pigeon, Band-tailed	2
Woodpecker, Hairy	2
Wood-Pewee, Western	2
Heron, Green	1
Teal, Blue-winged	1
Osprey	1
Pheasant, Ring-necked	1
Sora	1
Gull, Glaucous-winged	1
Flycatcher, Olive-sided	1
Flycatcher, Least	1
Lark, Horned	1
Kinglet, Golden-crowned	1
Warbler, McGillivray's	1
Yellowthroat, Common	1

Species	Number
Grosbeak, Black-headed	1
Bunting, Lazuli	1
Sparrow, Grasshopper	1
Finch, Purple	1
Total no. individuals	23,050

Table C: Seasonal Occurrence, Relative Abundance of Bird Species Observed
Tolay Lake Regional Park, Sonoma County, California

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Forest, Riparian, and Brush - breeding/summer resident						
Hummingbird, Allen's	0.0	0.7	3.6	1.0	0.0	0.0
Flycatcher, Olive-sided	0.0	0.0	0.1	0.0	0.0	0.0
Wood-Pewee, Western	0.0	0.0	0.1	0.0	0.3	0.0
Flycatcher, Pacific Slope	0.0	0.0	0.1	0.3	1.3	0.0
Flycatcher, Ash-throated	0.0	0.0	0.6	1.5	0.0	0.0
Wren, House	0.4	0.3	1.3	3.8	0.0	0.7
Kingbird, Western	0.0	0.0	3.3	3.5	0.3	0.0
Vireo, Warbling	0.0	0.0	0.0	0.5	0.7	0.2
Warbler, Orange-crowned	0.0	0.0	1.0	0.0	0.0	0.2
Warbler, Wilson's	0.0	0.0	0.4	0.0	0.3	0.5
Warbler, Yellow	0.0	0.0	0.0	0.0	1.3	1.0
Grosbeak, Black-headed	0.0	0.0	0.0	0.0	0.3	0.0
Tanager, Western	0.0	0.0	0.0	0.0	3.7	0.2
Bunting, Lazuli	0.0	0.0	0.0	0.3	0.0	0.0
Oriole, Bullock's	0.0	0.0	3.3	2.0	0.0	0.0
Total	0.4	1.0	13.9	12.8	8.3	2.7
Forest, Riparian, and Brush - migratory/winter resident						
Flycatcher, Willow	0.0	0.0	0.0	0.0	0.7	0.3
Flycatcher, Least	0.0	0.0	0.0	0.0	0.3	0.0
Warbler, Yellow-rumped	4.0	8.3	1.3	0.0	1.0	6.0
Warbler, MacGillivray's	0.0	0.0	0.0	0.0	0.0	0.2
Swift, Vaux's	0.0	0.0	0.0	0.0	3.3	0.3
Hummingbird, Rufous	0.0	0.7	1.0	0.0	0.0	0.0
Selasphorus sp.	0.0	1.3	0.0	0.0	0.0	0.0
Phoebe, Say's	5.4	2.7	0.0	0.0	4.0	9.3
Kinglet, Ruby-crowned	1.8	1.7	0.0	0.0	0.3	2.3
Thrush, Varied	6.0	7.3	0.0	0.0	0.0	0.0
Waxwing, Cedar	0.0	0.0	2.3	0.0	0.0	0.0
Warbler, Townsend's	0.2	0.0	0.0	0.0	1.0	0.2
Sparrow, Fox	0.6	0.0	0.0	0.0	0.0	0.2
Total	18.0	22.0	4.6	0.0	10.7	18.8
Forest, Riparian, and Brush - year-round resident						
Turkey, Wild	0.0	0.0	1.1	0.8	5.0	1.8
Dove, Mourning	1.6	0.7	7.9	17.3	2.0	6.5
Dove, Eurasian Collared	0.0	0.0	0.1	0.0	0.3	0.0
Pigeon, Rock	2.2	7.0	6.9	2.0	0.7	10.5

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Pigeon, Band-tailed	0.2	0.0	0.0	0.3	0.0	0.0
Hummingbird, Anna's	3.6	3.3	7.1	1.3	1.7	2.0
Phoebe, Black	5.8	1.7	3.7	12.8	10.3	11.7
Jay, Steller's	4.0	3.3	1.0	2.5	2.3	0.8
Scrub-Jay, Western	6.0	2.7	0.6	4.8	4.3	2.8
Titmouse, Oak	2.0	1.3	0.4	2.8	1.0	0.3
Chickadee, Chestnut-backed	0.0	0.7	0.6	1.3	1.3	0.5
Bushtit	17.8	9.3	4.1	4.0	6.7	18.2
Nuthatch, White-breasted	0.8	2.0	0.4	0.5	1.3	0.3
Creeper, Brown	1.2	0.3	0.0	0.0	0.3	0.3
Wren, Bewick's	1.0	2.0	0.7	0.5	1.0	0.7
Robin, American	7.8	7.3	4.0	4.0	0.3	2.8
Thrush, Hermit	0.8	1.0	0.0	0.0	0.0	0.2
Mockingbird, Northern	0.2	0.3	0.9	1.5	2.0	2.8
Kinglet, Golden-crowned	0.0	0.0	0.0	0.0	0.0	0.2
Towhee, Spotted	3.0	4.3	1.9	2.5	2.0	2.0
Towhee, California	6.4	4.3	6.4	10.5	5.3	6.3
Junco, Dark-eyed	73.8	59.3	5.3	12.0	10.3	15.8
Finch, Purple	0.0	0.0	0.1	0.0	0.0	0.0
Finch, House	10.6	13.7	25.4	50.8	68.3	33.7
Sparrow, House	0.8	0.0	2.9	3.8	1.0	1.2
Owl, Barn	1.4	2.0	1.0	3.0	5.0	2.5
Owl, Great Horned	1.2	0.3	0.9	2.5	0.3	1.3
Woodpecker, Acorn	1.2	2.3	0.1	1.3	0.7	0.7
Sapsucker, Red-breasted	0.0	0.3	0.0	0.0	0.3	0.2
Woodpecker, Downy	0.2	0.3	0.1	1.0	2.0	1.0
Woodpecker, Hairy	0.2	0.0	0.0	0.3	0.0	0.0
Woodpecker, Nuttall's	1.2	1.7	2.0	2.0	5.3	1.2
Flicker, Northern	9.6	11.0	0.4	0.5	0.7	3.7
Total	165.0	142.7	86.1	146.0	142.7	132.7
Grassland - breeding/summer resident						
Swallow, Northern Rough-winged	0.0	0.0	0.7	0.0	0.7	0.0
Swallow, Violet-green	0.0	0.3	15.3	11.3	15.7	11.7
Swallow, Tree	2.8	9.0	24.7	19.0	2.7	3.3
Swallow, Cliff	0.0	0.0	59.9	38.8	0.0	0.0
Swallow, Barn	0.0	0.0	65.7	31.5	12.0	1.5
Cowbird, Brown-headed	0.0	0.0	1.7	0.5	0.0	0.2
Sparrow, Grasshopper	0.0	0.0	0.0	0.3	0.0	0.0
Total	2.8	9.3	168.0	101.3	31.0	16.7
Grassland - migratory/winter resident						

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Starling, European	247.8	49.0	17.1	16.5	224.3	756.2
Pipit, American	2.6	0.0	0.0	0.0	0.0	20.0
Meadowlark, Western	143.4	100.3	15.4	18.5	24.0	73.0
Sparrow, Golden-crowned	37.6	21.0	6.1	0.0	0.3	5.7
Sparrow, White-throated	7.0	0.0	0.3	0.0	0.0	0.0
Sparrow, White-crowned	69.6	67.7	11.9	0.0	15.3	26.8
Sparrow, Lincoln's	1.2	2.3	1.4	0.0	0.7	3.2
Total	509.2	240.3	52.3	35.0	264.7	884.8
Grassland - year-round resident						
Quail, California	9.0	9.0	13.4	14.8	9.3	18.7
Pheasant, Ring-necked	0.0	0.0	0.1	0.0	0.0	0.0
Lark, Horned	0.0	0.0	0.0	0.3	0.0	0.0
Bluebird, Western	10.0	12.3	6.9	6.8	16.7	12.5
Shrike, Loggerhead	2.2	1.7	0.7	2.0	1.0	2.3
Raven, Common	12.8	6.7	5.7	6.8	4.7	14.2
Crow, American	5.6	3.7	3.9	1.5	2.0	3.8
Sparrow, Savannah	52.4	10.0	5.7	2.3	26.3	76.3
Sparrow, Song	2.4	3.7	5.6	10.5	11.7	8.2
Sparrow, Lark	0.0	0.0	1.7	3.0	0.3	0.5
Blackbird, Brewer's	35.2	18.7	18.0	13.0	17.0	17.2
Goldfinch, Lesser	8.8	14.7	3.6	2.3	8.7	11.8
Goldfinch, American	18.6	32.0	9.1	28.5	37.0	25.0
Total	157.0	112.3	74.4	91.5	134.7	190.5
Marsh Birds						
Heron, Great Blue	1.6	1.0	0.4	0.5	0.7	1.3
Egret, Great	1.6	1.0	2.0	1.8	1.3	1.5
Heron, Green	0.0	0.0	0.0	0.3	0.0	0.0
Heron, Black-crowned Night	0.0	0.0	0.0	1.3	0.3	0.2
Wren, Marsh	0.2	0.0	0.0	0.3	0.0	0.5
Yellowthroat, Common	0.0	0.0	0.0	0.0	0.3	0.0
Blackbird, Red-winged	541.8	150.0	226.6	127.8	403.0	728.3
Sora	0.2	0.0	0.0	0.0	0.0	0.0
Total	545.4	152.0	229.0	131.8	405.7	731.8
Raptors - migratory/winter resident						
Hawk, Sharp-shinned	0.0	0.0	0.0	0.0	0.0	1.2
Hawk, Cooper's	0.6	1.0	0.3	0.3	0.7	0.7
Hawk, Swainson's	0.0	0.0	0.3	0.0	0.0	0.0
Hawk, Ferruginous	0.6	0.3	0.0	0.0	0.0	0.5
Hawk, Rough-legged	1.2	0.7	0.0	0.0	0.0	0.5
Merlin	0.4	1.0	0.0	0.0	0.0	0.0

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Falcon, Prairie	0.2	0.0	0.0	0.0	0.0	0.2
Falcon, Peregrine	0.2	0.3	0.1	0.3	0.0	0.5
Total	3.2	3.3	0.7	0.5	0.7	3.5
Raptors - year-round resident						
Vulture, Turkey	4.8	9.3	7.0	3.5	7.7	6.0
Harrier, Northern	5.6	0.7	0.3	1.0	7.0	4.5
Kite, White-tailed	5.0	3.3	0.9	3.5	11.0	6.5
Hawk, Red-shouldered	1.4	2.3	0.3	1.3	4.0	1.8
Hawk, Red-tailed	6.8	6.3	4.3	3.3	12.3	7.2
Eagle, Golden	0.6	0.7	0.1	0.8	1.3	0.7
Osprey	0.2	0.0	0.0	0.0	0.0	0.0
Kestrel, American	8.6	4.0	1.0	3.0	7.0	5.8
Total	33.0	26.7	13.9	16.3	50.3	32.5
Shorebirds - migratory/winter resident						
Yellowlegs, Greater	0.0	0.7	2.0	0.0	0.0	0.0
Curlew, Long-billed	6.4	3.3	0.6	0.0	0.0	0.0
Sandpiper, Western	0.0	0.0	0.4	0.0	0.0	0.0
Sandpiper, Least	0.0	0.0	4.3	0.0	0.0	0.0
Dowitcher, Long-billed	0.0	7.7	19.9	0.0	0.0	0.0
Snipe, Wilson's	0.6	2.7	2.0	0.0	0.0	0.0
Killdeer	34.2	5.3	4.0	4.8	3.7	37.0
Total	41.2	19.7	33.1	4.8	3.7	37.0
Waterfowl and Allies - migratory/winter resident						
Grebe, Horned	0.0	0.0	0.4	0.0	0.0	0.0
Grebe, Eared	0.0	1.3	0.0	0.0	0.0	0.0
Pelican, American White	0.0	0.0	0.0	0.0	4.7	0.8
Cormorant, Double-crested.	1.0	0.7	0.7	0.0	0.0	2.2
Goose, Gr. White-fronted	1.2	2.7	0.0	0.0	0.0	0.0
Teal, Blue-winged	0.0	0.0	0.0	0.0	0.3	0.0
Pintail, Northern	0.2	112.3	0.6	0.0	0.0	0.0
Wigeon, American	0.4	149.7	1.4	0.0	0.0	0.0
Shoveler, Northern	0.0	16.7	18.7	0.0	0.0	0.0
Teal, Green-winged	0.2	28.0	2.3	0.0	0.0	0.0
Duck, Ruddy	0.0	46.3	0.0	0.0	0.0	0.0
Canvasback	0.2	31.7	0.0	0.0	0.0	0.0
Scaup, Greater	1.2	2.0	0.3	0.0	0.0	0.0
Scaup, Lesser	2.0	0.0	0.0	0.0	1.7	0.0
Bufflehead	1.6	41.0	2.1	0.0	0.0	0.0
Merganser, Common	1.4	0.7	0.0	0.0	0.0	0.0
Duck, Ring-necked	0.0	41.0	0.0	0.0	0.0	0.0

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Gull, Glaucous-winged	0.2	0.0	0.0	0.0	0.0	0.0
Gull, California	0.6	0.0	0.0	0.0	0.0	0.0
Tern, Caspian	0.0	0.0	0.3	0.0	0.0	0.0
Total	10.2	474.0	26.9	0.0	6.7	3.0
Waterfowl and Allies - year-round resident						
Grebe, Pied-billed	0.0	1.7	1.1	0.0	0.0	0.0
Goose, Canada	59.8	61.3	4.9	0.0	0.0	6.7
Duck, Wood	0.8	0.0	0.0	0.0	0.0	0.0
Mallard	12.2	24.7	11.7	3.5	6.3	1.0
Gadwall	1.8	19.7	5.0	0.0	0.0	0.0
Teal, Cinnamon	0.0	8.3	4.0	0.0	0.7	0.0
Moorhen, Common	0.2	0.0	0.3	1.5	1.0	0.2
Coot, American	1.2	130.3	14.6	0.3	1.3	0.2
Kingfisher, Belted	0.0	0.3	0.0	0.3	0.3	0.0
Total	76.0	246.3	41.6	5.5	9.7	8.0
Total No. Counted	1,561	1,450	744	545	1,069	2,062
Number of Species	55	71	55	49	54	51

Table D: Seasonal Occurrence of Bird Guilds
Tolay Lake Regional Park, Sonoma County, California
(Numbers represent relative abundance)

	Season of Occurrence					
Guilds	**Dec-Jan**	**Feb-Mar**	**Apr-May**	**Jun-Jul**	**Aug-Sep**	**Oct-Nov**
Forest, Riparian, and Brush						
Forest, Riparian, and Brush - breeding/summer resident	0.4	1.0	13.9	12.8	8.3	2.7
Forest, Riparian, and Brush - migratory/winter resident	18.0	22.0	4.6	0.0	10.7	18.8
Forest, Riparian, and Brush - year-round resident	165.0	142.7	86.1	146.0	142.7	132.7
Grassland						
Grassland - breeding/summer resident	2.8	9.3	168.0	101.3	31.0	16.7
Grassland - migratory/winter resident	509.2	240.3	52.3	35.0	264.7	884.8
Grassland - year-round resident	157.0	112.3	74.4	91.5	134.7	190.5
Raptors						
Raptors - migratory/winter resident	3.2	3.3	0.7	0.5	0.7	3.5
Raptors - year-round resident	33.0	26.7	13.9	16.3	50.3	32.5
Waterbirds						
Marsh Birds	545.4	152.0	229.0	131.8	405.7	731.8
Shorebirds	41.2	19.7	33.1	4.8	3.7	37.0
Waterfowl and Allies - migratory/winter resident	10.2	474.0	26.9	0.0	6.7	3.0
Waterfowl and Allies - year-round resident	76.0	246.3	41.6	5.5	9.7	8.0
Relative numbers of individual birds	1,561	1,450	744	545	1,069	2,062
Relative number of Species	55	71	55	49	54	51

Figure 1: Forest, Riparian, and Brush Guild, Birds of Tolay Lake Regional Park

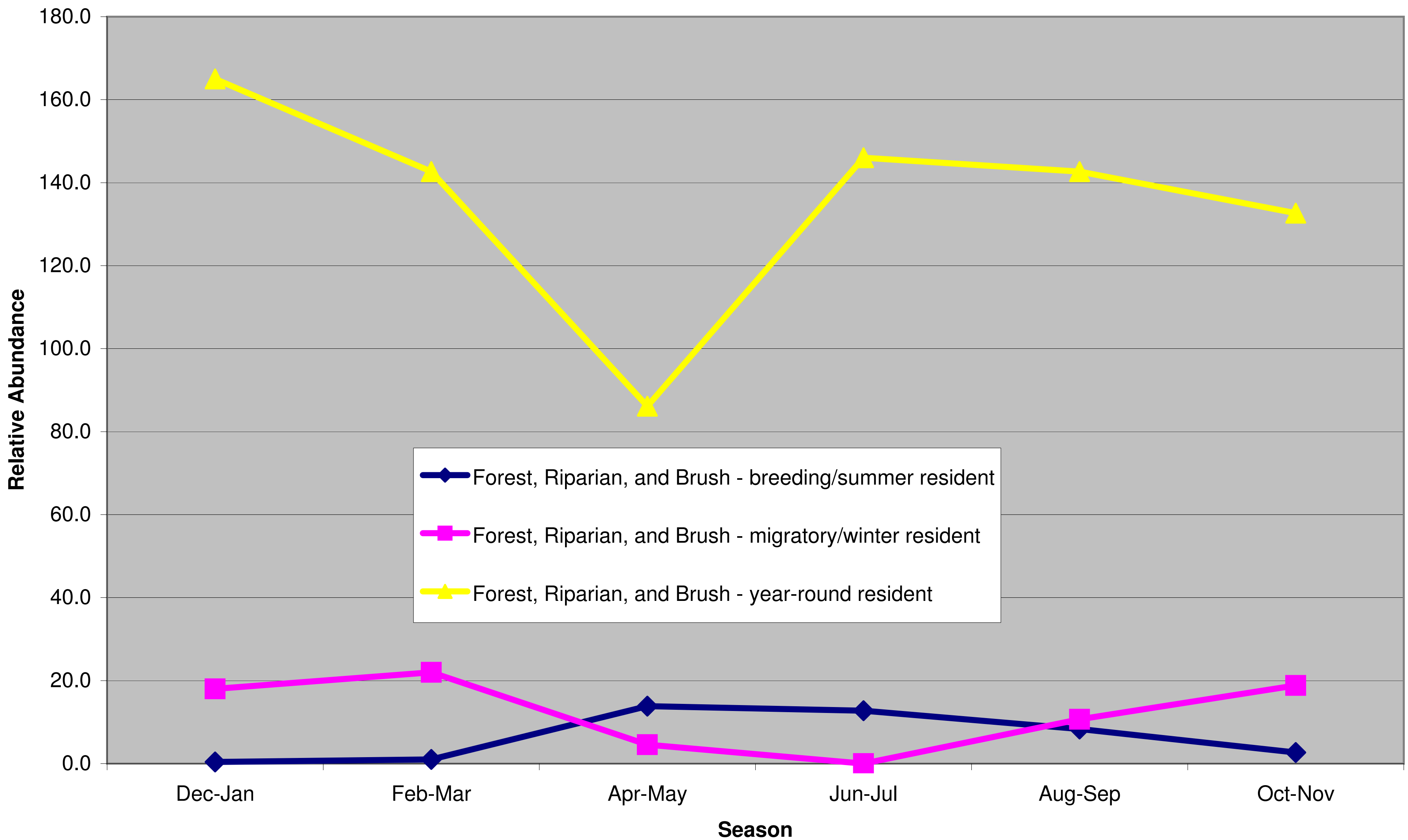

Figure 2: Grassland Guild, Birds of Tolay Lake Regional Park

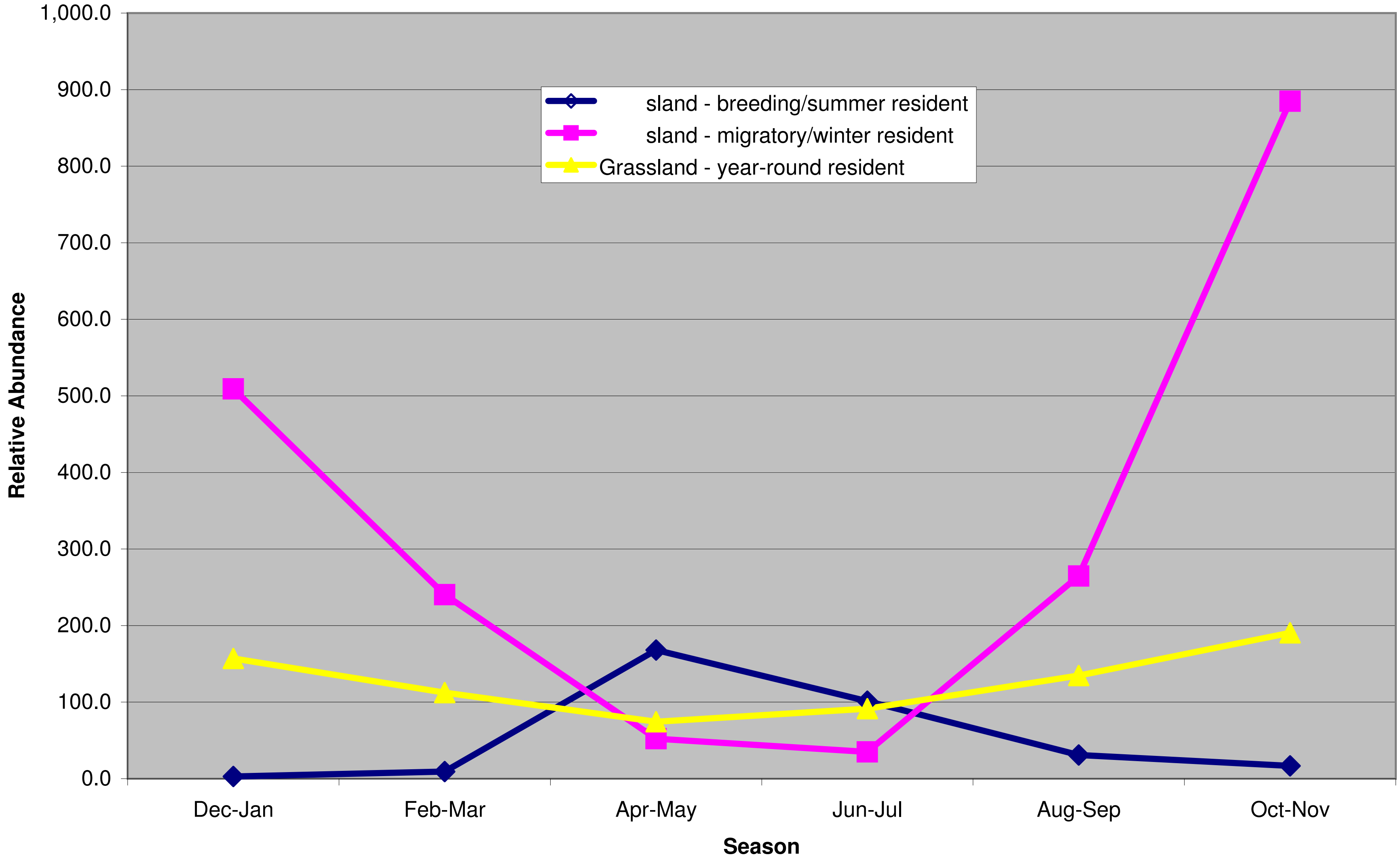

Figure 3: Raptors, Birds of Tolay Lake Regional Park

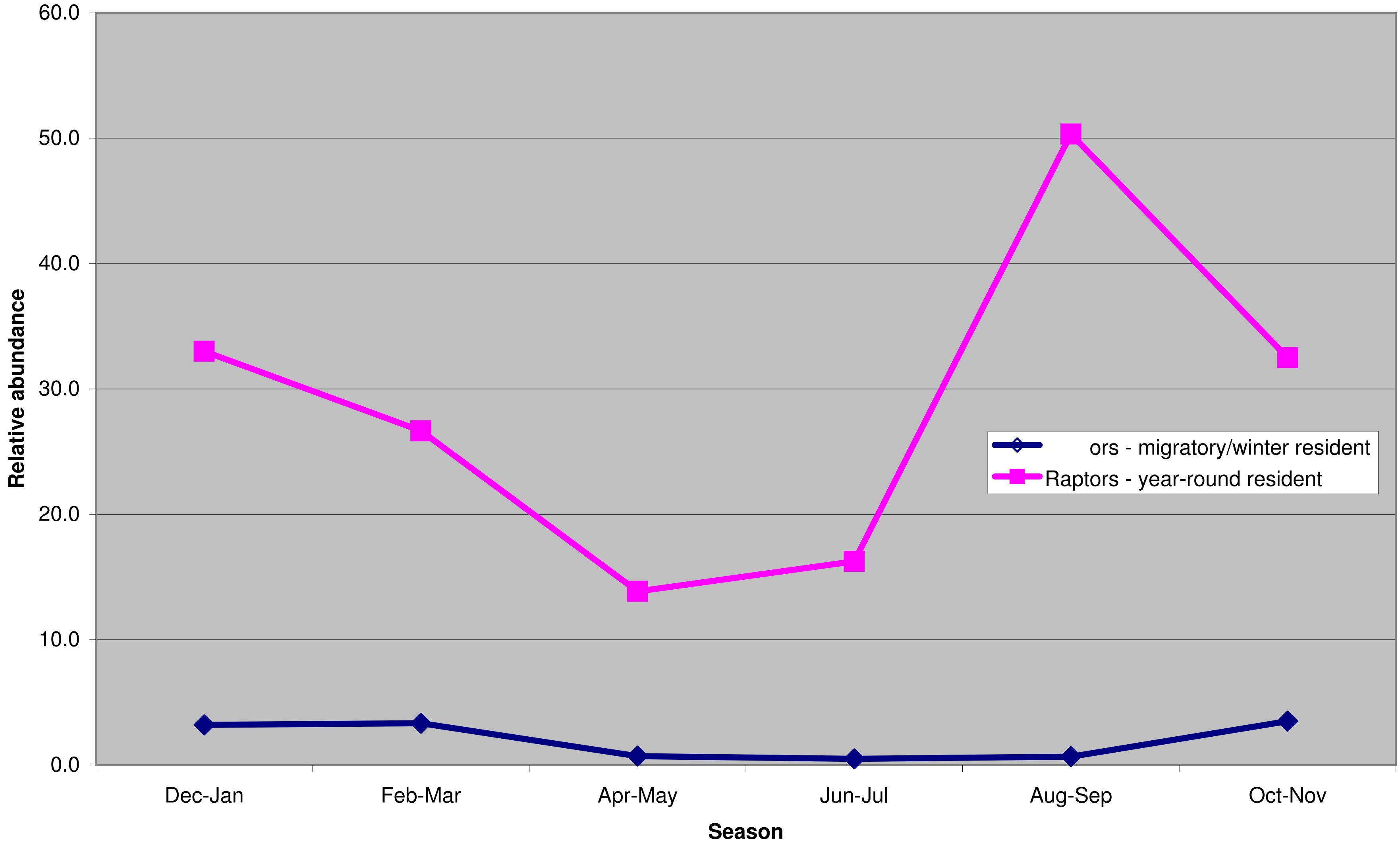

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Figure 4: Waterbirds, Birds of Tolay Lake Regional Park

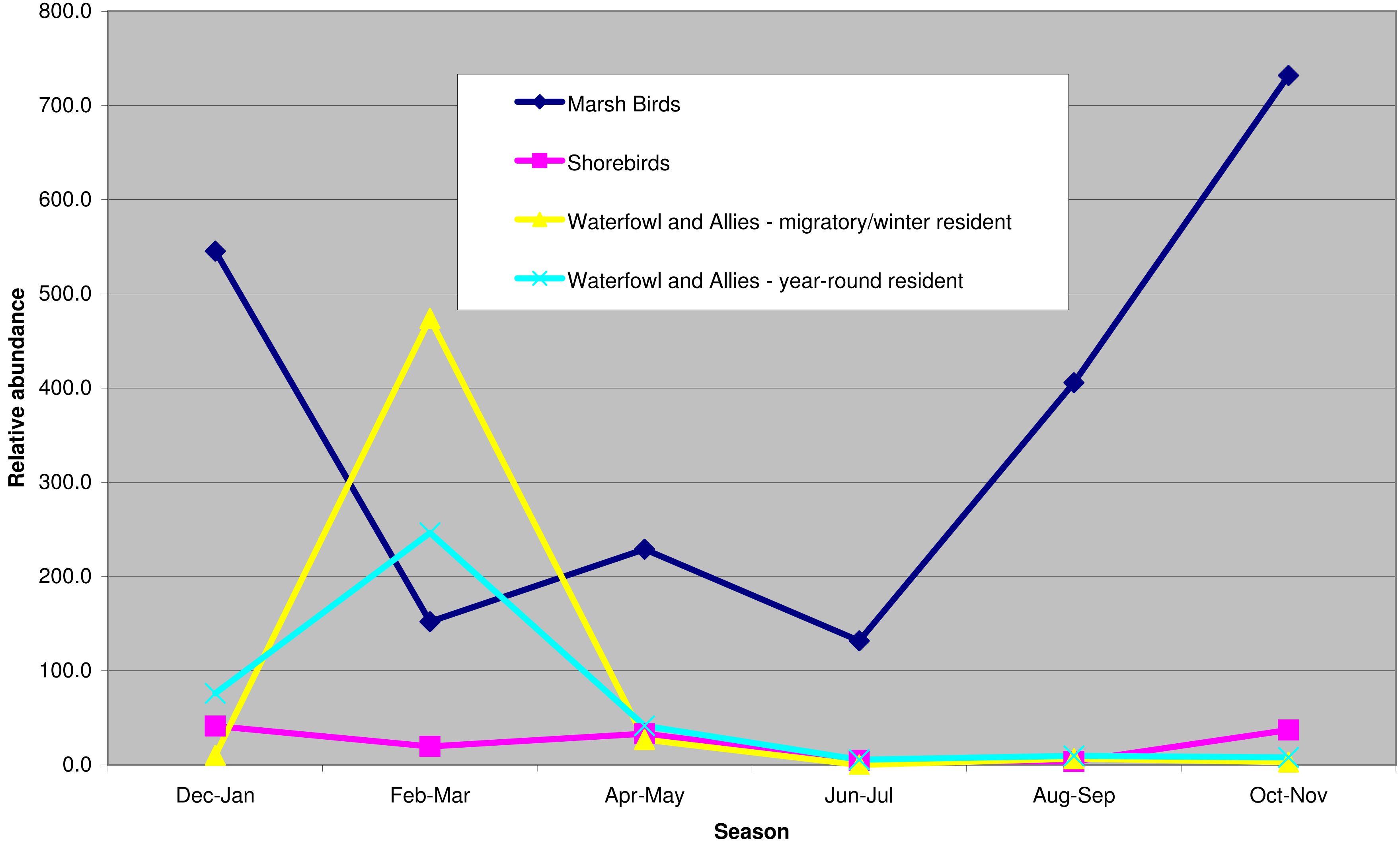

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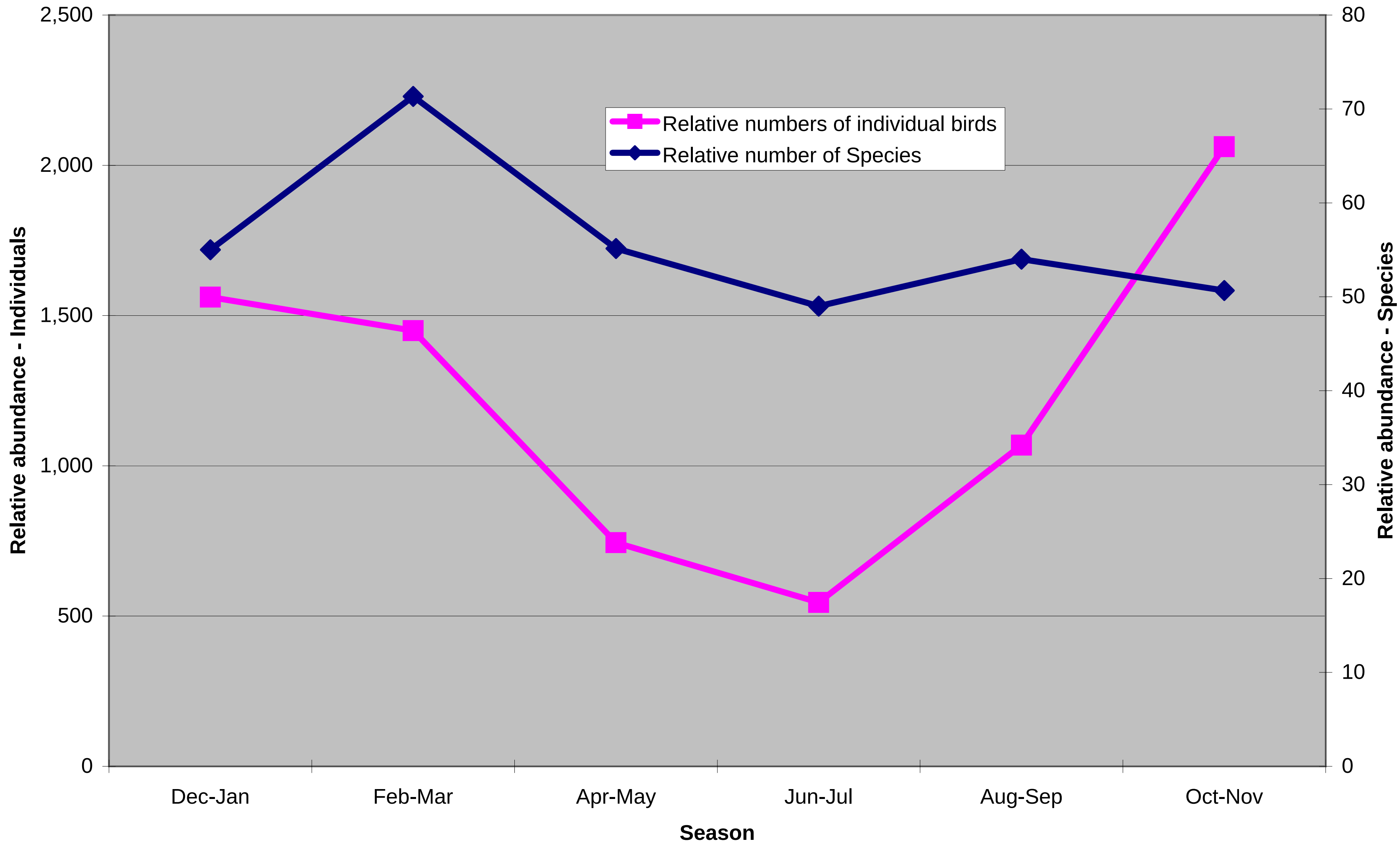
Figure 5: Relative Abundance by Season, Birds of Tolay Lake Regional Park



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BIOLOGICAL RESOURCES STUDY
TOLAY CREEK RANCH
SONOMA COUNTY, CALIFORNIA

Submitted to:

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Santa Rosa, California 95403

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LSA

May 20, 2009

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1.0 INTRODUCTION

1.1 PURPOSE

Tolay Creek Ranch is 1,657 acres and provides a connection between the Cougar Mountain Open Space Easement and Tolay Lake Regional Park. The Sonoma Land Trust commissioned LSA Associates Inc. (LSA) to provide a description of the biological resources of Tolay Creek Ranch. This report provides a detailed discussion and mapping of the vegetation and wildlife values. Management strategies, including weed removal and restoration, are also discussed. The report begins by discussing the setting of Tolay Creek Ranch including its physical characteristics such as topography, geology, soils, and hydrology. LSA also prepared a parallel study of the cultural resources of Tolay Creek Ranch (LSA 2009).

1.2 LOCATION

Tolay Creek Ranch is located on the west side of California State Highway 121, approximately 8 miles south of the city of Sonoma, 7 miles southeast of the city of Petaluma, and 6 miles northeast of the city of Novato, in unincorporated southern Sonoma County, California (Figure 1). Infineon Raceway is immediately to the south of the eastern portion of Tolay Creek Ranch. Direct access to Tolay Creek Ranch is from a gated dirt ranch road (Access Road) intersecting with Highway 121. Other access is available from the Sears Point to Lakeville Road (Mangel Ranch Road) off Highway 121 (Figure 2). Access is also available, with prior permission, through Tolay Lake Regional Park.

1.3 BACKGROUND

Tolay Creek Ranch was acquired from the Roche family in 2008 because of its biological and cultural values and because it provides a key connecting parcel among the adjacent protected lands (SCAPOSD 2006, 2007). Tolay Creek Ranch protects natural and cultural resources, provides important open space, public recreational, and educational opportunities, and preserves the scenic viewshed along Highway 121 (John Bouyea & Associates 2007). Acquisition of Tolay Creek Ranch realized goals and recommendations of thirteen local, regional, state, and federal plans (SCAPOSD 2006). It provides connectivity with the recently acquired 1,737-acre Tolay Lake Regional Park and through the Cougar Mountain open space easement, Sonoma Land Trust' Sears Point Restoration Project (Figure 3). Tolay Creek Ranch is part of the interconnected preserved open space that includes the California Department of Fish and Game's (CDFG) lands including the Napa-Sonoma Marshes Wildlife Area and the U.S. Fish and Wildlife Service's San Pablo Bay National Wildlife Refuge. These parcels contribute significantly to the sustainability of adjacent conservation efforts (Sonoma Land Trust 2007). Together, the protected land makes up a mosaic of over 21,000 acres, including the following nearby properties: Flocchini Ranch, Sleepy Hollow Dairy, Dickson Ranch, Cougar Mountain (open space easement held by Sonoma County), Tolay Lake Regional Park, Sonoma Land Trust's 2,327-acre Sears Point Restoration Project, and the San Pablo Bay National Wildlife Refuge. The entire watershed of the lower portion of Tolay Creek downstream of Tolay

Lake Regional Park is protected in one form or another by public agencies or private conservation organizations (Figure 3).

Tolay Creek Ranch is visible from Highway 121 which was designated a scenic corridor in the 1989 Sonoma County General Plan. The viewsheds of the Tolay Creek Ranch property from its 575-foot tall hilltops can be spectacular on clear days, providing views of San Pablo Bay, Mt. Tamalpais, the Petaluma River basin, the lower portion of the Valley of the Moon, San Francisco, Oakland, Mt. Diablo, and Mt. St. Helena.

The adjacent Tolay Lake Regional Park is nationally recognized as an important prehistoric gathering, foraging, and settlement site and contains many important archaeological resources including charmstones, midden mounds, and burial sites (Pulcheon et al 2008).

Tolay Creek Ranch contains approximately 2.5 miles of creek and riparian corridor. Combined with Tolay Lake Regional Park, it comprises over 50 percent of the entire watershed of Tolay Creek. Tolay Creek drains into San Pablo Bay, a part of the San Francisco Bay Estuary.

The Sonoma Land Trust expects to hold fee title for a period of 2-4 years before transferring title to Sonoma County Regional Parks for annexation to the adjacent Tolay Lake Regional Park. The Sonoma County Agricultural Preservation and Open Space District will retain a perpetual conservation easement over the property to preserve its important biotic and scenic values.

1.4 LAND USE AND HISTORY

Tolay Creek Ranch lies in the ethnographic territory of the Coast Miwok, who are believed to have entered the region about 3,500 years ago. Prior to Coast Miwok habitation of the area, Yukian and Hokan language groups inhabited the region. The Miwok culture utilized wetland areas and expanded more rapidly than the earlier groups (Archeological Resource Services 2003). Nearby Tolay Lake is also known as “Charmstone Lake” due to the large number of prehistoric artifacts recovered from the lakebed after it was drained for farming in the 1870s. The Tolay lakebed is considered one of the most prolific sources of charmstones in the United States. The charmstones are carved rock objects thought to have served ceremonial and/or practical purposes. The stones may have been used to induce favorable fishing and hunting in various ceremonial activities, they may have been used in slingshots to hunt waterfowl, or they may have served as fishing weights or lures. The presence of thousands of charmstones, three prehistoric village sites, numerous middens and other prehistoric sites indicate short- and long-term occupation of the Tolay Lake basin by humans for at least the past 5000 years (Pulcheon et al. 2008).

In 1996, a total of 19 prehistoric sites were recorded within the Tolay Valley. The plethora of sites, many of which are in relatively undisturbed condition and some of which contain human remains, constitute an area which would qualify for listing on the National Register of Historic Places (Pulcheon et al 2008).

When early European settlers arrived in the area in the early to mid 1800s, the Roche property was immediately adjacent to San Pablo Bay. The setting was ideal for settlers as there was ample fresh water and plentiful food supply from nearby Tolay Lake and the tidal marshes along San Pablo Bay. There may be up to four historic home sites at Tolay Creek Ranch, as well as a historic stone wall (B.

J. Roche, pers. comm., 2007). The remains of an old hunting cabin are located just east of Tolay Creek near the northern boundary of Tolay Creek Ranch. The Sears Point to Lakeville Road provides access to Tolay Creek Ranch and to Tolay Lake Regional Park to the northwest. It was historically lined with eucalyptus (*Eucalyptus* sp.) and cypress (*Cupressus* sp.) trees until an extended freeze in the 1950s killed many of them (B. J. Roche, pers. comm., 2007).

Tolay Creek Ranch was likely originally a part of the Petaluma Rancho, which at its largest covered 66,000 acres between Petaluma River and Sonoma Creek from the edge of the Bay northward to about where Glen Ellen is located today (EBA Engineering 2004). The rancho began to be divided into smaller holdings in the mid 1860s. The Roche family purchased their holding in 1978 and has developed vineyards on the eastern most parcels that remain under their ownership. The Tolay Creek Ranch portion, which was purchased by the Sonoma Land Trust, has been leased for cattle grazing to the same operator for at least 25 years. The Tolay Creek Ranch has probably been grazed since the advent of the European colonists.

1.5 REGULATORY CONTEXT

Biological resources on the site may fall under the jurisdiction of various regulatory agencies and be subject to regulations, as described below. In general, the greatest legal protections are provided for formally listed species. Informally listed species and habitats receive lesser legal protection.

1.5.1 Federal Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over federally listed threatened and endangered plant and animal species. The Federal Endangered Species Act (FESA) protects listed species from harm or “take,” broadly defined as to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.” Any such activity can be defined as a “take” even if it is unintentional or accidental.

Section 9 of the FESA and its applicable regulations restrict certain activities with respect to endangered and threatened plants. Nevertheless, these restrictions are less stringent than those applicable to animal species. The provisions of the FESA prohibit the removal of, malicious damage to, or destruction of any listed plant species "from areas under federal jurisdiction." Furthermore, listed plants may not be cut, dug up, damaged or destroyed in, or removed from any other area (including private lands) in known violation of a state law or regulation.

An endangered species is one that is considered in danger of becoming extinct throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Federal agencies involved in permitting projects that may result in take of federally listed species (e.g., U.S. Army Corps of Engineers) are required under Section 7 of the FESA to consult with the USFWS prior to issuing such permits. Any activity that could result in the take of a federally listed species and is not authorized as part of a Section 7 consultation, requires an FESA Section 10 take permit from the USFWS.

In addition to endangered and threatened species, which are legally protected under the FESA, the USFWS has a list of proposed and candidate species. Proposed species are those for which a proposed rule to list them as endangered or threatened has been published in the Federal Register. A candidate species is one for which the USFWS currently has enough information to support a proposal to list it as a threatened or endangered species. Proposed species could be listed at any time, and many federal agencies protect them as if they already are listed. Candidate species are not afforded legal protection under the FESA. A federally-listed plant species occurs and a federally-listed animal species potentially occurs at Tolay Creek Ranch.

1.5.2 Clean Water Act

The U.S. Army Corps of Engineers (Corps) is responsible under Section 404 of the Clean Water Act to regulate the discharge of fill material into waters of the United States. Waters of the United States and their lateral limits are defined in 33 CFR Part 328.3(a) and include streams that are tributaries to navigable waters and their adjacent wetlands. The lateral limits of jurisdiction for a non-tidal stream are measured at the line of the Ordinary High Water Mark (OHWM) (33 CFR Part 328.3[e]) or the limit of adjacent wetlands (33 CFR Part 328.3[b]). Any permanent extension of the limits of an existing water of the United States, whether natural or constructed, results in a similar extension of Corps jurisdiction (33 CFR Part 328.5).

Waters of the United States fall into two broad categories: wetlands and other waters. Other waters include waterbodies and watercourses such as rivers, streams, lakes, springs, ponds, coastal waters, and estuaries. Wetlands include marshes, wet meadows, seeps, floodplains, basins, and other areas experiencing extended seasonal or permanent soil saturation. Seasonally or intermittently inundated features, such as seasonal ponds, ephemeral streams, and tidal marshes, are categorized as wetlands if they have hydric soils and support wetland plant communities. Seasonally inundated waterbodies or watercourses that do not exhibit wetland characteristics are classified as other waters of the United States.

Wetlands and other waters that cannot trace a continuous hydrologic connection to a navigable water of the United States are not tributary to waters of the United States. These are termed “isolated” wetlands and waters. Isolated wetlands and waters are jurisdictional when their destruction or degradation can affect interstate or foreign commerce (33 CFR Part 328.3[a]). The Corps may or may not take jurisdiction over isolated wetlands, depending on the specific circumstances.

In general, a Section 404 permit must be obtained from the Corps before filling or grading wetlands or other waters of the United States. Certain projects may qualify for authorization under a Nationwide Permit (NWP). The purpose of the NWP program is to streamline the evaluation and approval process throughout the nation for certain types of activities that have only minimal impacts to the aquatic environment. Many NWPs are only authorized after the applicant has submitted a pre-construction notification (PCN) to the appropriate Corps office. The Corps is required to consult with the USFWS and/or NOAA-Fisheries under Section 7 of the ESA if the permitted activity may result in the take of federally listed species.

All Corps permits require state water quality certification under Section 401 of the Clean Water Act. This regulatory program for the property is administered by the San Francisco Bay Regional Water Quality Control Board (RWQCB). Projects that propose to fill wetlands or other waters of the United States must apply for water quality certification from the RWQCB. The RWQCB has adopted a policy requiring mitigation for any loss of wetland, streambed, or other waters of the United States. Tolay Creek, its tributaries, and adjacent wetlands would be considered waters of the United States.

1.5.3 Porter-Cologne Water Quality Control Act

Under this Act (California Water Code Sections 13000–14920), the RWQCB is authorized to regulate the discharge of waste that could affect the quality of the State's waters. Therefore, even if a project does not require a federal permit, it may still require review and approval by the RWQCB (e.g., for impacts to isolated wetlands and other waters). Most projects in waters of the state require permits. Examples of projects include installation of culverts, check dams, construction of in-stream stock ponds, and repair of eroding banks, etc. When reviewing applications, the RWQCB focuses on ensuring that projects do not adversely affect the "beneficial uses" associated with waters of the State. Such beneficial uses can include maintenance of water quality, ground water recharge, wildlife habitat, etc. In most cases, the RWQCB seeks to protect these beneficial uses by requiring the integration of water quality control measures into projects that will require discharge into waters of the State. For most construction projects, the RWQCB requires the use of construction and post-construction Best Management Practices (BMPs). Tolay Creek, its tributaries, and adjacent wetlands would be considered waters of the State. Isolated waters may not occur at Tolay Creek Ranch, but they would also be considered waters of the State.

1.5.4 Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) prohibits the taking, hunting, killing, selling, purchasing, etc. of migratory birds, parts of migratory birds, or their eggs and nests. As used in the MBTA, the term "take" is defined as "to pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires." Most bird species native to North America are covered by this act including those birds that occur at Tolay Creek Ranch with the exception of the non-native European starling, house sparrow, and any other non-native species.

1.5.5 California Endangered Species Act

The California Department of Fish and Game (CDFG) has jurisdiction over threatened or endangered species that are formally listed by the State under the California Endangered Species Act (CESA). The CESA is similar to the FESA both in process and substance; it is intended to provide additional protection to threatened and endangered species in California. The CESA does not supersede the FESA, but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both state and federal laws apply) or under only one act. A candidate species is one that the Fish and Game Commission has formally noticed as being under review by CDFG for addition to the State list. Candidate species are protected by the provisions of the CESA.

If a proposed project would result in impacts to a State-listed species, an "incidental take" permit pursuant to section 2081 of the Fish and Game Code would be necessary. CDFG will issue an incidental take permit only if:

1) The authorized take is incidental to an otherwise lawful activity;

2) the impacts of the authorized take are minimized and fully mitigated;
3) the measures required to minimize and fully mitigate the impacts of the authorized take:
a) are roughly proportional in extent to the impact of the taking on the species;
b) maintain the project applicant's objectives to the greatest extent possible; and,
c) capable of successful implementation; and,
4) adequate funding is provided to implement the required minimization and mitigation measures and to monitor compliance with, and the effectiveness of, the measures. Such a process would be required for effects to the state-listed plant species that occurs occurs at Tolay Creek Ranch.

1.5.6 California Fish and Game Code

The CDFG is also responsible for enforcing the California Fish and Game Code, which contains several provisions potentially relevant to construction projects. For example, Section 1602 of the Fish and Game Code governs the issuance of Lake and Streambed Alteration Agreements by the CDFG. Lake and Streambed Alteration Agreements are required whenever project activities substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated as such by the CDFG. Tolay Creek and its tributaries would be subject to section 1600 of the Fish and Game Code.

The Fish and Game Code also lists animal species designated as Fully Protected, which may not be taken or possessed. The Fully Protected designation does not allow "incidental take" and is thus more restrictive than the CESA. Fully Protected species are listed in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the Fish and Game Code, and section 500-5002 protects desert tortoise. Fully Protected species occur on Tolay Creek Ranch.

Section 3503 of the Fish and Game Code prohibits the take, possession, or needless destruction of the nest or eggs of any bird. Subsection 3503.5 specifically prohibits the take, possession, or destruction of any birds in the orders Falconiformes (hawks and eagles) or Strigiformes (owls) and their nests. These provisions, along with the federal MBTA, essentially serve to protect nesting native birds. Non-native species, including European starling and house sparrow, are not afforded any protection under the MBTA or California Fish and Game Code. As with the MBTA, the other bird species that occur at Tolay Creek Ranch would be protected by the California Fish and Game code.

1.5.7 California Environmental Quality Act

The California Environmental Quality Act (CEQA) applies to "projects" proposed to be undertaken or requiring approval by State or local governmental agencies. Projects are defined as having the potential to have a physical impact on the environment. Such projects that would be undertaken by the Sonoma Land Trust or the Sonoma County Regional Parks Department would be subject to CEQA. Under Section 15380 of CEQA, a species not included on any formal list "shall nevertheless be considered rare or endangered if the species can be shown by a local agency to meet the criteria" for listing. With sufficient documentation, a species could be shown to meet the definition of rare or endangered under CEQA, which would lower the threshold of significance for project impacts. Section 15380 of CEQA may apply to some of the species that occur at Tolay Creek Ranch, but are not formally listed. These species are *species of special concern*, species on the *List of Special*

Animals or species on the California Native Plant Society's lists.Being on these lists does not automatically qualify a species for coverage under CEQA; they must meet the criteria for listing.

1.5.8 State Species of Special Concern

The CDFG maintains an informal list of *species of special concern* (Jennings and Hayes 1994, Shuford and Gardali 2008, Williams 1986), *list of special vascular plants, bryophytes, and lichens* (CDFG 2007a), and *list of special animals* (CDFG 2007b). These are broadly defined as species that are of concern to the CDFG because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California. These species are inventoried in the California Natural Diversity Data Base (CNDDB) regardless of their legal status. Impacts to *Species of special concern* may be considered significant under CEQA. *Species of Special Concern* potentially occur on Tolay Creek Ranch.

1.5.9 Special Animals List

The animals on the special animals list are those species that the California Department of Fish and Game considers to be of greatest conservation need and are considered special-status species. These species are either listed or candidates for listing under the federal or state endangered species acts, species that meet the criteria for listing, species that are state species of special concern, taxa that are biologically rare, very restricted in distribution, declining throughout their range, or have a vulnerable stage in their life cycle that warrents monitoring, or taxa that are on the periphery of their range and are threatened with their extirpation in Califoria. This list of special animals is at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/spanimals.pdf. Species that are on the List of Special animals and potentially occur at Tolay Creek Ranch are discussed in section 5 *Special-status Species*.

1.5.10 California Native Plant Society

The non-governmental California Native Plant Society (CNPS) has developed lists of plants of concern in California (CNPS 2008). A CNPS List 1A plant is a species, subspecies, or variety that is considered to be extinct. A List 1B plant is considered rare, threatened, or endangered in California and elsewhere. A List 2 plant is considered rare, threatened, or endangered in California but is more common elsewhere. A List 3 plant is potentially endangered but additional information on taxonomy, rarity, and endangerment is needed. A List 4 plant has a limited distribution but is presently not endangered. Impacts to List 1B and List 2 plants are frequently considered significant under CEQA, depending on the lead agency. Plants on Lists 3 and 4 may be evaluated on a case-by-case basis to determine significance thresholds under CEQA. A CNPS list 4 species occurs at Tolay Creek Ranch and other species on the CNPS lists may also occur there.

2.0 METHODS

LSA reviewed the CDFG's California Natural Diversity Data Base (CNDDB 2008), LSA's draft biological report on Tolay Lake Regional Park (LSA 2008a) and other relevant environmental documents (Parsons 1996) for records of special-status species in the area of Tolay Creek Ranch. The CNDDB query included both plants and animals in the Cotati, Glen Ellen, Novato, Petaluma, Petaluma River, San Geronimo, Sears Point, and Sonoma USGS quadrangles. Based on this review, a list of 34 special-status plant species was compiled for focusing survey efforts. This list was used to help focus survey efforts by documenting blooming periods and habitat affinities of special-status plant species. Aerial photos and global positioning (GPS) technology were used for mapping vegetation types, habitats, and special-status species occurrences.

The survey area encompassed the entire Tolay Creek Ranch site. The surveys were conducted by walking 100 to 200-foot-wide transects in the focus areas of the site and in areas that provided potentially suitable habitat for special-status species. Areas outside of focus areas were less intensively surveyed. These focus areas are the existing ranch roads, the entry points to Tolay Creek Ranch, Roche Domestic Springs, and Lower Tolay Valley.

2.1 PLANT SURVEYS

Four LSA botanists (Clint Kellner, Greg Gallaugher, Steve Cochrane, and Zoya Akulova) participated in the botanical surveys of Tolay Creek Ranch. Early season surveys (March 28, April 1, 5, 11, May 10, 16. 19, 21, 22, 23, 26, and 27) were conducted by a team of two or three botanists and late season surveys (June 18, 19, and October 24, 2008) were conducted by one or two botanists. Late season surveys were conducted by checking the habitats of late blooming special-status plant species such pappose tarweed (*Centromadia parryi* ssp. *parryi*) and other species associated with seeps or wetlands.

The special-status fragrant fritillary (*Fritillaria liliacea*) often grows in association with the common Fremont's star lily (*Zigadenus fremontii*), and populations of the star lily were examined for fragrant fritillary.

Plants were identified using dichotomous keys in the Jepson Manual (Hickman 1993), and the Flora of Sonoma County (Best et al.1996). Plants collected in the field were also identified by comparing them to images from Calphotos and Google Images and to pressed specimens housed at the UC Berkeley and Jepson Herbaria. Botanical nomenclature is according to the Jepson Manual (Hickman 1993).

Tolay Creek Ranch is a rich site with respect to biological resources. Emphasis during the surveys was placed on searching for special-status plants and mapping wetland, native grassland, and weeds, especially on serpentine substrates. Because of the large size of the property, the mapping provides an indication of the richness of Tolay Creek Ranch with the focus areas more completely covered than others. Each of the areas of Tolay Creek Ranch was visited but not necessarily thoroughly sampled.

The goal of the sampling was to determine species and vegetation types in sufficient detail to guide the management of Tolay Creek Ranch.

2.2 WETLANDS

2.2.1 Wetland Identification Methodology

Field investigations of potential wetlands occurring on the property were conducted by surveying areas for hydrophytic vegetation. Hydrophytic plant species are listed by the USFWS in *National List of Plant Species that Occur in Wetlands* (Reed 1988). The *National List* identifies five categories of plants according to their frequency of occurrence in wetlands. The categories are:

Obligate wetland plants (OBL)	Plants that occur almost always in wetlands.
Facultative wetland plants (FACW)	Plants that usually occur in wetlands.
Facultative plants (FAC)	Plants that are equally likely to occur in wetlands or non-wetlands.
Facultative upland plants (FACU)	Plants that usually occur in uplands.
Obligate upland plants (UPL)	Plants that occur almost always in non-wetlands.

An area is considered to meet the hydrophytic vegetation criterion when more than 50 percent of the dominant species in each stratum (e.g., tree, shrub, and herb) present are in the obligate wetland, facultative wetland, or facultative categories.

2.2.2 Field Methodology

LSA surveyed wetlands in conjunction with conducting the botanical surveys. Potential wetland boundaries were mapped using three different methods: 1) by following vegetation and land forms; 2) tracing features on the aerial ortho-photo; and/or 3) using the GPS. A scale of 1-inch equals 400 feet aerial ortho-photo map of Tolay Creek Ranch and GPS units were used in the field for mapping purposes. Some of the GPS units were accurate to within 1 meter (39 inches) while other GPS units were accurate to within 3-5 meters.

Wetlands and other waters potentially subject to regulation were identified predominantly by the presence of basins, ditches or other depressed topographic features, and by the presence of hydrophytic vegetation. Drainage features were considered to be potentially jurisdictional if they contained water at the time of the survey, exhibited scour, shelving, a low-flow channel, debris deposits at the side of the channel, or otherwise showed evidence of prolonged flow.

2.3 ANIMAL SURVEYS

Surveys consisted of traversing selected areas of the site by foot while recording animal observations in field notes and noting areas of particular habitat value on aerial photos. These selected areas included representative examples of the existing habitats (e.g., Tolay Creek, oak woodland, grassland, riparian woodland) of Tolay Creek Ranch. Survey dates are the same as the botanical survey dates. Portions of Tolay Creek were surveyed on April 1and October 24, 2008.

Nomenclature used in this report for amphibians and reptiles conforms to Crother et al. (2000, 2003), while nomenclature for mammals conforms to Baker et al. (2003). Nomenclature for special-status species conforms to the CNDDB (2008). Scientific names of bird species are not provided in the text because English vernacular names are standardized in the American Ornithologists' Union (AOU) *Check-list of North American Birds* and supplements through the 49^{th} (AOU 2008 and Banks et al 2008).

3.0 PHYSICAL SETTING

3.1 TERRAIN AND HYDROLOGY

Tolay Creek Ranch is comprised of flat, rolling, and moderately steep terrain and is largely bounded by two ridges: the East Ridge and the West Ridge. These ridges separate the Petaluma River Valley and Sonoma Creek. The relatively level areas of Tolay Creek Ranch are located in the Lower Tolay Valley and along Highway 121. Nichols and Wright (1971) have mapped the presumed edge of San Pablo Bay just south of Highway 121 in the vicinity of Tolay Creek Ranch. An examination of the vegetation immediately south of Highway 121 surrounding Tolay Creek and a small watercourse to the east of Tolay Creek indicates that the elevation appears to be too high for salt marsh. Tolay Creek and the other watercourse are not tidal at Highway 121 and the vegetation is not salt marsh at the edges of these watercourses indicating that this portion of Tolay Creek Ranch was most likely grassland and seasonal wetland historically.

Tolay Creek, flowing from northwest to southeast, transects the center of Tolay Creek Ranch, before forming the approximate property boundary in the southeast portion of the Ranch (Figure 2). The majority of Tolay Creek Ranch drains into Tolay Creek, which is primarily a dry creek bed with a few isolated pools by early fall (during dry years). A small area of the northern portion of the West Ridge drains to the Petaluma River. Numerous seasonal creeks, springs and seeps are located on the relatively steep slopes of the Tolay Creek Ranch on either side of Tolay Creek. Elevations range from approximately 20 feet above sea level on the floor of Lower Tolay Valley at the Hwy 121 bridge to approximately 560 feet on the ridges on either side of Tolay Creek. The highest elevation on Tolay Creek Ranch is 575 feet at a rock outcrop along the southwestern property line.

The Tolay Lake basin is located just upstream of Tolay Creek Ranch to the northwest. The natural hydrology of the lake basin was altered in the mid 1800s by removing the natural dam and constructing drainage ditches for the purpose of farming the lakebed. Historically, the lake was seasonally variable and could have sustained a lake 14 feet deep before spilling over into Tolay Creek (Kamman Hydrology andEngineering 2003). During most years, Tolay Lake likely functioned as a large seasonal, semi-permanent marsh. During years of heavy rainfall, Tolay Lake likely existed as a permanent wetland. The lake was probably an important source of freshwater for human populations and wildlife well into the dry summer months. During the wet season of recent years, Tolay Lake typically reaches 4 to 8 feet in the deepest locations, although much of it ranges from 2 to 3 feet deep. The lake has historically been pumped dry during the spring to accommodate farming operations. Sonoma County Regional Parks is currently developing a master plan for Tolay Lake Regional Park, which will include restoration of Tolay Lake to a portion of its historic extent.

3.2 SOILS AND EROSION

The Sonoma County Soil Survey (USDA 1972) classifies soils on Tolay Creek Ranch into four soil map types: Clear Lake Clay Loam (CcA), Diablo Series (DbC, DbD, DbE, and DbE2), Goulding Series (GlD and GoF), Montara loam (MoE), and gullied land (GuF) (Figure 4).

Clear Lake Clay Loam occurs in the relatively level area along Tolay Creek and is formed under poorly drained conditions. It has a clay loam surface layer, 10 –15 inches in depth, underlain by clay. Vegetation is primarily annual and perennial grasses and forbs. The Diablo series occupies most of the slopes at Tolay Creek Ranch. It typically has low permeability, high runoff potential, and high shrink-swell potential.

The Diablo series has high erosion potential that increases with steepness. The Goulding-Toomes Complex soil consists of clay and rocky loam on varying slope with moderate permeability and medium or high runoff and erosion potential.

Land use is primarily rangeland. Gullied land consists of gently sloping to steep, rounded hills that have been damaged by erosion. It typically occurs where excess runoff, caused by overgrazing by livestock or unusually heavy storms, has cut into natural water courses on hillsides (USDA 1972). It is mapped in the southern portion of the West Ridge by the USDA (1972), but LSA also mapped some gullied land on the East Ridge (Figure 4). Gullies occur elsewhere on Tolay Creek Ranch, but are not as large as those mapped on Figure 4.

The Montara cobbly clay loam is located within the southwest portion of Tolay Creek Ranch. These soils are well drained and underlain by weathered serpentine. Some segments of Tolay Creek are severely eroded, with exposed, nearly vertical banks and gullying is occurring on many of the tributaries of Tolay Creek. The New Years Day 2006 flood event in the area caused extensive erosion on the site as well as other watersheds in the area (B. J. Roche, pers. comm., 2007).

3.3 GEOLOGY

The geology within the area is complex, consisting of several geologic formations, landslides and faults (California Department of Conservation, California Geologic Survey. 2002). The northeast portion of Tolay Creek Ranch is predominantly made up of Donnell Ranch Volcanics, consisting of rhyolite, basalt and basaltic andesite lava flows, breccias, and scoria. The southeastern portion of Tolay Creek Ranch consists of the Petaluma Formation which is predominantly a lacustrine and fluvial deposit consisting of siltstone, sandstone, shale, and conglomerate with minor amounts of tuff, chert, lignite, and limestone. The southwest portion of Tolay Creek Ranch consists of serpentinized ultramafic rock. The Franciscan Complex mélange makes up the northwestern portion of Tolay Creek Ranch. The Franciscan complex is a tectonic mixture of resistant rock including sandstone, greenstone, chert, gabbro, and exotic metamorphic rock. The Lower Tolay Valley consists primarily of alluvial deposits.

Numerous Quaternary landslides are located on the steeper slopes throughout Tolay Creek Ranch (Koenig 1963). The Roche-Cardoza fault transects the northern portion of Tolay Creek Ranch. The Tolay Fault Zone ia a 600 meter wide area of imbricate thrust faults. The Rogers Creek Fault is roughly parallel to Tolay Creek and is located in the vicinity of the East Ridge through the length of Tolay Creek Ranch.

3.4 CLIMATE

Sonoma County has a Mediterranean climate with typically dry summers and mild, wet winters. The climate near San Pablo Bay is heavily influenced by the Pacific Ocean and is characterized by mild seasonal temperatures, prevailing west to northwest winds, and frequent heavy fog. Temperatures tend to be more extreme further away from the mitigating effects of the Bay. Local southerly winds may also develop seasonally due to differential heating between Tolay Lake, Sonoma Creek valley, Petaluma River valley, and San Pablo Bay. Median annual precipitation is approximately 22.5 inches, but this amount varies widely with a maximum of 49.8 inches and a minimum of 9.7 inches over the period from 1914 to 1997 (Kamman Hydrology and Engineering, Inc. 2003).

3.5 EXISTING INFRASTRUCTURE

Improvements on Tolay Creek Ranch are primarily associated with ranch operations. Both perimeter and interior fencing are in various states of repair, and a network of unimproved seasonal ranch roads is in various states of condition. There are two at grade crossings of Tolay Creek that are currently used. One crossing is beneath the entrance road and another one is at the gate just south of the former crossing at the old bridge at the boundary with Tolay Lake Regional Park. This former crossing at the Sears Point to Lakeville Road is overgrown with willow trees and is in disrepair. Several culverts are under the Sears Point to Lakeville Road along the northeast side of Tolay Creek. There are no structures on Tolay Creek Ranch with the exception of a small shed near the southern-most Tolay Creek crossing and the remains of a hunting shack constructed by a previous ranch owner near the northern-most Tolay Creek crossing. Numerous developed springs occur throughout Tolay Creek Ranch that provide water for livestock and supply water to the reservoir (through the 6-inch pipe) on the adjoining property retained by the Roche’s for vineyard use. The 4-inch pipes serve the water tanks for the house at the Roche’s property. There is no power on Tolay Creek Ranch; the water is gravity-fed through pipes to the off-site reservoir.

4.0 VEGETATION AND WILDLIFE VALUES

This section describes the vegetation and wildlife values of Tolay Creek Ranch. The characteristics of the vegetation are mentioned such as dominant and associated species, height and cover and size of trees. The animal species that are most likely to occur in those vegetation types are also discussed. Table A provides a list of the plant species observed within Tolay Creek Ranch and Table B provides a list of the animal species observed within Tolay Creek Ranch.

4.1 WOODLAND

The native woodland vegetation consists of coast live oak woodland (coast live oak, California bay, California buckeye), valley oak woodland (valley oak), riparian woodland (arroyo willow, sandbar willow, and/or red willow) or quite often, a combination of these vegetation types. Separating these woodland types on Figures 5a and b would be a time-consuming process because of the small size of the stands of these vegetation types and the frequency of their occurrence together. Non-native trees consist of blue gum (*Eucalyptus globulus*), black acacia (*Acacia melanoxylon*), and Monterey cypress (*Cupressus macrocarpa*).

4.1.1 Botanical Values

4.1.1.1 Oak Woodland. Oak woodland occurs mostly in small stands along Tolay Creek and its tributaries although a relatively large stand occurs along a bench of a slope of the West Ridge (Figure 5a). The West Ridge supports more oak woodland than the East Ridge (Figure 5a). This plant community is dominated by coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*) with scattered California buckeye (*Aesculus californica*). The coast live oak trees are large with trunk diameters averaging or exceeding 2 feet diameter at breast height (dbh) as measured 4.5 feet from the ground surface. Tree height averages 30 feet or less. Many factors can affect the size of trees including amount of water stress, nutrient availability, and disease. Age of similar sized or larger trees at Olompali State Historic Park is less than 70 years.

Shrubby species of the understory of oak woodland include poison oak (*Toxicoendron diversilobum*), snowberry (*Symphoricarpos album*), and occasionally California rose (*Rosa californica*). Herbaceous species of the understory of oak woodland include miner's lettuce (*Claytonia perfoliata*), hedge nettle (*Stachys* sp.), Dutchman's pipe (*Aristilochia californica*), and Pacific sanicle (*Sanicula crassicaule*). Table A provides a comprehensive list of the plant species observed within Tolay Creek Ranch.

Valley oak (*Quercus lobata*) trees grow in small stands along Tolay Creek. These trees are large, 2 – 4 feet dbh, and approximately 40 feet tall. They grow in single species stands or in association with coast live oak and/or willow (*Salix* spp.) trees. Understory is composed of non-native grassland. Mistletoe (*Phoradendron villosum*) occurs on the branches of some trees.

4.1.1.2 Blue Gum Trees. Small stands of non-native blue gum grow on the West Ridge and along a tributary to Tolay Creek (Figures 6a and b). A few blue gum trees grow at the southern end of the East Ridge with ornamental shrubs (Figure 6a). These trees are large and provide a complete canopy cover.

4.1.1.3 Monterey Cypress. Monterey cypress is only native to the Monterey Peninsula, but has been planted ornamentally throughout California. It grows in a row in one location beside Tolay Creek. These trees are quite large; are greater than 2 feet in diameter and taller than 40 feet (Figure 6a).

4.1.2 Wildlife Values

Oak woodlands are one of the most species-rich wildlife habitats in California, primarily due to their production of acorns, which are an important food source for a variety of wildlife (CalPIF 2002). The ecological relationship between birds and oaks can often be reciprocal when species such as western scrub-jay and Steller's jay disperse acorns. Large oak trees also provide cover and nest sites for both cup-nesting and cavity-nesting birds, and are used as caching sites for the storage of acorns by acorn woodpeckers (CalPIF 2002). Such trees also provide nest sites for raptors. Bullock's oriole was observed in a valley oak in the spring and presumably nested on-site.

Mature trees and snags provide potential roost sites for bat species known to occur in the region. Although not detected by LSA, Yuma myotis (*Myotis yumanensis*), little brown myotis (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), and pallid bat (*Antrozous pallidus*) could potentially occur in the oak woodlands on-site. Black-tailed deer (*Odocoileus hemionus*), while not restricted to oak woodlands, browse upon the foliage provided by the lower tree branches and take shelter there. Other mammal species likely to use this habitat include northern raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), gray fox (*Urocyon cinereoargenteus*), Virginia opossum (*Didelphis virginiana*), and striped skunk (*Mephitis mephitis*).

Oak woodlands typically occur on north-facing and east-facing slopes, where precipitation is concentrated and moisture is lost less rapidly to evaporation. As a result of these relatively dense and moist conditions, salamanders often occur in oak woodlands on north-facing slopes. Although not detected by LSA, salamander species typically observed in oak woodlands within this region include California slender salamander (*Batrachoseps attenuatus*) and arboreal salamander (*Aneides lugubris*). Common reptiles expected within oak woodland include the western skink (*Plastiodon skiltonianus*), southern alligator lizard (*Elgaria multicarinata*), ring-necked snake (*Diadophis punctatus*) and sharp tailed snake (*Contia tenuis*). Down branches and rock outcrops provide cover for the animals inhabiting the oak woodland.

4.2 RIPARIAN VEGETATION

4.2.1 Botanical Values

Tolay Creek supports small stands of riparian woodland and often the riparian woodland grows adjacent to coast live oak woodland. Both of these types are mapped as woodland on Figures 5a and b. Other watercourses support single willows or small stands composed of a few trees. The riparian woodland is dominated by various combinations of arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and sandbar willow (*Salix exigua*). Some stands of the riparian woodland are quite mature with red willow trees exceeding 12 inches in diameter. The larger trees grow at the top of the bank of an incised channel that can be as much as 8 to 10 feet deep. Occasional willow trees that colonize the bottom of the channel are smaller than the willow trees growing at the top of the bank. The absence of large willow trees in the bottom of the channel of Tolay Creek indicates that the channel has recently incised 8 to 10 feet.

Native shrubs are largely absent from the understory of the riparian woodland owing to the bushy nature of the growth of the willow trees and the grazing experienced by Tolay Creek Ranch. Nevertheless, the following shrubs were observed growing in patches either in the open or beneath the canopy of trees: non-native Himalayan blackberry (*Rubus discolor*) and the native California blackberry (*Rubus ursinus*), snowberry, poison oak, and California rose.

4.2.2 Wildlife Values

Riparian areas are generally recognized as an important wildlife habitat (Faber 2003) and have been identified as the most important habitats for landbirds in California (Manley and Davidson 1993, cited in RHJV 2004). Several species depend on riparian habitats for their entire breeding cycle (e.g., yellow warbler), while many others use them for roosting and foraging during the winter (e.g. yellow-rumped warblers), or during migration (e.g., western tanager).

The following bird species are likely to use both the riparian and oak woodland at Tolay Creek Ranch: mourning dove, Anna's hummingbird, downy woodpecker, northern flicker, black phoebe, tree swallow, bushtit, Bewick's wren, ruby-crowned kinglet (winter), hermit thrush (winter), American robin, yellow-rumped warbler (winter), spotted towhee, California towhee, white-crowned sparrow (winter), golden-crowned sparrow (winter), and house finch. The dense foliage of these vegetation types provides particularly good habitat. Most of these species are not restricted to the woodland habitats and will forage in the adjacent grassland.

4.3 GRASSLANDS AND NATIVE FORBS

4.3.1 Botanical Values

4.3.1.1 Native Grasslands. Native grasslands are sensitive biological resources because little of the original native California grassland remains in low elevation areas of California, including Tolay Creek Ranch. Communities dominated by native grasses and graminoids that occur at Tolay Creek Ranch (Figures 5a and b) include needlegrass grasslands and creeping wildrye grasslands.

Purple needlegrass (*Nassella pulchra*) grows on slopes where soils are relatively shallow at Tolay Creek Ranch. They occur in relatively small stands and occur with native forbs and non-native grasses (Figures 5a and b). The shallow soils allow the purple needlegrass to compete more favorably with the non-native grass. The sloping areas of the ridges are more likely to support needlegrass dominated grasslands than the deep soils of the Lower Tolay Valley and the West Ridge supports more native grass than does the East Ridge. Hayfield tarweed (*Hemizonia congesta* ssp. *luzulaefolia*) grew in extensive stands throughout the West Ridge of Tolay Creek Ranch and often grew with purple needlegrass.

Creeping wild rye (*Leymus triticoides*) grows in areas of relative deep and moist soil. It spreads rhizomatously and grows in dense or sparse stands. At Tolay Creek Ranch, it grows in patches throughout the level areas and some of the slopes of the West Ridge. When growing in a dense stand it is the dominant species and other species are largely absent. In sparse stands, it occurs with the non-native medusahead (*Taeniantherum caput-medusae*), Italian rye grass (*Lolium multiflorum*), and soft chess (*Bromus hordeaceus*) and the native meadow barley (*Hordeum brachyantherum*) and harvest brodiaea (*Brodiaea elegans*).

4.3.1.2 Native Forbs. Native forbs commonly grow in dense stands particularly on the West Ridge and Lower Tolay Valley (Figures 5a and b). These species were the dominant vegetation along with purple needlegrass in some areas. They grow in a variety of combinations with the most common associations mentioned below.

Fremont star lily grows with miniature lupine (*Lupinus bicolor*) and California buttercup (*Rannculus californica*) in patches in the Lower Tolay Valley. Minature lupine is also common in the grassland areas where it also grows with a variety of other plants species. Large stands of narrow-leaved mule ears (*Wyethia angustifolia*) and Kellogg's yampah (*Perideridia kelloggii*) occur in the grassland. Purple needlegrass, hill morning-glory (*Calystegia subacaulis*), and yarrow (*Achillea millefolium*) were also observed growing on the West Ridge.

Large and small stands of Johnny jump-up (*Viola pedunculata*) grow in sparse to dense aggregations on portions of the West Ridge. A large stand of dense blue-eyed grass (*Sisyrinchium bellum*) also grows on the West Ridge. Blue-eyed grass also grows with other species of forbs and grasses such as meadow barley, California buttercup, and lotus (*Lotus wranglianus*).

Figures 5a and b show the location of mapped stands of native forbs on the West Ridge. These stands often form a mosaic with native grassland and non-native grassland. The East Ridge did not appear to support as many and as large of stands of native forb communities. Because of the variety of forb vegetation types and the high frequency of their occurrence with or beside native grasslands, the different forb types were combined into a native forb grouping for mapping purposes.

4.3.1.3 Non-Native Grasslands. Non-native grassland grows throughout Tolay Creek Ranch. The cover of this grassland is high and approaches 100 percent. The height of the grassland depends on soil depth and moisture content and averages 1 to 1.5 feet tall. This past year (2008) was very dry and the cattle had consumed the majority of the grass by autumn. Hoof prints pockmarked the entire grassland area at Tolay Creek Ranch such that the ground was difficult to walk over.

The non-native species that are commonly observed include: ripgut brome (*Bromus diandrus*), soft chess, wild oats (*Avena fatua*, *Avena barbata*), hare barley (*Hordeum murinum* ssp. *leporinum*), which grow in various combinations in dry areas. Relatively moist areas support Mediterranean barley and Italian ryegrass. Medusahead grows in small stands throughout Tolay Creek Ranch.

Non-native grasslands include many other weedy species including broad-leaf filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), common vetch (*Vicia sativa*), geranium (*Geranium molle*), Shepherd's needle (*Scandix pecten-veneris*), rose clover (*Trifolium hirtum*), and subterranean clover (*Trifolium subterraneum*). These species do not form large stands but grow sparsely among the grasses.

Tolay Creek Ranch is notable for the extensive stands of the native hayfield tarweed which grow in the native and non-native grasslands. Other native forbs of the non-native grasslands include Ithuriel's spear (*Triteleia laxa*), Fremont's star lily, blue-eyed grass, California poppy (*Eschscholzia californica*), soap plant (*Chlorogalum pomeridianum*), California checker mallow (*Sidalcea malvaeflora*.), Johnny jump-up, and hill morning-glory.

4.3.1.4 Invasive Plant Species. Medusahead, Italian thistle (*Carduus pycnocephalus*), bristly ox-tongue (*Picris echioides*), and yellow star-thistle (*Centaurea solstitialis*) are the most common non-native invasive plants at Tolay Creek Ranch (Figures 6a and b). Yellow star-thistle is particularly common throughout Tolay Creek Ranch in sparse stands. Medusahead and Italian thistle occur in small stands throughout the site and bristly ox-tongue is particularly abundant in the seeps and moist areas. Purple star-thistle (*Centaurea calcitrapa*) and milk thistle (*Silybum marianum*) are less common at Tolay Creek Ranch and occur in a relatively few places. Other non-native weed species that are less invasive and grow relatively sparsely within the study area include bull thistle (*Cirsium vulgare*), jointed charlock (*Raphanus raphanistrum*), black mustard (*Brassica nigra*), and smooth cat's ear (*Hypochaeris radicata*). Narrow-leaved plantain (*Plantago lanceolata*) was a common non-native species in some areas of the grassland.

4.3.2 Wildlife Values

Grasslands constitute the most widespread habitat type at Tolay Creek Ranch. In addition to common bird species such as western meadowlark, grasslands on the site are likely to support breeding grasshopper sparrows and horned larks judging by the observation of horned larks and singing or calling grasshopper sparrows at Tolay Creek Ranch. Both of these species are more restricted in their distribution and together indicate high-quality, diverse grasslands with horned larks preferring short grass and bare areas while grasshopper sparrows preferring comparatively tall grass habitats. Grasslands also provide foraging habitat for raptor species such as red-tailed hawk, northern harrier, white-tailed kite, American kestrel, great horned owl, and barn owl, which feed on the small mammals that occur in grasslands (see below). Other local bird species that spend a large portion of their life cycle within or adjacent to grasslands include turkey vulture, loggerhead shrike, western kingbird, Say's phoebe, American crow, Savannah sparrow, and red-winged blackbird

The grasslands of Tolay Creek Ranch are likely to support several species of small mammals such as deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californica*), Botta's pocket gopher (*Thomomys bottae*), and western harvest mouse (*Reithrodontomys megalotis*). Grasslands also provide suitable foraging habitat for bat species, northern raccoon, and striped skunk. Skunks forage in the grasslands, while raccoons forage in the ponds, seeps, streams and other wet areas of Tolay Creek Ranch.

Black-tailed jackrabbit (*Lepus californicus*) and coyote (*Canis latrans*) are known to occur on the site, and spend the majority of their time foraging or resting in grasslands. The jackrabbit comprises a major prey item for the carnivores that occur at Tolay Creek Ranch. Brush rabbits (*Sylvilagus bachmani*) were not observed at the ranch. With additional shrubby cover, rabbits and other small mammals could occur on-site in greater numbers than currently and provide a greater prey base for the carnivores.

California ground squirrel (*Spermophilus beecheyi*) creates burrows that are used by a wide variety of animals including reptiles, amphibians, insects, arachnids, and snails. Because of this and their importance as prey for foxes, coyotes, golden eagles, and other raptors, California ground squirrel has a positive influence on the diversity of animal species in grasslands.

California ground squirrels experience natural fluctuations in their population numbers at Tolay Lake Regional Park and the adjacent ranches according to Jenette Cardoza, the former owner of the Cardoza Ranch (Ehret pers. comm.). California ground squirrels were rarely observed at Tolay Creek Ranch (and Tolay Lake Regional Park). Given the extensive suitable habitat for ground squirrels and the past favorable land management regime of intensive grazing, the scarcity of ground squirrels on the site could be the result of a low point of a natural population fluctuation and/or intense predation by a suite of predators.

Common reptiles typically found in grasslands in this region include western fence lizards (*Sceloporus occidentalis*), gophersnakes (*Pituophis catenifer*), and northern American racers (*Coluber constrictor*). Grassland areas adjacent to seasonal wetlands in this area could also support northern Pacific treefrog (*Pseudacris regilla*) and western toad (*Anaxryus boreas*).

4.4 SEEPS AND SPRINGS

4.4.1 Botanical Values

Well developed seeps and springs are located on slopes both east and west of Tolay Creek. The larger seeps contained water until summer and dried by November 2008. Species present included Pacific rush (*Juncus effuses*), spreading rush (*Juncus patens*), brown-headed rush (*Juncus phaeocephalus*), California semaphore grass (*Pleuropogon californicum*), and tall fescue (*Festuca arundinacea*). Broad-leaved species that grow in some of these seeps include Bloomer's buttercup (*Ranunculus orthorhynchus* ssp. *bloomei*), prickle-seeded buttercup (*Ranunculus muricatus*), strawberry clover (*Trifolium fragiferum*), and the seep-spring monkey flower (*Mimulus guttatus*). All of these species are native except prickle-seeded buttercup, strawberry clover, and tall fescue.

The Roche Domestic Springs have been altered to provide water to the Roche Farm. Usually a productive spring that supplies water over a long duration occurs in a round or oval configuration with saturation to the surface throughout. The Roche Domestic Springs contain several spring boxes and the topography has been altered to channel the run-off from the springs (Figure 5b). The rainfall of 2008 was much below average. In a wet year the configuration of the wetland vegetation may appear in a more well-developed oval shape, much like an undeveloped spring.

4.4.2 Wildlife Values

Birds, mammals, and reptiles would all be expected to frequent the seeps for drinking water. Cover would be provided within the dense growth of rushes and other vegetation. Shrews (*Sorex* spp.) would be expected to occur within the seeps where they would conduct the majority of their foraging. Bird species such as killdeer, great egret, and Wilson’s snipe are more likely to forage within the wet areas of seeps and springs than in the drier adjacent grassland habitats.

The use of seeps and springs by amphibians largely depends on the seasonal duration of the seep. Seasonal seeps that have a relatively short wet season hydrology may aid in the dispersal of adult frogs. Nevertheless, permanent seeps and springs are more useful to amphibians during the summer months and common amphibian species such as northern Pacific treefrogs and western toads are likely to use these areas in the summer. Northern Pacific treefrog tadpoles occurred at a small shallow pond at the Roche Domestic Springs (Figure 5b). The red-sided garter snake (*Thamnophis sirtalis infernalis*.) and the southern alligator lizard were observed there as well.

4.5 SEASONAL WETLANDS

4.5.1 Botanical Values

Seasonal wetlands occur throughout Tolay Creek Ranch (Figures 5a and b). Hydrology of these features is provided by direct rainfall and run-off. The seasonal wetlands of the Lower Tolay Valley occur on level, dense clay soils. Seasonal wetlands also occur in swales at Tolay Creek Ranch. These seasonal wetlands rarely pond water and are at the drier end of the wetland continuum. Some of these seasonal wetlands, such as the Baltic Rush Meadow, which is described below, may not not be jurisdictional because of the absence of sufficient water to result in observable indicators of the Corps wetland hydrology criterion.

Baltic rush (*Juncus balticus*) and brown-headed rush grow with native and non-native grass in relatively moist patches in grassland. Fremont's star lily and California buttercup are common associates of these rushes. This vegetation occurs in the level areas of the Lower Tolay Valley. Although these features were fairly common in the dense clay, the sparseness of the rush indicates relatively dry conditions and this vegetation may not qualify as jurisdictional waters of the United States.

4.5.2 Wildlife Values

The wildlife value of the seasonal wetlands varies with the hydrology. The relatively dry seasonal wetlands would be used the same as grassland habitat by wildlife. The wetter seasonal wetlands would be used for hydration habitat and the values would be similar to those of seeps and springs.

4.6 VERNAL POOLS AND SMALL SEASONAL PONDS

4.6.1 Botanical Values

A large shallow vernal pool occurs on a bench on the West Ridge southwest of Tolay Creek and west of a large wetland (Figure 5a). Both the vernal pool and the large wetland drain into tributaries of Tolay Creek. Three shallow seasonal ponds were created by heavy equipment east of the Roche Domestic Springs (Figure 5b). These ponds are located in an area that had slumped, but the steepness of the mounding adjacent to the ponds is gives the impression of creation by heavy equipment. These ponds support small and sparse stands of spikerush (*Eleocharis* sp.). Lobb's aquatic buttercup (*Ranunculus lobbii*), a CNPS list 4 species, also grows in these features. Because of their small size and proximity to each other, they are mapped as a single feature on Figure 5b near 4 small wetland features.

4.6.2 Wildlife Values

The wildlife values discussed in the section of *Seeps and Springs* are also relevant for the vernal pool and small seasonal ponds. Although these features provide suitable breeding habitat for northern Pacific treefrogs and western toads, ponding does not last long for these features. Red-sided garter snakes (*Thamnophis sirtalis*) and terrestrial garter snakes (*Thamnophis elegans*) would also be expected to occur in and adjacent to seasonal wetlands. Garter snakes predominantly feed on fish, toads, frogs, salamanders, and their larvae.

4.7 CREATED POND

A pond was created near one of the Roache Domestic Springs and is south of a large polygon of native grassland (Figure 5b). This pond is surrounded by fencing to prevent cattle from entering.

4.7.1 Botanical Values

This pond supports stands of emergent wetland vegetation (cattails and/or bulrush) and spikerush growing at the edge with open water in the center.

4.7.2 Wildlife Values

The wildlife values discussed in the section of *Seeps and Springs* and *Vernal Pools and Small Seasonal Ponds* are also relevant for the the created pond. The created pond provides suitable breeding habitat for the sierran treefrog and western toads. The pond appears perennial and is likely to support breeding habitat for California red-legged frogs and American bullfrogs. Red-sided garter snakes and terrestrial garter snakes would also be expected to occur in and adjacent to seasonal wetlands. Garter snakes predominantly feed on fish, toads, frogs, salamanders, and their larvae.

4.8 LARGE SEASONAL POND

A large seasonal pond occurs in the panhandle portion of Tolay Creek Ranch adjacent to Highway 121 (Figure 5b). This pond remains inundated into early May of most years and it was dry on May 21 of 2008 and remained dry through at least mid January of 2009. The pond is formed by an intermittent watercourse that flows beneath Highway 121. The majority of this pond extends upstream and off-site onto the adjacent property.

4.8.1 Botanical Values

Vegetation of the seasonal pond consists of native and non-native species. Dominant species include curly dock (*Rumex crispus*) and narrow-leaved bird's-foot trefoil (*Lotus tenuis*), both non-native species, and California semaphore grass, brown-headed rush, and coyote thistle (*Eryngium* sp.) all native species. Other species that occurred in the seasonal pond include popcorn flower (*Plagiobothrys* sp.), common water-plantain (*Alisma lanceolatum*), downingia (*Downingia* sp.), smooth lasthenia (*Lasthenia glaberrima*), and cream sacs (*Castilleja rubicundula* ssp.

lithospermoides), all native species. Cocklebur (*Xantium strumarium*) and brass buttons, both non-native species also grow in the pond.

The seasonal pond is slightly alkaline or salty judging from the occurrence of species adapted to salty environments. These species are alkali heath (*Frankenia salina*), saltgrass (*Distichlis spicata*), salt heliotrope (*Heliotropium curassavicum*), alkali mallow (*Malvella leprosa*), all native species, and rabbit's foot grass (*Polypogon monspeliense*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), and bird's foot trefoil, all non-native species. The watercourse that forms the pond supports water plantain, water buttercup (*Ranunculus aquatilis*), and prairie bulrush (*Bolboschoenus maritimus*). A CNPS list 4 species Lobb's aquatic buttercup also grows in this seasonal pond in an area next to Highway 121 (Figure 7b).

4.8.2 Wildlife Values

This pond is a valuable wildlife feature because it supports a variety of water birds while inundated. Species of waterfowl observed on the pond include Canada goose, mallard, American widgeon, and cinnamon teal. Shore birds present at this pond include killdeer, black-necked stilt, Wilson's snipe, and greater yellowlegs. Great egrets, snowy egrets, and probably great blue herons forage in this pond as well.

This pond is likely to provide breeding habitat for native northern Pacific treefrogs and western toads, which also makes it likely habitat for common garter snakes and terrestrial garter snakes. Habitat for California red-legged frog (*Rana draytonii*) and western pond turtles (*Actinemys marmorata*) also occurs at the pond although they have not been observed there.

4.9 STREAMS

4.9.1 Tolay Creek

Tolay Creek extends approximately 2.7-2.8 miles downstream of the northern boundary of Tolay Creek Ranch with Tolay Lake Regional Park (Figures 5a and b). Tolay Creek varies from about 8 to 15 feet wide. The channel is incised an estimated 1 to 10 (or perhaps more in places) feet from the top of the bank to the channel bottom throughout much of the site. The deeper portions occur in the middle reaches of Tolay Creek. Terraces indicating the former channel of Tolay Creek occur 1 to 4 feet above portions of the channel of Tolay Creek. The substrate of Tolay Creek consists of silt and sand in low velocity segments of the creek, while gravel and cobbles occur where the current flows faster. The deeper pools within the channel contained standing water into October 2008, while the majority of the creek dried by summer. Presumably the pools that contained water are perennial considering that this is the second dry year in a row.

The vegetation of Tolay Creek consists of both woody and herbaceous species. The woody species were described above in the section on *Riparian Woodland*. The following discussion pertains to the vegetation of the channel of Tolay Creek. Some reaches support cattails (*Typha* sp.), bulrush (*Scirpus* sp.), and spikerush. These species grow within the channel of the creek in small patches 10 to 20 feet long and 3 to 6 feet wide. Smaller stands of the non-native water cress (*Rorippa nasturtium-aquaticum*), cocklebur, and pennyroyle (*Mentha pulegium*) and the native common water-plantain, knotweed (*Polygonum* sp.), and water pennywort (*Hydrocotyle ranunculoides*) also grow in the creek.

The terraces and bank beside the creek support native species including Baltic rush, mugwort (*Artemesia douglansiana*), nettle (*Urtica dioica*), and horsetail (*Equisetum* sp.). Some terraces support saltgrass, a native species adapted to grow in moist salty areas. Non-native species such as teasel (*Dipsacus* sp.), yellow star-thistle, Italian thistle, and non-native grass also grow on the terraces.

Tolay Creek is important for wildlife use due to the presence of year-round water and cover. The occurrence of water in the creek allows wildlife to remain at Tolay Creek Ranch without traveling to the stock ponds that are on adjacent parcels. It is also important for providing breeding habitat for amphibians. The relatively high amount of plant cover allows Tolay Creek and its tributaries to function as movement corridors which allows wildlife to travel unobserved throughout the site and to off-site areas. The combination of cover, water, and dense foliage also provides foraging habitat for wildlife.

4.9.2 Tributaries to Tolay Creek

A number of tributaries discharge into Tolay Creek. These tributaries drain both the East and West ridges and are not as wide or deep as Tolay Creek (Figures 5a and b). Most of these tributaries are incised and the banks of some of these tributaries are eroding. Some may contain pools that remain into the summer. The larger tributaries generally support woody vegetation along at least a portion of their reaches while the upper reaches usually support herbaceous vegetation, not woody.

4.10 ROCK OUTCROPS

Rock outcrops provide habitat for native plants and animals. Some of the mapped rock outcrops consist of cobble fields in which cobbles and small boulders occur on shallow soil. Other rock outcrops consist of large boulders protruding from either deep or shallow soil. The historic rock walls, although not a natural feature, also provide habitat for small mammals and function as rock outcrops. Figures 5a and b show the location of the rock outcrops.

At Tolay Creek Ranch, rock outcrops occur along the west bank of Tolay Creek and on the East and West ridges. Rock outcrops are often surrounded by shallow soils that support a higher proportion of native plant species than adjacent grasslands. Some of the rock outcrops, however, are heavily used by cattle for rubbing and support ruderal plants typical of disturbed areas. The rock outcrops along Tolay Creek are often located below coast live oak trees and support poison oak, snowberry, California rose, wild cucumber, and Duchman’s pipe. Species include the non-native yellow star-thistle and Italian thistle and the native fiddleneck (*Amsinckia menziesii* var. *intermedia*). Wildlife species are likely to use rock outcrops for dens or observation posts. California ground squirrels often construct their burrows at rock outcrops.

5.0 SPECIAL-STATUS SPECIES

A variety of special-status species and sensitive habitat types occur at Tolay Creek Ranch. Special-status species observed during field work or otherwise known to occur on-site include Marin western flax (*Hesperolinon congestum*), Lobb's aquatic buttercup, marsh zigadene (*Zigadenus micranthus* var. *fontanus*), California red-legged frog, western pond turtle, golden eagle, burrowing owl, California horned lark, grasshopper sparrow, and Opler' longhorn moth (*Adela oplerella*).

Locations of special-status species and their habitats are mapped on Figures 7a and b. Sensitive habitats that occur at Tolay Creek Ranch are oak woodlands, riparian woodlands, native grasslands including serpentine areas, wetlands, and rock outcrops (Figures 5a and b).

The CNDDB query provides a list of special-status species that are known to occur in the vicinity of Tolay Creek Ranch and therefore could potentially occur on the ranch. The CNDDB query covers a relatively large area surrounding Tolay Creek Ranch and as such includes species that occur in habitats that are not present (such as salt marsh) or species that are restricted to a particular geographic area such as Mt. Tamalpais. Only those species whose known distribution could encompass Tolay Creek Ranch or whose habitats occur on Tolay Creek Ranch are addressed in this report as potentially occurring on the ranch.

5.1 PLANTS

5.1.1 Known Occurrences of Special-status Plants

Three special-status plant species, Marin western flax, Lobb's aquatic buttercup, and marsh zigadene are described below and have been observed at Tolay Creek Ranch

5.1.1.1 Marin Western Flax. Marin western flax, federally and state threatened and CNPS List 1B, occurs in serpentine barrens and serpentine grassland and chaparral at an elevation between 100 and 1,200 feet. Extensive stands were observed growing in the serpentine of the southwestern portion of Tolay Creek Ranch (Figure 7b). This is the only known location of this species in Sonoma County. It grows on shallow rocky soils and on deeper soils. It often grew with the white-flowered hayfield tarweed.

5.1.1.2 Lobb's Aquatic Buttercup. Lobb's aquatic buttercup, a CNPS list 4 species, grows in shallow pools in the spring. Their white flowers and leaves float on the surface of the water. It occurs in a vernal pool on the West Ridge, in some ponds that appeared to be created incidentally as part of some former earth-moving activity by heavy equipment, and in the large seasonal pond adjacent to Highway 121 (Figures 7a and b).

5.1.1.2 Marsh Zigadene. Marsh zigadene, A CNPS list 4 species, grows in serpentine areas that are usually wet. It can be distinguished from the Fremont's star lily by its summer flowering period and habitat preference for wet serpentine areas although the Fremont's star lily may occasionally occur in wet areas. A few marsh zigadene plants grow along a tributary to Tolay Creek (Figure 7b) just outside of the serpentine areas mapped on Figure 5b.

5.1.2 Potential Occurrences of Special-status Plants

The following plant species are not known to occur within Tolay Creek Ranch, but are known from the vicinity. They were not found during surveys and they are unlikely to occur at Tolay Creek Ranch. Nevertheless, the occurrence of some of these species, especially those of small size, cannot be completely ruled out because small stands could have been overlooked during the surveys.

5.1.2.1 Franciscan Onion. Franciscan onion (*Allium peninsulare* var. *franciscanum*), CNPS List 1B, occurs on clay soils, often on serpentine, and on dry hillsides at an elevation between 330 and 1,000 feet. Although not encountered during surveys, small stands of the Franciscan onion potentially occur in the serpentine area of Tolay Creek Ranch.

5.1.2.2 Sonoma Alopecurus. Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), CNPS List 1B, occurs in wet areas, vernal pools, marshes and riparian banks. There are a number of wet seeps at Tolay Creek Ranch and although unlikely, small numbers of Sonoma alopecurus growing in a large seep could have been missed during surveys. Although unlikely, the occurrence of Sonoma alopecurus cannot be ruled out from Tolay Creek Ranch.

5.1.2.3 Napa False Indigo. Napa false indigo (*Amorpha californica* var. *napensis*), CNPS List 1B, occurs in openings in forest, or woodland, and/or chaparral vegetation at an elevation between 500 and 6,500 feet. It is not likely to occur in the site because it was not found during surveys of openings within woodland habitats.

5.1.2.4 Bent-flowered Fiddleneck. Bent-flowered fiddleneck (*Amsinckia lunaris*), CNPS List 1B, occurs in woodland and grassland habitats. Bent-flowered fiddleneck was not encountered during surveys of Tolay Creek Ranch. Although unlikely, small stands of bent-flowered fiddleneck could have been missed during the surveys conducted in the extensive area of grassland. Its occurrence therefore cannot be ruled out from Tolay Creek Ranch.

5.1.2.5 Alkali Milk-vetch. Alkali milk-vetch (*Astragalus tener* var. *tener*), CNPS List 1B, occurs on alkali flats, flooded areas of annual grassland, in playas, or in vernal pools at an elevation between 1 and 550 feet. Alkaline or salty soils occur in the seasonally ponded area along Highway 121. Alkali milk-vetch is not likely to occur within Tolay Creek Ranch because it was not found during surveys.

5.1.2.6 Sonoma Sunshine. Sonoma sunshine (*Blennosperma bakeri*), CNPS List 1B, occurs in vernal pools and swales at an elevation between 30 and 330 feet. It is not likely to occur at Tolay Creek Ranch because it was not found during surveys.

5.1.2.7 Narrow-anthered California Brodiaea. Narrow-anthered California brodiaea (*Brodiaea californica* var. *leptandra*), CNPS List 1B, occurs in broad-leaved upland forest, chaparral, and lower montane coniferous forest at an elevation between 360 and 3,000 feet. Most of the observations were from areas beside scrub or chaparral (CNDDB 2008). Habitat for the narrow-anthered California brodiaea occurs in the rocky area that supports some shrubs at the western border of Tolay Creek

Ranch. It is not likely to occur in the site because it was not found during surveys within suitable habitats.

5.1.2.8 Round-leaved filaree. Round-leaved filaree (*California macrophyllum*), CNPS List 2, occurs in grasslands on clay soil between an elevation of 50 and 4,000 feet. Although not encountered during surveys, the grassland habitat is extensive and round-leaved filaree potentially occurs in grassland on Tolay Creek Ranch.

5.1.2.9 Tiburon Paintbrush. Tiburon paintbrush (*Castilleja affinis* ssp. *neglicta*), Federally endangered and State threatened, occurs in serpentine grassy areas, mostly in Marin County but has been observed in Napa and Santa Clara counties. It is not likely to occur on Tolay Creek Ranch because it was not observed during surveys.

5.1.2.10 Pappose tarplant. Pappose tarplant (*Centromadia parryi* ssp. *parryi*), CNPS List 1B, occurs in vernally mesic, often alkaline sites at an elevation between 6 and 1,400 feet. It is not likely to occur within Tolay Creek Ranch because it was not found during surveys of suitable habitats.

5.1.2.11 Sonoma spineflower. Sonoma spineflower (*Chorizanthe valida*), CNPS List 1B, occurs in sandy soil at an elevation between 30 and 160 feet. It is not likely to occur in the site because sandy soils are absent.

5.1.2.12 Yellow larkspur. Yellow larkspur (*Delphinium luteum*), CNPS List 1B, occurs on north-facing rocky slopes at an elevation up to 330 feet. It has been observed in western Marin County in moist scrubby and rocky habitats. It is not likely to occur at Tolay Creek Ranch because suitable habitat appears to be missing.

5.1.2.13 Western leatherwood. Western leatherwood (*Dirca occidentalis*), CNPS List 1B, occurs on brushy slopes and mesic sites; mostly in mixed evergreen and foothill woodland communities at an elevation between 100 and 1,800 feet. It is not likely to occur in the site because its mesic scrub habitat is absent.

5.1.2.14 Dwarf downingia. Dwarf downingia (*Downingia pusilla*), CNPS List 2, occurs in vernal lake and pool margins at an elevation between 1 and 1,600 feet. It is not likely to occur in the site because it was not found during surveys of vernal pools or other seasonally ponded areas.

5.1.2.15 Tiburon buckwheat. Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*), CNPS List 1B, occurs on serpentine substrates. It apparently is only known from the Tiburon Peninsula although the other variety (*Eriogonum luteolum* var. *luteolum* occurs widely throughout the San Francisco Bay Area. Tiburon buckwheat is not likely to occur at Tolay Creek Ranch.

5.1.2.16 Fragrant Fritillary. Fragrant fritillary, a CNPS list 1B species, occurs to the north in Tolay Lake Regional Park on the east-facing portion of the West Ridge. It grows among Fremont's star lily where they both are one of the first wildflowers to bloom in the spring (February-April). Because soils of the West Ridge of both Tolay Creek Ranch and Tolay Lake Regional Park are largely composed of Diablo Clay, other reasons account for the absence of fragrant fritillary from Tolay Creek Ranch. There were extensive stands of Fremont's star lily at Tolay Creek Ranch growing in Diablo Clay, but the fragrant fritillary was not observed growing among them. It often grows in small stands and would not be easily observed among the extensive stands of the Fremont's star lily, because they both have white flowers. Although unlikely, fragrant fritillary could occur in small stands at Tolay Creek Ranch.

5.1.2.17 Burke's Goldfields. Burke's goldfields (*Lastenia burkei*), CNPS List 1B, occurs in vernal pools and swales at an elevation between 50 and 1,900 feet. It is not likely to occur on the site because it was not found during surveys of ponded areas or the saturated soil of wetlands.

5.1.2.18 Contra Costa Goldfields. Contra Costa goldfields (*Lastenia conjugens*), CNPS List 1B, occurs in vernal pools, swales, low depressions, and open grassy areas at an elevation between 1 and 1,500 feet. It is not likely to occur at Tolay Creek Ranch because it was not found during surveys of ponded areas or the saturated soils of wetlands.

5.1.2.19 Legenere. Legenere (*Legenere limosa*), CNPS List 1B, occurs in the beds of vernal pools at an elevation between 1 and 3,000 feet. It is not likely to occur in the site because it was not found during surveys of ponded areas.

5.1.2.20 Jepson's Leptosiphon. Jepson's leptosiphon (*Leptosiphon jepsonii*), CNPS List 1B, occurs on grassy slopes of volcanic or serpentine substrates at an elevation between 300 and 1,600 feet. It was not observed during the survey of the serpentine areas. If present at Tolay Creek Ranch, Jepson's leptosiphon would occur in small colonies.

5.1.2.21 Sebastopol meadowfoam. Sebastopol meadowfoam (*Limnanthes vinculans*), CNPS List 1B, occurs in swales, wet meadows, vernal pools, and marshy areas in valley oak savanna. Soil types include poorly drained soil of clay and sandy loam at an elevation between 50 and 400 feet. It is not likely to occur at Tolay Creek Ranch because it was not observed during surveys of the vernal pools and other wet areas of the site.

5.1.2.22 Marsh microseris. Marsh microseris (*Microseris paludosa*), CNPS List 1B, occurs in grassland areas between an elevation of 15 and 1,000 feet. Although not encountered during surveys, the grassland habitat is extensive and the marsh microseris potentially occurs in grassland on Tolay Creek Ranch.

5.1.2.23 Baker's navarretia. Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*), CNPS List 1B, occurs in vernal pools and swales on adobe or alkaline soils at an elevation between 15 and 3,000 feet. It is not likely to occur at Tolay Creek Ranch because it was not found during surveys of vernal pools or other ponded and wet areas.

5.1.2.24 Marin County navarretia. Marin County navarretia (*Navarretia rosulata*), CNPS List 1B, occurs in dry open rocky places and sometimes on serpentine at an elevation between 600 and 2,000 feet. It is not likely to occur at Tolay Creek Ranch because it was not observed during surveys of rocky areas. In addition, rocky areas were often trampled by cows and supported a weedy flora. Although unlikely, small stands may occur on the serpentine area at Tolay Creek Ranch.

5.1.2.25 Yampah. Extensive stands of Kellogg's yampah (*Perideridia kelloggii*), a common species, were observed on the West Ridge. Plants of the rare Gairdner's yampah, (*Perideridia gairdneri* ssp. *gairdneri*), a CNPS List 4 species could potentially grow among the stands of Kellogg's yampah.

Gairdner's yampah grows in moist grassland areas, adobe flats, and grassland areas beneath pine trees (Best et al. 1996). In Sonoma County, Gairdner's yampah occurs much west and north of Tolay Creek Ranch mostly from the Laguna de Santa Rosa westward to the coast. Kellogg's yampah is common and grows in grassland including adobe flats and serpentine (Best et al. 1996). Gairdner's yampah is therefore not very likely to occur at Tolay Creek Ranch because it was not observed during surveys and grows in the western portion of Sonoma County.

5.1.2.26 Petaluma popcorn-flower. Petaluma popcorn-flower (*Plagiobotrys mollis* var. *vestitus*), CNPS List 1A, is known from a single specimen collected in the late 1800s from Petaluma. It is thought to occur in wet sites in grasslands or the edges of coastal marshes at a probable elevation between 30 and 150 feet. It is not likely to occur because it was not found during surveys of wet areas of Tolay Creek Ranch.

5.1.2.27 North Coast semaphore grass. North Coast semaphore grass (*Pleuropogon hooverianus*), CNPS List 1B, occurs in wet, grassy, and usually shady areas, and sometimes in freshwater marshes at an elevation between 30 and 4,000 feet. It is not likely to occur on the site because it was not found during surveys of wet and ponded areas. A similar species, California semaphore grass was observed in a number of seeps of Tolay Creek Ranch.

5.1.2.28 Point Reyes checkerbloom. Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *rhizomata*), CNPS List 1B, occurs in freshwater marshes near the coast usually at an elevation between 15 and 240 feet. It is not likely to occur in the site because it was not observed during surveys of wet areas.

5.1.2.29 Marin checkerbloom. Marin checkerbloom (*Sidalcea hickmanii* ssp. *viridis*), CNPS List 1B, occurs on serpentine or volcanic soils and sometimes appears after burns. Its elevational range varies between sea level and 1,400 feet. It is not likely to occur on the site because it was not observed during surveys.

5.1.2.30 Two-fork Clover. Two-fork clover (*Trifolium amoenum*), Federally endangered and CNPS List 1B, occurs on relatively deep and probably slightly moist soils. Its height made it susceptible to loss from grazing and weed maintenance along roads. As a result, it was considered extirpated until it was observed at a site of recent disturbance in the 1990s. Due to the continually heavy grazing at Tolay Creek Ranch, two-fork clover is not likely to occur there.

5.1.2.31 Saline Clover. Saline clover (*Trifolium depauperatum* var. *hydrophilum*), CNPS List 1B, occurs in saline or alkaline areas. It was not observed at the edge of the seasonal pond adjacent to Highway 121 and is therefore not likely to occur at Tolay Creek Ranch.

5.1.2.32 Oval-leaved viburnum. Oval-leaved viburnum (*Viburnum ellipticum*), CNPS List 2, occurs in chaparral, cismontane woodland, and lower montane coniferous forest at an elevation between 700 and 4,600 feet. It was not found during surveys and is therefore not likely to occur at Tolay Creek Ranch.

5.2 INVERTEBRATES

5.2.1 Opler's Longhorn Moth

Opler's longhorn moth is on the special animals list and feeds on the flowers of cream cups, and the adult moths are usually observed resting on the petals of cream cups. One individual of Opler's longhorn moth was observed on the serpentine area of Tolay Creek Ranch (Figure 7b). The only information available from the CNDDB (2008) is that a population was observed in serpentine grassland in 1990-91. The serpentine area supported a large number of stands of cream cups. The size of the stands of the cream cups ranged from a few plants to hundreds of plants.

5.2.2 Blennosperma Bee

The blennosperma bee (*Andrena blennospermatis*) is on the special animals list and collects pollen from species of blennosperma. It has been recorded on the common blennosperma (*Blennosperma nanum*) and Sonoma sunshine. The common blennosperma was not very abundant at Tolay Creek Ranch. Nevertheless, this was a dry year, and it is possible that the blennosperma would be more abundant during a year of average rainfall. The blennosperma bee may have the ability to remain in a dormant state through dry years and emerge the following year when rainfall and blennosperma populations are more normal. If blennosperma occurs in relatively large stands at Tolay Creek Ranch, then the blennosperma bee could potentially occur there.

5.2.3 Rare Arachnids

Rare arachnids are known from serpentine areas where they occur at the interface between serpentine rocks and serpentine soil. They are most often observed during wintertime. Three genera of harvestman (daddy long-legs) occur on serpentine in the San Francisco Bay Area (*Calcina, Microcina,* and *Sitalcina*). The Marin blind harvestman (*Calcina dimuna*) occurs only on Mt. Burdell, across the Petaluma River from Tolay Creek Ranch. The Tiburon micro blind harvestman (*Microcina tiburonensis*) only occurs on the Tiburon Peninsula. Another rare arachnid, ubick's gnaphsodid spider (*Talanites ubicki*) also is only known from Mt. Burdell. Because these species appear to be very restricted, other species of rare arachnids could potentially occur in the serpentine of Tolay Creek Ranch. All three of these species are on the special animals list.

5.2.4 Tomales Isopod

The Tomales isopod (*Caecidotea tomalensis*) is on the list of special animals. It occurs in freshwater pools and is known from a site on Sonoma Mountain east of Rohnert Park. On Sonoma Mountain, it also occurs in a stream adjacent to the pond but otherwise is not known from streams. One of the ponds on Sonoma Mountain frequently dries at the end of the season, indicating that the isopods either remain in mud or otherwise are able to withstand short dry periods. The absence of ponds that retain water for long durations indicates that it is unlikely that Tomales isopods occur at Tolay Creek Ranch. A few ponds in Tolay Creek appear to retain water year round, but the ability of a population of the Tomales isopod to survive in a creek habitat without the presence of a perennial pond is not known. It is unlikely that the Tomales isopod occurs at Tolay Creek Ranch.

5.2.5 Zerene Silverspot Subspecies

An un-named subspecies of the zerene silverspot butterfly (*Speyeria zerene*) occurs on the adjacent Cougar Mountain property (Figure 3) and potentially occurs on Tolay Creek Ranch. Because it has not yet been described as a species and named in the taxonomic literature, it is not on any list of special-status species. Once it is taxonomically described, it will most likely be on the list of special animals. The larvae of the zerene silverspot feed upon violets. Large stands of Johnny jump-up grow on the West Ridge of Tolay Creek Ranch and are the likely food plant of the un-named silverspot butterfly. This un-named subspecies of silverspot butterfly is likely to be very restricted in its geographic distribution because it apparently is only known from the Cougar Mountain property and has not been observed nearby in similar habitats. Because the subspecies of the zerene silverspot butterfly appears to be restricted in distribution, it and its food plants should be protected.

5.2.6 Ricksecker's Water Scavenger Beetle

Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*) is on the list of special animals. It is an aquatic insect that is known from only a few localities in the San Francisco Bay Area. The closest known locality to Tolay Creek Ranch is approximately12 miles further north on Sonoma Mountain. Ricksecker's water scavenger beetles occur in ponds where their predaceous larvae remain on vegetation near the shore. Little else is known regarding Ricksecker's water scavenger beetles. Habitat for Ricksecker's water scavenger beetles occurs in the seasonal pond adjacent to Highway 121 and potentially in the ponds in Tolay Creek. The other ponds and vernal pool at Tolay Creek Ranch do not pond water long enough for the larvae to mature.

5.2.7 Marin Hesperian

The Marin Hesperian (*Vespericola marinensis*) is on the list of special animals and is a terrestrial snail that occurs in moist areas. It is only known from central Marin County. It has been observed under leaves of cow parsnip, in leaf mold, in alder woods and mixed evergreen forest, around springs and seeps, and along streams. The Marin Hesperian is unlikely to occur at Tolay Creek Ranch because it appears to be dryer than within its central Marin County habitats.

5.3 AMPHIBIANS

5.3.1 California Red-Legged Frog

The California red-legged frog was federally listed as threatened on May 23, 1996 (USFWS 1996) and is currently a CDFG species of special concern[1]. The habitat types that this species occupies are diverse and include ephemeral ponds, intermittent streams, seasonal wetlands, springs, seeps, permanent ponds, perennial creeks, constructed aquatic features, marshes, lagoons, riparian corridors, blackberry thickets, non-native annual grasslands, and oak savannas (USFWS 2002). Breeding occurs within ponds in streams, stock ponds, or other types of ponds that contain water into May at a minimum, but usually June or July..

[1] The state status of the California red-legged frog will likely be elevated to candidate due to recent court decisions.

The USFWS published a recovery plan (USFWS 2002) identifying core areas and priority watersheds for focused recovery efforts. Tolay Creek Ranch falls within the Petaluma Creek-Sonoma Creek Core Recovery Area, which was designated because it currently supports frogs, may serve as a source of frogs that colonize adjacent areas, and provides connectivity to core recovery areas to the east and west. The conservation needs identified for this area include protecting existing populations, reducing impacts of urban development, and protecting, restoring, and creating breeding and dispersal habitat.

California red-legged frogs have been observed on and adjacent to Tolay Creek Ranch (Parsons 1996 and Bacchini pers. comm.). They were observed at the pool in Tolay Creek that formed at the boundary with Tolay Lake Regional Park. This pool appears to be perennial because it contained water during the second of two drought years during a visit on October 24, 2008. California red-legged frogs have also been noted within a stock pond and tributary to Tolay Creek within a half mile up-stream of the northern boundary of Tolay Lake Regional Park (CNDDB 2008) and in a stock pond beyond the western boundary of Tolay Lake Regional Park (Parsons 1996).

Breeding habitat for California red-legged frogs also appears to occur in other locations of Tolay Creek on Tolay Creek Ranch. Large pools (Figures 7a and b), some of which contained water during the October 2008 survey, were observed in Tolay Creek. At least some of these pools should provide potential habitat for breeding. Nevertheless, many of these pools lacked cover and may not be used for breeding for that reason.Mapping shows these pools upstream of the entrance road crossing of Tolay Creek. Suitable deep pools may occur downstream of the crossing, but that area had not been surveyed.

No California red-legged frogs were observed during LSA's field visits. The surveys were conducted during the day when there was less chance of success of encountering California red-legged frogs, as compared to night-time surveys (Fellers and Kleeman 2006). Although California red-legged frogs were not observed during surveys by LSA, they possibly occur at Tolay Creek Ranch at a low density. They have been known from Tolay Creek Ranch in the past and because habitat has not appeared to have changed, they could possibly continue to occur there.

The occurrence of introduced American bullfrogs (*Lithobates catesbiana*) limits the suitability of aquatic habitat for the California red-legged frog. Several researchers have attributed the decline and extirpation of California red-legged frogs throughout their range to the introduction of American bullfrogs and predatory fishes (Hayes and Jennings 1986). The presence of California red-legged frogs has been negatively correlated with the presence of American bullfrogs (Fisher and Shaffer 1996), and American bullfrog adults have been observed preying on tadpole, juvenile, and adult California red-legged frogs.

American bullfrogs were not observed at Tolay Creek Ranch but are likely to occur at low densities or occur temporarily as they travel across the ranch. Large bodies of permanent water are absent from Tolay Creek Ranch and breeding populations of American bullfrogs are probably absent. Large American bullfrog populations occur to the north of Tolay Creek Ranch at Tolay Lake Regional Park and adjacent properties. Because of the tendency of American bullfrogs to disperse long distances and because of the adjacent large population, American bullfrogs probably enter Tolay Creek Ranch on a regular basis. The effect of American bullfrogs on the possibly-occurring California red-legged frog is not known.

5.3.2 Foothill Yellow-Legged Frog

Foothill yellow-legged frog (*Rana boylii*) is a California species of special concern. They occur in partly shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Foothill yellow-legged frogs need at least some cobble-sized stones as a substrate for egg-laying. The tadpoles require at least 15 weeks to metamorphose into the juvenile form.

Foothill yellow-legged frogs were not observed in Tolay Creek despite the occurrence of potentially suitable substrate and the occurrence of water in pools into the summer. Foothill yellow-legged frogs potentially occur in Tolay Creek and its tributaries at Tolay Creek Ranch.

5.4 REPTILES

5.4.1 Western Pond Turtle

Western pond turtle is a California species of special concern. Western pond turtles have been observed in a pool in Tolay Creek downstream of the northern boundary (LSA observations) and either the same individual or an additional turtle was observed in the pool at the boundary with Tolay Lake Regional Park (Neale pers. comm.). They have also been observed in Tolay Lake (Parsons 1996). They occur along the shore of waterbodies and on floating debris. Egg laying occurs in soft or sandy soil, often a considerable distance from any body of water. The limiting resources for the species are the aquatic and the egg-laying habitats.

5.5 BIRDS

5.5.1 White-tailed Kite

White-tailed kite is a state fully protected species. This species requires open habitats (e.g., grasslands, agricultural fields, marshes) for foraging and dense trees or shrubs for nesting. The diet of white-tailed kites consists almost entirely of mice and voles (Peeters and Peeters 2005). Although no nests were found during our 2008 surveys, suitable nesting habitat is present and white-tailed kites have been observed foraging to the north on Tolay Lake Regional Park (LSA obs.). White-tailed kite is a likely nesting species at Tolay Creek Ranch.

5.5.2 Golden Eagle

Golden eagles are a state fully protected species. They nest in trees or cliffs and forage in grasslands. Major food items consist of the California ground squirrel and a variety of rabbit species. Golden eagles have been observed (Bob Neale and LSA field observations) flying over and perching on the West Ridge, and they are regularly observed at Tolay Creek Ranch (Neale pers. comm.).

Nesting is thought to occur in the large blue gum eucalyptus trees at the homestead near where the Sears Point to Lakeville Road enters Tolay Creek Ranch (Figure 7a). A nest structure was observed in this eucalyptus (Neale pers. comm.), although during field work in April 2008 no eagle was observed at this location. Suitable nesting habitat is also present in the eucalyptus and Monterey cypress growing beside Tolay Creek and perhaps in the coast live oak trees at Tolay Creek Ranch.

Golden eagles usually build or repair a few nests prior to choosing one nest to use (Peeters and Peeters 2005). They may not use the same nest every year and will alternate use of several nests. Some pairs of golden eagles may not nest every year (Peeters and Peeters 2005). Golden eagles are also thought to nest elsewhere in the vicinity (Ehret pers. comm) and this nest may be from the same pair as those on Tolay Creek Ranch.

Golden eagle is a possible nesting species at Tolay Creek Ranch. The ranch also likely encompasses foraging territory of golden eagles nesting elsewhere.

5.5.3 Burrowing Owl

Burrowing owls are a state species of special concern and have been observed in a rock outcrop near a ranch road on the West Ridge (Neale pers. comm.) (Figure 5a). They are also known from rock outcrops at Tolay Lake Regional Park (Ehret pers. comm. and LSA obs.) and the Sonoma Land Trust's Sears Point property (Neale pers. comm.). The use of these areas is typically by single individuals during the winter and spring indicating dispersing juvenile or over-wintering birds, although several were observed in concrete rubble on the Sears Point property. The owls prefer short grass and respond well to areas that are regularly grazed. This species is dependent on burrows as nest sites and as year-round shelter. The owls typically use burrows created by small mammals, although the owls may subsequently modify the burrows for their own uses. The owls also readily occupy constructed burrows, debris piles, concrete rubble, and other types of shelter.

Burrowing owls appear to be a transitory species at Tolay Creek Ranch and some may occasionally overwinter on the ranch. Due to a climate of cool spring and summer nights, which probably reduces insect prey, the ranch is not optimal breeding habitat.

5.5.4 California Horned Lark

California horned larks are on the list of special animals. They were formerly on the list of state species of special concern but were recently removed form that list (Shuford and Gardali 2008). They were observed on the top of the West Ridge during the spring and they most likely nest in grasslands at Tolay Creek Ranch. Because California horned larks can occur in any portion of the grassland at Tolay Creek Ranch, specific observations are not indicated on Figures 7a and b.

5.5.5 Grasshopper Sparrow

Grasshopper sparrows are a state species of special concern (Unitt 2008) and are a rather uncommon sparrow of grasslands. Grasshopper sparrows were heard calling at Tolay Creek Ranch and are presumed to nest in the grasslands supporting dense grass growing taller than 12 or 18 inches. Grasshopper sparrows were also observed at Tolay Lake Regional Park and are presumed to nest there as well.

5.5.6 Tricolored Blackbird

Tricolored blackbird is a California species of special concern. They nest in large colonies in cattails and tules, or Himalayan blackberry associated with creeks or ponds, or in grain fields. Their nesting colonies can range from 100 birds to tens of thousands of birds. Himalayan blackberry occurs in the understory of the woodland along Tolay Creek or in small stands in grassland and was therefore not suitable to support colonies of nesting tricolored blackbirds. Tricolored blackbirds are unlikely to occur at Tolay Creek Ranch as a breeding species, although wintering flocks may visit the ranch.

5.5.7 Nesting Birds

Although they are not considered special-status species, almost all native birds and their active nests are protected by the federal MBTA and the California Fish and Game Code.

5.6 MAMMALS

5.6.1 American Badger

American badger is a state species of special concern that occurs in open areas, including dry grasslands. Because of its semifossorial habits, it requires friable soils in open, uncultivated ground suitable for burrowing. It also requires healthy populations of ground squirrels and pocket gophers, its two primary prey items (Jameson and Peeters 2004). Although there are no records of this species in the immediate vicinity of Tolay Creek Ranch, suitable habitat conditions are present along the East and West ridges and in the Lower Tolay Valley.

5.6.2 Townsend's Big-Eared Bat

Townsend’s big-eared bats (*Corynorhinus townsendii*) are a state species of special concern. Although this species occurs in a wide variety of habitats throughout California (CNDDB 2008), it is extremely sensitive to human disturbance as it roosts in the open (i.e., from walls or ceilings of old buildings). Nursery colonies have been found in caves, mine shafts, and buildings (Jameson and Peeters 2004). No roosts of this species are known from the immediate vicinity of Tolay Creek Ranch, but a shack on the site represents potential habitat. In addition, Townsend’s big-eared bats roosting in the region may forage over the site at night.

5.6.3 Pallid Bat

Pallid bat (*Antrozous pallidus*) is a state species of special concern. It is somewhat more common than other special-status bats, occurring throughout most of California at elevations below 6,500 feet (Jameson and Peeters 2004). The pallid bat feeds mostly on flightless arthropods. Pallid bats have been observed flying low (6 to 36 inches) to the ground searching for prey. After locating its prey, it will drop to the ground, grab the prey in its mouth, and fly to a feeding roost to consume the prey. (Texas Parks and Wildlife 1997). Roosting occurs in fissures in cliffs, abandoned buildings, bird boxes, and under bridges (Jameson and Peeters 2004). Several roosts of this species are known from the general vicinity of Tolay Lake (CNDDB 2008), and suitable roosting habitat in the shack is present on site. As such, this species has moderate potential to occur within the study area.

6.0 POTENTIAL CONSTRAINTS

Tolay Creek Ranch will eventually become part of Tolay Lake Regional Park with trails and potentially other visitor-serving amenities. In addition, existing management activities such as fence installation and road repair, could also affect biological resources. The special-status species and the sensitive plant communities that occur at Tolay Creek Ranch pose constraints for trails, fences, road repair and other infrastructure that may be proposed for the ranch to accommodate the public and existing management activities. There is likely to be flexibility in siting the trails, fences, and other proposed features. Impacts, if any, are likely to be small. Enhancing the sensitive plant communities through management is likely to off-set any impacts.

Recreational facilities should be located to avoid impacts to sensitive habitats such as serpentine areas, wetlands, native grasslands, riparian woodland, buckeye woodland, and oak woodland where possible. Trail crossings of these habitats should be designed to minimize impacts. Picnic and vista areas should be located away from sensitive resources, if possible, or should be reduced in size to lessen impacts. Unavoidable losses of acreage of native grasslands, riparian habitats, woodlands, and wetlands should be replaced at a specified ratio. There is no universally established ratio for impacts to these resources. Mitigation ratios are often based on the sensitivity of a resource with greater ratios applying to the more sensitive resources. Ratios are also based on the ability of the mitigation to replace the functions and values of the affected resource. For example, it may require decades to replace the functions and values of mature trees and thereby justifying a greater mitigation ratio. A minimum mitigation ratio of 1:1 is recommended (with the exception of wetlands) at Tolay Creek Ranch because all habitat is valuable and implementing mitigation will result in conversion of one type of habitat to another. Until we know more about the ecology of Tolay Creek Ranch, it is best to maintain the vegetation in roughly its current state (although enhancement and weed control are recommended). Wetland mitigation ratios are established at 2:1 by the RWQCB.

6.1 SENSITIVE PLANT COMMUNITIES AND HABITATS

6.1.1 Serpentine Areas

Serpentine occurs in the south western portion of Tolay Creek Ranch (Figure 5b). The serpentine area at Tolay Creek Ranch is a valuable habitat because it is dominated by native species, non-native species are scarce, and it represents vegetation that occurred prior to the colonization of California by the Spanish. The serpentine at Tolay Creek Ranch is dominated by native species including purple needlegrass, California barley, hayfield tarweed, Marin western flax, California goldfields, and other wildflowers. This area should remain intact with as little disturbance as possible. The existing ranch road could also serve as a trail thereby minimizing impacts from trails to this area. This would minimize impacts to the special plant communities that occur on serpentine soils and could reduce impacts to the rare species that occur in the serpentine area (Opler's longhorn moth and Marin western flax). Impacts are not known to Marin western flax from visitors walking the trails at the Ring Mountain Preserve on the Tiburon Peninsula.

6.1.2 Native Grasslands

Native grasslands occur mostly on the West Ridge but a few, mostly small, stands also occur on the East Ridge (Figure 5a). Native grasslands are composed of native grass and forbs. This plant community is special because much of the native grassland in lowland California has been developed for urban or cultivated agricultural purposes. Improper grazing has also resulted in the destruction of native grasslands. As with the serpentine area, impacts to the native grasslands should be reduced to the minimum amount possible.

6.1.3 Wetlands and Watercourses

Wetlands and watercourses are biologically valuable habitats because 1) they provide hatibat that is required by a large number of wildlife species; 2) their absence can limit the occurrence of wildlife; and 3) they have experienced a tremendous decline due to urban and agricultural development and are not as abundant as formerly. Because of their habitat value, impacts to them are regulated by the Corps, RWQCB, and CDFG. Some of the features discussed below may be jurisdictional and alteration of them may be regulated activities requiring permits. Establishing riparian vegetation along watercourses is a generally beneficial activity if done such that a variety of habitat types remains along the watercourses. Areas dominated by cattails, bulrush, and/or spikerush are valueable and some of these areas should remain along Tolay Creek and its tributaries. Similarly, establishing riparian vegetation in wetlands that support a large diversity of native species would eventually create shade that results in a reduction of species diversity of the wetland, and should be avoided.

6.1.3.1 Seeps and Seasonal Wetlands. Seeps and seasonal wetlands occur throughout Tolay Creek Ranch and should be avoided by park infrastructure (Figures 5a and b). Trail crossings of sensitive habitats should be designed to minimize impacts. Infrastructure should be located away from sensitive resources, if possible, or should be reduced in size to lessen impacts. Unavoidable losses of acreage of wetlands should be replaced on a 2:1 basis through habitat creation. The proposed restoration program would most likely result in a large increase in native grasslands and wetlands, which would more than compensate for impacts from park facilities.

6.1.3.2 Large Seasonal Pond. A seasonal pond develops during the rainy season at the edge of Highway 121 (Figure 5b). This seasonal pond is a jurisdictional wetland and impacts to it should generally be avoided. Lobb's aquatic buttercup, a CNPS list 4 (watch list) species also grows in the pond. Many non-native species, such as curly dock, bird's foot trefoil, and cocklebur, occur in the seasonal pond and their removal would enhance the biological value of the pond.

6.1.3.3 Vernal Pool and Seasonal Ponds. A vernal pool (Figure 5a) and 3 small seasonal ponds (mapped as a single feature) on Figure 5b occur at Tolay Creek Ranch. These ponds support plant species that occur in seasonally ponded areas, including the rare Lobb's aquatic buttercup (Figure 7b). They are likely to be considered to be jurisdictional features. Because they are fairly small, they can be avoided. The seasonal ponds are the result of work by heavy equipment and they could be enhanced by deepening and enlarging. These features are affected by trampling from cattle and fencing should be considered. Prior to fencing, the vegetation should be measured to ensure that any changes to vegetation from the fencing are beneficial.

6.1.3.4 Tolay Creek and Other Watercourses. Tolay Creek and the other watercourses at Tolay Creek Ranch are likely to be jurisdictional features and should be avoided to the extent possible by infrastructure with the exception of restoration projects. Any crossing of these features by a trail or road should occur with the least impact. Cattle trample the bed and banks of the watercourses and fencing should be considered.

6.1.4 Woodland

Any trails in oak woodlands should be located outside of the root zone in a manner that avoids as much damage as possible. Trails within oak woodlands should also be designed without excavation to the extent possible to avoid damage to roots. Trails should be minimized in riparian woodland in order to reduce impacts to breeding birds by human visitation.

Many species of wildlife are sensitive to the presence of humans. Locating trails and other facilities along riparian areas and other areas where cover is used by wildlife could adversely affect wildlife use of those areas. Repeated use of trails or other park facilities in a particular area may reduce use of those areas by wildlife. Proposed establishment of a dense cover of shrubs would facilitate wildlife movement throughout the ranch, provide additional refuges for wildlife, increase wildlife use of the ranch, and increase the diversity of wildlife.

Riparian areas are known for their habitat value for migratory songbirds including use as nesting areas. Locating a trail within a songbird nesting area may result in disruption of breeding activity, and a reduction of the habitat value of the riparian woodlands. Impacts of trails in riparian habitat could be mitigated by habitat restoration. Widening and lengthening existing riparian habitat containing trails would further mitigate impacts.

6.2 SPECIAL-STATUS SPECIES

A number of laws and regulatory agencies protect special-status species. Marin western flax is protected by the federal and state endangered species acts. CEQA addresses other species that can be shown to meet the criteria for listing but are not currently listed. These species could include those listed by the CNPS, those designated as California Species of Special Concern, others that are informally-listed, and those species that are tracked by the CNDDB as special animals. Marin western flax, Lobb's aquatic buttercup, and marsh zigadene are all listed by the CNPS. The golden eagle is protected by the Bald Eagle Protection Act. The California Fish and Game Code and the Migratory Bird Treaty Act protect nesting birds including golden eagle and burrowing owl. The California red-legged frog is federally listed as threatened and is a state species of special concern while the western pond turtle is a state species of special concern. Opler's longhorn moth is on the list of special animals. The zerene silverspot butterfly should be considered in project planning because it is currently only known from the Tolay Creek/Sears Point area.

6.2.1 Marin Western Flax

Extensive stands of the Marin western flax occur in the serpentine areas on Tolay Creek Ranch (Figure 7b). These stands should be avoided to the extent possible. A ranch road passes through some of these stands. Maintenance of this road should occur in a manner that does not substantially affect the adjacent Marin western flax.

6.2.2 Lobb's Aquatic Buttercup

Lobb’s aquatic buttercup grows in seasonally ponded areas (Figures 7a and b). These seasonal ponds are most likely jurisdictional wetlands and should be avoided.

6.2.3 Marsh Zigadene

Marsh zigadene grows in one or two locations near a tributary to Tolay Creek (Figure 7b). The tributary is eroding. Any erosion control measures should avoid the marsh zigadene. If any necessary earth moving is required, where marsh zigadene is present, then marsh zigadine should be established in another area of suitable habitat as mitigation. One manner of implementing the mitigation is to collect marsh zigadine bulbs, propagate them in a nursery, then transplant to suitable habitat.

6.2.4 Golden Eagle

Nesting golden eagles can be particularly sensitive to human activity within ¼ mile of the nest. Nesting can occur between February and August but generally occurs some time between March and June or July. A potential nest tree is approximately 1,100 – 1,200 feet from the Sears Point to Lakeville Road (Figure 7a). The sensitivity of the nesting pair of golden eagles to traffic and people in the vicinity of the nest should be examined. If this pair of eagles is sensitive to the presence of people, then a seasonal closure of this road may be appropriate. The specifics of this closure would depend on the distance of humans to the nest, the sensitivity of this particular pair of golden eagles to humans, and the presence of any cover or natural vegetation screen between the nest and humans.

6.2.5 Burrowing Owl

The sensitivity of burrowing owls to humans varies; some owls are able to occur in burrows next to a large amount of human activity while others are more sensitive to human presence. Burrowing owls occur in a rock outcrop that is beside an existing ranch road on the West Ridge of Tolay Creek Ranch (Figure 7a). If this ranch road were converted to a trail and if the owls were particularly sensitive, hikers along the trail may disturb them and the burrowing owls may leave. CDFG Guidelines (CDFG 1995) call for buffer widths of 250 feet during the breeding season and 160 feet during the non-breeding season between disturbance and burrowing owl nests. If possible, a hiking trail should avoid this outcrop by 250 feet.

Although no breeding activities by burrowing owls were observed during this season, breeding could occur in the future. Prior to constructing trails, pre-construction surveys would be necessary to preclude impacts to burrowing owls and design mitigation measures. The sensitive period for burrowing owls is between February and September 1.

6.2.6 Nesting Birds

California horned larks, grasshopper sparrows, and other ground nesting birds could nest virtually anywhere in the grassland areas of Tolay Creek Ranch. Prior to constructing trails during the nesting season (between February and July 31), preconstruction surveys should be conducted to ensure that nests are not damaged. If nesting birds are observed within 50 to 100 feet of the proposed trail or park feature, then construction should be diverted to areas beyond the buffer until the young birds have fledged. The width of this buffer could vary based on recommendations by a qualified wildlife biologist depending on the circumstances at the nest. These conditions would also apply to trails constructed through woodland and any other habitat occurring at Tolay Creek Ranch.

Nesting raptors would require greater buffers than the 50- to 100-foot buffers often recommended for song birds. Construction and use of trails, roads, or other facilities within 300 feet of a raptor nest could potentially cause stress and nest abandonment. An appropriate buffer should be established around raptor nests and once young have fledged, construction can begin within the boundary of the buffer.

6.2.7 California Red-Legged Frog and Western Pond Turtle

California red-legged frogs and western pond turtles potentially use the deeper ponds in Tolay Creek (Figures 7a and b). Trails should avoid the vicinity of these ponds by at least 25 feet, or these ponds should be screened from view by shrubby vegetation, such as California rose, California blackberry, snowberry or taller vegetation such as trees depending on the visibility of the pond from a proposed trail or other feature. Avoidance of wetlands, to the extent possible, elsewhere in Tolay Creek Ranch is also recommended to protect potential frog and turtle habitat. Turtles are more likely to occur in ponded areas, than wetlands where ponding is absent. California red-legged frogs could potentially occur in any wetland while moist or wet. Trail crossings should be designed to minimize disturbance to wetlands and watercourses. Enhancement activities planned for the habitat of the California red-legged frog should occur given the general procedures mentioned below.

Preconstruction surveys, by a qualified biologist, should be conducted prior to trail construction in suitable California red-legged frog and western pond turtle habitat. Depending on the regulatory context and the potential for impacts to California red-legged frogs, consultation with the USFWS may be advised. Additional mitigation may require buffers, monitoring, fencing, and/or replacement of affected habitat.

6.2.8 Opler's Longhorn Moth and the Zerene Silverspot Butterfly

Cream cups (food plant of Opler’s longhorn moth) and the Johnny jump-up (food plant of a rare subspecies of zerene fritillary butterfly) could also be affected by the installation of park facilities. Trails and other park facilities should be planned to avoid occurrences of cream cups and Johnny jump-up to the extent possible to avoid impacts to the caterpillars of these two lepidopteran species.

6.3 EARTH-MOVING ACTIVITY

Any earth-moving activity would remove vegetation and expose the surface of the soil, which could result in an increase of sediment entering Tolay Creek or its tributaries. This would create a temporary adverse impact until vegetation covers the exposed soil surface. Best management practices should be implemented to reduce the amount of sediment generated. If more than a minor amount of sediment would be generated, based on the size and location of the construction, appropriate erosion control BMPs should be utilized to contain the sediment within the construction area.

6.4 PUBLIC USE

Tolay Creek Ranch is a relatively large property with a number of sensitive resources. In general, the sensitive biological resources would not be affected by public use because the large size of the ranch allows for flexibility in placement of facilities and public use. The stands of Marin western flax are extensive and are not likely to be harmed by visitation during guided tours and scientific study. The stands of Johnny jump-up food plant of the zerene silverspot butterfly are numerous and similarly are not likely to be affected by visitation. The Lobb's aquatic buttercup grows in ponded areas that are not likely to be directly affected by human visitation. Scientists interesting in studying the ponds should be made aware of the occurrence of Lobb's aquatic buttercup in order for effects to be avoided. The marsh zigadene grows in a small area that should be avoided by any facilities.

The serpentine areas are valuable due to high plant and insect diversity and the sensitivity of small species to a large amount of trampling. This area has withstood the trampling of cattle since the arrival of the Spanish. The occasional group of 30 hikers participating on a guided hike is unlikely to damage the serpentine flora. Unrestricted visitation should be relegated to established trails through the serpentine areas. The existing ranch road through the serpentine area should also serve as a trail, if possible. Nevertheless, if a more appropriate alignment for the road/trail is determined, the existing road should be decommissioned and restored.

Sensitive resources that should be avoided are nesting burrowing owls and the pools of Tolay Creek that provide habitat for the California red-legged frog and western pond turtle. Visitation is likely to have substantial effects on these resources. If burrowing owls were to nest at Tolay Creek Ranch, any scientific study could be safely carried out from a distance to avoid stressing the owls. Approaching the nest burrow, in order to collect pellets or for other reasons, should be done to minimize stressing the owls such as when the owls are within their burrow or are away from the burrow.

There are relatively few pools that are sufficiently deep in Tolay Creek that are suitable for California red-legged frogs and western pond turtles (Figure 7a and b). Some of these pools may support breeding of the California red-legged frog. Frequent visitation to these pools is likely to drive away these species. Study of these pools, if at all should be controlled.

A dilapidated bridge on the Sears Point to Lakeville Road occurs at the boundary with Tolay Lake Regional Park. California red-legged frogs and a western pond turtle were observed within the pool beneath the bridge. This bridge is located at one of the access points that connect Tolay Creek Ranch with Tolay Lake Regional Park. If this area is to be developed as a major connector and trail, then habitat for the California red-legged frog and western pond turtle should be enhanced in Tolay Creek and other areas of Tolay Creek Ranch. Although greater opportunities may occur for mitigation at Tolay Lake Regional Park, the apparent absence of breeding American bullfrogs at Tolay Creek Ranch makes Tolay Creek Ranch a superior habitat area.

7.0 MANAGEMENT GUIDELINES AND RESTORATION RECOMMENDATIONS

The specific condition of the vegetation present at Tolay Creek Ranch prior to the arrival of Europeans is not known. Kuchler (1977) depicts the study area as grassland on the map of the *Natural Vegetation of California*. The current limited shrub and tree cover and the absence of stumps or logs in the study area supports Kuchler (1977). In addition, Diablo Clay (underlain by calcareous fine-grained sandstone, clayey shale, and weathered siltstone) and Clearlake Clay (underlain by alluvium) are common soils of Tolay Creek Ranch and primarily support grassland vegetation (USDA 1972). The Goulding-Toomes complex (underlain by metamorphosed basic igneous and weathered andesitic basalt for Goulding and andesitic basalt and volcanic breccia for Toomes) is less common than the Diablo soils, but also supports grassland (USDA 1972).

The woodland at Tolay Creek Ranch was probably never well developed and primarily, but not entirely, restricted to the drainages and rocky outcrop areas. For areas in the vicinity of Tolay Creek Ranch that formerly supported woodland, the loss of trees is likely the result of cutting and the subsequent grazing that reduce recruitment of new trees. Upon cessation of grazing, portions of the grasslands of Tolay Creek Ranch may become woodland as have portions of the East Bay hills.

Shrub cover in particular was most likely higher before the introcuction of cattle. Likewise, the breath of the riparian corridors were likely to have been substantially broader and with a more developed multi-layered canopy. The locations and extent of wetlands, native grassland, oak woodland and other native plant communities were highly altered by historic ranching and farming operations, and opportunities thus exist for ecological restoration. In particular, woody vegetation is restricted to portions of watercourses perhaps due to the historic land use practices of grazing or due to incompatible soils where woodland is absent.

Some of the restoration actions that are discussed below involve ground-disturbing activities be they use of earth-moving equipment to fix head-cuts of erosional areas or use of a trowel to plant acorns. Any ground-disturbing activity could potentially affect cultural resources and the cultural resource study (LSA 2009) provides recommendations to avoid or minimize impacts. Ground-disturbing activities should be avoided on sites known to contain sensitive cultural resources.

Ground-disturbing activities may also promote the colonization of an area by non-native plant species. A challenge for the success of restoration is maintaining non-natives at a low density. Control of invasive species should be a part of the restoration activities.

7.1 RESTORATION OF SELECTED HABITATS

7.1.1 Oak Woodland

Oak woodland currently provides cover along Tolay Creek and its tributaries on the East and West ridges. A variety of age classes of oak trees were observed on site and the role that wildlife and cattle play in reducing oak regeneration is not clear at Tolay Creek Ranch. Coast live oak has been documented as not adequately regenerating in some areas because of a combination of factors including livestock and wildlife herbivory and competition with dense stands of non-native grasses (McCreary 2001). In addition, oaks may establish seedlings and saplings only during years with unusual weather conditions of summer moisture.

It is likely that oak woodland was never very abundant at Tolay Creek Ranch based on the the presence of Diablo, Clear Lake, and Goulding-Toomes complex soil types that usually support grassland. The Langier soils are underlain by rhyolite or rhyolitic tuff and often support oak woodlands just east of Tolay Creek Ranch and on the East Ridge of Tolay Lake Regional Park. Establishing oak woodland at Tolay Creek Ranch should therefore be done on a very limited scale.

The shrubby understory of the oak woodland provides cover for wildlife. At Tolay Creek Ranch, the understory of oak woodland is patchy with the most well developed understory beneath coast live oak trees. The understory of the deciduous valley oak trees is usually dominated by grassland.

The coast live oak and valley oak woodland could be slightly expanded along selected tributaries to form a more complete movement corridor for the larger species of wildlife (Figure 8a). A combination of fencing cattle from the selected drainages and planting oak trees could be used to accomplish this goal.

Regeneration of oak woodland, including the shrubby understory, should be monitored in fenced areas and oaks planted if monitoring shows an absence of natural regeneration. Oak trees may be planted on slopes above watercourses, such as the upper reaches of the major tributary flowing from the east (Figure 8a). Establishing woody vegetation on the over-steepened slopes of this watercourse would reduce slope failure and reduce sedimentation. The entire reaches of other watercourses were not selected for oak woodland restoration in order to provide open creek side habitat or to avoid adjacent grassland or serpentine habitat, which is also valuable. Seeps occur at some of the upper reaches of the watercourses and these should be preserved as herbaceous vegetation as opposed to converting them to woody vegetation.

Planting could be done using container plants or acorns. The grazing of livestock should be managed to encourage oak regeneration and the establishment of a shrubby understory. The grazing concept applied at Tolay Lake Regional Park (LSA 2008b) is to graze the areas with watercourses and seeps in the winter and spring, when water is not limiting and thereby reduce degradation of these valuable habitats. Nevertheless, cattle use of these areas should be monitored to ensure that damage remains at an acceptable level. The cattle would be moved to other pastures not supporting watercourses and seeps for late spring, summer, and fall grazing.

Sudden oak death (*Phytophthora ramorum*) is known from southern Sonoma County. Two dead coast live oak trees along Tolay Creek appeared to have sudden oak death. If the coast live oaks were to become infected by sudden oak death, restoration should include establishing single-species stands of coast live oak, without an understory. Current research indicates that coast live oaks acquire sudden oak death from other species of plants (M. Garbelletto, pers. comm.). Sudden oak death may result in woodlands dominated by California bay trees because the bay trees are more resistant and they also serve as a vector for the pathogen to infect oaks. The sudden oak death pathogen does not appear to be able to infect coast live oak trees from nearby coast live oak trees. Other species of nearby trees and shrubs are required for the pathogen to infect coast live oak.

7.1.2 Watercourses and Riparian Woodlands

Willow, coast live oak, valley oak, California buckeye, blue elderberry, and big-leaf maple currently grow along Tolay Creek. Prior to the arrival of Europeans, the woodland along Tolay Creek probably supported a greater number of trees and a more complete cover over the creek. Large patches of willow trees, consisting of hundreds of trees, were likely to have grown along the channel of Tolay Creek based on the occurrence of old willow trees currently growing at the top of the bank. Since Tolay Creek has incised, smaller willow trees have occasionally colonized the bed of Tolay Creek.

Where Tolay Creek flows through rolling topography in the Tolay Creek Canyon, big-leaf maples grow among the coast live oaks in the oak woodland that occurs on the banks. In the Lower Tolay Valley (Figure 8b), Tolay Creek is fairly deeply incised for much of its length. Here valley oaks grow at the top of the bank above the incised channel and an occasional willow tree grows in the bed of Tolay Creek.

Restoration of the woodland along Tolay Creek should mimic the existing pattern of vegetation along its banks. The upstream portion of Tolay Creek could support a mosaic of willow and oak trees growing along the bank. Selected areas of the creek bed could support willow vegetation and some areas should be left bare for herbaceous habitat. The coast live oak – big-leaf maple vegetation should be expanded along the middle portions of Tolay Creek in areas where there are large sloping banks above the creek. In the Lower Tolay Valley, clumps of valley oak should be planted on the terrace above the bank and willows should be added to selected areas of the creek bed that retain water for a long duration. Portions of the creek bed should also remain open for herbaceous habitat.

The entire length of Tolay Creek should be fenced. Cattle enter the creek and feed upon the herbaceous vegetation and create hoof prints in the substrate and trample the vegetation. Fencing would preclude this damage of the vegetation of Tolay Creek. Monitoring of the vegetation within Tolay Creek may indicate that cattails and bulrush may become so dense as to grow throughout the pools within the creek. Occassional short-term grazing may be necessary to maintain the habitat diversity of Tolay Creek.

This fencing could occur in phases because of the expense in involved in fencing the several miles of of Tolay Creek within the study area. The first phase of this fencing should include both downstream reaches and upstream reaches of Tolay Creek. It is important to fence the downstream reaches because of the reduced amount of woody vegetation. Such fencing should result in an increase in woody vegetation. Selected upstream areas that contain deep pools or are otherwise habitat of the California red-legged frog and western pond turtle should also be fenced to increase the cover surrounding potential breeding habitat.

7.1.3 Native Bunchgrass Grassland

Purple needlegrass and California barley are the most common native bunchgrasses at Tolay Creek Ranch. Purple needlegrass grows in stands on and off of serpentine substrates. The year 2008 was a very dry year and in some areas the native grass was difficult to observe because the intense grazing kept it at a low stature. Selected stands on and off of serpentine should be fenced to see the effect of grazing on purple needlegrass and associated species. Figures 8a and 8b map candidate areas for fencing. These areas are selected such that native grassland, non-native grassland, and native forbs are chosen to be near each other to reduce the variability among the fenced areas. California barley was mostly observed on the serpentine substrates. Stands of California barley should also be fenced to determine the effect of grazing on it and its associated species.

7.1.4 Fragrant Fritillary

Fragrant fritillary grows from a bulb that forms lobes. Each lobe when separated from the bulb, will produce a new fragrant fritillary plant. The fragrant fritillary can be propagated in a nursery setting and then out-planted at selected locations of Tolay Creek Ranch. This propagation for establishment of the fragrant fritillary on Tolay Creek Ranch should only be implemented after exhaustive surveys have been completed. It may be detrimental to a scientific study of fragrant fritillary at Tolay Creek Ranch if genetic stock from a different population were mixed with the genetic stock that naturally occurred at Tolay Creek Ranch.

Such a program to establish fragrant fritillary should not be taken lightly because it results in the "alteration" or human manipulation of an aspect of the ecology of Tolay Creek Ranch. Fragrant fritillary may never have occurred at Tolay Creek Ranch or if not occurring as a population of plants, it may occur as seeds lying dormant in the soil. Nevertheless, undertaking a program to translocate a small number of fragrant fritillary plants to a small area of Tolay Creek Ranch, may provide a great deal of scientific information with minimal detrimental ecolocial ramifications.

7.1.5 Seeps

A number of very wet seeps occur at Tolay Creek Ranch. These include the Roche Developed Springs, well developed springs or seeps north of the Roche Developed Springs, and other springs on the East and West ridges (Figure 5b). These wet springs support stands of Pacific rush that can provide cover for wildlife if not grazed. In 2008 they were grazed to a short height. These seeps also support a number of non-native species including tall fescue and bristly ox-tongue.

The effects of grazing should be examined by establishing fenced grazing enclosures in selected areas. It appears that the cattle are having a profound effect on the seeps. Cattle are trampling the vegetation and consuming virtually all the above ground foliage of the plants growing in the seeps. Each selected seep could be partially fenced to compare grazed areas with ungrazed areas of the same seep. The vegetation of each area should be sampled in plots prior to fencing. In this manner, the change in the vegetation of grazed and ungrazed plots can be compared. Monitoring of the grazing regime will help inform management strategies. Grassland monitoring and adaptive management concepts are described in greater detail in the Rangeland Resources Study for Tolay Lake Regional Park (LSA 2008b). If cattle are having a deleterious effect on the vegetation of the seeps, then the seeps can be fenced and water piped to a trough for use by cattle outside of the fence.

If restoration of any seep is needed, the wettest areas could be restored to semaphore grass, rushes, and sedges. Drier areas could be restored to creeping wildrye, meadow barley, and California oat grass. The non-native species should be removed from these seeps, although it will be very difficult to remove the tall fescue, bristly ox-tongue, and other established weeds because they are growing among the native plants.

7.1.6 Rocky Knoll

A rocky knoll is located on the western property line near the serpentine area. This knoll is conical shaped and supports a small tree at the summit (Figure 8b). The plant species that grow here are a combination of scrub and grassland resulting in a diverse assemblage of plants consisting of ocean spray (*Holodiscus discolor*), poison oak, bush monkey flower (*Mimulus aurantiacus*), Chinese houses (*Collinsia heterophylla*), phacelia (*Phacelia* sp.), foothill needlegrass (*Nassella lepida*), Ithuriel's spear, sweet pea (*Lathrys vestitus*), and lomatium (*Lomatium* sp.). Cattle have access to this area and it was heavily grazed in 2008.

This area should be monitored to determine the intensity of grazing and it should be fenced if intense grazing continues. Intense grazing is probably beneficial in some years to prevent the shrubs from increasing in density and out-competing the grassland species.

7.2 WILDLIFE ENHANCEMENT

7.2.1 California Red-legged Frog

7.2.1.1 Habitat Enhancement. California red-legged frogs can breed in seasonal or perennial waterbodies whereas American bullfrogs require perennial waterbodies. Ideal breeding ponds for California red-legged frogs should be deep enough to contain water through June or July but dry by the end of the year to prevent colonization by American bullfrogs. The existing perennial ponds at Tolay Creek Ranch are small and lack cover. California red-legged frogs and their tadpoles would be subjected to predation in these ponds, nevertheless, these ponds may support breeding.

Fencing reaches of Tolay Creek that support breeding habitat for California red-legged frogs is likely to result in increased cover and a resulting increase in suitability for breeding. This would be the most rapid enhancement measure that could be implemented for the California red-legged frog. Surveys should probably be conducted for the California red-legged frog to assess the effectiveness of the enhancement measures.

If fencing does not result in an increase in suitability of habitat for the California red-legged frog, then surveys should be conducted to determine reasons for the absence of successful breeding. Additional enhancement measures could be implemented depending on the results of the surveys.

If the studies indicate that Tolay Creek does not provide good breeding habitat and California red-legged frogs occur on Tolay Creek Ranch, then ponds outside of the channel could be considered to enhance breeding. The drawback of creating ponds is that they are a created habitat that is not natural to Tolay Creek Ranch and they often support dominance of non-native plant species. These non-native species could include curly dock, bird's foot trefoil, Italian ryegrass, rabbit's foot grass, and swamp timothy (*Crypsis schoenoides*). American bullfrogs, may also use these ponds while they contain water. Nevertheless, a special-status species, Lobb's aquatic buttercup, CNPS List 4, has colonized un-natural seasonal ponds at Tolay Creek Ranch and is likely to colonize additional created ponds.

Ponds could be created by constructing small dams in suitable areas of some of the smaller tributaries to Tolay Creek, by excavating depressions in the floor of the Lower Tolay Valley and/or by diverting a small amount of water from one of the large seeps to a created depression at the edge of the seep. If these ponds were to be created, then spike rush and other shoreline vegetation should be established within any created pond to provide cover for the frogs and their larvae.

Once cover has been established at the breeding ponds, grazing could be used to manage the extent of the cover. Year-round heavy grazing can virtually eliminate freshwater marsh and riparian vegetation reducing cover for frogs and increasing the likelihood of predation. Elimination of grazing, on the other hand, can result in dense stands of cattails that reduce habitat diversity. The optimal condition for red-legged frogs is a mosaic of open water, freshwater marsh, and riparian vegetation. This condition can be created by managing the timing and intensity of livestock grazing. Fencing portions of the ponds could also accomplish this objective.

7.2.1.2 Control of American Bullfrogs. Because permanent ponds within Tolay Creek are small, suitability for breeding American bullfrogs is low and the need for control of American bullfrogs is likely to be low in any given year.

7.2.2 Western Pond Turtle

Western pond turtles occur in Tolay Creek. Providing habitat for the California red-legged frog would also provide habitat for the western pond turtle.

7.2.3 Burrowing Owl

A few burrowing owls are regularly observed at Tolay Creek Ranch in the vicinity of rock outcrops suitable for refuge. The site is probably not optimal breeding habitat due to climatic factors. Burrows suitable for nesting by burrowing owls are limited in extent at the park, in part due to the small numbers of California ground squirrels. Burrowing owls can use the burrows of other types of animals besides ground squirrels (such as foxes), and they have been observed using holes in rock outcrops at Tolay Creek Ranch. Creation of artificial burrows suitable for nesting by burrowing owls could be considered in the short-term. In the long-term, proper range management may encourage an increase in the number of ground squirrels, which would create burrows that could be used by burrowing owls.

7.2.4 Mammals

Woody cover for mammals could be expanded at Tolay Creek Ranch as discussed in the section on *Restoration of Selected Habitats*. This would allow mammals to utilize a greater portion of Tolay Creek Ranch and provide cover for mammals traveling through the ranch. Increasing cover would likely increase mammalian diversity and the abundance of northern raccoon, striped skunk, Virginia opossum, gray fox, and coyote. An increase of rabbits could also increase the numbers and diversity of predators at Tolay Creek Ranch.

Tolay Creek Ranch should also be managed to allow the colonies of California ground squirrels to expand. This will increase the diversity of the grassland fauna that uses the squirrel burrows for refuge. California ground squirrels are also important prey species and, as such, may be important in maintaining predator diversity.

7.3 NON-NATIVE PLANT SPECIES CONTROL

A number of invasive non-native species occur in sufficient density at Tolay Creek Ranch to warrant control (Figures 6a and b). The most numerous weeds are yellow star-thistle and Medusahead. Other species present in lesser numbers are bristly ox-tongue, purple star-thistle, Italian thistle, milk thistle, black mustard, wild radish, teasel, and Himalayan blackberry. Curly dock and cocklebur should be removed from the large seasonal pond next to Highway 121. In addition, acacia, tamarisk (*Tamarisk* sp.), Monterey Cypress, and blue gum should be managed.

Invasive plants are defined as those that can spread into wildland ecosystems and displace desirable native species, hybridize with native plants, and alter biological communities and ecosystem processes (Cal-IPC 2006). Without control, invasive plants can spread to encompass areas much larger than several acres and become the dominate plant species. This is of particular concern at Tolay Creek Ranch because of the large areas of grassland that are dominated be native species, including the serpentine area. These native grasslands are a very valuable resource because of their scarcity in California. Furthermore, the grasslands support cream cups, the food plant of Opler's longhorn moth (on serpentine soil) and Johnny jump-up, the food plant of an un-named subspecies of zerene silverspot butterfly. Invasive weeds could out-compete these species and threaten these rare insect species. These invasive species correspond with those species listed in Table A of the California Invasive Plant Inventory (Cal-IPC 2006).

The extent and location of weedy species within Tolay Creek Ranch should be monitored annually and appropriate control activities should be implemented. Control/eradication activities such as through physical means (grazing, mowing, hand-pulling), chemical/herbicide means, and/or controlled burning should be implemented in an integrated pest management approach as deemed appropriate for the species and circumstances of the infestation,. Such work should be monitored for effectiveness.

Herbicides should be applied by a Licensed Applicator in accordance with recommendations by the manufacturer to control some weedy plant species. Timing of application would depend on the phenology of the weeds and any restrictions due to seasonal grazing activity or other constraints posed by wildlife on a seasonal basis.

Mowing should be timed carefully to remove weed flowers prior to seed ripening. After initial treatments during the first 2 years, mowing schedules should be adjusted using adaptive management based on the results of monitoring. Mowing height should typically not exceed 3-4 inches. To minimize build-up of thatch and to remove non-native seed-heads before they shatter, the mowing regime should use a haying and baling approach with the bales removed from the property to an appropriate location where weed introduction would not pose a threat.

Weed management through training goats and cows to select invasive species should be evaluated for use on this site (Voth 2006). Depending on the density of weeds, areas where weeds have been controlled may need to be seeded or planted with native perennial grasses to discourage re-establishment of the weeds.

Controlled burning can be an effective manner to reduce weed infestations and enhance grassland areas by reducing thatch and increasing wildflowers. The local fire department may support controlled burning for practice purposes. Timing should occur after rare plants have dropped their seed.

Specific treatments for target invasive species are discussed below in order of perceived threat to native species. It should be noted that as target species prioritized for control become less abundant, other species may fill the void. Additionally, new introductions of invasive species could occur in the future. For these reasons, the invasive plant control program should maintain flexibility based on monitoring to adapt to new challenges and opportunities.

7.3.1 Medusahead

Medusahead is one of the most common weeds at Tolay Creek Ranch. It occurs in patches mostly in the lower Tolay Valley with a few small stands on the West Ridge. It does not appear to dominate extensive areas at Tolay Creek Ranch (Figures 6a and b). Medusahead is of concern because it grows very densely and over time can exclude other species including native grasses and forbs. Medusahead has the ability to spread to other areas in the fur of animals and without some type of control, has the ability to grow throughout large areas of Tolay Creek Ranch. It is ranked highly because of its ability to exclude other species and its ability to spread.

A carefully managed combination of prescribed fire, grazing, herbicide treatments, and reseeding with native perennial grasses may be the most effective combination of treatments of medusahead (McKell et al. 1962) and should be considered if feasible. In addition to the intensive grazing program discussed above, the following treatments should be implemented. Mowing during the boot stage is an option, but the straw would have to be baled and removed to prevent seed-heads from shattering and avoid thatch build-up. Treatment with glyphosate between mid-March and mid-May may also be effective in controlling medusahead. Care must be used to avoid herbicide drift onto native species.

Control can be attained through intensive grazing to force livestock to graze medusahead. This high density grazing results in severe competition for forage between animals, forcing them to graze less selectively and more uniformly. Medusahead can be reduced by up to 90% in 2 years of carefully timed grazing treatments (George 1992, George et al. 1989, Wildland Solutions 2005). In addition, Doran (2007) found that over 95% control of medusahead can be attained by very high intensity, short-duration (from a few days to two weeks) livestock grazing in the late spring.

This treatment is successful only when intensive grazing coincides with the period when medusahead is in the “boot” stage (before the seed head emerges from the uppermost leaf). This intensive grazing treatment should be timed (based on frequent observations) to coincide with the boot-stage of the phenology of medusahead, which can vary from late April to early May depending on yearly weather fluctuations (Young et al. 1970). This timing is critical because if livestock grazing ceases prior to the boot stage, the plants will re-grow and produce new seed heads. If grazing occurs after the seed head emerges from the boot, the livestock will avoid it because of the sharp awns, and there is a high risk of spreading the infestation by livestock after the seed is ripe. Livestock should be removed when grazing has reached the "heavy" level of use, with residual dry matter levels below 500 pounds per acre. Residual dry matter is the amount of vegetation remaining in an area.

7.3.2 Yellow Star-thistle

Yellow star-thistle, along with medusahead, is a common weed at Tolay Creek Ranch. It grows throughout Tolay Creek Ranch in patches (Figures 6a and b). A large mapped polygon on the East Ridge consists of a mosaic of smaller patches of yellow star-thistle and grassland (Figure 6).

Yellow star-thistle forms a rosette in late spring and begins to flower in fall. A dense growth of rosettes has the potential to exclude native forbs that grow in the late spring and summer because of shading by the rosette or competition for water. Yellow star-thistle is ranked highly because of its ability to dominate large areas.

Yellow star-thistle is rated as a high priority invasive species by the Cal-IPC (2006). A combination of techniques is most effective in controlling this annual invasive species, including grazing, mowing, burning, herbicide use, and biological controls. Mid to late- spring grazing (May-June), before the plant has produced spines but after bolting, may control seed production and spread to a limited degree (Thomsen et al. 1996).

The following approach may be used to control yellow star-thistle where infestations are extremely dense and other methods cannot be used for some reason. Under this approach, grazing would be initiated within a temporarily fenced enclosure after the growth and elongation of the grasses and yellow star-thistle occurred. High intensity grazing would be applied during the period when yellow star-thistle begins to emerge from the rosette and flower. Repeated treatments would be required to maintain that control. Extra livestock management would be required to keep animals at the site past the normal grazing period, maintain the fencing, and manage the animals. If the resource manager deems it appropriate, sheep or goats may be used instead of cattle for intensively managed grazing treatment of invasive species. In small areas where grazing is not feasible, mowing or herbicides during the same period should be used to control yellow star-thistle.

7.3.3 Purple Star-thistle

Purple star-thistle is rated as a moderate priority invasive weed (List B) by the Cal-IPC (2006). This species, unlike yellow star-thistle, is unpalatable to livestock at all life stages and dense stands of this weed can preclude cattle from grazing (Witham 2006). Therefore, this species causes significant losses of forage and is not effectively controlled by grazing. It is often a biennial or perennial species, with rosettes forming the first year followed by flowering the second and subsequent years. It was observed in one area at Tolay Creek Ranch (Figure 6b).

Purple star-thistle has the ability to spread to disturbed areas, including the ranch roads, at Tolay Creek Ranch. A dense growth of purple star-thistle excludes all other species, native or non-native. Purple star-thistle is of a moderate priority for control because it is not very abundant at Tolay Creek Ranch. Nevertheless, it should be monitored to ensure that it does not increase in abundance.

Application of glyphosate in the late spring-early summer on the rosettes and early blooming plants after adjacent desirable annual species have set seed is an effective control (Amme 1985). Care must be taken to limit this treatment to areas devoid of native perennials because this herbicide is non-selective. Selective herbicides that are effective in these cases include 2,4,D; Dicamba; or Garlon 3A. Areas to be treated should be mowed in the early spring prior to seed set to remove standing purple star-thistle flowers and to open the treated areas to grazing (DiTomaso pers. com., reported in Witham 2006). Hand pulling or using a shovel to cut off the purple star-thistle plant, an inch or more below the soil surface, is effective for small patches and individuals of purple star-thistle.

7.3.4 Italian Thistle

Italian thistle grows in mostly small stands above the bank of Tolay Creek and in disturbed areas of the non-native grassland and woodland. Its occurrence is spotty throughout Tolay Creek Ranch and is therefore of moderate priority for control. Dense stands of Italian thistle often occur in the same area year after year and they can exclude all other species. It is rated statewide as a moderate threat (Cal-IPC 2006). It reproduces only by seed, which have a high germination rate and can remain viable in the soil as long as 8 years.

Grazing by sheep, goats, and horses can be effective in controlling Italian thistle, but cattle need to be trained to graze it (Voth 2006). Application of selective herbicides (Picloram and 2,4,-D) have shown limited success in controlling this species (ESNERS 2000).

7.3.5 Bristly Ox-tongue

Bristly ox-tongue is considered a limited threat throughout California (Cal-IPC 2006). Precise locations were not mapped because it grows in many of the seeps and moist areas and occasionally in grassland at Tolay Creek Ranch. Small infestations may be controlled by hand pulling or hoeing 2-inches below the surface when soils are moist (ESNERS 2000) or by spot spraying. Livestock can also be trained to eat bristly ox-tongue.

Bristly ox-tongue grows in disturbed areas and in moist areas where it is a domint species of the seeps. The rosettes of bristly ox-tongue are quite dense in the seeps and can exclude native plants. Bristly ox-tongue is also a dominant weed at Tolay Lake Regional Park in the fallow fields. This weed is extremely dense in these fields and its wind-blown seeds disperse widely throughout the area. Bristly ox-tongue is of moderate priority for control because it is very abundant and control would necessitate considerable effort.

7.3.6 Black Mustard

This species is rated as a moderate invasive species by the Cal-IPC (2008). It grows in localized areas on Tolay Creek Ranch (Figures 6b) and should be at least monitored if it is not controlled. Some ungrazed grasslands support large stands of black mustard that have out-competed the grassland species. These stands of black mustard return in the same location in succeeding years and support few, if any, native species. Black mustard is of moderate priority for control because it is not abundant at Tolay Creek Ranch.

Control methods have not been specifically developed for black mustard, but Cal-IPC suggests hand removal of small stands. Their research indicates that mowing does not result in control. Spot spraying of herbicide (1% solution of glyphosate was suggested for wild radish (*Raphanus sativus*) which is applicable to black mustard (Cal-IPC 2008). Experimental treatments could include intensive grazing followed up by hand control or herbicides.

7.3.7 Curly Dock, Bird's Foot Trefoil, and Cocklebur

Curly dock, bird's foot trefoil, and cocklebur grow in the large seasonal pond beside Highway 121 (Figure 8b). They are present throughout the entire seasonal pond both within and outside the boundaries of the Tolay Creek Ranch property. The cocklebur is an annual species while bird's foot trefoil and curly dock are perennial species.

Any control measures should be instituted throughout the entire pond necessitating cooperation with the adjacent landowner. Control would be a large effort and would necessitate much hand weeding or herbicide use. If herbicides are used during the dry season, they should avoid the native species growing among the curly dock, bird's foot trefoil, and cocklebur.

The pond continues to provide wildlife habitat and the non-natives do not appear to be excluding any native wildlife species. Nevertheless, removal experiments may be interesting to implement to determine if the density of native species increases upon removal of these non-native species. Considering the effort necessary to remove these non-native species and considering that they also grow in the off-site portion of the pond, control efforts should be a lower priority. Nevertheless, these species should be monitored to ensure that native plant species continue to persist in the large seasonal pond.

7.3.8 Teasel

Teasel is rated as a moderate invasive species by the Cal-IPC (2008). It tends to grow in disturbed areas and at Tolay Creek Ranch it grows along the banks of Tolay Creek in moist areas. Teasel currently grows in a relatively few small stands but has the potential to grow over a much larger area. The rosettes of teasel form a siginificant amount of cover in these moist areas and are likely to exclude native species. Control of teasel would be low priority because it is not very abundant and control efforts would likely require a significant amount of time if done by hand.

Control options are not addressed in Cal-IPC (2008) but could include hand removal using tools and/or herbicide. It is a biennial species indicating that usually requires 2 years to grow to flowering and then it dies after flowering. Removal of seed stalks late in the season prior to dispersing seed may be tried on an experimental basis to determine whether teasel will grow another flowering stalk prior to dying.

7.3.9 Himalayan Blackberry

Himalayan blackberry grows most often in the understory of riparian areas where it forms an impenetrable stand among the lower branches and trunks of willow and oak trees (Figure 6b). It also grows as compact stands in a few grassland areas, and at the head of unvegetated watercourses. When in riparian situations, it dominates the understory, appears to spread, and may exclude other species. Himalayan blackberry, however, provides excellent cover for wildlife such as California quail.

Control could be by either hand removal or use of goats. Control should be phased such that alternative understory plant species would be established nearby prior to removal of a stand or portion of a stand of Himalayan blackberry. In this manner, cover would be maintained for wildlife. We recommend that control of Himalayan blackberry be given a low priority.

7.3.10 Blue Gum Eucalyptus, Tamarisk, and Black Acacia

Blue gum eucalyptus and black acacia grow in a few small clumps at Tolay Creek Ranch (Figures 6a and b). These trees should be monitored and seedlings and saplings removed to ensure that these trees do not expand and colonize native habitat. A potential golden eagle nest occurs in the blue gum at the former homestead near the crossing of Tolay Creek by the Sears Point to Lakeville Road (Figure 6a). Tamarisk, a species that is highly invasive to watercourses, also occurs at this historic homestead. Tamarisk should be monitored to ensure that it does not colonize the adjacent seep and tributary to Tolay Creek. If left unchecked, these three species have the potential to cover significant areas of the seeps, watercourses, and grasslands of Tolay Creek Ranch. Valuable wetland and watercourse habitat could be converted to a non-native woodland with a resulting reduction in species diversity. Control of these species would be low priority but removal of seedlings and saplings would be a high priority to prevent spreading.

7.3.11 Water Primrose

A speciesof water primrose (*Ludwegia* sp.) occurs within a couple of ponds at Tolay Lake Regional Park. The potential exists for the water primrose to disperse to Tolay Creek or other waterbodies within the general area. If it were to colonize Tolay Creek, it would be very difficult to eradicate because it would have the opportunity to colonize the entire downstream reach of Tolay Creek from Tolay Lake. Tolay Creek and other semi-pemanent waterbodies should be monitored for the occurrence of water primrose.

7.4 EROSION

Many of the slopes of Tolay Creek Ranch, especially those on the West Ridge contain landslides that occurred during the Quaternary period. In addition, the East Ridge is susceptible to debris flows (Florsheim 2009). Erosion is occurring at Tolay Creek Ranch in areas where head-cuts occur in watercourses and swales (Figures 8a and b). These head-cuts result in channel incision and the deposition of sediment downstream. They can also result in unstable slopes due to slope steepness. Particularly steep slopes are located along a tributary to Tolay Creek that flows through the “blue soil” area” of the East Ridge which is mapped as gullied land on Figure 4. This unstable “blue soil” also occurs in the West Ridge along a tributary to Tolay Creek (gullied land of Figure 4). Although mapped over an extensive area by the USDA (1972) the erosion occurs within a smaller area than that on the East Ridge.

A slumping and eroding area, slightly less than 0.5 acre, occurs on the northern part of the West Ridge in the Petaluma River watershed (Figure 8a). This area consists of several adjoining large gullies that appear to be expanding. The actively eroding portions of the head-cuts and any actively eroding portions at the top of the slope of the gullies should be smoothed and some type of geotextile applied to prevent further erosion.

Most of the other head-cuts occur in small watercourses or swales and are small themselves. The need to treat head-cuts in watercourses would depend on the size of the head-cut, the amount of sediment deposited by the continuing erosion, and the reduction of slope stability as the head-cut progresses upstream or upslope. Figures 8a and b show the location of some of the head-cuts at Tolay Creek Ranch. Not all of the head-cuts were mapped because they are fairly numerous in each of the watercourses and swales.

Portions of some of the ranch roads are rutted. These portions will continue to erode without repair and could create deep gullies. Many of these rutted areas are located at quite some distance from Tolay Creek and would not appear to directly affect sedimentation of the creek. Nevertheless, there is a fair amount of erosion directly adjacent to the Mengels Ranch road where it runs right next to Tolay Creek, in the upper watershed. These eroded portions of the roads should be repaired.

Erosion at Tolay Creek Ranch can potentially degrade large areas of upland due to the formation of large rills within ranch roads, head-cuts in swales, and the down-cutting of tributaries to Tolay Creek. Furthermore, this erosion may contribute sediment to Tolay Creek. In addition, the Florsheim (2009) study indicates that Tolay Creek has experienced periodic erosion and down-cutting since 1990.

Additional thought and additional study are required to develop priorities in a systematic fashion to address the repair of erosion at Tolay Creek Ranch. To develop these priorities, the Sonoma Land Trust may consider the importance of the deposition of sediment within Tolay Creek, formation of gullies within swales, down-cutting of tributaries to Tolay Creek, and down-cutting of Tolay Creek. Studies may need to occur for each of the topics mentioned above in order to quantify the need for erosion control. Each of these topic areas is briefly addressed below.

Determining the significance of sediment entering Tolay Creek is important since salmonid fish do not spawn in Tolay Creek. Nevertheless there would be the need to determine if there is a significant adverse impact to other aquatic life from sediment. Addressing those areas that contribute the most sediment, may be considered a high priority for erosion control. Areas of swales and tributaries that are experiencing down-cutting may be considered a high priority for erosion control if they are likely to become unstable over time because of the formation of steep slopes and the result of continued erosion and generation of sediment.

Tolay Creek experienced a tremendous amount of down-cutting since `1990 (Florsheim 2009). This down-cutting has left riparian vegetation at the top of the bank, 10 feet or more in some cases. This reduces the ability to develop large areas of riparian vegetation because the water table has likely dropped with the downcutting. For this reason, preventing further down-cutting of Tolay Creek and restoring its riparian vegetation may be the highest priority.

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8.3 PERSONAL COMMUNICATIONS

Sam Bacchini, Biological Consultant, EIP Associates, Sacramento, Conducted field work for Parson (1996)

Steve Ehret, Park Planner, Sonoma County Regional Parks, Santa Rosa, California

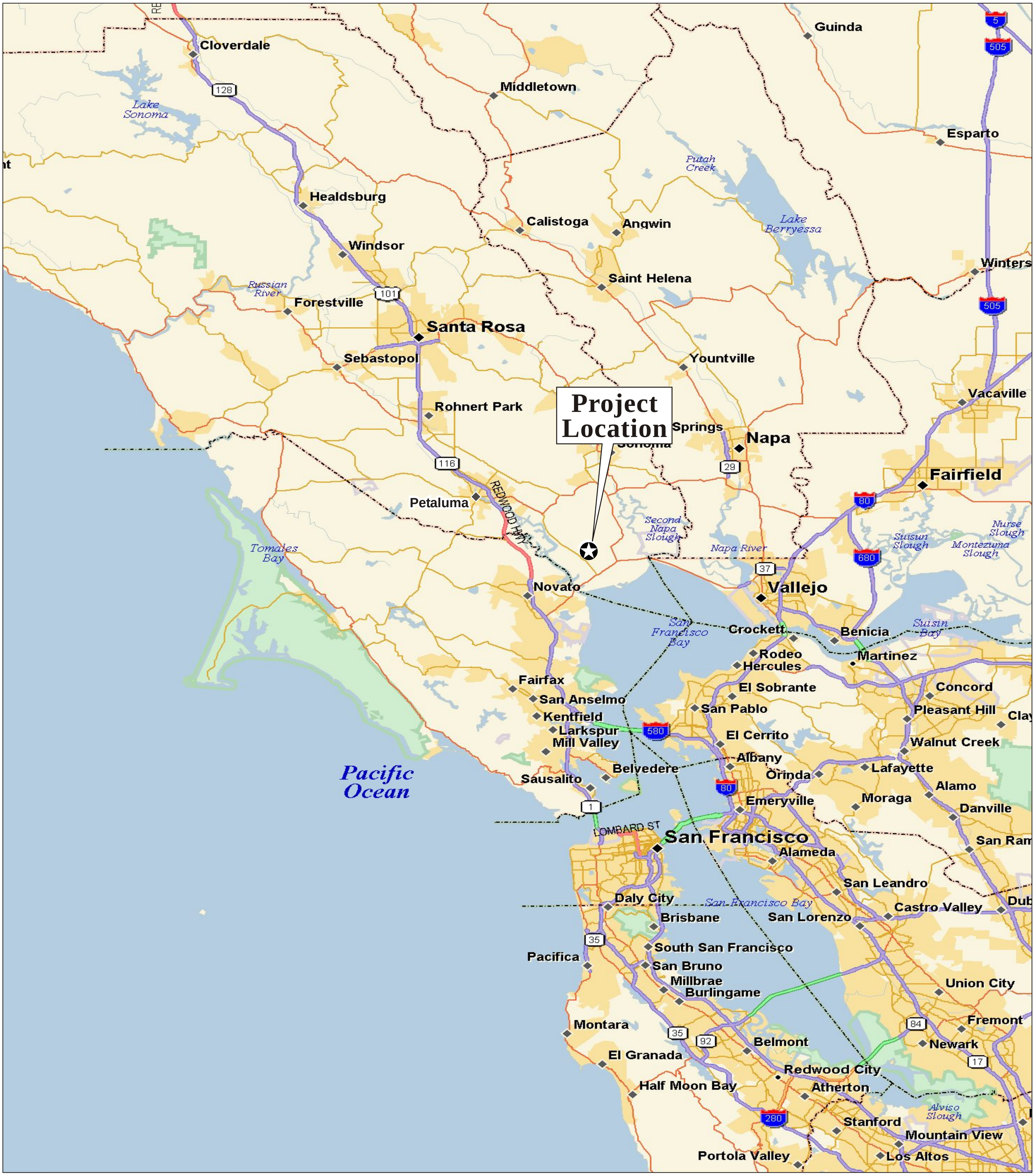
Matteo Garbelotto, Plant Pathologist, expert on Sudden Oak Death, University of California, Berkeley

Robert Neale, Stewardship Director, Sonoma Land Trust, Santa Rosa, California

B.J. Roche, 2007. Roche Ranch Representative

FIGURES

Figure 1: Project Location and Vicinity
Figure 2: Project Area
Figure 3: Adjacent Properties
Figure 4: Soils
Figure 5: Vegetation and Habitat Map
Figure 6: Location of Special-status Species and Habitat
Figure 7: Restoration and Management Areas
Figure 8: Non-native Species



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SOURCE: ©2006 DeLORME. STREET ATLAS USA®2006.

FIGURE 1

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Project Location and Vicinity

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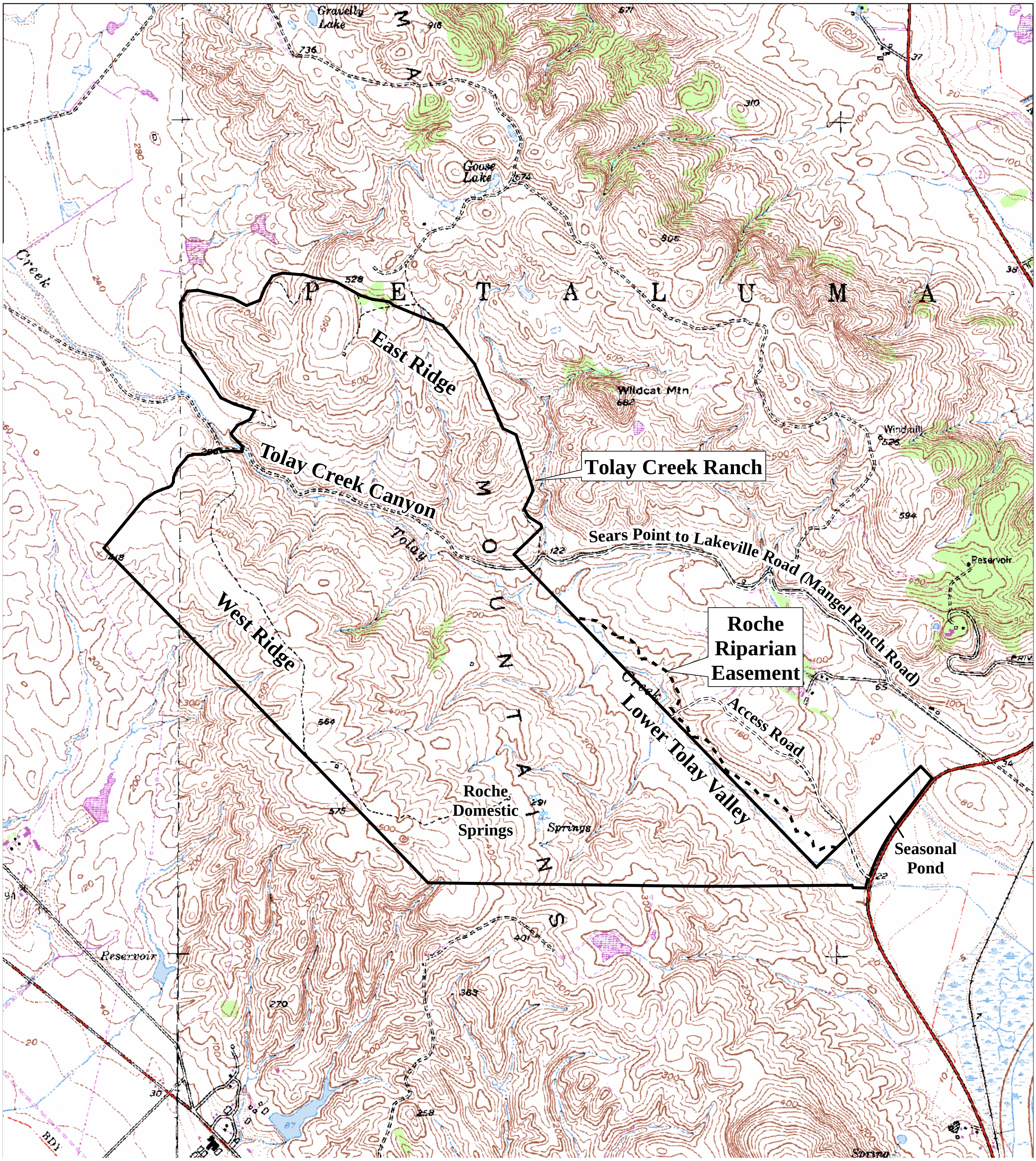

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Tolay Creek Ranch Boundary

Roche Riparian Easement Boundary

Study Area Includes Both Tolay Creek Ranch and the Roche Riparian Easement

FIGURE 2

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Study Area

Source: USGS 7.5' topographic quadrangles: *Petaluma River, Calif.* 1980; *Sears Point, Calif.* 1968

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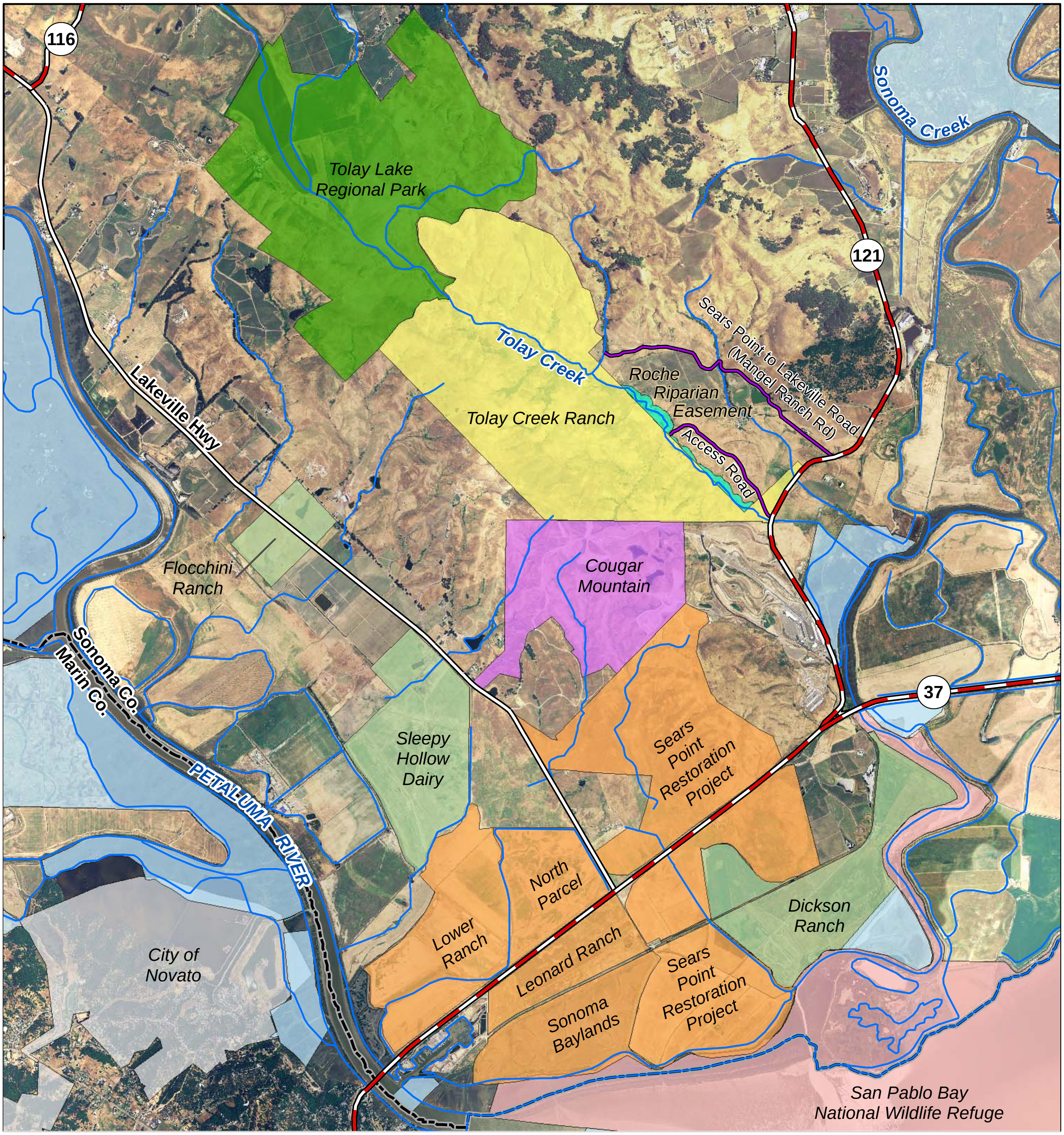

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Highways
Major Roads
Roche Access Roads
Streams

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Tolay Creek Ranch Property
Roche Riparian Easement
Sonoma County Regional Park Dept.
Sonoma County Ag. Preservation and Open Space District
Sonoma County Open Space Easement
Sonoma Land Trust Protected Lands
Calif. Dept. of Fish and Game Lands
Other Public Lands

FIGURE 3

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Adjacent Properties

Source: Ray Carlson & Assoc.; Sonoma County Ag Pres. & OS District; Sonoma Land Trust. USDA NAIP 2005.
Adapted from Circuit Rider Productions, Inc.

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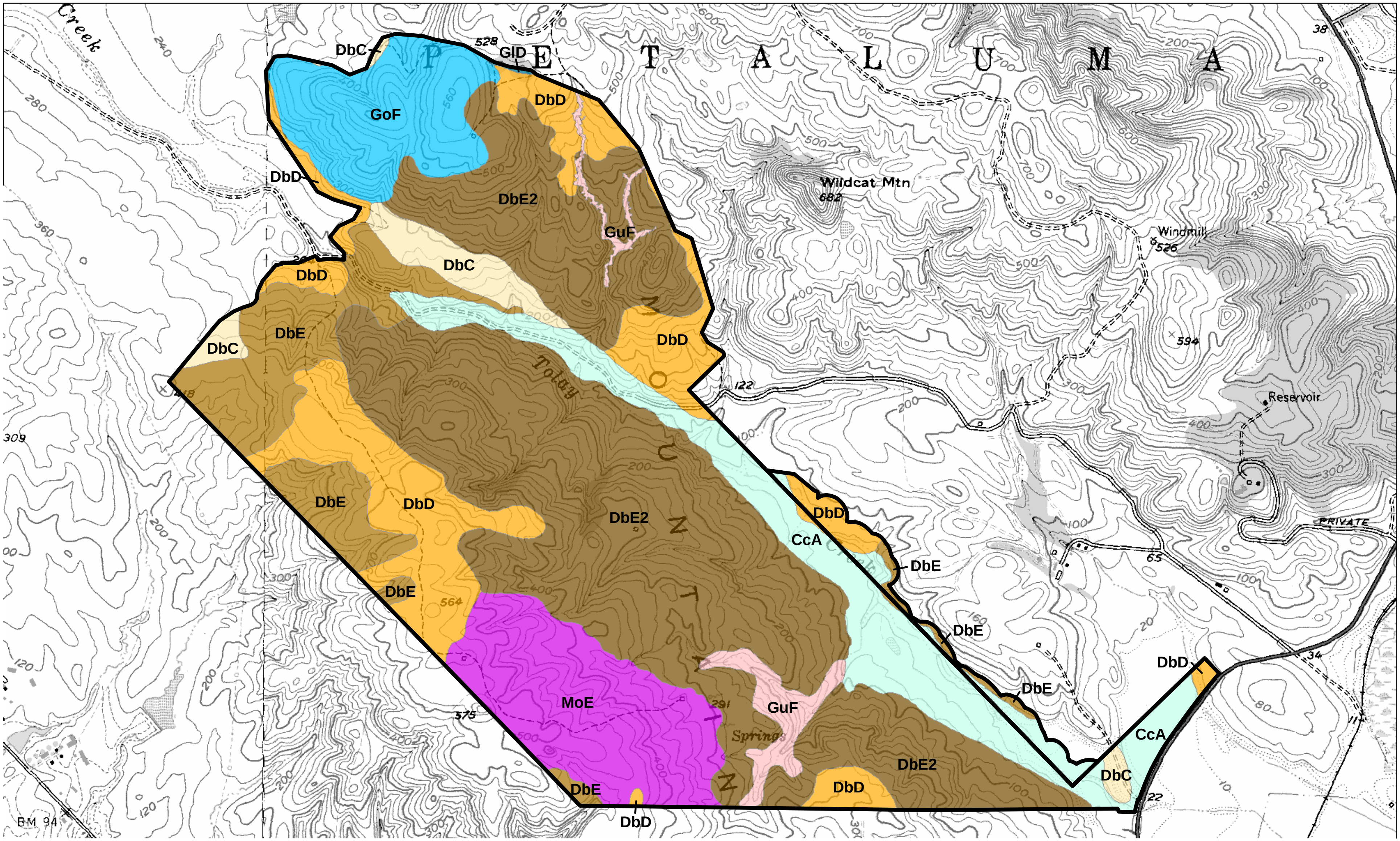

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CcA	Clear Lake Clay Loam, 0-2% Slopes
DbC	Diablo Clay, 2-9% Slopes
DbD	Diablo Clay, 9-15% Slopes
DbE	Diablo Clay, 15-30% Slopes
DbE2	Diablo Clay, 15-30% Slopes, Eroded
GlD	Goulding Cobbly Clay Loam, 5-15% Slopes
GoF	Goulding-Toomes Complex, 9-40% Slopes
GuF	Gullied Lands
MoE	Montara Cobbly Clay Loam, 2-30% Slopes

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FIGURE 4

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Soils

Source: USDA, NRCS 2000; USGS 7.5' topographic quadrangles: *Petaluma River, Calif.* 1980; *Sears Point, Calif.* 1968

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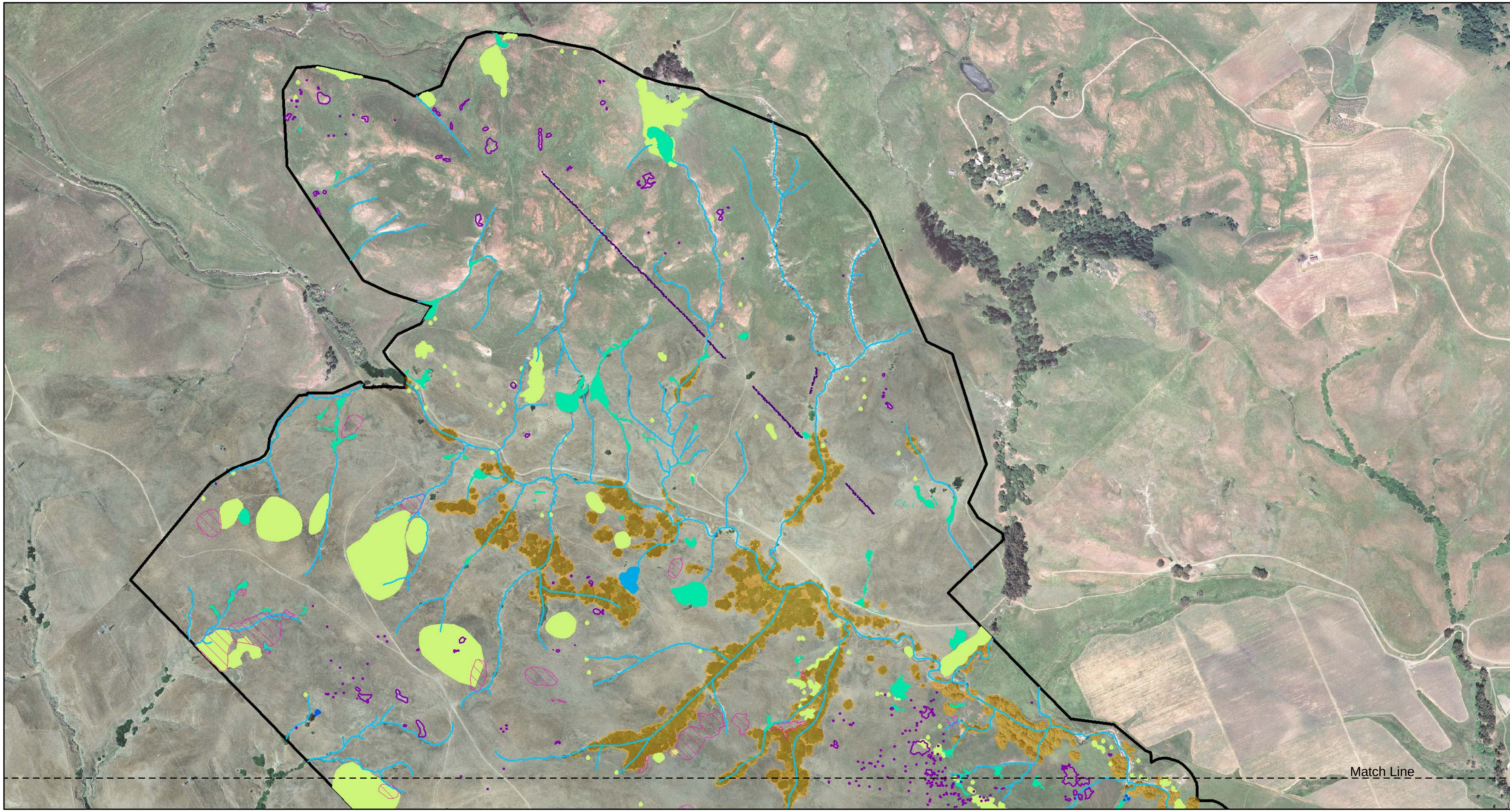

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Grassland with Native Forbs
Native Grassland
Non-Native Grassland
Woodland
Rock Outcrops
Rock Wall
Serpentine Soils (Montara Cobbly Clay Loam)
Vernal Pool and Large Seasonal Pond
Small Seasonal Ponds and Created Pond
Wetland
Roche Domestic Springs
Drainage
Study Area Boundary

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FIGURE 5a

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Vegetation and Habitat Map

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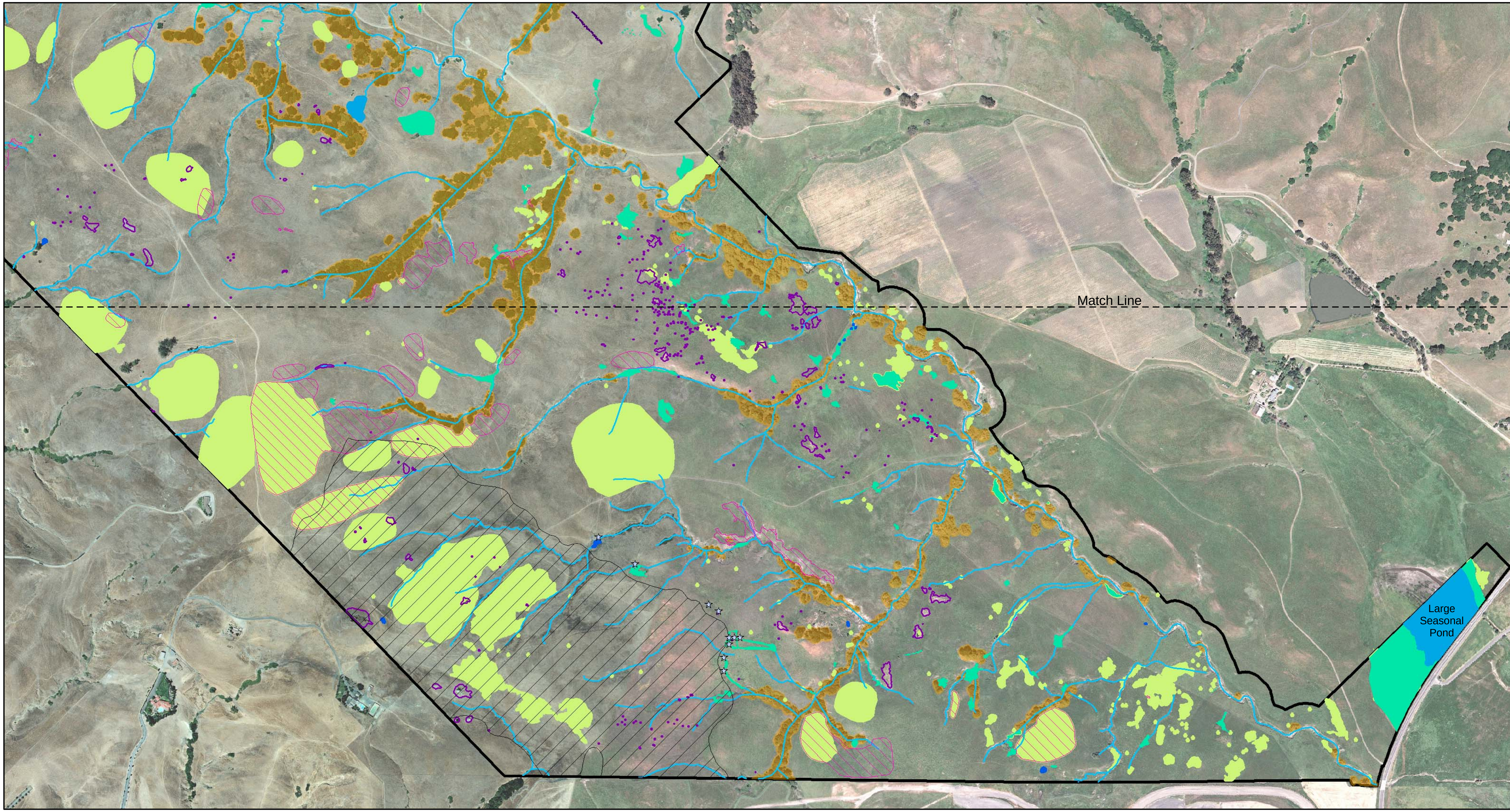

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Grassland with Native Forbs
Native Grassland
Non-Native Grassland
Woodland
Rock Outcrops
Rock Wall
Serpentine Soils (Montara Cobbly Clay Loam)
Vernal Pool and Large Seasonal Pond
Small Seasonal Ponds and Created Pond
Wetland
Roche Domestic Springs
Drainage
Study Area Boundary

FIGURE 5b

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Vegetation and Habitat Map

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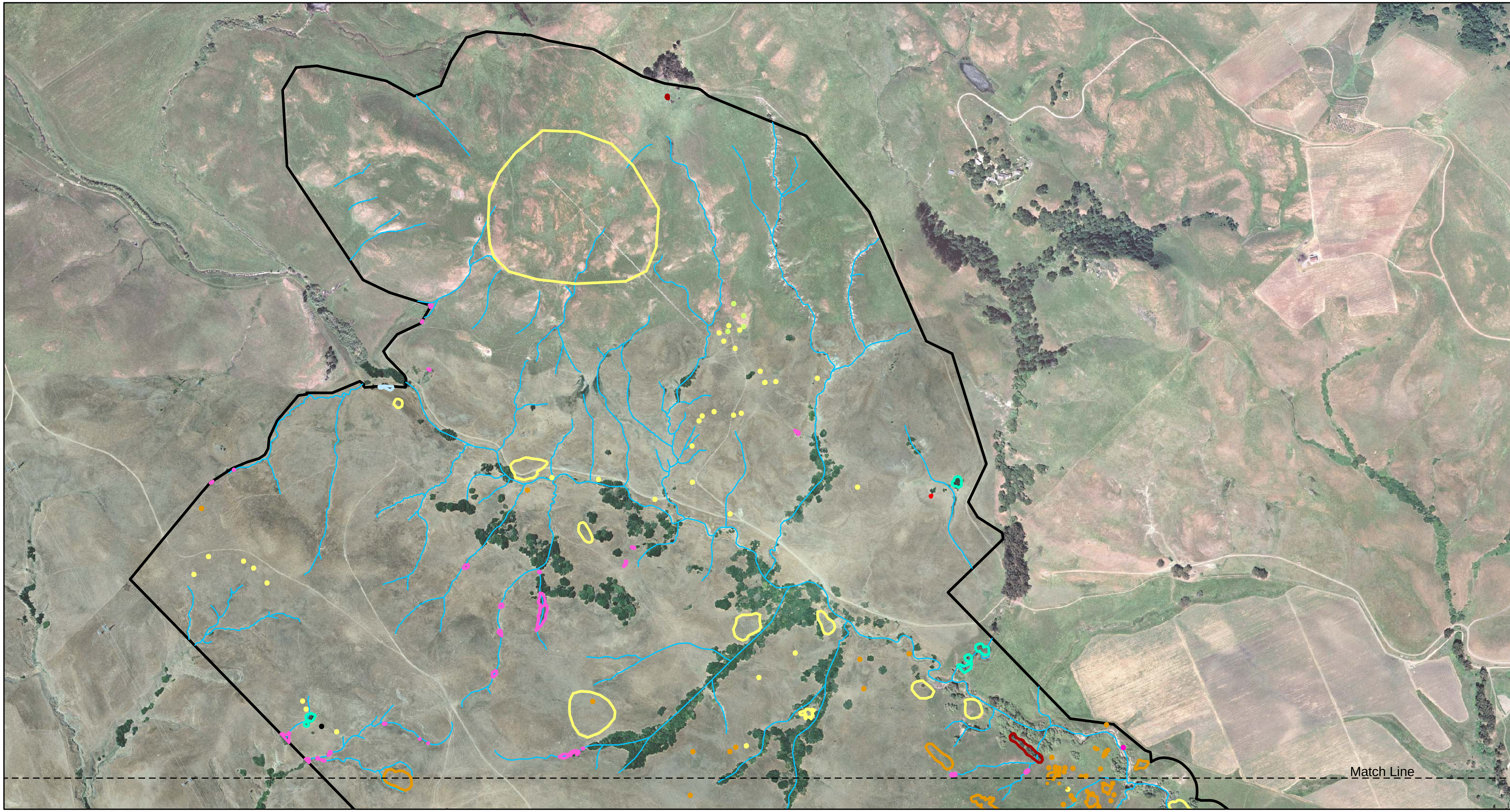

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Yellow Star-Thistle (*Centaurea solstitialis*)
Medusahead (*Taeniatherum caput-medusae*)
Medusahead (*Taeniatherum caput-medusae*) and Yellow Star-Thistle (*Centaurea solstitialis*)
Himalayan Blackberry (*Rubus discolor*)
Purple Star-Thistle (*Centaurea calcitrapa*)
Black Mustard (*Brassica nigra*)
Blue Gum (*Eucalyptus globulus*)
Tamarisk (*Tamarix sp.*)
Black Acacia (*Acacia melanoxylon*)
Monterey Cypress (*Cupressus macrocarpa*)
Other Invasive Non-native Species
Drainage
Study Area Boundary

FIGURE 6a

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Non-native Species

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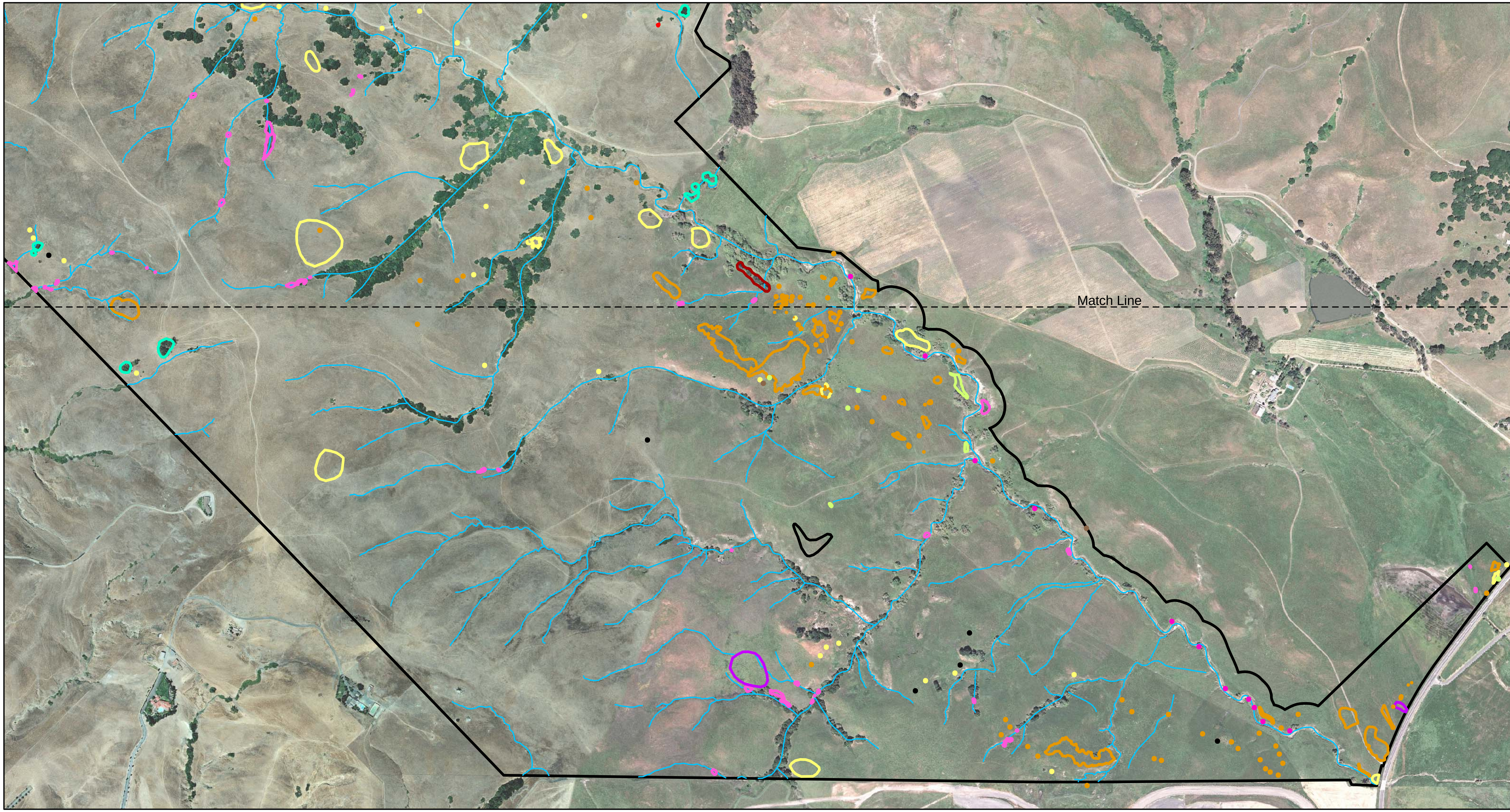

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Yellow Star-Thistle (*Centaurea solstitialis*)

Medusahead (*Taeniatherum caput-medusae*)

Medusahead (*Taeniatherum caput-medusae*) and Yellow Star-Thistle (*Centaurea solstitialis*)

Himalayan Blackberry (*Rubus discolor*)

Purple Star-Thistle (*Centaurea calcitrapa*)

Black Mustard (*Brassica nigra*)

Blue Gum (*Eucalyptus globulus*)

Tamarisk (*Tamarix* sp.)

Black Acacia (*Acacia melanoxylon*)

Monterey Cypress (*Cupressus macrocarpa*)

Other Invasive Non-native Species

Drainage

Study Area Boundary

FIGURE 6b

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Non-native Species

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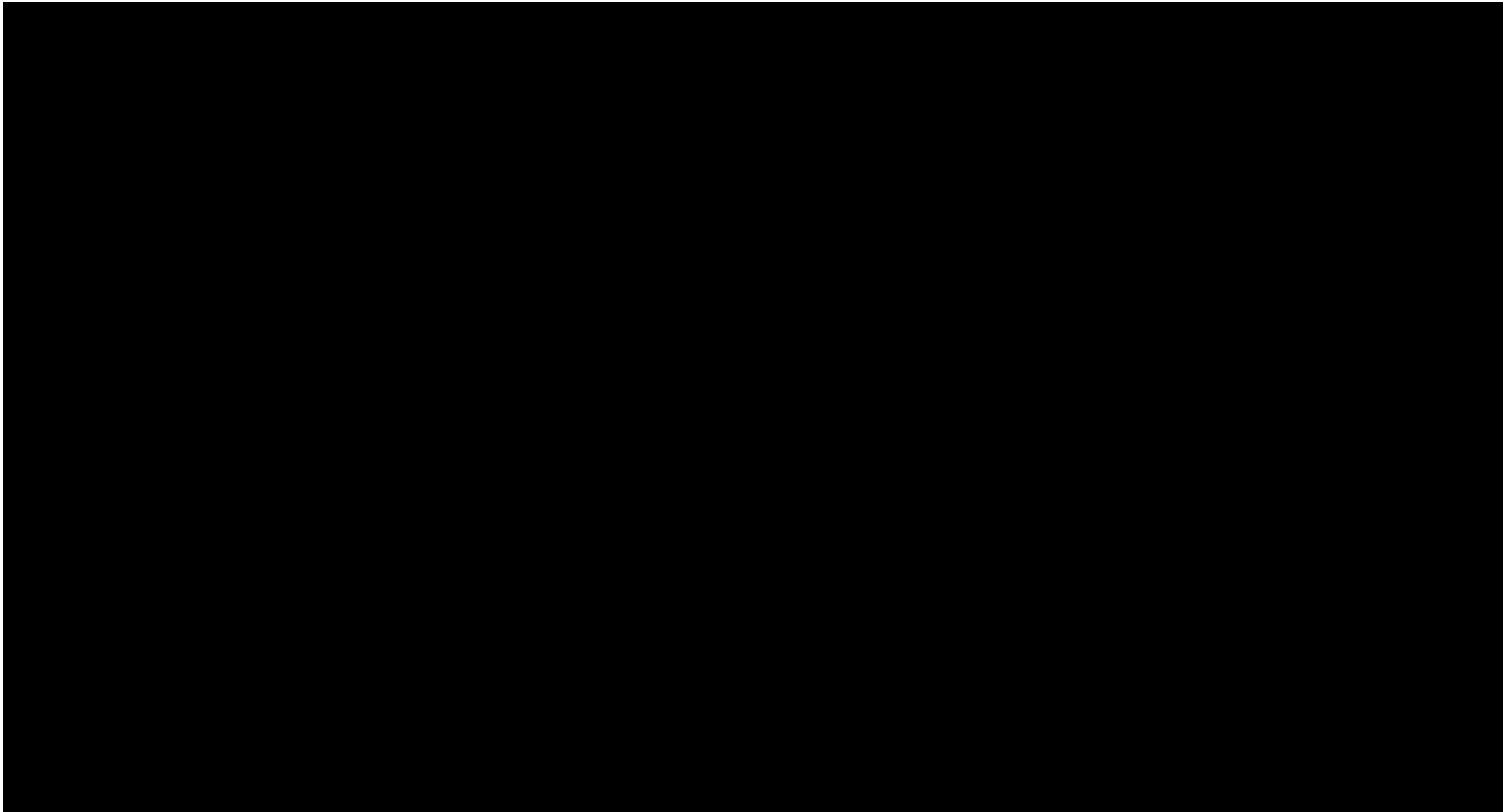


Marin Western Flax (*Hesperolinon congestum*)

Lobb's Aquatic Buttercup (*Ranunculus lobbii*)

Marsh Zigadene (*Zigadenus micranthus* var. *fontanus*)

Cream Cups (*Platystemon californicus*), Larval Food Plant for Opler's Longhorn Moth

Johnny Jump-up (*Viola pedunculata*), Larval Food Plant for Zerene Silverspot Butterfly

Potential Golden Eagle Nest Tree

Burrowing Owl

California Red-legged Frog

Western Pond Turtle

Pools in Tolay Creek (field work only completed in upper reaches of Tolay Creek)

Drainage

Study Area Boundary

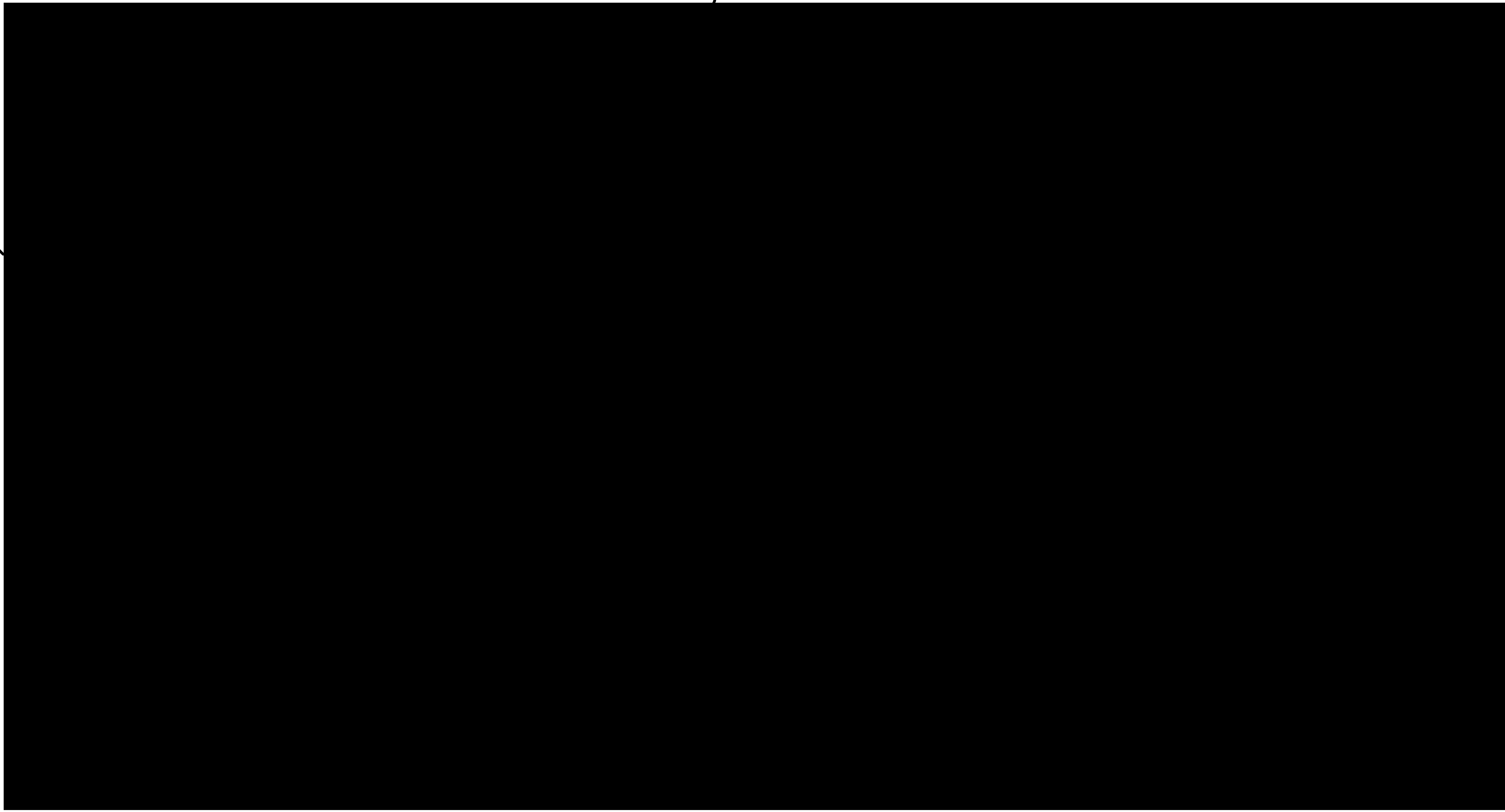
FIGURE 7a

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Location of Special-status Species and Habitat

I:\SOZ0801\GIS\Maps\Biological Resources Study\Figure7_Location of Special-status Species and Habitat.mxd (04/21/2009)



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- Marin Western Flax (*Hesperolinon congestum*)
- Lobb's Aquatic Buttercup (*Ranunculus lobbii*)
- Marsh Zigadene (*Zigadenus micranthus* var. *fontanus*)
- Cream Cups (*Platystemon californicus*), Larval Food Plant for Opler's Longhorn Moth
- Johnny Jump-up (*Viola pedunculata*), Larval Food Plant for Zerene Silverspot Butterfly
- Potential Golden Eagle Nest Tree
- Burrowing Owl
- California Red-legged Frog
- Western Pond Turtle
- Pools in Tolay Creek (field work only completed in upper reaches of Tolay Creek)
- Drainage
- Study Area Boundary

FIGURE 7b

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Location of Special-status Species and Habitat

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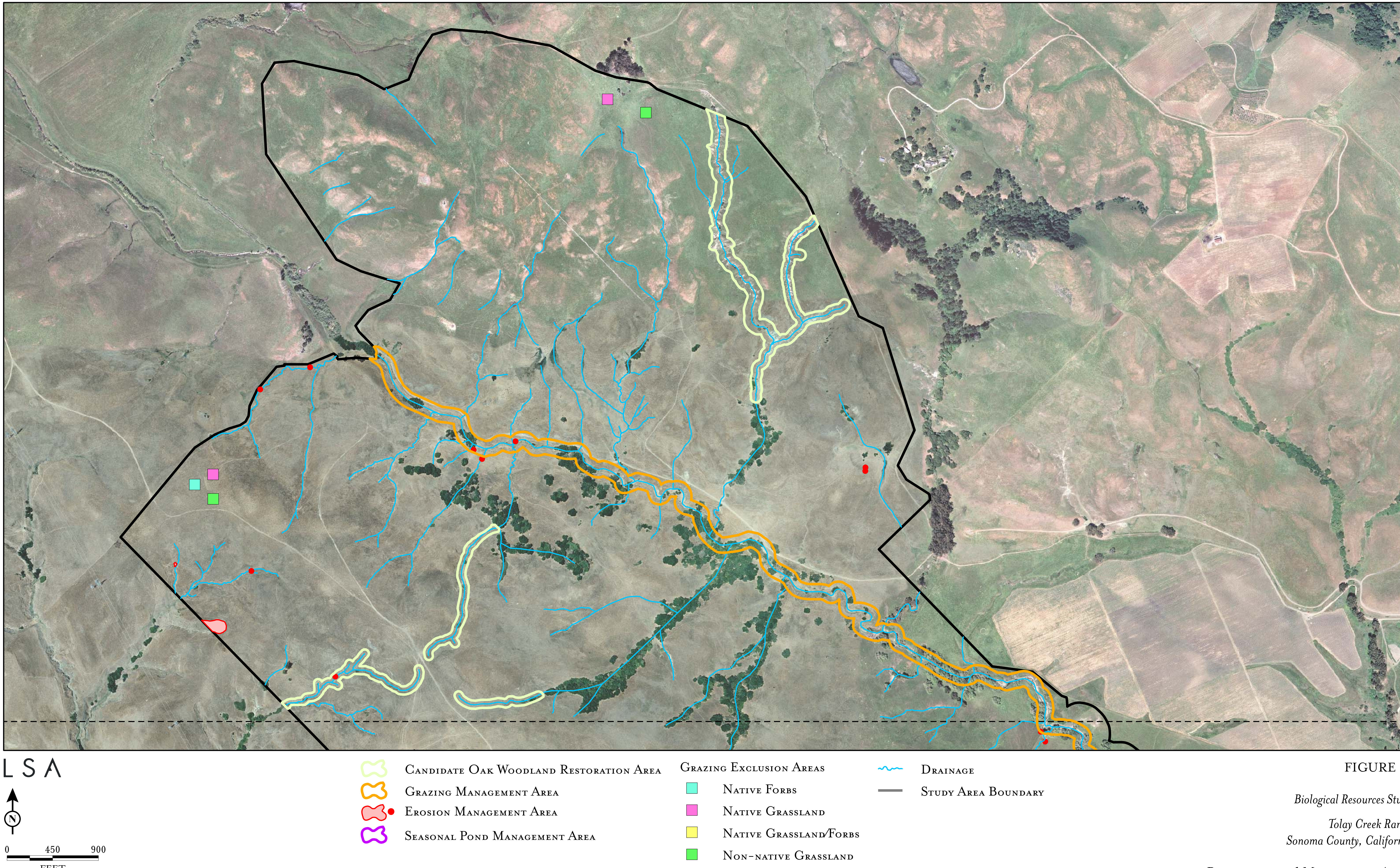

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FIGURE 8a

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Restoration and Management Areas

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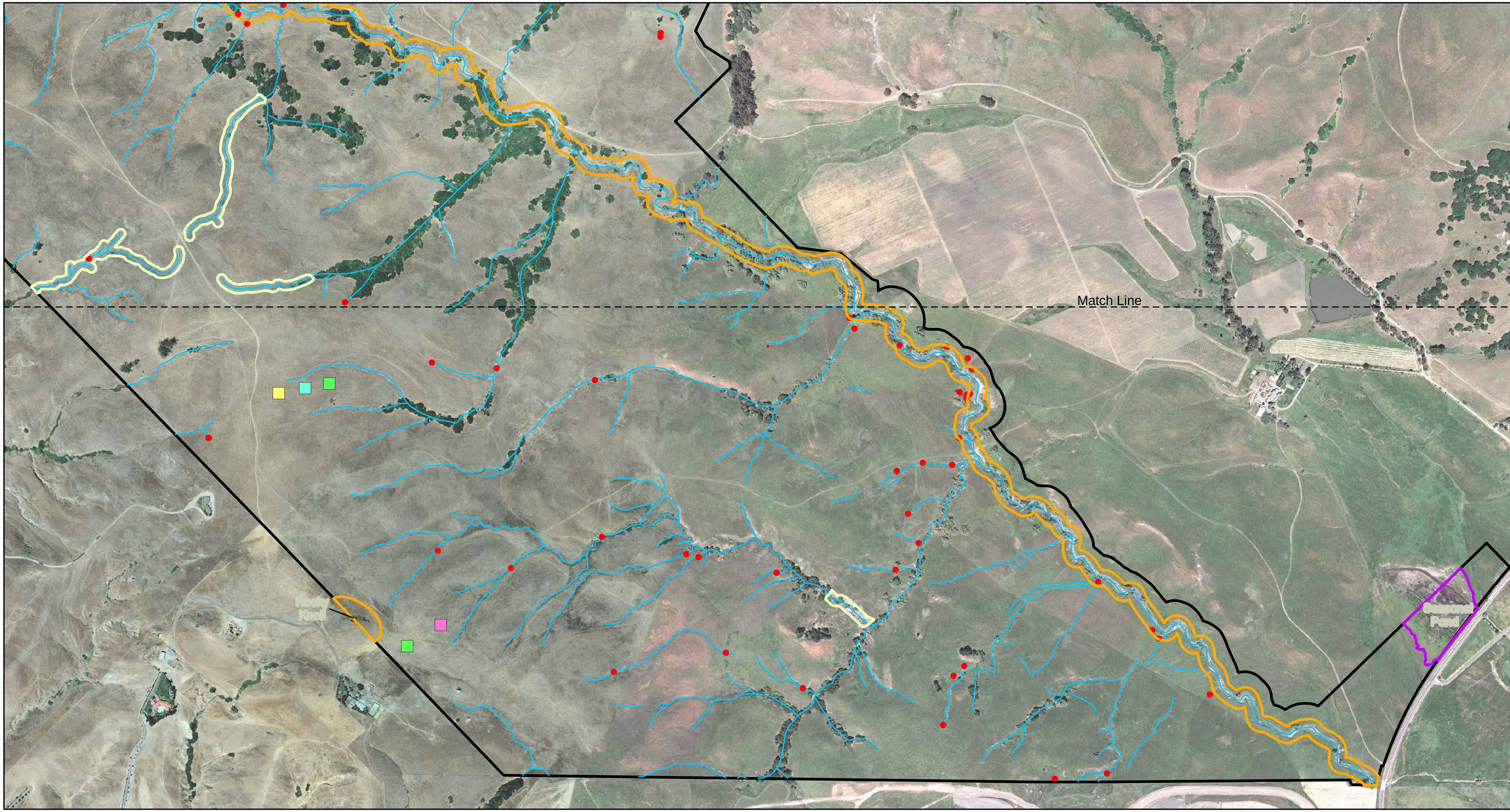

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Candidate Oak Woodland Restoration Area
Grazing Management Area
Erosion Management Area
Seasonal Pond Management Area

Grazing Exclusion Areas
- Native Forbs
- Native Grassland
- Native Grassland/Forbs
- Non-native Grassland

Drainage
Study Area Boundary

FIGURE 8b

Biological Resources Study

Tolay Creek Ranch
Sonoma County, California

Restoration and Management Areas

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TABLES

Table A: Plant Species Observed
Table B: Animal Species Observed

Table A: Plant Species Observed, Tolay Creek Ranch 2008

Family	Scientific Name	Common Name	Native
Aceraceae	*Acer macrophyllum*	big-leaf maple	yes
Alismataceae	*Alisma lanceolatum*	water plantain	no
Anacardiaceae	*Toxicodendron diversilobum*	poison oak	yes
Apiaceae	*Conium maculatum*	poison hemlock	no
	Daucus pusillus	American wild carrot	yes
	Eryngium aristulatum	coyote thistle	yes
	Foeniculum vulgare	sweet fennel	no
	Hydrocotyle ranunculoides	water pennywort	yes
	Lomatium utriculatum	spring-gold	yes
	Perideridia kelloggii.	yampah	yes
	Sanicula bipinnata	poison sanicle	yes
	Sanicula bipinnatifida	purple sanicle	yes
	Sanicula crassicaulis	Pacific sanicle	yes
	Scandix pectin-veneris	Venus needle	no
	Torilis arvensis	field hedge parsley	no
	Torilis nodosa	knotted hedge parsley	no
Aristolochiaceae	*Aristolochia californica*	Dutchman’s pipe	yes
Asclepiadaceae	*Asclepias fascicularis*	narrowleaf milkweed	yes
Asteraceae	*Achillea millefolium*	yarrow	yes
	Agoseris grandiflora	grand mountain dandelion	yes
	Artemisia douglasiana	mugwort	yes
	Aster radulinus	broad leaf aster	yes
	Baccharis pilularis	coyote brush	yes
	Baccharis salicifolia	mule fat	yes
	Blennosperma nanum var. *nanum*	common blennosperma	yes
	Carduus pycnocephalus	Italian thistle	no
	Centaurea calcitrapa	purple star-thistle	no
	Centaurea melitensis	Maltese star-thistle	no
	Centaurea solstitialis	yellow star-thistle	no
	Cirsium vulgare	bull thistle	no
	Cotula coronopifolia	brass buttons	yes
	Erigeron philadelphicus	Philadelphia daisy	yes
	Gnaphalium stramineum	cotton-batting plant	yes
	Hemizonia congesta ssp. *congesta*	hayfield tarweed	yes
	Hemizonia congesta ssp. *luzulaefolia*	hayfield tarweed	yes
	Hesperevax sparsiflora var. *sparsiflora*	erect hespserevax	yes
	Hypochaeris glabra	smooth cat’s ears	no
	Lactuca saligna	willowleaf lettuce	no
	Lactuca serriola	prickly lettuce	no
	Lasthenia californica	California goldfields	yes
	Lasthenia glaberrima	rayless goldfields	yes
	Layia chrysanthemoides ssp. *chrysanthemoides*	tidy-tips	yes
	Layia platyglossa	tidy tips	yes
	Madia gracilis	slender tarweed	yes
	Madia sativa	coast tarweed	yes
	Microseris douglasii ssp. *tenella*	Douglas microseris	yes

Family	Scientific Name	Common Name	Native
	Picris echioides	bristly ox-tongue	no
	Senecio vulgaris	common groundsel	no
	Silybum marianum	milk thistle	no
	Sonchus asper	prickly sow-thistle	no
	Taraxacum officinale	dandelion	no
	Tragopogon porrifolius	oyster plant	no
	Wyethia angustifolia	mule's ears	yes
	Xanthium spinosum	spiny cochlebur	no
	Xanthium strumarium	cochlebur	no
Boraginaceae	*Amsinskia menziesii* var. *menziesii*	Menzies' fiddleneck	yes
	Amsinckia menziesii var. *intermedia*	intermediate fiddleneck	yes
	Heliotropium curassavicum	heliotrope	yes
	Plagiobotrys notofulvus	common popcorn flower	yes
	Plagiobotrys stipitatus	valley popcorn flower	yes
Brassicaceae	*Brassica nigra*	black mustard	no
	Capsella bursa-pastoris	shepherd's purse	no
	Cardamine californica	California toothwort	yes
	Cardamine oligosperma	little western bitter-cress	yes
	Guillenia lasiophylla	California mustard	yes
	Lepidium nitidum	peppergrass	yes
	Raphanus raphanistrum	jointed charlock	no
	Raphanus sativus	wild radish	no
	Rorippa nasturtium-aquaticum	water cress	yes
	Sisymbrium officinale	hedge mustard	no
	Sinapis arvensis	charlock	no
Campanulaceae	*Downingia pulchella*	valley downingia	yes
Caprifoliaceae	*Symphoricarpos albus* var. *laevigatus*	common snowberry	yes
Caryophyllaceae	*Cerastium glomeratum*	mouse ear chickweed	no
	Minuartia douglasii	Douglas sandwort	yes
	Sagina sp.	pearlwort	yes
	Silene gallica	windmill pinks	no
	Stellaria media	common chickweed	no
Chenopodiaceae	*Atriplex triangularis*	spearscale	yes
Convolvulaceae	*Calystegia subacaulis*	stemless morning glory	yes
	Convolvulus arvensis	bindweed	no
	Cressa truxillensis	alkali weed	yes
Crassulaceae	*Crassula connata*	sand pygmyweed	yes
Cucurbitaceae	*Marah fabaceus*	California man-root	yes
Cyperaceae	*Bolboschoenus maritimus*	prairie bulrush	yes
	Carex sp1	sedge	yes
	Carex sp2	sedge	yes
	Cyperus eragrostis	nutsedge	yes
	Eleocharis macrostachya	spikerush	yes
	Scirpus acutus var. *occidentalis*	bulrush	yes
	Scirpus americanus	three square	yes
Dipsacaceae	*Dipsacus* sp.	wild teasel	no
Dryopteridaceae	*Dryopterus arguta*	wood fern	yes
Equisetaceae	*Equisetum laevigatum*	smooth scouring rush	yes
	Equisetum telmateia ssp. *braunii*	giant horsetail	yes

Family	Scientific Name	Common Name	Native
Euphorbiaceae	*Chamaesyce* sp.	sandmat	?
	Euphorbia crenulata	Chinese cups	yes
Fabaceae	*Acacia melanoxylon*	blackwood acacia	no
	Astragalus gambellianus	Gambel's milk-vetch	yes
	Glycyrrhiza lepidota	American licorice	yes
	Lathyrus vestitus	sweet pea	yes
	Lotus purshianus var. *purshianus*	Spanish clover	yes
	Lotus tenuis	narrow-leaf bird's-foot trefoil	no
	Lotus wrangelianus	California lotus	yes
	Lupinus bicolor	miniature lupine	yes
	Lupinus formosus var. *formosus*	summer lupine	yes
	Lupinus microcarpus var. *densiflorus*	chick lupine	yes
	Lupinus succulentus	arroyo lupine	yes
	Medicago polymorpha	California burclover	no
	Melilotus indica	yellow sweetclover	no
	Thermopsis macrophylla	false lupine	yes
	Trifolium albopurpureum	rancheria clover	yes
	Trifolium bifidum	notchleaf clover	yes
	Trifolium campestre	hop clover	no
	Trifolium dubium	little hop clover	no
	Trifolium fragiferum	strawberry clover	no
	Trifolium fucatum	bull clover	yes
	Trifolium gracilentum	pinpoint clover	yes
	Trifolium hirtum	rose clover	no
	Trifolium incarnatum	crimson clover	no
	Trifolium microdon	thimble clover	yes
	Trifolium olyganthum	fewflower clover	yes
	Trifolium subterraneum	subterraneum clover	no
	Trifolium variegatum	whitetip clover	yes
	Vicia benghalensis	reddish tufted vetch	no
	Vicia sativa	common vetch	no
Fagaceae	*Quercus agrifolia*	coast live oak	yes
	Quercus lobata	valley oak	yes
Frankeniaceae	*Frankenia salina*	alkali heath	yes
Gentianaceae	*Centaurium muehlenbergii*	Muelenberg's centaury	yes
Geranicaeae	*Erodium botrys*	long beaked filaree	no
	Erodium cicutarium	redstem filaree	no
	Erodium moschatum	white-stem filaree	no
	Geranium dissectum	geranium	no
	Geranium molle	dove's foot geranium	no
Hyppocastanaceae	*Aesculus californica*	California buckeye	yes
Hydrophyllaceae	*Nemophila heterophylla*	variable-leaf baby-blue-eyes	yes
	Phacelia sp.	phacelia	yes
Iridaceae	*Sisyrinchium bellum*	blue-eyed grass	yes
Juncaceae	*Juncus balticus*	Baltic rush	yes
	Juncus bufonius	toad rush	yes
	Juncus effusus	common rush	yes
	Juncus patens	spreading rush	yes
	Juncus phaeocephalus	brown-headed rush	yes

Family	Scientific Name	Common Name	Native
Lamiaceae	*Mentha pulegium*	pennyroyal	no
	Stachys ajugoides	ajuga hedge nettle	yes
Lauraceae	*Umbellularia californica*	California bay	yes
Liliaceae	*Brodiaea elegans*	harvest brodiaea	yes
	Calochortus luteus	gold nuggets	yes
	Calochortus venustus	butterfly mariposa lily	yes
	Chlorogalum pomeridianum var. *pomeridianum*	soap plant	yes
	Dichelostemma capitatum	blue dicks	yes
	Triteleja laxa	Ithuriel's spear	yes
	Zigadenus fremontii	death camas	yes
	Zigadenus micranthus var. *fontanus*	death camas	yes
Linaceae	*Hesperolinon congestum*	Marin western flax	yes
Lythraceae	*Lythrum hyssopifolia*	loosestrife	no
Malvaceae	*Malvella leprosa*	alkali mallow	yes
	Sidalcea malvaeflora	California checker bloom	yes
Myrtaceae	*Eucalyptus globulus*	blue gum eucalyptus	no
Onagraceae	*Camissonia ovata*	suncups	yes
	Clarkia purpurea	winecup clarkia	yes
	Epilobium brachycarpum	willowherb	yes
Papaveraceae	*Eschscholzia californica*	California poppy	yes
	Platystemon californicus	creamcups	yes
Plantaginaceae	*Plantago erecta*	California plantain	yes
	Plantago lanceolata	English plantain	no
	Plantago major	common plantain	no
	Plantago subnuda	coast plantain	yes
Poaceae	*Agrostis exarata*	spike bentgrass	yes
	Agrostis viridis var. scabrida	water bent grass	no
	Avena barbata	slender wildoats	no
	Avena fatua	wild oats	no
	Brachypodium distachyon	false brome	no
	Bromus diandrus	ripgut brome	no
	Bromus hordeaceus	soft chess	no
	Crypsis schoenoides	swamp-timothy	no
	Cynodon dactylon	Bermuda grass	no
	Cynosurus echinatus	hedgehog dogtail	no
	Danthonia californica	California oatgrass	yes
	Distichlis spicata	saltgrass	yes
	Elymus multisetus	big squirreltail grass	yes
	Elymus glaucus	blue wildrye	yes
	Festuca arundinacea	tall fesque	no
	Glyceria sp.	glyceria	no
	Holcus lanatus	velvet grass	no
	Hordeum brachyantherum ssp. *brachyantherum*	meadow barley	yes
	Hordeum brachyantherum ssp. *californicum*	California barley	yes
	Hordeum murinum ssp. *leporinum*	hare barley	no
	Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	no
	Lolium multiflorum	Itaian ryegrass	no
	Melica californica	California melic	yes
	Nassella lepida	foothill needle grass	yes

Family	Scientific Name	Common Name	Native
	Nassella pulchra	purple needle grass	yes
	Phalaris aquatica	harding grass	no
	Phalaris paradoxa	hood canarygrass	no
	Pleuropogon californicus	California semaphore grass	yes
	Poa annua	annual bluegrass	no
	Polypogon australis	Chilean rabbitfoot grass	no
	Polypogon monspeliensis	rabbitfoot grass	no
	Taeniatherum caput-medusae	medusahead	no
	Vulpia myuros	annual fescue	no
Polemoniaceae	*Gilia capitata*	globe gilia	yes
	Linanthus bicolor	bi-colored linanthus	yes
	Linanthus parviflorus	common linanthus	yes
Polygonaceae	*Polygonum arenastrum*	common knotweed	no
	Polygonum sp.	aquatic knotweed	?
	Rumex acetosella	sheep sorrel	no
	Rumex crispus	curly dock	no
	Rumex pulcher	fiddle dock	no
Polypodiaceae	*Polypodium californicum*	California polypody	yes
Portulacaceae	*Calandrinia ciliata*	red maids	yes
	Claytonia perfoliata	miner's lettuce	yes
Primulaceae	*Anagallis arvensis*	scarlet pimpernel	no
	Dodecatheon hendersonii	shooting star	yes
Pteridiaceae	*Adiantum jordanii*	California maidenhair fern	yes
	Pellaea andromedifolia	coffee fern	yes
	Pentagramma triangularis	goldback fern	yes
Ranunculaceae	*Delphinium variagatum*	royal larkspur	yes
	Ranunculus aquatilis	water buttercup	yes
	Ranunculus californicus	California buttercup	yes
	Ranunculus lobbii	Lobb's aquatic buttercup	yes
	Ranunculus muricatus	prickly-fruited buttercup	no
	Ranunculus occidentalis	western buttercup	yes
	Ranunculus orthorhynchus var. *bloomeri*	straight-beaked buttercup	yes
Rhamnaceae	*Rhamnus californica*	California coffeeberry	yes
Rosaceae	*Aphanes occidentalis*	western lady's mantle	yes
	Holodiscus discolor	ocean spray	yes
	Rosa californica	California rose	yes
	Rubus discolor	Himalayan blackberry	no
	Rubus ursinus	California blackberry	yes
Rubiaceae	*Galium aparine*	goose-grass	no
	Galium sp.	bedstraw	yes
Salicaceae	*Populus fremontii* ssp. *fremontii*	Fremont cottonwood	yes
	Salix exigua	narrowleaf willow	yes
	Salix laevigatus	red willow	yes
	Salix lasiolepis	arroyo willow	yes
Saxifragaceae	*Lithophragma affine*	woodland star	yes
Scrophulariaceae	*Bellardia trixago*	bellardia	no
	Castilleja densiflora	Purple owl's clover	yes
	Castilleja exserta	Purple owl's clover	yes
	Castilleja rubicunda ssp. lithospermoides	cream sacs	yes

Family	Scientific Name	Common Name	Native
	Collinsia heterophylla	Chinese houses	yes
	Mimulus auraniacus	bush monkey flower	yes
	Mimulus guttatus	common monkey flower	yes
	Parentucellia viscosa	yellow parentucellia	no
	Scrophularia californica ssp. *californica*	California figwort	yes
	Triphysaria pusilla	dwarf owl's clover	yes
Solanaceae	*Solanum americanum*	small-flowered nightshade	yes
Tamaricaceae	*Tamarix* sp.	tamarisk	no
Typhaceae	*Typha angustifolia*	narrow-leaved cattail	yes
Urticaceae	*Urtica dioica*	stinging nettle	yes
Valerianaceae	*Plectritis macrocera*	long-spur plectritis	yes
Verbenaceae	*Phyla nodiflora*	common lippia	yes
	Verbena lasiostachys	western vervain	yes
Violaceae	*Viola pedunculata*	Johnny jump-up	yes
Viscaceae	*Phoradendron macrophyllum*	big-leaf mistletoe	yes

? Native status cannot be determined because species unknown

Table B: Animal Species Observed at Tolay Creek Ranch in 2008

Common Name	Scientific Name
AMPHIBIANS	
sierran treefrog	*Pseudacris sierra*
REPTILES	
western fence lizard	*Sceloporus occidentalis*
southern alligator lizard	*Elgaria multicarinata*
red-sided garter snake	*Thamnophis sirtalis*
common king snake	*Lampropeltis getula californiae*
gopher snake	*Pituophiscatenifer*
BIRDS	
Canada goose	*Branta canadensis*
American wigeon	*Anas americana*
mallard	*Anas platyrhynchos*
cinnamon teal	*Anas cyanoptera*
northern shoveler	*Anas clypeata*
green-winged teal	*Anas crecca*
wild turkey	*Meleagris gallopavo*
California quail	*Callipepla californica*
great egret	*Ardea alba*
snowy egret	*Egretta thula*
turkey vulture	*Cathartes aura*
white-tailed kite	*Elanus leucurus*
northern harrier	*Circus cyaneus*
red-shouldered hawk	*Accipiter striatus*
red-tailed hawk	*Buteo jamaicensis*
golden eagle	*Aquila chrysaetos*
American kestrel	*Falco sparverius*
killdeer	*Charadrius vociferus*
black-necked stilt	*Himantropus mexicanus*
greater yellowlegs	*Tringa melanoleuca*
Wilson’s snipe	*Gallinago delicata*
mourning dove	*Zenaida macroura*
Nuttall’s woodpecker	*Picoides nuttallii*
acorn woodpecker	*Melanerpes formicivorus*
northern flicker	*Colaptes auratus*
black phoebe	*Sayornis nigricans*
Say’s phoebe	*Sayornis saya*

Common Name	Scientific Name
western scrub-jay	*Aphelocoma californica*
American crow	*Corvus brachyrhynchos*
common raven	*Corvus corax*
horned lark	*Eremophila alpestris*
violet-green swallow	*Tachycineta thalassina*
white-breasted nuthatch	*Sitta carolinensis*
rock wren	*Salpinctes obsoletus*
western bluebird	*Sialia mexicana*
American robin	*Turdus migratorius*
northern mockingbird	*Mimus polyglottos*
spotted towhee	*Pipilo maculatus*
California towhee	*Pipilo crissalis*
lark sparrow	*Chondestes grammacus*
Savannah sparrow	*Passerculus sandwichensis*
grasshopper sparrow	*Ammodramus savannarum*
song sparrow	*Melospiza melodia*
golden-crowned sparrow	*Zonotrichia atricapilla*
dark-eyed junco	*Junco hyemalis*
red-winged blackbird	*Agelaius phoeniceus*
western meadowlark	*Sturnella neglecta*
Brewer's blackbird	*Euphagus cyanocephalus*
Bullock's oriole	*Icterus bullockii*
house finch	*Carpodacus mexicanus*
American goldfinch	*Carduelis tristis*
MAMMALS	
skunk (sp.)	*Mephitis* or *Spilogale*
coyote	*Canis latrans*
black-tailed deer	*Odocoileus hemionus*
California ground squirrel	*Spermophilis beecheyi*
California vole	*Microtus californicus*
deer mouse (sp.)	*Peromyscus* sp.
Botta's pocket gopher	*Thomomys bottae*
black-tailed jackrabbit	*Lepus californicus*

Biological Resources Report

Tolay Lake Regional Park
Sonoma County, California

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1.0 INTRODUCTION

Located in the southern extent of the Sonoma Mountains, the Tolay Valley plays host to a diverse ecosystem and offers a unique opportunity to protect and enhance a substantial portion of the Tolay Creek watershed (Figure 1). The rich soils and diverse biologic resources of the Tolay Valley have been utilized for an array of needs from the ceremonial and resource-gathering of Native Americans to the modern farming and ranching of the Cardoza and other ranching families, and most recently for recreation and reflection of Sonoma County residents and other visitors to Tolay Lake Regional Park (Park). This document summarizes the existing biologic conditions of the Park and the Sonoma Land Trust (SLT) property with special emphasis on the sensitive and special-status resources.

1.1 Overview and Purpose

This Biological Resources Report (BRR) presents existing biological conditions of the Tolay Regional Park, which includes the Sonoma Land Trust property, to the south of the current Park boundaries, within a historical and regional context. This report is intended to be an ecological baseline and provide guidance for the Resource Management and Master plans. Several biologic, conservation, and restoration studies have been conducted in the Tolay Valley (LSA 2009a, LSA 2009b, LSA 2009c, Ducks Unlimited 2005, Kamman 2003, Parsons 1996). These studies form the basis of this document, with the LSA 2006-2008 studies providing the bulk of the data. The Park's existing wetlands, non-wetland waters, vegetation communities, special-status and common plant species, wildlife habitat and observed wildlife have been documented, characterized, and mapped to understand and ensure the protection of these resources during the park planning and management process for the enjoyment of future generations.

This report presents the findings and recommendations of site visits conducted by LSA between 2006 and 2008 and attendant reports, as well as site visits conducted in 2013 by WRA. To present the most recent scientific literature on California ecology, WRA has updated plant species nomenclature following the *Jepson Manual, 2nd Edition* (Baldwin et al. 2012), updated wetland indicator status for the Arid West (Lichvar 2012), and revised the vegetation community descriptions ascribed to *A Manual of California Vegetation, 2nd Edition* (Sawyer et al. 2009). LSA conducted separate studies of the northern and southern portions of the Tolay Lake / Tolay Creek, reporting in two documents (LSA 2009b, LSA 2009c), which have been synthesized into one cohesive document here.

1.2 Property Description

The Park is composed of several parcels under separate ownership, with the northern portion (Tolay Lake Regional Park) under the ownership of the Sonoma County Regional Parks (SCRP), and the southern portion (Tolay Creek Ranch) under the ownership of Sonoma Land Trust (SLT). Additionally, SLT holds an easement on undeveloped portion of the adjacent Roche Ranch Winery property to enhance the banks and riparian area of lower Tolay Creek, adjacent to the southeastern portion of the Park. Primary and public access to the Park is from Cannon Lane off Lakeville Highway in the northwest, with secondary and private access from Highway 121 in the south. The current Park headquarters is located at the former Cardoza residence in the northern portion of the Park.

1.2.1 Existing Conditions and Historic Land Use

Prior to European settlement of Sonoma County, the Tolay Valley was utilized by several groups of Native Americans for settlement, resource-gathering, and ceremonial events. Following European settlement, the valley has been utilized for ranching, farming, and rural residences. The valley was part of the General Mariano Guadalupe Vallejo's Mexican land-grant, located between his Petaluma Adobe in today's City of Petaluma, and the Mission San Francisco de Solano and his private residence in today's City of Sonoma. During this period, the valley was likely grazed by cattle under the auspice of the land-grant. Since the Vallejo era, portions of the valley have been under various ownership, most recently the Cardoza family (LSA 2008). A variety of agricultural activities including grazing, potato farming, hay farming, and pumpkin farming have been conducted in the modern era (Thompson 1877, LSA 2008).

The dominant natural feature within Tolay Valley is Tolay Lake, a naturally occurring seasonal waterbody, which when unaltered, flooded up in the wet season, followed by a draw down in spring and early summer. Presumably, the lake ponded water due to being situated on heavy clay soils (Clear Lake clay soil series) with very slow permeability combined with a natural earthen dam that prevented rapid outflow. It is likely that the lake experienced pronounced interannual variation in the hydroperiod, with dryer years exposing the lakebed from complete draw down, while wetter years witnessed inundated conditions through the summer.

In an attempt to increase arable land, Tolay Lake was drained by removal of the natural earthen dam and drainage ditches dug to reroute surface flows. Stock ponds have been constructed to capture water for summer irrigation and flood control within the Tolay Valley inadvertently creating wildlife habitat. The current Park headquarters is a collection of former Cardoza family residences and farm buildings located in the northern portion of the Park. Several ranch roads traverse the Park, with Cannon Lane-Mangel Ranch Road running from Lakeville Highway to Highway 121 alongside the majority of Tolay Creek. Overhead powerlines and an associated access road run the length of the northern section of West Ridge. Currently, portions of the Park are utilized for cattle grazing with row crop agriculture centered near the Park headquarters.

1.2.2 Surrounding Land Uses

The Park is in the southern extent of the Sonoma Mountains, between Petaluma Valley/Marsh and Sonoma Valley. Stage Gulch Road/Highway 116 is located to the north, Lakeville Highway to the west, Arnold Drive/Highway 121 to the east, and Highway 37 to the south. The cities of Petaluma, Sonoma, and Novato are approximately five miles northwest, northeast, and southwest, respectively, of the Park.

The Park is adjacent to vineyards to the north, northwest, and east. The property is bordered on the south by Sonoma Raceway (formerly Sears Point Raceway and Infineon Raceway), a developed professional / amateur auto racetrack. The remainder of the property is immediately surrounded by contiguous habitats, primarily open grasslands in grazing production and rural residential.

Several thousand acres of conserved lands, through ownership or easement, are adjacent to or within the immediate vicinity of the Park. The U.S. Fish and Wildlife Service (USFWS) manages the San Pablo Bay National Wildlife Refuge which includes tidal portions of lower Tolay Creek, and the California Department of Fish and Wildlife (CDFW) manages wildlife refuges along the Petaluma River and Marsh. The Sonoma County Agricultural Preservation and Open Space District (SCAPOSD) holds ownership and/or easements over Flocchini Ranch, Sleepy Hollow Dairy, and Cougar Mountain, while SLT manages several contiguous parcels on either side of Highway 37in the Sears Point vicinity (Figure 2).

1.2.3 Climate and Watershed

The Park is within a mildly seasonal Mediterranean climate, with warm-hot dry summers and cool wet winters. The average annual maximum temperatures for Petaluma[1] and Sonoma[2] are 70.4 degrees and 73.7 degrees Fahrenheit, respectively while the average annual minimum temperature is 44.9 degrees Fahrenheit. For both Petaluma and Sonoma, the warmest months are June through September, while the coolest months are December through February (WRCC 2013).

Predominantly, precipitation falls as rainfall with an annual average of 24.93 inches. Precipitation bearing weather systems are predominantly from the west and south with the majority of rain falls between November and March, with a combined average of 20.94 inches (WRCC 2013). Fog is common in the Park, with late spring and summer westerly / southerly advection fog arising from the Pacific Ocean flowing over the Marin Hills and north across San Pablo Bay in early evening and typically receding by midday. Low-lying fall and winter convection fog is common, particularly with presence of Tolay Lake. Very rarely winter precipitation falls as snow, but typically is less than one inch and does not regularly remain for a period greater than 24 hours.

The Park resides almost entirely within the Tolay Creek watershed, with the exception of the western boundary including the headwaters of several unnamed drainages in the Petaluma River watershed. The headwaters of Tolay Creek emerge north of the Park boundary, very near Highway 116 (Stage Gulch Road). Several small tributaries and one sizable tributary emerge off-site and enter lower Tolay Creek from the adjacent Roche property in the southeast. Tolay Creek enters the Sonoma Marsh complex immediately off-site to the southeast, meandering south and entering San Pablo Bay approximately six river miles from the Park boundary.

1.2.4 Geology and Soils

The geology within the vicinity of the Park consists of several geologic formations, faults, landslides, and contact zones (CDC 2002a, CDC 2002a). Several faults are present throughout the Park, with the Lakeville, Roche-Cardoza, and Rogers Creek faults being the most prominent. The Lakeville and Rogers Creek faults run the length of the West Ridge and East Ridge, respectively, each periodically entering the Park. The Roche-Cardoza fault breaks from the Rogers Creek Fault, entering the southern portion of the Park (Koenig 1963, CDC 2002a, CDC 2002b).

The northern portion of the Park, including the Tolay Lake bed, is underlain primarily by Holocene basin deposits composed of fine-grained alluvium. The central-eastern portion of the Park is underlain primarily by the Donnell Ranch Volcanics composed of basalt and basaltic

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[1] Weather Station: Petaluma Fire Stn 3, CA (046826), approximately six miles northwest of the Park
[2] Weather Station: Sonoma, CA (048351), approximately six miles northeast of the Park

andesite, breccia, scoria, and rhyolite flows and tuffs. The southeastern portion of the Park is underlain primarily by the Petaluma Formation composed of predominantly of lacustrine and fluvial deposits of siltstone, sandstone, shale, conglomerate, with minor inclusions of silicified tuff, chert, and limestone. The southwestern portion of the Park is underlain primarily by Jurassic period serpentinized ultramafic rock. The central-west and northwestern portion of the Park is underlain primarily by the Franciscan complex composed of sandstone, altered mafic volcanics, chert, gabbro, and schist and semischist (CDC 2002a, CDC 2002b).

The regional complex geology contributes to the formation of a diversity of soil structures, textures, chemistry, and depths contributing to the often pronounced and diverse vegetation communities within the Park. The *Soil Survey of Sonoma County* (USDA 1977) indicates the presence of 13 soil mapping units composed of seven soil series (Table 1). Table 1 summarizes the soil mapping units, including slope class, hydric rating (USDA 2012), parent material (mineral constituent of soil), soil chemistry, drainage, and notes on the ecologic characteristics. Figure 3 depicts the distribution of soil types within the planning area boundaries. The predominant soil types are Clear Lake Clay Loam, 0-2 percent slopes, and Diablo Clay, 15 to 30 percent slopes.

Generally, clay-rich soils with low slope gradients (e.g. Clear Lake clay loam) have a much higher potential to support wetland habitat than well drained, coarser textured soils, particularly on higher gradient slopes (e.g., Laniger loam). However, seep wetlands are frequently associated with a diversity of soil textures on high gradient slopes where shallow lithic contact and/or rock outcrops are present.

Vegetation communities and plant species are often closely associated with the physical characteristics of soils including parent material (i.e., serpentinite), soil chemistry (i.e., alkaline), and soil texture (i.e., clay). Therefore, the complex geology and diversity of soil types within the Park, along with microclimate conditions are directly correlated with the potential for the presence of special-status plant species and sensitive vegetation communities.

Table 1. Soil Mapping Units in Tolay Lake Regional Park (USDA 1977)

Soil Map Unit (map code)	Slope Class	Hydric (Sonoma County)	Parent Material & Chemistry	Drainage, Runoff, &Permeability	Ecological Notes
Clear Lake clay loam (CcA)	0-2%	Yes	Alluvium, sandstone & shale; Moderately alkaline (pH 8.0)	Poorly drained; Negligible to high runoff; Slow to very slow permeability	May support clay associated rare plants; High potential to support wetlands (clays, shrink-swell); Native grasses and forbs, non-native annual grasses; Low erosion potential (neutral slopes);
Diablo clay (DbC)	2-9%	Yes	Residuum, sedimentary rock; Moderately alkaline (pH 8.0)	Well drained; Slow runoff (dry), medium to rapid (wet); Slow permeability	May support clay associated rare plants; May support wetlands (clay-rich and shrink-swell); Annual grasses and forbs; Moderate-high erosion potential (slopes)
Diablo clay (DbD)	9-15%	No			
Diablo clay (DbE)	15-30%				
Diablo clay, eroded (DbF2)	30-50%				
Goulding cobbly clay loam	5-15%	No	Residuum, tuff breccia, basalt, andesite; Slightly acid (pH 6.0)	Well-somewhat excessively drained; Medium-rapid runoff; Moderate permeability	May support volcanic associated rare plants; May support seep wetlands; Oaks, scrub, grasses and forbs; Moderate-high erosion potential (slopes)
Goulding-Toomes complex (GoF)	9-50%	No			
Haire clay loam (HcD)	9-15%	No	Alluvium, sedimentary rock; Slightly acid (pH 6.0)	Moderately well drained; Slow-rapid runoff; Very slow permeability	May support sandstone associated rare plants; May support seasonal wetlands (low slopes); Annual grasses and forbs; Low-moderate erosion potential
Laniger loam (LaC)	5-9%	No	Residuum, rhyolite; Medium to slightly (pH 6.0-6.5)	Well-somewhat excessively drained; Medium-rapid runoff; Moderate-rapid permeability	May support volcanic associated rare plants; May support seep wetlands; Oaks, manzanita, ceanothus, and grasses Moderate-high erosion potential (slopes)
Laniger loam (LaD)	9-15%				
Laniger loam, eroded (LaE2)	15-30%				
Montara cobbly clay loam (MoE)	2-30%	No	Residuum, serpentinite; Moderately alkaline (pH 8.0)	Well drained; Medium-high runoff; Moderately slow permeability	May support serpentine associated rare plants; May support seep wetlands; Native grasses and forbs; Low-moderate erosion potential (slopes)
Gullied Land	varies	No	mixed	Well drained	Unlikely to support rare plants (disturbance); May support swale wetlands and non-wetland waters; Non-native and ruderal plants; High-extreme erosion potential

1.2.5 Vegetation and Plant Species

Moderate annual temperatures and precipitation of southern Sonoma County contribute to vegetation dominated by drought-resistant trees and shrubs, perennial native grasses, annual native forbs, and annual non-native grasses in upland positions. Generally, the Park's soils, geology, and use as rangeland contribute to open grasslands, with patches of oak-bay woodlands located in deep canyons, north-facing slopes, and along lower Tolay Creek. Additionally, clay-rich soils and watershed size contribute to the formation of extensive wetlands and non-wetland waters (e.g., Tolay Lake) in low gradient areas, as well as seep / swale complexes on higher gradient slopes. Sections 3 and 4 contain detailed discussions of each vegetation community, descriptions of the special-status plant species observed or with the potential to occur in the Park, as well as the habitat values for and the potential presence of special-status wildlife species.

1.3 Conservation Values

The Park parcels were purchased to protect unique cultural and historical values; as well as to protect and enhance wildlife habitat and natural areas, while providing public access. The Tolay Valley is not within the viewshed of any developed area within Sonoma County, and only the lower reach of Tolay Creek and the upper Tolay Valley are visible from public roads (Highway 121 and Stage Gulch Road, respectively). Despite its "hidden" aspect, the Park provides a unique opportunity to address conservation and recreation values of the general public.

The location and size of the Park contribute to its value for protection, enhancement, and restoration of the natural resources. Included as part of the regional preservation and restoration efforts (e.g., Dickson Ranch; Figure 2), the Park offers the opportunity to preserve almost the entirety of the Tolay Creek watershed, thereby providing land managers and restoration specialists the opportunity to affect system-wide preservation of this invaluable aquatic resource. The Park provides habitat linkages and wildlife corridors between Petaluma Marsh and the Sonoma-Napa Marshes, and Cougar Mountain and the greater Mayacama Mountains region (Merenlander et al. 2010). Additionally, its relative size and geologic, edaphic, and topographic variation provide the physical basis for a rich biodiversity of plant and wildlife species, contributing to genetic diversity and species resiliency in a regional context.

The property's close proximity to Highway 37 provides ready local access for Petaluma, Sonoma, and Novato, as well as regional access to Bay Area residents. The Park headquarters and other historical agricultural infrastructure offer a sense of place and history for park visitors, while the diverse natural resources provide aesthetic, research, and education opportunities. The management of cultural and natural resources including avoidance and minimization efforts during project activities, as well as on-going park utilization, will be addressed in the Resource Management and Master plans.

2.0 DATA COLLECTION METHODS

2.1 Background Review

Prior to site visits conducted in 2006-2008, the Soil Survey of Sonoma County, California (USDA 1977), Geologic Map of the Sears Point 7.5-minute quadrangle (CDC 2002a), Geologic Map of the Petaluma River 7.5-minute quadrangle (CDC 2002b), and aerial photographs were examined to determine if any unique geology and/or soil types that could support sensitive plant communities and/or special-status plant species (e.g. serpentine or volcanic endemics), and/or wetland and non-wetland water habitats (e.g., low permeability clays) were present in the Park.

Potential occurrence of special-status plant and wildlife species in the Park was evaluated by first determining which special-status species occur in the vicinity of the Park through literature and database searches. A search of the California Natural Diversity Database (CNDDB) focusing on the Cotati, Glen Ellen, Novato, Petaluma, Petaluma River, San Geronimo, Sears Point, and Sonoma USGS 7.5-minute quadrangles was performed prior to site visits (LSA 2009b, LSA 2009c).

Prior to site visits conducted in 2013, WRA conducted a literature and database search to update the potential occurrences of sensitive biological communities, and special-status plant and wildlife species. WRA increased the search to capture both the Petaluma River and Sears Point quadrangles, as well as the ten surrounding quadrangles (Appendix B). Additional resources reviewed by WRA to update the potential occurrence of special-status species and/or sensitive biological communities, include the current list of vegetation alliances and vegetation mapping guidelines (CDFG 2009, CDFG 2010), the Consortium of California Herbaria (CCH 2013), the Arid West supplement (Corps 2008), and *A Flora of Sonoma County* (Best et al. 1996).

2.2 Field Surveys

Table 2 summarizes the field studies conducted within the Park to date. LSA conducted the studies 2006-2008, supplemented by WRA site visits in 2013. Additionally Petaluma Wetlands Alliance (PWA) conducted bird counts 2006-2009. Field Survey methods are detailed in the following subsections.

Table 2. Summary of biological field studies to date at Tolay Lake Regional Park

Field Study	Responsible Party	Date(s)	Recent Climatic Condition*
Wetland Delineation (Tolay Lake Regional Park)	LSA	2006: March 22, 23, 30 May 5, 8, 24 June 2, 5 July 12, 13, 16	WY2005**: normal (0.5 inch above average) WY2006: normal (4 inches above average)
Wetland Assessment (Tolay Creek Ranch)	LSA	2008: March 28 April 1, 5, 11 May 10, 16, 19, 21-23, 26-27	WY2007: below normal (13.5 inches below average) WY2008: below normal (13 inches below average)
Rare Plant Surveys& Vegetation Mapping	LSA	2006: March 22, 23, 30 May 5, 8, 24 June 2, 5 July 12, 13, 16 July 28 August 6, 21 November 5 2007: January 19 2008: March 28 April 1, 5, 11 May 10, 16, 19, 21-23, 26-27	
Wetland Update & Vegetation Classification	WRA	2013: January 21	Oct 2012 – Jan 2013: normal

Field Study	**Responsible Party**	**Date(s)**	**Recent Climatic Condition***
Bird Counts	PWA	2006: April 15, 29 October 17, 24 November 6 December 2 2007: January 27 April 7, 21 May 7 September 1, 23 November 3 December 8 2008: February 20 March 15 April 19 May 24 June 21 July 19 September 13 October 5 November 15 December 14 2009: January 2 February 21	WY2006: normal (4 inches above average) WY2007: below normal (13.5 inches below average) WY2008: below normal (13 inches below average) Oct 2008 – Jan 2009: below

*Recent climate conditions summarize the rainfall for the preceding season and at the time of the field survey; precipitation data from Petaluma East (CIMIS #144) and Sonoma (NCDC #8351), WETS Station from Sonoma (NCDC #8351)

**WY2005 = Water Year 2005, the water year runs from October 1 through September 30

2.2.1 Biological Communities

<u>Wetlands and Non-wetland Waters</u>

LSA conducted a wetland delineation within the northern portion of the Park in 2006, followed by a wetland assessment in the southern portion in 2008. During both the 2006 and 2008 field visits, non-wetland waters (streams, creeks, stock ponds, etc.) were deemed potentially jurisdictional based on the presence of water, scour, shelving, debris deposits, wrack, or other indicators of flowing water and/or inundation, per Corps guidelines (Corps 2005).

During the 2008 (Tolay Creek Ranch) wetland assessment, field biologists surveyed the property mapping potential wetlands following a three-part method: (1) following vegetation and landforms; (2) tracing features on an aerial ortho-photo; and/or (3) using a GPS unit. The presence of hydrophytic vegetation and depressional topography (pools, basins, swales, etc.) were the primary superficial indicators of potential jurisdictional wetland habitats. Soils and wetland hydrology were not sampled, and no datasheets were entered.

During the 2006 wetland delineation (Tolay Lake Regional Park), field biologists sampled vegetation, soils, and hydrology in accordance with the Corps Manual (Environmental Laboratory 1987); however, these data were not reported on Corps data forms. Field biologists assigned plant species identified within the Park a wetland status according to the Corps list of plant species that occur in wetlands (Reed 1988). This wetland classification system is based on the expected frequency of occurrence in wetlands as follows:

OBL	Obligate Wetland	Always found in wetlands	>99% frequency
FACW	Facultative Wetland	Usually found in wetlands	67-99%
FAC	Facultative	Equal in wetland or non-wetlands	34-66%
FACU	Facultative Upland	Usually found in non-wetlands	1-33%
NL	Not Listed	An upland plant	<1%

An area is considered to meet the hydrophytic vegetation criterion when more than 50 percent of the dominant species in each stratum (tree, shrub, herbs, etc.) present are in the obligate, facultative wetland, or facultative categories.

The Natural Resource Conservation Service (NRCS) defines a hydric soil as that has formed "under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register 1994). Soils formed over long periods of time under wetland (anaerobic) conditions often possess characteristics that indicate they meet the definition of hydric soils. Hydric soils can have a hydrogen sulfide odor, low chroma matrix color, presence of redoximorphic concentrations, gleyed or depleted matrix, or high organic matter content. Field biologists sampled soils and assigned a chroma and value using a standard Munsell soil color chart (Gretag Macbeth 2000) according to the methodology provided in the Corps Manual (Environmental Laboratory 1987) to assess if hydric soil indicators were present.

The Corps jurisdictional wetland hydrology criterion is satisfied if an area is inundated or saturated for a period sufficient to create anoxic soil conditions during the growing season (a minimum of 14 consecutive days). Evidence of wetland hydrology include indicators, such as visible inundation or saturation, drift deposits, oxidized root channels, salt crusts, a shallow aquitard, or crayfish burrows. Field biologists examined sample locations for direct (e.g. saturated soils) and/or indirect (e.g. oxidized root channels) indicators to determine if wetland hydrology was present.

Upland Vegetation Communities

In 2006 and 2008, upland vegetation communities within the Park were classified based on observed dominant and characteristic species by biologists in the field (LSA 2009b, LSA 2009c), but specific documented vegetation communities from published literature (e.g., Holland 1986, Sawyer and Keeler-Wolf 1995, Barbour et al. 2007, Sawyer et al. 2009) were not ascribed.

WRA conducted a follow-up site visit in January and March 2013 to ascribe vegetation alliances currently on the CDFW *List of Vegetation Alliances* (CDFG 2010) and descriptions in *A Manual of California Vegetation, 2nd Edition* (Sawyer et al. 2009). However, in some cases it was necessary to identify variants of community types or to describe non-vegetated areas that are not described in the literature. Sensitive communities were determined based on NatureServe's (2013) methodology, and are listed by CDFW (CDFG 2010).

2.2.2 Special-status Plant Species

LSA botanists conducted botanical surveys over 29 days in spring 2006 through summer 2008 (Table 2). Early season surveys were conducted in the months March, April, and May, while late season surveys were conducted in the months of June, July, August, September, and October. During early season surveys, botanists traversed the entire Park with particular focus on habitats with a higher potential to support special-status plant species. For instance, botanists noted a close association between the common plant species, Fremont's star lily (*Toxicoscordion fremontii*) and the special-status plant species, fragrant fritillary (*Fritillaria liliacea*). Therefore, areas supporting Fremont's star lily received more attention than those areas without when searching for fragrant fritillary. Generally, late season surveys were composed of concentrated searches in fewer habitats supporting summer blooming species, such as pappose tarplant (*Centromadia parryi* ssp. *parryi*) and other species associated with seeps and wetlands.

All plants were identified with the dichotomous keys in *The Jepson Manual* (Hickman 1993) and *A Flora of Sonoma County* (Best et al. 1996). Additionally, plants collected in the field were identified or confirmed by comparison to images from Google Images and/or Calphotos, and pressed specimens at the UC Berkeley and Jepson herbaria. All plant species observed are included Appendix A. In January and March 2013, WRA conducted site visits recording each plant species observed, but did not perform protocol-level rare plant surveys. Plant species nomenclature was updated to follow Baldwin et al. (2012).

2.2.3 Special-status Wildlife Species

LSA wildlife biologists conducted wildlife habitat assessments and wildlife reconnaissance-level surveys on March 23, May 2, June 8, and August 29, 2006, and April 1 and October 24, 2008. The surveys consisted of pedestrian wanderings recording all direct (e.g. sightings, bird song) and indirect (e.g. scat, tracks) observations, while the assessment consisted of recording habitat values on aerial photographs. Selected survey areas included representative examples of existing habitats present within the park, with specific survey areas and dates included below.

Additionally, volunteer birders have performed surveys and recorded observations from the Park. Volunteers from the PWA have conducted bird surveys in the northern parcel of the Park since April 2006. In 2009, LSA performed an analysis of the bird surveys conducted by PWA which is included as an appendix in this report. Volunteers with the Raptor Project noted raptor activity during four visits in 2007, and their results are included herein (Thiessen and Wilson 2007).

The March 23, 2006 survey focused on wintering bird use in and around Tolay Lake, as well as other aquatic features for California red-legged frog (*Rana draytonii*), western pond turtle (*Actinemys marmorata*), and other herpetofauna. Birds were surveyed from still, elevated positions northwest of Tolay Lake using binoculars and a spotting scope. Herpetofauna surveys were conducted during daylight hours, and included the aquatic features of upper Tolay Creek, Eagle Creek, Cardoza Creek, drainage ditches, Willow Pond, Duck Pond, Vista Pond and Fish Pond on East Ridge, and a stock pond on West Ridge. These surveys consisted of traversing slowly, scanning the banks of the features with binoculars, scanning with the naked eye, and listening for frogs or turtles entering the water.

The May 2, 2006 survey focused on riparian habitat along upper Tolay Creek, Cardoza Creek below Fish Pond, and Fish Pond, as well as grassland habitats and rock outcrops in the Cardoza Creek watershed and the West Ridge.

The June 8, 2006 survey included a reexamination of riparian areas on upper Tolay Creek for passerine birds (i.e., songbirds), isolated blue gum trees on the gently sloping area west of the East Ridge for nesting raptors, and general wildlife surveys on the West Ridge and associated drainages.

The August 29, 2006 survey focused on surveying for metamorphosed California red-legged frogs within inundated aquatic features. The survey was conducted during daylight hours in portions of South Creek, upper Tolay Creek, Cardoza Creek, Vista Pond and Fish Pond, and smaller stock ponds. Additionally, an off-site stock pond to the west of the Park was surveyed remotely with binoculars.

The April 1 and October 24, 2008 surveys focused on general wildlife and were conducted in the southern parcel of the Park including lower Tolay Creek, stock ponds, and terrestrial habitats (e.g., coast live oak woodlands).

Nomenclature for amphibians and reptiles follows Crother et al. (2008), while nomenclature for mammals follows Baker et al. (2003). Nomenclature for special-status species conforms to the CNDDB (CDFW 2013a). Scientific names for species have been included parenthetically within the report despite the acceptance of English vernacular names in the American Ornithologists' Union (AOU) *Check-list of North American Birds* and supplements (AOU 2008, Parks et al 2008).

Table 3. Summary of Biological Communities at Tolay Lake Regional Park

Biological Community	**Vegetation Structure &Type**[1]	**Vegetation Alliance**[2]	**Sensitive Status**[3]
Disturbed and Developed Areas	--	--	No Rank
Non-wetland Waters	--	--	Section 404/401 CWA; Section 1600 CFGC
Wetlands	Marshes and Swamps	Hardstem bulrush marshes (*Schoenoplectus acutus* Herbaceous Alliance)	CDFW Rank G5 S4; Section 404/401 CWA
		Cattail marshes (*Typha angustifolia* Herbaceous Alliance)	CDFW Rank G5 S5; Section 404/401 CWA
		Saltmarsh bulrush marshes (*Bolboschoenus maritimus* Herbaceous Alliance)	CDFW Rank G4 S3; Section 404/401 CWA
		Salt grass flats (*Distichlis spicata* Herbaceous Alliance)	CDFW Rank G5 S4; Section 404/401 CWA
		**Water smartweed marsh (*Persicaria amphibia* Provisional Herbaceous Alliance)	CDFW No Rank; Section 404/401 CWA
	Vernal Pools	Common spikerush marshes (*Eleocharis macrostachya* Herbaceous Alliance)	CDFW Rank G4 S4; Section 404/401 CWA
		**California semaphore grass patches (*Pleuropogon californicus* Provisional Herbaceous Alliance)	CDFW No Rank; Section 404/401 CWA
	Meadows and Seeps	Meadow barley patches (*Hordeum brachyantherum* Herbaceous Alliance)	CDFW Rank G4 S3?; Section 404/401 CWA
		**California semaphore grass patches (*Pleuropogon californicus* Provisional Herbaceous Alliance)	CDFW No Rank; Section 404/401 CWA
		Pacific rush marshes (*Juncus effusus* Herbaceous Alliance)	CDFW Rank G4 S4?; Section 404/401 CWA

Biological Community	Vegetation Structure &Type[1]	Vegetation Alliance[2]	Sensitive Status[3]
		Common rush marshes (*Juncus patens* Provisional Herbaceous Alliance)	CDFW Rank G4? S4?; Section 404/401 CWA
		Common monkeyflower seeps (*Mimulus guttatus* Herbaceous Alliance)	CDFW Rank G4? S3?; Section 404/401 CWA
		**Mixed-annual wetland forb patches (Undocumented Herbaceous Alliance)	CDFW No Rank; Section 404/401 CWA
Riparian Area	Riparian Woodland	Red willow thickets (*Salix laevigata* Woodland Alliance)	CDFW Rank G3 S3; Section 404/401 CWA (partial); Section 1600 CFGC
Woodlands and Groves	Cismontane Woodland	Coast live oak woodlands (*Quercus agrifolia* Woodland Alliance)	CDFW Rank G5 S4
		Valley oak woodlands (*Quercus lobata* Woodland Alliance)	CDFW Rank G3 S3
		California buckeye groves (*Aesculus californica* Woodland Alliance)	CDFW Rank G3 S3
		Blue gum groves (*Eucalyptus globulus* Semi-natural Woodland Stands)	No Rank
	Closed-cone Coniferous Forest	Monterey cypress stands (*Hesperocyparis macrocarpa* Woodland Alliance)	No Rank*
Rock Outcrops	Coastal Scrub	Poison oak scrubs (*Toxicodendron diversilobum* Shrubland Alliance)	G4 S4
Grasslands	Valley and Foothill Grassland (native)	Purple needlegrass grasslands (*Stipa pulchra* Herbaceous Alliance)	G4 S3?
		California oat grass prairies (*Danthonia californica* Herbaceous Alliance)	CDFW Rank G4 S3

Biological Community	Vegetation Structure &Type[1]	Vegetation Alliance[2]	Sensitive Status[3]
		Creeping wild rye turfs (*Elymus triticoides* Herbaceous Alliance)	CDFW Rank G4 S3
	Wildflower Fields	mixed wildflower fields (Mixed native wildflowers Undocumented Herbaceous Alliance)	CDFW No Rank
		Johnny jump-up wildflower fields (*Viola pedunculata* Undocumented Herbaceous Alliance)	CDFW No Rank
		Cream cup wildflower fields (*Platystemon californicus* Undocumented Herbaceous Alliance)	CDFW No Rank
	Valley and Foothill Grassland (non-native)	Italian rye grass grasslands (*Festuca perennis* Semi-natural Herbaceous Stands)	No Rank
		**Medusa head patches (*Elymus caput-medusae* undescribed Semi-natural Herbaceous Stands)	No Rank
		Slender wild oat grasslands (*Avena barbata* Semi-natural Herbaceous Stands)	No Rank
		Soft chess grasslands (*Bromus hordeaceus* Semi-natural Herbaceous Stands)	No Rank
		Dogtail grass grasslands (*Cynosurus echinatus* Semi-natural Herbaceous Stands)	No Rank

[1]Source: CNPS Vegetation Mapping Classification (CNPS 2013)
[2]Source: *A Manual of California Vegetation, 2nd Edition* (Sawyer et al. 2009)
[3]Sensitive Status based on Section 404/401 of the Clean Water Act; Section 1600 of the California Fish and Game Code; CDFW/NatureServe natural communities ranking
*Considered sensitive in native stands only highly restricted to Monterey Peninsula; community here represents planted stands not indicative of the natural vegetation community/alliance described in the literature
**Not previously described in Sawyer et al. 2009 or elsewhere

3.0 EXISTING HABITATS

3.1 Developed and Disturbed Areas

Developed and disturbed areas are not specifically addressed in the vegetation literature (Holland 1986, Barbour et al. 2007, Sawyer et al. 2009); however, these areas tend to be composed of similar disturbance-adapted, invasive plant species, and often provide habitat for native wildlife species. Within the Park, developed and disturbed habitat is present primarily in around the former Cardoza Residence (Park Headquarters) in the northwestern portion, as well as in and around roads, bridges, and other infrastructure.

3.1.1 Vegetation of Developed and Disturbed Areas

Developed and disturbed areas within the park are not composed of documented vegetation alliances, but do host a suite of non-native plant species and native species are essentially absent. Several ornamental species were observed but not identified to species in and around and the Park Headquarters. Naturalized, and often invasive, plant species identified include blackwood acacia (*Acacia melanoxylon*), common fig (*Ficus carica*), mustard (*Brassica nigra*), charlock (*Sinapis arvensis*), thistles and lettuces (*Carduus pycnocephalus, Centaurea solstitialis, Silybum marianum, Lactuca saligna, L. serriola*), fennel (*Foeniculum vulgare*), bull mallow (*Malva nicaeensis*), and stork's bills (*Erodium botrys, E. cicutarium, E. moschatum*). The presence and persistence of these disturbance-adapted, invasive species poses a threat to the native habitats throughout the Park by providing a seed source that can be transported from the Park Headquarters and other disturbed areas.

3.1.2 Wildlife Values of Developed and Disturbed Areas

If somewhat diminished in quality, developed and disturbed areas can offer some wildlife habitat values. Wildlife within developed areas is typically more habituated to repeated human activity, and often common in urban to suburban settings. Ornamental vegetation, buildings, and other infrastructure provide nesting and roosting sites for a variety of birds including barn owl (*Tyto alba*), California towhee (*Pipilo crissalis*), black phoebe (*Sayornis nigricans*), barn swallow (*Hirundo rustica*), house finch (*Carpodacus mexicanus*), and American goldfinch (*Cardeulis tristis*).

Western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinata*), and gopher snake (*Pituophis catenifer*) commonly forage in around developed areas for insects and small vertebrates, while skunk (*Mephitis* sp.), raccoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*) will frequently occupy abandoned or lightly used barns and other out-buildings. Garden vegetables and domestic ornamentals are often an attractant for black-tailed deer (*Odocoileus hemionus columbianus*), which likely browse nocturnally and at sunset / sunset rise in the Park Headquarters area when human activity is low.

3.2 Non-wetland Waters

Non-wetland waters include those habitats of ephemeral to perennial flowing or sill open water with very little to no emergent vascular vegetation. These features are frequently jurisdictional under the Clean Water Act, and within the Park include Tolay Lake, creeks, and stock ponds.

Often these features are adjacent to herbaceous or woody wetland habitat (Sections 3.3 and 3.4, below), but the majority of the areas mapped as non-wetland waters within the Park generally lack vegetation cover in excess of five percent across the entire feature.

3.2.1 Tolay Creek and Tributaries

Tolay Creek is the dominant drainage within the Park, extending approximately four miles from the south end of Tolay Lake in the north to Highway 121 in the south (Figure 4). Tolay Creek has been channelized through and downstream of Tolay Lake for approximately 0.3 mile, presumably to drain Tolay Lake for agriculture, and dredge spoils are located in several locations along the upper reach of Tolay Creek. The entire run of Tolay Creek below Tolay Lake is within a confined and incised channel. The upper reach is approximately 4 to 10 feet deep, and 10 to 20 feet in width, while the lower reach is approximately 8 to 15 feet in width, with similar depths. Historic floodplain terraces are present in the lower reach. Numerous tributaries discharge into Tolay Creek from both West Ridge and East Ridge.

Flows of Tolay Creek are strongly seasonal with active, flowing water observed in late fall through spring months, but drying by summer, while the tributaries are ephemeral to intermittent with winter through spring flows. Deeper pools in the lower reach of Tolay Creek typically remain wetted year-round, and pools in several tributaries remain into summer. The substrate of the creek in the upper reach is composed of sorted sediments and muck from decomposed vegetation. Sands and silts comprise the lower velocity portions of the lower reach, and cobbles and gravels comprise the high velocity areas.

Areas of dense in-channel vegetation are located in the upper reaches of Tolay Creek where alteration to the channel has occurred, and is composed of cattail (*Typha angustifolia*) and water smartweed (*Persicaria amphibia*). The lower reach contains less in-channel vegetation made up of small patches of cattail, hardstem bulrush (*Schoenoplectus acutus*), pennyroyal (*Mentha pulegium*), watercress (*Nasturtium officinale*), water pennywort (*Hydrocotyle ranunculoides*), water plantain (*Alisma lanceolatum*), and rough cocklebur (*Xanthium strumarium*). The banks and historic floodplain terraces of the creek support intermittent riparian woodland (Section 3.4), as well as patches of Himalaya blackberry (*Rubus armeniacus*), poison hemlock (*Conium maculatum*), Baltic rush (*Juncus balticus*), mugwort (*Artemisia douglasiana*), stinging nettle (*Urtica dioica*), and horsetails (*Equisetum laevigatum, E. telmateia*).

3.2.2 Cardoza Creek

Cardoza Creek is made up of two primary drainages, the Main and North forks. The Main Fork originates outside and to the east of the Park, and flows into Vista Pond where the channel has been rerouted from its original flow line into Fish Pond.The bank is deeply incised and eroding in several locations and the bed is composed of sediments of mixed size. The channel is approximately 4 to 10 feet in width, and flows appear to be intermittent throughout the winter and spring. Above Vista Pond, scattered coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), and California buckeye (*Aesculus californica*) trees grow along the streambank, along with poison oak (*Toxicodendron diversilobum*), California coffeeberry (*Frangula californica*), creeping snowberry (*Symphoricarpos mollis*), and bee plant (*Scrophularia californica*).

The North Fork of Cardoza Creek originates in seep wetlands adjacent to the property line and ridgeline of East Ridge, and flows directly into Fish Pond approximately 1,000 feet below the confluence with the Main Fork. The bank is frequently incised, undercut, and eroding, and the bed contains mixed sediments. The channel is approximately 3 to 8 feet in width, and flows appear to be intermittent with no flow in summer months. Above Fish Pond, a cluster California buckeye and California bay trees are located in the higher portion of the reach, but herbaceous species such as brownhead rush (*Juncus phaeocephalus*), common rush (*J. patens*), and bee plant dominate the vegetation along this fork of Cardoza Creek.

The historic Main Fork channel is currently present between the dam face of Vista Pond and Fish Pond, which flows in winter and spring months reverting to a seep wetland in summer months. Fish Pond discharges across a concrete-lined spillway creating downstream erosion and undercutting at the spillway. Automobiles, concrete block, and other detritus appear to have been intentionally placed in the channel below the spillway to reduce erosion. The channel below the spillway appears to have stabilized because it has attained a stable elevation with the downstream reach of Cardoza Creek. The historic channel emerging from the Fish Pond dam face does not exhibit wetland characteristics but does contain willow riparian habitat.

The lower reach of Cardoza Creek (below Fish Pond) flows through a natural, somewhat downcut channel for approximately 2,800 feet where the channel appears to have been altered to flow straight into Tolay Creek 1,200 feet further downstream.

3.2.3 North Creek – Oak Grove Fork

The headwaters of the Oak Grove Fork of North Creek originate in the northeast portion of the Park on East Ridge as a slumped gully, then flows within a defined channel through oak woodland. Waters flow off property into a large agricultural reservoir. Flows reenter the Park from the this reservoir into man-made ditch system which runs on the east side of Tolay Lake, eventually joining Tolay Creek approximately 690 feet upstream from the Farm Bridge. In the upper reach, the channel is approximately 4 to 8 feet in width, the bank incision is generally muted from the oak woodlands, and the bed is composed of mixed sized sediment. Flows appear to be intermittent, but flowing waters were observed in August and November 2006 (LSA 2009b), an above average rainfall year for Petaluma (UC-IPM 2013, WRCC 2013).

The slumped gully headwaters support hydrophytes such as Pacific rush (*Juncus effusus*), brownhead rush, and pennyroyal. The reach underneath the oak woodland canopy does not exhibit wetland characters, but the ditches of the lower reach contain a mucky channel bottom and emergent hydrophytes such as cattail and water smartweed.

3.2.4 Eagle Creek

The headwaters of Eagle Creek originate on the edge of the property line and ridgeline of East Ridge as seep wetlands. The waters flow off property between vineyards located immediately north of the Park, then are routed through man-made ditches returned to Park eventually joining Tolay Creek at the Farm Bridge. In the upper reach, the channel is approximately 2 to 6 feet in width, the bank is incised in several locations, and the bed is composed of mixed sized sediment. Flows appear to be intermittent, but standing water was observed in August 2006 (LSA 2009b). A small grove of coast live oak is present along the upper portion of the reach, and Pacific rush and brownhead rush are present along the bank periodically in-channel. In the lower reaches where Eagle Creek has been routed into man-made ditches, the channel bottom is composed of muck from decaying vegetation, and the vegetation is predominantly a mix of weedy hydrophytes and cattail.

3.2.5 Ponds

Several ponds for irrigation and livestock watering are located throughout the Park. Although these ponds were man-made, they contain functions and values similar to naturally occurring water bodies. Several of these ponds dry out by summer, functioning as seasonal wetlands with distinct vegetation communities (see Section 3.3).

Vista Pond and Fish Pond, located on East Ridge, were constructed within the Cardoza Creek watershed, and are supplied by in-channel flow, surface runoff, direct precipitation, and seasonal and perennial springs. Inundation is perennially, with a verge of wetland grasses such as western mannagrass (*Glyceria* x *occidentalis*), meadow barley (*Hordeum brachyantherum*), Mediterranean barley (*H. marinum*), Italian rye grass (*Festuca perennis*), and California semaphore grass (*Pleuropogon californicus* var. *californicus*). A patch of willow riparian is established on the west shore of Fish Pond, where Cardoza Creek enters, made up primarily of red willow (*Salix laevigata*) (see Section 3.4).

Duck and Willow ponds, located on the West Ridge adjacent to the Park Headquarters, are supplied by over a mile pipe from springs located on the northeastern portion of the Park. Overflow water flows from Willow Pond into Duck Pond, and onward into a small swale which runs into a culvert under the primary ranch road. These ponds contain a verge of common facultative grasses, similar to Fish Pond and Vista Pond, and red willows ring the western edge of Willow Pond.

A large, unnamed, seasonal pond / vernal marsh is located in the remote southeastern portion of the Park adjacent to Highway 121. The pond is supplied by an ephemeral drainage which runs underneath Highway 121 and into the Sonoma Creek Marsh. The presence of Highway 121 acts as a dam, backing waters up in winter months in this pond, but drying by early summer. Several aquatic plant species are present when ponded water is present in winter and early spring, including Lobb's buttercup (*Ranunculus lobbii*), aquatic buttercup (*R. aquatilis*), water plantain, and saltmarsh bulrush (*Bolboschoenus maritimus*). Following draw-down of winter waters, the pond becomes alkali vernal marsh habitat dominated by salt-tolerant wetland species (see Section 3.3.2).

Several small stock ponds and depressional features are scattered throughout the Park, particularly on the West Ridge. These features collect surface runoff, in-channel runoff, and direct precipitation, wetting up through the winter months, and drawing down by the summer or late spring. Vegetation is very similar to that of vernal pool (see Section 3.3.3).

3.2.6 Wildlife Values of Non-wetland Waters

The year-round water availability and vegetation cover provide wildlife with important resources, particular in the dry summer months. Mammals and birds almost certainly water in the deeper pools of Tolay Creek and its tributaries, and amphibians and aquatic invertebrates may utilize the creek for breeding and foraging habitat. California red-legged frog have been observed within Tolay Creek (Parsons 1996), but were not observed during LSA's or WRA's studies (LSA 2009b, LSA 2009c). Riparian areas present along Tolay Creek and its tributaries provides cooler waters more favorable for California red-legged frog than for the invasive bullfrog (*Rana* *catesbeianus*); however, one bullfrog was observed in 2006 on a tributary adjacent to Tolay Creek.

Numerous water birds have been observed in and around the Park's several ponds, including Canada goose, mallard, American widgeon, cinnamon teal, great egret, snowy egret, and great blue heron. Shorebirds, such as killdeer, black-necked stilt, Wilson's snipe, and greater yellowlegs utilize the ponds and their edge habitat for foraging. Similar to the pools of Tolay Creek, ponds with an extended hydroperiod provide suitable breeding habitat for Sierran tree frog (*Pseudacris sierra*), western toad (*Bufo boreas*), bullfrog, and possibly California red-legged frog. Although not observed in the ponds, these features provide suitable foraging and basking habitat for western pond turtle. Garter snakes (*Thamnophis* spp.) and southern alligator lizard are frequent visitors to ponds and other aquatic features, foraging on insects, toads, frogs, and small fish.

3.3 Wetlands

Wetlands and moist grasslands are those features dominated by herbaceous hydrophytic species rooted in soils that are saturated during the growing season for a period sufficient to meet hydric conditions (i.e., 14 days or greater). These features are jurisdictional under Section 404/401 of the Clean Water Act. Tolay Lake, the largest wetland / non-wetland water within the Park, is composed of several spatially and temporally distinct wetland types. In addition to Tolay Lake, the Park contains seeps, seasonal wet meadows, seasonal depressions, seasonal swales, and vernal pools containing several vegetation alliances typically dominated by native herbaceous, hydrophytic species.

The hydrology of wetlands in the Park varies from perennial or nearly perennial in marsh and seep wetlands to intermittent or seasonal in vernal pools and meadows. Hydrology, soil type, and soil/water chemistry are the strongest determinants of dominant vegetation communities and species composition within these wetlands. Secondarily, disturbance, soil/hydrologic modification, and grazing regime influence vegetation patterns within these features.

3.3.1 Tolay Lake

Tolay Lake is a natural lake which has been substantially altered over the past century. To drain the lake, it is believed that the natural earthen dam was removed, Tolay Creek widened and deepened, and North Creek diverted to enter Tolay Creek below the lake. Consequently, the extent and duration of ponding has been greatly reduced, thereby altering the biological functions of the lake.

Historically, Tolay Lake is thought to have been perennial during years of high rainfall, extending to Stage Gulch Road located approximately one mile north of the Park's northern boundary (Kamman 2003, Ducks Unlimited 2005). A secondary account from 1823, reported in 1877, has the lake varying in width from approximately 420 feet to 3,300 feet, and a length of 3,300 feet (Thompson 1877), while the Petaluma Land Grant map of 1860 approximates the lake at one-quarter mile wide and two miles long (Ducks Unlimited 2005). Given the variability in these accounts and other historic maps, as well as contemporary observation, it is assumed that Tolay Lake has functioned as a vernal or semi-permanent marsh/lake through recorded history.

Currently, Tolay Lake is a large, shallow basin segmented into agricultural checks divided by drainage ditches. The lake becomes inundated in the winter months, remaining through the early spring. The Cardoza family traditionally pumped water from the lake in April through May for their farming operation, with some lower, unconnected areas of the lakebed retaining inundation later in the season. Parsons (1996) indicates that two acre-feet of water are present in Tolay Creek during normal to wet years, and one acre-foot of water during dry years. LSA observed water within Tolay Creek in August 2006, an above average water year, despite an observed dried lakebed.

Clearly delineating ponded areas (non-wetland waters) from vegetated areas (wetlands) is difficult due to the extensive, historic alteration of the lake and annual variation in rainfall and consequent vegetation patterns. The outermost extent of the lake was delineated by LSA in 2006 based on a “slight break in the slope of the formerly cultivated field” which may indicate the historic shoreline on the eastern side of the Tolay Lake (LSA 2009b).

The vegetation within Tolay Lake varies spatially, seasonally, and annually, largely depending on amount of rainfall and topographic position. Generally, soils within the upper margin of Tolay Lake are saturated throughout the wet season drying out in early summer, and inundation is only present in above normal water years. The lower margin experiences saturation throughout the majority of the year to year-round, and is frequently inundated. The lakebed experiences experiences frequent and repeated inundation within the wet season, which may remain into the dry season depending on volume and timing of rainfall. As a result, a shift from meadow to freshwater marsh habitat is evident between the upper lake margin, the lower margin, and the lakebed, effectively dividing the lake into approximately three vegetation alliances: meadow barley patches, water smartweed marsh, and mixed-annual wetland forb patches.

Meadow barley patches (*Hordeum brachyantherum* Herbaceous Alliance). CDFW Rank G4 S3?; Section 404/401 Waters (Sensitive): Meadow barley patches have been documented from the Coast Ranges, Sierra Nevada Foothills and Eastside, and Modoc Plateau (Holland 1986, Sawyer et al. 2009). These patches are located upslope of the lower lake margin and contain a mix of spring blooming hydrophytes and summer blooming upland species. Early in the spring, meadow barley, Mediterranean barley, spiny-fruit buttercup (*Ranunculus muricatus*), curly dock (*Rumex pulcher*), dominate the upper lake margin, followed by the emergence of black mustard, charlock, bristly ox-tongue (*Helminthotheca echioides*), and field bindweed (*Convolvulus arvensis*).These patches intergrade with mixed-annual wetland forb patches downslope toward Tolay Lake, and upland grasslands upslope from Tolay Lake.

Mixed-annual wetland forb patches (Undocumented Herbaceous Alliance). CDFW No Rank; Section 404/401 Waters (Sensitive): Mixed-annual wetland forb patches have not been previously documented in the vegetation literature (Holland 1986, Barbour et al. 2007, Sawyer et al. 2009); however, the distinct change in vegetation assemblage between the upper lake margin and lakebed merits inclusion as a distinct vegetation alliance. This area of Tolay Lake is dominated by species which emerge earlier in the spring as waters begin to recede and soils begin to dry, such as slender popcorn flower (*Plagiobothrys stipitatus*), purslane speedwell (*Veronica peregrina* ssp. *xalapensis*), starwort (*Callitriche* sp.), hyssop loosestrife (*Lythrum hyssopifolia*), and common monkeyflower (*Mimulus guttatus*). These emerge earlier in the spring as waters begin to recede and soils begin to dry.

Water smartweed marsh (*Persicaria amphibia* Undocumented Herbaceous Alliance). CDFW No Rank; Section 404/401 Waters (Sensitive): Water smartweed marshes have not been previously documented in the vegetation literature (Holland 1986, Barbour et al. 2007, Sawyer et al. 2009); however, the prevalence of water smartweed on the lakebed of Tolay Lake merits inclusion as a distinct vegetation alliance. Downstream of the causeway of Tolay Lake, water smartweed forms a near complete monoculture. Upstream of the causeway, it is a dominant species, with substantial cover of other semi-aquatic species including water plantain in the spring through summer. As the water draws down, late spring and summer blooming species emerge such as Fuller's teasel (*Dipsacus fullonum*), mayweed (*Anthemis cotula*), heliotrope (*Heliotropium curassavicum* var. *oculatum*), swamp pricklegrass (*Crypsis schoenoides*), red ammannia (*Ammannia coccinea*), fat hen (*Atriplex prostrata*), smooth willowherb (*Epilobium campestre*), devil's claw (*Proboscidea lutea*), velvet-leaf (*Abutilon theophrasti*), and common purslane (*Portulaca oleracea*).

3.3.2 Vegetation of Marshes and Swamps

Marshes are typically located in estuaries, deltas, floodplains, broad alluvial valleys, and large depressions where low velocity surface water collects, creating saturated soil conditions for a majority of the year. These systems can range from freshwater to saline, and are often subject to tidal action. Within the Park, marsh habitat is associated with Tolay Lake, the fringes of ponds, and agricultural ditches in the Tolay Valley. Vegetation alliances documented within marsh habitats in the Park include hardstem bulrush marsh, cattail marsh, saltmarsh bulrush marsh, and salt grass flats; however, due to frequent intergradation between these alliances, alliance-level mapping was not performed.

Hardstem bulrush marshes (*Schoenoplectus acutus* Herbaceous Alliance). CDFW Rank G5 S4; Section 404/401 Waters (Sensitive): Hardstem bulrush marshes are known from the Central Valley, Modoc Plateau, the Bay Area, and coastal marshes (Holland 1986, Sawyer et al. 2009). These marshes dominate the agricultural ditches in Tolay Valley and the fringe of ponds, and intergrade with cattail marshes. The dominant species is the emergent graminoid, hardstem bulrush, but includes substantial cover of chairmaker's bulrush (*Schoenoplectus americanus*), cattail, water smartweed, and water plantain.

Cattail marshes (*Typha angustifolia* Herbaceous Alliance). CDFW Rank G5 S4; Section 404/401 Waters (Sensitive): Cattail marshes have been documented throughout California except at the highest elevations (Holland 1986, Sawyer et al. 2009). Similar to hardstem bulrush marshes, this vegetation alliance is located in agricultural ditches and ringing ponds. Dominated by the cosmopolitan hydrophyte cattail, this alliance contains substantial cover of hardstem bulrush, chairmaker's bulrush, water pennywort, water smartweed, and water plantain.

Saltmarsh bulrush marshes (*Bolboschoenus maritimus* Herbaceous Alliance). CDFW Rank G5 S4; Section 404/401 Waters (Sensitive): Saltmarsh bulrush marshes are known from the Bay Area, Humboldt Bay, and the South Coast (Holland 1986, Sawyer et al. 2009). Within the Park, saltmarsh bulrush marsh is located in the deeper portions and channel of the large seasonal pond adjacent to Highway 121, which emerges as spring waters draw down. The dominant species is saltmarsh bulrush, with subdominant and characteristic cover of water plantain, water buttercup, and Lobb's buttercup.

Salt grass flats (*Distichlis spicata* Herbaceous Alliance). CDFW Rank G5 S4; Section 404/401 Waters (Sensitive): Salt grass flats are extensively distributed in moderate to high saline environments throughout the Central Valley, Eastside Sierra, Modoc Plateau, Deserts, and coastal regions of California (Holland 1986, Sawyer et al. 2009). Salt grass flats are located in the large seasonal pond adjacent to Highway 121, and contain a mix of saline tolerant wetland species such as alkali heath (*Frankenia salina*), heliotrope, alkali mallow (*Malvella leprosa*), rabbit's-foot grass (*Polypogon monspeliensis*), Mediterranean barley, brass buttons (*Cotula coronopifolia*), narrowleaf bird's-foot trefoil (*Lotus tenuis*), coyote thistle (*Eryngium* sp.), smooth goldfields (*Lasthenia glaberrima*), and curly dock (*Rumex crispus*).

3.3.3 Vegetation of Vernal Pools and Stock Ponds

Vernal pools are unique seasonal wetlands located on flat to hillock terrain in concave depressions. These habitats are underlain by restrictive soils, typically either fine textured Vertic clays or medium grained substrate overlying a shallow hardpan. Watersheds vary in size from very localized to extensive in large vernal pool complexes. Vernal pools can range in pH with alkali vernal pools common in the Great Valley, Delta, and San Francisco Baylands. Although not naturally occurring in the Park, several wetlands function similar to vernal pools and host a similar suite of plant species; therefore, they are referred to vernal pools. Within the Park, these features are associated with or located in stock ponds and in-channel depressions of ephemeral and intermittent tributary streams, and on the top of West Ridge. Vernal pools were characterized as such primarily by their observed vegetation assemblage as containing a dominance or prevalence of characteristic vernal pool species. Vegetation alliances within vernal pool and stock pond fringe habitats in the Park include common spikerush wetland (Sawyer et al. 2009); however, the species assemblages are often quite rich and shift annually with climatic variation, and distinct alliance-level characterization can be difficult to determine.

<u>Common spikerush wetland (*Eleocharis macrostachya* Herbaceous Alliance). CDFW Rank G4 S4; Section 404/401 Waters (Sensitive)</u>: Common spikerush wetlands are known throughout California, particularly in the Central Valley, Sierra Nevada Foothills, and Coast Ranges (Holland 1986, Sawyer et al. 2009). Common spikerush wetlands were observed on the drying margins of stock ponds and within the intermittent and ephemeral drainages on the East and West ridges. Observed species include common spikerush (*Eleocharis macrostachya*), armed coyote thistle (*Eryngium armatum*), Lobb's aquatic buttercup, aquatic buttercup, common yellow monkey flower, flowering quillwort (*Triglochin scilloides*), water chickweed (*Montia fontana*), California semaphore grass, rabbit's-foot grass, Mediterranean barley, brownhead rush Pacific rush, and common rush.

3.3.4 Vegetation of Meadows and Seeps

Meadows or moist grasslands are typically located on flat to very slightly concave alluvial floodplains, terraces, and valley bottoms. These habitats are often underlain by fine textured soils which hold saturation into late spring or summer thereby supporting wetland grasses and forbs, but extensive surface ponding of water is uncommon or very short lived. These systems are overwhelmingly freshwater and soil pH is often neutral to alkaline. They are associated with upper margins of Tolay Lake (see Section 3.3.1), the large seasonal pond adjacent to Highway 121, and scattered locales in Tolay Valley.

Seeps are associated with springs and typically located on hillsides, often as headwaters to defined wetland swales and streams. These habitats are typically underlain by mixed textured sediments with substantial cobble and gravel, and/or associated with rock outcrops. Saturated conditions are strongly seasonal to year-round, and surface ponding may be present, particularly in areas were ungulates graze heavily or which have been developed. These systems are freshwater and pH varies with soil type.

Vegetation alliances within meadow and seep habitats in the Park include Pacific rush meadows, common rush meadows, common monkeyflower seeps, and California semaphore grass meadows (Sawyer et al. 2009). Due to their frequently relatively small size and indistinct boundaries between these vegetation alliances, they were not mapped to alliance level.

Pacific rush meadows (*Juncus effusus* Herbaceous Alliance). CDFG Rank G4 S3; Section 404/401 Waters (Sensitive): Pacific rush meadows are known from the Bay Area, Delta Area, and Sierra Nevada Foothills. (Sawyer et al. 2009). This community is dominated by Pacific rush, a perennial cespitose or tussocked graminoid closely associated with fine grained soils and extended saturation, and are scattered throughout the Park in low gradient positions and in small patches adjacent to hillside seeps. Associated species include hydrophytes including common rush, brownhead rush, meadow barley, creeping wild rye (*Elymus triticoides*), common monkeyflower, purslane speedwell, and rabbit's-foot grass.

Common rushmeadows (*Juncus patens* Provisional Herbaceous Alliance). CDFG Rank G4 S3; Section 404/401 Waters (Sensitive): Common rush meadows are considered a provisional alliance requiring further investigation by vegetation ecologists (Sawyer et al. 2009); however, several areas in low gradient positions and adjacent to hillside seeps support a characteristic to dominant presence of common rush. Associated species include hydrophytes including Pacific rush, California semaphore grass, tall fescue (*Festuca arundinacea*), meadow barley, and Mediterranean barley, and Italian rye grass.

California semaphore grass meadows (*Pleuropogon californicus* Provisional (Undescribed) Herbaceous Alliance). CDFW No Rank; Section 404/401 Waters(Sensitive): California semaphore grass wetlands are known throughout the Central Valley and North Coast Ranges of California (Holland 1986, Sawyer et al. 2009). Wetlands dominated by California semaphore grass are located in similar positions as common spikerush wetlands, as well as broad meadow-like wetlands within Tolay Valley. Other dominant or characteristic species in wetter areas include meadow barley, brownhead rush, and creeping wild rye, while drier portions support facultative species such as Mediterranean barley, Italian rye grass, and California oat grass (*Danthonia californica*).

Common monkeyflower seeps (*Mimulus guttatus* Herbaceous Alliance). CDFG Rank G4 S3; Section 404/401 Waters (Sensitive): Common monkeyflower seeps have been documented from the Klamath and Cascade Ranges, Sierra Nevada Foothills, Interior Coast Ranges, and Modoc Plateau (Sawyer et al. 2009); however, small patches of this alliance are relatively frequent in seep and spring areas throughout the Coast Ranges (Calflora 2013, Baldwin et al. 2012). This vegetation alliance is located adjacent to hillside seeps where strongly seasonal flows support several obligate and facultative wetland species including brass buttons, Jersey cudweed (*Pseudognaphalium luteoalbum*), slender popcorn flower, watercress, water pygmyweed (*Crassula aquatica*), rushes, and purslane speedwell.

3.3.5 Wildlife Values of Tolay Lake and Other Wetlands

Tolay Lake

Tolay Lake provides an important year-round or nearly year-round water source for a variety of wildlife, from large mammals to migratory birds. Black-tailed deer, raccoon, long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), and Virginia opossum are likely to water in and around the lake. There is no recent reported evidence of beaver (*Castor canadensis*) or river otter (*Lontra canadensis*) from Tolay Valley.

Tolay Lake is recognized as an important wintering area for migratory waterfowl (Steve Ehret pers. comm., LSA 2009b). The spatial extent and relatively shallow depth of the lake attracts ducks and other waterbirds, while the extensive vegetation provides important forage for over-wintering waterfowl. LSA (2009b) and PWA have identified eleven duck species, eight of which are dabblers, and include gadwall (*Anas strepara*), American widgeon (*Anas americana*), mallard (*Anas platyrhynchos*), cinnamon teal (*Anas cyanopera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), green-winged teal (*Anas cracca*), canvasback (*Aythya valisineria*), greater scaup (*Aythya marila*), bufflehead (*Bucephala albeola*), and ruddy duck (*Oxyura jamaicensis*). Other birds observed in and around Tolay Lake associated water bodies include Canada goose (*Branta canadensis*), pied-billed grebe (*Podilymbus podiceps*), double-crested cormorant (*Phalacrocorax auritus*), American coot (*Fulica americana*), and Caspian tern (*Hydroprogne caspia*).

The shallow water and productive vegetation provide forage and cover for wading birds such as great blue heron (*Ardea herodias*), great egret (*Ardea alba*), and snowy egret (*Egrettia thula*), which forage along the lake edge. Egret rookeries have been observed in blue gum groves along Lakeville Highway and downtown Petaluma, which may utilize Tolay Lake among other waterbodies in southern Sonoma County. The shallower margins of the lake likely provide foraging habitat for wintering and migrating shorebirds such as killdeer (*Charadrius vociferous*), greater yellowlegs (*Tringa melanoleuca*), least sandpiper (*Calidris minutilla*), western sandpiper (*Calidris mauri*), and long-billed dowitcher (*Limnodromus scolopaceus*).

The importance of Tolay Lake as habitat for invertebrates has not been investigated, but the seasonal drawdown of the lake likely reduces macro-invertebrate diversity. Insect hatches are likely in spring and early summer, providing important forage resources for bats, swallows, and other insectivores. The lake provides suitable breeding habitat in most years for western toads and Sierran tree frogs, and California red-legged frog in protected areas when waters remain into early summer. Although American bullfrogs utilize the lake for forage and cover, breeding is unlikely due to the depth and seasonal drawdown.

<u>Other Wetlands</u>

Wildlife values for other wetlands are similar to those as Tolay Lake (above) and upland grasslands (Section 3.6). Many of the Park's wetlands provide water resources into late summer when water availability is at a minimum. Birds, mammals, and reptiles are expected to frequent wetlands for watering, and the associated dense vegetation provides cover. Shrews (*Sorex* spp.) and other small mammals are likely to utilize seep wetland habitat for foraging and cover, while birds such as killdeer, great egret, and Wilson's snipe (*Gallinago delicata*) are more likely to forage in wet areas than drier portions of grasslands and wildflower fields.

The wetlands within the Park provide suitable breeding, foraging, and dispersal habitat for a variety of amphibians and reptiles. Wetlands with an extended spring hydroperiod provide breeding habitat for Sierran tree frog and western toad, while connected streams and creeks provide a dispersal pathway and adjacent uplands provide estivation sites. Suitable breeding habitat for American bullfrog and California red-legged frog is present within several of the larger seasonal wetlands, vernal pools, and stock ponds. Garter snakes forage in and around meadows, seeps, and vernal pools where their prey resources, such as toads, frogs, salamanders, and small fish, are plentiful. Southern alligator lizard and western fence lizard are frequently, though not exclusively, observed in and around wetland resources foraging, sheltering, and thermoregulating in the warmer periods of the year.

3.4 Riparian Areas

Riparian areas are broadly defined as vegetation assemblages associated with streams or other water bodies, predominantly composed of woody species, which is dependent upon the hydrology of the associated water body (CDFG 1994). Located throughout California, these systems provide numerous benefits to the associated water body including nutrient input, water cooling, bank stabilization, and flood control, as well as essential wildlife habitat. Within the Park, riparian areas are composed primarily of one vegetation alliance, red willow thickets, but scattered coast live oak woodlands in the upper reaches of ephemeral and intermittent streams function as riparian areas as well.

3.4.1 Vegetation of Riparian Woodland

Red willow thickets (*Salix laevigata* Woodland Alliance). CDFW Rank G3 S3; (portions) Section 404/401; Section 1600 CFGC (Sensitive): Red willow thickets have been documented in reaches of the Desert, and cismontane California with the exception of the North Coast (Sawyer et al. 2009). The overstory of this community varies in height and crown, but is generally greater than 15 feet tall and wider than 30 feet. The canopy is dominated by several willow species (*Salix* spp.), with some individuals exceeding DBH of 12 inches. Larger, mature trees are located on the top of bank of Tolay Creek, Cardoza Creek, and other streams, with saplings often colonizing the lower banks and channel bottoms.

The canopy is dominated by a mix of red willow, arroyo willow (*Salix lasiolepis*), yellow willow (*S. lasiandra*), and sandbar willow (*S. exigua*), with occasional Fremont cottonwood (*Populus fremontii*), coast live oak, valley oak (*Quercus lobata*), and California buckeye. The understory is made up of scattered upright snowberry, California blackberry (*Rubus ursinus*), Himalaya blackberry, California rose (*Rosa californica*), and mugwort. Shrubs and perennial herbs of the understory are relatively scattered or absent due largely to a nearly closed canopy and/or extensive grazing.

3.4.2 Wildlife Values of Riparian Areas

Riparian areas are recognized as important habitat for wildlife through the provision of cover, migration, foraging, nesting, breeding, and watering (Faber 2003), and are essential for many bird species in California (RHJV 2004). Neither LSA nor PWA observed riparian obligate passerines despite the relatively well developed riparian habitat along Tolay and Cardoza creeks (LSA 2009b). Red-winged blackbirds and song sparrows were the two most abundant birds observed within the Tolay Creek watershed, along with single to few observations of warbling vireo, orange-crowned warbler, Wilson's warblers, yellow warblers, and willow flycatcher; however, breeding of these latter species was not confirmed, which may have been migrants (LSA 2009b). Other birds that are assumed to use or were observed using riparian areas within the Park include mourning dove, Anna's hummingbird, downy woodpecker, northern flicker, black phoebe, tree swallow, bushtit, Bewick's wren, ruby-crowned kinglet (winter), hermit thrush (winter), American robin, yellow-rumped warbler (winter), spotted towhee, California towhee, white-crowned sparrow (winter), golden-crowned sparrow (winter), and house finch.

In addition to utilization by numerous bird species, riparian canopy provides cover for migration for large mammals, and shading and cooling of stream waters for aquatic species. Direct observations of deer and coyote (*Canis latrans*) have been made in and around riparian areas along Tolay Creek, as well as raccoon tracks on the banks of Tolay Creek. Additional mammal species that are likely to frequent or utilize riparian habitat include common gray fox (*Urocyon cinereoargenteus*) and Virginia opossum.

3.5 Woodlands and Groves

Cismontane woodland is broadly defined as vegetation communities typically dominated by broadleaf trees with relatively open canopies located west of the Sierra Nevada crest, while closed-cone coniferous forests are stands of dense, typically even-aged, fire dependent coniferous species often associated with nutrient deficient soils (Holland 1986, CNPS 2013). These vegetation communities have been described in further taxonomic detail to the vegetation alliance level, which in the Park, includes coast live oak woodland, valley oak woodland, California bay woodland, blue gum groves, and Monterey cypress groves (Sawyer et al. 2009) (Figure 5).

Woodlands and groves are largely confined to north-facing slopes, deep stream canyons, along lower Tolay Creek, and adjacent to the Park Headquarters. Although termed “forest” in the literature (Holland 1986, Sawyer et al. 2009), the Monterey cypress dominated area may more appropriately be deemed a grove as the dominant species, Monterey cypress (*Hesperocyparis macrocarpa*) does not naturally occur in Sonoma County, and the extent of this community is limited to a few acres or less.

3.5.1 Vegetation of Cismontane Woodlands

<u>Coast live oak woodlands (*Quercus agrifolia* Woodland Alliance). CDFW Rank G5 S4 (Sensitive)</u>: Coast live oak woodlands are known throughout coastal California on a variety of substrates, topography, and microclimates (Sawyer et al. 2009). The overstory of this vegetation community dominated by coast live oak with subdominant California bay and scattered individuals of California buckeye located along lower Tolay Creek and the lower margins of tributary streams. Higher on slopes, these woodlands contain scattered individuals of Pacific madrone (*Arbutus menziesii*) and California black oak (*Quercus kelloggii*).Many coast live oak trees exceed four feet in diameter at breast height (DBH; 4.5 feet above ground), and approach 30 feet in height. LSA suggested that equivalent sized trees from Olompali State Historic Park, approximately four miles west, were less than 70 years old (LSA 2009c).

The understory of coast live oak woodlands in the northern areas of the Park tended to be dominated by herbaceous species with very little shrub cover, while those in the southern portions contained a higher proportion of shrubs. Additionally, a cursory observation of oak saplings/seedlings suggests a higher rate of regeneration in the south. This difference may be attributable to different grazing intensities in the two areas and/or the reduced accessibility of southern woodlands due steeper slopes and more extensive stands. Shrub species include upright snowberry, poison oak, California coffeeberry, and California rose. Herbaceous cover is dominated by miner’s lettuce (*Claytonia perfoliata*), common bedstraw (*Galium aparine*), Pacific sanicle (*Sanicula crassicaulis*), hedge nettle (*Stachys ajugoides*), Dutchman's pipe (*Aristolochia californica*), and white baby blue eyes (*Nemophila heterophylla*).

Valley oak woodlands (*Quercus lobata* Woodland Alliance). CDFW Rank G3 S3 (Sensitive): Much reduced from their original extent, valley oak woodlands are located in throughout the Central Valley, valleys in the Coast Ranges, and the Transverse Range where deep clay soils have accumulated (Holland 1996, Barbour et al. 2007, Sawyer et al. 2009). Located on the lower reach of Tolay Creek, this woodland or savannah is dominated by valley oak. Leaf shape suggest that many of these oaks may be hybrids between Oregon white oak (*Quercus garryana*) and valley oak, both within white oak subgenus (*Lepidobalanus*) (West Coast Watershed 2009). Individuals reach an estimated height of 40 to 50 feet, and have a DBH between two and four feet. Mistletoe (*Phoradendron serotinum*) is frequent within the crown, as are cavities from broken and dropped limbs.

Occasional tree and shrub associates include coast live oak, willows (*Salix* spp.), California rose, and coyote brush (*Baccharis pilularis*), but the understory is dominated by non-native annual grasses, horehound (*Marrubium vulgare*), and dwarf nettle (*Urtica urens*). Very little regeneration was observed within this community, but exclusion fencing and plantings (oak seedlings and willow poles) have been installed in coordination between SLT and Point Reyes Bird Observatory's (PRBO) Students and Teachers Restoring a Watershed (STRAW) project.

California buckeye woodlands (*Aesculus californica* Woodland Alliance). CDFW Rank G3 S3 (Sensitive): Isolated California buckeye woodlands are common throughout coastal California and the Sierra Nevada Foothills (Sawyer et al. 2009). Confined to several small rock outcrops, the overstory of this woodland composed solely of California buckeye. Individual trees are of average size with DBH of up to two feet, and heights less than 20 feet. Mistletoe (*Phoradendron* spp.) is prevalent in the crown, but limb loss appears minimal.

The understory is composed of large rocks, thin soils, and herbaceous species. The only shrub is low-growing poison oak, while the herb layer is dominated by weedy species including dwarf nettle, Italian thistle, and yellow star thistle.

Blue gum groves (*Eucalyptus globulus* Semi-natural Woodland Stands). CDFW No Rank (Not Sensitive): Blue gum groves are common in southern and western Sonoma County where trees were planted for shelterbelts and woodlots (Holland 1996, Sawyer et al. 2009). The Park contains several groves of planted blue gum (*Eucalyptus globulus*), with the largest located immediately west of the Park Headquarters. Trees are relatively large with heights reaching an estimated 50 to 70 feet, and DBH of four to six feet. Blue gum trees are prone to windthrow/windsnap causing a large accumulation of limbs and downed trees as well as shredded bark in lower limbs and bole forks.

The overstory of this community is dominated by a single species, blue gum, and the understory contains no shrubs and few herbs due to heavy leaf/bark litter, a dense nearly complete overstory canopy, and possibly allelopathic effect. Scattered herbs include dogtail grass (*Cynosurus echinatus*), ripgut brome (*Bromus diandrus*), and yellow bedstraw (*Galium murale*).

3.5.2 Vegetation of Closed-cone Coniferous Forest

Monterey cypress groves (*Hesperocyparis macrocarpa* Semi-natural Woodland Stands). CDFW No Rank (in planted/escaped stands) (Not Sensitive): Native Monterey cypress groves are known only from relict stands on the Monterey Peninsula, but have been planted widely throughout coastal California (Holland 1986, Sawyer et al. 2009). One small grove of Monterey cypress is present along the banks of lower Tolay Creek, which may be indicative of an old homestead. Trees are large with an estimated height of 40 feet and DBH of two to 3 feet. The overstory is dominated by a single species, Monterey cypress. The understory is relatively sparse due to a dense nearly closed canopy, but includes dogtail grass, Italian thistle, miner's lettuce, and hedge nettle.

3.5.3 Wildlife Values of Woodlands and Groves

Woodlands and groves throughout California provide species-rich wildlife habitat, primarily due the production of acorns and other fruits, as well as the provision of cover, nesting, and sheltered rearing areas (CalPIF 2002). Acorns are exceptionally nutritious and frequently prodigious, providing feed for numerous species of birds, and are grazed upon by black-tailed deer, western gray squirrels (*Sciurus griseus*), and feral pig (*Sus scrofa*) among other species. Feral pigs have been infrequently observed near the Park, but no recent observations of pigs within the Park have been recorded. Mature trees and snags provide potential roost sites for bat species known to occur in the region, including Yuma myotis (*Myotis yumanensis*), little brown myotis (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), and pallid bat (*Antrozous pallidus*); however, none have been positively identified (LSA 2009b, LSA 2009c). Additionally, long-tailed weasel, and striped skunk are closely, but not exclusively, associated with woodlands and groves.

Herpetofauna shelter within woodlands and groves for thermo-regulation during warm periods, because evaporative pressure is reduced beneath the shaded canopy (Block and Morrison 1998). Leaf litter, downed branches, and rock outcrops provide cover and forage habitat for herpetofauna. Salamander species typically observed in California woodlands include slender salamander (*Batrachoseps attenuatus*) and arboreal salamander (*Aneides lugubris*), and common reptiles expected to inhabit or utilize woodlands and groves include the western skink (*Plestiodon skiltonianus*), southern alligator lizard (*Elgaria multicaranata*), ring-necked snake (*Diadophis punctatus*), and sharp tailed snake (*Contia tenuis*).

Dozens of birds are closely associated with and dependent upon oak woodlands. A reciprocal relationship exists between western scrub-jay and Steller's jay and oak trees which provide high quality forage in exchange for dispersal. Large trees, including oaks, provide cover and nest sites for both cup-nesting and cavity-nesting birds, and frequently utilized as cache sites by acorn woodpeckers (CalPIF 2002), and several species appear to utilized the Park's oak woodlands solely including band-tailed pigeon, Stellar's jay, oak titmouse, brown creeper, winter wren, and spotted towhee (LSA 2008b). Raptors, such as red-tailed and red-shouldered hawks, typically construct nests in large trees. In March 2006, LSA observed a pair of red-tailed hawks in courtship above an oak woodland, (LSA 2009b), and nesting behavior was observed at the Park headquarters eucalyptus grove; however, specific nest sites were not documented. Golden eagles have been observed within and around the Park (Steve Ehret pers. comm.), and may utilize large oak or blue gum trees in midslope positions for nesting, although there have been no confirmed golden eagle nests within the Park.

Grassland areas hosting high densities of wildflowers support butterflies, flies, bees, and other invertebrate pollinators. Opler's longhorn moth (*Adella oplerella*) are dependent upon cream cups (*Platystemon californicus*), which are present sporadically throughout the grasslands of the Park, with particularly dense patches in areas underlain by serpentine substrate in the southwestern portion. The larvae of silverspot butterflies or fritillaries (*Speyeria callippe*) are completely dependent upon Johnny jump-ups (*Viola pedunculata*), while the adults nectar on a variety of flowers, especially thistles and mints (*Mentha pulegium, M. arvensis, Monardella* spp.) (Shapiro and Manolis 2007).

3.6 Upland Grasslands and Wildflower Fields

The dominant vegetation type within the Park, valley and foothill grasses, are distinguished here from meadows by their species composition, soil texture and moisture regime, and landscape position (Figure 5). The majority of valley and foothill grassland habitat is dominated by non-native annual Mediterranean grasses introduced to California in 19th century; however, stands of remnant native grasslands and wildflowers are located throughout the Park. The once extensive native grasslands and wildflower fields diminished rapidly in California with the overgrazing by sheep and cattle followed by severe drought in the 19th century, and it is estimated that 10 percent of these habitats remain (McNaughton 1968, Jackson 1985). Consequently, native grasslands and wildflower fields frequently are considered sensitive biological resources by CDFW (CDFG 2009).

3.6.1 Vegetation of Valley and Foothill Grasslands (Native)

<u>Purple needlegrass grassland (*Stipa pulchra* Herbaceous Alliance). CDFW Rank G4 S3? (Sensitive)</u>: Purple needlegrass grasslands are known throughout the Coast Ranges, South Coast, western Transverse Range, and the Sierra Nevada Foothills (Holland 1986, Sawyer et al. 2009). These grasslands are often dominated by a suite of non-native grasses, but purple needlegrass (*Stipa pulchra*) composes ten percent or greater relative cover within these stands (Sawyer et al. 2009). Within the Park these grasslands are overwhelmingly located on slopes underlain by shallow, well-drained soils, on both west- and east-facing aspects. Additionally, extensive purple needlegrass grasslands are present on serpentine substrate in the remote southwest portion of the Park. The serpentine and shallow, non-serpentine soils may allow for purple needlegrass and other native species to compete with non-native grasses, which generally require more nitrogen than these soil types offer (Harrison 1999).

Although not completely devoid of non-native annual grasses, purple needlegrass grasslands contain relatively high densities of the native perennial grasses including purple needlegrass, foothill needlegrass (*Stipa lepida*), blue wild rye (*Elymus glaucus*), California onion grass (*Melica californica*), and California oat grass. Native forbs are typically more prevalent within these grasslands than non-native grasslands (see below), and include miniature lupine (*Lupinus bicolor*), sky lupine (*L. nanus*), and yellow and hayfield tarweeds (*Hemizonia congesta* ssp. *lutescens, H. c.* ssp. *luzulifolia*).

<u>California oat grass prairie (*Danthonia californica* Herbaceous Alliance). CDFG Rank G4 S3 (Sensitive)</u>: California oat grass prairies are known from coastal sites in Northern and Central California, the Coast Ranges, Sierra Nevada Foothills (Holland 1986, Sawyer et al. 2009). In the Park, this community is located sporadically in Tolay Valley on clay-rich soils where it intergrades with rush wetlands (Pacific rush meadow, common rush meadow), and on coarser

textured soils of slopes where it intergrades with purple needlegrass grassland and non-native grassland habitats.

California oat grass prairies/grasslands in the lower parts of Tolay Valley are dominated by California oat grass, with a mix of meadow barley, creeping wild rye, sedges (*Carex* sp.), and rushes (*Juncus* sp.). These areas exhibit many of the same elements as meadows/moist grasslands; however, soils and or wetland hydrology were not observed and are therefore considered upland grasslands. Those areas dominated by California oat grass on hillsides contain a greater mix of upland species including purple needlegrass, foothill needlegrass, and non-native grasses.

<u>Creeping wild rye turfs (*Elymus triticoides* Herbaceous Alliance). CDFG Rank G4 S3 (Sensitive)</u>: Creeping wild rye turfs are known from the South Coast, Humboldt Bay, the Bay Area, and Central Valley (Holland 1986, Sawyer et al. 2009). Similar to California oat grass prairie, these turfs intergrade with upland grasslands and meadows/moist grasslands, within the same topographic positions. These turfs contain a very similar suite of associated grasses as California oat grass prairies, but often are nearly a monotypic stand of creeping wild rye.

3.6.2 Vegetation of Wildflower Fields

<u>Wildlflower fields (Undocumented Herbaceous Alliances). CDFW No Rank (Not Sensitive)</u>: Mixed wildflower fields are known throughout Coastal California, the Great Valley, and Sierra Nevada Foothills, and attempts to document several specific vegetation alliances are currently underway (Holland 1986, Barbour et al. 2007, Sawyer et al. 2009). These communities are located on slopes and ridgelines, and are typically situated on shallow soils and/or soils derived from serpentine thereby limiting the competition with non-native annual grasses, and allowing for a persistent year-to-year swatch of native wildflowers. Wildflower fields within the Park are closely associated and often intergrade with purple needlegrass grassland. Three wildflower field alliances were identified within the Park, cream cup wildflower fields, Johnny jump-up wildflower fields, and mixed wildflowered fields.

As with purple needlegrass grassland, these fields contain non-native annual grasses including wild oats (*Avena* spp.), bromes (*Bromus* spp.), and barleys (*Hordeum* spp.), but the characteristic presence of native perennial and annual forbs which bloom throughout the spring and into summer, distinguish this community from native and non-native grasslands. Native perennial forbs include Johnny jump-up, California poppy (*Eschscholzia californica*), Fremont's star lily, blue-eyed grass (*Sisyrinchium bellum*), hog fennel (*Lomatium utriculatum*), and sanicles (*Sanicula bipinnata, S. bipinnatifida*). Spring annuals include miniature lupine, sky lupine, cream cups, soft blow wives (*Achyrachaena mollis*), California goldfields (*Lasthenia californica*), rusty popcornflower (*Plagiobothrys nothofulvus*), coastal tidytips (*Layia platyglossa*), Johnny-tuck (*Triphysaria eriantha* ssp. *eriantha*), owl's-clovers (*Castilleja densiflora, C. exserta*), and a variety of clovers (*Trifolium* spp.). Often overlooked, the late spring and summer blooms of annual forbs includes yellow and white hayfield tarweeds, coast tarweed (*Madia sativa*), Monterey centaury (*Zeltnera muehlenbergii*), California dwarf flax (*Hesperolinon californicum*), winecup clarkia (*Clarkia purpurea* ssp. *quadrivulnaris*), and bluehead gilia (*Gilia capitata* ssp. *capitata*).

3.6.3 Vegetation of Valley and Foothill Grasslands (Non-native)

Non-native grasslands (Several Herbaceous Alliances). CDFW No Rank: Non-native grasslands are known throughout cismontane California on nearly all soil types and all topographic positions (Holland 1986, Sawyer et al. 2009). In the 19th Century, following severe drought and overgrazing, grasses from the Mediterranean region came to dominate existing native grasslands. Complete removal of woody cover in woodlands, savannahs, and scrublands can also result in a predominance of non-native annual grasslands, and historically was conducted to increase pasture and grazing lands. These grasslands are typically dominated by annual grasses, but can exhibit annual shifts in species dominance as well as can be dominated by non-native annual forbs in drought years. Because of the complex spatial and annual variability, classifying and mapping these grasslands at a given location typically only represents that year's dominant species, and therefore specific vegetation alliance are listed here, but detailed descriptions are not given (Table 3).

Non-native grassland is by far the most prevalent community within the Park, and is composed of several annual grasses including Medusa head (*Elymus caput-medusae*), wild oats, bromes, little rattlesnake grass (*Briza minor*), dogtail grass, Italian rye grass, and barleys. Non-native perennial grasses are present within these grasslands, often forming monotypic stands, and include common velvet grass (*Holcus lanatus*), dallis grass (*Paspalum dilatatum*), harding grass (*Phalaris aquatica*), and hood canary grass (*P. paradoxa*).

During drought years, non-native grasslands can exhibit a higher coverage of native and non-native forbs, including lupines, filarees, geraniums (*Geranium dissectum, G. molle*), spring vetch (*Vicia sativa*), shepherd's needle (*Scandix pectin-veneris*), and clovers (*Trifolium dubium, T. hirtum, T. subterraneum*) (Knopps and Barthell 1996). Additionally, in areas with repeated disturbance or excessive grazing, very weedy species can come to dominate these grasslands, reducing forage production and wildlife values. Aggressive invasive non-native forbs and grasses include Medusa head, black mustard, radishes (*Raphanus raphanistrum, R. sativum*), charlock, star thistles (*Centaurea calcitrapa, C. solstitialis*), milk thistle (*Silybum marianum*), rough cat's-ears (*Hypochaeris radicata*), and bristly ox-tongue.

Native forbs persist within these grasslands, but do not form substantial stands or cover. Typically, these natives are hearty perennial species, particularly geophytes that can compete with the rapid growth of non-native annual grasses in the winter and spring, and include California poppy, Ithuriel's spear (*Triteleia laxa*), soap plant (*Chlorogalum pomeridianum* var. *pomeridianum*), California checkerbloom (*Sidalcea malviflora* ssp. *laciniata*), Fremont's star lily, blue-eyed grass, Johnny jump-up, and hillside morning glory (*Calystegia subacaulis* ssp. *subacaulis*).

3.6.4 Wildlife Values of Upland Grasslands and Wildflower Fields

Grasslands dominate the landscape of the Park, and therefore provide the largest, contiguous habitat for wildlife. Dozens of common bird species forage in grasslands and several may ground nest including western meadowlark. Grasshopper sparrows and horned larks may breed in and around the grasslands of Park based on behavior observed by LSA (2009b, 2009c). These species are more restricted in their distribution than many common grassland bird species and therefore their presence suggest relatively high quality grassland habitat of varying structure. Raptors forage over grasslands for small mammals, birds, and insects. Observed or assumed present raptor species within the Park include red-tailed hawk, northern harrier, white-tailed kite, American kestrel, great horned owl, and barn owl. Other local bird species closely associated with grasslands include turkey vulture, loggerhead shrike, western kingbird, Say's phoebe, American crow, Savannah sparrow, and red-winged blackbird. A fairly recent introduction to California, wild turkeys typically utilize meadows and grasslands adjacent to woodlands for foraging and courtship.

Carnivorous mammals such as coyote and bobcat (*Lynx rufus*) forage widely in grasslands for small mammals and herpetofauna. Black-tailed deer and black-tailed jackrabbit (*Lepus californicus*) forage throughout every type of grassland, sheltering in adjacent woodlands or rock outcrops, and California ground squirrels (*Spermophilus beecheyi*) create extensive burrow networks which are utilized by reptiles, amphibians, insects, arachnids, and mollusks. Other small mammals such as deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californica*), Botta's pocket gopher (*Thomomys bottae*), and western harvest mouse (*Reithrodontomys megalotis*) are assumed present within the grasslands of the Park.

Black-tailed jackrabbit, California ground squirrel (*Spermophilis beecheyi*), and other small mammals constitute major prey species for raptors, coyotes, foxes, and bobcat. LSA (2009b, 2009c) did not observe excessive numbers of California ground squirrel (*Spermophilis beecheyi*) despite plentiful habitat; however, Jenette Cardoza, the former owner of the Cardoza Ranch, has observed natural fluctuations in their population numbers (Steve Ehret pers. comm.). The paucity of numbers observed by LSA may suggest a natural population trough from predation or other factors.

Common reptiles typically found in grasslands in this region include western fence lizards, Northern Pacific rattlesnake (*Crotalus oreganus oreganus*), common garter snake (*Thamnophis sirtalis*), gopher snakes, and northern American racers (*Coluber constrictor*). Grassland areas adjacent to seasonal wetlands in this area could also support northern Sierran tree frog and western toad.

3.7 Rock Outcrops

Rock outcrops can consist of boulder fields overlying and interspersed with shallow soils as well as large emerging rocks from shallow to deep soil. Organic debris combines with mineral soil in rock fissures to provide a rooting matrix for many shrubs and native forbs. Natural rock outcrops are located throughout the Park, particularly on the West Ridge, as well as historic rock walls, which function similarly to rock outcrops, on the East Ridge (Figure 5). These features often provide cover and nesting habitat for wildlife and host a rich flora. While several large rock outcrops are located in coast live oak woodlands and California buckeye woodlands, poison oak scrub is predominant vegetation alliance associated with these features within the Park, particularly when located in a larger grassland mosaic.

3.7.1 Vegetation of Rock Outcrops (Coastal Scrub)

Poison oak scrubs (*Toxicodendron diversilobum* Shrubland Alliance). CDFW Rank G4 S4: Poison oak scrubs are located throughout cismontane California in the Coast Ranges, Sierra Foothills, and western Transverse Range (Holland 1986, Sawyer et al. 2009). Although not uniquely associated with rock outcrops, these scrubs are often closely associated with exposed sandstone and chert outcrops, as well as rock walls in coastal Sonoma and Marin counties. The dominant shrub species is poison oak, but scattered individuals of sticky monkey (*Mimulus aurantiacus*), upright snowberry (*Symphoricarpos albus*), California rose, California coffeeberry are located throughout this community. The herbaceous layer is generally richer than surrounding habitats, and composed of fiddleneck (*Amsinckia menziesii, A. intermedia*), shooting stars (*Dodecatheon hendersonii*), California polypody (*Polypodium californicum*), California maidenhair fern (*Adiantum jordanii*), coffee fern (*Pellaea andromedifolia*), gold back fern (*Pentagramma triangularis*), winecup clarkia, woodland star (*Lithophragma affine*), phacelia (*Phacelia* sp.), wild cucumber (*Marah fabacea*), soap plant, and Dutchman's pipe.

3.7.2 Wildlife Values of Rock Outcrops

A variety of fossorial mammals and bird species have been observed utilizing rock outcrops. The prominent function offered by these features, particularly in surrounding grassland habitat, provides perches for lookout and calling. The fissures within the rock and friable soil are common densities for California ground squirrels (*Spermophilis beechyi*), and burrowing owls (*Athene cunicularia*) have been observed in and around rock outcrops. Western fence lizards (*Scleroporus occidentalis*) are a ubiquitous siting in and around rock outcrops where they can take shelter and thermo-regulate in shaded fissures during warm temperatures, and capture radiant heat in cooler temperatures.

Predators such as coyote and bobcat often stalk fossorial mammal prey in and around rock outcrops, and mountain lion (*Puma concolor*) may use larger, shrubby or wooded outcrops within the Park to ambush prey.

The generally dense wildflower displays in and around rock outcrops provide nectaring and larval host support for a variety of butterflies and moths, and the presence of Dutchman's pipe in more shaded positions around coast live oak woodlands, presumably provides larval food for the pipevine swallowtail (*Battus philenor*).

4.0 SPECIAL-STATUS SPECIES

4.1 Special-status Species Definition

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA). These acts afford protection to both listed species and species proposed for listing. In addition, CDFW Species of Special Concern, which are species that face extirpation in California if current population and habitat trends continue, USFWS Birds of Conservation Concern, and CDFG special-status invertebrates are all considered special-status species. Although CDFG Species of Special Concern generally have no special legal status, they are given special consideration under the California Environmental Quality Act (CEQA). In addition to regulations for special-status species, most birds in the United States, including non-status species, are protected by the Migratory Bird Treaty Act of 1918. Under this legislation, destroying active nests, eggs, and young is illegal.

Plant species included within the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (Inventory) with California Rare Plant Rank (Rank) of 1 and 2 are also considered special-status plant species and must be considered under CEQA. Very few Rank 3 or Rank 4 plants meet the definitions of Section 1901 Chapter 10 of the Native Plant Protection

Act or Sections 2062 and 2067 of the CDFG Code that outlines the California Endangered Species Act. However, CNPS and CDFW strongly recommend that these species be fully considered during the preparation of environmental documentation relating to CEQA, and have therefore been included here. Additionally, regionally significant plants and/or plants with particular wildlife values are those species that otherwise do not have formal legal protection, but may be considered sensitive by local agencies or organizations. While no formal list exists on the Milo Baker CNPS Chapter, Sonoma County planning documents, or other organizations, regionally significant plant species and plants with specific wildlife values were assessed based on herbarium records from Harvard (2013), the Consortium of California Herbaria (CCH 2013), and Sonoma State Herbarium as partially transcribed in *A Flora of Sonoma County* (Best et al. 1996). Section 6 describes the regulatory context of special-status species in greater detail.

4.2 Special-status Plant Species

Initially, it was determined that 34 special-status plant species have the potential to occur within the park (LSA 2009b, LSA 2009c). Following site visits, this number was revised to 33 species, with the site lacking suitable habitat for the remaining species. The number and list of species returned from the initial (2006) database queries were not previously reported. The updated database query returned 73 special-status plant species within the 12 quadrangle search area (CDFW 2013a, CNPS 2013, USFWS 2013). An updated assessment of all 73 special-status plant species is included in Appendix B. The species initially evaluated, and/or with the potential to occur, and/or were observed during the 2006-2008 surveys are detailed below. Locations of all special-status plant species observed in the Park to-date are included in Figure 6.

4.2.1 Special-status Plant Species Observed within the Park

LSA documented three special-status plant species, fragrant fritillary, Lobb's aquatic buttercup, and marsh death zigadene (*Toxicoscordion fontanum*). Initially, Marin western flax (*Hesperolinon congestum*) was reported from the southeast portion of the Park; however, closer examination at the Jepson herbarium resulted in a revised identification to the common species, California western flax. Additionally, Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*) may have been observed by LSA within the Park, but this species is very difficult to distinguish from the more common, Kellogg's yampah (*Perideridia kelloggii*), and positive identification was not confirmed.

Fragrant fritillary (*Fritillaria liliacea*). CNPS Rank 1B. High Potential (Present): Fragrant fritillary is a low-growing, bulbiferous perennial forb in the lily family (Liliaceae) that blooms from February to April. It typically occurs in open, grassy areas in valley and foothill grassland, coastal scrub, and coastal prairie habitat at elevations ranging from 10 to 1345 feet (CDFW 2013a, CNPS 2013). Soil survey data at known locations suggest that this species is typically located on moderately acidic (pH 5.8) to neutral (pH 6.7) clay loams to clays derived from volcanics or serpentine (CDFW 2013a, CSRL 2013). This species has a serpentine affinity rank of weak indicator (1.8) (Safford et al. 2005). Observed associated species include soap plant, coyote brush, purple needlegrass, California oat grass, large flowered star tulip (*Calochortus uniflorus*), California buttercup (*Ranunculus californicus*), sun cups (*Taraxia ovata*), shooting stars, needleleaf pincushion plant (*Navarretia intertexta*), one-sided bluegrass (*Poa secunda*), and Greene's popcornflower (*Plagiobothrys greenei*) (CDFW 2013a).

Fragrant fritillary is documented from 38 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Marin, Monterey, San Benito, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma counties (CNPS 2013). There are ten CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and six CCH (2013) records from Sonoma County. Fragrant fritillary was assessed to have a high potential to occur in the Park due the presence of clay substrate derived from serpentine soils and the relative location of documented occurrences. In 2006 and 2008, hundreds of individuals were observed in two populations on northeast-facing slope underlain by Diablo clay in the northwest portion of the Park (Figure 6).

Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*). CNPS Rank 4. Moderate Potential (Possibly Present): Gairdner's yampah is a perennial forb in the carrot family (Apiaceae) that blooms from June to October. It typically occurs in vernally mesic areas within broadleaf upland forest, chaparral, coastal prairie, valley and foothill grassland, and vernal pool habitat at elevations ranging from 0 to 1985 feet (CNPS 2013, Baldwin et al. 2012). This species is a facultative (FAC) plant (Lichvar 2012), and is known from vernal pool habitat in some regions of California, but is generalist in others (Keeler-Wolf et al. 1998). Observed associated species are not reported in the literature.

Gairdner's yampah has been documented from eight USGS 7.5-minute quadrangles, but is known from Contra Costa, Kern, Los Angeles, Marin, Mendocino, Monterey, Napa, Orange, San Benito, Santa Clara, Santa Cruz, Santa Clara, San Diego, San Luis Obispo, San Mateo, Solano, and Sonoma counties (CNPS 2013). There are no CNDDB (CDFW 2013a) records from the greater vicinity of the Park, and 24 CCH (2013) records from Sonoma County. Gairdner's yampah was assessed to have a moderate potential to occur within the Park due the presence of mesic grassland and seasonal wetland habitat. This species is very difficult to distinguish from the more common, Kellogg's yampah (*Perideridia kelloggii*), and positive identification was not confirmed.

Lobb's aquatic buttercup (*Ranunculus lobbii*). CNPS Rank 4. High Potential (Present): Lobb's aquatic buttercup is annual aquatic forb in the buttercup family (Ranunculaceae) that blooms from February to May. It typically occurs in vernally wet areas within cismontane woodland, North Coast coniferous forest, valley and foothill grassland, and vernal pool habitat at elevations ranging from 45 to 1530 feet (CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is known from vernal pool habitat in some regions of California, but is generalist in others (Keeler-Wolf et al. 1998). Observed associated species include mosquito fern (*Azolla filiculoides*), western mannagrass, pale spike-rush, iris-leaf rush (*Juncus xiphioides*), common monkeyflower, calico flowers (*Downingia* spp.), perennial rye grass, meadow barley, and Mediterranean barley (personal observation 2010, 2011, 2012).

Lobb's aquatic buttercup is known from nine USGS 7.5-minute quadrangles in Alameda, Contra Costa, Marin, Mendocino, Napa, Santa Cruz, San Mateo, Solano, and Sonoma counties (CNPS 2013). There are no CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and 18 CCH (2011) records from Sonoma County. Lobb's aquatic buttercup was assessed to have a high potential to occur within the Park due to the presence of seasonal wetland habitat and stock ponds, and the presence of the associated species. In 2006-2008, Lobb's aquatic buttercup was observed in vernal pools, seasonal depressions at hillside slumps, and stock ponds on the western ridgeline of the Park, and the large seasonal pond adjacent to Highway 121 (Figure 6).

Marsh zigadene (*Toxicoscordion fontanum*). CNPS Rank 4. High Potential (Present): Marsh zigadene is a bulbiferous perennial forb in the false-helleborine family (Melanthiaceae) that blooms from April to July. It typically occurs in vernally mesic areas underlain by clay substrate derived from serpentine in chaparral, cismontane woodland, lower montane coniferous forest, meadow and seep, and marsh and swamp habitat at elevations ranging from 45 to 3250 feet (CNPS 2013, CDFW 2013a). This species is an obligate (OBL) wetland plant (Lichvar 2012), and has a serpentine affinity rank of broad endemic/strong indicator (3.8) (Safford et al. 2005). Observed associated species include non-native annual grasses (e.g., soft chess, Mediterranean barley, Italian rye grass, meadow barley, western mannagrass, California oat grass, and fragrant fritillary (personal observation 2011).

Marsh zigadene is known from Lake, Marin, Mendocino, Monterey, Napa, San Benito, Santa Cruz, San Luis Obispo, San Mateo, and Sonoma counties, but is only documented from three USGS 7.5-minute quadrangles (CNPS 2013). There are no CNDDB (CDFW 2013a) records from the greater vicinity of the Park, and no CCH (2013) records from Sonoma County. Marsh zigadene was assessed to have a high potential to occur within the Park due to the presence of serpentine seep habitat. A few marsh zigadene individuals were observed along a tributary to Tolay Creek in the southeast portion of the Park (Figure 6).

4.2.2 Special-status Plant Species with the Potential to Occur in the Park, but not Observed

Twenty-nine special-status plant species have the potential to occur in the park, but were not observed during surveys and site visits conducted in 2006, 2007, 2008, and 2013. Although these species were not observed, they should be considered to have the potential to occur as the surveys, though extensive, were not protocol-level and recent colonization is possible.

Franciscan onion (*Allium peninsulare* var. *franciscanum*). CNPS Rank 1B. Moderate Potential: Franciscan onion is a perennial forb in the lily family (Liliaceae) that blooms from May to June. It typically occurs on dry hillsides underlain by clay substrate, often derived from serpentine, in cismontane woodland and valley and foothill grassland habitat at elevations ranging from 165 to 975 feet (CDFW 2013a, CNPS 2013). This species has a serpentine affinity rank of weak indicator (1.8) (Safford et al. 2005). Observed associated species include California bay, California buckeye, coast live oak, leather oak (*Quercus durata*), and purple needlegrass (CDFW 2013a).

Franciscan onion is known from ten USGS 7.5-minute quadrangles in Mendocino, Santa Clara, San Mateo, and Sonoma counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and five CCH (2013) records from Sonoma County. Franciscan onion has a moderate potential to occur within the Park due to the presence of serpentine substrate, and associated species; however, this species was not observed during plant surveys in 2006, 2007, and 2008.

Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*). Federal Endangered, CNPS Rank 1B. Moderate Potential: Sonoma alopecurus is a perennial herb in the grass family (Poaceae) that blooms from May to July. It typically occurs in wet areas in freshwater marsh and riparian habitat at elevations ranging from 15 to 1200 feet (CDFW 2013a). Soil survey data at known locations in Sonoma County suggest that this species is typically located on moderately strongly acid (pH 5.0) to neutral (pH 6.7) loams, often mixed with larger textures derived from sandstone or other sedimentary rock (CDFW 2013a, CSRL 2012). This species is an obligate (OBL) wetland plant (Lichvar 2012), with no vernal pool indicator status (Keeler-Wolf et al. 1998).

Observed associated species include rushes (*Juncus* spp.), sedges (*Carex* spp.), rabbit's-foot grass, water pepper (*Piperia hydropiperoides*), western mannagrass, water parsley (*Oenanthe sarmentosa*), and false manna grass (*Torreyochloa pallida*) (CDFW 2013a).

Sonoma alopecurus is known from eight USGS 7.5-minute quadrangles in Marin and Sonoma counties (CNPS 2013). There is one CNDDB (CDFW 2013a) record in the greater vicinity of the Park, and six CCH (2013) records from Sonoma County. Sonoma alopecurus has a moderate potential to occur within the Park due to the presence of perennial wetland habitat, and some associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

<u>Napa false indigo (*Amorpha californica* var. *napensis*). CNPS Rank 1B. Moderate Potential</u>: Napa false indigo is a small deciduous tree in the pea family (Fabaceae) that blooms from April to July, with identifiable vegetative structures remaining into early fall. It typically occurs on north-facing aspects in openings in broadleaf upland forest, chaparral, and cismontane woodland habitat at elevations ranging from 395 to 6560 feet (CDFW 2013a, CNPS 2013). Soil survey data at known locations in Sonoma County suggest that this species is typically located on moderately acid (pH 5.6) to neutral (pH 6.7) loams, often mixed with larger textures derived from a variety of orogeny (CDFW 2013a, CSRL 2012). Observed associated species include California bay, black oak, coast live oak, Douglas fir (*Pseudotsuga menziesii*), tanoak (*Notholithocarpus densiflorus*), Pacific madrone, California hazelnut (*Corylus cornuta* var. *californica*), ocean spray (*Holodiscus discolor*), poison oak, wood fern (*Dryopteris arguta*), bracken fern (*Pteridium aquilinum*), wood rose (*Rosa gymnocarpa*), and rein orchid (*Piperia transversa*) (CDFW 2013a).

Napa false indigo is known from 21 USGS 7.5-minute quadrangles in Marin, Monterey, Napa, and Sonoma Counties (CNPS 2013). There are nine CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and eight CCH (2013) records from Sonoma County. Napa false indigo has a moderate potential to occur in the Park due to the presence of shaded woodland with associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

<u>Bent-flowered fiddleneck (*Amsinckia lunaris*). CNPS Rank 1B. Moderate Potential</u>: Bent-flowered fiddleneck is an annual forb in the forget-me-not family (Boraginaceae) that blooms from March to June. It typically occurs in open areas within cismontane woodland, valley and foothill grassland, and coastal bluff scrub habitat often underlain by clay substrate at elevations ranging from 10 to 1625 feet (CDFW 2013a, CNPS 2013, Hickman 1993). Observed associated species include coast live oak, blue oak (*Quercus douglasii*), California juniper (*Juniperus californicus*), buck brush (*Ceanothus cuneatus*), poison oak, miniature lupine, foothill lotus (*Acmispon brachycarpus*), calf lotus (*A. wrangelianus*), fringe pod (*Thysanocarpus curvipes*), q-tips (*Micropus californicus*), cream cups, slender tarweed (*Madia gracilis*), common yarrow (*Achillea millefolium*), goldenback fern, one-sided bluegrass, woolly sunflower (*Eriophyllum lanatum*), and slender wild oat (*Avena barbata*) (CDFW 2013a).

Bent-flowered fiddleneck is known from 35 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Colusa, Lake, Marin, Napa, San Benito, Santa Clara, Santa Cruz, San Mateo, and Yolo counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and one CCH (2013) record from Sonoma County. Bent-flowered fiddleneck has a moderate potential to occur within the Park due the presence of open woodland and grassland habitat with associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Alkali milk-vetch (*Astragalus tener* var. *tener*). CNPS Rank 1B. Moderate Potential: Alkali milk-vetch is an annual herb in the pea family (Fabaceae) that blooms from March to June. It typically occurs on low ground in alkali flats and flooded lands in alkali playa, valley and foothill grassland, and vernal pool habitat at elevations ranging from 0 to 200 feet (CDFW 2013a, CNPS 2013). This species is a facultative wetland (FACW) plant (Lichvar 2012), and is regularly known from vernal pool habitat, but may occur in other wetland habitat types (Keeler-Wolf et al. 1998). Observed associated species include docks, rough cocklebur, spiny cocklebur, bird's-foot trefoil (*Lotus corniculatus*), Mediterranean barley, Italian rye grass, harvest brodiaea (*Brodiaea elegans*), slender popcornflower, woolly marbles (*Psilocarphus tenellus*), salt grass (*Distichlis spicata*), mousetail (*Myosurus minimus*), and alkali heath (CDFW 2013a).

Alkali milk-vetch is known from 35 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Merced, Monterey, Napa, San Benito, Santa Clara, San Francisco, San Joaquin, Solano, Sonoma, Stanislaus, and Yolo counties (CNPS 2013). There are three CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and one CCH (2013) record from Sonoma County. Alkali milk-vetch has a moderate potential to occur within the Park due to the presence of seasonal wetland habitat with some associated species; however, this species is closely associated with vernal pools with high pH, and it was not observed during plant surveys conducted during 2006, 2007, and 2008.

Sonoma sunshine (*Blennosperma bakeri*). Federal Endangered, State Endangered, CNPS Rank 1B. Moderate Potential: Sonoma sunshine is an annual herb in the sunflower family (Asteraceae) that blooms from March to May. It typically occurs on heavy clay soils in vernally wet areas in vernal pool, and valley and foothill grassland habitat (CDFW 2013a, CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include California semaphore grass, bractless hedge hyssop (*Gratiola ebracteata*), Douglas' mesamint (*Pogogyne douglasii*), calico flowers, slender popcornflower, goldfields, common monkeyflower, lady's-thumb (*Persicaria maculosa*), tidy tips, white hyacinth (*Triteleia hyacinthina*), meadowfoams (*Limnanthes* spp.), and non-native annual grasses (CDFW 2013a).

This species is known from seven USGS 7.5-minute quadrangles in Sonoma County (CNPS 2013). There are eight CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and 30 CCH (2013) records from Sonoma County. Sonoma sunshine has a moderate potential to occur within the park due the presence of seasonal wetland habitat with some associated species; however, this species is closely associated with vernal pools on the Santa Rosa Plain and Valley of the Moon, and it was not observed during plant surveys conducted during 2006, 2007, and 2008.

Round-leaved filaree (*California macrophylla*). CNPS Rank 1B. Moderate Potential: Round-leaved filaree is an annual forb in the geranium family (Geraniaceae) that blooms from March to May. It typically occurs on clay to loamy clay substrates in cismontane woodland, and valley and foothill grassland habitat at elevations ranging from 50 to 3900 feet (CDFW 2013a, CNPS 2013). Observed associated species include coast live oak, shiny pepperweed (*Lepidium nitidum*), blue dicks (*Dichelostemma capitatum*), fiddleneck, tomcat clover (*Trifolium willdenovii*), showy madia (*Madia radiata*), one-sided bluegrass, and wild parsley (*Apiastrum angustifolium*) (CDFW 2013a).

Round-leaved filaree is known from 126 USGS 7.5-minute quadrangles in Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kings, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Clara, San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma, Stanislaus, Tehama, Tulare, and Yolo counties (CNPS 2013). There is one CNDDB (CDFW 2013a) within the greater vicinity of the Park, and two CCH (2013) records from Sonoma County. Round-leaved filaree has a moderate potential to occur within the Park due to the presence of clay-rich soils and grassland with some associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*). Federal Endangered, State Threatened, CNPS Rank 1B. Moderate Potential: Tiburon paintbrush is a hemiparasitic perennial forb in the broomrape family (Orobanchaceae) that blooms from April to June. It typically occurs in dry slopes on rocky serpentine substrate in valley and foothill grassland habitat at elevations ranging from 195 to 1300 feet (CDFW 2013a, CNPS 2013, Hickman 1993). This species has a serpentine affinity rank of strict endemic (6.1) (Safford et al. 2005). Observed associated species include soap plant, long-tubed iris (*Iris macrosiphon*), California onion grass, Torrey's onion grass (*Melica torreyana*), hayfield tarweed, woolly sunflower, musk brush (*Ceanothus jepsonii*), Marin dwarf flax, and Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*) (CDFW 2013a).

Tiburon paintbrush is known from five USGS 7.5-minute quadrangles in Marin, Napa, and Santa Clara counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and no CCH (2013) records in Sonoma County. Tiburon paintbrush has a moderate potential to occur within the Park due to the presence of serpentine grassland with some associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Pappose tarplant (*Centromadia parryi* ssp. *parryi*). CNPS Rank 1B. Moderate Potential: Pappose tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from May to November. It typically occurs in vernally mesic, often alkaline areas in coastal prairie, meadow, seep, coastal salt marsh, and valley and foothill grassland habitat at elevations ranging from 5 to 1380 feet (CDFW 2013a, CNPS 2013). This species is a facultative wetland (FACW) plant (Lichvar 2012), and is a vernal pool generalist (Keeler-Wolf et al. 1998). Observed associated species include bristly ox-tongue, wild radish, foxtail fescue (*Festuca myuros*), willow leaf dock (*Rumex salicifolius*), toad rush (*Juncus bufonius*), Italian rye grass, Mediterranean barley, salt grass, alkali heath, perennial pepperweed (*Lepidium latifolium*), yellow star thistle, alkali mallow (*Malvella leprosa*), and alkali weed (*Cressa truxillensis*) (CDFW 2013a).

Pappose tarplant is known from 17 USGS 7.5-minute quadrangles in Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, and Sonoma counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Parks, and three CCH (2013) records from Sonoma County. Pappose tarplant has a moderate potential to occur within the Park due to the presence of grassland habitat with many associated species; however, this species is typically located in an alkali grassland-coastal brackish marsh ecotone, and was not observed during plant surveys conducted in 2006, 2007, and 2008.

Dwarf downingia (*Downingia pusilla*). CNPS Rank 2. Moderate Potential: Dwarf Downingia is an annual herb in the harebell family (Campanulaceae) that blooms from March to May. It typically occurs on mesic sites of vernal lake and pool margins in valley and foothill grassland, and vernal pool habitat at elevations ranging from 0 to 1460 feet (CDFW 2013a, CNPS 2013, Baldwin et al. 2012). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is regularly known from vernal pool habitat, but may occur in other wetland habitat types (Keeler-Wolf et al. 1998). Observed associated species include spotted throat calico flower (*Downingia concolor*), California oat grass, Lobb's buttercup, coyote thistle (*Eryngium aristulatum*), dodder (*Cuscuta* spp.), tricolor monkeyflower (*Mimulus tricolor*), bractless hedge hyssop, Douglas' mesamint, California semaphore grass, meadowfoams, and non-native annual grasses (CDFW 2013a).

Dwarf downingia is known from 42 USGS 7.5-minute quadrangles in Fresno, Merced, Napa, Placer, Sacramento, San Joaquin, Solano, Sonoma, Stanislaus, Tehama, and Yuba Counties, and is known from the continent of South America (CNPS 2013). There are six CNDDB (CDFW 2013a) records within the greater vicinity of the Park, and 16 CCH (2013) records from Sonoma County. Dwarf downingia has a moderate potential to occur in the Park due the presence of seasonal wetland habitat with associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*). CNPS Rank 1B. Moderate Potential: Tiburon buckwheat is an annual forb in the buckwheat family (Polygonaceae) that blooms from May to September. It typically occurs in chaparral, valley and foothill grassland, cismontane woodland, and coastal prairie habitat at elevations ranging from 0 to 2275 feet (CDFW 2013a, CNPS 2013). Soil survey data at known locations suggest that this species is typically located on very slightly acidic to neutral (pH 6.7 to pH 7.2) unweathered bedrock to stony clay loams derived from serpentine (CDFW 2013a, CSRL 2013). This species has a serpentine affinity rank of strict endemic (6.2) (Safford et al. 2005). Observed associated species include purple needlegrass, squirrel tail (*Elymus elymoides*), California onion grass, blue-eyed grass, California poppy, woolly lessingia (*Lessingia hololeuca*), and ocean spray (CDFW 2013a).

Tiburon buckwheat is known from eight USGS 7.5-minute quadrangles in Alameda, Contra Costa, Marin, and Sonoma counties (CNPS 2013). There are four CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and one CCH (2013) record from Sonoma County. Tiburon buckwheat has a moderate potential to occur in the Park due to the presence of serpentine grassland and outcrops with associated species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

White hayfield tarplant (*Hemizonia congesta* ssp. *congesta*). CNPS Rank 1B. High Potential: White hayfiedl tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from April to November. It typically occurs in grassy areas and fallow fields in coastal scrub, and valley and foothill grassland at elevations ranging from 65 to 1840 feet (CDFW 2013a, CNPS 2013). This species has a serpentine affinity rank of weak indicator / indifferent (1.3) (Safford et al. 2005). Observed associated species include coast live oak, white hyacinth, Italian rye grass, little rattlesnake grass, pennyroyal, and spiny-fruited buttercup (CDFW 2013a).

White hayfield tarplant is known from 23 USGS 7.5-minute quadrangles in Marin, Mendocino, San Francisco, San Mateo, and Sonoma counties (CNPS 2013). There are seven CNDDB (CDFW 2013a) records in the greater vicinity of the Park, 71 CCH (2013) records from Sonoma County. White hayfield tarplant has a high potential to occur in the Park due to the presence of grassland habitat, and the presence of documented occurrences within the local vicinity; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Marin western flax (*Hesperolinon congestum*). Federal Threatened, State Threatened, CNPS Rank 1B. Moderate Potential: Marin western flax is an annual forb in the flax family (Linaceae) that germinates in early spring, blooms from April to July, and senesces by mid-summer. It typically occurs in serpentine grassland, scrub, or barrens in chaparral and valley and foothill grassland habitat at elevations ranging from 15 to 1205 feet (CDFW 2013a, CNPS 2013). This species has a serpentine affinity rank of strict endemic (6.1) (Safford et al. 2005). Observed associated species include leather oak, chamise (*Adenostoma fasciculatum*), Mt. Tamalpais manzanita (*Arctostaphylos montana* ssp. *montana*), wicker stem buckwheat (*Eriogonum vimineum*), Tiburon buckwheat, pitted onion (*Allium lacunosum*), farewell to spring (*Clarkia amoena*), yellow mariposa lily (*Calochortus luteus*), hairy gumweed (*Grindelia hirsutula*), rancheria clover (*Trifolium albopurpureum*), sandwort (*Minuartia douglasii*), small-flower western flax (*Hesperolinon micranthum*), Marin county navarretia (*Navarretia rosulata*), purple needlegrass, California onion grass, and Torrey's onion grass (CDFW 2013a).

Marin western flax is known from ten USGS 7.5-minute quadrangles in Marin, San Francisco and San Mateo counties (CNPS 2013). There are five CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and no CCH (2013) records from Sonoma County. Marin western flax was reported from the southeast portion of the Park; however, closer examination at the Jepson herbarium resulted in a revised identification to the common species, California western flax. Although California western flax does not have a federal, state, or CNPS listing, the discovery of this species within the Park is no less significant. This discovery is only the second documented case of California western flax from Sonoma County, both of which are on serpentine substrates (CCH 2013, Best et al. 1996).

Burke's goldfields (*Lasthenia burkei*). Federal Endangered, State Endangered, CNPS Rank 1B. Moderate Potential: Burke's goldfields are annual herbs in the sunflower family (Asteraceae) that bloom from April to June. They typically occur in mesic portions of pools and swales in meadow, seep, and vernal pool habitat at elevations ranging from 45 to 1970 feet (CDFW 2013a, CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include Italian rye grass, Mediterranean barley, California semaphore grass, California oat grass, meadowfoams, goldfields, and rushes (CDFW 2013a).

Burke's goldfields are known from twelve USGS 7.5-minute quadrangles in Lake, Mendocino, Napa, and Sonoma Counties (CNPS 2013). There is one CNDDB (CDFW 2013a) record in the greater vicinity of the Park, and 25 CCH (2013) records from Sonoma County. Burke's goldfields have a moderate potential to occur in the Park due to the presence of seasonal wetland habitat with some associated plant species; however, this species is closely associated with valley bottom vernal pools, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Contra Costa goldfields (*Lasthenia conjugens*). Federal Endangered, CNPS Rank 1B. Moderate Potential: Contra Costa goldfields are annual herbs in the sunflower family (Asteraceae) that bloom from March to June. They typically occur in vernally saturated areas in pools, depressions, and swales of open grassy areas in valley and foothill grassland, vernal pool, and cismontane woodland habitat at elevations ranging from 0 to 470 feet (CDFW 2013a, CNPS 2013). This species is a facultative wetland (FACW) plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include Italian rye grass, Mediterranean barley, woolly marbles (*Psilocarphus* spp.), slender popcornflower, legenere (*Legenere limosa*), smooth goldfields, yellow rayed goldfields (*Lasthenia glabrata*), California semaphore grass, calico flowers, and brass buttons (CDFW 2013a).

Contra Costa goldfields are known from 24 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma Counties (CNPS 2013). There are four CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and one CCH (2013) record from Sonoma County. Contra Costa goldfields have a moderate potential to occur in the Park due to the presence of seasonal wetland habitat with some associated plant species; however, this species is closely associated with alkali valley bottom vernal pools, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Legenere (*Legenere limosa*). CNPS Rank 1B. Moderate Potential: Legenere is an annual forb in the harebell family (Campanulaceae) that blooms from April to June. It typically occurs in the lower portions of vernal pool habitat at elevations ranging from 0 to 2890 feet (CDFW 2013a, CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include needle spikerush (*Eleocharis acicularis*), water chickweed, goldfields (*Lasthenia* spp.), meadowfoams, and non-native annual grasses (CDFW 2013a).

Legenere is known from 33 USGS 7.5-minute quadrangles in Alameda, Lake, Napa, Placer, Sacramento, Santa Clara, Shasta, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, Tehama, and Yuba Counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and no CCH (2013) records from Sonoma County. Legenere has a moderate potential to occur in the Park due to the presence of seasonal wetland habitat with some associated plant species; however, this species is closely associated with valley bottom vernal pools, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Bristly Leptosiphon (*Leptosiphon acicularis*). CNPS Rank 4. Moderate Potential: Bristly leptosiphon is an annual forb in the phlox family (Polemoniaceae) that blooms from April to July. It typically occurs in chaparral, cismontane woodland, coastal prairie, and valley and foothill grassland habitat at elevations ranging from 175 to 4875 feet (CNPS 2013). Observed associated species include bird's-eyes (*Gilia tricolor*), true babystars (*Leptosiphon bicolor*), redstem filaree (*Erodium cicutarium*), purple needlegrass, European hair grass (*Aira caryophyllea*), foothill lotus, Spanish lotus (*Acmispon americanus*), and miniature lupine (personal observation 2012).

Bristly leptosiphon is known from nine USGS 7.5-minute quadrangles in Alameda, Butte, Contra Costa, Fresno, Humboldt, Lake, Marin, Mendocino, Napa, Santa Clara, San Mateo, and Sonoma counties (CNPS 2013). There are no CNDDB (CDFW 2013a) records within the greater vicinity of the Park, and seven CCH (2013) records from Sonoma County. Bristly

Leptosiphon has a moderate potential to occur within the Park dur to the presence of associated species and vegetation communities; however, this species is typically associated with hillside “shoulders” with very shallow soils, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Jepson’s Leptosiphon (*Leptosiphon jepsonii*). CNPS Rank 1B. Moderate Potential: Jepson’s Leptosiphon is an annual herb in the phlox family (Polemoniaceae) that blooms from March to May. It typically occurs in open to partially shaded areas on volcanic or serpentine substrate in chaparral and cismontane woodland habitat at elevations ranging from 325 to 1640 feet (CDFW 2013a, CNPS 2013). Observed associated species include California bay, coast live oak, chamise, toyon (*Heteromeles arbutifolia*), purple needlegrass, California oat grass, and non-native annual grasses (CDFW 2013a, personal observation 2010, 2012).

Jepson’s Leptosiphon is known from 18 USGS 7.5-minute quadrangles Lake, Napa, and Sonoma counties (CNPS 2013). There are two CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and five CCH (2013) records from Sonoma County. Jepson’s Leptosiphon has a moderate potential to occur in the Park due to the presence of associated species and vegetation communities; however, this species is closely associated with rocky volcanic substrate located on chaparral fringes, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Woolly-headed Lessingia (*Lessingia hololeuca*). CNPS Rank 4. Moderate Potential: Woolly-headed lessingia is an annual herb in the sunflower family (Asteraceae) that blooms June to October. It typically occurs on clay often derived from serpentine in broadleaf upland forest, coastal scrub, lower montane coniferous forest, and valley and foothill grassland at elevations ranging from 45 to 1000 feet (CNPS 2013). Observed associated species include Italian rye grass, ripgut brome, soft chess, California poppy, dwarf plantain, cream cups, onion (*Allium* spp.), and common muilla (*Muilla maritima*) (personal observation 2009).

This species is known from 27 USGS 7.5-minute quadrangles in Alameda, Marin, Monterey, Napa, Santa Clara, San Mateo, Solano, Sonoma, and Yolo Counties (CNPS 2013). There are no CNDDB records for this species, and eight CCH (2013) records from Sonoma County. Woolly-headed Lessingia has a moderate potential to occur within the Park due to the presence of some associated plant species and serpentine substrate; however, it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Sebastopol meadowfoam (*Limnanthes vinculans*). Federal Endangered, State Endangered, CNPS Rank 1B. Moderate Potential: Sebastopol meadowfoam is an annual herb in the meadowfoam family (Limnanthaceae) that blooms from April to May. It typically occurs on poorly drained clay or sandy soils in swales, depressions, and pools of marshy areas of valley oak savanna, mesic meadow, vernal pool, and valley and foothill grassland habitat at elevations ranging from 45 to 1000 feet (CDFW 2013a, CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include California semaphore grass, goldfields, blennosperma species (*Blennosperma* spp.), Lobb’s buttercup, Douglas’s mesamint, California oat grass, Italian rye grass, Mediterranean barley, pennyroyal, popcornflowers (*Plagiobothrys* spp.), spikerushes (*Eleocharis* spp.), and quillwort (CDFW 2013a).

Sebastopol meadowfoam is known from nine USGS 7.5-minute quadrangles in Napa and Sonoma Counties (CNPS 2013). There are five CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and 23 CCH (2013) records from Sonoma County. Sebastopol meadowfoam has a moderate potential to occur in the Park due to the presence of seasonal wetland habitat with some associated plant species; however, this species is closely associated with valley bottom vernal pools, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Mt. Diablo cottonweed (*Micropus amphibolus*). CNPS Rank 3. Moderate Potential: Mt. Diablo cottonweed is an annual herb in the sunflower family (Asteraceae) that blooms from March to May. It typically occurs on thin, rocky substrates in broadleaf upland forest, chaparral, cismontane woodland, and valley and foothill grassland habitat at elevations ranging from 145 to 2710 feet (CNPS 2013). Observed associated species include filarees (*Erodium* spp.), annual fescues (*Festuca* spp.), owl's clovers, California goldfields, and annual lupines (personal observation 2010).

This species is known from 32 USGS 7.5-minute quadrangles in Alameda, Contra Costa, Colusa, Lake, Marin, Monterey, Napa, Santa Barbara, Santa Clara, Santa Cruz, San Joaquin, San Luis Obispo, Solano, and Sonoma Counties (CNPS 2013). There are no CNDDB records for this species, and six CCH (2013) records from Sonoma County. Mt. Diablo cottonweed has a moderate potential to occur in the Park due to the presence of associated plant species and vegetation communities; however, this species is typically located on thin sandstone substrates, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Marsh microseris (*Microseris paludosa*). CNPS Rank 1B. Moderate Potential: Marsh microseris is a perennial herb in the sunflower family (Asteraceae) that blooms from April to June, sometimes into July. It typically occurs in closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland habitat at elevations ranging from 15 to 985 feet (CDFW 2013a, CNPS 2013). Observed associated species include coast live oak, coyote brush, English plantain (*Plantago lanceolata*), blue-eyed grass, bracken fern, rough cat's ear, common velvet grass, little rattlesnake grass, and Douglas iris (*Iris douglasiana*) (CDFW 2013a).

Marsh microseris is known from 24 USGS 7.5-minute quadrangles in Marin, Mendocino, Monterey, San Benito, Santa Cruz, San Francisco, San Luis Obispo, San Mateo, and Sonoma counties (CNPS 2013). There is one CNDDB (CDFW 2013a) record in the greater vicinity of the Park, and four CCH (2013) records from Sonoma County. Marsh microseris has a moderate potential to occur in the Park due to the presence of grassland habitat with some associated plant species; however this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*). CNPS Rank 1B. Moderate Potential: Baker's navarretia is an annual herb in the phlox family (Polemoniaceae) that blooms from April to June. It typically occurs in vernally wet areas underlain by adobe and/or alkaline substrates in cismontane woodland, meadow, seep, vernal pool, valley and foothill grassland, and lower montane coniferous forest habitat at elevations ranging from 15 to 5710 feet (CDFW 2013a, CNPS 2013). This species is an obligate (OBL) wetland plant (Lichvar 2012), and is restricted to vernal pool habitat (Keeler-Wolf et al. 1998). Observed associated species include pillwort (*Pilularia americana*), Douglas' mesamint, tricolor monkeyflower, pennyroyal, calico flowers, California semaphore grass, Lobb's buttercup, and non-native annual grasses (CDFW 2013a).

Baker's navarretia is known from 26 UGSG 7.5-minute quadrangles in Colusa, Glenn, Lake, Marin, Mendocino, Napa, Solano, Sonoma, Sutter, Tehama, and Yolo Counties (CNPS 2013). There is one CNDDB (CDFW 2013a) record in the greater vicinity of the Park, and 15 CCH (2013) records from Sonoma County. Baker's navarretia has a moderate potential to occur in the Park due to the presence of seasonal wetland habitat with some associated plant species; however, this species is closely associated with valley bottom vernal pools, and it was not observed during plant surveys conducted in 2006, 2007, and 2008.

Petaluma popcornflower (*Plagiobothrys mollis* var. *vestitus*). CNPS Rank 1A. Moderate Potential: Petaluma popcornflower is a perennial forb in the forget-me-not family (Boraginaceae) that blooms from June to July. This presumed extinct species is assumed to have located in wet areas on the margins of valley and foothill grassland and coastal salt marsh habitat at elevations ranging from 30 to 165 feet (CDFW 2013a, CNPS 2013). This species is a facultative wetland (FACW) plant (Lichvar 2012). Observed associated species are not reported in the literature.

Petaluma popcornflower is known from one USGS 7.5-minute quadrangle in Sonoma County (CNPS 2013). There is one CNDDB (CDFW 2012) record within the greater vicinity of the Park, and no CCH (2013) records from Sonoma County, or elsewhere. Petaluma popcornflower has a moderate potential to occur in the Park due to the presence of grassland-wetland ecotone, and very little is known about this species; however, it was not observed during plant surveys conducted in 2006, 2007, and 2008.

North Coast semaphore grass (*Pleuropogon hooverianus*) State Threatened, CNPS Rank 1B. Moderate Potential: North Coast semaphore grass is a perennial herb in the grass family (Poaceae) that blooms from April to June. It typically occurs in shady, wet grassy areas in broadleaf upland forest, meadow, seep, and North Coast coniferous forest habitat at elevations ranging from 30 to 2205 feet (CDFW 2013a, CNPS 2013). Soil survey data at known locations suggest that this species is typically located on strongly to slightly acid (pH 5.5 to pH 6.1) gravelly to sandy loams derived from a variety of orogeny (CDFW 2013a, CSRL 2013). This species is a facultative wetland (FACW) plant (Lichvar 2012), and is restricted to vernal pool habitat in some regions of California, but is a generalist in other regions (Keeler-Wolf et al. 1998). Observed associated species include coast live oak, California bay, rushes, California blackberry, dense sedge (*Carex densa*), field sedge (*Carex praegracilis*), and harding grass (CDFW 2013a).

North Coast semaphore grass is known from eleven USGS 7.5-minute quadrangles in Marin, Mendocino, and Sonoma counties (CNPS 2013). There are four CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and ten CCH (2013) records from Sonoma County. North Coast semaphore grass has a moderate potential to occur due to the presence of mesic areas in oak-bay woodlands with some associated plant species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *rhizomata*). CNPS Rank 1B. Moderate Potential: Point Reyes checkerbloom is a perennial, rhizomatous forb in the mallow family (Malvaceae) that blooms from April to September. It typically occurs in freshwater marshes and swamps near the coast at elevations ranging from 10 to 245 feet (CNPS 2013, CDFW 2013a). This species is an obligate (OBL) wetland plant (Lichvar 2012). Observed associated species include sedges, rushes, panicled bulrush (*Scirpus microcarpus*), water parsley, American speedwell (*Veronica americana*), common monkeyflower, musk monkeyflower (*Mimulus* *moschatus*), golden-eyed grass (*Sisyrinchium californicum*), Pacific silverweed (*Potentilla anserina* ssp. *pacifica*), Douglas iris, swamp harebell (*Campanula californica*), California blackberry, and common velvet grass (CDFW 2013a).

Point Reyes checkerbloom is known from ten USGS 7.5-minute quadrangles in Marin, Mendocino, and Sonoma counties (CNPS 2013). There is one CNDDB (2013) record within the greater vicinity of the Park, and nine CCH (2013) records from Sonoma County. Point Reyes checkerbloom has a moderate potential to occur within the Park due to the presence of perennial wetland habitat with some associated plant species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

<u>Showy rancheria clover (*Trifolium amoenum*). Federal Endangered, CNPS Rank 1B. Moderate Potential</u>: Showy rancheria clover is an annual forb in the pea family (Fabaceae) that blooms from April to June. It typically occurs on open, sunny sites, in swales, on roadsides, and cliffs sometimes underlain by serpentine substrate in valley and foothill grassland and coastal bluff scrub habitat at elevations ranging from 15 to 1365 feet. This species is a facultative wetland (FACW) plant (Lichvar 2012), and has a serpentine affinity rank of weak indicator (1.3) (Safford et al. 2005). Observed associated species include slender wild oat, bromes, annual fescues, Italian rye grass, California oat grass, California brome (*Bromus carinatus*), meadow barley, Italian thistle, and pale flax (*Linum bienne*).

Showy Rancheria clover is known from 16 USGS 7.5-minute quadrangles in Marin, Napa, Santa Clara, Solano, and Sonoma counties (CNPS 2013). There are five CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and ten CCH (2013) records from Sonoma County. Showy Rancheria clover has a moderate potential to occur in the Park due to the presence of serpentine grassland habitat with some associate species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

<u>Saline clover (*Trifolium hydrophilum*) CNPS Rank 1B. High Potential</u>: Saline clover is an annual herb in the pea family (Fabaceae) that blooms from April to June. It typically occurs in mesic, alkali sites in marsh, swamp, valley and foothill grassland, and vernal pool habitat at elevations ranging from 0 to 1495 feet (CDFW 2013a, CNPS 2013). This species is a facultative (FAC) plant (Lichvar 2012), and is a vernal pool generalist (Keeler-Wolf et al. 1998). Observed associated species include California semaphore grass, salt grass, Italian rye grass, brass buttons, calico flowers, Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), hyssop loosestrife, toad rush, California oat grass, purslane speedwell, meadow barley, clovers (*Trifolium microdon*, *T. wormskioldii*, *T. fucatum*), and sand spurry (*Spergularia macrotheca*) (CDFW 2013a).

Saline clover is known from 22 USGS 7.5-minute quadrangles in Alameda, Colusa, Monterey, Napa, San Benito, Santa Clara, Santa Cruz, San Luis Obispo, San Mateo, Solano, and Sonoma Counties (CNPS 2013). There are three CNDDB (CDFW 2013a) records in the greater vicinity of the Park, and two CCH (2013) records in Sonoma County. Saline clover has a high potential to occur in the Park due to the presence of seasonal wetland habitat with many associated plant species, and the relative location of the nearest documented occurrence; however, this species was not observed during plant surveys in 2006, 2007, and 2008.

<u>Oval-leaf Viburnum (*Viburnum ellipticum*). CNPS Rank 2. Moderate Potential</u>: Oval-leaf viburnum is a shrub in the honeysuckle family (Caprifoliaceae) that blooms from May to June, with identifiable vegetative characteristics remaining intact into fall. It typically occurs in

chaparral, cismontane woodland, and lower montane coniferous forest habitat at elevations ranging from 695 to 4550 feet (CDFW 2013a, CNPS 2013). Observed associated species include Pacific madrone, blue oak, Oregon white oak, California black oak, interior live oak (*Quercus wislizenii*), California bay, sticky manzanita (*Arctostaphylos viscida*), poison oak, choke cherry (*Prunus virginiana*), mock orange (*Philadelphus lewisii*), and thimbleberry (*Rubus parviflorus*) (CDFW 2013a).

Oval-leaf viburnum is known from 30 USGS 7.5-minute quadrangles in Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Mendocino, Napa, Placer, Shasta, Sonoma, and Tehama counties, and is known from the states of Oregon and Washington (CNPS 2013). There is one CNDDB (CDFW 2013a) record within the greater vicinity of the Park, and three CCH (2013) records from Sonoma County. Oval-leaf viburnum has a moderate potential to occur in the Park due to the presence of shaded woodland sites with some associated plant species; however, this species was not observed during plant surveys conducted in 2006, 2007, and 2008.

4.2.3 Plant Species with Regional Significance or Habitat Value Observed within the Park

Three plant species within the Park have regional significance or habitat value (Appendix A). These plants are either uncommon or rare in Sonoma County despite being common elsewhere, or offer specific habitat requirements for special-status wildlife species. Generally, these species are at the edge of their range or occur in unique habitats such as serpentine.

<u>Cream cups (*Platystemon californicus*). No Rank – Opler's longhorn moth larval host plant. High Potential (Present)</u>: Cream cup is an annual forb in the poppy family (Papaveraceae) that blooms from February to May (Baldwin et al. 2012). It typically occurs on a variety of substrate, including volcanics and serpentine, in valley and foothill grassland, as well as open woodlands, chaparral, and coastal scrub habitat at elevations ranging from 0 to 3000 feet (Baldwin et al. 2012, Calflora 2013, WRA observations). This species has a serpentine affinity rank of weak indicator (1.7) (Safford et al. 2005). Observed associated species include California poppy, bluehead gilia, bird's-eye gilia, owl's clovers, tidy tips, goldfields, lupines, needlegrasses, small fescue (*Festuca microstachys*), Idaho fescue (*Festuca idahoensis*), California onion grass, and a suite of non-native annual grasses (WRA observations).

Cream cup is not documented in the CNPS Inventory or CNDDB. It is relatively common in grasslands in Sonoma, Marin, and Napa counties, with 28, 33, and 22 CCH (2013) records documented from these counties, respectively. Although cream cup does not have a federal or state listing or other formal conservation designation, it is believed to be the sole source of Opler's longhorn moth larval food, and therefore should be considered sensitive within the Park. Several substantial colonies of cream cups were mapped within the Park (Figure 5).

<u>Johnny jump-up (*Viola pedunculata*). No Rank – Silverspot larval and nectar host plant. High Potential (Present)</u>: Johnny jump-up is a perennial forb in the violet family (Violaceae) that blooms from February to April (Baldwin et al. 2012). It typically occurs on a variety of well-drained substrates located on hillsides and ridgelines in full sun within valley and foothill grassland, and open cismontane woodland and chaparral habitat at elevations ranging from 0 to 5000 feet (Baldwin et al. 2012). Observed associated species include oaks, needlegrasses, checkerblooms (*Sidalcea* spp.), lupines, blue-eyed grass, blue dicks, California poppy, purple sanicle, and a suite of non-native annual grasses (WRA observations).

Johnny jump-up is not documented in the CNPS Inventory or CNDDB; however, it is relatively common in grasslands in Sonoma, Marin, and Napa counties, with nine, 10, and eight CCH (2013) records documented from these counties, respectively. Although Johnny jump-up does not have a federal or state listing or other formal conservation designation, it is likely the larval and nectar host for an unnamed silverspot butterfly known from Cougar Mountain, and therefore should be considered sensitive within the Park. Several substantial colonies of Johnny jump-up were mapped within the Park (Figure 5).

California western flax (*Hesperolinon californicum*). No Rank – Regionally Significant. High Potential (Present): California western flax is an annual forb in the flax family (Linaceae) that blooms from May through June. It typically occurs on serpentine substrate in valley and foothill grassland, chaparral, and cismontane woodland at elevations ranging between 0 to 2000 feet (Baldwin et al. 2012, CCH 2013). This species has a serpentine affinity rank of strong indicator (2.8) (Safford et al. 2005). Observed associated species include bluehead gilia, needlegrasses (*Stipa* spp.), California onion grass, Torrey's onion grass, June grass (*Koeleria californica*), Idaho fescue, and small fescue (*Festuca microstachya*) (personal observation 2011).

California western flax is not documented in the CNPS Inventory or CNDDB, but collections have been recorded from Alameda, Butte, Colusa, Contra Costa, Fresno, Lake, Marin, Merced, Napa, Placer, Sacramento, San Joaquin, San Mateo, Solano, Sonoma, Stanislaus, Sutter, Tehama, and Yolo counties (CCH 2013). The core population of this species is in Napa, Lake, and Colusa counties, which is the center of diversity for the genus *Hesperolinon* (O'Donnell 2010). Because the Park contains one of only two documented occurrences from Sonoma County (CCH 2013), this species is considered regionally sensitive. A substantial population of this species was mapped inadvertently as Marin western flax in the southwest portion of the Park within serpentine grasslands (Figure 5).

4.3 Special-Status Wildlife Species

4.3.1 Invertebrates

Opler's longhorn moth (*Adella oplerella*). No Status (Special Animals List). High Potential (Present): Opler's longhorn moth was a federal species of concern that was considered but rejected for listing as an endanged species in 1994, and is currently on the Special Animals List (CDFG 2011). The moth is endemic to grasslands where its larval food plant, cream cups, grows. Descriptions of the life history and early stages of this moth are incomplete, but it is known that the moth completes the active portions of its life cycle during the winter-spring wet season (Powell 1969). Eggs are deposited directly into the unopened flowers of the host plant, and larvae emerge after they have consumed the developing seeds. The larvae may enter diapause during the summer and re-emerge after the winter rains to continue feeding until they are large enough to pupate. The adult host plant is not known, though it appears that the adults may feed on the nectar of cream cups, and other native herbaceous species.

In recent years, Opler's longhorn moth has been recorded from sites extending along the west side of San Francisco Bay, the inner Coast Ranges, and Alameda, Marin, Sonoma, Santa Cruz, and Santa Clara counties (A. Launer, pers. comm., 1997, J. Powell, pers. comm., 1997 in USFWS 1998b). The moth was previously thought to only occur in areas of serpentine soil where its exclusive host plant is often found in prodigious numbers, but it has been observed in non-serpentine areas where thin soils support a high density of native species, including cream cups. Therefore, it may be more accurate to associate the moth with low fertility soils that support a sufficient density of host plants. Within the Park, one individual was observed in native grassland habitat underlain by serpentine substrate in the southwest. The presence of cream cup colonies and recorded observations of Opler's longhorn moth suggest that the Park offers high quality habitat for this species.

Blennosperma vernal pool andrenid bee (*Andrena blennospermatis*). No Status (Special Animals List). Moderate Potential: Blennosperma bee has no federal or state listing, but is included on the Special Animals List (CDFG 2011). This bee is a specialist pollinator of common blennosperma (*Blennosperma nanum* var. *nanum*) and Sonoma sunshine (*B. bakeri*). Bees nest in upland areas, such as mima mounds, near vernal pools and seasonal wetland complexes where blennosperma is prevalent. The CNDDB contains records from Sonoma, Lake, Solano, Colusa, Sacramento, Placer, San Joaquin, and Tehama counties, including records from the Valley of the Moon and Santa Rosa Plain (CDFW 2013a).

LSA noted that although being present, blennosperma numbers may have been lower than normal due to drier than average conditions at the time of surveys (LSA 2009c). Should the populations of blennosperma be more robust than observed and blennosperma bee capable of dormancy during unfavorable years, this species may be present within the Park. The bee is most likely to be in the vicinity of the serpentine habitat where blennosperma individuals were documented by both LSA and WRA.

Zerene silverspot butterfly subspecies (*Speyeria zerene*). No Status (Special Animals List). High Potential: An unnamed subspecies of Zerene silverspot butterfly has been documented from the Cougar Mountain property located immediately south of the Park. Currently, this subspecies has not been formally described in the taxonomic literature, and therefore has no official legal protection. However, this subspecies appears to be highly restricted to the Cougar Mountain area, and therefore, following formal description is likely to receive protective status. Other silverspot butterfly larva host on native violets (*Viola adunca, V. pedunculata*), and it is assumed the unnamed subspecies documented from Cougar Mountain does so as well. Due to the relative location of documented occurrences of this subspecies of silverspot butterfly and the presence of large Johnny jump-up colonies on the East and West ridges, this subspecies has a high potential to occur in the Park.

Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*). No Status (Special Animals List). Moderate Potential: Ricksecker's water scavenger beetle does not have federal or state listing, but is included on the Special Animal List (CDFG 2011). Very little is known about the life history and ecology of this species, but adults and larvae of other species within this genus are aquatic, and adults are capable of flight (NatureServe 2013). This beetle is known from small ponds and vernal pools, where larvae are predacious and remain on shoreline vegetation. Documented occurrences are from the Bay Area and Central Valley, including specimens from Sonoma, Marin, San Mateo, Solano, Contra Costa, Alameda, Sacramento, and Placer counties (CDFW 2013a, ESSIG 2013). The nearest documented occurrence is from June 1969 on Sonoma Mountain, approximately 10 miles north of the Park (CDFW 2013a). The presence of stock ponds and vernal pool-like wetlands, as well as very little documentation regarding distribution and ecology, suggest that this species has a moderate potential to occur in the Park.

California linderiella (*Linderiella occidentalis*). No Status (Special Animals List). High Potential (Present): California linderiella does not have federal or state listing, but is on the Special Animals List (CDFG 2011). This fairy shrimp has been documented from 39 locations in the Central Valley and Coast Ranges, and is the mostly widely distributed of the fairy shrimp (Eng et al. 1990, Erickson and Belk 1999). Completely aquatic, California linderiella are known from vernal pools, playas, and other seasonally inundated areas with open water. Water may be clear to slightly turbid, and must remain inundated for a minimum of 31 days to allow for reproduction. Pool size varies widely from several square feet to several acres. Vegetation in their habitat is typically sparse to moderately dense, and excessive emergent vegetation diminishes the quality of habitat (Helm 1998, Erickson and Belk 1999).

California linderiella motility is by means of beating motions that pass along their swimming legs in a wave-like motion from head to tail. California linderiella life cycle is completed in one season, with breeding females carrying their eggs in a brood sac on their abdomen, which are either dropped to the pool bottom or carried until the female dies and sinks (Federal Register 1994). Eggs or cysts are resistant to heat, cold, and prolonged dry periods, and several years of breeding may comprise the soil of occupied vernal pools, forming the cyst bank (Donald 1983). California linderiella forage on algae, rotifers, bacteria, and small bits of organic matter (Pennak 1989). This species was observed within Tolay Lake, and is expected to occur there and in other aquatic habitat within the Park (Sam Bacchini pers. comm. from LSA 2009b).

4.3.2 Amphibians and Reptiles

California red-legged frog (*Rana draytonii*). Federal Threatened, CDFW Species of Special Concern. High Potential (Present): California Red-legged Frog was listed as Federally Threatened May 23, 1996 (61 FR 25813-25833). Critical Habitat for CRLF was designated on March 17, 2010 (75 FR 12815 12959). A Recovery Plan for CRLF was published by the USFWS on May 28, 2002. The Park falls within the Petaluma Creek-Sonoma Creek Core Recovery Area. There are four Primary Constituent Elements (PCEs) that are considered to be essential for the conservation or survival of this species. The PCEs for California red-legged frog include: (1) aquatic breeding habitat; (2) non-breeding aquatic habitat; (3) upland habitat; and (4) dispersal habitat (USFWS 2006).

Aquatic breeding habitat consists of low-gradient fresh water bodies including natural and manmade (e.g., stock) ponds and pools in perennial streams, marshes, lagoons, and dune ponds with still or slow-moving water, and dense shrubby riparian vegetation (Hayes and Jennings 1986, Jennings 1988, Jennings and Hayes 1994). Aquatic breeding habitat must hold water for a minimum of 20 weeks in most years to allow for egg, larvae, and tadpole development (USFWS 2006). Aquatic non-breeding habitat may or may not hold water long enough for this species to hatch and complete its aquatic life cycle, but it provides shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frog. These waterbodies include plunge pools within intermittent creeks, seeps, quiet water refugia during high water flows, and springs of sufficient flow to withstand the summer dry period. California red-legged frog can use large cracks in the bottom of dried ponds as refugia to maintain moisture and avoid heat and solar exposure (Alvarez 2004).

Upland habitats (e.g., grasslands, woodlands) provide shelter, forage, and cover, and include areas within 200 to 300 feet. Upland habitat can include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), as well as small mammal burrows and moist leaf litter (USFWS 2006). Dispersal habitat includes accessible upland or riparian habitats between occupied locations within 0.7 mile of each other that allow for movement between these sites, but dispersal of up to 1.8 miles has been documented (USFWS 2002, Fellers and Kleeman 2007). Moderate to high density urban or industrial developments, large reservoirs and heavily traveled roads without bridges or culverts are considered barriers to dispersal

(USFWS 2006). Short-distance dispersal movements are generally straight-line movements, and dispersal typically occurs at night during wet weather (Bulger et al. 2003, USFWS 2002, Bulger et al. 2003, Fellers and Kleeman 2007). California red-legged frogs tend to remain very close to a water source during dry weather; however, overland dispersal may occur in response to receding water (USFWS 2002).

Foothill yellow-legged frog (*Rana boylii*) CDFW Species of Special Concern. Moderate Potential: This species is typically located in forested and woodland habitats, occurring in shaded, shallow streams and riffles with a rocky substrate. Egg masses are attached to the rock substrate, and at least some cobble-sized stones are necessary. Tadpoles require at least 15 weeks to metamorphose into juvenile form. Foothill yellow-legged frog does not estivate and is rarely found far from a source of permanent water. Historically, this species was known to occur in most Pacific drainages from Oregon to Los Angeles (Jennings and Hayes 1994). Populations have declined due to siltation and the introduction of American bullfrogs and exotic fish. Tolay Creek and its tributaries contain suitable breeding, foraging, and dispersal habitat for foothill yellow-legged frog; however, this species was not observed during site visits in 2006-2008.

Western pond turtle (*Actinemys marmorata*). CDFW Species of Special Concern. High Potential: Western pond turtle is the only freshwater aquatic turtle native to most of California, associated with rivers, creeks, lakes, and ponds throughout much of the state. Typical aquatic habitat features stagnant or low gradient water, aquatic vegetation, and aerial basking sites such as logs, rocks, and mud-banks. Adult females excavate nests in riparian and upland areas in the spring or early summer. Nest sites are generally located on sunlit slopes, and require friable soil that is sufficiently dry to promote successful egg development (Holland 1994). The young generally hatch and overwinter in the nest (Jennings and Hayes 1994, Reese and Welsh 1997). At least under some ecological conditions, pond turtles may regularly utilize terrestrial habitats (Reese and Welsh 1997). While some populations are active principally in the spring and aestivate during the rest of the year, turtles along the southern California coast may be active year-round (Jennings and Hayes 1994). Western pond turtle is a dietary generalist, subsisting principally on invertebrates as well as plant material and carrion.

LSA did not observe western pond turtles during site investigations in 2006-2008; however, anecdotal observations and the relatively high quality habitat on-site suggest that this species has a high potential to occur within the Park.

4.3.3 Birds

White-tailed kite (*Elanus leucurus*). CDFW Fully Protected Species. High Potential (Present): White-tailed kite is resident in a variety of open habitats, including agricultural areas, grasslands, scrub and open chaparral habitats, meadows, and emergent wetlands throughout the lower elevations of California. Nests are constructed mostly of twigs and placed in small to large trees, often at habitat edges or in isolated groves (Dunk 1995). This species preys upon a variety of small mammals and other vertebrates. The Park provides open habitats for foraging and suitable trees for nesting, as well as contiguous high-quality foraging habitat adjacent to the Park. White-tailed kites have been observed by LSA foraging within the Park. Although no nesting location has been documented to date, suitable nesting habitat is present within the Park.

Golden eagle (*Aquila chrysaetos*). CDFW Fully Protected Species, USFWS Bird of Conservation Concern. High Potential (Present): A fully protected species, golden eagle is largely resident in open and semi-open areas from sea level to 11,500 feet elevation. Occupied habitats include shrublands, grasslands, desert, mixed woodlands, and coniferous forests. This species is usually found in mountainous areas, but it may also nest in wetland, riparian, and estuarine habitats at lower elevations (Kochert et al. 2002). Golden eagles typically build or maintain multiple nests prior to selecting one nest for a given year; however, they do exhibit strict site fidelity, often moving nesting locations between years, and may not nest each year (Peeters and Peeters 2005). Nests are large and typically built on cliff ledges or in large, relatively isolated trees; therefore, many of the blue gum and possibly larger coast live oak trees in the Park provide potential nesting locations.

Golden eagles forage over wide areas, most frequently above open canopied shrub or woodland, or grassland habitat, and feed primarily on ground squirrels, rabbits, large birds, and carrion. The Park's expansive grassland habitat is optimal for foraging, and the mix of riparian, woodland, and minor shrub elements provide cover for many of the prey animals of the golden eagle.

Golden eagles have been repeatedly observed in and immediately adjacent to the Park (Steve Ehret pers. comm. in LSA 2009b, PWA 2009), and the Tolay Lake area is thought to host five active golden eagle nests (Janet Thiessen pers. comm. in LSA 2009b), likely lending to the frequent observations. The East Ridge has the highest frequency of observations, and due to its relatively isolated location and the presence of coast live oak woodland with sizable trees, it is thought that nesting is most likely here, though perhaps outside of the Park. According to Peeters and Peeters (2005), the optimal nesting location is at the midslope position of north- and east-facing ridges gaining maximum protection from strong winds, and there have been no observations of nests on ridgelines. Although golden eagles have been observed soaring, foraging, and perching over the site by Steve Ehret, LSA, and others (Steve Ehret pers. comm. in LSA 2009b), and the Park provides suitable nesting habitat, no nesting has been observed on-site.

Burrowing owl (*Athene cunicularia*). CDFW Species of Special Concern. High Potential (Present): Burrowing owl is a state protected species, but does not have any federal listing. These birds prefer short grass grasslands with burrow networks, and frequently with boulder fields or rock outcrops. Burrows of small mammals, such as ground squirrels, are utilized for year-round shelter and nesting, and are frequently modified by these owls. Constructed burrows are readily occupied by burrowing owls, and have been constructed for habitat enhancement and mitigation in several sites in California.

Burrowing owls have been observed within the grasslands of the Park, particularly in areas of burrow activity and rock outcrops (Steve Ehret pers. comm. in LSA 2009b). Single individuals have been repeatedly observed at rock outcrops and boulder fields in winter and spring, though infrequently in summer, suggesting dispersing juveniles or over-wintering birds. Breeding burrowing owls have not been observed in Sonoma County since 1987, and breeding colonies are considered extirpated from the county (Burridge 1995).

Short-eared owl (*Asio flammeus*), CDFW Species of Special Concern, High Potential (Present): Short-eared owl is a state protected species, but does not have any federal listing. These owls are ground-nesting, and therefore require tall herbaceous vegetation to conceal their nests. Typically located in grasslands and emergent wetlands (Holt and Leasure 1993), within

California short-eared owls are concentrated on the Modoc Plateau, Great Basin, western Sacramento Valley, and southern Coast Ranges, with isolated populations around the state (Shuford and Gardali 2008).

A short-eared owl was observed within grassland habitat on the West Ridge on November 18, 2005 (Jake Newell, pers. comm.). Short-eared owls do not typically breed in Sonoma or Marin counties, but fledged young have been observed in Point Reyes National Seashore and Annadel State Park in 1979 (Shuford and Gardali 2008). The Park provides suitable foraging and overwintering habitat, but regular nesting is unlikely due to the presence of grazing and very limited observations of breeding in the North Bay.

Grasshopper sparrow (*Ammodramus savannarum*). CDFW Species of Special Concern. High Potential (Present): A second priority species of special concern (Unitt 2008), grasshopper sparrow generally prefers moderately open grasslands and prairies with patchy bare ground. They select different components of vegetation depending on grassland ecosystem. This sparrow typically avoids grasslands with extensive shrub cover, although some level of shrub cover is important for birds in western regions (Vickery 1996).

Grasshopper sparrows are ground nesting birds, creating cupped nests domed with overhanging grasses and a side entrance, which are very rarely located in tall grasses of grasslands. Eggs are usually lain in early to mid-June and hatch within 14 days. Both males and females provide care to the young, and second broods are common. This species primarily feeds on insects (Vickery 1996). Suitable foraging and breeding habitat for this species is widely present, where open shrubs and grasslands with bare ground create a habitat mosaic, and therefore specific observations are not indicated on Figure 5.

Tricolored blackbird (*Agelaius tricolor*), CDFW Species of Special Concern, USFWS Bird of Conservation Concern. High Potential: The tricolored blackbird is a locally common resident in the Central Valley and along coastal California. This species breeds adjacent to freshwater, preferably in emergent wetlands with tall, dense cattails (*Typha* spp.) or tules (*Schoenoplectus* spp.), thickets of willow (*Salix* spp.), blackberry and/or tall herbs, as well as flooded agricultural fields with dense vegetation (Shuford and Gardali 2008). Insects are the primary food source. This species is highly colonial; nesting habitat must be large enough to support a minimum of 30 pairs, and colonies are commonly substantially larger, ranging from 100 to tens of thousands of individuals. Several confirmed and probable breeding locations have been observed in southern Sonoma County (Burridge 1995). Tricolored blackbirds have been observed within the Park (PWA 2009), and it has a high potential to nest within the Park due to observations within the Park, relative to the location of documented nesting observations in southern Sonoma County and the presence of emergent freshwater marsh vegetation.

Nesting birds (various spp.). MBTA, CFGC. High Potential (Present): Despite no federal or state listing, all native birds are protected either by the Migratory Bird Treaty Act (MBTA) or the California Fish and Game Code (CFGC). The MBTA protects active nests of all birds including migratory species. Upland game and waterfowl birds are allowed to be taken, but strict seasons have been developed around the life cycle of these birds. Breeding bird season may vary dependent upon species, site condition, annual weather and legal agreement (e.g., mitigation plans), but generally runs from February 1 to August 31 in a given year. Red-tailed hawk and western meadowlark have been observed nesting on site by LSA (LSA 2009b), and several other species undoubtedly nest each year within the Park's boundaries.

4.3.4 Mammals

American badger (*Taxidea taxus*). CDFW Species of Special Concern. Moderate Potential: The American badger is a semifossorial mammal in the weasel family (Mustelidae). Macrohabitat includes dry, open forests and woodlands, open scrub, and grasslands. Microhabitat conditions require loose friable soils for burrow creation and foraging potential. Badgers are typically solitary, nocturnal, and construct burrows for refuge during daylight hours. Badger burrows are usually elliptical, with only one entrance, and are located in areas with plentiful prey sources. The primary prey is composed of ground squirrels and pocket gophers, which are typically pursued by digging into their burrows (Jameson and Peeters 2004). Alternative prey resources include mice, rats, reptiles, amphibians, and bird eggs. Young are born in the spring and independent by the end of summer.

Badgers have very large home ranges, depending on available habitat. Males can forage across a range of approximately one square mile to 25 square miles in patchier habitat, while females can range from one-half square mile to 15 square miles (Messick and Hornocker 1981, Newhouse and Kinley 2000). However, in general, densities are one badger per square mile in occupied, prime habitat (Long 1973). Badgers have not been recorded in the Park or immediate vicinity, but suitable habitat is present on hillsides (i.e., East and West ridges) away from heavy clay soils, soil disturbance, and frequent human visitation in Tolay Valley. Several large holes have been observed in the Park that may have been constructed by American badger (Steve Ehret pers. comm.).

Townsend's big-eared bat (*Corynorhinus townsendii townsendii*). CDFW Species of Special Concern, WBWG High Priority Species. Moderate Potential: This species ranges throughout western North America, from British Columbia to the central Mexico. It is typically associated with caves, but also found in man-made structures, including mines and buildings (CDFW 2013a). While many bats wedge themselves into tight cracks and crevices, big-eared bats hang from walls and ceilings in the open. Males roost singly during the spring and summer months while females aggregate in the spring at maternity roosts to give birth. Females roost with their young until late summer or early fall, until young become independent and can fly and forage on their own. Hibernation roosts tend to be made up of small aggregations of individuals in central and southern California (Pierson and Rainey 1998). Although there are no documented roost sites within the Park or its immediate vicinity, the presence of old farm buildings offers the potential for suitable roost sites. Townsend big-eared bats roosting elsewhere in the area may forage over the Park at night.

Pallid bat (*Antrozous pallidus*).CDFW Species of Special Concern, WBWG High Priority Species. Moderate Potential: Pallid bats are distributed from southern British Columbia and Montana to central Mexico, and east to Texas, Oklahoma, and Kansas. This species occurs in a number of habitats ranging from rocky arid deserts to grasslands, and into higher-elevation coniferous forests. Pallid bats are most abundant in the arid Sonoran life zones below 6,000 feet, but have been found up to 10,000 feet in the Sierra Nevada. They often roost in colonies of between 20 and several hundred individuals. Roosts are typically in cliffs, rock crevices, tree hollows, mines, caves, and a variety of man-made structures, including vacant and occupied buildings, bridges, and bird boxes (Jameson and Peeters 2004). Tree roosting has been documented in large conifer snags (e.g., ponderosa pine [*Pinus ponderosa*]), inside basal hollows of giant sequoias (*Sequoiadendron giganteum*), and within bole cavities in oak (*Quercus* spp.) trees. They have also been reported roosting in stacks of burlap sacks and stone piles. Pallid bats are primarily insectivorous, feeding on large prey that is taken on the ground, or sometimes in flight (Texas Parks and Wildlife 1997). Prey items include arthropods such as scorpions, ground crickets, and cicadas (WBWG 2013). Pallid bats have a moderate potential to occur due to the presence of several documented roost sites in the general vicinity of the Park (CDFW 2013a) and the presence of suitable roosting habitat (e.g., old farm buildings) within the Park.

5.0 ECOLOGICAL PROCESSES

Understanding the ecological processes across the Park and how the Park fits within a wider mosaic of open space lands is essential for proper management of the Park's resources. Disturbance regimes, including natural and man-induced, interplay with the nutrient and hydrologic cycles which support intact, native vegetation and wildlife habitat. Species movement across landscapes provides genetic diversity and colonization / recolonization of native species. The fragmentation of landscape can alter the rate, distance, and direction of species dispersal, and contribute to invasion by undesirable plant and wildlife species which can have deleterious effects on water quality, the nutrient cycle, native vegetation, fire hazard, and wildlife species.

5.1 Disturbance Regimes

5.1.1 Grazing

Livestock grazing has occurred in California since the early 18th century, with introduction of cattle to the North Bay in the Mexican Colonial Era. Cattle and wild horses likely grazed throughout the current Park boundary during Vallejo's tenure of the land. Records from the Rancho Petaluma suggest that 15,000 cattle were present across the Rancho in 1841 (Silliman 2004), but this is likely an underestimate of the total grazing pressure when accounting for feral livestock, wild horses, elk, and deer (LSA 2009a). Between 1857 and 1943, successive owners of the current Park raised dairy cattle, beef cattle, sheep, and horses, as well as farmed row crops, grains, silage, and vineyards. It was during this period that intense and prolonged drought contributed to decline in native prairies and type conversion to the non-native annual grasslands present today (Heady 1988, Jackson 1985, Bartolome et al. 2007). However, pollen evidence suggests that invasive species may have slightly preceded European expansion (Mensing and Byrne 1998).

In 1943, the Cardoza family purchased the Tolay Lake property, where they raised silage, row crops, dairy cattle, beef cattle, and sheep. At the time of the property transfer from the Cardoza family to Sonoma County, in 2005, a cow-calf operation was the sole livestock enterprise on the ranch. Conversations with the Cardoza family (LSA 2009a) ascertained that the former Cardoza holding (northern portion of the Park) supported between 150 and 250 cow-calf pairs, depending upon whether the lakebed was grazed. Currently, Glen Mohring of H & L Mohring Ranch holds the grazing lease for the northern and southern portions of the Park with SCRP and SLT, respectively.

Despite the complex interactions between grazing and natural biota, some beneficial and deleterious effects from grazing are well understood and measurable. Primarily, grazing affects vegetation through direct herbivory, trampling, changes in the nutrient cycle, soil and hydrologic disturbance through compaction and erosion (Bush 2006). These effects favor plants adapted to or tolerant of disturbance, which are often non-native annual grasses and invasive species. Additionally, shrubs, saplings, and even large trees can be browsed or impacted from "loafing" thereby reducing regeneration of woodlands and shrublands and contributing to type conversion (Bartolome et al. 2007). Sensitive habitats including riparian areas, wetlands, and plant species with a high susceptibility to direct herbivory can quickly be negatively impacted (Fleischner 1994, Painter 1995, Belsky et al. 1999). A history of grazing may be contributing to stream bank incision, headcuts, reduced shrub understory, browsed tree limbs, among other effects.

When managed properly, livestock have several beneficial effects, including thatch reduction, floral diversity, fire suppression, and wildlife habitat maintenance. Non-native annual grasslands develop excessive thatch accumulation that can inhibit seed germination of other species and increase fire hazard (Kyser et al. 2007). Properly timed grazing can promote native plant species growth through reduced competition for space and nutrients, thatch reduction, and a long term reduction of non-native species in the seed bank (D'Antonio et al. 2001, Hayes and Holl 2003, Huntsinger et al. 2007). In turn, native wildlife dependent upon specific plants gain benefits, and perhaps continued survival, through grazing, such as the Bay checkerspot butterfly and Callippe silverspot butterfly whose host plants can readily become out-competed by non-native grasses (Weiss 1999, Weiss et al. 2007). The deleterious and beneficial effects of grazing on wildlife are well documented, if, sometimes, little understood; however, grazing is an effective tool for wildlife and vegetation management when adaptive management principles guide the grazing regime and monitoring results are used to adjust practices as needed.

5.1.2 Fire

Much of California's vegetation has evolved with fire as a major component of its disturbance and renewal process. Wet winters and springs with relatively mild temperatures allow for rapid plant growth, while warm to hot, relatively moistureless summers dry senescent vegetation, particularly of annual species, thereby creating conditions conducive to late season wildfire. Several notable species in California are aided by fire in their successful reproduction (e.g., giant sequoia, Bishop pine), and fire has contributed to vegetation patchiness and, thus, floral diversity. Additionally, fire has been used as a tool to intentionally manipulate vegetation by reducing cover or increasing visibility and ease of movement, providing favored wildlife habitat, and increasing abundance of food plants (e.g., geophytes).

Frequency of wildfires set by Native Americans in California is not well understood; however, the intensity of fires appears to have been such to create type conversion from shrubland and woodland to open savannah and grassland (Keely 2001, Anderson 2005). Evidence from fire scars on coast redwoods in Annadel State Park suggests that intentional fires were set, recurrently at 6 to 23 years, and were of low intensity (Finney and Martin 1992). Type conversion from fires started by Native Americans may be most evident on the coastal prairie of California where shrubs and conifers were removed by fire and cutting, a practice which European settlers replicated to maintain extensive rangelands (Keely 2001).

Type conversion from woody dominated communities to those dominated by favored herbs set the stage for the invasion by Eurasian annual grasses and forbs. The most prevalent non-native grasses of California are overwhelmingly annual and from the Mediterranean, and, in their place of origin, are adapted to disturbance (Jackson 1985). However, these species are not particularly fire-adapted, and fire has been utilized to control and reverse the spread of aggressive annual invasive species with varying success. Burning of yellow star thistle has yielded some success in control of this species (DiTomaso 1999), but it has been shown to return without repeated treatments (Kyser and DiTomaso 2002). Burning of Medusa head has proven somewhat effective, but specific timing, intensity, and repeated treatments are essential to achieve a reduction in this species (Rice and Smith 2008).

In general, fire is an effective tool for land management when applied in conjunction with other management techniques (e.g., grazing, soil grubbing). Additionally, public health and safety concerns surround the use of prescribed burns. Controlled burning would likely be most effective when applied with other treatments and conducted away from Park Headquarters, neighboring residences, and public roads (i.e., Highway 121). Similar to grazing, fire can be a cost effective management technique over broad areas where herbicide, mechanical removal, and other treatments for invasive species are impracticable.

5.2 Hydrologic Cycle and Geomorphology

All ecosystems are dependent upon reliable water availability. Because the Park resides within a strongly seasonal, Mediterranean climate, the summer months are very dry, with precipitation virtually absent for up to six months. Conversely, November through March can see an excessive amount of rainfall, with streams and creeks repeatedly swelling to bank-full during the winter's cyclonic storms. Therefore, areas that can capture the winter rainfall and store it through the summer months are important and, often delicate, resources for the wildlife and plant life of a given area. The wetlands of the Park function as natural reservoirs which soak up the winter rains, which are slowly discharged during the spring into summer.

Although wetlands can slow surface and subsurface flows of water as well as nutrient and sediment migration, intact surrounding upland habitats (e.g. grasslands, woodlands) serve to intercept and infiltrate water migrating towards wetland and water features. Intact soils with healthy, perennial vegetation can attenuate overland sheet flow and reduce erosion, even in upland systems. When these areas become denuded or overwrought with ephemeral annual vegetation, the first winter rains can deliver large sediment and nutrient pulses into aquatic features. Multi-canopied habitats with undisturbed leaf litter and downed woody debris protect the soil surface from erosion, add material for absorption, and disperse sheet flow more slowly during and following heavy storm events. A reduction in leaf litter and/or shrub layer, particularly on steep slopes, can increase overland sheet flows and sediment loading. Likewise, native perennial grasses have much deeper root systems than annual species, creating pathways for water infiltration to deeper areas in the soil profile.

Water capture and storage maintains seeps and springs throughout the Park, prolonging the growing season for nearby plants and providing water resources for wildlife. Grazing animals utilize seeps and springs in the summer months to graze on green vegetation and access water supplies. Heavy grazing can create rilling, channelization, and incision within these areas, providing conduits for water to shed more rapidly, as well as compact soils reducing infiltration and absorption. Likewise, roads, trails, and paths can alter overland flows by concentrating surface waters and increasing the velocity of flows.

Portions of the Park have severe hydrologic modifications, particularly Tolay Lake. A history of stock pond creation and drainage of the lakebed has increased the velocity of flows within downstream channels contributing to down-cutting, head-cutting, and incision. Head-cuts and incision migrate uphill providing a pathway for invasive species (e.g. Himalayan blackberry), reducing native vegetation communities (e.g. purple needlegrass grassland), and altering the subsurface hydrology of wetlands (e.g. seep/spring wetlands) often located at the head of ephemeral and intermittent streams. Incision within these can compromise the wetland's ability to store water later into the season, thereby reducing important resources for wildlife and vegetation dependent upon surface or near-surface waters. Additionally, the ability of wetlands to slow surface water also slows sediment migration, when these damaged, these systems can increase soil migration and sediment loads in the downstream watershed.

5.3 Species Interactions and Habitat Connectivity

5.3.1 Natural Regeneration of Native Plant Species

Regeneration of native species within California is of major interest to land managers. The preservation of intact vegetation communities dominated by native species tends to provide greater soil stability, higher water quality, and wildlife habitat. Understanding how the habitats of the Park have changed through time and what they may look like is important for the guidance of successful management and restoration activities. The restoration and preservation of native grasslands has received much attention from researchers and land managers concerned with water quality, soil retention, forage and range quality, biodiversity, and carbon sequestration.

Native grassland habitats in California are among the state's most threatened habitats (Noss et al. 1995), and an estimated 90 percent of native perennial grasslands have been lost to development, agriculture, or type conversion since the mid-19th century (Dell et al. 2007). Additionally, approximately 90 percent of the species listed in the CNPS Electronic Inventory of Rare and Endangered Plants are closely associated with grassland habitats in California (CNPS 2013, Skinner and Pavlik 1994). Upland grasslands are the dominant habitats within the Park, and the presence of intact or relatively healthy native grasslands is encouraging for preservation and restoration. The decline in native grasslands is typically linked to overgrazing and extreme drought in the late 19th century, when non-native annual grasses came to dominate the herbaceous communities of California. However, much research has demonstrated the positive effects of well-managed grazing, particularly in coordination with fire or other means, to maintain and enhance native grassland habitats.Similar to native grasslands, oak woodlands throughout California have received much research attention, particularly concerning regeneration. Within California, over 330 species of birds, mammals, reptiles, and amphibians depend upon oak woodlands (Barrett 1980), including up to 40 percent of the terrestrial mammal species documented in California, and over 5,000 insect species (Pavlik et al. 1991). Within the Park, oak woodland is second only to grasslands in terms of cover among terrestrial vegetation communities. Because oak woodlands maintain soil and water quality, and they have an extremely high biodiversity, a noticeable lack of regeneration in oak woodlands is a major concern.

Oak are wind-pollinated and generally require cross-pollination with other individual trees to develop viable acorns. Depending on conditions and species, acorns can take several seasons to mature, in which time numerous insects can predate on them while still on the tree. Once mature, acorns fall to woodland floor, where they become an important food resource to deer, feral pigs, squirrels, insects, birds, and historically humans. Those acorns that are not consumed, may germinate and remain small seedlings whereupon their short stature and nutritious leaves and twigs provide browse for deer and livestock. Seedlings can remain under the parent tree for years before light and space open allowing for a "release" on the young trees.

Oak regeneration within the Park has not been formally investigated, but casual observations of coast live oak seedlings, particularly at the dripline of adult trees, is encouraging. Far fewer oak seedlings are present in open grasslands, presumably due to distance from source, competition from herbaceous plants, and grazing and browsing by deer and livestock. Annual grass soil moisture use differs from native perennial grasses, which may be contributing to the decline in oak regeneration (Gordon et al. 1989). Studies at Annadel State Park found that oak seedlings within perennial grasslands (i.e., native) were more plentiful and more robust than those observed within annual grasslands (i.e., non-native) (Barnhart et al. 1991), possibly due to differing soil moisture regimes or presence of beneficial mycorrhizae. Distance from source may be contributing to fewer oak seedlings as well, as studies from blue oak woodlands suggest that habitat fragmentation and fewer trees may provide less opportunity for successful pollination (Knapp et al. 2001, Sork et al. 2002).

It is possible that healthy, intact, native perennial grasslands provide an opportunity for oak woodland establishment and preservation. Additionally, it is almost certain that the preservation of large, adult and nursery trees on-site is fundamental to the maintenance of oak seedlings. Therefore, the preservation, enhancement, and restoration of native perennial grasslands as well as the Park's oak woodlands are beneficial to both community types, and the wildlife, water quality, and soil integrity the depend upon them.

5.3.2 Maintenance of Habitat Diversity

Habitat includes both the biotic and abiotic conditions necessary to support the suite of plant and wildlife species that occupy and utilize a given location. Climate (macro- and micro-), soil type (texture, parent material, permeability, pH), geomorphology (chemistry, depth to bedrock), and topography (e.g., shape, slope, and aspect) are the dominant abiotic factors to drive the diversity and complexity of habitat types. Increased structural complexity and vegetation diversity within a habitat may provide more niches for species, both numbers of individuals within a given species and different types of species. Although few species occupy only one habitat type, evidence or direct observation within a given habitat type can be reliably determined based on the presence of a species constituent elements (e.g., soil texture, presence of slack water). Increased habitat and structural diversity as a mosaic across a landscape, therefore, provides a greater opportunity for a given species to occupy and survive within a given location, such as the Park.

Therefore, the presence of several habitat types (e.g., grasslands, woodlands, wetlands) within the Park increases the likelihood of plant and wildlife diversity, and the maintenance of that habitat diversity increases the chances for those species to perpetuate. For instance, as noted above, native perennial grasslands may provide the opportunity for oak seedlings to establish and reproduce. Differing stand densities and heights of grasslands provide different niches for small mammals and ground-nesting birds, which in turn provide prey sources for larger mammals (e.g., coyote, fox) and raptors (e.g., hawk, owl). The presence of snags, singular trees, and fences provides perches for raptors from which they can hunt, or provides observation posts for California quail while the others within the covey forage seed. Structural diversity within woodlands and riparian areas, provides more niches for nesting birds, amphibians, and mammals which depend on resources that are provided from these different layers (e.g., food sources in the lower and middle stories, nesting and observation resources from the upper canopy). Preservation and enhancement of a rich habitat mosaic, as well as in-habitat diversity (plant species, structure) provides a richer species diversity and healthier individuals within that species.

5.3.3 Species Dispersal and Habitat Fragmentation

Species dispersal refers to the successful migration of an individual organism from its source or existing population to a new, favorable location where it can successfully establish and reproduce (Fahrig 2003). Generally, plant species dispersal is via seed through one or more mechanisms. Seeds can be carried on the wind or water, with adaptive or specialized structures to aid in their movement. Fleshy or nutty fruits may provide nutrition to an animal predator who later distributes elsewhere viable seed through fecal deposits, or seed can be carried in hand or fur by humans or animals, intentionally or unintentionally, to new locations. In addition to seed dispersal, vegetative propagules can break from a parent plant and be carried to a new location to establish new populations or comingle with existing populations. Wildlife species are generally more mobile than plants. While some species lack the ability of long-range self-motility, most are capable of dispersing across the landscape to seek out new habitats, higher quality habitats, and/or breeding partners.

In addition to escaping unfavorable conditions and finding more favorable locales, species dispersal can create genetic mixing. Out-crossing among two or more populations can provide new individuals with robust, well-adapted traits at a broader scale, and ensure continued species survival. However, dispersal barriers can limit the ability of organisms from successfully reaching other individuals or locations that otherwise would be hospitable to that organism. Barriers can be natural such as rivers, oceans, mountain ranges, or artificial such as highways, developed lands, or denuded landscapes (i.e., habitat fragmentation).

Habitat fragmentation refers to the intentional or unintentional division or separation of habitats such that barriers to species dispersal have been created (Fahrig 2003). Fragmentation of extensive, contiguous, and/or diverse habitats into smaller patches can influence species diversity, persistence, and genetic exchange, particularly for smaller, less mobile species. Some species are seemingly less affected by habitat fragmentation (e.g., birds), while other are particularly sensitive to habitat fragmentation (e.g., plants). Habitat fragmentation reduces space for species occupation, and increases a species exposure to disease, predation, incidental harm (e.g., vehicular accidents), etc. Additionally, habitat fragmentation increases the area to edge ratio of remnant habitat patches, which can have provide conduits for disturbance invasive plant species, and diminish the quality of native species diversity. The preservation of intact, native habitats and a rich mosaic of habitat types within the Park provide the opportunity for the continued presence of plant and wildlife species. The Park is located at or very near the intersection of several differing habitat types (e.g., coastal brackish marsh, upland grasslands, oak woodlands), and the Tolay properties acquisitions of nearly an entire watershed, offer the opportunity to preserve, research, and enhance the intersection of these habitats and provide core, unfragmented habitat for many species.

5.3.4 Invasive Plant Species

Invasive plant infestations can have a profound negative impact on native vegetation communities, alteration of wildlife patterns and breeding, increased fire hazard and frequency, increased sedimentation and erosion, reduced livestock forage capacity, and other threats to healthy ecosystems. Invasive species are typically non-native in origin and out-compete locally native plant species through several advantages. Non-native species often are resistant to or have no local predators, and frequently reproduce through prodigious seed set or vegetative propagules; therefore, invasive species can reproduce rapidly with very few biotic stressors to curb population growth. Additionally, because these species are frequently adapted to disturbance, roadways, trails, and other human activity can act as a conduit for continued dispersal.

Invasive plant species were mapped during the 2006-2008 surveys, and additional data were collected in 2013 (Figure 7). Fifty-eight plant species considered invasive or that have been assessed by Cal-IPC (2006) have been observed within the Park over several surveys and site visits (Table 4). Additionally, two plants that were not identified to the species level, tamarisk (*Tamarix* sp.) and water primrose (*Ludwigia* sp.), have a high probability of being species that are considered invasive. WRA evaluated invasive species ranked as “assessed” and “limited” and determined that only two, bristly ox-tongue and curly dock, appeared to pose a substantial future threat to certain habitats or species within the Park. All four invasive species with a rank “high” and seven of the 29 species ranked “moderate” were determined to pose a current or future threat to substantially alter the native habitat or management regime within the Park, and are therefore discussed here. Figure 7 illustrates locations of dense infestations of invasive plant species mapped by LSA in 2006-2008; however, due to the ubiquitous, diffuse, and/or intermittent distributions of several species, as well as shifting populations / distributions, mapping results should not be considered static.

In general, non-native grasses (e.g., soft chess) constitute their own vegetation alliances or are characteristic species within other vegetation alliances and are nearly impossible to eradicate; therefore, these species are not addressed as potential threats to the existing habitats and species within the Park. Additionally, these species, although competitive with native grasses and forbs, often provide habitat for native wildlife and valuable forage for livestock which are a potentially vital component of overall management of the Park. Those species of the highest concern for specific management goals and biological resources within the Park are summarized in Table 4 and are discussed below.

<u>Blue gum (*Eucalyptus globulus*). Cal-IPC: Moderate</u>: Blue gum is an evergreen tree in the myrtle family (Myrtaceae) that blooms from October through March, and sets seed in winter through summer. Blue gum was introduced from Australia for fuel wood, shelterbelts, and ornamentals, and is known throughout the Coast Ranges and South Coast (Baldwin et al. 2012, CCH 2013). This evergreen tree reproduces primarily through seed, but copsed trees can stump sprout. Although blue gum is often considered a hazard tree from a tendency for wind fall and fire, and the probably alleolapathic character precludes understory vegetation, it does provide nesting and cover habitat for native birds and other wildlife. The primary recommended control method is mechanical removal, herbicide application to cut stumps, followed by herbicide application or mechanical removal of saplings and seedlings.

<u>Tamarisk (*Tamarix* sp.). Cal-IPC: unknown (possibly High)</u>: Tamarisk is an evergreen tree or shrub in the tamarisk family (Tamaricaceae) that typically bloom in spring and set seed in summer. Most tamarisk species are introduced ornamentals from Eurasia and Africa, and are known throughout California. Although the tamarisk present in the Park was not identified to the species, it is most likely small-flower tamarisk (*T. parviflora*), a relatively common escapee in the North Bay and drier margins of the North Coast Range. Primarily tamarisk species are threat to vegetation and reduce forage available, through alteration of soil pH and a lowered water table. The deep roots of these species bring water and salts from the water table. However, tamarisk

can provide cover and nesting habitat for native birds. The recommended control method is mechanical removal, application of herbicide treatment to the cut stump, and follow-up herbicide application to saplings and/or stump sprouts (Cal-IPC 2006).

Table 4. Invasive plant species threat evaluation in the Park

Species	**Threat**				
	Erosion	**Vegetation**	**Fire**	**Wildlife**	**Grazing**
blue gum	none	moderate-high	High	low	moderate-high
tamarisk	none-low	moderate-high	moderate-high	low-moderate	moderate
Himalayan blackberry	none-low	high	moderate-high	none-low	moderate
black mustard	moderate	moderate-high	Moderate	low-moderate	moderate-high
Italian thistle	moderate	moderate	Moderate	low-moderate	moderate-high
purple star thistle	moderate	moderate	Moderate	low	high
yellow star thistle	moderate-high	moderate-high	Moderate	low	high
poison hemlock	low	high	Moderate	low-moderate	high
Fuller's teasel	none-low	moderate	low-moderate	low	moderate
Medusa head	moderate	moderate-high	moderate-high	low	high
fennel	none-low	high	moderate-high	low-moderate	moderate-high
bristly ox-tongue	none-low	moderate	Low	low-moderate	moderate
water primrose	none	high	None	moderate-high	none
harding grass	none-low	high	moderate-high	low-moderate	low
curly dock	none-low	moderate	Low	low	moderate

(LSA 2009b, LSA 2009c)

Himalayan blackberry (*Rubus armeniacus*). Cal-IPC: High: Himalayan blackberry is an evergreen shrub/vine in the rose family (Rosaceae) that blooms from March to June, and sets seed into early fall. It is originally native to Eurasia, but is known throughout cismontane California at elevations below 5000 feet (CCH 2013, Baldwin et al. 2012, Cal-IPC 2006), and is considered a facultative-upland species (Lichvar 2012). Himalayan blackberry primarily reproduces through rhizomes, but can be transported by seed, and therefore can invade disturbed areas, wetlands, and shady areas rapidly and displace native species (CCH 2013, Cal-IPC 2006). However, Himalayan blackberry can provide shade for streams and nesting, foraging, and shelter habitat for birds and small mammals.

Black mustard (*Brassic nigra*). Cal-IPC: Moderate: Black mustard is an annual forb in the mustard family (Brassicaceae) that blooms from April to July. It is a native Europe, but is now known widely throughout North America including all of cismontane California (Baldwin et al. 2012, CCH 2013). It reproduces solely through seed which are prodigiously set in spring through summer. Because the tall stalks of (3 to 6 feet) black mustard often forms extensive, monotypic stands and is tolerant of soil disturbance and nutrient-poor soils, this species can rapidly overtop and out-compete native forbs and grasses, particularly in disturbed areas.

Recommended control methods include weed whipping, herbicide application, and/or grazing (Cal-IPC 2006).

Italian thistle (*Carduus pycnocephalus*). Cal-IPC: Moderate: Italian thistle is an annual forb in the sunflower family (Asteraceae) that blooms from February through July, and seed set concurrently. It is native to the Mediterranean, and is known throughout coastal California and the northern Sierra Nevada Foothills (Baldwin et al. 2012, CCH 2013). It reproduces solely by seed, and can out-compete native herbaceous species due to its relative unpalatability, tolerance of light shade and full sun, prodigious seed set, and often monotypic stand forming character. Recommended control includes weed whipping and herbicide application (Cal-IPC 2006).

Purple star thistle (*Centaurea calcitrapa*). Cal-IPC: Moderate: Purple star thistle is an annual to perennial forb in the sunflower family (Asteraceae) that blooms from July through October, and sets seed in late summer through early winter. It is native to southern Europe, and is known from the Bay Area, South Coast, and Central Valley (Baldwin et al. 2012, CCH 2013). Because this species is unpalatable to livestock, and often toxic to horses, it can rapidly invade grasslands and open disturbed areas, particularly in areas with compacted soils and heavy grazing (Cal-IPC 2006, Baldwin et al. 2012). Recommended control methods include weed whipping, herbicide application, and grubbing to destroy the deep, strong tap root which can over-winter (Cal-IPC 2006).

Yellow star thistle (*Centaurea solstitialis*). Cal-IPC: High: Yellow star thistle is an annual forb in the sunflower family (Asteraceae) that blooms from May to October, and sets seed summer through fall. It is originally native to southern Europe, but is known throughout California except the high Sierra Nevada below 4500 feet (CCH 2013, Baldwin et al. 2012, Cal-IPC 2006). Yellow star thistle reproduces through seed in late summer to early winter. Because this species is unpalatable to livestock, and often toxic to horses, it can rapidly invade grasslands and open disturbed areas, particularly in areas with compacted soils and heavy grazing (Cal-IPC 2006, Baldwin et al. 2012). Recommended control methods include weed whipping prior to seed set but during flower when individuals have spent the majority of their energy. For large infestations, altered grazing regime accompanied by mechanical removal and herbicide applications may be necessary (Bossard et al. 2000).

Poison hemlock (*Conium maculatum*). Cal-IPC: Moderate: Poison hemlock is a perennial forb in the carrot family (Apiaceae) that blooms from April to June, and sets seed throughout late spring and summer. It is originally native to Eurasia and North Africa, and is known throughout cismontane California and the Great Basin below 5000 feet elevation (Baldwin et al. 2012, Calflora 2013, CCH 2013). Poison hemlock reproduces through seed in summer, which is prodigious and spread by wildlife, wind, water, and humans. This species is lethally toxic to humans, wildlife, and livestock when ingested, and can rapidly invade wetland and mesic upland habitats (Cal-IPC 2006). It poses a moderate threat to wetland and riparian habitat as stands can be monotypic, as well as its toxicity to wildlife. Recommended control methods include hand and mechanical removal, including rooting structures prior to seed set, for smaller populations (Bossard et al. 2000).

Fuller's teasel (*Dipsacus fullonum*). Cal-IPC: Moderate: Fuller's teasel is a perennial forb in the teasel family (Dipsacaceae) that blooms from June to August, and set seed through summer. It is originally native to Europe, and is known throughout the Coast Ranges, South Coast, Modoc Plateau, and northern Sierra Nevada Foothills (Baldwin et al. 2012, CCH 2013). Fuller's teasel reproduces solely from seed, which is distributed by wind and livestock, primarily in summer into fall. Because this species is unpalatable to livestock, tolerant to soil disturbance, and mesic soil moisture regime, this species poses a substantial threat seasonal wetland and perennial marsh (fringe) habitat. Recommended control methods include weed whipping and grubbing of rosettes in early spring, with follow-up herbicide treatment for greater efficacy (Cal-IPC 2006).

Medusa head (*Elymus caput-medusae*). Cal-IPC: High: Medusa head is an annual graminoid in the grass family (Poaceae) that blooms from April to July, and sets seed in summer. It is originally native to Eurasia, but is known from the Coast Ranges, Klamath Ranges, Central Valley, Modoc Plateau, northern Great Basin, and Transverse Ranges below 7000 feet (Baldwin et al. 2012). Medusa head reproduces through a prodigious annual seed set throughout summer, and can rapidly invade grasslands, pastures, and meadows (Cal-IPC 2006). This species is a threat to the forage potential of the Park as it is not palatable throughout most of the year and does not provide as much nutrition as other grasses and forbs to grazing livestock. Because, grazing livestock has been, and will likely continue to be, a primary component of the Park, consideration of management through fire or other means may be warranted (Bossard et al. 2000, Marty 2007, Reiner et al. 2007).

Fennel (*Foeniculum vulgare*). Cal-IPC: High: Fennel is a perennial forb in the carrot family (Apiaceae) that blooms from May to September, and sets seed from August through October. It is originally native to the Mediterranean, and is known from throughout cismontane California below 5200 feet elevation (CCH 2013, Baldwin et al. 2012, Cal-IPC 2006). Fennel reproduces through seed in late summer and early fall, and seeds are spread by flowing water, wildlife, and humans. Because this species is relatively unpalatable to livestock, the seeds are moderately long-lived, and there is a prodigious seed-set well adapted to disturbed soils, it can rapidly invade roadsides and other harsh substrates forming near monotypic stands (Cal-IPC 2006). Recommended control methods for small infestations include hand removal including full removal of all rooting structures, followed by repeated removals and possible herbicide application. For large infestations, hand or mechanical removal in coordination with herbicide applications may be necessary (Bossard et al. 2000).

Bristly ox-tongue (*Helminthotheca echioides*). Cal-IPC: Limited: Bristly ox-tongue is an annual to perennial forb in the sunflower family (Asteraceae) that blooms from June through December, and sets seed concurrently. It is native to Europe, and is known throughout coastal California and the Central Valley (Baldwin et al. 2012, CCH 2013). It reproduces solely from seed, and can rapidly invade disturbed areas and can tolerate mesic soil moisture regimes. Recommended control methods include weed whipping and grubbing of rosettes in early spring, with follow-up herbicide treatment for greater efficacy (Cal-IPC 2006).

Water primrose (*Ludwigia* sp.). Cal-IPC: unknown (possibly High): Water primrose is a perennial aquatic forb in the evening primrose family (Onagraceae) that blooms from March through December, and sets seed concurrently. Although water primrose was not identified to species, it is likely that it is six petal water primrose (*Ludwigia hexapetala*), a native to California, but an extremely aggressive invasive species. Water primrose can reproduce by seeds, but likely reproduces through rhizomatous growth and broken nodes that root in new locations. Its rapid growth can quickly out-compete native emergent marsh and aquatic species, as well as diminish open water habitat for amphibians (California red-legged frog) and reptiles (e.g. western pond turtle), and decomposing matter can exacerbate eutrophication of ponds and lakes. Recommended control methods include complete draw-down of water in controlled waterbodies (e.g. stock ponds), herbicide application combined with mechanical removal to reduce eutrophication.

Harding grass (*Phalaris aquatica*). Cal-IPC: Moderate: Harding grass is a perennial graminoid in the grass family (Poaceae) that blooms from February through March, and sets seed through spring. It reproduces through seed and short rhizomes, forming monotypic tussock stands. It is native to the Mediterranean, and has been introduced throughout California as post-fire erosion control and livestock forage. The monotypic and tall growth form precludes shorter native grasses and forbs, and the excessive thatch buildup can increase fire hazard, particularly when adjacent to shrub and woodland communities. Recommended controls include repeated mowing early in the growing season, repeated burns, grazing, and/or herbicide treatment (Cal-IPC 2006).

Curly dock (*Rumex crispus*). Cal-IPC: Limited: Curly dock is a perennial forb in the buckwheat family (Polygonaceae) that blooms and sets seed year-round. It is native to Eurasia, but has a worldwide distribution and is known throughout California (Baldwin et al. 2012, CCH 2013). Curly dock reproduces by seed and can rapidly invade areas with a mesic soil moisture regime. Recommended control methods include weed whipping, soil grubbing, and herbicide application (Cal-IPC 2006).

5.3.5 Invasive Wildlife Species

Similar to invasive plant species, non-native wildlife can alter native wildlife behavior, over-browse native vegetation, provide pathways for invasive plants, share communicable diseases with native fauna, and compromise agricultural enterprises. Several non-native wildlife species have been documented within or have a high potential to occur in the Park. Although California red-legged frog and American bullfrog co-occur and have breeding cycles separated by up to ten weeks (Cook and Jennings 2007), predation by American bullfrogs has been documented (Cook and Jennings 2001, Wilcox 2011). Several of the stock ponds support suitable breeding habitat for both of these amphibians, and therefore, American bullfrog could pose a considerable localized threat to the existing or established populations of California red-legged frog. Wild turkeys are present within the Park; however, it is unclear if this species has deleterious effects on oak regeneration and small invertebrates. Studies from Annadel State Park suggest that the diet of wild turkey is predominantly non-native plants supplemented by insects and small vertebrates (Barrett and Kucera 2005), and wild turkeys have very little overlap with California quail (Lau 2006). Of greater concern may be feral pigs which are frequent migratory residents in the Sonoma Mountains. Feral pigs cause excessive damage to soil through rooting and wallowing, increasing erosion and providing a pathway for invasive species. Invasive brooms (*Genista* spp., *Cytisus* spp.), and other soil disturbance adapted invasive plant species may spread more rapidly and form dense thickets precluding native vegetation where feral pigs frequent (Sheppard and Hosking 1998, personal observation 2010). Currently, no broom species have been reported from the Park, and continued exclusion of these species will rely on proper management of human visitation as well as non-native wildlife, such as feral pigs.

5.4 Nutrient Cycling

Nutrient cycling supports the existence of biota throughout the world, and understanding the delicate relationship of nutrient cycling within a given site is important for successful land management. There are seventeen essential nutrients to support plant life, with oxygen, carbon, nitrogen, phosphorus, and potassium being the primary macronutrients. Oxygen and carbon are absorbed from the atmosphere; nitrogen, phosphorus, and potassium are taken up from the soil. Soil bacteria fix nitrogen in a soluble form that plants take up and re-deposit through fecal deposits, which are then washed into the soil and find their way into the water cycle. Eventually bacteria returns nitrogen to the atmosphere.

Local vegetation communities and plant species have evolved or adapted to the balance of nutrient availability within a given site. Therefore, alterations to the availability of nutrients can severely disrupt the ability of some species to survive, yet allow others, particularly non-native species, to readily invade. For instance, the increase in soluble nitrogen from automobile exhaust may be a primary cause of increased invasion by non-native grasses into serpentine grasslands, an otherwise restrictive environment for plants not adapted to this nitrogen deficient soil type (Weiss 2006). Additionally, nutrient loads, particularly phosphates, are responsible for harmful algal blooms that deoxygenate waterbodies resulting in fish kills.

Within the Park, livestock grazing, the historic use of fertilizers, and relative location of major transportation corridors (e.g., Lakeville Highway, Highway 37) are likely the primary sources of human-induced effects on the local nutrient cycle. Livestock graze across a broad range, taking up nitrogen and other macronutrients which form their vegetative diet, and deposit them in localized fecal deposits. Frequently, in areas where livestock are penned or “loaf” (e.g., tree lines, troughs) concentrated nutrient loads are evident in the presence of dense stands of invasive species such as milk thistle and Italian thistle, although repeated soil disturbance is certainly a considerable contribution to this highly localized phenomenon. Probably the most significant threats from nutrient cycling alterations are in the waterbodies and serpentine areas of the Park, where increased inputs of nitrogen and phosphates can alter the local vegetation communities, threaten sensitive species, and contribute to eutrophication. Therefore, grazing management and considerations on fertilizer use within the Park should account for these potential alterations.

6.0 MANAGEMENT CONSIDERATIONS

The overall goals for the management of Tolay Lake Regional Park include the maintenance and enhancement of the biological resources and the abiotic factors contributing their integrity. At the same time, these goals are balanced with other Park goals including the protection of valuable cultural and historical resources, public access, and educational and recreational opportunities. The provision of public access and other human visitation to the Park will likely require infrastructure improvements and installation, and its continued and periodic maintenance. Therefore, in order to protect the biological resources of the Park, the development of a resource management plan is essential to provide a framework and guidance for proposed improvements and their future upkeep. The following sections summarize those areas within the Park that may require further study, consideration, and/or management during and following the initial phase of the Park opening.

6.1 Habitat Enhancement and Conservation

Non-wetland Waters and Wetlands

Numerous wildlife species depend upon the wetlands, stock ponds, Tolay Lake, and Tolay Creek within the Park. Additionally, native plant species diversity is frequently relatively high within these habitats. Therefore, these habitats should be managed and, where feasible, enhanced to ensure the continued viability of high quality plant and wildlife habitat. The following management options should be considered in the resource management plan for non-wetland waters and wetlands within the Park:

- Preliminary jurisdictional determination of wetland and non-wetland boundaries in areas with specific planned impacts (e.g., trails, Park infrastructure);
- Where feasible, avoidance of wetland and non-wetland habitats for trail implementation;
- Development of restoration guidelines of Tolay Lake and Tolay Creek;
- Enhancement, and/or restoration of existing degraded seeps, meadows, and vernal pool/stock ponds;
- Through a grazing management plant, monitoring of grazing effects and the exclusion of cattle, either seasonally or year-round, as necessary;
    - Development of wildlife-friendly alternative water resources for grazing animals away from wetlands and other sensitive habitats;
- Minimization of sediment migration and nutrient delivery through trail alignment, grazing exclusion, etc.
- Development and maintenance of buffers for trail locations and other Park infrastructure;
- Seasonal access restrictions and appropriate spanning structures (e.g., bridges, boardwalks), and;
- Monitoring and management of invasive weed and aquatic wildlife species infestations, as appropriate.

Riparian Areas

Riparian areas offer several benefits to native plants, wildlife, and water quality including but not limited to buffering nutrient loading, sediment migration, shading, cover, and water cooling. Riparian areas should be managed, and where feasible, enhanced to provide continued habitat for native species and improved water quality. The following management potions should be considered in the resource management plan for riparian areas within the Park:

- Where feasible, avoidance of trail alignments through or adjacent to riparian areas;
- Minimization of human visitation to areas of natural native tree and shrub regeneration and possible exclusion of grazing from these areas;
- Propagation and planting of native trees and shrubs from local populations through cuttings and seed collection;
- Restoration of native understory species with an emphasis on natural successional patterns;
- Removal of existing high priority invasive plant species (e.g., Himalayan blackberry);
- Through a grazing management plant, monitoring of grazing effects and the exclusion of cattle, either seasonally or year-round, as necessary;
    - Development of wildlife-friendly alternative water resources for grazing animals away from wetlands and other sensitive habitats;

- Minimization of sediment migration and nutrient delivery through appropriate trail alignment, grazing exclusion, etc.
- Development and maintenance of buffers for trail locations and other Park infrastructure;
- Seasonal access restrictions and appropriate spanning structures (e.g., bridges, boardwalks), and;
- Minimization of fragmentation of existing riparian woodlands/scrubs.

Woodlands and Groves

Oak and California buckeye woodlands provide some of the richest plant and wildlife habitat within the Park. Blue gum and Monterey cypress groves offer nesting habitat for birds, but may diminish native floristic diversity. Therefore, these features may require differing management regimes to maintain and enhance native plant community diversity, while providing essential wildlife habitat. The following management options should be considered in the resource management plan for woodlands and groves fields within the Park:

- Where feasible, avoidance of tree cutting for trail alignment;
- Minimization of human visitation to areas of natural native tree and shrub regeneration and possible exclusion of grazing from these areas;
- Propagation and planting of native trees and shrubs from local populations through cuttings and seed collection;
- Restoration of native understory species where the understory is currently dominated by non-native species;
- Development and implementation of a grazing plan with monitoring requirements;
- Monitoring, containment, and/or removal of existing sudden oak death areas;
- Monitoring and removal of invasive plant species infestations during and following trail construction and other Park improvement projects; stewardship programs to remove existing invasive plant infestations;
- Minimization of fragmentation of existing oak and California buckeye woodlands.

Upland Grasslands and Wildflower Fields

Grassland and wildflower field habitats should be managed to maintain and enhance the presence of native plant species and their community structure, upon which many wildlife species depend. The following management options should be considered in the resource management plan for upland grassland and wildflower fields within the Park:

- Where feasible, avoidance of trail alignment in the areas of highest floral diversity;
- Minimization of human visitation through planned trail alignment and information materials (i.e., signage, pamphlets);
- Decommission and rehabilitation of non-vital access roads and social trails;
- Development and implementation of a grazing plan with monitoring requirements;
- Seeding / planting of locally collected native plant species, possibly including special-status plant species (e.g., fragrant fritillary) and important larval species (e.g., Johnny jump-up);
- Monitoring and removal of invasive plant species infestations during and following trail construction and other Park improvement projects; stewardship programs to remove existing invasive plant infestations.

Rock Outcrops

Rock outcrops offer a refuge for several native plant species that have been extirpated from surrounding grasslands, and provides cover wildlife species. The following management options should be considered in the resource management plan for rock outcrops as well as stone walls within the Park:

- Where feasible, avoidance and minimization of trail alignment through rock outcrops;
- Development and implementation of a grazing plan.

Special-status Species

Several special-status plant and wildlife species have been documented within the Park or have the potential to exist within the Park. These species should be protected and, where feasible, their habitat enhanced. The following management options should be considered in the resource management plan for special-status species within the Park:

- Avoidance of documented populations including appropriate buffered area (e.g., fragrant fritillary) or high quality habitats (e.g., Johnny jump-up colonies);
- Educational resources for park visitors about special-status species and their importance to the local ecosystem;
- Possible propagation of special-status plant species and reintroduction to existing high quality unoccupied habitat within the Park;
- Scheduled monitoring of plant populations with thresholds for management actions;
- Enhancement or restoration of existing habitats for special-status species (e.g., pond creation for California red-legged frog; invasive plant species abatement).

Invasive Species

Aggressive infestations of non-native, invasive species can reduce native species reproduction, increase fire and other hazards, alter hydrologic and ecologic functions, among other threats to healthy functioning native systems. Therefore, the following management options should be considered in the resource management plan for invasive species within the Park:

<u>Invasive Plant Species</u>:

- Minimization of ground disturbance activities
- Mitigation measures, such native species seeding and weed abatement, for areas where ground disturbance is unavoidable;
- Use of weed free straw for erosion control; weed free forage for supplemental feeding of livestock;
- Educational resources for park visitors and employees about invasive plant species;
- Localized native species propagules and seeds for restoration, erosion control, revegetation, etc.;
- Prevention program of introduction and reintroduction of invasive species.

<u>Invasive Wildlife Species</u>:

- Develop site-specific bullfrog eradication or control methods;

- Develop site-specific methods and/or studies for assessing potential wild turkey impacts;
- Develop site-specific methods should feral pigs become introduced to the Park.

6.2 Preferred Habitats for Park Development and Sensitive Habitat Avoidance

The Park is composed of several unique and otherwise sensitive habitats, including though not limited to oak woodlands, serpentine grassland, and Tolay Lake. To develop park infrastructure and provide public access, the following considerations for the placement of access, trails, fences, etc. that minimize the deleterious effects to the Park's sensitive biological resources, with preference for Park infrastructure and heaviest visitation in the Park's more common or ubiquitous habitats, should be included in the resource management plan:

- Consideration of trail and infrastructure location and installation to encourage passive recreation;
- Implement a visitor educational program to inform about the sensitive habitats and species within the Park;
- Trails could be preferentially located in more ubiquitous, less sensitive habitats such as non-native annual grasslands, while extremely sensitive habitats such as wetlands may be avoided or impacts to such, minimized;
- Habitats could be evaluated for their level of sensitivity, and the trail system designed accordingly (e.g. heavy use in grasslands, light use in woodlands, very light/seasonal use in wetlands);
- Consider placing seasonal restrictions on certain trails to minimize or prevent erosion, invasive species spread, etc.;
- Avoidance of extremely sensitive habitats/species and development of appropriate buffers;
- Where feasible, incorporation of existing livestock and social trails, and ranch roads as part of the trail system;
- Parking, picnic areas, and other larger infrastructural improvements should be located in existing developed areas (i.e., existing Park Headquarters / Cardoza residence).

6.3 Minimization of Erosion, Hydrologic Alteration, and Nutrient Loading

Intentional and significant hydrologic modifications were historically conducted within the Park, particularly through the draining of Tolay Lake, the creation of stock ponds, and channelization of agricultural ditches. Unintended hydrologic alteration has likely resulted from these modifications as well as the long history of grazing where compacted soils and channelized drainages have allowed water to move more quickly in overland sheet flow and lowered water table. Channelization and compacted soils have increased erosion throughout the watershed, which provide opportunities for invasive plant species, increase sediment loads in Tolay Creek, etc. Therefore, the following options should be considered in the resource management plan to conserve hydrologic and geomorphic integrity of the Park:

- Mapping and monitoring of headcuts and incision near wetlands;
- Monitor road and trail channel crossings;
- Trail and access road design to prevent or minimize erosion, flow concentration, and lower velocity of overland sheet flow;
- Development / refinement of grazing management to reduce soil compaction, trampling, and visitation to wetlands;

- Livestock exclusion from wetlands and other aquatic features;
- Inter-annual / inter-decadal movement of water troughs and other livestock infrastructure to "rest" and rehabilitate areas of livestock concentration;
- Seasonal trail and road restrictions to prevent or minimize sediment migration, erosion, etc.

6.4 Data Gaps

Several in-depth studies have been conducted to date regarding the biological resources within the Park; however, additional, site specific surveys may be necessary depending on exact infrastructural designs. The following information may be necessary:

- Section 404/401 jurisdictional determination of wetlands and non-wetland waters at proposed infrastructural improvements / installations to determine the precise extent of jurisdictional features.
- Updated protocol-level rare plant surveys along proposed trail corridors and other Park infrastructure to ensure the avoidance of special-status plant species.
- Breeding bird and bat roost surveys should include trees, shrubs, or existing structures be slated for removal.
- Species-specific wildlife surveys along proposed trail corridors and other Park infrastructure to ensure the avoidance of special-status plant species.

6.5 Adaptation to Climate Change

It is universally accepted throughout the scientific community that climate change is being exacerbated by human activity. Probable effects of climate change include increased heat waves, drought, and more intense storms (Pew 2013). Modeling for California suggests that climate change effects will decrease Sierran and Cascadian snowpacks, cause a rise in sea level, increase the duration and intensity of heat waves, increase critically dry years (annual drought), and increase wildfires (Karl et al. 2009, Luers et al. 2006). Rises in ocean temperature may affect fog and precipitation, but is unclear if precipitation will increase, decrease, or remain overall the same but with changes in timing. Additionally, changes in species distribution and phenology have been repeatedly reported throughout the world (Malcolm and Pitelka 2000, Walther et al. 2002). It is uncertain how climate change will impact Sonoma County's vegetation communities, wildlife species, hydrologic cycle, nutrient cycle, and other elements of the ecosystem. Therefore it is important for land managers to plan for conservation benefits that will provide habitats with the resiliency to buffer the effects of climate change uncertainty. The Park confers several benefits to the region and resident plant and wildlife species that may allow them to adjust to climate change. Land management of the Park should consider these beneficial elements and provide enhancement for them.

- The Park provides connectivity for plant and wildlife species through latitudinal (north-south) and elevational gradients;
- Maintenance and enhancement of functional vegetation groups to provide resiliency in individual species;
    - Maintenance and enhancement of native floral diversity and seedbed which increase the opportunity for species adaptation to changing climate;
    - Invasive species control and monitoring to effectively reduce or prevent type conversion;

- Wetlands and non-wetland waters provide valuable water storage during drier periods, and attenuate runoff and sediment transport during wetter periods;
- Wetlands, non-wetland waters, and riparian areas provide aquatic and cooling refugia to species for thermo-regulating.

Due to the uncertainty of climate change, developing monitoring and management strategies to measure and evaluate changes within the Park will provide land managers with the ability to respond effectively. Adaptive management encourages the continual incorporation of the most recent research and strategies for land management, and the general principles of adaptive management should be incorporated into the resource management plan.

6.6 Regulatory Jurisdictions and Policies

Several federal, state, and local agencies, through regulation and guidance, attempt to protect sensitive biological resources. The following sections explain the regulatory context guiding the protection of biological resources in Sonoma County and the State of California, including applicable federal and state laws and regulations that helped guide field investigations.

6.6.1 Environmental Quality Acts

California Environmental Quality Act (CEQA)

Projects that are funded, administered, or requiring a permit from a state or local agency must comply with the California Environmental Quality Act. Projects are defined as discretionary actions that have the potential to have a physical impact on the environment, including but not limited to, biological resources. Essentially a disclosure law, CEQA is intended to disclose to the public proposed and approved projects with environmental impacts, inform municipalities/agencies and the public about potential impacts of proposed projects on environmental quality, identify avoidance and minimization measures of those impacts, and address alternatives to the project or project design to avoid impacts or detail mitigation measures to reduce the levels of impact from the proposed project.

National Environmental Policy Act (NEPA)

Similar to CEQA, projects that are funded, administered, or permitted by a federal agency require review under the National Environmental Policy Act (NEPA). NEPA requires federal agencies to consider environmental impacts from project undertaken or permitted by said agency, and provide reasonable alternatives to the project or mitigation.

6.6.2 Federal Regulations

Clean Water Act (CWA) & Rivers and Harbors Act

Section 404 of the Clean Water Act (CWA) gives the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) regulatory and permitting authority regarding discharge of dredged or fill material into “navigable waters of the United States”. Section 502(7) of the CWA defines navigable waters as “waters of the United States, including territorial seas.” Section 328 of Chapter 33 in the Code of Federal Regulations defines the term “waters of the United States” as it applies to the jurisdictional limits of the authority of the Corps under the CWA. A summary of this definition of “waters of the U.S.” in 33 CFR 328.3 includes

(1) waters used for commerce; (2) interstate waters and wetlands; (3) “other waters” such as intrastate lakes, rivers, streams, and wetlands; (4) impoundments of waters; (5) tributaries to the above waters; (6) territorial seas; and (7) wetlands adjacent to waters. Therefore, for purposes of the determining Corps jurisdiction under the CWA, “navigable waters” as defined in the Clean Water Act are the same as “waters of the U.S.” defined in the Code of Federal Regulations above.

The limits of Corps jurisdiction under Section 404 as given in 33 CFR Section 328.4 are: (a) *Territorial seas:* three nautical miles in a seaward direction from the baseline; (b) *Tidal waters of the U.S.:* high tide line or to the limit of adjacent non-tidal waters; (c) *Non-tidal waters of the U.S.:* ordinary high water mark or to the limit of adjacent wetlands; (d) *Wetlands:* to the limit of the wetland.

The Corps of Engineers also has jurisdiction over “navigable waters” under Section 10 of the Rivers and Harbors Act of 1899. Section 10 of this Act applies to tidal areas below Mean High Water (MHW) and includes tidal areas currently subject to tidal influence, as well as historical tidal areas behind levees that both historically and presently reside at or below MHW. “Navigable waters of the U.S.”, as defined in 33 CFR Part 329, are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. The act prohibits any unauthorized action that obstructs the “navigable capacity of any waters of the United States.” These actions can include building of structures; excavation, fill; alterations and modifications to navigable waters (33 USC 403). A determination of navigability, once made, applies laterally over the entire surface of the waterbody and is not extinguished by later actions or events which impede or destroy navigable capacity. The upper limit of navigable water is at the point along its length where the character of the river changes from navigable to non-navigable, such as at a major fall or rapids. Since the upper limit of navigability of waterways under Section 10 jurisdiction is sometimes difficult to discern, determinations of navigability under Section 10 are often made by the Corps and kept on file, independent of submitted permit applications or delineations.

Federal Endangered Species Act (ESA)

The Federal Endangered Species Act (ESA) protects listed species from harm or “take,” broadly defined as to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.” Any such activity can be defined as a “take” even if it is unintentional or accidental. The USFWS has jurisdiction over federal threatened and endangered plant and wildlife species.

An endangered species is defined as a species “in danger of extinction within the foreseeable future throughout all or a significant portion of its range,” while a threatened species is defined as a species “likely to become an endangered species” (USFWS 2013). A candidate species is defined as one which the USFWS has “sufficient information on biological vulnerability and threat(s) to support an issuance of a proposed rule to list but issuance of the proposed rule is precluded” (USFWS 2013). Endangered and threatened species are protected under the ESA, while candidate species are generally not afforded protection.

Under Section 7 of the ESA, federal agencies involved in permitting that may or will result in the take of federal listed species are required to consult with the USFWS prior to issuance of the permit. If the action in question does not involve another federal permit, under Section 10 of the

ESA, direct consultation with the USFWS is necessary for the issuance of a take permit. Certain activities regarding endangered and threatened plants are regulated under Section 9 of the ESA. The removal, intentional or malicious damage, or intentional destruction of federal listed plant species are prohibited under the ESA.

Migratory Bird Treaty Act (MBTA)

The federal Migratory Bird Treaty Act (MBTA) of 1918 prohibits the take, killing, selling, purchasing, and any attempt thereof of migratory birds, or parts of migratory birds, or their eggs and/or nests. Under the MBTA, "take" is defined as "to pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires." Most birds native to North America, migratory or otherwise, are protected by the MBTA. Several non-native species, such as European starling and house sparrow, are not protected under the MBTA. Permission to take birds protected under the MBTA, but otherwise not protected under other legal provisions (e.g., ESA), is subject to review and approval by the USFWS.

6.6.3 State Regulations

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act of 1969 established the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCB) in the State of California. The SWRCB and RWQCB regulate activities in waters of the State which include "Waters of the U.S." "Waters of the State" are defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state."

The RWQCB regulates discharges of fill and dredged material that require a Section 404 permit from the Corps under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act through the State Water Quality Certification Program. State Water Quality Certification is necessary for projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact "Waters of the State." In order for a Section 404 permit to be valid, Section 401 of the CWA requires a Water Quality Certification or waiver to be obtained. The Water Quality Certification (or waiver) is issued if the RWQCB assesses that permitted activities will not violate water quality standards individually or cumulatively over the term of the action. Water Quality Certification must be consistent with the requirements of the Federal CWA, the California Environmental Quality Act, the California Endangered Species Act, and the Porter-Cologne Act.

If a proposed project or portion of a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to "Waters of the State," the RWQCB has the option to regulate the dredge and fill activity under its state authority in the form of Waste Discharge Requirements or Certification of Waste Discharge Requirements. In these cases a Water Quality Certification is not necessary under Section 401 of the CWA because federal jurisdiction does not apply.

California Endangered Species Act (CESA)

Functionally very similar to the ESA, the California Endangered Species Act (CESA) is intended to provide additional protection to endangered and threatened species within the State of California. State listed species include endangered, threatened, and candidate species, the latter of which is afforded protection under the CESA. Under the auspice of the CDFW, the CESA does not supersede the federal ESA, but works in conjunction with it.

Under proposed project impacts, state-listed species require an “incidental take” permit under Section 2081 of the California Fish and Game Code (CFGC), but only if (1) the take is incidental under an otherwise lawful activity; (2) impacts are minimized and fully mitigated; (3) mitigation is proportional and capable of successful implementation; and (4) adequate funding is provided to implement required minimization and mitigation measures including monitoring compliance.

California Fish and Game Code (CFGC)

Under Sections 1600-1616 of the California Fish and Game Code (CFGC), streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by CDFW. Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term “stream”, which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life…[including] watercourses having a surface or subsurface flow that supports or has supported riparian vegetation” (14 CCR 1.72). In addition, the term “stream” can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFG 1994). “Riparian” is defined as “on, or pertaining to, the banks of a stream.” Riparian vegetation is defined as “vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself” (CDFG 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFW.

In addition to the protection of lakes, streams, and riparian areas, the CDFW designates certain wildlife species as “fully protected” under several sections of the CFGC. Bird species are protected under Section 3511, mammals under Section 4700, herpetofauna under Section 5050, and fishes under Section 5515. It is unlawful to take or possess fully protected species at any time, and permission to do so is generally never granted by the CDFW.

6.6.4 Other Guidance and Considerations

State Species of Special Concern, Special Animal Lists, and Special Plant Lists

The CDFW maintains several lists composing the Species of Special Concern (Jennings and Hayes 1994, Shuford and Gardali 2008, Williams 1986). Generally, species of special concern are those species the CDFW considers to have a particularly restricted distribution, associated with declining or sensitive habitats, or have experienced noticeable population declines. Regardless of legal status (e.g., federal / state threatened), these species are inventoried in the CNDDB, and may be considered under CEQA or other state permitting action during proposed project implementation.

In addition to the Species of Special Concern, the CDFW maintains a Special Animals List (CDFG 2011) and Special Plants List (CDFW 2013b). The species on these lists are considered by the CDFW to be of the greatest conservation need and are typically special-status species with other state or federal protection. These species are either listed or candidates for listing under the ESA or CESA, species that meet the criteria for listing, species that are state Species of Special Concern, taxa that are biologically rare, very restricted in distribution or their habitat requirements, declining throughout their range, have a vulnerable stage in their life cycle that warrants monitoring, or taxa that are on the periphery of their range and are threatened with their extirpation in California. Generally, these species are protected under federal and/or state laws, and are considered under CEQA.

Sensitive Biological Communities and California Native Plant Society Ranks

Sensitive biological communities include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFW. CDFW ranks sensitive communities as "threatened" or "very threatened" and keeps records of their occurrences in its CNDDB (CDFG 2013a). Sensitive plant communities are also identified by CDFW (CDFG 2003, CDFG 2007, CDFG 2009), and CNDDB vegetation alliances are ranked 1 through 5 based on NatureServe's (2013) methodology, with those alliances ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified in local or regional plans, policies, or regulations or those identified by the CDFW or USFWS must be considered and evaluated under CEQA (CCR Title 14, Div. 6, Chap. 3, Appendix G). Specific habitats may also be identified as sensitive in city or county general plans or ordinances.

Plant species included within the CNPS Inventory of Rare and Endangered Plants (CNPS 2013) with California Rare Plant Rank (Rank) of 1 and 2 are also considered special-status plant species and must be considered under CEQA. Very few Rank 3 or Rank 4 plants meet the definitions of Section 1901 Chapter 10 of the Native Plant Protection Act or Sections 2062 and 2067 of the CFGC that outlines the California Endangered Species Act. However, CNPS and CDFW strongly recommend that these species be fully considered during the preparation of environmental documentation relating to CEQA. This may be particularly appropriate for the type locality of Rank 3 and 4 plants, for populations at the periphery of a species range, or in areas where the taxon is especially uncommon, or has sustained heavy losses, or from populations exhibiting unusual morphology, or occurring on unusual substrates.

A CNPS Rank 1A plant is a species, subspecies, or variety that is considered to be extinct. A Rank 1B plant is considered rare, threatened, or endangered in California and elsewhere. A Rank 2 plant is considered rare, threatened, or endangered in California but is more common elsewhere. A Rank 3 plant is potentially endangered but additional information on taxonomy, rarity, and endangerment is needed. A Rank 4 plant has a limited distribution but is presently not endangered.

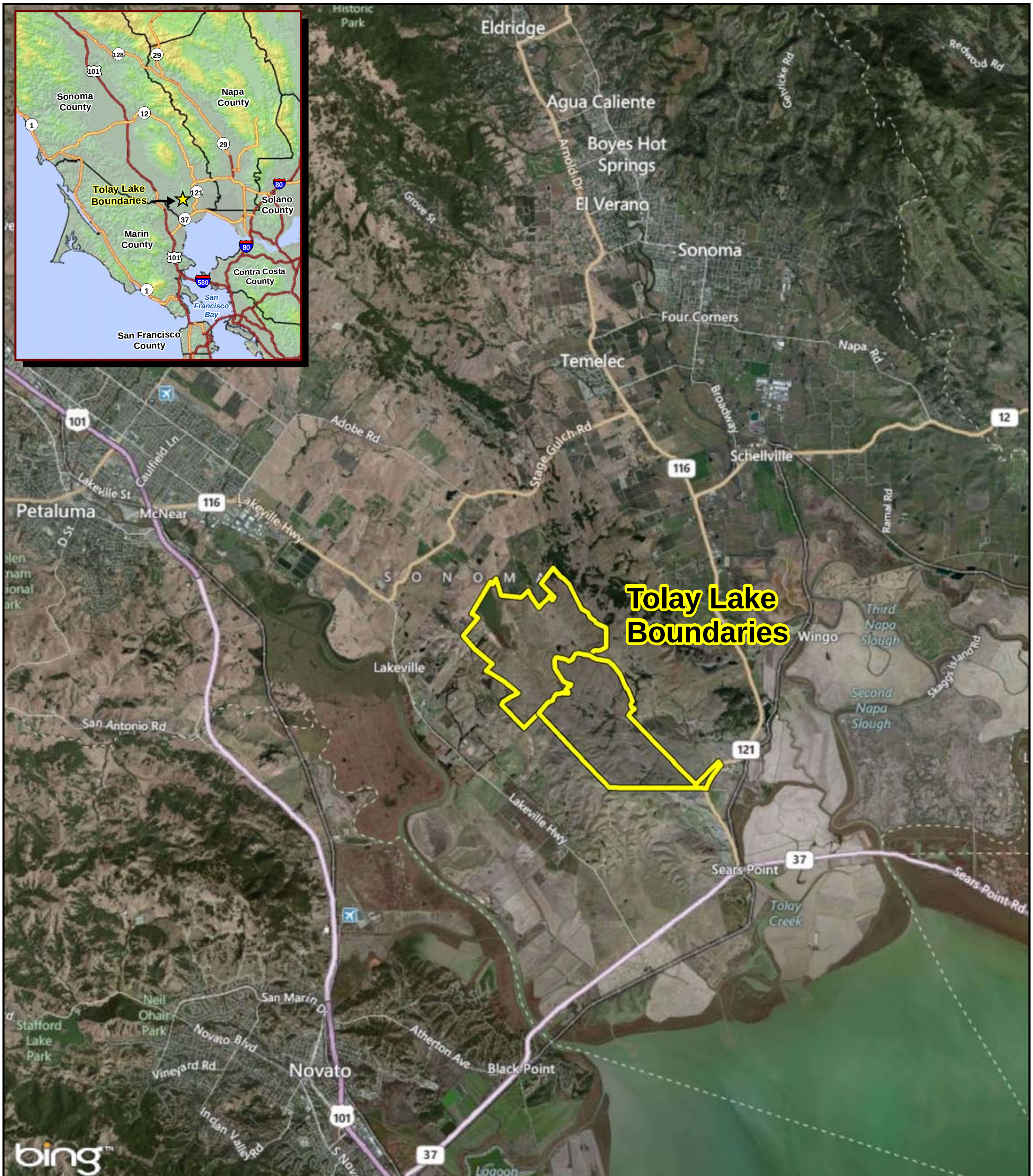

Figure 1. Location and Setting of Tolay Regional Park

Tolay Lake Regional Park
Sonoma County, California

0 0.5 1 2
Miles

wra
ENVIRONMENTAL CONSULTANTS

Date: January 2012
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Location.mxd

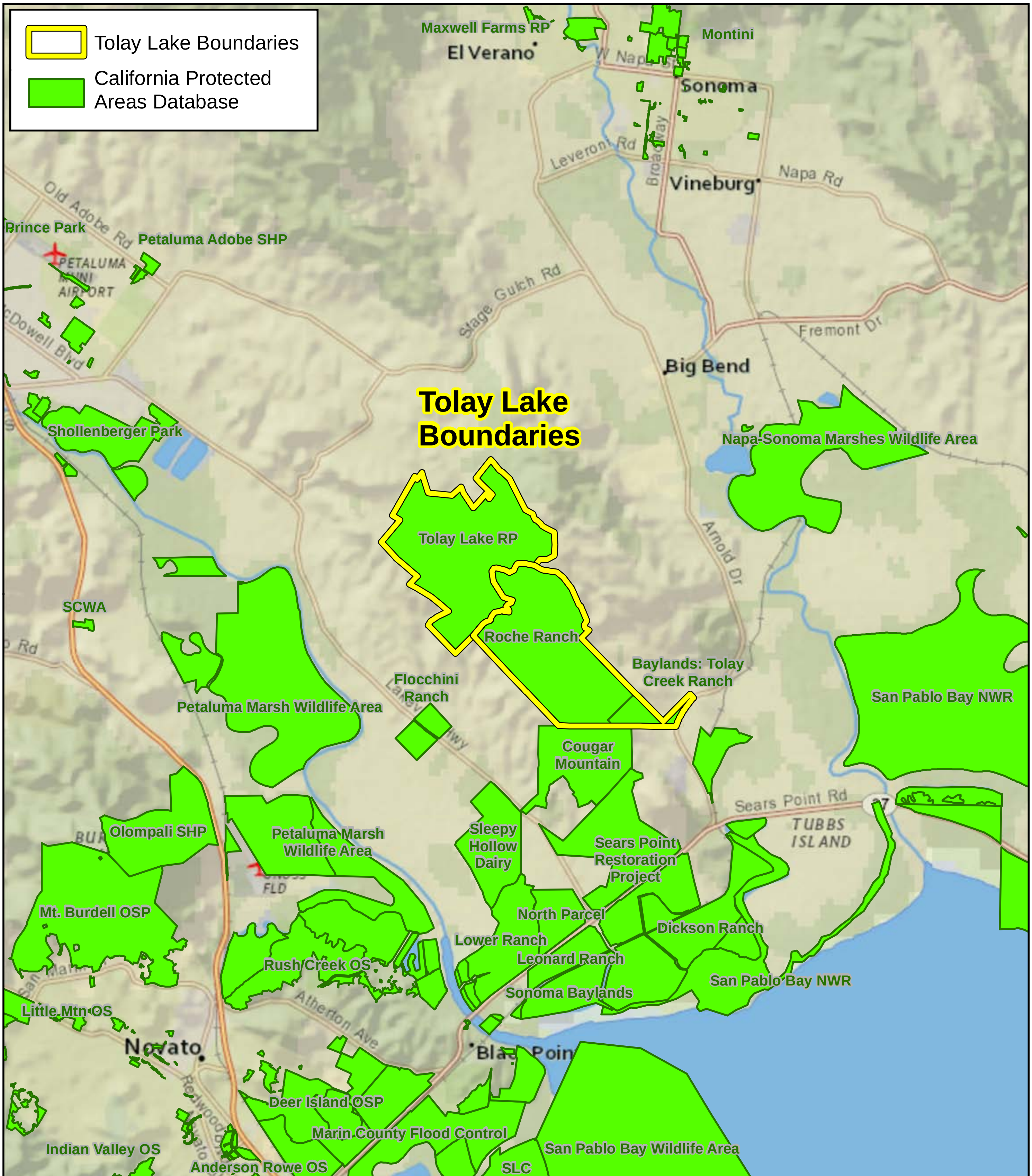

Figure 2. Conserved Lands in the Tolay Lake Regional Park Region

Tolay Lake Regional Park
Sonoma County, California

ENVIRONMENTAL CONSULTANTS

Date: March 2013
Map By: Michael Rochelle
Basemap: NatGeo

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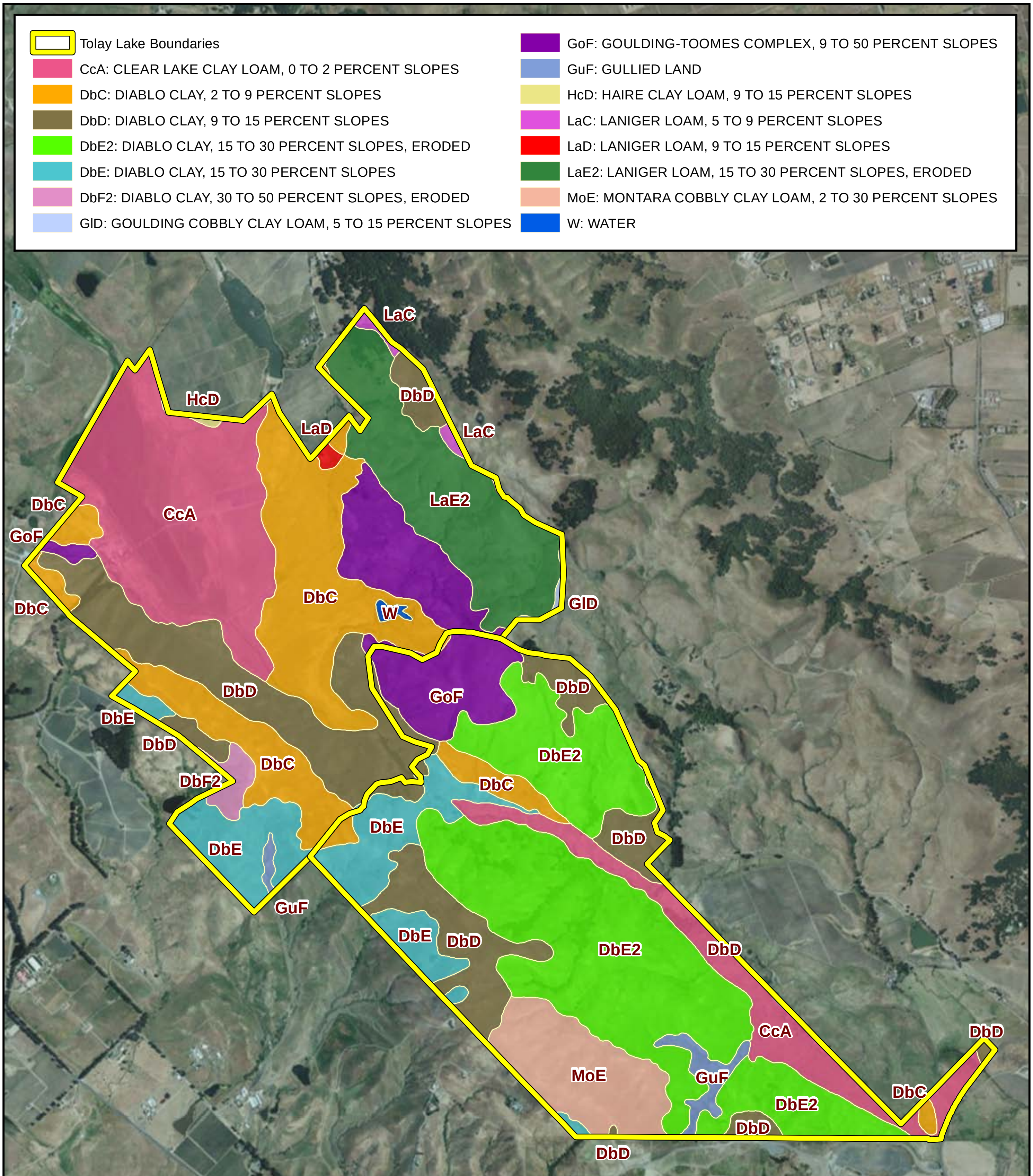


Figure 3. Mapped Soil Units within Tolay Lake Regional Park

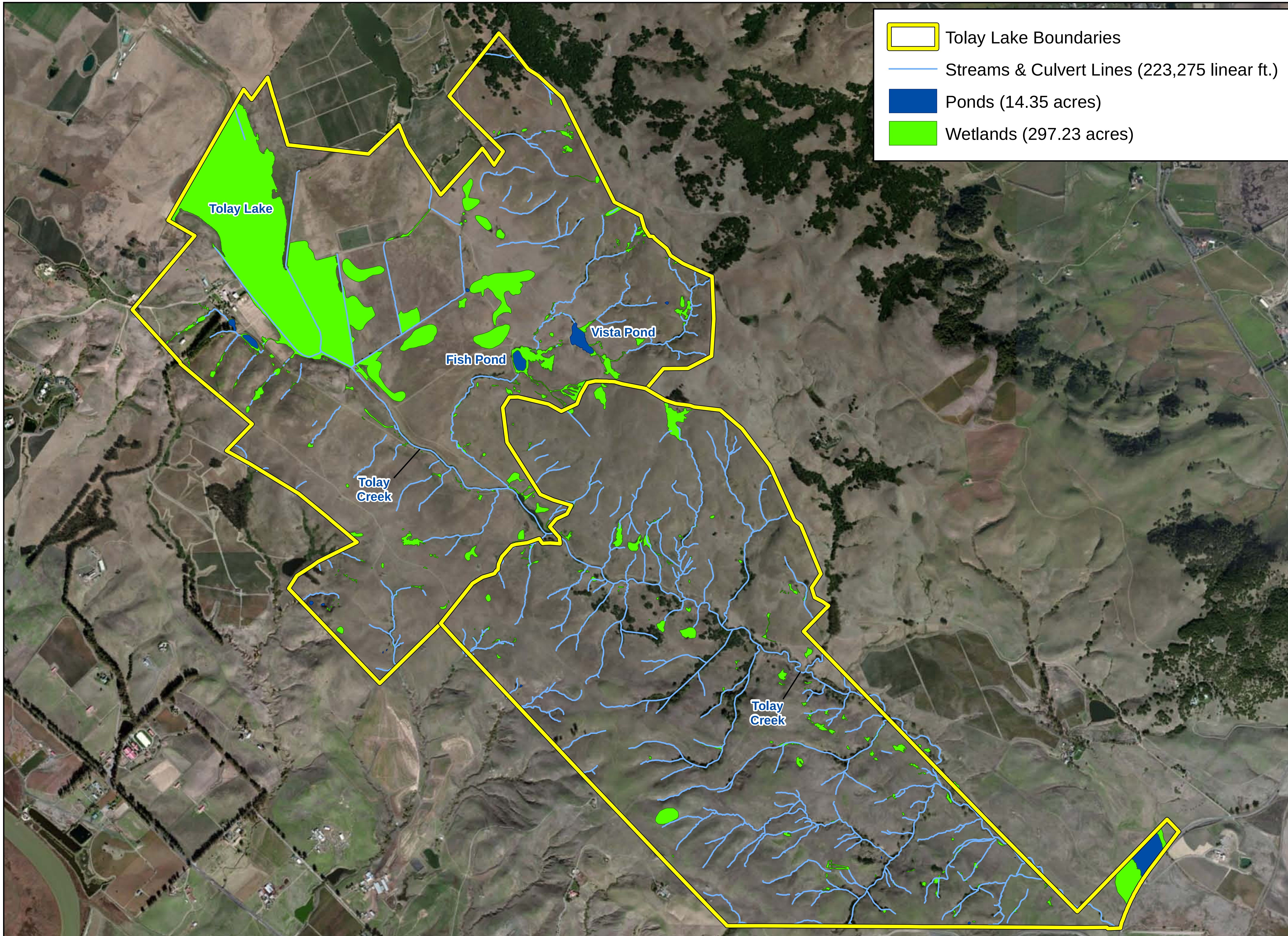
Tolay Lake Regional Park
Sonoma County, California

0 1,250 2,500 5,000
Feet

ENVIRONMENTAL CONSULTANTS

Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Soils.mxd



wra ENVIRONMENTAL CONSULTANTS

Tolay Lake Regional Park

Sonoma County, California

Figure 4.

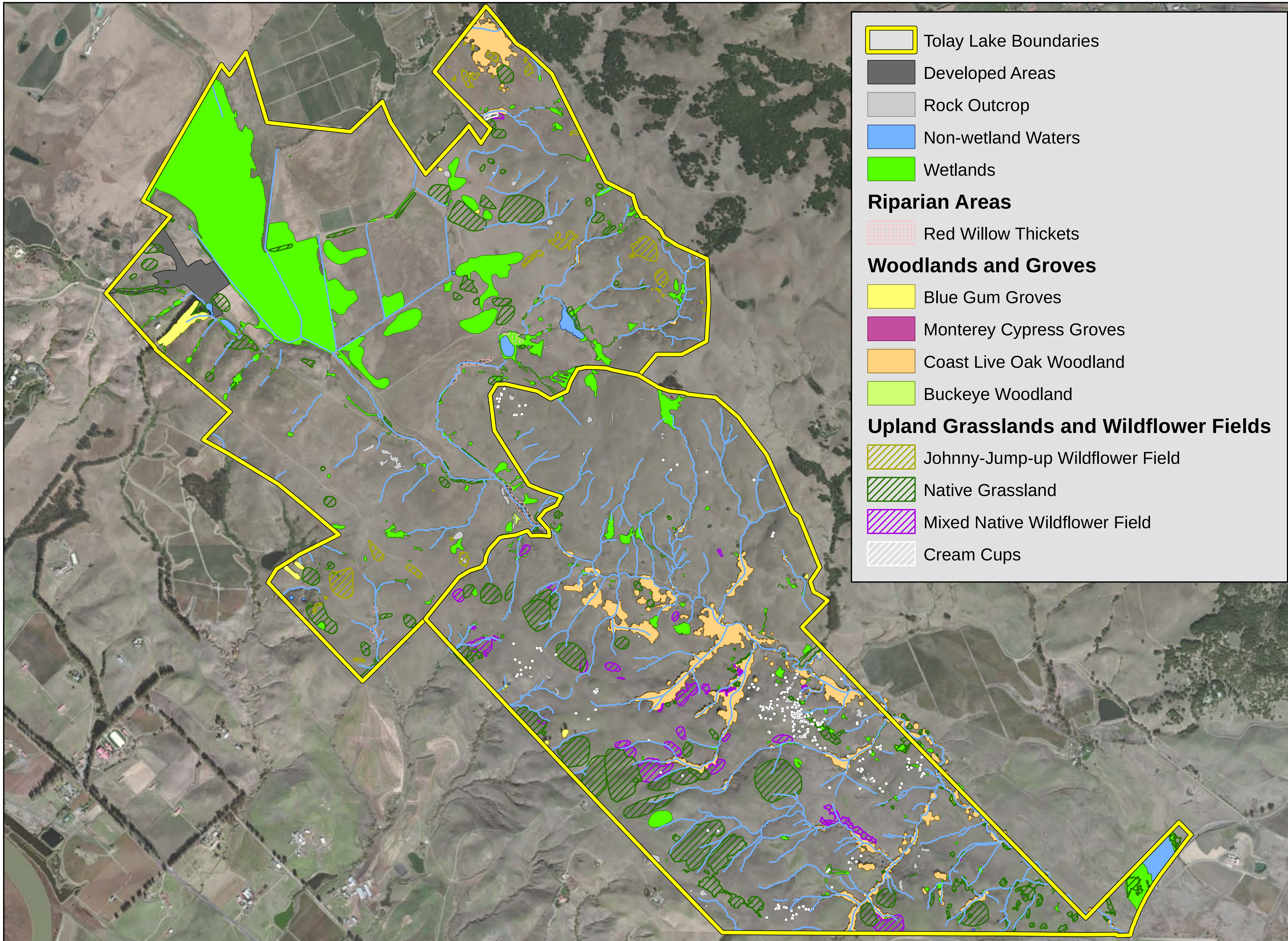
Wetlands and Waters Mapped in Tolay Lake Regional Park

N
W E
S

0 1,000 2,000 Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Wetlands and Waters.mxd



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ENVIRONMENTAL CONSULTANTS

Tolay Lake Regional Park

Sonoma County, California

Figure 5.

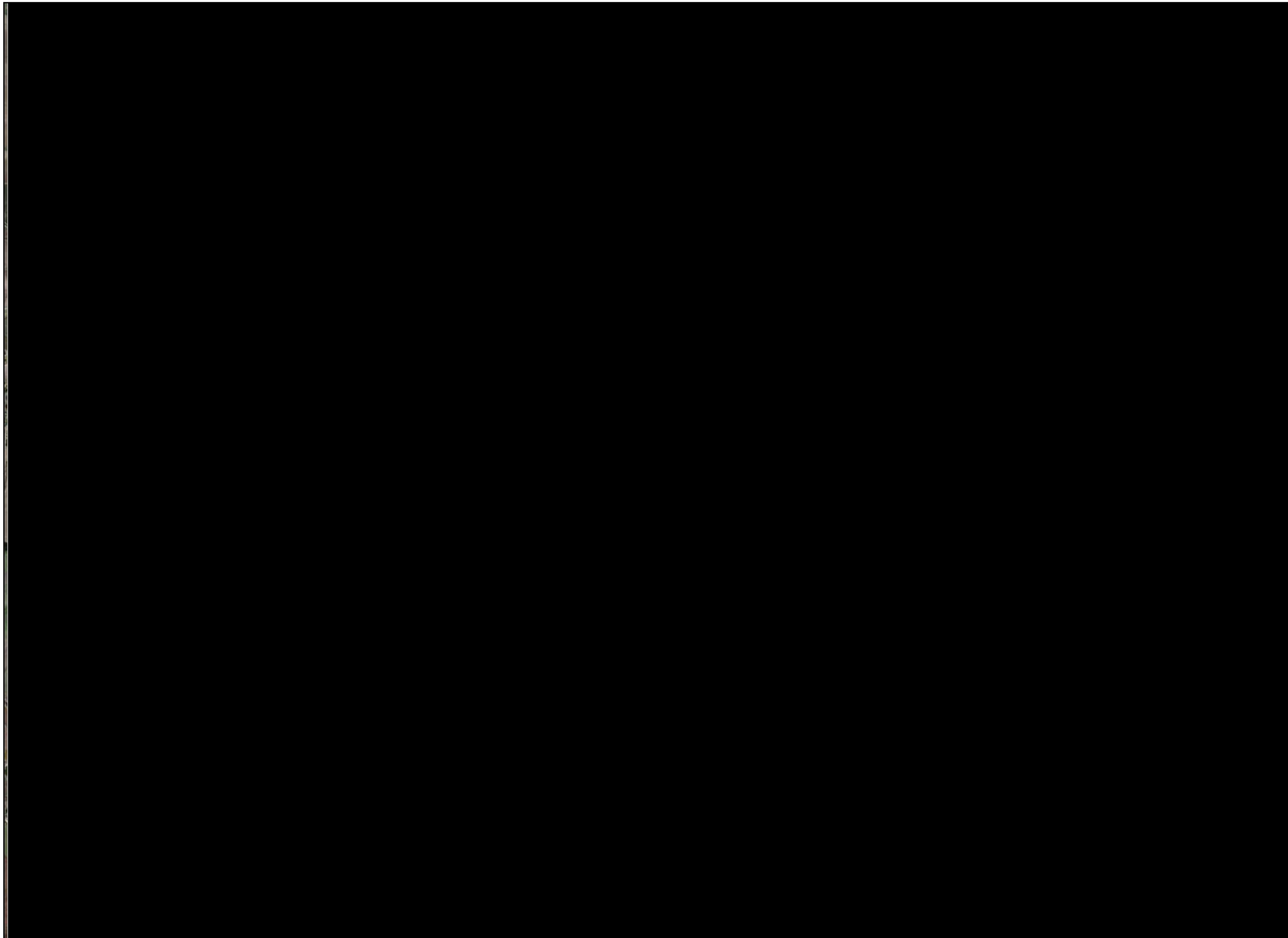
Biological Communities within Tolay Lake Regional Park

N
W E
S

0 1,000 2,000 Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Biological Communities.mxd

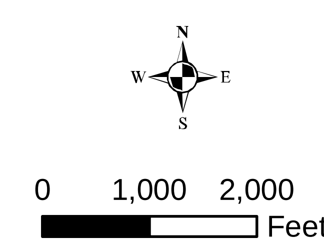


Tolay Lake
Regional Park

Sonoma County,
California

Figure 6.

Special-status Plant and Wildlife Species within Tolay Lake Regional Park



Map Date: June 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

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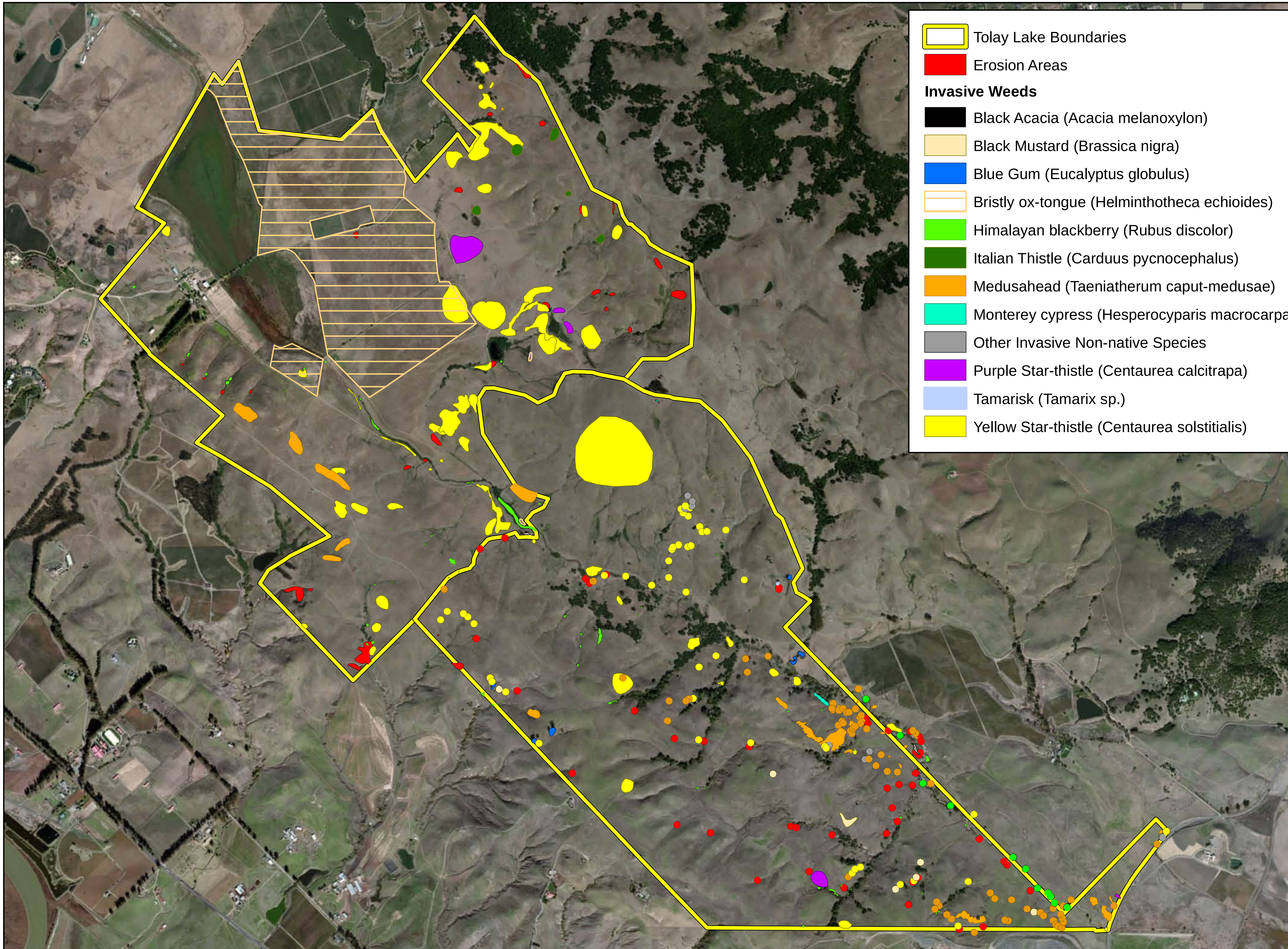


WRA ENVIRONMENTAL CONSULTANTS

Tolay Lake Regional Park

Sonoma County, California

Figure 7.

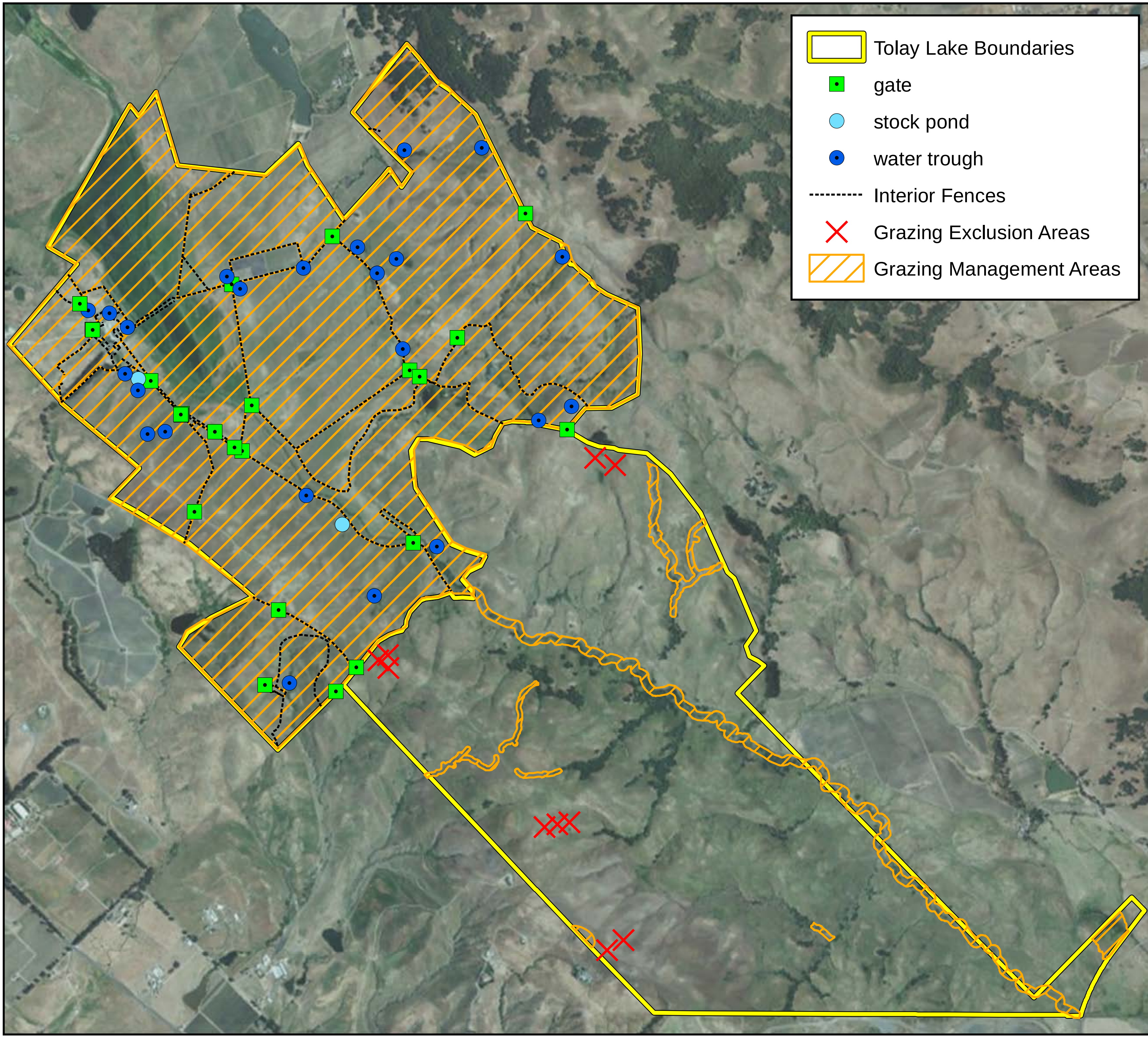
Invasive Plant Species and Erosion within Tolay Lake Regional Park

N W E S

0 1,000 2,000 Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Invasives and erosion.mxd



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ENVIRONMENTAL CONSULTANTS

Tolay Lake
Regional Park

Sonoma County,
California

Figure 8.

Grazing Management
and Infastructure
within Tolay Lake
Regional Park

N
W E
S

0 1,500 3,000
Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Grazing.mxd

Figure 1. Location and Setting of Tolay Lake Regional Park

Figure 2. Conserved Lands in the Tolay Lake Regional Park Region

Figure 3. Mapped Soil Units within Tolay Lake Regional Park

Figure 4. Biological Communities within Tolay Lake Regional Park

Figure 5. Special-status Plant and Wildlife Species and Resources within Tolay Lake Regional Park

Figure 6. Invasive Plant Species and Erosion within Tolay Lake Regional Park

Figure 7. Grazing Management and Infrastructure within Tolay Lake Regional Park

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Appendix A – Plant and Wildlife Species Observed within the Park

Table A-1. Plant Species Observed at Tolay Lake Regional Park by LSA Associates 2006-2008, and WRA 2013

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Agavaceae [Liliaceae]	*Chlorogalum pomeridianum* var. *pomeridianum*	common soap plant	perennial forb	native	--	--	NL	--	--
Alismataceae	*Alisma lanceolatum*	water plantain	perennial forb	non-native	--	--	OBL	--	--
Amaranthaceae	*Amaranthus blitoides*	mat amaranth	annual forb	native	--	--	NL	--	--
Amaranthaceae	*Amaranthus retroflexus*	redroot amaranth	annual forb	non-native	--	--	NL	--	--
Anacardiaceae	*Toxicodendron diversilobum*	poison oak	deciduous shrub	native	--	--	NL	--	--
Apiaceae	*Conium maculatum*	poison hemlock	perennial forb	non-native	--	moderate	FAC	--	--
Apiaceae	*Daucus pusillus*	American wild carrot	annual forb	native	--	--	NL	--	--
Apiaceae	*Eryngium aristulatum* var. *aristulatum*	California button celery	perennial forb	native	--	--	OBL	--	VPA?
Apiaceae	*Eryngium armatum*	coastal button celery	perennial forb	native	--	--	FACW	--	VPA?
Apiaceae	*Foeniculum vulgare*	fennel	perennial forb	non-native	--	high	NL	--	--
Apiaceae	*Lomatium utriculatum*	hog fennel	perennial forb	native	--	--	NL	WI	--
Apiaceae	*Lomatium* sp.	biscuit root	perennial forb	native	--	--	NL	unknown	--
Apiaceae	*Osmorhiza berteroi*	sweet cicely	perennial forb	native	--	--	FACU	--	--
Apiaceae	*Perideridia kelloggii*	Kellogg's yampah	perennial forb	native	--	--	NL	WI	--
Apiaceae	*Sanicula bipinnata*	poison sanicle	perennial forb	native	--	--	NL	--	--
Apiaceae	*Sanicula bipinnatifida*	purple sanicle	perennial forb	native	--	--	NL	WI	--
Apiaceae	*Sanicula crassicaulis*	Gamble weed	perennial forb	native	--	--	NL	--	--
Apiaceae	*Scandix pecten-veneris*	shepherd’s needle	annual forb	non-native	--	--	NL	--	--
Apiaceae	*Torilis arvensis*	hedge parsley	annual forb	non-native	--	moderate	NL	--	--
Apiaceae	*Torilis nodosa*	knotted hedgeparsley	annual forb	non-native	--	--	NL	--	--
Apocynaceae [Asclepiadaceae]	*Asclepias fascicularis*	Mexican milkweed	perennial forb	native	--	--	FAC	--	GEN
Araceae	*Lemna* sp.	duck weed	perennial forb	native	--	--	OBL	--	unknown
Araliaceae [Apiaceae]	*Hydrocotyle ranunculoides*	water pennywort	perennial forb	native	--	--	OBL	--	--
Aristolochiaceae	*Aristolochia californica*	Dutchman's pipe	perennial vine	native	--	--	NL	--	--
Asteraceae	*Achillea millefolium*	common yarrow	perenial forb	native	--	--	FACU	--	--
Asteraceae	*Achyrachaena mollis*	soft blow wives	annual forb	native	--	--	FAC	--	GEN
Asteraceae	*Agoseris grandiflora*	large-flowered agoseris	perenial forb	native	--	--	NL	--	--
Asteraceae	*Anthemis cotula*	mayweed	annual forb	non-native	--	assessed	FACU	--	--
Asteraceae	*Artemisia douglasiana*	mugwort	perennial forb	native	--	--	FACW	--	--
Asteraceae	*Baccharis pilularis* ssp. *consanguinea*	coyote brush	evergreen shrub	native	--	--	NL	--	--
Asteraceae	*Baccharis salicifolia*	mule fat	evergreen shrub	native	--	--	FACW	--	--
Asteraceae	*Blennosperma nanum* var. *nanum*	common blennosperma	annual forb	native	--	--	FACW	--	VPI?

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Asteraceae	*Carduus pycnocephalus*	Italian thistle	annual forb	non-native	--	moderate	NL	--	--
Asteraceae	*Centaurea calcitrapa*	purple star thistle	annual forb	non-native	--	moderate	NL	--	--
Asteraceae	*Centaurea melitensis*	tocalote	annual forb	non-native	--	moderate	NL	--	--
Asteraceae	*Centaurea solstitialis*	yellow star thistle	annual forb	non-native	--	high	NL	--	GEN
Asteraceae	*Cirsium vulgare*	bull thistle	perennial forb	non-native	--	moderate	FACU	--	--
Asteraceae	*Cotula coronopifolia*	brass buttons	perennial forb	non-native	--	limited	OBL	--	GEN
Asteraceae	*Erigeron philadelphicus*	Philadelphia fleabane	perennial forb	native	--	--	FACU	--	--
Asteraceae	*Eurybia radulina* [*Aster radulinus*]	roughleaf aster	perennial forb	native	--	--	NL	--	--
Asteraceae	*Grindelia camporum*	common gumplant	perennial forb	native	--	--	FACW	WI	--
Asteraceae	*Helminthotheca echioides* [*Picris echioides*]	bristly ox-tongue	perennial forb	non-native	--	limited	FAC	--	--
Asteraceae	*Hemizonia congesta* ssp. *lutescens*	yellow hayfield tarweed	annual forb	native	--	--	NL	--	--
Asteraceae	*Hemizonia congesta* ssp. *luzulifolia*	white hayfield tarweed	annual forb	native	--	--	NL	--	--
Asteraceae	*Hesperevax sparsiflora* var. *sparsiflora*	erect dwarf cudweed	annual forb	native	--	--	FACU	WI	--
Asteraceae	*Hypochaeris glabra*	smooth catsear	annual forb	non-native	--	limited	NL	--	GEN
Asteraceae	*Hypochaeris radicata*	hairy catsear	perennial forb	non-native	--	moderate	FACU	--	--
Asteraceae	*Lactuca saligna*	willowleaf lettuce	annual forb	non-native	--	--	FACU	--	--
Asteraceae	*Lactuca serriola*	prickly lettuce	annual forb	non-native	--	assessed	FACU	--	--
Asteraceae	*Lasthenia californica* ssp. *californica*	California goldfields	annual forb	native	--	--	UPL	--	VPA?
Asteraceae	*Lasthenia glaberrima*	smooth goldfields	annual forb	native	--	--	OBL	--	VPI?
Asteraceae	*Layia chrysanthemoides*	smooth tidytips	annual forb	native	--	--	FACW	--	GEN
Asteraceae	*Layia gaillardioides*	woodland tidytips	annual forb	native	--	--	NL	--	--
Asteraceae	*Layia platyglossa*	coastal tidytips	annual forb	native	--	--	NL	--	--
Asteraceae	*Madia gracilis*	gumweed tarweed	annual forb	native	--	--	NL	--	--
Asteraceae	*Madia sativa*	coast tarweed	annual forb	native	--	--	NL	--	GEN
Asteraceae	*Matricaria discoidea* [*Chamomilla suaveolens*]	pineapple weed	annual forb	non-native	--	--	FACU	--	GEN
Asteraceae	*Microseris douglasii* ssp. *tenella*	Douglas' silverpuffs	annual forb	native	--	--	UPL	WI/IN	GEN
Asteraceae	*Pseudognaphalium luteoalbum* [*Gnaphalium luteoalbum*]	Jersey cudweed	annual forb	non-native	--	--	FACW	--	--
Asteraceae	*Pseudognaphalium stramineum* [*Gnaphalium stramineum*]	cotton batting plant	perennial forb	native	--	--	FAC	--	--
Asteraceae	*Senecio vulgaris*	old man in the Spring	annual forb	non-native	--	--	FACU	--	GEN
Asteraceae	*Silybum marianum*	milk thistle	perennial forb	non-native	--	limited	NL	--	--
Asteraceae	*Sonchus asper* ssp. *asper*	prickly sow thistle	annual forb	non-native	--	assessed	FACU	--	--

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Asteraceae	*Sonchus oleraceus*	common sow thistle	annual forb	non-native	--	--	NL	--	--
Asteraceae	*Taraxacum officinale*	common dandelion	perennial forb	non-native	--	assessed	FACU	--	--
Asteraceae	*Tragopogon porrifolius*	purple salsify	perennial forb	non-native	--	--	NL	--	--
Asteraceae	*Wyethia angustifolia*	narrow leaf mule ears	perennial forb	native	--	--	FACU	--	--
Asteraceae	*Xanthium spinosum*	spiny cocklebur	annual forb	native	--	--	FACU	--	--
Asteraceae	*Xanthium strumarium*	rough cocklebur	annual forb	native	--	--	FAC	--	GEN
Boraginaceae	*Amsinckia intermedia* [*Amsinckia menziesii* var. *intermedia*]	common fiddleneck	annual forb	native	--	--	NL	--	--
Boraginaceae	*Amsinckia menziesii* [*Amsinckia menziesii* var. *menziesii*]	Menzies' fiddleneck	annual forb	native	--	--	NL	--	--
Boraginaceae	*Heliotropium curassavicum* var. *oculatum*	heliotrope	perennial forb	native	--	--	OBL	--	GEN
Boraginaceae [Hydrophyllaceae]	*Nemophila heterophylla*	white baby blue eyes	annual forb	native	--	--	NL	--	--
Boraginaceae [Hydrophyllaceae]	*Phacelia* sp.	phacelia	annual or perennial forb	native	unknown	--	unknown	unknown	--
Boraginaceae	*Plagiobothrys nothofulvus*	rusty popcornflower	annual forb	native	--	--	FAC	--	GEN
Boraginaceae	*Plagiobothrys stipitatus*	slender popcornflower	annual forb	native	--	--	FACW	--	VPA?
Brassicaceae	*Brassica nigra*	black mustard	annual forb	non-native	--	moderate	NL	--	--
Brassicaceae	*Capsella bursa-pastoris*	shepherd's purse	annual forb	non-native	--	--	FACU	--	GEN
Brassicaceae	*Cardamine californica*	California Toothwort	perennial forb	native	--	--	NL	--	--
Brassicaceae	*Cardamine oligosperma*	Idaho bittercress	annual forb	native	--	--	NL	--	GEN
Brassicaceae	*Caulanthus lasiophyllus* [*Guillenia lasiophylla*]	California mustard	annual forb	native	--	--	NL	--	--
Brassicaceae	*Lepidium nitidum*	shining pepperweed	annual forb	native	--	--	FAC	--	VPA?
Brassicaceae	*Nasturtium officinale* [*Rorippa nasturtium-aquaticum*]	watercress	perennial forb	native	--	--	OBL	--	GEN
Brassicaceae	*Raphanus raphanistrum*	jointed charlock	perennial forb	non-native	--	--	NL	--	--
Brassicaceae	*Raphanus sativus*	wild radish	perennial forb	non-native	--	limited	NL	--	--
Brassicaceae	*Rorippa curvisiliqua*	curvepod yellowcress	perennial forb	native	--	--	OBL	--	GEN
Brassicaceae	*Sinapis arvensis*	charlock	annual forb	non-native	--	limited	NL	--	--
Brassicaceae	*Sisymbrium officinale*	hedge mustard	annual forb	non-native	--	--	NL	--	--
Campanulaceae	*Downingia pulchella*	flat-face calicoflower	annual forb	native	--	--	OBL	--	VPA
Caprifoliaceae	*Symphoricarpos albus* var. *laevigatus*	upright snowberry	deciduous shrub	native	--	--	FACU	--	--
Caprifoliaceae	*Symphoricarpos mollis*	creeping snowberry	deciduous shrub	native	--	--	NL	--	--
Caryophyllaceae	*Cerastium fontanum* ssp. *vulgare*	mouse-ear chickweed	perennial forb	non-native	--	--	FACU	--	--
Caryophyllaceae	*Cerastium glomeratum*	mouse-ear chickweed	annual forb	non-native	--	--	FACU	--	GEN

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Caryophyllaceae	*Minuartia douglasii*	Douglas' stitchwort	annual forb	native	--	--	NL	SI	--
Caryophyllaceae	*Polycarpon tetraphyllum*	fourleaf manyseed	annual forb	non-native	--	--	NL	--	GEN
Caryophyllaceae	*Sagina apetala*	annual pearlwort	annual forb	native	--	--	FAC	--	--
Caryophyllaceae	*Silene gallica*	windmill pink	annual forb	non-native	--	--	NL	--	GEN
Caryophyllaceae	*Spergularia rubra*	red sandspurry	perennial forb	non-native	--	--	FAC	--	GEN
Caryophyllaceae	*Stellaria media*	common chickweed	annual forb	non-native	--	--	FACU	--	GEN
Chenopodiaceae	*Atriplex prostrata* [*Atriplex triangularis*]	fat hen	annual forb	non-native	--	--	FAC	--	--
Chenopodiaceae	*Chenopodium album*	white goosefoot	annual forb	non-native	--	--	FACU	--	--
Convolvulaceae	*Calystegia subacaulis* ssp. *subacaulis*	hillside morning glory	perennial forb	native	--	--	NL	--	--
Convolvulaceae	*Convolvulus arvensis*	field bindweed	perennial forb	non-native	--	assessed	NL	--	GEN
Convolvulaceae [Cuscutaceae]	*Cuscuta* sp.	dodder	annual forb	unknown	unknown	unknown	unknown	unknown	unknown
Convolvulaceae	*Cressa truxillensis*	spreading alkaliweed	perennial forb	native	--	--	FACW	--	VPA
Crassulaceae	*Crassula aquatica*	water pygmyweed	annual forb	native	--	--	OBL	--	VPI?
Crassulaceae	*Crassula connata*	sand pygmyweed	annual forb	native	--	--	FAC	--	GEN
Cucurbitaceae	*Marah fabacea*	wild cucumber	perennival vine	native	--	--	NL	--	--
Cupressaceae	*Hesperocyparis macrocarpa* [*Cupressus macrocarpus*]	Monterey cypress	evergreen tree	native	Rank 1B.2*	--	NL	--	--
Cyperaceae	*Bolboschoenus maritimus* [*Scirpus maritimus*]	saltmarsh bulrush	perennial graminoid	native	--	--	OBL	--	--
Cyperaceae	*Carex abrupta*	abrupt-beaked bulrush	perennial graminoid	native	--	--	FAC	--	--
Cyperaceae	*Carex* sp.	sedge	perennial graminoid	native?	unknown	--	unknown	unknown	unknown
Cyperaceae	*Carex* sp.	sedge	perennial graminoid	native?	unknown	--	unknown	unknown	unknown
Cyperaceae	*Cyperus eragrostis*	tall flatsedge	perennial graminoid	native	--	--	FACW	--	GEN
Cyperaceae	*Eleocharis macrostachya*	common spikerush	perennial graminoid	native	--	--	OBL	--	VPI?
Cyperaceae	*Schoenoplectus acutus* var. *occidentalis* [*Scirpus acutus* var. *occidentalis*]	hardstem bulrush	perennial graminoid	native	--	--	OBL	--	--
Cyperaceae	*Schoenoplectus americanus* [*Scirpus americanus*]	chairmaker's bulrush	perennial graminoid	native	--	--	OBL	--	--
Dipsacaceae	*Dipsacus fullonum*	Fuller's teasel	perennial forb	non-native	--	moderate	FAC	--	--
Dryopteridaceae	*Dryopteris arguta*	California wood fern	perennial fern	native	--	--	NL	--	--
Equisetaceae	*Equisetum arvense*	field horsetail	perennial fern	native	--	--	FAC	--	--
Equisetaceae	*Equisetum laevigatum*	smooth horsetail	perennial fern	native	--	--	FACW	--	--
Equisetaceae	*Equisetum telmateia* ssp. *braunii*	giant horsetail	perennial fern	native	--	--	FACW	--	--
Ericaceae	*Arbutus menziesii*	Pacific madrone	evergreen tree	native	--	--	NL	--	--

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Euphorbiaceae	*Chamaesyce maculata*	spotted spurge	annual forb	non-native	--	--	NL	--	--
Euphorbiaceae	*Chamaesyce* sp.	spurge	annual or perennial forb	unknown	unknown	unknown	unknown	unknown	unknown
Euphorbiaceae	*Euphorbia crenulata*	Chinese caps	perennial forb	native	--	--	NL	--	--
Euphorbiaceae	*Euphorbia peplus*	petty spurge	annual forb	non-native	--	--	NL	--	--
Fabaceae	*Acacia melanoxylon*	blackwood acacia	evergreen tree	non-native	--	limited	NL	--	--
Fabaceae	*Acmispon americanus* var. *americanus* [*Lotus purshianus* var. *purshianus*]	American lotus	annual forb	native	--	--	NL	--	GEN
Fabaceae	*Acmispon wrangelianus* [*Lotus wrangelianus*]	Wrangel's lotus	annual forb	native	--	--	NL	--	--
Fabaceae	*Astragalus gambelianus*	Gambel's dwarf milk vetch	annual forb	native	--	--	NL	--	--
Fabaceae	*Glycyrrhiza lepidota*	American licorice	perennial forb	native	--	--	FAC	--	--
Fabaceae	*Lathyrus vestitus* var. *vestitus*	common Pacific pea	perennial forb	native	--	--	NL	WI	--
Fabaceae	*Lathyrus* sp.	pea	annual or perennial forb	unknown	unknown	unknown	unknown	unknown	unknown
Fabaceae	*Lotus corniculatus*	bird's-foot trefoil	perennial forb	non-native	--	assessed	FAC	--	GEN
Fabaceae	*Lotus tenuis*	narrowleaf bird's-foot trefoil	perennial forb	non-native	--	--	NL	--	--
Fabaceae	*Lupinus bicolor*	miniature lupine	annual forb	native	--	--	NL	--	--
Fabaceae	*Lupinus formosus* var. *formosus*	summer lupine	perennial forb	native	--	--	NL	--	--
Fabaceae	*Lupinus microcarpus* var. *densiflorus*	chick lupine	annual forb	native	--	--	NL	--	--
Fabaceae	*Lupinus nanus*	sky lupine	annual forb	native	--	--	NL	--	GEN
Fabaceae	*Lupinus succulentus*	hollowleaf annual lupine	annual forb	native	--	--	NL	--	--
Fabaceae	*Medicago polymorpha*	bur medic	annual forb	non-native	--	limited	FACU	--	--
Fabaceae	*Melilotus indicus*	yellow annual sweetclover	annual forb	non-native	--	--	FACU	--	--
Fabaceae	*Melilotus officinalis*	yellow sweetclover	annual forb	non-native	--	assessed	FACU	--	--
Fabaceae	*Thermopsis californica* var. *californica*	California goldenbanner	perennial forb	native	--	--	NL	--	--
Fabaceae	*Trifolium albopurpureum*	rancheria clover	annual forb	native	--	--	FACU	--	--
Fabaceae	*Trifolium bifidum var. bifidum*	Pinole clover	annual forb	native	--	--	NL	--	--
Fabaceae	*Trifolium campestre*	hop clover	annual forb	non-native	--	--	NL	--	--
Fabaceae	*Trifolium ciliolatum*	tree clover	annual forb	native	--	--	NL	--	--
Fabaceae	*Trifolium depauperatum*	cowbag clover	annual forb	native	--	--	FAC	--	--
Fabaceae	*Trifolium dubium*	Shamrock clover	annual forb	non-native	--	--	FACU	--	--
Fabaceae	*Trifolium fragiferum*	strawberry clover	perennial forb	non-native	--	--	FACU	--	--
Fabaceae	*Trifolium fucatum*	bull clover	annual forb	native	--	--	FACU	WI/IN	--
Fabaceae	*Trifolium gracilentum*	pinpoint clover	annual forb	native	--	--	NL	WI/IN	--
Fabaceae	*Trifolium hirtum*	rose clover	annual forb	non-native	--	moderate	NL	--	--
Fabaceae	*Trifolium incarnatum*	crimson clover	annual forb	non-native	--	--	NL	--	--

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Fabaceae	*Trifolium microdon*	thimble clover	annual forb	native	--	--	NL	--	--
Fabaceae	*Trifolium oliganthum*	mini-tomcat clover	annual forb	native	--	--	NL	--	--
Fabaceae	*Trifolium subterraneum*	subterranean clover	annual forb	non-native	--	--	NL	--	--
Fabaceae	*Trifolium variegatum*	small-flowered variegated clover	annual forb	native	--	--	FAC	--	VPA?
Fabaceae	*Vicia benghalensis*	reddish tufted vetch	annual forb	non-native	--	--	NL	--	--
Fabaceae	*Vicia sativa ssp. nigra*	garden spring vetch	annual forb	non-native	--	--	UPL	--	--
Fabaceae	*Vicia sativa ssp. sativa*	pubescent spring vetch	annual forb	non-native	--	--	UPL	--	--
Fagaceae	*Quercus agrifolia* var. *agrifolia*	coast live oak	evergreen tree	native	--	--	NL	--	--
Fagaceae	*Quercus kelloggii*	California black oak	deciduous tree	native	--	--	NL	--	--
Fagaceae	*Quercus lobata*	valley oak	deciduous tree	native	--	--	FACU	--	--
Frankeniaceae	*Frankenia salina*	alkali heath	perennial forb	native	--	--	FACW	--	VPA?
Gentianaceae	*Zeltnera muehlenbergii* [*Centaurium muehlenbergii*]	Monterey centaury	annual forb	native	--	--	FACW	--	GEN
Geraniaceae	*Erodium botrys*	longbeak stork's bill	annual forb	non-native	--	assessed	FACU	--	GEN
Geraniaceae	*Erodium cicutarium*	redstem stork's bill	annual forb	non-native	--	limited	NL	--	--
Geraniaceae	*Erodium moschatum*	musky stork's bill	annual forb	non-native	--	assessed	NL	--	GEN
Geraniaceae	*Geranium dissectum*	cutleaf geranium	annual forb	non-native	--	moderate	NL	--	GEN
Geraniaceae	*Geranium molle*	woodland geranium	perenial forb	non-native	--	assessed	NL	--	GEN
Iridaceae	*Sisyrinchium bellum*	blue-eyed grass	perennial forb	native	--	--	FACW	--	--
Juncaceae	*Juncus balticus* ssp. *ater*	Baltic rush	perennial graminoid	native	--	--	FACW	--	--
Juncaceae	*Juncus bufonius*	toad rush	annual graminoid	native	--	--	FACW	--	VPA?
Juncaceae	*Juncus effusus* ssp. *pacificus*	Pacific rush	perennial graminoid	native	--	--	FACW	--	--
Juncaceae	*Juncus mexicanus*	Mexican rush	perennial graminoid	native	--	--	FACW	--	GEN
Juncaceae	*Juncus patens*	common rush	perennial graminoid	native	--	--	FACW	--	--
Juncaceae	*Juncus phaeocephalus*	brownhead rush	perennial graminoid	native	--	--	FAC	--	VPA?
Juncaginaceae	*Triglochin scilloides* [*Lilaea scilloides*]	flowering-quillwort	annual forb	native	--	--	OBL	--	VPI?
Lamiaceae	*Lamium purpureum*	purple deadnettle	annual forb	non-native	--	--	NL	--	--
Lamiaceae	*Marrubium vulgare*	horehound	perennial forb	non-native	--	limited	FACU	--	--
Lamiaceae	*Mentha pulegium*	pennyroyal	perennial forb	non-native	--	moderate	OBL	--	VPA?
Lamiaceae	*Stachys ajugoides*	bugle hedgenettle	perennial forb	native	--	--	OBL	--	VPA?
Lauraceae	*Umbellularia californica*	California bay	evergreen tree	native	--	--	FAC	--	--
Liliaceae	*Calochortus luteus*	yellow mariposa lily	perennial forb	native	--	--	NL	--	--
Liliaceae	*Calochortus venustus*	butterfly mariposa	perennial forb	native	--	--	NL	--	--
Liliaceae	*Fritillaria liliacea*	fragrant fritillary	perennial forb	native	Rank 1B.2	--	NL	WI	GEN

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Limnanthaceae	*Limnanthes douglasii*	Douglas' meadowfoam	annual forb	native	--	--	OBL	--	VPA
Linaceae	*Hesperolinon californicum*	California dwarf flax	annual forb	native	--	--	NL	SI	--
Lythraceae	*Ammannia coccinea*	purple ammannia	annual forb	native	--	--	OBL	--	--
Lythraceae	*Lythrum hyssopifolia*	hyssop loosestrife	annual forb	non-native	--	moderate	OBL	--	VPA?
Malvaceae	*Abutilon theophrasti*	velvet-leaf	annual forb	non-native	--	--	FACU	--	--
Malvaceae	*Malva nicaeensis*	bull mallow	annual forb	non-native	--	--	NL	--	--
Malvaceae	*Malvella leprosa*	alkali mallow	perennial forb	native	--	--	FACU	--	GEN
Malvaceae	*Sidalcea malviflora* ssp. *laciniata*	California checkerbloom	perennial forb	native	--	--	FACW	--	--
Martyniaceae	*Proboscidea lutea*	yellow devil's claw	annual forb	non-native	--	--	NL	--	--
Melanthiaceae [Liliaceae]	*Toxicoscordion fontanum* [*Zigadenus micranthus* var. *fontanus*]	marsh star lily	perennial forb	native	Rank 4.2	--	OBL	BE/SI	--
Melanthiaceae [Liliaceae]	*Toxicoscordion fremontii* [*Zigadenus fremontii*]	Fremot's star lily	perennial forb	native	--	--	NL	--	--
Montiaceae [Portulacaceae]	*Calandrinia ciliata*	common redmaids	annual forb	native	--	--	FACU	--	GEN
Montiaceae [Portulacaceae]	*Claytonia exigua*	serpentine springbeauty	annual forb	native	--	--	NL	SI	--
Montiaceae [Portulacaceae]	*Claytonia perfoliata*	miner's lettuce	annual forb	native	--	--	FAC	--	GEN
Moraceae	*Ficus carica*	common fig	deciduous tree	non-native	--	moderate	FACU	--	--
Myrsinaceae [Primulaceae]	*Anagallis arvensis*	scarlet pimpernel	annual forb	non-native	--	--	NL	--	GEN
Myrsinaceae [Primulaceae]	*Anagallis minima* [*Centunculus minimus*]	chaffweed	annual forb	native	--	--	NL	--	VPI?
Myrtaceae	*Eucalyptus globulus*	blue gum	evergreen tree	non-native	--	moderate	NL	--	--
Onagraceae	*Clarkia purpurea* ssp. *quadrivulnera*	winecup clarkia	annual forb	native	--	--	NL	--	--
Onagraceae	*Clarkia* sp.	clarkia	annual forb	native	unknown	--	--	unknown	--
Onagraceae	*Epilobium brachycarpum*	annual willowherb	annual forb	native	--	--	NL	--	GEN
Onagraceae	*Epilobium campestre* [*Epilobium pygmaeum*]	smooth willowherb	annual forb	native	--	--	OBL	--	VPI?
Onagraceae	*Ludwigia* sp.	floating primrose	perennial forb	unknown	--	unknown	OBL	--	--
Onagraceae	*Taraxia ovata* [*Camissonia ovata*]	sun cup	perennial forb	native	--	--	NL	--	--
Orobanchaceae [Scrophulariaceae]	*Bellardia trixago*	Mediterranean lineseed	annual forb	non-native	--	limited	NL	--	--
Orobanchaceae [Scrophulariaceae]	*Castilleja attenuata*	valley tassels	annual forb	native	--	--	NL	--	GEN

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Orobanchaceae [Scrophulariaceae]	*Castilleja densiflora*	dense-flowered owl's-clover	annual forb	native	--	--	NL	--	GEN
Orobanchaceae [Scrophulariaceae]	*Castilleja exserta*	exserted owl's-clover	annual forb	native	--	--	NL	--	--
Orobanchaceae [Scrophulariaceae]	*Castilleja rubicundula* ssp. *lithospermoides*	cream sacs	annual forb	native	--	--	NL	WI	--
Orobanchaceae [Scrophulariaceae]	*Parentucellia viscosa*	yellow glandweed	annual forb	non-native	--	limited	FAC	--	--
Orobanchaceae [Scrophulariaceae]	*Triphysaria eriantha* ssp. *eriantha*	Johnny-tuck	annual forb	native	--	--	NL	--	GEN
Orobanchaceae [Scrophulariaceae]	*Triphysaria pusilla*	dwarf owl's clover	annual forb	native	--	--	NL	--	GEN
Orobanchaceae [Scrophulariaceae]	*Triphysaria versicolor* ssp. *faucibarbata*	yellowbeak owl's clover	annual forb	native	--	--	NL	--	GEN
Papaveraceae	*Eschscholzia californica*	California poppy	perennial forb	native	--	--	NL	--	--
Papaveraceae	*Platystemon californicus*	creamcups	annual forb	native	--	--	NL	WI	--
Phrymaceae [Scrophulariaceae]	*Mimulus aurantiacus* var. *aurantiacus*	sticky monkey	evergreen shrub	native	--	--	NL	--	--
Phrymaceae [Scrophulariaceae]	*Mimulus guttatus*	common monkeyflower	perennial forb	native	--	--	OBL	--	VPA?
Plantaginaceae [Callitriche]	*Callitriche* sp.	starwort	annual or perennial forb	unknown	--	--	unknown	--	unknown
Plantaginaceae [Scrophulariaceae]	*Collinsia heterophylla* var. *heterophylla*	purple Chinese houses	annual forb	native	--	--	NL	--	--
Plantaginaceae [Scrophulariaceae]	*Kickxia elatine*	sharpleaf cancerwort	perennial forb	non-native	--	--	FAC	--	--
Plantaginaceae	*Plantago erecta*	foothill plantain	annual forb	native	--	--	NL	WI/IN	GEN
Plantaginaceae	*Plantago lanceolata*	English plantain	perennial forb	non-native	--	limited	FACU	--	GEN
Plantaginaceae	*Plantago major*	common plantain	perennial forb	non-native	--	--	FAC	--	--
Plantaginaceae	*Plantago subnuda*	tall coastal plantain	perennial forb	native	--	--	FACW	--	--
Plantaginaceae [Scrophulariaceae]	*Veronica peregrina* ssp. *xalapensis*	purslane speedwell	annual forb	native	--	--	OBL	--	VPA?
Plantaginaceae [Scrophulariaceae]	*Veronica persica*	bird's-eye speedwell	annual forb	non-native	--	--	NL	--	--
Poaceae	*Agrostis exarata*	spike bentgrass	perennial graminoid	native	--	--	FACW	--	--
Poaceae	*Avena barbata*	slender wild oat	annual graminoid	non-native	--	moderate	NL	--	--
Poaceae	*Avena fatua*	wild oat	annual graminoid	non-native	--	moderate	NL	--	--
Poaceae	*Brachypodium distachyon*	false brome	perennial graminoid	non-native	--	moderate	NL	--	--
Poaceae	*Briza minor*	little rattlesnake grass	annual graminoid	non-native	--	--	FAC	--	GEN

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Poaceae	*Bromus diandrus*	ripgut brome	annual graminoid	non-native	--	moderate	NL	--	--
Poaceae	*Bromus hordeaceus*	soft chess	annual graminoid	non-native	--	limited	FACU	--	GEN
Poaceae	*Crypsis schoenoides*	swamp pricklegrass	annual graminoid	non-native	--	--	FACW	--	UNK
Poaceae	*Cynodon dactylon*	Bermuda grass	perennial graminoid	non-native	--	moderate	FACU	--	--
Poaceae	*Cynosurus echinatus*	dogtail grass	annual graminoid	non-native	--	moderate	NL	--	--
Poaceae	*Danthonia californica*	California oat grass	perennial graminoid	native	--	--	FAC	SI	GEN
Poaceae	*Distichlis spicata*	saltgrass	perennial graminoid	native	--	--	FACW	--	VPA?
Poaceae	*Elymus caput-medusae* [*Taeniatherum caput-medusae*]	Medusa head	perennial graminoid	non-native	--	high	NL	--	GEN
Poaceae	*Elymus glaucus*	blue wild rye	perennial graminoid	native	--	--	FACU	--	GEN
Poaceae	*Elymus multisetus*	big squirreltail	perennial graminoid	native	--	--	NL	--	--
Poaceae	*Elymus triticoides* [*Leymus triticoides*]	creeping wild rye	perennial graminoid	native	--	--	FAC	--	GEN
Poaceae	*Festuca arundinacea*	tall fescue	perennial graminoid	non-native	--	moderate	FAC	--	--
Poaceae	*Festuca bromoides* [*Vulpia bromoides*]	brome fescue	perennial graminoid	non-native	--	--	FACU	--	GEN
Poaceae	*Festuca myuros* [*Vulpia myuros*]	rattail fescue	perennial graminoid	non-native	--	moderate	FACU	--	GEN
Poaceae	*Festuca perennis* [*Lolium multiflorum*]	Italian rye grass	annual graminoid	non-native	--	moderate	FAC	--	GEN
Poaceae	*Gastridium phleoides* [*Gastridium ventricosum*]	nit grass	annual graminoid	non-native	--	--	FACU	--	GEN
Poaceae	*Glyceria* X *occidentalis* [*Glyceria occidentalis*]	western mannagrass	perennial graminoid	non-native	--	--	OBL	--	GEN
Poaceae	*Holcus lanatus*	common velvet grass	perennial graminoid	non-native	--	moderate	FAC	--	--
Poaceae	*Hordeum brachyantherum* ssp. *brachyantherum*	meadow barley	perennial graminoid	native	--	--	FACW	--	GEN
Poaceae	*Hordeum brachyantherum* ssp. *californicum*	California barley	perennial graminoid	native	--	--	FACW	SI	GEN
Poaceae	*Hordeum marinum* ssp. *gussoneanum*	Mediterranean barley	annual graminoid	non-native	--	moderate	FAC	--	GEN
Poaceae	*Hordeum murinum* ssp. *leporinum*	mouse barley	annual graminoid	non-native	--	moderate	FAC	--	GEN
Poaceae	*Melica californica*	California onion grass	perennial graminoid	native	--	--	NL	--	--
Poaceae	*Paspalum dilatatum*	dallis grass	perennial graminoid	non-native	--	--	FAC	--	--
Poaceae	*Phalaris aquatica*	harding grass	perennial graminoid	non-native	--	moderate	FACU	--	--
Poaceae	*Phalaris paradoxa*	hood canary grass	annual graminoid	non-native	--	--	FAC	--	VPA?
Poaceae	*Pleuropogon californicus* var. *californicus*	annual semaphore grass	perennial graminoid	native	--	--	OBL	--	VPA?
Poaceae	*Poa annua*	annual bluegrass	annual graminoid	non-native	--	--	FAC	--	GEN
Poaceae	*Polypogon australis*	Chilean rabbit's-foot grass	perennial graminoid	non-native	--	--	FACW	--	--
Poaceae	*Polypogon monspeliensis*	rabbit's-foot grass	annual graminoid	non-native	--	limited	FACW	--	VPA?

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Poaceae	*Polypogon viridis* [*Agrostis viridis*]	water beard grass	annual graminoid	non-native	--	--	FACW	--	--
Poaceae	*Stipa lepida* [*Nassella lepida*]	foothill needlegrass	perennial graminoid	native	--	--	NL	--	--
Poaceae	*Stipa pulchra* [*Nassella pulchra*]	purple needlegrass	perennial graminoid	native	--	--	NL	--	--
Poaceae	*Triticum aestivum*	bread wheat	annual graminoid	non-native	--	--	NL	--	--
Polemoniaceae	*Gilia capitata* ssp. *capitata*	bluehead gilia	annual forb	native	--	--	NL	WI	--
Polemoniaceae	*Leptosiphon bicolor* [*Linanthus bicolor*]	true babystars	annual forb	native	--	--	FACU	--	--
Polemoniaceae	*Leptosiphon parviflorus* [*Linanthus parviflorus*]	variable linanthus	annual forb	native	--	--	NL	--	--
Polygonaceae	*Persicaria amphibia* [*Polygonum amphibium*]	water smartweed	perennial forb	native	--	--	OBL	--	--
Polygonaceae	*Persicaria hydropiperoides* [*Polygonum hydropiperoides*]	common smartweed	perennial forb	native	--	--	OBL	--	--
Polygonaceae	*Polygonum aviculare* ssp. *aviculare* [*Polygonum arenastrum*]	dooryard knotweed	perennial forb	non-native	--	--	FAC	--	GEN
Polygonaceae	*Polygonum* sp.	knotweed	annual or perennial forb	unknown	unknown	unknown	unknown	unknown	unknown
Polygonaceae	*Rumex acetosella*	common sheep sorrel	perennial forb	non-native	--	moderate	FACU	--	GEN
Polygonaceae	*Rumex conglomeratus*	clustered dock	perennial forb	non-native	--	--	FACW	--	--
Polygonaceae	*Rumex crispus*	curly dock	perennial forb	non-native	--	limited	FAC	--	GEN
Polygonaceae	*Rumex pulcher*	fiddle dock	perennial forb	non-native	--	--	FAC	--	GEN
Polypodiaceae	*Polypodium californicum*	California polypody	perennial fern	native	--	--	NL	--	--
Portulacaceae	*Portulaca oleracea*	common purslane	annual forb	non-native	--	--	FAC	--	--
Primulaceae	*Dodecatheon hendersonii*	shooting stars	perennial forb	native	--	--	NL	--	--
Pteridaceae	*Adiantum jordanii*	California maidenhair fern	perennial fern	native	--	--	FAC	--	--
Pteridaceae	*Pellaea andromedifolia*	coffee fern	perennial fern	native	--	--	NL	--	--
Pteridaceae	*Pentagramma triangularis*	gold back fern	perennial fern	native	--	--	NL	--	--
Ranunculaceae	*Delphinium variegatum* ssp. *variegatum*	royal larkspur	perennial forb	native	--	--	NL	--	--
Ranunculaceae	*Ranunculus aquatilis* var. *aquatilis*	aquatic buttercup	perennial forb	native	--	--	OBL	--	VPA?
Ranunculaceae	*Ranunculus californicus*	California buttercup	perennial forb	native	--	--	FAC	--	GEN
Ranunculaceae	*Ranunculus lobbii*	Lobb's aquatic buttercup	annual forb	native	Rank 4.2	--	OBL	--	VPA?
Ranunculaceae	*Ranunculus muricatus*	spiny buttercup	perennial forb	non-native	--	--	FACW	--	VPA?
Ranunculaceae	*Ranunculus occidentalis*	western buttercup	perennial forb	native	--	--	FACW	--	--
Ranunculaceae	*Ranunculus orthorhynchus* var. *bloomeri*	Bloomer's beaked buttercup	perennial forb	native	--	--	FACW	--	VPA?
Rhamnaceae	*Frangula californica*	California coffeeberry	evergreen shrub	native	--	--	NL	--	--

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Rosaceae	*Aphanes occidentalis*	lady's mantle	perennial forb	native	--	--	NL	--	--
Rosaceae	*Holodiscus discolor* var. *discolor*	oceanspray	deciduous shrub	native	--	--	FACU	WI/IN	--
Rosaceae	*Prunus* sp.	domestic plum	tree	unknown	--	unknown	--	--	--
Rosaceae	*Rosa californica*	California wildrose	evergreen shrub	native	--	--	FAC	--	--
Rosaceae	*Rosa* sp.	domestic rose	evergreen shrub	unknown	--	unknown	unknown	--	--
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	evergreen shrub	non-native	--	high	FACU	--	--
Rosaceae	*Rubus ursinus*	California blackberry	evergreen shrub	native	--	--	FACU	--	--
Rubiaceae	*Galium aparine*	stickywilly	annual forb	native	--	--	FACU	--	--
Rubiaceae	*Galium murale*	yellow wall bedstraw	annual forb	non-native	--	--	NL	--	--
Rubiaceae	*Galium trifidum*	threepetal bedstraw	perennial forb	native	--	--	FACW	--	--
Rubiaceae	*Galium* sp.	bedstraw	annual or perennial forb	unknown	unknown	unknown	--	unknown	--
Rubiaceae	*Sherardia arvensis*	blue fieldmadder	annual forb	non-native	--	--	NL	--	--
Salicaceae	*Populus fremontii*	Fremont cottonwood	deciduous tree	native	--	--	FACW	--	--
Salicaceae	*Salix exigua var. exigua*	sandbar willow	deciduous tree	native	--	--	FACW	--	--
Salicaceae	*Salix laevigata*	red willow	deciduous tree	native	--	--	FACW	--	--
Salicaceae	*Salix lasiandra* var. *lasiandra*	yellow willow	deciduous tree	native	--	--	FACW	--	--
Salicaceae	*Salix lasiolepis*	arroyo willow	deciduous tree	native	--	--	FACW	--	--
Sapindaceae [Aceraceae]	*Acer macrophyllum*	big leaf maple	deciduous tree	native	--	--	FACU	--	--
Sapindaceae [Hippocastanaceae]	*Aesculus californica*	California buckeye	deciduous tree	native	--	--	NL	--	--
Saxifragaceae	*Lithophragma affine*	woodland star	perennial forb	native	--	--	NL	--	--
Scrophulariaceae	*Scrophularia californica*	California figwort	perennial forb	native	--	--	FAC	--	--
Solanaceae	*Solanum americanum*	American black nightshade	perennial forb	native	--	--	FACU	--	--
Tamaricaceae	*Tamarix* sp.	tamarisk	evergreen shrub	non-native	--	unknown	unknown	--	--
Themidaceae [Liliaceae]	*Brodiaea elegans* ssp. *elegans*	harvest brodiaea	perennial forb	native	--	--	FACU	--	--
Themidaceae [Liliaceae]	*Dichelostemma capitatum* ssp. *capitatum*	bluedicks	perennial forb	native	--	--	FACU	--	VPA?
Themidaceae [Liliaceae]	*Muilla maritima*	sea muilla	perennial forb	native	--	--	NL	WI	VPA?
Themidaceae [Liliaceae]	*Triteleia hyacinthina*	white hyacinth	perennial forb	native	--	--	FAC	--	VPA?
Themidaceae [Liliaceae]	*Triteleia laxa*	Ithuriel's spear	perennial forb	native	--	--	NL	--	--
Typhaceae	*Typha angustifolia*	narrowleaf cattail	perennial forb	non-native	--	--	OBL	--	--
Urticaceae	*Urtica dioica* ssp. *holosericea*	hoary nettle	perennial forb	native	--	--	FAC	--	--

FAMILY	SCIENTIIFC NAME	COMMON NAME	LIFE FORM	ORIGIN	RARE STATUS[1]	INVASIVE STATUS[2]	WETLAND INDICATOR STATUS[3]	SERPENTINE STATUS[4]	VERNAL POOL STATUS[5]
Urticaceae	*Urtica urens*	dwarf nettle	annual forb	non-native	--	--	NL	--	--
Valerianaceae	*Plectritis macrocera*	longhorn plectritis	annual forb	native	--	--	FACU	--	--
Verbenaceae	*Phyla nodiflora*	common lippia	perennial forb	native	--	--	FAC	--	--
Verbenaceae	*Verbena lasiostachys* var. *lasiostachys*	western vervain	perennial forb	native	--	--	FAC	--	--
Violaceae	*Viola pedunculata*	Johnny jump-up	perennial forb	native	--	--	NL	--	--
Viscaceae	*Phoradendron serotinum* ssp. *macrophyllum* [*Phoradendron macrophyllum*]	bigleaf mistletoe	perennial forb	native	--	--	NL	--	--
Viscaceae	*Phoradendron serotinum* ssp. *tomentosum* [*Phoradendron villosum*]	pine mistletoe	perennial forb	native	--	--	NL	--	--
Woodsiaceae [Dryopteridaceae]	*Athyrium filix-femina* var. *cyclosorum*	subarctic lady fern	perennial fern	native	--	--	FAC	--	--

Species identified with the *Jepson Manual* (Hickman 1993), *Jepson Manual, 2nd Edition* (Baldwin et al. 2012), and *A Flora of Sonoma County* (Best et al. 1996); nomenclature follows Baldwin et al. 2012 with those in brackets from Hickman 1993

[1]Rare Status: The CNPS Inventory of Rare and Endangered Plants (CNPS 2013)

FE:	Federal Endangered
FT:	Federal Threatened
SE:	State Endangered
ST:	State Threatened
SR:	State Rare
Rank 1A:	Plants presumed extinct in California
Rank 1B:	Plants rare, threatened, or endangered in California and elsewhere (*List 1B: Species rare in native stands only; native stands not present in the Park)
Rank 2:	Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3:	Plants about which we need more information – a review list
Rank 4:	Plants of limited distribution – a watch list

[2]Invasive Status: California Invasive Plant Inventory (Cal-IPC 2006)

High:	Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate:	Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited-moderate distribution ecologically
Limited:	Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Assessed:	Assessed by Cal-IPC and determined to not be an existing current threat

[3]Wetland Status: National List of Plant Species that Occur in Wetlands, California – Arid West (Lichvar 2012)

OBL:	Almost always found in wetlands; >99% frequency
FACW:	Usually found in wetlands; 67-99% frequency
FAC:	Equally found in wetlands and uplands; 34-66% frequency
FACU:	Usually not found in wetlands; 1-33% frequency
UPL:	Almost never found in wetlands; >1% frequency
NL:	Not listed, assumed almost never found in wetlands; >1% frequency
NI:	No information; not factored during wetland delineation

[4]Serpentine Status: Serpentine Endemism in the California Flora: A Database of Serpentine Affinity (Safford et al. 2005)

SE:	Strict Endemic; 95% occurrence on ultramafic soils
BE:	Broad Endemic; 85-94% occurrence on ultramafic soils
BE/SI:	Broad Endemic/Strong Indicator; 75-84% occurrence on ultramafic soils
SI:	Strong Indicator; 65-74% occurrence on ultramafic soils
WI:	Weak Indicator; 55-64% occurrence on ultramafic soils
WI/IN:	Weak Indicator/Indifferent: 50-54% occurrence on ultramafic soils

[5]Vernal Pool Status: California Vernal Pool Assessment Preliminary Report (Keeler-Wolf et al. 1998)

VPI:	Species restricted to vernal pools and not known from other habitats
VPA:	Species regularly occurring in vernal pools, but not restricted to them; also occurring in other wetland habitats
GEN:	Species that can occur in wetland or upland, or sometimes both, including vernal pools, pool margins, disturbed areas, and grasslands
VPI?:	Species that is VPI in certain region(s) only, and can be a VPA or GEN in other regions
VPA?:	Species that is VPA in certain region(s), and is GEN in other regions
VPI/VPA:	Species that is VPI in some regions and VPA in other regions, but not known to be GEN

Table A-2. Wildlife Species Observed at Tolay Lake Regional Park by LSA Associates, Steve Ehret, PWA volunteers 2006-2008, and WRA 2013

CLASS	COMMON NAME	SCIENTIFIC NAME
Amphibian	bull frog	*Rana catesbeiana*
Amphibian	Sierran tree frog	*Pseudacris sierra*
Reptile	Western fence lizard	*Sceloporus occidentalis*
Reptile	Southern alligator lizard	*Elgaria multicarinata*
Reptile	red-sided garter snake	*Thamnophis infernalis*
Reptile	common garter snake	*Thamnophis sirtalis*
Reptile	ring-necked snake	*Diadophis punctatus*
Reptile	common king snake	*Lampropeltis getula californiae*
Reptile	gopher snake	*Pituophis catenifer*
Birds	Canada goose	*Branta canadensis*
Birds	gadwall	*Anas strepara*
Birds	American widgeon	*Anas americana*
Birds	mallard	*Anas platyrhynchos*
Birds	cinnamon teal	*Anas cyanoptera*
Birds	Northern shoveler	*Anas clypeata*
Birds	Northern pintail	*Anas acuta*
Birds	green-winged teal	*Anas cracca*
Birds	canvasback	*Aythya valisineria*
Birds	greater schaup	*Aythya marila*
Birds	bufflehead	*Bucephala albeola*
Birds	ruddy duck	*Oxyura jamaicensis*
Birds	wild turkey	*Meleagris gallopavo*
Birds	California quail	*Callipepla californica*
Birds	pied-billed grebe	*Podilymbus podiceps*
Birds	double-crested cormorant	*Phalacrocorax auritus*
Birds	great blue heron	*Ardea Herodias*
Birds	great egret	*Ardea alba*
Birds	snowy egret	*Egrettia thula*
Birds	turkey vulture	*Cathartes aura*
Birds	white-tailed kite	*Elanus leucurus*
Birds	Northern harrier	*Circus cyaneus*
Birds	sharp-shinned hawk	*Accipiter striatus*
Birds	Cooper’s hawk	*Accipiter cooperi*
Birds	red-shouldered hawk	*Buteo lineatus*
Birds	red-tailed hawk	*Buteo jamaicensis*
Birds	golden eagle	*Aquila chrysaetos*
Birds	American kestrel	*Falco sparverius*

CLASS	COMMON NAME	SCIENTIFIC NAME
Birds	American coot	*Fulica americana*
Birds	killdeer	*Charadrius vociferous*
Birds	black-necked stilt	*Himantropus mexicanus*
Birds	greater yellowlegs	*Tringa melanoleuca*
Birds	Western sandpiper	*Calidris mauri*
Birds	least sandpiper	*Calidris minutilla*
Birds	long-billed dowitcher	*Limnodromus scolopaceus*
Birds	Wilson's snipe	*Gallinago delicata*
Birds	Caspian tern	*Hydroprogne caspia*
Birds	rock pigeon	*Columba livia*
Birds	band-tailed pigeon	*Patagioenas fasciata*
Birds	mourning dove	*Zenaida macroura*
Birds	barn owl	*Tyto alba*
Birds	great horned owl	*Bubo virginianus*
Birds	burrowing owl	*Athene cunicularia*
Birds	short-eared owl	*Asio flammeus*
Birds	Vaux's swift	*Chaetura vauxi*
Birds	Anna's hummingbird	*Calypte anna*
Birds	rufous hummingbird	*Selasphorus rufus*
Birds	Allen's hummingbird	*Selasphorus sasin*
Birds	Nuttall's woodpecker	*Picoides nuttallii*
Birds	acorn woodpecker	*Melanerpes formicivorus*
Birds	downy woodpecker	*Picoides pubescens*
Birds	Northern flicker	*Colaptes auratus*
Birds	willow flycatcher	*Empidonax traillii*
Birds	black phoebe	*Sayornis nigricans*
Birds	Say's phoebe	*Sayornis saya*
Birds	Western kingbird	*Tyrannus verticalis*
Birds	loggerhead shrike	*Lanius ludovicianus*
Birds	Hutton's vireo	*Vireo huttoni*
Birds	warbling vireo	*Vireo gilvus*
Birds	Steller's jay	*Cyanocitta stelleri*
Birds	Western scrub-jay	*Aphelocoma californica*
Birds	American crow	*Corvus brachyrhynchos*
Birds	common raven	*Corvus corax*
Birds	horned lark	*Eremophila alpestris*
Birds	tree swallow	*Tachycineta bicolor*
Birds	violet-green swallow	*Tachycineta thalassina*

CLASS	COMMON NAME	SCIENTIFIC NAME
Birds	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Birds	cliff swallow	*Petrochelidon pyrrhonata*
Birds	barn swallow	*Hirundo rustica*
Birds	chestnut-backed chickadee	*Poecile rufescens*
Birds	oak titmouse	*Baeolophus inornatus*
Birds	bushtit	*Psaltriparus minimus*
Birds	brown creeper	*Certhia americana*
Birds	white-breasted nuthatch	*Sitta caroliniensis*
Birds	rock wren	*Salpinctes obsoletus*
Birds	Bewick's wren	*Thryomanes bewickii*
Birds	house wren	*Troglodytes aedon*
Birds	winter wren	*Troglodytes troglodytes*
Birds	marsh wren	*Citothorus palustris*
Birds	ruby-crowned kinglet	*Regulus calendula*
Birds	Western bluebird	*Sialia mexicana*
Birds	hermit thrush	*Catharus guttatus*
Birds	American robin	*Turdus migratorius*
Birds	Northern mockingbird	*Mimus polyglottos*
Birds	European starling	*Sturnus vulgaris*
Birds	cedar waxwing	*Bombycilla cedrorum*
Birds	American pipit	*Anthus rubescens*
Birds	orange-crowned warbler	*Vermivora celata*
Birds	yellow warbler	*Dendroica petechial*
Birds	yellow-rumped warbler	*Dendroica coronata*
Birds	Wilson's warbler	*Wilsonia pusilla*
Birds	Western tanager	*Piranga ludoviciana*
Birds	spotted towhee	*Pipilo maculatus*
Birds	California towhee	*Pipilo crissalis*
Birds	lark sparrow	*Chondestes grammacus*
Birds	savannah sparrow	*Passerculus sandwichensis*
Birds	grasshopper sparrow	*Ammodramus savannarum*
Birds	fox sparrow	*Passerella iliaca*
Birds	song sparrow	*Melospiza melodia*
Birds	Lincoln's sparrow	*Melospiza lincolnii*
Birds	white-throated sparrow	*Zonotrichia albicollis*
Birds	white-crowned sparrow	*Zonotrichia leucophrys*
Birds	golden-crowned sparrow	*Zonotrichia atricapilla*
Birds	dark-eyed junco	*Junco hyemalis*

CLASS	COMMON NAME	SCIENTIFIC NAME
Birds	red-winged blackbird	*Agelaius phoeniceus*
Birds	tricolored blackbird	*Agelaius tricolor*
Birds	Western meadowlark	*Sturnella neglecta*
Birds	Brewer's blackbird	*Euphagus cyanocephalus*
Birds	brown-headed cowbird	*Molothrus ater*
Birds	Bullock's oriole	*Icterus bullockii*
Birds	house finch	*Carpodacus mexicanus*
Birds	lesser goldfinch	*Carduelis psaltria*
Birds	American goldfinch	*Carduelis tristis*
Birds	house sparrow	*Passer domesticus*
Mammals	Virginia opossum	*Didelphis virginiana*
Mammals	skunk (sp.)	*Mephitis* or *Spilogale*
Mammals	coyote	*Canis latrans*
Mammals	raccoon	*Procyon lotor*
Mammals	black-tailed deer	*Odocoileus hemionus*
Mammals	California ground squirrel	*Spermophilis beecheyi*
Mammals	California vole	*Microtus californicus*
Mammals	deer mouse (sp.)	*Peromyscus* sp.
Mammals	Botta's pocket gopher	*Thomomys bottae*
Mammals	black-tailed jackrabbit	*Lepus californicus*

Appendix B – Special-status Plant and Wildlife Species with the Potential to Occur

Table B. Potential for Special Status Plant and Wildlife Species to Occur in the Park. List compiled from the California Department of Fish and Wildlife (CDFW) Natural Diversity Database (2013), U.S. Fish and Wildlife Service (USFWS) Species Lists (2013), and California Native Plant Society (CNPS) Electronic Inventory (2013) searches of the Cotati, Glen Ellen, Sonoma, Napa, Petaluma, Petaluma River, Sears Point, Cuttings Wharf, Nicasio, Novato, Petaluma Point, and Mare Island USGS 7.5' quadrangles.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
PLANTS				
Allium peninsulare var. *franciscanum* Franciscan onion	Rank 1B	Cismontane woodland, valley and foothill grassland; on clay substrate, often derived from serpentine. Elevation range 170 – 985 feet. Blooms: May – June.	**Moderate Potential.** The Park contains serpentine clays underlying grassland habitat.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Alopecurus aequalis var. *sonomensis* Sonoma alopecurus	FE, Rank 1B	Freshwater marshes and swamps, riparian scrub; closely associated with other wetland species. Elevation range: 15 – 1200 feet. Blooms: May – July.	**Moderate Potential.** The Park contains perennial wetland habitat that may support this species; however, the degree of disturbance and hydrologic modification as well as grazing reduces this species potential.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Amorpha californica var. *napensis* Napa false indigo	Rank 1B	Openings in broadleaf upland forest, chaparral, cismontane woodland. Elevation range: 395 – 6560 feet. Blooms: April – July.	**Moderate Potential.** The Park contains cismontane woodland that may support this species; however, the presence of cattle and relatively thin shrub understory reduces this species potential.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Amsinckia lunaris bent-flowered fiddleneck	Rank 1B	Cismontane woodland, valley and foothill grassland, coastal bluff scrub. Elevation range: 10 – 1625 feet. Blooms: March – June.	**Moderate Potential.** The Park contains grassland habitat that may support this species; however, this species has not been reported from the Sonoma Mountains, Petaluma or Sonoma valleys.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Antirrhinum virga twig-like snapdragon	Rank 4	Chaparral, lower montane coniferous forest; located on rocky openings often derived from serpentine. Elevation range: 325 – 6550 feet. Blooms: June – July.	**No Potential.** The Park does not contain chaparral or coniferous forest necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Arabis blepharophylla coast rock cress	Rank 4	Broadleaf upland forest, coastal bluff scrub, coastal prairie, coastal scrub; located on rocky sites, often on coastal bluffs. Elevation range: 10 – 3575 feet. Blooms: February – May.	**No Potential.** Although the Park contains poison oak scrub (coastal scrub), this species is closely associated with rock outcrops and bluffs near the coast within direct maritime influence.	**Not Present.** No further actions are recommended for this species.
Arctostaphylos bakeri ssp. *bakeri* Baker's manzanita	SR, Rank 1B	Broadleaf upland forest, chaparral, closed-cone coniferous forest; located on serpentine substrate. Elevation range: 240 – 975 feet. Blooms: February – April.	**No Potential.** This species is closely associated to serpentine chaparral and Sargent cypress woodland not present within the Park.	**Not Present.** No further actions are recommended for this species.
Arctostaphylos canescens ssp. *sonomensis* Sonoma manzanita	Rank 1B	Chaparral, lower montane coniferous forest; sometimes on serpentine substrate. Elevation range: 590 – 5495 feet. Blooms: January – June.	**No Potential.** The Park does not contain chaparral or coniferous forest habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Arctostaphylos montana ssp. *montana* Mt. Tamalpais manzanita	Rank 1B	Chaparral, valley and foothill grassland; on rocky serpentine slopes in scrub and grassland. Elevation range: 520 – 2470 feet. Blooms: February – April.	**Unlikely.** Although the Park contains grassland habitat with serpentine substrates, this species is closely associated with chaparral habitats on Mt. Tamalpais.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Astragalus tener var. *tener* alkali milk-vetch	Rank 1B	Playas, vernal pools, valley and foothill grassland; located in mesic grassy areas on alkaline substrate. Elevation range: 0 – 195 feet. Blooms: March – June.	**Moderate Potential.** The Park contains seasonal wetland habitat with some assumed alkali conditions that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Atriplex joaquiniana San Joaquin spearscale	Rank 1B	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland; located on alkaline substrate. Elevation range: 0 – 2715 feet. Blooms: April – October.	**No Potential.** The Park does not contain high alkaline habitats (i.e. grassland, playa) necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Blennosperma bakeri Sonoma sunshine	FE, SE, Rank 1B	Vernal pools, vernal swales, and mesic areas in valley grassland; highly restricted to the Santa Rosa Plain and Valley of the Moon. Elevation range: 35 – 360 feet. Blooms: March – April.	**Moderate Potential.** The Park contains mesic grassland, seasonal wetland, and vernal pool-like wetlands that may support this species; however, this species is closely associated with native/natural vernal pools on the Santa Rosa Plain and Sonoma Valley.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Brodiaea leptandra narrow-anthered California brodiaea	Rank 1B	Broadleaf upland forest, chaparral, lower montane coniferous forest; located on volcanic tuff substrates. Elevation range: 360 – 3000 feet. Blooms: May – July.	**No Potential.** The Park does not contain upland forest, chaparral, or coniferous forest habitat nor does it contain extensive, nutrient-poor volcanic tuff soils necessary to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Calandrinia breweri Brewer's Calandrinia	Rank 4	Chaparral, coastal scrub; located on sandy or loamy substrate in areas often recently disturbed or burned. Elevation range: 30 – 3965 feet. Blooms: March – June.	**Unlikely.** Although the Park contains poison oak scrub (coastal scrub), this species is closely associated with burnt chaparral and diverse coastal scrub not present within the Park.	**Not Present.** No further actions are recommended for this species.
California macrophylla round-leaved filaree	Rank 1B	Cismontane woodland, valley and foothill grassland; located in areas underlain by clay substrate. Elevation range: 45 – 3900 feet. Blooms: March – May.	**Moderate Potential.** The Park contains clay substrates underlying grassland habitat that may support this species; however, this species' distribution is closely associated with the Central Valley and Interior Coast Range valleys.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Castilleja affinis ssp. *neglecta* Tiburon paintbrush	FE; ST; Rank 1B	Valley and foothill grassland; located in grassy, open areas and rock outcrops underlain by serpentine substrate. Elevation range: 195 – 1300 feet. Blooms: April – June.	**Moderate Potential.** The Park contains serpentine grassland habitat that may support this species; however, this species is restricted to Ring Mountain in the North Bay, and has not been documented on other well-surveyed serpentine outcrops (e.g. Mount Burdell).	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Ceanothus sonomensis Sonoma ceanothus	Rank 1B	Chaparral; located on sandy serpentine or volcanic substrates. Elevation range: 705 – 2625 feet. Blooms: February – April.	**No Potential.** The Park does not contain chaparral habitat necessary to support this species. This species is known from a diverse mosaic of chaparral types in the Mayacama Mountains.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Centromadia parryi ssp. *parryi* pappose tarplant	Rank 1B	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland; in vernally mesic sites, often with alkali substrate. Elevation range: 5 – 1380 feet. Blooms: May – November.	**Moderate Potential.** The Park contains grassland and wetland habitat that may support this species; however, this species typically occurs in alkali grassland-brackish marsh ecotones not present in the Park.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Chloropyron maritimum ssp. *palustre* Point Reyes bird's-beak	Rank 1B	Coastal salt marshes; located in low-growing saltgrass and pickleweed mats. Elevation range: 0 – 35 feet. Blooms: June – October.	**No Potential.** The Park does not contain coastal brackish marsh necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Chloropyron molle ssp. *molle* soft bird's-beak	FE, SR, Rank 1B	Coastal brackish or salt marshes; located in low-growing saltgrass and picklweed mats. Elevation range: 0 – 10 feet. Blooms: June – November.	**No Potential.** The Park does not contain coastal brackish marsh necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Chorizanthe valida Sonoma spineflower	FE, SE, Rank 1B	Coastal prairie; in sandy soils. Elevation range: 35 – 1000 feet. Blooms: June – August.	**No Potential.** The Park does not contain coastal prairie underlain by sandy substrates necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Cirsium hydrophilum var. *vaseyi* Mt. Tamalpais thistle	Rank 1B	Broadleaf upland forest, chaparral; located on streams and serpentine seeps in woodland and scrub habitat. Elevation range: 780 – 2015 feet. Blooms: May – August.	**No Potential.** The Park does not contain serpentine scrub or woodland habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Delphinium bakeri Baker's larkspur	FE; SE; Rank 1B	Coastal scrub, valley and foothill grassland; located on rocky north-facing slopes derived of decomposed shale. Elevation range: 260 – 995 feet. Blooms: March – May.	**No Potential.** The Park does not contain chaparral or grassland habitat underlain by decomposing shale on north-facing slopes necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Delphinium luteum yellow larkspur	FE; SR; Rank 1B	Chaparral, coastal prairie, coastal scrub; located on rocky north-facing slopes. Elevation range: 0 – 325 feet. Blooms: March – May.	**No Potential.** The Park does not contain chaparral, coastal prairie, or coastal scrub necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Dirca occidentalis western leatherwood	Rank 1B	Broadleaf upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, North Coast coniferous forest, riparian forest, riparian woodland; located on brushy, mesic slopes in woodland and forest. Elevation range: 165 – 1285 feet. Blooms: January – April.	**Unlikely.** Although the Park contains woodland habitat, this species is closely associated with a mixed scrub-woodland community on mesic slopes. Additionally, the relatively denuded shrub understory likely precludes the presence of this species.	**Not Present.** No further actions are recommended for this species.
Downingia pusilla dwarf downingia	Rank 2	Valley and foothill grassland, vernal pools; located in mesic grassy sites, pool and lake margins. Elevation range: 3 – 1450 feet. Blooms: March – May.	**Moderate Potential.** The Park contains mesic grassland and vernal-pool like habitats that may support this species; however, this species is closely associated with a mosaic of native vernal pools containing low-growing, native annual vegetation not present in the Park.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Elymus californicus California bottle-brush grass	Rank 4	Broadleaf upland forest, cismontane woodland, North Coast coniferous forest, riparian woodland; located in mesic areas. Elevation range: 50 – 1530 feet. Blooms: May – August, sometimes November.	**Unlikely.** Although the Park contains woodland habitat, this species is closely associated with coastal or near-coastal sites within the direct maritime influence.	**Not Present.** No further actions are recommended for this species.
Erigeron biolettii Streamside daisy	Rank 3	Broadleaf upland forest, cismontane woodland, North Coast coniferous forest; on rocky, mesic. Elevation range: 95 – 3610 feet. Blooms: June – October.	**Unlikely.** Although the Park contains woodland habitat, this species is closely associated with dense woodland-forest fringes not present in the Park.	**Not Present.** No further actions are recommended for this species.
Erigeron greenei Greene's narrow-leaved daisy	Rank 1B	Chaparral; located on volcanic or serpentine substrate. Elevation range: 260 – 3270 feet. Blooms: May – September.	**No Potential.** The Park does not contain chaparral habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Eriogonum luteolum var. *caninum* Tiburon buckwheat	Rank 1B	Chaparral, valley and foothill grassland, cismontane woodland, coastal prairie; located on sandy or gravelly substrate derived from serpentine. Elevation range: 0 – 2275 feet. Blooms: May – September.	**Moderate Potential.** The Park contains serpentine grassland habitat that may support this species; however, this species is typically located on open talus or serpentine with extensive bare ground not present in the Park.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Fritillaria lanceolata var. *tristulis* Marin checker lily	Rank 1B	Coastal bluff scrub, coastal scrub, coastal prairie; observed in canyons, riparian areas, and rock outcrops; often located on serpentine substrate. Elevation range: 45 – 490 feet. Blooms: February – May.	**No Potential.** The Park does not contain coastal bluff scrub, coastal scrub, or coastal prairie habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Fritillaria liliacea fragrant fritillary	Rank 1B	Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland; located in grassy sites underlain by clay, typically derived from volcanics or serpentine. Elevation range: 10 – 1335 feet. Blooms: February – April.	**High Potential.** The Park contains grassland and open woodland habitat underlain by clay substrates derived from both volcanic and serpentine parent material.	**Present.** Several populations were observed and mapped in the northern portion of the Park during plant surveys 2006-2008.
Helianthella castanea Diablo helianthella	Rank 1B	Broadleaf upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; typically located in oak woodland/chaparral ecotone underlain by rocky, azonal substrates, often in partial shade. Elevation range: 195 – 4225 feet. Blooms: March – June.	**Unlikely.** This species is closely associated with chaparral-woodland fringes not present in the Study Area.	**Not Present.** No further actions are recommended for this species.
Hemizonia congesta ssp. congesta white hayfield tarplant	Rank 3	Coastal scrub, valley and foothill grassland. Elevation range: 65 – 1840 feet. Blooms: April – October.	**High Potential.** The Park contains grassland habitat that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Hesperolinon congestum Marin western flax	FT, ST, Rank 1B	Chaparral, valley and foothill grassland; located on serpentine substrate. Elevation range: 15 – 1205 feet. Blooms: April – July.	**Moderate Potential.** The Park contains serpentine grassland that may support this species; however, this species is restricted to sites in Marin County.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Holocarpha macradenia Santa Cruz tarplant	FT, SE, Rank 1B	Coastal prairie, coastal scrub, valley and foothill grassland; typically located on sandy clay substrate. Elevation range: 30 – 715 feet. Blooms: June – October.	**Unlikely.** Although the Park contains grassland habitat, this species has not been documented north of southern Marin County.	**Not Present.** No further actions are recommended for this species.
Horkelia tenuiloba thin-lobed horkelia	Rank 1B	Broadleaf upland forest, coastal scrub, valley and foothill grassland, chaparral; in mesic openings, on sandy substrate. Elevation range: 165 – 1640 feet. Blooms: May – July.	**Unlikely.** Although the Park contains grassland habitat, this species is restricted to sandy substrates and is most closely associated with open chaparral and open woodland sites.	**Not Present.** No further actions are recommended for this species.
Iris longipetala coast iris	Rank 4	Coastal prairie, lower montane coniferous forest, meadows and seeps; located on mesic sites. Elevation range: 0 – 1950 feet. Blooms: March – May.	**Unlikely.** This species is closely associated with coastal sites within direct maritime influence.	**Not Present.** No further actions are recommended for this species.
Juglans hindsii North California black walnut	Rank 1B	Riparian forest, riparian woodland. Elevation range: 0 – 1430 feet. Blooms: April – May.	**Unlikely.** Although the Park contains riparian areas, native stands of this species were historically restricted to the interior Coast Ranges.	**Not Present.** No further actions are recommended for this species.
Lasthenia burkei Burke's goldfields	FE; SE; Rank 1B	Vernal pools, meadows and seeps; typically located in pools and swales. Elevation range: 45 – 1950 feet. Blooms: April – June.	**Moderate Potential.** The Park contains mesic grassland, seasonal wetland, and vernal pool-like wetlands that may support this species; however, this species is closely associated with native/natural vernal pools on the Santa Rosa Plain and Ukiah Valley.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Lasthenia conjugens Contra Costa goldfields	FE; Rank 1B	Valley and foothill grassland, vernal pools, cismontane woodland; located in pools, swales, and depressions in mesic grassy sites underlain by alkaline substrate. Elevation range: 0 – 1530 feet. Blooms: March – June.	**Moderate Potential.** The Park contains mesic grassland, seasonal wetland, and vernal pool-like wetlands that may support this species; however, this species is closely associated with native/natural vernal pools on the coastal Bay plain and Delta.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Lathyrus jepsonii var. *jepsonii* Delta tule pea	Rank 1B	Freshwater and brackish marshes; typically located near or on slough margins, closely associated with cattail, tules, bulrushes, Baltic rush, California rose, and Suisun Marsh aster; known widely throughout Suisun Bay and Delta regions. Elevation range: 0 – 15 feet. Blooms: May – July, sometimes September.	**No Potential.** The Park does not contain coastal brackish marsh necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Legenere limosa legenere	Rank 1B	Vernal pools; typically located in the deepest portions of pools. Elevation range: 3 – 2860 feet. Blooms: April – June.	**Moderate Potential.** The Park contains mesic grassland and vernal-pool like habitats that may support this species; however, this species is closely associated with a mosaic of native vernal pools containing low-growing, native annual vegetation not present in the Park.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Leptosiphon acicularis bristly leptosiphon	Rank 4	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland; often located on shallow, rocky substrate in foothill positions. Elevation range: 175 – 4875 feet. Blooms: April – July.	**Moderate Potential.** The Park contains shallow, rocky areas in woodland and grassland habitat that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Leptosiphon jepsonii Jepson's leptosiphon	Rank 1B	Chaparral, cismontane woodland; on open to partially shaded grassy slopes on volcanic or the periphery of serpentine substrate. Elevation range: 330 – 1640 feet. Blooms: April – May.	**Moderate Potential.** The Park contains woodland habitat underlain by volcanic soils; however, this species is typically located within openings of or adjacent to chaparral habitat.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Lessingia hololeuca woolly-headed lessingia	Rank 3	Broadleaf upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland; typically on clay, serpentine substrate. Elevation range: 3 – 2885 feet. Blooms: April – June.	**Moderate Potential.** The Park contains grassland habitat underlain by serpentine clay substrate that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Lessingia micradenia var. *micradenia* Tamalpais lessingia	Rank 1B	Chaparral, valley and foothill grassland; usually located on serpentine, often on roadsides. Elevation range: 325 – 1625 feet. Blooms: June – October.	**Unlikely.** Although the Park contains serpentine grassland habitat, this species is closely associated with extensive bare ground and serpentine talus not present in the Park.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Lilaeopsis masonii Mason's Lilaeopsis	SR, Rank 1B	Freshwater and brackish coastal marshes, riparian scrub; located on channel banks in the splash zone on bare mud substrate. Elevation range: 0 – 35 feet. Blooms: April – November.	**No Potential.** The Park does not contain coastal brackish marsh necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Lilium rubescens redwood lily	Rank 4	Broadleaf upland forest, chaparral, lower montane coniferous forest, upper montane coniferous forest, North Coast coniferous forest; often located on serpentine substrates, and along roadcuts. Elevation range: 95 – 6210 feet. Blooms: April – September.	**No Potential.** The Park does not contain chaparral or coniferous forest habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Limnanthes vinculans Sebastopol meadowfoam	FE, SE, Rank 1B	Mesic meadows, valley and foothill grassland, vernal pools; located in swales, wet meadows, depressions, and pools in the oak savanna of the Santa Rosa Plain on heavy adobe clay substrate. Elevation range: 3 – 2885 feet. Blooms: April – June.	**Moderate Potential.** The Park contains mesic grassland, seasonal wetland, and vernal pool-like wetlands that may support this species; however, this species is closely associated with native/natural vernal pools on the Santa Rosa Plain.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Lomatium repostum Napa Lomatium	Rank 4	Chaparral, cismontane woodland; located on serpentine substrate. Elevation range: 290 – 2700 feet. Blooms: March – June.	**Unlikely.** Although the Park contains woodland habitat, this species is known from serpentine chaparral and serpentine woodland habitat.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Lupinus sericatus Cobb Mountain lupine	Rank 1B	Broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest; typically located in stands of knobcone pine-oak woodland, on open wooded slopes in gravelly substrate, sometimes serpentine. Elevation range: 890 – 4960 feet. Blooms: March – June.	**No Potential.** This species is closely associated with forest, chaparral, and woodland habitat underlain by volcanic tuffs or serpentine substrate not present within the Park.	**Not Present.** No further actions are recommended for this species.
Micropus amphibolus Mt. Diablo cottonweed	Rank 3	Broadleaf upland forest, chaparral, cismontane woodland, valley and foothill grassland; typically on thin, rocky soils. Elevation range: 145 – 2710 feet. Blooms: March – May.	**Moderate Potential.** The Park contains grassland and open woodland habitat underlain by shallow soils that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Microseris paludosa marsh microseris	Rank 1B	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland. Elevation range: 5 – 300 feet. Blooms: April – June.	**Moderate Potential.** The Park contains grassland habitat that may support this species; however, this species is typically located in coastal sites and the Santa Rosa Plain.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Navarretia leucocephala ssp. *bakeri* Baker's navarretia	Rank 1B	Wet, mesic sites underlain by adobe and/or alkaline substrate in cismontane woodland, meadows, seeps, vernal pools, valley and foothill grassland, lower montane coniferous forest. Elevation range: 15 – 5710 feet. Blooms: April – July.	**Moderate Potential.** The Park contains seasonal wetland and vernal pool-like wetlands that may support this species; however, this species is closely associated with valley-bottom vernal pools.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Navarretia rosulata Marin County navarretia	Rank 1B	Closed-cone coniferous forest, chaparral; located on dry, rocky sites often formed from serpentine. Elevation range: 650 – 2065 feet. Blooms: May – July.	**No Potential.** The Park does not contain serpentine coniferous forest or serpentine habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Plagiobothrys mollis var. *vestitus* Petaluma popcornflower	Rank 1A	Coastal salt marsh, valley and foothill grassland; presumed to occur in mesic grasslands on marsh fringe. Elevation range: 30 – 165 feet. Blooms: June – July.	**Moderate Potential.** The Park contains grassland-wetland fringe that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Pleuropogon hooverianus North coast semaphore grass	ST, Rank 1B	Broadleaf upland forests, meadows and seeps, freshwater marshes and swamps, North Coast coniferous forest, shaded, wet, and grassy areas in forested habitat. Elevation range: 10 – 635 feet. Blooms May – August.	**Moderate Potential.** The Park contains mesic openings and meadows in woodland habitat that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Ranunculus lobbii Lobb's buttercup	Rank 4	Cismontane woodland, North Coast coniferous forest, valley and foothill grassland, vernal pools; located in mesic, vernally wet areas. Elevation range: 45 – 1530 feet. Blooms: February – May.	**High Potential.** The Park contains aquatic features and vernal pool-like wetlands that may support this species.	**Present.** This species was observed during 2006-2008 surveys in several aquatic features in the southern portion of the Park. The resource management plan should account for the preservation of this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Rhynchospora globularis round-headed beaked-rush	Rank 2	Freshwater marshes and swamps. Elevation range: 145 – 200 feet. Blooms: July – August.	**Unlikely.** Although the Park contains perennial wetland features, this species is closely associated with high acid wetlands, and is highly restricted to freshwater marsh features near Sebastopol.	**Not Present.** No further actions are recommended for this species.
Ribes victoris Victor's gooseberry	Rank 4	Broadleaf upland forest, chaparral; located in shady, mesic sites. Elevation range: 325 – 2440 feet. Blooms: March – April.	**Unlikely.** The Park does not contain forest or chaparral habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Senecio aphanactis chaparral ragwort	Rank 2	Cismontane woodland, chaparral, coastal scrub; located on drying alkaline flats. Elevation range: 45 – 2600 feet. Blooms: January – April.	**No Potential.** The Park does not contain drying alkaline flats in chaparral, scrub, or woodland habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Sidalcea calycosa ssp. *rhizomata* Point Reyes checkerbloom	Rank 1B	Marshes and swamps; located in freshwater marsh habitat near the coast. Elevation range: 10 – 245 feet. Blooms: April – September.	**Moderate Potential.** The Park contains perennial wetland habitat that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Sidalcea hickmanii ssp. *viridis* Marin checkerbloom	Rank 1B	Chaparral; situated on dry hillslopes underlain by serpentine or volcanic, typically near the coast. Elevation range: 160 – 1400 feet. Blooms: May – June.	**No Potential.** The Park does not contain serpentine chaparral habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Streptanthus batrachopus Tamalpais jewel-flower	Rank 1B	Closed-cone coniferous forest, chaparral; located on serpentine talus slopes. Elevation range: 990 – 2115 feet. Blooms: April – July.	**No Potential.** The Park does not contain serpentine coniferous or serpentine chaparral habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Streptanthus glandulosus ssp. *pulchellus* Mt. Tamalpais jewelflower	Rank 1B	Chaparral, valley and foothill grassland; located on serpentine slopes. Elevation range: 490 – 2600 feet. Blooms: May – August.	**Unlikely.** Although the Park contains serpentine habitat, this species is closely associated with rock outcrops and barrens, with substantial serpentine cobble and bare ground at the surface.	**Not Present.** No further actions are recommended for this species.
Symphyotrichum lentum Suisun Marsh aster	Rank 1B	Freshwater and brackish marshes and swamps; typically located on slough margins and edges, closely associated with cattail, tules, bulrushes, California rose, and Delta Tule pea. Elevation range: 0 – 10 feet. Blooms: May – November.	**No Potential.** The Park does not contain coastal brackish marsh necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Toxicoscordion fontanum marsh zigzag	Rank 4	Chaparral, cismontane woodland, lower montane coniferous forest, meadows and seeps, marshes and swamps; located in vernally mesic sites, often underlain by serpentine. Elevation range: 45 – 3250 feet. Blooms: April – July.	**High Potential.** The Park contains seep habitat underlain by serpentine that may support this species.	**Present.** Several populations were observed and mapped in the southern portion of the Park during plant surveys 2006-2008.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Trichostema ruygtii Napa bluecurls	Rank 1B	Cismontane woodland, chaparral, valley and foothill grassland, vernal pools, lower montane coniferous forest; located in open, sunny locations, and dried vernal pools. Elevation range: 95 – 2210 feet. Blooms: June – October.	**Unlikely.** Although the Park contains vernal pool-like and grassland habitat, this species is highly restricted to east Napa County.	**Not Present.** No further actions are recommended for this species.
Trifolium amoenum showy rancheria clover	FE, Rank 1B	Valley and foothill grassland, coastal bluff scrub, swales, open sunny sites, sometimes on serpentine. Elevation range: 15 – 1365 feet. Blooms: April – June.	**Moderate Potential.** The Park contains serpentine grasslands and roadcuts that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Trifolium hydrophilum saline clover	Rank 1B	Marshes and swamps, mesic portions of alkali vernal pools, mesic, alkali valley and foothill grassland. Elevation range: 0 – 985 feet. Blooms: April – June.	**Moderate Potential.** The Park contains seasonal wetland habitat with some assumed alkali conditions that may support this species.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
Triteleia lugens dark-mouthed triteleia	Rank 4	Broadleaf upland forest, chaparral, lower montane coniferous forest, coastal scrub. Elevation range: 325 – 3250 feet. Blooms: April – June.	**No Potential.** The Park does not contain forest or chaparral habitat necessary to support this species.	**Not Present.** No further actions are recommended for this species.
Viburnum ellipticum oval-leaved viburnum	Rank 2	Chaparral, cismontane woodland, lower montane coniferous forest. Elevation range: 705 – 4595 feet. Blooms: May – June.	**Moderate Potential.** The Park contains cismontane woodland that may support this species; however, the presence of cattle and relatively thin shrub understory reduces this species potential.	**Not Observed.** This species was not observed during rare plant surveys in 2006-2008.
WILDLIFE				

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Invertebrates				
Andrena blennospermatis Blennosperma vernal pool android bee	SAL	Generalist pollinator of common blennosperma (*Blennosperma nanum* ssp. *nanum*) and Sonoma sunshine (*B. bakeri*). Located in grasslands with vernal pools and seeps that support blennosperma; ground-nesting.	**Moderate Potential.** The Park supports common blennosperma and suitable upland nesting habitat.	**Unknown.** Individuals were not observed or surveyed.
Adella oplerella Opler's longhorn moth	SAL	Grasslands in the Bay Area; cream cups (*Platystemon californicus*) are suspected / assumed larval and nectar source; often serpentine, but not restricted.	**High Potential.** The Park contains grasslands with cream cups.	**Present.** One individual observed in the southwest portion of the Park.
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE, RP, SSI	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	**No Potential.** This species is generally found within three miles of the coast. The inland nature of the Park precludes this species from being found on the site.	**Not Present.** No further actions are recommended for this species. **Present.** An undocumented subspecies of *Speyeria zerene* has been documented from Cougar Mountain adjacent to the Park.
Hydrocharia rickseckeri Ricksecker's water scavenger beetle	SAL	Aquatic beetle known from stock ponds, vernal pools, and small lakes throughout Bay Area.	**Moderate Potential.** The presence of stock ponds and other aquatic features may provide habitat for this species.	**Unknown.** Individuals were not observed or surveyed.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Syncaris pacifica California freshwater shrimp	FE, SE, SSI, RP	Endemic to Marin, Napa, and Sonoma counties. Found in low elevation, low gradient (generally less than 1%) perennial streams where riparian cover is moderate to heavy. Shallow pools away from main stream flow. Winters near undercut banks with exposed roots. In the summer uses leafy branches touching water.	**Unlikely.** This species is not known from the Tolay Creek watershed.	**Not Present.** No further actions are recommended.
Linderella occidentalis California linderella	SAL	Freshwater fairy shrimp known from vernal pools in the Central Valley and Coast Ranges. Pool size varies and water is typically clear to slightly turbid.	**Moderate Potential.** The presence of stock ponds and vernal pool-like wetland habitat may support this species.	**Unknown.** Individuals were not observed or surveyed.
Amphibians & Reptiles				
Rana aurora draytonii California red-legged frog	FT, SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation. Requires 11 to 20 weeks of permanent water for larval development. Must have access to aestivation habitat.	**High Potential.** Perennial stock ponds within the Park provides high quality aquatic breeding habitat, and CRLF have been previously documented within the Park. Wetland complexes provide non-breeding aquatic habitat and grassland and woodland habitats within the Park provide upland and dispersal habitat	**Assumed Present.** Anecdotal observations of this species suggest it is present. Considerations for this species within the management plan to protect existing habitat.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Rana boylii foothill yellow-legged frog	SSC	Found in or near rocky streams in a variety of habitats. Prefers partly-shaded, shallow streams and riffles with a rocky substrate; requires at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis. Feeds on both aquatic and terrestrial invertebrates.	**Moderate Potential.** The drainages within the Park provide suitable breeding, foraging, and dispersal habitat.	**Not Observed.** This species was not observed during surveys conducted in 2006-2008; however, confirmed absence is still unknown.
Ambystoma californiense California tiger salamander	FE, ST	Populations in Santa Barbara and Sonoma counties currently listed as endangered. Inhabits grassland, oak woodland, ruderal and seasonal pool habitats. Seasonal ponds and vernal pools are crucial to breeding. Adults utilize mammal burrows as aestivation habitat.	**No Potential.** The Park is south of the southern extent of the range of the Santa Rosa DPS.	**Not Present.** No further actions are recommended.
Actinemys marmorata Pacific pond turtle	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg-laying.	**High Potential.** The Park provides suitable aquatic and nesting habitat for Pacific pond turtles. This species has been documented in San Antonio Creek and in pools in the lower sections of the unnamed tributary to San Antonio Creek within the Park.	**Assumed Present.** Anecdotal observations of this species suggest it is present. Considerations for this species within the management plan to protect existing habitat.
Fishes				

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Pogonichthys macrolepidotus Sacramento splittail	SSC	Endemic to the lakes and rivers of the Central Valley, but now confined to the Sacramento Delta, Suisun Bay and associated marshes. Occurs in slow-moving river sections and dead end sloughs. Requires flooded vegetation for spawning and foraging for young. Splittail are primarily freshwater fish, but are tolerant of moderate salinity and can live in water where salinity levels reach of 10-18 parts per thousand.	**Unlikely.** Flooded vegetation along Tolay Creek in summer generally absent. Addtionally, barriers to upstream migration are present along Tolay Creek near Highway 121 which would preclude this species from occurring within the Park.	**Not Present.** No further actions are recommended for this species
Eucyclogobius newberryi tidewater goby	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**No Potential**. No lagoon, estuary or suitable low flow habitat within the Park. Additionally, this species is believed to be extirpated from San Francisco and San Pablo Bays.	**Not Present.** No further actions are recommended for this species
Oncorhynchus mykiss steelhead – Central CA Coast ESU	FT, NMFS	Occurs from the Russian River south to Soquel Creek and Pajaro River. Also in San Francisco and San Pablo Bay Basins. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for one or more years before migrating downstream to the ocean.	**No Potential.** No documented occurrences from Tolay Creek watershed (Leidy et al. 2005).	**Not Present.** No further actions are recommended for this species

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Birds				
Aquila chrysaetos golden eagle	BCC, CFP	Rolling foothills mountain areas, sage-juniper flats, desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	**High Potential.** The Park contains deep canyons with large trees suitable for nesting and a robust population of black-tailed jackrabbits.	**Present.** Repeated observations of this species suggest it utilizes the Park. Considerations for this species within the management plan to protect existing habitat.
Elanus leucurus white-tailed kite	CFP	Year-long resident of coastal and valley lowlands; frequently found around grasslands and agricultural areas. Specific plant associations appear unimportant for nesting and roosting, but vegetation structure and prey abundance are considered important. Preys on small diurnal mammals and occasional birds, insects, reptiles, and amphibians.	**High Potential.** Suitable nesting and foraging habitat is present within the Park.	**Present.** LSA (2009b, 2009c) and others have observed this species foraging on site. Considerations for this species within the management plan to protect existing habitat.
Haliaeetus leucocephalus bald eagle	SE, CFP	Frequents ocean shores, lake margins, and rivers for both nesting and wintering. Requires large bodies of water, or free-flowing rivers with abundant fish and adjacent snags or other perches. Most nests are located within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branchwork. Shows a preference for ponderosa pine. Roosts communally in winter.	**Unlikely.** The Park is outside of the known breeding range. Bald eagles may roost here in the winter. The Park may offer wintering roosting sites.	**Not Present.** No observations of bald eagle from the Park. No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Rallus longirostris obsoletus California clapper rail	FE, SE, CFP	Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed (*Salicornia pacifica*), but feeds away from cover on invertebrates from mud-bottomed sloughs.	**No Potential**. No suitable nesting or foraging habitat present within the Park.	**Not Present.** No further actions are recommended for this species.
Laterallus jamaicensis coturniculus	ST, BCC, CFP	Mainly inhabits salt marshes bordering larger bays. Occurs in tidal salt marsh heavily grown to pickleweed; also in fresh-water and brackish marshes, all at low elevation.	**No Potential**. No suitable nesting or foraging habitat present within the Park.	**Not Present.** No further actions are recommended for this species.
Coccyzus americanus occidentalis western yellow-billed cuckoo	FC, SE, BCC	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow (*Salix* spp.) often mixed with cottonwoods (*Populus fremontii*), with understory of blackberry (*Rubus* sp.), nettles (*Urtica* sp.), or wild grape (*Vitis californica*).	**No Potential.** Riparian habitat within the Park is not extensive enough to support this species.	**Not Present.** No further actions are recommended for this species.
Athene cunicularia burrowing owl	BCC, SSC	Found in open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**High Potential.** Wintering habitat is present in the Park. Low-growing vegetation around mammal burrows.	**Present.** Burrowing owls have been detected on numerous occasions within the Park. Unlikely to breed within the Park. Considerations for this species within the management plan to protect existing habitat.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Asio flammeus short-eared owl	SSC	Freshwater and salt swamp and marsh habitats; as well as lowland meadows, grasslands, and irrigated alfalfa fields. Tule patches and/or tall grass needed for nesting and daytime seclusion. Nests on dry ground in depression concealed in tall, herbaceous vegetation.	**Moderate Potential.** The Park offers wetland and grassland habitat sufficient to support foraging and overwintering site; however, only one documented occurrence of nesting in Sonoma County suggests this species is unlikely to utilize the Park for nesting.	**Present.** One adult was observed in November 2005; however nesting has not been observed. Considerations within the management plan Considerations for this species within the management plan to protect existing habitat.
Chaetura vauxi Vaux's swift	SSC	Found in redwood, Douglas fir, and other coniferous forests. Nests in large hollow trees and snags. Often nests in flocks. Forages over most terrains and habitats but shows a preference for foraging over rivers and lakes.	**Unlikely.** Marginal nesting habitat may be present within the cavities of the large trees on-site, however, the Park lacks suitable coniferous forest with such cavities. This species may pass through the Park during migration periods. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013a).	**Present.** Vaux's swift observed within the Park September and October; likely migrating. No further actions are recommended for this species.
Cypseloides niger black swift	BCC, SSC	Generally found in the coastal belt of Santa Cruz and Monterey County; central and southern Sierra Nevada; San Bernardino and San Jacinto Mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above surf; forages widely.	**Unlikely.** No waterfalls are present within the Park. Species may rarely occur over the Park during migration periods. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013A).	**Not Present.** No further actions are recommended.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Riparia riparia bank swallow	ST	Migrant in riparian and other lowland habitats in western California. Colonial nester in riparian areas with vertical cliffs and bands with fine-textured or fine-textured sandy soils near streams, rivers, lakes or the ocean.	**Unlikely.** Low quality breeding habitat is present along the banks of San Antonio Creek, however, the Park is outside of this species' documented range. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013A).	**Not Observed.** No further actions are recommended for this species.
Contopus cooperi olive-sided flycatcher	BCC, SSC	Nesting habitats are mixed conifer, montane hardwood-conifer, douglas-fir, redwood, red fir and lodgepole pine. Most numerous in montane conifer forests where tall trees overlook canyons, meadows, lakes or other open terrain.	**Unlikely.** Marginal nesting habitat may be present within the cavities of the large trees on-site, however, the Park lacks suitable coniferous forest. This species may pass through the Park during migration periods. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013A).	**Present.** Observed within the Park in May 2007. Possible migrating individual. No further actions are recommended.
Lanius ludovicianus loggerhead shrike	BCC, SSC	Generally nests in broken woodlands, savannah, pinyon-juniper, Joshua tree and riparian woodlands, desert oases, scrub, and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting. Found throughout much of the state.	**Moderate Potential.** Suitable foraging habitat exists within the open grassland habitats and nesting habitat is present within chaparral habitats within the Park. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013A).	**Present.** Observed in the Park. No further actions are recommended. Considerations for this species within the management plan to protect existing habitat

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Dendroica petechia brewsteri yellow warbler	SSC	Frequents riparian plant associations. Prefers willows, cottonwoods, aspens, sycamores and alders for nesting and foraging. Also nests in montane shrubbery in open conifer forests.	**Moderate Potential.** Within the Park, relatively large patches of willows are present along San Antonio Creek where the overstory is comprised of Oaks, maples, buckeye and ash. No known nesting occurrences are known from within 5.0 miles of the Park (CDFW 2013A).	**Present.** Observed in the Park. No further actions are recommended. Considerations for this species within the management plan to protect existing habitat.
Geothlypis trichas sinuosa saltmarsh common yellowthroat	BCC, SCC	Resident of the San Francisco Bay region, in fresh and saltwater marshes with riparian forest. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Moderate Potential.** The Park contains sufficient freshwater marsh with riparian forest habitat for this species. Documented nesting in Petaluma Marsh to the west and Sonoma Marsh to the east (CDFW 2013A).	**Present.** Common yellowthroat observed in September 2007 within the Park. No documented nesting activity within the Park.
Agelaius tricolor tricolored blackbird	BCC, SSC, RP	A highly colonial species, most numerous in Central Valley and vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	**High Potential.** Aquatic emergent vegetation within Tolay Lake may provide nesting habitat for this species.	**Present.** Tricolored blackbird has been observed within the Park, but nesting behavior has not been detected. No further actions are recommended for this species.
Mammals				

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Antrozous pallidus pallid bat	SSC, WBWG High	Found in deserts, grasslands, shrublands, woodlands, and forests. Roost sites include old ranch buildings, rocky outcrops and caves within sandstone outcroppings. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Moderate Potential.** There are suitable building and rocky outcrops for roosting sites for this species. A pallid bat maternity colony is known from nearby Olompali State Park approximately five miles to the west (CNDDB 2013a).	**Unknown.** This species has not been documented or surveyed in the Park. Future surveys in areas where impacts are scheduled to potential roost sites. Considerations for this species within the management plan to protect existing habitat.
Corynorhinus townsendii Townsend's big-eared bat	SSC, WBWG High	This species is associated with a wide variety of habitats from deserts to mid-elevation mixed coniferous-deciduous forest. Females form maternity colonies in buildings, caves and mines and males roost singly or in small groups. Foraging occurs in open forest habitats where they glean moths from vegetation.	**Moderate Potential.** There are suitable building and rocky outcrops for roosting sites for this species. A big-eared bat maternity colony is known from nearby Olompali State Park approximately five miles to the west (CNDDB 2013a).	**Unknown.** This species has not been documented or surveyed in the Park. Future surveys in areas where impacts are scheduled to potential roost sites. Considerations for this species within the management plan to protect existing habitat.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PARK	RESULTS AND RECOMMENDATIONS
Taxidea taxus American badger	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Requires friable soils and open, uncultivated ground. Preys on burrowing rodents.	**Moderate Potential.** Friable soils are present in pockets of grassland habitat within the Park, particularly on East Ridge and West Ridge. American badger has been documented in the Petaluam environs (CDFW 2013a).	**Unknown.** Several large burrows have been observed within the Park. Future surveys in areas where impacts are scheduled to potential burrow sites. Considerations for this species within the management plan to protect existing habitat.
Reithrodontomys raviventris saltmarsh harvest mouse	FE, SE, CFP	Found only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Do not burrow, build loosely organized nests. Require higher areas for flood escape.	**No Potential.** No pickleweed or saltmarsh habitat found within the Park.	**Not Present.** No further actions are recommended this species.
Sorex ornatus sinuosus Suisun shrew	SSC	Found in tidal marshes of the northern shores of San Pablo Bay and Suisun Bay; requires dense low-growing cover and vegetative litter above the mean high tide line for nesting and foraging.	**No Potential.** The Park does not contain tidal marsh habitat necessary to support this species.	**Not Present.** No further actions are recommended this species.

*** Key to status codes:**

FE	Federal Endangered
FT	Federal Threatened
FC	Federal Candidate
FD	Federal De-listed
BCC	USFWS Birds of Conservation Concern
SE	State Endangered
SD	State Delisted
ST	State Threatened
SR	State Rare
SSC	CDFW Species of Special Concern
CFP	CDFW Fully Protected Animal
SAL	CDFW Special Animals List
WBWG	Western Bat Working Group High or Medium Priority species
Rank 1A	CNPS List 1A: Plants presumed extinct in California
Rank 1B	CNPS List 1B: Plants rare, threatened or endangered in California and elsewhere
Rank 2	CNPS List 2: Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3	CNPS List 3: Plants about which CNPS needs more information (a review list)
Rank 4	CNPS Rank 4: Plants of limited distribution (a watch list)

Potential to Occur:

<u>No Potential</u>. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

<u>Unlikely</u>. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

<u>Moderate Potential</u>. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

<u>High Potential</u>. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

Results and Recommendations:

<u>Unknown</u>. Species has the potential to occur, but surveys have not been performed to document occurrence.

<u>Assumed Present</u>. Species has been reported historically, but recent documentation of presence is lacking.

<u>Present</u>. Species was observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

<u>Not Present</u>. Species is assumed to not be present due to a lack of key habitat components.

<u>Not Observed</u>. Species was not observed during surveys.

Appendix C – LSA & PWA Bird Survey Analysis (LSA 2009b)

BIRD SURVEY ANALYSIS, TOLAY LAKE REGIONAL PARK

A dedicated and technically proficient group of about a dozen volunteer birders associated with Petaluma Wetland Alliance have regularly surveyed the Tolay Lake Regional Park for birds starting on April 15, 2006. They have conducted 28 surveys as of February 21, 2009, having made visits in every month of the year except August over the nearly three-year period. On each visit, the survey covers most of the property, but not all. All birds are identified to species and the number of individuals is tallied. Data are also recorded regarding weather conditions. Although there is some variation in the coverage of each survey, methodologically the visits are roughly comparable and scientifically valid.

The quality of the data is excellent. With a year or two more of surveys, the accumulated data should be used to develop a checklist of bird species with seasonal frequency of abundance information. The data are also extremely useful for park planning and conservation purposes. For example, introductions of new species can be tracked, such as the observation of Eurasian collared dove on September 23, 2007, and again on April 19, 2008. Special-status species such as grasshopper sparrow can be monitored. The data can also be mined to see what ordinarily common species, such as hermit thrush, are under-represented at the park due to marginal habitat conditions that could be enhanced, particularly bird species requiring mature trees or developed underbrush.

Table A compiles the results of these bird surveys. Number of species observed on each survey varied from 34 to 75. Number of individual birds counted on each survey varied from 419 to 5,204. Cumulatively, 149 species and 23,050 individuals have been observed.

Table B aggregates the data by species to give the frequency of abundance of birds observed. The five most frequently observed species in order of abundance were red-winged blackbird, European starling, western meadowlark, house finch, and Savannah sparrow. All of these species are birds that primarily forage in grasslands and marshlands, which are the two most abundant habitat types on Tolay Lake Regional Park.

Table C aggregates the data by relative seasonal abundance and by guilds. For the relative seasonal abundance analysis, the months of the year were joined in pairs; e.g., December with January and so forth. Then the number of birds counted in each monthly pair was added together and divided by the number of counts in that monthly pair to create an index of relative abundance. The six pairs of months roughly correspond to the following phenologies in the annual cycles of birds: April-May is the nesting season; June-July is the fledgling season; August-September is the post breeding season/migration season; October-November is the peak of migration for many non-resident birds; December-January is the beginning of the winter resident season; and February-March is end of the winter resident season and the beginning of the migratory season. Of course, the phenologies of some individuals and even species will differ in particulars from this generalized pattern.

Table C also groups the birds observed at Tolay Lake Regional Park by guilds, which are groupings of species using the same or similar habitats. Table D presents a summary of the data contained in Table C. The groups are necessarily broad but are designed to illustrate the relative seasonal abundances. The following guilds are delineated:

- The **forest, riparian, and brush guild** is generally composed of birds that are dependent on woody habitat from shrubs to mature trees for important phases of their life cycle, particularly for foraging and nesting.

- The **grassland guild** is generally composed of birds that forage primarily in grasslands. Some of these species also nest in grasslands. All the swallows were placed in this guild, even though some forage over forest and marsh as well; none of them nest in grass.
- The **raptor guild** is the most taxonomically parsimonious grouping, composed of hawks and falcons along with the turkey vulture.
- The **waterbird guild** is broken into marsh birds such herons and egrets, shorebirds such as sandpipers and plovers, and waterfowl and allies. The latter category includes ducks and geese along with gulls, a tern species, grebes, American coot, and belted kingfisher.

With the exception of marsh birds and shorebirds, each of the guilds is broken into two or three of the following seasonal categories: breeding/summer resident, migratory/winter resident, and year-round resident. These seasonal categorizations are based on the findings of the *Birds of Sonoma County California* (Bolander and Parmeter 2000) for the part of Sonoma County where Tolay Lake Regional Park is located. Some species, such as the European starling and the western meadowlark, are year-round residents, nesting in the park. But in the winter their numbers are greatly enhanced by migratory conspecifics. In the case of the starling and meadowlark, winter abundance is so disproportionately greater than in the breeding season that these birds were treated as migratory/winter residents.

Figures 1-4 graph the relative abundances of the four guilds. Among the forest, riparian, and brush guild birds, the most abundant are the year-round residents, although their numbers drop considerably in the nesting season (Figure 1). This drop suggests that suitable nesting habitat may be limited for some of these birds, many of which require mature trees or developed brush habitat. The breeding/summer resident birds, using forest, riparian, and brush habitat, have very low relative abundance in the winter, early spring, and fall as would be expected. But their breeding season numbers are not especially strong either, suggesting a paucity of suitable habitat for this group, which is composed mainly of neotropical migrants (i.e., bird species that winter in the neotropics).

Figure 2 illustrates the relative abundances of birds that comprise the grassland guilds. The largest group are the migratory/winter resident species with large numbers of migratory European starlings, western meadowlarks, and white-crowned and golden-crowned sparrows. The sparrow species may nest in Sonoma County, but mainly along the coast (Bolander and Parmeter 2000). Resident grassland birds, such as Savannah sparrow and Brewer’s blackbird, are present year-round in moderate numbers with a slight depression in numbers during the breeding season. The grassland breeding/summer resident species, mainly swallows, peak as expected in the breeding season and into the summer. However, their numbers may be limited by the lack of suitable nesting habitat on-site.

Figure 3 illustrates the relative abundances of raptors. Tolay Lake Regional Park has an exceptionally healthy population of year-round resident raptors. Many forage in the grasslands and nest in the riparian and oak woodlands. Their numbers peak in the late summer/early fall augmented by migratory conspecifics coming down from the north. The more strictly migratory species are found on-site in relatively low numbers in the winter, early spring, and fall. The relatively low abundance of migratory raptors likely reflects mainly that these top predators occur at naturally low numbers, rather than lack of suitable habitat.

Figure 4 illustrates the relative abundances of birds that comprise the waterbird guilds. Both migratory and year-round resident waterfowl peak in February/March, but are virtually absent the rest of the year, reflecting the hydration period of Tolay Lake. Augmentation of the seasonal hydration of Tolay Lake could significantly increase waterfowl presence on-site. Shorebirds, which are primarily migrants and winter residents, are present at low numbers primarily due to the limited amount of suitable habitat. The marsh bird group is dominated by the large number of red-winged blackbirds, especially in the fall and winter.

Figure 5 illustrates the relative abundance by season of all species and individuals. Both relative number of species and relative number of individuals track the same seasonal pattern at Tolay Lake Regional Park with high numbers in the winter, early spring, and fall and correspondingly low numbers in the latter part of the spring and through the summer, when the seasonal wetlands desiccate and many bird species migrate to the coast or to the north to breed.

Overall the data indicate a substantially rich avifauna at Tolay Lake Regional Park. Raptor populations are particularly strong. Waterfowl occur in large numbers when Tolay Lake is hydrated, but are limited by the seasonal nature of that waterbody. Enhancement of riparian, brush, and woody understory vegetation would likely increase the numbers of neotropical migrant breeding birds as well as year-round resident birds that use such habitat.

REFERENCE:

Bolander, G.L., and B.D. Parmeter. 2000. Birds of Sonoma County, California: An Annotated Checklist and Birding Gazetteer. Redwood Ornithological Society, Napa, CA. 155 pp.

Table A: Bird Species Observed, Number of Individuals and Dates, Tolay Lake Regional Park, Sonoma County, California

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Grebe, Horned								3																				
Grebe, Eared																	2	2										
Grebe, Pied-billed	2	4							1	1							2	2										1
Pelican, Am. White														14	5													
Cormorant, D.-cr.								3		2						2		1							13		3	1
Heron, Great Blue		1	3	1		2						1	1	1		4	1	1	1	1		1		2	2		2	1
Egret, Great			1		2	3	3	1		5	2			1	3	1	1		3	5	3	2	3	2	1		1	2
Heron, Green												1																
Heron, Bl.-cr. Night												1										4	1	1				
Goose, Canada	7	5	26	6		238	10	10		8					8	9	29	22		4						12	30	133
Goose, Gr. White-fr.						2																					4	8
Duck, Wood																4												
Mallard	9	12		1		5	18	11	4	14	1	7		14		6	12	22	14	18	1	5	5	5		11	21	40
Gadwall	10	7				5		3	2	6						4	18	3	3	4								38
Pintail, Northern	2							1									241	9	1								1	87
Wigeon, American	8																60	83	2								2	306
Shoveler, Northern	1	3						126		1							36	10										4
Teal, Cinnamon	2	1						4	3	4			1	1			3	13	6	8								9
Teal, Blue-winged														1														
Teal, Green-winged	2							12									19	27	2								1	38
Canvasback																	40										1	55
Scaup, Greater	2																5	1									6	
Scaup, Lesser														5		10												
Bufflehead	12	1						2								7	37	30									1	56
Merganser, Com.							1									4											2	2
Duck, Ring-necked																	100	2										21
Duck,Ruddy																	76	41										22
Vulture, Turkey	1	1	8	4	4	10		9	5	16	4	3	8	4	6	2	19	3	7	10	1	6	11	13	1	2	10	6
Harrier, Northern	0	0	3	4	4	6	3	1	1		1	3	10	8	8	8							3	3	5	4	7	2
Kite, White-tailed	0	0	2	7	4	5	7	5		1		12	25	7	17	5	4	3				2	1	6	3	4	4	3
Hawk, Sharp-shin.			2												2									1	2			

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Hawk, Cooper's									1	1					3	1	1				1		2		1	1	1	2
Hawk, Red-sh.	1	0		4		1		1			1	2	9	1	3	3		2			2		2	3	1		3	5
Hawk, Swainson's																			2									
Hawk, Red-tailed	2	1	7	3	9	6	3	4	4	11		2	15	12	11	6	6	7	4	4	1	10	10	7	6	9	10	6
Hawk, Ferruginous					1										1			1							1	2	1	
Hawk, Rough-leg.						1									1	1		1							2	2	2	1
Eagle, Golden								1				1		3	2	2	2				2		1		2		1	
Osprey							1																					
Merlin							1											2									1	1
Kestrel, American	1	2	6	6	7	6	9	1				7	9	5	6	11	4	4	3		1	4	7	5	5	8	9	4
Falcon, Prairie																								1			1	
Falcon, Peregrine					1	1			1									1			1			2				
Quail, California	0	9		16	6		8	19	20	15	12	14	26		4		8	13	11	20	18	15	2	20	66		37	6
Pheasant, Ring-n.										1																		
Turkey, Wild		1			1														7			3	15		10			
Moorhen, Common				1						2		3	2	1								3				1		
Coot, American	14	34				2		28	5	3		1	1	3		4	150	225	18					1				16
Sora																											1	
Killdeer	5	7	14	86	58	20	10	2	1	5	2	12	6	1	26	14	9	1	6	2	3	2	4	21	17	8	119	6
Yellowlegs, Greater	3	1						2	1								1	1	7									
Curlew, Long-billed						1		1	3							5										16	10	10
Sandpiper, West.		3																										
Sandpiper, Least		30																										
Dowitcher, Long-b.	5	119															9		15									14
Snipe, Wilson's								9									1	4	5							1	2	3
Gull, Glaucous-w.							1																					
Gull, California																										2	1	
Tern, Caspian		1																	1									
Dove, Mourning	4	0	3	4	14	2			7	18	19	18	1	1	2	2			7	19	16	16	4	5	11		4	2
Dove, Eurasian Co.														1						1								
Pigeon, Rock	8	8	14	15	9	2		12	7	3				2		1	14	4	3	7	7	1		13	12	1	7	3
Pigeon, Band-t.												1															1	
Owl, Barn	2	2	3	4	2	2	2			2	1	7	9	4	3	1	2	3	1		2	2	2	1	2		2	1
Owl, Great Horned	1		2	1			2	1	1	1		4				1		1		2		6	1	4	1	1	2	

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Swift, Vaux's			2											10														
Humming., Allen's	2	4						5	3		2	1						1	7	4		1						1
Humming., Rufous	1							1	4	1							1	1										
Humming., Anna's	7	12	2		1	1	7	16	5	2	1	2	1	2	2		5	3	7	1	2		2	5	2	3	7	2
Selasphorus sp.																		4										
Kingfisher, Belted												1					1						1					
Woodpecker, Acorn						1						1						3	1		4		2		4		5	4
Sapsucker, Red-br.																							1		1			1
Woodpeck., Downy			1	4							1		3	2		1			1		2	1	1	1				1
Woodpeck., Hairy																1						1						
Woodpeck., Nuttall's	2	1		1					1	3		2	4	3	3	1	1	2	5	2	4	2	9	2	1	1	4	2
Flicker, Northern					4	11	3	1				1		1	7	10	8	19	1	1	1		1	3	8	7	17	6
Flycatcher, Olive-s.										1																		
Wood-Pewee, W.																			1				1					
Flycatcher, Pac. S.										1				1							1		3					
Flycatcher, Willow			1	1									1										1					
Flycatcher, Least													1															
Phoebe, Black	3	2	11	10	6	6	2	6	4	2	12	6	16	5	14	9	1	1	5	4	4	29	10	22	7	2	10	3
Phoebe, Say's			10	10	11	4	2							9	8	10	5	1					3	12	5	4	7	2
Flycatcher, Ash-thr.												2							4		1	3						
Kingbird, Western	2	1						3		1	2	7	1						5	11	3	2						
Shrike, Loggerhead				5	1	2			1	2		2	2		1	3	2	1	2		2	4	1	3	4	4	2	2
Vireo, Warbling			1											1								2	1					
Vireo, Hutton's			1		1								2		1	1									1	1		
Jay, Steller's						5				5		8		2		3	3	3	2		2		5		5		12	4
Scrub-Jay, Western			2		5	8	5				4	5	9	1	3	9	3	3		4	5	5	3	4	3	2	6	2
Raven, Common	4	4	4	10	21	10	11	3	5	10	4	7	8	2	25	12	5	11	5	9	7	9	4	19	6	13	18	4
Crow, American	2	1	1	1	5	5	1	1		2		3		6	12	2		6	3	18	3			3	1	9	11	5
Lark, Horned												1																
Swallow, N. R.-w.	1	4												2														
Swallow, Violet-gr.	23	5	54	2				10	3	31	3	24		24			1		35		17	1	23	14				
Swallow, Tree	9	40	20			12		8	30	2	3	11					2	24	29	55	19	43	8			2		1
Swallow, Cliff	70	80							52	70	25	66							72	75	60	4						
Swallow, Barn		241	5	3	1			72	20	19	19	41	18	5					18	90	35	31	13					

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Titmouse, Oak												4		3		2	2	1	3		7				2		8	1
Chickadee, Ch.-b.										2			3				2		2		4	1	1		3			
Bushtit	1			15	45	3			5	4	7	5				20	21	2	3	16	1	3	20	25	24	7	59	5
Nuthatch, Wh.-br.						1										1	2	3	3		2		4		2		2	1
Creeper, Brown														1											2	2	4	1
Wren, Bewick's				1	3					1			2	1		1	2	2	4		2						4	2
Wren, House			1	2				1		2		12			1			1	3	3	3					2		
Wren, Marsh				2								1			1												1	
Kinglet, Golden-cr.																									1			
Kinglet, Ruby-cr.					6	6								1	2			3							6	2	1	2
Bluebird, Western	9	5	2	2	14	19	15		1	1		10	19	17	5		6	13	12	20	12	5	14	28	24	7	9	18
Robin, American	3	3				5	26		3			2	1		1	2	4	6	11	8	6	8			16	3	3	12
Varied Thrush																											30	22
Thrush, Hermit							2									1	1	2							1	1		
Mockingbird, N.	1	1	3	2	4			2		1		6	4		2			1		1			2	6			1	
Starling, European	15	12	9	63	64	978	169	27	12	15	24	6	21	47	4249	3	20	25	24	15	21	15	605	51	101	16	73	102
Pipit, American					1	1									94	7									25		5	
Waxwing, Cedar		16																										
Warbler, Or.-cr.				1					1	1									5									
Warbler, Yellow			3	2										1									3	1				
Warbler, Yellow-r.	6				11	6	4								12	3	3	11	3				3	1	12	2	5	11
Warbler, Towns.						1								3											1			
Warbler, MacGilliv.					1																							
Yellowthroat, C.														1														
Warbler, Wilson's			1	2						3			1															
Grosbeak, Black-h.													1															
Tanager, Western			1																				11					
Bunting, Lazuli												1																
Towhee, Spotted			1		3		1		1	6		2		2		2	3	2	6		6	2	4		8	1	11	8
Towhee, California	7	4	10	4	3	1	6	10	5	3	7	15	8	3	10	5	3	7	9	7	8	12	5	8	3	7	13	3
Sparrow, Grasshop.											1																	
Sparrow, Savannah			13	99	82	69	87	7	16	6	5	4	10	65	69	58	13	11	10	1			4	158	37	13	35	6
Sparrow, Lark			1	2						8		10		1					4		2							
Sparrow, Golden-cr.	2	1			21	22	77	21	5					1	5	21	4	22	14						8	21	47	37

Species	Date of survey and number of birds observed by species																											
	4/15/06	4/29/06	10/17/2006	10/24/2006	11/6/2006	12/2/2006	1/27/2007	4/7/2007	4/21/2007	5/7/2007	6/9/07	7/7/07	9/1/07	9/23/07	11/3/07	12/8/07	02/20/08	03/15/08	04/19/08	05/24/08	06/21/08	07/19/08	9/13/2008	10/5/2008	11/15/2008	12/14/2008	1/2/2009	02/21/09
Sparrow, White-thr.	1						35	1																				
Sparrow, White-cr.	14		6	30	11	19		59	7					46	88	84	102	82	3					18	8	88	157	19
Sparrow, Fox															1											2	1	
Sparrow, Song	7	4	6	23	2		2	9	6	1	16	16	8	21	3	2	2	4	2	10	3	7	6	7	8	3	5	5
Sparrow, Lincoln's			3	4	5		1	7						2			2	4	3					7		5		1
Junco, Dark-eyed	5	8			5	69	54	5		12		6		10	31	22	75	24	6	1	42		21		59	25	199	79
Meadowlark, West.		1	29	62	81	110	211	6	15	29	8	47	26	20	176	150	65	193	17	40	2	17	26	53	37	96	150	43
Cowbird, Brown-h.	1	1						1	1		1								4	4	1			1				
Blackbird, Red-w.	152	243	285	296	3000	2034	153	137	113	269	263	164	45	214	157	167	67	258	182	490	59	25	950	522	110	235	120	125
Blackbird, Brewer's	25	23	1	6	14	2	20	13	15	11	5	17	12	25	59	7		41	16	23	17	13	14	13	10	116	31	15
Oriole, Bullock's	1	1						1		5	3	4							9	6	1							
Finch, Purple																			1									
Finch, House	11	64	24	21	1	22		10	12	19	22	32	49	62	19	9	18	17	22	40	41	108	94	106	31	6	16	6
Goldfinch, Lesser					4					5		5	19	4	3	25		44	16	4	2	2	3	64			19	
Goldfinch, American		2	7	25	3	64		4	6	15	8	26	86	16	28	7	50	30	16	21	26	54	9	57	30	6	16	16
Sparrow, House	7	2	2	2	2	4		9		1	6	2	3		1					1	5	2						
Total No. Counted	498	1,039	617	876	3,564	3,821	973	728	419	692	495	688	507	733	5,204	779	1,417	1,437	745	1,090	504	494	1,966	1,330	781	799	1,435	1,495
Number of Species	56	55	48	48	48	51	38	56	45	59	34	61	44	61	51	60	66	73	70	45	55	46	57	49	60	51	75	75

Table B: Birds Observed in Order of Frequency of Observation, 4/15/06 to 02/21/09
Tolay Lake Regional Park, Sonoma County, California

Species	Number
Blackbird, Red-winged	10,835
Starling, European	6,782
Meadowlark, Western	1,710
Finch, House	882
Sparrow, Savannah	878
Sparrow, White-crowned	841
Junco, Dark-eyed	758
Swallow, Barn	631
Goldfinch, American	628
Swallow, Cliff	574
Blackbird, Brewer's	564
Goose, Canada	557
Coot, American	505
Killdeer	467
Wigeon, American	461
Quail, California	365
Pintail, Northern	342
Sparrow, Golden-crowned	329
Swallow, Tree	318
Bushtit	291
Bluebird, Western	287
Swallow, Violet-green	270
Mallard	256
Raven, Common	250
Goldfinch, Lesser	219
Phoebe, Black	212
Sparrow, Song	188
Towhee, California	186
Shoveler, Northern	181
Dove, Mourning	179
Hawk, Red-tailed	176
Vulture, Turkey	174
Dowitcher, Long-billed	162
Pigeon, Rock	153
Bufflehead	146
Duck, Ruddy	139
Pipit, American	133
Kestrel, American	130
Kite, White-tailed	127
Duck, Ring-necked	123
Robin, American	123
Flicker, Northern	110
Gadwall	103
Phoebe, Say's	103
Teal, Green-winged	101
Crow, American	101
Hummingbird, Anna's	100
Canvasback	96

Species	Number
Warbler, Yellow-rumped	93
Scrub-Jay, Western	91
Harrier, Northern	84
Towhee, Spotted	69
Owl, Barn	62
Jay, Steller's	59
Woodpecker, Nuttall's	56
Teal, Cinnamon	55
Thrush, Varied	52
Sparrow, House	49
Curlew, Long-billed	46
Shrike, Loggerhead	46
Egret, Great	45
Hawk, Red-shouldered	44
Sparrow, Lincoln's	44
Kingbird, Western	38
Turkey, Wild	37
Mockingbird, Northern	37
Sparrow, White-throated	37
Titmouse, Oak	33
Owl, Great Horned	32
Hummingbird, Allen's	31
Wren, House	31
Oriole, Bullock's	31
Sandpiper, Least	30
Kinglet, Ruby-crowned	29
Sparrow, Lark	28
Heron, Great Blue	26
Cormorant, Double-crested	25
Snipe, Wilson's (Common)	25
Woodpecker, Acorn	25
Wren, Bewick's	25
Nuthatch, White-breasted	21
Pelican, American White	19
Woodpecker, Downy	19
Chickadee, Chestnut-backed	18
Eagle, Golden	17
Yellowlegs, Greater	16
Waxwing, Cedar	16
Scaup, Lesser	15
Hawk, Cooper's	15
Cowbird, Brown-headed	15
Goose, Greater White-fronted	14
Scaup, Greater	14
Grebe, Pied-billed	13
Moorhen, Common	13
Swift, Vaux's	12
Tanager, Western	12

Species	Number
Hawk, Rough-legged	11
Flycatcher, Ash-throated	10
Creeper, Brown	10
Warbler, Yellow	10
Merganser, Common	9
Hummingbird, Rufous	9
Vireo, Hutton's	8
Thrush, Hermit	8
Warbler, Orange-crowned	8
Heron, Black-crowned Night	7
Hawk, Sharp-shinned	7
Hawk, Ferruginous	7
Falcon, Peregrine	7
Swallow, N. Rough-winged	7
Warbler, Wilson's	7
Flycatcher, Pacific Slope	6
Merlin	5
Vireo, Warbling	5
Wren, Marsh	5
Warbler, Townsend's	5
Grebe, Eared	4
Duck, Wood	4
Selasphorus sp.	4
Flycatcher, Willow	4
Sparrow, Fox	4
Grebe, Horned	3
Sandpiper, Western	3
Gull, California	3
Kingfisher, Belted	3
Sapsucker, Red-breasted	3
Hawk, Swainson's	2
Falcon, Prairie	2
Tern, Caspian	2
Dove, Eurasian Collared	2
Pigeon, Band-tailed	2
Woodpecker, Hairy	2
Wood-Pewee, Western	2
Heron, Green	1
Teal, Blue-winged	1
Osprey	1
Pheasant, Ring-necked	1
Sora	1
Gull, Glaucous-winged	1
Flycatcher, Olive-sided	1
Flycatcher, Least	1
Lark, Horned	1
Kinglet, Golden-crowned	1
Warbler, McGillivray's	1
Yellowthroat, Common	1

Species	Number
Grosbeak, Black-headed	1
Bunting, Lazuli	1
Sparrow, Grasshopper	1
Finch, Purple	1
Total no. individuals	23,050

Table C: Seasonal Occurrence, Relative Abundance of Bird Species Observed
Tolay Lake Regional Park, Sonoma County, California

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Forest, Riparian, and Brush - breeding/summer resident						
Hummingbird, Allen's	0.0	0.7	3.6	1.0	0.0	0.0
Flycatcher, Olive-sided	0.0	0.0	0.1	0.0	0.0	0.0
Wood-Pewee, Western	0.0	0.0	0.1	0.0	0.3	0.0
Flycatcher, Pacific Slope	0.0	0.0	0.1	0.3	1.3	0.0
Flycatcher, Ash-throated	0.0	0.0	0.6	1.5	0.0	0.0
Wren, House	0.4	0.3	1.3	3.8	0.0	0.7
Kingbird, Western	0.0	0.0	3.3	3.5	0.3	0.0
Vireo, Warbling	0.0	0.0	0.0	0.5	0.7	0.2
Warbler, Orange-crowned	0.0	0.0	1.0	0.0	0.0	0.2
Warbler, Wilson's	0.0	0.0	0.4	0.0	0.3	0.5
Warbler, Yellow	0.0	0.0	0.0	0.0	1.3	1.0
Grosbeak, Black-headed	0.0	0.0	0.0	0.0	0.3	0.0
Tanager, Western	0.0	0.0	0.0	0.0	3.7	0.2
Bunting, Lazuli	0.0	0.0	0.0	0.3	0.0	0.0
Oriole, Bullock's	0.0	0.0	3.3	2.0	0.0	0.0
Total	0.4	1.0	13.9	12.8	8.3	2.7
Forest, Riparian, and Brush - migratory/winter resident						
Flycatcher, Willow	0.0	0.0	0.0	0.0	0.7	0.3
Flycatcher, Least	0.0	0.0	0.0	0.0	0.3	0.0
Warbler, Yellow-rumped	4.0	8.3	1.3	0.0	1.0	6.0
Warbler, MacGillivray's	0.0	0.0	0.0	0.0	0.0	0.2
Swift, Vaux's	0.0	0.0	0.0	0.0	3.3	0.3
Hummingbird, Rufous	0.0	0.7	1.0	0.0	0.0	0.0
Selasphorus sp.	0.0	1.3	0.0	0.0	0.0	0.0
Phoebe, Say's	5.4	2.7	0.0	0.0	4.0	9.3
Kinglet, Ruby-crowned	1.8	1.7	0.0	0.0	0.3	2.3
Thrush, Varied	6.0	7.3	0.0	0.0	0.0	0.0
Waxwing, Cedar	0.0	0.0	2.3	0.0	0.0	0.0
Warbler, Townsend's	0.2	0.0	0.0	0.0	1.0	0.2
Sparrow, Fox	0.6	0.0	0.0	0.0	0.0	0.2
Total	18.0	22.0	4.6	0.0	10.7	18.8
Forest, Riparian, and Brush - year-round resident						
Turkey, Wild	0.0	0.0	1.1	0.8	5.0	1.8
Dove, Mourning	1.6	0.7	7.9	17.3	2.0	6.5
Dove, Eurasian Collared	0.0	0.0	0.1	0.0	0.3	0.0
Pigeon, Rock	2.2	7.0	6.9	2.0	0.7	10.5

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Pigeon, Band-tailed	0.2	0.0	0.0	0.3	0.0	0.0
Hummingbird, Anna's	3.6	3.3	7.1	1.3	1.7	2.0
Phoebe, Black	5.8	1.7	3.7	12.8	10.3	11.7
Jay, Steller's	4.0	3.3	1.0	2.5	2.3	0.8
Scrub-Jay, Western	6.0	2.7	0.6	4.8	4.3	2.8
Titmouse, Oak	2.0	1.3	0.4	2.8	1.0	0.3
Chickadee, Chestnut-backed	0.0	0.7	0.6	1.3	1.3	0.5
Bushtit	17.8	9.3	4.1	4.0	6.7	18.2
Nuthatch, White-breasted	0.8	2.0	0.4	0.5	1.3	0.3
Creeper, Brown	1.2	0.3	0.0	0.0	0.3	0.3
Wren, Bewick's	1.0	2.0	0.7	0.5	1.0	0.7
Robin, American	7.8	7.3	4.0	4.0	0.3	2.8
Thrush, Hermit	0.8	1.0	0.0	0.0	0.0	0.2
Mockingbird, Northern	0.2	0.3	0.9	1.5	2.0	2.8
Kinglet, Golden-crowned	0.0	0.0	0.0	0.0	0.0	0.2
Towhee, Spotted	3.0	4.3	1.9	2.5	2.0	2.0
Towhee, California	6.4	4.3	6.4	10.5	5.3	6.3
Junco, Dark-eyed	73.8	59.3	5.3	12.0	10.3	15.8
Finch, Purple	0.0	0.0	0.1	0.0	0.0	0.0
Finch, House	10.6	13.7	25.4	50.8	68.3	33.7
Sparrow, House	0.8	0.0	2.9	3.8	1.0	1.2
Owl, Barn	1.4	2.0	1.0	3.0	5.0	2.5
Owl, Great Horned	1.2	0.3	0.9	2.5	0.3	1.3
Woodpecker, Acorn	1.2	2.3	0.1	1.3	0.7	0.7
Sapsucker, Red-breasted	0.0	0.3	0.0	0.0	0.3	0.2
Woodpecker, Downy	0.2	0.3	0.1	1.0	2.0	1.0
Woodpecker, Hairy	0.2	0.0	0.0	0.3	0.0	0.0
Woodpecker, Nuttall's	1.2	1.7	2.0	2.0	5.3	1.2
Flicker, Northern	9.6	11.0	0.4	0.5	0.7	3.7
Total	165.0	142.7	86.1	146.0	142.7	132.7
Grassland - breeding/summer resident						
Swallow, Northern Rough-winged	0.0	0.0	0.7	0.0	0.7	0.0
Swallow, Violet-green	0.0	0.3	15.3	11.3	15.7	11.7
Swallow, Tree	2.8	9.0	24.7	19.0	2.7	3.3
Swallow, Cliff	0.0	0.0	59.9	38.8	0.0	0.0
Swallow, Barn	0.0	0.0	65.7	31.5	12.0	1.5
Cowbird, Brown-headed	0.0	0.0	1.7	0.5	0.0	0.2
Sparrow, Grasshopper	0.0	0.0	0.0	0.3	0.0	0.0
Total	2.8	9.3	168.0	101.3	31.0	16.7
Grassland - migratory/winter resident						

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Starling, European	247.8	49.0	17.1	16.5	224.3	756.2
Pipit, American	2.6	0.0	0.0	0.0	0.0	20.0
Meadowlark, Western	143.4	100.3	15.4	18.5	24.0	73.0
Sparrow, Golden-crowned	37.6	21.0	6.1	0.0	0.3	5.7
Sparrow, White-throated	7.0	0.0	0.3	0.0	0.0	0.0
Sparrow, White-crowned	69.6	67.7	11.9	0.0	15.3	26.8
Sparrow, Lincoln's	1.2	2.3	1.4	0.0	0.7	3.2
Total	509.2	240.3	52.3	35.0	264.7	884.8
Grassland - year-round resident						
Quail, California	9.0	9.0	13.4	14.8	9.3	18.7
Pheasant, Ring-necked	0.0	0.0	0.1	0.0	0.0	0.0
Lark, Horned	0.0	0.0	0.0	0.3	0.0	0.0
Bluebird, Western	10.0	12.3	6.9	6.8	16.7	12.5
Shrike, Loggerhead	2.2	1.7	0.7	2.0	1.0	2.3
Raven, Common	12.8	6.7	5.7	6.8	4.7	14.2
Crow, American	5.6	3.7	3.9	1.5	2.0	3.8
Sparrow, Savannah	52.4	10.0	5.7	2.3	26.3	76.3
Sparrow, Song	2.4	3.7	5.6	10.5	11.7	8.2
Sparrow, Lark	0.0	0.0	1.7	3.0	0.3	0.5
Blackbird, Brewer's	35.2	18.7	18.0	13.0	17.0	17.2
Goldfinch, Lesser	8.8	14.7	3.6	2.3	8.7	11.8
Goldfinch, American	18.6	32.0	9.1	28.5	37.0	25.0
Total	157.0	112.3	74.4	91.5	134.7	190.5
Marsh Birds						
Heron, Great Blue	1.6	1.0	0.4	0.5	0.7	1.3
Egret, Great	1.6	1.0	2.0	1.8	1.3	1.5
Heron, Green	0.0	0.0	0.0	0.3	0.0	0.0
Heron, Black-crowned Night	0.0	0.0	0.0	1.3	0.3	0.2
Wren, Marsh	0.2	0.0	0.0	0.3	0.0	0.5
Yellowthroat, Common	0.0	0.0	0.0	0.0	0.3	0.0
Blackbird, Red-winged	541.8	150.0	226.6	127.8	403.0	728.3
Sora	0.2	0.0	0.0	0.0	0.0	0.0
Total	545.4	152.0	229.0	131.8	405.7	731.8
Raptors - migratory/winter resident						
Hawk, Sharp-shinned	0.0	0.0	0.0	0.0	0.0	1.2
Hawk, Cooper's	0.6	1.0	0.3	0.3	0.7	0.7
Hawk, Swainson's	0.0	0.0	0.3	0.0	0.0	0.0
Hawk, Ferruginous	0.6	0.3	0.0	0.0	0.0	0.5
Hawk, Rough-legged	1.2	0.7	0.0	0.0	0.0	0.5
Merlin	0.4	1.0	0.0	0.0	0.0	0.0

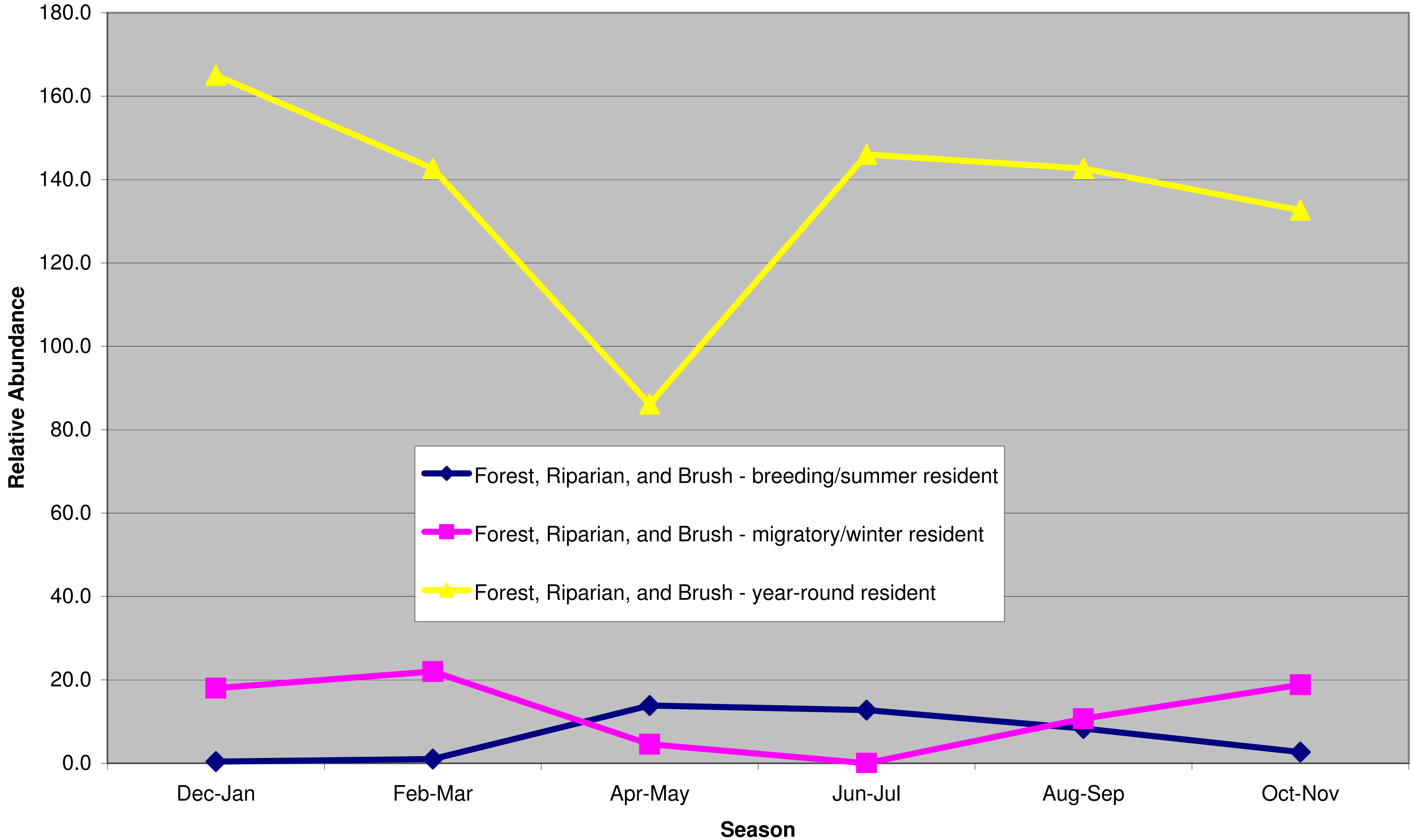
Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Falcon, Prairie	0.2	0.0	0.0	0.0	0.0	0.2
Falcon, Peregrine	0.2	0.3	0.1	0.3	0.0	0.5
Total	3.2	3.3	0.7	0.5	0.7	3.5
Raptors - year-round resident						
Vulture, Turkey	4.8	9.3	7.0	3.5	7.7	6.0
Harrier, Northern	5.6	0.7	0.3	1.0	7.0	4.5
Kite, White-tailed	5.0	3.3	0.9	3.5	11.0	6.5
Hawk, Red-shouldered	1.4	2.3	0.3	1.3	4.0	1.8
Hawk, Red-tailed	6.8	6.3	4.3	3.3	12.3	7.2
Eagle, Golden	0.6	0.7	0.1	0.8	1.3	0.7
Osprey	0.2	0.0	0.0	0.0	0.0	0.0
Kestrel, American	8.6	4.0	1.0	3.0	7.0	5.8
Total	33.0	26.7	13.9	16.3	50.3	32.5
Shorebirds - migratory/winter resident						
Yellowlegs, Greater	0.0	0.7	2.0	0.0	0.0	0.0
Curlew, Long-billed	6.4	3.3	0.6	0.0	0.0	0.0
Sandpiper, Western	0.0	0.0	0.4	0.0	0.0	0.0
Sandpiper, Least	0.0	0.0	4.3	0.0	0.0	0.0
Dowitcher, Long-billed	0.0	7.7	19.9	0.0	0.0	0.0
Snipe, Wilson's	0.6	2.7	2.0	0.0	0.0	0.0
Killdeer	34.2	5.3	4.0	4.8	3.7	37.0
Total	41.2	19.7	33.1	4.8	3.7	37.0
Waterfowl and Allies - migratory/winter resident						
Grebe, Horned	0.0	0.0	0.4	0.0	0.0	0.0
Grebe, Eared	0.0	1.3	0.0	0.0	0.0	0.0
Pelican, American White	0.0	0.0	0.0	0.0	4.7	0.8
Cormorant, Double-crested.	1.0	0.7	0.7	0.0	0.0	2.2
Goose, Gr. White-fronted	1.2	2.7	0.0	0.0	0.0	0.0
Teal, Blue-winged	0.0	0.0	0.0	0.0	0.3	0.0
Pintail, Northern	0.2	112.3	0.6	0.0	0.0	0.0
Wigeon, American	0.4	149.7	1.4	0.0	0.0	0.0
Shoveler, Northern	0.0	16.7	18.7	0.0	0.0	0.0
Teal, Green-winged	0.2	28.0	2.3	0.0	0.0	0.0
Duck, Ruddy	0.0	46.3	0.0	0.0	0.0	0.0
Canvasback	0.2	31.7	0.0	0.0	0.0	0.0
Scaup, Greater	1.2	2.0	0.3	0.0	0.0	0.0
Scaup, Lesser	2.0	0.0	0.0	0.0	1.7	0.0
Bufflehead	1.6	41.0	2.1	0.0	0.0	0.0
Merganser, Common	1.4	0.7	0.0	0.0	0.0	0.0
Duck, Ring-necked	0.0	41.0	0.0	0.0	0.0	0.0

Guilds/Species	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Gull, Glaucous-winged	0.2	0.0	0.0	0.0	0.0	0.0
Gull, California	0.6	0.0	0.0	0.0	0.0	0.0
Tern, Caspian	0.0	0.0	0.3	0.0	0.0	0.0
Total	10.2	474.0	26.9	0.0	6.7	3.0
Waterfowl and Allies - year-round resident						
Grebe, Pied-billed	0.0	1.7	1.1	0.0	0.0	0.0
Goose, Canada	59.8	61.3	4.9	0.0	0.0	6.7
Duck, Wood	0.8	0.0	0.0	0.0	0.0	0.0
Mallard	12.2	24.7	11.7	3.5	6.3	1.0
Gadwall	1.8	19.7	5.0	0.0	0.0	0.0
Teal, Cinnamon	0.0	8.3	4.0	0.0	0.7	0.0
Moorhen, Common	0.2	0.0	0.3	1.5	1.0	0.2
Coot, American	1.2	130.3	14.6	0.3	1.3	0.2
Kingfisher, Belted	0.0	0.3	0.0	0.3	0.3	0.0
Total	76.0	246.3	41.6	5.5	9.7	8.0
Total No. Counted	1,561	1,450	744	545	1,069	2,062
Number of Species	55	71	55	49	54	51

Table D: Seasonal Occurrence of Bird Guilds
Tolay Lake Regional Park, Sonoma County, California
(Numbers represent relative abundance)

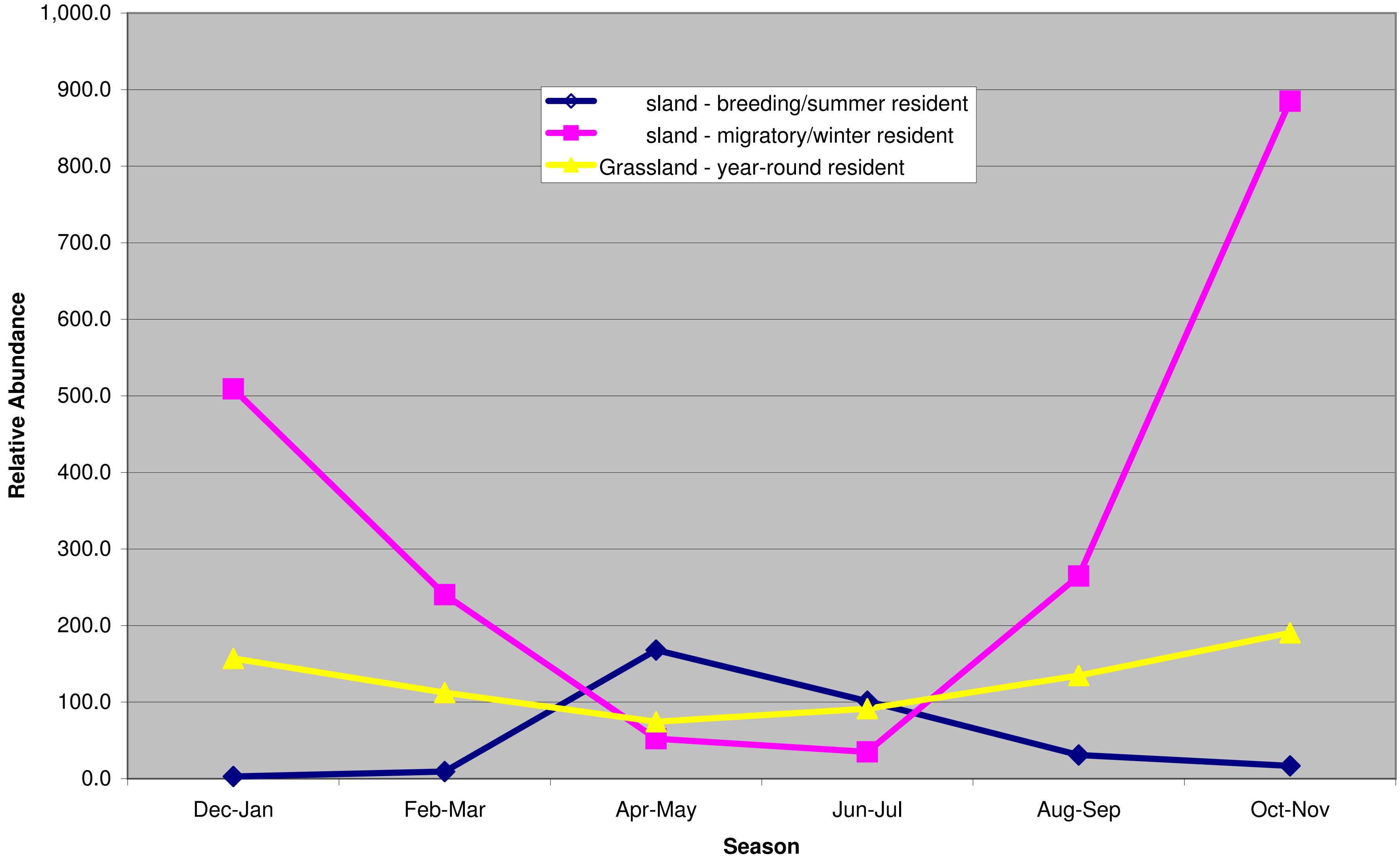
Guilds	Season of Occurrence					
	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Nov
Forest, Riparian, and Brush						
Forest, Riparian, and Brush - breeding/summer resident	0.4	1.0	13.9	12.8	8.3	2.7
Forest, Riparian, and Brush - migratory/winter resident	18.0	22.0	4.6	0.0	10.7	18.8
Forest, Riparian, and Brush - year-round resident	165.0	142.7	86.1	146.0	142.7	132.7
Grassland						
Grassland - breeding/summer resident	2.8	9.3	168.0	101.3	31.0	16.7
Grassland - migratory/winter resident	509.2	240.3	52.3	35.0	264.7	884.8
Grassland - year-round resident	157.0	112.3	74.4	91.5	134.7	190.5
Raptors						
Raptors - migratory/winter resident	3.2	3.3	0.7	0.5	0.7	3.5
Raptors - year-round resident	33.0	26.7	13.9	16.3	50.3	32.5
Waterbirds						
Marsh Birds	545.4	152.0	229.0	131.8	405.7	731.8
Shorebirds	41.2	19.7	33.1	4.8	3.7	37.0
Waterfowl and Allies - migratory/winter resident	10.2	474.0	26.9	0.0	6.7	3.0
Waterfowl and Allies - year-round resident	76.0	246.3	41.6	5.5	9.7	8.0
Relative numbers of individual birds	1,561	1,450	744	545	1,069	2,062
Relative number of Species	55	71	55	49	54	51

Figure 1: Forest, Riparian, and Brush Guild, Birds of Tolay Lake Regional Park



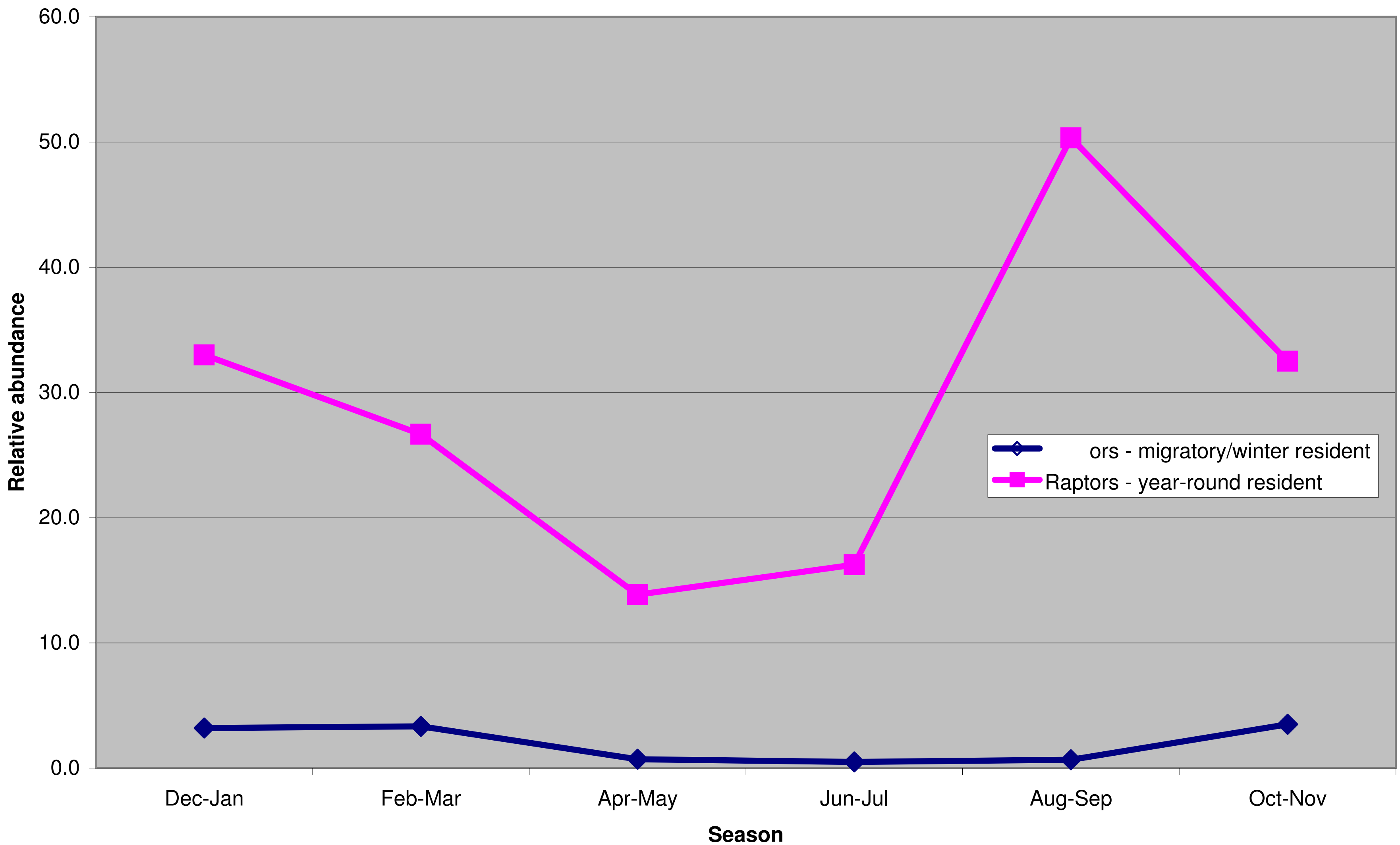
4/24/2009 P:\SOG0602\Animals\Bird List -seasonal use.xlsForest Guild

Figure 2: Grassland Guild, Birds of Tolay Lake Regional Park



4/24/2009 P:\SOG0602\Animals\Bird List -seasonal use.xlsGrassland Guild

Figure 3: Raptors, Birds of Tolay Lake Regional Park



4/24/2009 P:\SOG0602\Animals\Bird List -seasonal use.xlsRaptor Guild

Figure 4: Waterbirds, Birds of Tolay Lake Regional Park

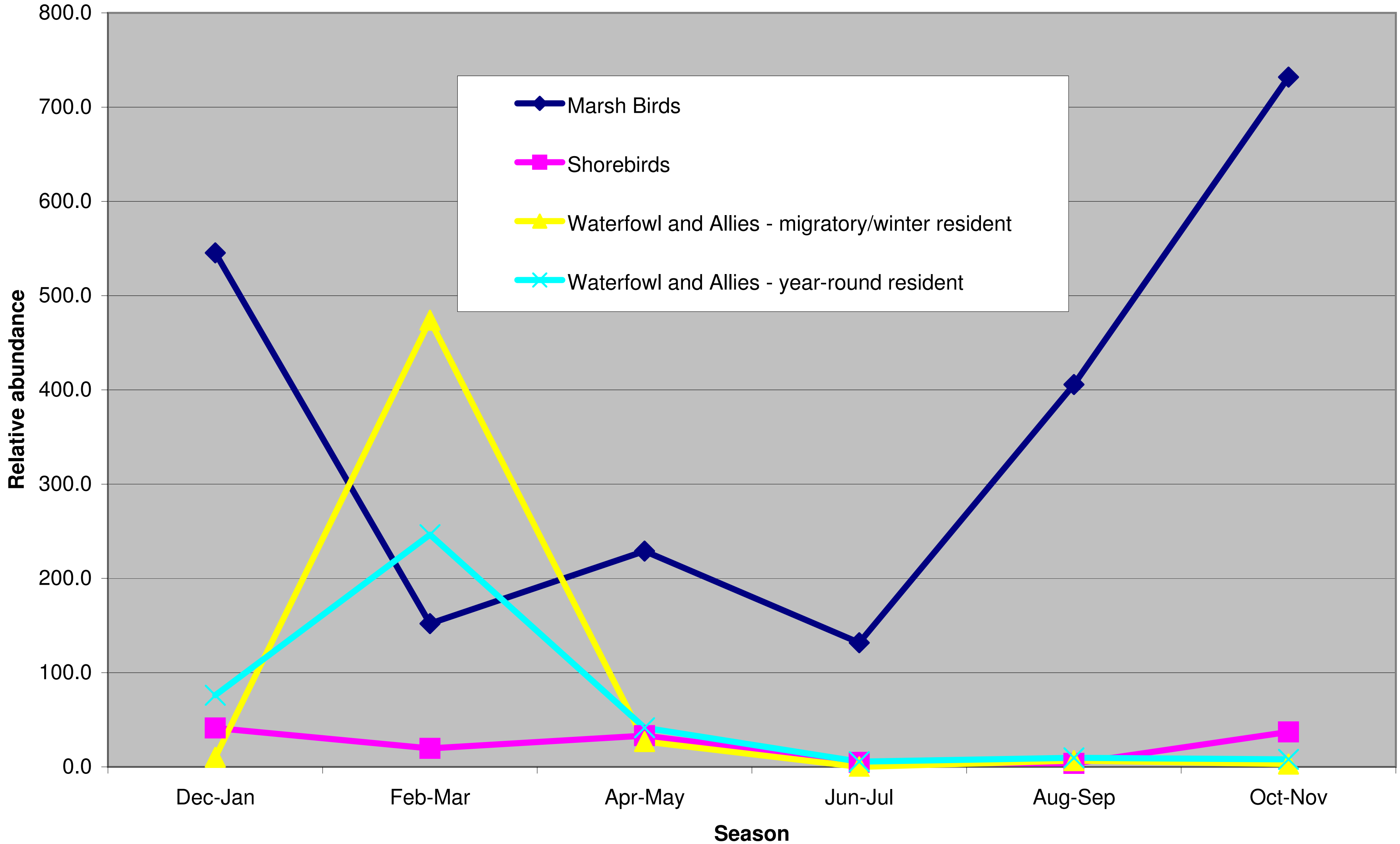
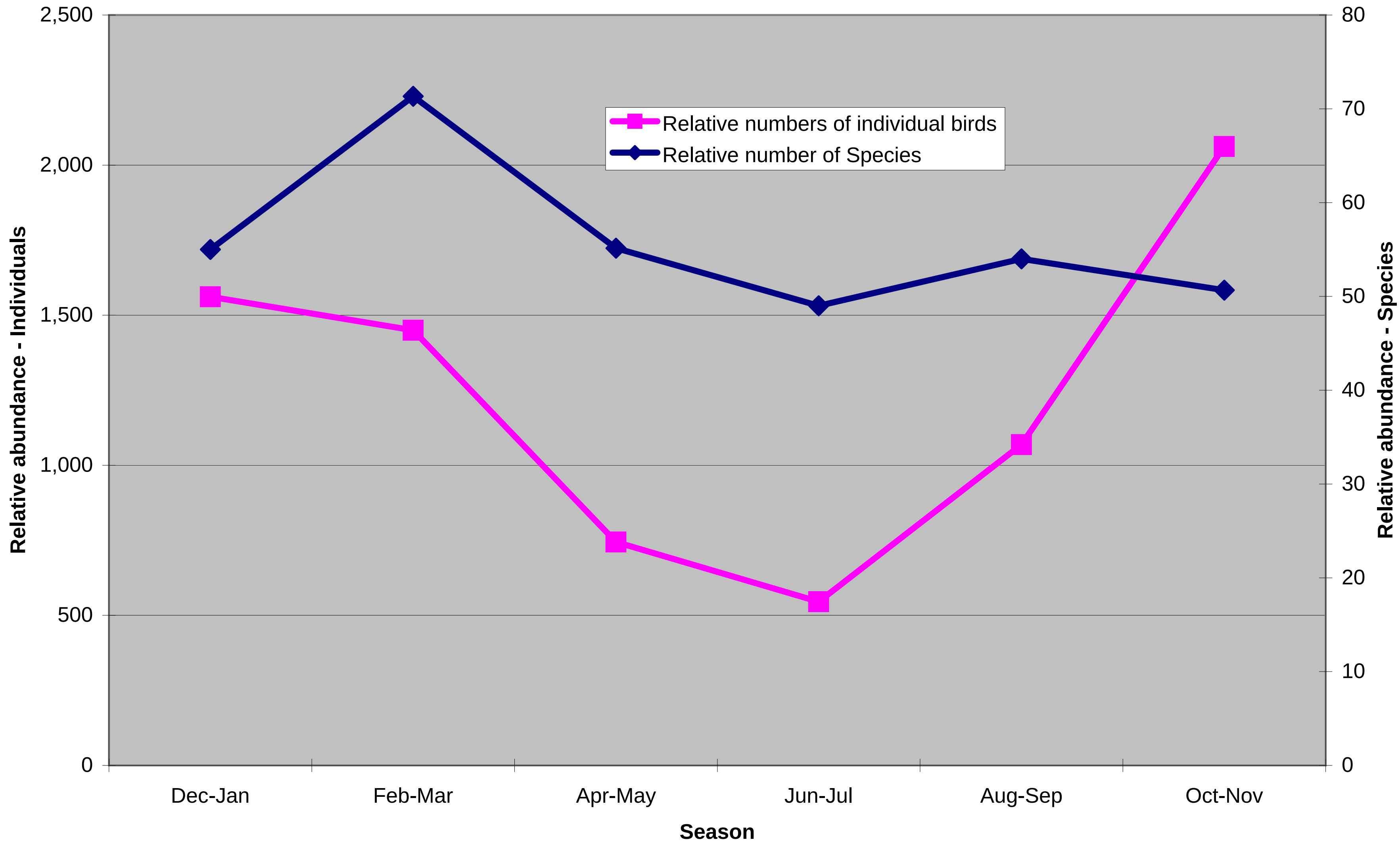


Figure 5: Relative Abundance by Season, Birds of Tolay Lake Regional Park



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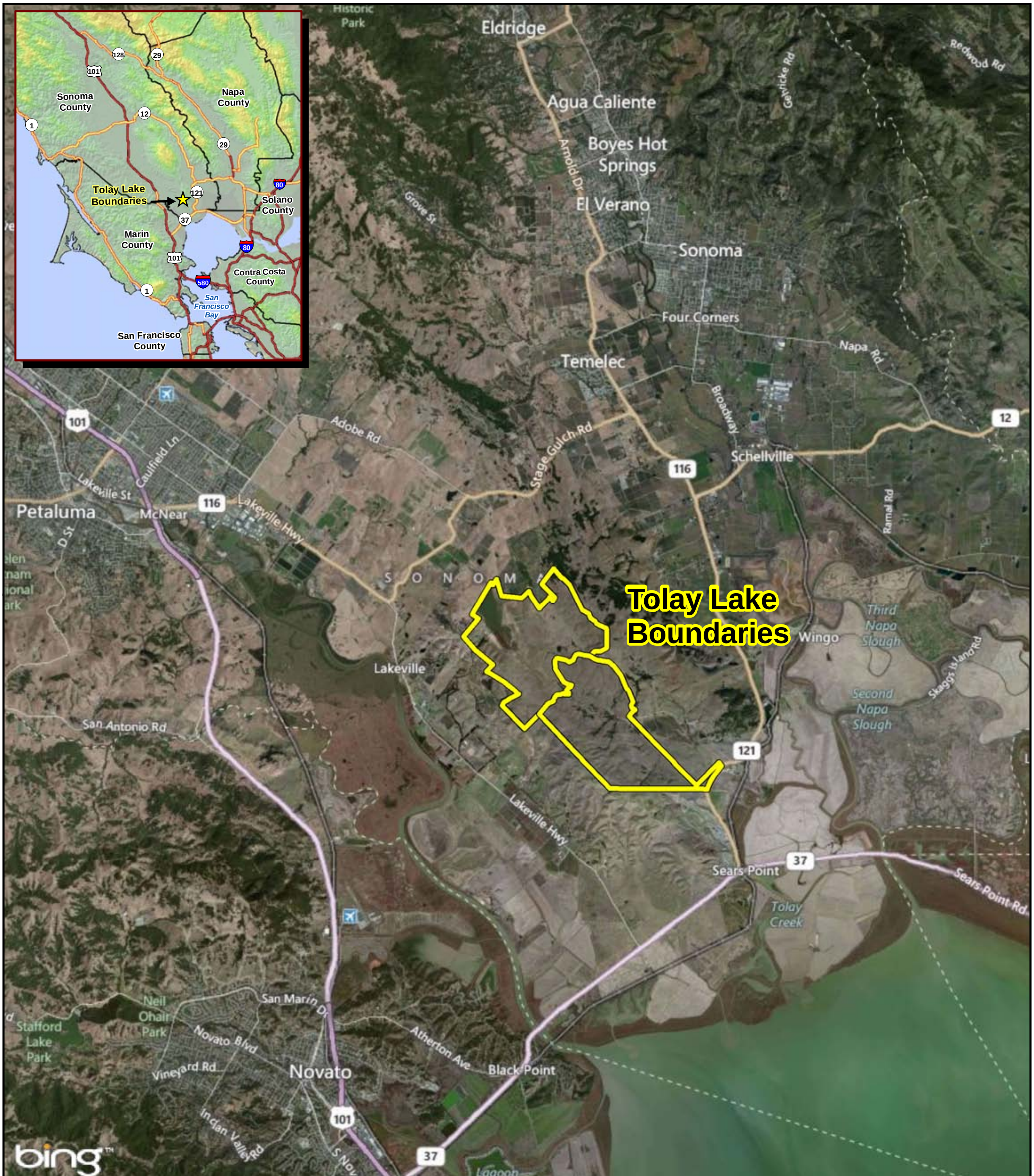

Figure 1. Location and Setting of Tolay Regional Park

Tolay Lake Regional Park
Sonoma County, California

0 0.5 1 2
Miles

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Date: January 2012
Map By: Michael Rochelle

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Location.mxd

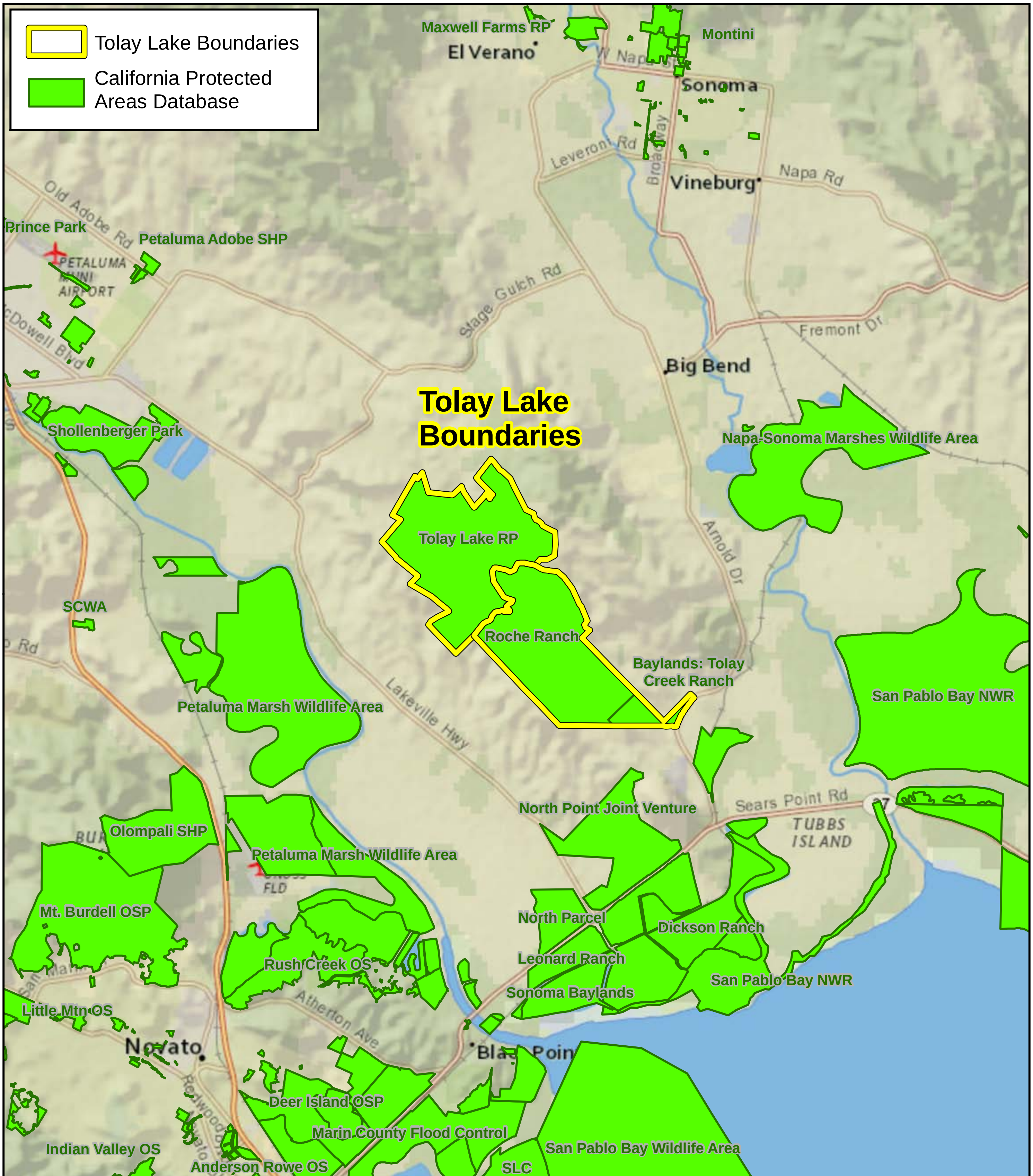


Figure 2. Conserved Lands in the Tolay Lake Regional Park Region

Tolay Lake Regional Park
Sonoma County, California

WRA ENVIRONMENTAL CONSULTANTS

Date: March 2013
Map By: Michael Rochelle
Basemap: NatGeo

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Conserved Lands.mxd

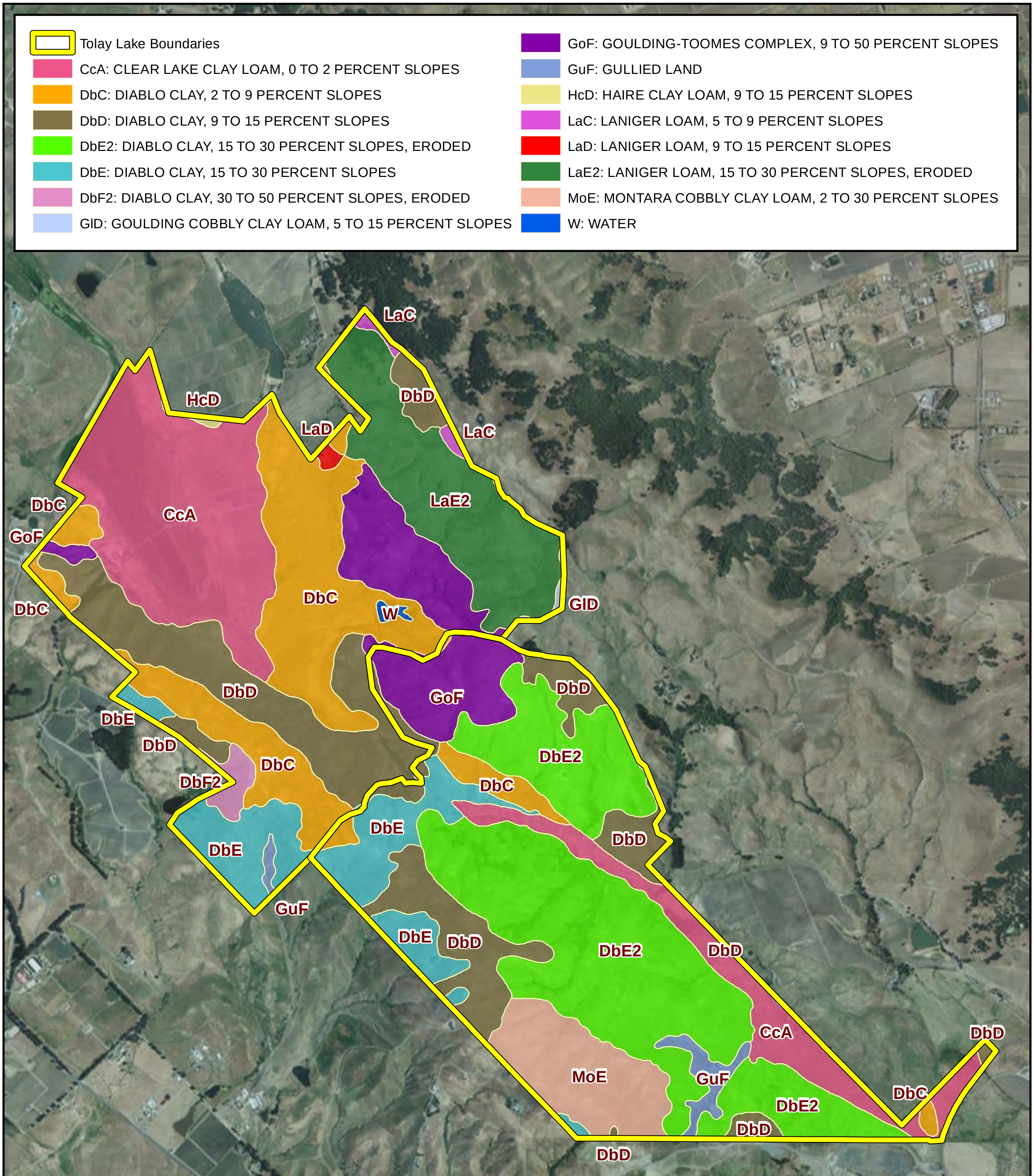


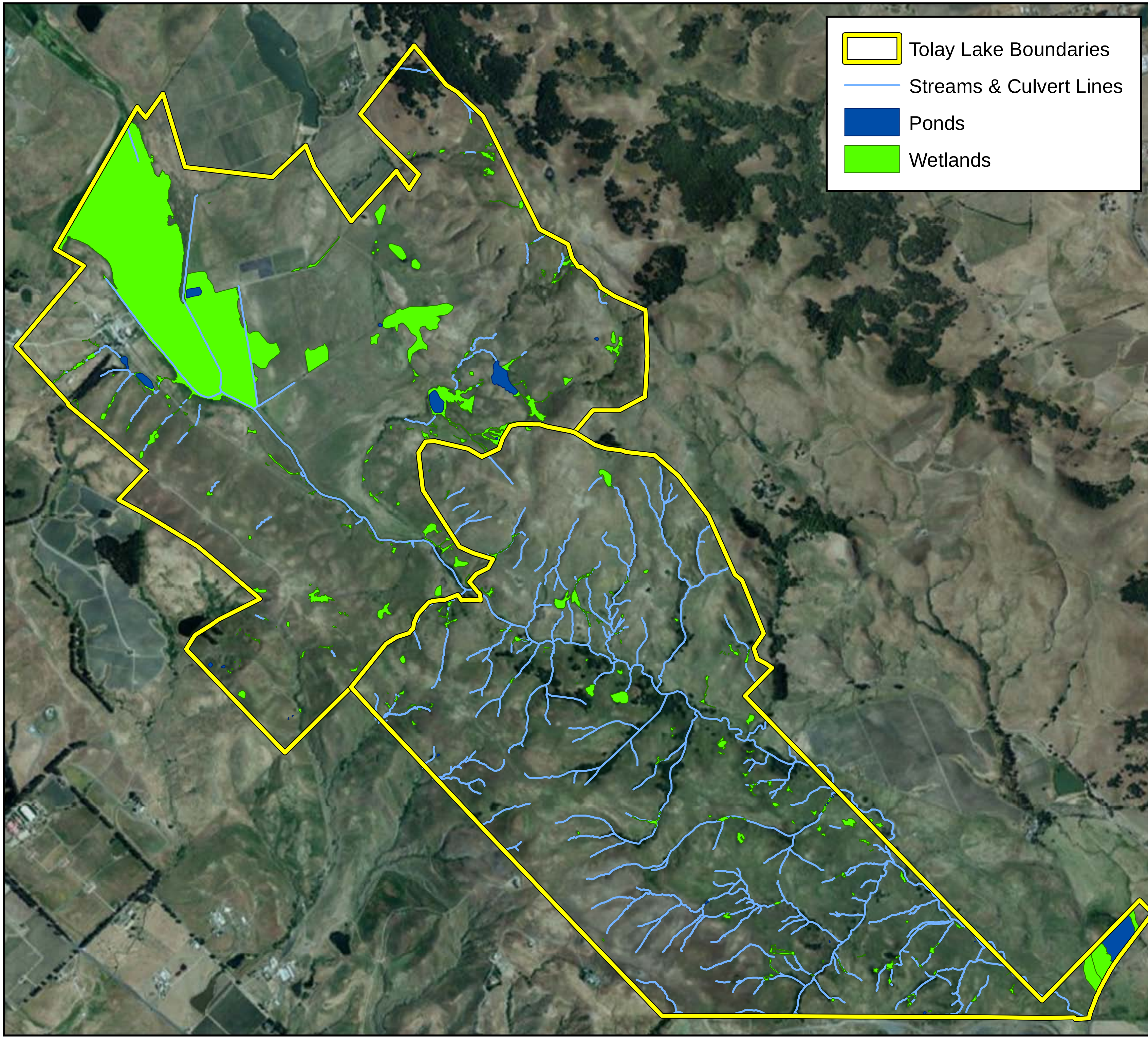
Figure 3. Mapped Soil Units within Tolay Lake Regional Park

Tolay Lake Regional Park
Sonoma County, California

wra
ENVIRONMENTAL CONSULTANTS

Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Soils.mxd



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Tolay Lake Regional Park

Sonoma County, California

Figure 4.

Wetlands and Waters Mapped in Tolay Lake Regional Park

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

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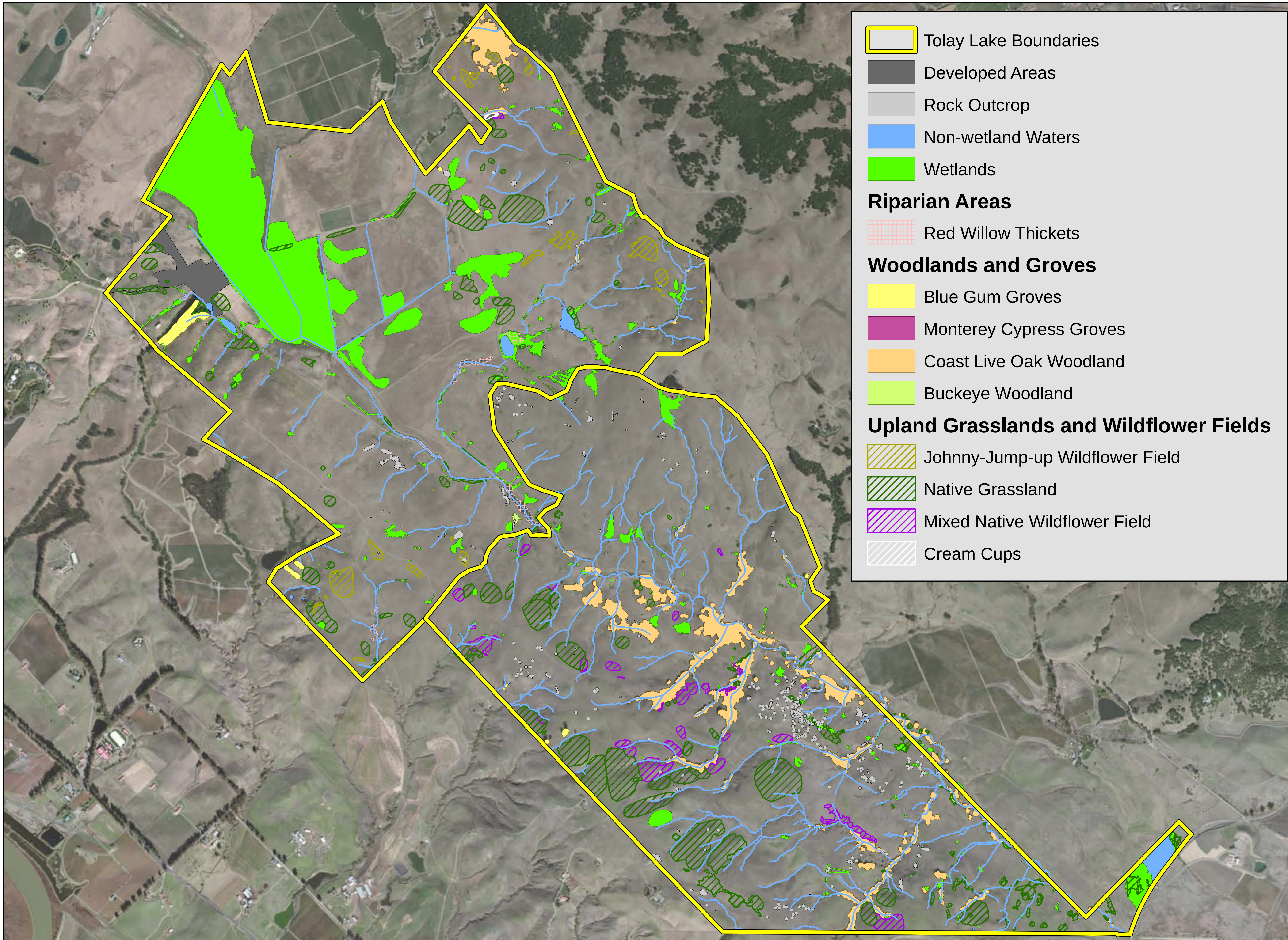

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Tolay Lake Regional Park

Sonoma County, California

Figure 5.

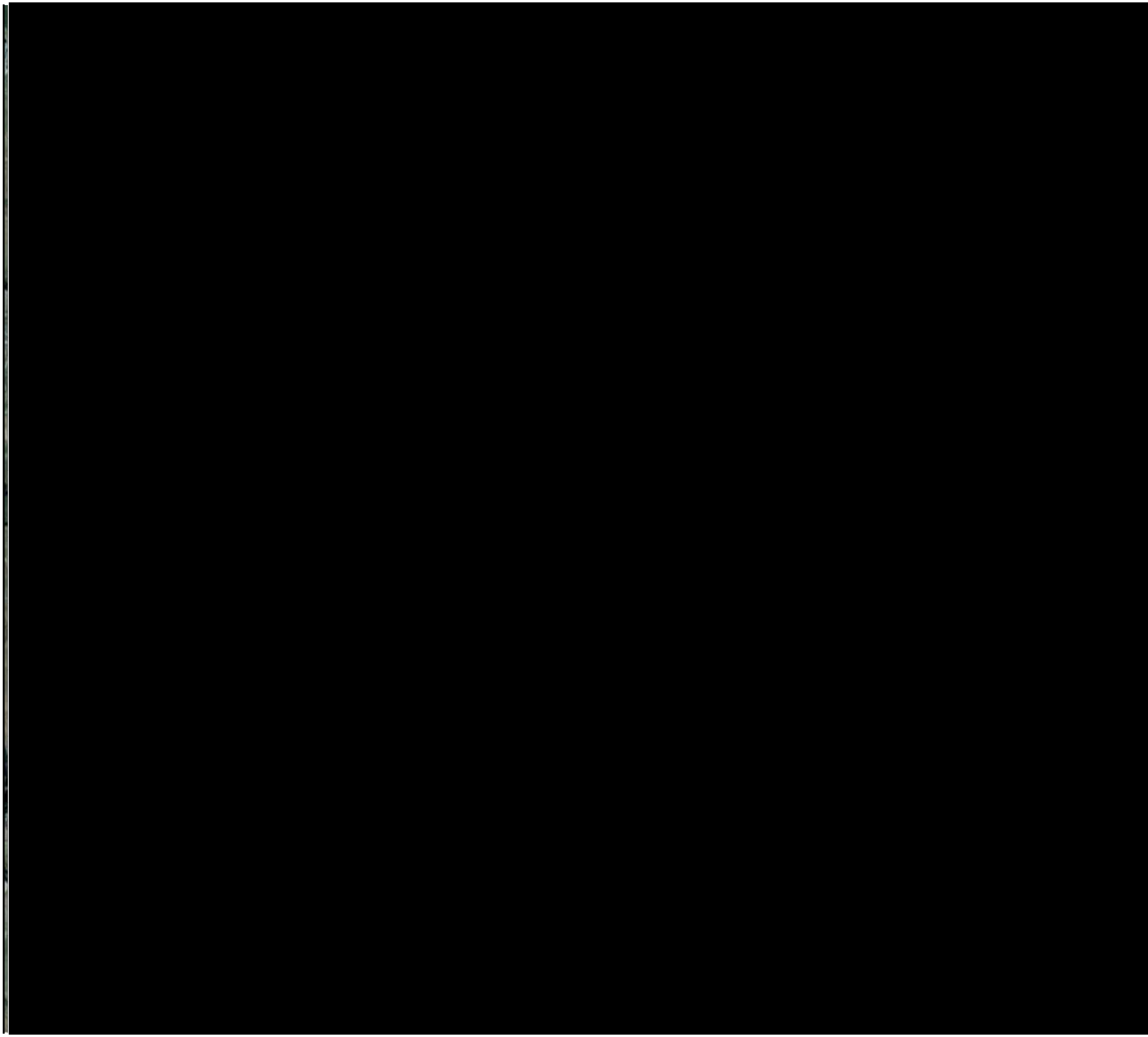
Biological Communities within Tolay Lake Regional Park

N W E S

0 1,000 2,000 Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Biological Communities.mxd



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Tolay Lake
Regional Park

Sonoma County,
California

Figure 6.

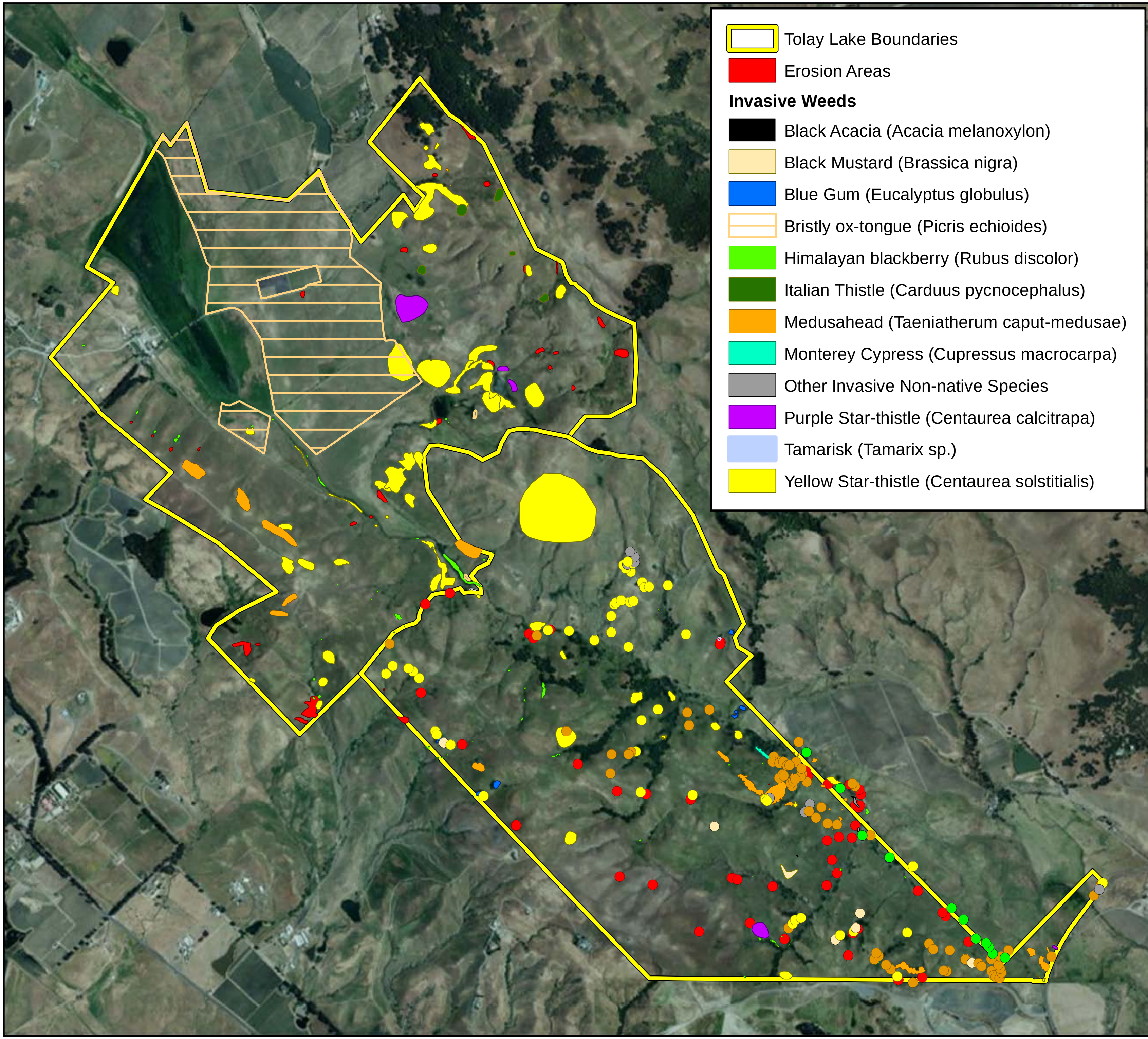
Special-status Plant and Wildlife Species within Tolay Lake Regional Park

N
W E
S

0 1,500 3,000
Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Plants and Wildlife.mxd



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Tolay Lake Regional Park

Sonoma County, California

Figure 7.

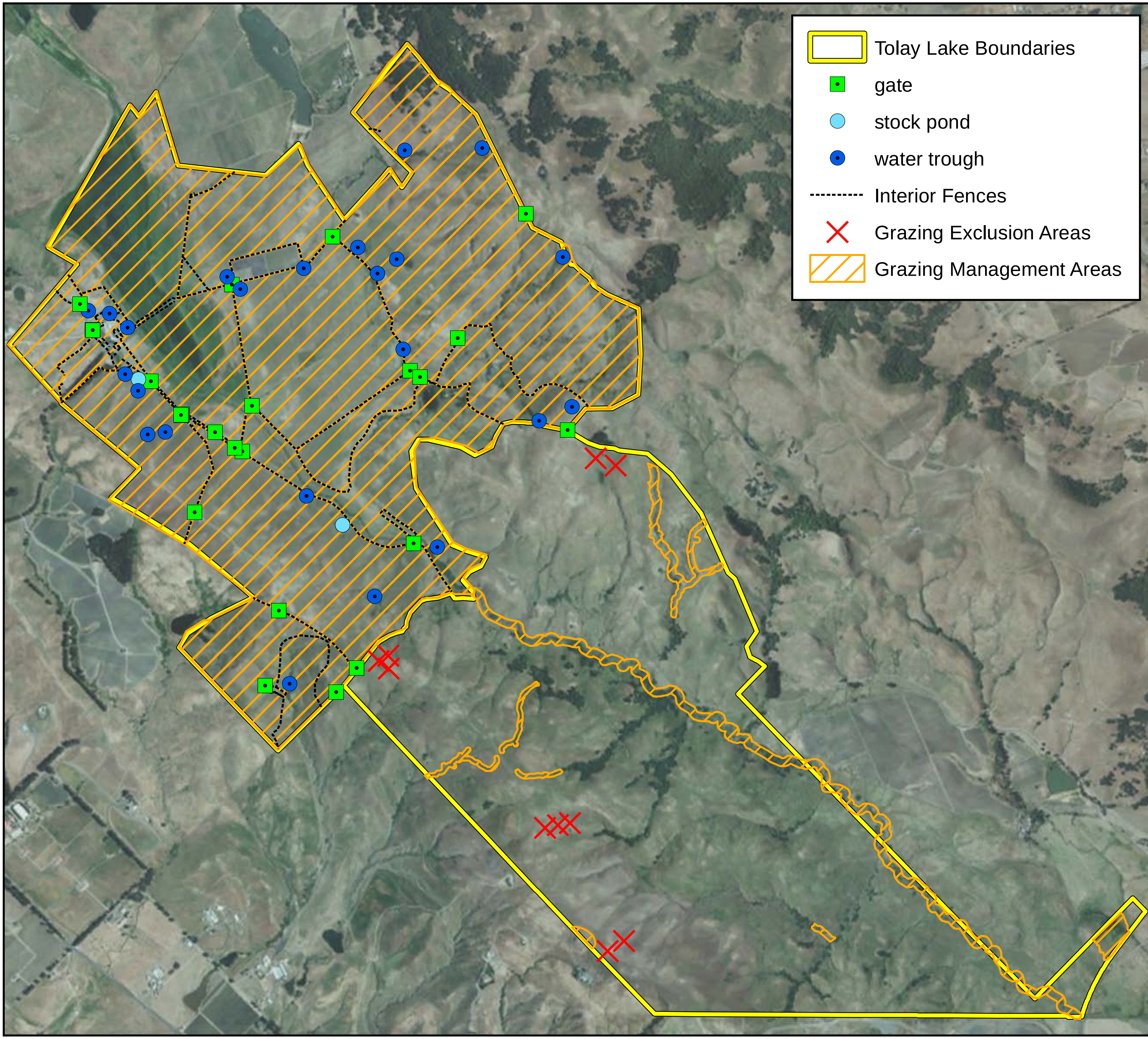
Invasive Plant Species and Erosion within Tolay Lake Regional Park

N W E S

0 1,500 3,000 Feet

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Invasives and erosion.mxd



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Tolay Lake Regional Park

Sonoma County, California

Figure 8.

Grazing Management and Infrastructure within Tolay Lake Regional Park

Map Date: March 2013
Map By: Michael Rochelle
Aerial: San Francisco 2010

Path: L:\Acad 2000 Files\22000\22050\gis\arcmap\Report Figures\Grazing.mxd

Appendix E

Cultural Resource Report

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

TOLAY LAKE
CARDOZA RANCH

HISTORIC STRUCTURES REPORT

Prepared for:

SONOMA COUNTY REGIONAL PARKS DEPARTMENT

Prepared by:

Architectural Resources Group, Inc.

Draft November 16, 2012

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INTRODUCTION

PURPOSE OF THE HISTORIC STRUCTURES REPORT

ARG is part of a team led by MIG to prepare a Master Plan for Tolay Lake Regional Park. This historic structures report provides background information on the historic buildings of the Cardoza Ranch, at the heart of the Tolay Lake Regional Park. This report does not cover all of the structures at the Cardoza Ranch. Some of the buildings – the New Shop (16) and the Modern Barn (17) – are not included because they are not historic. The John Sr. House (3) and the Bunkhouse (2) are not included because they are currently used for ranger housing and will continue in that function under the master plan. The hunting lodge, which is located away from the Ranch, is not included because a viewing station is anticipated at that location.

METHODOLOGY

ARG did not conduct additional historical research for this report, but relied on the previous documentation provided by the County of Sonoma.

ARG visited the site on October 4 and October 17, 2012 to assess the buildings and record their conditions. ARG photographed the buildings and sketched the building plans for review and analysis. Preparation of CAD building plans was not part of the project scope.

Descriptions

The descriptions of the buildings are based on the visual inspection during the site visits. No non-destructive or destructive testing was conducted at any of the buildings. Likewise, no material testing was performed. Some building components were not visible and therefore cannot be fully described or assessed for conditions.

Character Defining Features

A character-defining feature is an aspect of a building's design, construction, or detail that is representative of the building's function, type, or architectural style. Generally, character-defining features include specific building systems, architectural ornament, construction details, massing, materials, craftsmanship, site characteristics and landscape features within the period of significance. In order for an important historic resource to retain its significance, its character-defining features must be retained to the greatest extent possible. An understanding of a building's character-defining features is a crucial step in developing a rehabilitation plan that incorporates an appropriate level of restoration, rehabilitation, maintenance, and preservation.

Character-defining features do not include building features that do not contribute to a building's historic significance or that post-date a building's period of significance. Unfortunately, periods of significance have not been assigned to the buildings at the Tolay Lake Cardoza Ranch site. In the absence of defined periods of significance, ARG has excluded from the lists of character-defining features those elements that are clearly less than 50 years of age and that were clearly added after the building's original construction (for example, the stucco cladding of Buildings 4 and 5.)

Existing Condition

Conditions of spaces and features were evaluated based on standard preservation criteria and guidelines. There are four criteria used to categorize the observed conditions: good, fair, poor and very poor. In some instances, in cases of seriously deteriorated spaces or features, a condition may not be categorized, but described more specifically.

Good The term *good*, as used in this report, indicates that the space or feature is sound, but in need of minor rehabilitation and possible repair.

Fair The term *fair*, as used in this report, indicates the space or feature shows a degree of disrepair and neglect. Rehabilitation and repair is required.

Poor The term *poor*, as used in this report, indicates the space or feature is deteriorated and in disrepair. Substantial rehabilitation and repair or replacement is required.

Very Poor The term *very poor*, as used in this report, indicates the space or feature is severely deteriorated and in complete disrepair. Replacement will likely be required, since the space or feature appears to be beyond rehabilitation and repair.

SUMMARY OF FINDINGS

In general the buildings at the Cardoza Ranch are in fair to poor condition.

DEVELOPMENT HISTORY

HISTORICAL OVERVIEW AND CONTEXT

Project Setting

The Cardoza Ranch sits along the western edge of seasonal Tolay Lake in Sonoma County, in a small valley (Tolay Valley) between the Petaluma River and Sonoma Creek. The Ranch is located in the westernmost portion of the approximately 1,737-acre Tolay Lake Regional Park, approximately 6.5 miles southeast of downtown Petaluma. The Ranch site generally has a northwest-southeast orientation, with Cannon Lane bisecting the site before turning westward to meet Lakeville Road. A dirt road – the Causeway Trail – extends northeast from the Ranch site, traversing the seasonal lake bed.

According to LSA Associates' 2008 Cultural Resources Study for the area:

> [Tolay Lake Regional Park] is situated in the Coast Ranges geomorphic province, an approximately 600-mile stretch of mountain ranges and valleys that extends from the Oregon border south to the Santa Ynez River in Santa Barbara County, California. The Coast Ranges are divided into north and south subprovinces, with San Francisco Bay marking the division between the two. [Tolay Lake Regional Park] is in southern Sonoma County, within a northwest-southeast oriented valley with gentle-to-steep sloping hills. The valley is drained by Tolay Creek, which flows southerly into San Pablo Bay (the northern arm of San Francisco Bay). To the west of [Tolay Lake Regional Park] is the Petaluma River Basin, to the east and north are rolling hills and low mountains, and to the south is the southern end of Tolay Valley, which opens to the tidal marshes of northern San Pablo Bay.[1]

Ethnographic Summary

Prior to Euro-American settlement, the Tolay Lake area was inhabited by speakers of Coast Miwok, a Penutian language group whose settlement area included all of present-day Marin County and much of southern Sonoma County. According to the Cultural Resources Study that LSA Associates completed for the Tolay Lake Regional Park in March 2008:

> Coast Miwok settlements were organized according to "tribelets," which constituted the basic ethnic, political, land-holding units throughout much of California. Within each tribelet's territory were several semi-permanent settlements, along with campsites in outlying areas that were used on a seasonal basis. Settlement locations were chosen for such factors as proximity to water, firewood, food resources, and well-drained soils. Smaller occupation sites were often clustered around a tribelet's principal village, which was the location of the ceremonial roundhouse.
>
> The *Alaguali* tribelet of the Coast Miwok likely inhabited the Tolay Lake area at the time of contact. The name *Tolay* possibly refers to the chief of the Alaguali tribelet, whose name appears on the San Francisco mission register on February 17, 1817. Other important Coast

[1] LSA Associates, "A Cultural Resources Study for the Tolay Lake Regional Park Project," March 28, 2008, 8.

> Miwok tribelets in the vicinity include *Petaluma* (where Mariano Vallejo established the headquarters of his Petaluma Rancho to take advantage of laborers from this village) and *Kotati*, from which Cotate Rancho and the city of Cotati derived their names….
>
> The Coast Miwok were rapidly incorporated into the mission system, with only a few individuals escaping conversion. Enforced conversion occurred from the time that the missions were established at San Francisco (1776), San Rafael (1817), and Sonoma (1823), which dislocated the population and resulted in the disintegration of traditional lifeways. Members of the Alaguali tribelet were incorporated into the three closest missions: Mission San Francisco de Asis, Mission San Jose, and Mission San Francisco Solano. From 1811-1817 50 Alaguali went to Mission San Francisco de Asis and another 70 went to Mission San Jose in 1816 and 1817. Most of the Alaguali survivors from the missions were eventually transferred to Mission San Francisco Solano.[2]

Historical Overview

The following historical overview of the site is taken from the Cultural Resources Study that LSA Associates completed for the Tolay Lake Regional Park in March 2008. Relevant pages of this report (including full citations) are included below in an appendix.

> The earliest visit of a non-native person to [Tolay Lake] occurred in June 1823. At this time, Governor Arguello advised Father Jose Altamira to establish a new mission at Sonoma and transfer the missions at San Francisco and San Rafael there due to the deteriorating conditions of the neophytes at these missions. Father Altamira, who arrived from Spain in 1819 to assist at Mission San Francisco de Asis, promptly traveled north to explore sites for the new mission. Altamira's June 27, 1823 diary entry noted his visit to *Laguna de Tolay* while en route to found the new mission, so named after the Coast Miwok man who was chief of the tribelet from this area. At the time of his visit, Altamira estimated Tolay Lake's dimensions as 150-200 varas (415-500 feet) wide and 1,200 varas (3,500 feet) long. Altamira would establish the last of California's 21 missions, Mission San Francisco Solano, in Sonoma only days later on July 4, 1823. The missions were secularized in 1834.
>
> In 1833, Lieutenant Mariano G. Vallejo was ordered by Governor Jose Figueroa to explore and settle the country north of Mission San Rafael, largely as a means to monitor the nearby Russian colony at Fort Ross. Vallejo applied for and received a 44,000-acre land grant for Rancho Petaluma, which encompassed Lake Tolay, from the governor in 1834. The land grant was confirmed and its size increased by 22,000 acres by Governor Manuel Micheltorena in 1843. This sprawling rancho, one of the largest in the state, stretched eastward from the Petaluma River to Sonoma Creek, from the bayshore north to approximately present-day Glen Ellen. Vallejo's Rancho Petaluma operation relied on Native American labor to produce hides and tallow, agricultural products, blankets, candles, and shoes. The Tolay Lake margins and foothills would have served as rangeland for the large herds of cattle, horses, and sheep owned by Vallejo. Once one of the wealthiest men in

[2] LSA Associates, "A Cultural Resources Study for the Tolay Lake Regional Park Project," 15-19.

the state, legal challenges to Vallejo's land-holdings and squatters forced him to sell his Rancho adobe in 1857.

William Bihler purchased the area that was to become the 1,737-acre Cardoza Ranch in 1865. In 1870, Bihler, noted as a 39-year-old single farmer and native of Baden, was residing on the ranch with a Russian housekeeper and her two children, seven farm laborers, and two cooks (one from Nova Scotia and another from China). Their residence was recorded as being in Vallejo Township, with a Petaluma Post Office address. During his tenure on the property, Bihler reputedly drained Lake Tolay so that he could use it for farming the land. A decade later Bihler was still noted as a farmer, and residing with the same housekeeper (noted as Prussian at this time), a foreman, eight farm laborers, four milkers, a butcher, and a saddler. Ten Chinese farm laborers and one cook were residing in the adjoining household, and presumably working on the same ranch. That same year the Agricultural Production Census noted that Bihler's 430-acre ranch had produced 100 tons of hay, 2,000 bushels of wheat, 400 bushels of apples, 360 dozen eggs, and 300,000 pounds of grapes the previous year.

Although the exact location and dates of operation of the Lake District School are unknown, one source noted that the school was located near the "site of the vanished Lake Tolay" and may have been within the boundaries of the present ranch. Apparently, the school was attended by children of the local ranchers and farmers.

Bihler sold the ranch in the 1880s, and between approximately 1885 and 1894 it was owned by James G. Fair, who had amassed a fortune in the Comstock Lode and served as a United States senator. Fair raised thoroughbred horses and cattle, and operated a vast vineyard that produced prize-winning grapes and brandies, as well as operating the "first continuous brandy distillery on the Pacific Coast."

The ranch was purchased from Fair's heirs by Arthur W. Foster in 1905, who operated it for the next two decades. Foster, president of the San Francisco North Pacific Railroad, operated the ranch as the Lakeville Stock Farm. Foster eventually owned most of the land between Petaluma and Sonoma Creek, purchasing small homesteads and combining them into his large landholdings along his railroad line. He also planted the eucalyptus trees along Lakeville Road, with hired men carrying barrels of water to irrigate them. The trees also line the Foster/Cardoza Road (a segment of the Sears Point-Lakeville Road), the original ranch entrance from Lakeville Road, as Foster reputedly didn't like to ride in the full sun.

Foster, his wife Louisiana, and their nine children never lived on the ranch; they resided instead at their home in San Rafael with numerous servants, in a house now occupied by the Marin Academy as Foster Hall. Foster apparently constructed the elaborate irrigation and drainage system at the ranch, as the date "1907" is incised in some of the concrete work, although some of it may have been constructed earlier.

The ranch was granted to the North Bay Farms Company in 1922, which retained ownership until 1943, the year that it was sold to John S. Cardoza, Sr., George S. Cardoza, and John S. Cardoza, Jr., natives of the Azores, who acquired the property in co-partnership. John Cardoza, Sr. was a dairyman who also raised sheep and Hereford cattle on the ranch.

According to descendant Marvin Cardoza, the ranch was in poor condition, undoubtedly due to absentee owners, when John Cardoza, Sr., purchased the property. During the late 1940s and early 1950s, John set about restoring the ranch as a viable livestock and dairy operation, demolishing many of the old buildings and using the timber, lumber, windows, and other architectural elements to build new structures and rebuild others, including barns, equipment sheds, and other amenities. Other buildings were moved around, with the Cottage (1) relocated from the location of the present Bunkhouse (2) area, and Foster's Line Shack (11) moved from the field to a site adjacent to the granary.

The old house on the property was knocked down in 1950 and a new California Ranch style home (3) built for John, Sr. on the site. Two other California Ranch style homes were built for other family members: one for George and Vera Cardoza in 1946 (4), and another for John, Jr. and Beatrice in 1947 (5) (recently the home of Marvin and Rita Cardoza).

The large Dairy Barn (7) on the hill west of the ranch complex was torn down and rebuilt in the late 1940s or early 1950s, with the milk taken to the stone creamery for processing. During this period the original stone Creamery (8) was enlarged and improved with a concrete floor, foundation, side walls, and a frame addition to the east elevation. The creamery was later converted to a winery, and the dairy barn to a sheep shed. The Workshop (12) was evidently one of the few buildings untouched by the Cardozas except for regular maintenance.

The Hay Barn (6) and Tractor Barn (13) were torn down and rebuilt in the early 1950s. A bunkhouse was built during the same period, as was an equipment shed. Corrals, fencing, water troughs, and other amenities were added or improved.

Cattle were butchered in the Slaughterhouse (15), with the offal fed to the hogs and chickens in pens and sheds (no longer extant) located on the hillside below. Hereford cattle grazed the hills, and hay and grains were planted in the fields. Grain was processed in the granary, which had a mill to chop the grain to feed the cattle. The Granary (9) was later converted to a combination museum and event center, primarily for the Cardoza's annual Pumpkin Festival.

In 1979, George S. and Vera Cardoza granted the property to Rita and Marvin Cardoza, who sold the ranch to the Sonoma County Regional Parks Department in 2005. During Marvin and Rita's tenure on the ranch, two new metal barn were erected, one in 1980 and another in 1992.

<u>Portuguese Farmers</u>
Although there is evidence of Portuguese and Spanish Sephardic Jews arriving in the United States as early as the mid-1660s, it wasn't until after 1870 that a sizeable permanent community was established. The first to arrive settled primarily in New England and California and engaged in whaling, fishing, and textile ventures, and in Hawaii, where they

worked in the sugar cane industry. In California they engaged in whaling and fishing to a small degree, but their major interest lay in gold mining and agriculture.

The second immigration stage, from 1870 to 1920, saw the decline of both the New England whaling industry and the California Gold Rush. During those years, 60% of the Portuguese in California worked on farms, primarily engaging in the self-supporting, small-scale production of fruits and vegetables and the raising of sheep. Between 1920 and 1960 they became prominent in the dairy industry, comprising 65% of California's dairy farmers.

The vast majority of the Portuguese who came to California emigrated from the Azores, an archipelago approximately 900 miles west of mainland Portugal comprised of nine islands: Corvo, Faial, Flores, Graciosa, Pico, Santa Maria, Sao Miguel, Sao Jorge, and Terceira. Settlement from mainland Portugal began in 1489 and the Azores became important for grain and cattle production for Portugal. Because of their strategic location, the islands became a stopping point between America, Europe, and Africa in the 16th and 17th centuries. In 1976, the Azores became an autonomous region of Portugal, and still produce dairy beef for export. Its primary industry, however, is tourism.

In California in the early years, the Azoreans who were involved in agriculture settled in the Sacramento Valley, Mission San Jose, San Leandro, Oakland, and Castro Valley. By 1880, 84% were living in rural areas, primarily owning or operating farms. Between 1890 and 1910, numerous Portuguese migrated primarily to the San Francisco Bay Area, where several dairies were established in Marin County. Around the turn of the 19th century, many Azoreans moved to the San Joaquin Valley to farm, and the area is still the center of their population. As noted by historian Robert Santos:

> Dairying and the Azoreans are like the euphemistic phrase "goes together like hand and glove." Being unskilled and using very few tools and implements, most Azorean farmer peasants brought only their hands and their farming knowledge to the United States for a livelihood.

His description of dairy farmers in the San Joaquin Valley also characterizes the Azorean experience in Sonoma County:

> Dairying provided security for those who practiced it. For one, there was always a monthly milk check providing constant revenue. The investment was solid because one owned land, equipment, and cattle which could always be sold in an economic crisis. For the thrifty minded Portuguese who save their money continuously, the initial investment was something they could afford. They saw opportunity in something that an unskilled, mostly illiterate, and non-English speaking Azorean peasant could do with success and profit.

Santos goes on to state:

> The Azoreans are family-oriented people who sacrifice and work together as a unit towards a common goal. This family effort is the basic reason why they became so

> successful in dairying. No dairy partnerships are formed outside the family because the children inherit the dairy.

This last description is particularly apt for the Cardoza family, an Azorean family who arrived in the area in 1943, purchased the ranch in partnership, worked together to improve the property, and whose children inherited and continued the ranching operation until the property was acquired by [the Sonoma County Recreation and Parks District] in 2005.[3]

CHRONOLOGY OF DEVELOPMENT AND USE

Note: Chronological information has been drawn from LSA Associates, "A Cultural Resources Study for the Tolay Lake Regional Park Project," March 28, 2008.

1823	Father Jose Altamira visited *Laguna de Tolay* en route to founding a new Mission in Sonoma.
1834	Mexican Governor Jose Figueroa granted 44,000-acre land grant (Rancho Petaluma), which included Tolay Lake, to Lieutenant Mariano G. Vallejo.
1843	Mexican Governor Manuel Micheltorena expanded Rancho Petaluma land grant to 66,000 acres.
1857	Vallejo sold his Petaluma Adobe. At one time the largest privately-owned adobe building in Northern California, the Petaluma Adobe is California Historical Landmark #18 and is now the centerpiece of the state-owned Petaluma Adobe State Historic Park.
1865	William Bihler purchased the area that would become the 1,737-acre Cardoza Ranch. Bihler reputedly drained Tolay Lake in order to farm the land.
1880s	Bihler sold the ranch.
c.1885-c.1894	Ranch owned by U.S. Senator and Comstock Lode millionaire James G. Fair.
Late 1800s	Workshop (12) constructed.
1905	Arthur W. Foster purchased the ranch from Fair's heirs, who had maintained ownership following Fair's death in 1894. Foster, president of the San Francisco North Pacific Railroad, operated the ranch as the Lakeville Stock Farm, and evidently constructed the elaborate irrigation and drainage system at the ranch.
1922	Ranch acquired by North Bay Farms Company.
1943	Ranch sold to John S. Cardoza, Sr.; George S. Cardoza; and John S. Cardoza, Jr., who converted the ranch to a dairy and cattle operation.
Late 1940s-	Cardozas demolished several buildings at the ranch, reusing the lumber, windows

[3] LSA Associates, "A Cultural Resources Study for the Tolay Lake Regional Park Project," 19-24.

Early 1950s	and other architectural elements to build new structures and rebuild others, including barns and equipment sheds. Some buildings (including the Cottage (1) and the Line Shack (10)) were left intact but relocated on the property. During this time, the Dairy Barn (7) on the hill southwest of the ranch complex was rebuilt and the Creamery (8) was enlarged with a concrete floor, foundation, side walls, and frame addition to the east elevation.
1946	George Cardoza and Vera Cardoza House (4) constructed.
1947	John Cardoza, Jr. and Beatrice Cardoza House (5) constructed.
1950	John Cardoza, Sr. House (3) constructed.
Early 1950s	Hay Barn (6) and Tractor Barn (13) rebuilt. Bunkhouse (2) and Storage Shed (14) constructed.
1979	George S. Cardoza and Vera Cardoza granted the property to Rita Cardoza and Marvin Cardoza.
1980	Metal Barn (16) constructed.
1992	Modern Barn (17) constructed.
2005	Rita Cardoza and Marvin Cardoza sold the property to the Sonoma County Regional Parks Department.

SIGNIFICANCE AND INTEGRITY

Significance

In the Cultural Resources Study that they completed for the Tolay Lake Regional Park in March 2008, LSA Associates found the Cardoza Ranch complex to be

> eligible for listing in the National Register under Criterion A due to its association with the Azorean Portuguese dairy and ranching industry in Sonoma County and California, an industry dominated by them from the 1920s through the 1960s, and Criterion C since the ranch features, while lacking individual distinction, represent a significant distinguishable entity that can trace its history to one family and one operation.[4]

LSA Associates also concluded that the Cardoza Ranch complex is National Register-eligible both as its own district and as a contributor to the larger Tolay Valley Historic District. This latter district, which was identified by LSA Associates, generally corresponds to the boundaries of Tolay Lake Regional Park and consists of 21 prehistoric archaeological sites, historic-period built environment resources, and resources with both prehistoric and historical components.[5]

Integrity

LSA Associate's Cultural Resources Study states that "Pre-Cardoza elements and the Cardoza Ranch retain a high degree of integrity of setting, location, workmanship, materials, feeling, and association."[6]

The LSA Associates study also states that although some of the buildings were used for operations different than originally intended at the time of the study (i.e. the Creamery as a winery, the Granary as a museum), "the landscape within which the ranch is situated has retained the integrity of its period of significance, and reflects a period of time and place when Portuguese dairy farms dotted the rural landscape of Sonoma and Marin counties. Therefore, the Cardoza Ranch appears to possess integrity."[7]

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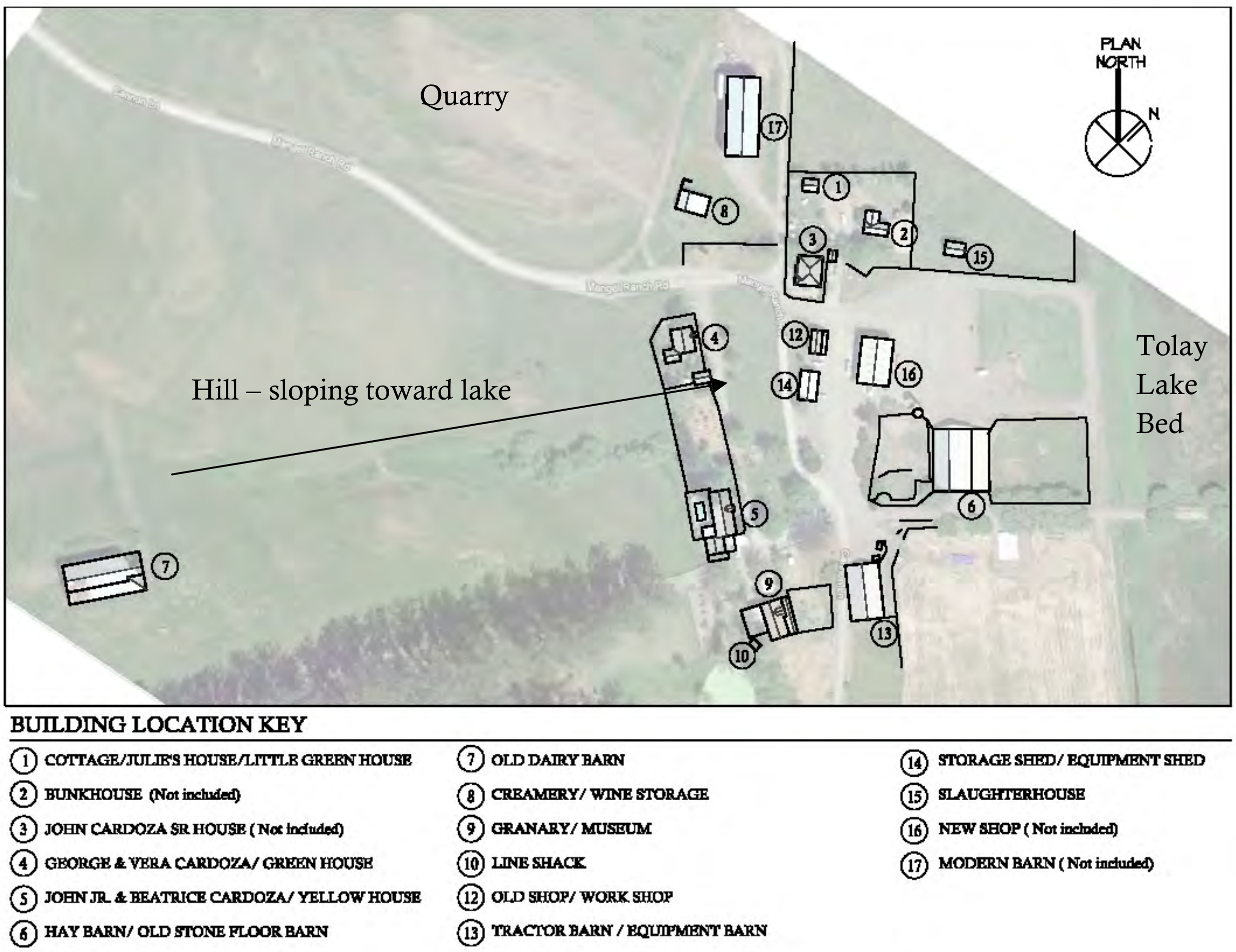
[4] LSA Associates, "A Cultural Resources Study for the Tolay Lake Regional Park Project," 59.
[5] Ibid., 46.
[6] Ibid., 47.
[7] Ibid., 59.

PHYSICAL DESCRIPTIONS, CONDITIONS, & TREATMENT RECOMMENDATIONS

See the introduction for definitions of condition ratings. Treatment recommendations are divided into two broad categories: basic treatments and use-specific treatments. The basic treatments include repairs to deteriorated elements and stabilization of the buildings. Use-specific treatments include modifications to the buildings related to the proposed new use(s).

SITE



Physical Description

The Cardoza Ranch site generally follows a northwest-southeast orientation, in accordance with the contour of the low hills southwest of the Ranch and the edge of the Tolay Lake lakebed to the northeast. The Cardoza Ranch site is accessed by two roads: Cannon Lane from the west and Cardoza Road from the southwest. The ranch buildings and structures are clustered around the portion of Cannon Lane that turns southeasterly to meet Cardoza Road. Multiple dirt paths and limited access dirt roads cross the site. The most notable is the dirt road that extends northeasterly along the causeway that bisects the lakebed of Tolay Lake. Fencing is used throughout the site, to demarcate both residential yards and livestock pens.

The Cardoza Ranch site, and the buildings thereon, can be broken into two sections: the upland half to the southwest, and the comparatively flat half to the northeast. The upland portion of the site includes the George and Vera Cardoza House (4) and the John, Jr. and Beatrice Cardoza House (5), along with the Granary (9), the Line Shack (10), the Creamery (8) and the Modern Barn (17). Several trees have been planted around the Granary and the two residences, and mature Eucalyptus line Cardoza Road as it leaves the Ranch site. A pond sits immediately south of the Granary. At the Ranch site's highest elevation, a small quarry has been dug into the hill immediately west of the Creamery. The dairy Barn (7) sits several hundred feet away from the main ranch on the hill to the southwest.

The other buildings occupy the flat half of the Ranch site. These buildings include three residences (the Cottage (1), the Bunkhouse (2) and the John Cardoza, Sr. House (3)) and the Slaughterhouse (15) at the northwest end, and a collection of barns and storage sheds (Hay Barn (6), Old Shop (12), Tractor Barn (13), Storage Shed (14), and Metal Barn (16)) to the southeast. Trees, which are fewer in number here than in the Ranch site's upland half, are concentrated along the Causeway Trail and near the residences at the northwest end. A concrete silo stands between the Hay Barn and the Metal Barn.

BUILDING 1: COTTAGE/JULIE'S HOUSE/LITTLE GREEN HOUSE

Image 1 - Entrance to Cottage, south side

Image 2 – Northeast corner of Cottage

Physical Description

The Cottage is currently located on the north side of the Ranch, behind John Cardoza, Sr.'s House (3) and beside the Bunkhouse (2). It was moved to this location by the Cardozas from the area where the Bunkhouse sits. It is on a relatively flat portion of the site and along with the other nearby houses is fenced off on the north, east and west sides. The Cottage is accessed via a shared driveway that runs between John Cardoza, Sr.'s House and the Bunkhouse. It likely dates from the early 1900s with later modifications.

The Cottage is a simple rectangular form with a gabled roof. The main building is 16 feet deep and 26 feet wide. The southern-facing enclosed porch is 6 feet deep and 26 feet long, and has a shed roof. The framing is enclosed, but is assumed to be standard wood framing.

The exterior walls are clad with three-inch-high rounded edge siding except at the south porch wall, which is clad in eight-inch-high V-groove siding. The roof is covered with asphalt shingles over wood singles.

The Cottage is entered via wood steps, a small landing and a door centered on the south porch. The steps and landing have wood railings. The door has a fixed union jack lower panel and an upper panel of diamond-shaped lights filled with amber-colored bull's-eye glass. The south side of the building has four sliding aluminum windows, with wood trim. There are two double-hung wood windows on the east wall, two on the north wall, and one on the west wall. All of the windows have a single pane of glass per sash. There is a wood-framed foundation vent at the east wall.

The interior of the porch has all painted wood finishes: wood flooring, plywood on the north wall, exposed wood framing and sheathing on the other walls and exposed board sheathing and rafters at the ceiling. The porch is used as the laundry room and contains the water heater, washer and dryer. The east end of the porch is portioned off as the bathroom with a shower, sink and toilet. The walls in the bathroom are painted vertical wood boards, and the ceiling is the exposed structure, also painted.

There is a small step up from the porch to the rest of the Cottage. The door from the porch to the cottage leads directly into the living room. The living room also serves as the kitchen. Along the south wall, there is a counter and sink. Above the sink is a sliding aluminum window, looking into the porch. On both sides of the window are wall mounted cabinets. These cabinets wrap the southwest corner and extend about four feet along the west wall. The floor of the living room and kitchen are painted wood boards. The walls have a random combination of wood siding and paneling. The ceiling consists of painted wood boards.

The bedroom is located in the northeast corner of the cottage and is entered through the east wall of the living room. The closet is located in along the east side of the cottage, between the bedroom and bathroom and is entered form the south wall of the bedroom. Like the living room, the bedroom and closet have painted wood floors, walls and ceilings.

The Cottage has electrical and water service. Gas is provided from a nearby propane tank. The electrical meter is located at the east wall and the panel is located inside the porch, on the north wall. Heat is currently provided with a wall heater on the west wall. However, there are at least two previous heating systems: there is an in-floor grill for a below-the-floor gas heater and there is an old metal flue at the northwest corner from a stove.

Image 3 - Bedroom with various types of wood paneling

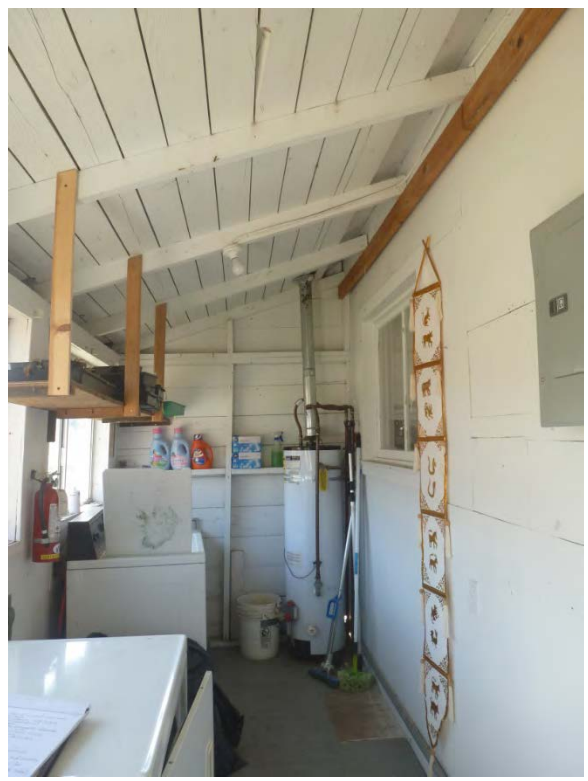


Image 4 - Enclosed porch used as laundry room

Character-Defining Features

- One-story height
- Rectangular plan
- Side gable roof with shed roof porch
- Wood siding with wood rakes
- Double-hung wood windows with wood surrounds

Existing Conditions

The Cottage is in poor condition overall.

<u>Foundation</u>
The building does not have a foundation and is resting on the ground.

<u>Structural Framing</u>
The building lacks approved cripple-wall bracing below the floor at exterior walls. The building lacks diagonal or structural sheathing at exterior walls. The building lacks structural sheathing at the roof.

<u>Exterior</u>
Roofing
The asphalt shingle roofing is in poor condition. There is no flashing where the lower roof meets the cottage wall; shingles have been wrapped up the face of the wall, but underlying wood is exposed and deteriorated. The gutter along the south eave has no downspout and drains out its open ends.

Image 5 - Enclosed porch roof at Cottage

Image 6 -Typical wood to earth contact

Cladding
The wood siding is in fair to poor condition. The paint finish is worn. There is wood-to-earth contact on all sides of the cottage and the wood at the base of the walls is very deteriorated.

Doors and Windows
The front door, likely a replacement, is in good condition. Both the wood and aluminum windows are in poor condition. Settlement has caused wracking of some window frames.

Image 7 - Window at east wall showing frame wracked due to settlement

Trim
All of the exterior wood trim is in poor condition, with particularly serious deterioration at the window sills and at the base of the front door trim and corner boards.

Features
The front porch, steps and railings are in poor condition. One porch board has been replaced; the steps are unstable.

<u>Interior</u>
Floor
The painted wood floor in the cottage is in fair condition; on the enclosed porch, several sections have been patched with plywood. The single step at the door between the cottage and enclosed porch presents a trip hazard.

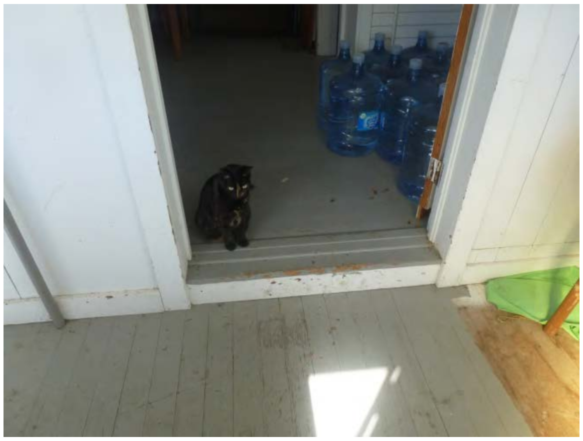


Image 8 - Step between enclosed porch and cottage

Image 9 - Random interior wood paneling at Cottage

Walls and Ceilings
The various types of wood paneling, including the exposed sheathing at the enclosed porch, are generally in fair condition, though the reused wood was installed in a haphazard, poorly fit manner.

Trim
Painted wood trim throughout the interior of the Cottage is in fair condition.

Doors
The interior wood doors are in good condition, except for wear and tear, mainly at the bottom edge.

Features
Washer and dryer are used by park staff and are assumed to be in good condition. The wood cabinets, laminate counter and sink are in fair condition.

Electrical
The circuit breaker and surface mounted conduit to junction boxes in each room are relatively new and in good condition. It does not appear that there is any substandard wiring in use.

Mechanical and Plumbing
The original floor and wall heaters are not functional. The gas water heater and wall heater and two air conditioners are newer and assumed to be functional. Both the water heater and wall heater are properly vented.

Accessibility Issues
The Cottage is not accessible from the exterior. Once inside, the Cottage is generally deficient as regards accessibility and ADA compliance (path of travel, bathroom, etc.). Required level of accessibility will depend upon use.

<u>Code Analysis</u>

Occupancy Classification	R-3 single family residential
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	10,500 square feet
Actual Area	572 square feet
Allowable height (CBC Section 504)	40 feet, 3 stories
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet /occupant	3
Required Exits (CBC Section 1015)	1
Provided Exits	1
Other considerations	The asphalt shingle roof over the wood shingles is a non-compliant condition per CBC 1510.3, paragraph 2

Treatment Recommendations

<u>Basic Treatments</u>

Structure

- Provide concrete foundation.
- Re-grade to provide positive drainage away from building.
- Add necessary seismic connections, shear walls, and plywood sheathing at roof.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Replace asphalt shingle roof on cottage, rolled roofing on enclosed porch; install new flashing, gutters and downspouts.
- Repair or replace damaged wood siding and trim: estimate replacement of 20% of siding and 50% of trim; eliminate all wood to earth contact.
- Realign and restore wood windows: estimate replacement of 50% of window components.
- Replace aluminum porch windows with wood to match those in cottage.
- Remove old woodstove vent pipe.
- Rebuild front steps and landing.
- Provide minor repairs to doors and hardware as needed; replace front door sill.
- Paint all wood elements.

Interior

The interior does not require any rehabilitation for its current storage use.

Systems

- Have all systems evaluated by a licensed contractor or engineer.
- Replace plumbing piping and all fixtures.
- Remove crawl space heater.

<u>Treatments Contingent on Use</u>
The preliminary recommended use for the Cottage is residential.

- Insulate walls and attic, including enclosed porch.
- Add finish over insulation at enclosed porch walls and ceiling.
- Repaint entire interior, including wood floor.
- Completely rehabilitate bathroom.
- Replace sink and counter with functional kitchen.
- Consider constructing a wall separating laundry area from entrance.

BUILDING 4: GEORGE AND VERA'S HOUSE/GREEN HOUSE

Image 10 –Front entrance to George and Vera's House, east side

Image 11 – George and Vera's Garage

Physical Description

This 1946 Ranch style house is located on the west side of the ranch complex, north of John Jr. and Beatrice's house (5) and south of the Creamery (8). The site slopes gently to the northeast, with a slightly leveled area around the house. The front door of the house faces east towards the Old Shop (12) and the lake. Vera still lived in the house when the Ranch became a regional park in 2005.

This house originally had the same general layout as John Jr. and Beatrice's house (5), but differing additions and modifications have since obscured the original form of both houses. This house is slightly smaller and originally had two bedrooms, not three like the other house. The original form was a simple rectangle. This house has an addition off of the southwest corner. A detached garage is located to the south of the house. The original house was 30 feet deep and 36 feet wide. The garage is 26 feet deep and 24 feet wide. The addition is about 17 feet wide and 30 feet deep. The original house has a half basement that is approximately 36 feet wide and 15 feet deep.

The exterior walls have stucco over wood V-groove siding. The front porch is wood framed with a metal railing and posts. The stairs, ceiling, and fascia have been covered with stucco. The garage also has stucco over wood siding. The main roof is asphalt shingles over wood shingles. The addition has asphalt shingles. The garage has asphalt shingles.

The main entrance door is a six panel door. The mud room door is a two panel door with glass in the upper panel. Both doors have screen doors. The door to the basement is a wood sliding door. The garage overhead door is a metal single section lift door; there is a wood man door in the south wall of the garage.

There are two large wood-framed picture windows at the living room, and the other original windows are double-hung with a single pane of glass per sash. The windows in the addition are a combination of fixed wood framed casements and double-hung windows. Most of the double-hung windows have aluminum screen at the exterior. The attic is vented through pointed metal vents at the gable ends. The foundation is vented through metal vents at the east and west walls.

The current layout is as follows. The front door enters into the living room. To the left is the kitchen, which is open to the dining area to the south straight through the living room is the door to the hallway. The mud room is located in the southwest corner of the kitchen. To the west of the hallway are two bedrooms and a bathroom. A second hallway has been added through the second bedroom. This hallway is L-shaped and connects the two bedrooms in the addition and the mud room. The basement is unfinished and contains a freestanding shower, and a two compartment sink.

Image 12 - Kitchen with original cabinets and counters

Image 13 - Bedroom in addition

Image 14 - Bathroom with original tile and fixtures

The interior finishes are primarily painted plaster walls and ceilings, with some gypsum board at the additions and modified areas. The mud room has a sheet vinyl floor and wainscot with wallpaper above. The bathroom has a tile floor and wainscot with wallpaper above. The kitchen has wood cabinets with tile counters and backsplashes. The kitchen walls are covered with wallpaper. The floor in the living room is carpet, but the rest of the house has sheet vinyl flooring.

The garage floor is exposed concrete. The garage has no interior finishes. Roof and wall framing and sheathing are exposed.

The electrical meter is on the north wall of the house, and power enters the building through the attic. The house has propane gas, which is supplied from a tank. The gas water heater is in the basement. There is an in-floor heater in the main hallway. The mud room has hookups for a washer and a gas dryer.

Image 15 - Interior of garage showing stepped foundation walls

Image 16 - Terraced patio on south side of garage

Character-Defining Features

- One-story height
- Rectangular plan
- Side gable roof with verge board
- Double-hung wood windows
- Picture windows at living room
- Gabled front porch with metal posts and railings

Existing Conditions

George and Vera's House is in poor and unstable condition. Significant structural movement has occurred.

<u>Structure</u>
The foundation has failed. It appears the expansive soils are creeping in the downhill (east) direction and are taking the house along with it. The north and west basement walls are cracked and leaning as much as 1.5 inches in 12 inches. Basement walls appear to be unreinforced concrete.

Cripple walls supporting the floor framing above the basement walls have failed and are leaning. Numerous interior girder-support posts are missing, leaning or have inadequate foundation support. Wood scraps and miscellaneous wood debris are littering the crawl space, attracting termites and leading to decay.

The front porch framing is decaying and failing; the porch and steps are pulling away from the house, and the porch roof is sloping along the eave lines.

The interior floor is sloping. Interior door frames are distorted and there are numerous cracks in the interior walls.

<u>Exterior</u>
Roofing
The asphalt shingle roofing is in poor condition. The original gutters are deteriorated and likely not functional. New gutters and downspouts on the back of the house are in good condition and connect to a drain pipe at the northwest corner. The rooftop vents and chimneys are corroded and in poor condition.

Cladding
The stucco finish on the house is in generally poor condition with significant cracking due to the building's movement. There is an almost continuous horizontal crack at the foundation; there is serious cracking and spalling where concrete walls meet stucco at the basement stairway and at both porches. The underlying tongue and groove wood siding could not be observed; there is likely some deterioration at grade due to wood to earth contact where planting beds about the stucco.

Image 17 - Deteriorated shingles and debris

Image 18 - Stucco at basement stair and door

Doors
The doors are in fair condition; their frames and screen doors are in poor condition. Wood sills are very deteriorated.

Windows
The wood and aluminum windows are in fair to poor condition. Sills are deteriorated. Some wood windows are out of plumb due to building settlement and are not operable. Window screens are in fair to poor condition; some are ill-fit due to settlement and some are missing. Wood basement windows are misaligned due to building settlement.

Trim
All wood trim at the roof, doors and windows is in poor condition.

Image 19 - Front porch separated from wall of house

Image 20 - Poorly constructed ramp and stairs at south entrance

Image 21 - Stairs to basement

Features

The covered front porch is not level; it has separated from the house due to differential settlement. The concrete slab and steps and the stucco facing are cracked and deteriorated. The ornamental railing and roof supports are rusted and out of plumb.

The porch at the south entrance is very poorly constructed. Modifications made to add the ramp created an unsafe stair approach. The supporting structure is extremely deteriorated.

Paving and Stairs

Concrete paving around the house has cracked and settled, creating trip hazards. The terraced concrete patio west and south of the garage has extensive settlement and structural cracking.

The concrete stair to the basement and the adjacent retaining walls are in fair condition. The stairway is filled with leaf debris, clogging the drain at the bottom; water can freely enter the basement. The wood fences surrounding the stair are in very poor condition and collapsing. This is a hazardous condition.

Image 22 - Multiple layers of flooring

Image 23 - Settlement damage

<u>Interior</u>

Floor

Linoleum and vinyl flooring throughout the house is in poor condition; carpet in northeast room is in fair condition.

Walls and Ceilings

The plaster finish throughout the house is in fair to poor condition with a significant number of cracks due to settlement. Tile wainscots and shower surrounds are in fair to good condition.

Trim

Painted wood trim throughout the house is generally in good condition, except in areas where settlement has led to open joints and some deterioration at window sills.

Doors

Wood doors are in good condition, except for wear and tear, mainly at the bottom edge.

Features

Wood kitchen cabinets and tile counters are in good condition. Miscellaneous built-in casework elsewhere in the house is also in good condition.

Basement

Condition of the exposed framing and foundation in the basement is described above. There are water stains on the concrete walls and floor and also on the wood framing above.

<u>Electrical</u>
Wiring throughout the house is substandard and potentially hazardous.

Image 24 – Mix of knob and tube and newer wiring in attic

<u>Mechanical and Plumbing</u>
The original under floor heater appears to have been removed. The floor grille remains. The gas fired water heater is located in an area of movement in the basement.

The plumbing piping is old and corroded; leaks are evident in the basement. Plumbing fixtures, including stall shower and sinks in the basement, are in poor condition.

<u>Garage</u>
Structure
The garage structure is in fair condition, lacking structural sheathing at the roof. The crack in the north foundation wall does not appear to have caused significant damage to the wood structure.

Exterior
The asphalt shingle roofing is in poor condition; the gutters are badly corroded and partially missing. In addition to the structural crack in the north wall, the stucco finish has numerous cracks, mainly at the lower part of the walls. The door, overhead garage door, and windows are in fair condition. The higher grade outside the south door allows water to enter the building. Wood trim is in fair condition.

Image 25 - Garage roof and corroded gutter

Image 26 - Structural crack in north wall

Interior

The wood structure and the roof and wall cladding exposed on the interior are addressed above. The floor slab is in fair condition. The electrical wiring is not in accordance with code.

<u>Accessibility Issues</u>

The house is not accessible from the exterior; the existing ramp is not code-compliant. Once inside, the house is generally deficient as regards accessibility and ADA compliance (path of travel, bathroom and kitchen, etc.) The garage is not accessible. Required level of accessibility for both buildings will depend upon use.

Code Analysis

House

Occupancy Classification	R-3 single family residential
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	10,500 square feet
Actual Area	1,527 square feet
Allowable height (CBC Section 504)	40 feet, 3 stories
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	8
Required Exits (CBC Section 1015)	1
Provided Exits	2
Other considerations	The asphalt shingle roof over the wood shingles is a non-compliant condition per CBC 1510.3, paragraph 2

Garage

Occupancy Classification	U - garage
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	160 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	12 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	1
Required Exits (CBC Section 1015)	1
Provided Exits	1
Other considerations	The asphalt shingle roof over the wood shingles is a non-compliant condition per CBC 1510.3, paragraph 2

Treatment Recommendations

Basic Treatments

The primary issue with this building is the failed foundation. There are three primary ways to deal with this: the first is to build a new foundation, the second is to completely rebuild the entire house and the third is to demolish the house and not rebuild. The recommendations listed below assume the first option.

Structure

- Conduct a geotechnical investigation near the house to determine the soils composition.
- Stabilize soils as recommended by geotechnical report.
- Move the house off of the existing failed foundation. Pour a new reinforced concrete foundation based on the geotechnical report findings. Move the house back to its original location over the new foundation.
- Provide additional shear strength at the walls and roof to resist the seismic loads.
- Improve attachments at the roof to wall connections.

- Eliminate basement and stair to basement.
- Remove existing porch and rebuild steps in concrete.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Remove asphalt and wood shingles. Install new plywood sheathing and new asphalt shingle roof. Install new gutter and downspouts.
- Repair cracks in stucco.
- Insulate exterior walls and attic.
- Repair windows and replace deteriorated elements as needed.
- Replace screen doors.
- Replace thresholds at doors.
- Repair and repaint metal railings at front porch.
- Provide new accessible ramp to kitchen door.
- Replace missing decorative shutters.
- Paint stucco walls and all wood elements.
- Move plantings away from building foundation.
- Add foundation drainage along the uphill side of the house.

Interior

- Insulate walls and attic.
- Replace all floor finishes.
- Repair cracks in walls and ceiling.
- Remove wallpaper and repaint all walls.
- Repair door frames where cracked.
- Repair windows; replace badly deteriorated windows to match.
- Repair and reuse wood cabinets in kitchen.
- Remove old heater and patch hallway floor.

Systems

- Have electrical system evaluated by a licensed contractor or engineer and upgrade as required.
- Replace light fixtures as needed.
- Replace plumbing fixtures in bathroom and mudroom.
- Provide new heating and air conditioning system.

Garage

- Seismic upgrade: install structural sheathing at roof and walls.
- Repair foundation and bolt framing to foundation.
- Install asphalt roof with gutters and downspouts.
- Re-grade around garage to keep soil at least six inches below the wood sill.
- Remove vegetation from around foundation.
- Minor repair of windows.

- Repair cracks in stucco.
- Paint stucco walls and all wood elements.
- Repair or replace patio at south side so that water doesn't drain into garage.
- Add perimeter drain at back of garage.
- Add area drain at side door.

Treatments Contingent on Use
Preliminary use options for the house are guest rental, staff housing, or office space.

- Upgrade kitchen, possibly as ADA-compliant.
- Completely rehabilitate bathroom, possibly as ADA-compliant.
- Upgrade lighting.
- Widen door openings for accessibility.
- Consider alterations to interior layout depending on use.

BUILDING 5: JOHN JR. AND BEATRICE'S HOUSE/YELLOW HOUSE

Image 27 – Front of John Jr. and Beatrice's House, east side

Image 28 - John Jr. and Beatrice's House, with addition and garage at south end

Physical Description

This 1947 Ranch style house is located on the west side of the ranch complex, south of George and Vera's House (4) and north of the Granary (9). The site slopes gently to the east, with a slightly leveled area around the house. The front door of the house faces east towards the Hay Barn (6) and the lake.

This house originally had the same general layout as George and Vera's house (4), but differing additions and modifications have since obscured the original form of both houses. This house was eight feet wider and had three bedrooms instead of two. The original form was a simple rectangle. This house has had a least four different additions. The first addition was the two-car garage to the south of the house. The second addition connected the house and the garage, converted the living room into a bedroom, converted the garage into a living space, and expanded the kitchen dining area. The third addition was a covered patio at the corner between the house and garage. The fourth addition was a shed on the south side of the garage. The original house was 30 feet deep and 44 feet wide. The garage is 26 feet deep and 24 feet wide. The connection between the house and the garage is 30 feet deep and 16 feet wide. The covered patio is about 18 by 20 feet and the shed is 30 feet deep and 14 feet wide. Adjacent to the patio, behind the original house, is a concrete paved terrace with an in-ground swimming pool. The original house has a partial basement that is approximately 20 feet wide and 15 feet deep.

The east side of the garage and the south side of the house have lapped wood siding with a brick wainscot. The other exterior walls have stucco over wood V-groove siding. The front porch is wood-framed with a wood railing and posts. The stairs, ceiling, and fascia have been covered with stucco. The chimney, on the north wall, is made of red brick. The main roof is asphalt shingles over wood shingles. The garage has asphalt shingles. The covered patio has a corrugated metal roof, and the shed has corrugated fiberglass panels.

The main entrance door is a six panel door with glass in the upper four panels. The kitchen door, on the south wall, is a panel door with a union jack panel at the lower half and six panes of glass above. The kitchen door has a small metal awning over it. The garage east doors are two pairs of doors that match the kitchen door. The door from the garage to the covered patio is a two panel door with a flat wood panel below and a single pane of glass above. The door from the second addition to the back patio matches the doors at the front, but also has a screen door of similar design as the door. The door to the shed is a single panel door.

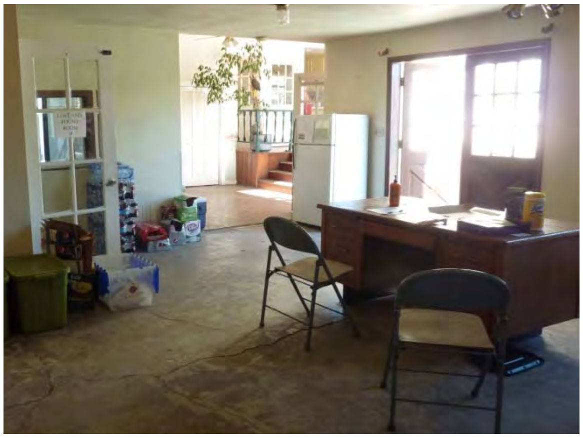


Image 29 –Garage looking into transition space and kitchen beyond. The covered patio is to the left and the front patio is to the right.

Image 30 - Edge of dining room, looking into kitchen and entrance hall beyond. The basement stair is at the left.

The current layout is as follows. The front door enters into a front hallway. To the right of the hallway is a bedroom, which was originally the living room and contains a fireplace and built in shelves on the north wall. To the left is the kitchen, which is open to the dining area to the south. The entrance hall opens up to the main hallway which runs north to south through the house. To the west of the hallway are three bedrooms and a bathroom. The closet in the middle bedroom has been converted to a shower and a sink in a counter added at the northeast corner. The south end of the hallway opens into the dining room. The dining room is the east side of the second addition. The west side of the second addition is four steps lower and is the transition between the garage and the rest of the house. This transition space is connected to the garage with a large framed opening. The garage has a vestibule at the northwest corner. A wood burning stove is located in the southwest corner. The shed can only be entered from the exterior. The basement is accessed via a stair between the kitchen and the main hallway. The basement is unfinished and contains a freestanding shower, a two compartment sink and the pool equipment.

Image 31 - Transition space with dining room at the right and kitchen beyond. The door on the left is to the hallway, the door on the right is to the basement.

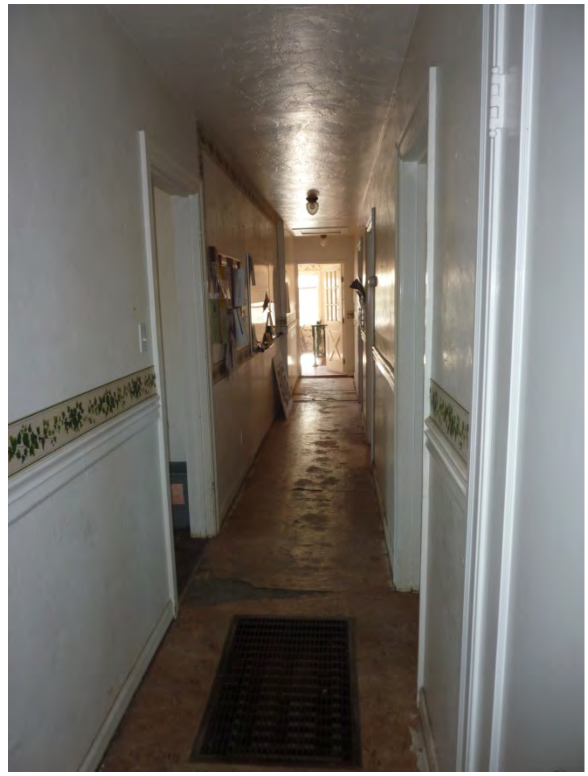


Image 32 - Hallway looking toward the kitchen. The door at the left is to the entrance hall. The door in the right foreground is the linen closet, the next door is the bathroom and the next two doors are bedrooms.

The interior finishes are primarily painted plaster walls and ceilings, with some gypsum board at the additions and modified areas. There is brick wall finish at the fireplace in the former living room, behind the wood burning stove in the garage and at the wall between the basement stair and the kitchen. The kitchen, transition space, and the former living room have wall paper. The bathroom has a wood wainscot. The main hallway has a wood chair rail. The kitchen and bathroom have wood cabinets with tile counters and backsplashes. The middle bedroom has plastic laminate cabinets and counters and the shower has tile floor, walls and ceiling. The former living room and the dining room have wood floors. The garage has an exposed concrete floor and the rest of the rooms have linoleum, vinyl, or vinyl tile floors.

The electrical meter is on the north wall of the house, and the panel is in the basement. The water heater is also in the basement. Some of the pool equipment is located behind the garage and some is in the basement. The house has propane gas, which is supplied from a tank. There is an in-floor heater in the main hallway and a gas stove in the former living room.

Character-Defining Features

- One-story height
- Side gable roof
- Wood siding at south end
- Gabled front porch
- Chimney and fireplace at north wall

Existing Conditions

In general, because it has been used and maintained by park staff, the Yellow House is in fair condition.

<u>Structure</u>

The original building lacks the following: effective cripple-wall bracing and anchor bolts below the floor at the exterior walls, diagonal or structural sheathing at exterior walls, and structural sheathing at the roof.

The front porch and sheathing is decaying and partially failing.

At the second addition, the cripple wall sheathing is decayed and has failed. It appears that concrete has been poured against the sheet metal flashing at along the south wall. The flashing has failed allowing water intrusion and decay of the plywood sheathing. The framing at the cripple wall is also decayed.

<u>Exterior</u>

Roofing

The condition of the roof varies from good to very poor: the asphalt shingle roofing on the former garage is in good condition; that on the west slope of the house is in fair condition, with some detached shingles; and that on the east slope of the house is in very poor condition, with curled and broken shingles and considerable leafy debris. The rooftop vents and chimneys on the garage and the west slope of the house are in fair condition, and those on the east slope are corroded, in poor condition. The gutters appear to be in fair condition, though some may be blocked by debris, and the newer galvanized downspouts drain away from the building via splash blocks. The corrugated sheet metal roof over the patio is in fair condition.

Cladding

The stucco finish on the house is generally in fair condition. There is one major vertical structural crack where the original house was expanded to the south. The underlying tongue and groove wood siding could be seen where the front porch had separated from the east wall of the house and appeared to be in good condition. The condition at other locations could not be observed, but there is likely some deterioration at grade, particularly along the west and north walls of the house, where planting beds abut the stucco. Stucco on the west wall of the former garage is in good condition, but that on the south wall, within the covered storage shed, is in poor condition, with extensive cracking and spalling. The wood siding at both the house and garage is in good condition, as is the brick base.

Image 33 - Deteriorated roofing and vents

Image 35 - Crack in east wall at addition

Image 34 - Debris filled gutter with new downspout

Image 36 - Extensive cracking at south wall

Doors
The wood doors are in fair condition. Aluminum thresholds are high and pose a trip hazard.

Windows
Most of the wood and aluminum windows are in fair condition. One west-facing wood window is in poor condition. Window screens are fair to poor and some are missing.

Trim
Wood trim at the roof, doors and windows is in fair condition. The wood louvered attic vents are in fair condition. The decorative shutters are in good condition. An awning over one door is in poor condition, with a lot of corrosion.

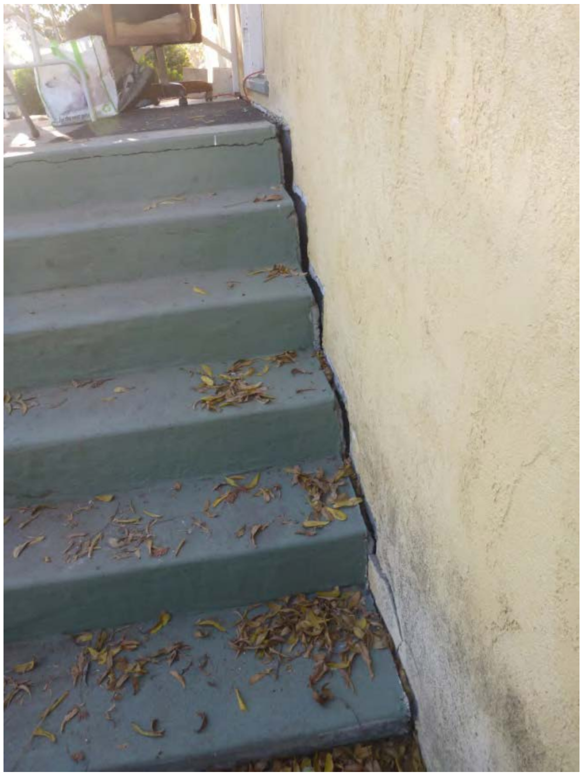


Image 37 - Front porch stair separated from house wall

Image 38 - Misaligned paving at pool

Image 39 - Deterioration in outdoor storage shed

Features

The covered front porch steps and stoop have separated from the house due to differential settlement. The stucco finish is cracked and deteriorated. The wood railing and roof support posts are in fair condition; the posts appear to be adequately supporting the porch roof; but the foundation is failing, so the overall condition should be considered very poor.

The brick chimney at the north end is in good condition, with minor cracking where it meets the stucco wall.

Patios

The concrete patio in front of the former garage is in fair condition. It has no control joints and, although it has a number of cracks, it remains level. The concrete steps and the brick planters surrounding the patio are in good condition.

At the rear patio, the brick planters, wood structure, including lattice, are in fair condition. The patio itself is in poor condition; portions of the concrete paving around the pool have lifted and/or cracked due to expansive soils, creating a trip hazard. The swimming pool appears to be in good condition, although its equipment was not tested.

Outdoor Storage Shed
This structure is in poor condition. The wood framing, various types of cladding (wood boards, plywood, wood lattice), and door are damaged and deteriorated. The concrete slab floor has extensive cracking. The corrugated fiberglass roofing is in fair condition.

<u>Interior</u>
Floor
Where carpet has been removed, the exposed linoleum is in poor condition; the underlying wood subfloor is in fair condition. The wood floor in the dining area is also in fair condition as are the wood stairs down to the lower level. Newer sheet vinyl in several rooms is in good condition. The concrete floor in the former garage is in fair condition, with several large cracks. Transitions between different types of flooring have created trip hazards.

Walls and Ceilings
The plaster finish throughout the house is in good condition. Wood and tile wainscots and shower surrounds are in fair to good condition.

Image 40 - Flooring deterioration and change of level

Image 42 - Deteriorated window at west wall

Image 41 - Floor at former garage

Image 43 - Cabinet at kitchen sink

Trim
Painted wood trim throughout the house is generally in good condition, except at the aluminum windows in the north wall, where it is deteriorated from water infiltration.

Doors
Wood doors and louvered closet doors are in good condition, except for wear and tear, mainly at the bottom edge.

Features
Wood cabinets in the kitchen, offices and bathroom are in good condition, except for water damage at the kitchen sink. Tile and laminate countertops vary from fair to good condition.

A gas range and dishwasher were removed from the kitchen.

The brick fireplace and hearth on the north wall appear to be in good condition, but the condition of the chimney is unknown.

The wood stove and brick hearth in the former garage are in good condition.

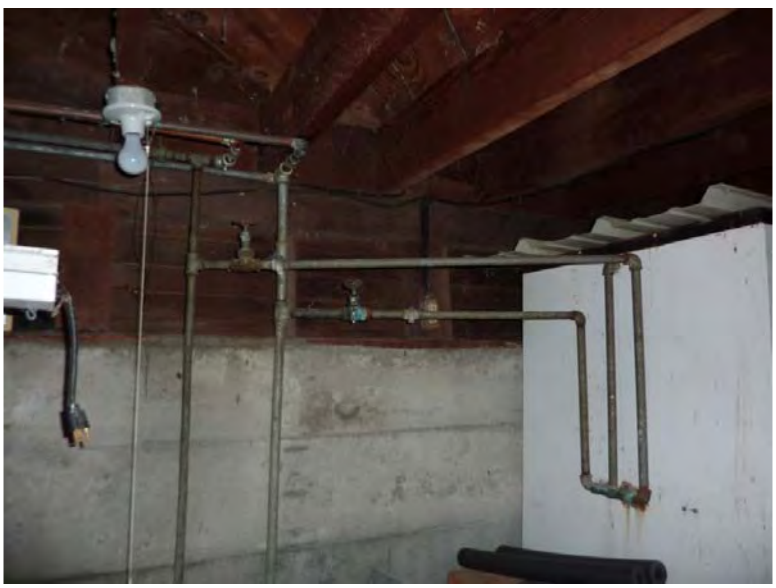


Image 44 - Deteriorated piping in basement

Basement
Condition of the exposed framing and foundation in the basement is described above. There are water stains on the concrete walls and floor. A free standing stall shower is in poor condition.

<u>Electrical</u>
Some components of the electrical system have been upgraded, but some original components remain. The entire system should be evaluated by a licensed engineer.

Mechanical and Plumbing
Mechanical equipment appears to be functioning adequately for the current occupancy, but should be evaluated by a licensed engineer. Elements of the plumbing piping have clearly been repaired and replaced, but much of the visible piping is corroded.

Accessibility Issues
The house is not accessible from the exterior; each entrance is reached via stairs. Once inside, the house has two levels and is generally deficient as regards accessibility and ADA compliance (path of travel, bathroom and kitchen, etc.) Required level of accessibility will depend upon use.

Code Analysis

Occupancy Classification	R-3 single family residential
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	10,800 square feet
Actual Area	2,837 square feet
Allowable height (CBC Section 504)	40 feet, 3 stories
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	15
Required Exits (CBC Section 1015)	2
Provided Exits	4
Other considerations	The asphalt shingle roof over the wood shingles is a non-compliant condition per CBC 1510.3, paragraph 2

Treatment Recommendations

Basic Treatments

Structure

- Stabilize soils on hill behind house.
- Reinforce attachment of walls to foundation.
- Reinforce attachments of roof to walls.
- Provide a perimeter foundation drain at the back of the house.
- Provide a perimeter foundation drain at the back of the pool.
- Demolish shed at south end and remove concrete slab.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Remove asphalt and wood shingles. Install new plywood sheathing. Provide new asphalt shingle roof with gutters and downspouts.
- Add shear strength at exterior walls.
- Repair cracked plaster.
- Repair wall at grade level at chimney.
- Repair paving at back porch.
- Repair brick planters and counters at back patio.

- Assess the pool and its equipment.
- Rebuild front porch steps with concrete.
- Make minor repairs to doors and hardware.
- Make minor repairs to windows in general.
- At the north window on the west wall, replace sill and lower sash.
- Paint stucco walls and all wood elements.

Interior

- Install new flooring throughout house.
- Repaint walls and ceilings.
- Remove old heater and repair floor in hallway.
- Inspect fireplace flues.
- Repair kitchen cabinets.
- Replace kitchen sink.

Systems

- Have electrical system evaluated by a licensed contractor or engineer and upgrade as required.
- Provide new heating and air conditioning system.
- Replace water, sewer and gas pipes.

<u>Treatments Contingent on Use</u>

Preliminary use options for the house are visitor center, guest rental, staff housing, or office space.

- Upgrade kitchen, possibly as ADA-compliant; install new appliances.
- Completely rehabilitate bathroom, possibly as ADA-compliant.
- Install a lift between two floor levels at dining/transition space.
- Upgrade lighting.
- Widen door openings for accessibility.
- Add wall and door between house and former garage.
- Consider alterations to interior layout depending on use.

BUILDING 6: HAY BARN/OLD STONE FLOOR BARN

Image 45 – South wall of Hay Barn with shed on right

Image 46 - Hay Barn interior looking north

Physical Description

The Hay Barn was constructed in the late 1940s or early 1950s on the site of a previous barn. Located on a slightly sloping site on the east edge of the ranch complex, it is aligned with the causeway and flanked on the east and west with corrals. A slip-formed concrete silo is located at the northwest corner. The Hay Barn, as its name suggests, was originally used to store hay. It now houses some exhibits and is open to the public for tours and events. A shed runs along the east side of the barn, within the corral, and is used to shelter goats.

The rectangular barn is approximately 60 feet wide and 100 feet long, and the shed to the east is 25 feet wide and 100 feet long. The foundation is concrete piers under the wood posts and a concrete perimeter footing. The structural frame is post and beam construction. The structural members appear to have been reused as they have mortise holes. The main barn is three bays across and ten bays long. The first 15 feet of the shed (west side) is partially enclosed from the exterior and open to the main barn. The last ten feet (east side) are open to the corral.

The exterior walls are covered with 1x12 vertical wood boards spaced about ¼ to ½ inches apart. The gable roof is covered with corrugated metal; the rafter ends are exposed; and the space between the rafters and the ridge are open for ventilation.

The two primary entrances to the barn are through large pairs of sliding doors at the north and south elevations. A smaller set of sliding doors are located on the north wall, near the northwest corner. The west section of the shed is accessed through pairs of sliding doors on the south and north and the east section is accessed through large swinging doors. There are no windows in the barn, but there are three wooden vents at the north gable and one at the south gable. A 68-foot-long section of the east wall of the shed is open with no door or structural supports.

Image 47 - Barn framing and open vent at ridge

Image 48 - Stone floor

The interior floor is about a foot below the adjacent grade and is covered with light tan colored stone set in cementitous grout. Small areas of the floor are unpaved (dirt) and some areas are patched with concrete or asphalt paving. The stone paving may date to the previous barn on the site. The stone pavers extend outside the north end of the building (probably due to the difference in size between the original and rebuilt barns)

Sections of the interior walls are covered with plywood, some with painted murals. There are several stalls at the east side of the barn, which are constructed of 2x wood and plywood and appear to be recent additions.

There is electrical power and lights in the barn. Water is located near the north and south entrances. The building is not heated.

Character-Defining Features

- Rectangular plan with gabled roof
- Stone floor (random rubble)
- Ventilation at roof peak, roof eaves, and upper walls
- Large sliding wood doors
- Vertical wood siding
- Wood truss roof
- Wood post and beam construction
- Alignment with Causeway Trail

Existing Conditions

In general, the barn is in fair condition and its attached shed is in poor condition. The building is very dirty with considerable lichen growth on wood and metal surfaces.

<u>Structure</u>
There is no visible bracing or other lateral-force resisting elements along the east wall of the main barn, at the connection to the east shed. There are only a few isolated pier blocks, but no other foundation at this wall.

At the east wall of the main barn, the load-bearing posts are not continuous from the roof to the ground. A beam runs about two feet above the ground and intersects the posts. The beam is supported on stub posts, which are leaning at the south end.

The interior posts in general do not have adequate connection to their foundations. Some of the posts have shifted to the edge, or partially off of their foundations.

The existing nailed connections at the timber bracing are likely inadequate to resist lateral forces.

<u>Exterior</u>
Roofing
The corrugated metal roofing on both the barn and the shed is intact and in fair condition, with rust staining on the exterior. At the southeast corner of the barn, the roof is sagging and there is corrosion and some warping of the shed roof where it meets the barn wall. The roof drainage system is non-functional. The gutter on the west side of the barn is partially detached and filled with leafy debris. Half of the gutter at the shed is missing. Downspouts are either missing or cut off several feet above grade.

Image 49 - Typical condition of roof

Image 51 - Typical repurposed and deteriorated siding

Image 50 - Failing roof at shed

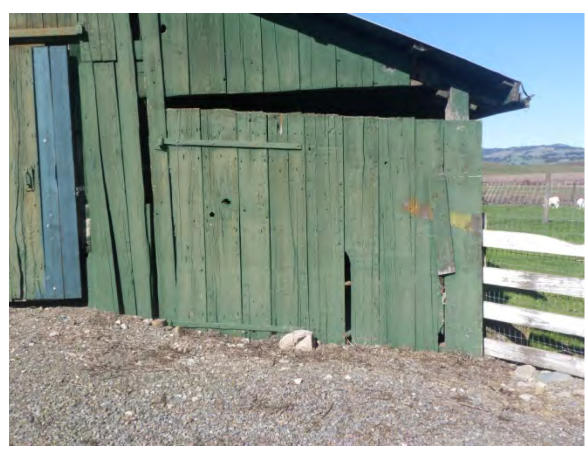


Image 52 - Shed siding with wood to earth contact

Cladding
The wood siding of the barn is in fair condition, considering its use as a hay barn, which required ventilation rather than a weather-tight envelope. Bottoms of boards are deteriorated due to damage from use and from water. As these were reused boards, the damage may date from earlier wood to earth contact. There are a number of split or warped boards, particularly at the east wall above the shed. The corrugated panels cladding the south wall are also in fair condition, with some missing fasteners and bent panels. The painted finish on both wood and metal is worn. The shed cladding is in poor condition. Siding is in contact with the ground and individual boards are warped, broken or missing.

Doors
The randomly constructed doors are in fair to poor condition. As with the wood siding, bottoms of doors are deteriorated due to damage from use and from water. The painted finish on both wood and metal is worn. The large pairs of doors at the ends of the barn are functional, with newer sliding hardware. The shed doors are very deteriorated, with damaged boards and hardware, and rest directly on grade.

Trim
The three wood louvered vents in the north gable and one in the south gable are in fair condition. The sill of the south gable vent is missing.

Paving
Concrete poured to allow access over the concrete perimeter foundation is poorly installed, poses a trip hazard, and does not provide an even slope from grade. This concrete covers the barn's stone pavers where they extend outside the north end of the building.

Image 53 – Gable vent with missing trim

Image 54 – Stone and concrete paving at north entrance

Image 55 - Interior view showing condition of siding

Image 56 - Stone floor with concrete topping at south entrance

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Floor
The stone floor, where it remains in place, is in fair condition. Mortar is worn or missing in some places and several sections of pavers have been removed and either left as gravel base or filled in with asphalt concrete. Asphalt and concrete used to create 'ramps' at north and south doors was poorly installed over stone pavers. These are cracked, posing a trip hazard, and do not provide an even slope from grade.

Features
The exposed wood structure is addressed above. The interior partitions, stalls and loft, built from new or reused lumber, are generally in good condition.

<u>Electrical</u>
The electrical system and lighting both need to be upgraded depending on the intended use of the building.

<u>Accessibility Issues</u>
The barn is not accessible from the exterior, due to its raised perimeter foundation and relation to grade. Ramps at entrances and door hardware and operation are not ADA-compliant. Once inside, the uneven stone floor does not provide an accessible path of travel. Required level of accessibility will depend upon use.

Code Analysis

Occupancy Classification	U - Barn
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	8,643 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	33 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 300 square feet/occupant	27
Required Exits (CBC Section 1015)	1
Provided Exits	0 (The sliding doors do not meet the requirements of Section 1008 and therefore do not count as required exits. The shed has 2 exits, but they are not accessible from the main barn.)
Other considerations	This barn is occasionally used for assembly purposes, which would greatly increase the occupant load and required exits.

Treatment Recommendations

Basic Treatments

The basic treatment approach for the Hay Barn is to stabilize and strengthen it and halt its deterioration.

Structure

- Repair and improve foundation, adding new footings where required, particularly along the east wall.
- Improve all framing connections and add bracing, as required for seismic strengthening.
- Repair wall structure between barn and shed; level sagging wall at south end.
- Provide added structural support at shed.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Re-grade at shed end walls to eliminate wood to earth contact.
- Re-grade at perimeter to provide positive drainage away from building.
- Remove concrete outside north barn door, possibly remove and salvage stone pavers in this area; install paving sloped up to provide level surface at door.
- Re-secure any loose corrugated roof panels.
- Install new gutters and downspouts at west wall of barn and at shed.
- Rebuild shed end walls.
- Repair and reattach siding; replace seriously damaged boards; estimate replacement of 20%.
- Fasten loose metal siding panels.
- Repair vents at gables, including trim replacement.

- Repair barn doors, replacing damaged boards; rehabilitate or replace hardware as required for functionality.
- Replace doors at both ends of shed.
- Paint all wood elements.

Interior

- Remove asphalt concrete ramping at barn doors and patch stone flooring below.
- Rehabilitate damaged areas of stone flooring and mortar.
- Construct new ramps, non-destructive to stone flooring, inside both doors.

Systems

- Have electrical system evaluated by a licensed contractor or engineer and upgrade as required.

<u>Treatments Contingent on Use</u>
The preliminary recommended use for the Hay Barn is as an unconditioned, non-weatherproof exhibit and/or assembly space. Code requirements for these uses would vary based on the anticipated number of occupants.

- Add exit doors as required for new use.
- Infill area of missing stone paving at west wall.
- Provide a code-compliant path of travel through the building; this could be a raised wood walkway that would not damage the stone floor; estimated coverage for access to exhibits: 25% of floor area.
- For assembly use, construct a raised platform of size required to provide accessible seating and satisfy other code requirements, size to be determined by program.
- Reconfigure interior partitions and stalls as required for intended use.
- Upgrade electrical service and lighting, including emergency lighting, as required for new use.
- Install sprinkler system if recommended or required.

BUILDING 7: OLD DAIRY BARN

Image 57 – North side of Old Dairy Barn with collapsed section at east end

Image 58 – West entrance to Old Dairy Barn

Physical Description

The Dairy Barn was constructed in the late 1940s or early 1950s of salvaged materials. The building is located atop a hill several hundred feet southwest of the rest of the ranch complex. As its name implies it was originally used to house dairy cows. Later it was used to for sheep, but currently is unused.

The dairy barn is rectangular in plan, and measures approximately 65 feet wide and 124 feet long. The foundation is wood posts that rest on wood blocks on the ground. The structural frame is post and beam construction and some of the joints are mortise and tenon connections, while others are nailed. The barn appears to have been built in three sections. The primary section is about 40 feet wide and 100 feet long. A 24-foot-long addition extends the original gabled form toward the east. A 15-foot-wide shed covers the south side, wraps around the east side with a hipped roof at the corner and then abuts the east addition.

The west and north elevations are covered with corrugated, galvanized sheet metal. The east wall and the south side of the east addition are covered with 1x12 vertical wood boards with about ¼- to ½-inch gaps between the boards. A wooden fence approximately three feet tall defines the south side of the building. The roof is covered with corrugated, galvanized metal with an open ridge and rafter ends.

The two primary entrances are at the east and west elevations. At the west elevation, the entrance has a pair of metal gates, while the east side has a pair of wooden gates. Above the east entrance, there is a hay door high on the wall. The south addition is entered through a pair of sliding doors at the east wall.

The interior floor is primarily dirt with small areas of elevated wood floor in the south shed. There are several partial-height partitions made of vertical boards spanning between the posts.

There are currently no utilities to the Dairy Barn. There is not a maintained road to the barn, although a historic road connected it to the main road at the north.

Character-Defining Features

- Rectangular plan with gabled roof
- Corrugated metal cladding
- Roof with wood rafters and purlins
- Southern addition with vertical wood cladding and hipped roof

Existing Conditions

The Dairy Barn has partially collapsed on the east end. The structure is in extremely poor condition and is unsafe. Signs and safety fencing have been placed around it to block access to the building.

<u>Structure</u>
The building has an inadequate foundation.

The south wall has no bracing or other lateral-force resisting elements. The roof framing along the south wall is sagging and has partially failed.

The existing rafters and beams appear to be undersized for their spans. The exterior walls lack any structural sheathing. The nailed connections at the timber bracing are likely inadequate.

<u>Exterior</u>
The sheet metal roofing is in extremely poor condition. The sheet metal siding is also very deteriorated with some missing panels. Large sections of wood siding and trim along the open south side of the barn are rotting, broken, and/or collapsed.

Image 59 - Collapsed east end of barn

Image 60 - Wood framing resting directly on grade

Image 61 - Failed wall at south side

Image 62 - Structural Damaged at south wall

Image 63 - Sheet Metal Roofing

Image 64 - Stalls inside barn

<u>Interior</u>

Within the Dairy Barn, the remaining corrals and stalls are generally in fair condition.

<u>Accessibility Issues</u>

The barn, while at grade level, has no accessible path of travel to or within the remaining building. Required level of accessibility for a rebuilt barn will depend upon use.

Code Analysis

Occupancy Classification	U - Barn
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	8,060 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	30 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 300 square feet/occupant	32
Required Exits (CBC Section 1015)	1
Provided Exits	1 (walls are not totally enclosed, thereby allowing exiting along the entire south side)
Other considerations	Current structure does not meet basic code requirements and is unsafe. If rebuilt, the new structure must meet the current building code requirements based on the proposed new use.

Treatment Recommendations

Basic Treatments

The recommended treatment approach for the Old Dairy Barn is demolition and either a) reconstruction to the same footprint, size, shape and materials as the original barn, b) construction of a new smaller barn, or c) no new construction. Prior to demolition, document the barn to HABS (Historic American Building Survey) standards.

Structure

- Demolish and salvage intact structural members for use in rehabilitation of existing ranch buildings or for new construction on site.

Exterior

- Demolish and salvage usable wood siding for use in rehabilitation of existing ranch buildings.

Interior

- Salvage significant barn equipment and/or features (corrals, stalls, etc.) for reinstallation in a reconstructed barn or for possible interpretive use.

BUILDING 8: CREAMERY/ WINE STORAGE

Image 65 – South wall of Creamery

Image 66 – East and north walls of Creamery

Physical Description

The Creamery building was originally constructed in the 1880s or 1890s, with a large addition to the east that dates from the 1940s or 1950s. The building is nestled into the hillside at the northwest corner of the main ranch complex. Originally used to produce and store dairy products, it was later used for wine storage.

The 30-by-49-foot, rectangular building has three sections that descend down the hill. The upper original section is 22 feet wide and 30 feet long, the middle section is 15 by 30 feet and the lower section is 12 by 30 feet. The original section has load bearing stone walls and the rest of the structure is wood framed.

Only the top of the stone wall is above ground on the west side of the building and the grade slopes down on the south side. On the north side, the grade is terraced down by a series of concrete retaining walls and slabs. The rest of the walls consist primarily of vertical boards, with horizontal boards at the north side. The roof is covered with corrugated galvanized metal. At the north gable end, in lieu of a barge board, the corrugated metal has been wrapped down over the exposed ends of the purlins.

Image 67 - Concrete walls on north side of creamery

Image 68 - Interior of upper section, with wood ceiling and stone walls

The upper section of the building is entered from the north and south through small wood plank swinging doors. The middle section is entered from the south through a pair of sliding doors and from the north through a swinging door. The lower section is entered from the east through a single sliding door. There are two small windows, covered with board awning shutters, on the west side of the building. There is a wood covered opening at the north side of the lower section.

The original stone wall separates the original building from the addition. A wood panel door, centered in the wall, allows access between the old and new section of the building. Throughout the building, the floor is made of concrete poured in 3-by-3-foot sections. The elevation of the floor from the original to the middle section drops gradually about one foot. The floor of the middle section is about three feet higher than the lower section. The exterior doors at the upper section are about two and a half feet above the floor level, and are accessed via wooded stairs without handrails. The middle and lower sections of the building are connected by a centered concrete stair. A wood railing, attached to full height framing, separates the two levels. The original section of the building has a wood ceiling, supported by wood framing. Above the ceiling is a large, inaccessible attic space. Some miscellaneous lumber construction, that may have once supported equipment, remains.

There are currently no utilities to the building. Conduit on the north and south gable ends indicates that the building once had electricity. A hose bib is located at the south elevation. There is a stone walkway along the north and east sides of the building. There are a series of concrete walls and slabs along the north side of the building of unknown use.

Character-Defining Features

- Rectangular plan
- Random rubble stone walls
- Saltbox roof
- Vertical and horizontal board siding with corner boards
- Sliding doors composed of vertical boards
- Setting into hill
- Ceiling with attic space above original section

Existing Conditions

The Creamery is in poor and unsound condition. Portions of the building are unsafe to enter.

Structure

The masonry walls are severely cracked and failing to the east (downhill). The building appears to have the same soil related problems as George and Vera's House (4).

The stone masonry and the concrete walls appear to have been constructed without reinforcement. This type of construction is considered hazardous in seismically-active areas.

The existing 2x4 rafters appear to be undersized for their span. The roof and exterior walls do not have any structural sheathing. The wood framing is decaying from water intrusion.

Image 69 - Severe cracking of masonry wall

Image 71 - Metal Roofing, wrapped at gable end

Image 70 - Failed wall at northeast corner

Image 72 - Condition at ridge

Image 74 - South wall showing poor overall condition of siding and doors

Image 73 - Overgrown vegetation on north side

<u>Exterior</u>

Roofing

The corrugated metal roofing is in poor condition. Some panels are bent, have missing fasteners and small holes, and rust staining on the exterior. The panels do not meet at the ridge, but there is no ridge cap covering the space between them.

Cladding

Both the vertical and horizontal wood siding are in very poor condition. Board ends are deteriorated; as these appear to have been reused boards, some of the damage may date from earlier wood to earth contact. The random length boards do not completely cover the ledger on top of the west stone wall. The painted finish is worn.

Doors

The wood doors are in very poor condition. Bottoms of doors are deteriorated due to their contact with the ground and overgrown vegetation that retains water. The painted finish is worn. The doors in the north and south stone walls are extremely deteriorated and falling off their hinges. The sliding door in the east wall is functional and the one in the south wall has newer hardware; however, both of the doors themselves are in very poor condition. The wood shutters over windows in the west stone wall are in similar condition, with missing hinges and very deteriorated frames.

Trim
The Creamery's corner boards remain in place, in the same condition as the siding. The barge board is missing from the east half of the south gable end.

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Floor
The concrete floor of the original, west portion of the building is in fair condition. Both levels of the east portion of the building are in very poor condition, becoming extremely poor at the lower level, with settlement/heaving and large structural cracks. Conversely, the concrete stair between the two levels is in good condition.

Features
The exposed wood structure is addressed above. The wood ceiling appears to be in good condition, although it may not be adequately supported from above. The paneled wood door and frame in the interior stone wall is in fair condition. Wood steps at doors in the north and south stone walls are also in fair condition. The board 'railing' between levels is partially collapsed.

Image 75 - General condition of interior

Image 76 - Floor slabs at mid-level of building

Image 77 - Condition at northeast corner.

Accessibility Issues

There is no accessible path of travel to or within the Creamery. With no occupancy, accessibility to and inside the building would not be required.

Code Analysis

Occupancy Classification	U - Barn
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	1,455 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	12 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 300 square feet/occupant	5
Required Exits (CBC Section 1015)	1
Provided Exits	3

Treatment Recommendations

Basic Treatments

The recommended treatment approach for the Creamery is to stabilize it in place as a landscape element and interpret it, with no occupancy. Prior to stabilization, document the interior and exterior to HABS (Historic American Building Survey) standards.

Structure

- Repair structural cracks in masonry walls for structural stability and to keep animals out of building.
- Confirm that concrete site walls are structurally stable; repair as required for safety.
- Install interior structural bracing as required for seismic stabilization for an unoccupied building.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Cut back overgrown vegetation and re-grade around building to provide positive drainage away from perimeter.
- Replace corrugated metal roofing.
- Reattach loose wood siding and trim; replace severely deteriorated boards.
- Repair wood doors, replacing damaged boards; secure in place.
- Paint all wood elements.
- Provide interpretive signage nearby building.

Interior

- Remove any historic equipment or features for possible interpretive use elsewhere on site.

BUILDING 9: GRANARY/MUSEUM

Image 78 – East side of Granary with chicken coops

Image 79 – North end of Granary

Physical Description

It is not clear when the Granary building was constructed. It is located at the southwest corner of the ranch complex, near the pond. The site is steeply sloped toward the northeast. The Granary is west of the Tractor Barn (13) and south of John Cardoza Jr.'s House (5). There is a corral at the east and a metal canopy to the west. Originally used to house a mill that ground animal feed, the Cardoza family converted the Granary into a small museum.

The main portion of the building is approximately 60 feet long and 27 feet wide. The original building is rectangular in plan. The addition at the east side is L shaped and includes the entrance, bathroom and a long narrow storage room. A 60-foot-by-20-foot chicken shed is attached to the east side and is rotated about 10 degrees clockwise of the main building. The wood structure is resting concrete footings. The floor is elevated above the ground on a series of walls spaced about seven feet on center and running north-south. The building has load-bearing exterior walls with posts down the center and nailed trusses. There is a wood-framed porch along the west wall. On the west side of the building is a covered patio that is approximately30 feet wide and 40 feet long.

The exterior walls are clad with a variety of metal and wood siding. There is vertical metal siding at the north, east and south sides of the main building, vertical wood boards at the shed and a portion of the west wall, and horizontal wood boards at the vestibule and a portion of the west wall. The granary has a gabled roof, with a gabled dormer on the east side. The chicken coop has a shed roof. The main building and the first 12 feet of the chicken coop are covered with corrugated galvanized sheet metal. The last ten feet of the chicken coop is enclosed with chicken wire at the roof and the east wall. The roof over the patio is a separate structure than the building. The patio roof has metal posts, wood beams, open-web steel trusses, wood purlins and a metal roof.

Image 80 - Patio on west side of building

Image 81 - Recessed entrance at north elevation

The main entrance is recessed 11½ feet into the northeast corner of the building. The door is accessed by flight of stairs. The door is rail and stile with diamond-shaped glass panels. The secondary door is on the west wall and is also a rail and stile door wood door. To the right of the secondary entrance is a sliding barn door. The windows are aluminum sliders on the west and south walls. There is a large picture window flanked by operable casements at the recessed entrance. The dormer has a framed opening filled with corrugated fiberglass. There is a boarded up vent high on the south gable. The chicken coop has a small vestibule and two wood plank doors at the north side. At the south side it has two framed openings filled with chicken wire.

The main interior space is divided into two sections, separated by a partial height wood wall with a pair of sliding barn doors. The south half of the space houses exhibits; the north half appears to have been a sales area, with a counter and some food preparation equipment. It also contains a large ca. 1900 harvester.

The main electrical panel for the barns is located in the Granary. There are water and sewer connections to the building for the ¾ bath and the sink in the northwest corner.

Image 82 - Exhibits in south portion of building

Image 83 - View of museum exhibit area

Character-Defining Features

- Rectangular plan
- Side gable roof with gabled dormer
- Corrugated metal cladding
- Vertical board and board and batten siding

Existing Conditions

The overall condition of the Granary is fair to poor.

Structure

The building does not have sufficient lateral bracing including: adequate cripple-wall bracing below the floor at the exterior walls, diagonal or structural sheathing at the exterior walls, or structural sheathing at the roof.

The picnic area canopy roof trusses lack effective lateral bracing at their bearing points.

Image 84 - Deteriorated structure below building

Image 85 - Deteriorated roof structure over picnic area

Exterior

Roofing

The corrugated metal roofing, including ridge cap and flashing, is in poor condition. Some panels are bent, have missing fasteners and small holes, and heavy rust staining on the exterior. Corrosion is visible on interior surfaces as well. There is a buildup of leafy debris on the relatively flat roof over the picnic area on the west side. The gutter along the east side of the chicken coop and the drainpipe at the south end are deteriorated.

Cladding

Wood and metal siding on the Granary varies from poor to very poor condition. Wood boards are warped and split. The ends are deteriorated; as these appear to have been reused boards, some of the damage may date from earlier wood to earth contact. However, there is still wood to earth contact at many locations. The south end wall and chicken coop walls, in particular, are extremely deteriorated. The metal siding is corroded and damaged; at the southwest corner the siding does not cover the deteriorated framing. The painted finish is worn.

Doors
The two wood panel doors to the Granary are in fair condition. Board doors into the chicken coop are in poor condition.

Windows
Aluminum windows are in poor condition. Two gable end windows that have been in-filled with corrugated fiberglass panels (one with a nailed on screen) are also in poor condition.

Image 86 - General condition of roofing

Image 87 - Roofing and trim at ridge, south end

Image 88 - Typical condition of wood siding and doors to chicken coop.

Image 89 - Typical condition of metal siding.

Image 90 - South Gable window with fiberglass infill.

Image 91 - Poorly installed window adjacent to entrance.

Features
The porch along the west side is in poor condition; the non-compliant plywood ramp and deck are rotting and in contact with the ground. Wood stairs to the north entrance are in fair condition but also have direct wood to earth contact. Trim throughout the Granary is in poor condition: worn, split and rotted.

Image 92 - Deteriorated plywood at ramp to west entrance.

Image 93 - Wood to earth contact at stairs to north entrance.

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Floor
The wood plank floor is generally in fair condition. There is some water damage in the bathroom.

Walls
Wood plank walls are in good condition. Wall finishes in the bathroom are in poor condition.

Features
Wood railings and other features of exhibits are in good condition. Wood casework and cabinets are very dirty and in fair to poor condition. The condition of the exhibits themselves ranges from good to poor.

<u>Electrical and Plumbing</u>
The main electrical panel is corroded. Light fixtures inside and outside the building have been installed in a haphazard manner; exterior fixtures are corroded.

Plumbing is also a haphazard installation; steel and plastic bathroom piping is exposed in the chicken coop. Bathroom fixtures are in very poor condition.

Image 94 - Typical electrical installation.

Image 95 - Deteriorated plumbing fixtures.

Accessibility Issues

The Granary has a deteriorated, non-compliant ramp to its east entrance. Inside, the building is generally deficient as regards accessibility and ADA compliance (path of travel, bathroom, etc.) Required level of accessibility will depend upon use.

Code Analysis

Occupancy Classification	A-3 museum, U- agricultural shed
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	1,640 square feet (museum), 1,243 square feet (shed), Total:2,883 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	16 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 15 net for A, 300 square feet/occupant for U	80 museum, 4 shed
Required Exits (CBC Section 1015)	2 museum, 1 shed
Provided Exits	2 museum, 1 shed
Other considerations	

Treatment Recommendations

Basic Treatments

Structure

- Make improvements to the foundation.
- Replace deteriorated framing at south end of building.
- Add necessary seismic connections, shear walls, and plywood sheathing at walls and roof of Granary and at canopy over picnic area.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Replace corrugated metal roofing, gutters and downspouts.

- Re-grade where required to provide positive drainage away from building and eliminate wood to earth contact.
- Replace metal siding on walls and dormer.
- Replace wood enclosure walls at both ends of chicken coop; including doors and framed screened openings.
- Repair wood siding and trim elsewhere on building; patch/replace boards as required: estimate replacement of 10% of siding and 20% of trim.
- Provide secure enclosure of space below building.
- Repair entrance doors, including hardware.
- Demolish entrance ramp and porch on west side; reconstruct new porch, possibly larger and with access at both ends, including a code-compliant ramp.
- Add concrete curb at bottom of north entrance stair.
- Repair chicken coop partitions and roof as required.
- Replace deteriorated aluminum windows; replace window in north gable and fiberglass paneled openings in south gable and dormer.
- Paint all wood and painted metal elements.

Interior
- Remove bathroom fixtures.
- Remove miscellaneous cabinets, counters and appliances.
- Retain and rehabilitate granary machinery inside building.

Systems
- Have electrical system evaluated by a licensed contractor or engineer.
- Remove all plumbing and heating equipment, piping, and fixtures.

<u>Treatments Contingent on Use</u>
The Granary, when rehabilitated, would lend itself to a number of possible uses, contingent on program needs and the Master Plan. These include Park offices, meeting/event space, or continued interpretive use.

- Install new mechanical and electrical systems.
- Consider construction of a single user accessible restroom at location of existing bathroom.
- Improve lighting; specific requirements will depend on building use.

For office or meeting room use:
- Remove all exhibits for possible use elsewhere on site.
- Install finished floor over existing wood subfloor.
- Insulate walls and roof and add finishes.
- Consider installation of a small kitchen at location of existing sink.
- Consider installation of air conditioning.

For exhibit/museum use:
- Retain or remove existing exhibits depending on interpretive program established for the site.

BUILDING 10: LINE SHACK

Image 96 – Front of Line Shack, facing north, leaning toward west

Physical Description

The Line Shack is currently located at the southwest corner of the ranch, near the Granary (9) and the pond. It sits slightly tilted on a gradual slope. Built in the 1890s or early 1900s, the line shack housed ranch hands. It was repeatedly moved around the ranch to keep it near the grazing cattle.

The simple gable-form structure is 12 feet wide and 16 feet long, with a shed roof over a 4-foot-deep porch. The structure is wood framed with 2x members for the floor, walls and roof. The floor structure is supported on wood skids on the long sides. The skids are elevated on wood blocks on the east side and the shed is tilted towards the west.

The exterior walls are clad with vertical wood boards tightly fit together. The main roof and porch roof are both covered with cut wood shingles. The west side of the roof is covered with a blue plastic tarp. The front porch is accessed via a center wood stair and surrounded by a wood rail attached to the wood posts.

The only entrance is through the porch to the four panel rail and stile wood door. There are three six-light fixed casement windows: one each on the west, north and south walls. The windows and door are painted at the interior, but have exposed wood at the exterior.

The interior floor is unpainted wood boards of random widths. The walls are painted a mint green.

There are currently no utilities to the building. There is some old knob and tube wiring on the exterior wall, indicating that the building once had electrical power. A wood burning stove is located in the northeast corner.

Character-Defining Features

- One story height
- Gable roof

- Exposed rafter tails
- Rectangular plan
- Rustic vertical board siding
- Wood skids below floor framing
- Shed roof porch
- Wood panel door
- Multi-light wood windows
- Wood burning stove

Existing Conditions

The Line Shack is unstable and leaning to the west due to subsidence along that side of the building. The wood structure sits directly on the ground.

Structure

The line shack lacks a foundation and is rests directly on the ground. It lacks diagonal sheathing or structural sheathing at the walls, and lacks structural sheathing at the roof.

Image 97 - Tarp-clad east side of roof

Image 98 - Roofing and structure at west side

Exterior

Roofing

The wood shingle roofing is in very poor condition. The east side has been covered by a tarp, which is now also deteriorated.

Cladding

The vertical, unfinished wood siding is in very poor condition. Wood boards are warped and split. Several large knot holes have been covered with wire mesh, but other, larger holes are uncovered. A bird or animal nest has been built behind the boards of the west wall.

Door and Windows

The wood panel door and fixed wood windows, and their trim, are in poor condition.

Image 99 - Building set on wood skids directly on ground

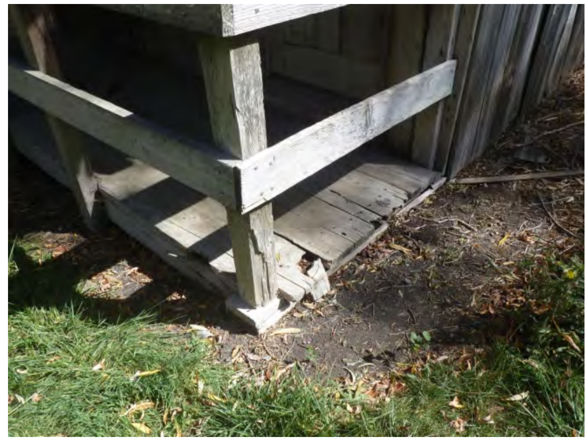


Image 101 - Deterioration at west end of porch

Image 100 - Deteriorated condition of window (typical)

Features
The west end of the front (north) porch has settled almost a foot. The wood decking is rotting and the entire porch is unsafe.

Interior
The interior is in fair condition, considering the building's unstable structure and unprotected exterior.

Accessibility Issues
The Line Shack is not accessible and its sloped porch and stairs are unsafe. Required level of accessibility will depend upon use: with no occupancy, accessibility would not be required.

Code Analysis

Occupancy Classification	R-3 single family residential
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	9,625 square feet
Actual Area	200 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	12 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	1
Required Exits (CBC Section 1015)	1
Provided Exits	1
Other considerations	

Treatment Recommendations

Basic Treatments

Structure

- Provide precast concrete footings under wood skids.
- Level building so that it is not leaning.
- Reconstruct porch floor.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Replace roof with new shingle roof to match original roof.
- Repair rafter ends and other rotted structural elements.
- Repair siding and replace sections that are deteriorated beyond repair.
- Reinstall chimney flue for stove for interpretive purposes, not to make functional.
- Repaint door.
- Replace window putty and repair window frames.

Interior

- Clean interior.
- Furnish interior as it would have been used in the field.

BUILDING 12: OLD SHOP/WORKSHOP

Image 102 – North wall of Old Shop

Image 103 –Old Shop with shed on east side

Physical Description

The workshop and attached equipment shed are located near the center of the ranch between John Cardoza, Sr.'s House (3) and the Equipment Shed (14). The late 1880s workshop is on the west side and an attached equipment storage shed is on the east. There is a steep slope of the west side of the building and an unpaved road at the top of the incline.

The workshop is 36 feet long and 16 feet wide, while the attached shed is 36 feet long and 9 feet wide. The workshop is a simple gabled form, and the shed is a single slope roof. Both the shop and the shed are balloon framed.

The shop has 7½-inch, V-grooved horizontal wood siding. The shed has a random combination of different wood siding including three inch lap siding and nine inch shiplap siding. The roof of the shop is asphalt shingles over wood shingles. The shed has corrugated galvanized sheet metal.

Image 104 - Interior of workshop

Image 105 - Door hardware

The shop has two swinging doors on the north elevation, which are accessed by wooden stairs. There are no handrails on the stairs. The shop also has a large sliding door at the south elevation. The shed has a pair of large swinging doors on the north elevation and a single swinging door on the east wall. The shop has a fixed casement window high on the gable ends (north and south). The north window is a single pane of glass, while the south window has six panes of glass. There is a fixed casement window on the south elevation of the shed, which has six lights and as unusual trim details.

The shop has a raised wood floor and the shed floor is dirt. The northwest corner of the shed is partially divided from the rest of the shed with a stud wall. The studs are covered with horizontal boards to about three feet above the floor. The area is used for chemical storage and is about 11½ feet long by 6 feet wide. This area currently is storage for chemicals. There is wood-framed shelving along the west wall of the shop and the chemical area. There are wood shelves along the east side of the chemical area, facing the main shop, and along the east wall of the shop. The shed also has some wood shelves, along the west and east walls, near the south end. The interior face of the exterior walls is partially covered with spaced horizontal boards. A table saw is mounted to the floor in the center of the shop. The shop has skipped sheathing and the underside of the wood shingles exposed at the ceiling. The shed has purlins and the metal roofing exposed.

The shop has electricity, but no water or heating.

Image 106 - Original exterior wall within shed

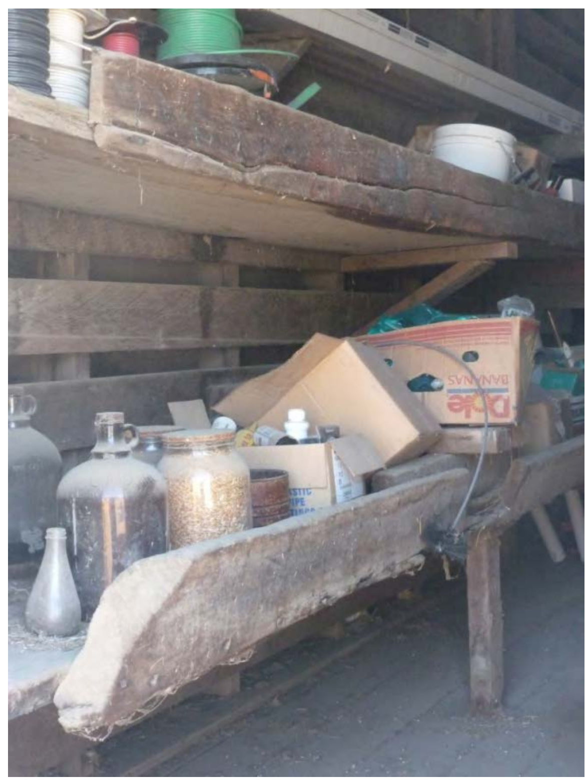


Image 107 - Recycled wood used as shelving

Character-Defining Features

- Gable roof
- Wood corner boards and rakes
- Wood window and door surrounds
- Multi-light, wood windows near gable peak
- Doors composed of vertical wood boards
- V-groove horizontal siding
- Exposed rafters and purlins

Existing Conditions

The Old Shop is in fair to poor condition. There is wood –to-earth contact around the entire perimeter and no positive drainage away from the north, west and south sides of the building. The southwest corner appears to be settling.

<u>Structure</u>
The Old Shop has an inadequate foundation. It lacks diagonal sheathing or structural sheathing at the walls, and lacks structural sheathing at the roof.

<u>Exterior</u>
Roofing
The asphalt shingles on the roof of the workshop are in fair condition; there are no lost shingles, but those at the ridge appear deteriorated. There is staining on the skip sheathing below the roofing, but that may pre-date the installation of the shingles. The corrugated metal roofing on the attached shed is in fair condition.

Image 108 - Typical condition of roofing

Image 109 - Siding at southeast corner of shed

Image 110 - Deteriorated corner boards and earth to wood contact

Cladding
The wood siding of the Old Shop is in poor condition. The painted finish is worn and individual boards are warped, split or missing. The siding on all sides is in contact with the ground. The south wall, in particular, has suffered from ultraviolet damage.

Doors
The two doors that are raised above grade are in fair condition; their wood sills are in poor condition. The doors into the shed are in very poor condition due to their contact with the ground. The large sliding door in the south wall of the workshop is in fair condition, but its lack of threshold exposes the structure below. Doors are hung and secured with miscellaneous hardware.

Windows
The windows are in very poor condition with broken glazing and missing putty and deteriorated frames and mullions. Neither the windows, nailed to the inside face of the wall, nor their exterior trim, fit the openings in which they are mounted.

Features
Wood stairs at both north entrances are in poor, hazardous condition. Wood trim is in fair to poor condition. Many boards have rotten ends; corner boards are warped and rotted at bottoms, in some cases exposing the wall structure. Paint finish is worn.

Image 111 - Poorly fit window with Plexiglas panel

Image 112 - Deteriorated wood stairs directly on ground

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Flooring
The board flooring in the workshop is generally in fair condition, with some deterioration at the south end wall and at the doors in the north wall.

Walls
The tongue and groove boards forming the wall between the workshop and the shed are in good condition.

Features
Wood shelving in both the workshop and the shed is in fair to poor condition. It is generally sturdy, but constructed of random lumber, some of it split or warped.

<u>Electrical</u>
The knob and tube wiring could present a hazard if used for power tools which are located in the workshop.

<u>Accessibility Issues</u>
The workshop and shed are generally deficient as regards accessibility and ADA compliance from the exterior and within the building (path of travel, bathroom, etc.). Required level of accessibility will depend upon use.

<u>Code Analysis</u>

Occupancy Classification	S-1 storage
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	13,500 square feet
Actual Area	918 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	3
Required Exits (CBC Section 1015)	1
Provided Exits	3
Other considerations	Although chemicals are stored in the building, it is not categorized as a hazardous use under Section 307.1, exception 8.
	The asphalt shingle roof over the wood shingles is a non-compliant condition per CBC 1510.3, paragraph 2

Treatment Recommendations

<u>Basic Treatments</u>

Structure

- Provide a continuous perimeter concrete foundation at the workshop and shed; provide concrete piers at interior posts and at exterior stairs.
- Install structural sheathing at roof and walls.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Re-grade at perimeter to eliminate wood to earth contact and to provide positive drainage away from building.
- Remove asphalt and wood shingle roofing. Install new asphalt shingle roof over plywood sheathing, with new gutters and downspouts.
- Repair metal roof as needed.
- Repair exterior siding and replace in kind where deteriorated beyond repair; estimate replacement of 25% of siding.
- Replace stairs to doors, provide landings and railings.
- Replace windows to match.
- Repair shed doors and eliminate contact with the ground.
- Paint all wood elements.

Interior

- Replace electrical wiring.

<u>Treatments Contingent on Use</u>

Preliminary recommendations include possible adaptation of the workshop for interpretive or exhibit space or for public restrooms. Either of these uses could use the shed for storage. Alternatively, the entire building could continue as storage space.

- Insulate building.
- Provide accessible entrance(s) to workshop from grade.
- Upgrade lighting.
- Install new finishes at walls, floor and ceiling.
- Install plumbing system and fixtures, including ADA-compliant facilities.
- Add heating and air conditioning system.

BUILDING 13: TRACTOR BARN/ EQUIPMENT BARN

Image 113 – North entrance to Tractor Barn.

Image 114 – Southeast corner of Tractor Barn.

Physical Description

The Tractor Barn was built between 1952 and 1953 (date in foundation says 1947) of recycled building materials at the south edge of the ranch. It is located at the intersection of Cannon Lane and Cardoza Road. The east side of the barn has a narrow fenced-in area about 12 feet wide, and a large field beyond. At the northeast corner of the barn are two small structures, one of which houses some water supply equipment. The building historically housed large tractors and farm equipment. Now, in addition to a few historic pieces of farm equipment, it is used for general storage.

Measuring 53 feet wide and 89 feet long, the tractor barn is a simple low-sloped gabled form, with no additions. It is post and beam construction with three structural bays in the east to west direction and six bays in the north to south direction. The center bay is about 20 feet wide and the side bays are about 16 feet wide. The interior posts are supported on concrete footings and the east and west walls have continuous concrete footings.

The exterior walls are clad with vertical 1x12 wood boards, spaced about 1/2 inch apart. The roof is clad with corrugated galvanized metal with open ridge and eaves.

The primary entrance to the barn is from the north through a metal gate across a large framed opening. On the opposite wall, there is a pair of large sliding doors. At the west side bay, there are pairs of hinged doors at the north and side walls. There are three unequally spaced windows along the west wall: each a fixed casement with six panes of glass. Each window is covered with thin Plexiglas at the exterior.

The floor of the barn is dirt and there are no interior partitions. The metal roof is exposed between the rafters and purlins. There are no finishes on interior of the walls.

The barn has limited power and lights. Water is located east of the main entrance.

Image 115 - Barn interior showing framing and dirt floor

Character-Defining Features

- Rectangular plan
- Gable roof
- Walls and door composed of vertical wood boards
- Wood post and beam construction, with exposed rafters and purlins
- Multi-light, wood windows with wood surrounds

Existing Conditions

The Tractor Barn is in fair to poor condition. There is no positive drainage away from the north, west and south sides of the building.

<u>Structure</u>

The east foundation wall is cracked and leaning. It is likely unreinforced and the supporting footing is unknown.

There are numerous decayed framing members due to water intrusion and wood-to-earth contact. One interior post has been cut off above the floor, and the other posts have inadequate connections to their foundations. One horizontal out-of-plane wall brace has failed.

The existing 2x6 rafter and 4x6 beams are undersized for their spans. The 4x6 posts are undersized for their height. The nailed connections at the timber bracing are likely inadequate to resist lateral forces. The roof and walls lack structural sheathing.

Image 116 - Typical condition of roofing

Image 117 - Wood to earth contact of siding

Exterior

Roofing

The corrugated metal roofing is in fair condition. The original roofing as well as the later panels, gable cap, and eave trim are in similar condition, with some missing fasteners and bent panels and trim. The original roofing has rust staining on the exterior. The lack of gutters has contributed to water damage at grade.

Cladding

The wood siding of the barn is in fair to poor condition. The siding at the north, west, and south walls is in contact with the ground and bottoms of boards are deteriorated due to damage from water. The painted finish is worn and individual boards are warped, split or missing.

Doors

The large opening at the north end has no doors. The pair of doors adjacent to this opening is hung unevenly with miscellaneous hardware. The two pairs of large doors at the south end are in very poor condition. Both are inoperable, in part due to built up soil against the bottom. The larger, sliding pair has extremely warped boards. The smaller pair of swinging doors is failing also due to inadequately sized hardware. As with the wood siding, bottoms of doors are deteriorated due to damage from water.

Windows

The windows are in very poor condition with broken glazing and missing putty and deteriorated frames and mullions.

Trim

Trim at the north entrance, windows and gable ends of roof is in fair condition. Paint finish is worn.

Image 118 - Deteriorated doors at south end of building

Image 119 - Typical window with plexiglas cover

Image 120 - Cracked foundation at south wall

Image 121 - Corroded electrical components

Interior
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Electrical
Electrical switches and some conduit are corroded and potentially unsafe; incandescent fixtures provide bare minimum illumination.

Accessibility Issues
The Tractor Barn's main entrance is on grade; however, the dirt floor is not considered compliant. The building could be made accessible, with the required level of accessibility dependent upon use.

Code Analysis

Occupancy Classification	S-1 storage
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	15,750 square feet
Actual Area	4,673 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	20 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	16
Required Exits (CBC Section 1015)	1
Provided Exits	1 (gate at north side)

Treatment Recommendations

<u>Basic Treatments</u>

The basic treatment approach for the Tractor Barn is to stabilize and strengthen it and halt its deterioration.

Structure

- Stabilize or remove and replace the east foundation wall.
- Replace decayed and damaged framing and add supplementary framing where required.
- Improve all framing connections and add bracing, as required for seismic strengthening.
- Install plywood sheathing at roof and walls as required for seismic strengthening.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Re-grade at perimeter eliminate wood to earth contact and to provide positive drainage away from building.
- Replace corrugated metal roofing.
- Install new gutters and downspouts at east and west walls of barn.
- Repair and reattach siding; replace seriously damaged boards; estimate replacement of 20%.
- Replace one pair of barn doors at south wall of barn, including hardware.
- Repair other barn doors, replacing damaged boards; rehabilitate or replace hardware as required for functionality.
- Repair windows or replace to match.
- Paint all wood elements.

Interior

- Level dirt floor and eliminate all word to earth contact.

Systems

- Have electrical system evaluated by a licensed contractor or engineer.

<u>Treatments Contingent on Use</u>

The preliminary recommended use for the Tractor Barn is unconditioned agricultural storage and maintenance.

- Upgrade electrical service and lighting as required for safe use of equipment.
- Consider adding doors to opening at north end of barn.

BUILDING 14: STORAGE SHED/ EQUIPMENT SHED

Image 122 – Northeast corner of Storage Shed

Image 123 – West wall and rusted roof of Storage Shed

Physical Description

The 1950 Storage Shed is located at the center of the Cardoza Ranch, northwest of the work yard. The Storage Shed is aligned with the Old Shed to its north. There is a steep slope of the west side of the building and an unpaved road at the top of the incline. This building was used for storage of equipment historically and is now used as the carpentry shop.

Measuring 26 feet wide and 48 feet long, the tractor barn is a simple low-sloped gabled form, with no additions. The building is balloon framed with nailed wood trusses supporting the roof. The walls rest on a continuous concrete footing.

The exterior walls are clad with vertical 1x12 wood boards, spaced about 1/2 inch apart. The roof is clad with corrugated galvanized metal with open ridge and eaves.

There are two pairs of sliding doors on the east elevation and one pair at the south. There are three equally spaced windows on the north wall and five unequally spaced windows on the west wall. All of the windows are fixed casement windows. Two of the windows on the west wall have one pane of glass and the rest have six panes each. All of the windows are covered with a thin Plexiglas at the exterior.

The Storage Shed floor is concrete. The walls have no interior finish and the ceiling is open to the exposed rafters, purlins and metal roofing.

The building has power. Water is located at the exterior, near the south door. There is no heating in the building. There is a small concrete pad in front of the northern door on the east wall.

Image 124 - Interior currently being used as a workshop

Image 125 - Large sliding doors to accommodate equipment.

Character-Defining Features

- Rectangular plan
- Gable roof
- Walls and sliding doors composed of vertical wood boards
- Wood roof truss
- Multi-light, wood windows with wood surrounds
- Large sliding doors

Existing Conditions

The Storage Shed is in fair to poor condition. There is wood-to-earth contact around the entire perimeter and no positive drainage away from the north, west and south sides of the building. The southwest corner appears to be settling.

<u>Structure</u>
The Storage Shed lacks a concrete foundation, diagonal sheathing or structural sheathing at the walls, and structural sheathing at the roof.

<u>Exterior</u>
Roofing
The corrugated metal roofing is in poor condition, with surface staining from corrosion. There is no ridge cap and some panels appear damaged at the ridge. The sheet metal chimney (no longer in use) is corroded and poorly attached to its flashing and the roof. The lack of gutters and minimal overhang of the metal roofing has contributed to deterioration of the wood trim at eaves and at the base of the wall below.

Image 126 – Entrance to working space in Storage Shed

Image 128 - Typical window with Plexiglas covering; damaged trim

Image 127 - Deteriorated siding with wood to earth contact.

Cladding
The wood siding of the Storage Shed is in poor condition. The painted finish is worn and individual boards are warped, split or missing. Although wood-to-earth contact occurs only at the northwest and southwest corners, the bottoms of siding boards are rotting throughout the building.

Doors
The two pairs of sliding doors are functional. The larger pair is in fair condition; the small pair in poor condition. The concrete building slab functions as a sill for both, protecting them from earth contact.

Windows
The windows are in poor condition with broken glazing and missing putty and deteriorated frames and mullions. Plexiglas sheets have been nailed over all of the windows to provide some weather protection.

Wood Trim
Barge boards and fascias are in poor condition, with some broken and missing sections. Trim at windows varies from fair to poor condition.

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Flooring
The concrete slab floor has a number of significant structural cracks and poses trip hazards.

<u>Electrical</u>
Upgrades made to the electrical system are temporary and do not meet code. The system is undersized for its current use for shop equipment.

Image 129 - Corrugated roofing and steel beam at door

Image 130 - Cracked concrete slab

Image 131 - Miscellaneous non-compliant electrical modifications

<u>Accessibility Issues</u>
The Storage Shed is built on grade; however, the entrances are not ADA-compliant. The building could be made accessible, with the required level of accessibility dependent upon use.

<u>Code Analysis</u>

Occupancy Classification	F-1 shop
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	12,750 square feet
Actual Area	1,248 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	5
Required Exits (CBC Section 1015)	1
Provided Exits	0 (The sliding doors do not meet the requirements of Section 1008 and therefore do not count as required exits.)

Treatment Recommendations

<u>Basic Treatments</u>

Structure

- Install structural sheathing at roof and walls.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Re-grade at perimeter to eliminate wood to earth contact and to provide positive drainage away from building.
- Remove and replace sheet metal roofing over new plywood sheathing. Provide gutters and downspouts.
- Repair exterior siding and trim; replace in kind where deteriorated beyond repair; estimate replacement of 25% of siding and 50% of trim.
- Replace windows to match.
- Paint all wood elements.

Interior

- Upgrade electrical system.
- Repair concrete floor slab.

Treatments Contingent on Use

The preliminary recommended use for the Storage Shed is for interpretive/visitor center use.

- Rehabilitate paved area at west side of building and provide an accessible entrance.
- Upgrade lighting.
- Consider insulating building, installing new finishes at walls, floor and ceiling, and add heating and air conditioning system.

BUILDING 15: SLAUGHTERHOUSE

Image 132 – Entrance in west wall of Slaughterhouse

Image 133 – East end of Slaughterhouse

Physical Description

The Slaughterhouse is located at the northeast corner of the ranch, east of the Bunkhouse. An old unmaintained road runs along the building's south side. The construction date is unknown. As its name implies, it was used for slaughtering cows and other farm animals. Now it is unused. A large blackberry bramble is engulfing the southeast corner of the building.

The 20-foot-wide, 30-foot-long slaughterhouse is a simple gable form. There appears to have been a roof attached on the east wall, perhaps a canopy or enclosed addition. The structure is wood post and beam with rafters supporting the skip sheathing. There is a continuous concrete slab poured over field stones.

The exterior walls are clad with vertical 1x12 wood boards, spaced about 1/2 inch apart. The roof is clad with corrugated galvanized metal with open ridge and eaves. The skip sheathing under the metal indicates that the roof was originally covered with wood shingles.

Large doors cover the west side of the building: a pair of hinged doors at the north side and a sliding door at the right. On the east side is a narrow, tall door with a narrow concrete ramp up to it. This door was likely used to bring in the cattle. At the east corner of the south wall, there is a low, wide door which is hinged from the top. This door may have been used to remove the carcasses. There are no windows in the slaughterhouse.

Like the other farm buildings, there are no interior wall or ceiling finishes. The floor is roughly poured concrete. At the east wall, near the south corner, the concrete slopes to the exterior and there is a gap between the wall and the foundation. This was likely to drain out the blood. At the southeast corner, there is a wood winch and tackle with a large metal hook at the end of the rope. There is a table and a couple of other pieces of equipment in the building, which relate to its historic use.

Image 134 - Concrete drainage trough at east end of building

Image 135 - Winch and tackle near southeast corner

The building currently has no utilities. A light socket mounted below a beam and wiring on the west gable show that the building once had power. No water connection was located.

Character-Defining Features

- Rectangular plan
- Gable roof
- Walls and doors composed of vertical wood boards
- Corner boards
- Wood post-and-beam construction, with exposed rafters and purlins
- Concrete foundation
- Wood winch and tackle

Existing Conditions

The Slaughterhouse is in poor condition. Although its roof is in good condition, the rest of the building envelope is extremely deteriorated.

<u>Structure</u>
The foundation is inadequate and the concrete slab, on which the building rests, is in very poor condition. The Storage Shed lacks diagonal sheathing or structural sheathing at the walls, and lacks structural sheathing at the roof. There is extensive decay of the wood framing due to water intrusion and soil contact.

<u>Exterior</u>
Roofing
The corrugated metal roofing is in generally good condition, with only one bent edge at the southwest corner. The ridge cap is also in good condition.

Cladding
The wood siding of the Slaughterhouse is in very poor condition. There are many warped, split or missing boards. Although the concrete slab separates the wood siding from the ground, dense plant growth around the building has contributed to the deterioration of the lower sections.

Image 136 - General condition of roofing.

Image 137 - Typical condition of wood siding and vestiges of former addition east end.

Doors
The sliding door in the west wall does not appear to be functional. The adjacent pair of doors is extremely deteriorated and also not functional; access to the building is gained by removing one of the door's boards. The smaller door at the opposite end is also in poor condition. The shutter low in the north wall is also in poor condition but may be operable

Wood Trim
All wood trim is in fair condition, with major deterioration at the bottom ends of corner boards.

Features
The short concrete ramp outside the east door is in poor condition.

<u>Interior</u>
The wood structure and the roof and wall cladding exposed on the interior are addressed above.

Flooring
The concrete slab floor is completely broken up in some areas and seriously cracked throughout the building.

Features
Remaining elements of the pulley system appear to be in fair condition.

Image 138 - Non-functional doors at west wall.

Image 139 - General deteriorated condition of slab and siding.

Accessibility Issues
There is no ADA-compliant access to or within the Slaughterhouse. The building is constructed on grade and could be made accessible, with the required level of accessibility dependent upon use.

Code Analysis

Occupancy Classification	F-1
Construction Type (CBC chapter 3)	VB, non-rated, combustible construction
Allowable area (CBC Section 503)	12,750 square feet
Actual Area	1,248 square feet
Allowable height (CBC Section 504)	40 feet, 1 story
Actual Height (feet/ stories)	14 feet, 1 story
Occupant Load (CBC table 1004.1) Factor: 200 square feet/occupant	5
Required Exits (CBC Section 1015)	1
Provided Exits	2
Other considerations	

Treatment Recommendations

Basic Treatments
The recommended treatment approach for the Creamery is to stabilize it in place for storage use. Prior to stabilization, document the interior and exterior to HABS (Historic American Building Survey) standards.

Structure

- Provide continuous perimeter foundation.
- Remove and replace any deteriorated structural elements.
- Provide seismic reinforcement at exterior walls and at roof.
- Refer to Structural Assessment in the Appendix for further discussion.

Exterior

- Cut back overgrown vegetation and re-grade around building to provide positive drainage away from perimeter.
- Reattach loose wood siding and trim; replace severely deteriorated boards; estimate replacement of 20% of siding and trim.
- Repair wood doors, replacing damaged boards, and secure in place. Provide one operable door and safe, level access to it.
- Paint all wood elements.
- Provide interpretive signage nearby building.

Interior

- Remove deteriorated concrete and install new floor slab.
- Remove winch and tackle for possible interpretive use elsewhere on site.

<u>Treatments Contingent on Use</u>
The preliminary recommended use for the slaughterhouse is for storage.

Additional Recommendations

Recommendations for New Structures or Additions

Recommendations for Further Study

APPENDICES

BIBLIOGRAPHY

STRUCTURAL ENGINEER'S REPORT

Appendix F

Hydrology and Water Quality

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

HYDROLOGY AND HYDRAULIC REPORT

SONOMA COUNTY, CA

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ATTACHMENT A: MODEL INPUT DATA AND PHOTOGRAPHS

1.0 INTRODUCTION

The purpose of this report is to present additional analyses that build upon the hydrology and geomorphology assessment work done to date. Results are presented that specifically examine hydrologic conditions of Tolay Lake, Tolay Creek, and associated tributaries within and adjacent to the Tolay Lake Regional Park (Park) property boundary under existing and proposed conditions. The purpose of the analyses presented herein is to clarify understanding of potential hydrologic impacts that might be incurred by lake restoration proposed under the Tolay Lake Regional Park Master Plan (Master Plan).

Tolay Lake in Tolay Lake Regional Park, Sonoma County, California, was originally formed by a natural dam across Tolay Creek that was about 14 feet higher than the lake bed (KHE 2003). The natural dam was breached in the 1860s to facilitate draining the lake. The lake and creek were further modified to their present condition over the historic period to create conditions more favorable for ranching (KHE 2003; Florsheim 2009). Under the existing conditions, flooding in the Park is common during the wet season, including overtopping of the existing causeway that crosses and divides Tolay Lake into upper and lower impoundments with approximately two-thirds of the lake upstream from the causeway and the remaining third downstream from the causeway (Figure 2). Tolay Lake generally dries completely during the summer dry season. The Tolay Lake Restoration Project (Project), which is part of the larger Tolay Lake Regional Park Master Plan, is intended to restore the lake to near historic conditions, thereby enhancing wildlife habitat and reducing flooding impacts in the Park without increasing flood risk to upstream landowners.

The hydrologic and hydraulic modeling analyses reported herein were conducted to support the Tolay Lake Master Plan Environmental Impact Report (EIR). MIG is the prime consultant for the Master Plan, which is sponsored by Sonoma County Regional Parks. As part of this effort, Wildscape Engineering Inc. (WE) was tasked with conducting supplemental field topographic surveys, quantifying watershed peak flow rates for modeling, conducting modeling analyses of existing and proposed conditions to determine impacts on hydraulics associated with the proposed project, and prescribing mitigation measures to reduce impacts as needed. This technical report was developed to summarize the methodologies and results of these efforts.

2.0 WATERSHED HYDROLOGY AND GEOLOGY

2.1 Hydrology

Tolay Creek flows from northwest to southeast in a valley situated between and roughly parallel to both Sonoma Creek and the Petaluma River drainages and discharges into a tidally influenced marsh complex at the southern end of Sonoma Valley (Arnold Drive/Hwy 121) before entering San Pablo Bay. The Tolay Creek watershed has a drainage area of approximately 8.3 square miles. The watershed boundary is defined by rounded ridges and hilltops with the highest elevation at approximately 916 feet (unnamed peak) down to 15 feet elevation at Arnold Drive (Florsheim 2009).

Based on topographic maps of the area, Tolay Creek is a third-order channel with a total main channel length of about 6.3 miles (Florsheim 2009). The subwatershed of interest for the purpose of this assessment is the Tolay Lake watershed, which comprises the Tolay Creek watershed upstream from what is known as the "farm bridge" (the furthest downstream hydraulically significant structure within the Park) and is contained entirely in the upper basin of the Tolay Creek watershed, a wide reach approximately 3.0 miles in length with a relatively low average slope of 0.0013 (Florsheim 2009).

The Tolay Lake watershed is bounded on the northeast by the Sonoma Mountains and on the southwest by a low line of hills that separate it from the Petaluma Valley to the west. Headwaters to the west and northwest feed the main channel, and headwaters to the north and northeast feed the two primary tributaries, North Creek and Eagle Creek. The watershed divide in the headwaters has a relatively low elevation and in some places is somewhat indistinct from the adjacent Petaluma River watershed (Florsheim, 2009).

The confluence of the tributaries with the main Tolay Creek channel is within the historic Tolay Lake lakebed just upstream of the farm bridge. The boundaries of the main channel, North Creek, and Eagle Creek sub-watersheds (Figure 1) are partially defined by irrigation channels within the Park and within private property up-gradient from the Park. Upstream water rights and associated management affect flows and hydrographs through the Park. Existing irrigation channels and hydraulic structures in the Park (Figure 2) also significantly affect flow and hydrographs through the Park.

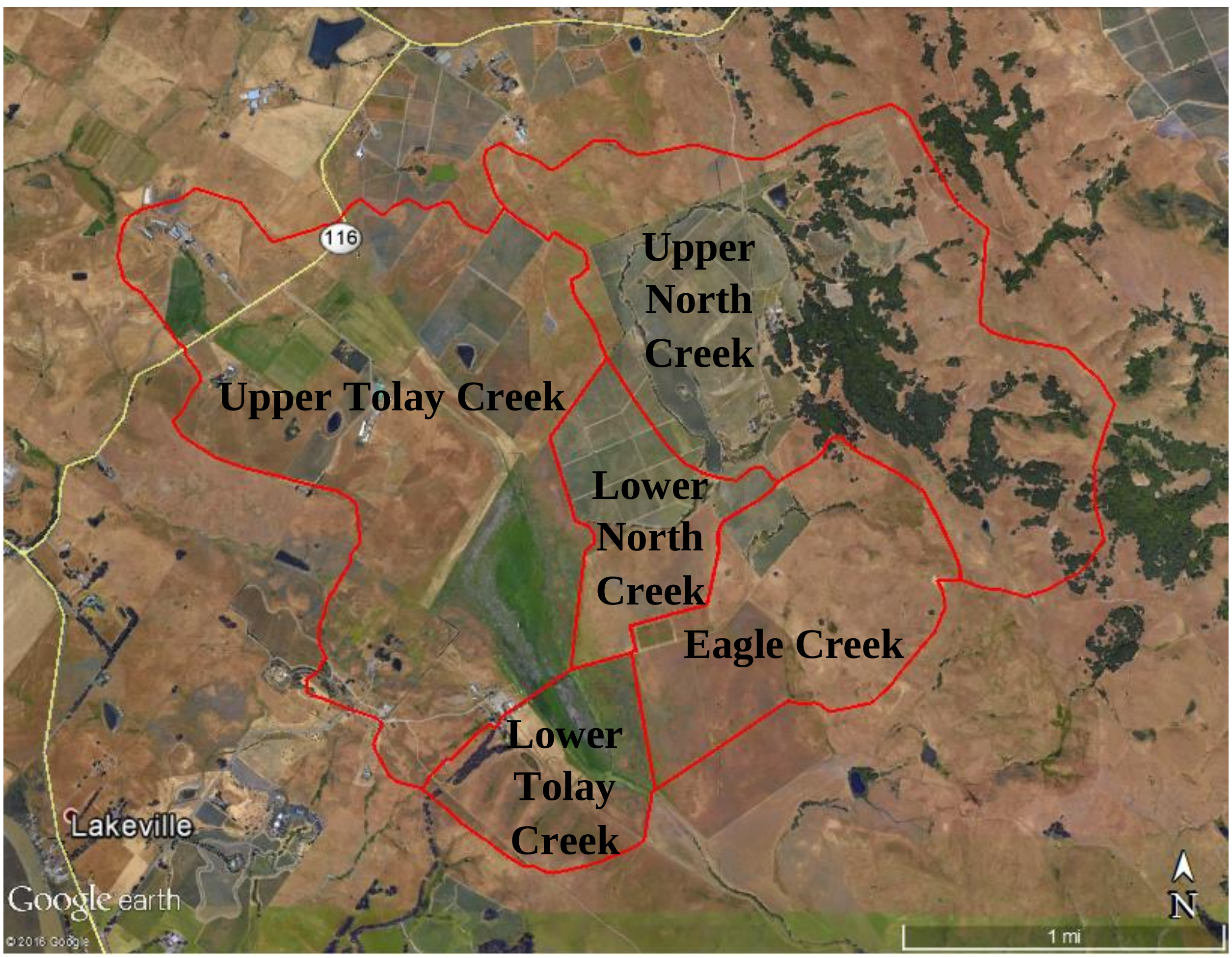

Figure 1. *Tolay Lake Watershed and Sub-Watersheds Upstream of the Farm Bridge (Google Earth 2016).*

Figure 2. *Existing Irrigation Channels and Hydraulic Structures in Tolay Lake Regional Park (WRA 2013).*

2.2 Soils and Geology

According to US Department of Agriculture (USDA) soil mapping (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm) the majority of Tolay Lake watershed soils consists of clays and clay loams. In general, clay soils are characterized as having low permeability and moderate to high runoff potential.

The valley of the watershed is underlain by Quaternary deposits and the Petaluma Formation composed primarily of silt, clay, with scattered sand or coarse-grained layers (Cardwell 1958; KHE 2003). The hills to the southwest are mainly underlain by Franciscan Formation metamorphic rock and the hills to the northeast are underlain by volcanic rocks; mainly the Sonoma Volcanics but some sources distinguish an older volcanic unit (Donnell Ranch or Tolay Volcanics) along the valley perimeter (Cardwell 1958; KHE 2003). The distribution of these geologic formations follows the northwest-trending regional geologic structure.

3.0 HEC-HMS HYDROLOGIC MODELING

3.1 Background

The assessment of potential hydrologic impacts to Tolay Lake and its infrastructure were undertaken by application of the hydrologic model, HEC-HMS (Scharffenberg and Fleming 2013). Runoff hydrographs resulting from a suite of precipitation events were modeled for existing and proposed conditions such that the relative impacts of the proposed restoration of Tolay Lake and its structures could be assessed.

Tolay Lake is potentially divided into three parts as described here:

1. A causeway crosses Tolay Lake near the midpoint of the lake/wetland and is used as access to the eastern portion of the Park (Figure 2). Drainage from Tolay Creek was at some time conveyed through a 30-inch diameter culvert through the causeway. However, the culvert is now almost completely blocked and provides little conveyance in relation to storm flows contributed to the lake (Figure 3). This was confirmed by field inspection and personal communication with park personnel and is demonstrated in photographs taken during "normal precipitation" years.

2. Downstream from the causeway is a small horseshoe-shaped berm (horseshoe). This feature conveys drainage from the western and eastern contributing watersheds to a point downstream from the horseshoe. Tolay Creek would have been conveyed through the horseshoe via a 42-inch diameter culvert (Figures 2 and 4), but again that culvert is blocked and has insufficient conveyance for significant flows, such as those generated by large precipitation events.

3. Downstream from the horseshoe is a small historic bridge called the "farm bridge" by Park staff. The structure has a relatively small conveyance capacity that is further reduced by a structural member located only about three feet above the channel bed (Figures 2 and 5).

Figure 3. *Largely blocked culvert in Causeway, inlet shown on left, outlet shown on right.*

Figure 4. *Closed gated culvert in horseshoe berm, inlet shown on left, outlet shown on right.*

Figure 5. *Historic farm bridge (view looking upstream)*

3.2. Approach

Modeling watershed runoff through the Tolay Lake system is complicated by the presence of the causeway and the horseshoe. Because the horseshoe does not impound much water and currently has a blocked outlet, it was assumed to not play a significant hydrologic role. The causeway, however, most likely impounds sufficient water to operate as a separate and distinct reservoir from the impoundment resulting from the farm bridge.

Therefore, two scenarios were considered for the existing condition. Under the first scenario it was assumed that the causeway provides a hydraulic control to the portion of the lake upstream from the causeway without backwater from the farm bridge. That is, the upper portion of the lake operates independently from the portion of the lake downstream from the causeway and upstream from the farm bridge. This condition was represented in the HEC-HMS model as two independent reservoirs with the causeway providing the hydraulic control for the upstream portion of Tolay Lake and the farm bridge providing hydraulic control for the lower portion of Tolay Lake. Flows from the upper portion (upstream from the causeway) flow into the lower portion and are routed through the farm bridge (in the model).

However, if backwater or lake elevation resulting from the hydraulic control provided by the farm bridge is sufficient, then overflow of the existing causeway will likely be "drowned" and the lake will behave as a single entity. Therefore, the second scenario was constructed assuming that the hydraulic control for the lake is at the farm bridge with the entire lake providing storage for routing of flows. The control case is the scenario that provides the greatest stage (highest water surface elevation) in the lake (and therefore the maximum extent of flooding from Tolay Lake).

Proposed changes to the Tolay Lake structures under the restoration plan are described in detail elsewhere in this report. In summary, they include:

1) Additional conveyance within the causeway in the form of ten pipe-arch culverts (approximately a five-foot rise and commensurate width),
2) An increase in causeway crest elevation,
3) Elimination of the drainage ditches that currently cross the lake and other ditches that bypass flows to the lake from adjacent watersheds,
4) Reduction/removal of the horseshoe berm,
5) Elimination of drainage ditches from North Creek and Eagle Creek, and
6) Improvements to the farm bridge.

The basic configuration of Tolay Lake under the proposed restoration with hydraulic controls at the causeway and the farm bridge remains unchanged. That is, to determine the worst case scenario, both conditions (one where the causeway splits Tolay Lake into upper and lower reservoirs and the second in which the farm bridge drowns the structures at the causeway) should be considered, parallel to what was done for the existing condition. Therefore, two post-project scenarios for the hydrologic modeling parallel the existing condition scenarios. The first is that the causeway provides a hydraulic control that results in independent operation of the upper and lower portions of Tolay Lake. The second, similar to that for the existing condition, is that the hydraulic control for Tolay Lake is at the farm bridge (with its proposed configuration).

In summary, four conditions were examined in the model:

1) Existing conditions:
    a. The hydraulics of flow over the causeway control operation of the upper portion of Tolay Lake independently from the lower portion of the lake (downstream from the causeway), which is then controlled by the existing farm bridge.
    b. The hydraulics of flow through/over the existing farm bridge control the routing of incoming hydrographs through Tolay Lake.

2) Proposed conditions:

   a. The hydraulics of the proposed changes to the causeway control operation of the upper portion of Tolay Lake independently from the lower portion of the lake (downstream from the causeway), which is controlled by the proposed configuration of the farm bridge. This scenario is a parallel to that of the existing condition, although the hydraulics of the proposed causeway structures are quite different from the existing condition.

   b. The hydraulics of flow through/over the proposed replacement farm bridge control the routing of incoming hydrographs through Tolay Lake. Again, this scenario is parallel to that of the existing condition, subject to the proposed changes to the hydraulics of the new farm bridge.

3.3. Development

There are currently no stream flow gages in the Tolay Creek watershed (Florsheim 2009), thus synthetic hydrology methods were used to construct estimates of runoff hydrographs for the analysis. A variety of technologies are available for such estimates. The approach used for this study are presented in the following paragraphs.

Estimates of watershed runoff hydrographs were developed using the following information:

1) Watershed characteristics (area, length of main channel, slope of main channel),
2) Estimates of rainfall from depth-duration-frequency analysis,
3) Estimates of rainfall temporal distribution through a design hyetograph,
4) Estimates of watershed runoff through a rainfall loss model, and
5) Estimates of watershed response through a characteristic response function (the unit hydrograph).

Watershed characteristics were determined from aerial mapping. The watershed drainage boundaries were hand-drawn using one-foot contours (LiDAR data; WSI 2016). Lengths and slopes of the main channels were measured from these maps. Rainfall depths for the storm durations of interest and appropriate hyetographs were taken from National Oceanic and Atmospheric Agency (NOAA) Atlas 14 (NOAA-14; Perica et al. 2014) for California. The Green-Ampt (1911) loss model was used to convert incoming precipitation to watershed runoff. The Natural Resources Conservation Service (NRCS) dimensionless unit hydrograph method was used to model the conversion of watershed runoff (effective precipitation) to watershed discharge (the runoff hydrograph). These data were combined in the HEC-HMS software for construction of flood hydrograph estimates, which were then used to assess the likely hydrologic impact of the proposed changes to Tolay Lake. Details of the process are provided in subsequent paragraphs.

Based on initial experiments with HEC-HMS, a storm duration of 12-hours was selected. The 12-hour storm provides a balance between maximum rainfall intensity (and therefore peak discharge) and total rainfall depth (and therefore runoff volume loading of reservoir/lake storage during runoff events). Shorter storms tend to emphasize peak discharge at the expense of runoff volume and longer storms tend to emphasize runoff volume (although over a longer time period) over peak discharge.

Rainfall depths for the events of interest for the 12-hour storm duration were obtained from NOAA-14 (http://hdsc.nws.noaa.gov/hdsc/pfds/). The storm depths used for this study were 2.04, 3.31, 4.48, and 5.00 inches for the 2-, 10-, 50-, and 100-year 12-hour storms, respectively. The median second quartile temporal dimensionless rainfall distribution was obtained from NOAA-14. Distributions of storm depth versus storm time for use in HEC-HMS were computed using a spreadsheet.

The Green-Ampt (Green and Ampt 1911) infiltration function was used to convert incoming precipitation into watershed runoff. The process is detailed in the HEC-HMS Technical Reference Manual (USACE 2000). Green-Ampt loss-model parameters were estimated using the Maricopa County method (Maricopa 2013). The Maricopa County method combines soil textural classification for site soils with general Green-Ampt parameter estimates to produce appropriate estimates for site-specific application[1].

Mapping of soil units was obtained from the US Department of Agriculture (through the web soil survey portal at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm). Geographical Information System (GIS) software was used to intersect watershed boundaries and soil units to produce the required data for parameter estimation. The Maricopa County procedure provides for increases to soil saturated hydraulic conductivity for the presence of vegetation by a multiplicative factor. This was used for the Tolay Lake analysis because site soils generally have reasonable vegetative cover. The Green-Ampt parameter values are presented in ***Table 1***.

Table 1. *Green-Ampt infiltration parameters derived from the Maricopa County hydrologic design manual for Tolay Creek watershed soils*[2].

Watershed	Area (mi^2)	Effective Ksat (in/hr)	Suction (in)	Initial Moisture Deficit (in)	Maximum Moisture Deficit (in)
Upper Tolay Creek	1.72	0.058	10.0	0.13	0.23
Lower Tolay Creek	0.31	0.055	10.0	0.12	0.23
Upper North Creek	1.61	0.130	8.0	0.15	0.30
Lower North Creek	0.33	0.068	9.0	0.13	0.23
Eagle Creek	0.61	0.091	9.0	0.15	0.27

[1]Essentially, the geometric mean saturated hydraulic conductivity is computed using mapping of site soils and soil textural classification from U.S. Department of Agriculture (USDA) mapping. With the site-selected saturated hydraulic conductivity, soil suction and soil moisture parameters are selected using tools in the Maricopa County hydrologic manual.

[2]Initial soil moisture deficit and maximum soil moisture deficit are parameters used in the Green-Ampt infiltration model. They represent the starting (beginning of storm) active soil moisture (water in the soil matrix) versus the maximum amount of water the soil matrix can accommodate. As the soil pores fill, then less water can infiltrate and the system moves towards an equilibrium state where the incoming infiltration into the soil is equal to the saturated hydraulic conductivity of the soil. The important point is that these are parameters used in the estimation of runoff from rainfall, which is the quantity that generates runoff hydrographs.

Main channel length and slope was used to estimate time of concentration for each watershed. Time of concentration is a parameter used to characterize the time-response of a watershed. It is defined as the time a quantity of runoff requires to traverse the watershed from the most hydraulic distant point to the watershed outlet. Shorter response times result in steeper/flashier hydrographs and longer response times result in flatter hydrographs. The time of concentration is used with the NRCS dimensionless unit hydrograph through the lag time, which is 0.6 times the time of concentration.

Based on results from Roussel and others (2005), a combination of the Kirpich (1940) equation with a 30-minute adjustment was used to estimate time of concentration for each watershed. Because of the low-slope condition of the Lower Tolay Creek watershed (0.0009), the adjustment to slope presented by Cleveland and others (2012) was used to obtain the time of concentration. These results are presented in ***Table 2***.

Table 2. *Time of concentration and lag time estimates for Tolay Creek watersheds.*

Watershed	Area (mi^2)	Main Channel Length (ft)	Main Channel Slope	Kirpich (min)	Kirpich +30 (min)	Lag Time (min)
Upper Tolay Creek	1.72	7944	0.011	45	75	45
Lower Tolay Creek	0.31	4200	0.0009	60	90	54
Upper North Creek	1.61	13100	0.047	67	97	58
Lower North Creek	0.33	4610	0.008	33	63	38
Eagle Creek	0.61	9370	0.076	24	54	32

The Natural Resources Conservation Service (NRCS) dimensionless unit hydrograph method was used to model the conversion of watershed runoff (effective precipitation) to watershed discharge (the runoff hydrograph). This procedure uses lag time (derived from time of concentration) and a standard unit hydrograph shape to estimate the unit hydrograph for the watershed of interest. The procedure is included in HEC-HMS.

Estimates of lake storage were obtained using stage-area tables extracted from contour mapping of Tolay Lake. Essentially, the estimate of lake storage is based on the areas of horizontal slices of pond volume bounded by adjacent contour elevations. Areas were estimated using computer software.

Because of the causeway, storage in the upper reservoir below the crest elevation of the causeway is not effective for routing flows through Tolay Lake. That is because the appropriate starting condition for reservoir routing is to assume that the upper reservoir is at capacity at the beginning of the storm event. This is the standard approach used for hydrologic analysis of reservoirs and is conservative. Starting elevation of the upper reservoir (upstream from the causeway) was 217.9 feet, which is the crest elevation of the causeway.

The existing causeway was assumed to act as a broad-crested weir during flood events, given the lack of conveyance through the existing, largely blocked 30-inch culvert. For the proposed condition, the proposed series of pipe-arch culverts were rated using the Federal Highway Administration (FHWA) HY-8 software (http://www.fhwa.dot.gov/engineering/hydraulics/software/hy8/). Estimates of tailwater elevation were constructed from the estimated stage-discharge relation for the farm bridge.

For the post-project condition, starting elevation for the upper reservoir was assumed to be 215feet. This is the target water-surface elevation for the pond to maintain a permanent water surface. This increases the amount of active storage in the upper reservoir used to attenuate incoming runoff hydrographs.

The existing and proposed farm bridge geometries were input into HEC-RAS (Brunner, 2010) for rating the structure[3]. The existing bridge is a non-standard design with a low-member that crosses between structure abutments about three feet above the bridge invert. The gap between the low-member and the low chord of the structure is likely to be ineffective or to be clogged with debris during significant flood events. Therefore, it was assumed that only the lower portion of the structure will be open to convey flows during runoff events.

The invert elevation of the existing farm bridge is 214.4feet. That elevation was used for the existing condition hydrologic analysis. The proposed invert is 215feet (which is also the target water-surface elevation for Tolay Lake) and was used as the starting elevation for the post-project models.

Channel conditions downstream from the farm bridge were extracted from site contours. An initial condition of uniform flow was assumed for the downstream boundary condition flow using the longitudinal slope of the floodplain downstream from the farm bridge. A variety of flows were used to construct the stage-discharge curve for the existing and proposed farm bridge structures. The stage-discharge curve is used in HEC-HMS to compute outflow through the structure.

3.4. Model Validation

Because measured runoff hydrographs to calibrate the hydrologic model are not available, best information is from the U.S. Geological Survey (USGS) suite of regional regression equations. Regional regression equations are relations between *n*-year peak discharge and a set of predictor variables developed by analyzing the flood-frequency curves from stream gages in the region of interest. USGS personnel collect and maintain measurements from numerous stream gaging stations. These data are analyzed by USGS personnel with cooperative funding from interested parties and published in official USGS reports. The most recent set for California are published in Gotvald and others (2012). The HEC-HMS model was operated using the parameters and watershed characteristics previously presented. Results from this model are summarized in ***Table 3*** under "Model" column adjacent to flowrate estimates derived from the regional regression equations ("RRE" column). Uncertainty in the discharge estimates derived from the regional regression equations is quite large – the standard error of estimate for these equations is on the order of 50 percent. Similarly, uncertainty in HEC-HMS modeling is likely quite large, although no statistical estimate of the uncertainty is available. Based on the relative proximity of the estimates displayed in ***Table 3*** and on engineering judgment, the HEC-HMS hydrologic model of Tolay Lake is appropriate for answering questions concerning the impact of proposed changes to the Tolay Lake system. Results from the HEC-HMS model were not further adjusted based on results from the regional regression equations given the standard of error associated with the regional regression equations is such that the HEC-HMS estimates are sufficient for use in this project. Additionally, the water-surface elevations predicted by the existing conditions model (as presented in Section 3.5 below) are consistent with anecdotal data provided by Parks staff, namely the overtopping of the

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[3]Although HEC-RAS was used for this project, its use was limited to establish the boundary condition (stage-discharge relation for the farm bridge) for the modeling effort, which was use of HEC-HMS for the computation of watershed runoff hydrographs and routing those hydrographs through Tolay Lake.

causeway and upstream flooding during normal precipitation years and high recurrent, i.e. 2-year, precipitation events.

Table 3. *Results from regional regression equations and HEC-HMS modeling of Tolay Creek watersheds that contribute flows to Tolay Lake.*

		2-year		10-year		50-year		100-year	
Watershed	**Area (mi^2)**	**RRE (cfs)**	**Model (cfs)**	**RRE (cfs)**	**Model (cfs)**	**RRE (cfs)**	**Model (cfs)**	**RRE (cfs)**	**Model (cfs)**
Upper Tolay Creek	1.72	70	132	224	321	387	487	464	557
Lower Tolay Creek	0.31	15	29	50	63	87	92	105	105
Upper North Creek	1.61	66	6.5	211	177	366	342	439	408
Lower North Creek	0.33	16	22	52	60	92	93	111	105
Eagle Creek	0.61	28	21	90	93	157	154	189	178

3.5. Results

Results from modeling runoff hydrographs from the selected events through Tolay Lake for the existing and proposed post-project conditions are presented in ***Table 4***. All four possibilities are included in the table, plus one additional case. The proposed pipe-arch culverts provide substantial conveyance through the causeway, making it possible that more of the storage in the upper reservoir will be available for the post-project condition than for the existing condition. Therefore, the additional case was included wherein the upper and lower reservoir storage was combined for one set of post-project model runs.

For existing conditions, it appears that hydraulic control for Tolay Lake changes between the 2- and 10-year events. That is, the peak stage from the causeway (218.1 feet) is greater than that at the farm bridge (216.6 feet) for the 2-year event, but for rarer larger hydrologic events, the peak stage at the farm bridge exceeds that for the causeway. That means that the hydraulics of the farm bridge controls the behavior of Tolay Lake under existing conditions for most flood events. The best estimate of the 100-year peak stage for Tolay Lake under existing conditions is about 219.9feet (Tolay Lake combined), with the hydraulic control at the farm bridge and the causeway hydraulics drowned by storage in Tolay Lake.

For proposed post-project conditions, conveyance through the proposed causeway pipe-arch culverts is sufficient to convey anticipated flood flows, thus the hydrologic behavior of Tolay Lake is controlled by the hydraulics of the proposed farm bridge. For all events analyzed for this project, post-project peak stages in Tolay Lake are no greater than estimated peak stages for existing conditions. In fact, if the proposed pipe-arch culverts result in greater use of the upper reservoir storage during significant flow events, then it is possible that reduction in peak stages (Tolay Lake PP) during runoff events will result from proposed improvements to Tolay Lake hydraulic structures (at the causeway and the farm bridge).

Table 4. *Estimates of Tolay Lake stage and discharge for existing and post-project conditions.*

		Stage (ft)				Discharge (cfs)			
Reservoir	**Crest (ft)**	**Q2 12Hr QII**	**Q10 12Hr QII**	**Q50 12Hr QII**	**Q100 12Hr QII**	**Q2 12Hr QII**	**Q10 12Hr QII**	**Q50 12Hr QII**	**Q100 12Hr QII**
	Existing Condition -- Independent Upper/Lower Assumption								
Causeway	217.9	218.1	218.3	218.4	218.4	73.8	271	455	530
Farm Bridge	220.0	216.6	219.9	221.1	221.3	58.1	221	672	941
	Existing Condition -- Hydraulic Control at Farm Bridge Assumption								
Tolay Lake (Combined)	220.0	217.5	219.1	219.9	220.2	84.9	166	222	333
	Proposed Condition -- Independent Upper/Lower Assumption								
Proposed Causeway	222.0	215.6	216.9	218.1	218.6	33.2	114	199	227
Proposed Farm Bridge	220.0	216.1	218.5	219.4	219.8	37.3	123	204	241
	Proposed Condition -- Hydraulic Control at Farm Bridge Assumption								
Tolay Lake PP (Alt Storage)	220.0	215.8	217.4	218.6	219.1	24.3	75	140	177
Tolay Lake PP (FB)	220.0	217.6	219.1	219.8	220.2	82.6	176	252	351

In addition, the hydraulics of the farm bridge are impacted by channel conditions downstream from the farm bridge. As part of the review associated with developing the stage-discharge curve for the farm bridge, it was observed that channel conditions immediately downstream from the existing farm bridge to a point approximately 1,000 feet downstream from the structure were modified from natural conditions. That is, stream properties farther downstream appear to be substantially different (wider and deeper) than those adjacent to the existing farm bridge. Therefore, it appears that the floodplain was modified sometime before collection of current aerial photography.

It appears, therefore, that an additional opportunity for riparian restoration is available for the reach of Tolay Creek downstream from the farm bridge approximately 1,000 feet. Such restoration could improve conveyance through the proposed farm bridge and potentially improve runoff outflows through the proposed structure with the result that flood hydrographs would pass through the system more readily.

4.0 SUMMARY AND CONCLUSIONS

A hydrologic model (HEC-HMS) of Tolay Lake and its contributing watersheds was constructed for evaluating proposed changes to Tolay Lake. A suite of 12-hour storms were selected for evaluating the proposed changes with annual return periods of 1-, 10-, 50-, and 100-years. Storm depths and temporal distributions were taken from NOAA data. The procedure documented in the Maricopa County Hydrology Manual was used to estimate parameters for the Green-Ampt infiltration function for use in HEC-HMS to convert incoming precipitation to watershed runoff. The NRCS dimensionless unit hydrograph was the selected procedure for converting watershed runoff to runoff hydrographs. The level-pool reservoir routing method (modified Puls) was selected for routing incoming hydrographs through Tolay Lake. Data and assumptions to support the modeling effort were extracted from a combination of sources documented in the paragraphs above.

Based on results from application of the hydrologic model, the following findings are offered:

1) Model peak discharges compare reasonably well with discharge estimates from regional

regression equations, which means model results are useful for making assessments of existing conditions and potential changes if proposed improvements to Tolay Lake and its structures are constructed.

2) With exception of the 2-year event, the farm bridge is the hydraulic control for runoff events under the existing condition. That is, the hydraulics of the farm bridge and the channel downstream from the farm bridge control flow through Tolay Lake.

3) For the 2-year event, it is likely that the upper and lower portions of Tolay Lake (separated by the causeway) function as two separate reservoirs under existing conditions. This has little impact on subsequent analyses of potential impacts of proposed changes.

4) Peak stages in Tolay Lake under existing conditions for the hydrologic events analyzed are between 218 and 220 feet. These events result in impoundment of water in the reach upstream from the project boundary under existing conditions.

5) For proposed post-project conditions, the worst-case assumption is that backwater from the farm bridge results in some loss of effective storage in the upper reservoir. Based on results from hydrologic modeling of Tolay Lake, peak stages in the lake for the hydrologic events analyzed are no greater than commensurate peak stages for the existing condition. Therefore, proposed changes to the lake and its structures should result in no significant impact from relatively rare hydrologic events.

6) Because of the increased conveyance of the proposed addition of ten pipe-arch culverts to the causeway with invert elevations of 215 feet, it is possible that more of the storage in the upper reservoir will be available for all hydrologic events than in either the existing condition or in the conservative post-project condition. If this is the case, then it is possible that peak stages from relatively rare hydrologic events for the post-project condition will be less than commensurate peak stages for the existing condition, resulting in improved conditions during flood events.

7) Finally, additional improvements to Tolay Lake operation during flood events are possible if the Tolay Creek channel downstream from the farm bridge is restored to conditions approximating those farther downstream from the project area. Those downstream conditions appear to be more representative of Tolay Creek. It appears that channel/floodplain modifications occurred sometime prior to this study.

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ATTACHMENT A
MODEL INPUT DATA AND PHOTOGRAPHS

Tolay Lake Restoration Project

CONTENTS

1. **Regression Equations and Inputs**
2. **Hydraulic Structures and Channels Photographs**
3. **Stage Areas**
4. **Proposed Conditions**
5. **Additional Information**

1. Regression Equations and Inputs

Table 1. Regression Equations

	Equation[1]
Area (sq. mi.)	
Q2 (cfs)	$1.82A^{0.904}P^{0.983}$
Q10 (cfs)	$14.8A^{0.880}P^{0.696}$
Q25 (cfs)	$26.0A^{0.874}P^{0.628}$
Q50 (cfs)	$36.3A^{0.870}P^{0.589}$
Q100 (cfs)	$48.5A^{0.866}P^{0.556}$

[1]Regression equations from Gatval et al (2012) for the North Coast region, where A = Drainage Area (sq. mi. as listed in Table 3 of the Technical Report main body) and P = Mean Annual Precipitation (25 inches). P = 25 inches was selected based on the following considerations. There are no precipitation data from within the Tolay Creek watershed (Florsheim 2009). The mean annual precipitation used for this computation was 25 inches, which was the value at roughly the watershed centroid on the isohyetal map developed by Sonoma County Water Agency (http://www.sonoma-county.org/prmd/docs/landscape_ ord/rainfall_ map.pdf). Furthermore, this mean annual precipitation value is consistent with the following data. At Petaluma Fire Station 3 (046826), average annual precipitation between 1893 and 2007 was about 25 inches, whereas, a shorter record from Mare Island (045333) between 1961 and 1975 reports a somewhat lower average annual precipitation of about 20 inches (Desert Research Institute Regional Climate Summaries; http://www.wrcc.dri.edu/Climsum.html). A long record from the City of Sonoma between 1899 to 1907 and 1931 to 1997 reports an annual average of 29.2 inches (see Figure 4 in McKee et al. 2000). Thus, it can be concluded that the average annual precipitation in the Tolay watershed is 20-30 inches and 25 inches is a suitable estimate.

2. Hydraulic Structures and Channels Photographs

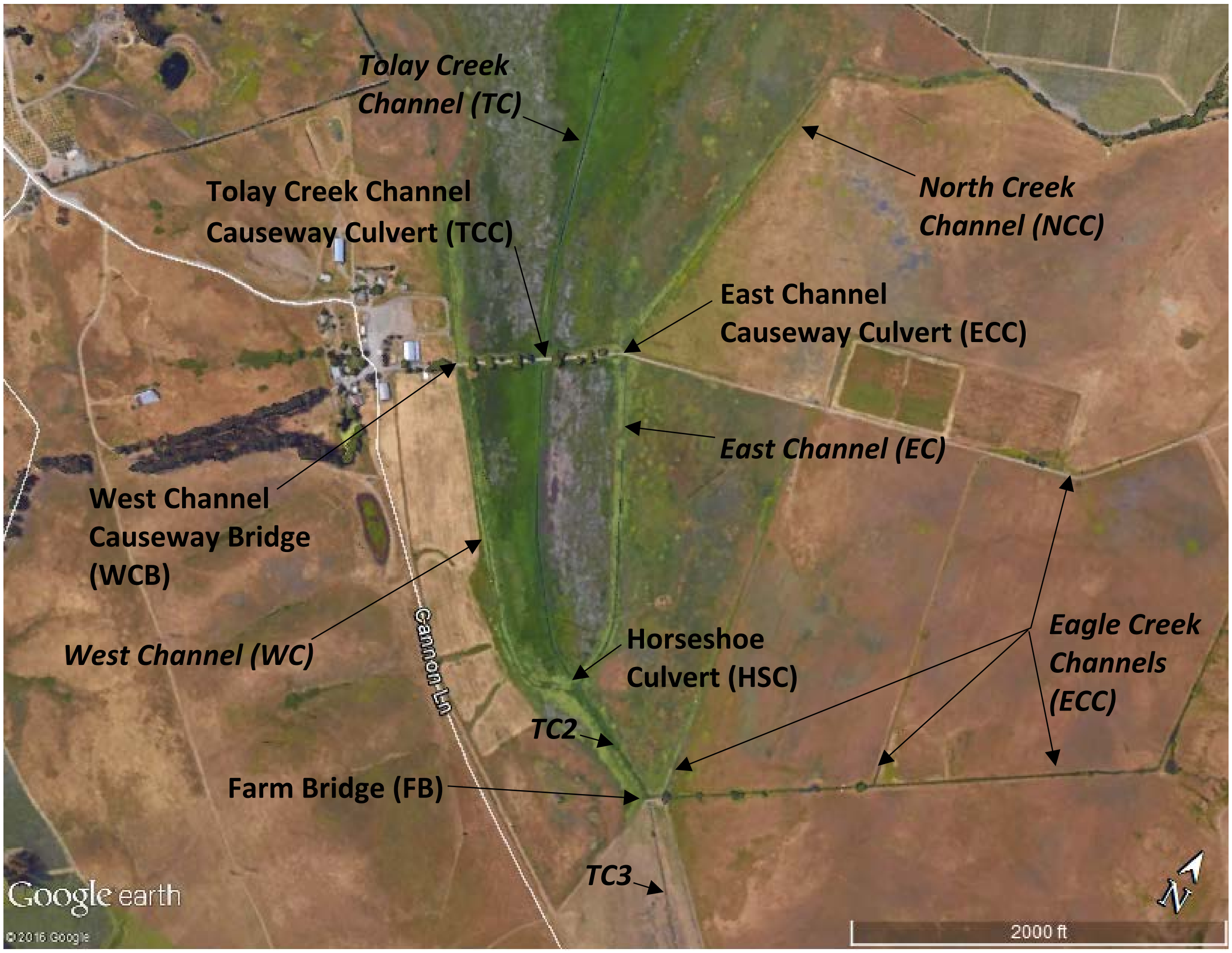


Figure 1. Hydraulic structures and channels and nomenclature used for modeling (channels in italics).


Figure 2. West Channel Causeway Culvert inlet.


Figure 3. West Channel Causeway Bridge.


Figure 4. West Channel downstream of Causeway (viewed from Causeway).


Figure 5. Tolay Creek Channel (TC) downstream of Causeway (looking upstream from the Horseshoe).


Figure 6. East Channel Causeway Culvert inlet.


Figure 7. East Channel Causeway Culvert outlet.

Figure 8. East Channel downstream of Causeway.

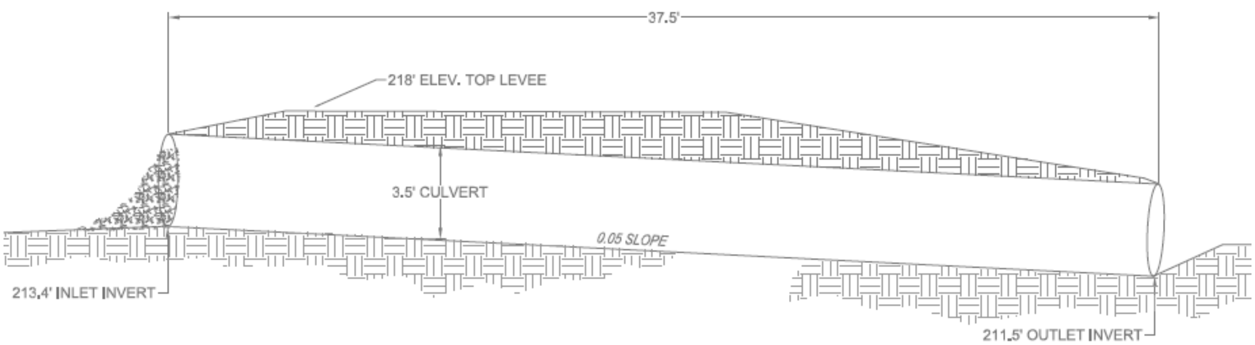


Figure 9. Horseshoe Culvert approximate profile.

Figure 10. Tolay Creek Channel (TC2) downstream of Horseshoe (looking upstream from Farm Bridge).

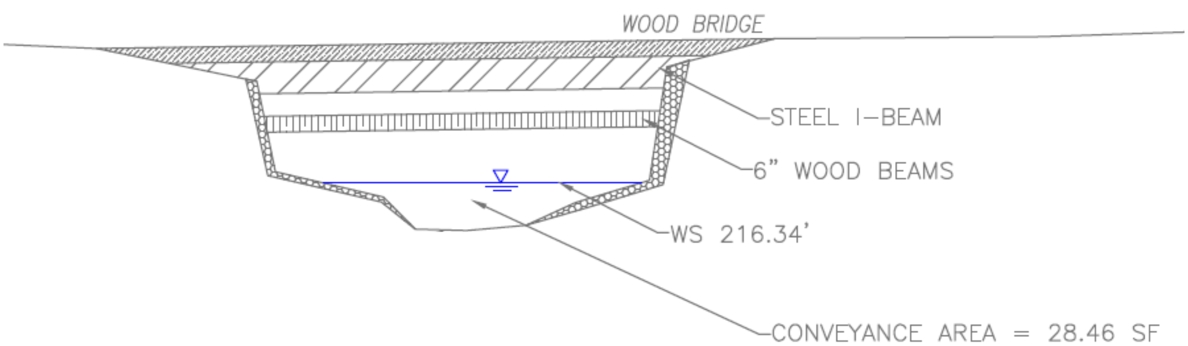


Figure 11. Farm bridge cross-section looking downstream (bottom of wood beams approximately 3 feet above thalweg; bottom of wood beams approximately 4 feet above thalweg).

Figure 12. Tolay Creek looking downstream from the Farm Bridge.

Figure 13. Confluence of Tolay Creek (from the left) and Eagle Creek (from the right) as seen from the Farm Bridge.

3. Stage Areas

Table 2: Stage Areas.

Pond/Stage	Upper Pond[1]	Lower Pond[1]	Total[2]
Stage 213ft: Area (acres)	19.8	0	19.8 (lake bottom)
Stage 214ft: Area (acres)	51.1	0	51.1
Stage 215ft: Area (acres)	75.1	0	75.1
Stage 216ft: Area (acres)	88.8	9.9	98.7
Stage 217ft: Area (acres)	104.7	24.6	129.3
Stage 218ft: Area (acres)	131.3	40.4	171.7
Stage 219ft: Area (acres)	171.0	67.6	238.6

[1]Upper Pond defined as Tolay Lake upstream of Causeway, Lower Pond defined as Tolay Lake downstream of Causeway and upstream of Farm Bridge. [2]Total stage area from WRA (2013), see Figure 24 below.

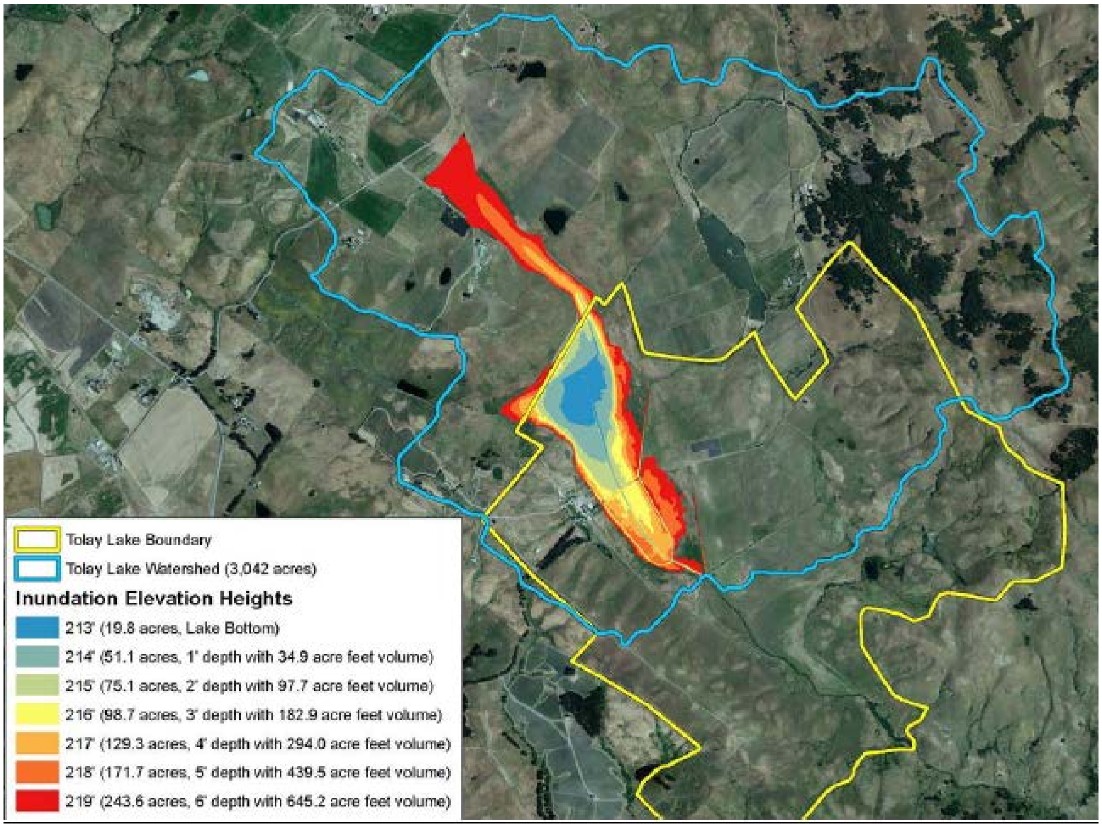


Figure 14. Stage areas from WRA (2013).

4. Proposed Conditions

The preferred restoration alternative, from WRA (2013), is illustrated in Figures 15-17 below.

Restoration Actions to Restore Original Hydrology within Lake:

1. Fill Central Lakebed Channel B (Tolay Creek Channel)
2. Fill Central Lakebed Channel A (Tolay Creek Channel)
3. Fill Drainage Channel 2 (West Channel)

Restoration Actions to Restore Wet Meadow:

4. Remove North Creek Drainage Channels and Culvert
5. Remove Eagle Creek Drainage Channel
6. Fill East-West Drainage Channel (Eagle Creek Channel)
7. Fill Pumpkin Patch Drainage Channels A and B
8. Fill Drainage Channel 1 (Eagle Creek Channel)

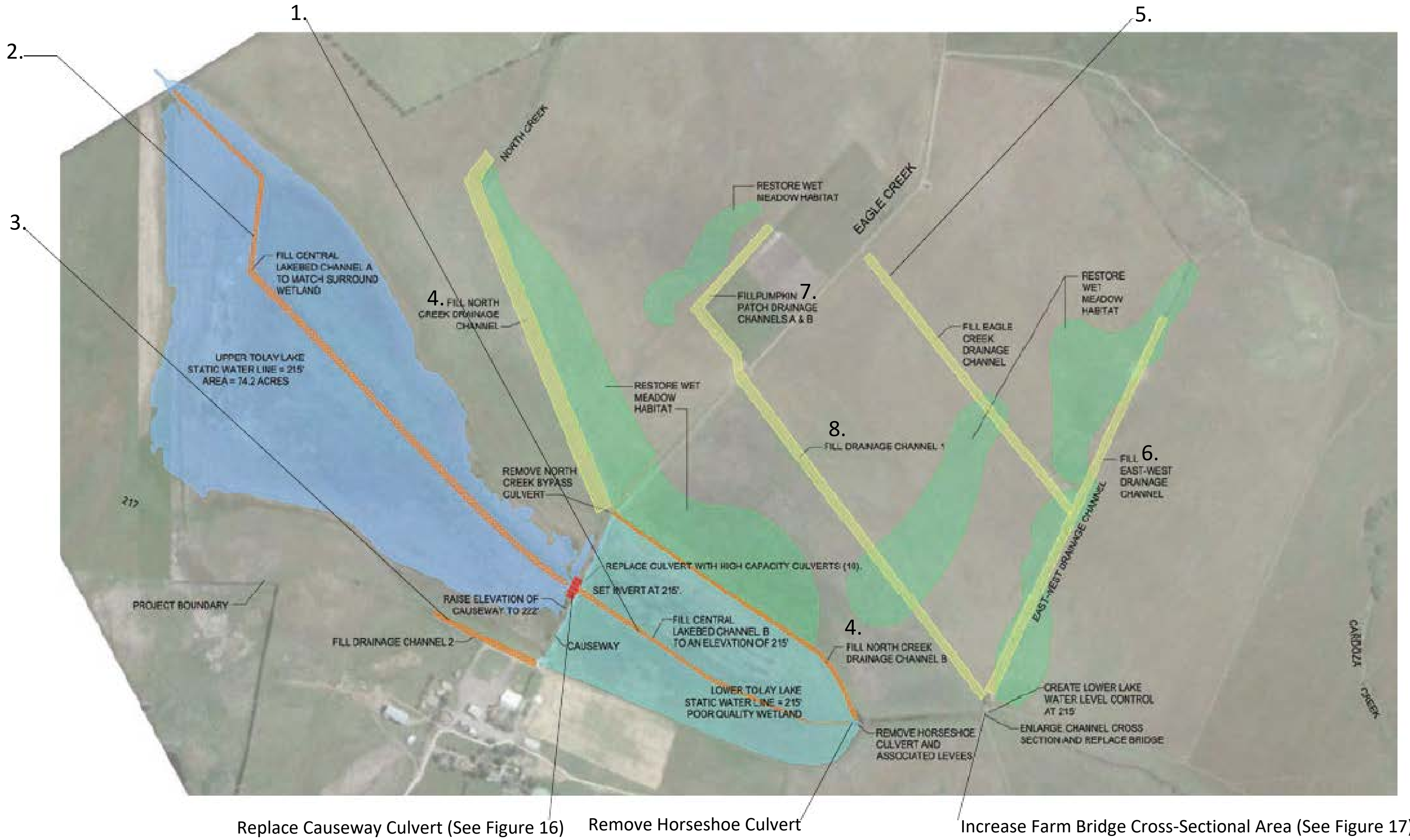
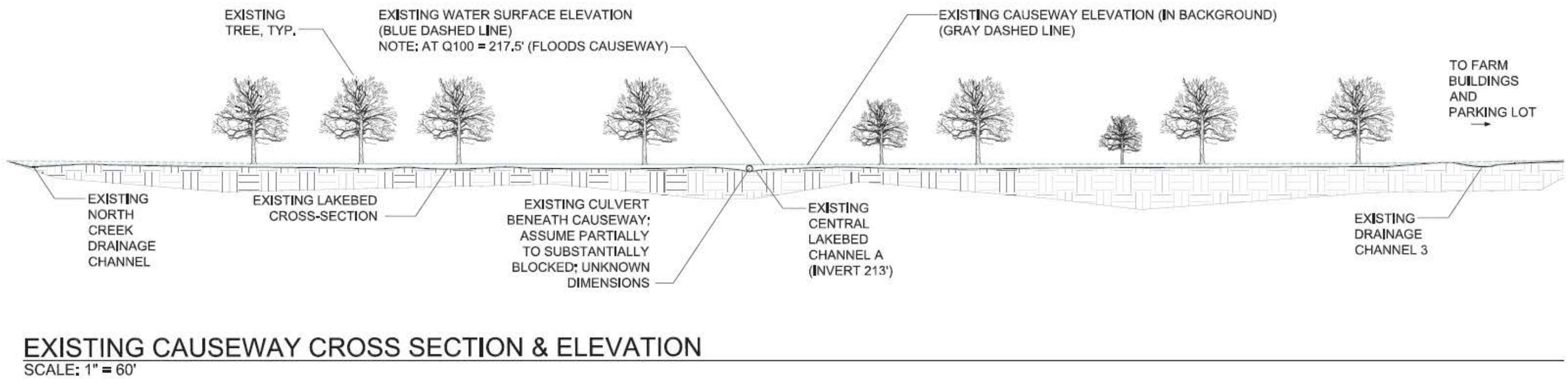


Figure 15. Preferred Restoration Alternative (WRA 2013).



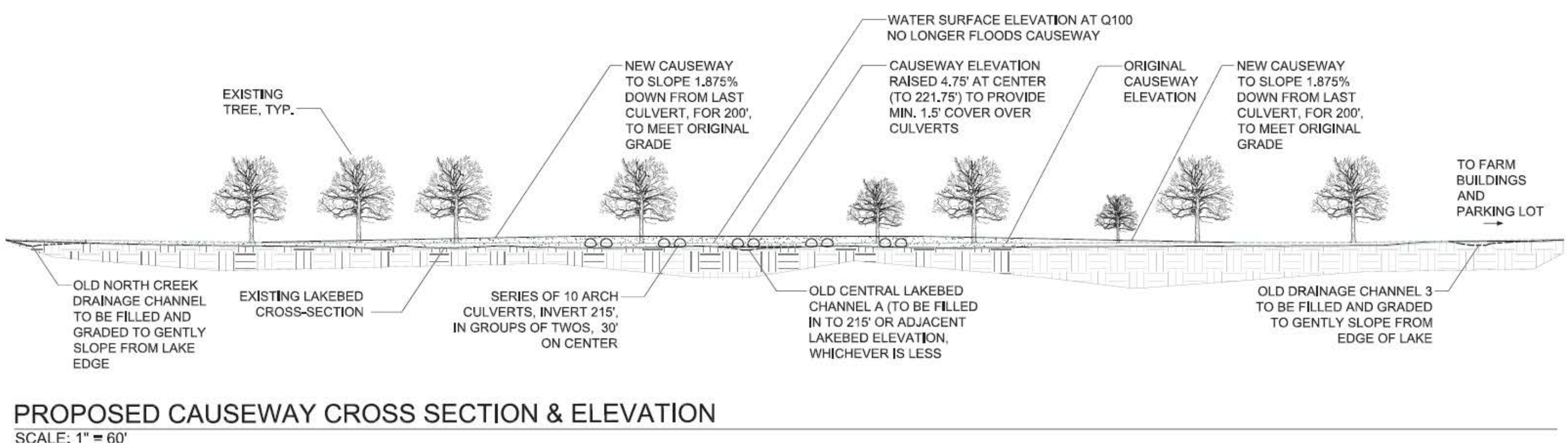


Figure 16. Proposed Tolay Creek Channel Causeway Culvert improvements.

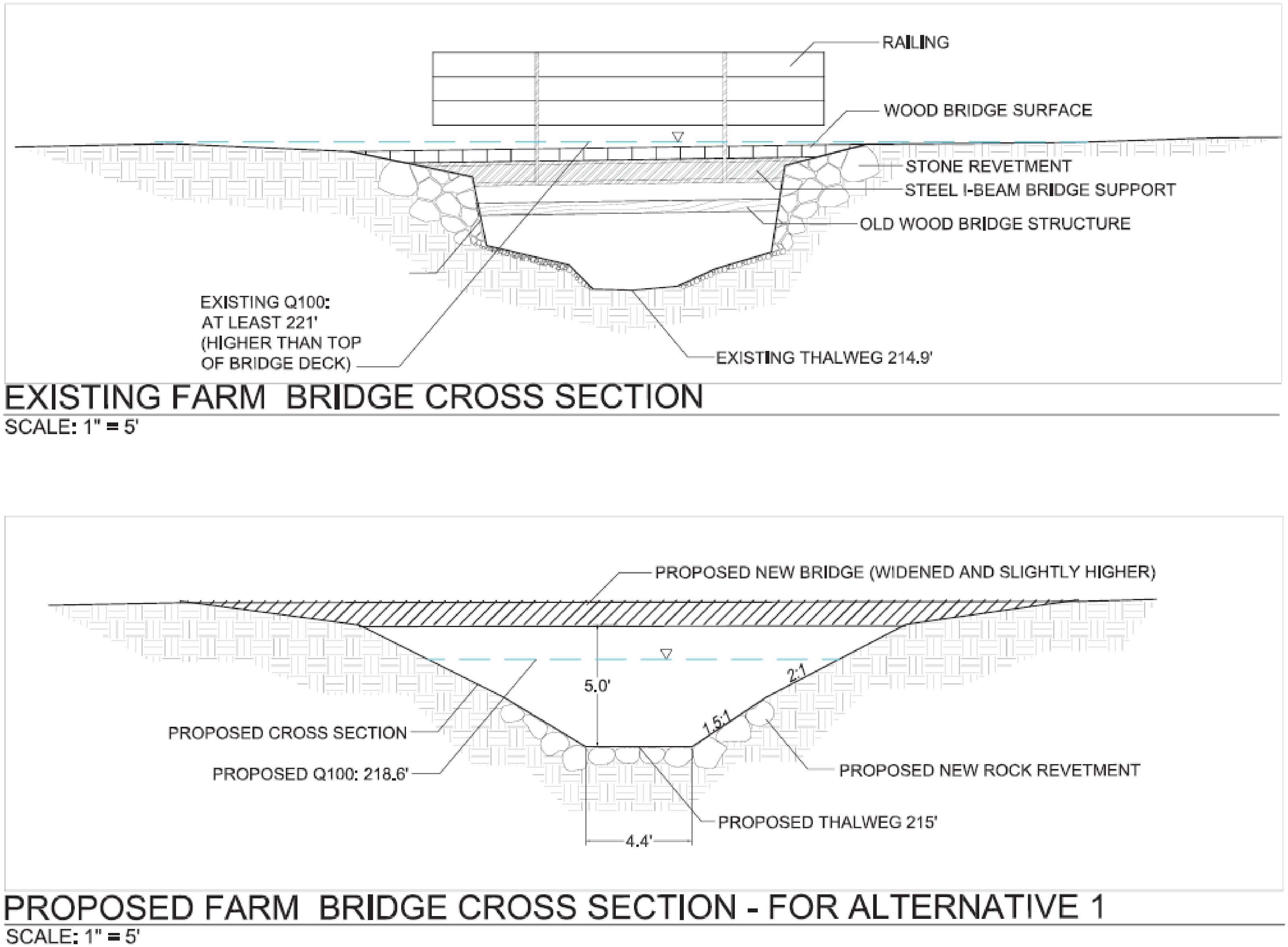


Figure 17. Proposed Farm Bridge improvements.

5. Additional Information

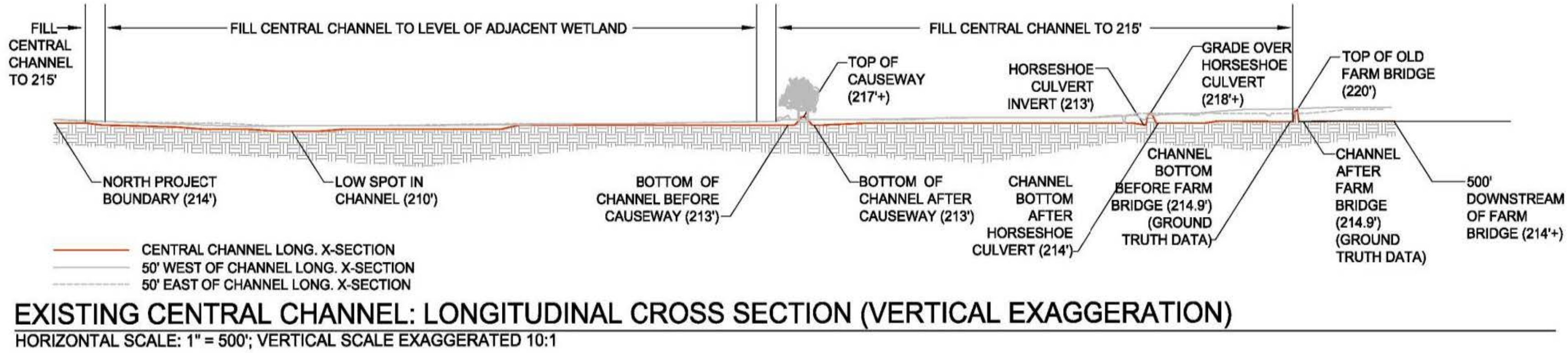


Figure 18. Central Channel longitudinal cross-section from WRA (2013).

Appendix G

Traffic Modeling Sheets

DISCLAIMER: Due to the nature and length of this appendix, this document is not available as an accessible document. If you need assistance accessing the contents of this document, please contact Victoria Willard, ADA Coordinator for Sonoma County, at (707) 565-2331, or through the California Relay Service by dialing 711. For an explanation of the contents of this document, please direct inquiries to Karen Davis-Brown, Park Planner II, Sonoma County Regional Parks Department at (707) 565-2041.

Turn Lane Warrant Analysis - 4 Legged Intersections

Study Intersection: SR 121/Phase B Project Access
Study Scenario: Weekday PM Future 2040 plus Phase B

Direction of Analysis Street: North/South

Phase B Project Access

SR 121
Northbound Volumes (veh/hr)
Left Turn Volume = 2
Through Volume = 730
Right Turn Volume = 18

SR 121
Southbound Volumes (veh/hr)
6 = Right Turn Volume
1042 = Through Volume
0 = Left Turn Volume

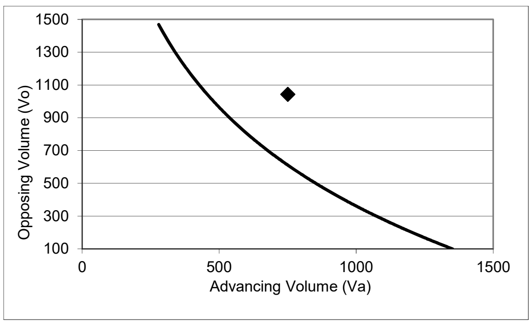
Northbound Speed Limit: 55 mph
Northbound Configuration: 2 Lanes Undivided

Ram's Gate Winery

Southbound Speed Limit: 55 mph
Southbound Configuration: 2 Lanes Undivided

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.3 %
Advancing Volume Threshold AV 457 veh/hr
If AV<Va then warrant is met

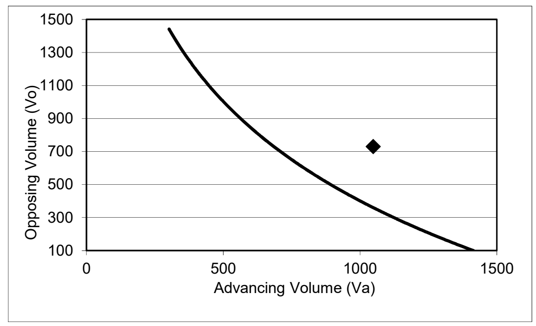


◆ Study Intersection
—— Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Southbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.0 %
Advancing Volume Threshold AV 685 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
—— Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Note: If one direction has a left turn lane warranted, a left turn lane should be installed on the other side as well

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold: AV = -
Advancing Volume Va = 750
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold: AV = -
Advancing Volume Va = 1048
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Northbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 40 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold AV = 733.3
Advancing Volume Va = 750
If AV<Va then warrant is met Yes

Right Turn Taper Warranted: YES

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold AV = -
Advancing Volume Va = 1048
If AV<Va then warrant is met -

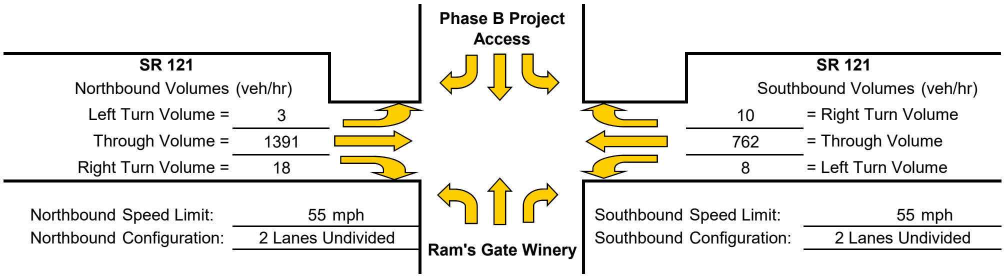
Right Turn Taper Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, Jan. 1997. The right turn lane and taper analysis is based on work conducted by Cottrell in 1981. The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

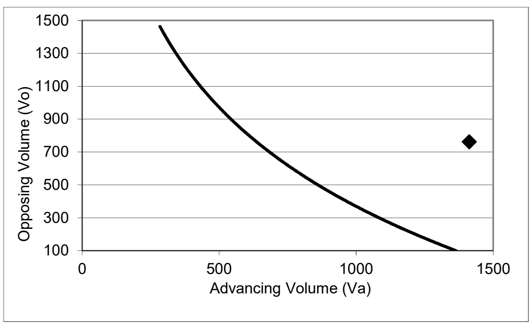
Turn Lane Warrant Analysis - 4 Legged Intersections

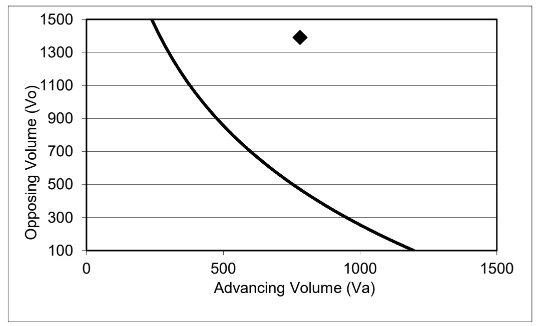
Study Intersection: SR 121/Phase B Project Access
Study Scenario: Weekend Midday Future 2040 plus Phase B

Direction of Analysis Street: North/South



Northbound Left Turn Lane Warrants		**Southbound Left Turn Lane Warrants**	
Percentage Left Turns %lt	0.2 %	Percentage Left Turns %lt	1.0 %
Advancing Volume Threshold AV	637 veh/hr	Advancing Volume Threshold AV	271 veh/hr
If AV<Va then warrant is met		If AV<Va then warrant is met	





Northbound:
◆ Study Intersection
—— Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Southbound:
◆ Study Intersection
—— Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Note: If one direction has a left turn lane warranted, a left turn lane should be installed on the other side as well

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold: AV =	-
Advancing Volume Va =	1412
If AV<Va then warrant is met	-

Right Turn Lane Warranted: NO

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold: AV =	-
Advancing Volume Va =	780
If AV<Va then warrant is met	-

Right Turn Lane Warranted: NO

Northbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 40 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold AV =	733.3
Advancing Volume Va =	1412
If AV<Va then warrant is met	Yes

Right Turn Taper Warranted: YES

Southbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold AV =	-
Advancing Volume Va =	780
If AV<Va then warrant is met	-

Right Turn Taper Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, Jan. 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981. The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - 4 Legged Intersections

Study Intersection: SR 121/Phase B Project Access
Study Scenario: Weekend Midday Future 2040 plus Fall Festival

Direction of Analysis Street: North/South

Phase B Project Access

SR 121
Northbound Volumes (veh/hr)
Left Turn Volume = 7
Through Volume = 1391
Right Turn Volume = 18

SR 121
Southbound Volumes (veh/hr)
21 = Right Turn Volume
762 = Through Volume
8 = Left Turn Volume

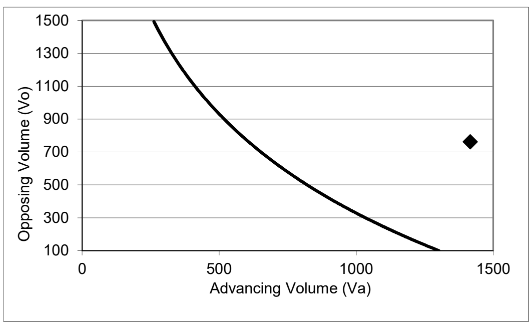
Northbound Speed Limit: 55 mph
Northbound Configuration: 2 Lanes Undivided

Ram's Gate Winery

Southbound Speed Limit: 55 mph
Southbound Configuration: 2 Lanes Undivided

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.5 %
Advancing Volume Threshold AV 608 veh/hr
If AV<Va then warrant is met

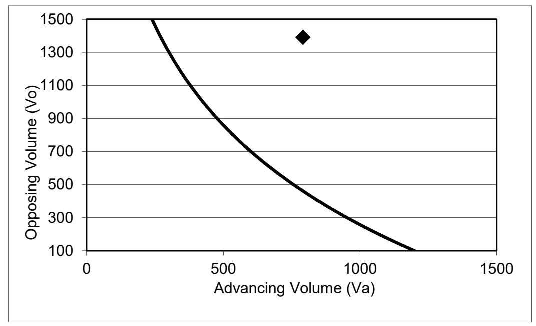


◆ Study Intersection
Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Southbound Left Turn Lane Warrants

Percentage Left Turns %lt 1.0 %
Advancing Volume Threshold AV 271 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 55 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: YES

Note: If one direction has a left turn lane warranted, a left turn lane should be installed on the other side as well

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
   Advancing Volume Threshold: AV = -
   Advancing Volume Va = 1416
   If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Northbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 40 vehicles

2. Check advance volume threshold criteria for taper
   Advancing Volume Threshold AV = 733.3
   Advancing Volume Va = 1416
   If AV<Va then warrant is met Yes

Right Turn Taper Warranted: YES

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
   Advancing Volume Threshold: AV = -
   Advancing Volume Va = 791
   If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for taper
   Advancing Volume Threshold AV = 490
   Advancing Volume Va = 791
   If AV<Va then warrant is met Yes

Right Turn Taper Warranted: YES

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, Jan. 1997. The right turn lane and taper analysis is based on work conducted by Cottrell in 1981. The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Warrant 3: Peak-Hour Volumes and Delay

Sonoma County
Lakeville Highway & Stage Gulch Rd

SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Stage Gulch Rd
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	30

Population less than 10,000? No
Date of Count: Tuesday, August 23, 2016
Scenario: PM Existing

Warrant 3 Met?: Met when either Condition A or B is met — **Yes**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach

Minor Approach Delay: 1.82 vehicle-hours

Condition A2 — Not Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 83 vph

Condition A3 — Met

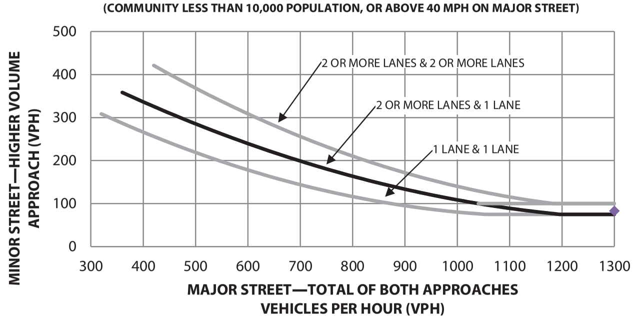
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 1982 vph

Condition B — Met

The plotted point falls above the curve

Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



Warrant 3: Peak-Hour Volumes and Delay

Sonoma County
Lakeville Highway & Stage Gulch Rd

SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Stage Gulch Rd
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	30

Population less than 10,000? No
Date of Count: Saturday, August 06, 2016
Scenario: Midday Weekend Existing

Warrant 3 Met?: Met when either Condition A or B is met — **Yes**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach

Minor Approach Delay: 1.41 vehicle-hours

Condition A2 — Not Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 79 vph

Condition A3 — Met

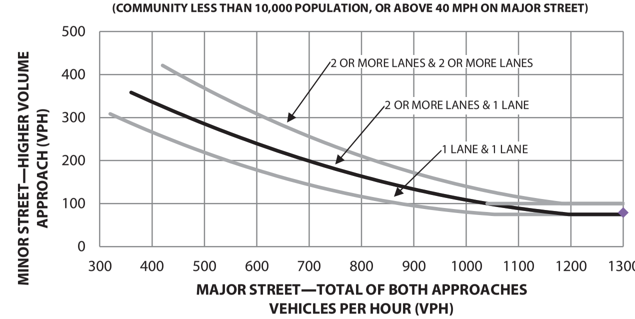
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 2115 vph

Condition B — Met

The plotted point falls above the curve

Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



Warrant 3: Peak-Hour Volumes and Delay

Sonoma County
Lakeville Highway & Cannon Lane

SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Cannon Lane
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	25

Population less than 10,000? No
Date of Count: Tuesday, August 23, 2016
Scenario: PM Future 2040

Warrant 3 Met?: Met when either Condition A or B is met — **No**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach

Minor Approach Delay: 0.22 vehicle-hours

Condition A2 — Not Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 19 vph

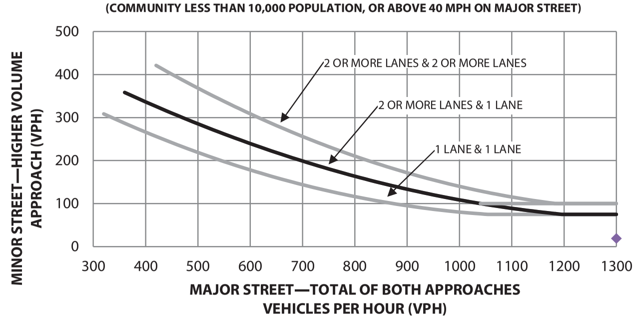
Condition A3 — Met

The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 2776 vph

Condition B — Not Met

The plotted point falls above the curve



Warrant 3: Peak-Hour Volumes and Delay

Sonoma County
Lakeville Highway & Cannon Lane

SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Cannon Lane
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	25

Population less than 10,000? No
Date of Count: Tuesday, August 23, 2016
Scenario: PM Future 2040 plus Phase B

Warrant 3 Met?: Met when either Condition A or B is met — **No**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach

Minor Approach Delay: 0.78 vehicle-hours

Condition A2 — Not Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 40 vph

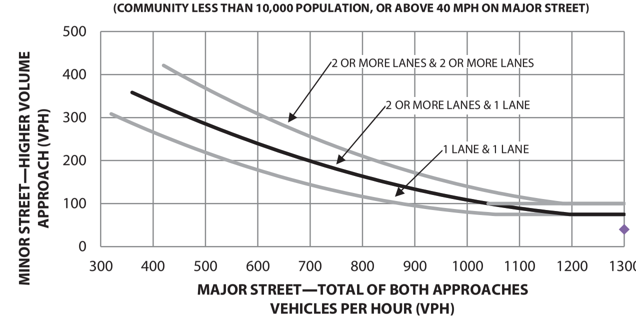
Condition A3 — Met

The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 2830 vph

Condition B — Not Met

The plotted point falls above the curve



Warrant 3: Peak-Hour Volumes and Delay

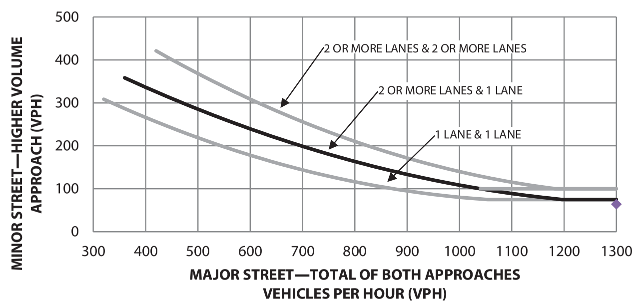
Sonoma County
Lakeville Highway & Cannon Lane
SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Cannon Lane
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	25

Population less than 10,000? No
Date of Count: Saturday, August 06, 2016
Scenario: Midday Weekend Future 2040 Plus Phase B

Warrant 3 Met?: Met when either Condition A or B is met	**No**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 3.21 vehicle-hours	
Condition A2	Not Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 64 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 2940 vph	
Condition B	Not Met
The plotted point falls above the curve	

Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



Warrant 3: Peak-Hour Volumes and Delay

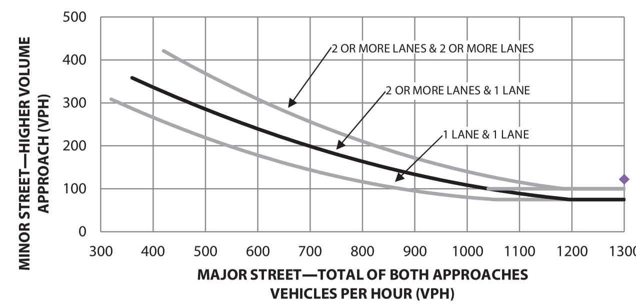
Sonoma County
Lakeville Highway & Cannon Lane
SOX568

	Major Street	Minor Street
Street Name	Lakeville Highway	Cannon Lane
Direction	N-S	E-W
Number of Lanes	2	1
Approach Speed	55	25

Population less than 10,000? No
Date of Count: Saturday, August 06, 2016
Scenario: Midday Weekend Future 2040 Plus Special Event

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Met
Condition A1	Met
The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one lane approach, or five vehicle-hours for a two-lane approach	
Minor Approach Delay: 15.33 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 122 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 3056 vph	
Condition B	Met
The plotted point falls above the curve	

Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION, OR ABOVE 40 MPH ON MAJOR STREET)



Intersection						
Int Delay, s/veh	5.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	18	65	1074	257	187	381
Future Vol, veh/h	18	65	1074	257	187	381
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	7	5	2	4	9
Mvmt Flow	20	71	1167	279	203	414

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2128	1307	0	0	1447	0
Stage 1	1307	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.236	-
Pot Cap-1 Maneuver	55	190	-	-	462	-
Stage 1	256	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	31	190	-	-	462	-
Mov Cap-2 Maneuver	31	-	-	-	-	-
Stage 1	256	-	-	-	-	-
Stage 2	244	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	78.8	0	6.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	31	190	462	-
HCM Lane V/C Ratio	-	-	0.631	0.372	0.44	-
HCM Control Delay (s)	-	-	237.8	34.8	18.8	-
HCM Lane LOS	-	-	F	D	C	-
HCM 95th %tile Q(veh)	-	-	2.1	1.6	2.2	-

Intersection						
Int Delay, s/veh	3.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	17	62	1171	147	125	593
Future Vol, veh/h	17	62	1171	147	125	593
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	65	1233	155	132	624

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2197	1310	0	0	1387	0
Stage 1	1310	-	-	-	-	-
Stage 2	887	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	49	194	-	-	494	-
Stage 1	252	-	-	-	-	-
Stage 2	402	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	36	194	-	-	494	-
Mov Cap-2 Maneuver	36	-	-	-	-	-
Stage 1	252	-	-	-	-	-
Stage 2	295	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	64.3	0	2.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	36	194	494	-
HCM Lane V/C Ratio	-	-	0.497	0.336	0.266	-
HCM Control Delay (s)	-	-	179.4	32.7	14.9	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	1.7	1.4	1.1	-

HCM 2010 TWSC
2: Lakeville Hwy & Cannon Lane

Intersection						
Int Delay, s/veh	0.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	0	16	1304	2	3	395
Future Vol, veh/h	0	16	1304	2	3	395
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	4	0	0	10
Mvmt Flow	0	18	1449	2	3	439

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1896	1450	0	0	1451	0
Stage 1	1450	-	-	-	-	-
Stage 2	446	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	77	162	-	-	473	-
Stage 1	218	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	77	162	-	-	473	-
Mov Cap-2 Maneuver	77	-	-	-	-	-
Stage 1	218	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.9	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	162	473	-
HCM Lane V/C Ratio	-	-	-	0.11	0.007	-
HCM Control Delay (s)	-	-	0	29.9	12.7	-
HCM Lane LOS	-	-	A	D	B	-
HCM 95th %tile Q(veh)	-	-	-	0.4	0	-

HCM 2010 TWSC
2: Lakeville Hwy & Cannon Lane

Intersection						
Int Delay, s/veh	0.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	1	6	1298	2	7	586
Future Vol, veh/h	1	6	1298	2	7	586
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	6	1366	2	7	617

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1999	1367	0	0	1368	0
Stage 1	1367	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	66	180	-	-	502	-
Stage 1	237	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	65	180	-	-	502	-
Mov Cap-2 Maneuver	65	-	-	-	-	-
Stage 1	237	-	-	-	-	-
Stage 2	523	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	30.8	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	65	180	502	-
HCM Lane V/C Ratio	-	-	0.016	0.035	0.015	-
HCM Control Delay (s)	-	-	61.3	25.7	12.3	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	0	0.1	0	-

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	581	1072	1	0	941	564	0	1	0	297	0	135
Future Volume (veh/h)	581	1072	1	0	941	564	0	1	0	297	0	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	10	160	0	0	5	2	0	0	0	14	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	599	1105	1	0	970	581	0	1	0	349	0	93
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	778	2443	1	2	1549	512	0	3	0	518	0	562
Arrive On Green	0.22	0.71	0.71	0.00	0.45	0.45	0.00	0.00	0.00	0.13	0.00	0.13
Sat Flow, veh/h	3442	3628	3	1774	3539	1583	0	1863	0	3548	0	1583
Grp Volume(v), veh/h	599	539	567	0	970	581	0	1	0	349	0	93
Grp Sat Flow(s),veh/h/ln	1721	1770	1862	1774	1770	1583	0	1863	0	1774	0	1583
Q Serve(g_s), s	16.2	12.4	12.4	0.0	20.4	31.2	0.0	0.1	0.0	9.3	0.0	4.0
Cycle Q Clear(g_c), s	16.2	12.4	12.4	0.0	20.4	31.2	0.0	0.1	0.0	9.3	0.0	4.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	778	1191	1257	2	1549	512	0	3	0	518	0	562
V/C Ratio(X)	0.77	0.45	0.45	0.00	0.63	1.14	0.00	0.39	0.00	0.67	0.00	0.17
Avail Cap(c_a), veh/h	1398	1285	1352	252	1617	724	0	284	0	1261	0	910
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.7	16.2	15.7	0.0	23.4	47.1	0.0	56.0	0.0	42.1	0.0	22.0
Incr Delay (d2), s/veh	2.3	0.6	0.5	0.0	1.1	78.7	0.0	77.0	0.0	1.8	0.0	0.2
Initial Q Delay(d3),s/veh	5.2	59.3	53.1	0.0	0.2	12.3	0.0	0.0	0.0	16.1	0.0	0.1
%ile BackOfQ(50%),veh/ln	9.6	45.8	45.1	0.0	11.6	32.8	0.0	0.1	0.0	7.1	0.0	2.1
LnGrp Delay(d),s/veh	45.2	76.2	69.4	0.0	24.7	138.1	0.0	133.0	0.0	60.0	0.0	22.3
LnGrp LOS	D	E	E		C	F		F		E		C
Approach Vol, veh/h		1705			1551			1			442	
Approach Delay, s/veh		63.0			67.2			133.0			52.1	
Approach LOS		E			E			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		4.1	0.0	76.6		17.7	25.6	51.1
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	71.5		35.0	40.0	45.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	14.4		11.3	18.2	33.2
Green Ext Time (p_c), s		0.0	0.0	49.5		1.9	3.4	11.3

Intersection Summary		
HCM 2010 Ctrl Delay		63.5
HCM 2010 LOS		E

Notes

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	731	1540	10	1	1116	568	2	8	4	576	1	80
Future Volume (veh/h)	731	1540	10	1	1116	568	2	8	4	576	1	80
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	761	1604	10	1	1162	592	2	8	4	626	0	56
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	612	2129	10	2	1423	596	4	15	8	761	0	669
Arrive On Green	0.21	0.62	0.62	0.00	0.41	0.41	0.02	0.02	0.02	0.21	0.00	0.21
Sat Flow, veh/h	3442	3606	22	1774	3539	1583	252	1006	503	3548	0	1583
Grp Volume(v), veh/h	761	787	827	1	1162	592	14	0	0	626	0	56
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1761	0	0	1774	0	1583
Q Serve(g_s), s	26.0	37.2	37.2	0.1	35.6	43.5	1.0	0.0	0.0	20.8	0.0	2.6
Cycle Q Clear(g_c), s	26.0	37.2	37.2	0.1	35.6	43.5	1.0	0.0	0.0	20.8	0.0	2.6
Prop In Lane	1.00		0.01	1.00		1.00	0.14		0.29	1.00		1.00
Lane Grp Cap(c), veh/h	612	1043	1099	2	1423	596	27	0	0	761	0	669
V/C Ratio(X)	1.24	0.75	0.75	0.52	0.82	0.99	0.52	0.00	0.00	0.82	0.00	0.08
Avail Cap(c_a), veh/h	728	1102	1157	202	1584	708	215	0	0	1270	0	902
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.1	24.2	23.8	66.7	34.6	45.6	65.3	0.0	0.0	46.7	0.0	21.5
Incr Delay (d2), s/veh	122.8	3.6	3.4	133.3	3.8	32.0	15.0	0.0	0.0	2.8	0.0	0.1
Initial Q Delay(d3),s/veh	23.3	16.9	15.1	0.0	1.2	9.2	0.0	0.0	0.0	1.7	0.0	0.1
%ile BackOfQ(50%),veh/ln	25.3	34.8	35.4	0.1	20.1	30.8	0.6	0.0	0.0	11.2	0.0	1.5
LnGrp Delay(d),s/veh	206.1	44.6	42.2	200.0	39.7	86.8	80.3	0.0	0.0	51.2	0.0	21.6
LnGrp LOS	F	D	D	F	D	F	F			D		C
Approach Vol, veh/h		2375			1755			14			682	
Approach Delay, s/veh		95.5			55.7			80.3			48.8	
Approach LOS		F			E			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		5.9	3.6	83.0		30.4	30.0	56.7
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	67.5		44.0	26.0	55.0
Max Q Clear Time (g_c+I1), s		3.0	2.1	39.2		22.8	28.0	45.5
Green Ext Time (p_c), s		0.0	0.0	27.8		3.1	0.0	4.7

Intersection Summary		
HCM 2010 Ctrl Delay		74.4
HCM 2010 LOS		E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	488	865	0	0	1012	94	0	0	0	345	0	0
Future Volume (veh/h)	488	865	0	0	1012	94	0	0	0	345	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	20	400	0	0	20	3	0	0	0	30	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	493	874	0	0	1022	0	0	0	0	348	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	665	2359	0	2	1776	1052	0	2	0	553	349	0
Arrive On Green	0.18	0.77	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.13	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	0	1863	0	3548	1863	0
Grp Volume(v), veh/h	493	874	0	0	1022	0	0	0	0	348	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	0	1863	0	1774	1863	0
Q Serve(g_s), s	13.4	7.3	0.0	0.0	17.6	0.0	0.0	0.0	0.0	9.2	0.0	0.0
Cycle Q Clear(g_c), s	13.4	7.3	0.0	0.0	17.6	0.0	0.0	0.0	0.0	9.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	665	2359	0	2	1776	1052	0	2	0	553	349	0
V/C Ratio(X)	0.74	0.37	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.63	0.00	0.00
Avail Cap(c_a), veh/h	1560	3299	0	256	2187	1181	0	365	0	1608	844	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	42.2	27.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	44.5	0.0	0.0
Incr Delay (d2), s/veh	1.7	0.4	0.0	0.0	1.1	0.0	0.0	0.0	0.0	1.2	0.0	0.0
Initial Q Delay(d3),s/veh	25.3	327.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	57.3	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.5	159.7	0.0	0.0	15.1	0.0	0.0	0.0	0.0	12.3	0.0	0.0
LnGrp Delay(d),s/veh	69.1	354.3	0.0	0.0	27.2	0.0	0.0	0.0	0.0	102.9	0.0	0.0
LnGrp LOS	E	F			C					F		
Approach Vol, veh/h		1367			1022			0			348	
Approach Delay, s/veh		251.5			27.2			0.0			102.9	
Approach LOS		F			C						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		0.0	0.0	80.7		16.4	21.1	59.6
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		0.0	0.0	9.3		11.2	15.4	19.6
Green Ext Time (p_c), s		0.0	0.0	59.2		1.2	1.7	34.0

Intersection Summary		
HCM 2010 Ctrl Delay		148.9
HCM 2010 LOS		F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	895	1197	0	1	1120	136	1	0	0	80	0	0
Future Volume (veh/h)	895	1197	0	1	1120	136	1	0	0	80	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	904	1209	0	1	1131	0	1	0	0	81	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	917	2376	0	2	1286	961	2	0	0	176	372	0
Arrive On Green	0.30	0.81	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	904	1209	0	1	1131	0	1	0	0	81	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	28.2	11.0	0.0	0.1	25.8	0.0	0.1	0.0	0.0	2.5	0.0	0.0
Cycle Q Clear(g_c), s	28.2	11.0	0.0	0.1	25.8	0.0	0.1	0.0	0.0	2.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	917	2376	0	2	1286	961	2	0	0	176	372	0
V/C Ratio(X)	0.99	0.51	0.00	0.52	0.88	0.00	0.52	0.00	0.00	0.46	0.00	0.00
Avail Cap(c_a), veh/h	1345	2875	0	221	1885	905	299	0	0	1386	728	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	60.6	24.4	0.0	74.8	52.6	0.0	74.8	0.0	0.0	53.6	0.0	0.0
Incr Delay (d2), s/veh	17.7	0.6	0.0	172.0	7.5	0.0	133.8	0.0	0.0	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	52.6	103.8	0.0	0.0	85.9	0.0	0.0	0.0	0.0	43.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.8	75.1	0.0	0.1	46.0	0.0	0.1	0.0	0.0	3.3	0.0	0.0
LnGrp Delay(d),s/veh	130.9	128.8	0.0	246.8	146.0	0.0	208.6	0.0	0.0	98.4	0.0	0.0
LnGrp LOS	F	F		F	F		F			F		
Approach Vol, veh/h		2113			1132			1			81	
Approach Delay, s/veh		129.7			146.0			208.6			98.4	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.1	3.6	97.5		8.4	37.4	63.7
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		2.1	2.1	13.0		4.5	30.2	27.8
Green Ext Time (p_c), s		0.0	0.0	71.0		0.3	3.2	29.9

Intersection Summary		
HCM 2010 Ctrl Delay		134.5
HCM 2010 LOS		F

Notes

HCM 2010 TWSC
5: SR 121 (Arnold Dr) & Project Driveway /Ram's gate South Entrance

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	2	0	531	0	0	758	0
Future Vol, veh/h	0	0	0	1	0	2	0	531	0	0	758	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	2	0	553	0	0	790	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1343	1343	790	1343	1343	553	-	0	0	553	0	0
Stage 1	790	790	-	553	553	-	-	-	-	-	-	-
Stage 2	553	553	-	790	790	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	129	152	390	129	152	533	0	-	-	1017	-	-
Stage 1	383	402	-	517	514	-	0	-	-	-	-	-
Stage 2	517	514	-	383	402	-	0	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	128	152	390	129	152	533	-	-	-	1017	-	-
Mov Cap-2 Maneuver	128	152	-	129	152	-	-	-	-	-	-	-
Stage 1	383	402	-	517	514	-	-	-	-	-	-	-
Stage 2	515	514	-	383	402	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	18.9	0	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	-	-	-	129	533	1017	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.004	-	-	-
HCM Control Delay (s)	-	-	0	33.1	11.8	0	-	-
HCM Lane LOS	-	-	A	D	B	A	-	-
HCM 95th %tile Q(veh)	-	-	-	0	0	0	-	-

HCM 2010 TWSC
5: SR 121 (Arnold Dr) & Project Driveway

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	16	0	1015	13	6	556	0
Future Vol, veh/h	0	0	0	1	0	16	0	1015	13	6	556	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	92	95	92	92	92	95	95	92	92	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	17	0	1068	14	7	585	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1673	1681	585	1673	1673	1075	585	0	0	1083	0	0
Stage 1	598	598	-	1075	1075	-	-	-	-	-	-	-
Stage 2	1075	1083	-	598	598	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	76	95	511	76	96	267	990	-	-	644	-	-
Stage 1	489	491	-	266	296	-	-	-	-	-	-	-
Stage 2	266	293	-	489	491	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	70	94	511	75	95	267	990	-	-	644	-	-
Mov Cap-2 Maneuver	70	94	-	75	95	-	-	-	-	-	-	-
Stage 1	489	486	-	266	296	-	-	-	-	-	-	-
Stage 2	249	293	-	484	486	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	21.4	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	990	-	-	-	75	267	644	-	-
HCM Lane V/C Ratio	-	-	-	-	0.014	0.065	0.01	-	-
HCM Control Delay (s)	0	-	-	0	53.7	19.4	10.6	-	-
HCM Lane LOS	A	-	-	A	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	0	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	66	1148	259	187	487
Future Vol, veh/h	27	66	1148	259	187	487
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	7	5	2	4	9
Mvmt Flow	27	66	1148	259	187	487

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2139	1278	0	0	1407	0
Stage 1	1278	-	-	-	-	-
Stage 2	861	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.236	-
Pot Cap-1 Maneuver	55	198	-	-	479	-
Stage 1	264	-	-	-	-	-
Stage 2	417	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	34	198	-	-	479	-
Mov Cap-2 Maneuver	34	-	-	-	-	-
Stage 1	264	-	-	-	-	-
Stage 2	254	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	99.5	0	4.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	34	198	479	-
HCM Lane V/C Ratio	-	-	0.794	0.333	0.39	-
HCM Control Delay (s)	-	-	264.5	32	17.2	-
HCM Lane LOS	-	-	F	D	C	-
HCM 95th %tile Q(veh)	-	-	2.8	1.4	1.8	-

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	19	69	1294	162	138	655
Future Vol, veh/h	19	69	1294	162	138	655
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	69	1294	162	138	655

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2306	1375	0	0	1456	0
Stage 1	1375	-	-	-	-	-
Stage 2	931	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	42	178	-	-	465	-
Stage 1	235	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	30	178	-	-	465	-
Mov Cap-2 Maneuver	30	-	-	-	-	-
Stage 1	235	-	-	-	-	-
Stage 2	270	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	82.3	0	2.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	30	178	465	-
HCM Lane V/C Ratio	-	-	0.633	0.388	0.297	-
HCM Control Delay (s)	-	-	245	37.5	16	-
HCM Lane LOS	-	-	F	E	C	-
HCM 95th %tile Q(veh)	-	-	2.1	1.7	1.2	-

Intersection						
Int Delay, s/veh	0.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↳		↰	↑
Traffic Vol, veh/h	0	17	1393	2	3	504
Future Vol, veh/h	0	17	1393	2	3	504
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	4	0	0	10
Mvmt Flow	0	17	1393	2	3	504

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1904	1394	0	0	1395	0
Stage 1	1394	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	77	175	-	-	497	-
Stage 1	232	-	-	-	-	-
Stage 2	607	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	77	175	-	-	497	-
Mov Cap-2 Maneuver	77	-	-	-	-	-
Stage 1	232	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.8	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	175	497	-
HCM Lane V/C Ratio	-	-	-	0.097	0.006	-
HCM Control Delay (s)	-	-	0	27.8	12.3	-
HCM Lane LOS	-	-	A	D	B	-
HCM 95th %tile Q(veh)	-	-	-	0.3	0	-

Intersection						
Int Delay, s/veh	0.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↳		↰	↑
Traffic Vol, veh/h	1	7	1434	2	8	648
Future Vol, veh/h	1	7	1434	2	8	648
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	7	1434	2	8	648

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2099	1435	0	0	1436	0
Stage 1	1435	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	57	164	-	-	473	-
Stage 1	219	-	-	-	-	-
Stage 2	512	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	56	164	-	-	473	-
Mov Cap-2 Maneuver	56	-	-	-	-	-
Stage 1	219	-	-	-	-	-
Stage 2	503	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	33.2	0	0.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	56	164	473	-
HCM Lane V/C Ratio	-	-	0.018	0.043	0.017	-
HCM Control Delay (s)	-	-	70.5	27.9	12.7	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	581	1220	1	0	1039	617	0	1	0	394	0	141
Future Volume (veh/h)	581	1220	1	0	1039	617	0	1	0	394	0	141
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	10	160	0	0	5	2	0	0	0	14	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	581	1220	1	0	1039	617	0	1	0	438	0	94
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	754	2397	1	2	1480	512	0	3	0	608	0	592
Arrive On Green	0.21	0.69	0.69	0.00	0.44	0.44	0.00	0.00	0.00	0.16	0.00	0.16
Sat Flow, veh/h	3442	3629	3	1774	3539	1583	0	1863	0	3548	0	1583
Grp Volume(v), veh/h	581	595	626	0	1039	617	0	1	0	438	0	94
Grp Sat Flow(s),veh/h/ln	1721	1770	1862	1774	1770	1583	0	1863	0	1774	0	1583
Q Serve(g_s), s	16.3	15.9	15.9	0.0	23.7	36.4	0.0	0.1	0.0	12.1	0.0	4.0
Cycle Q Clear(g_c), s	16.3	15.9	15.9	0.0	23.7	36.4	0.0	0.1	0.0	12.1	0.0	4.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	754	1169	1233	2	1480	512	0	3	0	608	0	592
V/C Ratio(X)	0.77	0.51	0.51	0.00	0.70	1.21	0.00	0.39	0.00	0.72	0.00	0.16
Avail Cap(c_a), veh/h	1350	1241	1306	244	1562	699	0	274	0	1218	0	879
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.2	17.9	17.4	0.0	27.3	47.1	0.0	57.7	0.0	42.4	0.0	21.5
Incr Delay (d2), s/veh	2.4	0.7	0.7	0.0	1.8	107.9	0.0	77.1	0.0	2.0	0.0	0.1
Initial Q Delay(d3),s/veh	5.5	68.7	61.6	0.0	0.3	11.6	0.0	0.0	0.0	13.6	0.0	0.1
%ile BackOfQ(50%),veh/ln	9.7	51.3	50.5	0.0	13.9	37.0	0.0	0.1	0.0	8.6	0.0	2.1
LnGrp Delay(d),s/veh	47.2	87.4	79.7	0.0	29.3	166.5	0.0	134.8	0.0	57.9	0.0	21.7
LnGrp LOS	D	F	E		C	F		F		E		C
Approach Vol, veh/h		1802			1656			1			532	
Approach Delay, s/veh		71.8			80.5			134.8			51.5	
Approach LOS		E			F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		4.1	0.0	77.0		20.8	25.6	51.4
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	71.5		35.0	40.0	45.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	17.9		14.1	18.3	38.4
Green Ext Time (p_c), s		0.0	0.0	49.0		2.3	3.3	6.5

Intersection Summary	
HCM 2010 Ctrl Delay	72.7
HCM 2010 LOS	E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	811	1717	11	1	1244	630	2	9	4	642	1	89
Future Volume (veh/h)	811	1717	11	1	1244	630	2	9	4	642	1	89
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	811	1717	11	1	1244	630	2	9	4	670	0	60
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	612	2076	9	2	1416	595	4	17	7	800	0	671
Arrive On Green	0.20	0.62	0.62	0.00	0.41	0.41	0.02	0.02	0.02	0.22	0.00	0.22
Sat Flow, veh/h	3442	3605	23	1774	3539	1583	236	1061	471	3548	0	1583
Grp Volume(v), veh/h	811	842	886	1	1244	630	15	0	0	670	0	60
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1768	0	0	1774	0	1583
Q Serve(g_s), s	26.0	44.8	44.9	0.1	41.0	50.0	1.1	0.0	0.0	23.4	0.0	2.9
Cycle Q Clear(g_c), s	26.0	44.8	44.9	0.1	41.0	50.0	1.1	0.0	0.0	23.4	0.0	2.9
Prop In Lane	1.00		0.01	1.00		1.00	0.13		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	612	1016	1072	2	1416	595	28	0	0	800	0	671
V/C Ratio(X)	1.33	0.83	0.83	0.52	0.88	1.06	0.54	0.00	0.00	0.84	0.00	0.09
Avail Cap(c_a), veh/h	693	1094	1149	192	1507	674	205	0	0	1208	0	858
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.1	28.2	27.7	69.1	38.4	45.6	67.6	0.0	0.0	48.4	0.0	22.5
Incr Delay (d2), s/veh	157.7	6.0	5.6	133.4	6.7	52.0	15.0	0.0	0.0	3.8	0.0	0.1
Initial Q Delay(d3),s/veh	21.8	25.4	22.5	0.0	1.9	11.4	0.0	0.0	0.0	1.7	0.0	0.1
%ile BackOfQ(50%),veh/ln	28.2	43.2	43.9	0.1	24.2	34.6	0.7	0.0	0.0	12.6	0.0	1.6
LnGrp Delay(d),s/veh	239.7	59.6	55.9	202.6	47.0	109.0	82.6	0.0	0.0	53.9	0.0	22.7
LnGrp LOS	F	E	E	F	D	F	F			D		C
Approach Vol, veh/h		2539			1875			15			730	
Approach Delay, s/veh		115.8			67.9			82.6			51.3	
Approach LOS		F			E			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		6.1	3.6	86.4		33.1	30.0	60.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	67.5		44.0	26.0	55.0
Max Q Clear Time (g_c+I1), s		3.1	2.1	46.9		25.4	28.0	52.0
Green Ext Time (p_c), s		0.0	0.0	20.4		3.2	0.0	1.5

Intersection Summary	
HCM 2010 Ctrl Delay	89.2
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	565	1044	0	0	1144	104	0	0	0	363	0	0
Future Volume (veh/h)	565	1044	0	0	1144	104	0	0	0	363	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	20	400	0	0	20	3	0	0	0	30	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	565	1044	0	0	1144	10	0	0	0	363	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	729	2359	0	1	1627	1063	0	2	0	561	343	0
Arrive On Green	0.20	0.78	0.00	0.00	0.54	0.54	0.00	0.00	0.00	0.13	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	0	1863	0	3548	1863	0
Grp Volume(v), veh/h	565	1044	0	0	1144	10	0	0	0	363	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	0	1863	0	1774	1863	0
Q Serve(g_s), s	16.7	9.9	0.0	0.0	23.1	0.2	0.0	0.0	0.0	10.5	0.0	0.0
Cycle Q Clear(g_c), s	16.7	9.9	0.0	0.0	23.1	0.2	0.0	0.0	0.0	10.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	729	2359	0	1	1627	1063	0	2	0	561	343	0
V/C Ratio(X)	0.77	0.44	0.00	0.00	0.70	0.01	0.00	0.00	0.00	0.65	0.00	0.00
Avail Cap(c_a), veh/h	1435	3035	0	235	2012	1106	0	335	0	1479	777	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.8	27.0	0.0	0.0	33.0	5.9	0.0	0.0	0.0	47.4	0.0	0.0
Incr Delay (d2), s/veh	1.8	0.5	0.0	0.0	2.1	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Initial Q Delay(d3),s/veh	24.1	359.4	0.0	0.0	3.7	0.1	0.0	0.0	0.0	58.2	0.0	0.0
%ile BackOfQ(50%),veh/ln	18.4	170.4	0.0	0.0	21.2	0.7	0.0	0.0	0.0	13.1	0.0	0.0
LnGrp Delay(d),s/veh	70.7	386.9	0.0	0.0	38.7	6.0	0.0	0.0	0.0	106.8	0.0	0.0
LnGrp LOS	E	F			D	A				F		
Approach Vol, veh/h		1609			1154			0			363	
Approach Delay, s/veh		275.8			38.5			0.0			106.8	
Approach LOS		F			D						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		0.0	0.0	87.8		17.7	24.6	63.2
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		0.0	0.0	11.9		12.5	18.7	25.1
Green Ext Time (p_c), s		0.0	0.0	66.1		1.2	1.9	32.1

Intersection Summary	
HCM 2010 Ctrl Delay	168.6
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	985	1335	0	0	1249	150	1	0	0	89	0	0
Future Volume (veh/h)	985	1335	0	0	1249	150	1	0	0	89	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	985	1335	0	0	1249	14	1	0	0	89	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	917	2435	0	1	1286	839	2	0	0	187	319	0
Arrive On Green	0.32	0.84	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	985	1335	0	0	1249	14	1	0	0	89	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	30.8	10.8	0.0	0.0	31.6	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Cycle Q Clear(g_c), s	30.8	10.8	0.0	0.0	31.6	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	917	2435	0	1	1286	839	2	0	0	187	319	0
V/C Ratio(X)	1.07	0.55	0.00	0.00	0.97	0.02	0.52	0.00	0.00	0.48	0.00	0.00
Avail Cap(c_a), veh/h	1343	2978	0	220	1884	909	299	0	0	1385	727	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	60.6	23.8	0.0	0.0	52.6	12.7	71.3	0.0	0.0	53.4	0.0	0.0
Incr Delay (d2), s/veh	45.6	0.7	0.0	0.0	17.4	0.0	133.6	0.0	0.0	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	53.0	107.5	0.0	0.0	127.2	0.1	0.0	0.0	0.0	39.4	0.0	0.0
%ile BackOfQ(50%),veh/ln	84.2	80.3	0.0	0.0	55.1	0.8	0.1	0.0	0.0	3.4	0.0	0.0
LnGrp Delay(d),s/veh	159.2	131.9	0.0	0.0	197.2	12.9	204.9	0.0	0.0	94.7	0.0	0.0
LnGrp LOS	F	F			F	B	F			F		
Approach Vol, veh/h		2320			1263			1			89	
Approach Delay, s/veh		143.5			195.1			204.9			94.7	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.1	0.0	100.9		8.8	40.0	60.9
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	12.8		4.8	32.8	33.6
Green Ext Time (p_c), s		0.0	0.0	74.0		0.3	3.2	21.3

Intersection Summary	
HCM 2010 Ctrl Delay	160.1
HCM 2010 LOS	F

Notes

Intersection												
Int Delay, s/veh	0											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	2	0	575	0	0	820	0
Future Vol, veh/h	0	0	0	1	0	2	0	575	0	0	820	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	2	0	575	0	0	820	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1395	1395	820	1395	1395	575	-	0	0	575	0	0
Stage 1	820	820	-	575	575	-	-	-	-	-	-	-
Stage 2	575	575	-	820	820	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	119	141	375	119	141	518	0	-	-	998	-	-
Stage 1	369	389	-	503	503	-	0	-	-	-	-	-
Stage 2	503	503	-	369	389	-	0	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	119	141	375	119	141	518	-	-	-	998	-	-
Mov Cap-2 Maneuver	119	141	-	119	141	-	-	-	-	-	-	-
Stage 1	369	389	-	503	503	-	-	-	-	-	-	-
Stage 2	501	503	-	369	389	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	19.8	0	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	-	-	-	119	518	998	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.004	-	-	-
HCM Control Delay (s)	-	-	0	35.5	12	0	-	-
HCM Lane LOS	-	-	A	E	B	A	-	-
HCM 95th %tile Q(veh)	-	-	-	0	0	0	-	-

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Future Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	17	0	1098	14	6	602	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1719	1726	602	1719	1719	1105	602	0	0	1112	0	0
Stage 1	614	614	-	1105	1105	-	-	-	-	-	-	-
Stage 2	1105	1112	-	614	614	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	89	500	71	90	256	975	-	-	628	-	-
Stage 1	479	483	-	256	286	-	-	-	-	-	-	-
Stage 2	256	284	-	479	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	66	88	500	70	89	256	975	-	-	628	-	-
Mov Cap-2 Maneuver	66	88	-	70	89	-	-	-	-	-	-	-
Stage 1	479	478	-	256	286	-	-	-	-	-	-	-
Stage 2	239	284	-	474	478	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	22.2	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	975	-	-	-	70	256	628	-	-
HCM Lane V/C Ratio	-	-	-	-	0.014	0.066	0.01	-	-
HCM Control Delay (s)	0	-	-	0	57.2	20.1	10.8	-	-
HCM Lane LOS	A	-	-	A	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	0	-	-

Intersection						
Int Delay, s/veh	7.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	66	1161	262	187	507
Future Vol, veh/h	32	66	1161	262	187	507
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	7	5	2	4	9
Mvmt Flow	32	66	1161	262	187	507

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2173	1292	0	0	1423	0
Stage 1	1292	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.236	-
Pot Cap-1 Maneuver	52	194	-	-	472	-
Stage 1	260	-	-	-	-	-
Stage 2	408	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 31	194	-	-	472	-
Mov Cap-2 Maneuver	~ 31	-	-	-	-	-
Stage 1	260	-	-	-	-	-
Stage 2	246	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	139.9	0	4.7
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	31	194	472	-
HCM Lane V/C Ratio	-	-	1.032	0.34	0.396	-
HCM Control Delay (s)	-	-	$ 360.8	32.8	17.5	-
HCM Lane LOS	-	-	F	D	C	-
HCM 95th %tile Q(veh)	-	-	3.5	1.4	1.9	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	6.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	69	1327	170	138	688
Future Vol, veh/h	27	69	1327	170	138	688
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	69	1327	170	138	688

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2376	1412	0	0	1497	0
Stage 1	1412	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	38	169	-	-	448	-
Stage 1	225	-	-	-	-	-
Stage 2	370	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 26	169	-	-	448	-
Mov Cap-2 Maneuver	~ 26	-	-	-	-	-
Stage 1	225	-	-	-	-	-
Stage 2	256	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	143.3	0	2.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	26	169	448	-
HCM Lane V/C Ratio	-	-	1.038	0.408	0.308	-
HCM Control Delay (s)	-	-	$ 406.6	40.3	16.6	-
HCM Lane LOS	-	-	F	E	C	-
HCM 95th %tile Q(veh)	-	-	3.2	1.8	1.3	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	4	33	1393	8	28	504
Future Vol, veh/h	4	33	1393	8	28	504
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	4	0	0	10
Mvmt Flow	4	33	1393	8	28	504

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1957	1397	0	0	1401	0
Stage 1	1397	-	-	-	-	-
Stage 2	560	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	71	174	-	-	494	-
Stage 1	231	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	67	174	-	-	494	-
Mov Cap-2 Maneuver	67	-	-	-	-	-
Stage 1	231	-	-	-	-	-
Stage 2	543	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	33.9	0	0.7
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	67	174	494	-
HCM Lane V/C Ratio	-	-	0.06	0.19	0.057	-
HCM Control Delay (s)	-	-	62.1	30.5	12.7	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	0.2	0.7	0.2	-

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	11	48	1434	12	49	648
Future Vol, veh/h	11	48	1434	12	49	648
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	48	1434	12	49	648

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2186	1440	0	0	1446	0
Stage 1	1440	-	-	-	-	-
Stage 2	746	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	50	163	-	-	469	-
Stage 1	218	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	45	163	-	-	469	-
Mov Cap-2 Maneuver	45	-	-	-	-	-
Stage 1	218	-	-	-	-	-
Stage 2	420	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	49.7	0	1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	45	163	469	-
HCM Lane V/C Ratio	-	-	0.244	0.294	0.104	-
HCM Control Delay (s)	-	-	109.2	36.1	13.6	-
HCM Lane LOS	-	-	F	E	B	-
HCM 95th %tile Q(veh)	-	-	0.8	1.2	0.3	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	586	1220	1	0	1039	619	0	1	0	395	0	144
Future Volume (veh/h)	586	1220	1	0	1039	619	0	1	0	395	0	144
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	10	160	0	0	5	2	0	0	0	14	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	586	1220	1	0	1039	619	0	1	0	440	0	96
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	759	2397	1	2	1476	512	0	3	0	610	0	595
Arrive On Green	0.21	0.69	0.69	0.00	0.44	0.44	0.00	0.00	0.00	0.16	0.00	0.16
Sat Flow, veh/h	3442	3629	3	1774	3539	1583	0	1863	0	3548	0	1583
Grp Volume(v), veh/h	586	595	626	0	1039	619	0	1	0	440	0	96
Grp Sat Flow(s),veh/h/ln	1721	1770	1862	1774	1770	1583	0	1863	0	1774	0	1583
Q Serve(g_s), s	16.5	16.0	16.0	0.0	23.8	36.8	0.0	0.1	0.0	12.2	0.0	4.1
Cycle Q Clear(g_c), s	16.5	16.0	16.0	0.0	23.8	36.8	0.0	0.1	0.0	12.2	0.0	4.1
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	759	1169	1233	2	1476	512	0	3	0	610	0	595
V/C Ratio(X)	0.77	0.51	0.51	0.00	0.70	1.21	0.00	0.39	0.00	0.72	0.00	0.16
Avail Cap(c_a), veh/h	1346	1237	1302	243	1557	697	0	273	0	1214	0	879
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.3	17.9	17.4	0.0	27.4	47.1	0.0	57.8	0.0	42.5	0.0	21.5
Incr Delay (d2), s/veh	2.4	0.7	0.7	0.0	1.8	109.5	0.0	77.1	0.0	2.0	0.0	0.2
Initial Q Delay(d3),s/veh	5.5	68.8	61.6	0.0	0.3	11.5	0.0	0.0	0.0	13.6	0.0	0.1
%ile BackOfQ(50%),veh/ln	9.8	51.4	50.6	0.0	14.0	37.2	0.0	0.1	0.0	8.6	0.0	2.2
LnGrp Delay(d),s/veh	47.2	87.4	79.7	0.0	29.5	168.2	0.0	134.9	0.0	58.0	0.0	21.7
LnGrp LOS	D	F	E		C	F		F		E		C
Approach Vol, veh/h		1807			1658			1			536	
Approach Delay, s/veh		71.7			81.3			134.9			51.5	
Approach LOS		E			F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		4.1	0.0	77.2		20.9	25.8	51.4
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	71.5		35.0	40.0	45.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	18.0		14.2	18.5	38.8
Green Ext Time (p_c), s		0.0	0.0	48.9		2.3	3.3	6.1

Intersection Summary	
HCM 2010 Ctrl Delay	73.0
HCM 2010 LOS	E

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	819	1717	11	1	1244	633	2	9	4	645	1	97
Future Volume (veh/h)	819	1717	11	1	1244	633	2	9	4	645	1	97
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	819	1717	11	1	1244	633	2	9	4	676	0	65
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	612	2075	9	2	1416	595	4	17	7	806	0	671
Arrive On Green	0.20	0.62	0.62	0.00	0.41	0.41	0.02	0.02	0.02	0.22	0.00	0.22
Sat Flow, veh/h	3442	3605	23	1774	3539	1583	236	1061	471	3548	0	1583
Grp Volume(v), veh/h	819	842	886	1	1244	633	15	0	0	676	0	65
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1768	0	0	1774	0	1583
Q Serve(g_s), s	26.0	45.2	45.3	0.1	41.2	50.7	1.1	0.0	0.0	23.8	0.0	3.2
Cycle Q Clear(g_c), s	26.0	45.2	45.3	0.1	41.2	50.7	1.1	0.0	0.0	23.8	0.0	3.2
Prop In Lane	1.00		0.01	1.00		1.00	0.13		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	612	1016	1072	2	1416	595	28	0	0	806	0	671
V/C Ratio(X)	1.34	0.83	0.83	0.52	0.88	1.06	0.54	0.00	0.00	0.84	0.00	0.10
Avail Cap(c_a), veh/h	689	1092	1147	191	1498	670	204	0	0	1202	0	853
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.1	28.3	27.8	69.3	38.5	45.6	67.8	0.0	0.0	48.6	0.0	22.7
Incr Delay (d2), s/veh	163.3	6.0	5.6	133.4	6.7	53.8	15.0	0.0	0.0	3.9	0.0	0.1
Initial Q Delay(d3),s/veh	21.6	25.5	22.6	0.0	1.9	11.3	0.0	0.0	0.0	1.7	0.0	0.1
%ile BackOfQ(50%),veh/ln	28.7	43.3	44.0	0.1	24.2	34.9	0.7	0.0	0.0	12.8	0.0	1.8
LnGrp Delay(d),s/veh	245.1	59.8	56.0	202.7	47.1	110.7	82.8	0.0	0.0	54.2	0.0	22.8
LnGrp LOS	F	E	E	F	D	F	F			D		C
Approach Vol, veh/h		2547			1878			15			741	
Approach Delay, s/veh		118.1			68.6			82.8			51.4	
Approach LOS		F			E			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		6.1	3.6	86.7		33.5	30.0	60.3
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	67.5		44.0	26.0	55.0
Max Q Clear Time (g_c+I1), s		3.1	2.1	47.3		25.8	28.0	52.7
Green Ext Time (p_c), s		0.0	0.0	20.1		3.3	0.0	1.1

Intersection Summary	
HCM 2010 Ctrl Delay	90.5
HCM 2010 LOS	F

Notes

HCM 2010 Signalized Intersection Summary
4: Tolay Creek Rd/Arnold Dr (SR 121) & Sears Point Rd (SR 37)

12/19/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	565	1045	0	0	1146	104	0	0	0	363	0	0
Future Volume (veh/h)	565	1045	0	0	1146	104	0	0	0	363	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	20	400	0	0	20	3	0	0	0	30	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	565	1045	0	0	1146	10	0	0	0	363	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	729	2359	0	1	1624	1063	0	2	0	561	343	0
Arrive On Green	0.20	0.78	0.00	0.00	0.54	0.54	0.00	0.00	0.00	0.13	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	0	1863	0	3548	1863	0
Grp Volume(v), veh/h	565	1045	0	0	1146	10	0	0	0	363	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	0	1863	0	1774	1863	0
Q Serve(g_s), s	16.7	9.9	0.0	0.0	23.1	0.2	0.0	0.0	0.0	10.5	0.0	0.0
Cycle Q Clear(g_c), s	16.7	9.9	0.0	0.0	23.1	0.2	0.0	0.0	0.0	10.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	729	2359	0	1	1624	1063	0	2	0	561	343	0
V/C Ratio(X)	0.77	0.44	0.00	0.00	0.71	0.01	0.00	0.00	0.00	0.65	0.00	0.00
Avail Cap(c_a), veh/h	1435	3034	0	235	2012	1106	0	335	0	1479	776	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	44.8	27.0	0.0	0.0	33.2	5.9	0.0	0.0	0.0	47.4	0.0	0.0
Incr Delay (d2), s/veh	1.8	0.5	0.0	0.0	2.1	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Initial Q Delay(d3),s/veh	24.1	359.6	0.0	0.0	3.7	0.1	0.0	0.0	0.0	58.2	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.4	170.4	0.0	0.0	21.4	0.7	0.0	0.0	0.0	13.1	0.0	0.0
LnGrp Delay(d),s/veh	70.7	387.1	0.0	0.0	39.0	6.0	0.0	0.0	0.0	106.8	0.0	0.0
LnGrp LOS	E	F			D	A				F		
Approach Vol, veh/h		1610			1156			0			363	
Approach Delay, s/veh		276.0			38.7			0.0			106.8	
Approach LOS		F			D						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		0.0	0.0	87.8		17.7	24.6	63.2
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		0.0	0.0	11.9		12.5	18.7	25.1
Green Ext Time (p_c), s		0.0	0.0	66.2		1.2	1.9	32.1

Intersection Summary	
HCM 2010 Ctrl Delay	168.7
HCM 2010 LOS	F

Notes

HCM 2010 Signalized Intersection Summary
4: Tolay Creek Rd/Arnold Dr (SR 121) & Sears Point Rd (SR 37)

12/19/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	985	1338	0	0	1252	150	1	0	0	89	0	0
Future Volume (veh/h)	985	1338	0	0	1252	150	1	0	0	89	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	985	1338	0	0	1252	14	1	0	0	89	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	917	2434	0	1	1286	839	2	0	0	187	319	0
Arrive On Green	0.32	0.84	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	985	1338	0	0	1252	14	1	0	0	89	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	30.8	10.9	0.0	0.0	31.7	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Cycle Q Clear(g_c), s	30.8	10.9	0.0	0.0	31.7	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	917	2434	0	1	1286	839	2	0	0	187	319	0
V/C Ratio(X)	1.07	0.55	0.00	0.00	0.97	0.02	0.52	0.00	0.00	0.48	0.00	0.00
Avail Cap(c_a), veh/h	1343	2978	0	220	1883	909	299	0	0	1385	727	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	60.6	23.8	0.0	0.0	52.6	12.7	71.4	0.0	0.0	53.4	0.0	0.0
Incr Delay (d2), s/veh	45.6	0.7	0.0	0.0	17.8	0.0	133.6	0.0	0.0	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	53.0	108.0	0.0	0.0	128.3	0.1	0.0	0.0	0.0	39.4	0.0	0.0
%ile BackOfQ(50%),veh/ln	34.2	80.6	0.0	0.0	55.4	0.8	0.1	0.0	0.0	3.4	0.0	0.0
LnGrp Delay(d),s/veh	159.2	132.5	0.0	0.0	198.6	12.9	204.9	0.0	0.0	94.7	0.0	0.0
LnGrp LOS	F	F			F	B	F			F		
Approach Vol, veh/h		2323			1266			1			89	
Approach Delay, s/veh		143.9			196.6			204.9			94.7	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.1	0.0	100.9		8.8	40.0	60.9
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	12.9		4.8	32.8	33.7
Green Ext Time (p_c), s		0.0	0.0	74.0		0.3	3.2	21.2

Intersection Summary	
HCM 2010 Ctrl Delay	160.8
HCM 2010 LOS	F

Notes

Intersection												
Int Delay, s/veh	0											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	2	0	575	0	0	820	0
Future Vol, veh/h	0	0	0	1	0	2	0	575	0	0	820	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	2	0	575	0	0	820	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1395	1395	820	1395	1395	575	-	0	0	575	0	0
Stage 1	820	820	-	575	575	-	-	-	-	-	-	-
Stage 2	575	575	-	820	820	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	119	141	375	119	141	518	0	-	-	998	-	-
Stage 1	369	389	-	503	503	-	0	-	-	-	-	-
Stage 2	503	503	-	369	389	-	0	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	119	141	375	119	141	518	-	-	-	998	-	-
Mov Cap-2 Maneuver	119	141	-	119	141	-	-	-	-	-	-	-
Stage 1	369	389	-	503	503	-	-	-	-	-	-	-
Stage 2	501	503	-	369	389	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	19.8	0	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	-	-	-	119	518	998	-	-
HCM Lane V/C Ratio	-	-	-	0.008	0.004	-	-	-
HCM Control Delay (s)	-	-	0	35.5	12	0	-	-
HCM Lane LOS	-	-	A	E	B	A	-	-
HCM 95th %tile Q(veh)	-	-	-	0	0	0	-	-

Intersection												
Int Delay, s/veh	0.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Future Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	17	0	1098	14	6	602	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1719	1726	602	1719	1719	1105	602	0	0	1112	0	0
Stage 1	614	614	-	1105	1105	-	-	-	-	-	-	-
Stage 2	1105	1112	-	614	614	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	89	500	71	90	256	975	-	-	628	-	-
Stage 1	479	483	-	256	286	-	-	-	-	-	-	-
Stage 2	256	284	-	479	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	66	88	500	70	89	256	975	-	-	628	-	-
Mov Cap-2 Maneuver	66	88	-	70	89	-	-	-	-	-	-	-
Stage 1	479	478	-	256	286	-	-	-	-	-	-	-
Stage 2	239	284	-	474	478	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	22.2	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	975	-	-	-	70	256	628	-	-
HCM Lane V/C Ratio	-	-	-	-	0.014	0.066	0.01	-	-
HCM Control Delay (s)	0	-	-	0	57.2	20.1	10.8	-	-
HCM Lane LOS	A	-	-	A	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	0	-	-

Intersection						
Int Delay, s/veh	162.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	70	1401	265	187	1013
Future Vol, veh/h	95	70	1401	265	187	1013
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	7	5	2	4	9
Mvmt Flow	95	70	1401	265	187	1013

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2921	1534	0	0	1666	0
Stage 1	1534	-	-	-	-	-
Stage 2	1387	-	-	-	-	-
Critical Hdwy	6.4	6.27	-	-	4.14	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.236	-
Pot Cap-1 Maneuver	~ 17	139	-	-	380	-
Stage 1	198	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 9	139	-	-	380	-
Mov Cap-2 Maneuver	~ 9	-	-	-	-	-
Stage 1	198	-	-	-	-	-
Stage 2	119	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 2964.7	0	3.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	9	139	380	-
HCM Lane V/C Ratio	-	-	10.556	0.504	0.492	-
HCM Control Delay (s)	-		$ 5108.9	54.6	23.3	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	13.4	2.4	2.6	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	32.5					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	92	1746	219	186	884
Future Vol, veh/h	25	92	1746	219	186	884
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	92	1746	219	186	884

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	3112	1856	0	0	1965	0
Stage 1	1856	-	-	-	-	-
Stage 2	1256	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 13	92	-	-	295	-
Stage 1	136	-	-	-	-	-
Stage 2	268	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 5	92	-	-	295	-
Mov Cap-2 Maneuver	~ 5	-	-	-	-	-
Stage 1	136	-	-	-	-	-
Stage 2	99	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 819.3	0	6.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	5	92	295	-
HCM Lane V/C Ratio	-	-	5	1	0.631	-
HCM Control Delay (s)	-		$ 3183.8	176.8	35.9	-
HCM Lane LOS	-	-	F	F	E	-
HCM 95th %tile Q(veh)	-	-	4.6	5.9	4	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	19	1700	2	4	1051
Future Vol, veh/h	0	19	1700	2	4	1051
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	4	0	0	10
Mvmt Flow	0	19	1700	2	4	1051

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2760	1701	0	0	1702	0
Stage 1	1701	-	-	-	-	-
Stage 2	1059	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	22	115	-	-	379	-
Stage 1	164	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	22	115	-	-	379	-
Mov Cap-2 Maneuver	22	-	-	-	-	-
Stage 1	164	-	-	-	-	-
Stage 2	332	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	42.4	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	115	379	-
HCM Lane V/C Ratio	-	-	-	0.165	0.011	-
HCM Control Delay (s)	-	-	0	42.4	14.6	-
HCM Lane LOS	-	-	A	E	B	-
HCM 95th %tile Q(veh)	-	-	-	0.6	0	-

Intersection						
Int Delay, s/veh	0.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	9	1935	3	10	874
Future Vol, veh/h	1	9	1935	3	10	874
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	9	1935	3	10	874

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2831	1937	0	0	1938	0
Stage 1	1937	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	19	82	-	-	303	-
Stage 1	123	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	18	82	-	-	303	-
Mov Cap-2 Maneuver	18	-	-	-	-	-
Stage 1	123	-	-	-	-	-
Stage 2	386	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	70.4	0	0.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	18	82	303	-
HCM Lane V/C Ratio	-	-	0.056	0.11	0.033	-
HCM Control Delay (s)	-	-	216.5	54.2	17.3	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	0.2	0.4	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	581	1798	4	0	1401	809	0	3	0	921	0	159
Future Volume (veh/h)	581	1798	4	0	1401	809	0	3	0	921	0	159
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	10	160	0	0	5	2	0	0	0	14	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	581	1798	4	0	1401	809	0	3	0	970	0	106
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	583	2200	2	1	1453	649	0	7	0	1022	0	722
Arrive On Green	0.17	0.61	0.61	0.00	0.41	0.41	0.00	0.00	0.00	0.29	0.00	0.29
Sat Flow, veh/h	3442	3623	8	1774	3539	1583	0	1863	0	3548	0	1583
Grp Volume(v), veh/h	581	878	924	0	1401	809	0	3	0	970	0	106
Grp Sat Flow(s),veh/h/ln	1721	1770	1861	1774	1770	1583	0	1863	0	1774	0	1583
Q Serve(g_s), s	24.8	56.8	56.8	0.0	56.8	60.5	0.0	0.2	0.0	39.5	0.0	5.7
Cycle Q Clear(g_c), s	24.8	56.8	56.8	0.0	56.8	60.5	0.0	0.2	0.0	39.5	0.0	5.7
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	583	1073	1129	1	1453	649	0	7	0	1022	0	722
V/C Ratio(X)	1.00	0.82	0.82	0.00	0.96	1.25	0.00	0.41	0.00	0.95	0.00	0.15
Avail Cap(c_a), veh/h	585	1076	1132	48	1455	651	0	89	0	1025	0	726
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.3	29.0	29.0	0.0	42.8	43.5	0.0	73.3	0.0	52.5	0.0	23.6
Incr Delay (d2), s/veh	36.3	5.7	5.4	0.0	16.0	123.5	0.0	33.0	0.0	17.3	0.0	0.1
Initial Q Delay(d3),s/veh	60.2	186.5	173.3	0.0	2.4	8.8	0.0	0.0	0.0	26.5	0.0	0.1
%ile BackOfQ(50%),veh/ln	19.6	100.8	101.8	0.0	32.1	50.6	0.0	0.2	0.0	26.9	0.0	2.9
LnGrp Delay(d),s/veh	157.8	221.2	207.7	0.0	61.1	175.8	0.0	106.3	0.0	96.3	0.0	23.7
LnGrp LOS	F	F	F		E	F		F		F		C
Approach Vol, veh/h		2383			2210			3			1076	
Approach Delay, s/veh		200.5			103.1			106.3			89.2	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		4.6	0.0	96.0		46.6	29.0	67.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		7.0	4.0	82.0		42.5	25.0	60.5
Max Q Clear Time (g_c+I1), s		2.2	0.0	58.8		41.5	26.8	62.5
Green Ext Time (p_c), s		0.0	0.0	23.1		0.6	0.0	0.0

Intersection Summary			
HCM 2010 Ctrl Delay			141.4
HCM 2010 LOS			F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1107	2376	15	2	1722	860	3	12	6	889	2	123
Future Volume (veh/h)	1107	2376	15	2	1722	860	3	12	6	889	2	123
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	1107	2376	15	2	1722	860	3	12	6	928	0	83
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	866	2325	10	4	1382	618	5	19	10	767	0	741
Arrive On Green	0.25	0.64	0.64	0.00	0.39	0.39	0.02	0.02	0.02	0.22	0.00	0.22
Sat Flow, veh/h	3442	3606	23	1774	3539	1583	252	1006	503	3548	0	1583
Grp Volume(v), veh/h	1107	1165	1226	2	1722	860	21	0	0	928	0	83
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1761	0	0	1774	0	1583
Q Serve(g_s), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	4.6
Cycle Q Clear(g_c), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	4.6
Prop In Lane	1.00		0.01	1.00		1.00	0.14		0.29	1.00		1.00
Lane Grp Cap(c), veh/h	866	1138	1196	4	1382	618	34	0	0	767	0	741
V/C Ratio(X)	1.28	1.02	1.02	0.53	1.25	1.39	0.62	0.00	0.00	1.21	0.00	0.11
Avail Cap(c_a), veh/h	866	1138	1195	46	1382	618	80	0	0	767	0	741
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.0	27.7	27.7	77.2	47.2	47.2	75.4	0.0	0.0	60.7	0.0	23.4
Incr Delay (d2), s/veh	134.1	32.8	32.6	83.2	117.1	185.9	17.1	0.0	0.0	106.5	0.0	0.1
Initial Q Delay(d3),s/veh	16.1	73.9	70.3	0.0	16.5	8.3	0.0	0.0	0.0	19.1	0.0	0.1
%ile BackOfQ(50%),veh/ln	37.2	83.7	86.7	0.2	56.0	60.4	1.1	0.0	0.0	30.2	0.0	2.4
LnGrp Delay(d),s/veh	208.1	134.3	130.5	160.4	180.9	241.5	92.6	0.0	0.0	186.4	0.0	23.5
LnGrp LOS	F	F	F	F	F	F	F			F		C
Approach Vol, veh/h		3498			2584			21			1011	
Approach Delay, s/veh		156.4			201.0			92.6			173.0	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		7.0	3.8	106.2		38.0	43.0	67.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		7.0	4.0	96.0		33.5	39.0	60.5
Max Q Clear Time (g_c+I1), s		3.8	2.2	101.7		35.5	41.0	62.5
Green Ext Time (p_c), s		0.0	0.0	0.0		0.0	0.0	0.0

Intersection Summary			
HCM 2010 Ctrl Delay			174.8
HCM 2010 LOS			F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	878	1834	0	0	1655	140	0	0	0	423	0	0
Future Volume (veh/h)	878	1834	0	0	1655	140	0	0	0	423	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	20	400	0	0	20	3	0	0	0	30	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	878	1834	0	0	1655	46	0	0	0	423	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	958	2835	0	1	1783	1021	0	1	0	504	260	0
Arrive On Green	0.27	0.81	0.00	0.00	0.51	0.51	0.00	0.00	0.00	0.13	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	0	1863	0	3548	1863	0
Grp Volume(v), veh/h	878	1834	0	0	1655	46	0	0	0	423	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	0	1863	0	1774	1863	0
Q Serve(g_s), s	41.8	34.6	0.0	0.0	71.7	1.8	0.0	0.0	0.0	19.7	0.0	0.0
Cycle Q Clear(g_c), s	41.8	34.6	0.0	0.0	71.7	1.8	0.0	0.0	0.0	19.7	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	958	2835	0	1	1783	1021	0	1	0	504	260	0
V/C Ratio(X)	0.92	0.65	0.00	0.00	0.93	0.05	0.00	0.00	0.00	0.84	0.00	0.00
Avail Cap(c_a), veh/h	1006	2859	0	42	1859	1041	0	56	0	529	278	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	63.5	17.5	0.0	0.0	42.0	11.1	0.0	0.0	0.0	75.5	0.0	0.0
Incr Delay (d2), s/veh	12.4	1.0	0.0	0.0	9.6	0.1	0.0	0.0	0.0	11.1	0.0	0.0
Initial Q Delay(d3),s/veh	37.5	348.9	0.0	0.0	12.6	0.1	0.0	0.0	0.0	142.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.9	205.1	0.0	0.0	46.1	1.7	0.0	0.0	0.0	23.0	0.0	0.0
LnGrp Delay(d),s/veh	113.4	367.4	0.0	0.0	64.2	11.2	0.0	0.0	0.0	228.6	0.0	0.0
LnGrp LOS	F	F			E	B				F		
Approach Vol, veh/h		2712			1701			0			423	
Approach Delay, s/veh		285.2			62.8			0.0			228.6	
Approach LOS		F			E						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		0.0	0.0	141.4		26.2	49.5	91.9
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		5.0	4.0	133.5		25.0	49.0	88.0
Max Q Clear Time (g_c+I1), s		0.0	0.0	36.6		21.7	43.8	73.7
Green Ext Time (p_c), s		0.0	0.0	95.9		0.5	1.7	12.2

Intersection Summary	
HCM 2010 Ctrl Delay	202.0
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1310	1847	0	0	1728	199	1	0	0	123	0	0
Future Volume (veh/h)	1310	1847	0	0	1728	199	1	0	0	123	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	1310	1847	0	0	1728	63	1	0	0	123	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
Arrive On Green	0.38	0.89	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	1310	1847	0	0	1728	63	1	0	0	123	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	68.0	22.0	0.0	0.0	87.0	3.5	0.1	0.0	0.0	6.2	0.0	0.0
Cycle Q Clear(g_c), s	68.0	22.0	0.0	0.0	87.0	3.5	0.1	0.0	0.0	6.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
V/C Ratio(X)	1.00	0.59	0.00	0.00	1.01	0.08	0.52	0.00	0.00	0.89	0.00	0.00
Avail Cap(c_a), veh/h	1306	3140	0	40	1718	831	50	0	0	139	73	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.6	7.2	0.0	0.0	46.1	21.4	89.5	0.0	0.0	86.1	0.0	0.0
Incr Delay (d2), s/veh	25.6	0.7	0.0	0.0	23.1	0.1	134.9	0.0	0.0	44.8	0.0	0.0
Initial Q Delay(d3),s/veh	40.3	70.9	0.0	0.0	98.1	0.1	0.0	0.0	0.0	209.1	0.0	0.0
%ile BackOfQ(50%),veh/ln	44.4	81.4	0.0	0.0	73.0	2.3	0.1	0.0	0.0	8.3	0.0	0.0
LnGrp Delay(d),s/veh	121.6	78.7	0.0	0.0	167.3	21.6	224.3	0.0	0.0	339.9	0.0	0.0
LnGrp LOS	F	E			F	C	F			F		
Approach Vol, veh/h		3157			1791			1			123	
Approach Delay, s/veh		96.5			162.2			224.3			339.9	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.2	0.0	165.0		11.0	72.0	93.0
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		5.0	4.0	151.5		7.0	68.0	87.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	24.0		8.2	70.0	89.0
Green Ext Time (p_c), s		0.0	0.0	126.6		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	125.6
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	3	0	730	0	0	1042	0
Future Vol, veh/h	0	0	0	1	0	3	0	730	0	0	1042	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	3	0	730	0	0	1042	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1772	1772	1042	1772	1772	730	-	0	0	730	0	0
Stage 1	1042	1042	-	730	730	-	-	-	-	-	-	-
Stage 2	730	730	-	1042	1042	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	65	83	279	65	83	422	0	-	-	874	-	-
Stage 1	277	307	-	414	428	-	0	-	-	-	-	-
Stage 2	414	428	-	277	307	-	0	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	65	83	279	65	83	422	-	-	-	874	-	-
Mov Cap-2 Maneuver	65	83	-	65	83	-	-	-	-	-	-	-
Stage 1	277	307	-	414	428	-	-	-	-	-	-	-
Stage 2	411	428	-	277	307	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	25.5	0	0
HCM LOS	A	D		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	-	-	-	65	422	874	-	-
HCM Lane V/C Ratio	-	-	-	0.015	0.007	-	-	-
HCM Control Delay (s)	-	-	0	61.2	13.6	0	-	-
HCM Lane LOS	-	-	A	F	B	A	-	-
HCM 95th %tile Q(veh)	-	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	22	0	1391	18	8	762	0
Future Vol, veh/h	0	0	0	1	0	22	0	1391	18	8	762	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	22	0	1391	18	8	762	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2178	2187	762	2178	2178	1400	762	0	0	1409	0	0
Stage 1	778	778	-	1400	1400	-	-	-	-	-	-	-
Stage 2	1400	1409	-	778	778	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	33	46	405	33	46	172	850	-	-	484	-	-
Stage 1	389	407	-	174	207	-	-	-	-	-	-	-
Stage 2	174	205	-	389	407	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	45	405	33	45	172	850	-	-	484	-	-
Mov Cap-2 Maneuver	28	45	-	33	45	-	-	-	-	-	-	-
Stage 1	389	400	-	174	207	-	-	-	-	-	-	-
Stage 2	152	205	-	383	400	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	32.8	0	0.1
HCM LOS	A	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	850	-	-	-	33	172	484	-	-
HCM Lane V/C Ratio	-	-	-	-	0.03	0.128	0.017	-	-
HCM Control Delay (s)	0	-	-	0	117.5	29	12.6	-	-
HCM Lane LOS	A	-	-	A	F	D	B	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	297

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	70	1418	265	187	1040
Future Vol, veh/h	95	70	1418	265	187	1040
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	7	5	2	4	9
Mvmt Flow	95	70	1418	265	187	1040

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2965	1551	0	0	1683	0
Stage 1	1551	-	-	-	-	-
Stage 2	1414	-	-	-	-	-
Critical Hdwy	7.1	6.27	-	-	4.14	-
Critical Hdwy Stg 1	6.1	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.5	3.363	-	-	2.236	-
Pot Cap-1 Maneuver	~ 9	136	-	-	375	-
Stage 1	144	-	-	-	-	-
Stage 2	172	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 5	136	-	-	375	-
Mov Cap-2 Maneuver	~ 5	-	-	-	-	-
Stage 1	144	-	-	-	-	-
Stage 2	~ 86	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 5507.9	0	3.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	5	136	375	-
HCM Lane V/C Ratio	-	-	19	0.515	0.499	-
HCM Control Delay (s)	-	$ 9524.6		56.6	23.8	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	13.8	2.5	2.7	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	39.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	92	1790	219	186	928
Future Vol, veh/h	25	92	1790	219	186	928
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	92	1790	219	186	928

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	3200	1900	0	0	2009	0
Stage 1	1900	-	-	-	-	-
Stage 2	1300	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 11	~ 86	-	-	284	-
Stage 1	129	-	-	-	-	-
Stage 2	255	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 4	~ 86	-	-	284	-
Mov Cap-2 Maneuver	~ 4	-	-	-	-	-
Stage 1	129	-	-	-	-	-
Stage 2	88	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 1030.7	0	6.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	4	86	284	-
HCM Lane V/C Ratio	-	-	6.25	1.07	0.655	-
HCM Control Delay (s)	-	$ 4067.8		205.4	38.8	-
HCM Lane LOS	-	-	F	F	E	-
HCM 95th %tile Q(veh)	-	-	4.6	6.3	4.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	1.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	36	1700	8	31	1051
Future Vol, veh/h	4	36	1700	8	31	1051
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	0	0	4	0	0	10
Mvmt Flow	4	36	1700	8	31	1051

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2817	1704	0	0	1708	0
Stage 1	1704	-	-	-	-	-
Stage 2	1113	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	20	115	-	-	377	-
Stage 1	163	-	-	-	-	-
Stage 2	317	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	18	115	-	-	377	-
Mov Cap-2 Maneuver	18	-	-	-	-	-
Stage 1	163	-	-	-	-	-
Stage 2	291	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	70.5	0	0.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	18	115	377	-
HCM Lane V/C Ratio	-	-	0.222	0.313	0.082	-
HCM Control Delay (s)	-	-	255	50	15.4	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	0.6	1.2	0.3	-

Intersection						
Int Delay, s/veh	4.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	53	1935	13	54	874
Future Vol, veh/h	11	53	1935	13	54	874
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	53	1935	13	54	874

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2924	1942	0	0	1948	0
Stage 1	1942	-	-	-	-	-
Stage 2	982	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	17	81	-	-	300	-
Stage 1	123	-	-	-	-	-
Stage 2	363	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	14	81	-	-	300	-
Mov Cap-2 Maneuver	14	-	-	-	-	-
Stage 1	123	-	-	-	-	-
Stage 2	298	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	180.3	0	1.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	14	81	300	-
HCM Lane V/C Ratio	-	-	0.786	0.654	0.18	-
HCM Control Delay (s)	-	-	$ 519.3	110	19.6	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	1.9	3	0.6	-

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	587	1798	4	0	1401	809	0	3	0	921	0	163
Future Volume (veh/h)	587	1798	4	0	1401	809	0	3	0	921	0	163
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	10	160	0	0	5	2	0	0	0	14	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	587	1798	4	0	1401	809	0	3	0	972	0	109
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	583	2200	2	1	1453	649	0	7	0	1022	0	722
Arrive On Green	0.17	0.61	0.61	0.00	0.41	0.41	0.00	0.00	0.00	0.29	0.00	0.29
Sat Flow, veh/h	3442	3623	8	1774	3539	1583	0	1863	0	3548	0	1583
Grp Volume(v), veh/h	587	878	924	0	1401	809	0	3	0	972	0	109
Grp Sat Flow(s),veh/h/ln	1721	1770	1861	1774	1770	1583	0	1863	0	1774	0	1583
Q Serve(g_s), s	25.0	56.8	56.9	0.0	56.8	60.5	0.0	0.2	0.0	39.6	0.0	5.9
Cycle Q Clear(g_c), s	25.0	56.8	56.9	0.0	56.8	60.5	0.0	0.2	0.0	39.6	0.0	5.9
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	583	1073	1129	1	1453	649	0	7	0	1022	0	722
V/C Ratio(X)	1.01	0.82	0.82	0.00	0.96	1.25	0.00	0.41	0.00	0.95	0.00	0.15
Avail Cap(c_a), veh/h	584	1076	1132	48	1454	651	0	89	0	1024	0	726
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.3	29.0	29.0	0.0	42.8	43.5	0.0	73.3	0.0	52.5	0.0	23.6
Incr Delay (d2), s/veh	39.0	5.7	5.4	0.0	16.1	123.5	0.0	33.0	0.0	17.6	0.0	0.1
Initial Q Delay(d3),s/veh	59.5	186.5	173.3	0.0	2.4	8.8	0.0	0.0	0.0	27.4	0.0	0.1
%ile BackOfQ(50%),veh/ln	20.0	100.8	101.8	0.0	32.2	50.6	0.0	0.2	0.0	27.1	0.0	3.0
LnGrp Delay(d),s/veh	159.7	221.2	207.7	0.0	61.2	175.8	0.0	106.3	0.0	97.6	0.0	23.8
LnGrp LOS	F	F	F		E	F		F		F		C
Approach Vol, veh/h		2389			2210			3			1081	
Approach Delay, s/veh		200.9			103.2			106.3			90.1	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		4.6	0.0	96.0		46.6	29.0	67.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		7.0	4.0	82.0		42.5	25.0	60.5
Max Q Clear Time (g_c+I1), s		2.2	0.0	58.9		41.6	27.0	62.5
Green Ext Time (p_c), s		0.0	0.0	23.0		0.5	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	141.8
HCM 2010 LOS	F

Notes

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1117	2376	15	2	1722	860	3	12	6	889	2	133
Future Volume (veh/h)	1117	2376	15	2	1722	860	3	12	6	889	2	133
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	1117	2376	15	2	1722	860	3	12	6	931	0	89
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	866	2325	10	4	1382	618	5	19	10	767	0	741
Arrive On Green	0.25	0.64	0.64	0.00	0.39	0.39	0.02	0.02	0.02	0.22	0.00	0.22
Sat Flow, veh/h	3442	3606	23	1774	3539	1583	252	1006	503	3548	0	1583
Grp Volume(v), veh/h	1117	1165	1226	2	1722	860	21	0	0	931	0	89
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1761	0	0	1774	0	1583
Q Serve(g_s), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	4.9
Cycle Q Clear(g_c), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	4.9
Prop In Lane	1.00		0.01	1.00		1.00	0.14		0.29	1.00		1.00
Lane Grp Cap(c), veh/h	866	1138	1196	4	1382	618	34	0	0	767	0	741
V/C Ratio(X)	1.29	1.02	1.02	0.53	1.25	1.39	0.62	0.00	0.00	1.21	0.00	0.12
Avail Cap(c_a), veh/h	866	1138	1195	46	1382	618	80	0	0	767	0	741
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.0	27.7	27.7	77.2	47.2	47.2	75.4	0.0	0.0	60.7	0.0	23.5
Incr Delay (d2), s/veh	139.0	32.8	32.6	83.2	117.1	185.9	17.1	0.0	0.0	108.1	0.0	0.1
Initial Q Delay(d3),s/veh	15.9	73.9	70.3	0.0	16.5	8.3	0.0	0.0	0.0	19.1	0.0	0.1
%ile BackOfQ(50%),veh/ln	37.7	83.7	86.7	0.2	56.0	60.4	1.1	0.0	0.0	30.4	0.0	2.5
LnGrp Delay(d),s/veh	213.0	134.3	130.5	160.4	180.9	241.5	92.6	0.0	0.0	187.9	0.0	23.6
LnGrp LOS	F	F	F	F	F	F	F			F		C
Approach Vol, veh/h		3508			2584			21			1020	
Approach Delay, s/veh		158.0			201.0			92.6			173.6	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		7.0	3.8	106.2		38.0	43.0	67.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		7.0	4.0	96.0		33.5	39.0	60.5
Max Q Clear Time (g_c+I1), s		3.8	2.2	101.7		35.5	41.0	62.5
Green Ext Time (p_c), s		0.0	0.0	0.0		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	175.6
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	878	1834	0	0	1655	142	0	0	0	424	0	0
Future Volume (veh/h)	878	1834	0	0	1655	142	0	0	0	424	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	20	400	0	0	20	3	0	0	0	30	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	878	1834	0	0	1655	48	0	0	0	424	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	958	2835	0	1	1783	1021	0	1	0	504	260	0
Arrive On Green	0.27	0.81	0.00	0.00	0.51	0.51	0.00	0.00	0.00	0.13	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	0	1863	0	3548	1863	0
Grp Volume(v), veh/h	878	1834	0	0	1655	48	0	0	0	424	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	0	1863	0	1774	1863	0
Q Serve(g_s), s	41.8	34.7	0.0	0.0	71.8	1.9	0.0	0.0	0.0	19.7	0.0	0.0
Cycle Q Clear(g_c), s	41.8	34.7	0.0	0.0	71.8	1.9	0.0	0.0	0.0	19.7	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	958	2835	0	1	1783	1021	0	1	0	504	260	0
V/C Ratio(X)	0.92	0.65	0.00	0.00	0.93	0.05	0.00	0.00	0.00	0.84	0.00	0.00
Avail Cap(c_a), veh/h	1006	2858	0	42	1858	1041	0	56	0	529	278	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	63.5	17.5	0.0	0.0	42.0	11.1	0.0	0.0	0.0	75.5	0.0	0.0
Incr Delay (d2), s/veh	12.4	1.0	0.0	0.0	9.6	0.1	0.0	0.0	0.0	11.3	0.0	0.0
Initial Q Delay(d3),s/veh	37.5	348.9	0.0	0.0	12.6	0.1	0.0	0.0	0.0	142.9	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.9	205.1	0.0	0.0	46.1	1.8	0.0	0.0	0.0	23.0	0.0	0.0
LnGrp Delay(d),s/veh	113.4	367.4	0.0	0.0	64.3	11.2	0.0	0.0	0.0	229.6	0.0	0.0
LnGrp LOS	F	F			E	B				F		
Approach Vol, veh/h		2712			1703			0			424	
Approach Delay, s/veh		285.2			62.8			0.0			229.6	
Approach LOS		F			E						F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		0.0	0.0	141.4		26.2	49.5	91.9
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		5.0	4.0	133.5		25.0	49.0	88.0
Max Q Clear Time (g_c+I1), s		0.0	0.0	36.7		21.7	43.8	73.8
Green Ext Time (p_c), s		0.0	0.0	95.9		0.5	1.7	12.1

Intersection Summary		
HCM 2010 Ctrl Delay		202.0
HCM 2010 LOS		F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1310	1847	0	0	1728	202	1	0	0	126	0	0
Future Volume (veh/h)	1310	1847	0	0	1728	202	1	0	0	126	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	1310	1847	0	0	1728	66	1	0	0	126	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
Arrive On Green	0.38	0.89	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	1310	1847	0	0	1728	66	1	0	0	126	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	68.0	22.0	0.0	0.0	87.0	3.7	0.1	0.0	0.0	6.3	0.0	0.0
Cycle Q Clear(g_c), s	68.0	22.0	0.0	0.0	87.0	3.7	0.1	0.0	0.0	6.3	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
V/C Ratio(X)	1.00	0.59	0.00	0.00	1.01	0.08	0.52	0.00	0.00	0.91	0.00	0.00
Avail Cap(c_a), veh/h	1306	3140	0	40	1718	831	50	0	0	139	73	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.6	7.2	0.0	0.0	46.1	21.4	89.5	0.0	0.0	86.1	0.0	0.0
Incr Delay (d2), s/veh	25.6	0.7	0.0	0.0	23.1	0.1	134.9	0.0	0.0	50.1	0.0	0.0
Initial Q Delay(d3),s/veh	40.3	70.9	0.0	0.0	98.1	0.1	0.0	0.0	0.0	218.8	0.0	0.0
%ile BackOfQ(50%),veh/ln	44.4	81.4	0.0	0.0	73.0	2.4	0.1	0.0	0.0	8.6	0.0	0.0
LnGrp Delay(d),s/veh	121.6	78.7	0.0	0.0	167.3	21.7	224.3	0.0	0.0	355.0	0.0	0.0
LnGrp LOS	F	E			F	C	F			F		
Approach Vol, veh/h		3157			1794			1			126	
Approach Delay, s/veh		96.5			161.9			224.3			355.0	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.2	0.0	165.0		11.0	72.0	93.0
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		5.0	4.0	151.5		7.0	68.0	87.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	24.0		8.3	70.0	89.0
Green Ext Time (p_c), s		0.0	0.0	126.6		0.0	0.0	0.0

Intersection Summary		
HCM 2010 Ctrl Delay		126.1
HCM 2010 LOS		F

Notes

HCM 2010 TWSC
5: SR 121 (Arnold Dr) & Project Driveway /Ram's gate South Entrance

12/19/2016

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	0	1	1	0	3	2	730	0	0	1042	6
Future Vol, veh/h	4	0	1	1	0	3	2	730	0	0	1042	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	1	1	0	3	2	730	0	0	1042	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1779	1779	1045	1780	1782	730	1048	0	0	730	0	0
Stage 1	1045	1045	-	734	734	-	-	-	-	-	-	-
Stage 2	734	734	-	1046	1048	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	64	82	278	64	82	422	664	-	-	874	-	-
Stage 1	276	306	-	412	426	-	-	-	-	-	-	-
Stage 2	412	426	-	276	305	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	63	82	278	64	82	422	664	-	-	874	-	-
Mov Cap-2 Maneuver	63	82	-	64	82	-	-	-	-	-	-	-
Stage 1	275	306	-	410	424	-	-	-	-	-	-	-
Stage 2	407	424	-	275	305	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	56.4	25.7	0	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	664	-	-	75	64	422	874	-	-
HCM Lane V/C Ratio	0.003	-	-	0.067	0.016	0.007	-	-	-
HCM Control Delay (s)	10.4	-	-	56.4	62.1	13.6	0	-	-
HCM Lane LOS	B	-	-	F	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	0	-	-

HCM 2010 TWSC
5: SR 121 (Arnold Dr) & Project Driveway

12/19/2016

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	0	3	1	0	22	3	1391	18	8	762	10
Future Vol, veh/h	10	0	3	1	0	22	3	1391	18	8	762	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	0	3	1	0	22	3	1391	18	8	762	10

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2189	2198	767	2191	2194	1400	772	0	0	1409	0	0
Stage 1	783	783	-	1406	1406	-	-	-	-	-	-	-
Stage 2	1406	1415	-	785	788	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	33	45	402	33	45	172	843	-	-	484	-	-
Stage 1	387	404	-	172	206	-	-	-	-	-	-	-
Stage 2	172	204	-	386	402	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	44	402	32	44	172	843	-	-	484	-	-
Mov Cap-2 Maneuver	28	44	-	32	44	-	-	-	-	-	-	-
Stage 1	380	397	-	169	202	-	-	-	-	-	-	-
Stage 2	147	201	-	377	395	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	153.4	33	0	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	843	-	-	36	32	172	484	-	-
HCM Lane V/C Ratio	0.004	-	-	0.361	0.031	0.128	0.017	-	-
HCM Control Delay (s)	9.3	0	-	153.4	121.1	29	12.6	-	-
HCM Lane LOS	A	A	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0	-	-	1.2	0.1	0.4	0.1	-	-

Intersection						
Int Delay, s/veh	14.1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	69	1385	183	138	746
Future Vol, veh/h	40	69	1385	183	138	746
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	69	1385	183	138	746

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2499	1477	0	0	1568	0
Stage 1	1477	-	-	-	-	-
Stage 2	1022	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 32	155	-	-	421	-
Stage 1	209	-	-	-	-	-
Stage 2	347	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 22	155	-	-	421	-
Mov Cap-2 Maneuver	~ 22	-	-	-	-	-
Stage 1	209	-	-	-	-	-
Stage 2	233	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 308.6	0	2.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	22	155	421	-
HCM Lane V/C Ratio	-	-	1.818	0.445	0.328	-
HCM Control Delay (s)	-	-	$ 762.3	45.6	17.7	-
HCM Lane LOS	-	-	F	E	C	-
HCM 95th %tile Q(veh)	-	-	5.2	2	1.4	-

Notes
~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

Intersection						
Int Delay, s/veh	50.4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	92	1837	219	186	975
Future Vol, veh/h	25	92	1837	219	186	975
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	60	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	92	1837	219	186	975

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	3294	1947	0	0	2056	0
Stage 1	1947	-	-	-	-	-
Stage 2	1347	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 10	~ 81	-	-	272	-
Stage 1	122	-	-	-	-	-
Stage 2	242	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 3	~ 81	-	-	272	-
Mov Cap-2 Maneuver	~ 3	-	-	-	-	-
Stage 1	122	-	-	-	-	-
Stage 2	77	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 1368.1	0	6.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	3	81	272	-
HCM Lane V/C Ratio	-	-	8.333	1.136	0.684	-
HCM Control Delay (s)	-	$ 5542.5	233.8	42.7	-	
HCM Lane LOS	-	-	F	F	E	-
HCM 95th %tile Q(veh)	-	-	4.7	6.6	4.6	-

Notes
~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

Intersection						
Int Delay, s/veh	8.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	29	119	1434	30	120	648
Future Vol, veh/h	29	119	1434	30	120	648
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	119	1434	30	120	648

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2337	1449	0	0	1464	0
Stage 1	1449	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	40	161	-	-	461	-
Stage 1	216	-	-	-	-	-
Stage 2	402	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	30	161	-	-	461	-
Mov Cap-2 Maneuver	30	-	-	-	-	-
Stage 1	216	-	-	-	-	-
Stage 2	297	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	126.5	0	2.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	30	161	461	-
HCM Lane V/C Ratio	-	-	0.967	0.739	0.26	-
HCM Control Delay (s)	-	-$ 346.1		73	15.5	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	3.2	4.6	1	-

Intersection						
Int Delay, s/veh	18.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱		↰	↑
Traffic Vol, veh/h	22	100	1935	24	101	874
Future Vol, veh/h	22	100	1935	24	101	874
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	50	-	-	180	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	100	1935	24	101	874

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	3023	1947	0	0	1959	0
Stage 1	1947	-	-	-	-	-
Stage 2	1076	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 15	~ 81	-	-	297	-
Stage 1	122	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 10	~ 81	-	-	297	-
Mov Cap-2 Maneuver	~ 10	-	-	-	-	-
Stage 1	122	-	-	-	-	-
Stage 2	216	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	$ 452.3	0	2.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	10	81	297	-
HCM Lane V/C Ratio	-	-	2.2	1.235	0.34	-
HCM Control Delay (s)	-	$ 1290.2		268	23.2	-
HCM Lane LOS	-	-	F	F	C	-
HCM 95th %tile Q(veh)	-	-	3.7	7.4	1.5	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

12/19/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	832	1717	11	1	1244	637	2	9	4	649	1	110
Future Volume (veh/h)	832	1717	11	1	1244	637	2	9	4	649	1	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	832	1717	11	1	1244	637	2	9	4	684	0	74
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	612	2074	9	2	1417	595	4	17	7	814	0	673
Arrive On Green	0.20	0.62	0.62	0.00	0.41	0.41	0.02	0.02	0.02	0.23	0.00	0.23
Sat Flow, veh/h	3442	3605	23	1774	3539	1583	236	1061	471	3548	0	1583
Grp Volume(v), veh/h	832	842	886	1	1244	637	15	0	0	684	0	74
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1768	0	0	1774	0	1583
Q Serve(g_s), s	26.0	45.7	45.8	0.1	41.5	51.6	1.1	0.0	0.0	24.2	0.0	3.7
Cycle Q Clear(g_c), s	26.0	45.7	45.8	0.1	41.5	51.6	1.1	0.0	0.0	24.2	0.0	3.7
Prop In Lane	1.00		0.01	1.00		1.00	0.13		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	612	1015	1071	2	1417	595	28	0	0	814	0	673
V/C Ratio(X)	1.36	0.83	0.83	0.52	0.88	1.07	0.54	0.00	0.00	0.84	0.00	0.11
Avail Cap(c_a), veh/h	684	1090	1145	190	1487	665	203	0	0	1193	0	847
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.1	28.3	27.9	69.5	38.7	45.6	68.0	0.0	0.0	48.8	0.0	22.9
Incr Delay (d2), s/veh	172.5	6.0	5.7	133.5	6.7	56.2	15.0	0.0	0.0	4.1	0.0	0.1
Initial Q Delay(d3),s/veh	21.3	25.6	22.7	0.0	1.9	11.2	0.0	0.0	0.0	1.7	0.0	0.1
%ile BackOfQ(50%),veh/ln	29.5	43.4	44.1	0.1	24.3	35.3	0.7	0.0	0.0	13.0	0.0	2.0
LnGrp Delay(d),s/veh	253.9	60.0	56.2	203.0	47.3	113.1	83.1	0.0	0.0	54.5	0.0	23.1
LnGrp LOS	F	E	E	F	D	F	F			D		C
Approach Vol, veh/h		2560			1882			15			758	
Approach Delay, s/veh		121.7			69.6			83.1			51.5	
Approach LOS		F			E			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		6.1	3.6	87.1		34.0	30.0	60.8
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		15.0	14.0	67.5		44.0	26.0	55.0
Max Q Clear Time (g_c+I1), s		3.1	2.1	47.8		26.2	28.0	53.6
Green Ext Time (p_c), s		0.0	0.0	19.6		3.3	0.0	0.7

Intersection Summary	
HCM 2010 Ctrl Delay	92.6
HCM 2010 LOS	F

Notes

HCM 2010 Signalized Intersection Summary
3: Reclamation Rd/Lakeville Hwy & Sears Point Rd (SR 37)

12/19/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1128	2376	15	2	1722	860	3	12	6	889	2	144
Future Volume (veh/h)	1128	2376	15	2	1722	860	3	12	6	889	2	144
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	5	50	0	0	8	2	0	0	0	5	0	2
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	1128	2376	15	2	1722	860	3	12	6	935	0	97
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	0	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	866	2325	10	4	1382	618	5	19	10	767	0	741
Arrive On Green	0.25	0.64	0.64	0.00	0.39	0.39	0.02	0.02	0.02	0.22	0.00	0.22
Sat Flow, veh/h	3442	3606	23	1774	3539	1583	252	1006	503	3548	0	1583
Grp Volume(v), veh/h	1128	1165	1226	2	1722	860	21	0	0	935	0	97
Grp Sat Flow(s),veh/h/ln	1721	1770	1859	1774	1770	1583	1761	0	0	1774	0	1583
Q Serve(g_s), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	5.4
Cycle Q Clear(g_c), s	39.0	99.7	99.7	0.2	60.5	60.5	1.8	0.0	0.0	33.5	0.0	5.4
Prop In Lane	1.00		0.01	1.00		1.00	0.14		0.29	1.00		1.00
Lane Grp Cap(c), veh/h	866	1138	1196	4	1382	618	34	0	0	767	0	741
V/C Ratio(X)	1.30	1.02	1.02	0.53	1.25	1.39	0.62	0.00	0.00	1.22	0.00	0.13
Avail Cap(c_a), veh/h	866	1138	1195	46	1382	618	80	0	0	767	0	741
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.0	27.7	27.7	77.2	47.2	47.2	75.4	0.0	0.0	60.7	0.0	23.6
Incr Delay (d2), s/veh	144.5	32.8	32.6	83.2	117.1	185.9	17.1	0.0	0.0	110.3	0.0	0.1
Initial Q Delay(d3),s/veh	15.8	73.9	70.3	0.0	16.5	8.3	0.0	0.0	0.0	19.0	0.0	0.1
%ile BackOfQ(50%),veh/ln	38.4	83.7	86.7	0.2	56.0	60.4	1.1	0.0	0.0	30.7	0.0	2.8
LnGrp Delay(d),s/veh	218.3	134.3	130.5	160.4	180.9	241.5	92.6	0.0	0.0	190.0	0.0	23.8
LnGrp LOS	F	F	F	F	F	F	F			F		C
Approach Vol, veh/h		3519			2584			21			1032	
Approach Delay, s/veh		159.9			201.0			92.6			174.4	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		7.0	3.8	106.2		38.0	43.0	67.0
Change Period (Y+Rc), s		4.0	3.5	6.5		4.5	4.0	6.5
Max Green Setting (Gmax), s		7.0	4.0	96.0		33.5	39.0	60.5
Max Q Clear Time (g_c+I1), s		3.8	2.2	101.7		35.5	41.0	62.5
Green Ext Time (p_c), s		0.0	0.0	0.0		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	176.6
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	985	1342	0	0	1256	150	1	0	0	89	0	0
Future Volume (veh/h)	985	1342	0	0	1256	150	1	0	0	89	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	985	1342	0	0	1256	14	1	0	0	89	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	917	2432	0	1	1286	839	2	0	0	187	319	0
Arrive On Green	0.32	0.84	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	985	1342	0	0	1256	14	1	0	0	89	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	30.8	10.9	0.0	0.0	31.8	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Cycle Q Clear(g_c), s	30.8	10.9	0.0	0.0	31.8	0.5	0.1	0.0	0.0	2.8	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	917	2432	0	1	1286	839	2	0	0	187	319	0
V/C Ratio(X)	1.07	0.55	0.00	0.00	0.98	0.02	0.52	0.00	0.00	0.48	0.00	0.00
Avail Cap(c_a), veh/h	1343	2978	0	220	1883	909	299	0	0	1385	727	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	60.6	23.9	0.0	0.0	52.6	12.7	71.4	0.0	0.0	53.4	0.0	0.0
Incr Delay (d2), s/veh	45.6	0.7	0.0	0.0	18.4	0.0	133.6	0.0	0.0	1.9	0.0	0.0
Initial Q Delay(d3),s/veh	53.0	108.7	0.0	0.0	129.7	0.1	0.0	0.0	0.0	39.4	0.0	0.0
%ile BackOfQ(50%),veh/ln	84.2	81.0	0.0	0.0	55.7	0.8	0.1	0.0	0.0	3.4	0.0	0.0
LnGrp Delay(d),s/veh	159.2	133.4	0.0	0.0	200.6	12.9	205.0	0.0	0.0	94.7	0.0	0.0
LnGrp LOS	F	F			F	B	F			F		
Approach Vol, veh/h		2327			1270			1			89	
Approach Delay, s/veh		144.3			198.6			204.9			94.7	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.1	0.0	100.9		8.8	40.0	60.9
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		19.0	14.0	90.5		44.0	44.0	60.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	12.9		4.8	32.8	33.8
Green Ext Time (p_c), s		0.0	0.0	74.0		0.3	3.2	21.0

Intersection Summary	
HCM 2010 Ctrl Delay	161.8
HCM 2010 LOS	F

Notes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1310	1847	0	0	1728	206	1	0	0	130	0	0
Future Volume (veh/h)	1310	1847	0	0	1728	206	1	0	0	130	0	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	15	200	0	0	50	3	0	0	0	10	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	1310	1847	0	0	1728	70	1	0	0	130	0	0
Adj No. of Lanes	2	2	0	1	2	1	0	1	0	2	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	0
Cap, veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
Arrive On Green	0.38	0.89	0.00	0.00	0.49	0.49	0.00	0.00	0.00	0.04	0.00	0.00
Sat Flow, veh/h	3442	3632	0	1774	3539	1583	1774	0	0	3548	1863	0
Grp Volume(v), veh/h	1310	1847	0	0	1728	70	1	0	0	130	0	0
Grp Sat Flow(s),veh/h/ln	1721	1770	0	1774	1770	1583	1774	0	0	1774	1863	0
Q Serve(g_s), s	68.0	22.0	0.0	0.0	87.0	3.9	0.1	0.0	0.0	6.5	0.0	0.0
Cycle Q Clear(g_c), s	68.0	22.0	0.0	0.0	87.0	3.9	0.1	0.0	0.0	6.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	1306	3140	0	1	1718	831	2	0	0	139	73	0
V/C Ratio(X)	1.00	0.59	0.00	0.00	1.01	0.08	0.52	0.00	0.00	0.94	0.00	0.00
Avail Cap(c_a), veh/h	1306	3140	0	40	1718	831	50	0	0	139	73	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	55.6	7.2	0.0	0.0	46.1	21.5	89.5	0.0	0.0	86.1	0.0	0.0
Incr Delay (d2), s/veh	25.6	0.7	0.0	0.0	23.1	0.2	134.9	0.0	0.0	57.8	0.0	0.0
Initial Q Delay(d3),s/veh	40.3	70.9	0.0	0.0	98.1	0.1	0.0	0.0	0.0	231.8	0.0	0.0
%ile BackOfQ(50%),veh/ln	44.4	81.4	0.0	0.0	73.0	2.5	0.1	0.0	0.0	9.0	0.0	0.0
LnGrp Delay(d),s/veh	121.6	78.7	0.0	0.0	167.3	21.8	224.3	0.0	0.0	375.7	0.0	0.0
LnGrp LOS	F	E			F	C	F			F		
Approach Vol, veh/h		3157			1798			1			130	
Approach Delay, s/veh		96.5			161.6			224.3			375.7	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		3.2	0.0	165.0		11.0	72.0	93.0
Change Period (Y+Rc), s		3.0	3.5	6.0		4.0	4.0	6.0
Max Green Setting (Gmax), s		5.0	4.0	151.5		7.0	68.0	87.0
Max Q Clear Time (g_c+I1), s		2.1	0.0	24.0		8.5	70.0	89.0
Green Ext Time (p_c), s		0.0	0.0	126.6		0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	126.7
HCM 2010 LOS	F

Notes

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Future Vol, veh/h	0	0	0	1	0	17	0	1098	14	6	602	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	0	17	0	1098	14	6	602	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1719	1726	602	1719	1719	1105	602	0	0	1112	0	0
Stage 1	614	614	-	1105	1105	-	-	-	-	-	-	-
Stage 2	1105	1112	-	614	614	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	89	500	71	90	256	975	-	-	628	-	-
Stage 1	479	483	-	256	286	-	-	-	-	-	-	-
Stage 2	256	284	-	479	483	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	66	88	500	70	89	256	975	-	-	628	-	-
Mov Cap-2 Maneuver	66	88	-	70	89	-	-	-	-	-	-	-
Stage 1	479	478	-	256	286	-	-	-	-	-	-	-
Stage 2	239	284	-	474	478	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	22.2	0	0.1
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	975	-	-	-	70	256	628	-	-
HCM Lane V/C Ratio	-	-	-	-	0.014	0.066	0.01	-	-
HCM Control Delay (s)	0	-	-	0	57.2	20.1	10.8	-	-
HCM Lane LOS	A	-	-	A	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	-	0	0.2	0	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	0	7	1	0	22	7	1391	18	8	762	21
Future Vol, veh/h	21	0	7	1	0	22	7	1391	18	8	762	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	30	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	7	1	0	22	7	1391	18	8	762	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2203	2212	773	2206	2213	1400	783	0	0	1409	0	0
Stage 1	789	789	-	1414	1414	-	-	-	-	-	-	-
Stage 2	1414	1423	-	792	799	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	32	44	399	32	44	172	835	-	-	484	-	-
Stage 1	384	402	-	171	204	-	-	-	-	-	-	-
Stage 2	171	202	-	382	398	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	27	42	399	30	42	172	835	-	-	484	-	-
Mov Cap-2 Maneuver	27	42	-	30	42	-	-	-	-	-	-	-
Stage 1	369	395	-	164	196	-	-	-	-	-	-	-
Stage 2	143	194	-	369	391	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	260.5	33.4	0	0.1
HCM LOS	F	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	835	-	-	35	30	172	484	-	-
HCM Lane V/C Ratio	0.008	-	-	0.8	0.033	0.128	0.017	-	-
HCM Control Delay (s)	9.3	0	-	260.5	129.1	29	12.6	-	-
HCM Lane LOS	A	A	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0	-	-	2.8	0.1	0.4	0.1	-	-