# PLANNING-LEVEL WETLAND DETERMINATION REPORT FOR SELECTED PROPOSED RESERVOIR SITES

**VOLUME I/ADDENDUM**

***Prepared for***

**City Of Santa Rosa**

***and***

**U.S. Army Corps of Engineers**

**March 1996/July 1996**

***Prepared by***

**PARSONS ENGINEERING SCIENCE, INC.**
**PLANNING · DESIGN · CONSTRUCTION MANAGEMENT**
***1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA 94501 · 510/769-0100***
***OFFICES IN PRINCIPAL CITIES***
*94-01*

***for***

***HARLAND BARTHOLOMEW AND ASSOCIATES, INC.***

# PLANNING-LEVEL WETLAND DETERMINATION REPORT FOR SELECTED PROPOSED RESERVOIR SITES

## VOLUME I/ADDENDUM

## SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

*Prepared for*

**City of Santa Rosa**
***and***
**U.S. Army Corps of Engineers**

**March 1996/July 1996**


***Prepared by***

**PARSONS ENGINEERING SCIENCE, INC.**
**PLANNING · DESIGN · CONSTRUCTION MANAGEMENT**
***1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA 94501 · 510/769-0100***
***OFFICES IN PRINCIPAL CITIES***
*94-01*

***for***

***HARLAND BARTHOLOMEW AND ASSOCIATES, INC.***

# TABLE OF CONTENTS

**VOLUME I**

**1 INTRODUCTION ..... 1-1**
Request and Authorization for the Determination ..... 1-1
Objectives of the Determination ..... 1-1
Field Investigation ..... 1-1

**2 PROJECT DESCRIPTION AND ALTERNATIVES ..... 2-1**
Project Description ..... 2-1
Description of Alternatives ..... 2-4

**3 METHODS ..... 3-1**
Standard Methods ..... 3-1
Site-Specific Modifications to Standard Methods ..... 3-7

**4 RESULTS AND DISCUSSION ..... 4-1**
General Regional Description ..... 4-1
Soils ..... 4-3
Vegetation 4-6
Functions and Values ..... 4-12
Site-Specific Descriptions ..... 4-16
Summary and Conclusion ..... 4-19

**5 LITERATURE CITED ..... 5-1**

**6 PREPARERS ..... 6-1**

**APPENDICES**

Appendix A Checklist of Wetland Determination Data Sheets and Corresponding Jurisdictional Findings

Appendix B 1" = 500' Wetland Determination Maps for Proposed Reservoir Sites
- Map 1 - Two Rock
- Map 2 - Adobe Road
- Map 3 - Tolay A and Lakeville Hillside
- Map 4 - Tolay C
- Map 5 - Sears Point
- Map 6 - Bloomfield, Valley Ford East, and Carroll Road North
- Map 7 - Huntley Reservoir

**VOLUME II**

Appendix C Routine Wetlands Determination Data Sheets

# LIST OF FIGURES

Figure Page

2.1 Project Area ..... 2-2

2.2 Reservoir Sites ..... 2-3

# LIST OF TABLES


| Table | | Page |
|---|---|---|
| 2.1 | Alternative Component Summary | 2-5 |
| 4.1 | Rainfall in Santa Rosa, 1989 - 1995 | 4-2 |
| 4.2 | Soils of the Study Area | 4-4 |
| 4.3 | Wetlands Classification Crosswalk | 4-13 |
| 4.4 | Wetlands and Other Waters of the U.S. and Other Natural Features Observed at Each Reservoir Site | 4-17 |

# 1 INTRODUCTION

## REQUEST AND AUTHORIZATION FOR THE DETERMINATION

This Planning-level Wetland Determination has been prepared for the City of Santa Rosa's Subregional Long-Term Wastewater Project in support of an environmental alternatives analysis pursuant to NEPA/CEQA guidelines. The preliminary U.S. Army Corps of Engineers (Corps) dredge and fill permit application, submitted in order to initiate the NEPA process, indicates that most project alternatives may potentially impact potential jurisdictional wetlands and other waters of the U.S. The Corps has accepted the role of federal lead agency. Assembled here are results of a planning-level wetland determination for ten proposed reclaimed water reservoir storage sites/configurations which are components of alternatives described in Section 2.

## OBJECTIVES OF THE DETERMINATION

The objectives of this planning-level determination are to determine the jurisdictional status of areas of apparent hydrophytic vegetation and estimate the extent of potential jurisdictional wetlands and other waters of the U.S. within selected proposed project impact areas in support of the project alternatives comparison, selection, and adoption process. The determination requested of the Corps will assist in the selection of an alternative that minimizes impacts to wetlands (i.e., meets Section 404 (b) (1) alternatives analysis requirements). Additionally, this determination will provide guidance for development of conceptual mitigation measures and a starting point for detailed wetland delineations that may be required for future permit applications for selected project components.

## FIELD INVESTIGATION

Parsons Engineering Science (Parsons ES) and Questa Engineering Corporation (Questa) conducted the initial field surveys in July, August and September of 1994. Follow-up surveys were performed between February and May of 1995 to confirm inferred hydrology indicators and vegetation determinations. Field methods utilized in this study resulted in a higher sample-point density than that found in the previously completed *Potential Jurisdictional Wetland Delineation for Portions of the Stemple and Americano Creeks Basins and the Tolay Valley* (CH2M Hill 1990). Given the extensive acreages involved, the frequency of routine, on-site determination data points are not as dense as may typically be used for permit level delineations for small projects. However, the level of resolution of this survey should be adequate for environmental impact analysis and alternative/component selection purposes.

# 2 PROJECT DESCRIPTION AND ALTERNATIVES

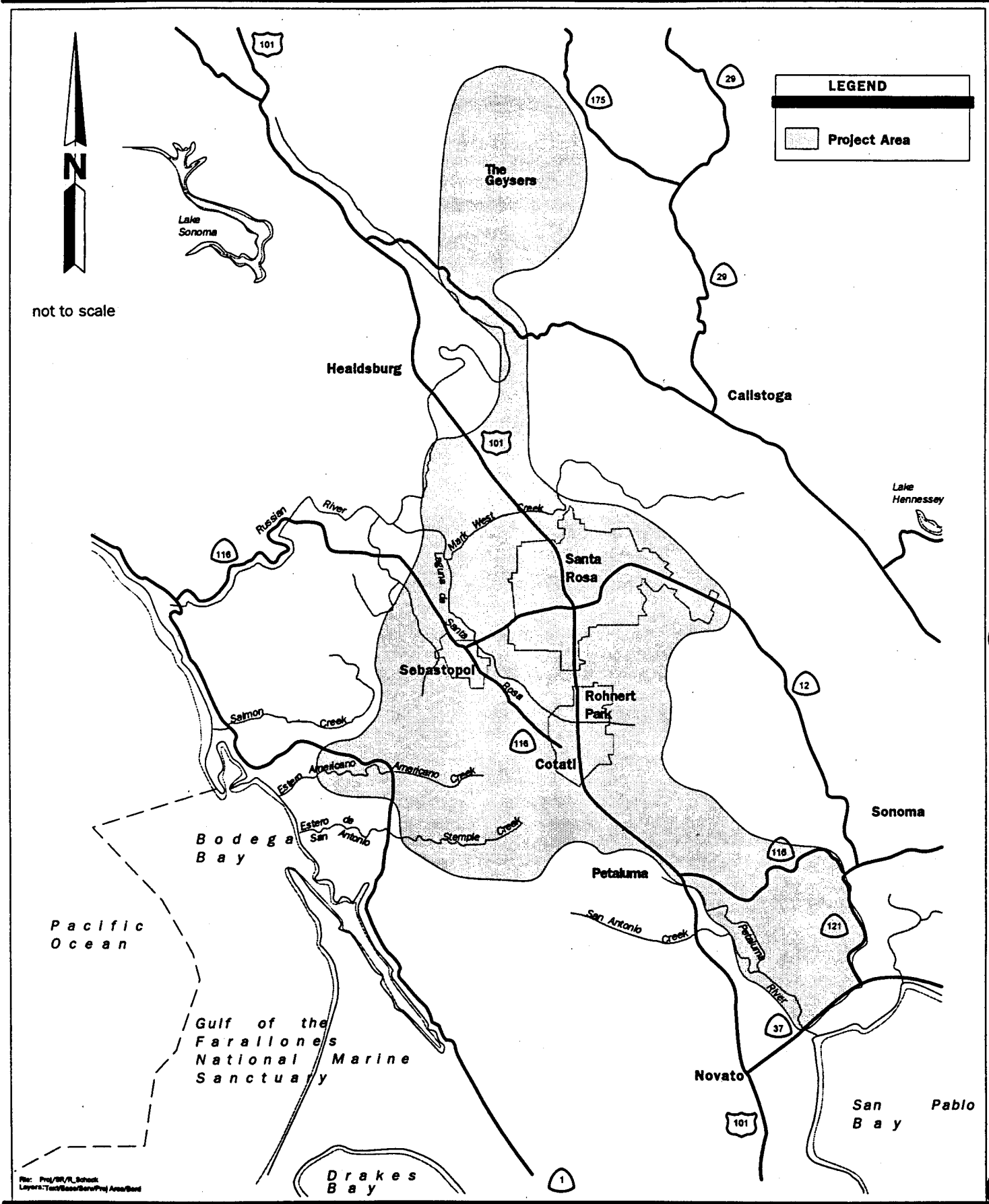
## PROJECT DESCRIPTION

The City of Santa Rosa (City) is developing a long-term wastewater project for the expansion of headworks capacity (pumping of effluent from the plant intake to the treatment facilities) and effluent disposal from the Laguna Wastewater Treatment Plant (Laguna Plant) through the year 2010.

The Laguna Plant, part of the Subregional Water Reclamation System (Subregional System) operated by the City, treats wastewater collected from the cities of Santa Rosa, Rohnert Park, Cotati, Sebastopol, and the Southpark Sanitation District (see Figure 2.1). The proposed reservoir sites which are the subject of this report are shown in Figure 2.2. The Laguna Plant, which also treats septic waste from most of Sonoma County, is a tertiary treatment facility, currently permitted to treat 18 million gallons per day (mgd) average dry weather flow (ADWF). The treated effluent is disposed through agricultural irrigation, created wetlands, urban irrigation, and discharge to the Russian River.

The existing disposal system does not reliably dispose of existing flows under all weather conditions. The goal of the Santa Rosa Subregional Long-Term Wastewater Project is to provide for disposal of existing flows and increased wastewater flows generated by an increasing population at buildout of the general plans of the entities comprising the Subregional System under all weather conditions. Wastewater flows through the Laguna Plant after reductions resulting from water conservation are expected to increase to 21 mgd ADWF by the year 2010. The projected increase results in an annual average flow of 8,220 million gallons (MG), an increase of 40 percent over the current annual average flow of 7,000 MG.

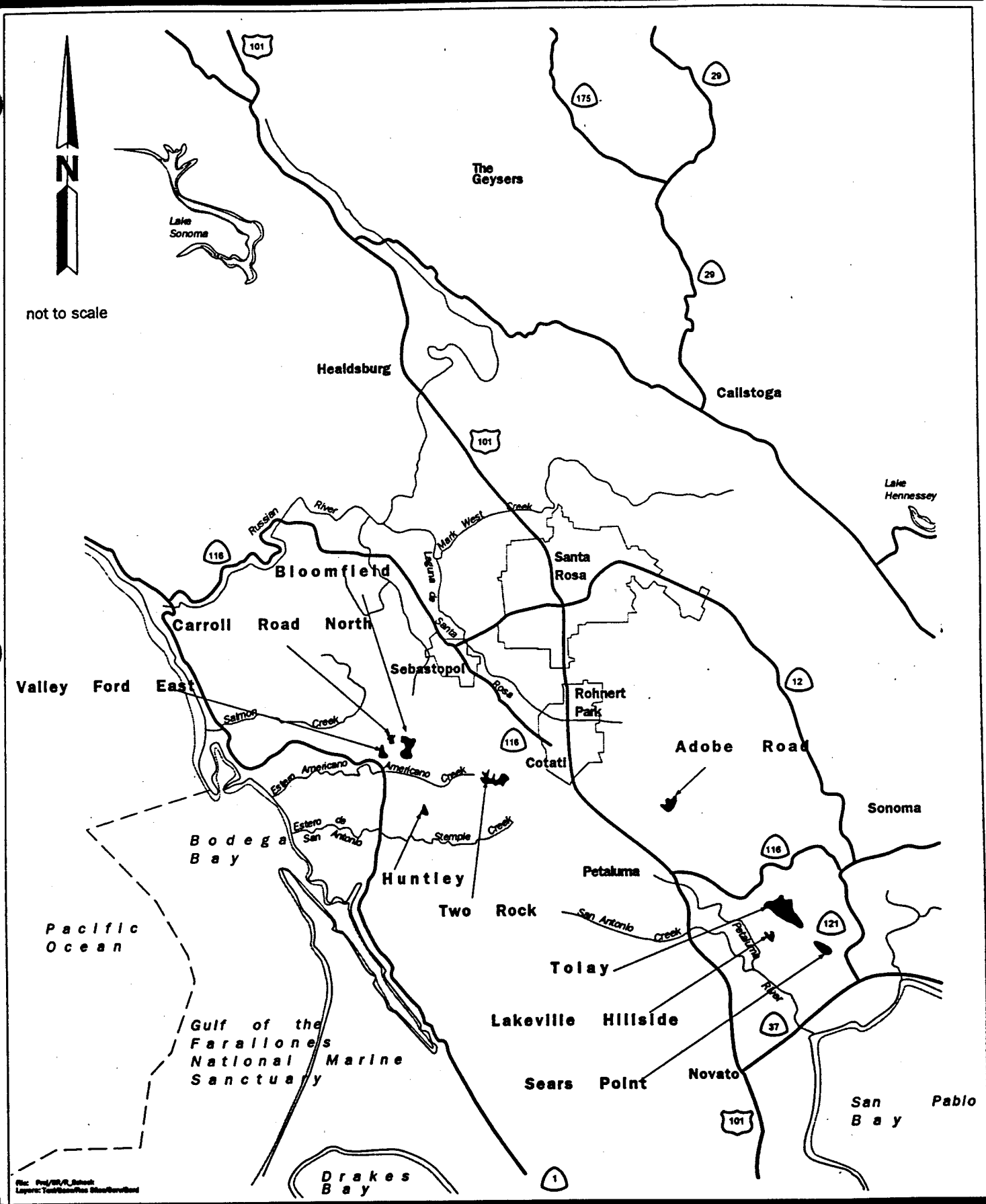
The Subregional System currently uses a combination of reuse and discharge for disposal of the treated effluent. A distribution system carries reclaimed water from the Laguna Plant to users for agricultural irrigation. Irrigation provides reclaimed water to over 5,000 acres of land located primarily in the Santa Rosa Plain, including golf course irrigation and urban landscape irrigation. A portion of the reclaimed water is also used for the management of two created wetland areas in the Santa Rosa Plain. The Subregional System is supported by storage facilities that hold the treated wastewater until it can be reused or discharged. Winter and early spring discharge from the Laguna Plant is to the Laguna de Santa Rosa and Santa Rosa Creek, which eventually flow into the Russian River approximately 10 miles north of the Laguna Plant. Ordinarily, the discharge to




HARLAND BARTHOLOMEW & ASSOCIATES, INC.
PARSONS ENGINEERING SCIENCE, INC.
UNITS OF PARSONS INFRASTRUCTURE & TECHNOLOGY INC.
PARSONS

Santa Rosa
Subregional Long-Term Wastewater Project

**Figure 2.1**
**PROJECT AREA**




HARLAND BARTHOLOMEW & ASSOCIATES, INC.
PARSONS ENGINEERING SCIENCE, INC.
UNITS OF PARSONS INFRASTRUCTURE & TECHNOLOGY INC.
PARSONS

Santa Rosa
Subregional Long-Term Wastewater Project

FIGURE 2.2
**RESERVOIR SITES**

the Russian River is limited to a maximum of 1 percent of River flow (5 percent with the permission of the Regional Water Quality Control Board) and storage is provided to hold treated wastewater so that maximum legal discharge is not exceeded. However, due to a combination of atypical or extreme weather conditions that may occur during the October 1 to May 14 discharge season, discharge to the Russian River currently has the potential to exceed the legal maximum. These conditions, although infrequent, occur during winters characterized by periodic light rain but overall drier-than-normal conditions. As a result, the current Subregional System is weather-dependent, leaving it without a reliable, legally sanctioned, wastewater disposal option.

By 1999 the Subregional System must put in place a disposal solution to meet future capacity needs, regardless of weather conditions. The Santa Rosa Subregional Long-Term Wastewater Project is intended to provide this solution. The following are descriptions of the project alternatives being considered. Table 2.1 identifies the various components within each alternative and subalternative.

## DESCRIPTION OF ALTERNATIVES

### Alternative 1 - No Project/No Action (Existing System with Interim Period Improvements)

Both CEQA and NEPA require that at least one alternative studied be a "No Project" alternative (in the case of CEQA) or "No Action" (in the case of NEPA). The No Project/No Action alternative is an evaluation of impacts if no project is implemented. In this case, the No Project/No Action alternative consists of the existing Santa Rosa Subregional Water Reclamation System (as of January 1, 1995), plus improvements to be constructed through 1996 under the Interim Period Reclamation System Master Plan, the Laguna Advanced Treatment Upgrade Project and the Santa Rosa Subregional Sludge Beneficial Use Project. This alternative also assumes continuation by the City of existing water conservation practices thereby reducing wastewater flow.

### Alternative 2 - South County Reclamation

The South County Reclamation alternative focuses on the reuse of treated wastewater for agricultural irrigation in areas south and east of Santa Rosa. Under this alternative, discharge to the Russian River would be maintained with consideration of a range of maximum discharge rates between 1 percent and 20 percent of River flow.

Within Alternative 2, five subalternatives have been defined. These subalternatives differ principally in the location of the proposed storage facilities for reclaimed water to be used in agricultural irrigation. The subalternatives with their associated storage facilities are:

- Subalternative 2A - TolayReservoir Site (ConfigurationA)
- Subalternative 2B - Adobe Roadand Lakeville HillsideReservoir Sites

# Table 2.1: Alternative Component Summary

| | ALTERNATIVES | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPONENT | 1 No Project | 2A S. Co. - Tolay Extended | 2B S. Co. - Adobe/Lakeville | 2C S. Co. - Tolay Confined | 2D S. Co. - Lakeville/Sears Point | 2E S. Co. - Tolay/ASR | 3A W. Co. - Two Rock | 3B W. Co. - Bloomfield | 3C W. Co. - Carroll Road | 3D W. Co. - Valley Ford | 3E W. Co. - Huntley | 3F W. Co. - Two Rock/ASR | 4 Geysers Recharge | 5A 20% Russian River Discharge | 5B 20% Laguna Discharge |
| **EXISTING** | | | | | | | | | | | | | | | |
| **Wetlands Reuse** | | | | | | | | | | | | | | | |
| Kelly | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Laguna | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Storage** | | | | | | | | | | | | | | | |
| Delta Ponds | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Agricultural Irrigation** | | | | | | | | | | | | | | | |
| Laguna (5,000 Acres) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ |
| **Urban Irrigation** | | | | | | | | | | | | | | | |
| Rohnert Park | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Conservation** | | | | | | | | | | | | | | | |
| Retrofit Program | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **IRRIGATION** | | | | | | | | | | | | | | | |
| **Urban Irrigation** | | | | | | | | | | | | | | | |
| Fountain Grove | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Bennett Valley | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| **Agricultural Irrigation** | | | | | | | | | | | | | | | |
| South County | | | | | | | | | | | | | | | |
| East of Rohnert Park | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| Adobe Road | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| North of Petaluma | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| Lakeville | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| Bayflats* | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| West County | | | | | | | | | | | | | | | |
| Americano | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Stemple | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Misc. | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Sebastopol | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| **DISHARGE/RECHARGE** | | | | | | | | | | | | | | | |
| 10% of Russian River Flow | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| 5% of Russian River Flow | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| 10% of Russian River Flow | | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | | | | |
| 20% of Russian River Flow | | | | | | | | | | | | | | ■ | ■ |
| Geysers | | | | | | | | | | | | | ■ | | |
| **STORAGE** | | | | | | | | | | | | | | | |
| **South County Reservoirs** | | | | | | | | | | | | | | | |
| Tolay** | | ■ | | | | ■ | | | | | | | | | |
| Adobe Road | | | ■ | | | | | | | | | | | | |
| Tolay C | | | | ■ | | | | | | | | | | | |
| Lakeville Hillside | | | ■ | | ■ | | | | | | | | | | |
| Sears Point | | | | | ■ | | | | | | | | | | |
| **West County Reservoirs** | | | | | | | | | | | | | | | |
| Two Rock** | | | | | | | ■ | | | | | ■ | | | |
| Bloomfield | | | | | | | | ■ | | | | | | | |
| Carroll Rd North | | | | | | | | | ■ | | | | | | |
| Valley Ford | | | | | | | | | | ■ | | | | | |
| Huntley | | | | | | | | | | | ■ | | | | |
| Aquifer Storage | | | | | | ■ | | | | | | ■ | | | |

** Coupled with ASR, Tolay and Two Rock Reservoirs would have smaller configurations

■ Included in Alternative

■ Options

- Subalternative 2C - Tolay Reservoir Site (Configuration C)
- Subalternative 2D - Sears Point and Lakeville Hillside Reservoir Sites
- Subalternative 2E - Tolay Reservoir Site (Configuration A-Reduced Size) Plus Aquifer Storage and Recovery

Principal project components which are common to all subalternatives under Alternative 2 are:

- Expansion of the influent pumping capacity at the Laguna Plant
- A transport system, consisting of transmission pipelines and pump stations, to carry the reclaimed water to storage and irrigation sites
- Agricultural irrigation west of Sebastopol, east of Rohnert Park, in the Petaluma River watershed north of Petaluma and in the Adobe Road, Lakeville and Bay Flats areas
- Urban irrigation projects in the Fountaingrove and Bennett Valley areas

### Alternative 3 - West County Reclamation

The West County Reclamation alternative focuses on the reuse of treated wastewater for agricultural irrigation in areas west of the Laguna de Santa Rosa. Under this alternative, discharge to the Russian River would be maintained with consideration of a range of maximum discharge rates between 1 percent and 20 percent of River flow.

Six subalternatives have been defined within Alternative 3. These subalternatives differ principally in the location of the proposed storage facilities for reclaimed water to be used in agricultural irrigation. The subalternatives with their associated storage facilities are:

- Subalternative 3A - Two Rock Reservoir Site
- Subalternative 3B - Bloomfield Reservoir Site
- Subalternative 3C - Carroll Road Reservoir Site
- Subalternative 3D - Valley Ford Reservoir Site
- Subalternative 3E - Huntley Reservoir Site
- Subalternative 3F - Two Rock Reservoir Site (Reduced Size) plus Aquifer Storage and Recovery

Principal project components which are common to all subalternatives under Alternative 3 are:

- Expansion of the influent pumping capacity at the Laguna Plant
- A transport system, consisting of transmission pipelines and pump stations, to carry the reclaimed water to storage and irrigation sites
- Agricultural irrigation west of Sebastopol and in the Stemple and Americano Creek watersheds
- Urban irrigation projects in the Fountaingrove and Bennett Valley areas

### Alternative 4 - Geysers Recharge

The Geysers Recharge alternative provides for transmission of the treated wastewater to the Sonoma Geysers, located northeast of Healdsburg, for recharge of the Geysers steamfield, which is currently used as a source of geothermal energy. This alternative would involve only minimal discharge of treated wastewater to the Laguna de Santa Rosa and Russian River, and no additional large storage is proposed for this alternative. Tanks for balancing flows would be located along the Geysers pipeline.

Other principal project components under Alternative 4 are:

- Expansion of the influent pumping capacity at the Laguna Plant

### Alternative 5 - 20 Percent Maximum Russian River Discharge

This alternative provides for the discharge of treated wastewater to the Russian River at a maximum rate of 20 percent of River flow. Under this alternative no additional reuse or storage of treated wastewater would be required

Two subalternatives have been defined within Alternative 5. These subalternatives differ principally in the means by which discharge to the Russian River would be accomplished. The subalternatives are:

- Subalternative 5A - Transmission of treated wastewater and direct discharge to the Russian River at a location above the Sonoma County Water Authority intakes;
- Subalternative 5B - Discharge of treated wastewater to the Laguna de Santa Rosa at the existing discharge locations.

# 3 METHODS

## STANDARD METHODS

Prior to field surveys for potential jurisdictional wetlands and other waters of the U.S., the following information was evaluated for ten reservoir sites: Two Rock; Adobe Road; Lakeville Hillside; Tolay A; Tolay C; Sears Point; Huntley; Bloomfield; Valley Ford East; and Carroll Road North.

- 1" = 500' aerial photos of the proposed reservoir sites overlain with proposed reservoir/shoreline boundaries;
- National Wetland Inventory maps prepared by the U.S. Fish and Wildlife Service;
- United States Geological Survey (USGS) quadrangle maps of the project site and surrounding region;
- Natural Resources Conservation Service (NRCS) Soil Survey of Sonoma County; and
- *Potential Jurisdictional Wetland Delineation for Portions of the Stemple and Americano Creek Basins and the Tolay Valley* prepared by North State Resources and Golden Bear Biological Studies for CH2M Hill.

Surveys of potential jurisdictional wetlands and other waters of the U.S. were performed following the manual currently in effect (Environmental Laboratory 1987). The approximated boundaries of wetlands are based on an analysis of aerial photos, vegetation community mapping performed by Sycamore Environmental Consultants, soils mapping from the Soil Survey for Sonoma County, base maps with USGS derived topographic contours, previous wetland delineations and field observations. Approximated wetland boundaries are not necessarily determined by recorded data points on Routine On-Site Data Forms (i.e., see Sears Point). Areas that appeared to support potential jurisdictional wetlands and other waters of the U.S. were initially identified on USGS and NRCS maps and aerial photos. Subsequently, field surveys were performed at each of the proposed reservoir sites. Observations of vegetation, soils, and hydrology were recorded at specific sampling sites. Site-specific methodology modifications discussed in the following section were necessary to address problem areas typical of western wetlands (Environmental Laboratory 1987). A summary and checklist of all sites visited is attached as Appendix A. Routine On-Site Determination Data Forms were completed at many potential jurisdictional wetland locations (See Appendix C, bound separately in Volume II).

Our planning-level wetland determination followed the Corps Routine On-Site Determination Method (Environmental Laboratory 1987). The Routine On-Site Method

utilizes a three-parameter approach (vegetation, soils, and hydrology) to identify potential jurisdictional wetlands. This process relies upon the prevalence of wetland vegetation, presence of hydric soil conditions, and evidence of soil saturation by surface or groundwater to define the occurrence of potential jurisdictional wetlands. Field work commenced with a reconnaissance and visual observation of the entire site. General physical characteristics (topography, microrelief, and vegetation) were noted. Areas of high potential jurisdictional wetland probability were then identified for further investigation.

The areas surveyed included all lands within each reservoir site and within 152 m (500 feet) of proposed impoundment shorelines. Portions of potential jurisdictional wetlands and other waters of the U.S. that extend beyond the construction boundary (anticipated area of impact) are not shown on the maps of the proposed storage sites contained in Appendix B. All potential jurisdictional wetlands and other waters of the U.S. larger than 0.10 acre were mapped and many other smaller seeps were also included. The approximated acreages for each wetland community type mapped on each reservoir site have been rounded off to the nearest acre, and should be accurate to within plus or minus one acre.

Field determinations were conducted during July, August, and September of 1994 and February, March, April, and May of 1995. When the surveyors encountered a potential jurisdictional wetland, a test pit was excavated, the soil profile described, potential hydrology indicators noted, and representative vegetation community recorded on a Routine On-Site Data Form. The investigators then proceeded out of the wetland location to what was likely an upland sample location. Soil, vegetation and hydrology indicators were recorded on a data sheet for this sample location. If the upland plot exhibited non-wetland characteristics, the investigators then attempted to identify distinct breaks in vegetation and/or changes in slope to approximate the wetland boundary. Once a wetland boundary was determined, the investigators extended observations along the wetland feature by keying on landforms and vegetation, while using supplemental soil probes and spot-checking the perceived wetland perimeter with occasional Routine On-Site determinations.

This familiarization process described above was repeated on each reservoir to acquaint surveyors with the characteristics of each wetland type on site. Then, based on these detailed field observations, the approximated boundaries of other obvious, similar types of wetlands were mapped using somewhat less detailed observations. Distinct breaks in vegetation type and topography were used in coordination with a soil probe to more quickly determine wetland boundaries. A single Routine Data Form was filled out for the majority of the obvious larger wetlands. Problematic seasonal wetlands often required additional observations and preparation of more Routine Data Forms to accurately estimate boundaries.

Some problematic areas were revisited to confirm vegetation determinations and to record hydrologic indicators which were not readily observable during earlier surveys.

Subsequent observations that were made during follow-up visits were generally either handwritten on existing data forms at previously visited locations or recorded on new data forms designated by the letter A placed immediately before the numeric reference for that individual data point.

Approximated wetland boundaries were recorded on 1"=500' scale aerial photos. Slight variations in shade and texture that were visible on the aerial photos were correlated with field observations to locate wetland boundaries. These approximated boundaries were then transferred to 1"=500' scale contour base maps of each site and coordinated with vegetation community mapping performed by Sycamore Environmental Consultants.

### Vegetation Criterion

Hydrophytic vegetation is dominated by plant species that possess physiological or reproductive adaptations that allow them to persist in soils subject to prolonged inundation and periodic anaerobic soil conditions (Reed 1988). Plant species listed in The National List of Plant Species That Occur in Wetlands, Region 0, California (Reed 1988) are classified by their probability of being associated with wetlands or uplands. Obligate (OBL) species almost always occur (99 percent or more of the time) in wetlands. Facultative Wetland (FACW) species occur in wetlands 67-99 percent of the time. Facultative (FAC) species have about an equal probability (33-66 percent) of occurring in wetlands or uplands. Facultative Upland (FACU) and Obligate Upland (UPL) species occur in wetlands 1-33 percent, and less than one percent of the time, respectively.

At each data point all plant species that contributed to the character of the vegetation were identified and the aerial cover of each was estimated. Plant species names and taxonomy are based on the Jepson Manual (Hickman 1993). The wetland indicator status of each species was obtained from Reed (1988). Species not listed were regarded as non-wetland species with the exception of those noted below. Species that constituted 10 percent or more of the existing vegetation were considered to be dominant species, except as noted below. Vegetation was determined to be hydrophytic when more than 50 percent of the dominant species were hydrophytic (OBL, FACW, FAC+, or FAC).

The following taxonomic updates and inferred indicator statuses depart from Reed (1988) but were used in this determination:

- *Hordeum hystrix= H. marinum* ssp. *gussoneanum* — FAC
- *Hordeum leporinum= H. murinum* ssp. *leporinum* — NI
- *Lolium multiflorum= L. perenne* — FAC*
- *Bromus mollis= Bromus hordeaceous* — FACU-
- *Bromus rigidus= Bromus diandrus* — NI
- *Salix laevigata* — FAC

- *Nasturtium officinale= Rorippa nasturtusim-aquaticum* OBL
- *Elymus triticoides= Leymus triticoides* FAC+

Heavy grazing, a common condition on almost all the sites, often made assessment of the vegetative criterion difficult. In some heavily grazed areas, all of the plants which could be identified were included as dominants for vegetation parameter determinations. If the vegetation was grazed or disturbed otherwise beyond recognition for the purposes of a wetland vegetation parameter determination, it was assumed to be hydrophytic if strong indicators of hydric soils and wetland hydrology were evident. Follow-up surveys conducted during spring 1995 focused on confirming vegetation determinations in disturbed potential jurisdictional wetland areas identified during earlier surveys and refining earlier boundaries that were based largely on the extent of hydric soils.

Distinct breaks in vegetation and assemblages of indicator species were used to establish the wetland vegetation criterion in these riparian wetlands. Such a break was a shift from widely scattered herbaceous and emergent species in the channel to grasslands dominated by soft brome (*Bromus hordaceous*), oats (*Avena* sp.) and other upland annual grasses located several feet above the channel. Another vegetation break useful for determining wetland boundaries was the perceived shift from willows (*Salix* sp.), cottonwood (*Populus* sp.), and occasional valley oaks (*Quercus lobata*), associated with wetland riparian communities, to coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*), associated with riparian upland communities. A list of riparian wetland indicator species contained in the article "Section 404 Jurisdictional Determinations in Riparian Systems" (Wakeman and Fong 1981) was used to establish the wetland hydrology criterion in riparian areas. Assemblages of indicator species were used to identify riparian wetlands, such as assorted willows, cottonwood, and occasional valley oak, combined with herbaceous species such as mugwort (*Artemisia douglasiana*), clovers (*Trifolium* sp.), cocklebur (*Xanthium* sp.), Bermuda grass (*Cynodon dactylon*), and Baltic rush (*Juncus balticus*).

### Soils Criterion

In the absence of vegetative components and readily observable primary hydrology indicators, distinct redoximorphic soil features were the most reliable wetland indicator for seasonal wetlands within the project site. This resulted in the overestimation of the size of some wetlands in which hydric soils extended beyond the limits of wetland vegetation and hydrology.

The field investigators relied heavily upon soil morphological and redoximorphic characteristics as outlined in the 1987 Manual and more specifically in *Field Indicators of Hydric Soil* (NRCS 1994). In this draft NRCS report, the authors suggest the presence of a single hydric soil indicator, i.e., *"Distinct or prominent oxidized rhizospheres, value <=4 and chroma <=6, surround more than 5 percent of the live roots in a soil matrix having dominant chroma <+2 within the upper 30cm*" identifies a soil as hydric. The field investigators attempted to confirm as many hydric indicators as possible. Because

the original surveys were performed during the late summer and early fall, the field investigation teams relied heavily upon mapping the areal distribution of hydric soils to determine the boundaries of seasonal wetlands. This parameter was seasonally constant and often the least disturbed. However, the extent of hydric soils often extends beyond the actual wetland boundary. Sites were revisited during the wet season to refine wetland boundaries based on vegetation determinations and observable hydrology indicators.

Follow-up surveys were performed during the spring of 1995 to confirm inundation or saturation within the top 12 inches and to identify vegetation in disturbed potential seasonal wetlands identified during earlier surveys. Sites were revisited in the spring approximately two weeks following substantial storm events to confirm the presence of an aquic moisture regime. Observations of groundwater breakout, overland flow, and ponding were used to refine earlier boundary determinations. A soil probe was utilized to quickly check for saturation within 12 inches of the surface.

Many of the soils encountered during surveys of the proposed reservoir sites are classified as mollisols or entisols. Both of these soil orders are considered as problematic for hydric soils determinations because hydric indicators are difficult to observe or are not present. Additionally, some vertisols encountered during surveys were problematic. Mollisols are grassland soils that are high in organic content. Humic acid from decaying organic matter can stain soil particles, resulting in dark soil matrix chromas, a characteristic which can be mistakenly interpreted to indicate soil formation under anaerobic conditions. Organic acids can also mask gleying and mottling, further complicating hydric soil determinations. Therefore, low chroma soil colors are not a reliable hydric soil indicator for mollisols.

The first step in making a hydric soil determination in a suspected mollisol was to confirm that in fact it was a mollisol. The Sonoma County Hydric Soils List (NRCS 1987) provided an indication of whether many of these soils were hydric, based on landform position. Bright-colored mottling in the top 12 inches was a useful indicator but was cautiously applied because it could be representative of relict conditions, particularly where mollic soils occur on old fans and terraces, elevated above the modern floodplain, or where the local drainage has been incised. Hydric soil determinations for mollisols relied heavily upon the presence of a distinct gleyed horizon within the top 10 to 12 inches. In the absence of a gleyed horizon or bright colored mottles, mollisols were assumed to be hydric soils when located on valley and basin floors, depressions or flat spots (less than 5 percent slope) and wetland vegetation was present. Sites were revisited during the wet season to confirm inundation or near-surface saturation, which are positive field indicators of hydric soils.

Entisols are another problematic soil order that were commonly encountered during the surveys. These soils were frequently found in stream channels and on adjoining stream terraces and flood plains. Entisols often support riparian wetland communities. Standard hydric soil indicators such as low chromas and redoximorphic features were usually not visible in the entisols encountered. Entisols often show no mottling or other signs of

prolonged moisture duration (Padgett et al. 1989). Consequently, hydric soil indicators were not a very useful tool for delineating riparian wetland boundaries. The occurrence of mature riparian plant communities and/or the extension of similar suitable conditions (similar landforms) was utilized in these situations.

Although they are not designated as being problematic by the 1987 Manual, some vertisols encountered during surveys proved problematic in the field. Vertisols by definition have both high clay content and high shrink/swell capacity. Deep prismatic cracking is characteristic of these soils.

Reliance upon low chromas solely as indicators of hydric soils in these vertisols could be misleading. In general, if these low-chroma vertisols were located on slopes of 5 percent or greater, they were considered upland soils. These vertisols were classified as hydric if they were located on slopes of less than five percent and showed distinct redoximorphic features, or other strong hydrological and vegetative indicators were present. Follow-up visits were performed in the spring to confirm inundation or near-surface saturation.

Clear Lake vertisols are primarily basin floor and floodplain soils, and often exhibit hydric soil characteristics. However, some vertisols the field team encountered had low chromas potentially indicative of soil development under anaerobic conditions, but were clearly located in upland locations. Examples of two vertisols that proved problematic were the Diablo and Clear Lake series. Clear Lake soils are classified as *Typic Pelloxererts* and Diablo soils are classified as *Chromic Pelloxererts.* These soils generally formed in old clay-rich sedimentary deposits on terraces and hills. They are often moderately deep to bedrock. Some clay-rich soils develop dark- or low-chroma colors because the clay particle size has a strong affinity to staining by organic colloids. Clear Lake soils are hydric. On the other hand, Diablo clay is a drained soil similar to Clear Lake soils. It is not hydric except for hydric inclusions of Clear Lake soils.

### Hydrology Criterion

For wetland hydrology parameters to be met, a site must be seasonally inundated or saturated consecutively for at least 12.5 percent of the growing season; areas inundated or saturated for 5 to 12.5 percent of the growing season may or may not meet the wetland hydrology criterion. This flooding or inundation must occur at least biannually or for 50 percent of the "wet" seasons. During our investigation, hydrology was often the most difficult of the three parameters to assess. Our original surveys were conducted during the dry season; thus, inundation and saturation, the most reliable primary hydrologic indicators, were not directly observable in the seasonal wetlands surveyed.

Primary hydrology indicators such as drainage patterns, sediment deposits, algae thatch, drift lines and water marks were useful for determining wetland boundaries along creeks and ponds, but were less useful for identifying the boundaries of seasonal wetlands and isolated seeps, where inundation rarely occurs. Observation of secondary hydrology indicators such as the presence of oxidized rhizospheres in the upper 12 inches of soils,

local soil survey data, and topographical landform position, were often required to establish the wetland hydrology parameter for these types of wetlands. Local soils (NRCS 1972) were examined to determine the seasonal depth to groundwater table. Observations of topographic landform position were utilized in conjunction with the Sonoma County Hydric Soils List (NRCS 1987). A secondary hydrology indicator was considered established if the local hydric soil list identified a confirmed soil group or an inclusion to be hydric in a specific landform position, such as stream terraces or basin floors.

On many of the data forms the space for recorded data/aerial photographs has been checked. This was done to inform the reviewer about data that is available which may be helpful for the determination, but is not intended to imply that ponding or other hydrologic indicators are visible on aerial photos.

Determining boundaries in riparian wetlands was problematic because of seasonal changes in hydrology and vegetation, heavy grazing, and a lack of readily observable hydric soil indicators. As stated earlier, at the time of year the surveys were performed, surface water or saturated soil conditions were usually not observable. Creeks may have sustained high flows for several weeks to several months during the wet season, but because of the coarse-grained, well-drained entisol soils, they were often completely dry by early summer. Because of these highly variable flows, many stream channels were completely devoid of vegetation or sparsely vegetated by annual herbaceous and emergent species. Heavy grazing also compounded this problem. The availability of water and herbaceous vegetation late in the season attracts concentrations of cattle to these areas and has resulted in heavily disturbed conditions in most low-order streams.

In the absence of reliable hydric soil indicators, directly observable surface water, or saturated soils and limited vegetation, wetland boundaries were established based on indirect indications of ordinary high water levels and breaks in vegetation types. Generally, along western rivers and streams, elevation and vegetation gradients between bottomland (wetlands or other waters of the U.S.) and upland are sharp and visual distinctions are usually clear (Mitsch and Gosselink 1993). This conservative approach resulted in inclusion of many areas of waters of the U.S. in the total jurisdictional wetlands acreage. The extent of ordinary high water was established by indicators such as a clear natural line impressed on the bank, shelving changes in character of the soils, absence of terrestrial vegetation, or the presence of litter and debris.

Follow-up surveys during the spring of 1995 focused on confirming inundation or saturation within 12 inches of the surface in these seasonal wetlands. Whenever possible, surveys were timed between two and three weeks following substantial storm events. Areas of groundwater breakout, overland sheet flow, and ponding were noted to refine the earlier boundary determinations, which relied heavily on hydric soils and topographic/ landform position.

### Waters of the U.S.

Distinct, well-defined drainage features, such as well-incised channels that carry natural drainage, were considered to be waters of the U.S. However, no differentiation has been made in this report between wetlands and other waters of the U.S.; therefore, these features have been categorized as potential jurisdictional wetlands and jurisdictional waters of the U.S. Man-made ditches constructed for the purpose of conveying agricultural irrigation or drainage and excavated in upland soils are not waters of the U.S. and were excluded from this classification.

## SITE-SPECIFIC MODIFICATIONS TO STANDARD METHODS

Many of the sites encountered during this wetland determination exhibited characteristics indicative of "problem areas" (Corps 1987). Problem areas were those areas that likely met all three wetland determination parameters during the wetter portion of the growing season, and often exhibited seasonal obscurity of one or more parameters (typically vegetation and/or hydrology). Authors of the 1987 Manual

state that wetland delineation in western North America, during the drier portion of the growing season, is often confounded by the following natural phenomena:

OBL and FACW plant species normally dominant during the wetter portion of the growing season, may be succeeded by FACU and UPL (usually annual) dominants during the drier portion of the growing season; and

Seasonal wet areas that may be visibly inundated during wetter portions of the growing season may lack wetland hydrology indicators during drier seasons.

Heavy grazing by livestock which rendered herbaceous vegetation unidentifiable was another commonly observed condition that made wetland delineation problematic.

The approach utilized when making wetland determinations in any problem area varied on a site-specific basis. The 1987 Manual authors suggest observation of assumably similar adjacent undisturbed plant communities as circumstantial evidence of previous vegetative composition at the problem site. At many of the locales surveyed during this determination, such a comparison was not possible, due to the extent of disturbance (dry seasons and extensive grazing by cattle). Potential seasonal wetlands where vegetation was absent during earlier surveys due to grazing or obscured by late-season blooming tarplant, which is unpalatable to livestock, were revisited in the spring to confirm or refine vegetation determinations and wetland hydrology indicators.

# 4 RESULTS AND DISCUSSION

## GENERAL REGIONAL DESCRIPTION

### Climate

The climate of the area is coastal Mediterranean, characterized by dry, moderately hot summers and cool, moderately wet winters. The soil moisture regime in the West County area and in the Tolay Valley was assumed to be xeric. The soil temperature regime throughout most of the study region is mesic, bordering isomesic, and the growing season was assumed to extend from March through October. The Tolay Valley is characterized by a thermic soil temperature regime; the growing season is assumed to extend from February through October (Miller 1972). The average annual precipitation is about 27 inches. Most of the precipitation, about 27 inches or 90 percent, occurs during the period from October to April (see Table 4.1). The winter/spring of 1995 was an above average year for rainfall and provided exceptional conditions for determining the approximate extent of problematic seasonal wetlands.

### Geology and Topography

Four geologic units occur in the general study area. These units consist of the Franciscan Complex, the Wilson Grove Formation, the Petaluma Formation, and unconsolidated alluvium. Throughout much of the area encompassing the West County proposed reservoir sites, the Franciscan Complex occurs at or near the surface. Franciscan Complex rocks consist of sandstone, shale, conglomerate, chert, greenstone (altered basalt), and metamorphosed graywacke (semi-schist) occurring in coherent rock masses of these lithologies or as melange — chaotic mixtures of fragmented rock masses in a sheared shale matrix. The Wilson Grove Formation composed of sedimentary rock occurs at or near the surface throughout broad areas of the West County and consists mainly of massive sandstone but also includes interbeds of conglomerate and consolidated volcanic ash. Both the Franciscan Complex and the Wilson Grove Formation generally underlie upland sites. Unconsolidated sedimentary deposits (alluvium) occur in low areas occupied by streams. These deposits consist of coarse-grained, fluvial deposits including sand, gravel and silt, and fine-grained, overbank basin deposits of clay and silt.

In the West County, the Two Rock site is underlain by the Franciscan Complex. The Bloomfield, Carroll Road North, Valley Ford East, and Huntley sites are underlain by the Wilson Grove Formation and smaller inclusions of the Franciscan Complex. All of these proposed reservoir sites include unconsolidated deposits along the valley bottoms.

## Table 4.1

Rainfall In Santa Rosa, 1989 - 1995

(Rainfall in Inches)

| | Average * | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|---|
| January | 6.48 | 1.79 | 7.24 | 0.71 | 2.21 | 9.70 | 3.38 | 17.08 |
| February | 4.74 | 1.85 | 2.65 | 3.82 | 7.46 | 6.05 | 4.80 | 1.54 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| March | 4.04 | 10.00 | 1.63 | 11.76 | 4.49 | 3.17 | 0.34 | 11.52 |
| April | 1.95 | 1.20 | 0.17 | 0.54 | 1.39 | 1.28 | 1.56 | 3.01 |
| May | 0.59 | T | 4.84 | 0.07 | 0.00 | 1.47 | 0.89 | 1.78 |
| June | 0.29 | 0.20 | 0.01 | 0.51 | 0.80 | 1.46 | 0.00 | 0.76 |
| July | 0.04 | 0.00 | T | 0.00 | 0.00 | 0.00 | 0.02 | ** |
| August | 0.13 | T | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | ** |
| September | 0.48 | 2.60 | 0.22 | 0.00 | 0.00 | 0.00 | 0.01 | ** |
| October | 1.83 | 2.40 | 0.44 | 1.85 | 3.81 | 2.54 | 1.02 | ** |
| November | 4.09 | 3.55 | 0.49 | 1.09 | 0.34 | 3.35 | 7.12 | ** |
| December | 5.15 | 0.00 | 1.19 | 3.64 | 8.24 | 3.37 | 3.37 | ** |
| TOTAL | 29.81 | 23.59 | 18.88 | 24.05 | 28.74 | 32.39 | 22.60 | ** |

SOURCE: State of California Climatological Research Office

T = Trace
*1951 - 1993
**Data collected up to the time of field work completion

Sedimentary rocks of the Tertiary Petaluma Formation underlie much of the upland area where the South County proposed reservoir sites (Adobe Road, Lakeville-Hillside, Tolay, and Sears Point) are located. The Petaluma Formation consists of deeply weathered massive claystone, siltstone and mudstone with lenses of sandstone. In portions of this area, particularly at the Tolay and Sears Point sites, Sonoma Volcanics interfinger and overlie the Petaluma Formation, and underlie surficial soils. The Sonoma Volcanics consist of basalt, andesite, rhyolite, and tuff (consolidated volcanic ash).

Unconsolidated sedimentary deposits occur in topographic lows along stream valleys, which, in the case of the Tolay site, broaden into a wide flood plain. Unconsolidated deposits consist of alluvium, lakebed deposits, and landslide deposits. The alluvium is subdivided into generally coarse-grained fluvial deposits consisting of sand, gravel and silt, and fine-grained basin deposits consisting of clay and silt, with the latter predominating at sites such as Tolay with broad flood plains.

In the South County, the Adobe site is underlain by the Petaluma Formation; the Lakeville-Hillside site is underlain by Petaluma Formation, with some Franciscan complex at the head of the canyon; and the Tolay and Sears Point sites are underlain by Petaluma Formation, possibly including some Sonoma Volcanics. All the sites underlain by rock units also include alluvium along valley bottoms or flood plains.

## SOILS

The following soil series summaries provide information on soil characteristics that is relevant to the wetland determinations for each of the soil types mapped by the USDA Soil Conservation Service (as it was then known) (Miller, 1972) on the proposed storage sites. The soil series summaries are based on information contained in the Soil Survey of Sonoma County (Miller 1972) and the Field Office Official List of Hydric Soil Map Units for Sonoma County, California. Soils are listed in Table 4.2, which also includes the subgroup and hydric/non-hydric character of the mapped soil unit. To the extent that the soil survey or hydric soils list indicate the presence and identity of hydric inclusions, these are mentioned. However, as is always the case for soil surveys of the order that are published, inclusions such as those observed at individual wetland data points or along minor drainageways may be too small to be observed or to merit mention. Thus, it is possible for hydric soils to be observed within mapping units that are determined to be, as a whole, non-hydric.

Common soils that occur within the Two Rock, Bloomfield, Valley Ford East, Carroll Road North, and Huntley proposed reservoir sites in the West County are mollisols: soils which exhibit dark, organic matter enriched surface horizons, called mollic epipedons. Soils of the Sears Point, Lakeville Hillside, and Adobe Road proposed reservoir sites, located in the South County area, are predominantly vertisols: dark-colored, high-clay soils that shrink and swell with changes in soil moisture content. Soil types at the reservoir sites can be assigned to two basic groups based on topographic position: uplands and topographic low areas. Topography often controls the nature of soil parent materials. Upland soils have parent materials derived from the underlying bedrock. Upland soils consist mainly of Steinbeck (*Mollic Haploxeralfs*) (30-60 inch depth), Los Osos (*Typic Argixerolls*) (15-50 inch depth), and Diablo (*Chromic Pelloxererts*) (25-60 inch depth), with smaller amounts of Goulding-Toomes complex (*Lithic Xerochrepts*) (12-24 inch depth) and Goulding-Toomes complex (*Lithic Xerorthents*) (5-20 inch depth). Soils underlying topographic low areas generally consist of parent materials derived from unconsolidated alluvial and basin deposits that have been deposited there. Soil types at lower-lying sites are more variable and include *Aquic Xerofluvents*, *Typic Fluvaquents*, Blucher and Pajaro (*Typic Haplaquolls*), and Clear Lake (*Typic Pelloxererts*).

# Table 4.2

Soils of the Study Area

| Mapped Soils Unit | Subgroup | Local Hydric Soils List Determination | Hydric Characteristics |
|---|---|---|---|
| Blucher fine sandy loam, overwash, 0-2% slopes | Typic Haplaquolls | Hydric stream terrace soil | Saturation |
| Blucher clay loam, 2-5% slopes | Typic Haplaquolls | Hydric inclusions (unnamed type) on basin floors | Near-surface saturation; prominent mottling |
| Clear Lake series | Typic Pelloxererts | Hydric basin floor soil type | Inundation or saturation; also mottles and/or oxidized rhizospheres |
| Diablo clay series | Chromic Pelloxererts | Hydric inclusions of Clear Lake clay and an unnamed type in depressions and upland seeps | Saturation or inundation; chroma of 1, or 2 with mottles |
| Goulding-Toomes complex | Lithic Xerochrepts and Lithic Xerorthents | Neither component hydric | NA |
| Gullied land | Not applicable | Hydric inclusions (unnamed type) in swales | Surface flows; non-wetland jurisdictional waters |
| Los Osos clay loam series | Typic Argixerolls | Not hydric | NA |
| Pajaro fine sandy loam, 2-5% slopes | Typic Haplaquolls | Not hydric | NA |
| Sebastopol sandy loam, 9-15% slopes | Typic Haploxerults | Not hydric | NA |
| Steinbeck series | Mollic Haploxeralfs | Hydric inclusions (unnamed type) in upland seeps | Saturation |

### Blucher Series

Blucher soils are somewhat poorly drained loams underlain by stratified silt and clay. Depth to seasonal high water table is 3.5 to 5 feet, and soil permeability is moderate to moderately slow. Accordingly, although soil chromas of Blucher clay loam are low throughout the profile (usually 1, as is typical for mollisols), it is not a hydric soil, but contains hydric inclusions of an unnamed type. These inclusions were observed at data points within this mapped soil type and were identified during the late summer primarily on the basis of the presence of numerous, prominent, bright mottles. Subsequent observations of saturation to the surface, or of shallow inundation, more than three weeks after last rainfall during the growing season corroborated previous judgments of the presence of hydric soils.

### Clear Lake Series

Several map units of this series of hydric clays and clay loams are found within the study area. Their general characteristics are similar for the purposes of this study. Clear Lake soils formed on basin floors under poorly drained conditions. The thick A horizon of these soils is dark gray, with typical chromas of 0 or 1 probably derived both from staining of clay particles by leached organic compounds and from reducing conditions. The underlying clay subsoils are light brownish gray to white. Although depth to the water table is 3 to 5 feet, permeability is slow and all Clear Lake soil units are hydric, although some areas are effectively drained and cropped.

### Diablo Clay Series

Diablo clays are more or less similar to Clear Lake clays in color, profile, pH, and texture. However, Diablo clays are well-drained, hence they are not hydric, except for inclusions of Clear Lake clay and an unnamed soil type in depressions and where seeps occur on hillsides.

### Goulding-Toomes Complex

This map unit consists of two components with relatively little profile development (an entisol and an inceptisol). Goulding soils are clay loams, often with many coarse fragments, that are underlain at shallow depths (one to two feet) by rock; they occur on mountains and hill sides. Toomes soils contain less clay, and volcanic bedrock occurs even closer to the surface. The bedrock that underlies Toomes soils very near the surface (0.5 to 1.5 feet) certainly perches a seasonal water table briefly, but permeability is moderate and drainage is good. Accordingly, both of these similar soil types are non-hydric.

### Gullied Land

This mapping unit was used for severely eroded areas on gentle to steep slopes, where much or all of the pre-existing soils have been lost. Accordingly, description of soils

horizons and characteristics is difficult or impossible. Many of the intermittent tributaries encountered, which are other waters of the U.S., fall within the gullied land map unit.

### Los Osos Clay Loam Series

This soil series consists of well drained clay loams underlain by clay subsoils. The "thin solum" (soil column or horizons) units have bedrock at depths of 15 to 25 inches. Having chromas of 2 and 3 throughout the profile and very low values in the subsoil, Los Osos clay loams are not quite as dark as other mollisols in the study area. Permeability is slow to moderately slow and depth to parent material is shallow, but the generally steeply sloping terrain of Los Osos soils drains them effectively, so they are not mapped as a hydric soil type. Nevertheless, on lower hill slopes where the near-surface bedrock results in widespread seasonal seepage, the prolonged early growing season saturation results in hydric conditions.

### Pajaro Fine Sandy Loam, 2-5 Percent Slopes

Pajaro soils are somewhat poorly drained fine sandy loams on low terraces and alluvial flood plains and fans. Soil colors are very typical for mollisols, 10 YR 5/1 or 5/2 throughout the profile. However, depth to the water table is 3 to 5 feet, and permeability is only moderately slow. Thus, Pajaro loams are not hydric, and the low mollic chromas are misleading, since low chromas usually indicate hydric soils. At wetland data points in Pajaro fine sandy loam, groundwater seepage created seasonal saturation at or near surface, which was observed during followup surveys in the spring of 1995 and is further evidenced by prominent bright mottling and oxidized living root zones, observed in late summer.

### Sebastopol Sandy Loam, 9-15 Percent Slopes

Sebastopol soils are acidic, well drained sandy loams formed from sandstone and underlain by a clay subsoil. The surface layer is brown (10YR), contrasting strongly with the variously reddish and yellow lower layers (2.5YR and 5YR). Chromas are high throughout (usually 3 or 4, but ranging up to 6). Although the seasonal water table may extend to near the surface, permeability is moderate to moderately slow, and drainage is usually good. Accordingly, Sebastopol sandy loams are not hydric, except very locally where the seasonal water table perched on the clay subsoil persists for a prolonged period.

### Steinbeck Series

Several map units of Steinbeck clay loams occur in the study area, corresponding to different slope classes (2-9 percent, 9-15 percent, 15-30 percent, and 30-50 percent). These soils are of a suborder that is of widespread occurrence in California (*Xeralfs*). As indicated by the subgroup prefix (*Mollic*), chromas of Steinbeck loams are lower (typically 1 or 2) than is usual for alfisols, perhaps suggesting origins under prehistoric grasslands rather than other vegetation types. Steinbeck loams are moderately well drained, with variable depth to bedrock and/or to seasonal water table, but with moderate permeability. Consequently, they are not hydric soils, although hydric inclusions of an unnamed type occur at seeps. These hydric inclusions were easily recognized by strong redoximorphic features such as prominent mottles and oxidized rhizospheres.

## VEGETATION

Most of the study area is located in the northwest area of the California floristic province (Hickman 1989). The following text provides a discussion of the vegetative composition of each major wetland plant community type encountered on the proposed storage sites. The wetland plant community descriptions and names used in this analysis were based primarily on Holland (1986) and Shuford and Timossi (1989), but have been modified to be applicable to the project study area. The classification scheme for wetland plant communities and specific community descriptions were coordinated with the classification scheme and plant community descriptions developed by Sycamore Environmental Consultants. Small areas of

waters of U.S. and wetlands have been categorized by vegetation community types not typically associated with waters of the U.S. and wetlands including: Oak-Bay-Madrone Woodland, Oak Woodland, Coastal Live Oak/Interior Live Oak Woodland, Eucalyptus, Vineyard and other minor inclusions. These small areas of non-typical wetland plant communities primarily occur along the upland fringe of drainages and riparian wetlands and have been typed accordingly because the overstories of these non-typical wetland communities overlapping these features.

### Annual Grassland

Annual grassland wetlands are the greatest single contributor to the overall total acreage of jurisdictional waters of the U.S. and wetlands in the study area and were the most problematic type of plant community for wetland determination that was encountered on all of the proposed reservoir sites. These wetlands have a vegetation matrix dominated by FAC plants similar to surrounding grasslands, but also include a codominant component of FACW and OBL plants. Typical hydrophytic vegetation in annual grassland wetlands includes: wild rye (*Lolium perenne = Lolium multiflorum*), Mediterranean barley (*Hordeum marinum* var. *leporinum*), meadow barley (*Hordeum brachyantherum*), barnyard grass (*Echinochloa crus-galli*), velvet grass (*Holcus lanatus*), curly dock (*Rumex crispus*), fiddle dock (*Rumex pulcher*) and clovers (*Trifolium* spp.). Other common components include: Baltic rush (*Juncus balticus*), toad rush (*Juncus bufonis* var. *bufonis*), prickle-fruited buttercup (*Ranunculus muricatus*), pennyroyal (*Mentha pulegium*), and in lesser amounts, other hydrophytic species found in freshwater seeps.

These annual grassland wetlands primarily occur on unconsolidated materials located on valley floors, basins, elevated stream terraces, lower alluvial fans and flat areas at the base of toe slopes. Mollisols and vertisols with dark chromas that occur in these landform positions are easily confused with wetland soils and also mask redoximorphic features. These annual grassland wetlands are seasonally flooded and boundaries can shift from season to season. Distinct breaks in vegetation type often are not discernible

in annual grassland wetlands. On many sites the dominant vegetation type in annual grassland wetlands was absent due to grazing and/or obscured by late blooming tarplant, which is distasteful to cattle, further complicating wetland vegetation determinations. The wetland/upland boundary in these communities was determined to be where a prevalence of the hydrophytic species listed above shifted to a prevalence of slender wild oat (*Avena barbata*), wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), soft brome, and hedgehog dogtail grass (*Cynosurus echinatus*). Because of the problematic nature of determining the boundaries of annual grassland wetlands and the extremely wet season when surveys were performed, it is likely that some non-wetland areas have been included in the estimated total amount of annual grassland wetlands.

Smaller areas of native grassland wetlands also occur on the proposed storage sites. However, because wet areas generally support vegetation later into the season, they tend to be subject to greater grazing disturbances. These disturbances tend to favor recolonization by annual non-native grasses over perennial native grasses. Consequently, the vast majority of grassland wetlands in the study area are dominated by annual grasslands primarily composed of non-native grasses. The few small areas of native grassland wetlands that were encountered typically supported creeping wild rye (*Leymus triticoides*), canary grass (*Phalaris* spp.), California oatgrass (*Danthonina californica* var. *californica*), slender hairgrass (*Deschampia elongata*), annual bluegrass (*Poa annua*), mannagrass (*Glyceria leptostachya*), tall fescue (*Festuca arundinacea*) and the rushes, sedges and other herbaceous species found in annual grassland wetlands of Sonoma County.

### Cropland

Cropland wetlands include areas currently in agricultural production that are subject to periodic inundation or saturation or have exhibited wetland characteristics in the past. Crop types observed in these areas include oat hay and saffron. Continuously cropped areas that exhibited wetland characteristics in the past, but which were modified prior to 1985 in ways that eliminated wetland hydrology could be considered prior converted croplands, not subject to Section 404 jurisdiction unless abandoned as agricultural lands. Other cropped areas that continue to experience inundation in most years could be considered farmed wetlands, where normal cropping activities are permitted, but which are subject to Section 404 jurisdiction if a conversion to another use occurs. Several large cropped areas on the proposed Tolay Reservoir site may fall into one or the other of these classifications. The jurisdictional status of these areas has not yet been determined.

### Drainages

Drainages are channels or low spots in the landscape which collect runoff and groundwater discharge and convey surface water for a few days to a few months. Most of the low order, high gradient USGS blue line streams were classified as drainages. Many drainages have been typed or classified by vegetation communities not normally associated with wetlands or other waters of the U.S. such as eucalyptus and coast live

oak/interior live oak woodlands. Drainages range from as narrow as one foot up to approximately ten feet wide and may or may not be vegetated. Most drainages occur as well defined sandy or gravely flat bottomed channels largely devoid of vegetation. Many of these are jurisdictional waters of the U.S., but not wetlands. Other drainages support discontinuous clumps of vegetation around areas of prolonged ponding or saturation similar to that found in freshwater seep wetlands. Typical vegetation includes isolated willows (*Salix* sp.), Baltic rush (*Juncus balticus*), brown headed rush (*Juncus phaeocephalus*), rye grass (*Lolium* spp.), rabbitsfoot grass (*Polypogon monspeliensis*), common monkey flower (*Mimulus guttatus*), cocklebur (*Xanthium* spp.), nutsedge (*Cyperus* spp.), spikerush (*Eleocharis macrostachya*) and Bermuda grass (*Cynodon dactylon*).

### Excavated Drainage Wetlands

Realigned historic drainages that receive sufficient precipitation or runoff to maintain wetland characteristics remain under Section 404 jurisdiction. Several excavated drainages are located on the proposed Tolay Reservoir site, including Tolay Creek and tributaries, which are actually realigned historic drainages and continue to function biologically as wetlands. Typical vegetation includes cattails (*Typha* sp.), tules (*Scirpus* spp.), knot weed (*Polygonum* spp.), water cress (*Rorippa* spp.) and other vegetation similar to that found in freshwater marshes. Teasel (*Dipsacus fullonum*) and poison hemlock (*Conium maculatum*) dominate the moist upper fringe of these ditches.

### Freshwater Marsh

This wetland type is characterized by vegetation that is adapted to perennially wet conditions. Cattails (*Typha* spp.) and tules (*Scirpus acutus* var. *occidentalis*) occur in deeper water and Baltic rush (*Juncus balticus*), spike rush (*Eleocharis macrostachya*) and nutsedge (*Cyperus* spp.) occur along the moist upper fringe. Freshwater marsh wetlands are found in association with perennial streams and around farm ponds.

### Freshwater Ponds

Natural lakes and ponds are rare in the project area, however, the valley floor of the proposed Tolay storage sites formerly supported a large seasonal lake and associated freshwater marsh vegetation. Most ponds and lakes in Sonoma County are man-made. Impoundments have been constructed to collect overland runoff and surface water flows in natural drainages for stock watering and agricultural irrigation. These stockponds function as freshwater pond wetlands and have been included in the totals of jurisdictional waters of the U.S. and wetlands because the vast majority impound natural drainages or have been excavated in areas that were formerly freshwater seeps or seasonal wetlands. The quality of wetland and aquatic habitat provided by stockponds or freshwater pond wetlands varies tremendously. Bands of emergent vegetation occur along the fringe of some stock ponds while others are completely devoid of vegetation due to livestock or to regular fluctuations in water levels. Typical vegetation around stockponds includes cattails (*Typha* spp.), spike rush (*Eleocharis macrostachya*), tules (*Scirpus acutus* var. *occidentalis*) and a variety of willows (*Salix* spp.).

### Freshwater Seep

In permanently or temporarily wet areas, ground water or springs flow or seep to the surface. Freshwater seep wetlands are interspersed throughout annual grasslands and are characterized by small areas of ponded water and/or moist green vegetation which remain throughout most, if not the entire year. They typically are subject to inundation or saturation for longer duration than annual grassland wetlands. Many of these areas have been modified by placement of spring boxes for livestock watering. Common vegetation found in freshwater seep wetlands includes: Baltic rush (*Juncus balticus*), toad rush (*Juncus buffonius* var. *buffonius*), spreading rush (*Juncus patens*), brown headed rush (*Juncus phaeocephalus* var. *phaeocephalus*), prickle-fruited buttercup (*Ranunculus muricatus*), bird's foot trefoil (*Lotus corniculatus*),

water sedge (*Carex aquatilis* var. *dives*) and grasses typically found in annual grassland wetlands. In areas of shallow, permanent, or semi-permanent standing surface water, duckweed (*Lemna minuscula*), water cress (*Rorippa* spp.), American brooklime (*Veronica americana*) and spike rush (*Eleocharis* spp.) are common.

### Seasonally Wet Vegetation

Seasonally wet vegetation wetlands are an intermediate community between freshwater seeps and annual grassland wetlands. These wetlands occur in low lying areas or small depressions in the landscape such as swales and basin floors that briefly pond water or that become saturated due to the presence of near surface groundwater. Seasonally wet vegetation wetlands generally receive less moisture for shorter duration and are larger features than freshwater seeps, but they receive more moisture and can be as large as annual grassland wetlands. They often are moist and darker green late into the season and the boundaries between adjacent vegetation types are generally more distinct than in annual grassland wetlands. Typical vegetation includes popcorn flower (*Plagiobothrys trachycarpus*), meadowfoam (*Limnanthes douglasii* ssp. *douglasii*), downingia (*Downingia concolor*), button celery (*Eryngium* spp.), loosestrife (*Lythrum hyssopifolia*), flowering quillwort (*Lilaea scilloides*), aquatic buttercups (*Ranunculus aquatilus* var. *subrigidus*), pennyroyal (*Mentha pugelium*), Baltic rush (*Juncus balticus*), and the grasses and sedges listed above that occur in freshwater seeps and annual grassland wetlands.

### Mixed Riparian Woodland

Mixed riparian woodland wetlands are closely associated with perennial or intermittent streams and are composed of various broad leaved, closed canopied deciduous trees with an extensive understory of shade tolerant shrubs. Near the coast, mixed riparian woodlands are dominated by red alder (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*). Further inland, red alder is replaced by white alder (*Alnus rhombifolia*), valley oak (*Quercus lobata*) and Fremont's cottonwood (*Populus fremontii*). Other trees that were encountered in lesser numbers in mixed riparian wetlands include wax myrtle (*Myrica californica*), Oregon ash (*Fraxinus latifolius*), black willow (*Salix gooddingii*) and yellow tree willow (*Salix lasiandra*). The upper edges of riparian corridors, which are outside of the area mapped as wetlands, commonly support California bay (*Umbellularia californica*), coast live oak (*Quercus agrifolia*), interior live oak (*Quercus wislizenii*) and buckeye (*Aesculus californica*) which intergrade into annual grasslands. Mixed riparian wetlands commonly have a dense understory of shrubs and vines including blackberry (*Rubus* sp.) and poison oak (*Toxicodendron diversilobum*). Wet slump and flat terrace areas along banks where seeping groundwater discharges are characterized by willows, common horsetail (*Equisetum arvense*), nettle (*Urtica* spp.) and chain fern (*Woodwardia fimbriata*).

### Willow Riparian

Willow riparian wetlands commonly are composed of a dense thicket dominated by red willow (*Salix laevigata*) and arroyo willow (*Salix lasiolepis*) with little or no understory. Occasionally they include dense stands of sandbar willow (*Salix exigua*) or are scattered with yellow tree willows (*Salix lasiandra*). Blackberry (*Rubus* spp.) and poison oak are occasionally intertwined throughout the thicket. Willow riparian wetlands generally occur within and immediately along stream courses and other locations where there is available surface water or groundwater seeps near the surface. Willow riparian wetland communities commonly occur in freshly deposited sand and silt soils on flood plains. Because these communities commonly occur in locations of permanent or semi-permanent moisture and they provide shade and forage throughout the year, they tend to attract livestock and are often severely degraded. Consequently, the degree of disturbance varies greatly between willow riparian wetlands in different locations and depends largely upon the amount of grazing a certain location has experienced.

### Non-wooded Riparian

These are well defined channels, generally wider than ten feet, that once supported riparian shrubs or trees that have been eliminated by grazing or other disturbances. Plant communities in non-wooded riparian wetlands can range from similar to that described above in drainages to that found in freshwater marshes. However, these disturbed riparian corridors are devoid of shrubby or woody vegetation. The main channel of these non-wooded riparian corridors is subject to frequent substrate disturbances from flooding, and livestock trampling and grazing which generally prevents the establishment of woody perennial vegetation. These non-wooded riparian communities are most often vegetated by a scattering of annual herbaceous species.

## FUNCTIONS AND VALUES

Wetland functions are physical, chemical and biological processes or attributes of wetlands that are vital to the integrity of the wetland system, and operate whether or not they are viewed as important to society. Values, on the other hand, are wetland attributes that are not necessarily important to the integrity of the wetland system itself, but are

perceived as being valuable to society. The assessment of wetland functions and values on the proposed reservoir sites utilizes a combination of functional classification systems, other related technical studies, and a Wet II, Level One Social Significance Evaluation.

Potential wetlands and other waters of the U.S. were grouped on each storage site by vegetation type, incorporating the classification systems developed by Holland (1986) and Shuford and Timossi (1989). These wetland plant communities were then related to other wetland or habitat classification systems including Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979), a Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988) and a Hydrogeomorphic Classification for Wetlands (Brinson 1993) (see Table 4.3). Cowardin provides a nationwide classification system developed to inventory national aquatic ecosystems in which wetlands are hierarchically grouped by similarity of hydrologic, geomorphic, chemical and biological factors. This classification system relates wetland types to aquatic habitats discussed in other technical memorandums. A Guide to Wildlife Habitats of California provides a classification system that relates wetland vegetation types to wildlife habitat types. The Hydrogeomorphic Classification for Wetlands identifies the geomorphic and hydrodynamic properties for the identified wetland types. The wetlands identified by vegetation type have been related to these classification schemes to provide the reader a basic understanding of wetland functions. The potential effects to these related functions are addressed in various related technical memorandums including: hydrology and water quality, terrestrial and aquatic biology and cultural resources.

A Wet II, Level One Social Significance Evaluation will be conducted to translate wetland functions to socioeconomic and biological values and to provide a relative assessment of wetland values on proposed storage sites. This will be prepared and included as an addendum to this report. Social significance is the value society places on wetland functions and values as evidenced by their economic worth or official recognition. Socioeconomic benefits or values include flood and stormwater damage protection, erosion control, water supply, water quality protection/enhancement, groundwater recharge, agricultural commodities, fish and shellfish production and recreation. Biological benefits or values primarily involve providing both terrestrial and aquatic habitat. The Wet II, Level One, Social Significance evaluation provides a standardized approach to assigning relative values to the biological, chemical and physical functions of potentially affected wetlands areas. The results of the Wet II Social Significance Evaluation and information contained in this technical memorandum should provide the reader adequate information to understand potential impacts to related wetland functions addressed in other technical memorandums and facilitate a relative comparison of wetland functions and values for each storage site sufficient for CEQA/NEPA alternative analysis purposes.

# Table 4.3

Wetlands Classification Crosswalk

| Wetland Plant Community Type[1] | Wetland Classification[2] | Wetland Wildlife Habitat[3] | HGM Characteristics[4] |
|---|---|---|---|
| Freshwater Marsh | Palustrine emergent wetland, permanently or irregularly flooded. | Fresh emergent wetland<br>Lacustrine | **Geomorphic Setting.** Low-gradient riverine or groundwater slope.<br>**Water Source.** Most units are linear runoff supported with some minor groundwater recharge from banks.<br>**Hydrodynamic Properties.** Seasonal vertical fluctuation primarily driven by rainfall and evapotranspiration with some groundwater recharge. |
| Freshwater Pond | Impounded, palustrine, emergent wetland fringe, with unvegetated shallows. | Lacustrine | **Geomorphic Setting.** Impoundments in natural or modified drainages.<br>**Water Source.** Some units mostly linear runoff-supported; others groundwater-supported.<br>**Hydrodynamic Properties.** Mostly unidirectional flow and percolation. |
| Freshwater Seep | Palustrine, emergent wetland, intermittently flooded. | Wet meadow | **Geomorphic Setting.** Groundwater slope.<br>**Water Source.** Groundwater, with minor contribution of direct precipitation and sheet runoff.<br>**Hydrodynamic Properties.** Unidirectional flow and evapotranspiration. |
| Willow Riparian | Palustrine, scrub/shrub or forested wetlands, seasonally flooded. | Valley foothill riparian | **Geomorphic Setting.** High and low-gradient riverine.<br>**Water Source.** Primarily seasonal runoff flooding; also groundwater.<br>**Hydrodynamic Properties.** Unidirectional flow of surface and groundwater. |

## Table 4.3 (continued)

| Wetland Plant Community Type[1] | Wetland Classification[2] | Wetland Wildlife Habitat[3] | HGM Characteristics[4] |
|---|---|---|---|
| Mixed Riparian Woodland | Palustrine, scrub/shrub or forested wetlands, temporarily flooded. | Valley foothill riparian | **Geomorphic Setting.** High and low-gradient riverine.<br>**Water Source.** Primarily seasonal runoff flooding; also groundwater.<br>**Hydrodynamic Properties.** Unidirectional flow of surface and groundwater. |
| Non-wooded Riparian | Riverine/Palustrine, seasonally flooded to permanently flooded. | Riverine | **Geomorphic Setting.** High and low-gradient riverine.<br>**Water Source.** Primarily seasonal runoff flooding; also groundwater.<br>**Hydrodynamic Properties.** Unidirectional flow of surface and groundwater. |
| Drainage | Riverine, intermittently flooded for short periods following flood events. | Riverine | **Geomorphic Setting.** High and low-gradient riverine.<br>**Water Source.** Primarily seasonal runoff flooding; also groundwater.<br>**Hydrodynamic Properties.** Unidirectional flow of surface and groundwater. |
| Excavated Drainage | Palustrine emergent wetland, permanently or irregularly flooded. | Riverine | **Geomorphic Setting.** High- and low-gradient riverine generally straightened, flat-bottomed, uniform channels which convey the flow of former natural drainages or collect and convey natural overland runoff.<br>**Water Source.** Primarily seasonal runoff flooding, also groundwater. Often discharge flow can be year round if impountment upstream.<br>**Hydrodynamic Properties.** Unidirectional flow of surface and groundwater. |

## Table 4.3 (continued)

| Wetland Plant Community Type[1] | Wetland Classification[2] | Wetland Wildlife Habitat[3] | HGM Characteristics[4] |
|---|---|---|---|
| Annual Grassland/ Native grassland | Palustrine, seasonally flooded. | Annual grassland | **Geomorphic Setting.** Valley floors, basins, elevated stream terraces, lower alluvial fans and flat areas at the base of toe slopes.<br>**Water Source.** Direct precipitation and sheetflow for short periods following storm events. Groundwater discharge often continues late into the spring or summer maintaining higher moisture regimes than surrounding upland annual grassland communities.<br>**Hydrodynamic Properties.** Unidirectional flow primarily of groundwater. |
| Cropland | Palustrine, seasonally flooded. | Cropland | **Geomorphic Setting.** Valley or basin floors which once supported freshwater lake and marsh habitat but have been drained for agricultural purposes.<br>**Water Source.** Direct precipitation, sheet flow and groundwater discharge.<br>**Hydrodynamic Properties.** Unidirectional flow of primarily groundwater. |
| Seasonally Wet Vegetation | Palustrine, emergent wetland, seasonally flooded. | Annual grassland | **Geomorphic Setting.** Groundwater slope.<br>**Water Source.** Groundwater, sheet surface runoff, and some direct precipitation.<br>**Hydrodynamic Properties.** Brief unidirectional flow. Hydrodynamic regime dominated by evapotranspiration. |

Source: Harland Bartholomew & Associates, 1995

1. Community types developed utilizing Shuford and Timossi's *Plant Communities of Marin County* (1989) and Robert Holland's *Preliminary Descriptions of the Terrestrial Natural Communities of California* (October 1986).
2. Cowardin et al., 1979. *Classification of wetlands and deepwater habitats of the United States*
3. Mayer and Laudenslayer, 1988. *A Guide to Wildlife Habitats of California*
4. Wetland function descriptions derived from the *Hydrogeomorphic Classification for Wetlands* (Brinson, 1993).

## SITE-SPECIFIC DESCRIPTIONS

This section provides brief site-specific accounts of wetlands and other waters of the U.S. encountered by field investigators. Table 4.4 summarizes these observations and provides the total extent of wetlands and other waters of the U.S., classified by vegetation types, that were determined to occur on each of the proposed storage sites. Appendix B contains 1" = 500' scale maps which show the approximate extent and boundaries of potential jurisdictional wetlands and other waters of the U.S. for each of the proposed storage sites.

### Adobe Road

Deeply-incised ephemeral tributaries feed a well-scoured, gravel-bottomed main channel at the Adobe Road site. Intermittent, pooled, standing water was observed in the main channel. Jurisdictional wetlands were observed predominantly in narrow gully-bottom swales. Other observed wetlands include an emergent marsh at the periphery of a stock pond (located at the drainage head), and several hillside seeps. Waters of the U.S. present at the site include ephemeral tributary channels and the ephemeral creek mainstem. Estimated wetland acreage observed at this site is approximately 28 acres (see Map 2).

### Lakeville Hillside

The Lakeville Hillside site possesses deeply-incised ephemeral tributaries discharging to a mainstem unnamed USGS blue-line creek. Jurisdictional wetlands were observed as narrow gully-bottom swales, broad bottomland swales dominated by annual grassland vegetation associated with the mainstem, hillside seeps, and some freshwater marsh associated with ponded segments of the mainstem creek. Waters of the U.S. observed at this site included steep-gradient ephemeral tributaries and the low-gradient, perennial, and intermittent creek mainstem. Wetland acreage at this site is estimated at approximately 22 acres (see Map 3).

### Tolay A & C

Wetlands were observed in areas along linear excavated drainages, the mainstem of Tolay Creek, hillside seeps, along the shorelines of stock ponds, willow riparian habitat in drainage swales and large acreages of seasonally wet cropland on the basin floor which is a historic lake bed deposit. Waters of the U.S. observed at the site included a few incised ephemeral drainages and the perennial mainstem of Tolay Creek.

Several excavated ditches at the Tolay site either carry significant wet season runoff, or support hydrophytic vegetation, or both. Most of these ditches constitute realigned segments of historic tributary waters of the U.S., which were judged to be potential jurisdictional channels both upstream and downstream of the realigned segments.

# Table 4.4

Wetlands, Other Waters of the U.S. and Other Natural Features Observed at Each Reservoir Site

| Reservoir Name | Gross Capacity (million gal.)** | Topography | Mapped Soils*** | Wetland Plant Communities | Approximate Jurisdiction Acreage[2] |
|---|---|---|---|---|---|
| Adobe Road | 3,700 | Narrow swale with several tributary swales. Side slope moderate to steep | Clear Lake clay, 0-2% slopes<br>Clear Lake clay, 2-5% slopes<br>Diablo clay, 15-30% slopes | Annual Grassland<br>Coastal Live Oak/Interior Live Oak Woodland<br>Freshwater Pond<br>Freshwater Seep<br>Mixed Riparian<br>Non-wooded Riparian<br>**Total Jurisdictional Area:** | 10<br>1<br>2<br>1<br>13<br>2<br>**30** |
| Lakeville Hillside | 1,500 | Two narrow stream-valleys merge into single one. Side slopes moderate to steep | Clear Lake clay, 0-2% slopes<br>Clear Lake clay, 2-5% slopes<br>Diablo clay, 15-30% slopes | Annual Grassland<br>Drainage<br>Eucalyptus<br>Freshwater Pond<br>Freshwater Seep<br>Native Grassland<br>Non-wooded Riparian<br>Poplar<br>Vineyard<br>Willow Riparian<br>**Total Jurisdictional Area:** | 5<br><1<br>3<br><1<br>1<br><1<br>6<br><1<br><1<br>6<br>**22** |

# Table 4.4 (continued)

| Reservoir Name | Gross Capacity (million gal.)** | Topography | Mapped Soils*** | Wetland Plant Communities | Approximate Jurisdiction Acreage[2] |
|---|---|---|---|---|---|
| Tolay A | 6,000 | Broad, flat stream-valley, local channels at principal tributary drainages; narrows to swale at head of principal and tributary drainages, side slopes moderate to steep | Clear Lake clay loam, 0-2% slopes<br>Diablo clay, 9-15% slopes<br>Diablo clay, 2-9% slopes<br>Goulding-Toomes complex, 9-50% slopes | Annual Grassland<br>Drainage<br>Eucalyptus<br>Freshwater Pond<br>Freshwater Seep<br>Excavated Drainage<br>Mixed Riparian<br>Native Grassland<br>Non-wooded Riparian<br>Seasonally Wet Vegetation<br>Willow Riparian<br>**Total Jurisdictional Area:**<br>**Crop[1]** | 37<br>6<br><1<br>10<br><1<br>6<br>3<br>4<br>13<br>14<br>2<br>**96**<br>**152 *** |
| Tolay C | 5,100 | Broad, flat stream-valley, local channels at principal tributary drainages; narrows to swale at head of principal and tributary drainages, side slopes moderate to steep | Clear Lake clay loam, 0-2% slopes<br>Diablo clay, 9-15% slopes<br>Diablo clay, 2-9% slopes<br>Goulding-Toomes complex, 9-50% slopes | Annual Grassland<br>Drainage<br>Freshwater Pond<br>Freshwater Seep<br>Excavated Drainage<br>Mixed Riparian<br>Native Grassland<br>Non-wooded Riparian<br>Seasonally Wet Vegetation<br>Willow Riparian<br>Urban<br>**Total Jurisdictional Area:**<br>**Crop[1]** | 22<br>3<br>2<br><1<br>4<br>3<br>4<br>13<br>1<br>2<br><1<br>**55**<br>**32 *** |

## Table 4.4 (continued)

| Reservoir Name | Gross Capacity (million gal.)** | Topography | Mapped Soils*** | Wetland Plant Communities | Approximate Jurisdiction Acreage[2] |
|---|---|---|---|---|---|
| Sears Point | 3,800 | Broad, slightly sloping valley, downstream becomes narrow stream-valley upstream with gradual downstream slope; becomes a narrow swale at the head of the principal and tributary drainages. Side slopes moderate to steep | Clear Lake clay loam<br>Diablo clay, 15-30% slopes<br>Gullied land | Annual Grassland<br>Coastal Live Oak/Interior Live Oak Woodland<br>Drainage<br>Eucalyptus<br>Freshwater Seep<br>Mixed Riparian<br>Non-wooded Riparian<br>Seasonally Wet Vegetation<br>Willow Riparian<br>**Total Jurisdictional Area:** | 26<br>1<br>1<br>1<br><1<br>10<br>5<br>1<br>7<br>**53** |
| Two Rock | 4,600 | Narrow stream-valley with gradual downstream slope; becomes a narrow swale at the head of the principal and tributary drainages. Side slopes moderate to steep | Blucher clay loam, 2-5% slopes<br>Los Osos clay loam, thin solum, 15-30% slopes<br>Los Osos clay loam 30 to 50% slopes, eroded<br>Sebastopol sandy loam, 9-15% slopes<br>Pajaro fine sandy loam, 2-5% slopes | Annual Grassland<br>Cypress<br>Drainage<br>Eucalyptus<br>Freshwater Pond<br>Freshwater Seep<br>Mixed Riparian<br>Non-wooded Riparian<br>Oak-Bay-Madrone Woodland<br>Seasonally Wet Vegetation<br>Willow Riparian<br>Freshwater Marsh<br>**Total Jurisdictional Area:** | 24<br><1<br><1<br><1<br>7<br>16<br>5<br>2<br>2<br>1<br>5<br><1<br>**62** |

## Table 4.4 (continued)

| Reservoir Name | Gross Capacity (million gal.)** | Topography | Mapped Soils*** | Wetland Plant Communities | Approximate Jurisdiction Acreage[2] |
|---|---|---|---|---|---|
| Huntley | 4,400 | Narrow stream-valley with gradual downstream slope. Moderate to steep side slopes. | Steinbeck loam, 2-9% slopes<br>Steinbeck loam, 9-15% slopes<br>Steinbeck loam, 15-30% slopes<br>Steinbeck loam, 15-30% slopes, eroded | Annual Grassland<br>Eucalyptus<br>Freshwater Pond<br>Freshwater Seep<br>Mixed Riparian<br>Non-wooded Riparian<br>Seasonally Wet Vegetation<br>Willow Riparian<br>**Total Jurisdictional Area:** | 29<br>2<br>1<br>2<br>1<br>3<br>8<br>2<br>**48** |
| Bloomfield | 4,500 | Narrow stream-valley with gradual downstream slope; becomes a narrow swale at the head of the principal and tributary drainages. Side slopes moderate to steep | Steinbeck loam, 2-9% slopes<br>Steinbeck loam, 9-15% slopes<br>Steinbeck loam, 15-30% slopes, eroded<br>Steinbeck loam, 30-50% slopes, eroded<br>Pajaro fine sandy loam, 2-5% slopes | Annual Grassland<br>Eucalyptus<br>Mixed Riparian<br>Non-wooded Riparian<br>Oak-Bay-Madrone Woodland<br>Willow Riparian<br>Freshwater Pond<br>**Total Jurisdictional Area:** | 40<br>2<br><1<br>10<br><1<br>4<br>1<br>**57** |
| Valley Ford East | 5,100 | Narrow, flat steam-valley, gradual down-stream slope; becomes narrow swale at head of principal and tributary drainages, side slopes moderate to steep | Steinbeck loam, 2-9% slopes<br>Steinbeck loam, 9-15% slopes<br>Steinbeck loam, 9-15% slopes, eroded<br>Steinbeck loam, 15-30% slopes<br>Steinbeck loam, 30-50% slopes, eroded | Annual Grassland<br>Drainage<br>Eucalyptus<br>Freshwater Pond<br>Freshwater Seep<br>Non-wooded Riparian<br>Oak-Bay-Madrone Woodland<br>Seasonally Wet Vegetation<br>Willow Riparian<br>**Total Jurisdictional Area:** | 49<br>3<br>1<br>3<br>2<br>3<br><1<br>35<br>6<br>**102** |

## Table 4.4 (continued)

| Reservoir Name | Gross Capacity (million gal.)** | Topography | Mapped Soils*** | Wetland Plant Communities | Approximate Jurisdiction Acreage[2] |
|---|---|---|---|---|---|
| Carroll Road North | 4,700 | Narrow stream-valley with gradual downstream slope; becomes a narrow swale at the head of the principal and tributary drainages. Side slopes moderate to steep | Steinbeck loam, 2-9% slopes<br>Steinbeck loam, 30-50% slopes, eroded<br>Los Osos clay loam, 30-50% slopes, eroded<br>Los Osos clay loam, thin solum, 30-50% slopes, eroded | Annual Grassland<br>Northern Coastal Scrub<br>Drainage<br>Eucalyptus<br>Freshwater Seep<br>Native Grassland<br>Non-wooded Riparian<br>Redwood<br>Willow Riparian<br>Freshwater Pond<br>**Total Jurisdictional Area:** | 44<br>1<br>1<br>4<br><1<br><1<br>1<br><1<br>15<br>2<br>**69** |

* Data collected by Harland Bartholomew and Associates, Inc. and Sycamore Environmental Consultants in support of the Santa Rosa Subregional Long-Term Wastewater Project EIR/EIS, November 7, 1994.

** Gross Capacity = Active Capacity + Local Runoff + Dead Storage

*** Source: Soil Conservation Service 1972, Soil Survey of Sonoma County, California.

1 Agricultural lands of undetermined jurisdictional status.

2 The actual approximated acreages for each wetland type were added together and rounded to the nearest acre to compute the approximated wetland acreage for each proposed reservoir site.

Two ditches, which run generally parallel to the topographic contours, were evidently excavated in dry land. However, the water in them is derived (passively) from incident rainfall and runoff, rather than from pumped or actively diverted irrigation water. Also, their purpose appears to be to dewater (by diversion) rather than to irrigate. Therefore, these ditches are likely to fall under Section 404 jurisdiction.

The basin floor of this site is the former Tolay lakebed, which has been cropped since the turn of the century. Because this area has been cropped continuously for many decades prior to 1985 and every year since then, portions of it that do not experience inundation in most years seem to constitute prior converted cropland. However, direct observation of inundation in 1995 and the presence of invertebrates that are associated with regularly ponded sites indicate that a substantial acreage of the former lakebed constitutes farmed wetlands. The total acreage of cropland of undetermined jurisdictional status on the Tolay A site totals 152 and on the Tolay C site totals 32.

Formal determination of the jurisdictional status of this area has not been made. Jurisdictional review will include consideration of available wet-season aerial photography, evaluation of the role of an impoundment constructed since 1985 on one of the main tributaries in altering the site's hydrology, and interviews with the landowner relating to the occurrence of inundation on the site.

If this area is classified as prior converted cropland, the approximate wetland acreage that could be affected on the Tolay A site would be 101 acres. Wetland impact acreage would be somewhat reduced with the implementation of Tolay Reservoir Impoundment Configuration "C"; about 56 acres would be affected (see Maps 3 and 4).

### Sears Point

The Sears Point site possesses deeply-incised ephemeral tributaries discharging to the moderate to deeply incised mainstem of Tolay Creek. Potential jurisdictional wetlands were observed primarily in the mainstem, adjacent stream terraces, and tributaries to Tolay Creek. Forested riparian woodlands bordered channels, especially on stream terraces. These riparian woodlands are composed of a mixture of willows, cottonwood, valley oak, and a sparse herbaceous understory. No ponded surface water was observed within the channel of Tolay Creek at the time surveys were performed. Potential jurisdictional wetlands were also observed in swales located in gully bottoms and in a few isolated hillside seeps and stock ponds constructed on the basin floor adjacent to Tolay Creek. Some emergent habitat is present, and is limited to narrow strips along low stream banks, small islands on sandbars at the confluence of creeks, and a few isolated side hill seeps. Wetland acreage at this site is estimated to be approximately 54 acres (see Map 5).

### Two Rock

The Two Rock site possesses a deeply-incised ephemeral tributary drainage discharging to the perennial, intermittently impounded mainstem of Two Rock Creek. Potential

jurisdictional wetlands were observed in narrow swales in gully bottoms, bottomland wet meadows, broad low-gradient hillside swales, hillside seeps, and emergent freshwater marsh habitat associated with stock ponds, tributaries and the mainstem of Two Rock Creek. Waters of the U.S. observed at this site include high gradient ephemeral drainages and the perennial Two Rock Creek channel. Swales and bottomland wet meadows dominated by grazed non-native grasslands represent approximately half of the potential jurisdictional wetlands at this proposed reservoir site. However, relative to the other proposed reservoir sites, the Two Rock site has larger areas of open water and emergent and riparian habitat. The site also supports many small isolated freshwater seeps. Potential wetland area for this site is estimated at approximately 62 acres (see Map 1).

### Bloomfield

A broad basin area incised by a perennial, slow-moving main creek-channel, which is a tributary to Americano Creek, is found on the Bloomfield site. The creek is dammed in several places, creating a series of stockponds with a scattering of emergent vegetation around them. Potential jurisdictional wetlands observed in the basin floor include seasonally wet vegetation dominated by heavily grazed, non-native grasses, emergent reaches of the mainstem creek, hillside seeps, and tributary drainages. Waters of the U.S. observed at the site include incised ephemeral stream channels and the perennial mainstem creek. The majority of wetland acreage on this site is seasonally wet vegetation or annual grassland wetlands on the basin floor. Some limited willow riparian woodland is located in the upper reaches of the mainstream creek and fenced side drainages, and limited emergent habitat is located downstream. Wetland acreage at this site is approximately 57 acres (see Map 6).

### Valley Ford East

This site exhibits broad, flat areas dominated by seasonally wet vegetation and heavily grazed, annual grassland wetlands, some incised channels, and several stock ponds. Jurisdictional wetlands were observed in the broad flat basin floor along the main axis of the proposed impoundment, in narrow seasonal swales in gully bottoms, and as emergent freshwater marsh associated with stock ponds. Waters of the U.S. observed at this site include incised ephemeral tributary channels and the perennial mainstem creek. The predominant type of wetland at the site was heavily-grazed, seasonally wet meadows located on the basin floor. However, some large areas of emergent habitat are located around the fringe of stock ponds on the site and a band of continuous riparian thicket is present along a fenced, deeply incised tributary to the main creek. Wetland acreage is approximately 102 acres (see Map 6).

### Carroll Road North

The Carroll Road site has incised, high-gradient tributaries discharging to a mainstem creek-channel. Most potential jurisdictional wetlands were observed in hillside seeps, broad-flat basin floors and wide low-gradient swales (both types dominated by grazed, non-native grasslands), and emergent areas associated with stock ponds and the deeply-incised mainstem. Waters of the U.S. were observed in incised ephemeral and perennial tributaries, as well as the perennial mainstem creek. The extent of wetlands observed at this site is approximately 69 acres (see Map 6).

### Huntley

The upper watershed of the proposed Huntley storage site is characterized by freshwater seeps, annual grassland, and seasonally wet vegetation wetlands in basins and swales, and high gradient eucalyptus lined drainages that discharge to the main channel on the valley floor, which traverses the length of the site. The upper third portion of main channel vegetation is dominated by eucalyptus. The middle section is dominated by dense mixed and willow riparian vegetation. The lower section is characterized by seasonally wet vegetation on the widened valley floor bisected by a non-wooded riparian channel. The

total amount of wetlands and other waters of the U.S. on the proposed Huntley storage site is estimated to be 48 acres (see Map 7).

## SUMMARY AND CONCLUSION

Based on our planning-level wetland determination, we conclude that reservoir construction at any of the surveyed proposed reservoir sites would impact greater than 10 acres of waters of the U.S., including special aquatic sites (wetlands), thereby requiring an individual Section 404 permit from the Corps. Estimated potential wetland impacts ranged from approximately 22 acres (Lakeville Hillside) to approximately 101 acres (Tolay A).

The soil, vegetation and hydrological data for each of the sample sites is recorded on Routine On-Site Determination Data Forms, which are included as Appendix C (bound separately as Volume II). A list of sample sites for each reservoir and the jurisdictional determination at each point is provided in Appendix A. The plant communities recognized on each proposed storage site during this investigation are listed in Table 4.4.

Approximate jurisdictional boundaries of wetlands and other waters of the U.S., agricultural lands of undetermined jurisdictional status, and observation point locations within the ten surveyed proposed reservoir locations are shown on the wetland determination maps. All field data form numbers correspond with data points on the 1" = 500' termination maps (Appendix B).

We consider the determination effort, frequency of data points, intensity, and therefore accuracy and precision adequate to determine the relative extent of potential jurisdictional wetlands for EIR/EIS impact analysis, alternatives selection, and conceptual mitigation planning purposes. However, the results contained in this planning-level wetland determination are preliminary and remain subject to Corps identification. Once a preferred alternative is determined, a formal delineation of wetlands and other waters of the U.S. to be affected by the project may be required.

# 5 LITERATURE CITED

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. U.S. Army Corps of Engineers, Technical Report WRP-DE-4.

CH2M Hill, North State Resources and Golden Bear Biostudies. 1990. Jurisdictional wetland delineation for portions of the Stemple and Americano Creek basins and the Tolay Valley. Prepared for the City of Santa Rosa. 16 pgs.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, FWS/OBS-79/81.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical report Y-87-1. 100 pgs.

Federal Interagency Committee for Wetland Delineation (FICWD). 1989. Federal manual for identifying and delineating jurisdictional wetlands. 76 pgs.

Hickman, J.C. 1993. The Jepson Manual: Higher Plants of California, University of California Berkeley, California.

Hickman, J.C. 1989. Introduction to the Jepson Manual. Jepson Herbarium and Library, University of California Berkeley, California. 73 pgs.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California Department of Fish and Game.

Mayer, K.E., and W.F. Laudenslayer, Jr. 1988. A guide to wildlife habitats of California. California Department of Forestry and Fire Protection.

Memorandum of Agreement. 1994. Among the Department of Agriculture, the Environmental Protection Agency, the Department of the Interior, and the Department of the Army: Concerning the delineation of wetlands for purposes of Section 404 of the Clean Water Act and Subtitle B of the Food Security Act. January 6.

Mitsch, W.J., and J.G. Gosselink. 1993. Wetlands, Second Edition. Van Nostrand Reinhold, New York.

Padgett, W.G., A.P. Youngblood, and A.H. Windward. 1989. Riparian Community Type Classification of Utah and Southeastern Idaho, Intermountain Region. U.S. Department of Agriculture Forest Service, R4-Ecol-89-01.

Reed, P.B. 1988. National list of plant species that occur in wetlands: California (Region 0). U.S. Fish and Wildlife Service, Biological Report 88 (26.10). 135pgs.

Shuford, W.D., and I.C. Timossi. 1989. Plant communities of Marin County. California Native Plant Society.

Soil Conservation Service (SCS). 1972. Soil Survey of Sonoma County, California. U.S. Department of Agriculture, SCS, Washington, D.C. 187 pgs.

Soil Conservation Service (SCS). 1986. Field office official list of hydric soil map units for Sonoma County, California.

Soil Conservation Service (SCS). 1987. Hydric soils of the United States. In cooperation with National Technical Committee for Hydric Soils.

Soil Conservation Service (SCS). 1994. West National Technical Center, draft report "Field Indicators of Hydric Soil." West NTC Bulletin No. W430-3-SOI.

U.S. Department of Agriculture, Soil Conservation Service. 1992. Field Office Official List of Hydric Soil Map Units for Sonoma County, California. 13 March

U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Department of the Interior, and U.S. Department of the Army. 1994. California Inter-Agency Mapping Conventions for Waters of the United States. 14 pgs.

Wakeman, T.H., and C.C. Fong. 1981. Section 404 Jurisdictional Determinations in Riparian Systems. Presented at California Riparian Systems Conference, University of California Davis.

# 6 PREPARERS

John A. Peters and Randy Schock of Parsons ES are primarily responsible for the determinations' accuracy. John A. Peters holds professional certifications in soil science, graduate course work in soil morphology and hydric soil mapping, as well as eight years of experience in wetland delineation. Randy Schock has a National Wetlands Institute certificate of training in wetland delineation and has four years of experience in vegetation mapping and wetland delineation. Michael Marangio has over twelve years experience in conducting biotic surveys and wetland delineations, and Dennis Worrell is a certified professional soil scientist with over seventeen years of experience in conducting soils and other biotic surveys. Molly Brown has a Bachelor's Degree in Soil Science and has two years of experience in field soils mapping with the U.S. Forest Service. Gary Halsey (Parsons ES) and Jeff Peters (Questa) are responsible for quality control. Gary Halsey also has a National Wetlands Institute certificate in wetland delineation and has nearly 20 years of experience in preparing wetland and resource assessments, environmental impact assessments, and project permitting. Jeff Peters (Questa) has an M.S. in soil science and has professional certifications in soil science and classification (ARCPACS), along with over 8 years of experience in wetland delineation and 20 years of experience in professional soil science and natural resource management.

**VOLUME II OF THIS DOCUMENT HAS BEEN FILED AS**

**EXHIBIT M-5**

# MITIGATION APPROACH FOR WETLANDS AND WATERS OF THE U.S. ON PROPOSED RESERVOIR SITES

## ADDENDUM TO DRAFT PLANNING LEVEL WETLAND DETERMINATION REPORT FOR PROPOSED RESERVOIR SITES

## SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

***Prepared for***

**City of Santa Rosa**

***and***

**U.S. Army Corps of Engineers**

**July 1996**

***Prepared by***

**PARSONS ENGINEERING SCIENCE, INC.**
**PLANNING · DESIGN · CONSTRUCTION MANAGEMENT**
***1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA94501 · 510/769-0100***
***OFFICES IN PRINCIPAL CITIES***
***723129/95-10***

***for***

***HARLAND BARTHOLOMEW AND ASSOCIATES, INC.***

# MITIGATION APPROACH FOR WETLANDS AND WATERS OF THE U.S. ON PROPOSED RESERVOIR SITES

## ADDENDUM TO DRAFT PLANNING LEVEL WETLAND DETERMINATION REPORT FOR PROPOSED RESERVOIR SITES

### SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

***Prepared for***

**City of Santa Rosa**
***and***
**U.S. Army Corps of Engineers**

**July 1996**

***Prepared by***

**PARSONS ENGINEERING SCIENCE, INC.**
**PLANNING · DESIGN · CONSTRUCTION MANAGEMENT**
***1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA94501 · 510/769-0100***
***OFFICES IN PRINCIPAL CITIES***
***723129/95-10***

***for***

***HARLAND BARTHOLOMEW AND ASSOCIATES, INC.***

# TABLE OF CONTENTS

**LIST OF TABLES** ..... **IV**

**LIST OF FIGURES** ..... **V**

**SUMMARY** ..... **VI**

**1 PROJECT DESCRIPTION** ..... **1-1**

Location 1-1
Summary of Overall Project ..... 1-1
Responsible Parties ..... 1-1
Jurisdictional Areas To Be Filled ..... 1-3
Type(s), Functions and Values of the Jurisdictional Areas ..... 1-3

**2 PROTECTION OF WETLANDS AND OTHER WATERS OF THE U.S. DURING CONSTRUCTION** ..... **2-1**

Preconstruction Surveys and Permit Acquisition ..... 2-1
Construction Timing ..... 2-2
Sequencing 2-2
Staging 2-4
Temporary Erosion Control ..... 2-4
Waste and Wastewater Disposal ..... 2-5
Site Clean-up and Demobilization ..... 2-5
Operation Design and Maintenance Considerations ..... 2-6

**3 COMPENSATORY MITIGATION FOR IMPACTS TO WETLANDS AND OTHER WATERS OF THE U.S.** ..... **3-1**

Goals of Mitigation ..... 3-1
Type(s), Functions and Values of the Habitat to be Created ..... 3-2
Seasonal Wetlands ..... 3-10
Riparian Wetlands ..... 3-12
Permanent to Semi-Permanent Wetlands ..... 3-14
Final Success Criteria ..... 3-15
Approach and Selection of Proposed Mitigation Sites ..... 3-16
Ownership Status ..... 3-41
Existing Functions and Values of Mitigation Areas ..... 3-42
Present and Proposed Uses of the Mitigation Areas and All Adjacent Areas ..... 3-42
Jurisdictional Delineations for Proposed Mitigation Areas ..... 3-43
Zoning 3-43
Implementation Plan ..... 3-43
Rationale for Expecting Implementation Success ..... 3-43
Responsible Parties ..... 3-44

# TABLE OF CONTENTS (CONTINUED)

Site Preparation ..... 3-44
Planting Plan ..... 3-44
Schedule 3-45
Irrigation Plan 3-45
As-Built Conditions ..... 3-46

**4 MONITORING AND REPORTING REQUIREMENTS ..... 4-1**
Monitoring Plan ..... 4-1
Maintenance 4-1
Annual Reports ..... 4-1
Schedule 4-2
Contingency Measures ..... 4-2
Completion and Verification ..... 4-2

**5 REFERENCES ..... 5-1**

**6 LIST OF PREPARERS ..... 6-1**

# LIST OF TABLES

3.1 Proposed Target Mitigation Ratios for Potential Wetlands and Other Waters of the U.S. That Could be Impacted on Reservoir Sites .....3-3
3.2 Conceptual Mitigation Compensation for Impacts to Potential Jurisdictional Wetlands and Other Waters of the U.S. .....3-17
3.3 Other Potential Habitat Mitigation .....3-20

# LIST OF FIGURES

1.1 Proposed Reservoir Sites....1-2
3.1 Wetland Mitigation Opportunities for Proposed Reservoir Sites - South County....3-35
3.2 Wetland Mitigation Opportunities for Proposed Reservoir Sites - South County....3-36
3.3 Wetland Mitigation Opportunities for Proposed Reservoir Sites - West County Americano Creek Watershed....3-37
3.4 Wetland Mitigation Opportunities for Proposed Reservoir Sites - West County - Stemple Creek Watershed....3-38
3.5 Wetland Mitigation Opportunities for Proposed Reservoir Sites - West County - Stemple Creek Watershed....3-39
3.6 Wetland Mitigation Opportunities for Proposed Reservoir Sites - South County....3-40

# SUMMARY

This preliminary wetland mitigation plan has been prepared for the City of Santa Rosa's Subregional Long-Term Wastewater Project in support of a CEQA/NEPA EIR/EIS alternatives analysis. It is an addendum to the Planning-Level Wetland Determination Report for Proposed Reservoir Sites (Parsons Engineering Science 1996), which contains the results of wetland determinations for ten proposed reservoir sites. A preliminary Corps dredge and fill permit application has been submitted to the Corps in order to initiate the NEPA process. Subsequently, the Corps has accepted the role of federal lead agency on the project. This report should be considered as part of the preliminary dredge and fill permit application and in support of the Section 404(b)(1) Alternatives Analysis to demonstrate avoidance, minimization, and compensation for impacts to wetlands and other waters of the U.S.

This report contains measures to protect wetlands and aquatic environments on site and downstream during construction, and a conceptual approach to compensate for wetlands that would be filled, inundated, or otherwise disturbed. The general approach to compensate for losses of wetlands and other waters of the U.S. is based on enhancing or restoring wetland, aquatic, and riparian habitat on other proposed but not selected reservoir site(s) within the same geographical area (South County or West County), combined with other opportunities for mitigation in the affected watershed or immediately nearby. The goal is to ensure, at a minimum, a 1:1 replacement ratio for wetland losses, including functions and values. In-kind replacement ratios and watershed-based site selection criteria are intended to ensure adequate replacement of functions and values and to minimize cumulative impacts. Flexibility has been incorporated into these requirements to allow out-of-kind replacement when it is more practical and determined to be biologically preferable.

This preliminary plan was prepared following the Habitat Mitigation and Monitoring Proposal Guidelines prepared by the San Francisco District Corps of Engineers (Department of the Army 1991), but does not provide detailed design-level mitigation plans for a specific project. It is intended to demonstrate the feasibility of mitigation wetland impacts on any proposed reservoir site for the EIR/EIS Alternative Analysis, and should be considered with other related information on functions and values associated with wetlands and biological, physical, and human environments contained therein. A detailed mitigation plan would be prepared and submitted along with application materials for an individual permit once a specific project has been selected. It is likely that an individual permit would be required for any alternative selected that involves a reservoir site, because more than 10 acres of wetlands or other waters of the U.S. would be inundated or filled.

# 1 PROJECT DESCRIPTION

## LOCATION

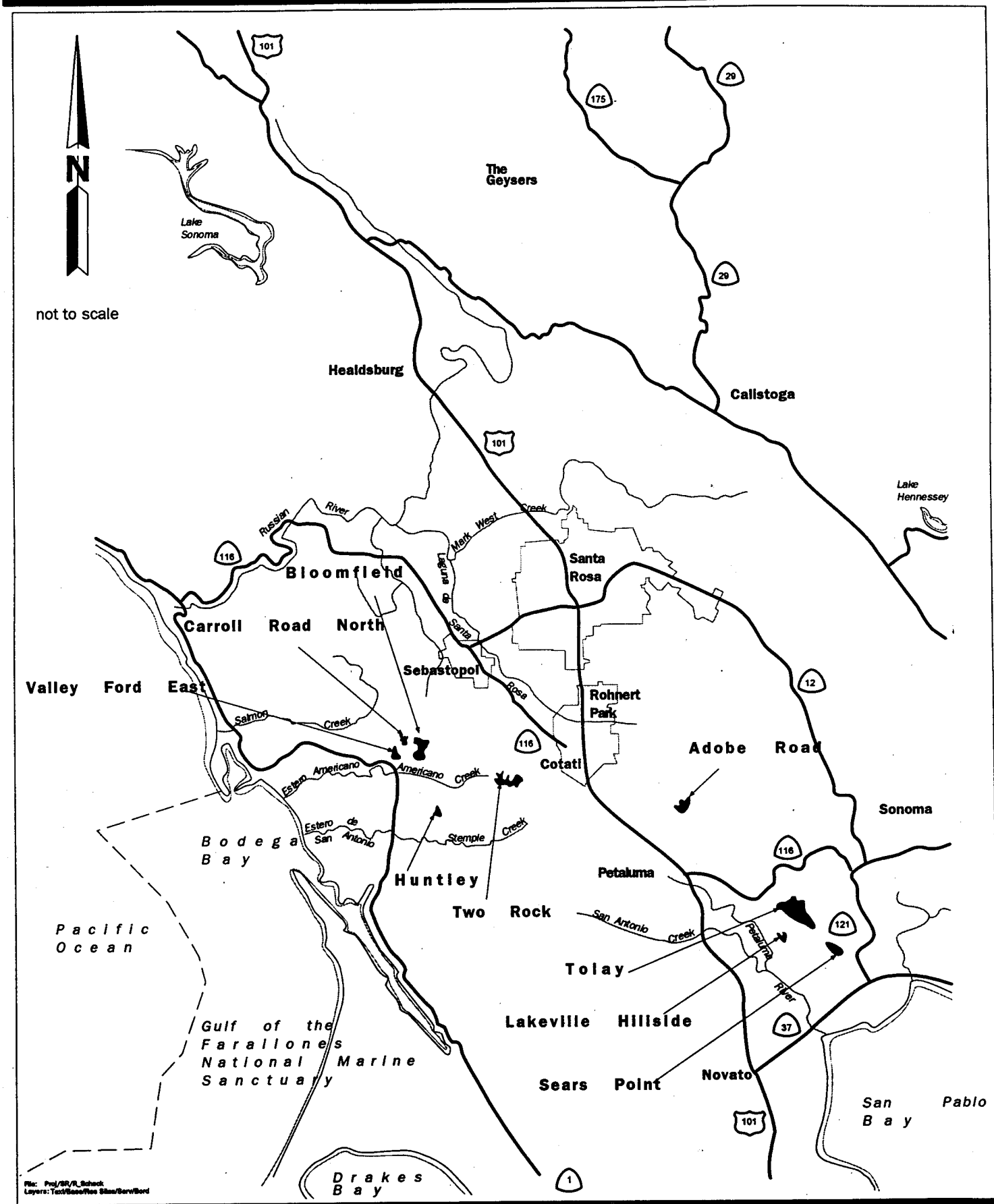
A project description showing the general location of each proposed reservoir site is contained in the previously issued Planning-Level Wetland Determination Report for Proposed Reservoir Sites, for which this technical memorandum is an addendum. The location of each of the proposed reservoir sites is also shown in Figure 1.1. The inclusion of proposed reservoir sites into South County or West County alternatives is based on watershed divisions and ultimate runoff discharge points. Runoff from all of the proposed South County sites discharges to San Pablo Bay. The proposed Adobe Road, Lakeville Hillside, Tolay A, Tolay C and Sears Point reservoir sites are all located within the South County Alternative project area. Runoff from the proposed Adobe Road site is conveyed by East Washington Creek to the Petaluma River and then is eventually discharged to San Pablo Bay. Runoff from the proposed Lakeville Hillside site is conveyed by an unnamed intermittent drainage the Petaluma River and eventually discharged into San Pablo Bay. The Tolay A, Tolay C and Sears Point Sites are located within Tolay Creek watershed, which discharges to San Pablo Bay. Runoff from all of the proposed West County Alternative Sites discharges to Bodega Bay and the Pacific Ocean at locations within the Gulf of the Farallones National Marine Sanctuary. The proposed Two Rock and Huntley sites are located within the Stemple Creek watershed and the proposed Carroll Road, Bloomfield and Valley Ford sites are located within the Americano Creek watershed.

## SUMMARY OF OVERALL PROJECT

The Planning-Level Wetland Determination Report contains a general overview of the project and a discussion of the project alternatives and the relationship of the various components, including reservoirs, to those alternatives. As mentioned above, the proposed reservoir storage sites are part of either Alternative 2 South County Reclamation or Alternative 3 West County Reclamation.

## RESPONSIBLE PARTIES

This report was prepared by Parsons Engineering Science for the City of Santa Rosa, which is lead agency for CEQA compliance. The San Francisco Army Corps of Engineers is responsible for evaluating the project's compliance with Section 404(b)(1) of the Clean Water Act and is NEPA lead agency for this project. More detailed information about the applicant and preparers is presented later in this report.




File: Proj/SR/R_Sched
Layers: Text/Base/Res Sites/Serv/Bord

HARLAND BARTHOLOMEW & ASSOCIATES, INC.
PARSONS ENGINEERING SCIENCE, INC.
UNITS OF PARSONS INFRASTRUCTURE & TECHNOLOGY INC.
PARSONS

Santa Rosa
Subregional Long-Term Wastewater Project

**Figure 1.1**
**RESERVOIR SITES**

## JURISDICTIONAL AREAS TO BE FILLED

The previously released Planning-Level Wetland Determination Report for Proposed Reservoir Sites contains 1" = 500' maps with topographic lines of all the proposed reservoir sites. The maps show the approximate extent of the jurisdictional wetlands and other waters of the U.S. and outlines the areas that would either be filled, inundated or otherwise disturbed by construction of the reservoir site. Other disturbances include clearing and grubbing of the perimeter safety zone, downstream bed and bank armoring or rip-rap placement, and compaction of soils and removal of vegetation in areas below the proposed dam due to construction access and staging. These maps have been provided to the Corps for verification that they adequately represent the potential jurisdictional wetlands and other waters of the U.S. present on each reservoir site and that the determination is suitable for conducting a CEQA/NEPA EIR/EIS alternatives analysis. Field visits with the Corps to verify wetland mapping were performed on the proposed West County Two Rock and Valley Ford sites in February 1996 and on the proposed South County Tolay site in March of 1996. In addition, color aerial photos of each of the proposed reservoir sites were provided to the Corps to support the wetland determinations on sites that were not visited.

## TYPE(S), FUNCTIONS AND VALUES OF THE JURISDICTIONAL AREAS

Wetlands and other waters of the U.S. have been classified by vegetative cover type. The wetland plant community names and descriptions were derived from Holland (1986) and Shuford and Timossi (1989), but have been modified to be applicable to the study area. Detailed descriptions of each of the wetland plant communities found on the reservoir sites are contained in the Planning-Level Wetland Determination Report for Proposed Reservoir Sites.

The evaluation of the potential loss of functions and values of potential jurisdiction wetlands and other waters of the U.S. on the proposed reservoir sites for the selection of potentially suitable mitigation sites is based largely on vegetative cover type and acreage lost. Project design measures or other evaluations contained in the EIR/EIS will address the issues of associated functions and values. If a reservoir site is selected, a detailed functions and values analysis would be performed during wetland delineations for permitting purposes. This later could be used to establish detailed performance standards for wetland and riparian replacement mitigation projects. The NEPA/CEQA Alternatives Section and Section 404(b)(1) Alternatives Analysis would evaluate the following wetland-related functions and values, as well as wetland area by vegetation type before determining the least damaging feasible alternative:

- Aquatic and Wildlife Diversity/Abundance
- Groundwater Recharge/Discharge

- Flood Flow Alteration
- Sediment Stabilization
- Sediment/Toxicant Retention
- Nutrient Removal/Transformation
- Recreation
- Uniqueness/Heritage

# 2 PROTECTION OF WETLANDS AND OTHER WATERS OF THE U.S DURING CONSTRUCTION

The following section contains a discussion of measures to prevent impacts to downstream wetlands and aquatic environments and measures to protect wildlife associated with wetlands and riparian areas during construction of the proposed reservoir site(s). Protection of existing wetland and riparian habitats on the site as long as possible during construction would minimize temporal and cumulative impacts due to the loss of wildlife habitat associated with loss of wetlands and riparian areas while off site mitigation is being developed.

## PRECONSTRUCTION SURVEYS AND PERMIT ACQUISITION

Construction of any of the proposed reservoir sites would involve placement of fill or inundation of more than 10 acres of wetlands and other waters of the U.S. subject to Corps jurisdiction under Section 404 of the Clean Water Act. Along with Corps approval of a Section 404(b)(1) analysis for a selected project, an individual Section 404 permit would be required, containing special conditions to protect downstream wetlands and aquatic environments. At a minimum, construction that could affect jurisdictional wetlands or other waters of the U.S. shall meet the conditions of the Individual Permit. Individual permit conditions could include measures developed in consultation with other responsible agencies including: U.S. Environmental Protection Agency (EPA), the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG). The project would also require a NPDES Section 401 water quality certification or waiver from the North Coast or San Francisco Bay Regional Water Quality Control Board. In addition, a Construction Management Plan will identify best management construction practices. The Construction Management Plan would also incorporate permit conditions and mitigation measures developed for the protection of jurisdictional wetlands and other waters of the U.S. and other related resources into the actual construction development program for the site.

Pre-construction surveys would be performed on the selected reservoir site and potential mitigation sites to comply with permitting requirements and to develop detailed performance standards for replacement habitat mitigation. A wetland delineation at 1"=100' would be performed and additional surveys for threatened and endangered species would likely be required. A detailed draft mitigation plan for the replacement of impacted wetland and riparian habitats would then be submitted to the Corps for approval. Equipment staging areas and temporary stream crossings would be sited and

environmentally sensitive areas on the site that would be protected during the early phases of construction would be identified during these pre-construction surveys.

## CONSTRUCTION TIMING

It is anticipated that construction of any one of the dam and reservoir sites would span two to three construction seasons. General construction activities would be performed annually for approximately an 8-month period from March through October. Construction activities in live streams, or clearing and grading that could expose large areas of soils, should be limited to the dry season or low flow period which generally lasts from June 1 through October 15.

## SEQUENCING

The potential for exposure of large areas of bare soils on the site for extended periods during construction, and the subsequent potential for increased erosion, scour, turbidity and sedimentation, should be minimized by construction sequencing. Because construction could take several years to complete and off-site mitigation measures may take several years of development before they begin to compensate for loss of wetland and riparian habitat functions and values, it would be desirable to sequence development of the site to protect wetland and riparian habitat on site as long as possible to minimize the temporal loss of habitat. A sequencing approach similar to that for a sanitary landfill, but with a shorter time horizon, should be incorporated into the Construction Management Plan.

The first phase of construction would involve development of staging areas, temporary roads, stream crossings, borrow areas, temporary erosion control measures and water diversion and control structures. Tunnel construction for the inlet pipeline on the Two Rock and Tolay Creek sites could begin during the first or second phases of construction. Development of stream flow diversion and control structures will be a primary goal during the first phase of construction. Stream flow and natural runoff must be controlled or diverted around the site before excavation of the dam foundation begins in order to maintain a dry construction site and minimize potential for erosion, downstream bed and bank scour and resultant sedimentation. Temporary dikes, drainage structures, sediment detention basins, and energy dissipaters should be used to divert and convey surface flow and prevent increased downstream scour and sedimentation during construction of the impoundment. A culverted diversion structure or retention basin and pump system should be put in place. The discharge should be controlled and should utilize energy dissipation devices to prevent erosion of upland areas, stream bottom scour, and suspension of sediments.

The second phase of construction would involve the majority of vegetation removal, excavation, earthwork, and development of inlet/outlet conduits. The second phase

would usually commence during the second dry construction season and could span two construction years or more on larger sites. Dam foundation drilling and grouting would also be performed during this phase on the proposed Two Rock site and, to a minor extent, at the proposed Huntley and Tolay sites. If on the smaller sites construction is not completed in the expected two seasons, or if on the larger sites temporary erosion control measures are not adequate, the sites could be subject to mass erosion and unwanted inundation. It is essential that any other mitigation measures developed for the protection of air quality, reductions in noise disturbances or other concerns do not constrain the ability of the contractor to revise the construction schedule to include double or even triple shifts during the second and third phases of construction to complete construction of facilities or temporary erosion control measures prior to the rainy season.

For the smaller dam structures, it may be possible to complete construction in two construction seasons, in which case it would be necessary to clear, strip, excavate and prepare the dam foundation during the first construction season. This would require that some earthwork fill placement for the dam be put in place during the first construction season to prevent inundation of the dam foundation area. The dam earthwork placement would be completed the following season. On larger sites dam sites, it is likely that the dam foundation work would occur during the second construction season except for areas developed for temporary water diversion or control as part of the final design. Earthwork placement for the dam would begin on the larger sites during the second season to avoid inundation of the foundation, and would likely be completed the following season.

The third phase of construction would involve demolition, clearing, grubbing, stripping, and excavating for the entire reservoir inundation area and safety zone. Earthwork fill placement for the dam would continue during the third phase. It is anticipated that the third phase would begin the second construction season on smaller sites and the third construction season on larger sites. All identified ESA's should be avoided as much as possible and protective buffers maintained during the first and second construction phases. This may not be feasible on some smaller sites with shorter construction time frames. Site clearing and grading should be limited to that area required for equipment storage and access, temporary roads and stream crossings, soil borrow areas, water control structures and actual dam structure. Final grubbing and clearing should be performed during the third phase of construction. This would provide some protection for the temporal loss of wildlife habitat associated with wetlands and other waters of the U.S. on the impacted site while replacement mitigation habitat is being developed off site.

The fourth phase would occur just prior to filling of the reservoir site(s), and some activities would be likely to continue for some time thereafter. This phase would involve construction of appurtenant structures such as spillways, final runoff diversion and control structures, pipelines, access roads, fencing, and dam instrumentation. Site clean-

up and demobilization would be the final construction activity. Equipment and debris would be removed from the site and staging areas would be restored.

## STAGING

The following staging measures, in combination with other best management practices, are intended to protect wetlands and aquatic environments on the site and downstream from discharges of toxic materials or increased suspended sediments from the site during construction:

- Construct no more than two stream crossings and restrict all other equipment entry from the mainstem creek and riparian corridor.
- Whenever possible, soil borrow areas, soil stock piles, spoils, quarried material and specialized fill should be located at least 100 feet away from the mainstem stream riparian corridor and 50 feet away from all other potential jurisdictional wetlands and other waters of the U.S.
- On-site equipment storage areas should be located in borrow areas if feasible, or other previously disturbed areas.
- Do not store hazardous materials, chemicals, fuels, lubricating oils, construction equipment or refuel equipment within 100 feet of streambanks.

## TEMPORARY EROSION CONTROL

The revised Manual of Standards for Erosion and Sediment Control Measures (Association of Bay Area Governments 1996) should be used as guidelines for design, construction and implementation of temporary erosion control measures. At a minimum, the following temporary erosion control measures should be included in the Construction Management Plan for the site:

- Silt fences reinforced by hay bales should be used to protect wetlands and riparian areas downslope of all working areas subject to ground disturbance, including but not limited to temporary roadways, borrow areas and staging areas.
- Soil borrow areas should be confined to within the proposed reservoir construction boundary or existing disturbed quarry sites nearby except for specialized material that needs to be imported such as rock and gravel.
- Exposed soils should be watered regularly and sprayed with a non-toxic tackifier during the dry season.

- Exposed areas should be hydromulched with a mixture of grasses common to that area prior to the onset of the rainy season.

## WASTE AND WASTEWATER DISPOSAL

Water and wastewater generated on the site during construction would be disposed of in accordance with all federal and State laws. The following measures combined with construction Best Management Practices (BMPs) would ensure further that impacts to wetlands and the aquatic environment due to waste or wastewater disposal would be avoided or minimized.

- Solid and vegetative debris should be hauled to a Class III landfill or other approved disposal site for composting or disposal.
- Water used for construction activities on the site, including rock crushing and dust control, should be discharged to upland areas or meet RWQCB standards prior to discharge to any natural channel.
- Concrete washdown or other water that does not meet Regional Water Quality Control Board basin plan discharge requirements should be disposed of at a facility or location approved by the Regional Water Quality Control Board.
- Construction debris, excess concrete, broken equipment, and gas or oil containers should not be buried on the site.

## SITE CLEAN-UP AND DEMOBILIZATION

Site clean-up and demobilization involves debris and waste removal as previously described and moving the construction equipment off the site. Additional measures would not be required for clean-up and demobilization of the site within the impoundment area. However, staging areas located outside of the impoundment area would need to be restored to original grade and revegetated. This would include the following measures:

- Loosen and aerate compacted soils.
- Restore original contours and drainage patterns.
- Revegetate with native or adapted species.
- Utilize temporary erosion control measures, such as hydroseeding or placement of fiber netting, until vegetation becomes established.

## OPERATION DESIGN AND MAINTENANCE CONSIDERATIONS

All reservoir sites selected should include riparian vegetation restoration immediately downstream of rip-rapped outlet structures to attenuate flood flows, stabilize stream banks, and reduce stream bank scour. Woody riparian revegetation along reservoir outlet structures should be included in the project design to provide habitat for terrestrial species, enhance habitat for aquatic species, and visually integrate the structure with surroundings. In addition, depending on the size and planned uses of the watershed above the selected site(s), energy dissipation devices, sediment detention basins and nutrient/sediment filters should be considered for placement at the outlet. If included, regularly scheduled maintenance of structures, including annual excavation of accumulated sediments and debris in the detention basin, should be included in the operations plan for the site. Alteration of surface and subsurface water flow below the proposed reservoir sites and related effects to the aquatic environment are addressed in other technical memoranda (see Aquatic Biological Impacts Assessment and Water Quality Impact Analysis Technical Memoranda, Merritt Smith Consulting, March and April 1996).

Gullied and eroded areas in the upper watershed that are subject to continued erosion should be restored prior to filling the site and maintained throughout the life of the project to extend the life of the site. Inspections should be scheduled annually throughout the life of the project for the upper watershed to check for and repair eroded or gullied areas. The Geotechnical Assessment of Alternative Reservoir Sites and Pipeline Routes, Volumes 1 and 2 (Rust Environmental and Infrastructure November 1995) evaluates shoreline stability and recommends measures for the various sites. In addition, it may be desirable to periodically hydromulch and seed the perimeter safety zone with grasses native or adapted to the area to further reduce erosion and sedimentation of the site. The perimeter of the reservoir site should be regularly inspected for erosion and gullying during the wet season. Any gullying, washouts, or slope failures should be immediately stabilized.

The upper watershed of a selected reservoir site, or a portion thereof, should be purchased by the City and managed to be compatible with the long-term operation of the site. Continued grazing and livestock management practices in the upper watershed could contribute substantially to water quality degradation downstream or result in unwanted increases in sediment accumulation and nutrient loading in the reservoir. These activities should be restricted or comprehensive management plans should be developed to allow for continued livestock grazing while protecting downstream water quality and ensuring the proper operation of the reservoir storage facility and irrigation program. This plan should limit the number of livestock, identify pasture rotation schemes, and specify measures to restore and exclude livestock from riparian areas and surface water bodies.

# 3 COMPENSATORY MITIGATION FOR IMPACTS TO WETLANDS AND OTHER WATERS OF THE U.S.

Construction of any of the proposed reservoir sites would involve the direct placement of fill or other related consequent impacts such as inundation that would result in the loss of potential jurisdictional wetlands and other waters of the U.S. This loss of potential wetlands and other waters of the U.S. would need to be mitigated by the enhancement, restoration or creation of wetland and riparian habitat at no less than a 1:1 replacement ratio to ensure no net loss of wetlands would occur as a result of the project.

The following terms are defined for the purposes of this document:

- Wetland or riparian enhancement: The improvement, maintenance and management of existing wetland and riparian areas for a particular purpose or function. Installation of exclusionary fencing, planting, irrigation, exotics control, grazing and livestock control, and erosion control are examples of activities used to enhance wetland and riparian areas.
- Wetland or riparian restoration: The rehabilitation of a degraded wetland, riparian area or a hydric soil area that was previously a wetland. It can include all the measures listed above but often includes extensive measures to restore previously existing hydrologic conditions.
- Wetland creation: The conversion of a non-wetland area into a wetland where a wetland never existed. Creation is used most frequently for marsh communities and almost always requires major hydrological modifications to create conditions suitable for the development of a wetland community. It is generally impractical to create riparian communities because it requires excavation of a new channel and provision of a water source.

## GOALS OF MITIGATION

The goals for mitigating unavoidable losses of potential jurisdictional wetlands and other waters of the U.S. on any of the ten proposed reservoir sites are:

1. No net loss of wetlands, including associated functions and values;
2. Replacement of impacted wetland types in-kind unless it is determined that it is impractical, or out-of-kind would provide a higher biological replacement value; and
3. Replacement of impacted habitat preferably should be within the same watershed; but adjacent or nearby watersheds could be utilized if not enough area of any given wetland type is available.

## TYPE(S), FUNCTIONS AND VALUES OF THE HABITAT TO BE CREATED

Wetlands and other waters of the U.S. on proposed reservoir sites have been classified by vegetation type and further grouped into seasonal wetlands, riparian wetlands and permanent to semi-permanent marsh based on similarities in vegetation types, hydrologic characteristics, landform relationships, soils, functions and values.

Detailed descriptions of each of these wetland plant communities are contained in the Planning-Level Wetland Determination. Table 3.1 contains target mitigation replacement ratios for each wetland type. Table 3.1 also contains exceptions and out-of-kind replacements and the rationale for each, and brief descriptions of general characteristics of vegetation, hydrology, soils, functions, and values for each type of wetland. The target wetland mitigation ratios should be interpreted to give enough flexibility to allow for other yet to be identified out-of-kind replacements if it can be demonstrated that such replacements are practicable and biologically preferable. It would be the responsibility of the City to demonstrate that out-of-kind or out-of-watershed mitigation opportunities would be biologically preferable during the development of a Draft Detailed Mitigation Plan for a specific reservoir site.

Out-of-kind or out-of-watershed mitigation would be biologically preferable when it could provide greater ecological value. In general, this would involve participation in large parcel or regional program restoration projects such as the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan, San Pablo Bay Lands Restoration project, Stemple Creek/Estero de San Antonio Watershed Enhancement Plan, and other watershed enhancement projects. The determination of whether it would be biologically preferable to participate in such plans should include the following considerations. Participation in the plan or program would:

- Contribute to watershed function and help to maintain the integrity of a regional aquatic ecosystem;
- Increase regional biodiversity or provide important habitat for threatened or endangered species;
- Restore wetland types historically reduced of threatened by development in the region or watershed; or
- Satisfy other prioritized objectives in a regional preservation or watershed enhancement plans such as flood control or water quality improvement or protection.

The rationales for out-of-kind exceptions in Table 3.1 are based on wetland vegetation type subgrouping, wetland types historically reduced in the watershed, and practicality

# Table 3.1

Proposed Target Mitigation Ratios for Potential Wetlands and Other Waters of the U.S. That Could be Impacted on Reservoir Sites

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| **Seasonal Wetlands** | | | | | | | |
| Annual Grassland | 1 to 1 | Annual Grassland/native grassland restoration or enhancement | Somewhat disturbed borderline jurisdictional wetlands provide limited functions in current state. Creating or replicating existing plant communities and hydrologic regime provides little benefit for wildlife or other values. | Borderline or transitional wetland areas. Facultative plant community varies little from adjacent uplands. The vegetation is heavily disturbed due to livestock grazing and introduced forage species. | Area of accumulated runoff, subsurface flow or seasonally shallow depth to groundwater. Ponding, if at all, or near surface saturation occurs infrequently for short periods. Many of these areas do not pond for 15 or more consecutive days in most years. | Soils are often somewhat well drained loams, alluvial material on toe slopes, concave bowls, valley floors. Subsurface flow impeded by an argillic horizon, near surface bedrock and/or down gradient man-made impoundments. | Water quality protection, sediment and nutrient retention, and forage production. Provides some limited habitat for wildlife. |
| Cropland | 1 to 1 | Annual/native grassland or freshwater/ brackish marsh restoration or enhancement. If designated into FSA classes at a later date, Prior Converted Croplands may not require mitigation.[1] | Creating or replicating existing plant communities and hydrologic regime provides little benefit for wildlife or other values. Restoration of Grassland or freshwater/brackish marsh in former baylands would provide valuable pasture and wildlife habitat. | Native or natural vegetation is largely absent in these areas due to historic cropping practices. | Hydrology of most of these areas has been modified so that most no longer meet the jurisdictional requirements of a wetland except some isolated areas of farmed wetlands, farmed wetland pasture, and seasonal wetlands. | Somewhat poorly drained to very poorly drained soils on relatively flat or gently sloping areas. Hydric soils extend beyond the current jurisdictional wetland boundaries. | Forage or other agricultural commodity protection. Provides some limited habitat for wildlife. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| Native Grassland | 2 to 1 | Annual Grassland/native grassland restoration or enhancement | Enhancement or restoration of annual/native grasslands and management as riparian pastures would encourage the re-establishment of native grasses. | Most native grasses remaining occur in upland areas subject to less grazing pressure. Annual grasses tend to outcompete natives in areas subject to heavy grazing. | Ponding, if at all, or near surface saturation occurs infrequently for short periods. Many of these areas do not pond for 15 or more consecutive days in most years. | Soils vary. Isolated areas tend to occur mostly on occur on somewhat well drained alluvial areas with impeded subsurface flow or seasonal shallow depth to groundwater. Historically, native grasslands were prevalent on valley and basin floors. | Water quality protection, sediment and nutrient retention, and forage production. Habitat of concern due to historical losses. |
| Freshwater Seep | 2 to 1 | Annual/Native Grassland restoration/ enhancement or freshwater marsh restoration/creation. | Difficulty in replicating reliable groundwater discharge system warrants grassland restoration or freshwater marsh creation. | Vegetation is intermediate between grasslands and freshwater marsh. | Stay moist or saturated near surface throughout most of the year due to groundwater discharge. Some small areas of semi-permanent surface ponding. Often manipulated for stock watering purposes. | Soils vary, but most remain saturated long enough to have developed hydric features. Occur frequently in alluvium on toe slopes but also on steeply sloping areas, high on hillsides where groundwater breaks out. | Indirectly protects water quality by providing an upland water source for livestock, attracts an abundance and diversity of wildlife. Groundwater discharge. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| Seasonally Wet Vegetation | 2 to 1 | Annual/Native Grassland or seasonally wet vegetation enhancement/ restoration. | Similarity in landform position, composition and function to wet annual/native grasslands restoration and enhancement. Riparian pasture management would encourage establishment of similar vegetation. | Transitional between wet annual grasslands and freshwater seeps. Larger and less hydrophytic than freshwater seeps but more hydrophytic vegetation than grasslands. | Mostly on valley floors or large concave basins where either seasonal runoff and sub-surface flows accumulate or shallow depth to groundwater occurs. | Soils vary, however mostly alluvial deposits on valley floors along drainages. | Water quality protection by sediment and nutrient retention and groundwater recharge. Provides some limited wildlife habitat. |
| Vernal Swales/ Marshes/ Pools | 3 to 1 | No vernal pool habitat is present on the proposed reservoir sites. | Not Applicable | Unique habitat type known to support endemic Special-Status Species. | Seasonal surface ponding from direct precipitation and some surface runoff usually lasts longer than 7 days. | Clay duripan layer which impedes surface water infiltration. | Unique habitat which is greatly reduced due to historical losses. Known to provide habitat for threatened and endangered species. |
| **Riparian Wetlands** | | | | | | | |
| Drainages | 2 to 1 | Mixed riparian, willow riparian with aquatic riverine habitat restoration. | Existing conditions would provide little value if replicated. Riparian vegetation restoration would provide valuable habitat for wildlife. | Mostly devoid of vegetation except for scattered weedy species. | Brief surface flows lasting for no more that a couple of weeks following storm events. | Well drained sandy soils in generally flat well defined channels. | Surface runoff collection and conveyance, groundwater recharge, aquatic and semi-aquatic habitat. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| Excavated Drainages | 2 to 1 | Mixed riparian, willow riparian with aquatic riverine habitat restoration or freshwater/ brackish marsh restoration/creation. | Many excavated drainages are permanently wet and support Freshwater Marsh vegetation. Before drainage was realigned and drainage control structures regulated flood conditions these areas supported riparian or freshwater marsh vegetation. | Straightened historic stream channels or channels which collect natural surface runoff many of which support Freshwater Marsh Vegetation. | Areas that support freshwater marsh vegetation pond surface water for most of the year. Ponding is usually due to control structures and not natural hydrology. | Deposited silts and clays on top of well drained streambed deposits. Long period of standing water has led to development of strong hydric soil characteristics. | Surface runoff collection and conveyance, groundwater recharge, aquatic and semi-aquatic habitat. |
| Non-wooded Riparian | 1 to 1 | Mixed riparian, willow riparian with aquatic riverine habitat restoration. | Disturbance usually the reason that these areas no longer support vegetation. | Mostly devoid of vegetation except for scattered weedy species. Most of these areas likely once supported Willow Riparian vegetation. | Surface flows lasting more than a couple of weeks. | Well drained sandy soils in generally flat well defined channels. | Surface runoff collection and conveyance, groundwater recharge, aquatic and semi-aquatic habitat. |
| Eucalyptus | 1 to 1 | Mixed riparian, willow riparian with aquatic riverine habitat restoration. | Disturbed areas where exotics have likely displaced what was originally willow riparian vegetation. | Dominated by an overstory of Eucalyptus with a sparse understory of introduced weedy species. Some scattered willows may remain but will eventually be shaded out by overstory. | Duration of surface flows varies. | Well drained sandy soils in generally flat well defined channels. | Surface runoff collection and conveyance, groundwater recharge, aquatic and semi-aquatic habitat. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| Mixed Riparian Woodland | 3 to 1 | Mixed Riparian with aquatic riverine habitat enhancement/ restoration. | Dense broad leaved trees with an understory of woody vines. | Dense canopy of a variety of broad leaved trees with an understory of woody vines. | Surface or shallow subsurface flows which last most of the year. | Well drained sandy soils with deposited silts can occur along well defined channels but most extensive on broad flat seasonal flood plains. | Water quality protection: reduces water temperature and stabilizes stream banks. Important habitat for wildlife, somewhat unique and greatly reduced in project area. |
| Willow Riparian | 3 to 1 | Mixed Riparian with aquatic riverine habitat enhancement/ restoration. | Mixed riparian provides habitat for species similar to those found in willow riparian communities and provide similar physical and chemical wetland functions. | Dense thicket of willows with little or no understory vegetation. | Surface flows lasting from a couple of weeks to a couple of months with shallow subsurface flows lasting most of the year. | Generally occurs on fairly well drained sandy loam soils in a variety of landform positions. | Water quality protection: reduces water temperature and stabilizes stream bank. Provides important wildlife habitat and is historically reduced in the project area. |
| Poplar | 2 to 1 | Mixed Riparian or Willow Riparian with riverine aquatic habitat enhancement/ restoration. | Occurs is areas that formerly supported willow riparian or mixed riparian vegetation. | Isolated clumps of poplars. | Surface flows lasting from a couple of weeks to a couple of months with shallow subsurface flows lasting most of the year. | Occurs on fairly well drained sandy loam soils immediately along stream banks. | Stream bank stabilization in areas that likely once supported willow riparian habitat. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| Live Oak Woodland | 3 to 1 | None | This community type is greatly reduced from its historic range, limited in some watersheds, and provides important wildlife habitat in the immediate region. | Overstory is dominated by coast live oak which is not normally associated with wetlands. | This community has been included because the canopy overhangs and shades drainages on north facing slopes. | Occurs on wetter north facing slopes. Common in many areas of California but somewhat rare in western Sonoma County. | Water quality protection: reduces water temperature and stabilizes stream banks. Important habitat for wildlife, somewhat unique and greatly reduced in project area. |
| Oak-Bay-Madrone Woodland | 3 to 1 | None | This community type is greatly reduced from its historic range, limited in some watersheds, and provides important wildlife habitat in the immediate region. | Complex community dominated by coast live oak, madrone and bay. Bay is a facultative species but coast live oak and madrone both are non-wetland species. | This community has been included because the canopy overhangs and shades drainages on north facing slopes. | Occurs on wetter north facing slopes. Common in many areas of California but somewhat rare in western Sonoma County. | Water quality protection: reduces water temperature and stabilizes stream banks. Important habitat for wildlife, somewhat unique and greatly reduced in project area. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| **Perennial Wetlands** | | | | | | | |
| Freshwater Ponds | 2 to 1 | Freshwater, brackish marsh restoration. | Restoring historic former natural wetland areas would be environmentally preferrable and more practical than re-creating a modified environment. | Mostly open water habitat but areas along the shoreline support vegetation dominated by emergent monocots. | Most of these contain surface water year round. The amount of water level fluctuation and grazing determine the amount of shoreline vegetation. | Vary with deposited sediments. Strong hydric soils indicators evident because of long-term reducing environment. | Water storage for agricultural production, and sediment and toxicant retention. Water source for wildlife. Resting and staging habitat for shorebirds and waterfowl. |
| Freshwater Marsh | 3 to 1 | Freshwater, brackish marsh restoration | Areas of Freshwater Marsh vegetation occur in irrigation ditches or around stockponds Restoring former natural wetland areas would be more practical than re-creating a modified environment. | Wetter areas are dominated by emergent monocots while drier areas on upland transition often support facultative species commonly found in Annual Grassland and Seasonally Wet wetland communities. | Soils are permanently or semi-permanently ponded on the surface. | Vary with deposited sediments. Strong hydric soils indicators evident because of long-term reducing environment. | Important wildlife habitat for birds and amphibians. Sediment and toxicant retention and nutrient and toxicant transformation. |

## Table 3.1 (continued)

| Type | Mitigation Ratio | Exceptions / Out-of-kind Replacements | Rationale | Vegetation | Hydrology | Soils | Functions and Values |
|---|---|---|---|---|---|---|---|
| **Incidentals** | | | | | | | |
| Vineyard, cypress, gullied areas | 1 to 1 | Mixed riparian, willow riparian with riverine restoration | Vegetation is planted or not typical of wetlands. Usually included in wetland determination mapping because they occur along drainages. | Small inclusions of vegetation not typically associated with wetlands have been included in mapped because they overhang drainages or are within larger areas mapped as wetland where determining exact wetland/upland boundaries was not practical. | Usually occur as linear features along drainages or small islands within large areas of marginal Annual Grassland Wetlands. | Usually, well drained sand and gravel in drainages or areas of somewhat well drained sandy loams which are seasonally wet at or near the surface due to an argillic horizon or bedrock which perches the sub surface flow. | Agricultural production, wind breaks, and limited habitat for reptiles and amphibians. |

[1] Based on existing FSA policy, impacts to farmed wetlands and farmed wetland pasture would need to be mitigated by restoring areas of Prior Converted Croplands. Isolated seasonal wetlands would remain under Corps Section 404 authority and would require mitigation.

and availability. In general, out-of-kind replacements should be of the same subgroup type; seasonal, riparian or permanent to semi-permanent marsh. However, in many instances it is preferable in terms of wetland function and value replacement and more practicable to restore wetland types historically reduced in the area rather than to replace or replicate degraded conditions. Restoration of historic or substantially-degraded wetlands and/or other aquatic resources (e.g., prior converted cropland, farmed wetland) utilizing proven techniques increases the likelihood of success and typically does not result in the loss of other valuable resources (*Federal Register* November 28, 1995). In some locations, not enough suitable area is available for mitigation in the same watershed. It is not practical to create some wetlands because extensive hydrological modification would be required which could require prolonged maintenance, fail, or result in greater impacts than those being mitigated.

At this stage of project development, it is assumed that replacing habitats in kind would provide the best assurance that functions and values would be adequately compensated. If an alternative is selected that involves a reservoir site, appropriate performance standards would be developed at that time for each wetland type. Performance standards would be reservoir and mitigation site specific and could include provisions for replacement of specific functions and values related to the loss of threatened and endangered species or aquatic habitat. Reference sites to determine the success of replacement habitat have not been selected yet. When a project is selected, reference sites or detailed performance standards for replacement mitigation would be developed prior to permitting.

Some overlap of mitigation measures is likely to exist between those contained in this technical report for wetlands and those developed for terrestrial and aquatic habitats in other technical memorandums. Mitigation requirements for terrestrial riparian areas, aquatic habitats and any wetland-related special-status species should be combined with wetland mitigation measures in a comprehensive mitigation habitat replacement plan.

## SEASONAL WETLANDS

Seasonal wetlands are generally dominated by grasses and herbs and are subject to short periods of shallow inundation or near surface saturation. Most seasonal wetlands on the proposed reservoir sites have been highly modified and degraded by grazing and cropping practices. Seasonal wetlands, except for vernal pools and freshwater seeps, provide limited wildlife habitat. Vernal pools support a unique assemblage of plants and aquatic invertebrates, including a number of threatened and endangered species. Freshwater seeps often have been manipulated for livestock watering purposes and attract a variety and abundance of wildlife. Both of these types of seasonal wetlands tend to occur as smaller isolated features, and vernal pools are not known to occur on any of the proposed reservoir sites.

Other types of seasonal wetlands including annual grassland wetlands, seasonally wet vegetation, and cropland wetlands occur as larger features. They tend to occur in valley and basin floors, alluvial fan deposits and other relatively flat areas that are seasonally poorly drained because of soils or their low position in the landscape. Cropland wetlands occur on large level areas that have been drained or otherwise hydrologically altered for agricultural production. These seasonal wetland types provide limited habitat for common wildlife and do not provide exclusive habitat for any threatened or endangered species. The primary functions and values these wetlands provide are production of agricultural commodities and some limited water quality protection. Some smaller areas of native grassland wetlands occur within annual grassland and seasonally wet vegetation wetland areas. However, native grasses tend to occur on hillsides and drier positions in the landscape and it is uncommon to find native grasses in wetland and riparian areas. Riparian and wetland areas tend to attract cattle and grazing pressure is likely the reason that native grasses, which are less tolerant than annuals, are largely absent from these areas.

The loss of areas of annual grasslands, seasonally wet vegetation, cropland, native grassland and freshwater seep wetlands would be best compensated for by the preservation and enhancement of existing annual grassland and seasonally wet vegetation wetland areas along riparian corridors. Many areas of annual grassland and seasonally wet vegetation on the reservoir sites and proposed mitigation sites which were determined to be wetlands for alternative comparison, are actually transitional areas between wetlands and uplands and do not meet the jurisdictional requirements for a wetland. It is impractical and of limited value to restore or create these types of wetlands because of uncertainties involved with recreating hydrology and the same services can be provided by enhancing existing areas. Historic and current livestock management practices have degraded and continue to disturb or threaten these areas. Enhancement of these areas would provide water quality protection, improve habitat for wildlife and allow for continued production of agricultural commodities. Areas of native grassland and freshwater seep wetlands should be mitigated at a slightly higher ratio because they are either unique or a valuable resource to wildlife. Cropland wetlands could either be restored to seasonal wetland or freshwater marsh and brackish marsh wetlands.

Grassland enhancement would involve fencing off strips of degraded grasslands and seasonally wet vegetation wetlands along creeks and excluding or managing livestock. In many pastures cattle tend to concentrate in or near riparian areas resulting in disturbance or complete elimination of vegetation while much upland forage goes ungrazed. Native grasses have been virtually eliminated in many of the seasonally wet areas and annual grasslands along riparian drainages. Complete exclusion of livestock or fencing of woody riparian vegetation combined with grazing management practices should be implemented to encourage re-establishment of native grasses and wildflowers. This enhancement would create vegetated riparian buffer strips that could protect water quality by trapping sediments and nutrients before they reach surface water bodies. If

these areas were managed as riparian pastures, they would also offset the loss of forage production and still provide water quality protection functions.

Grassland enhancement would include certain grazing management practices to create riparian pastures. These management practices would need to be developed for site specific conditions and should include:

- Implementing grazing systems
- Developing hillside water
- Improving non-riparian grazing
- Building riparian pastures

Enhanced seasonally wet vegetation and annual grassland wetlands in riparian pastures would be designed to be grazed. Seasonally wet vegetation or annual grassland wetlands, including transitional wetland areas, along degraded riparian corridors would be fenced to limit the duration and intensity of grazing. Some upland areas should be included in the riparian pasture, especially if a large percentage of the site is comprised of the riparian pasture, to avoid overuse of uplands. Areas desired for woody riparian vegetation enhancement or restoration should be protected with exclusionary fencing. The top wire on both riparian pastures and riparian enclosures should be smooth (not barbed) to allow access for big game.

Access to riparian pastures should be limited to a short season in late spring to early summer. This would be sometime between 1 May and 31 July in most years but could occur as early as April in many years. Advantages of limiting grazing in herbaceous riparian pastures to short seasons during this time of year include:

- Soils should no longer be ponded or saturated on the surface, consequently, vegetation disturbances and soil compaction from cattle trampling would be minimized.
- Sufficient soil moisture and warmth remains for vegetation to regrow before winter.
- Sediments in spring flood waters have been trapped by last years standing dead growth.
- Herbaceous species may still be green and forage preference has not yet shifted to woody species.

- Livestock can most benefit from green feed on upland range areas later, after it has fully matured.

The short season is intended to minimize grazing of regrowth. These areas can be grazed heavily for short periods if enough moisture remains to support regrowth. It is the regrowth that creates next season's standing dead growth that provides early season forage. For this reason, it is desirable to allow some recovery time, preferably, one or two years before grazing of newly created riparian pastures. It also would be desirable to rotate between years the use of riparian pastures. In some settings, it may be possible to set up a series of riparian pastures for sequential or rotation grazing.

Potential mitigation areas that support vernal pools would not be suitable for conversion to different types or use as riparian pastures. These areas could still be purchased, managed, and fenced as mitigation areas for impacts to seasonal wetlands.

### Riparian Wetlands

Vegetation composition and complexity varies greatly in the riparian wetland classification but woody vegetation is a common and prevalent feature, now or in the near past, in most riparian wetlands. Riparian wetlands are linear features in the landscape that collect and convey surface waters and nutrients. The hydrologic permanence varies greatly in this classification from main stem perennial streams bordered by mixed riparian habitat to mostly unvegetated intermittent drainages. The natural hydrologic regimes and permanence are difficult to determine for streams in the project area because of upstream impoundments and diversions. Soils are composed of well drained sand and buried gravels in the immediate channel and deposited silts and clays beyond a natural levee farther away from the channel. In low gradient basin and valley floors with extensive floodplains, near surface groundwater is present throughout much of year. Areas of woody riparian vegetation are greatly reduced by lowered groundwater tables from upper watershed diversions and impoundments and uncontrolled livestock grazing.

Riparian wetlands provide important functions such as protection of water quality and provision of habitat for aquatic and terrestrial wildlife. Riparian wetlands protect water quality by stabilizing streambanks and trapping sediments thereby decreasing streambank erosion, scour, and subsequent increases in downstream turbidity and sedimentation. Riparian vegetation canopy shades the channel and cools water temperature. Roots provide instream cover and shelter for aquatic species. A wide variety of birds is known to inhabit or utilize riparian vegetation in the region.

Riparian community creation would require excavation of a stream channel, provision of a new water source, and major modifications to the natural environment. Therefore, because it is impractical to create riparian communities and extensive areas of degraded riparian wetlands exist, it is more practical to enhance or restore riparian communities. Some riparian communities are easier to restore or enhance than others. Willow riparian

habitats are opportunistic by nature and in the absence of grazing tend to establish by themselves naturally after disturbances. On the other hand, the species and subcanopy composition is varied and complex in mixed riparian and various oak woodland communities. Recreating these types of habitats would be more difficult.

Enhancement and restoration of riparian wetlands could result in conversion of seasonal wetlands in riparian areas to wooded riparian wetlands. Conversion of seasonally wet vegetation and annual wetland grasslands to mixed riparian and willow riparian would provide valuable wildlife habitat and improve water quality, restoring conditions similar to those which existed prior to agrestal and pastoral modification of the land.

Enhancement and restoration of willow riparian vegetation would compensate for the loss of willow riparian habitat and would be suitable to compensate for losses of drainages, excavated drainages, eucalyptus, non-wooded riparian, poplar and other incidental wetland areas. Many areas of degraded willow riparian habitat could be enhanced by construction of exclusionary fencing. Prior to the beginning of restoration these areas should be investigated to determine the causes for the loss of vegetation. Many of these areas are expected to have existing hydrological and soils conditions suitable for the establishment of replacement vegetation. However, previously existing hydrological conditions may need to be restored by acquiring upstream water rights or altering channel morphology and topography. Restoration of willow riparian communities would also involve construction of exclusionary fencing, planting, irrigation and other maintenance measures.

Enhancement or restoration of mixed riparian and various oak riparian communities should be avoided if possible. These communities are historically reduced, and limited habitat suitable for restoration or enhancement remains in some watershed. They also provide important habitat for wildlife, protect and enhance water quality, and restoration takes longer and involves greater uncertainty than for other types of riparian communities.

### Permanent to Semi-Permanent Wetlands

Areas of permanent to semi-permanent wetlands are dominated by typical marsh vegetation, emergent monocots (primarily cattails and bulrushes), or open water habitat that is too deep for the establishment of vegetation. Vegetation found in these types of wetlands is generally associated with permanent or semi-permanent inundation. These type of wetlands occur in swales, channels and other low spots which collect and pond surface runoff. Stockponds and freshwater marshes on the reservoir sites provide some limited functions and values such as flood flow alteration, sediment retention, nutrient transformation and wildlife habitat. Natural freshwater lakes are not common and natural freshwater marsh communities are historically greatly reduced in the project area. The Tolay site supports the remnants of a large seasonal freshwater lake and the remaining freshwater marsh on the valley floor and in channels attracts an abundance and

large diversity of bird life. Areas of isolated freshwater marsh in drainages and fringes of stockponds provide important habitat for waterfowl and shorebirds that once inhabited scattered extensive marshes and ponds along esteros.

Many opportunities exist throughout the project area for restoration or creation of freshwater marsh and stock pond habitat. Stockpond and freshwater marsh creation can be accomplished by impounding natural runoff and surface flows or by providing other water sources such as reclaimed wastewater. Water level fluctuations and livestock access can limit the establishment of marsh vegetation. If freshwater marsh vegetation is desired these areas should be fenced to exclude livestock and water levels should not be subject to regular fluctuation. Planting is not necessary but would accelerate establishment of marsh vegetation. Freshwater marsh should be created by including high flow bypass channels in with riparian enhancement and restoration activities. Stock pond creation could be used in upland areas in association with grassland enhancement and riparian pastures to provide a water source to support upland pasture. Other opportunities exist to create freshwater marsh in association with dam and diversion structure development, on a selected reservoir site, or restoration of former tidal lands.

### Final Success Criteria

Final success criteria need to take into account target functions and values of the habitat to be created, the desired hydrological regime, and the amount of jurisdictional acreage to be created.

At the time a project is selected further wetland delineations for permitting would need to be performed on any of the reservoir sites that are selected. Information collected during these more detailed surveys should be used to establish success criteria, or reference sites could be chosen at that time. The mitigation project would not be considered successful until all final success criteria are met for a period of at least two years without human assistance such as irrigation, replanting and weeding.

Success criteria will vary by type of habitat to be created, but the success criteria for all should be measured by area established to ensure a successful 1:1 habitat replacement ratio and no net loss of wetlands or other waters of the U.S. resulting from the project after compensation. This would require restoration and creation of an acreage equal to that which would be impacted. Mitigation credit would be provided for enhancement only after the 1:1 replacement of habitat is met by restoration or creation. Grassland enhancement to mitigate for losses of seasonal wetlands would be the exception, since it is not practical to restore the affected seasonal wetland types. Other success criteria should be developed to ensure adequate replacement of lost functions and values.

Success criteria for replacement of seasonal wetland habitats by grassland enhancement should also include percent cover, increased or established diversity of native species,

amount of cover of dry standing grasses the following winter, or re-establishment of perennial grasses on surrounding upland areas.

Success criteria for riparian communities should vary by type and whether it is enhanced, restored or created. Performance standards for enhancement or restoration of willow riparian vegetation should be based largely upon cover density, canopy cover over channel and qualitative assessments of bank stabilization. Mortality rates or indicators of plant vigor such as or height or root mass could be used for performance standards during implementation monitoring. Mixed Riparian areas and Oak Bay Woodland of different types are complex communities with great species diversity and multiple canopy and subcanopy elements. Final success criteria in these communities should based on more complex measures. Measures of vegetation cover by type, canopy heights, stratification and sapling to tree ratios should all be considered for these community types. Attraction of certain wildlife common in the region to early seral stages of these habitats may be useful as a measure of successful replacement of lost functions and values. Complete replacement of functions and values would require a time period beyond those reasonable to propose, but attraction of certain species could demonstrate progress towards successful replacement of functions and values in approximately 8 to 10 years.

## APPROACH AND SELECTION OF PROPOSED MITIGATION SITES

An off-site approach to compensate for the loss of jurisdictional wetlands and water of the U.S. was determined to be necessary because of the large area that would be affected and the limited mitigation opportunities available on-site in association with construction and operation of the site. The first part of the approach would involve preserving, enhancing, and restoring existing wetlands and aquatic environments on proposed reservoir site(s) not selected and located in the same or adjacent watershed. The second part, if necessary, would involve performing additional wetland and riparian enhancement, restoration or creation in the impacted watershed at locations other than the proposed reservoirs. Limited opportunities for on-site preservation, enhancement, restoration or creation of wetland habitat that are available in association with construction and operation of reservoir sites should be pursued wherever practicable.

This approach was selected because the proposed reservoir sites, within the same watershed and to a lesser degree the South or West County Alternative's geographical area, share similarities in size, physical and biological environment, and are located in close proximity to each other. Additionally, numerous studies detailing the resources of these sites and site availability have already been performed which may allow for quicker and less expensive development of comprehensive mitigation plans. Additional opportunities off of the site provide flexibility and could be used to make up for deficiencies in acreage, type, or any other wetland function or value not adequately compensated on the replacement reservoir site, or in association with construction and operation of the selected site. The general approach of in-kind and on-site, or in this case

for in-watershed or close proximity, ensures adequate compensation for impacted wetland functions and values. Cumulative regional losses of both wetland area and functions and values are addressed by mitigating for South County Alternative sites in the South County geographical area and mitigating West County Alternative sites in the West County geographical area.

One or a combination of proposed reservoir sites that are not selected should be preserved into perpetuity as a habitat conservation area, and used for wetland enhancement and restoration to offset impacts on the selected reservoir site. It is preferable that the replacement reservoir site be located within the same watershed but it would be acceptable if it is within the same geographical alternative area. Table 3.2 provides examples of the different combinations of suitable proposed reservoir replacement sites and identifies other opportunities to compensate for unavoidable losses of wetlands and other waters of the U.S. Estimates of the replacement wetland and riparian habitat available on the various reservoir sites by vegetation type are contained in the Planning Level Wetland Determination.

To evaluate the availability and feasibility of the mitigation approach it is assumed that the entire area within the construction envelope would be used for mitigation. The actual amount of mitigation credit provided for wetland and riparian habitat enhancement and restoration on the replacement reservoir site(s) would be determined later on a site specific basis for permitting purposes and the development of a draft detailed mitigation plan.

Other opportunities exist off of the proposed replacement reservoir sites to develop independent mitigation projects or to participate in regional watershed enhancement and restoration plans in the immediate region. Some of these potential mitigation sites are listed in Table 3.3 and their locations are shown in Figures 3.1 through 3.6. Potential acreages of opportunities for enhancement, restoration and creation are provided in Table 3.3. Other opportunities are listed to demonstrate the availability of suitable replacement mitigation habitat and should not preclude other opportunities brought forth at a later date that are acceptable to the Corps and other responsible agencies.

The identification of other opportunities for mitigation is based on information compiled during wetland determinations for reservoirs, pipelines and agricultural irrigation areas, additional aerial photo analysis, soils surveys mapping for Marin and Sonoma Counties and information from previous studies, as well as information from previous studies. Vegetation was either heavily degraded or absent on the other opportunity mitigation sites. Wetland mapping, observations and familiarity with the region obtained during earlier wetland determinations was an invaluable resource for identifying areas of other opportunities for mitigation. Observations made in the field and from reviews of aerial photos were used to determine the suitability of soils and hydrology for restoration.

# Table 3.2

Conceptual Mitigation Compensation for Impacts to Potential Jurisdictional Wetlands and Other Waters of the U.S.

| Reservoir Site Name | Replacement Site(s) | Other Opportunities | Other Considerations |
|---|---|---|---|
| **South County** | | | |
| Adobe Road | Lakeville Hillside | Restoration of mixed riparian and riverine habitat along Lynch, Washington, Adobe and other unnamed creeks that discharge to the Petaluma River. | • Upland oak woodland may be easier to replace on Two Rock or Sears Point Sites. |
| Lakeville Hillside | Adobe Road | Restoration of mixed riparian, willow riparian and riverine habitat along Stage Gulch Creek, Wheat Creek and unnamed intermittent drainages east of Lakeville Highway between Stage Gulch Road and Highway 37. Sonoma Baylands Trust Creation/Restoration. | |
| Lakeville Hillside | Tolay | Restoration of mixed riparian, willow riparian and riverine habitat along Stage Gulch Creek, Wheat Creek and unnamed intermittent drainages east of Lakeville Highway between Stage Gulch Road and Highway 37. Sonoma Baylands Trust Creation/Restoration. | |
| Tolay A | Sears Point | Sonoma Baylands Trust or San Pablo Baylands Project Creation/Restoration, Upstream Wetland Creation or Enhancement of Existing Reservoir. | • Archaeological mitigation<br>• FSA status undetermined and potential FSA mitigation requirement limitations |
| Tolay A | Sears Point and Lakeville Hillside | Sonoma Baylands Trust or San Pablo Baylands Project Creation/Restoration, Upstream Wetland Creation or Enhancement of Existing Reservoir. | • Archaeological mitigation<br>• FSA status undetermined and potential FSA mitigation requirement limitations |
| Tolay C | Sears Point | Sonoma Baylands Trust or San Pablo Baylands Project Creation/Restoration, Upstream Wetland Creation or Enhancement of Existing Reservoir | • Archaeological mitigation<br>• FSA status undetermined and potential FSA mitigation requirement limitations |
| Tolay C | Sears Point and Lakeville Hillside | Sonoma Baylands Trust or San Pablo Baylands Project Creation/Restoration, Upstream Wetland Creation or Enhancement of Existing Reservoir | • Archaeological mitigation<br>• FSA status undetermined and potential FSA mitigation requirement limitations |
| Sears Point | Tolay and Lakeville Hillside | Sonoma Baylands Trust or San Pablo Baylands Project Creation/Restoration | • Oak woodland and mixed riparian enhancement/ restoration opportunities limited in watershed. |

| Reservoir Site Name | Replacement Site(s) | Other Opportunities | Other Considerations |
|---|---|---|---|
| **West County — Stemple Creek Watershed** | | | |
| Two Rock | Huntley | Stemple Creek Restoration and Enhancement | • Oak woodland habitats would need to be restored throughout watershed. |
| Huntley | Two Rock | Stemple Creek Restoration and Enhancement | • Bloomfield, Valley Ford East and Carroll Road North provide similar restoration opportunities but are not within the same watershed. |
| **West County — Americano Creek Watershed** | | | |
| Bloomfield | Valley Ford East | Americano Creek Restoration and Enhancement | |
| Bloomfield | Carroll Road | Americano Creek Restoration and Enhancement | |
| Bloomfield | Valley Ford East and Carroll Road North | Americano Creek Restoration and Enhancement | |
| Bloomfield | Two Rock | Americano Creek Restoration and Enhancement | |
| Valley Ford East | Bloomfield | Americano Creek Restoration and Enhancement | |
| Valley Ford East | Carroll Road North | Americano Creek Restoration and Enhancement | |
| Valley Ford East | Bloomfield and Carroll Road North | Americano Creek Restoration and Enhancement | |
| Valley Ford East | Two Rock | Americano Creek Restoration and Enhancement | |
| Carroll Road North | Bloomfield | Americano Creek Restoration and Enhancement | |
| Carroll Road North | Valley Ford East | Americano Creek Restoration and Enhancement | |
| Carroll Road North | Bloomfield and Valley Ford East | Americano Creek Restoration and Enhancement | |
| Carroll Road North | Two Rock | Americano Creek Restoration and Enhancement | |

# Table 3.3

Other Potential Habitat Mitigation

sq. ft.

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| | | | | | **South County** | | | | | |
| 1 | Bayflats Agricultural Area N of Hwy 37 and southwest of Lakeville Highway | Former tidelands or marshlands which have been converted to agricultural use. | | | | | | | 750,000 | 250,000 |
| 2 | Bayflats Agricultural Area N of Hwy. 37 and east of Hwy. 121 | Former tidelands or marshlands which have been converted to agricultural use. | | | | | | | 750,000 | 25,000 |
| 3 | Backwater dam fresh water marsh creation in coordination with proposed Tolay site | Areas upstream of historic Tolay Lakebed could be impounded and a large seasonal fresh water lake could be created. | | | | | | | | 500,000 |
| 4 | Tolay Creek large reservoir upstream of proposed Tolay site's watershed | Manage water levels and grazing around existing reservoir to enhance existing shoreline emergent vegetation. | | | | | | | | 75,000 |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 5 | Intermittent drainage below proposed Lakeville Reservoir site. NE of Lakeville Highway on both sides of Old Lakeville Hwy #3 | 50' by 3,000' degraded riverine with a few scattered willows and areas of seasonally wet vegetation along banks. | 75,000 | | 300,000 | 75,000 | | | | |
| 6 | Unnamed drainage east of Old Lakeville Road #3 | Watershed just to the southeast of the proposed Lakeville Hillside reservoir site. Unnamed drainages 9,000 linear feet ranging from 10' to 20' wide. A few scattered willows remain. | 180,000 | | | 180,000 | | | | |
| 7 | Unnamed drainage east of Old Lakeville Road #2 | Watershed just to the northwest of the proposed Lakeville Hillside storage site. 10,000 linear feet 10' to 15' wide of degraded willow riparian habitat. | 200,000 | | | 200,000 | | | | |
| 8 | Stage Gulch Cr.; 800' to 2000' north of Lakeville Hwy. on northeast side of Stage Gulch Rd. | 15' by 1,300' riverine with some freshwater marsh, disturbed willow riparian along fringe about 10' wide and seasonally wet areas on gullied slumping stream terrace. | 13,000 | | | 13,000 | | | | |
| 9 | Wheat Cr.; Lakeville Hwy. & 500' southwest of Lakeville Hwy. | 30' by 500' degraded riverine with scattered willows. Channel disperses into fields and is drained by agricultural ditches. | 7,500 | | | 7,500 | | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 10 | Wheat Cr.; Lakeville Hwy. & 1000' northeast of Lakeville Hwy (near stock pond) | 40' by 1,000' degraded riverine almost completely devoid of any woody vegetation. Area likely formerly supported willow riparian vegetation. | | | | 40,000 | | | | |
| 11 | Unnamed creek south of Adobe Cr. & north of Browns Ln. Reach from Lakeville Hwy. to S. Ely Rd. | 20' by 2,400' degraded riverine discharges to Petaluma River just north of City of Petaluma Treatment Ponds, minor amounts of willow riparian along fringes of straightened channel. Riparian area immediately upstream is 50' wide. | 40,000 | | | 80,000 | | | | |
| 12 | Unnamed creek south of Adobe Cr. & north of Browns Rd; Reach from S. Ely Rd. north to confluence of channels. | 30' by 4,500' degraded riverine with a few scattered oaks and willows, area immediately upstream support a mixed riparian corridor over 100' feet wide. Assume 75' wide MR restoration along entire channel with 100' grassland/swv area enhancement. | | | 450,000 | | 337,500 | | | |
| 13 | Adobe Cr. corridor; on northwest side of Casa Grande Rd. & Adobe Cr. Golf Course | 20 by 2,000' degraded riverine, with a few remaining scattered willows along fringe. Area may be in landing strip safety zone. Assume 20' wide wr fringe restoration. | | | | 40,000 | | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 14 | Adobe Cr. corridor; Casa Grande Rd. to Adobe Rd. | 20' by 1,300' degraded riverine, incised channel, degraded mixed riparian woodland along fringes 15' wide both sides (area within Adobe Cr. Golf Course). | | 19,500 | | | 19,500 | | | |
| 15 | Adobe Cr. corridor; Adobe Rd. to northern Adobe State Historic Park boundary. | 20' by 1,200' degraded riverine; deeply incised channel with corridor up to 50' wide of willow riparian, mixed riparian & oak woodland (area within State Park). | | 36,000 | | | | | | |
| 16 | Adobe Cr. corridor; northern boundary of Adobe State Historic Park to just south of Manor Road. | 20' by 3,000' degraded riverine with a few scattered willow and oaks along the fringe. Areas up and down stream support mixed riparian and oak woodland up to 50' wide. Could provide mitigation for oak woodland and aquatic impacts also. | | 50,000 | | | 100,000 | | | |
| 17 | Adobe Cr. corridor; northwest of Manor Road | 15' by 1,500' degraded riverine channel, with scattered willows and oaks along fringe. Assume 50' wide corridor restoration possible. | | 25,000 | | | 50,000 | | | |
| 18 | Tributary to East Washington Cr.; SW of Adobe Rd, | 20' by 2,000' degraded riverine channel, straightened, some willow riparian up to 50' wide remains. Could be within runway safety area. | 50,000 | | | 50,000 | | | | |

## Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 19 | Tributary to East Washington Cr.; Northeast of Adobe Rd. | 25' by 1,000' degraded riverine and dense willow riparian vegetation as much as 50' wide. | 25,000 | | | 25,000 | | | | |
| 20 | East Washington Cr. SW o f Adobe Rd.. | 100' by 3,500' degraded riverine with scattered mixed riparian woodland. Site has been partially developed as a park. Immediately downstream of proposed Adobe Road Storage Site. | | 100,000 | | | 75,000 | | | |
| 21 | Lynch Cr. corridor; Petaluma City Limit boundary to 500' south of boundary. | 40' by 500' degraded riverine, minor emergent with few willow and oak trees; southern boundary adjoining large contiguous mixed riparian woodland 200' wide or greater. | | | 50,000 | | 50,000 | | | |
| 22 | Lynch Cr. corridor; Petaluma City Limit to Adobe Rd. | 35' by 2,000' degraded riverine, minor amount of emergent wetland & willow riparian & oak woodland. Riparian corridor 100' upstream and 200' wide downstream. | | 50,000 | 200,000 | | 150,000 | | | |
| 23 | Lynch Cr. corridor; Adobe Rd. to Sonoma Mtn. Rd. | 30' by 2,000' degraded riverine channel with scattered mixed riparian, willow riparian and oak woodland along the fringe. Riparian corridor is between 50 and 100 feet up and down stream. | | 75,000 | 200,000 | | 75,000 | | | |

## Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 24 | Lynch Cr. corridor; Sonoma Mtn. Rd. to 1000' upstream. | 25' by 1,000' degraded riverine with scattered mixed riparian woodland & willow riparian. | 7,500 | 7,500 | | 5,000 | 5,000 | | | |
| 25 | Willow Cr.; NW Pacific RR to Adobe Rd. | 35' by 6,600' degraded riverine with freshwater marsh and scattered willows. Assumed potential for 50' wide riparian corridor. | 220,000 | | | 110,000 | | | | |
| 26 | Willow Cr.; Immediately NE of Adobe Rd. until confluence of 2 channels. | 35' by 1,300' degraded willow riparian & riverine. Wooded riparian areas 100' wide and greater just upstream. Hydric soils on stream terrace could provide good opportunities for grassland enhancement. | | 30,000 | 130,000 | | 30,000 | | | |
| 27 | Willow Cr., east fork; 800' to 1500' north of Adobe Rd. | 30' by 1,000' degraded riverine with oak bay woodland and mixed riparian along fringes. Areas upstream support 100' wide vegetated riparian corridor. | | 50,000 | | | 50,000 | | | |
| 28 | Willow Cr.; 800' northeast of Adobe Rd. to 1600' northeast of Adobe Rd at creek fork. | 35' by 1,300' degraded riverine with oak woodland and mixed riparian along fringes. | | 65,000 | | | 65,000 | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 29 | Unnamed creek (north of Willow Cr.) NW Pacific RR to Adobe Rd. | 25' by 4,200' degraded riverine with freshwater marsh & scattered isolated willows. Areas up and downstream with wooded riparian corridors 50' plus. | 105,000 | | 210,000 | 105,000 | | | | |
| 30 | Unnamed creek (north of Willow Cr.) Adobe Rd. to 700' northeast of Adobe Rd. | 25' by 1,000' degraded riverine with some freshwater marsh and scattered isolated willows and oaks. | | 25,000 | 200,000 | | 25,000 | | | |
| | | Total Mitigation Habitat Available | 924,000 | 533,000 | 1,740,000 | 940,500 | 1,032,000 | 0 | 1,500,000 | 850,000 |
| | | **West County — Americano Creek Watershed** | | | | | | | | |
| 31 | Americano Cr. corridor; 1,000' west of Bloomfield Rd. to Jones Rd. | 60' by 6,000' degraded riverine with some freshwater marsh, very few scattered willows along channel and seasonally wet areas up to 1000' feet wide. Excellent restoration potential along this reach. | 300,000 | | | 300,000 | | | | |
| 32 | Americano Cr.; Jones Rd. to Carroll Rd. | 75' by 2,000' degraded riverine and with a few scattered clumps of willow riparian vegetation. Hydric soils extend up to 1000' along creek on flood plain. | 50,000 | | 400,000 | 150,000 | | | | |
| 33 | Americano Cr. corridor; Carroll Rd. to Hwy. 1 | 50' to 75' wide by 6,000' degraded riverine with some freshwater marsh, with disturbed willow riparian corridor up to 150' wide. | 450,000 | | | 450,000 | | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 34 | Americano Cr. corridor; Marsh Rd. to 7000' upstream to extensive willow riparian woodland. | 50' - 75' by 7,000' degraded riverine with freshwater marsh in channel, willow riparian woodland mostly devoid along fringes but some areas remain as wide as 150' feet. | 350,000 | | | 1,050,000 | | | | |
| 35 | Americano Cr.; Marsh Rd. to Middle Rd at approximate former salt marsh boundary where soil changes from Blucher to Novato series. | 30' to 50' wide by 4,500' degraded riverine, deeply incised channel with brackish/freshwater marsh and scattered willows and eucalyptus along upper bank. | 135,000 | | | 90,000 | | | | |
| 36 | Americano Cr.; South of intersection of Marsh Rd. and Middle Road to Valley Ford/ Franklin School Rd. | 40' wide by 8,000' degraded riverine with brackish/freshwater marsh in deeply incised channel. Upper half of reach potential grassland enhancement lower half of reach potential brackish/salt marsh restoration/creation. | | | 800,000 | | | | | 400,000 |
| 37 | Unnamed drainage below proposed Carroll Road reservoir; below reservoir to Valley Ford Rd. | 100' by 6,000' degraded mainly riverine and minor willow riparian woodland. | | | 600,000 | 300,000 | | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 38 | Drainage below proposed Valley Ford Reservoir site to Valley Ford Road. | 50' wide by 500' mixed riparian vegetation with large adjoining seasonally wet and ponded area with some freshwater marsh vegetation. | | 25,000 | | | 75,000 | | | 100,000 |
| 39 | Unnamed tributary to Americano Creek 3000' east of the town of Valley Ford. | 5,000' of linear feet by 10' to 20' wide incised drainages with some willow riparian vegetation remaining. In watershed immediately west of the proposed Valley Ford Storage Site. | 100,000 | | | | 100,000 | | | |
| 40 | Unnamed tributary to Americano Creek at the town of Bloomfield. | Somewhat degraded willow riparian corridor with incised drainage 25' to 30' wide 8,000 linear feet. Watershed immediately east of proposed Bloomfield Reservoir Site. | 200,000 | | | 200,000 | | | | |
| | | Total Mitigation Habitat Available | 1,585,000 | 25,000 | 1,800,000 | 2,540,000 | 175,000 | 0 | 0 | 500,000 |
| | | **West County — Stemple Creek Watershed** | | | | | | | | |
| 41 | Tributary to Stemple Creek south of Walker Road to confluence of two drainages. | Willow riparian vegetation 50' to 100' wide along drainage. Much of upstream riparian corridor has been fenced and restored. Degraded seasonally wet area in low spot between two drainages. Riparian, seasonally wet or freshwater marsh restoration. | 75,000 | | 250,000 | 75,000 | | | | 250,000 |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 42 | Tributary to Stemple Creek paralleling east side of Petaluma Valley Ford Road. | Degraded willow riparian along incised riparian channel varying from 25' to 40' wide by 3,000' long with large seasonally wet or annual grassland wetlands immediately adjacent | 75,000 | | 300,000 | 75,000 | | | | |
| 43 | Tributary to Stemple Creek west of Petaluma Valley Ford Road to Fallon Two Rock Road. | Channelized incised drainage 25'-30' wide by 3,500' long with scattered willows and freshwater marsh vegetation. Adjacent areas are in cultivation and contain extensive prior converted wetlands. Parallel ditch 500' to the west drains cultivated area. | 87,500 | | | 87,500 | | | | |
| 44 | Tributary to Stemple Creek south of Fallon Two Rock Road to confluence with Stemple Creek. | Meandering channel 25' to 30' wide by 2,500' feet long, deeply incised mostly devoid of vegetation with scattered freshwater marsh/fresh water seep vegetation in channel. | 62,500 | | 500,000 | 62,500 | | | | |
| 45 | Main Stem of Stemple Creek west of Petaluma Valley Ford Road. | Incised channel 25' to 40' wide by 4,000' long mostly devoid of vegetation with isolated pools fringed with freshwater marsh/seasonally wet vegetation. Large disturbed annual grassland or seasonally wet vegetation immediately adjacent to channel. | 100,000 | | 800,000 | 100,000 | | | | |

## Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 46 | Tributary to Stemple Creek north of Tomales Petaluma Road to confluence with Stemple Creek. | Incised channel 25' to 35' wide by 2,500' long mostly devoid of vegetation. Areas immediately upstream support 100' - 150' wide riparian corridor. | 87,500 | | 250,000 | 175,000 | | | | |
| 47 | Main stem of Stemple Creek west of Pepper Road to Petaluma Valley Ford Road. | Incised channel 25' to 40' wide by 7,500' long mostly devoid of vegetation except a few scattered willows. Large disturbed seasonally wet vegetation/annual grassland wetlands on basin floor immediately adjoining channel. | 187,500 | | 750,000 | 187,500 | | | | |
| 48 | Tributary to Stemple Creek south of Bodega Ave to just east of Spring Hill Road. | Incised straightened drainage 25' - 30' wide by 8,000 feet long with a few isolated clumps of willows. | 200,000 | | 500,000 | 200,000 | | | | |
| 49 | Main stem Stemple Creek below confluence of tributaries to just east of Alexander Road. | Incised drainage 30 to 50 feet wide by 18,000 feet long, mostly devoid of vegetation except for a few scattered willows and freshwater marsh/freshwater seep vegetation which occurs along fringes of isolated pooled areas. | 900,000 | | | 900,000 | | | | |

# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 50 | Tributary to Stemple Creek south of Seavey Drive | Incised drainage 20' to 25' wide branches into 2 or more drainages upstream. Downstream areas support willow riparian vegetation while areas upstream on steeper north facing slopes support oak woodlands. | 75,000 | | | 150,000 | | 200,000 | | |
| 51 | | Incised drainage 20' to 25' wide branches into 2 or more drainages upstream. North facing slopes and lower areas along drainages support oak woodlands. | | | | | | 200,000 | | |
| 52 | Tributary to Stemple Creek paralleling Chileno Valley Road south of Petaluma Tomales Road. | Incised drainage with disturbed willow riparian habitat along lower drainage and oak woodland in upper north facing slopes in the drainage. | 62,500 | | | 62,500 | | 250,000 | | |
| 53 | Tributary to Stemple Creek south of Petaluma Tomales Road 2,000' west of intersection with Chileno Valley Road. | Incised drainage 15' to 20' wide by 3,000' long mostly devoid or vegetation. | 30,000 | | | 30,000 | | | | |

## Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 54 | Tributary to Stemple Creek south of Petaluma Tomales Road 2,000' east of Alexander Road. | Incised drainage 20' to 25' wide by 6,000' long. Lower reaches and areas in immediate channel support willows, upper reaches along upland fringe of channel and north facing slopes support oak woodlands. | 100,000 | | | 100,000 | | 200,000 | | |
| 55 | Tributary to Stemple Creek 2,500' east of intersection of Petaluma Tomales Road and Twin Bridges Road. | Incised drainage 15' to 20' wide. 2,000' reach which joins Stemple Creek is completely devoid of vegetation. 1000' reach just south of Petaluma Tomales Road supports dense willow riparian. Further up drainage 1000' oak woodland. | 50,000 | | | 50,000 | | 100,000 | | |
| 56 | Main stem Stemple Creek west of Alexander Road to Twin Bridge Road. | Deeply incised channel ranging from 40' to 100' wide by 9,000 linear feet with degraded fresh water marsh vegetation adjacent low lying areas support extensive seasonally wet or annual grassland wetland vegetation. | 450,000 | | | 900,000 | | | | |
| 57 | Tributary to Stemple Creek which parallels Carmody Road before crossing Fallon Two Rock Road and Alexander Road. | Incised drainage 10' to 15' wide by 7,000 linear feet which has been straightened and is mostly devoid of vegetation. | 140,000 | | | 140,000 | | | | |

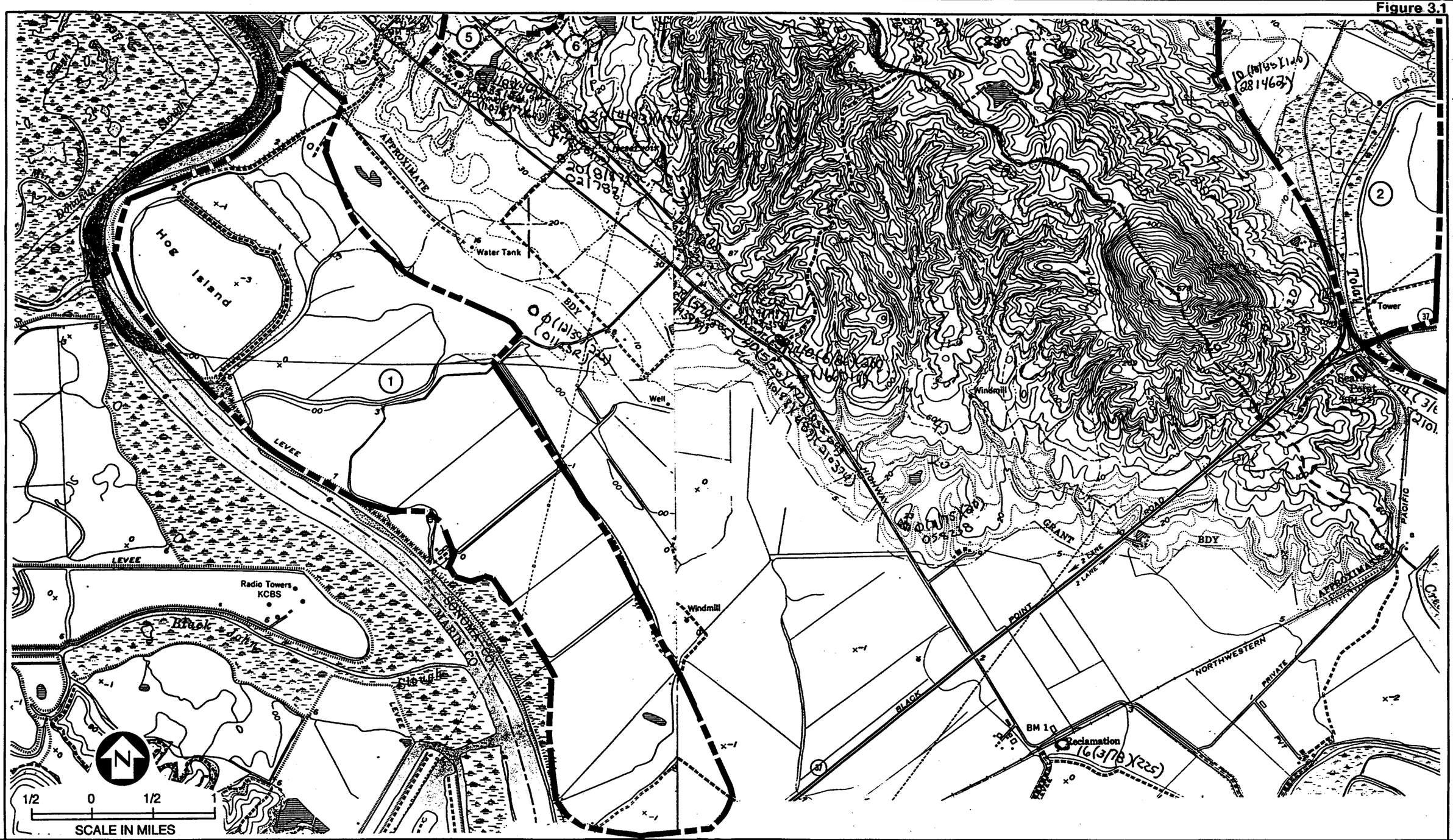
# Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 58 | Drainage directly below proposed Huntley Reservoir site to Fallon Two Rock Road. | Incised drainage 15' to 20' wide by 3,500 linear feet almost completely devoid of vegetation with extensive areas of seasonally wet vegetation immediately adjoining channel. | 70,000 | | 350,000 | 70,000 | | | | |
| 59 | Tributary to Stemple Creek just south of intersection of Huntley Road and Fallon Two Rock Road. | Incised drainage 20' wide by 3,000 linear feet long mostly devoid of vegetation except for some areas of degraded freshwater marsh in the channel. | 60,000 | | | 60,000 | | | | |
| 60 | Mainstem of Stemple Creek from west of Twin Bridge Road to Highway 1 | Incised drainage 50' wide 20,000 linear feet with some limited areas of freshwater marsh and willow riparian vegetation. Large annual grassland and seasonally wet vegetation wetlands on basin floor immediately adjacent the channel. | 1,000,000 | | | 1,000,000 | | | | |
| 61 | Tributary to Stemple Creek 3000' west of Huntley Road - south of Fallon Two Rock Road to confluence with Stemple Creek. | Incised drainage 15 to 20 by 3,250 linear feet wide former willow riparian corridor now almost devoid of vegetation. | 81,250 | | | 81,250 | | | | |

## Table 3.3 (continued)

| | | | Enhancement | | | Restoration | | | | Creation |
|---|---|---|---|---|---|---|---|---|---|---|
| ID No. | Area of Opportunity | Description of Area | Willow Riparian | Mixed Riparian | Grass-land | Willow Riparian | Mixed Riparian | Oak Wood-land | Cropland | Marsh / Pond |
| 62 | Tributary to Stemple Creek paralleling both sides of Huntley Road | Incised drainage 10' wide by 5,000' long on basin floor with extensive seasonally wet vegetation and annual grassland wetlands. Area is in adjacent watershed to proposed Huntley Reservoir site and is currently used to graze sheep. | 100,000 | | 500,000 | 100,000 | | | | |
| 63 | Tributary to Stemple Creek 3000' west of Huntley Road - north of Fallon Two Rock Road. | Incised drainage 15 to 20 feet wide 5,00' long with some scattered freshwater marsh and willow riparian vegetation in the channel. Seasonally wet vegetation and annual grassland vegetation on adjoining basin floor. | 110,000 | | | 110,000 | | | | |
| | | Total Mitigation Habitat Available | 3,203,750 | 0 | 4,200,000 | 4,716,250 | 0 | 950,000 | 0 | 250,000 |

Figure 3.1




HARLAND BARTHOLOMEW & ASSOCIATES, INC.

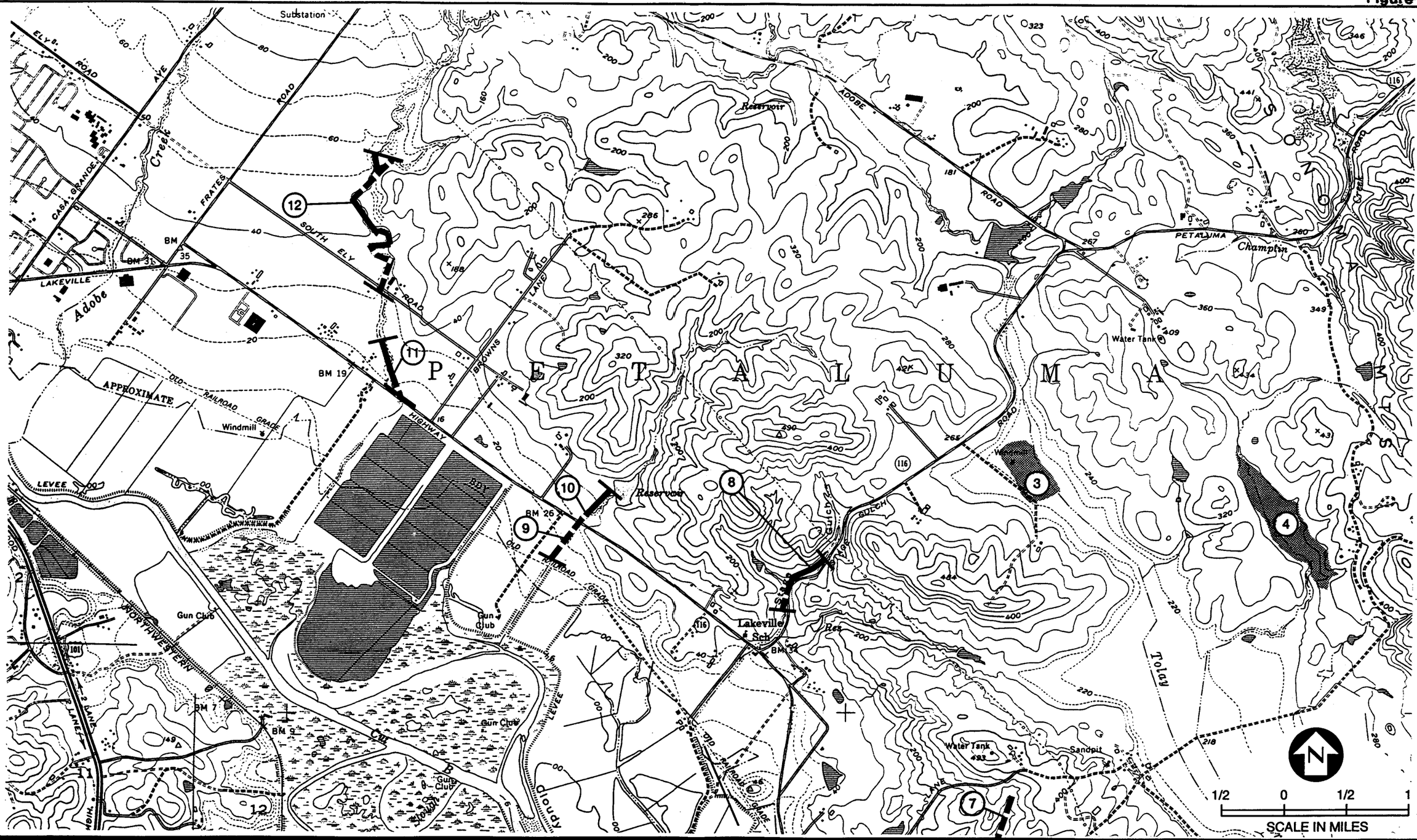
**SANTA ROSA Subregional Long-Term Wastewater Project**

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**South County**

REV. 1 SRWM-02.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Figure 3.2




**HARLAND BARTHOLOMEW & ASSOCIATES, INC.**

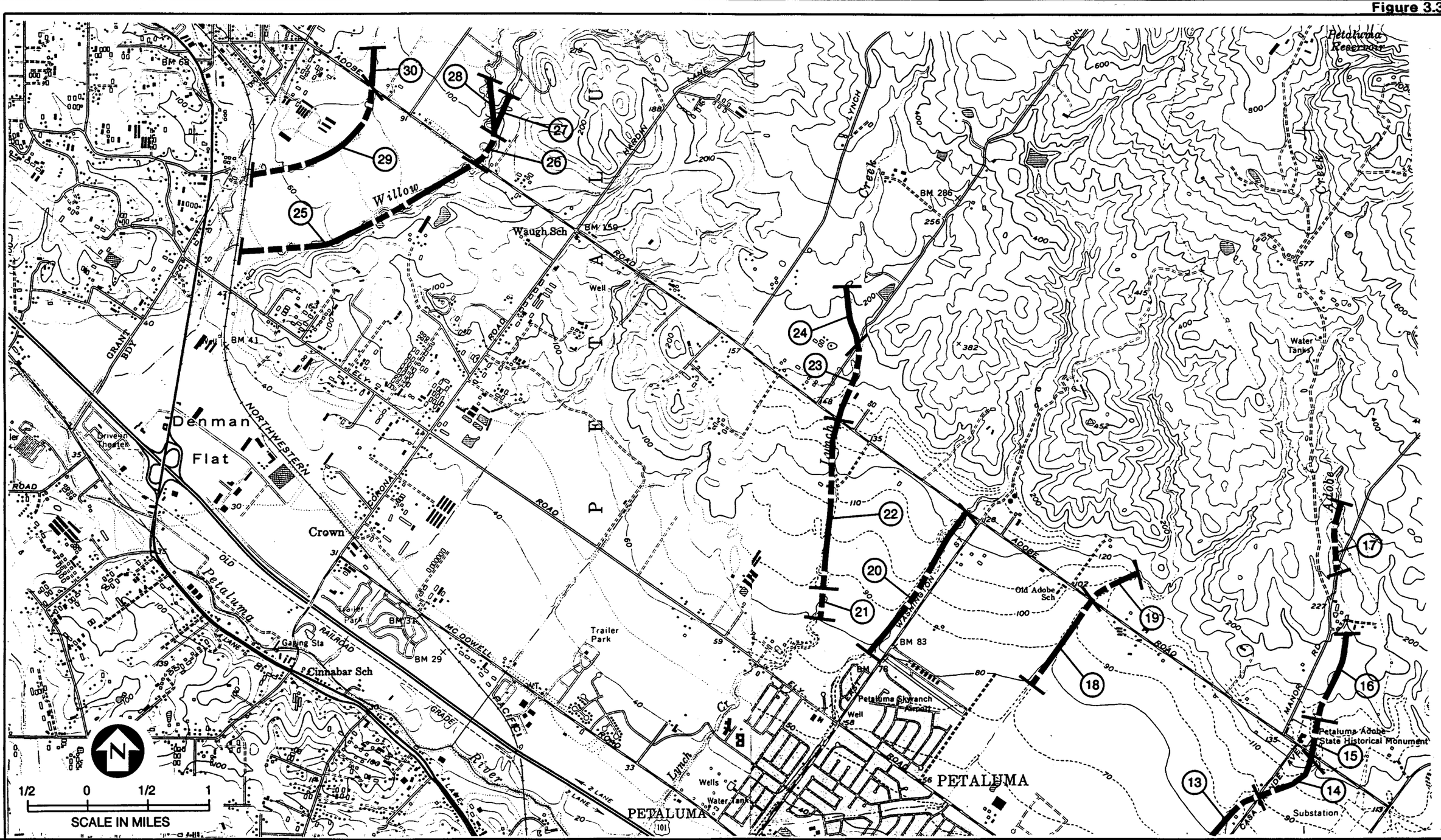
**SANTA ROSA Subregional Long-Term Wastewater Project**

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**South County**

REV. 1 SRWM-02.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Figure 3.3




**HARLAND BARTHOLOMEW & ASSOCIATES, INC.**

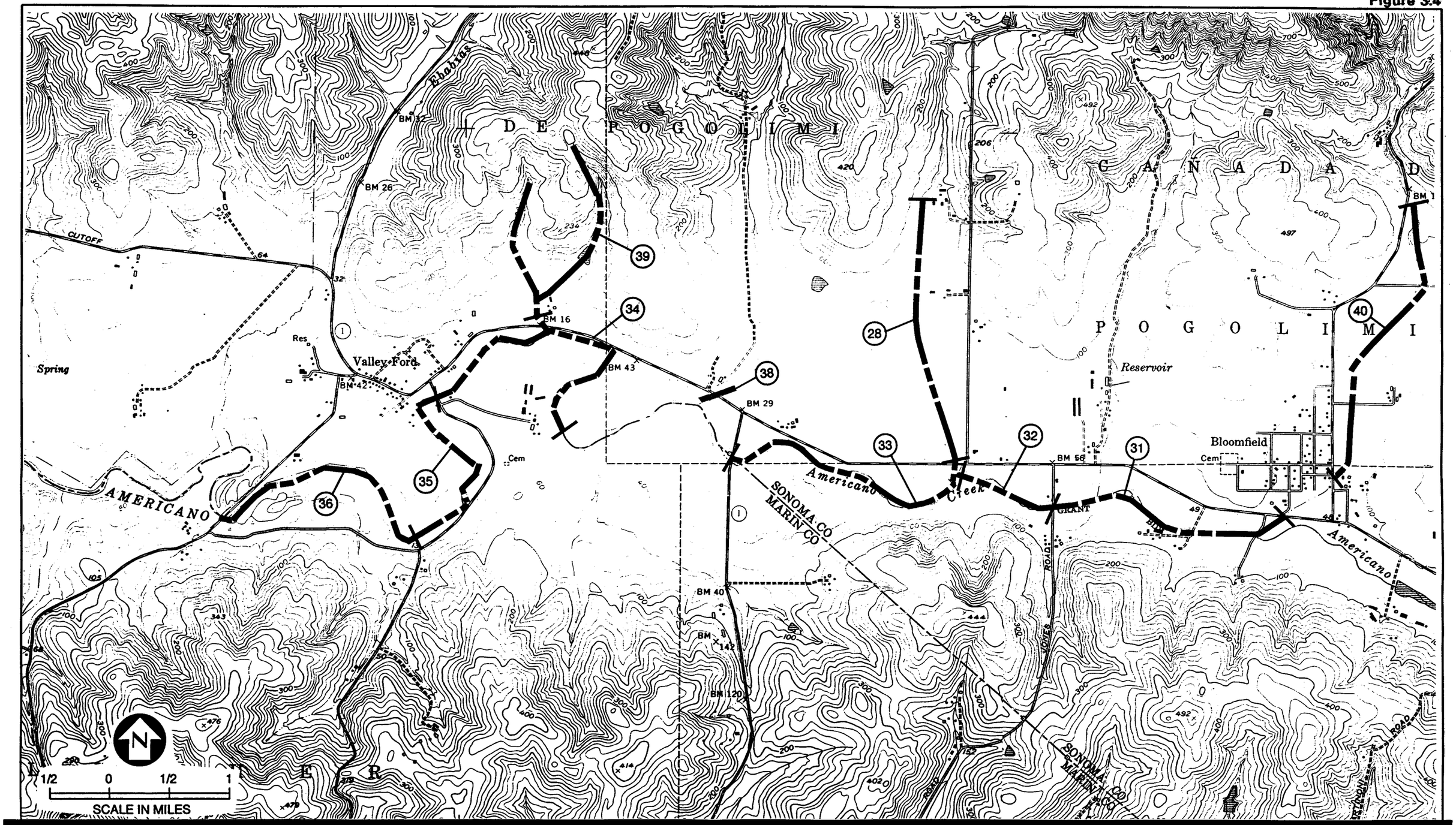
**SANTA ROSA Subregional Long-Term Wastewater Project**

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**South County**

REV. 1 SRWM-02.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Figure 3.4




HARLAND BARTHOLOMEW & ASSOCIATES, INC.

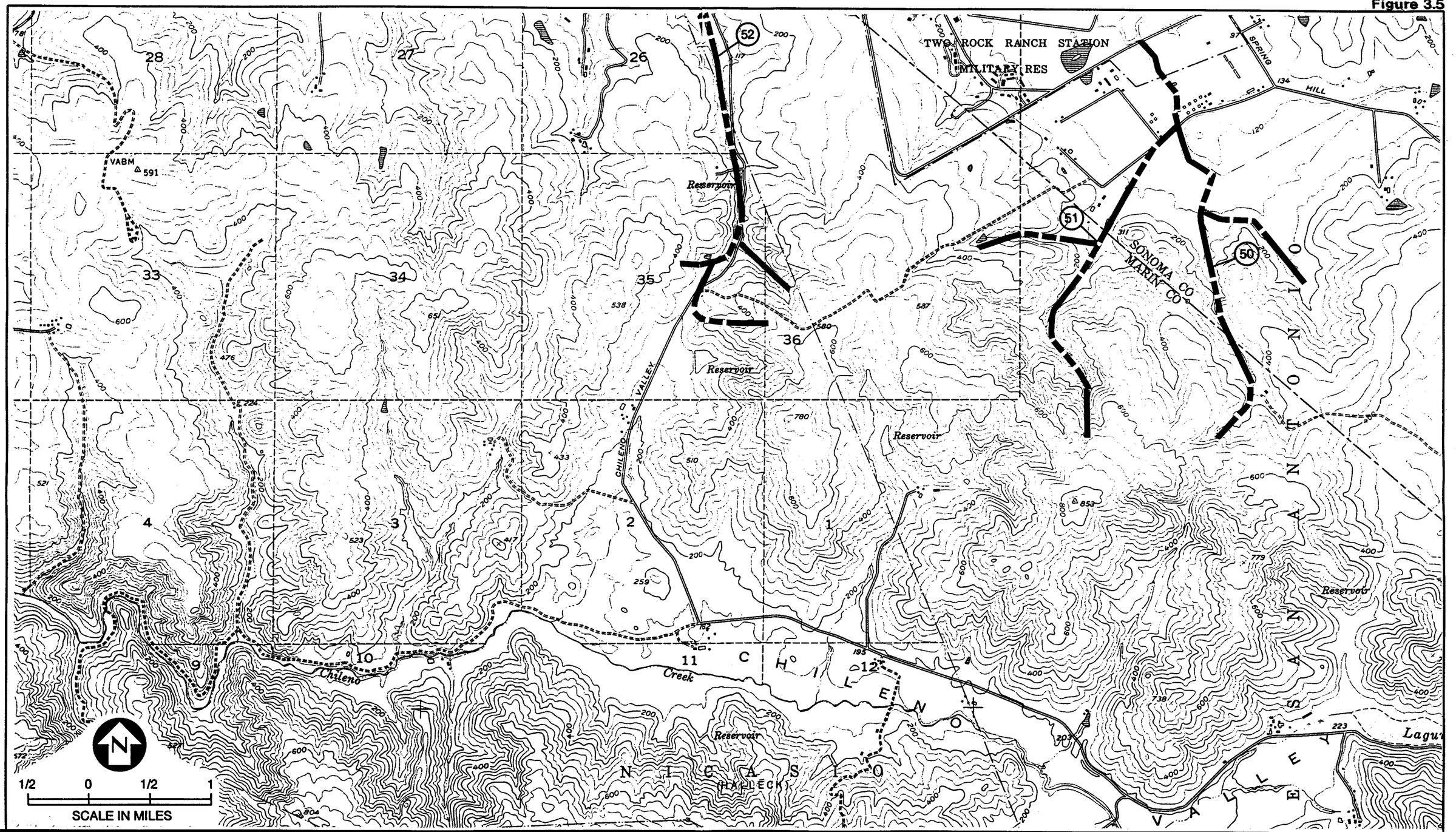
SANTA ROSA Subregional Long-Term Wastewater Project

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**West County Americano Creek Watershed**

REV. 1 SRWM-01.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Figure 3.5




**HARLAND BARTHOLOMEW & ASSOCIATES, INC.**

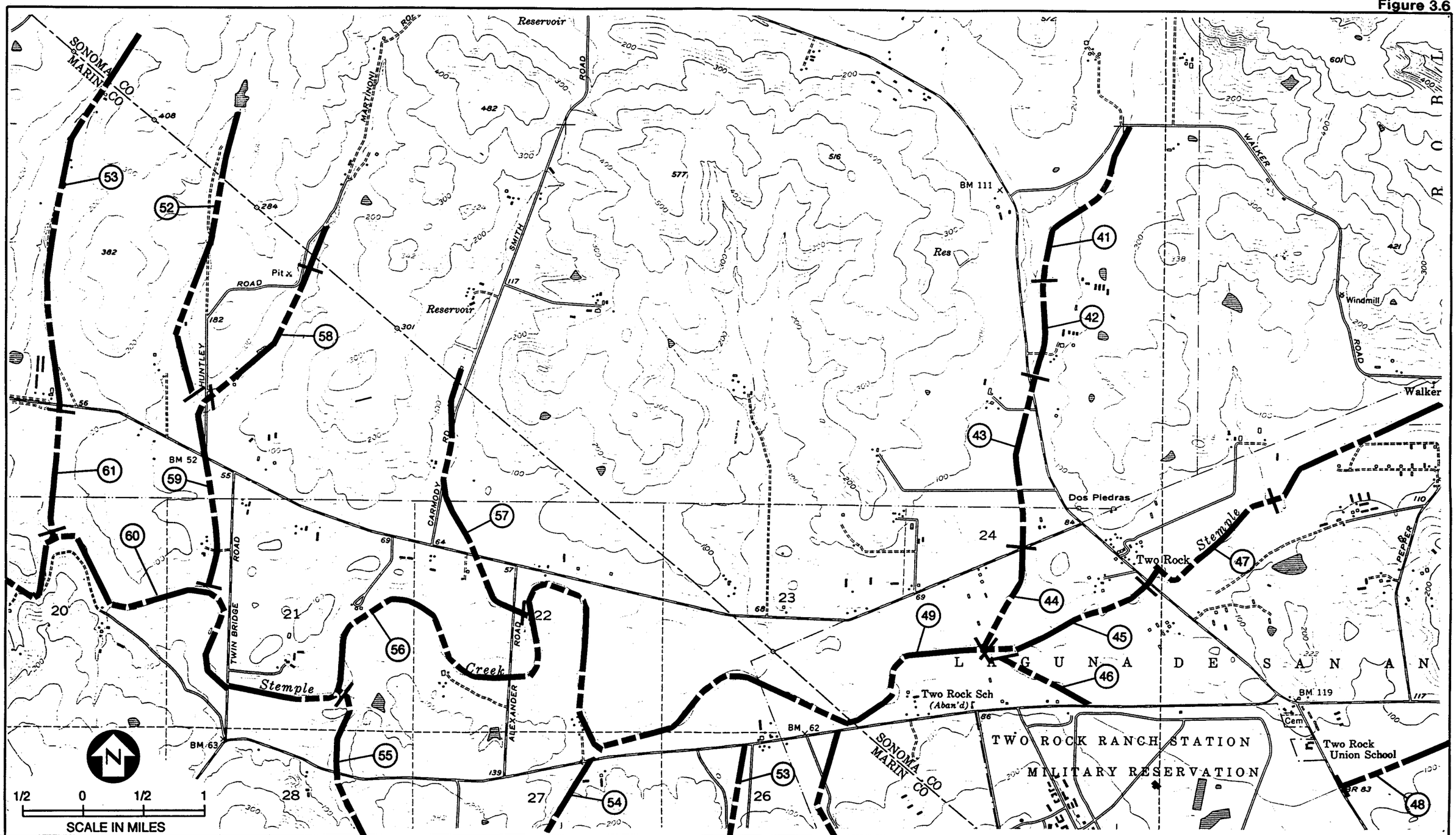
**SANTA ROSA Subregional Long-Term Wastewater Project**

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**West County - Stemple Creek Watershed**

REV. 2 SRWM-04.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Figure 3.6




HARLAND BARTHOLOMEW & ASSOCIATES, INC.

SANTA ROSA Subregional Long-Term Wastewater Project

**WETLAND MITIGATION OPPORTUNITIES FOR PROPOSED RESERVOIR SITES**
**West County - Stemple Creek Watershed**

REV. 1 SRWM-02.DWG 04/24/96

PARSONS ENGINEERING SCIENCE, INC.

Areas immediately up and downstream that were fenced to exclude livestock or pastures regularly rotated were used to determine the potential and approximate width or amount of enhancement or restoration available. Areas of mapped hydric soils and areas mapped as seasonally wet vegetation and annual grassland wetlands were assumed to have suitable existing or restorable hydrology and soil conditions for development of replacement riparian and wetland habitat. Variations in shading, tone and texture on the aerial photos were used to indicate ponded areas or areas where plant germination has been delayed by excessive moisture and were often also determined to be areas suitable for wetland and riparian mitigation replacement. Previous wetlands delineations for the Americano Creek Basin, the Stemple Creek Basin and the Tolay Valley (North State Resources et al. 1990) were also reviewed to determine the suitability of soils and hydrology. The Marin Coastal Watershed Enhancement Project (U.C. Cooperative Extension Novato 1995) and the Stemple Creek/Estero de San Antonio Watershed Enhancement Plan were also reviewed during the identification of other opportunities for mitigation (Prunuske Chatham, Inc.).

It would be desirable whenever possible to participate in ongoing watershed and wetland enhancement and restoration projects rather than developing scattered smaller projects which provide limited replacement for lost functions and values and may be more difficult to implement and manage. Opportunities for combined mitigation exist in the South County with the Sonoma County Land Trust and San Pablo Baylands Restoration Project and in the West County with the Stemple and Americano Creek Watershed Enhancement Plans.

The previously prepared Draft Environmental Impact Report estimated that 472 acres of tidal wetlands were available for restoration in the vicinity of Lakeville Highway and Highway 37 (EIP Associates 1990). Based on aerial photo interpretations, it was estimated that 138 acres along the Petaluma River west of Lakeville Highway and another 69 acres east of Highway 121 opposite Sears Point Raceway of former tidal habitat exists that would be suitable mitigation for this project. Reclaimed water from this project could be used to seasonally flood and restore areas of farmed wetlands, farmed wetland pasture, and isolated seasonal wetlands could be enhanced or restored by taking these lands out of agricultural production. Estimates for other mitigation opportunities along Stemple and Americano Creeks are based on individual segments and do not take into account the total acreage for mitigation available in the larger Stemple and Americano Creek enhancement plans.

Some opportunities for limited on-site mitigation are available in association with construction and operation of a selected site in the configurations of the reservoir sites. Opportunities exist for riparian and seasonal wetland restoration and enhancement in the upper watershed and immediately below the dam sites and freshwater marsh creation in association with various dam and diversion structure configurations. These opportunities vary tremendously by site and configuration and their suitability would be determined

after a site is selected during development of a detailed draft mitigation plan for the site. The Tolay site provides opportunities for the creation of a large freshwater lake and marsh complex in association with the Tolay A, Tolay C or Sears Point reservoir configurations. Other opportunities also exist in the upper Tolay Creek watershed for freshwater marsh enhancement by regulating water levels and excluding livestock from a large existing reservoir to expand the extent of exiting marsh vegetation.

## OWNERSHIP STATUS

The vast majority of the potential mitigation sites identified are owned by private land owners. Some large tracts of former tidal marsh lands in the Bayflats Agricultural Irrigation Area that may be suitable for restoration are owned by the Sonoma County Land Trust. Because most of the land is owned by private entities, the City of Santa Rosa would need to purchase the sites or enter into conservation easements or land trust agreements with land owners to ensure the protection of selected mitigation sites. Outright purchase of fee title and attachment of deed restrictions would provide the best assurance that mitigation sites are protected into perpetuity.

The City of Santa Rosa would be responsible for the long-term management and protection of the replacement wetland habitat mitigation areas. After a project is selected and approved, and mitigation areas are chosen, long-term development plans would be developed by the City for all mitigation sites. The conditions in the long-term plans would become deed restrictions. If the mitigation sites are to be transferred to a federal or state agency or private conservation group for long-term management they would enter into written agreement to manage the area in conformance with goals of the mitigation plan for that site and continue to do so after monitoring requirements have passed. Deed restrictions would be attached to ensure the site is managed according to the mitigation and long term development plan for that site.

Control of water to and from the site varies tremendously for all of the identified mitigation sites. Flows in most if not all the creeks identified as suitable for development of replacement habitat have been modified by upstream impoundments and are highly variable. Tidal areas have been diked and ditched to drain for agriculture. Areas selected for enhancement, restoration or creation of wetlands would be based on the suitability of existing hydrology and the presence of hydric soils. Modifications such as elimination of drainage structures, temporary irrigation with reclaimed water or purchase of upper watersheds or water rights from landowners could be used to ensure adequate water flow and hydrological regimes during and after the establishment of the mitigation project. Reclaimed water from the project could be used for freshwater marsh creation.

## EXISTING FUNCTIONS AND VALUES OF MITIGATION AREAS

The evaluation of replacement of functions and values of the potential mitigation sites is based on in-kind and on-site or close proximity. Later, if a reservoir site is selected, more detailed function and value analysis of the proposed reservoir site and replacement habitat mitigation sites would be conducted. Replacement sites were selected by identifying existing or former vegetation type in close proximity to ensure adequate replacement. When selecting mitigation sites functions and values of mitigation areas already were assumed to be somewhat degraded as evidenced by patchy or absent vegetation. Mitigation potential was evaluated by observing areas located immediately up and downstream of the potential mitigation sites.

## PRESENT AND PROPOSED USES OF THE MITIGATION AREAS AND ALL ADJACENT AREAS

Most of the proposed mitigation areas sites and surrounding areas are currently or have in the past been used for agricultural production. This has resulted in placement of fill and draining of wetlands, introduction of non-native species and grazing with varying degrees of disturbance. Although many past agricultural practices may not have been compatible with the development of replacement wetland and riparian habitat or may have even contributed to their loss and degradation, current practices are believed to be compatible. Grassland enhancement and riparian woodland enhancement and restoration would provide important water quality protection benefits that could provide for the continued production of forage. The open space provided by agricultural lands adjacent to wetland and riparian areas would provide foraging habitat for wildlife and enhance the function and value of mitigation sites.

## JURISDICTIONAL DELINEATIONS FOR PROPOSED MITIGATION AREAS

Potential mitigation sites have been identified as part of the approach. Any mitigation project should at a minimum comply with the conditions of Nationwide Permit No. 27 for Wetland and Riparian Restoration and Creation Activities and the general and Section 404 Nationwide permit conditions.

## ZONING

Mitigation areas should be purchased by the City and rezoned as open space, wildlife conservation areas, watershed protection areas or something similar. The zoning designation and mitigation conditions should become a part of the deed or a deed restriction for the property. These conditions should be attached to the deed into perpetuity and should remain in effect even if the City decides to transfer title of the property to a public agency or private conservation group. It would be preferable for

areas surrounding wetland and riparian mitigation sites to be zoned for agriculture. This would provide a buffer from residential development.

## IMPLEMENTATION PLAN

Once a project is selected and approved, appropriate feasible mitigation sites will be selected and implementation plans will be prepared for each mitigation project for permitting purposes. The following section briefly discusses some basic elements that should be included in the implementation plans for the wetland and riparian replacement sites.

### Rationale for Expecting Implementation Success

As part of the implementation plan for each individual mitigation project a well developed rationale for expecting success should be established that takes into consideration site specific hydrology and soils conditions. The rationale for expecting successful enhancement, restoration, and creation of replacement habitat on mitigation sites selected in this report was based on an evaluation of areas nearby in similar topographic landform positions. Areas located immediately upstream and downstream of the identified sites, where exclusionary fencing and pasture rotations were used, were viewed to determine if areas were suitable for replacement mitigation habitat and the amount that was available. Additionally, the rationale for any mitigation sites chosen should take into consideration similar types of restoration projects in the immediate vicinity that have proven successful and areas that are known to have formerly supported the target mitigation type. It will be important to select soils and landform position that continue to be regularly inundated or saturated near surface.

### Responsible Parties

The City of Santa Rosa would be responsible for the successful implementation of the mitigation project.

### Site Preparation

Site preparation plans should be specific to the site condition and the type of wetland or riparian habitat that is being enhanced, restored or created. The implementation plan should contain at a minimum plan drawings to scale on top of base maps and cross-sections with elevations for the mitigation sites and descriptions of proposed grading, hydrologic changes, water control structures, soil amendments, erosion control and bank stabilization measures, equipment and procedures to be used, site access control, procedures for removal and control of exotic vegetation and excavation methods. The plan should also identify the person(s) supervising or providing biological monitoring during grading activities and where they may be contacted.

### Planting Plan

Planting techniques will vary by community type and should be site specific. The planting plans should use species native to that immediate region. Genetic material such as cuttings, seeds or plant plugs should be collected from areas on or adjacent to the sites or in similar microhabitat and landform positions and as near to the mitigation sites as possible. If additional plant or seed materials are required they should be obtained from a nursery or other seed source familiar with the propagation of native plants in that immediate area.

A planting plan that discusses the overall planting scheme and techniques should be prepared for each site. It should included a table of species to be planted that includes numbers by type, transplant age or size, spacing of propagules and container sizes. The plan should also identify source for seeds, cuttings or plant plugs and show planting and species locations on project plans. Transplant and seed and nursery

storage procedures should also be described and other expected volunteer native vegetation that may colonize the site should be identified.

### Schedule

It is anticipated that mitigation site development will occur prior to or concurrent with development of a reservoir site. Construction sequencing and habitat protection measures should lessen temporal loss of wildlife habitat while wetlands and riparian habitat is replaced off site. Preservation and enhancement of similar habitat on other proposed reservoir site(s) in the same watershed or nearby would minimize cumulative losses of wetland habitat, including functions and values, in the area.

The sites should be prepared for planting in the summer or the fall before the onset of the rainy season. Temporary erosion control measures should be employed during the site preparation stage and throughout implementation of the mitigation project until vegetation is completely established. The sites should preferably be planted in early winter.

### Irrigation Plan

As part of the implementation plan the City will develop a detailed irrigation plan for each mitigation site describing irrigation methods, irrigation frequency and rates of application and water sources. The irrigation plan should also contain illustrations of the irrigation system or water flow contours.

All mitigation areas will eventually rely on natural hydrology but most types of enhancement, restoration, or creation of wetland or riparian habitat will require supplemental watering until native vegetation can develop root systems and become self sufficient. Long-term provision of irrigation water to natural wetland and riparian

mitigation sites is not desirable and should be avoided if at all possible. It generally takes at least three years of supplemental irrigation before plantings develop enough roots to become self-sufficient. Grassland enhancement in itself does not require hydrological modification or irrigation, but nearby uplands may require irrigation to provide adequate late season forage and enough water for the creation of stockponds in upland pastures to make riparian pasture rotation feasible.

Many areas need no hydrological restoration to enhance or restore vegetation. Many areas which formerly supported dense willow riparian vegetation can be restored by constructing exclusionary fencing. Some areas will need to have natural hydrology restored. Many drainages have become incised and local water table elevations have dropped below the level required to establish riparian vegetation in areas that formerly supported riparian vegetation. In these areas, topographic alterations of stream banks and channels to restore more natural conditions and contours may be necessary.

### As-Built Conditions

As part of the implementation plan, the City of Santa Rosa should submit a report to the Corps within six-weeks of completion of site preparation and planting describing as-built-status of the mitigation project. Separate reports should be submitted for grading and planting if they are not completed within six weeks of each other. The as-built report should identify any deviations due to physical conditions on the site or additional avoidance achieved during development of the site (vernal pools or threatened or endangered species) due to on-site biological monitoring during construction of the mitigation site and how this affects the amount of jurisdictional area enhanced, restored or created. Detailed as-built-conditions plans should be provided that show all the plantings and other structures and incorporate any deviations that were necessary during construction.

# 4 MONITORING AND REPORTING REQUIREMENTS

## MONITORING PLAN

A monitoring plan should be prepared for each of the mitigation sites which establishes periodic performance criteria or yearly bench marks to demonstrate reasonably paced progress toward the final success criteria. The plan should establish monitoring methods including a systematic approach for assessment of natural population growth by target species. It should specify monitoring frequencies and a quantitative sampling approach for different wetland types. At a minimum, monitoring should be performed annually.

## MAINTENANCE

The City of Santa Rosa would be responsible for the maintenance of the mitigation sites during the monitoring period. Maintenance measures should be included in the mitigation plan. They should include such things as inspection of the irrigation system, plant replacement, weeding, water structure inspection, erosion control, herbivore protection and trash removal. Contact persons with the City responsible for ensuring regular maintenance and performance of corrective measures if necessary should be identified. If the City hires a contractor to carry out work, the contact person with the contractor should be identified also. A regular schedule for maintenance inspections should be included in the monitoring plan.

## ANNUAL REPORTS

The City would be required to submit annual reports to the Corps and any other interested responsible agencies such as USFWS, CDFG, and NMFS. Annual reports should include an assessment of progress toward yearly target criteria and final success criteria. This should include identification of all parties involved in implementing, maintaining and monitoring activities that year. Copies of any required permits, special conditions, and subsequent letters of modification should be attached. The annual report should also include detailed maps of all monitored mitigation areas and any new plantings or planned or unplanned modifications to the site. It should also include an analysis of all quantitative monitoring data, monitoring data collection sheets, and photographs.

## SCHEDULE

A reporting and performance schedule would be provided by the City to the Corps and any other interested responsible agencies such as USFWS and CDFG. Because the exact

date of site modification or planting is often difficult to predict, the monitoring schedule and performance requirements should be tied to the actual implementation date rather than to predetermined years. The first annual report should be delivered on (month, day) of the year following the first growing season after planting. Annual reports should be submitted for a minimum of five consecutive years thereafter or until it can be demonstrated that success criteria have been met for at least two years without human support.

## CONTINGENCY MEASURES

If an annual performance criterion is not met for all or any portion of the mitigation project in any year, or if the final success criteria are not met the City would need to prepare an analysis of the causes of the failure. Remedial or corrective actions should be developed as part of the monitoring plan so that immediate actions can be taken to correct the problem. These actions could involve increasing the frequency or rate of supplemental irrigation, replanting, weeding, employing different planting techniques or establishing new sources of water. If these measures are determined to be unsuccessful, the Corps may require further remedial action.

Sometimes a certain site or location may prove to be unsuitable for mitigation. The City should identify other off-site locations that could be used if mitigation fails. Failure could be the result of not being able to successfully restore or create self-sustaining wetland hydrology. Ownership and funding sources for contingency sites should be identified and included in the monitoring plan.

## COMPLETION AND VERIFICATION

The Corps or other responsible agencies may want to visit the site to monitor progress toward performance criteria during implementation of the mitigation project. If lead or responsible agencies express such an interest, all efforts should be made to schedule visits during regular maintenance monitoring trips. The City should notify the Corps of completion with an annual report after the monitoring period is completed and the City believes that final success criteria have been met. A wetland delineation may be required at that time to demonstrate that the success criteria have been met. The Corps may require a final site visit to confirm the wetland delineation and successful completion of the mitigation project.

# 5 REFERENCES

CH2M Hill 1995. Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan, Phase 1 Final Report. Prepared for the Santa Rosa Plain Vernal Pool Task Force.

Department of the Army, San Francisco District Corps. of Engineers 1991. Habitat Mitigation and Monitoring Proposal Guidelines. October

Department of Defense 1995. Notice Vol. 60 No. 228, p. 58605. Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. 28 November

EIP Associates 1990. Long-Term Wastewater System Draft Environmental Impact Report/Statement. December

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California Department of Fish and Game

Kline, Stan 1995. Rust Environment & Infrastructure. Memorandum to Boccia, Li Parsons Engineering Science, Subject: Dam and Reservoir Construction Operations EIR/EIS Input Santa Rosa Subregional Wastewater Project, September 28

Merritt Smith Consulting (for Harland Bartholomew & Associates, Inc.) 1996. Draft Aquatic Biological Resources Impact Analysis Report, Santa Rosa Subregional Long-Term Wastewater Project. Prepared for City of Santa Rosa and U.S. Army Corps of Engineers. April

Merritt Smith Consulting (for Harland Bartholomew & Associates, Inc.) 1996. Aquatic Habitat Survey Results, Santa Rosa Subregional Long-Term Wastewater Project. Prepared for City of Santa Rosa and U.S. Army Corps of Engineers. March

North State Resources, Golden Bear Biostudies, CH2M Hill 1990. Jurisdictional Wetland Delineation for Portions of the Stemple and Americano Creeks Basins and the Tolay Valley. June

Parsons Engineering Science, Inc. 1996. Draft Planning-Level Wetland Determination Report for Selected Proposed Reservoir Sites. March

Parsons Engineering Science, Inc. 1996. Draft Wetland Determination and Mitigation Technical Memorandum for Proposed Pipeline Alignments. April

Prunuske Chatham, Inc. 1994. Stemple Creek/Estero de San Antonio Watershed Enhancement Plan. July

Rust Environment & Infrastructure 1995. Geotechnical Assessment of Alternative Reservoir Sites and Pipeline Routes, Vols. 1 and 2, Santa Rosa Subregional Long-

Term Wastewater Project. Prepared for Harland Bartholomew & Associates, Inc. November

Schock, Randy, Parsons Engineering Science, 1996. Technical memorandum to Joyce Hunting of Harland Bartholomew Associates, Inc. re: Proposed Agricultural Irrigation Areas Wetland Determination for the City of Santa Rosa Subregional Long-Term Wastewater Project. April 11

Shuford, W.D., and I.C. Timossi 1989. Plant communities of Marin County. California Native Plant Society

Soil Conservation Service (SCS) 1972. Soil Survey of Sonoma County, California. U.S. Department of Agriculture, SCS, Washington, D.C. 187 pgs.

University of California Cooperative Extension 1995. The Marin Coastal Watershed Enhancement Project. November

U.S. Department of Agriculture, Soil Conservation Service 1992. Field Office Official List of Hydric Soil Map Units for Sonoma County, California. 13 March

U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Department of the Interior, and U.S. Department of the Army 1994. California Inter-Agency Mapping Conventions for Waters of the United States. 14 pgs.

# 6 LIST OF PREPARERS

## PREPARED BY:

Parsons Engineering Science
1301 Marina Village Parkway, Suite 200
Alameda, California 94501
(510) 769-0100

| | |
|---|---|
| Randy Schock | Environmental Scientist |
| Dennis Worrel | Senior Soil Scientist |
| Robin P. Cort, Ph.D. | Internal Reviewer |

Harland Bartholomew & Associate
2233 Watt Avenue, Suite 350
Sacramento, CA 95825
(916) 483-0481

External Review

## PREPARED FOR APPLICANT:

City of Santa Rosa

**VOLUME II OF THIS DOCUMENT HAS BEEN FILED AS**