
Village at Loch Lomond Marina

Year 1 Annual Wetland Monitoring Report

Loch Lomond Marina
San Rafael, California

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Corps Permit Number : 2004-287030N
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City of San Rafael
2332



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1.0 INTRODUCTION

This report presents the results of the first year (Year 1) of wetland monitoring at the Village at Loch Lomond Marina (Project) in San Rafael, Marin County, California. Three mitigation wetlands were created to mitigate for permanent and temporary impacts to jurisdictional wetlands as part of the Project. Mitigation wetland monitoring is conducted annually for 5 years as required by the U.S. Army Corps of Engineers (Corps, Permit Number 2004-287030N) and Regional Water Quality Control Board (RWQCB Permit Number 2003-0017-DWQ), Bay Conservation and Development Commission (BCDC, Permit Number 2006.010.03) and as outlined in *The Village at Loch Lomond Marina Wetland Mitigation/Monitoring Proposal and Management Plan* (WRA 2005). Mitigation wetland monitoring is conducted annually for 10 years per the City of San Rafael City Council Resolution 12332 for the Environmental Design and Review Permit ED 04-063. Monitoring is conducted to document habitat development and assess whether the site is meeting performance criteria for wetland vegetation and hydrology conditions (hydric soils and evidence of wetland hydrology). This monitoring report identifies any problems with flooding, erosion, grading elevations, invasion of non-native species, and/or other general causes of poor vegetation survival or wetland degradation. Recommendations to improve success in achieving performance criteria are also included, if necessary.

The Project resulted in permanent impacts to 0.014 acre of seasonal wetland, and 0.014 acre of unvegetated intertidal habitat. An additional 0.183 acre of seasonal wetland was temporarily impacted. Permanent impacts to 0.028 acre of seasonal wetland and unvegetated intertidal habitat were mitigated onsite by restoring 0.21 acre of seasonal wetlands. Grading was completed in 2015 and was subsequently planted with native species. The final creation resulted in 0.24 acre of wetlands within the mitigation wetlands, 0.03 acre more than planned.

2.0 PROJECT DESCRIPTION

2.1 Project Location

The Project is part of an approximately 128 acre property located at 82 Loch Lomond Dr. in San Rafael, Marin County, California (37.97°N and 122.48°W; Figure 1). The Project is located approximately 2 miles east of U.S. Highway 101, immediately south of Point San Pedro Road. Elevations within the Project area ranged from approximately 2 feet below to 9 feet above mean sea level (MSL).

2.2 Summary of Mitigation Project

The Applicant was permitted to construct buildings homes, offices associated with marina use, and improve previously existing marina facilities. Because impacts to the wetland and unvegetated subtidal habitat could not be avoided by the Project, regulatory permits were obtained prior to the start of construction. Corps and RWQCB permits authorized the mitigation of 0.028 acres of impacts by the on-site creation of 0.21 acre of seasonal wetlands. A 0.24 acre area adjacent to existing seasonal wetlands was proposed as a mitigation site for wetland restoration. This 0.24 acre area was excavated and graded to create native wetland habitat (Mitigation Wetlands).

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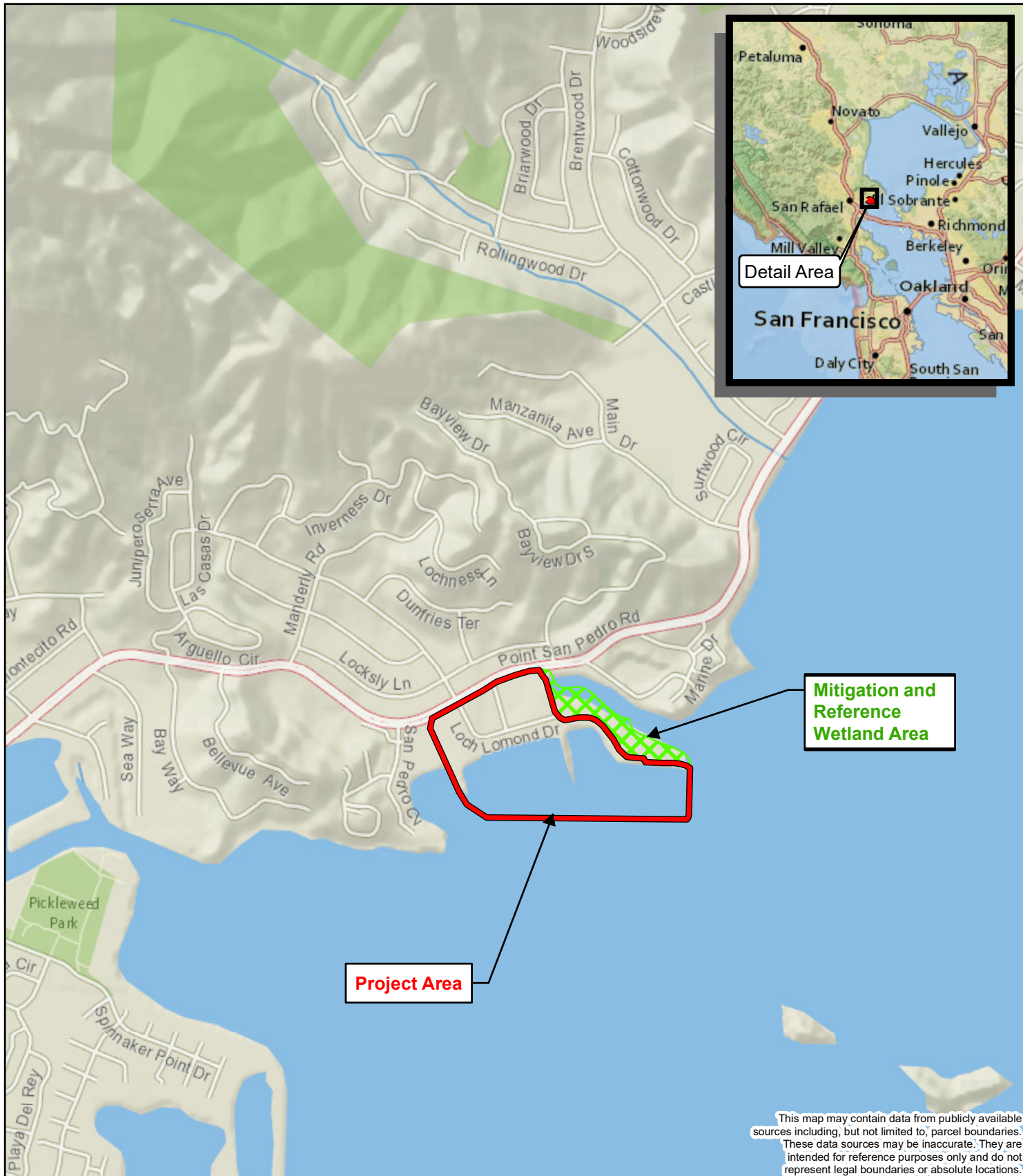
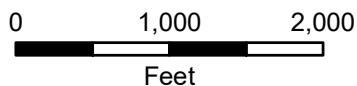


Figure 1. Project Area Location Map

Loch Lomond Marina
Marin County, California



Map Prepared Date: 12/22/2016
Map Prepared By: fhourigan
Base Source: Esri Streaming - National Geographic
Data Source(s): WRA

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2.3 Summary of Mitigation Area Creation

The Mitigation Wetlands construction was completed in accordance with the *WRA Wetland Mitigation Landscape Design Plans*, dated August 14, 2009 (Landscape Plans, WRA, 2009). Construction activities commenced in June 2015 and were completed in December 2015. Figure 2 shows the as-built grading plans and Figure 3 shows the planting plans. The Mitigation Wetlands were constructed in three connected smaller mitigation wetlands, hereafter referred to as MW1, MW2 and MW3. MW1 is 0.088 acre and is located in the northwest corner of the Mitigation Wetland area. MW2 is 0.069 acre and located in the southwest portion of the Mitigation Wetland area. MW3 is located in the southeastern corner of the Mitigation Wetland area and is 0.082 acre. The built acreages of MW1, MW2, and MW3 sums to 0.24 acre, 0.03 acre greater than the mitigation requirements of 0.21 acre.

The locations and sizes of the constructed Mitigation Wetlands are illustrated in Figures 2 and 3, and design and as-built acreages are listed in Table 1. Appendix A contains representative photographs of MW1, MW2, and MW3 and the condition of each during Year 1 monitoring period. The design and as-built areas are shown in Table 1.

Table 1. Seasonal Wetland Mitigation Area Summary

	Design Area (Acre)	As-Built Area (Acre)	Mitigation Area Totals (Acre)	Mitigation Area Requirement (Acre)
Seasonal Mitigation Wetlands				
MW1	0.09	0.09	0.09	*
MW2	0.07	0.07	0.07	*
MW3	0.08	0.08	0.08	*
TOTAL TIDAL WETLAND AREA	0.24	0.24	0.24	0.21

Following earthwork, a spray irrigation system was installed as specified in the Landscape Plans. Native marsh species were installed within MW1, MW2, and MW3 after grading was completed. The installation locations of plantings are shown in Figure 3. The design and as-built quantities of plantings are listed in Table 2.

3.0 PERFORMANCE CRITERIA

Following construction and planting of the Mitigation Wetlands, a 5-year monitoring program is being implemented to comply with the Corps and RWQCB permits to determine whether the Mitigation Wetlands have achieved functions equal to or greater than the existing seasonal Reference Wetland, and whether corrections to the site designs or implementation procedure are necessary. This monitoring program will be continued for another 5 years to meet a 10-year monitoring period to comply with the City of San Rafael City Council Resolution 12332. This annual monitoring report constitutes Year 1 (2016) of monitoring. The Year 1 performance criteria will be used as benchmarks for this report (see Table 3).

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GRADING NOTES

1. THE GRADING PLANS INDICATE FINISHED GRADE ELEVATIONS. REFER TO THE GRADING DETAILS FOR SUBGRADE SPECIFICATIONS.
2. MINIMUM AREA REQUIREMENT WITHIN THE WETLAND BOUNDARY SHALL BE AS NOTED ON THE DRAWINGS AND SHALL BE MEASURED AT THE ELEVATION NOTED.
3. NO GRADING SHALL OCCUR WITHIN THE DRIPLINE OF EXISTING TREES TO REMAIN. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING TREES.

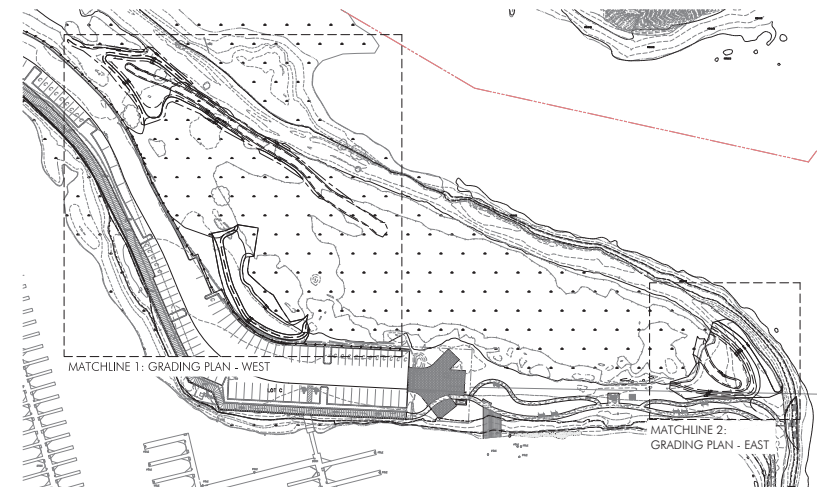
4. THE CONTRACTOR SHALL MINIMIZE GRADING AND VEGETATION REMOVAL WITHIN THE EXISTING WETLAND TO THE AREAS SHOWN WITHIN THE LIMIT OF GRADE.

CUT & FILL ESTIMATES

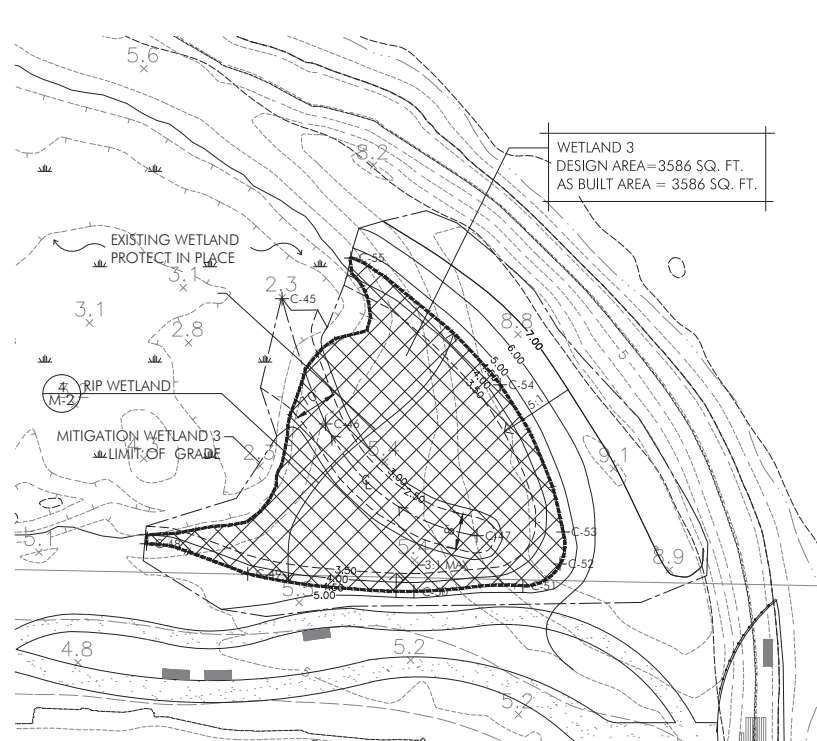
CUT = 1,018 C.Y.
 FILL = 8 C.Y.
 NET = 1,010 C.Y. (CUT)
 TOTAL EARTH MOVED = 1,026 C.Y.

GRADE STAKING DATA

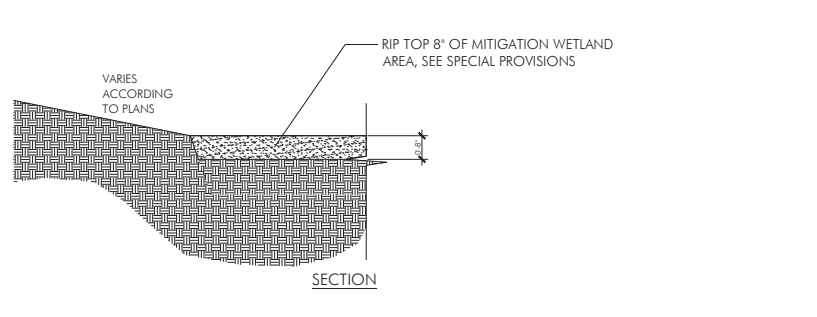
PT. NO.	NORTHING	EASTING
C-1	2183094.09	5991110.18
C-2	2183076.69	5991148.58
C-3	2183042.30	5991208.67
C-4	2183007.24	5991262.38
C-5	2182985.76	5991298.75
C-6	2182959.92	5991325.44
C-7	2182927.20	5991369.67
C-8	2182907.23	5991397.97
C-9	2183028.30	5991127.05
C-10	2183046.24	5991122.76
C-11	2183097.95	5991082.56
C-12	2183107.83	5991080.96
C-13	2183110.72	5991089.76
C-14	2183107.05	5991115.79
C-15	2183106.63	5991131.32
C-16	2183099.18	5991147.42
C-17	2183072.30	5991178.77
C-18	2182911.39	5991256.48
C-19	2182899.09	5991244.48
C-20	2182895.30	5991236.39
C-21	2182888.67	5991231.59
C-22	2182852.49	5991231.38
C-23	2182829.41	5991244.07
C-24	2182807.52	5991265.51
C-25	2182799.56	5991279.78
C-26	2182797.55	5991292.40
C-27	2182813.01	5991312.90
C-28	2182913.03	5991230.13
C-29	2182908.21	5991226.96
C-30	2182906.01	5991221.43
C-31	2182893.78	5991213.59
C-32	2182848.04	5991224.01
C-33	2182810.74	5991242.52
C-34	2182794.53	5991264.23
C-35	2182787.70	5991302.11
C-36	2182791.93	5991309.31
C-37	2182803.34	5991311.77
C-38	2182878.58	5991246.46
C-39	2182875.28	5991240.63
C-40	2182852.58	5991240.06
C-41	2182846.12	5991247.22
C-42	2182839.33	5991250.90
C-43	2182818.75	5991269.19
C-44	2182804.62	5991292.76
C-45	2182788.12	5991755.43
C-46	2182759.64	5991765.34
C-47	2182734.27	5991799.74
C-48	2182732.41	5991724.65
C-49	2182725.59	5991747.63
C-50	2182721.61	5991785.41
C-51	2182722.79	5991810.17
C-52	2182727.82	5991818.61
C-53	2182735.11	5991819.31
C-54	2182768.54	5991804.99
C-55	2182797.35	5991771.06



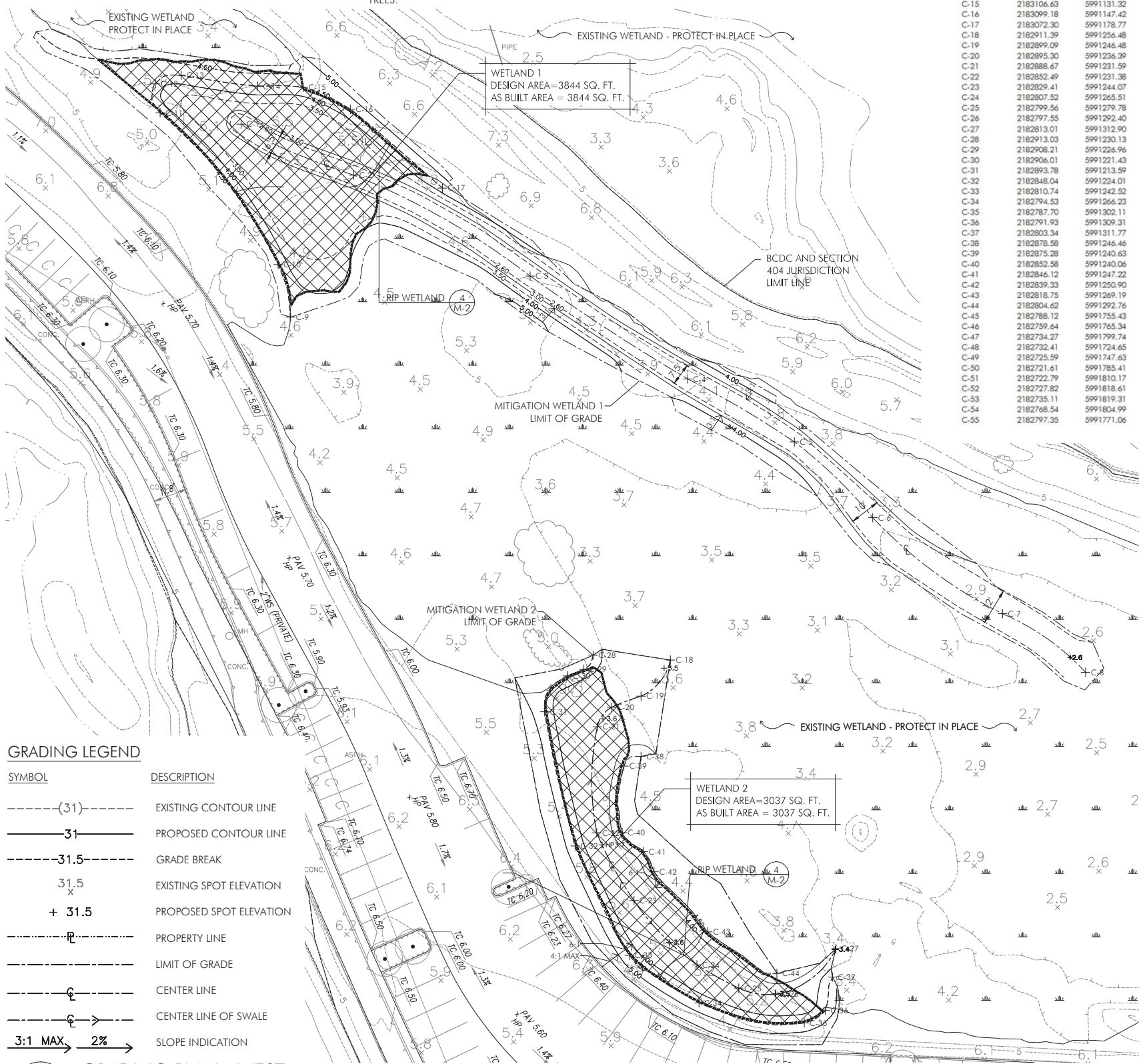
1 KEY MAP
 SCALE: 1" = 100'



3 GRADING PLAN - EAST
 SCALE: 1" = 20'



4 WETLAND SUBGRADE DETAIL
 NOT TO SCALE



2 GRADING PLAN - WEST
 SCALE: 1" = 20'

GRADING LEGEND

SYMBOL	DESCRIPTION
---(31)---	EXISTING CONTOUR LINE
—31—	PROPOSED CONTOUR LINE
---31.5---	GRADE BREAK
31.5	EXISTING SPOT ELEVATION
+ 31.5	PROPOSED SPOT ELEVATION
---	PROPERTY LINE
---	LIMIT OF GRADE
---	CENTER LINE
---	CENTER LINE OF SWALE
3:1 MAX 2%	SLOPE INDICATION

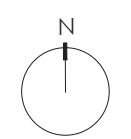
LOCH LOMOND MARINA
 WETLAND MITIGATION PROJECT
 SAN RAFAEL, CALIFORNIA

AS-BUILT GRADING PLAN

09/14/09 | 100% PERMIT SET
 Date Issues And Revisions No.

PROJECT #12094-2
 DRAWN BY: MWS, KET
 CHECKED BY: GJS
 ORIGINAL DRAWING SIZE: 24 X 36

SCALE: 1" = 20'



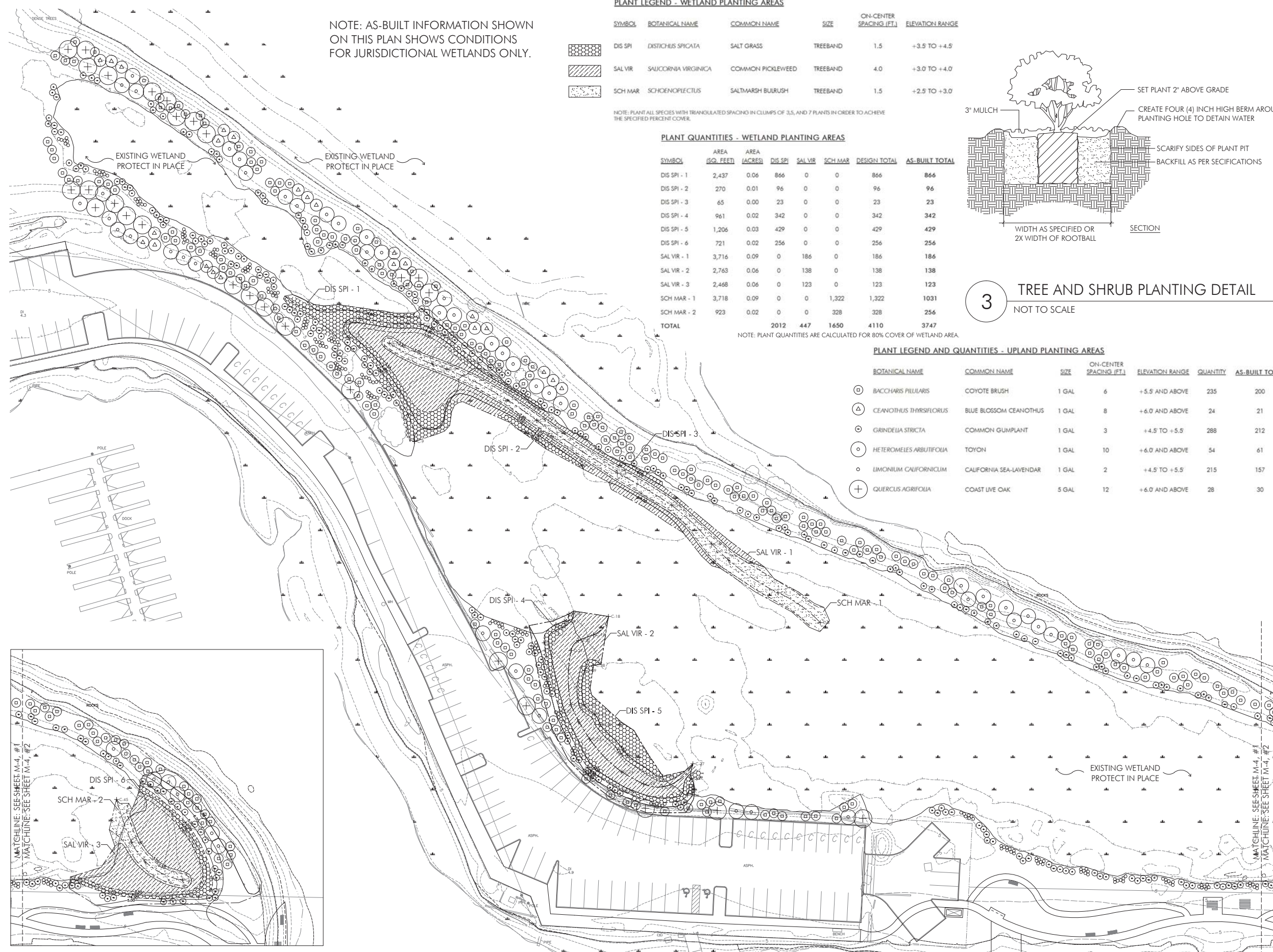
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FIGURE 3

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LOCH LOMOND MARINA
 WETLAND MITIGATION PROJECT
 SAN RAFAEL, CALIFORNIA

AS-BUILT PLANTING PLAN



NOTE: AS-BUILT INFORMATION SHOWN ON THIS PLAN SHOWS CONDITIONS FOR JURISDICTIONAL WETLANDS ONLY.

PLANT LEGEND - WETLAND PLANTING AREAS

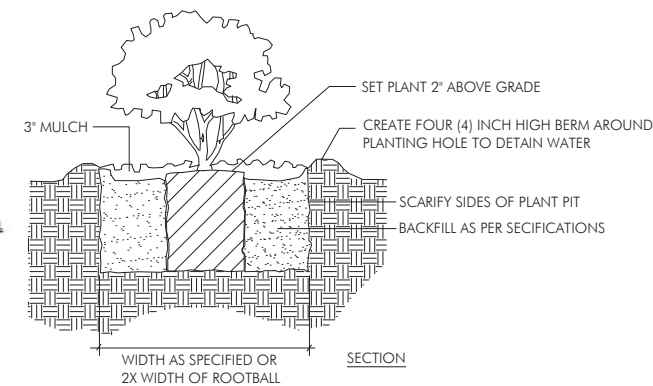
SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	ON-CENTER SPACING (FT.)	ELEVATION RANGE	
	DIS SPI	DISTICHUS SPICATA	SALT GRASS	TREEBAND	1.5	+3.5 TO +4.5
	SAL VIR	SAUICORNIA VIRGINICA	COMMON PICKLEWEED	TREEBAND	4.0	+3.0 TO +4.0
	SCH MAR	SCHOENOPLECTUS	SALT-MARSH BULRUSH	TREEBAND	1.5	+2.5 TO +3.0

NOTE: PLANT ALL SPECIES WITH TRIANGULATED SPACING IN CLUMPS OF 3, 5, AND 7 PLANTS IN ORDER TO ACHIEVE THE SPECIFIED PERCENT COVER.

PLANT QUANTITIES - WETLAND PLANTING AREAS

SYMBOL	AREA (SQ. FEET)	AREA (ACRES)	DIS SPI	SAL VIR	SCH MAR	DESIGN TOTAL	AS-BUILT TOTAL
DIS SPI - 1	2,437	0.06	866	0	0	866	866
DIS SPI - 2	270	0.01	96	0	0	96	96
DIS SPI - 3	65	0.00	23	0	0	23	23
DIS SPI - 4	961	0.02	342	0	0	342	342
DIS SPI - 5	1,206	0.03	429	0	0	429	429
DIS SPI - 6	721	0.02	256	0	0	256	256
SAL VIR - 1	3,716	0.09	0	186	0	186	186
SAL VIR - 2	2,763	0.06	0	138	0	138	138
SAL VIR - 3	2,468	0.06	0	123	0	123	123
SCH MAR - 1	3,718	0.09	0	0	1,322	1,322	1,031
SCH MAR - 2	923	0.02	0	0	328	328	256
TOTAL			2012	447	1650	4110	3747

NOTE: PLANT QUANTITIES ARE CALCULATED FOR 80% COVER OF WETLAND AREA.



3 TREE AND SHRUB PLANTING DETAIL
 NOT TO SCALE

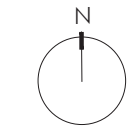
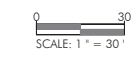
PLANT LEGEND AND QUANTITIES - UPLAND PLANTING AREAS

BOTANICAL NAME	COMMON NAME	SIZE	ON-CENTER SPACING (FT.)	ELEVATION RANGE	QUANTITY	AS-BUILT TOTAL	
	BACCHARIS PILLULARIS	COYOTE BRUSH	1 GAL	6	+5.5 AND ABOVE	235	200
	CEANOTHUS THYRSIFLORUS	BLUE BLOSSOM CEANOTHUS	1 GAL	8	+6.0 AND ABOVE	24	21
	GRINDELIA STRICTA	COMMON GUMPLANT	1 GAL	3	+4.5 TO +5.5	288	212
	HETEROMELES ARBUTIFOLIA	TOYON	1 GAL	10	+6.0 AND ABOVE	54	61
	LIMONIUM CALIFORNICUM	CALIFORNIA SEA-LAVENDAR	1 GAL	2	+4.5 TO +5.5	215	157
	QUERCUS AGRIFOLIA	COAST LIVE OAK	5 GAL	12	+6.0 AND ABOVE	28	30

09/14/09 | 100% PERMIT SET
 Date Issues And Revisions No.

PROJECT #12094-2
 DRAWN BY: MWS, KET
 CHECKED BY: GJS
 ORIGINAL DRAWING SIZE: 24 X 36

SCALE: AS INDICATED



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FIGURE 2

2 INSET PLANTING PLAN
 SCALE: 1" = 30' - 0"

1 PLANTING PLAN
 SCALE: 1" = 30' - 0"

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Table 2. Number of Plants in Restored Seasonal Wetlands

Scientific Name Common Name		Seasonal Wetland Mitigation Areas			
		MW1	MW2	MW3	Total
<i>Distichlis spicata</i> Salt Grass	Design Quantity	985	771	256	2012
	As-Built Quantity	985	771	256	2012
<i>Salicornia virginica</i> Pickleweed	Design Quantity	186	138	123	447
	As-Built Quantity	186	138	123	447
<i>Schoenoplectus maritimus</i> Alkali Bulrush	Design Quantity	1322	0	328	1650
	As-Built Quantity	1031	0	256	1287
Total Plants Installed in Each Area		2493	909	707	3746

Table 3. Performance Criteria of Mitigation Wetlands

Success Criterion Number	Success Criteria Description	Year One	Year Two	Year Three	Year Four	Year Five
#1	The majority of Mitigation Wetlands (MW1-MW3) will be continually inundated for at least specified number weeks.	2	2	2	2	2
#2	The majority of the soils within Mitigation Wetlands (MW1-MW3) will be continually saturated for at least specified number of weeks.	6	6	6	6	6
#3	Invasive plants on the California Invasive Plant Council (Cal-IPC) "A" List will not exceed specified percent cover within mitigation wetlands.	5	5	5	5	5
#4	Total vegetation percent cover in Mitigation Wetlands (MW1-MW3) should average at least specified percent of the Reference site's total vegetation percent cover.	20	30	50	75	85
#5	The percent cover of non-native species within Mitigation Wetlands (MW1-MW3) should not exceed specified percentage of the non-native vegetation percent cover within the Reference Wetlands (RW1-RW3).	150	140	125	110	100
#6	The wetlands mitigation areas will meet the three Corps wetlands criteria (Environmental Laboratory 1987) in YEAR 5.	N/A	N/A	N/A	N/A	Meets

In addition to the wetland performance criteria, this report addresses the management plan as outlined in Section 10.3 of *The Village at Loch Lomond Marina Wetland Mitigation/Monitoring Proposal and Management Plan* (WRA 2005). The management plan calls for annual inspection and as-needed repair of the wetland fence, signage, and erosion; debris removal activities; non-native plant removal; mosquito control; and record keeping.

4.0 METHODS

Year 1 monitoring of the Mitigation Wetlands was completed on July 27, 2016. The three wetland parameters of hydrology, soils, and vegetation, were examined to assess progress in creating a successful Mitigation Area. All monitoring was performed by a qualified biologist with experience in wetland mitigation monitoring. Methods for monitoring the performance of the (MW1-MW3) with regards to the performance success criteria are described below.

4.1 Hydrology

The hydrology of the Mitigation Wetlands were monitored on March 25, April 22, and April 26, 2016 during the rainy season to ensure that the sites are functioning hydrologically as seasonal wetlands. In addition, precipitation and tidal records were analyzed. Based on methodologies in the Corps Wetland Delineation Manual (Environmental Laboratory 1987), reference wetlands (RW1-RW3) and mitigation wetlands (MW1-MW3) were monitored periodically to ensure that soils are either inundated or saturated within the root zone (1.0 foot from the soil surface). Inundation and saturation was monitored using a series of markers installed in MW3 as used as a proxy for the other two Mitigation Wetlands. The markers were installed in a line in 10-foot increments (0 to 60 feet) beginning at the edge of the wetland boundary and leading inwards towards the center of MW3. Saturation was accessed by determining at what distance (0 to 60 feet away from wetland boundary) the root zone ceased to be saturated 1 foot below the soil surface. Inundation was recorded based on the observation of water on the soil surface, and the depth was recorded. Periodic visits determined the duration of saturation and inundation. Photographs of mitigation wetlands (MW1-MW3) and reference wetlands (RW1-RW3) were taken from established photo points (see Appendix A and Figure 4) during the hydrology monitoring visits to document hydrologic conditions.

4.2 Soils

The Natural Resource Conservation Service (NRCS) defines a hydric soil as:

“A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.”

Federal Register July 13, 1994
US Department of Agriculture, NRCS

Soils formed over long periods of time under wetland (anaerobic) conditions often possess characteristics that indicate they meet the definition of hydric soils. Hydric soils can have a hydrogen sulfide (rotten egg) odor, low chroma matrix color (generally designated 0, 1, or 2) used to identify them as hydric, presence of redox concentrations, gleyed or depleted matrix, or high organic matter content.

The Arid West Supplement (Corps 2008) contains a list of 23 hydric soil indicators that are known to occur in the Arid West region. Soils samples were collected and described according to the methodology provided in the Arid West Supplement (Corps 2008). Soil chroma and values were determined by utilizing a standard Munsell soil color chart (GretagMacbeth 2000). Indicators are not intended to replace or relieve the requirements contained in the definition of a hydric soil. Therefore, a soil that meets the definition of a hydric soil is hydric whether or not it exhibits indicators (Corps 2008).

Because hydric soils from over long time periods, inspection of hydric soils at this early date (Year 1) is not feasible and therefore hydric soils were not specifically analyzed. Instead, the inundation and saturation period thresholds are used to directly observe whether soil is being formed *“under conditions of saturation, flooding, or ponding”*.

In following years hydric soils will be specifically investigated. Hydric soils will be determined to be present if inundation and saturation period thresholds are met or any of the soils samples meet one or more of the 23 hydric soil indicators described in the Arid West Supplement (Corps 2008) and Field Indicators of Hydric Soils in the United States (USDA 2006).

4.3 Vegetation

4.3.1 Vegetation Sample Quadrat Locations

Mitigation Wetland (MW1-MW3) transects were positioned within and across the restored wetlands. One transect was placed within each of the three Mitigation Wetland (MW1-MW3). The transects were positioned to capture the breadth of elevations and microhabitats within the wetland.

Reference Wetland (RW1-RW3) transects were positioned within existing wetlands to gather baseline data and compare to the performance of the mitigation wetlands. The locations were selected within previously existing wetlands outside of the Mitigation Wetlands area. Reference Wetland transects are located outside of sloughs and are representative of native seasonal wetland species. Reference Wetlands were located as close to each corresponding MW1-MW3 as feasibly possible. Baseline Reference Wetland transects are similar in elevation and approximately the same length as the corresponding Mitigation Wetland transects. Transects are paired as follows: MW1 with RW1, MW2 with RW2, and MW3 with RW3. Locations of the transects are shown in Figure 4.

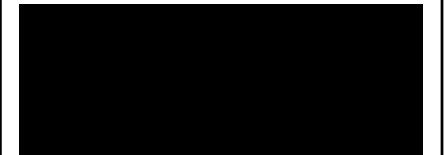
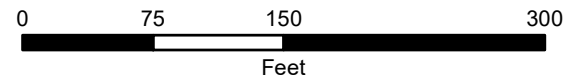
Ten vegetation sampling quadrats were located within each of the three Mitigation Wetlands (MW1-MW3) and in three Reference Wetland locations (RW1-RW3) offset from baseline transects for a total of 60 sample quadrats. The location of each baseline transect is shown in Figure 2. All baseline transects were positioned to avoid sloughs or channels. Metal T-posts were placed at both ends of each baseline transect to ensure comparative purposes across years. The lengths of each transect was designed to capture a variation of elevations across that specific wetland. Table 4 depicts each transect length.

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Figure 2. Wetland Monitoring Transects and Photo Point Locations

Loch Lomond
Marin County, California



Map Prepared Date: 12/23/2016
Map Prepared By: fhourigan
Base Source: Esri Streaming - GE March 16, 2016
Data Source(s): WRA

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Table 4. Lengths of Wetland Vegetation Transects

Wetland Number	Baseline Transect Length (feet)	
	Mitigation Wetland	Reference Wetland
1	75	75
2	150	150
3	40	40

Intersection transects were used to offset the vegetation sampling quadrats at random distances along the baseline transect. Five random distances along the length of each baseline transect were used to position intersection transects. Each intersection transect was 10 feet long and ran to one side of the baseline transect. Two sample quadrats were placed on each intersection transect using a random number generator. A diagram for placement of sample quadrats is shown in Figure 5.

4.3.2 Vegetation Field Monitoring

Vegetation was monitored in the summer (July 27, 2016) when wetland plant species were identifiable to species level. Additionally, conducting monitoring in the summer captures most plants at the height of their growth period, allowing for the most accurate and informative percent cover estimates.

Monitoring was conducted by assessing the cover of each plant species with a 0.25 m² (0.5m x 0.5m) quadrat. Percent cover of plant species, bare ground, and litter (i.e., dead vegetative material lying on the soil surface) was estimated visually using the Braun-Blanquet system of cover classes (Table 5).

Table 5. Braun-Blanquet System of Vegetation Cover Classes

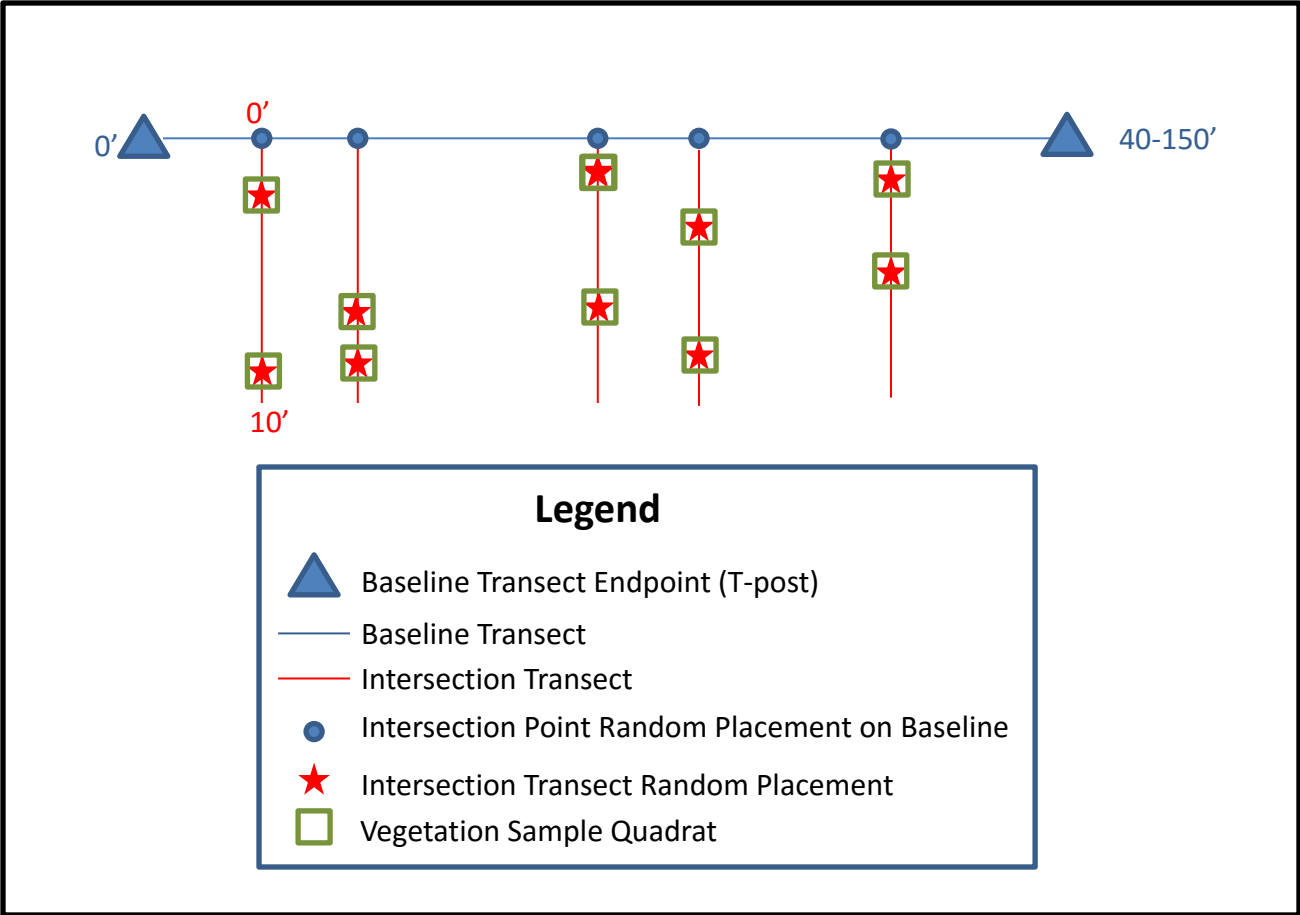
Class	Range of Cover (%)	Mean (%)
6	96-100	98.0
5	76-95	85.5
4	51-75	63.0
3	26-50	38.0
2	6-25	15.5
1	1-5	3.0

4.3.3 Vegetation Data Analysis

The data from the all quadrats in the Mitigation Wetlands (MW1-MW3) were summed to determine an estimate of the percent cover of each plant species over the entire Mitigation Wetland habitat. Similarly, the data from the all quadrats in the Reference Wetland (RW1-RW3) were summed to determine an estimate of the percent cover of each plant species over the entire Reference Wetland habitat. Dominance of the Mitigation Wetlands and Reference Wetlands by wetland vegetation was evaluated by determining the total cover by facultative (FAC), facultative wetland (FACW), and obligate (OBL) plant species as indicated by the National Wetland Plant List (Corps 2016). These data were tabulated and analyzed to assess

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Figure 5. Vegetation monitoring transects and sampling quadrats.



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whether vegetation coverage in Mitigation Wetlands was meeting, or is on-track to meet, the performance criteria goals outlined in Section 3.0.

4.4 Photographic Documentation

Visual records are utilized to document changes in the Mitigation Wetlands over the 5-year monitoring period. Photographic reference points were established throughout the Mitigation Wetlands (see Figure 4) and photographs were taken during annual monitoring events as required by Section 6 of the Conditional Water Quality Certification for the Village at Loch Lomond Marina Project, Marin County. Photographs taken at photo points during Year 1 monitoring are in Appendix A, Photographs 5-10.

4.5 Management Plan

The Loch Lomond Marina harbormaster is responsible for implementing the management plan. The Harbormaster or his staff regularly (at least weekly) conduct site visits to the Mitigation Wetlands and perform inspections and repairs of the wetland fence, signage, and signs of erosion. The Harbormaster also directs regular debris removal activities, non-native plant removal, and is responsible for the record keeping. Loch Lomond Marina provides access to the Mitigation Wetlands and allows the Marin/Sonoma Mosquito and Vector Control District (MSMVCD) to conduct mosquito control as necessary.

5.0 RESULTS

In Year 1 all three Mitigation Wetlands (MW1-MW3) met all the Year 1 success criteria. Planted wetland vegetation within the Mitigation Wetlands has established and is beginning to fill in. Hydrology within the mitigation wetlands was observed to meet the established criteria. The majority of the wetlands were observed to be inundated by approximately 6 inches of water for four weeks. The percent cover of non-native invasive plants within the mitigation wetlands was 5.0 percent. There was no Cal-IPC "A" List cover within Mitigation Wetlands. Hydrology, soil, and vegetation data are summarized in the sections below. A summary of the criteria and the results are shown below in Table 6.

5.1 Hydrology

Inundation was directly observed continually within the mitigation wetlands from March 25th until April 26, 2016, a period of four weeks. The mitigation wetlands were inundated for greater than two weeks; therefore, the first success criterion was met. Based on professional judgement and experience, the Mitigation Wetlands were inundated prior to the first monitoring site visit on March 25, 2016 and the majority of soils were saturated at least two weeks prior to this. Figure 4 show that the majority of Mitigation Wetlands were inundated on March 16, 2016.

Records of rainfall on site during January and February 2016 totaled 12.11 inches. In addition, king tides overtopped the levees into the wetland multiple times in December 2015 and January and February 2016. An additional 0.1 inch of precipitation occurred in March, and another 0.8 inch fell in April. Therefore, it is assumed saturation was present in the majority of soils within the Mitigation Wetland for at least six weeks. As a result, the second success criterion for the majority of soils within the mitigation wetlands will be continually saturated for at least 6 weeks was met.

Table 6. Summary of Success Criteria and Criteria Results

Year 1 Success Criteria	Year One	Mitigation Wetland Result	Reference Wetland Result	Comparison	Criterion Met
Criterion #1	Continually inundated for at least 2 weeks.	> 4 weeks	> 4 weeks	NA	Yes
Criterion #2	Saturation for at least 6 weeks.	> 6 weeks	> 6 weeks	NA	Yes
Criterion #3	Invasive plants < 5 percent cover	5.0 %	5.43 %	NA	Yes
Criterion #4	Vegetation percent cover > 20 percent of the Reference Wetland	16.97 %	58.10 %	29.2 %	Yes
Criterion #5	non-native species percent cover < 150 percent of the Reference Wetland	9.60 %	6.97 %	138 %	Yes

5.2 Soils

Wetland soil indicators, including redoximorphic features, can take many years to develop in established or rehabilitated wetlands, and may not become apparent within the first 5 years following restoration. If hydric soil indicators are not observed during monitoring visits, the presence of hydric soils may be presumed in early years of monitoring because it takes time for these indicators to develop in previously non-wetland soils. The National Technical Committee for Hydric Soils (NTCHS) defines hydric soils, in part, by the degree of ponding; therefore, hydrology data on the presence of ponding may partially represent the presence of hydric soils in the mitigation wetlands in early years. If the mitigation wetlands fail to meet the hydrology success criterion by the end of the 5 year monitoring period, soil samples will be taken to analyze compaction and soil texture in order to assess whether or not the wetland grading needs modification.

5.3 Vegetation

In Year 1, the vegetation cover across the Mitigation Wetlands was 17 percent. Total vegetation cover within the Reference Wetland was 58 percent. Total vegetation percent cover in the mitigation wetlands is 29.2 percent of that within the reference wetlands. Total vegetation cover is 9.2 percent higher than the fourth success criterion; therefore the fourth success criterion is met. All of the vegetation within the Mitigation Wetlands was wetland vegetation and no upland species were present.

The total cover of invasive plants on the California Invasive Plant Council (Cal-IPC) "A" list within the Mitigation Wetland was 5 percent. This is equal to the 5 percent maximum for the third success criterion. Therefore, the third success criterion is met. Percent cover of non-natives within the mitigation wetlands was 138 percent of the percent of non-natives within the reference wetlands. This is 12 percent lower than the 150 percent requirement, and therefore the fifth success criterion was met.

5.4 Management Plan

The Loch Lomond Harbormaster performed or oversaw the tasks conducted as specified in the Management Plan. Regular inspections were conducted throughout 2016 for the wetland fence, signage, debris, and signs of erosion. WRA also performed these same inspections during wetland and vegetation monitoring (see Appendix D. No deficiencies in fencing or signage were observed. No erosional features were observed. Substantial amounts of debris were not observed. Extensive non-native vegetation within the Mitigation Wetlands was not observed, although non-native vegetation was observed to an extent that warrants removal in the wetland buffers and upland areas adjacent to Mitigation Wetlands. Records of inspection are on file with the Loch Lomond Harbormaster and those conducted by WRA are included in Appendix D.

The MSMVCD staff visited the site at least once per month from January through June 2016 and also visited in November and December 2016. The site was treated with larvicide in February, March, and April 2016.

6.0 DISCUSSION AND RECOMMENDATIONS

The Project is currently meeting all five of the Year 1 success criteria. A summary of the success of the Mitigation Wetlands for the Year 1 monitoring period is presented in Table 6 above. A discussion of how the Mitigation Wetlands are meeting performance criteria for each of the five monitoring metrics is provided below. Recommended corrective actions are provided in Section 6.4.

6.1 Hydrology

Year 1 hydrology monitoring data show that the Mitigation Wetlands experienced inundation for approximately four weeks and inundation occurred for much longer. The Mitigation Wetlands have been built with the correct elevations and are receiving adequate hydrology from precipitation and tidal inundations.

6.2 Soils

Specific soil characteristics monitoring was not conducted during Year 1. Wetland soil indicators, including redoximorphic features, can take many years to develop in established or rehabilitated wetlands, and may not become apparent within the first 5 years following restoration. Due to the amount of grading within the mitigation wetlands during construction, wetland soil indicators are not expected to be observable in Year 1. However, due to the amount of observed inundation during the wet season in 2016, it is expected some wetland soil indicators are starting to form.

6.3 Vegetation

The Mitigation Wetlands met the Year 1 vegetative success criteria (criteria #3, #4, and #5). Vegetation within the Mitigation Wetlands has established. However, total vegetation cover within mitigation wetlands is sparse, and a moderate amount of bare ground is present. This may be a result of the extended period of inundation observed within all the mitigation wetlands in the early spring. Many of the plants installed in late 2015, were submerged underwater for approximately 6 weeks. The Mitigation Wetlands were inundated long enough for significant amounts of algae (bio-crust when dried) to grow and later blanket the majority of the mitigation wetlands. It is expected that some planted species may not succeed due to the extended inundation, but other native species (e.g., pickleweed or saltmarsh bulrush) will be self-establishing in these highly inundated areas and the long-term success will be met. There are very few non-natives within the

mitigation wetlands. However, there are moderate amounts of black mustard, radish, and perennial pepperweed adjacent the mitigation wetlands.

6.4 Recommendations

Hydrology within the mitigation wetlands should continue to be monitored regularly during the rainy season in Year 2 in order to ensure success criteria #1 and #2 are on track to meet the Year 2 targets. Irrigation was used in the mitigation wetlands to supplement planting growth during the first year of establishment. Irrigation should continue to be utilized during Years 1, 2, and 3 in order to aide in native wetland plant establishment. In addition, WRA recommends that weeds, such as black mustard, radish, and perennial pepperweed continue to be monitored and managed throughout the mitigation wetlands in order to provide additional habitat for the growth, expansion, and recruitment of native wetland plant species. Invasive and non-native species removal within the Mitigation Wetlands and adjacent areas is recommended for spring 2017. The Project is currently meeting all Year 1 success criteria, and therefore no further recommendations are being provided at this time.

7.0 REFERENCES

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APPENDIX A
REPRESENTATIVE SITE PHOTOGRAPHS

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Photograph 1. View of near complete inundation within Mitigation Wetland MW1 on 03/25/2016.



Photograph 2. View of near complete inundation within Mitigation Wetland MW3 on 04/22/2016.



Photograph 3. View of near complete inundation within Mitigation Wetland MW2 on 04/23/2016.



Photograph 4. View of near complete inundation within Mitigation Wetland MW1 on 04/26/2016.



Photograph 5. Year 1: View (facing north) of the baseline transect within Mitigation Wetland MW3. July 27, 2016.



Photograph 6. Year 1: View (facing northwest) of the baseline transect within Mitigation Wetland (MW2). July 27, 2016.



Photograph 7. Year 1: View (facing northwest) of the baseline transect within Mitigation Wetland MW1. July 27, 2016.



Photograph 8. Year 1: View (facing northeast) of the baseline transect within Reference Wetland at RW1. July 27, 2016.



Photograph 9. Year 1: View (facing west) of the baseline transect within Reference Wetland RW2. July 27, 2016.



Photograph 10. Year 1: View (facing south) of the baseline transect within Reference Wetland RW3. July 27, 2016.

APPENDIX B
VEGETATION MONITORING RESULTS

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Vegetation Monitoring Results Summary

SPECIES	Common Name	Indicator	n=native i=invasive x=exotic	Total Cover by Species: Mitigation Wetlands	Total Cover by Species: Reference Wetlands	Percent Cover of Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Non-Natives in Mitigation Wetland	Percent Cover of Non-Natives in Reference Wetland	Percent Cover of non-natives within Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Invasive Plants within Mitigation Wetlands	Percent Cover of Invasive Plants within Reference Wetlands
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	<i>x</i>	0	0		0	0			
<i>Anthemis cotula</i>	stinking chamomile	FACU	<i>i</i>	0	0		0	0			
<i>Avena sp.</i>	wild oats	NI	<i>x</i>	0	0		0	0			
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	<i>n</i>	0	0						
<i>Baccharis pilularis</i>	coyote brush	NL	<i>n</i>	0	0						
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	<i>n</i>	42	0						
<i>Brassica nigra</i>	black mustard	NL	<i>i</i>	0	0		0	0			
<i>Bromus hordeaceus</i>	soft chess	NI	<i>x</i>	0	0		0	0			
<i>Chenopodium atropost</i>	lamb's quarters	FAC	<i>i</i>	5	163		5	163			
<i>Convolvulus arvensis</i>	field bindweed	NI	<i>x</i>	0	0		0	0			
<i>Crypsis schoenoides</i>	swamp grass	OBL	<i>x</i>	0	0		0	0			
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	<i>n</i>	0	0						
<i>Distichlis spicata</i>	salt grass	FACW	<i>n</i>	6	111						
<i>Dittrichia graveolens</i>	stinkwort	UPL	<i>x</i>	0	32		0	32			
<i>Elymus glauca</i>	blue wildrye	FACU	<i>n</i>	0	0						
<i>Epilobium ciliatum</i>	willow herb	FACW	<i>n</i>	0	26						
<i>Eremocarpus setigerus</i>	turkey mullein	NI	<i>n</i>	0	0						
<i>Erodium sp.</i>	filaree	NI	<i>x</i>	0	0		0	0			
<i>Festuca perennis</i>	Italian ryegrass	FAC*	<i>i</i>	0	0		0	0			
<i>Frankenia salina</i>	alkali heath	FACW	<i>n</i>	0	0						
<i>Geranium sp.</i>	geranium	NI	<i>x</i>	0	0		0	0			
<i>Grindelia stricta</i>	marsh gumplant	FACW	<i>n</i>	0	0						
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	<i>x</i>	0	0		0	0			

Appendix B. Year 1 Vegetation Monitoring Results

Vegetation Monitoring Results Summary

SPECIES	Common Name	Indicator	n=native i=invasive x=exotic	Total Cover by Species: Mitigation Wetlands	Total Cover by Species: Reference Wetlands	Percent Cover of Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Non-Natives in Mitigation Wetland	Percent Cover of Non-Natives in Reference Wetland	Percent Cover of non-natives within Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Invasive Plants within Mitigation Wetlands	Percent Cover of Invasive Plants within Reference Wetlands
<i>Hordeum brachyantherum</i>	meadow barley	FACW	<i>n</i>	0	0						
<i>Hordeum marinum</i>	Mediterranean barley	FAC	<i>x</i>	0	0		0	0			
<i>Hordeum murinum</i>	foxtail barley	NI	<i>x</i>	0	0		0	0			
<i>Juncus bufonius</i>	toad rush	FACW+	<i>n</i>	0	0						
<i>Juncus balticus</i>	baltic rush	OBL	<i>n</i>	0	0						
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	<i>n</i>	0	0						
<i>Juncus mexicanus</i>	Mexican rush	FACW	<i>n</i>	0	0						
<i>Juncus patens</i>	spreading rush	FAC	<i>n</i>	0	0						
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	<i>n</i>	0	0						
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	<i>x</i>	0	0		0	0			
<i>Lasthenia glabrata</i>	goldfields	FACW	<i>n</i>	0	0						
<i>Limonium californicum</i>	marsh lavender	OBL	<i>n</i>	0	0						
<i>Lotus corniculatus</i>		FAC	<i>x</i>	4	6		4	6			
<i>Lythrum hyssopifolia</i>	loosestrife	FACW	<i>x</i>	4	6		4	6			
<i>Malva nicaeensis</i>	bull mallow	UPL	<i>x</i>	0	0		0	0			
<i>Medicago polymorpha</i>	California bur clover	NI	<i>x</i>	0	0		0	0			
<i>Melilotus indica</i>	Indian sweetclover	FAC	<i>x</i>	0	0		0	0			
<i>Poa annua</i>	annual bluegrass	FACW-	<i>x</i>	0	0		0	0			
<i>Polygonum aviculare</i>	knotweed	FAC	<i>x</i>	0	0		0	0			
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	<i>x</i>	275	2		275	2			
<i>Rumex crispus</i>	curly dock	FACW-	<i>x</i>	0	0		0	0			
<i>Salicornia pacifica</i>	pickleweed	OBL	<i>n</i>	173	1397						
<i>Salsola tragus</i>	prickly russian thistle	FACU	<i>i</i>	0	0		0	0			

Vegetation Monitoring Results Summary

SPECIES	Common Name	Indicator	n=native i=invasive x=exotic	Total Cover by Species: Mitigation Wetlands	Total Cover by Species: Reference Wetlands	Percent Cover of Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Non-Natives in Mitigation Wetland	Percent Cover of Non-Natives in Reference Wetland	Percent Cover of non-natives within Mitigation Wetlands Compared to Reference Wetlands	Percent Cover of Invasive Plants within Mitigation Wetlands	Percent Cover of Invasive Plants within Reference Wetlands
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	<i>n</i>	0	0						
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	<i>n</i>	0	0						
<i>Silybum marianum</i>	milk thistle	NI	<i>x</i>	0	0		0	0			
<i>Spergularia rubra</i>	purple sand spurry	FAC-	<i>x</i>	0	0		0	0			
<i>Taeniatherum caput-medusae</i>	medusa head	NI	<i>i</i>	0	0		0	0			
<i>Trifolium dubium</i>	shamrock clover	FACU	<i>x</i>	0	0		0	0			
<i>Trifolium hirtum</i>	rose clover	NL	<i>I</i>	0	0		0	0			
Rock				844	54			54			
Biocrust				1078	942			942			
Litter and Thatch				183	166			166			
Bare ground				0	0			0			
Total Cover				16.97	58.10						
Sum				16.97	58.10	29.20	9.60	6.97	1.38	5.00	5.43

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n					6					
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i					3	2				
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n										1
<i>Dittrichia graveolens</i>	stinkwort	UPL	x										
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Epilobium ciliatum</i>	willow herb	FACW	n										
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x										
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x	5		55	4	10	5	1		8	
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n	15		3	1	1	25	10	6	2	55
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
Rock								5					2
biocrust				50	90	32	10	85			15	80	5
Litter and Thatch													
Bare ground				30	10	10	85		61	88	79	10	37
Transect #'s				10	10	27	27	53	53	50	50	32	32
Line #'s				2	10	5	8	9	2	2	7	10	4

Notes: Transect is 55 feet long.

Appendix B. Year 1 Vegetation Monitoring Results

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n	1	1			2		2		+	
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i										
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n						5				
<i>Dittrichia graveolens</i>	stinkwort	UPL	x										
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Epilobium ciliatum</i>	willow herb	FACW	n										
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x		4								
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x	25	12		10	25	40	10	45	5	15
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n	1	8	2	10	4	4	5	6	5	5
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
Rock						10	2						
Biocrust								40			49		
Litter and Thatch				50	20				51	83			
Bare ground				25	55	88	67	29				90	80
Transect #'s				70	70	13	13	67	67	73	73	15	15
Line #'s				9	1	7	4	8	10	5	10	8	3

Notes: Photos taken at 12:25. Line 2 facing north. Transect length is 80 feet.

Appendix B. Year 1 Vegetation Monitoring Results

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n				20		10				
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i										
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n										
<i>Dittrichia graveolens</i>	stinkwort	UPL	x										
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Epilobium ciliatum</i>	willow herb	FACW	n										
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x										
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x										
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n			2		1		+			2
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
Rock					8					5			
Biocrust				60		80	75	95	90	10	40		90
Litter and Thatch													
Bare ground													
Transect #'s				17	17	25	25	38	38	42	42	7	7
Line #'s				4	7	2	5	5	9	6	10	3	8

Notes: Transect length was 45 feet. Line oriented west.

Appendix B. Year 1 Vegetation Monitoring Results

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n										
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i	10	10	30	20	2	2	4	1	10	10
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n	40						70	1		
<i>Dittrichia graveolens</i>	stinkwort	UPL	x										30
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Eleocharis spp.</i>			2		4					2		20	
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x			1		1					4
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x					2					
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n	20	40	55	40	88	81	4	93	50	20
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
Rock													
Biocrust													
Litter and Thatch				15	61	10	30	5	15	20	5	20	36
Bare ground				15	5	5	10	2	2				
Transect #'s				27	27	17	17	14	14	42	42	34	34
Line #'s				10	5	6	8	8	2	7	9	3	5

Notes: Lines facing west

Appendix B. Year 1 Vegetation Monitoring Results

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n										
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i			5	20					32	
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n										
<i>Dittrichia graveolens</i>	stinkwort	UPL	x				2						
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Epilobium ciliatum</i>	willow herb	FACW	n										
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x										
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x										
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n	40	30	10	1	92	85	80	2	80	35
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
Rock													
Biocrust													
Litter and Thatch				60	70	85	77	8	15	15	58	20	65
Bare ground											5	5	
Transect #'s				46	46	23	23	14	14	39	39	78	78
Line #'s				7	4	10	9	5	4	2	8	3	5

Notes: line at southside of quad

Appendix B. Year 1 Vegetation Monitoring Results

SPECIES	Common Name	indicator	n=native i=invasive x=exotic	Line 1		Line 2		Line 3		Line 4		Line 5	
				1	2	3	4	5	6	7	8	9	10
<i>Anagallis arvensis</i>	scarlet pimpernel	FAC	x										
<i>Anthemis cotula</i>	stinking chamomile	FACU	i										
<i>Avena sp.</i>	wild oats	NI	x										
<i>Baccharis glutinosa</i>	salt marsh baccharis	FACW	n										
<i>Baccharis pilularis</i>	coyote brush	NL	n										
<i>Bolboschoenus maritimus</i>	alkali bulrush	OBL	n										
<i>Brassica nigra</i>	black mustard	NL	I										
<i>Bromus hordeaceus</i>	soft chess	NI	x										
<i>Chenopodium atropost</i>	lamb's quarters	FAC	i	1	1	5							
<i>Convolvulus arvensis</i>	field bindweed	NI	x										
<i>Cyperis schoenoides</i>	swamp grass	OBL	x										
<i>Cyperus eragrostis</i>	umbrella sedge	FACW	n										
<i>Distichlis spicata</i>	salt grass	FACW	n										
<i>Dittrichia graveolens</i>	stinkwort	UPL	x										
<i>Elymus glauca</i>	blue wildrye	FACU	n										
<i>Epilobium ciliatum</i>	willow herb	FACW	n										
<i>Eremocarpus setigerus</i>	turkey mullein	NI	n										
<i>Erodium sp.</i>	filaree	NI	x										
<i>Festuca perennis</i>	Italian ryegrass	FAC*	i										
<i>Frankenia salina</i>	alkali heath	FACW	n										
<i>Geranium sp.</i>	geranium	NI	x										
<i>Grindelia stricta</i>	marsh gumplant	FACW	n										
<i>Helminthotheca echioides</i>	prickly ox tongue	FAC	x										
<i>Hordeum brachyantherum</i>	meadow barley	FACW	n										
<i>Hordeum marinum</i>	Mediterranean barley	FAC	x										
<i>Hordeum murinum</i>	foxtail barley	NI	x										
<i>Juncus bufonius</i>	toad rush	FACW+	n										
<i>Juncus balticus</i>	baltic rush	OBL	n										
<i>Juncus effusus</i>	common bog rush	FACW+/OBL	n										
<i>Juncus mexicanus</i>	Mexican rush	FACW	n										
<i>Juncus patens</i>	spreading rush	FAC	n										
<i>Juncus xiphioides</i>	iris-leaved rush	OBL	n										
<i>Lactuca serriola</i>	prickly wild lettuce	FAC	x										
<i>Lasthenia glabrata</i>	goldfields	FACW	n										
<i>Limonium californicum</i>	marsh lavender	OBL	n										
<i>Lotus corniculatus</i>		FAC	x										
<i>Malva nicaeensis</i>	bull mallow	UPL	x										
<i>Medicago polymorpha</i>	California bur clover	NI	x										
<i>Melilotus indica</i>	Indian sweetclover	FAC	x										
<i>Poa annua</i>	annual bluegrass	FACW-	x										
<i>Polygonum aviculare</i>	knotweed	FAC	x										
<i>Polypogon monspeliensis</i>	rabbitfoots grass	FACW+	x										
<i>Rumex crispus</i>	curly dock	FACW-	x										
<i>Salicornia pacifica</i>	pickleweed	OBL	n	55	60	45	40	71	85	5	30	15	45
<i>Salsola tragus</i>	prickly russian thistle	FACU	i										
<i>Schoenoplectus americanus</i>	chairmaker's bulrush	OBL	n										
<i>Schoenoplectus pungens</i> var. <i>longispicatus</i>	common three square	ONL	n										
<i>Silybum marianum</i>	milk thistle	NI	x										
<i>Spergularia rubra</i>	purple sand spurry	FAC-	x										
<i>Taeniatherum caput-medusae</i>	medusa head	NI	i										
<i>Trifolium dubium</i>	shamrock clover	FACU	x										
<i>Trifolium hirtum</i>	rose clover	NL	I										
rock								9					
Biocrust													
Litter and Thatch				45	40	10	40	15	15	55	70	60	30
Bare ground								5					
Transect #'s				4	4	31	31	40	40	25	25	37	37
Line #'s				1	4	9	3	5	7	2	6	7	2

Notes: all photos from end. Side trans towards north east (towards mit wetland)

Appendix B. Year 1 Vegetation Monitoring Results

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APPENDIX C
HYDROLOGY MONITORING FORMS

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Loch Lomond Marina Monitoring Sheet

Date: 4/26/16
 Monitor: David Z.
 Current Weather: Partly Cloudy

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Distance from wetland boundary to edge of inundation/saturation	0-10 feet	11-20 feet	21-30 feet	31-40 feet	41-50 feet	51-60 feet
Is inundation present?	Yes					
If so, how deep?	~7 inches					
Is saturation present?	Yes					
If so, how deep?	N/A					
Photos:	10:29am					
Lat & Long:						

Notes: *saturation assumed based on length of inundation.*

Loch Lomond Marina Monitoring Sheet

Date: 4/22/16
 Monitor: David Z.
 Current Weather: Overcast

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Distance from wetland boundry to edge of inudation/saturation	0-10 feet	11-20 feet	21-30 feet	31-40 feet	41-50 feet	51-60 feet
Is inudation present?	yes					
If so, how deep?	~7 inches					
Is saturation present?	yes					
If so, how deep?	N/A					
Photos:	8:55am					
Lat & Long:						

Notes: *saturation assumed based on length of inudation.*

Loch Lomond Marina Monitoring Sheet

Date: 3/25/16
 Monitor: Brian B.
 Current Weather: Sunny

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Distance from wetland boundry to edge of inudation/saturation	0-10 feet	11-20 feet	21-30 feet	31-40 feet	41-50 feet	51-60 feet
Is inudation present?	yes					
If so, how deep?	~ 8 inch					
Is saturation present?	yes					
If so, how deep?	N/A					
Photos:	2:50 pm-3:30 pm					
Lat & Long:						

Notes: *saturation assumed based on length of inudation*

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APPENDIX D
MANAGEMENT PLAN MONITORING FORMS

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Loch Lomond Regular Maintenance and Management Plan Monitoring

Date:

03/25/16

Post Storm Event?

Yes

No

Monitor:

BRYAN BARTELL

Wetland Fence

Are any breaks in the fence?

Yes

No

Are any fence repairs required?

Yes

No

Locations of repairs needed:

Signs

Are all signs present?

Yes

No

Are all signs legible and unobstructed?

Yes

No

Do any signs require repair or replacement?

Yes

No

Locations of repairs needed:

NOT INSTALLED YET

Erosion

Is an erosion evident on banks?

Yes

No

Is erosion evident elsewhere?

Yes

No

Locations of erosional repairs needed:

Debris

Is any debris (dead vegetation or trash) present?

Yes

No

Was debris controlled and picked up?

Yes

No

Is there a need for additional debris control?

Yes

No

Locations of additional debris removal needed:

Non-Native Vegetation (Biologists Only)

Should non-native vegetation be scheduled?

Yes

No

Locations of non-natives to be targeted:

Species of non-native vegetation:

GRASSES MAINLY

Loch Lomond Regular Maintenance and Management Plan Monitoring

Date: 4/22/16

Post Storm Event? Yes No

Monitor: D. Zwick

Wetland Fence

Are any breaks in the fence? Yes No

Are any fence repairs required? Yes No

Locations of repairs needed: _____

Signs

Are all signs present? Yes No

Are all signs legible and unobstructed? Yes No

Do any signs require repair or replacement? Yes No

Locations of repairs needed: _____

Erosion

Is an erosion evident on banks? Yes No

Is erosion evident elsewhere? Yes No

Locations of erosional repairs needed: _____

Debris

Is any debris (dead vegetation or trash) present? Yes No

Was debris controlled and picked up? Yes No

Is there a need for additional debris control? Yes No

Locations of additional debris removal needed: _____

Non-Native Vegetation (Biologists Only)

Should non-native vegetation be scheduled? Yes No

Locations of non-natives to be targeted: Observed minimal non-natives in wetlands. Significant non-natives w/in surrounding wetland buffer

Species of non-native vegetation: Italian rye grass, mustard, raddish, pepper weed

Loch Lomond Regular Maintenance and Management Plan Monitoring

Date: 4/26/16

Post Storm Event? Yes

No

Monitor: D. ZWICH

Wetland Fence

Are any breaks in the fence? Yes No

Are any fence repairs required? Yes No

Locations of repairs needed: _____

Signs

Are all signs present? Yes No

Are all signs legible and unobstructed? Yes No

Do any signs require repair or replacement? Yes No

Locations of repairs needed: _____

Erosion

Is an erosion evident on banks? Yes No

Is erosion evident elsewhere? Yes No

Locations of erosional repairs needed: _____

Debris

Is any debris (dead vegetation or trash) present? Yes No

Was debris controlled and picked up? Yes No

Is there a need for additional debris control? Yes No

Locations of additional debris removal needed: _____

Non-Native Vegetation (Biologists Only)

Should non-native vegetation be scheduled? Yes No

Locations of non-natives to be targeted: non-natives observed within upland areas. Very few w/in wetlands

Species of non-native vegetation: Mustard, Pepperweed, Radish, Italian Rye Grass

Loch Lomond Regular Maintenance and Management Plan Monitoring

Date: 7/27/16

Post Storm Event? Yes

No

Monitor: _____

Wetland Fence

Are any breaks in the fence? Yes No

Are any fence repairs required? Yes No

Locations of repairs needed: _____

Signs

Are all signs present? Yes No

Are all signs legible and unobstructed? Yes No

Do any signs require repair or replacement? Yes No

Locations of repairs needed: _____

Erosion

Is an erosion evident on banks? Yes No

Is erosion evident elsewhere? Yes No

Locations of erosional repairs needed: _____

Debris

Is any debris (dead vegetation or trash) present? Yes No

Was debris controlled and picked up? Yes No

Is there a need for additional debris control? Yes No

Locations of additional debris removal needed: _____

Non-Native Vegetation (Biologists Only)

Should non-native vegetation be scheduled? Yes No

Locations of non-natives to be targeted: non-native veg located within upland areas w/in wetland buffers

Species of non-native vegetation: Mustard, Peppercweed, radish, Italian Ryegrass