Meeting of the Central Valley Flood Protection Board
July 25, 2014

Staff Report

Feather River Wildlife Area, Abbott Lake Unit
Abbott Lake Restoration Project
Yolo County

1.0 – ITEM

Consider approval of Resolution No. 14-25 and Draft Permit No. 18882.
(Attachments B and C)

2.0 – APPLICANT

California Department of Fish and Wildlife (CDFW)

3.0 – LOCATION

The project is located within the Abbott Lake Unit of the Feather River Wildlife Area, approximately 7-miles south of Yuba City and 1.5-miles east from the intersection of Highway 99 and Obanion Road.
(Feather River, Yolo County, See Attachment A)

4.0 – PROJECT DESCRIPTION

The applicant proposes to remove invasive vegetation from 96-acres and plant approximately 17,341 plants to include riparian shrubland, low shrubland, riparian woodland, and grassland, on 150-acres (South Field) of the 439-acre Abbott Lake Unit of the Feather River Wildlife Area on the right (west) overflow bank of the Feather River near River Mile 20.

5.0 - AUTHORITY OF THE BOARD

California Water Code § 8534, 8590 – 8610.5, and 8700 - 8710

California Code of Regulations, Title 23 (Title 23)

- § 6, Need for a Permit
- § 13, Evidentiary Hearings
- § 112, Streams Regulated and Nonpermissible Work Periods
- § 131, Vegetation

6.0 – BACKGROUND

On February 26, 2010 the Central Valley Flood Protection Board (Board) conditionally approved Permit No. 18531 for the restoration of 169-acres of the Abbott Lake Unit of the Feather River Wildlife Area (Abbott Lake). The proposed restoration project included a 19-acre field at the northern end of Abbott Lake and a 150-acre field at the southern end of Abbott Lake. As a condition of approval the plantings on the 19-acre field were limited to native grasses due to modeling results that showed a significant change in water surface elevation when vegetation other than grass was planted on this field. The local maintaining agency (LMA) for levee maintenance on the left (east) bank levee, RD-784, endorsed the project with conditions. The LMA for the right (west) bank levee, Levee District No. 1 of Sutter County (LD-1), choose not to endorse the project for the following reasons:

- Potential increases in water surface elevations due to the proposed project would negate benefits gained from recent levee setback projects in the area.
- The validity of the CEQA findings that resulted in a Notice of Exemption for the “minor alteration of land”.
- Concerns that maintenance funding would be insufficient and LD-1’s maintenance costs would increase as a result.

Approval of the Permit No. 18531 was also contingent on Board staff receiving the following:

1) A letter from the Corps stating they had No-Objection to the project;
2) An executed Memorandum of Understanding between the Department of Fish and Game (now known as the California Department of Fish and Wildlife) and the

Division of Flood Management of the Department of Water Resources for Maintenance of Flood Control Projects in the Sacramento River and Feather River Wildlife Areas; and

3) A photo record of the project site, including associated descriptions, native plant species counts, and floodway conditions.

None of these items were ever received by Board staff.

On June 10, 2010 the Department of Fish and Game wrote a letter to the Board's Executive Officer requesting that Permit No. 18531 be rescinded "In light of the ongoing discussions with LD-1 and the lack of consensus on a solution,…". On August 28, 2013 CDFW submitted an encroachment permit application for the proposed restoration of the southern 150-acre field of Abbott Lake.

7.0 – PROJECT ANALYSIS

The project area lies within the 439-acre Abbott Lake Unit of the Feather River Wildlife Area (Abbott Lake) on the right bank of the Feather River in Sutter County, California. The 150-acre restoration site (southern field) consists of abandoned agricultural lands on the waterside of the levee that have failed to regenerate to riparian forest. A 19-acre restoration site located just north of the 150-acre south field is scheduled to be restored in the future when funding becomes available, the 19-acre field not a component of this application.

Abbott Lake is surrounded by state and private ownership and is located directly across the river from the Three Rives Levee Improvement Authority's (TRLIA) Setback Levee Improvement Project that was completed in 2009-2010. In addition Abbott Lake is located approximately 0.3 miles upstream of the Star Bend Setback Levee Improvement Project. The Abbott Lake project in conjunction with restoration at the nearby O'Connor Lakes Unit will result in nearly 400-acres of new habitat on the right (west) bank of the Feather River between river miles 18 and 22.

River Partners has worked closely with CDFW in developing the restoration plan for the south field. Invasive vegetation will be removed and three plant communities will be planted. Valley Foothill Riparian woodland will be planted on approximately 44-acres at a density of 65 trees per acre. The low shrubland community will be planted on approximately 78-acres at an overall plant density of 121 plants per acre. Native grasslands will be planted on approximately 28-acres to reduce erosion and improve flood water conveyance.

To create a more open design and thereby enhance floodwater conveyance, the low shrubland community will be planted in hedgerows with spaces of 100-feet between every five rows. Rows will be oriented to flood flows (generally a curve oriented from north to south) in order to maintain the flood conveyance patterns across the site. A herbaceous understory will be planted between all rows and hedgerows to improve habitat quality and to limit the emergence of invasive species. Open areas are a major component of the restoration design and will be planted with native grasses and forbs to reduce erosion and improve flood water conveyance. A 60' buffer from the levee toe will be established to allow access for maintenance practices. There will be no trees planted in the first planting row from the levee (See Attachment D).

There will be a three year establishment period of the restoration site that will include watering and monitoring of the vegetation by River Partners. The purpose of the establishment period is to ensure that the restoration project results in at least 70% plant survival rate. Monitoring results will be recorded that include; monthly field reports, end of season monitoring, annual photo points, annual end of season memos, and a final report. River Partners will remove all farm equipment from the site during the flood season. In the event of a flood, flood debris will be cleared from the site following the flood season. Throughout three year establishment River Partners will periodically mow between rows and planting clusters, and along the perimeter of project areas, to reduce potential fire hazards. A drip irrigation system will be used to water the plants during the establishment period.

CDFW will be responsible for maintaining the site following the three year establishment period. A Vegetation Maintenance Plan (VMP) has been submitted but Board staff has concluded that the VMP lacks sufficient "action" details (See Attachment E). CDFW is proposing to perform maintenance only when "…action is demonstrated as necessary to ensure conveyance." The submitted planting scheme for the project includes 35-acres of grassland areas and 100-foot wide separating strips aligned parallel to flow to better convey flood flows. A hydraulic analysis was done using the submitted planting design configuration and results confirm that hydraulic impacts due to the planting design are negligible. To ensure that the site continues to convey flood flows as-designed the open areas must be kept clear of woody vegetation. Therefore, Special Condition 28 of Permit No. 18882 requires CDFW to remove all woody vegetation in these open areas prior to vegetation reaching a diameter of 3-inches. In addition, the agreed to 60-foot buffer area along the levee must be actively maintained to ensure levee access is maintained and vegetation does not spread onto the levee slope thereby increasing the maintenance costs of LD-1. Furthermore, Special Condition 29 requires the applicant to actively maintain the 60-foot levee buffer zone to prevent elderberry plants from spreading onto the levee thereby preventing possible mitigation costs to LD-1.

7.1 – Hydraulic Analysis

A 2-D hydraulic simulation model was used to calculate water surface elevations and velocities for the base and project conditions for both the 19-acre north field and the 150-acre south field. The hydraulic model used was the RMA 2 model developed by MBK Engineers for the basis of design of the Feather River Setback Levee Project. The model includes the Feather from river mile (RM) 8.0 to RM 28.7. It also includes the Bear River from RM 5.0 to the confluence with the Feather River. The simulations were performed in a steady state flow condition.

Water surface elevation difference was calculated and mapped for the 1-in-100 event (281,000-cfs) and 1-in-200 AEP event (353,000-cfs). The Corps' 1957 Sacramento River Flood Control Project design flow for this section of the Feather River is 300,000-cfs. The hydraulic analysis results indicate that the proposed Abbott Lake Restoration Project will have a less than significant impact upon the water surface elevation and velocity in the Feather River at the project site. Results show a localized increase in water surface elevation of approximately 0.15 feet for both the 1-in-100 and 1-in-200 AEP events, with most of the impact coming from the north field. The water surface impacts dampen out to less than 0.05 feet upstream and downstream of the project area. There would be no significant increase in velocity for both the 1-in-100 and 1-in-200 AEP events (See Attachment F).

7.2 – Geotechnical Analysis

The proposed project does not involve any grading or structures so a geotechnical analysis was not required.

8.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project, from all pertinent agencies are shown below:

- The Department of Water Resources Flood Maintenance Office (FMO)/Sutter Maintenance Yard has endorsed the project with conditions; the conditions will be incorporated into the permit as Exhibit B.

- LD-1 has endorsed the project with conditions; the conditions will be incorporated into the permit as Exhibit C.

- The U.S. Army Corps of Engineers draft 208.10 comment letter has been received for this application. The USACE District Engineer has no objection to the project, subject to conditions. The final letter will be incorporated into the permit as Exhibit D.

9.0 – CEQA ANALYSIS

Board staff has prepared the following CEQA findings:

The Board, as a responsible agency under CEQA, has reviewed the Initial Study/Mitigated Negative Declaration (IS/MND) (SCH Number: 2013082005, August 2013) and Mitigation Measures for the Abbott Lake Restoration Project prepared by the lead agency, the California Department of Fish and Wildlife. These documents, including project design, may be viewed or downloaded from the Central Valley Flood Protection Board website at http://www.cvfpb.ca.gov/meetings/2014/07-25-2014.cfm under a link for this agenda item. These documents are also available for review in hard copy at the Board and the CDFW offices.

CDFW determined that the project would not have a significant effect on the environment on December 16, 2013 and filed a Notice of Determination on December 17, 2013 with the State Clearinghouse. Board staff finds that although the proposed project could have a potentially significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. The project proponent has incorporated mandatory mitigation measures into the project plans to avoid identified impacts or to mitigate such impacts to a point where no significant impacts will occur. These mitigation measures are included in the project proponent's IS/MND and address impacts to air quality, biological resources, cultural resources, hazards and hazardous materials, hydrology and water quality. The description of the mitigation measures are further described in the adopted IS/MND.

10.0 – SECTION 8610.5 CONSIDERATIONS

1. Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

   The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit.

3. Effects of the decision on the entire State Plan of Flood Control, and consistency of the proposed project with the Central Valley Flood Protection Plan as adopted by Board Resolution 2012-25 on June 29, 2012:

   There will be no adverse effect to the entire State Plan of Flood Control as the hydrologic impacts from the proposed project are considered to be insignificant. The project site will be managed by the California Department of Fish and Wildlife for both habitat benefits and to ensure that there are no negative hydraulic impacts due to the proposed project. The proposed project is compatible with the Central Valley Flood Protection Plan as it will promote ecosystem functions which are a supporting goal of the Central Valley Flood Protection Plan.

4. Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

   There will be minimal impacts to the proposed vegetation from reasonable projected future events.

11.0 – STAFF RECOMMENDATION

Staff recommends that the Board adopt Resolution No. 14-25, which constitutes the written findings and decisions in the matter of Permit No. 18882. The resolution contains the CEQA findings; Findings of Fact; and approval of Permit No. 18882; and directs the Executive Officer to take the necessary actions to prepare and execute the permit and related documents and to file a Notice of Determination with the State Clearinghouse.

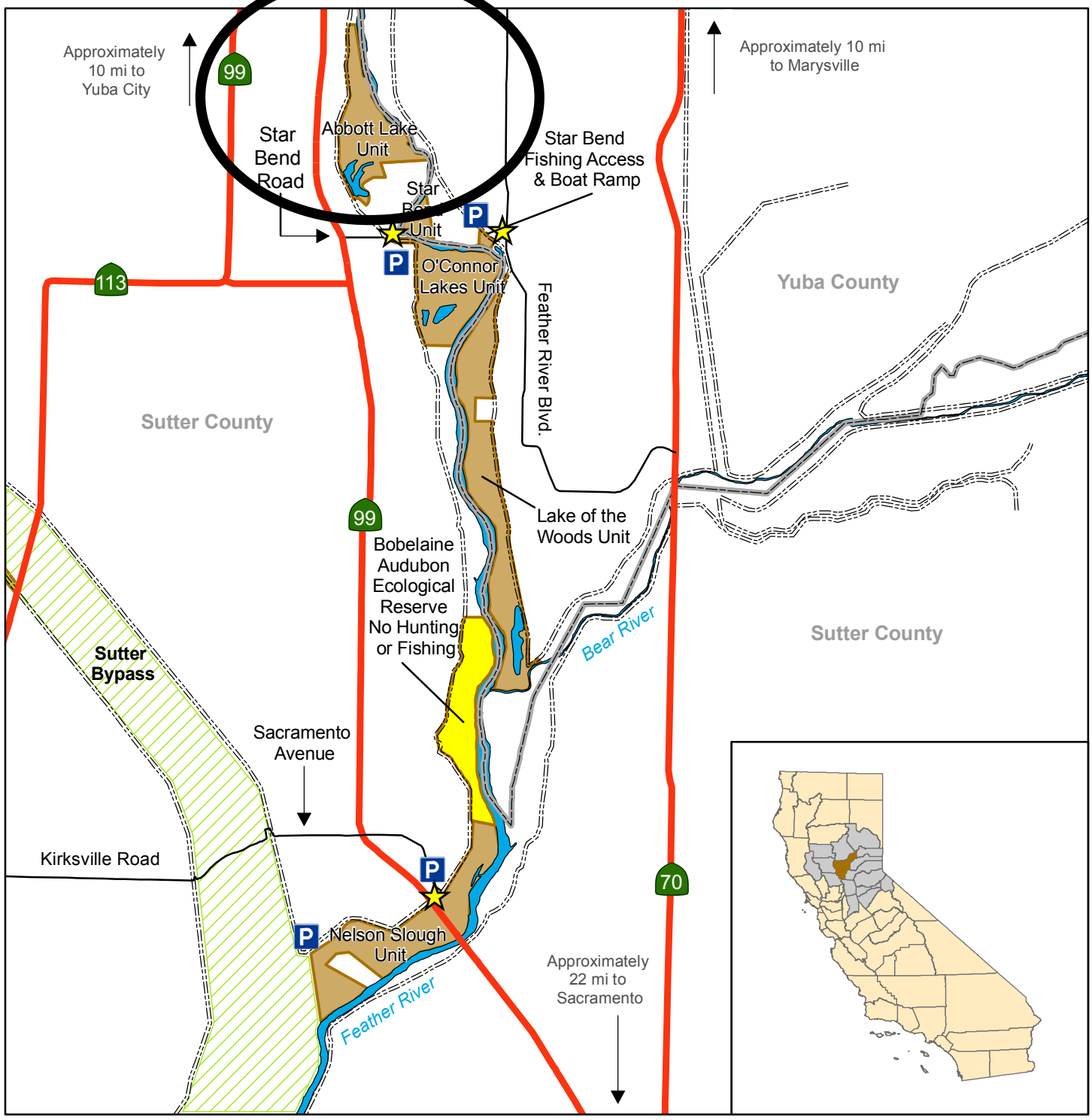
12.0 – LIST OF ATTACHMENTS

A. Location Maps and Photos
B. Draft Resolution No. 14-25
C. Draft Permit No. 18882
D. Draft planting plan
E. Vegetation Management Plan
F. Hydraulic Report

Design Review:	Gary W. Lemon P.E.
Environmental Review:	Andrea Buckley
Document Review:	Mitra Emami P.E., Len Marino P.E., Chief Counsel Leslie Gallagher

Attachment A

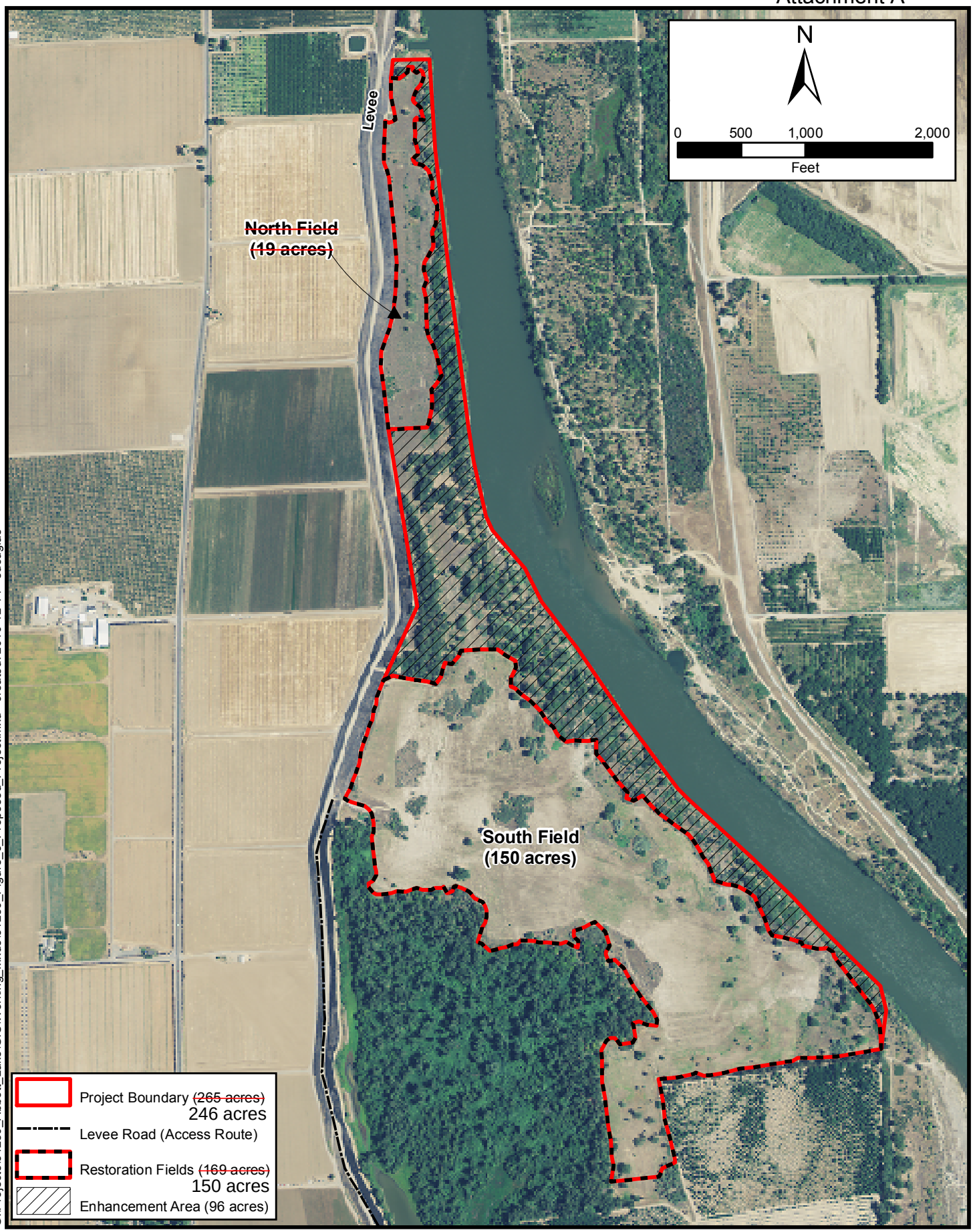
California Department of Fish and Game
North Central Region
FEATHER RIVER WILDLIFE AREA
Sutter, Yuba Counties



Wildlife Area
Ecological Reserve
Sutter Bypass
Local Road
State Highway
Levees - No Vehicle Access
P Parking
N
0
1.5 Miles

June 2008 - Stacey Lee, DFG - WB / BDB
Prepared by BDB for WB

Attachment A



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North State Resources, Inc.

Abbott Lake Restoration Project

Figure 3
Proposed Project Area

Photo point E:

Photo point E (cont.) Near river on current access road.

Photo point F: Central portion of the south field.

Photo point G: Looking north from the southern property line.

Photo point H: Looking north from northwest corner of field .

Appendix VI. Photo point location descriptions and photos for the Abbott Lake Riparian Restoration Project

Photo Point Descriptions

Site: Abbott Lake **Date: 3/26/2008** **Observers: Nick Pacini**

Subunit/Area: North and South Fields **Camera Info: Nikon digital D40x**

Photo point	Location/Notes (triangulation, landmark, direction, distance, or GPS coordinates)
~~A~~	~~North Field. Near the pump station on the north end of the site. ~50 yards due east of the levee and ~100 yards due south of the pump station. 20 yards southeast of the stand of 3 large cottonwoods and elderberries.~~ ~~UTM: N 4322471 E 620344~~
~~B~~	~~North Field. On levee road. ~1/4 mile south of the northern access ramp to the north field. ~100 yards southeast of telephone pole and small pump in the field on the dry side of the levee.~~ ~~UTM: N 4322204 E620263~~
~~C~~	~~North Field. On the approximate southeast corner of the field. ~100 yards east of the levee along the stand of remnant vegetation bordering the river.~~ ~~UTM: N 4321645 E 620390~~
~~D~~	~~South Field. On the south access ramp from levee. Along the access road ~40 yards east of the junction with the levee road.~~ ~~UTM: N 4320742 E 620217~~
E	South Field. Near river on the current access road. ~1/4 mile due east of access ramp. Well is to the northwest (332 degrees) ~50 yards. South of telephone line ~50 yards. UTM: N 4320786 E 620721
F	South Field. The central portion of the field near the upper corner of the remnant area that extends furthest into the field. South of Point E ~1/2 mile and ~1/4 mile north of southern property boundary (orchard). On the western edge of the field. UTM: N 4320444 E 620834
G	South Field. Along southern property boundary (orchard). ~1/4 mile west of river and ~200 yards east of the northwest corner of the orchard. UTM: N 4320110 E 621226
H	South Field. At the northwest corner of the private orchard south of the site. ~15 yards north of a wooden fence post on the boundary. ~25 yards northwest of the last eucalyptus on the property boundary. UTM: N 4320074 E 620949

STATE OF CALIFORNIA
THE RESOURCES AGENCY
CENTRAL VALLEY FLOOD PROTECTION BOARD
Draft RESOLUTION NO. 14-25
FINDINGS AND DECISION AUTHORIZING ISSUANCE OF
ENCROACHMENT PERMIT NO. 18882
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

WHEREAS, the California Department of Fish and Wildlife (CDFW) proposes to plant native vegetation on approximately 150 acres of the right (west) bank overflow area of the Feather River; and

WHEREAS, the CDFW submitted Application No. 18882 to the Central Valley Flood Protection Board on August 28, 2013. The application proposes the planting of trees, shrubs, and native grasses to increase and improve wildlife habitat. The project area will be planted to woodland areas, low shrubland areas and grassland areas. The project will be identified as the Abbott Lake Restoration Area of the Feather River Wildlife Area (Abbott Lake Unit); and

WHEREAS, the Abbott Lake Unit provides improved wildlife habitat for recreation, upland game hunting and scenic views; and

WHEREAS, the Central Valley Flood Protection Board has conducted a hearing on July 25, 2014 and has reviewed the application, the Report of its staff, the documents and correspondence in its file; and

WHEREAS, California Department of Fish and Wildlife, as lead agency under the California Environmental Quality Act, Public Resources Code sections 21000 *et seq*. ("CEQA") prepared an Initial Study, Mitigated Negative Declaration (IS/MND) (State Clearinghouse No.: 2013082005, August 2013) and Mitigation Monitoring and Reporting Plan (MMRP) on the Abbott Lake Restoration Project (incorporated herein by reference and available at the Central Valley Flood Protection Board offices or CDFW office); and

WHEREAS, CDFW, as lead agency, certified the IS/MND, adopted mitigation measures and a MMRP (incorporated herein by reference and available at the Central Valley Flood Protection Board or at CDFW), approved findings pursuant to CEQA and the CEQA Guidelines (incorporated herein by reference); and filed a Notice of Determination with the State Clearinghouse on December 17, 2013 approving the Project; and

WHEREAS, the Sacramento and San Joaquin Drainage District & Levee District No. 1 of Sutter County holds a clearing easement for the purpose of promoting the free flow of overflow water on 474-acres of the project site; and

WHEREAS, the CDFW has developed a Vegetation Maintenance Plan (VMP) that will be followed by CDFW staff for maintaining the channel, and that the VMP is incorporated into the Permit as Exhibit A; and

WHEREAS, the CDFW, by Special Condition No. TWENTY-EIGHT, will remove woody vegetation greater than 3-inches in diameter from the designated grassland areas, the 60-foot levee buffer zone, and from the 100-foot hedgerow spacing to maintain the roughness coefficients that were used in the hydraulic modeling done for the project; and

WHEREAS, the CDFW, by Special Condition No. TWENTY-NINE, will remove all elderberry plants (*Sambucus* species) from the 60-foot levee buffer zone prior to the stems reaching 1 inch in diameter at ground level; and

WHEREAS, the Department of Water Resources Sutter Maintenance Yard has endorsed the proposed project subject to conditions, and that the letter has been incorporated into the Permit as Exhibit B; and

WHEREAS, the Levee District No. 1 of Sutter County has endorsed the proposed project subject to conditions, and that the letter has been incorporated into the Permit as Exhibit C; and

WHEREAS, the U.S. Army Corps of Engineers (USACE) comment letter was received on July xx, 2014 without objection to the proposed project subject to conditions, and that the letter has been incorporated into the Permit as Exhibit D; and

NOW, THEREFORE, BE IT RESOLVED THAT,

Findings of Fact.

1. The Central Valley Flood Protection Board hereby adopts as findings the facts set forth in the Staff Report unless amended by RESOLUTION No. 14-25.

2. The Board has reviewed the Attachments listed in the Staff Report.

CEQA Findings

3. The Central Valley Flood Protection Board, as a responsible agency, has independently reviewed the analysis in the IS/MND, MMRP, and the findings prepared by the lead agency, CDFW, and has reached its own conclusions.

4. The Central Valley Flood Protection Board, after consideration of the IS/MND, MMRP, and CDFW findings, adopts the project description, analysis and findings which are relevant to activities authorized by issuance of Encroachment Permit No. 18882 for the Abbott Lake Restoration Project.

5. **Custodian of Record**. The custodian of the CEQA record for the Board is its Acting Executive Officer, Leslie Gallagher, at the Central Valley Flood Protection Board Offices at 3310 El Camino Avenue, Room 151, Sacramento, California 95821.

Findings pursuant to Water Code section 8610.5

6. **Evidence Admitted into the Record**. The Board has considered all the evidence presented in this matter, including the original and updated applications, past and present Staff Reports and attachments and the Corps of Engineers recommendations. The Board has also considered all letters and other correspondence received by the Board and in the Board's files related to this matter.

7. **Best Available Science**. In making its findings, the Board has used the best available science relating to the issues presented by all parties.

8. **Effects on State Plan of Flood Control**. This project has no effects on the State Plan of Flood Control as the hydraulic impacts due to the proposed project are considered to be insignificant and it includes conservation habitat for the Abbott Lake Unit.

Other Findings/Conclusions regarding Issuance of the Permit.

9. This resolution shall constitute the written decision of the Central Valley Flood Protection Board in the matter of Permit No. 18882.

Approval of Revised Final Encroachment Permit No. 18882

10. Based on the foregoing, the Central Valley Flood Protection Board hereby adopts and approves, in substantially the form provided:

    - The CEQA findings;
    - Resolution No. 2014-25; and
    - Permit No. 18882.

11. The Board directs the Executive Officer to take the necessary actions to prepare and execute the permit and related documents and to o prepare and file a Notice of Determination pursuant to CEQA and to approve the permit for the CDFW, Abbott Lake Unit Project.

PASSED AND ADOPTED by vote of the Board on _____, 2014

_____
William H. Edgar
President

_____
Jane Dolan
Secretary

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DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18882 BD

This Permit is issued to:

California Department of Fish and Wildlife
1701 Nimbus Road
Rancho Cordova, California 95670

To remove invasive vegetation from 96-acres and plant approximately 17,341 plants to include shrubland, riparian woodland, and grassland, on 150-acres (South Field) of the 439-acre Abbott Lake Unit of the Feather River Wildlife Area on the right (west) overflow bank of the Feather River near River Mile 20. The project is located approximately 7-miles south of Yuba City and 1.5-miles east from the intersection of Highway 99 and Obanion Road (Section 26 & 35, T14N, R3E, MDB&M, Levee District 1 Sutter, Feather River, Sutter County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

_____
Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection

Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18882 BD

THIRTEEN: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

FOURTEEN: All work approved by this permit shall be in accordance with the submitted "Project Plans for Construction of Abbott Lake Restoration Project Feather River Wildlife Area" dated July 03, 2014 except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FIFTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SIXTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SEVENTEEN: The Central Valley Flood Protection Board, Department of Water Resources, and Levee District No.1 of Sutter County shall not be held liable for any damages to the permitted encroachment(s) resulting from flood fight, operation, maintenance, inspection, or emergency repair.

EIGHTEEN: The Abbott Lake Restoration Project shall be subordinate to the purpose of the Sacramento River Flood Control Project and to the flowage easements held by the Sacramento and San Joaquin Drainage District (i.e. The Central Valley Flood Protection Board) and Levee District No.1 of Sutter County.

NINETEEN: Upon receipt of a signed copy of the issued permit the permittee shall contact the Department of Water Resources by telephone, (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY: No construction work of any kind shall be done during the flood season from November 1st to April 15th without prior approval of the Central Valley Flood Protection Board.

TWENTY-ONE: No material stockpiles, temporary buildings, or equipment shall remain in the floodway during the flood season from November 1st to April 15th.

TWENTY-TWO: Cleared trees and brush (or prunings therefrom) shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1st to April 15th.

TWENTY-THREE: Trees shall not be planted within 100-feet of the levee toe.

TWENTY-FOUR: The permittee shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

TWENTY-FIVE: The irrigation system shall be removed from the floodway upon completion of the three year establishment period.

TWENTY-SIX: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

TWENTY-SEVEN: The submitted Vegetation Maintenance Plan shall be attached to this permit as Exhibit A and shall be a fully enforceable condition of this permit. Any material changes to the plan after the date of issuance of this permit, shall be submitted to the Central Valley Flood Protection Board for approval.

TWENTY-EIGHT: The permitte shall remove all woody species greater than three (3) inches in diameter from the designated grassland areas, from the 60-foot levee buffer zone, and from the 100-foot hedgerow spacing for the low shrub community.

TWENTY-NINE: The permittee shall remove all elderberry plants (Sambucus species) from the 60-

foot levee buffer zone prior to the stems reaching one (1) inch in diameter at ground level.

THIRTY: The Central Valley Flood Protection Board may require the clearing and/or pruning of trees planted within the floodway in order to minimize obstruction to floodflows.

THIRTY-ONE: After each period of high water, debris that accumulates at the site shall be completely removed from the floodway.

THIRTY-TWO: Areas where plantings are lost to erosion shall not be replanted.

THIRTY-THREE: The permittee shall restore the project site to the initial as-constructed approved project conditions if the Central Valley Flood Protection Board determines that the project is having a negative impact on flood conveyance and/or flood capacities in the Feather River.

THIRTY-FOUR: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

THIRTY-FIVE: The permittee will be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

THIRTY-SIX: The permittee agrees to incur all costs for compliance with local, state and federal permitting and resolve conflicts between any of the terms and conditions that agencies might impose under the laws and regulations it administers and enforces.

THIRTY-SEVEN: All maintenance and monitoring reports will be provided to DWR’s Sutter Maintenance Yard, Levee District No.1 of Sutter County, and the Central Valley Flood Project Board.

THIRTY-EIGHT: The permittee shall comply with all conditions set forth by DWR's Sutter Maintenance Yard which are attached to this permit as Exhibit B and is incorporated by reference.

THIRTY-NINE: The permittee shall comply with all conditions set forth by Levee District No.1 of Sutter County which are attached to this permit as Exhibit C and is incorporated by reference.

FORTY: The permittee shall comply with all conditions set forth in the letter from the Department of the Army (U.S. Army Corps of Engineers, Sacramento District) dated July XX, 2014, which is attached to this permit as Exhibit D and is incorporated by reference.

FORTY-ONE: Upon completion of the project, the permittee shall submit a final planting plan to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite 256, Sacramento, California 95821.

Exhibit B

State of California

DEPARTMENT OF WATER RESOURCES
CENTRAL VALLEY FLOOD PROTECTION BOARD

California Natural Resources Agency

APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMIT

Application No. _____
(For Office Use Only)

1. Description of proposed work being specific to include all items that will be covered under the issued permit.

The project will plant approximately 17,000 native riparian plants (tree, shrub and herbaceous species) on 150 of 439 acres located on a benched flood plain known as the Abbott Lake Unit of the Feather River Wildlife Area in Sutter County, Ca. See Exhibit 1 (Description of Proposed Work) and Exhibit 2 (Figures and Photos) for more details.

2. Project Location: Feather River WLA, Abbot Lake Unit, Sutter County, in Section 35

Township: 14 (N) (S), Range: 3 (E) (W), M. D. B. & M.

Latitude: _____ Longitude: _____

Stream: _____, Levee: _____ Designated Floodway: _____

APN: _____

3. California Department of Fish and Wildlife (Name of Applicant / Land *Owner*) of 1701 Nimbus Rd. (Address)

Rancho Cordova (City) CA (State) 95670 (Zip Code) 916-358-2900 (Telephone Number)

_____ (E-mail)

4. Jason Holley (Name of Applicant's Representative) of CA Fish and Widlife (Company)

Rancho Cordova (City) CA (State) 95670 (Zip Code) 916-358-2868 (Telephone Number)

jason.holley@wildlife.ca.gov (E-mail)

5. Endorsement of the proposed project from the Local Maintaining Agency (LMA):

We, the Trustees of Dept of Water Resources - Sutter Yard (Name of LMA) approve this plan, subject to the following conditions:

☐ Conditions listed on back of this form ☒ Conditions Attached ☐ No Conditions

Trustee Karen Hull 12/17/13 Date

Trustee _____ Date

Trustee _____ Date

Trustee _____ Date

Conditions for Encroachment Application – Abbot Lake, CFWS – 12/17/13

- 1. Maintenance of the project will be the responsibility of California Fish and Wildlife Service or permittee in perpetuity, in accordance with CVFPB, and USACE requirements.

- 2. No orchard prunings or brush piles will be placed on the levee slope or left in the flood channel. All pruning debris will be the responsibility of the permittee to dispose of prior to the start of flood season.

Exhibit C

State of California | DEPARTMENT OF WATER RESOURCES, CENTRAL VALLEY FLOOD PROTECTION BOARD | California Natural Resources Agency

APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMIT

Application No. _____ (For Office Use Only)

1. Description of proposed work:
The project will plant approximately 17,000 native riparian plants (tree, shrub and herbaceous species) on 150 acres of flood-prone land on the 439-acre Abbott Lake Unit of the Feather River Wildlife Area in Sutter County, California. See Exibit 1 (Description of Proposed Work) and Exibit 2 (Figures and Photographs) for more details.

2. Location: Feather River WA, Abbot Lake, Sutter County, in Section 35 , Township: 14 (N) (S), Range 3 (E) (W), M. D. B. & M.

3. California Department of Fish and Wildlife (Name of Applicant) of 1701 Nimbus Rd. (Address)

Rancho Cordova (City) | CA (State) | 95670 (Zip Code) | (916) 358-2900 (Telephone Number)

(916) 358-2912 (Fax Number)

4. Endorsement: (of Reclamation District)
We, the Trustees of Levee District 1, Sutter County (Name and District Number)

approve this plan, subject to the following conditions:

☐ Conditions listed on back of this form ☒ Conditions Attached ☐ No Conditions

Trustee 8/12/13 Date | Trustee Date

8/12/13

5. Names and addresses of adjacent property owners sharing a common boundary with the land upon which the contents of this application apply. If add ional space is required, list names and addresses on back of the application form or an attached sheet.

Name	Address	Zip Code
Billy Bains	4247 Fortuna Street, Yuba City, CA	95993
Sierra Gold Nursery	5320 Garden Highway, Yuba City, CA	95991

Levee District No. 1 has the following conditions to be included on the Central Valley Flood Protection Board Encroachment Permit for the Department of Fish and Wildlife Abbott Lake habitat planting project. The conditions below are the minimum conditions:

1. All improvements endorsed by this permit shall be in accordance with the submitted drawings. The improvement plans shall include an acknowledgement title block on each sheet for Levee District No. 1 signature. No further improvements, other than approved by this permit, shall be done in the area without prior endorsement of Levee District No. 1;

2. The proposed project shall not increase, as determined by the U.S. Corps of Engineers and the California Central Valley Flood Protection Board, the 1-in-100 and 1-in-200 water surface elevation or the velocity on the east or west bank of the Feather River. A copy of the hydraulic report and computer modeling (HEC –RAS) approved by SBFCA, USACE, and CVFPB shall be provided to Levee District No. 1 prior to construction;

3. The encroachment permit and license agreement shall include a provision that the permittee shall be required to remove or alter all or any part of the herein permitted project if removal or alteration is necessary as part of or in conjunction with any present or future flood control plan or project, or if damaged by any cause. If the permittee or successor does not comply, Levee District No. 1, SBFCA, USACE, and/or the CVFPB may remove or modify the herein permitted project at the permittee's or successor's sole cost and expense;

4. The permitted/licensed encroachment(s) shall not interfere with operation and maintenance of the flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation and maintenance of the flood control project to interfere, the permittee shall be required, at permittee's or successor's sole cost and expense, to modify or remove the permitted encroachment(s).

5. If the project or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project, at the permittee's or successor's sole cost and expense.

6. The California Department of Fish and Wildlife shall indemnify Levee District No. 1 from any and all liability associated with the endorsement of the project;

7. Grading or Tree/Shrub Plantings shall be designed not to direct water towards the existing levee or the diversion (training) levees. Grading or plantings shall not affect the hydraulic characteristics of the river in a negative manner;

8. Appropriate operation and maintenance shall be performed by the project owners to prevent any adverse impacts on the floodway and levee systems. A Vegetation Management Plan (VPM) shall be provided to Levee District No. 1 for review and approval. No work shall occur until approval of VMP by Levee District No. 1, SBFCA, CVFPB, and USACE;

9. A set of As-Built Mylar plans shall be provided to Levee District No. 1 upon completion of the work;

10. A copy of the Board approved Central Valley Flood Protection Board Permit shall be provided to Levee District No. 1 prior to any work;

11. Levee District No. 1 shall be notified five (5) working days prior to any construction activities;

12. Levee District No. 1 shall be notified five (5) working days prior to the Central Valley Flood Protection Board meeting which shall include approval of the encroachment permit.

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

REPLY TO ATTENTION OF

Flood Protection and Navigation Section (18882)

Leslie M. Gallagher, Acting Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Ms. Gallagher:

We have reviewed a permit application by the California Department of Fish and Wildlife (application number 18882). These plans include removing invasive vegetation from 96 acres and planting approximately 19,411 plants to include riparian shrubland, low shrubland, riparian woodland and grassland on 150 acres (South Field) of the 439 acre Abbot Lake Unit of the Feather River Wildlife Area on the right (west) overflow bank of the Feather River near River Mile 20. The project is located approximately 7 miles south of Yuba City and 1.5 miles east from the intersection of Highway 99 and Obanion Road, at 39.0275°N 121.6049°W NAD83, Sutter County, California.

The District Engineer has no objection to approval of this application by your Board from a flood control standpoint, subject to the following conditions:

a. That the proposed work shall not be performed during the flood season of November 1 to April 15, unless otherwise approved in writing by your Board.

b. That an operation and maintenance plan shall be developed and provided to the Central Valley Flood Protection Board, prior to planting, for approval (with a copy to USACE). The plan shall address how the proposed plantings will be maintained and will not impact the hydraulic conditions of the flood risk management project.

c. That the applicant shall remove all buildup of debris or underbrush from the plantings, outside the limits of the project right-of-way, prior to the beginning of the flood season, November 1, and after each high water event.

d. That the proposed work shall not interfere with the integrity or hydraulic capacity of the flood risk management project; easement access; or maintenance, inspection, and flood fighting procedures.

e. That the sponsor shall ensure an effective rodent control program is in place.

f. That the proposed work shall not change the streamflow velocity in such a way that might cause damage to the existing waterside levee slope or reduce the channel flow velocity.

g. That the removed invasive vegetation shall be properly disposed of by either complete burning or complete removal outside the limits of the project right-of-way.

h. That the proposed plantings shall be located at least 15 feet from the waterside levee toe.

Based upon the information provided, no Section 10 or Section 404 permit is needed.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite 200, Sacramento, CA, 95821.

Sincerely,

Rick L. Poeppelman, P.E.
Chief, Engineering Division

Attachment D

PROJECT PLANS FOR CONSTRUCTION OF
ABBOTT LAKE RESTORATION PROJECT
FEATHER RIVER WILDLIFE AREA

PROJECT OVERVIEW

INDEX

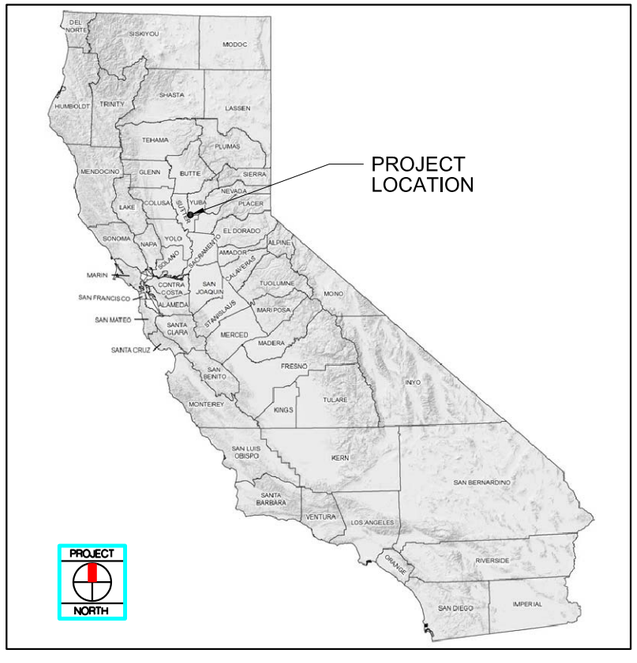
PREPARED FOR:

California Department of Fish and Wildlife
1701 Nimbus Road
Rancho Cordova, CA 95670
(916) 874-7606
Contact: Jason Holley,
North Central Region-Wildlife Program Supervisor

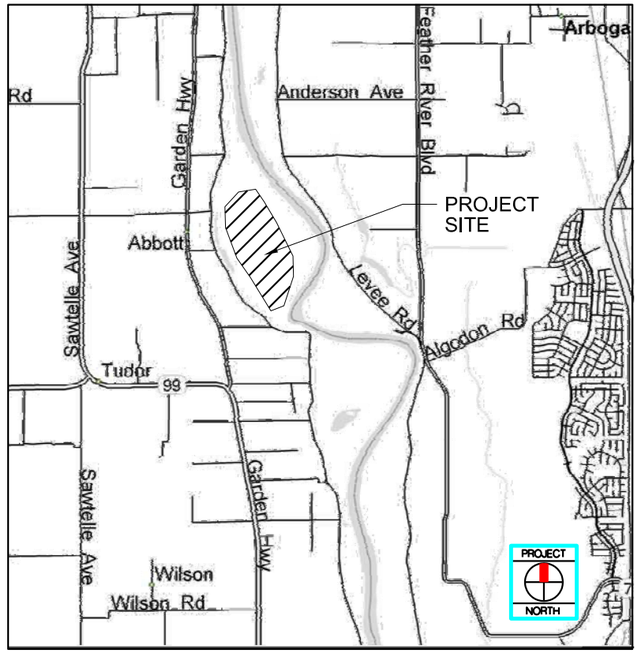
Levee District 1
250 Second Street
Yuba City, CA 95991

Central Valley Flood Protection Board
3310 El Camino Avenue
Room 151
Sacramento, CA 95821

VICINITY MAP



LOCATION MAP



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1701 Nimbus Road
Rancho Cordova, CA 95670

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

ABBOTT LAKE RESTORATION
Sutter County, California

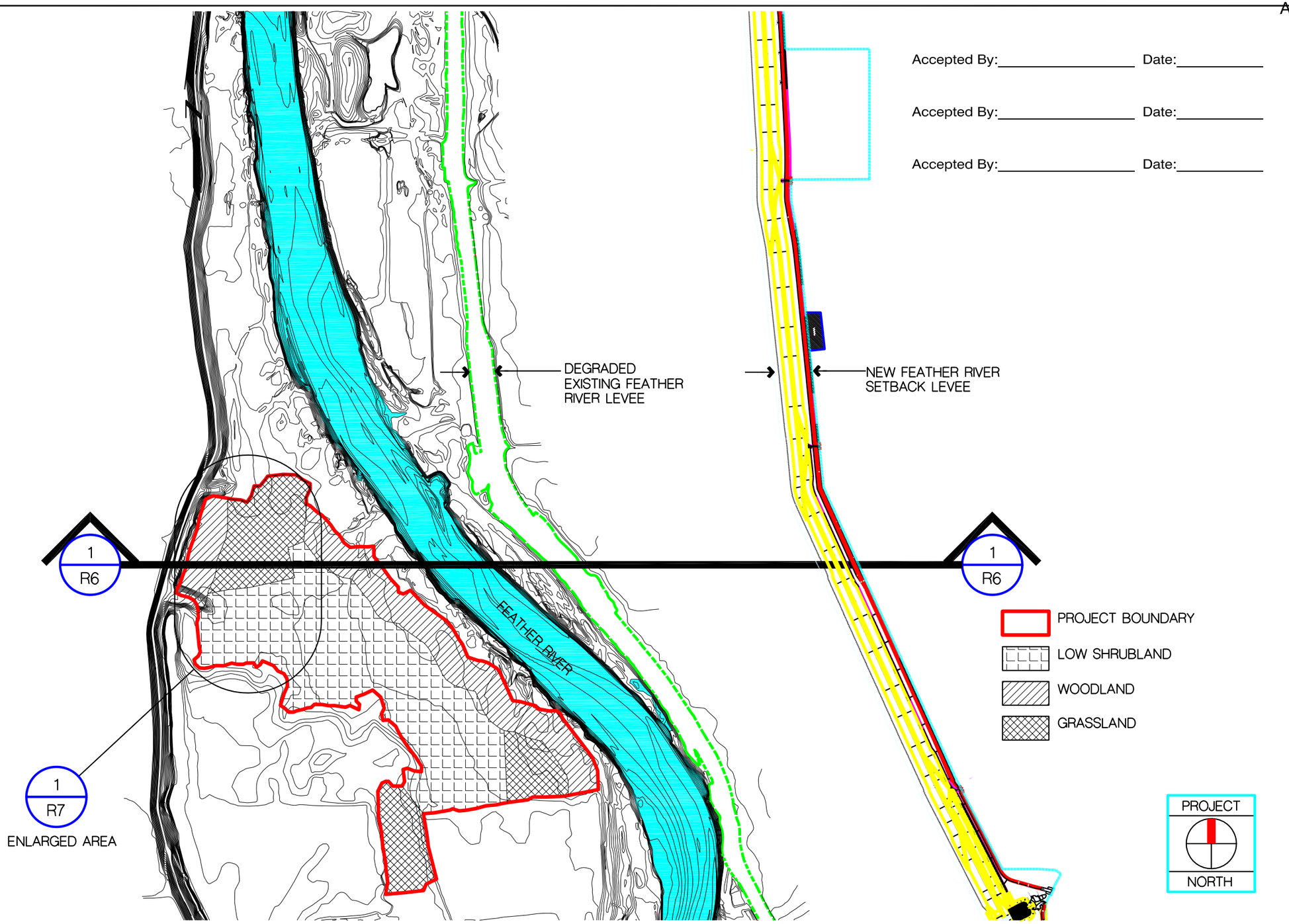
COVER SHEET

FIGURE

L1

DATE: 07-03-14

Attachment D



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ABBOTT LAKE PLANTING AREA 1

GRAPHIC SCALE: 1" = 1000'-0"

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ABBOTT LAKE RESTORATION
Sutter County, California

PLANTING AREA PLAN

FIGURE

L2

DATE: 07-03-14

Plants

Symbol	Treatment	Details	Key	Botanical Name	Common Name	Plant Size	Quantity	Plant Spacing
	Low Shrubland [1]	SHEETS R9A-B	BU	*Cephalanthus occidentalis*	Buttonbush	Deepot	570	10' x 20' Hedgerows
			BB	*Rubus ursinus Chain. & Schldl.*	California blackberry	Deepot	2,542	10' x 20' Hedgerows
			CB	*Baccharis pilularis DC.*	Coyote bush	Deepot	1,593	10' x 20' Hedgerows
			PI	*Aristolochia californica*	Dutchman's pipevine	Deepot	570	10' x 20' Hedgerows
			EB	*Sambucus mexicanas*	Elderberry	Deepot	760	10' x 20' Hedgerows
			MF	*Baccharis salicifolia*	Mule fat	Cutting	380	10' x 20' Hedgerows
			OK	*Quercus lobata Nee*	Valley oak	Acorn	235	10' x 20' Hedgerows
			RO	*Rosa californica Cham. & Schldl.*	Wild rose	Deepot	2,185	10' x 20' Hedgerows
			AW	*Salix lasiolepis Benth.*	Arroyo willow	Cutting	665	10' x 20' Hedgerows
	Woodland [1]	SHEETS R8A-E	BB	*Acer negundo L.*	Box elder	Deepot	788	10' x 20'
			BU	*Cephalanthus occidentalis*	Buttonbush	Deepot	473	10' x 20'
			BB	*Rubus ursinus Chain. & Schldl.*	California blackberry	Deepot	1,103	10' x 20'
			CB	*Baccharis pilularis DC.*	Coyote bush	Deepot	1,260	10' x 20'
			EB	*Sambucus mexicanas*	Elderberry	Deepot	473	10' x 20'
			CO	*Populus fremontii S.Watson ssp. fremontii*	Fremont cottonwood	Cutting	36	10' x 20'
			MF	*Baccharis salicifolia*	Mule fat	Cutting	315	10' x 20'
			AS	*Fraxinus latifolia Benth*	Oregon ash	Deepot	945	10' x 20'
			OK	*Quercus lobata Nee*	Valley oak	Acorn	36	10' x 20'
			SY	*Platanus racemosa Nutt.*	Western sycamore	Deepot	36	10' x 20'
			RO	*Rosa californica Cham. & Schldl.*	Wild rose	Deepot	1,260	10' x 20'
			AW	*Salix lasiolepis Benth.*	Arroyo willow	Cutting	236	10' x 20'
			BW	*Salix goodingii C.R. Ball*	Gooding's black willow	Cutting	945	10' x 20'
	Grassland			*Elymus triticoides*	Creeping wildrye	Seed	5 lbs/acre	NA
				Elymus glaucus	Blue wildrye	Seed	5 lbs/acre	NA

[1]Ground cover in the Low Shrubland and Woodland will consists of the following herbaceous species:

Botanical Name	Common Name	Plant Size	Quantity
Artemisia douglasiana	Mugwort	Seed	2 lbs/acre
Grindelia camporum	Gumplant	Seed	2 lbs/acre
Heterotheca grandiflora	Telegraph weed	Seed	2 lbs/acre
Carex barbarae	Santa Barbara sedge	Plug	1878*

*6 plugs planted at each Valley oak

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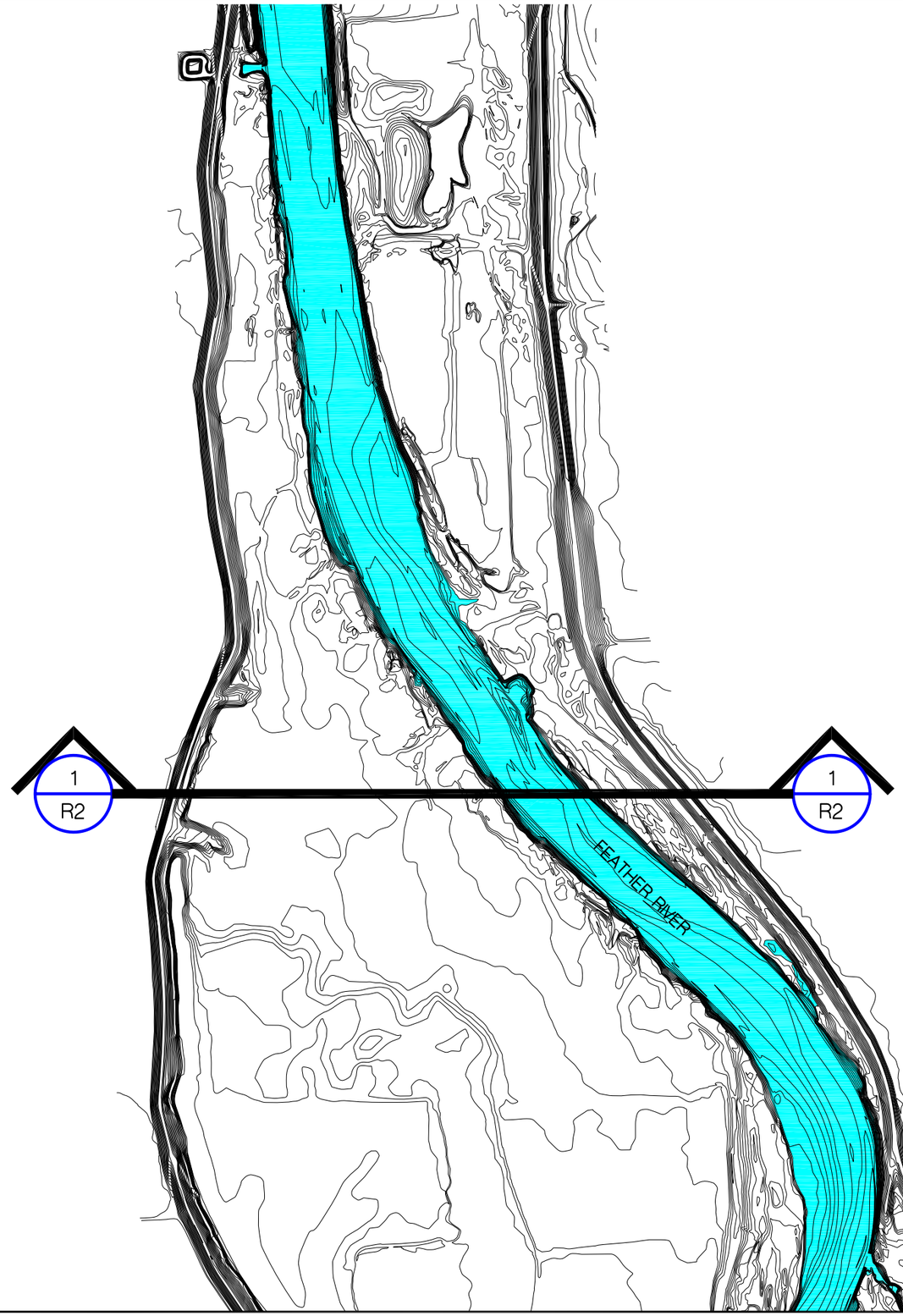
ABBOTT LAKE RESTORATION
Sutter County, California

PLANTING LEGEND

FIGURE
L3
DATE: 07-03-14



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PROJECT
NORTH

PRE-EXISTING ABBOTT LAKE AREA 1

0' 1000' 2000' 4000'

GRAPHIC SCALE: 1" = 1000'-0"

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FEATHER RIVER RESTORATION
Sutter County, California

PRE-EXISTING
ABBOTT LAKE
AREA PLAN

FIGURE

R1

DATE: 07-03-14

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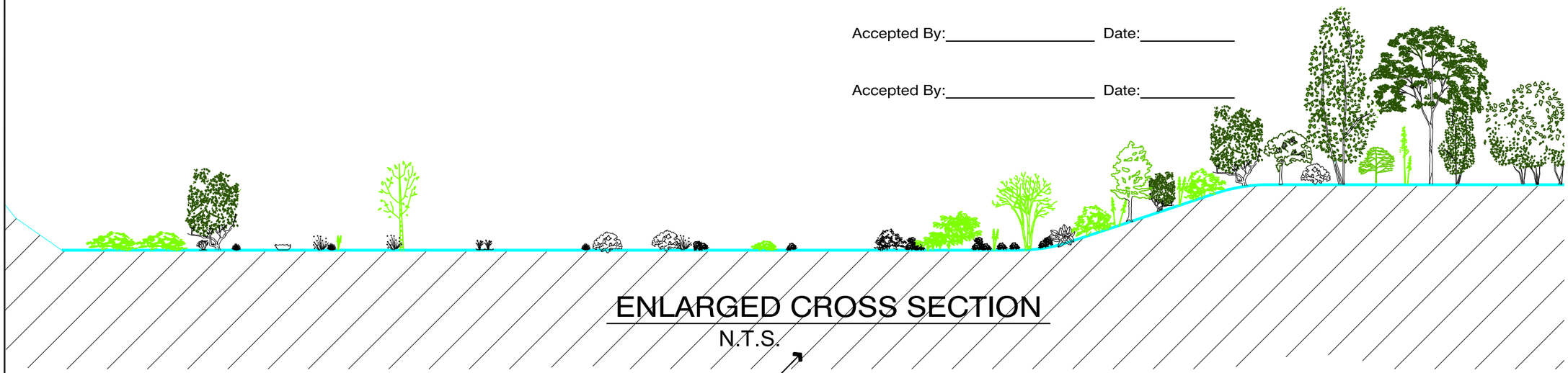
Accepted By:_____ Date:_____



ENLARGED CROSS SECTION

N.T.S.

PRE-EXISTING CROSS SECTION @ ABBOTT LAKE AREA 1

GRAPHIC SCALE: 1" = 500' (HORIZ.) - 1" = 20' (VERT.)

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PRE-EXISTING
ABBOTT LAKE
CROSS SECTION

FIGURE

R2

DATE: 07-03-14

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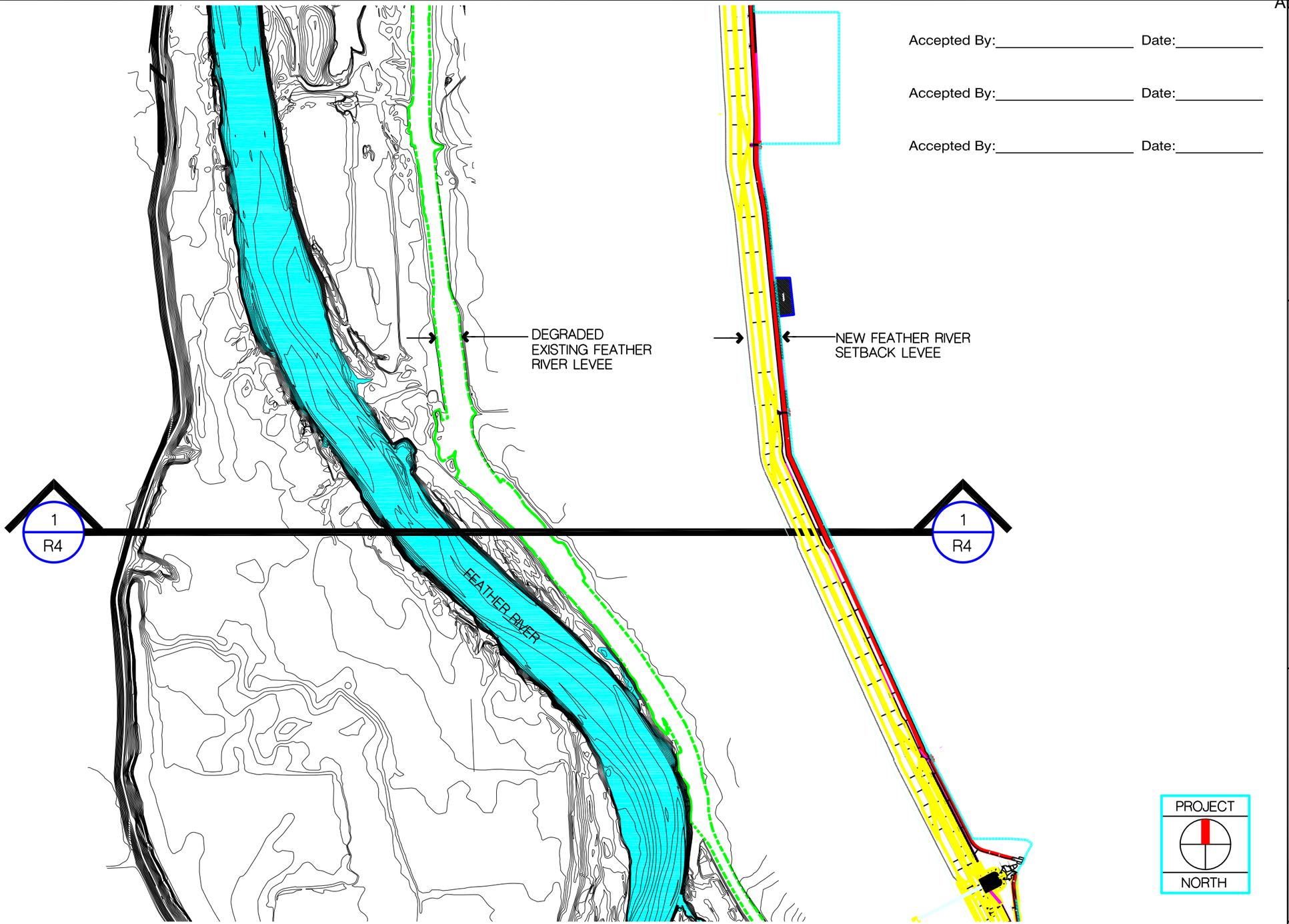

EXISTING ABBOTT LAKE w/ SETBACK LEVEE AREA 1

GRAPHIC SCALE: 1" = 1000'-0"

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CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

FEATHER RIVER RESTORATION
Sutter County, California

EXISTING
ABBOTT LAKE w/ SETBACK
LEVEE AREA PLAN

FIGURE

R3

DATE: 07-03-14

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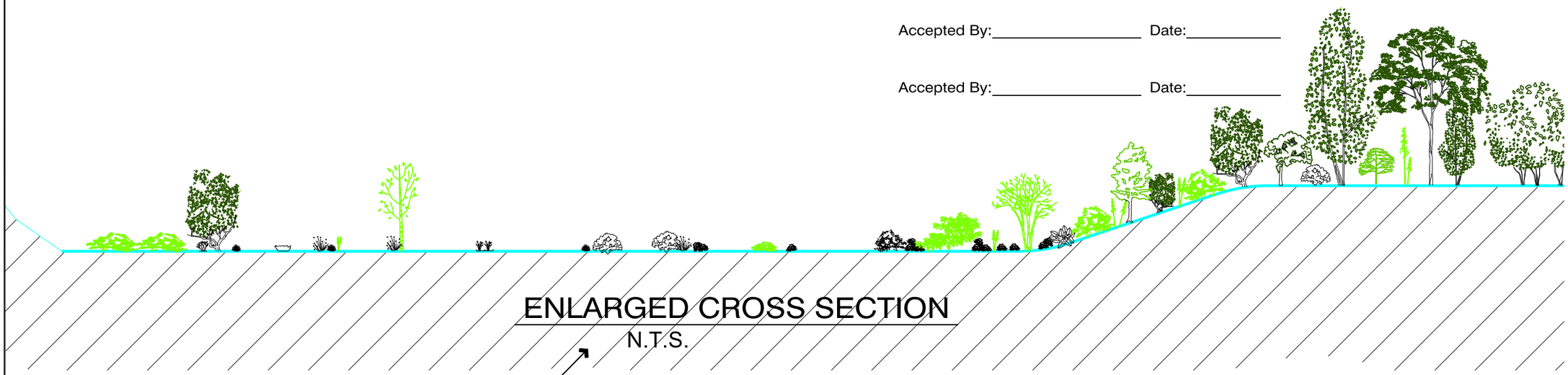

ENLARGED CROSS SECTION

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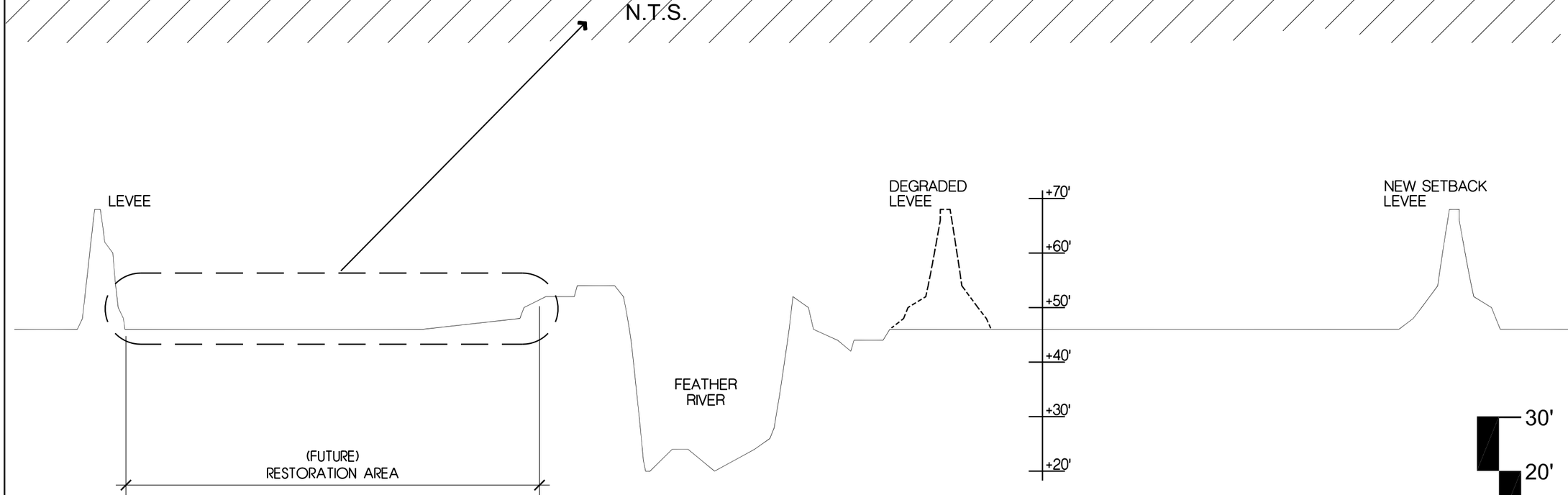

EXISTING

CROSS SECTION @ ABBOTT LAKE w/ SETBACK LEVEE AREA

1

GRAPHIC SCALE: 1" = 500' (HORIZ.) - 1" = 20' (VERT.)

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FEATHER RIVER RESTORATION

Sutter County, California

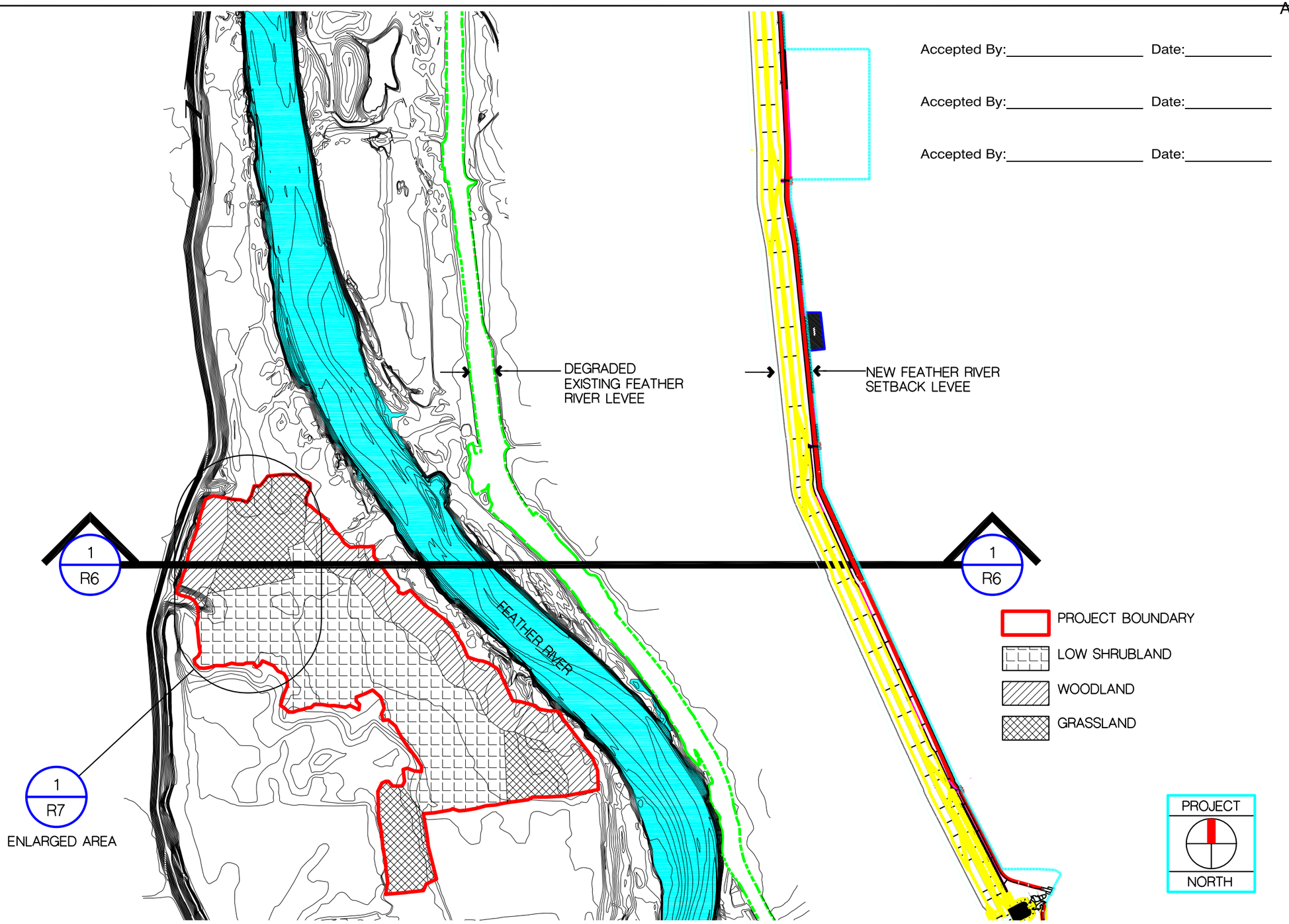
ABBOTT LAKE w/ SETBACK LEVEE CROSS SECTION

FIGURE

R4

DATE: 07-03-14

Attachment D



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FEATHER RIVER RESTORATION
Sutter County, California

ABBOTT LAKE
RESTORATION AREA PLAN

PROJECT CONDITIONS AT ABBOTT LAKE RESTORATION AREA 1

GRAPHIC SCALE: 1" = 1000'-0"

FIGURE

R5

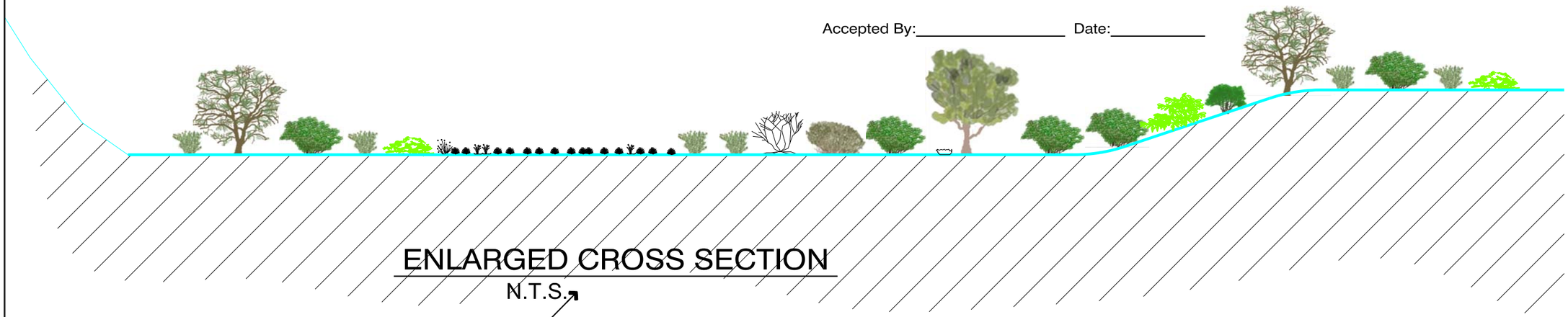
DATE: 07-03-14

Attachment D

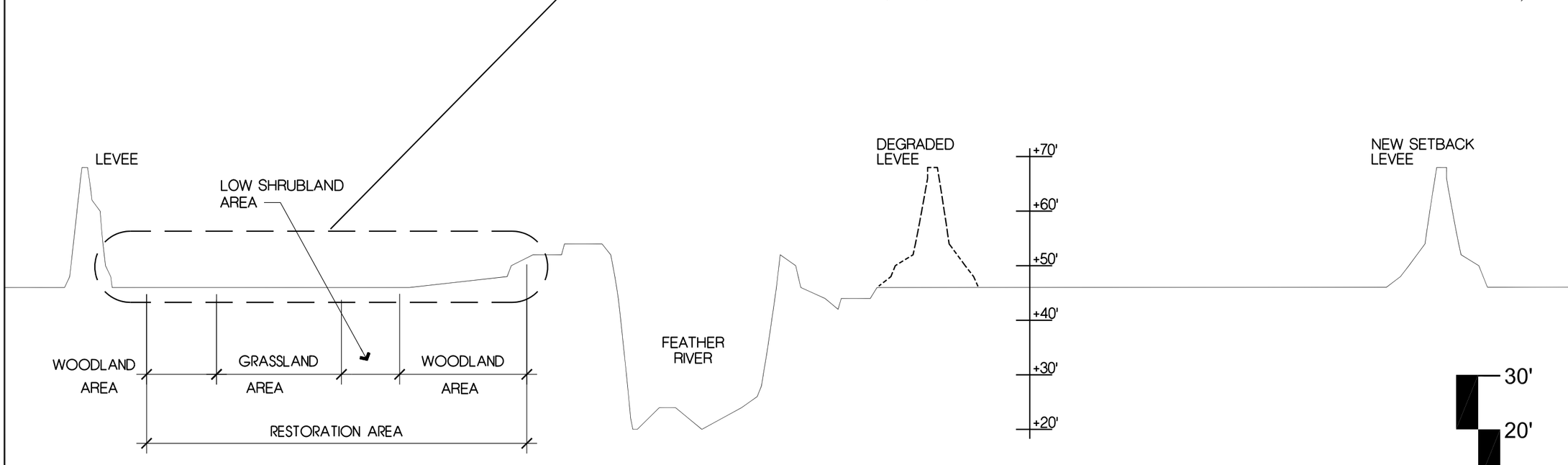
Accepted By:_____ Date:_____

Accepted By:_____ Date:_____

Accepted By:_____ Date:_____



ENLARGED CROSS SECTION
N.T.S.



PROJECT CONDITIONS
CROSS SECTION @ ABBOTT LAKE RESTORATION AREA

1

GRAPHIC SCALE: 1" = 500' (HORIZ.) - 1" = 20' (VERT.)

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FEATHER RIVER RESTORATION
Sutter County, California

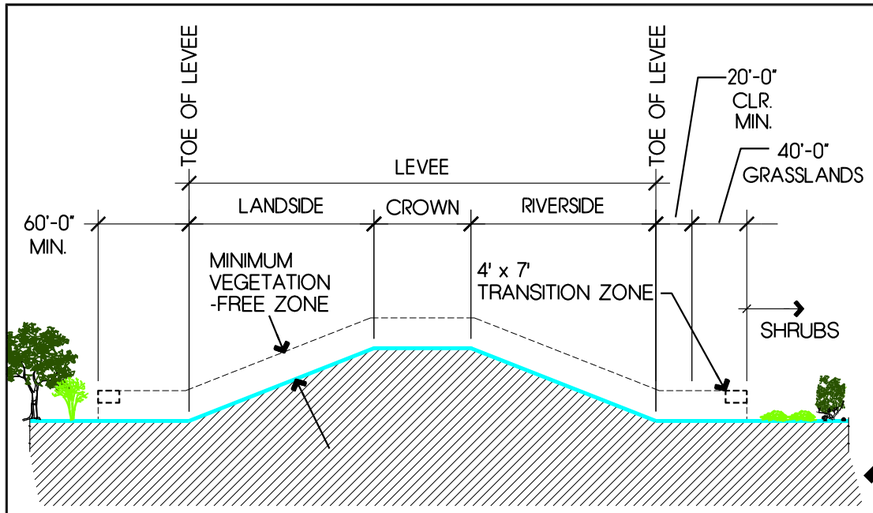
ABBOTT LAKE RESTORATION AREA CROSS SECTION

FIGURE

R6

DATE: 07-03-14

Attachment D



LEVEE CROSS SECTION 2
N.T.S.

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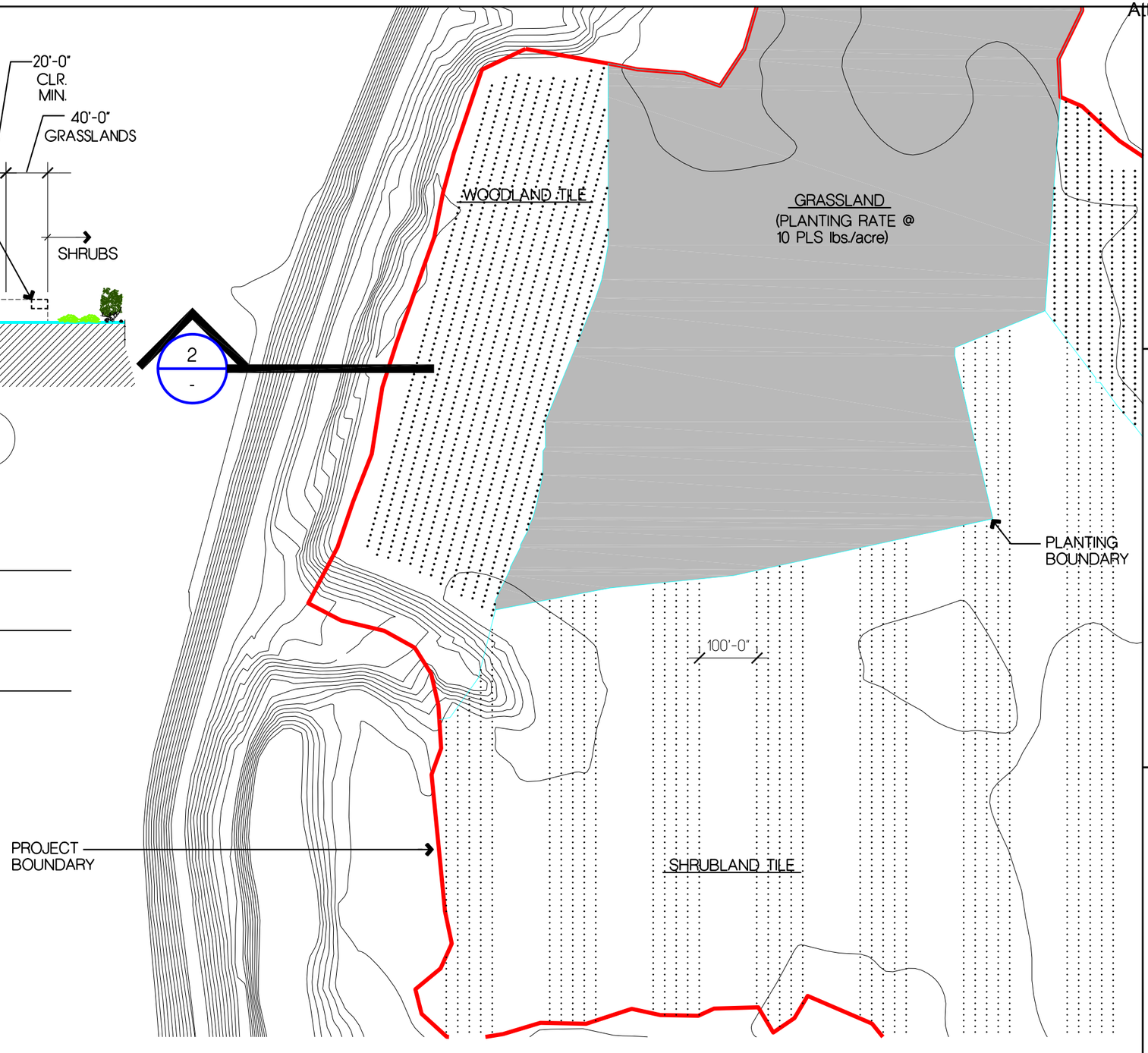
Accepted By:_____ Date:_____

Accepted By:_____ Date:_____



PROJECT
NORTH

ENLARGED AREA PLAN 1

0' 200' 400' 800'

GRAPHIC SCALE: 1" = 200'-0"

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FEATHER RIVER RESTORATION
Sutter County, California

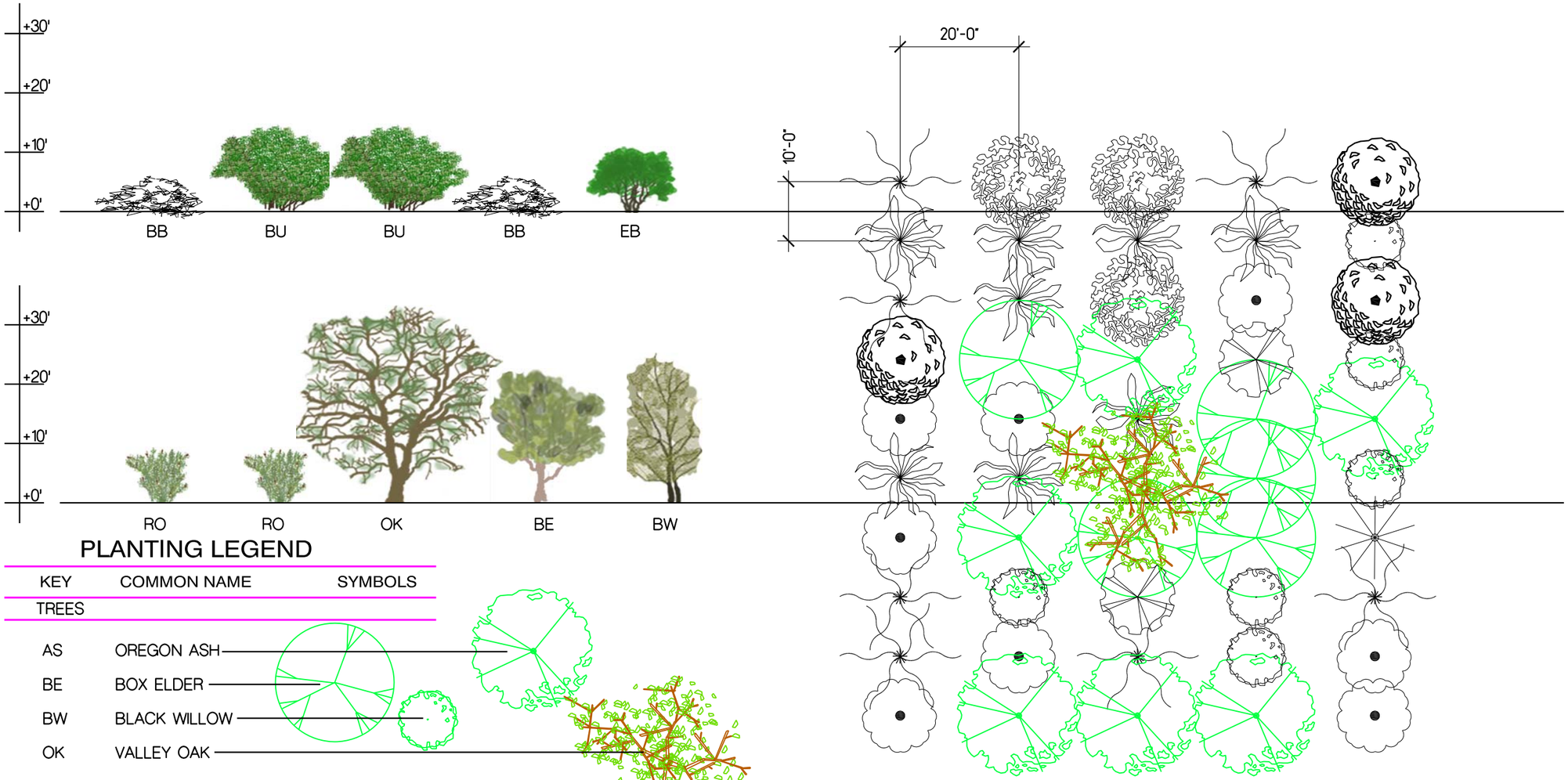
ABBOTT LAKE
ENLARGED AREA PLAN

FIGURE

R7

DATE: 07-03-14

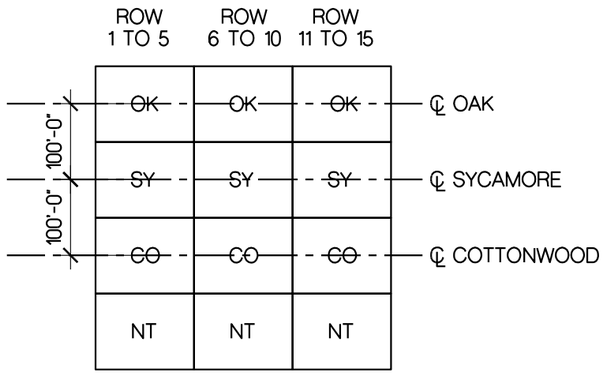
Attachment D



PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
AS	OREGON ASH	
BE	BOX ELDER	
BW	BLACK WILLOW	
OK	VALLEY OAK	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	

WOODLAND TILE - OAK



WOODLAND TILE LAYOUTS
OK = OAK TILE, SY = SYCAMORE TILE
CO = COTTONWOOD TILE, NT = NO LARGE TREE TILE

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Sutter County, California

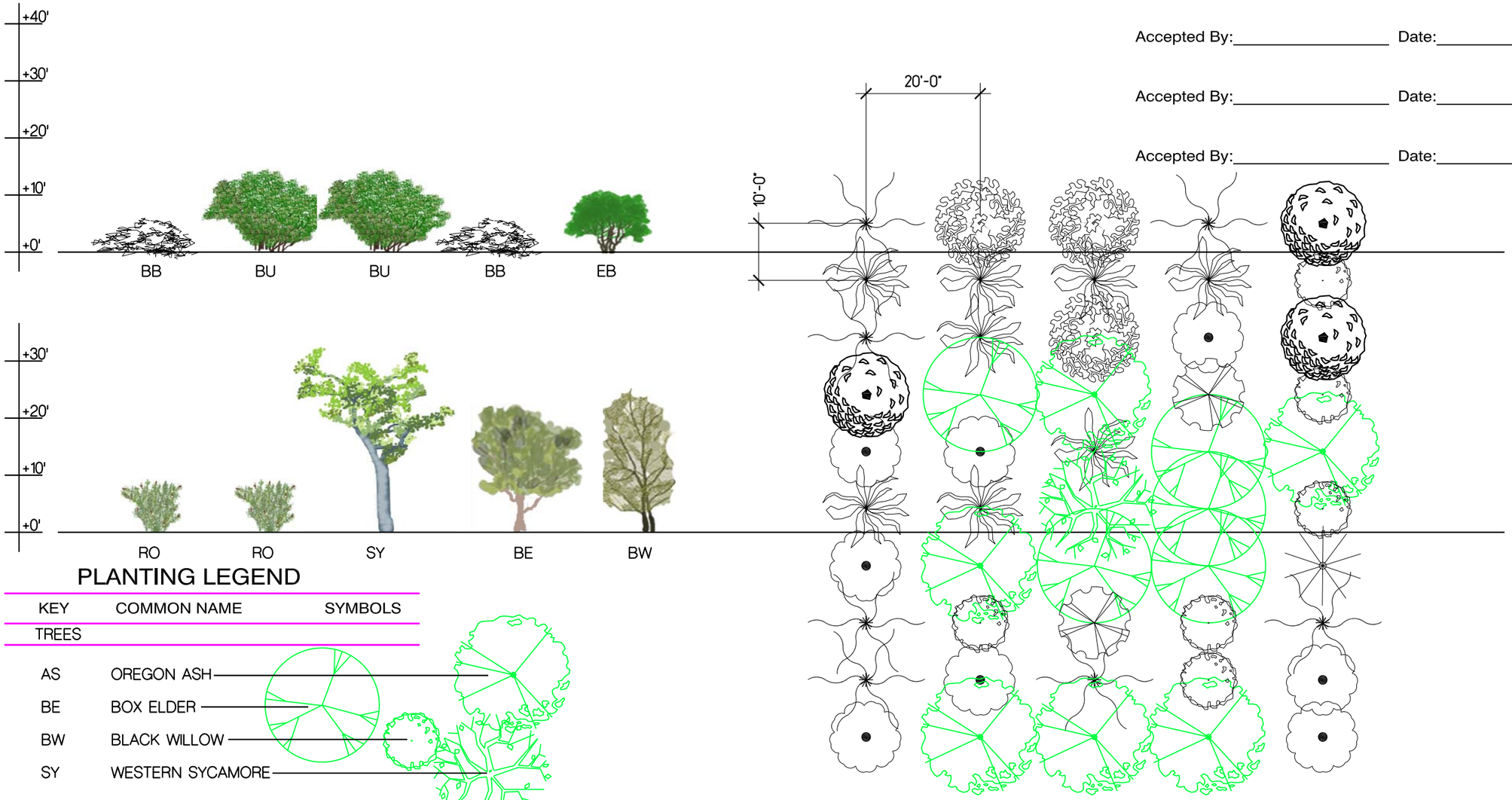
ABBOTT LAKE
WOODLAND PLANTING
TILE LAYOUT -OAK

FIGURE

R8A

DATE: 07-03-14

Attachment D



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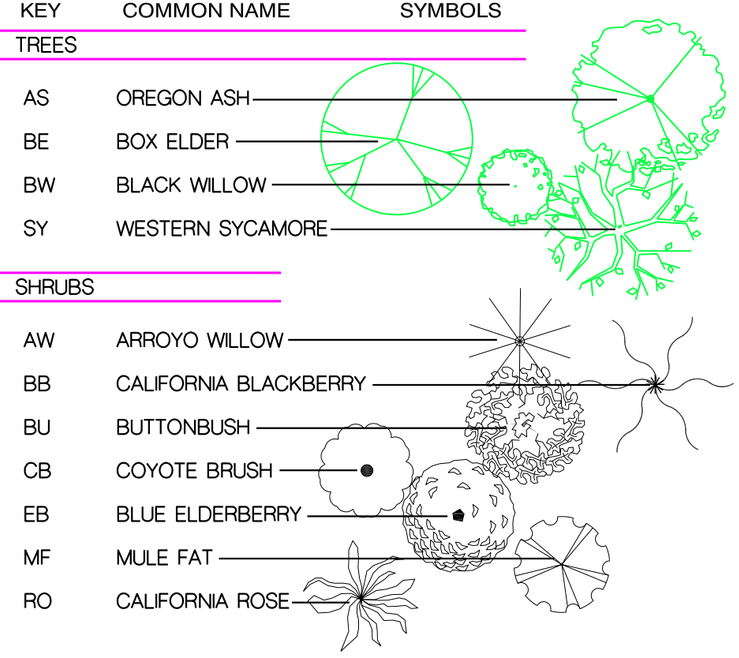
PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
AS	OREGON ASH	
BE	BOX ELDER	
BW	BLACK WILLOW	
SY	WESTERN SYCAMORE	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	



WOODLAND TILE - SYCAMORE

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ABBOTT LAKE
WOODLAND PLANTING
TILE LAYOUT-SYCAMORE

FIGURE

R8B

DATE: 07-03-14

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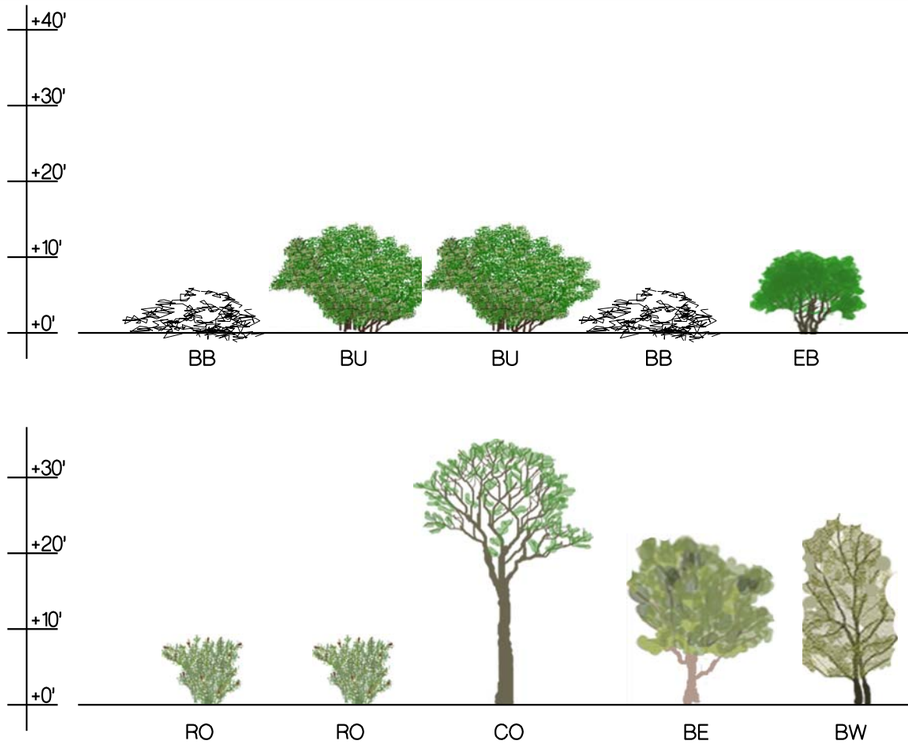

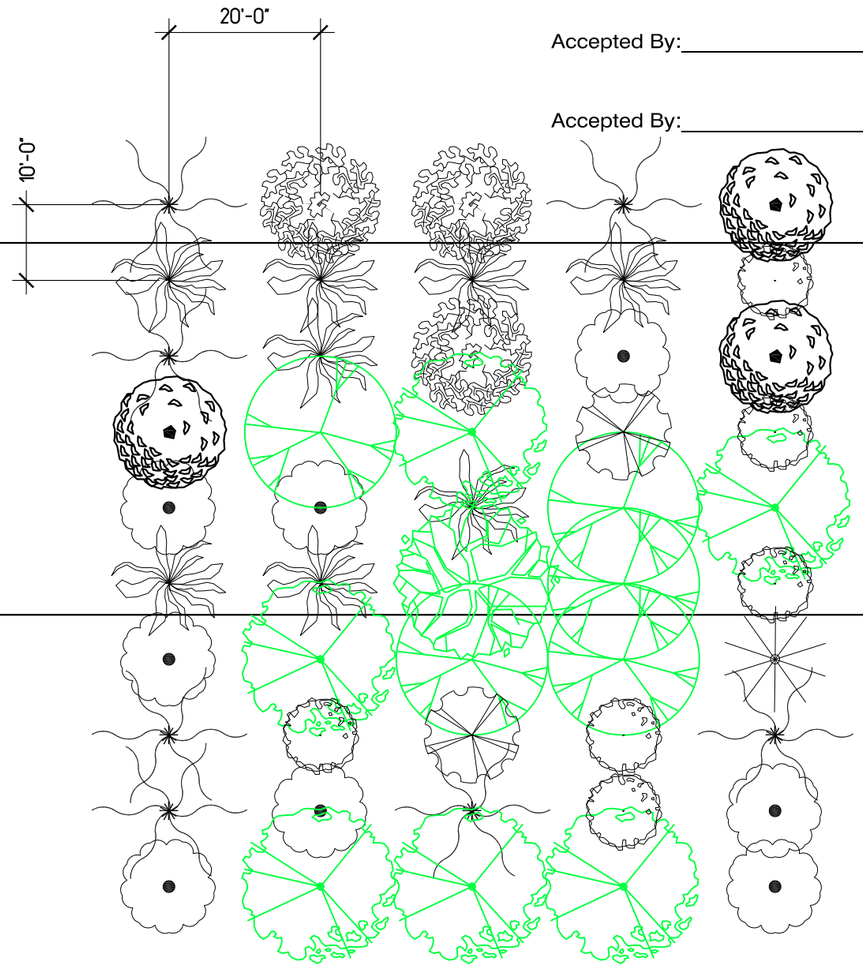

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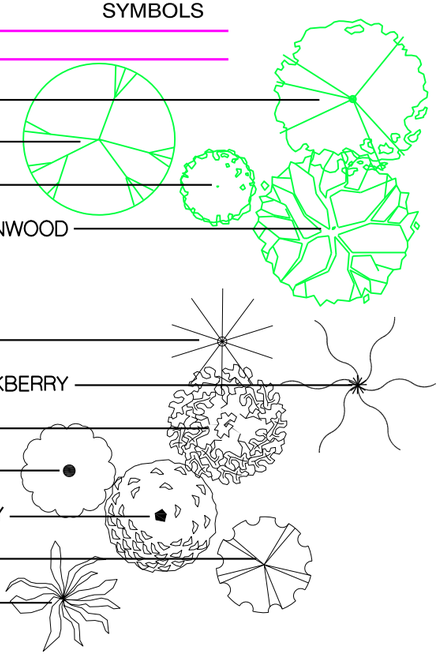
PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
AS	OREGON ASH	
BE	BOX ELDER	
BW	BLACK WILLOW	
CO	FREMONT COTTONWOOD	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	



WOODLAND TILE - COTTONWOOD

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Sutter County, California

ABBOTT LAKE
WOODLAND PLANTING
TILE LAYOUT-COTTONWOOD

FIGURE

R8C

DATE: 07-03-14

Attachment D

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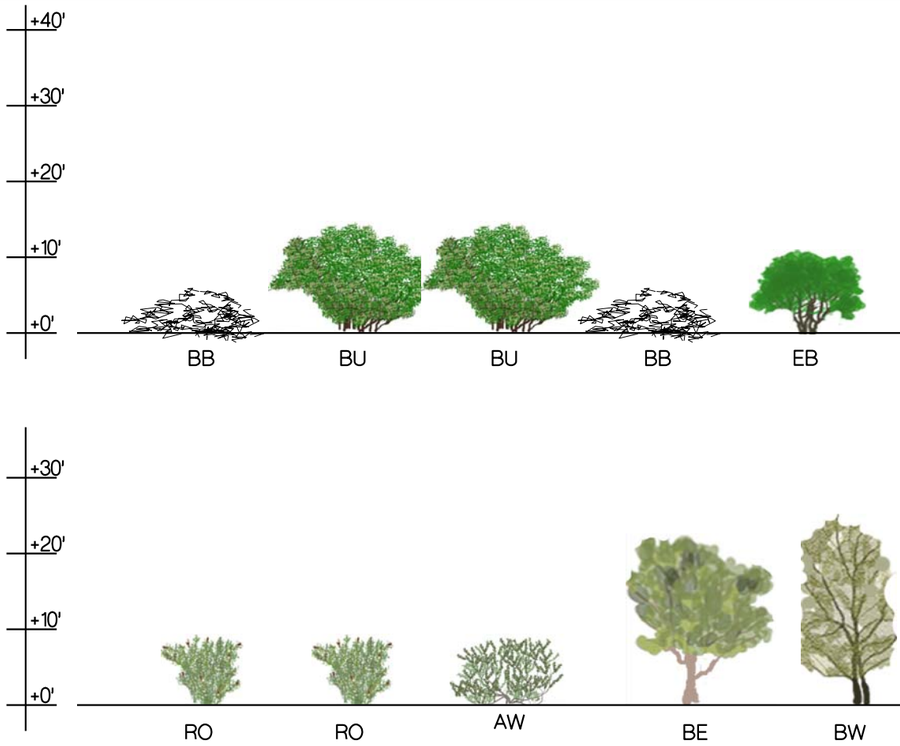
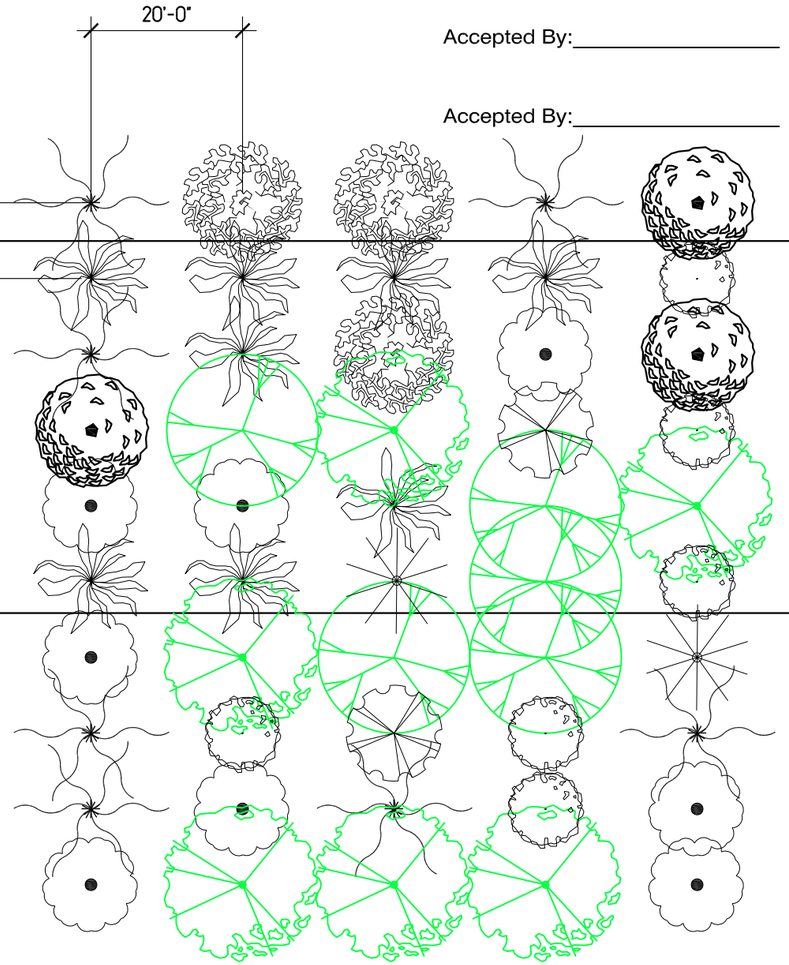
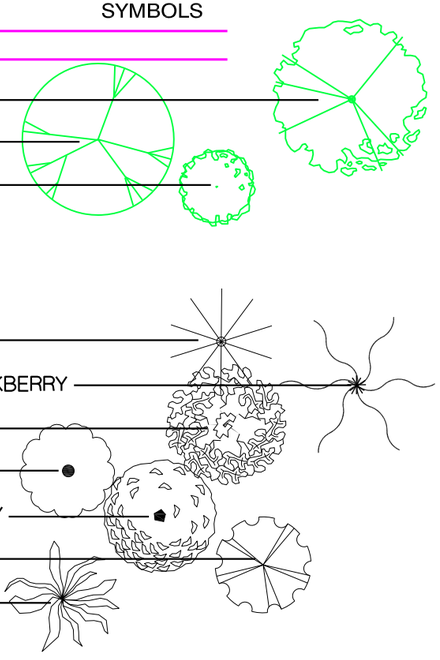
Accepted By:_____ Date:_____





PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
AS	OREGON ASH	
BE	BOX ELDER	
BW	BLACK WILLOW	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	



WOODLAND TILE - NO LARGE TREES

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ABBOTT LAKE
WOODLAND PLANTING
TILE LAYOUT
NO LARGE TREES

FIGURE

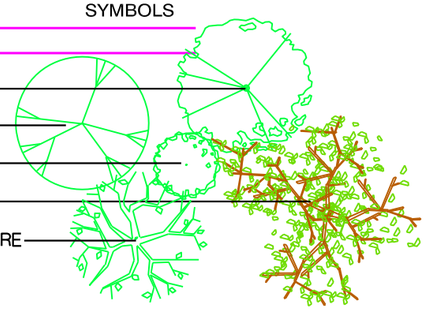
R8D

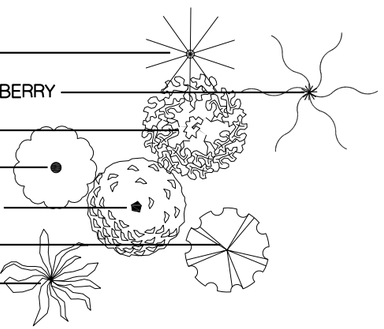
DATE: 07-03-14

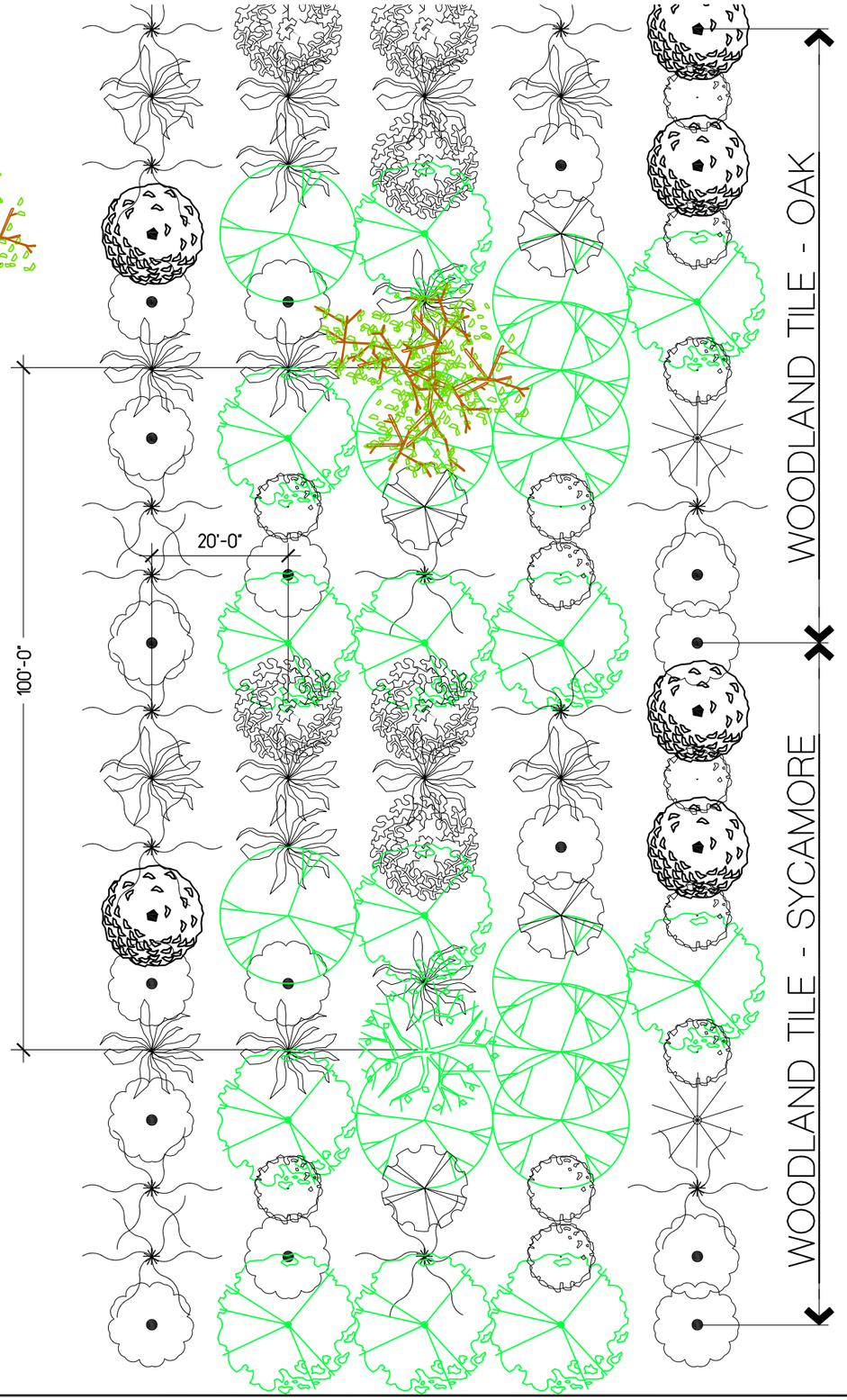
Attachment D

PLANTING LEGEND

KEY	COMMON NAME
TREES	
AS	OREGON ASH
BE	BOX ELDER
BW	BLACK WILLOW
OK	VALLEY OAK
SY	WESTERN SYCAMORE
SHRUBS	
AW	ARROYO WILLOW
BB	CALIFORNIA BLACKBERRY
BU	BUTTONBUSH
CB	COYOTE BRUSH
EB	BLUE ELDERBERRY
MF	MULE FAT
RO	CALIFORNIA ROSE







	ROW 1 TO 5	ROW 6 TO 10	ROW 11 TO 15	
100'-0"	OK	OK	OK	℄ OAK
100'-0"	SY	SY	SY	℄ SYCAMORE
	CO	CO	CO	℄ COTTONWOOD
	NT	NT	NT	

WOODLAND TILE LAYOUTS

OK = OAK TILE, SY = SYCAMORE TILE
CO = COTTONWOOD TILE, NT = NO LARGE TREE TILE

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ABBOTT LAKE
WOODLAND PLANTING
TILE LAYOUTS

FIGURE

R8E

DATE: 07-03-14

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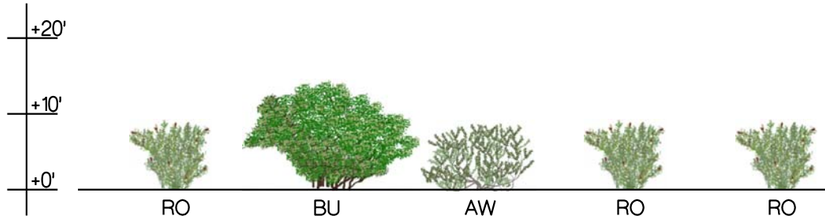
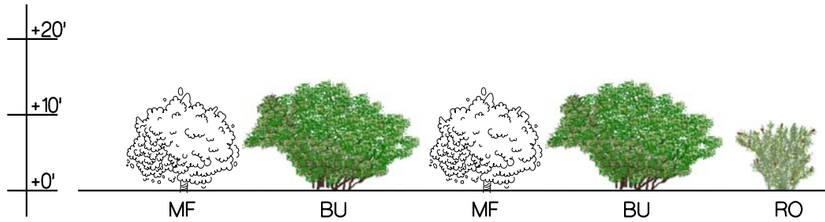
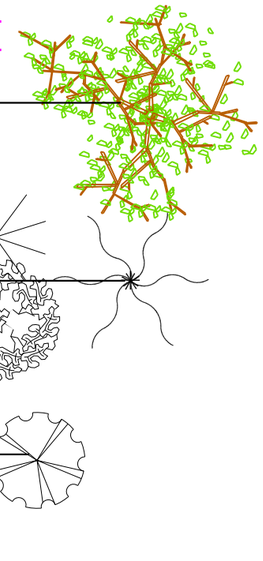
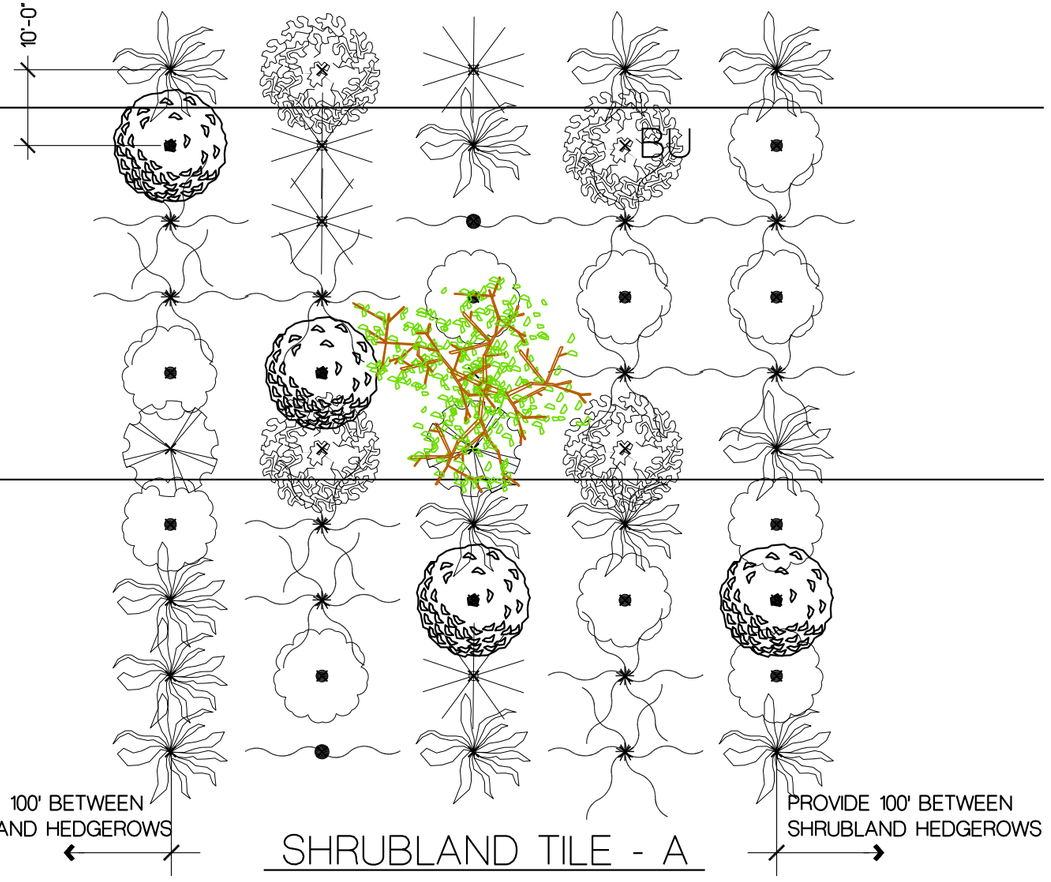




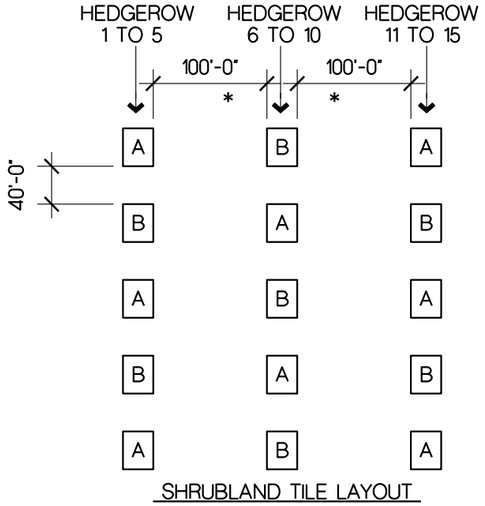
PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
OK	VALLEY OAK	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	
VINES		
PI	DUTCHMAN'S PIPEVINE	





SHRUBLAND TILE - A



SHRUBLAND TILE LAYOUT

* 50/50 MIX MW & GP - BTWN. TILES (@ 4 PLS lbs./acre)

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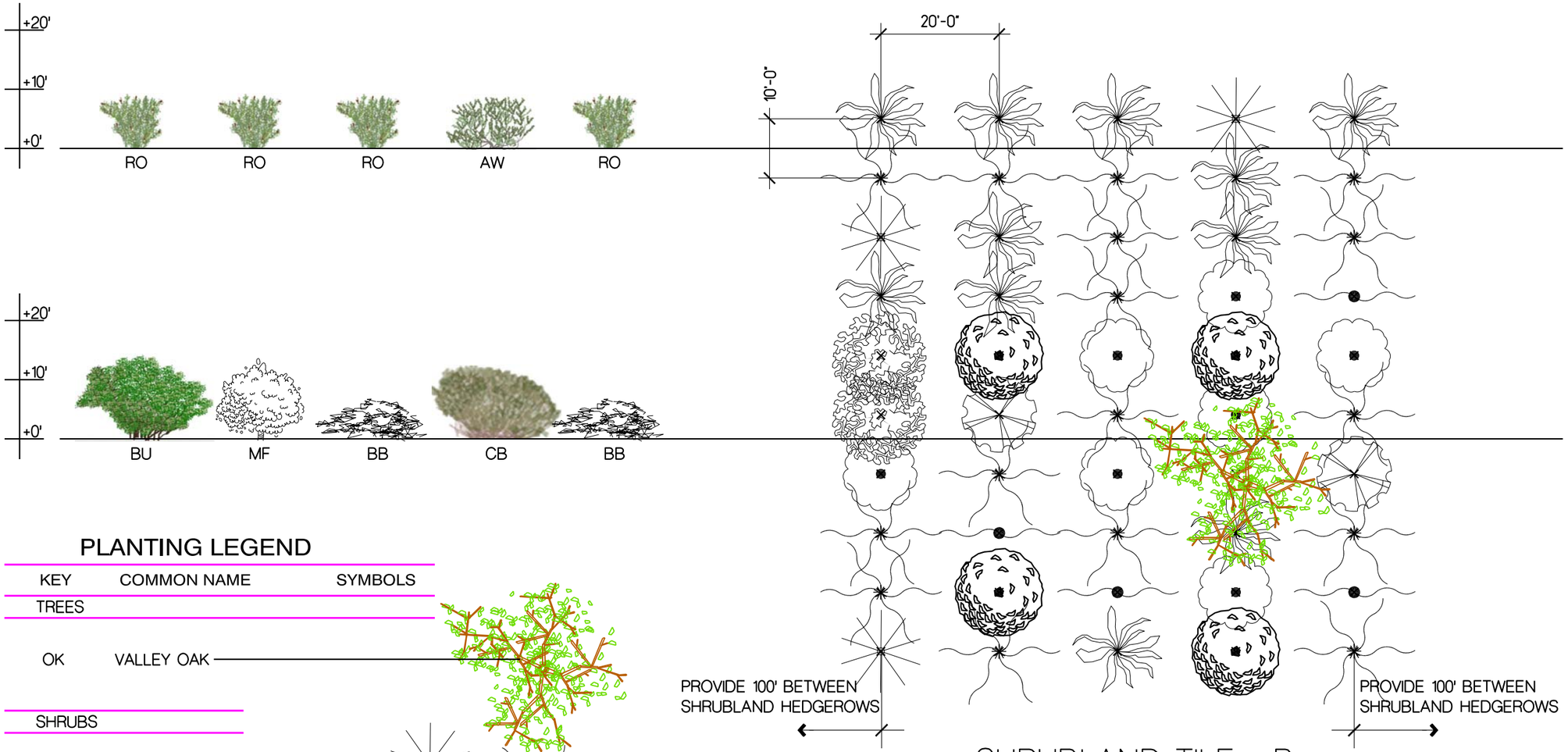
ABBOTT LAKE
SHRUBLAND PLANTING
TILE LAYOUT

FIGURE

R9A

DATE: 07-03-14

Attachment D



SHRUBLAND TILE - B

PLANTING LEGEND

KEY	COMMON NAME	SYMBOLS
TREES		
OK	VALLEY OAK	
SHRUBS		
AW	ARROYO WILLOW	
BB	CALIFORNIA BLACKBERRY	
BU	BUTTONBUSH	
CB	COYOTE BRUSH	
EB	BLUE ELDERBERRY	
MF	MULE FAT	
RO	CALIFORNIA ROSE	
VINES		
PI	DUTCHMAN'S PIPEVINE	

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SHRUBLAND PLANTING
TILE LAYOUT

FIGURE

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VEGETATION MAINTENANCE PLAN – Abbott Lake Restoration Site

This Vegetation Maintenance Plan describes each of the desirable outcomes for native plant vegetation structure in the Abbott Lake restoration area, and provides guidance for California Department of Fish & Wildlife (CDFW) staff members who are responsible for maintaining the channel.

Property Owner Responsible

CDFW will maintain the Abbott Lake restoration site in consultation with River Partners, Levee District 1, and the Department of Water Resources (Sutter Maintenance Yard).

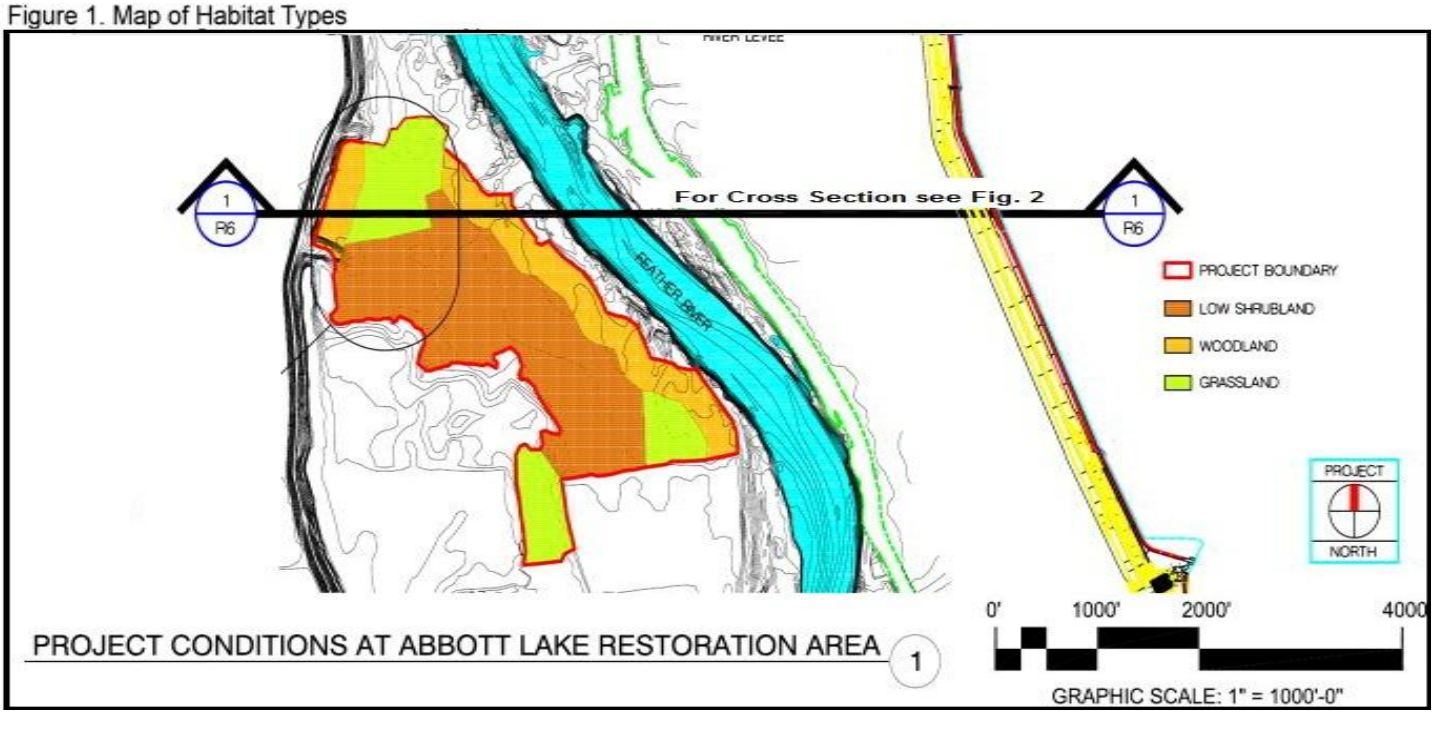
Funding

The budget for this work is built into the existing project grant for the first three years. Thereafter, maintenance allocations will derive from the CDFW regional *Non-staffed wildlife area fund* for maintaining regional wildlife areas and is expected to remain at minimum of $200,000 per year for the foreseeable future.

Self-Maintaining Design and Project Modelling

The Abbott Lake project incorporated many best practice design concepts including planting hedgerows parallel to river flow and an open, savannah-style center allowing for greater natural river flow across the entire site (**Figure 1**). This work compliments at least 17 other restoration or enhancement efforts included in the Department of Water Resources – Division of Flood Management's Lower Feather River Corridor Management Plan (LFRCMP). The LFRCMP calls for reducing existing maintenance schedules throughout the area (e.g. the LFRCMP proposes to cease routine vegetation clearing on a mile-long corridor in the Lake of the Woods Unit of the Feather River Wildlife Area, near the location of the Bear River setback area. This change in maintenance practices would facilitate natural regrowth and maturation of approximately 100 acres of riparian vegetation. The entire Lower Feather River from Marysville to the Sutter Bypass was extensively modelled to measure the hydraulic and hydrological impact from all of these projects combined (full vegetative build-out at all restoration projects was assumed). The model showed these habitat restoration efforts (including Abbott Lake) to pose no significant effect to channel flow, capacity, and levee freeboard. Although the models showed no significant impacts to conveyance or freeboard, CDFW provides the following maintenance plan and monitoring activities for the 150-acre Abbott Lake site:

Figure 1. Map of Habitat Types



Three Year Initial Maintenance Schedule (completed by River Partners)

Various methods will be used to control invasive weed species depending on the phase of the project. Once the woody species are planted, the berms will be sprayed with **nonselective herbicides targeting all weeds.** All habitat types will be subject to weed control throughout the life of the project. The row centers will undergo one season of general weed control before understory species are planted, which will **include mowing** at appropriate stages of weed growth followed by spraying non-selective herbicides. Once understory species are planted, selective herbicides will be used. In the case of this project, the understory consists entirely of broadleaf species. Herbicides such as Poast® (sethoxydim) will be used to target non-native grasses. **Early season mowing** will also take place to help control fast-growing annual grasses and broadleaf species and favor the establishment of the perennial understory. Weed control in the native grasslands will consist of early season mowing to target annuals. Selective herbicide applications, such as 2,4-D, will be used to target broadleaf weeds. **Non-native woody species will be the primary target** in enhanced areas. Removal of species such as Himalayan blackberry, tree-of heaven and black locust trees will be followed up with applications of Garlon® (triclopyr) on resprouts. Telar® (chlorosulfuron), which targets perennial species, will be used to control pepperweed populations that do not occur within any of the planted areas. Giant reed patches will be mowed and sprayed immediately with Round-up® (glyphosate). **Ongoing resprout control** will take place throughout the life of the project.

General Maintenance Schedule

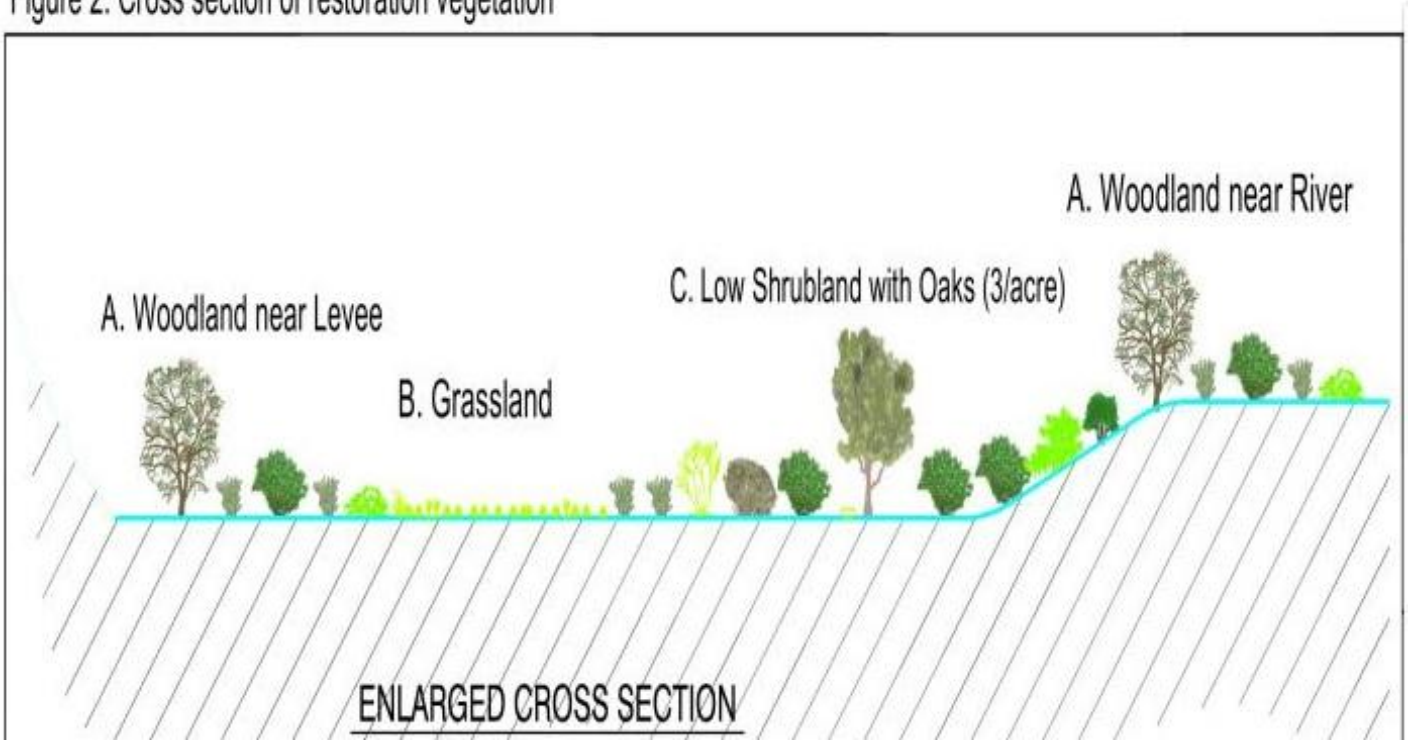
Inspection, Coordination, Weed Treatment, and/or Pruning as Needed

The restoration area will be inspected, at a minimum, in the early Spring and early Fall. Additional inspections will be opportunity-based and include input from Levee District and DWR maintenance yard observations. CDFW will meet at least annually with local partners to discuss site condition, receive feedback, and assess need for treatment. Invasive weed spraying and tree pruning to 48" will be conducted, as needed, by response crews and generally on foot. Invasive weeds will be treated in the Spring and early Summer. Tree pruning activities will take place, as needed, in the Fall or Winter. Monitoring will take place across all habitat types and include photo-stations with annual photo-updates. The accumulation of sedimentation or natural growth of rigid tree species (oak, sycamore, cottonwood, etc.) greater than 3" diameter in the Low Shrubland and/or Grassland will trigger consultation with local maintenance offices. CDFW will be responsible for removing such trees and/or sedimentation when such action is demonstrated as necessary to ensure conveyance. To improve overall habitat condition, Excess Vegetation Permits (involving livestock grazing) and controlled burns will also be pursued as appropriate.

Maintenance Components

The vegetation plantings throughout the project are similar in structure within each of the habitat types. **Figure 2** displays a cross-section of the 3 habitat types within the restoration work (levee on the left, river on the right).

Figure 2. Cross section of restoration vegetation



A. Woodland (prune-able trees**):** a **36-acre** habitat split between two parallel strips (in light orange on **Fig1**); woodland will consist of a mix of native trees and shrubs planted in rows parallel to river flow. Primary maintenance concerns in this area include invasive species and possible pruning needs. The primary invasive plant threats in this habitat type include: Yellow star thistle, Himalaya blackberry, tree of heaven, and black locust tree. Active removal of invasive species and pruning to 48" will commence as needed according to general maintenance schedule (above).

B. Grassland: approximately **35 acres** are split in three main areas across the project (in bright green on **Fig1**); grassland will consist mainly of wild rye grass species and create open habitat sections between wooded areas at the north and south ends of the site. Primary maintenance concerns in this area include invasive plant species. The primary invasive threats in this habitat type include: Yellow star thistle, Himalaya blackberry, and giant reed. Active removal of invasive species will commence as needed according to general maintenance schedule (above).

C. Low Shrubland: This habitat type is our largest (**79 acres**) and consists of mixed shrub species (mainly native blackberry and coyote brush). Our Low Shrubland plant design also calls for dispersed oaks which compliment an open-savannah like habitat complex. Primary maintenance concerns in this area include invasive plant species. The primary invasive threats in this habitat type include: Yellow star thistle, Himalaya blackberry, and giant reed. Active removal of invasive species will commence as needed according to general maintenance schedule (above).

Other Maintenance Considerations throughout the habitat zones: CDFW staff will also monitor, collect information, and take action regarding inappropriate use and vandalism of the area. Trash dumping, marijuana cultivation, squatting, and other general misuse will be reported to our Law Enforcement Division for Game Warden response. Additional maintenance options (such as grazing and controlled burns) will also be considered for these habitat zones using local partner input and CDFW resources. Maintenance and monitoring reports will be available upon request on an annual basis.

For reporting maintenance concerns at this area, please contact the California Department of Fish and Wildlife, North Central Region Wildlife Management Program at 916-358-2882. *All figures contained herein modified from River Partner originals.*

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TECHNICAL REPORT

HYDRAULIC ANALYSIS OF ABBOTT LAKES RESTORATION PROJECT

January 2009

Prepared for

River Partners
580 Vallombrosa Ave
Chico, California 95926

Prepared By

MBK ENGINEERS
2450 Alhambra Boulevard, Second Floor
Sacramento, California 95817

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. PURPOSE

River Partners proposes to perform habitat enhancement on the right bank of the Feather River just upstream of Star Bend. The habitat enhancement project consists of planting approximately 23,000 native riparian plants within the designated floodway. MBK Engineers has performed hydraulic analysis to determine potential impacts to water surface elevation and velocities within the floodway.

2. PROJECT SETTING

The proposed project consists of habitat enhancement of approximately 169 acres within the 439 acre Abbott Lake Unit of the Feather River Wildlife Area. The project is located on the right bank of the Feather River in Sutter County, California (Figure 1). The 169 acre restoration area currently consists of abandoned agricultural lands that have failed to regenerate to riparian forests.

The project site is comprised of two separate fields. A 19 acre field (Field 1) lies along the north end of the unit immediately adjacent to the levee (Figure 2). The second field (Field 2) is to the south of Field 1 located on the wide overbank floodplain of the Feather River (Figure 2). The second field is approximately 150 acres. Both fields are currently fairly open fields with various native and non-native herbaceous species as well as native wood species scattered throughout.

3. ENHANCEMENT PLAN

The proposed enhancement plan consists of planting Fields 1 and 2 with plantings to create a diverse plant community. Five distinct plant communities are proposed. Following is a list of the plant communities and a list of some of species in each:

1. Valley Foothill Riparian Woodland – Arroyo willow, box elder, cottonwood, valley oak, wild rose, and buttonbush.
2. Low Shrub Community – California blackberry, California rose and wild grape, coyote brush, arroyo willow.
3. Riparian Shrubland - Coyote brush, buttonbush, mule fat, deergrass, dogbane, arroyo willow and sandbar willow.
4. Native Grasslands – Blue and creeping wildrye.
5. Herbaceous Understory – Mugwort, gumplant, forb mix.

A detailed description of the plant communities, plant species, and number of plants can be found in Appendix A.

3.1. Planting Spacing and Layout

For Field 1, Riparian Shrubland plant species are proposed to be planted (Figure 3). In Field 2, the Valley Foothill Riparian Woodland would be planted on the outer north and eastern edge of the field (Figure 3). The remaining portions of the field would be planted with the Low Shrub and Native Grassland plant species.

Trees and shrubs will be planted in rows for the Riparian Shrubland in Field 1 and the Valley Foothill Riparian Woodland in Field 2. The row spacing will be 20 feet apart and plants will be planted 10 feet apart in each row. Between the rows, the Herbaceous Understory consisting of Mugwort will be planted to limit the extent of weed invasion.

In Field 2 for the Low Shrub Community, plants will be planted in hedgerows (Figure 4). Each hedgerow consists of five planting rows which are spaced 20 feet apart. The plant spacing within each of the rows is 10 feet apart. Between each of the rows in the hedgerow, Herbaceous Understory will be planted. Field 2 will be comprised of many hedgerows which will be oriented north south and will generally follow flow lines as much as possible. The spacing between the hedgerows will be 100 feet apart and will be planted with Herbaceous Understory. It's anticipated that 50% of Field 2 will consist of the Low Shrub Community and 50% of the area will be Herbaceous Understory.

There are three areas within Field 2 which will be planted with the Native Grassland (Figure 3). Those three areas encompass approximately 28 acres.

4. ANALYSIS

4.1. Methodology and Model Development

The methodology used to determine the hydraulic impacts associated with the proposed project was to develop a base condition model and compare the results with a project condition model. Output from the model simulations was used to determine if there are any impacts to water surface elevation and velocity.

A 2-D hydraulic simulation model was used to calculate water surface elevations and velocities for the base and project conditions. The hydraulic model used was the RMA 2 model developed by MBK Engineers for the basis of design of the Feather River Setback Levee Project currently under construction by the Three Rivers Levee Improvement Authority (TRLIA). The model development, calibration and design simulations are documented in MBK (2008). The model includes the Feather from river mile (RM) 8.0 to RM 28.7. It also includes the Bear River from RM 5.0 to the confluence with the Feather River. The simulations were performed in a steady-state flow condition.

4.2. Base Condition

A base condition assumption was developed for the model simulations since significant geometric changes in the Feather-Yuba River system have occurred or are ongoing. Work on the Abbott Lake restoration project is anticipated to begin in 2009. The hydraulic model was calibrated to hydraulic conditions as of January 1997 therefore it was necessary to update the model to reflect the hydraulic conditions expected at the time of construction of the restoration project. Since January 1997, the Bear River north levee setback has been constructed. In addition, the Feather River east levee setback from RM 17 to 24 was added to the model as it has been authorized by TRLIA and is currently under construction (Figure 1). The Feather River

east levee setback is expected to be completed at the time work begins on the Abbott Lakes restoration project.

Another project under design is the Star Bend setback levee (Figure 1) proposed by Levee District No. 1 (LD1). This project was added to the base condition model as it is anticipated that construction work on the LD 1 setback levee would begin 2009 or 2010.

4.3. Project Condition

The base condition model was then modified to reflect the project condition. To simulate the proposed plantings, the Manning's roughness coefficient in the model mesh was modified to reflect the long term vegetation at each of the fields. Modifications were not made to the field elevations as the proposed planting plan does not include any re-grading of the project site.

A Manning's n value of 0.07 was used in the model for the Riparian Shrubland in Field 1. For Field 2 with the Low Shrub Community, a composite Manning's n value of 0.053 was assigned. The composite value is based on 50% of the area planted with shrubs (n=0.07) and 50% of the area planted with Herbaceous Understory (n=0.035). The Valley Foothill Riparian Woodland areas in Field 2 were simulated using a Manning's n value of 0.08. A Manning's n value of 0.035 was used in Field 2 where Grasslands will be planted. Selection of Manning's n value was based on reference tables in Chow (1959). Figure 5 show the assignment of Manning's n value for the project condition simulations. The Manning's n value for Fields 1 and 2 under the Base Condition range from 0.040 to 0.052, see Figure 6.

4.4. Hydrology

The base and project condition models were simulated using peak flows for the 1-in-100 and 1-in-200 Annual Exceedence Probability (AEP) flood events. The boundary conditions used in the RMA2 model for the 1-in-100 AEP and 1-in-200 AEP are shown in Table 1. Results from the MBK Feather-Yuba HEC-RAS model were used to develop these boundary conditions.

Table 1. Boundary Condition for RMA-2 Model

Boundary Condition Location	1-in-100 AEP	1-in-200 AEP
Feather River at RM 28.7	127,182 cfs	157,704 cfs
Yuba River at RM 1.2	153,937 cfs	195,697 cfs
Bear River at RM 3.95	40,213 cfs	45,723 cfs
Feather River at Nicolaus RM 8	46.7 ft-NGVD	49.0 ft-NGVD

5. RESULTS

Plots and maps were prepared to map the impact areas. Water surface elevation difference was calculated and mapped for the 1-in-100 and 1-in-200 AEP events. The plots were generated by subtracting the base condition water surface elevation from the project condition water surface elevation. Positive values indicate an increase in water surface due to the project and a negative value indicates a decrease in water surface. Figure 7 and 8 shows the water surface impact for the 1-in-100 and 1-in-200 AEP, respectively.

The velocity difference was also mapped for the 1-in-100 and 1-in-200 AEP event. Figure 9 and 10 show the velocity difference for each flood event. As with the water surface difference, positive values indicate an increase in velocity due to the project and a negative value indicates a decrease in velocity.

Velocity contours under the Base Condition for the 1-in-100 and 1-in-200 AEP events are shown in Figures 11 to 12.

The maximum water surface elevation profile along the Feather River east and west levee were plotted versus the top of levee for the 1-in-100 and 1-in-200 AEP events. Figure 13 to 16 plot the maximum water surface elevation for the Base and Project Condition.

6. DISCUSSION

The proposed habitat enhancement project will have a less than significant impact upon the water surface elevation and velocity in the Feather River. Figure 7 and 8 shows only a localized increase in water surface elevation of approximately 0.15 feet for both the 1-in-100 and 1-in-200 AEP events. The water surface impacts dampen out to less than 0.05 feet upstream and downstream of the project area. Plots of the velocity difference (Figure 9 and 10) indicate that there would be no significant increase in velocity for both the 1-in-100 and 1-in-200 AEP event. The maximum increase in velocity is along the east levee of the Feather River and is on the order of 0.5 fps.

Review of Figures 13 to 16 show that for under the proposed project there is greater than 6 feet of freeboard on the east and west levees for the 1-in-100 AEP event and 3 feet of freeboard on the 1-in-200 AEP event. The minimum freeboard requirement in this reach of the Feather River is 3 feet on the 1957 Sacramento River Flood Control Project design flow (300,000 cfs). The 1-in-100 AEP flow simulated in this reach is 281,000 cfs and the 1-in-200 AEP flow is 353,000 cfs. The increase in water surface elevation does not have a significant impact of the freeboard along the east and west levee for the 1-in-100 and 1-in-200 AEP event.

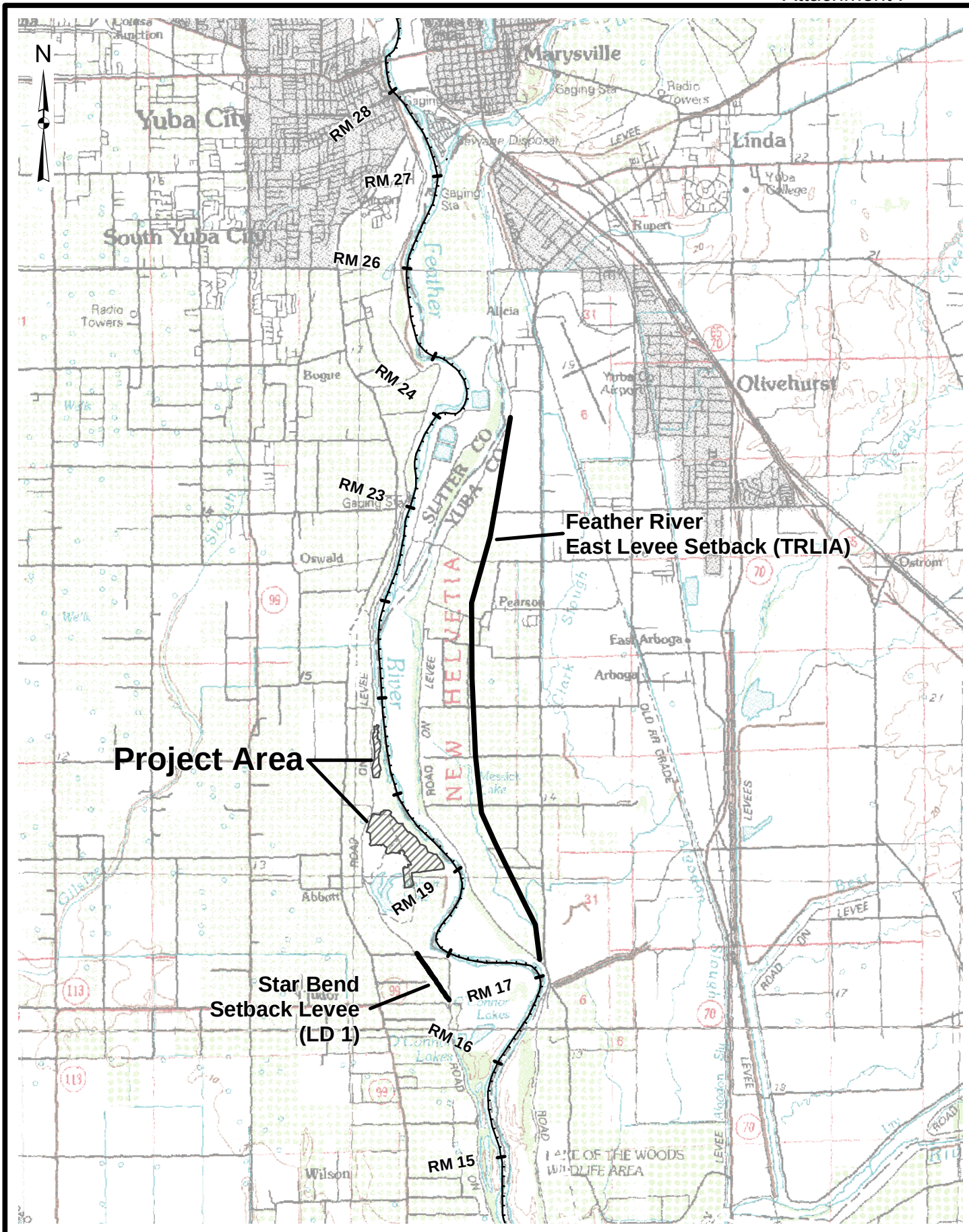
The proposed enhancement project is anticipated to be planted during fall of 2009 with full plant maturity within 5 to 10 years. The construction of the Feather River east setback levee is anticipated to be completed during Fall 2009 and construction of the LD1 setback levee completed in 2010. Based on the simulation results, the water surface and velocity impacts associated are less than significant and would not have a significant hydraulic impact to the water surface elevation, velocity in the Feather River or performance of the Sacramento River Flood Control Project in the vicinity of the project.

7. REFERENCES

Chow, *Open Channel Hydraulics*, McGraw Hill Book Company Inc, 1959.

MBK Engineers, *Hydrologic and Hydraulic Analysis of the Three River's Levee Authority Phase IV Project, Basis of Design for Feather River Setback Levee Project,* January 2008.

FIGURES

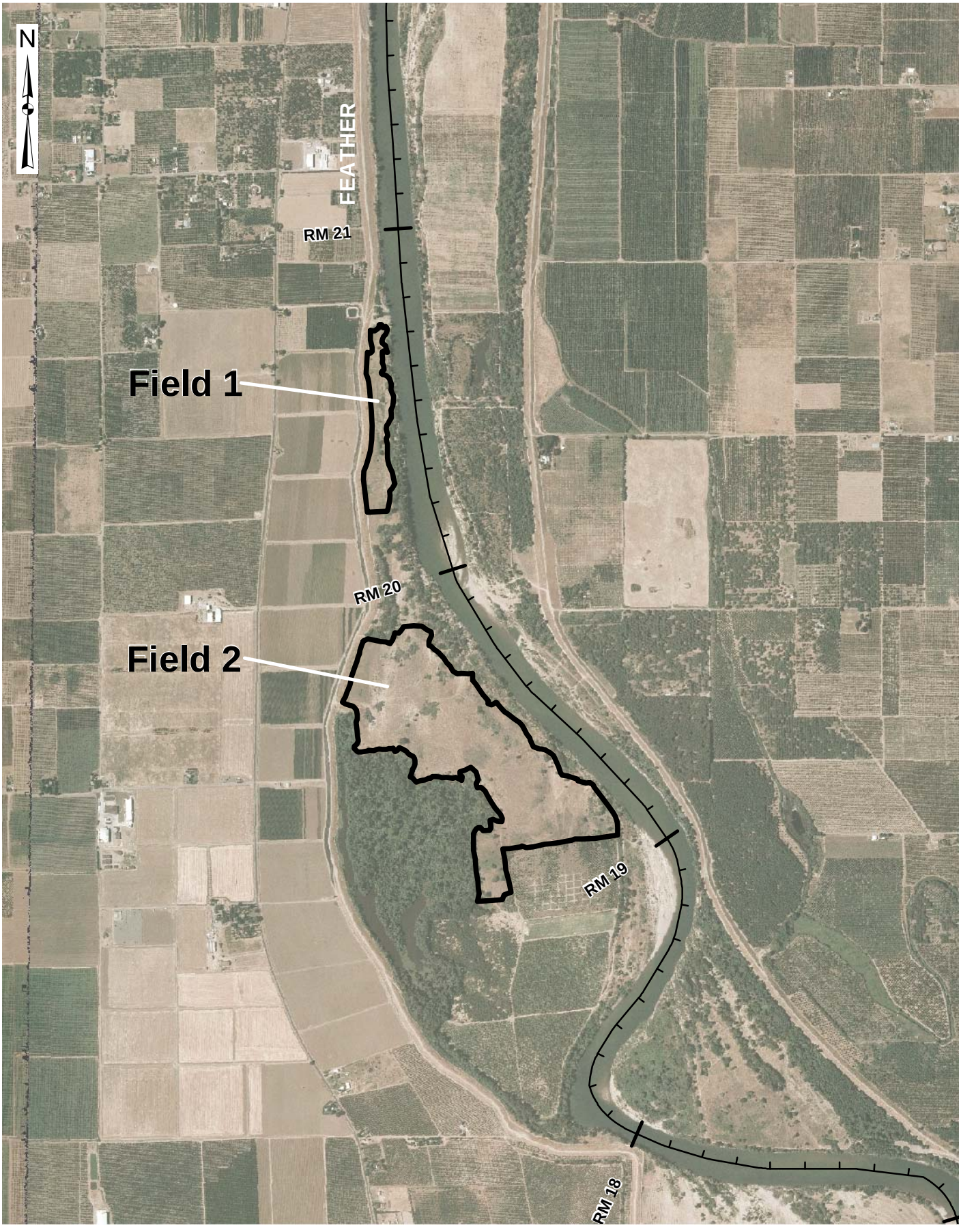


MBK ENGINEERS

Vicinity Map

0 3,500 7,000
Scale in Feet

Figure 1



MBK ENGINEERS

Site Map

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Scale in Feet

Figure 2

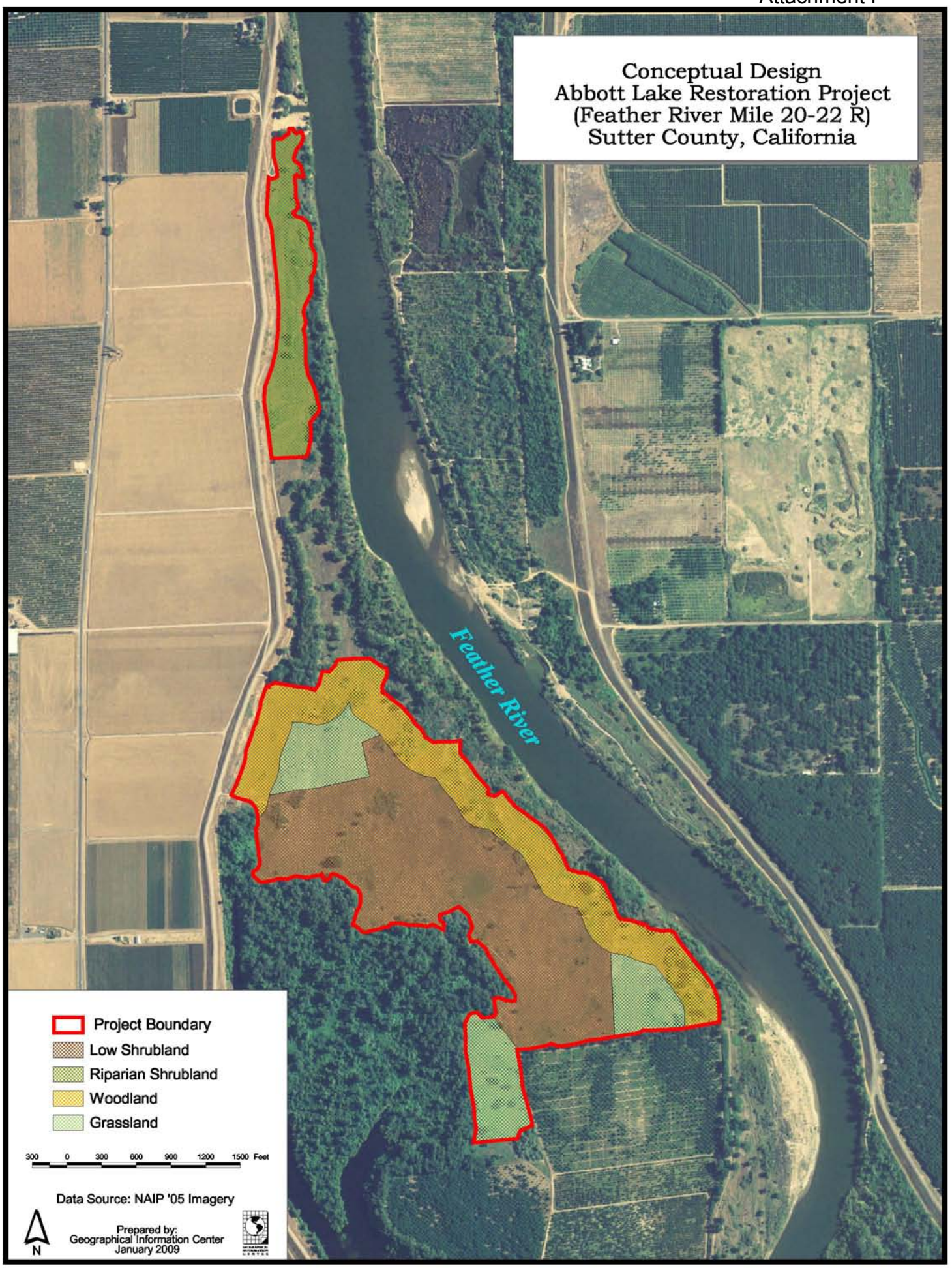
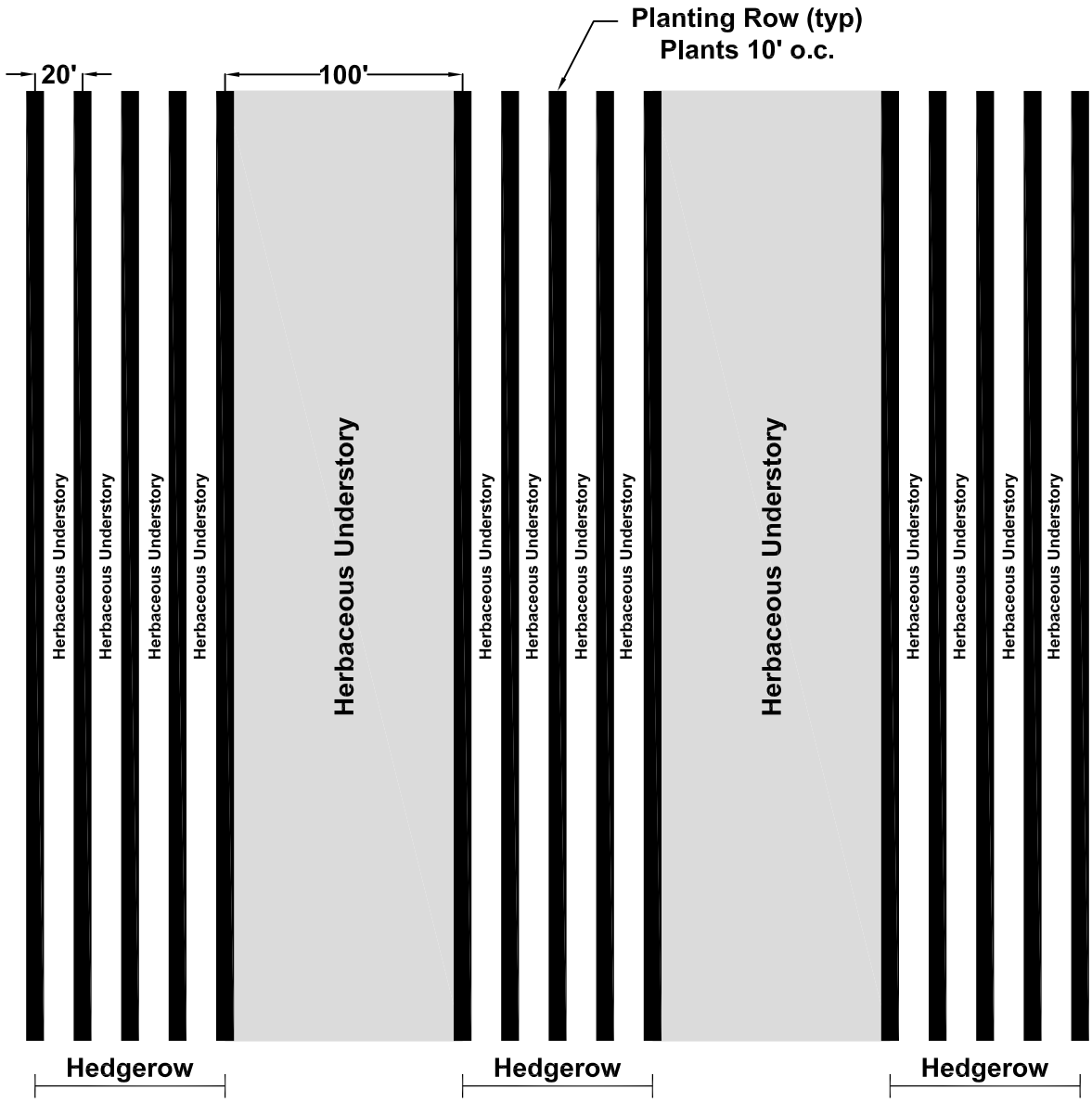
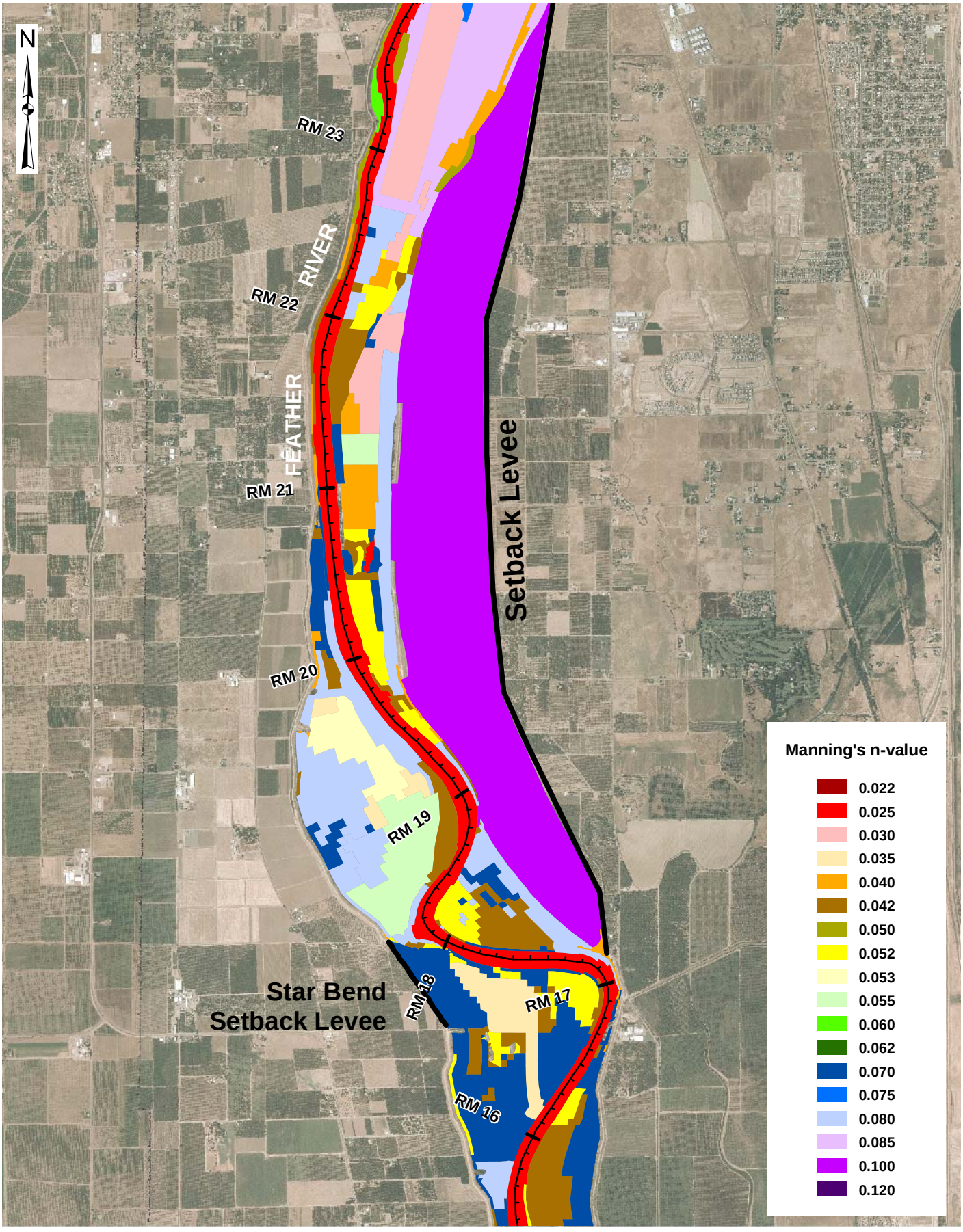

Conceptual Design
Abbott Lake Restoration Project
(Feather River Mile 20-22 R)
Sutter County, California
Feather River
Project Boundary
Low Shrubland
Riparian Shrubland
Woodland
Grassland
300 0 300 600 900 1200 1500 Feet
Data Source: NAIP '05 Imagery
N
Prepared by:
Geographical Information Center
January 2009

Figure 3



MBK ENGINEERS	Planting Layout for Hedgerows in Field 2	Not to Scale	Figure 4



MBK ENGINEERS

Project Condition
Roughness Values

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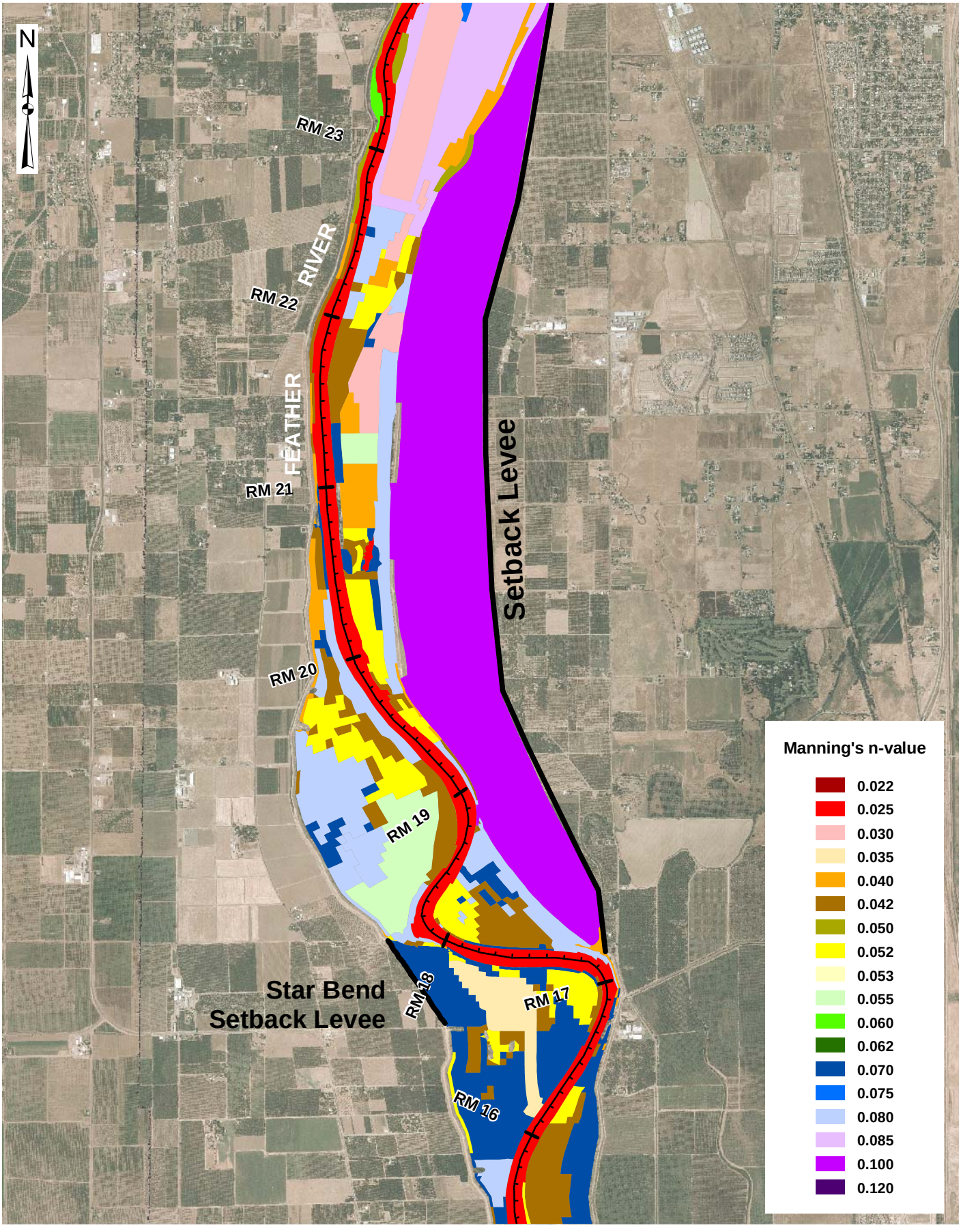
Scale in Feet

Figure 5



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Base Condition
Roughness Values

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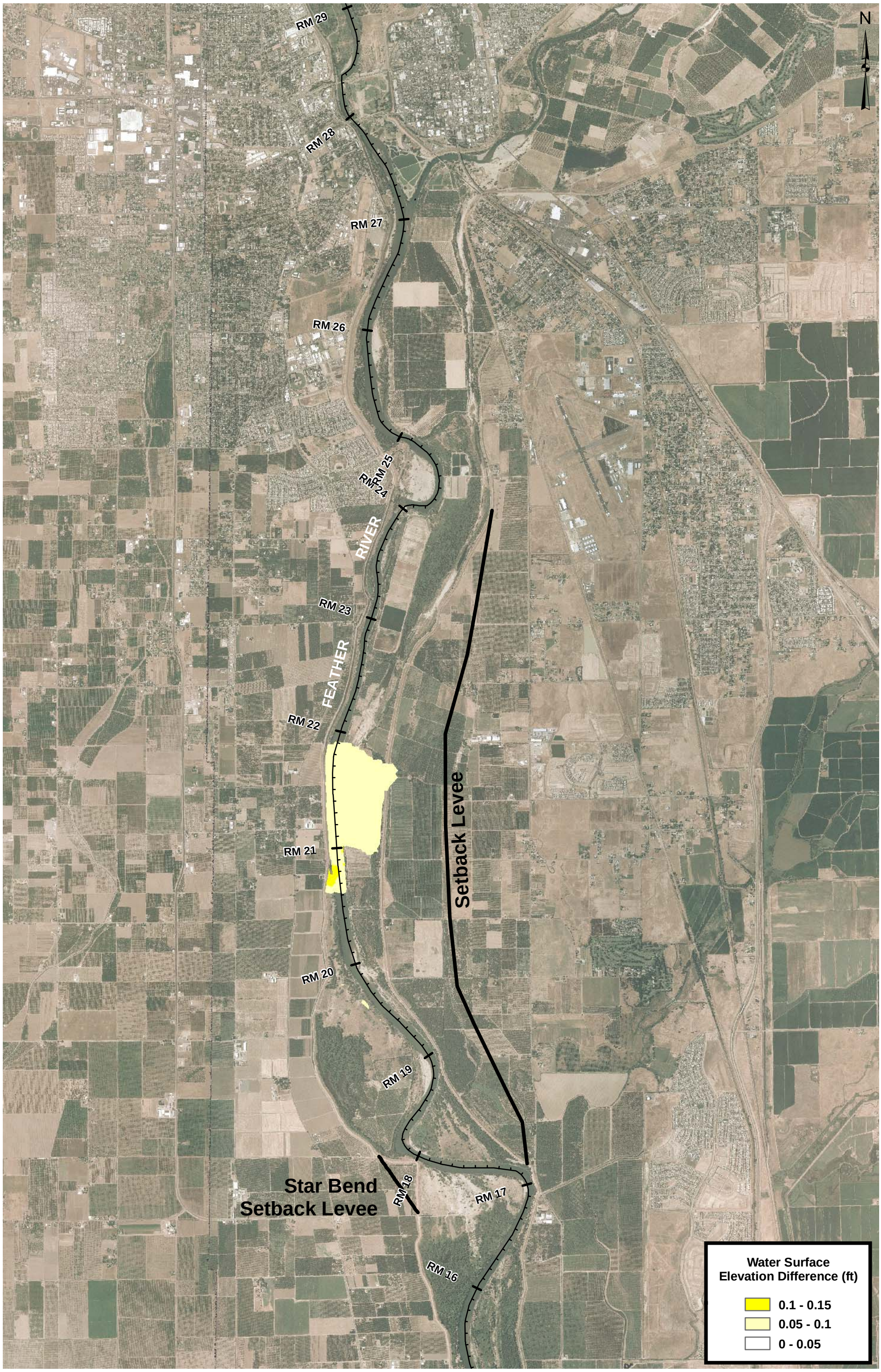
Scale in Feet

Figure 6



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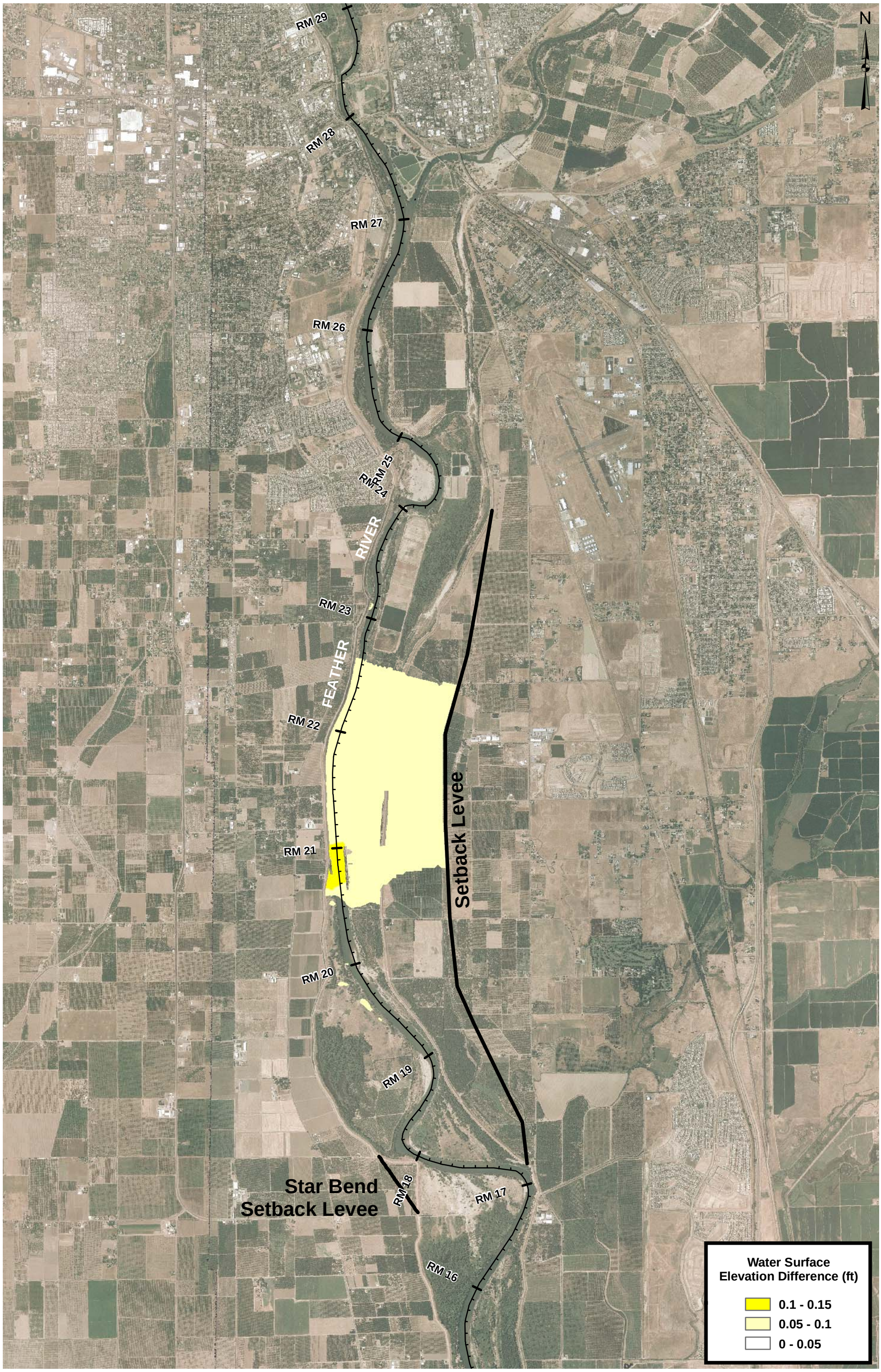
Sacramento, California 95817-1125
(916) 456-4400

Project Condition Impacts over Base Condition
1-in-100 AEP - Water Surface Elevation Difference

0 2,000 4,000
Scale in Feet

Figure 7



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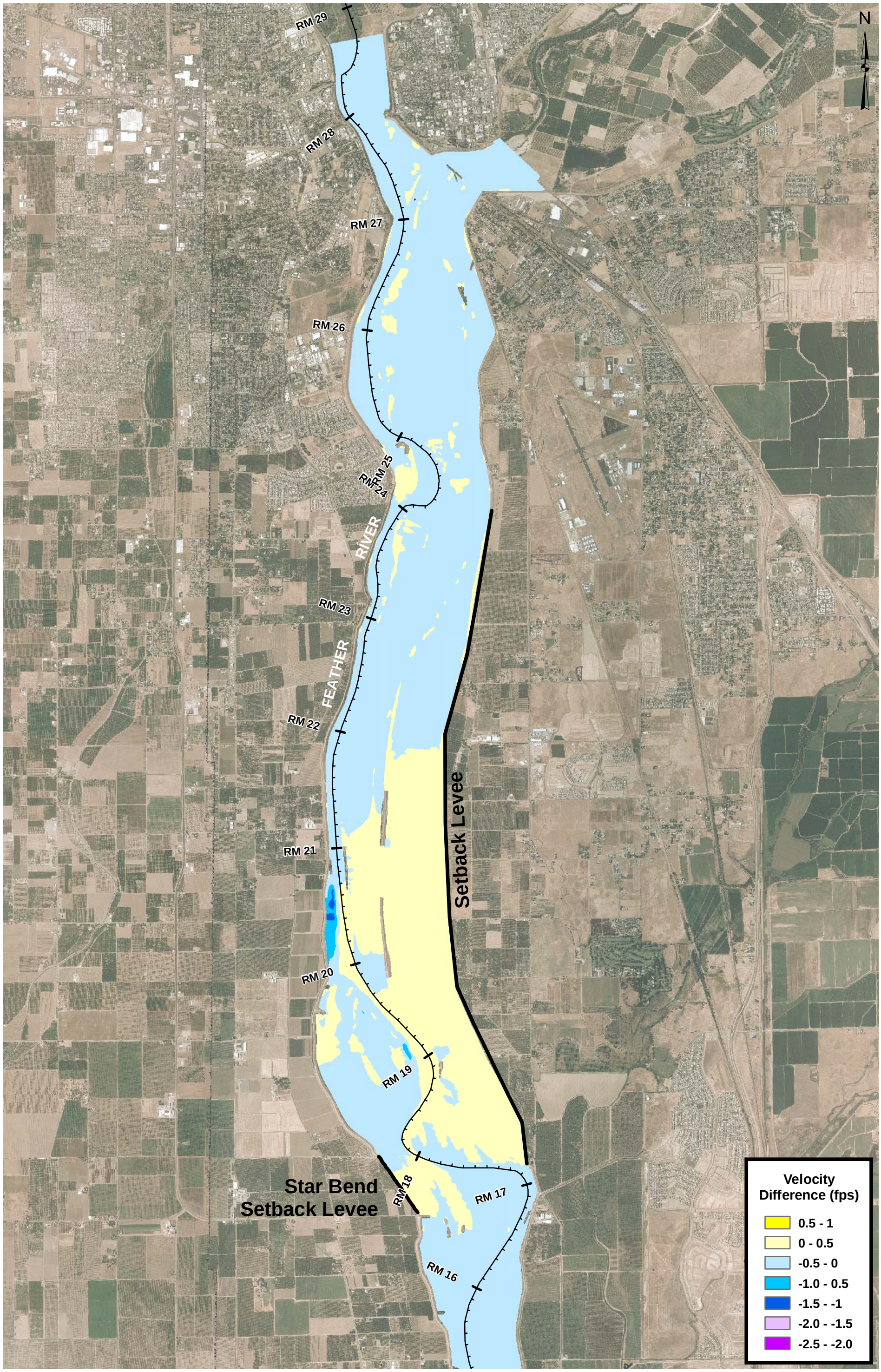
(916) 456-4400

Project Condition Impacts over Base Condition
1-in-200 AEP - Water Surface Elevation Difference

0 2,000 4,000
Scale in Feet

Figure 8



MBK ENGINEERS
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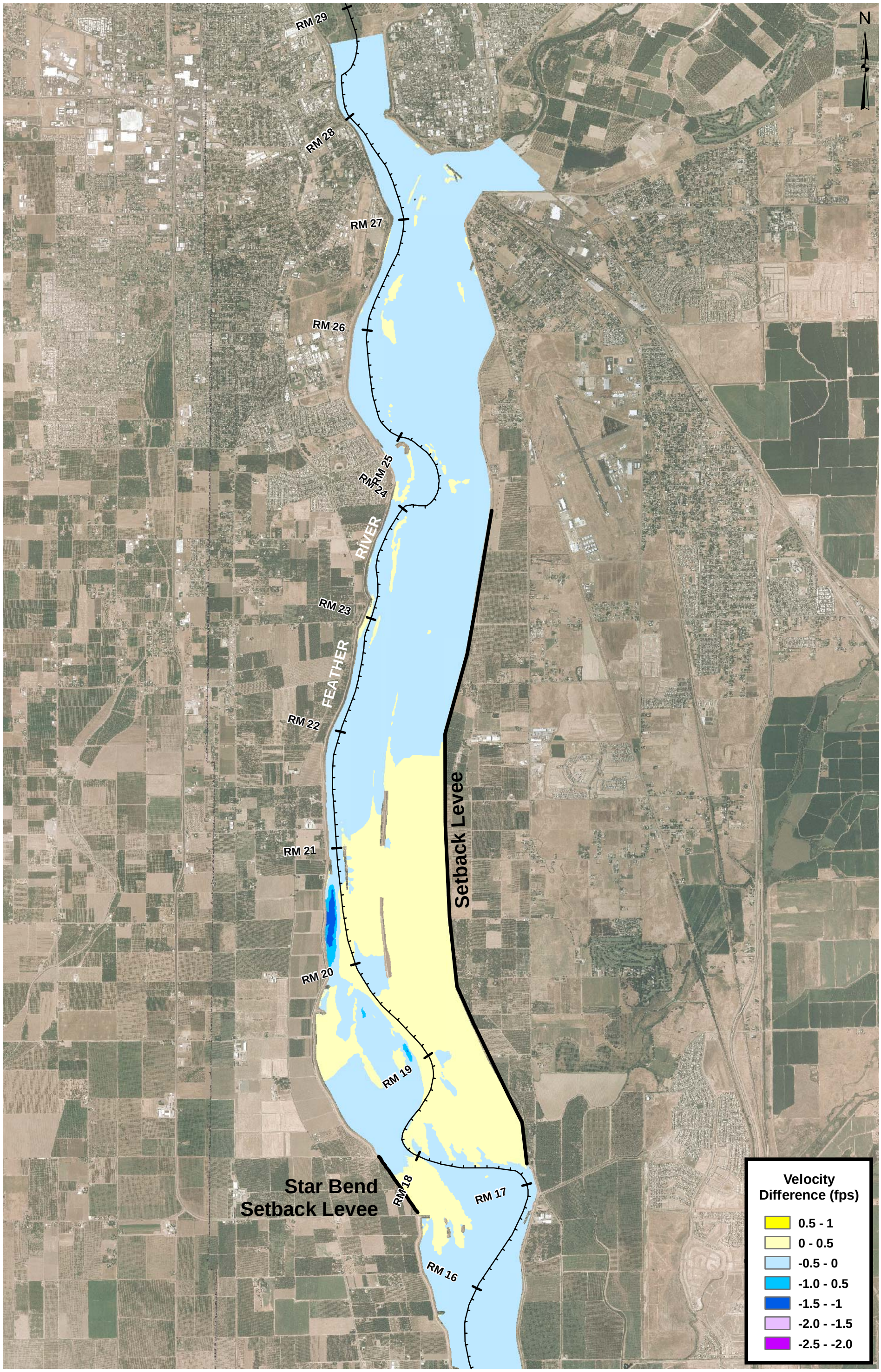
Project Condition Impacts over Base Condition
1-in-100 AEP - Velocity Difference

0 2,000 4,000
Scale in Feet

Figure 9



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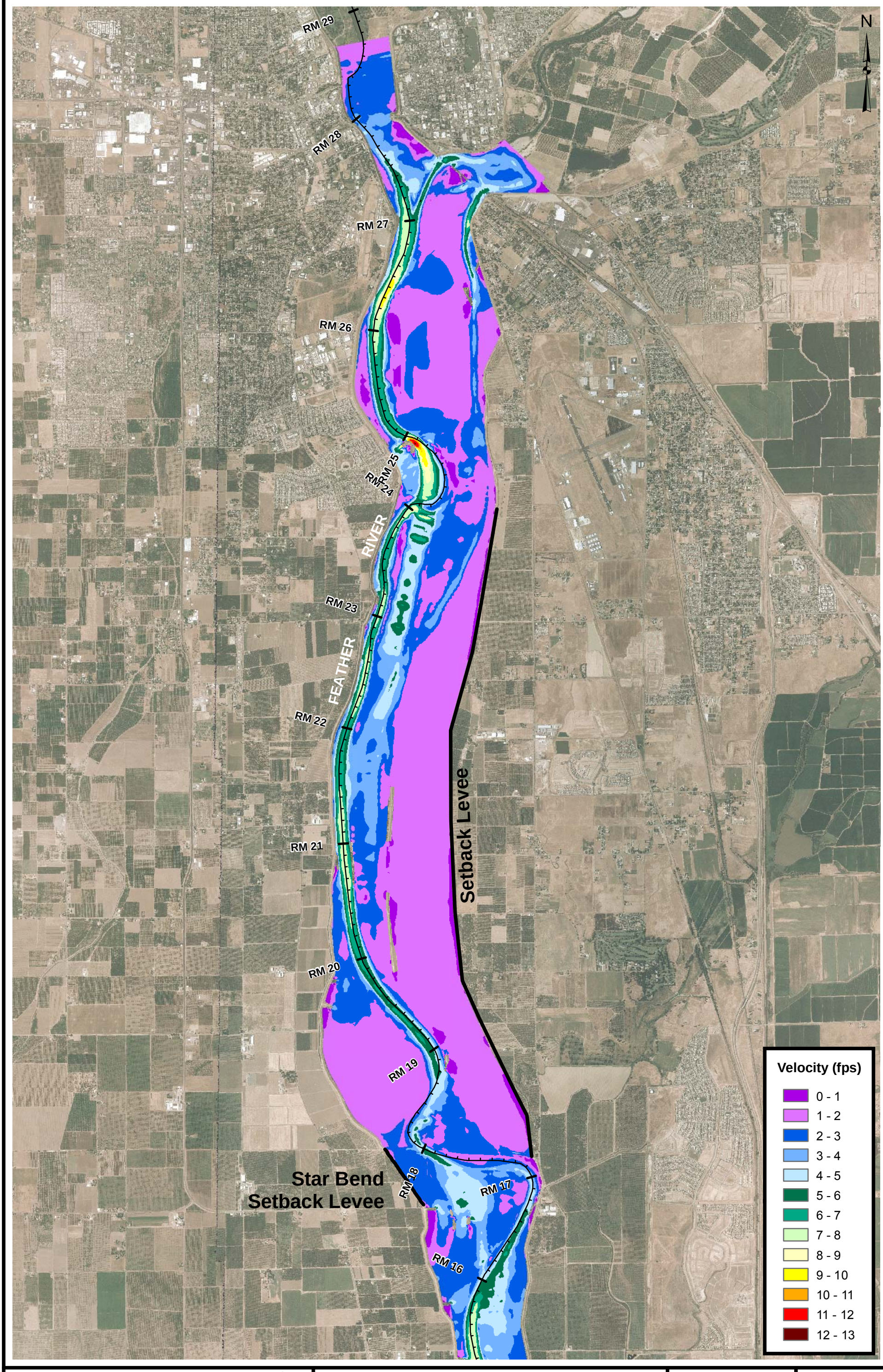
(916) 456-4400

Project Condition Impacts over Base Condition
1-in-200 AEP - Velocity Difference

0 2,000 4,000
Scale in Feet

Figure 10



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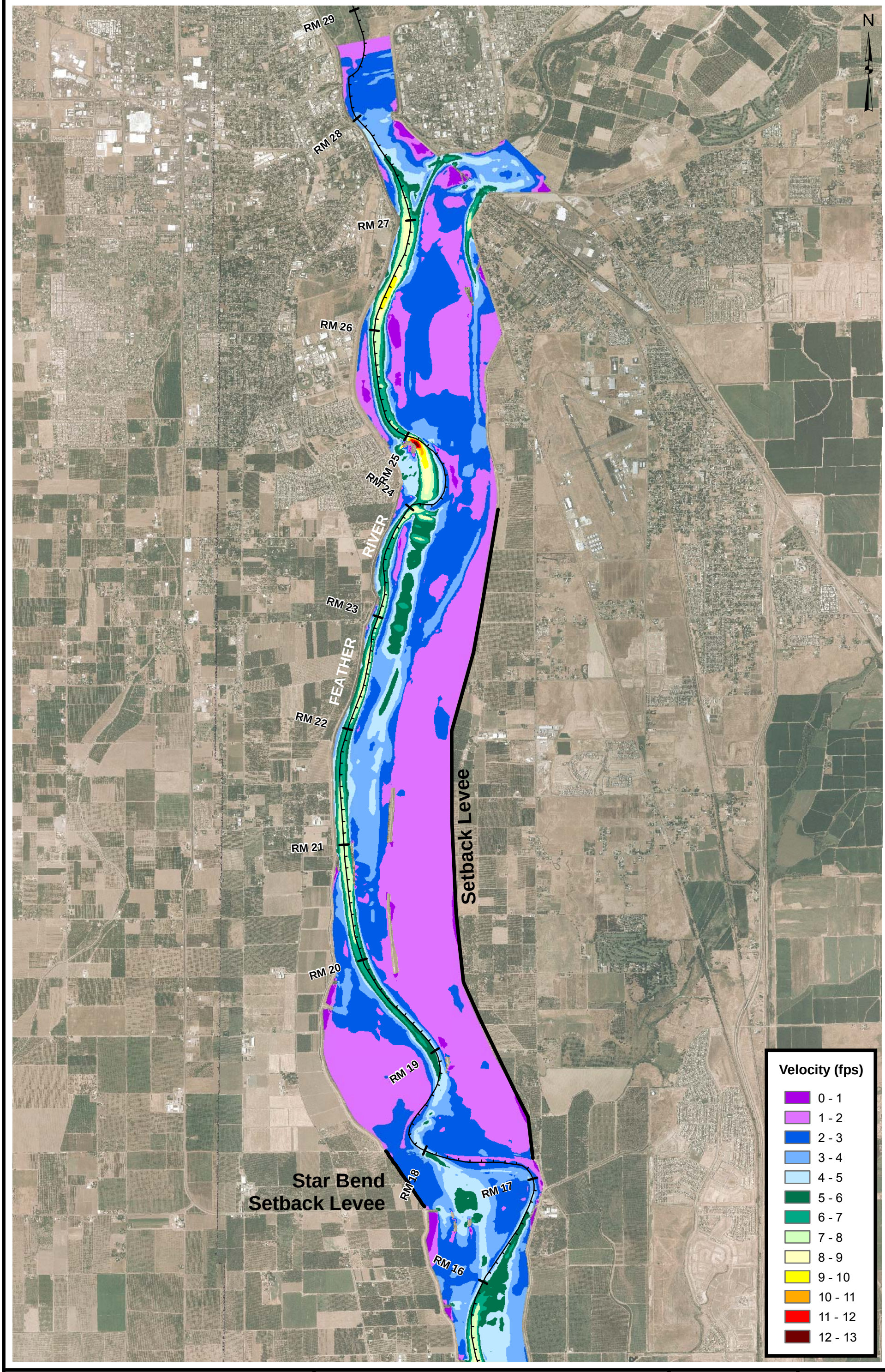
Base Condition
1-in-100 AEP - Velocity

0 2,000 4,000
Scale in Feet

Figure 11



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(916) 456-4400

Base Condition
1-in-200 AEP - Velocity

0 2,000 4,000
Scale in Feet

Figure 12

Figure 13
Feather River West Levee
Maximum Water Surface Profile
Base and Project Condition
1-in-100 AEP

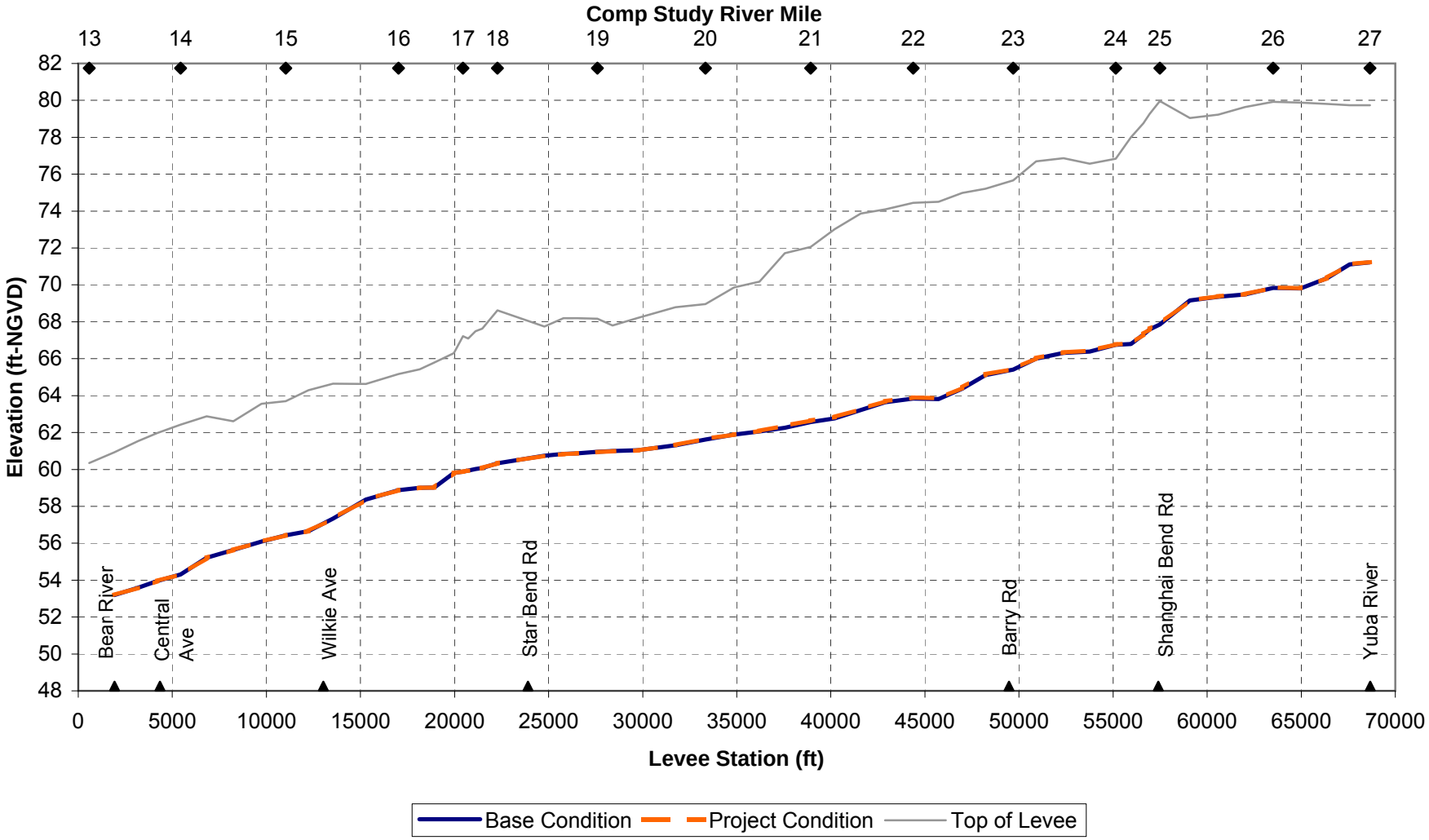
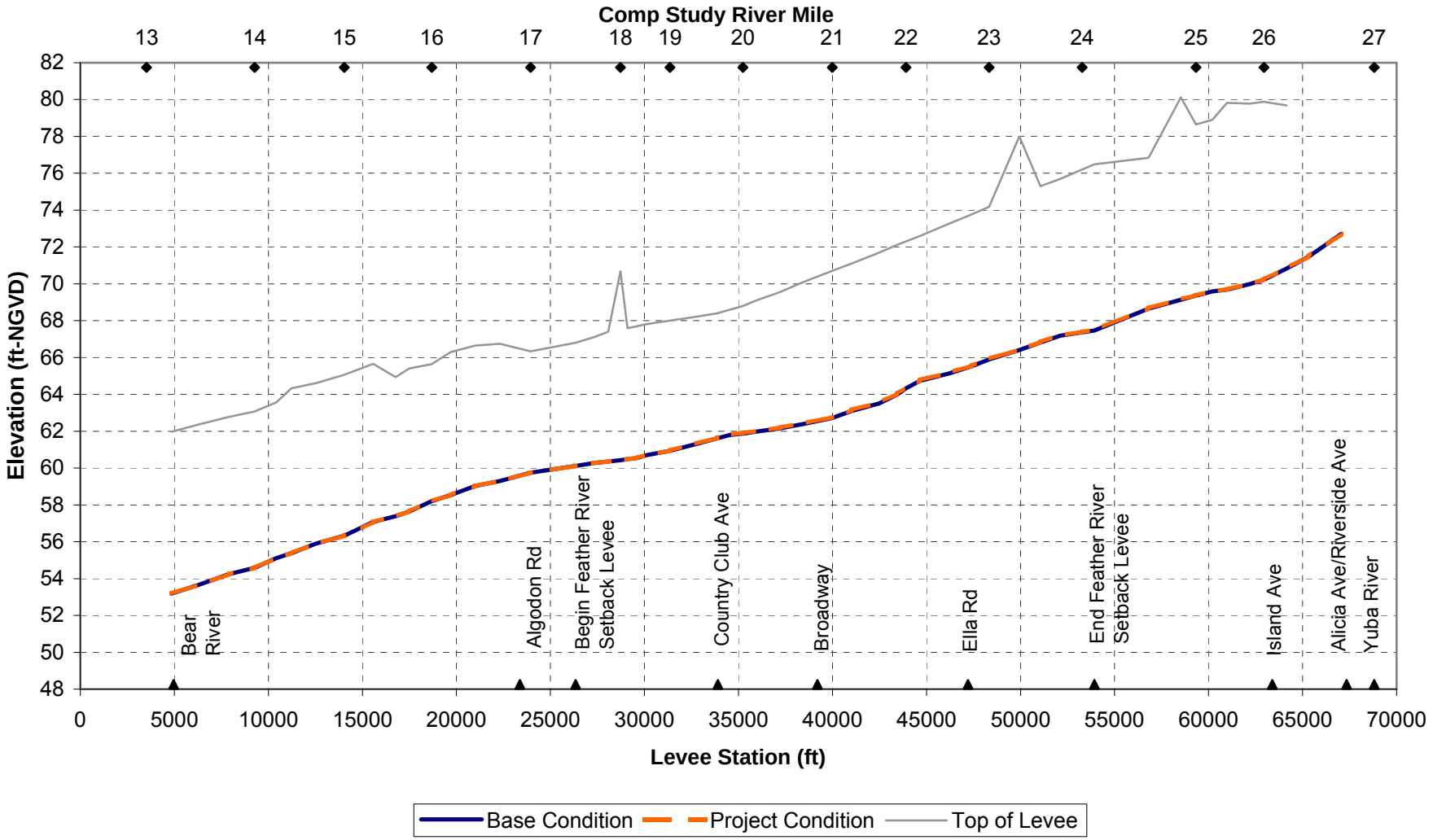


Figure 14
Feather River East Levee
Maximum Water Surface Profile
Base and Project Condition
1-in-100 AEP



R:\4735 Abbot Lake\Hydraulic_Model_Results [1/22/2009] 100 Sb Lev Ex-Pr Veg E

Figure 15
Feather River West Levee
Maximum Water Surface Profile
Base and Project Condition
1-in-200 AEP

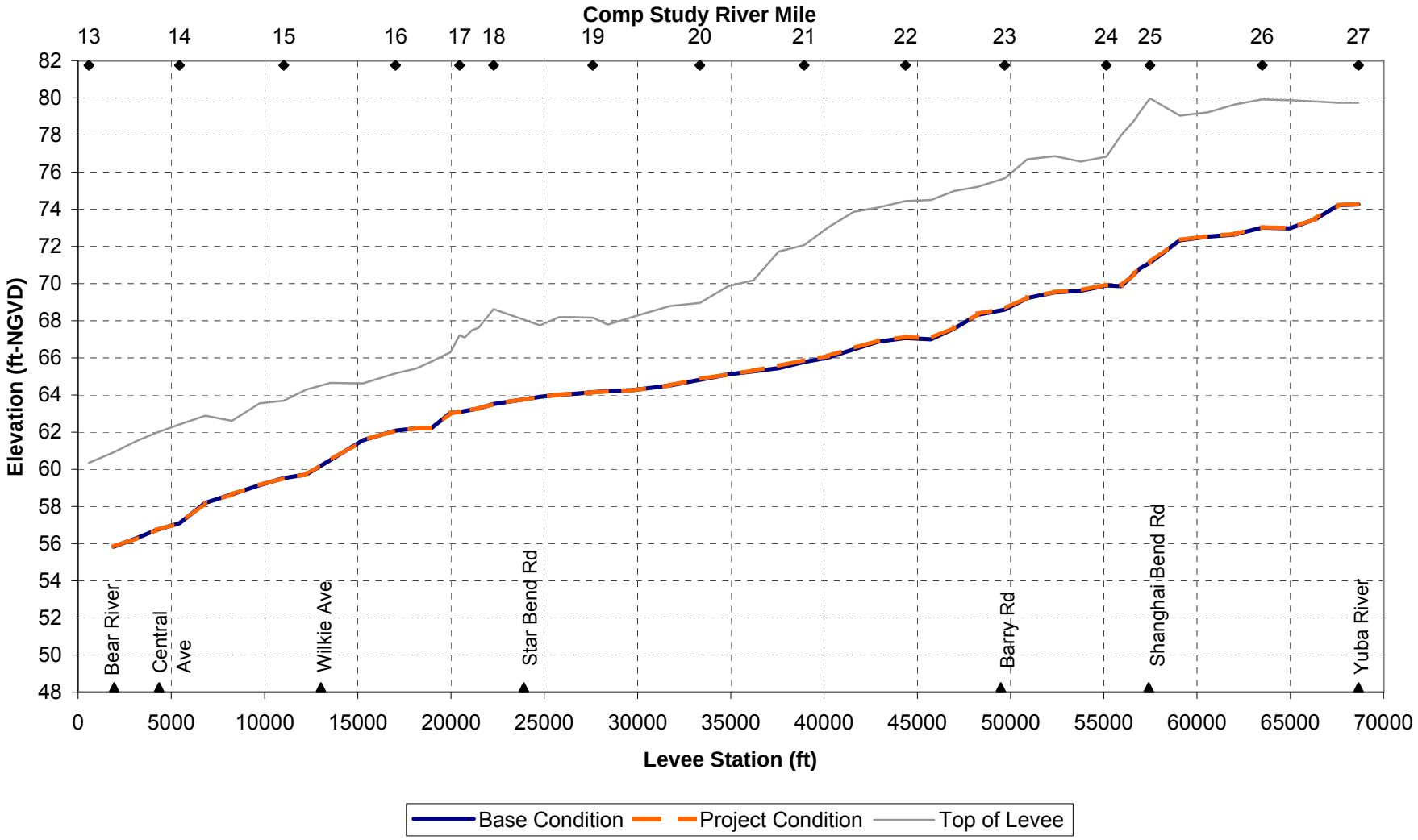
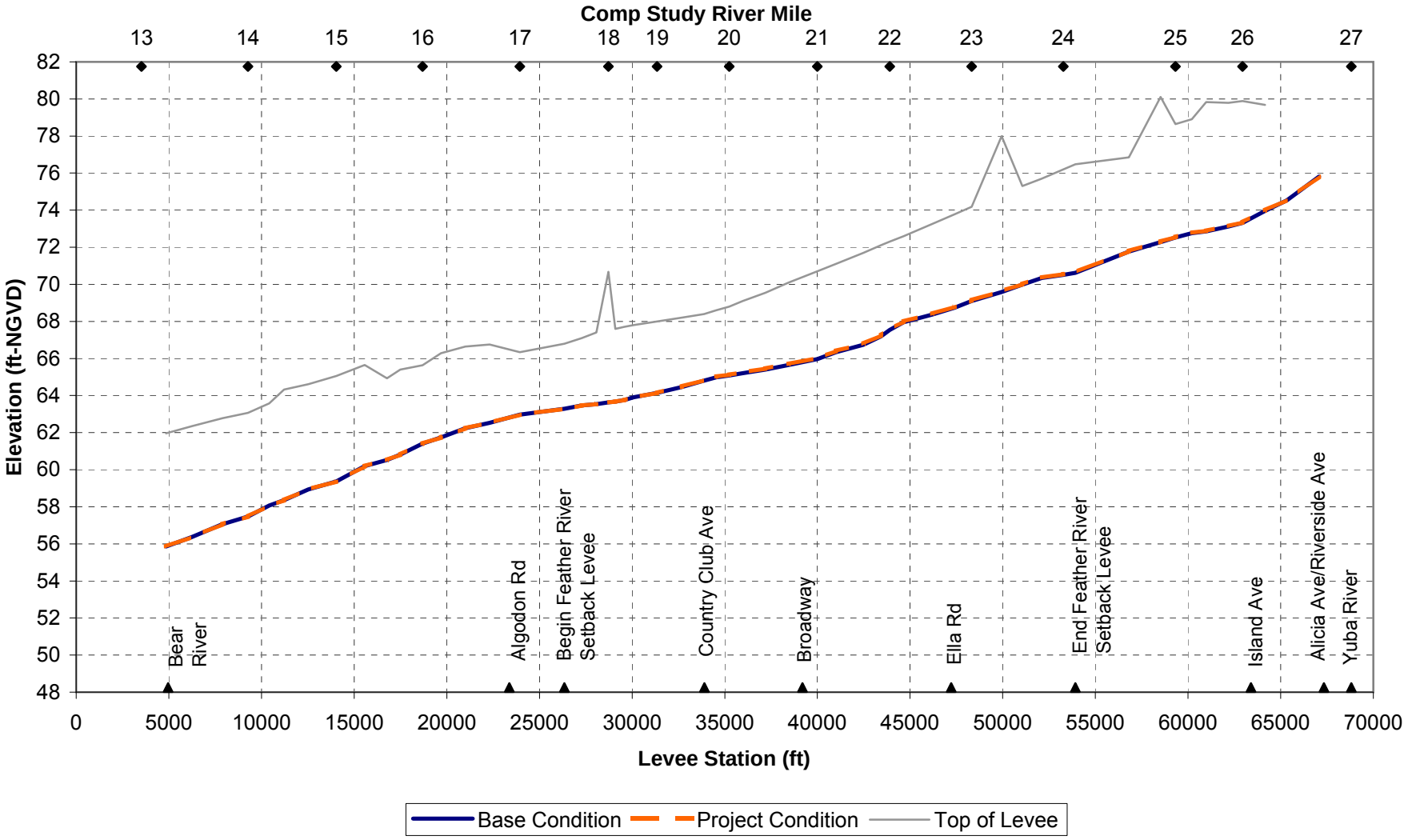


Figure 16
Feather River East Levee
Maximum Water Surface Profile
Base and Project Condition
1-in-200 AEP



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APPENDIX A

Abbott Lake Riparian Restoration Planting Design Description
January 29, 2009

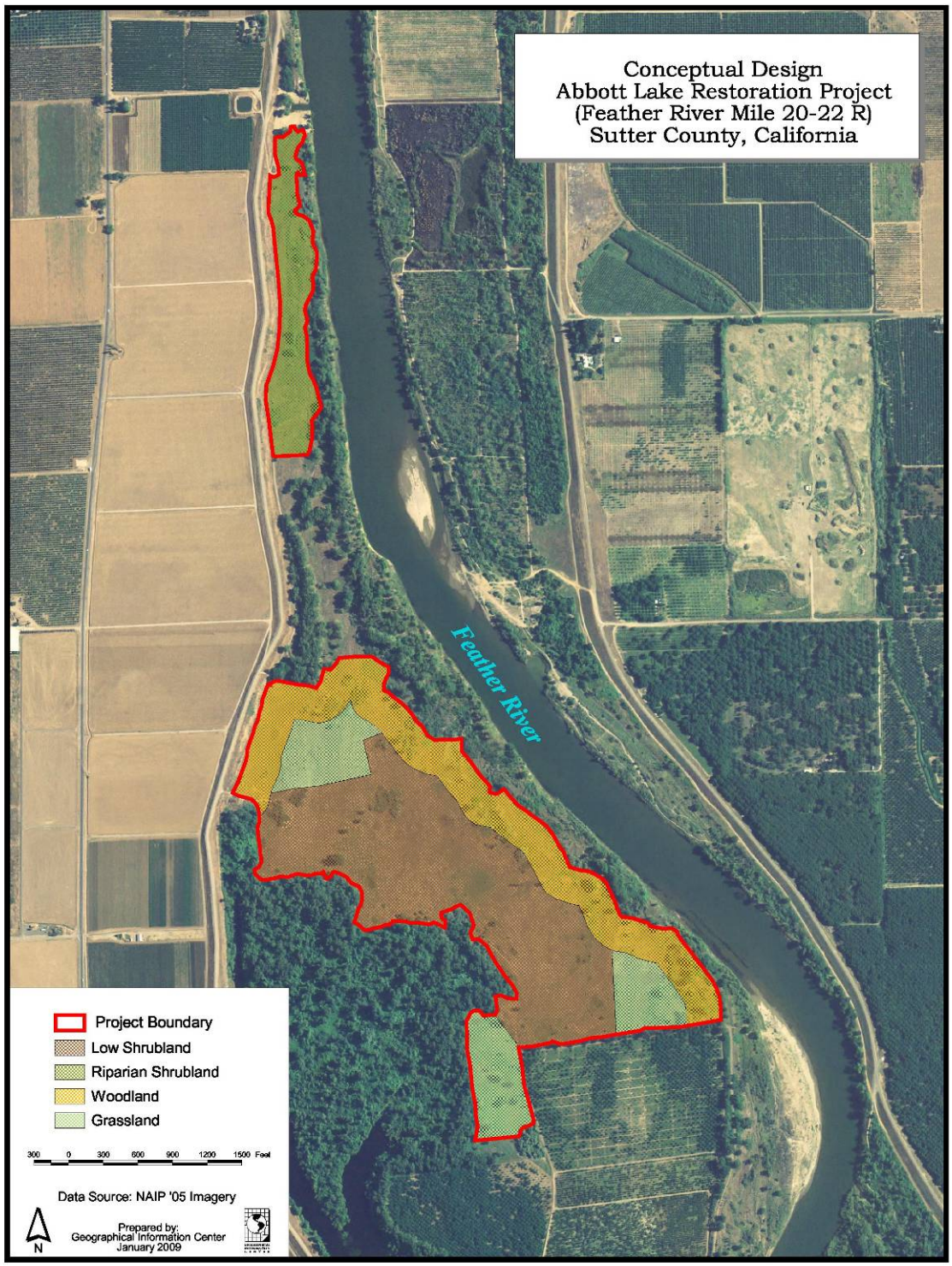
A. Composition and Location of Plant Communities

Four different plant communities are proposed for the site based on the varying hydrological and biological conditions of the site: riparian shrubland, low shrubland, Valley Foothill Riparian woodland, low shrubland and native grasslands (Table 1, Figure 1). Tree and shrub densities and compositions (Tables 2-6) will vary across the site. Relatively open areas will be planted with a shrub community. An integral component of the design is a native understory, which will be included in all communities.

Table 1. Summary of Overall Proposed Plant Species at the Abbott Lake Restoration Project.

Total Acres:	**169**			
Common name	**Scientific name**	**Species composition (%)**	**Density (plant/acre)**	**Total Number**
Tree Species				
Arroyo willow	*Salix lasiolepis* Benth.	5.1	7.0	1,187
Box elder	*Acer negundo* L.	1.7	2.3	384
Elderberry	*Sambucus mexicana*	3.3	4.5	759
Fremont cottonwood	*Populus fremontii* S.Watson ssp. *fremontii*	0.8	1.1	192
Gooding's black willow	*Salix gooddingii* C.R. Ball	1.7	2.3	384
Oregon ash	*Fraxinus latifolia Benth*	1.7	2.3	384
Sandbar willow	*Salix exigua* Nutt.	1.1	1.5	248
Valley oak	*Quercus lobata* Nee	4.5	6.2	1,051
Western sycamore	*Platanus racemosa* Nutt.	1.7	2.3	384
White Alder	*Alnus rhombifolia*	1.7	2.3	384
Total Trees		**23.3**	**31.8**	**5,357**
Shrub Species				
Buttonbush	*Cephalanthus occidentalis*	8.8	12.1	2,053
California blackberry	*Rubus ursinus* Chain. & Schldl.	10.2	14.0	2,372
Clematis	*Clematis ligusticifolia*	3.5	4.9	825
Coyote brush	*Baccharis pilularis* DC.	10.4	14.3	2,418
Dutchman's pipevine	*Aristolochia californica*	3.5	4.9	825
Mule fat	*Baccharis salicifolia*	5.5	7.6	1,287
Poison oak	*Toxicodendron diversilobum*	5.1	7.0	1,190
Wild grape	*Vitis californica*	2.9	3.9	664
Wild rose	*Rosa californica* Cham. & Schldl.	23.3	32.0	5,412
Total Shrubs		**73.2**	**100.7**	**17,046**
Herbaceous Species				
Dogbane	*Apocynum cannabinum*	2.1	2.9	497
Deergrass	*Muhlenbergia rigens*	1.4	2.0	331
Total Herbaceous		**3.5**	**4.9**	**828**
TOTAL		**100**	**137.4**	**23,231**

Figure 1. Planting communities on the Abbott Lake Riparian Restoration Project, Feather River Wildlife Area, Sutter County, California.



B. North Field

1. Riparian Shrubland

The 19-acre north field is located at a spot where the levees are narrow and will potentially constrict floodwaters. In order to maintain flood neutrality, the north field will be planted with flexible-stemmed shrub and tree species in a riparian shrubland community (Table 2). Like the shrub communities of the south field, willows are included to provide habitat structure. Herbaceous species such as dogbane (*Apocynum cannabinum*) and deergrass (*Muhlenbergia rigens*) are included in the tile design to help facilitate flood conveyance and provide structure as well. Unlike the low shrub communities described below, the riparian shrubland will not be planted in hedgerows, making for a denser shrub habitat and increased diversity across the site as a whole. An herbaceous understory of mugwort will be planted between the rows.

Table 2. Composition of the riparian shrubland community at the Abbott Lake Restoration Project.

Total Acres: 19.0

Common name	Scientific name	Species comp. (%)	Density (plant/acre)	Total Number
Tree Species				
Arroyo willow	*Salix lasiolepis* Benth.	8	17	331
Sandbar willow	*Salix exigua*	6	13	248
Total Trees		**14**	**30**	**579**
Shrub Species				
Buttonbush	*Cephalanthus occidentalis*	8	17	331
Clematis	*Clematis ligusticifolia*	6	13	248
Coyote brush	*Baccharis pilularis* DC.	10	22	414
Dutchman's pipevine	*Aristolochia californica*	6	13	248
Mule fat	*Baccharis salicifolia*	8	17	331
Poison oak	*Toxicodendron diversilobum*	8	17	331
Wild rose	*Rosa californica* Cham. & Schldl.	20	44	828
Total Shrubs		**66**	**143**	**2,731**
Herbaceous Species				
Deergrass	*Muhlenbergia rigens*	8	17	331
Dogbane	*Apocynum cannabinum*	12	26	497
Total Herbaceous		**20**	**43**	**828**
TOTAL		**100**	**216**	**4,138**

2. South Field

a) Low Shrubland

The majority of the south field will be planted into one of two low shrub communities, low shrub A (Table 3) and low shrub B (Table 4). The low shrub communities will be comprised primarily of lower-stature, flexible-stemmed species such as California blackberry (*Rubus ursinus*), California rose (*Rosa*

californica) and wild grape (*Vitis californica*). Larger shrubs and small trees such as coyote brush (*Baccharis pilularis*) and arroyo willow (*Salix lasiolepis*) are incorporated into the design in order to provide structural diversity. The main difference between the two shrub communities is that low shrub B has a higher percentage of California blackberry and California rose.

The low shrub communities will be grouped into hedgerows across the site. The spacing between the hedgerows will be 100 feet. Between the rows within the hedgerows an understory of Spanish clover (*Lotus purshianus*) will be planted and is intended to be a high-quality food source for California quail (*Callipepla californica*) and other wildlife. Between the hedgerows an understory of mugwort (*Artemisia douglasiana*) and gumplant (*Grindelia camporum*) will be planted. These two species provide cover for wildlife and are aggressive competitors against herbaceous weed species.

Table 3. Plant composition of the Low Shrub 'A' community at the Abbott Lake Riparian Restoration Project, Feather River Wildlife Area, Sutter County, California.

Total Acres:	**39.2**			
Common name	**Scientific name**	**Species comp. (%)**	**Density (plant/acre)**	**Total Number**
Tree Species				
Arroyo willow	*Salix lasiolepis* Benth.	10	12	474
Valley oak	*Quercus lobata* Nee	6	7	285
Total Trees		**16**	**19**	**759**
Shrub Species				
Buttonbush	*Cephalanthus occidentalis*	6	7	285
California blackberry	*Rubus ursinus* Chain. & Schldl.	20	24	949
Coyote brush	*Baccharis pilularis* DC.	8	10	379
Elderberry	*Sambucus mexicana*	10	12	474
Mule fat	*Baccharis salicifolia*	8	10	379
Poison oak	*Toxicodendron diversilobum*	10	12	474
Wild rose	*Rosa californica* Cham. & Schldl.	18	22	854
Wild grape	*Vitis californica*	4	5	190
Total Shrubs		**84**	**102**	**3,984**
TOTAL		**100**	**121**	**4,743**

Table 4. Plant composition of the Low Shrub 'B' community at the Abbott Lake Riparian Restoration Project, Feather River Wildlife Area, Sutter County, California.

Total Acres: 39.2

Common name	Scientific name	Species comp. (%)	Density (plant/acre)	Total Number
Tree Species				
Arroyo willow	*Salix lasiolepis* Benth.	4	5	190
Valley oak	*Quercus lobata* Nee	4	5	190
Total Trees		**8**	**10**	**380**
Shrub Species				
Buttonbush	*Cephalanthus occidentalis*	6	7	285
California blackberry	*Rubus ursinus* Chain. & Schldl.	30	36	1,423
Coyote brush	*Baccharis pilularis* DC.	14	17	664
Elderberry	*Sambucus mexicana*	6	7	285
Wild rose	*Rosa californica* Cham. & Schldl.	26	31	1,233
Wild grape	*Vitis californica*	10	12	474
Total Shrubs		**92**	**110**	**4,364**
TOTAL		**100**	**120**	**4,744**

b) Valley Foothill Riparian woodland

The Valley Foothill Riparian woodland (Table 5) will be planted along the northern and eastern edge of the project area in the south field, as well as throughout the north field. This community will be comprised of a mixture of fast-growing species, such as Fremont cottonwood (*Populus fremontii*) and slow-growing species such as western sycamore *(Platanus racemosa*) and valley oak (*Quercus lobata*), and will provide short- and long-term wildlife habitat. A diverse mix of shrub species such as coyote brush and California rose are included to provide structural diversity, especially in the lower canopy. An understory of mugwort and telegraph weed (*Heterotheca grandiflora*) will be planted between planting rows in order to provide cover for wildlife and to aggressively compete with herbaceous weeds.

Table 5. Composition of Valley Foothill Riparian Woodland Association at the Abbott Lake Restoration Project.

Total Acres: 44.1

Common name	Scientific name	Species comp. (%)	Density (plant/acre)	Total Number
Tree Species				
Arroyo willow	*Salix lasiolepis* Benth.	2	4	192
Box elder	*Acer negundo* L.	4	9	384
Fremont cottonwood	*Populus fremontii* S.Watson ssp. *fremontii*	2	4	192
Gooding's black willow	*Salix gooddingii* C.R. Ball	4	9	384
Oregon ash	*Fraxinus latifolia Benth*	4	9	384
Valley oak	*Quercus lobata* Nee	6	13	576
Western sycamore	*Platanus racemosa* Nutt.	4	9	384
White alder	*Alnus rhombifolia*	4	9	384
Total Trees		**30**	**65.4**	**2,880**
Shrub Species				
Buttonbush	*Cephalanthus occidentalis*	12	26	1,153
Clematis	*Clematis ligusticifolia*	6	13	576
Coyote brush	*Baccharis pilularis* DC.	10	22	960
Dutchman's pipevine	*Aristolochia californica*	6	13	576
Mule fat	*Baccharis salicifolia*	6	13	576
Poison oak	*Toxicodendron diversilobum*	4	9	384
Wild rose	*Rosa californica* Cham. & Schldl.	26	57	2,497
Total Shrubs		**70**	**152.5**	**6,722**
TOTAL		**100**	**217.9**	**9,602**

c) Native Grasslands

The planting of native grass minimizes the invasion of non-native species, enhances wildlife habitat, limits erosion and provides less hazardous fire conditions. Two areas in the north and the south of the site will be planted with native grasses, for a total of approximately 28 acres. These grasslands will provide foraging habitat for various raptor species including Swainson's hawk, a state-listed Threatened species that has been known to occur on the site (Whitmore, personal communication). Two species, blue wildrye (*Elymus glaucus*) and creeping wildrye (*Leymus triticoides*), will be planted (Table 6). These are perennial species that will do well in sandy soils and will out-compete non-native species, thus reducing long-term maintenance costs.

Seed will be purchased from stock collected from the same ecoregion as the restoration project and will be planted with a no-till drill at a rate of 10 lbs/acre pure live seed (PLS) (5 lbs. PLS of each species). Seed will be applied in late-fall, likely October or November, before the first rains.

Table 6. Summary of native grass species to be seeded at the Abbott Lake Restoration Project.

Common Name	Scientific Name	Rate (lbs. PLS/acre)	Est. Total lbs.
Blue wildrye	*Elymus glaucus*	5	140
Creeping wildrye	*Leymus triticoides*	5	140
Total		10	280

3. Herbaceous Understory

To prevent establishment and limit the extent of weed invasions, a dense, aggressive understory will be planted throughout the restoration. Incorporation of herbaceous plants will provide important wildlife habitat, produce native plant seed sources, and inhibit the establishment of invasive, exotic species. Mugwort is an especially important component of riparian communities and appears to be good competitor against invasive non-native species. Mugwort will be broadcasted between planting rows at a rate of 2 lbs/acre PLS. Seeds of local ecotypes will be collected or purchased for this restoration project.