ATTACHMENT 2: PROJECT JUSTIFICATION

This attachment includes the following:

- Summary of the proposed projects
- Project descriptions
- Regional and project maps
- Estimated physical benefits of the projects
- Technical analysis of the physical benefits claimed
- Direct water-related benefits to DACs
- Project performance monitoring plans
- Explanation as to whether the benefits will be attained through the least cost alternative.

The Project Summary Table is presented on the following page, followed by individual project sections. The supporting documentation for each project is included in an associated appendix at the end of this attachment.

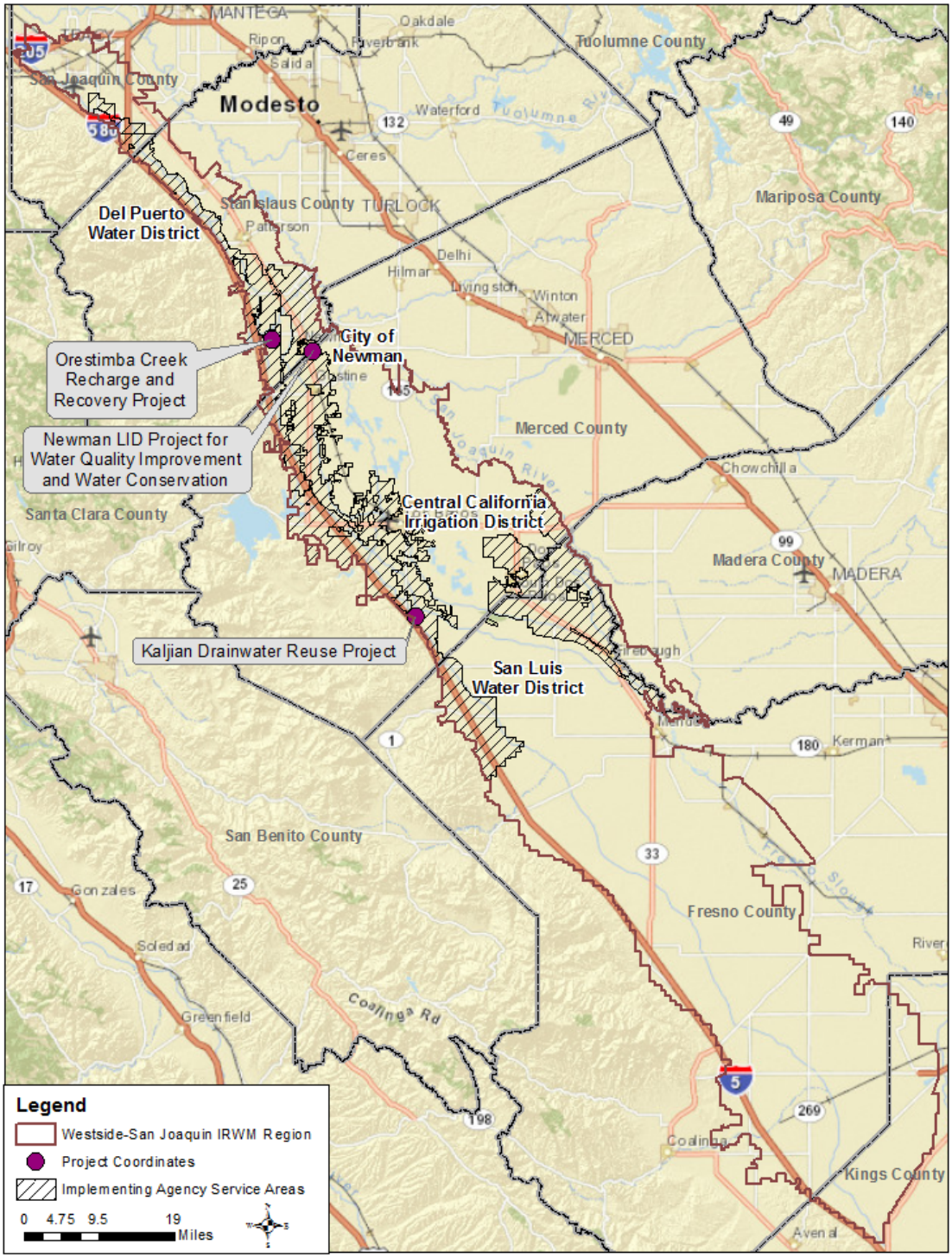
Project Summary Table

IRWM Project Element		Kaljian Drainwater Reuse Project	Orestimba Creek Recharge and Recovery Project	Newman LID Project for Water Quality Improvement and Water Conservation
IR.1	Water Supply reliability, water conservation, and water use efficiency	X	X	X
IR.2	Stormwater capture, storage, clean-up, treatment, and management			X
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands			
IR.4	Non-point source pollution reduction, management, monitoring			X
IR.5	Groundwater recharge and management		X	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	X		X
IR.7	Water banking, exchange, reclamation, and improvement of water quality	X	X	X
IR.8	Planning and implementation of multipurpose flood management programs			X
IR.9	Watershed protection and management	X	X	X
IR.10	Drinking water treatment and distribution			
IR.11	Ecosystem and fisheries restoration and protection			

Regional Map

The following map shows the location of the three non-administrative projects contained in this application. The Grant Administration Project, an administrative project, encompasses the Westside-San Joaquin Region as a whole.

Regional Map - Westside-San Joaquin 2015 Implementation Grant Application



PROJECT 1: Grant Administration Project

IMPLEMENTING AGENCY: San Luis and Delta-Mendota Water Authority (SLDMWA)

Project Description

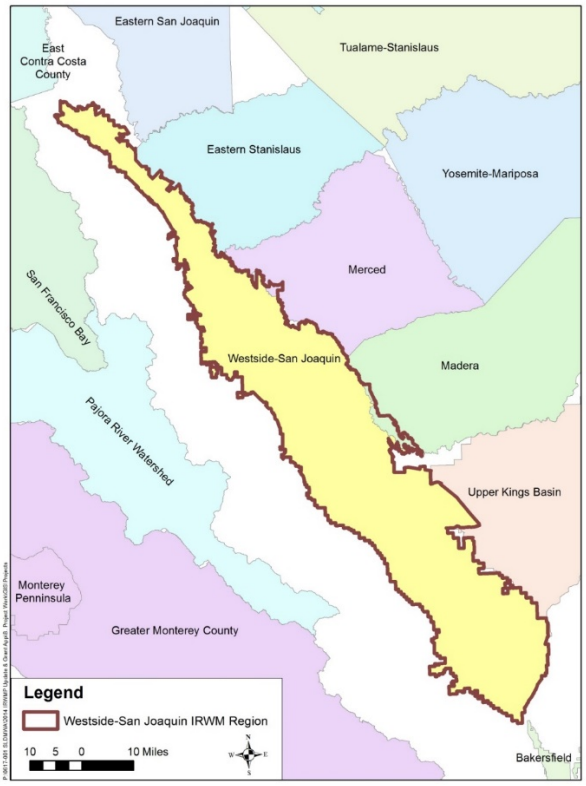
(25 Words) This Project will provide administration support for meeting the requirements as set forth in the Proposition 84 Implementation Grant funding agreement between DWR and SLDMWA.

(Expanded) The SLDMWA's Grant Administration Project will provide administration support for the Westside-San Joaquin IRWM Region's Proposition 84 Implementation Grant award, and provides SLDMWA's services as the contracting agency for DWR. As part of this 'project', SLDMWA will coordinate funding-related activities such reporting and invoicing, and implement program-level administration associated with any funding received under the 2015 IRWM Implementation Grant program. As part of this project, the SLDMWA will:

- Coordinate execution of the funding agreement (including signing of the agreement);
- Ensure implementation and tracking of project performance monitoring;
- Ensure implementation and tracking labor compliance requirements;
- Compile and submit invoices and progress reports;
- Coordinate prepare project completion reports; and
- Coordinate all activities necessary for funding agreement close-out.

As this project is intended to provide administration support only, further requirements are not applicable.

Project Map



Project Physical Benefits

This project is administrative only in nature and therefore does not provide any physical benefits.

Technical Analysis of Physical Benefits Claimed

This project is administrative only in nature and therefore does not provide any physical benefits.

Direct Water-Related Benefit to a DAC

This project is administrative only in nature and therefore does not provide any direct water-related benefits to DACs.

Project Performance Monitoring Plan

As this project is administrative only, there are no physical benefits to be monitored. However, overall project performance will be measured by the Region's success in meeting the funding agreement requirements, including meeting scheduled deliverables (i.e. progress reports).

Cost Effectiveness Analysis

Not applicable

PROJECT 2: Kaljian Drainwater Reuse Project

IMPLEMENTING AGENCY: San Luis Water District (SLWD)

Project Description

(25 words) Project will rehabilitate two pumping plants and conveyance pipelines to blend agricultural drain water with surface water and create local water supply of 2,300 AFY.

(Expanded) The Project will rehabilitate the Kaljian Pumping Plant, 9,100 feet of the Kaljian Pipeline, 17,800 feet of the Main Canal, and the Fittje Pump Station to capture, blend and recirculate 2,300 AFY of agricultural drain water back into the SLWD irrigation system. The Kaljian Pumping Plant is located adjacent to Charleston Drainage District (CDD). CCD is part of the Grassland Drainage Area (San Joaquin River Restoration Program, SJRRP) which collects, treats, and disposes of agricultural drain water in western San Joaquin Valley. After being conveyed through a system of canals and pump stations, the agricultural drain water collected from the Grassland Drainage Area is managed with a variety of treatment and/or disposal methods, mainly irrigating salt-tolerant crops such as the Jose Tall Wheatgrass (i.e., no commercial value for crops). When the capacity of the SJRRP is exceeded, excess agricultural drain water bypasses treatment and gets diverted to the Grassland Bypass Channel and San Luis Drain to be discharged to the San Joaquin River (SJR). The bypass protects wildlife habitat from constituents in the agricultural drain water. In addition, during storm events, CDD flows routinely exceed the capacity of the collection system and drain water spills into the Delta-Mendota Canal (DMC), a source of irrigation supply. As a result of this Project, this agricultural drain water will be captured, blended with water from the DMC and circulated back into the SLWD irrigation system for reuse. From the Fittje Pump Station, the blended water will be conveyed under Interstate 5 to the Relief Canal to serve irrigation customers.

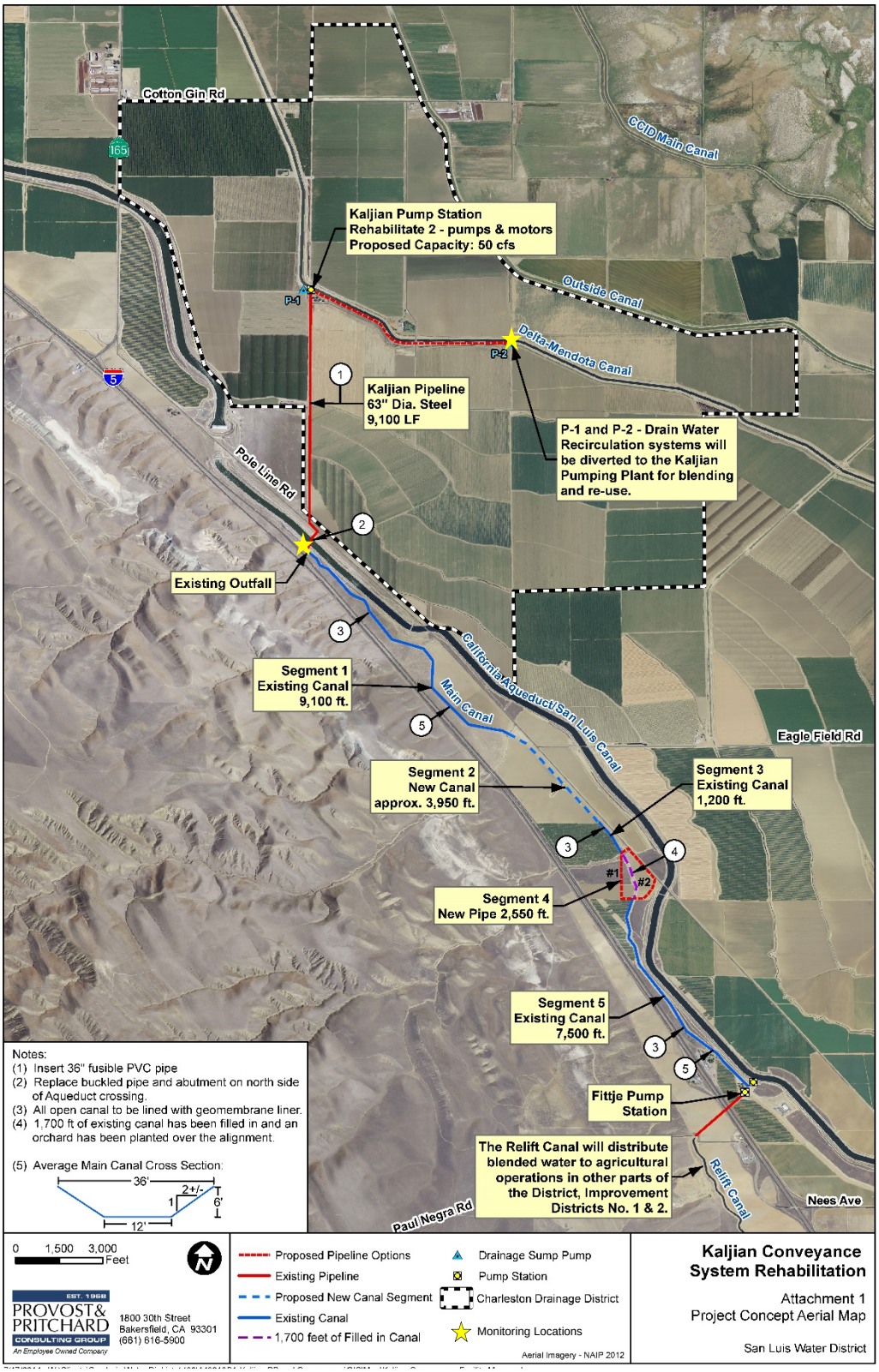
The pumping plants and conveyance system for this part of the SLWD irrigation system were decommissioned approximately 20 years ago with the construction of the San Luis Canal (California Aqueduct) and has not been operational since. This Project would reactivate the pumping plant, collect 2,300 AFY of agricultural drain water from the CDD, and blend it with Central Valley Project (CVP) water from the DMC. The blended agricultural drain water would be conveyed outside the Grassland Drainage Area using the Fittje Pumping Station. This would eliminate the need for treatment at the SJRRP, convey agricultural drain water to areas that are not experiencing overflows, and create a new supply source for downstream users at the SLDMWA's Improvement District No. 1 and 2.

This Project provides a new local water supply source by capturing and reusing agricultural drain water that was historically discharged for treatment to the SJRRP system or to the SJR. Treatment at the SJRRP is solely for effluent management purposes and provides no other benefit. The Project would provide an additional 2,300 AFY of local agricultural water supply in an area that relies on the critical and drought-diminished CVP system deliveries. The Project can be easily implemented since most of the infrastructure is in place, primarily requiring rehabilitation. The Project can be implemented rapidly and begin bringing critical local supplies on line by as early as January 2018.

The Project also reduces water quality conflicts created by the drought by diverting 2,300 AFY of agricultural drain water from the Grassland Drainage Area and the SJRRP system to existing agricultural customers. This Project can help to reduce water quality degradation of the SJR. Currently, the agricultural drain water contains high total dissolved solids (TDS), selenium, and boron concentrations not suitable for agricultural use or riparian habitats. The Project will reduce the treatment/maintenance load on the Grass Drainage Area and SJRRP system and will reduce the flow of agricultural drain water to the SJR. The Project will also eliminate the amount of agricultural drain water that spills to the DMC during storm events.

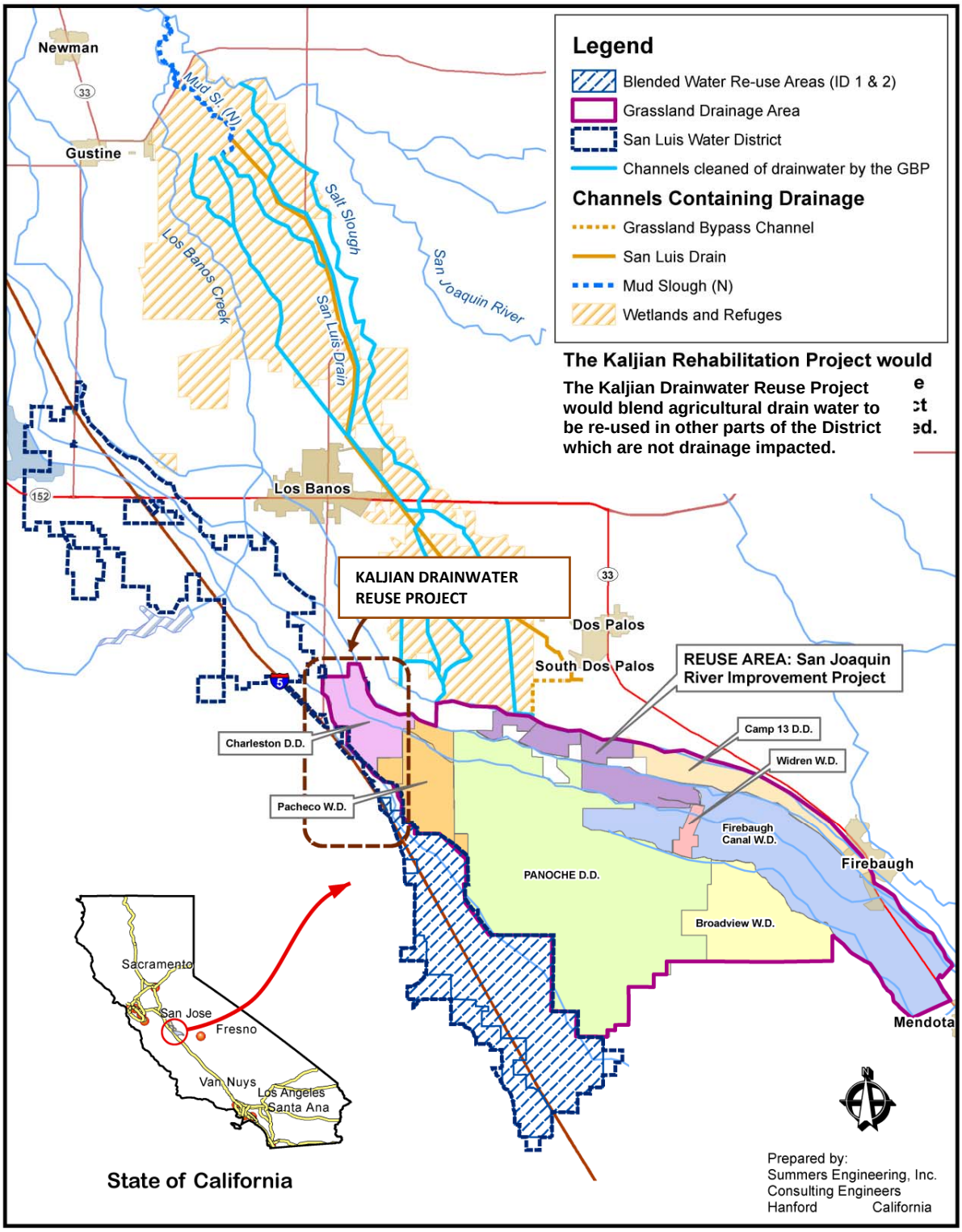
Expedited funding is needed for this Project to immediately supplement and diversify SLWD water supply with an additional 2,300 AFY of local agricultural water and to offset impacts resulting from reduced CVP deliveries to agriculture due to the current drought. Long-term, the Project will significantly improve water supply reliability for the region.

Project Maps



GRASSLAND BYPASS PROJECT MAP

KALJIAN DRAINWATER REUSE PROJECT



G:\data\ARCVIEW\MAPS\SLWD\GBP project map and kajian and drain water blending projects.mxd

Project Physical Benefits

The following primary and secondary physical benefits are claimed for the Kaljian Drainwater Reuse Project and listed in **Table 5a** and **Table 5b**, respectively, below.

- Primary Benefit - Increased Local Water Supplies/Reliability
- Secondary Benefit – Improved Water Quality/Reduced TDS, Selenium, and Boron Loads to the SJR/DMC

Primary Physical Benefit – Increased Local Water Supplies/Reliability

Table 5a below is **PSP Table 5** that provides information on the primary benefit of increasing local water supplies and reliability by reclaiming 2,300 AFY of water that has historically been treated and managed by the SJRRP and the CDD for drainage effluent management only. The 2,300 AFY currently being treated and used for irrigation that has no beneficial use. Blending and diverting this supply back into the SLWD irrigation system increases local agricultural supplies and will function as a new local source available as soon as construction is complete. The volumes below (column d) show the increase in local agricultural water supply provided by the Project. It is anticipated that project construction will be completed by the end of 2017, so full benefits are shown for the year 2018 and for all subsequent years.

Table 5a – Primary Annual Project Physical Benefits
Project Name: Kaljian Drainwater Reuse Project
Type of Benefit Claimed: Increased Local Water Supplies/Reliability
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 40 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2015	0	0 – Award Contract	0
2016	0	0 – Construction	0
2017	0	0 – Construction	0
2018 - 2057	0	2,300	2,300

Comments:

References Cited for Primary Project Benefit

- *Charleston Drainage District – Historical Flow Characteristics Table. Refer to the secondary benefit tables for details.*

Secondary Physical Benefit – Improve Water Quality/Reduced TDS, Selenium and Boron Loads to SJR/DMC

Table 5b below is **PSP Table 5** that provides information for the secondary benefit of improving water quality for Total Dissolved Solids (TDS), selenium and boron in drainages to the SJR as a result of the capture and recirculation of agricultural drain water that would otherwise discharge to the river when the capacity of the SJRRP is exceeded. Based on CCD's historical flow records, approximately 120 AFY of drain water is discharged to the SJR. The concentrations shown in the table below are based on water quality monthly samples from three years of data (April 2011 to April 2014). The samples were collected at tile sumps T-2 and SL-2 near Charles Pump Station1 (P-2). In Table 5b, column (d), the mass (in pounds or lbs) of TDS, selenium and boron that would not be discharged to the SJR and the DMC as a result of Project implementation are also presented. Estimates of constituent loads (in lbs/year) that would not be diverted to the SJR are calculated based on the conversion from mg/L using the following formula:

$$\frac{lbs}{year} = \frac{mg}{L} \times \frac{8.245\,\frac{lbs}{MG}}{\frac{mg}{L}} \times 0.325851\,\frac{MG}{AF} \times \frac{120\ AF}{year}$$

Construction is not complete until the end of 2017, so full benefits are shown for the year 2018 and for all subsequent years.

Table 5b – Secondary Annual Project Physical Benefits

Project Name: Kaljian Drainwater Reuse Project
Type of Benefit Claimed: Improve Water Quality/Reduced TDS, Selenium and Boron Loads to SJR/DMC
Units of the Benefit Claimed: mg/L
Anticipated Useful Life of Project (years): 40 years

(a)		(b)	(c)	(d)
	Physical Benefits			
Year	**Constituent**	**Without Project**	**With Project**	**Change Resulting from Project**
2015	TDS	3,345	3,345	0
	Selenium	0.09	0.09	0
	Boron	6.1	6.1	0
2016	TDS	3,345	3,345	0
	Selenium	0.09	0.09	0
	Boron	6.1	6.1	0
2017	TDS	3,345	3,345	0
	Selenium	0.09	0.09	0
	Boron	6.1	6.1	0

(a)		(b)	(c)	(d)
	Physical Benefits			
Year	**Constituent**	**Without Project**	**With Project**	**Change Resulting from Project**
2018 - 2057	TDS	6.1	0	-6.1 mg/L This translates to a reduction of 43,134,080 lbs of TDS being discharged to the SJR/DMC over the 40 year life of the project.
	Selenium	0.09	0	-0.09 mg/L This translate to a reduction of 1,120 lbs of selenium being discharged to the SJR/DMC over the 40 year life of the project.
	Boron	3,345	0	-3,345 mg/L This translates to a reduction of 78,920 lbs of boron being discharged to the SJR/DMC over the 40 year life of the Project.

Comments:

References Cited for Secondary Project Benefit

- *Historical Water Quality at Charleston Drainage District Pump Station #2 – monthly average samples of electrical conductivity (EC), selenium, and boron were taken. Average of three years of data from April 2011- April 2014 was used to calculate the benefit. Refer to secondary benefits tables for details.*
- *Charleston Drainage District's Flow Characteristics – Tile Recirculation & Agricultural Drainage. 2014.*

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   CVP deliveries south of the Delta have been growing increasingly unreliable, and in recent years, due to drought conditions and Delta pumping restrictions, SLWD has experienced significant shortages and decreased reliability. On average, CVP deliveries have been approximately 65% of contracted amounts under normal water year conditions, and both last year (2014) and this year (2015), SLWD's CVP supply has been 0% of its full contract amount. Future contract deliveries continue to be uncertain given the pending 'Delta fix' and climate change impacts on the State's water supply systems. This Project would provide an additional 2,300 AFY of local agricultural water supply to an area that relies on the critical and drought-diminished CVP water delivery system.

   A second benefit of the proposed project is a reduction of loading of key constituents into the San Joaquin River (SJR). As previously noted, agricultural drain water containing elevated concentrations of TDS, selenium and boron are sometimes discharged to the San Joaquin River when flows to the Grassland Drainage Area exceed irrigation capacity. This Project will reduce the treatment/maintenance load on the Grass Drainage Area and SJRRP system and will reduce the flow of agricultural drain water to the SJR, assisting in meeting TMDLs on the river. The Project will also eliminate the amount of agricultural drain water that spills to the DMC during storm

events.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   Without the Project, the SLWD would not be able to make use of 2,300 AFY of additional local supplies as the agricultural drain water (effluent) will continue to be managed by the CCD recirculation system (which provides no beneficial use) or discharged to the SJR/DMC. In addition, the CCD charges an assessment fee of $48/acre for the management (recirculation) of drainage water. The Project would provide beneficial use for the drainage from over 2,365 acres. Without the Project, approximately 830 acres of permanent crops could be lost in, even if the State receives normal precipitation, and elevated concentrations of TDS, selenium and boron would continue to discharge to the SJR.

3. **Describe the methods used to estimate the physical benefits.**

   The estimated volume of 2,300 AFY is the historical tile and drain flow in the CCD during the agricultural season (six month period). The 2,300 AFY tile and drain system receives treatment for effluent management at the SJRRP; it is this volume that would be recirculated into the SLWD irrigation system through implementation of the proposed Project. Approximately 120 AFY of the 2,300 AFY goes untreated and discharges to SJR or spills into the DMC. This volume (120 AFY) was used along with measured concentrations from samples at tile sumps T-2 and SL-2 to estimate the reduction in concentration and water quality improvements to the SJR as a result of Project implementation.

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   The Project will include rehabilitation of the Kaljian Pump Station, 9,100 linear feet of the Kaljian Pipeline, Outfall, 17,800 linear feet of the Main Canal and the Fittje Pump Station. In addition, 3,950 feet of canal and 2,550 feet of new pipeline will be constructed as part of the Project.

   No new policies or actions are required to obtain the physical benefits of the project.

5. **Describe any potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   The Project is not expected to have any long-term adverse impacts and would instead provide physical benefits to the SJR. At this time, no mitigation measures should be required during construction beyond implementation of standard construction-related BMPs and monitoring for and mitigation of any short-term construction-related impacts.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The Project would provide a long-term local water supply of 2,300 AFY that is the historical tile and drain flow in the CCD during the agricultural season (6-month period). At present, the 2,300 AFY gets treated for effluent management at the SJRRP and used to irrigate a crop with no beneficial value. With the Project, 2,300 AFY of additional local agricultural water supply would be available and 2,300 AFY of imported water from the CVP would not be required to meet irrigation demands (and therefore not withdrawn from the Delta). During droughts, when CVP allocations are cut back, this additional water supply will become a critical water supply, reducing groundwater pumping to meet agricultural demands.

Secondary Physical Benefit

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   The SRRP and the CCD are currently at management/treatment capacity, especially during the agricultural season. Each year, approximately 120 AF of untreated drain water discharges into the SJR and/or DMC. The occurrence of spills of drain water into the DMC has caused the U.S. Bureau of Reclamation (USBR) to issue notices of violation.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   Without the Project, it is estimated that the following loads of constituents will discharge to the SJR/DMC annually: 1,973 lbs of boron, 28 lbs of selenium and 1,078,352 lbs of TDS. The potential for additional notices of violation from the USBR also will continue to exist.

3. **Describe the methods used to estimate the physical benefits.**

   According to the CCD's flow characteristics, an average of 120 AFY of drain water is discharged without treatment to either the SJR or the DMC. Using the historical water quality data from CCD at Pump Station 2, the reduction in pounds per year of constituent was calculated.

   The three years monthly average sample data from April 2011- April 2014 were used to calculate the reduced loading benefit. The electrical conductivity (EC) was converted to TDS in mg/L using this formula:

   TDS (mg/L) = 0.64 x EC (umhos)

   For each constituent (TDS, selenium and boron), the three-year monthly average in mg/L was used to calculate the load in pounds (lbs)/year that would not be discharged to the SJR using this formula:

$$\frac{lbs}{year} = \frac{mg}{L} \times \frac{8.245\frac{lbs}{MG}}{\frac{mg}{L}} \times 0.325851\frac{MG}{AF} \times \frac{120\ AF}{year}$$

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   Rehabilitation of the Kaljian Pump Station, 9,100 linear feet of the Kaljian Pipeline, Outfall, 17,800 linear feet of the Main Canal and the Fittje Pump Station is required for the project. In addition, 3,950 feet of canal and 2,550 feet of new pipeline would be constructed.

   No new policies or actions are required to obtain the physical benefits.

5. **Describe potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   No long-term adverse impacts are anticipated as a result of Project implementation, and would, instead, result in physical benefits to the SJR. Short-term construction-related impacts would be addressed through the implementation of construction-related BMPs, and monitoring will be conducted to identify and mitigate any short-term construction-related impacts.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The Project would provide a long-term local water supply of 2,300 AFY that is the historical tile and drain flow in the CCD during the agricultural season (6-month period). At present, the 2,300 AFY tile and drain gets treated for effluent management at the SJRRP and presently provides no beneficial use. With the Project, 2,300 AFY of additional local agricultural water supply would be available and 2,300 AFY of imported water from the CVP would not be required to meet irrigation demands. During droughts when CVP allocations are cut back, this additional water supply will become a critical water supply by reducing groundwater pumping to meet agricultural demands. Furthermore, this Project directly improves water quality conditions of the SJR/DMC by preventing the drain water discharge to the SJR/DMC.

Direct Water-Related Benefit to a DAC

The Westside-San Joaquin Region is home to large Hispanic or Latino populations which are greatly dependent upon agricultural production as a source of employment. Improving water supply reliability and quality, and otherwise enhancing the conditions for production of agriculture in this Region, will expand employment opportunities for these disadvantaged populations. SLWD Kaljian Drainwater Reuse Project will capture agricultural tailwater runoff and recirculate it back into the irrigation systems, thereby reduce the volume of groundwater extraction required to make up that same volume of water that would otherwise be lost. This Project will reduce groundwater extraction and preserve groundwater supplies for the cities and rural areas that are dependent on groundwater as their potable water supply and which include large DAC communities. Thus, the Project addresses the critical water supply need of the DACs in the Westside-San Joaquin IRWM Region. Attachment 7 of this Grant Application presents the documentation of the DAC communities within the Project area, including a map that identifies the locations of the DACs.

Project Performance Monitoring Plan

PSP Table 6 below identifies the project monitoring targets and measures that will demonstrate that the Project will meet its intended goals and achieve measurable outcomes for the primary and secondary benefits claimed herein. The Project Performance Monitoring Plan describes the tools that will be used to monitor project performance and set targets that will be used to track the Project's progress in meeting the benefits claimed in Tables 5a and 5b above. The plan describes where data will be collected and the types of analyses used, and explains how the monitoring tools and targets are appropriate for the benefits claimed.

Table 6 – Project Performance Monitoring Plan **Project:** Kaljian Drainwater Reuse Project		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary benefit: Increased Local Water Supplies/Reliability	Increase supplies in the SLWD system an average amount of up to 2,300 AF per year	Flow meter with totalizer at the Charleston Drain and drain water pump station with data comparison against historical data
Secondary benefit: Improved Water Quality/Reduced TDS, Selenium, and Boron Loads to the SJR	Reduce releases of the following constituents (and associated loads) to the SJR: Boron @ 6.12 mg/L or 1,973 lb[1] Selenium @ 0.09 mg/L or 29 lb[1] TDS @ 3,345 mg/L or 1,078,352 lb[1]	Water quality samples in the Charleston Drain during irrigation operations to evaluate the concentration of the three constituents. These data will be used along with flow data from above to estimates of load reduction to the SJR.

Note: [1]Based on CCD's historical flow records, approximately 120 AFY of drain water is discharged to the SJR.

PROJECT 3: Orestimba Creek Recharge and Recovery Project

IMPLEMENTING AGENCY: Del Puerto Water District

Project Description

(25 Words) Project will recharge the Delta-Mendota groundwater basin with 452 AFY of excess flows and will convey the banked water to the Delta-Mendota Canal.

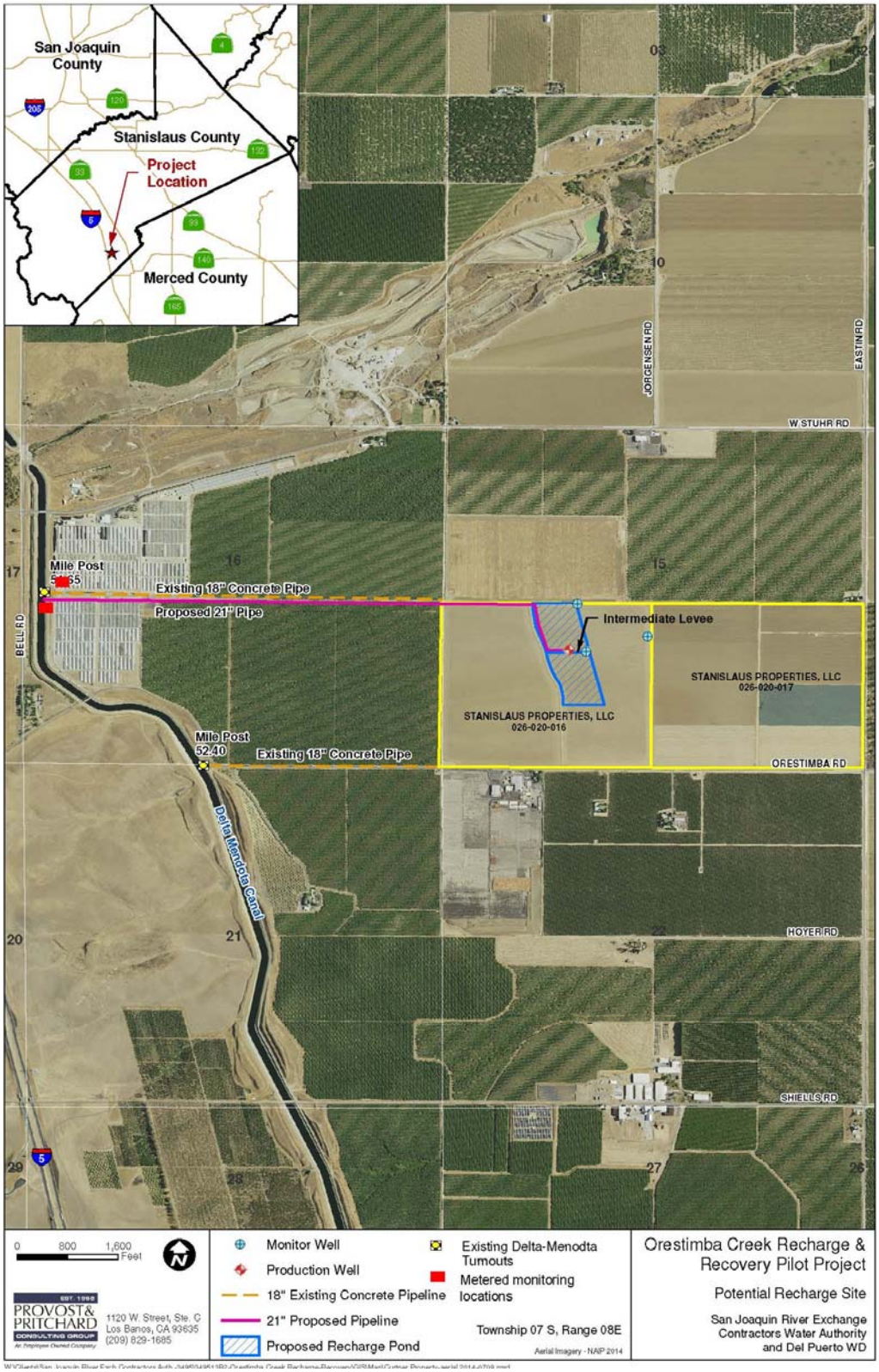
(Expanded) This Project constitutes the second phase of the Orestimba Creek Recharge and Recovery Project, implemented by the Del Puerto Water District (DPWD) with the Central California Irrigation District (CCID) as a project participant. This Project will construct a 20-acre groundwater banking facility that relies on excess surface water flows to provide replenishment of 452 acre-feet per year (AFY), on average, to the underlying Delta-Mendota Subbasin of the San Joaquin Valley Groundwater Basin. The banked water will be available for recovery during dry periods through the construction of one 600-foot deep extraction well and a pipeline connection to the Delta-Mendota Canal (DMC). The Project's water supplies for groundwater banking include raw water from the DPWD irrigation system and excess flows from the Kings River and San Joaquin River. Other potential sources of water for banking are raw water from other irrigation districts (such as CCID) and Orestimba Creek flows, if the appropriate water rights are obtained. In addition to the recharge basin and the extraction well, three groundwater observation/monitoring wells will be constructed, along with a 6,400-foot long PVC pipeline connecting the DMC to the recharge facility providing the ability to convey raw water from the DMC for banking and to return recovered water to the canal for distribution to downstream DPWD growers.

This Project provides immediate regional drought relief by providing the necessary infrastructure to divert, recharge, store/bank, and recover an average of 452 AFY of raw water in the local groundwater basin. The banked water can be recovered and used during dry periods for irrigation and potable uses (following treatment). For instance, water can be conveyed back to the DMC for distribution to downstream DPWD irrigators who may be forced to fallow their acres otherwise, especially during periods of drought.

This Project will increase local water supply reliability and further ensure the delivery of safe drinking water by banking an average of 452 AFY of winter-month excess surface water flows in the groundwater basin. The banked water will also improve local groundwater quality by introducing higher-quality surface water into the groundwater basin (which currently has high salinity). The banked water will also augment local groundwater supplies and thus allow for improved groundwater basin management under varying conditions (including current and future drought conditions).

Expedited funding is needed for this Project to immediately construct the recharge facilities necessary to develop this local groundwater bank. Having these facilities in place by the 2017-2018 winter will allow the Region to bank wintertime flows, even if they are short-term in duration. This banking will create an additional water supply source and improve local groundwater quality that has been compromised due to overpumping in response to surface water shortfalls. The proposed Project will also improve water delivery flexibility on a regional level and make additional water available to DPWD growers in the summer, thereby helping to reduce demands on the Bay-Delta. The absence of this Project could result in the fallowing of crops throughout the service area (as is currently being experienced in response to the current drought) and increase of threat of die-off of permanent crops, both of which could lead to widespread regional economic losses.

Project Map


San Joaquin County
Stanislaus County
Project Location
Merced County
JORGENSEN RD
EASTIN RD
W STUHR RD
Mile Post
Existing 18" Concrete Pipe
Proposed 21" Pipe
Intermediate Levee
STANISLAUS PROPERTIES, LLC
026-020-017
STANISLAUS PROPERTIES, LLC
026-020-016
BELL RD
Mile Post
52.40
Existing 18" Concrete Pipe
ORESTIMBA RD
Delta Mendota Canal
HOYER RD
SHIELLS RD
0 800 1,600 Feet
Monitor Well
Production Well
18" Existing Concrete Pipeline
21" Proposed Pipeline
Proposed Recharge Pond
Existing Delta-Menodta Turnouts
Metered monitoring locations
Township 07 S, Range 08E
Aerial Imagery - NAIP 2014
PROVOST& PRITCHARD
CONSULTING GROUP
1120 W. Street, Ste. C
Los Banos, CA 93635
(209) 829-1685
Orestimba Creek Recharge & Recovery Pilot Project
Potential Recharge Site
San Joaquin River Exchange Contractors Water Authority and Del Puerto WD

Project Physical Benefits

The following primary and secondary physical benefits are claimed for the Orestimba Creek Recharge and Recovery Project and listed in **Table 5a** and **Table 5b**, respectively, below.

- Primary Benefit - Increased Local Water Supplies/Reliability
- Secondary Benefit - Decreased Demands on the Bay-Delta

Primary Physical Benefit – Increased Local Water Supplies/Reliability

Table 5a below is **PSP Table 5** that provides information on the primary benefit of increasing local water supplies and reliability by increasing conjunctive use capabilities and basin management. This would be achieved by developing facilities to recharge and bank primarily excess surface water and/or raw district water for recovery during dry or peak periods. The volumes below (column d) show the increase in local water supply provided by recharging and banking winter supplies that would otherwise have flowed to the Bay-Delta and ultimately to the ocean. It is anticipated that the Project will complete construction by the spring of 2017, so full benefits are expected beginning the winter of 2017 and for all subsequent years.

Table 5a – Primary Annual Project Physical Benefit

Project Name: Orestimba Creek Recharge and Recovery Project
Type of Benefit Claimed: Water Supply- Increased Local Water Supply/Reliability
Units of the Benefit Claimed: AF
Anticipated Useful Life of Project (years): 30

(a)	(b)	(c)	(d)
Year	**Physical Benefits**		
	Without Project	**With Project**	**Change Resulting from Project**
2015	0	0 – Award Contract	0
2016	0	0 – Construction	0
2017-2047	0	452	452

Comments:

References Cited for Primary Project Benefit

- *Orestimba Creek Recharge and Recovery Project, Engineer's Opinion of Probable Construction Cost* (page 2, Appendix 2.2)

Secondary Physical Benefit – Decreased Demands on the Bay-Delta

Table 5b below is **PSP Table 5** that provides information for the secondary benefit of reducing demands on the Bay-Delta. This Project will cause an increase in local supplies through groundwater banking and recovery, which will lead to a direct reduction in DMC-imported water (and associated diversions) from the Bay-Delta that would have previously been necessary during irrigation months. It is anticipated that the Project will complete construction by the spring of 2017, so full benefits are expected beginning the winter of 2017 and for all subsequent years.

Table 5b – Secondary Annual Project Physical Benefit **Project Name:** Orestimba Creek Recharge and Recovery Project **Type of Benefit Claimed:** Habitat Protected - Decreased Demands on the Bay-Delta **Units of the Benefit Claimed:** AF **Anticipated Useful Life of Project (years):** 30			
(a)	**(b)**	**(c)**	**(d)**
Year	**Physical Benefits**		
	Without Project	**With Project**	**Change Resulting from Project**
2015	452	452 – Award Contract	0
2016	452	452 – Construction	0
2017-2047	452	0	-452
Comments: **References Cited for Secondary Project Benefit:** • *Orestimba Creek Recharge and Recovery Project, Engineer's Opinion of Probable Construction Cost* (page 2, Appendix 2.2)			

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   DMC allocations have been 0% of contracted amounts during the current drought, causing many DPWD irrigators to fallow their lands. The Project would provide for the banking and eventual recovery of an average of 452 AFY by banking wet-weather surface waters in the Delta-Mendota groundwater basin, therefore improving local water supply reliability and improving groundwater sustainability. This Project will allow the banked groundwater to be withdrawn and used in dry period, thereby offsetting the impacts of reduced surface water deliveries via the DMC.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   Without the Project, local growers will continue to rely on water delivered via the DMC and there will be no delivery of banked water and associated 452 AFY reduction in demand on water from the Bay-Delta. Under drought conditions such as those currently being experienced, water shortages lead to ongoing (and perhaps permanent) crop fallowing, an increased risk of permanent crop die-off or removal, and all associated economic losses.

3. **Describe the methods used to estimate the physical benefits.**

   The 452 AFY is the estimated average project yield from the consultants who performed the feasibility studies. The physical benefits are based on initial recharge estimates based on local hydrogeologic conditions documented in the *Orestimba Creek Recharge and Recovery Project,*

Initial Review of Draft Fatal Flaw Analysis (page 7, Appendix 2.2), as updated in the more recent *Orestimba Creek Recharge and Recovery Project, Engineer's Opinion of Probable Construction Cost* (page 2, Appendix 2.2). However, this value may change with further, site-specific information about the selected project site.

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   New project facilities will include a 20-acre groundwater recharge facility (requiring the construction of levees to form the tandem recharge pond system), one 600-foot deep groundwater extraction well, three 300-feet deep nearby monitoring wells, and a 6,400-foot long PVC pipeline connecting the recharge and extraction facilities to the DMC.

   No new policies or actions are required to obtain the physical benefits of the project, although a permit will be required from the RWQCB for project-related recharges.

5. **Describe any potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   The Project is not expected to have any adverse long-term impacts. The Project proponent, DPWD, will conduct an Initial Study/Environmental Assessment for the Project with the intent to adopt a Negative Declaration or Mitigated Negative Declaration. During construction, BMP's and environmental assessment recommendations will be implemented and monitored to mitigate any short-term construction-related impacts.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The Project would provide a long-term local water supply of an average of 452 AFY from the banking and eventual recovery of wintertime excess surface water flows or raw water from DPWD. With the Project, 452 AFY of additional supply could help DPWD irrigators who, due to the ongoing drought are currently at risk of having to fallow their crops, perhaps permanently, to survive future drought periods and overall to help with the long-term sustainability of the Delta-Mendota Subbasin. Furthermore, this Project directly promotes conjunctive use and efficient groundwater management by storing surface water in the ground for later use.

<u>Secondary Physical Benefit</u>

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   The Project allows for the banking and eventual recovery of an average of 452 AFY by banking wet-weather surface waters in the groundwater basin, therefore reducing the amount of water diverted from the DMC and, subsequently, from the Bay-Delta. This Project not only reduces the normal water volume diverted from the DMC by 452 AFY, but also provides a way for downstream DPWD users to bank and receive recovered water by returning the banked water back to the canal. With DMC allocations at 0% during the current drought, requiring less water from the Bay-Delta frees that water up for other uses, including environmental protection, under both this and future drought situations.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   Without the Project, local growers will continue to rely on water delivered via the DMC and there will be no 452 AFY reduction in water demand from the Bay-Delta.

3. **Describe the methods used to estimate the physical benefits.**

   The 452 AFY is the estimated average project yield from the consultants who performed the feasibility studies. The physical benefits are based on local hydrogeologic conditions and initial estimates from the *Orestimba Creek Recharge and Recovery Project, Initial Review of Draft Fatal Flaw Analysis* (page 7, Appendix 2.2). These estimates were updated in the more recent *Orestimba Creek Recharge and Recovery Project, Engineer's Opinion of Probable Construction Cost* (page 2, Appendix 2.2); however, this value may change with further information about the selected project site.

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   New project facilities will include a 20-acre groundwater recharge facility (requiring the construction of levees to form the tandem recharge pond system), one 600-foot deep groundwater extraction well, three 300-feet deep monitoring wells, and a 6,400-foot long PVC pipeline connecting the recharge and extraction facilities to the DMC.

   No new policies or actions are required to obtain the physical benefits of the project, although a permit will be required from the RWQCB for project-related recharges.

5. **Describe potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   The Project is not expected to have any long-term adverse impacts. The Project proponent will conduct an Initial Study/Environmental Assessment for the Project with the intent to adopt a Negative Declaration or Mitigated Negative Declaration. During construction, BMP's and environmental assessment recommendations will be implemented and monitored to mitigate any short-term construction-related impacts.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The Project would provide a new local water supply with an average of 452 AFY from groundwater banking and eventual recovery of wintertime excess surface water flows or raw water from the DMC, therefore reducing (by 452 AFY) the amount of water diverted from the DMC and Bay-Delta. In the long-term, this reduction in water taken from the Bay-Delta only aides the CALFED Bay-Delta Program's objectives.

Direct Water-Related Benefit to a DAC

The Westside-San Joaquin Region is home to large Hispanic or Latino populations which are greatly dependent upon agricultural production as a source of employment. Improving water supply reliability and quality, and otherwise enhancing the conditions for production of agriculture in this Region, will expand employment opportunities for these disadvantaged populations. According to the DAC map presented in Attachment 7 of this application, the project area of the DPWD lies within the DAC area. The Orestimba Creek Recharge and Recovery Project will capture excess wet season surface water and bank it in the ground for later extraction and use, thereby reducing groundwater pumping by DPWD irrigators who can instead benefit from the better quality banked water. Recharge will also result in keeping groundwater levels elevated, thus reducing energy

use and pumping costs. Groundwater supplies will thus be preserved for domestic uses in the areas that include large DAC communities and this Project addresses the critical water supply needs of the DACs in the Westside-San Joaquin IRWM Region.

Project Performance Monitoring Plan

PSP Table 6 below identifies the project monitoring targets and measures that will demonstrate that the project will meet its intended goals and achieve measurable outcomes for the primary and secondary benefits claimed for the project. Project Performance Monitoring Plan describes the tools that will be used to monitor project performance and set targets that will be used to track the project's progress in meeting the benefits claimed in Tables 5a and 5b above. The plan describes where data will be collected and the types of analyses used and explains how the monitoring tools and targets are appropriate for the benefits claimed.

Table 6 – Project Performance Monitoring Plan
Project: Orestimba Creek Recharge and Recovery Project

Proposed Physical Benefits	Targets	Measurement Tools and Methods
Primary benefit: Increased Local Water Supplies/Reliability	Bank an average amount of 452 AF of water per year	• Flow meters will measure the amount of water delivered to the recharge ponds • Three 300-foot observation wells placed nearby 20-acre recharge area will monitor groundwater levels
Secondary benefit: Decreased Demands on the Bay-Delta	Reduce diversions from the Bay-Delta (via the DMC) by an average of 452 AFY	Metering devices will measure the amount of water DPWD deliveries from the DMC; these values will be compared to historical values to reflect the increased use of local supply in lieu of DMC water

PROJECT 4: Newman LID Project for Water Quality Improvement and Water Conservation

IMPLEMENTING AGENCY: City of Newman

Project Description

(25 words) The Project will treat and store 903 AFY of urban water runoff and reuse 714 AFY of treated water for irrigation and inlieu groundwater banking.

(Expanded) The City of Newman has acquired, and is proposing to develop, 103 acres of land to implement Low Impact Development (LID) techniques for receiving, treating and storing local storm water and urban water runoff such as nuisance water from park/open spaces, parking areas and landscaped areas. The City will develop 78 acres of the 103 acres for water treatment, implementing LID applications such as vegetated swales, constructed wetlands, and bioretention basins. The remaining 25 acres will be used for the storage of the treated water, which will then be used to irrigate city land, offsetting groundwater pumping currently used for irrigation, providing for the in-lieu banking of that offset groundwater, and implementing water conservation by reusing the treated water to its highest beneficial use. All acreage will be landscaped, with recreational facilities (i.e. trails) and habitat incorporated into the design.

The LID project consists of five components; reducing discharges of sediment/pollutants; improving the quality of urban water runoff; re-using the treated water for irrigation (and offsetting groundwater pumping for the same purpose); providing an attractive and highly utilized recreational park for bicyclists and pedestrians; and implementing the public outreach/education programs for LID and Water Conservation. The Project will be implemented in three phases as follows:

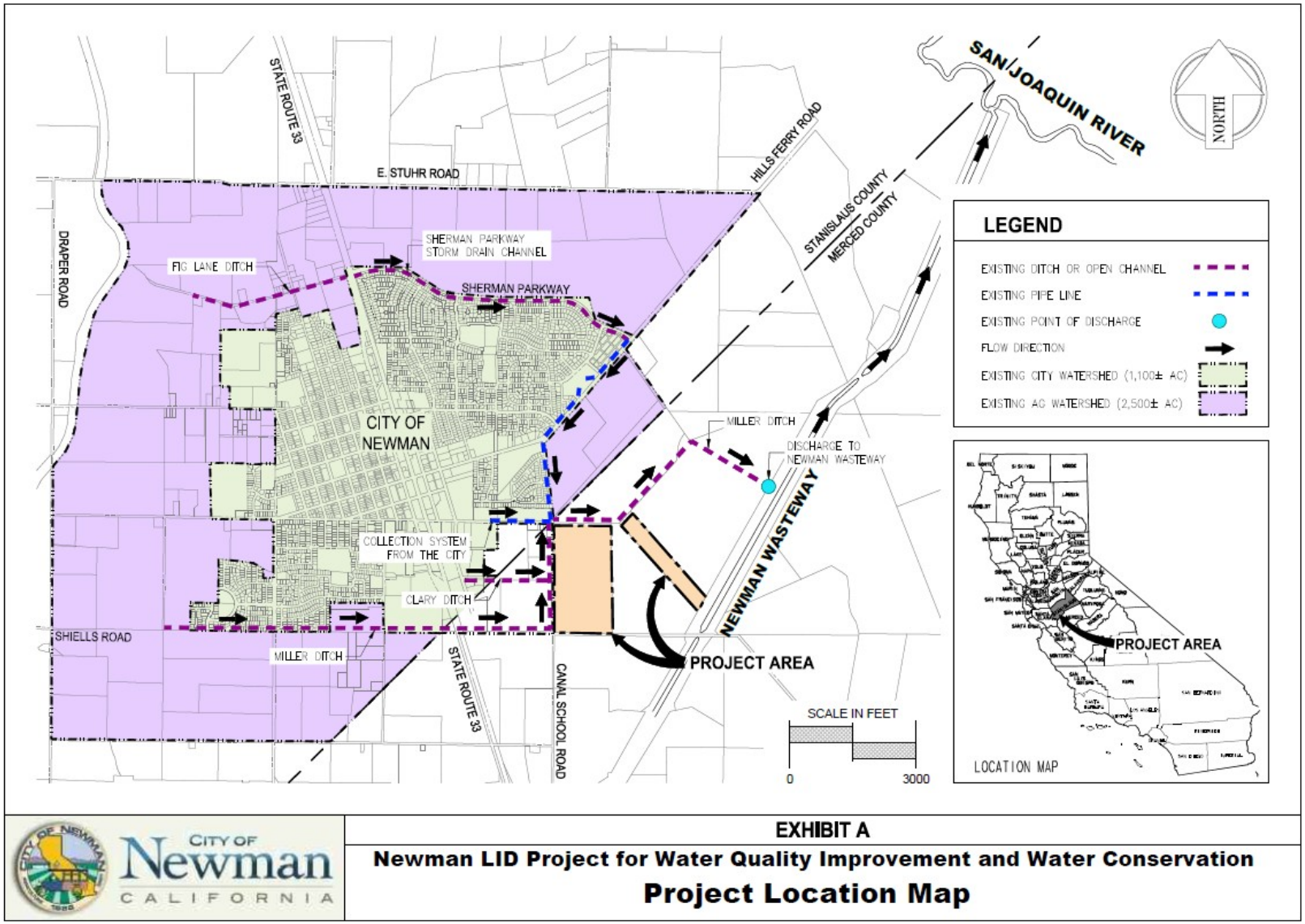
> Phase I – Design/permitting/environmental clearance, and construction of the pump station, bioswales, and constructed wetlands/habitat
>
> Phase II – Construction of the bioretention cells/storage and associated landscaping
>
> Phase III – Construction of additional recreational features, including paths for bicyclists and pedestrians

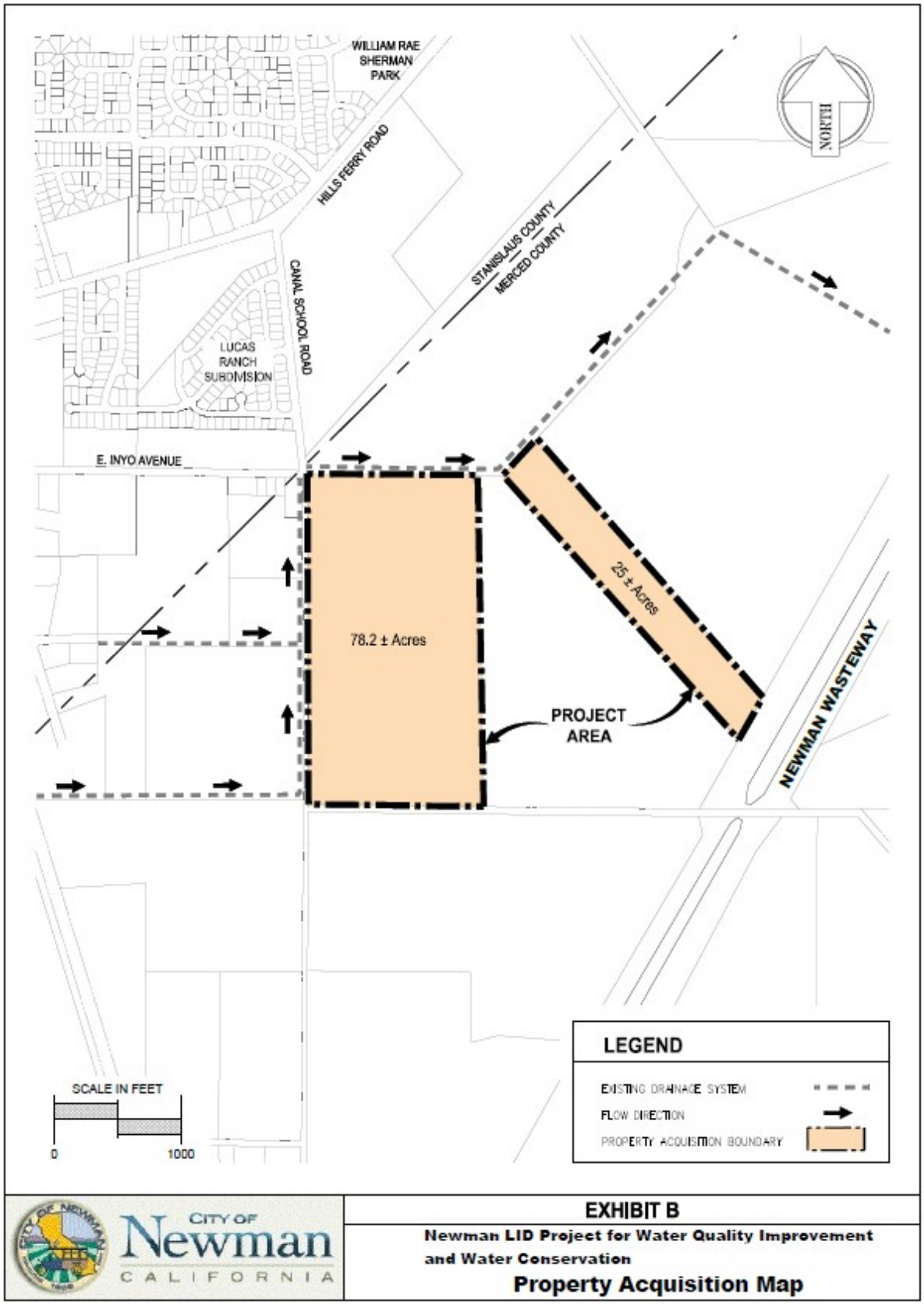
Funding sought in this application will be used to complete Phase I of the Project. However, when fully implemented, the LID Project will allow the City to achieve a long-term water quality improvement as well as reuse water more efficiently, matching water quality to its highest appropriate beneficial use.

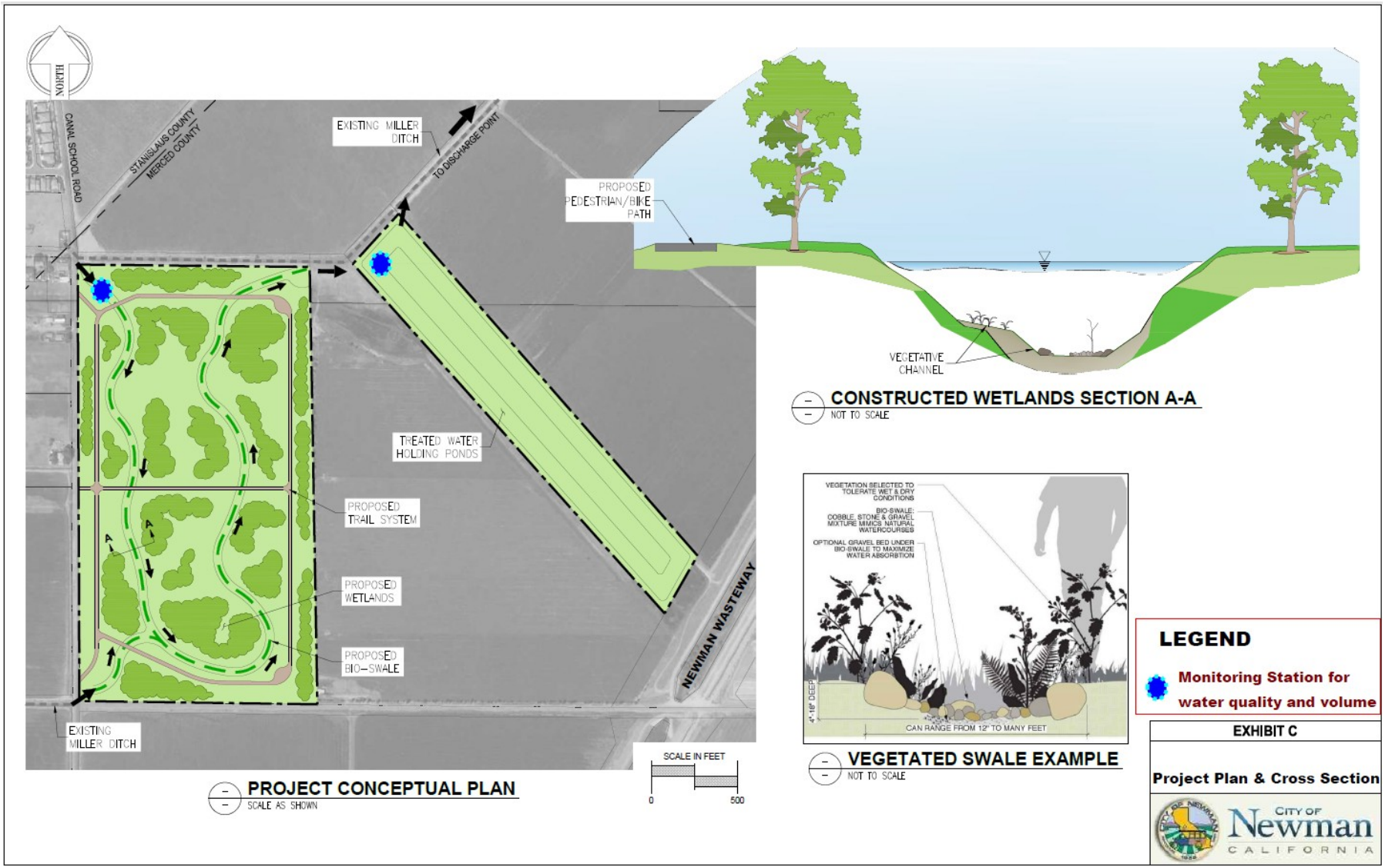
The key benefits of the proposed LID project are summarized as follows:

- Reducing the discharge of sediment and pollutants in untreated stormwater runoff and irrigation tail water into the Newman Wasteway, and ultimately, the San Joaquin River System, in turn improving the quality of water discharged;
- Reducing the amount of stormwater discharged into the San Joaquin River System;
- Improving quality of municipal drainage discharge water;
- Regulating discharge into the Newman Wasteway;
- Preserving open space and improving flood protection;
- Reusing treated water for irrigation of City property or sale to other users; and
- Providing recreational enhancements for bike, pedestrian and other recreational uses.

Project Maps




WILLIAM RAE SHERMAN PARK
HILLS FERRY ROAD
NORTH
STANISLAUS COUNTY
MERCED COUNTY
CANAL SCHOOL ROAD
LUCAS RANCH SUBDIVISION
E. INYO AVENUE
78.2 ± Acres
25 ± Acres
PROJECT AREA
NEWMAN WASTEWAY
LEGEND
EXISTING DRAINAGE SYSTEM
FLOW DIRECTION
PROPERTY ACQUISITION BOUNDARY
SCALE IN FEET
0
1000
CITY OF Newman CALIFORNIA
EXHIBIT B
Newman LID Project for Water Quality Improvement and Water Conservation
Property Acquisition Map


NORTH
CANAL SCHOOL ROAD
STANISLAUS COUNTY
MERCED COUNTY
EXISTING MILLER DITCH
TO DISCHARGE POINT
PROPOSED PEDESTRIAN/BIKE PATH
TREATED WATER HOLDING PONDS
PROPOSED TRAIL SYSTEM
PROPOSED WETLANDS
PROPOSED BIO-SWALE
NEWMAN WASTEWAY
EXISTING MILLER DITCH
SCALE IN FEET
0
500
PROJECT CONCEPTUAL PLAN
SCALE AS SHOWN
VEGETATIVE CHANNEL
CONSTRUCTED WETLANDS SECTION A-A
NOT TO SCALE
VEGETATION SELECTED TO TOLERATE WET & DRY CONDITIONS
BIO-SWALE: COBBLE, STONE & GRAVEL MIXTURE MIMICS NATURAL WATERCOURSES
OPTIONAL GRAVEL BED UNDER BIO-SWALE TO MAXIMIZE WATER ABSORBTION
4"-18" DEEP
CAN RANGE FROM 12" TO MANY FEET
VEGETATED SWALE EXAMPLE
NOT TO SCALE
LEGEND
Monitoring Station for water quality and volume
EXHIBIT C
Project Plan & Cross Section
CITY OF Newman CALIFORNIA

Project Physical Benefits

The following primary and secondary physical benefits are claimed for the Newman LID Project for Water Quality Improvement and Water Conservation and listed in **Table 5a** and **Table 5b**, respectively, below.

- Primary Benefit – Store and Reuse Water Runoff (Water Supply Produced, Saved or Recycled)
- Secondary Benefit – Water Runoff Treated through LID (Water Quality Improvement)

Primary Physical Benefit – Store and Reuse Water Runoff (Water Supply Produced, Saved or Recycled)

Table 5a below is **PSP Table 5** that provides information on the primary benefit of capturing, storing and reusing 714 AFY of the treated urban and storm water runoff through implementation of the proposed LID techniques. This benefit implements water conservation/recycling by reusing the treated water to irrigate city land and maximizing in-lieu groundwater banking. This increase in local water supplies will function as a new local source and will be available as soon as construction is complete. It is anticipated that the Project will finish construction at the end of September 2017. Partial benefits are quantified for the year 2017 and full benefits are shown for the year 2018 and for all subsequent years.

Table 5a – Primary Annual Project Physical Benefits
Project Name: Newman LID Project for Water Quality Improvement and Water Conservation
Type of Benefit Claimed: Store and Reuse Water Runoff (Water Supply Produced, Saved or Recycled)
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 30 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Difference
2016	0	0	0
2017*	0	180	180
2017 – 2046	0	714	714

*Partial benefits were assumed for 2017, assuming an anticipated project completion of September 2017.

Comments:

References Cited for Primary Project Benefit

- The Technical Memorandum by Blackwater Engineering (Apr. 22, 2013) prepared for the Storm Drain Conveyance system analyzed the current state of the City's storm drain system in this area and identified sediment and debris that were negatively affecting the current conveyance facilities.
- Through the preliminary feasibility study, the City staff analyzed that the proposed LID facility will be able to treat a drainage area up to 1,950 acres with an estimated water quality improvements for flows up to 903 AFY.
- The proposed Storage Pond will be used to store urban and storm water runoff treated through LID for reuse as irrigation. The estimated water runoff from the total watershed (3,611 acres) is 1,428 AFY. It is assumed that minimum 50% of the water (714 AFY) can be stored and reused through the LID components.

Secondary Physical Benefit – Water Runoff Treated through LID (Water Quality Improvement)

Table 5b below is **PSP Table 5** that provides information on the secondary benefit of treating 903 AFY of urban runoff through the proposed LID techniques that will improve the quality of the urban and storm water runoff percolating into the groundwater basin and eliminate discharges of those same pollutants to the SJR. At present, there is no treatment of the 903 AFY of urban and storm water supply, and all pollutants contained in the runoff is conveyed to the local storm drain system and the Newman Wasteway, and ultimately to the San Joaquin River. This project will divert and treat this runoff, removing this pollutant load via natural techniques. The water quality improvements will be realized as soon as construction is complete. It is anticipated that the Project will finish construction at the end of September 2017. Partial benefits are quantified for the year 2017 and full benefits are shown for the year 2018 and for all subsequent years.

Table 5b – Secondary Annual Project Physical Benefits
Project Name: Newman LID Project for Water Quality Improvement and Water Conservation
Type of Benefit Claimed: Water Runoff Treated through LID (Water Quality Improvement)
Units of the Benefit Claimed: AFY
Anticipated Useful Life of Project (years): 30 years

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Difference**
2016	0	0	0
2017*	0	226	226
2018 – 2046	0	903	903

*Partial benefits were assumed for 2017, assuming an anticipated project completion of September 2017.

Comments:

References Cited for Secondary Project Benefit

- The Technical Memorandum by Blackwater Engineering (Apr. 22, 2013) prepared for the Storm Drain Conveyance system analyzed the current state of the City's storm drain system in this area and identified sediment and debris that were negatively affecting the current conveyance facilities.
- Through the preliminary feasibility study, the City staff analyzed that the proposed LID facility will be able to treat a drainage area up to 1,950 acres with an estimated water quality improvements for flows up to 903 AFY.

Technical Analysis of Physical Benefits Claimed

Primary Physical Benefit

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   At present, urban dry and wet weather flows from the City of Newman are routed to the City's storm drain system, which drains into the Newman Wasteway and ultimately the San Joaquin River for disposal. Pollutants contained in the runoff are therefore conveyed to the storm drain system and ultimately the river. The City plans to develop 78 acres of land for water treatment via LID applications such as vegetated swales, constructed wetlands, and bioretention basins. The treatment of urban and storm water runoff will, in turn improve the quality of water discharged. The remaining 25 acres of land will be used for the storage of the treated water, which will ultimately be used for irrigation of City lands, offsetting groundwater currently used for the same purpose and reusing the treated water to its highest beneficial use.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   The estimated water runoff from the total watershed (3,611 acres) is 1,428 AFY. It is assumed that approximately 903 AFY of that runoff can be treated (see discussion below) and that a minimum of 50% of the runoff (714 AFY) can be stored and reused through the LID components. [50% x 0.47 (Runoff Coefficient) X 3,611 (Acres) X 10.1" (Mean Annual Precipitation) / 12 (inch/foot) = 714 AFY].

   Without implementation of the Project, minimum 714 AFY water runoff from the watersheds will not be captured, stored and reused annually.

3. **Describe the methods used to estimate the physical benefits.**

   The proposed bioretention structure and storage pond will be used to store treated urban and storm water runoff for irrigation reuse. The estimated water runoff from the total watershed (3,611 acres) using standard hydrologic routing techniques is 1,428 AFY. It is assumed that minimum 50% of the water (714 AFY) can be stored and reused through the LID components. [50% x 0.47 (Runoff Coefficient) X 3,611 (Acres) X 10.1" (Mean Annual Precipitation) / 12 (inch/foot) = 714 AFY].

   As such, a minimum 714 AFY treated water can be stored and reused as part of water conservation.

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   The proposed project site is currently categorized as "Agriculture" in the land use of General Plan. In order to preserve the proposed LID BMPs as a permanent sustainability measures, the land use for the project site will be changed to "Open Space" and recreational features will be incorporated into the Project.

   New facilities to be constructed for the Project include bioswales, constructed wetlands, bioretention basins, a 25-acre storage pond, a pump station and trails to distribute water to city lands for irrigation and provide recreational benefits to the community. No new policies or actions are anticipated to obtain the physical benefits of the project other than the rezoning of the proposed project site.

5. **Describe any potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   The Project is not anticipated to result in any long-term adverse impacts. In fact, the proposed LID treatment system will improve local water quality through the natural removal of pollutants prior to storage in the pond. Since treated water can be stored and reused, there will not be any adverse effects. Short-term impacts resulting from project construction are anticipated to be mitigated through the implementation of standard construction BMPs.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The proposed project will address long-term drought preparedness by capturing and reusing stormwater and urban water runoff for non-potable irrigation, thereby offsetting groundwater use for the same purpose and aiding in the long-term sustainability of the underlying Delta-Mendota groundwater basin. The in-lieu banking of the unused groundwater will assist in minimizing drawdown in groundwater elevations, thereby reducing pumping costs and associated greenhouse gas emissions for this small, disadvantaged community and improving water supply reliability in dry years.

<u>Secondary Physical Benefit</u>

1. **Explain the need for the project, including recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.**

   The Water Quality Control Plan for the San Joaquin River Basins (Basin Plan) contains numeric and narrative Water Quality Objectives (WQO) for selected portions of the San Joaquin River and its tributaries. The Project's direct receiving water is Newman Wasteway, which discharges into San Joaquin River just south of its confluence with Merced River. The City's LID Project is proposing to develop a 78 acre parcel which would allow the City to provide a regional solution to development within their municipality and provide treatment of stormwater as well as non-stormwater runoff to help to reduce the discharge of sediment, pollutants, selenium, and salts to the Newman Wasteway and San Joaquin River.

2. **Explain estimates of the without-project conditions (e.g., explain the levels of the physical benefits in the future, without the project, but with other planned projects).**

   Over 1,400 AFY water runoff from the watersheds flows into the existing Miller Ditch without treatment. Without this project, pollutants carried in this flow will ultimately end up in, and contribute to WQO exceedances, in the San Joaquin River.

3. **Describe the methods used to estimate the physical benefits.**

   Using the general 4% rule to size treatment BMPs, the proposed LID facility (78 acres) would be able to treat a drainage area up to 1,950 acres of runoff. [78 acres of LID facility / 4% = 1,950 acres]

   Based on the capacity of the proposed LID facility, LID BMPs will be able to treat a drainage area up to 1,950 acres with water quality flows up to 903 AFY.

   [0.55 (Runoff Coefficient) X 1,950 (Acres) X 10.1" (Mean Annual Precipitation) / 12 (inch/foot) = 903 AFY]

4. **Identify all new facilities, policies, and actions required to obtain the physical benefits.**

   The proposed project site is currently categorized as "Agriculture" in the land use of General Plan. In order to preserve the proposed LID BMPs as a permanent sustainability measures, the land use for the project site will be changed to "Open Space" and recreational features will be incorporated into the Project.

   New facilities to be constructed for the Project include bioswales, constructed wetlands, bioretention basins, a 25-acre storage pond, a pump station to distribute water to city lands for irrigation and recreational trails. No new policies or actions are anticipated to obtain the physical benefits of the project other than the rezoning of the proposed project site.

5. **Describe any potential adverse physical effects and what is being done to mitigate those impacts. If none, explain.**

   Because the proposed LID BMPs will enhance the water quality of runoff, and as most construction for LID will be vegetated swales, constructed wetlands, and bioretention basins, long-term adverse effects are not expected. Alternatively, the project is expected to produce long-term physical benefits through the removal of pollutant loads in discharges to the Newman Wasteway and the San Joaquin River. Short-term impacts resulting from project construction are anticipated to be mitigated through the implementation of standard construction BMPs.

6. **Describe whether the proposed project effectively addresses long-term drought preparedness goals.**

   The proposed Project will produce long-term economic and environmental benefits by preventing urban pollution of storm/irrigation water from the watershed and protecting Open Spaces.

   The proposed project also addresses long-term drought preparedness by capturing and reusing stormwater and urban water runoff for non-potable irrigation, thereby offsetting groundwater use for the same purpose and aiding in the long-term sustainability of the underlying Delta-Mendota groundwater basin. The in-lieu banking of the unused groundwater will assist in minimizing drawdown in groundwater elevations, thereby reducing pumping costs and associated greenhouse gas emissions for this small, disadvantaged community.

Direct Water-Related Benefit to a DAC

According to the DAC map presented in Attachment 7 of this application, the City of Newman lies within the DAC area and fits the requirement as a DAC. This Project will promote the capture and reuse of urban and storm water runoff for local irrigation, thereby offsetting groundwater use the same purpose. This in-lieu banking of unused groundwater supplies will aid in minimizing drawdown in groundwater elevations, thereby reducing pumping costs and associated greenhouse gas emissions for this small, disadvantaged community that depends solely on groundwater for its water supplies. The project will also provide recreational benefits to the DAC community through the construction of recreational trails for walking and biking, and will reduce pollutant loading to the local Newman Wasteway. The key LID measures included in this Project will provide long-term economic and environmental benefits to the DAC community of City of Newman.

Project Performance Monitoring Plan

PSP Table 6 below identifies the project monitoring targets and measures that will demonstrate that the project will meet its intended goals and achieve measurable outcomes for the primary and secondary benefits claimed for the project. Project Performance Monitoring Plan describes the tools that will be used to monitor project performance and set targets that will be used to track the project's progress in meeting the benefits claimed in Tables 5a and 5b above. The plan describes where data will be collected and the types of analyses used and explains how the monitoring tools and targets are appropriate for the benefits claimed.

Table 6 – Project Performance Monitoring Plan **Project:** Newman LID Project for Water Quality Improvement and Water Conservation		
Proposed Physical Benefits	**Targets**	**Measurement Tools and Methods**
Primary benefit: Store and Reuse Water Runoff (Water Supply Produced, Saved or Recycled)	Store and reuse up to 714 AFY of water treated through the Project's LID facilities	Measure the total water volume stored in the pond via staff gages, and the volume reused from the proposed storage pond through metering of flows at the pump station
Secondary benefit: Water Runoff treated through LID (Water Quality Improvement)	Treat up to 903 AFY of water runoff through the LID facilities	Estimate flows through the facilities on an annual basis based on precipitation rates measured at an on-site rain gage. Water quality analyses of stored water compared to historical storm drain water quality data.

Appendix 2.1 – Kaljian Drainwater Reuse Project Supporting Documentation

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TECHNICAL MEMORANDUM

To: Lon Martin

From: Jeff Eklund, P.E.

Subject: Preliminary Project Assessment of the Kaljian Conveyance System Rehabilitation

Date: June 16, 2014

INTRODUCTION

The San Luis Water District (SLWD or District) retained Provost & Pritchard Consulting Group to investigate the rehabilitation of the Kaljian Conveyance System (System). The System was constructed in the early 1960s and was designed to take water from the Delta Mendota Canal (DMC) for delivery to lands further south in the District. These facilities have been out of service for approximately 20 years and are in need of substantial improvement or replacement before they can be again placed into service. The District desires to use this System to convey supplemental water from several sources including the Delta-Mendota Canal (DMC) to lands further south in the District.

This technical memorandum summarizes the details of this proposed rehabilitation project. Two conveyance capacity options were investigated; a 50 cubic feet per second (cfs) option and a 100 cfs option. For each option a lower end cost and an upper end cost were estimated based on the degree of rehabilitation required and the selected potential alternative facilities. These project options and cost estimates have been prepared for consideration by the District in helping determine which option best meets the goals of the District.

BACKGROUND

The Kaljian Conveyance System is located in southern Merced County, approximately 9 miles south of the City of Los Banos. An aerial map of the System is included as **Attachment 1** (herein referenced as the "Map"). The System consists of the following main components:

Kaljian Pump Station – The Kaljian PS (also known as Pump Station No. 1) is located on the DMC and consists of 5 pumping units with a total original design capacity of approximately 155 cfs (nameplate data for the pump units are included in **Attachment 2**). To make the station operable, the pumps, motors, valves, and electrical equipment need rehabilitation. Additionally, the electrical cables from the motor control center (MCC) have been vandalized and require replacement.

Kaljian Pipeline – The 63-inch diameter coal tar lined and coated steel pipeline proceeds south from the pump station and follows along a dirt road. Near the end of the 9,100 foot pipeline the pipeline crosses over the San Luis Canal (SLC) and then discharges into the Main Canal. The first 60 feet of the pipeline is the above ground manifold at the Kaljian PS. The last 1000 feet of the pipeline was reconstructed to cross over the SLC when it was built in the mid 1960s.

For the purposes of this investigation, the District hired V&A Engineering to conduct a visual assessment of portions of the pipeline and document their findings in a report (see **Appendix A**). The assessment found that the pipeline exhibits some locations of corrosion in need of repair, particularly at some of the pipeline joints. The majority of the pipeline, though, is in fair condition with minor corrosion. Additionally, the assessment found that the pipeline has a buckled section including damage to the northern abutment at the SLC crossing. It should be noted that District staff mentioned that the pipeline leaked at multiple locations, most likely at the joints, when the system was last operated.

Main Canal – The existing Main Canal parallels the south side of SLC. Portions of the canal (Segments 2 and 4 on the Map) have been filled-in and orchards have been planted over the canal alignment. The remaining canal segments are in fair condition and have an average cross section as shown on the Map. The length of the Main Canal alignment is approximately 4.5 miles from the existing outfall to the Fittje PS.

Fittje Pump Station – Prior to the abandonment of the Kaljian Conveyance System the Fittje PS (also known as Pump Station No. 2) would take delivery of water flowing down the Main Canal and pump across Interstate 5 to the Relift Canal. The Fittje PS was abandoned at the same time as the Kaljian PS, and deliveries to the Relift Canal are now achieved through Pump Station No. 3. The original design capacity of the pump station was 120 cfs (details of the pumps are also included in Attachment 1). If the Fittje PS were to be used in the conveyance of the supplemental water, the station would require similar rehabilitation as the Kaljian PS (with the exception that the electrical wire is in-place).

Pump Station No. 3 – As an alternative to the use of the Fittje PS for the conveyance of supplemental water, the PS No. 3 could potentially be connected to the Main Canal and pump the water to the Relift Canal

PROPOSED PROJECT CONCEPT

As mentioned above, two options are being considered by the District, a 50 cfs and a 100 cfs conveyance capacity. The estimated costs for each of these options are included as **Attachments 3** and **4**. For each option a lower and an upper range of costs were estimated based on the degree of rehabilitation required and the selected potential alternative facilities. The estimated costs for the improvements are based on general cost information obtained from product vendors, contractors, RS Means (an online construction cost database), and P&P's past project experience. Based on the

concept-level of analysis, a contingency of 20% has been applied to the overall project cost.

Option 1 – 50 cfs Conveyance Capacity Design

The following is a summary of the proposed project concept details for the 50 cfs option:

Kaljian PS

- Pump, Motor, and Valving Rehabilitation – To meet the 50 cfs design requirement, two pumps, motors, isolation valves, and check valves will need rehabilitation. The cost for the rehabilitation of these items is uncertain until the components are dismantled and reviewed. Precision Pump & Machine provided a rough cost estimate, which has been included as the lower end estimate. The upper end estimate is based on actual costs for similar sized pump repairs conducted by the Berrenda Mesa Water District over the past 7 years. Similar to the Kaljian Plant, these pumps are mostly two-stage Byron Jackson units with similar capacities. Byron Jackson pumps are now serviced by the Flowserve Corporation.
- Electrical System Rehabilitation – Frank Silveria, the District's electrical consultant, performed a visual review of the existing electrical system, and besides the theft of the electrical cables, the components in the MCC appeared to be in fair condition. A rough cost estimate was provided by A-C Electric for the installation of new 500 MCM (thousand circular mil) cables and the clean-up of the MCC.
- Surge Tank and Manifold Piping Rehabilitation – Based on V&A's report, some portions of the piping have exhibited a moderate amount of corrosion damage (wall thickness loss varied from 3% to 10%, with one location having a 32% loss). The interior of the surge tank has not been inspected but similar corrosion is expected to be found. V&A recommended that the pipeline be abrasive blast and recoated with one coat epoxy and a finish coat of polyurethane at a cost of $15 per square foot. The surge tank could be coated in a similar method if this corrosion protection is warranted. Other miscellaneous appurtenances will also need to be replaced such as a new air compressor for the surge tank, air/vacuum release valves, etc.

Kaljian Pipeline

- Alternative 1, Spot Coating Repair of 63-inch Pipeline (Preferred Alternative) – For the lower end estimate, approximately 25% of the pipeline was assumed to need spot coating repairs, primarily at the pipeline joints. V&A estimates that the cost would be $415 per foot and would consist of an abrasive blast of the surface and the application of a 100% solids epoxy lining. After the initial repair and when the pipeline is first pressurized, additional repairs will be required as leaks appear on the ground surface or through leak detection activities.
- Alternative 2, Insert 36-inch Fusible PVC Pipe – As a more robust alternative that would have no leaks or the need for major future repairs, a fusible PVC pipe can be pulled through the existing pipeline. Fusible PVC weighs less (i.e. can be pulled a greater length), is cheaper, and provides more flow capacity than an equivalent HDPE pipe. The 36-inch diameter would be sufficient in size to

convey approximately 50 cfs at 7 feet per second (fps); however, a waterhammer analysis should be performed to determine the sufficiency of the pipe size, material, and pressure class with the existing surge tank renovated.

- Rehabilitate the Cathodic Protection System – As recommended by V&A, a new cathodic protection system should be designed and installed to protect the pipeline from further corrosion. The system should be installed regardless of the alternatives above to sustain the structural strength of the existing pipeline as much as possible.
- SLC Crossing Rehabilitation – The V&A assessment found significant corrosion in this portion of the pipeline with severe buckling of the pipeline and a cracked concrete support near the east side of the SLC crossing. It is recommended that the buckled section be replaced, the concrete support repaired, and the entire crossing be recoated inside and out.

Main Canal Rehabilitation

The Main Canal has been divided into 5 segments as shown on the Map, with each one needing to be addressed as follows:

- Segment 1 – The existing canal along this segment is in fair shape with vegetation that needs to be removed and some resurfacing of the canal. With approximately 50 cfs flowing down the canal, the water depth could be in the range of 1 to 3 feet. A topographic survey of the canal slope and profile along with an open channel hydraulic model (e.g. HEC-RAS) is required to more accurately depict the flow regime. At the end of this segment, there is an existing corrugated metal culvert across the Laguna Seca Creek that appears to be in fair condition based on cursory review of the culvert ends.
- Segment 2 – This portion of the Main Canal has been mostly filled-in and an orchard has been planted over the top of the canal. With the length of this segment, it is recommended that a new canal be constructed along a new alignment. This is most likely the lowest cost alternative as a 48-inch diameter (or possibly larger) gravity pipeline may be needed to accommodate a flowrate of 50 cfs. Because the existing canal R/W through the orchard is owned by the District, the landowner should be willing to accommodate the District and provide suitable R/W along an alignment that minimizes the impacts to the crops. However, a line item is included in the cost estimate for R/W acquisition costs that would provide mitigation funds for the crop impacts. The relocation of power lines may be necessary along this alignment as well. Additionally, three 48-inch culverts are anticipated to be needed to maintain farm road access across the canal.
- Segment 3 – This segment is similar to Segment 1.
- Segment 4 – Two pipeline alternative alignments were analyzed for this segment. Alternative 1 (see map) is the preferable alignment as it is the shortest in length. Further investigation and coordination with landowners are needed to ascertain potential impacts and the recommended alignment. The pipeline size is estimated to be about a 48-inch diameter, but may be larger depending on the final project hydraulic grade line. The estimate has assumed that a reinforced concrete pipe (RCP) would be used; however, a corrugated HDPE pipe (e.g. ADS product) or a profile wall HDPE pipe (KWH's Weholite product) could be considered in the preliminary design.

- Segment 5 – This segment is similar to Segment 1. The forebay of the Fittje PS or the potential turnout to PS No. 3 is located at the end of this segment. About 200 feet downstream of Fittje PS is an existing check structure that would stop the flow from continuing down the Main Canal.
- Canal Lining – For Segments 1, 2, 3, and 5 a 40 Mil HDPE liner is proposed to be installed on the canal surface to reduce seepage losses. The liner will need to be installed from bank to bank with an anchor trench along each side. Colorado Lining International provided an estimate of $0.50 per square foot (sf) for a liner furnished and installed over a smooth surface. Based on costs from similar canal lining projects, a reasonable overall cost is $1.00 per sf which includes mobilization, the anchor trenches, subgrade preparation, and extra material as needed. This cost can be refined once a topographic survey has been conducted.

Delivery of Water to Relift Canal

Two alternatives were considered for delivering the supplemental water to the Relift Canal. Alternative 1 consists of a new turnout and pipeline that would be connected to PS No. 3. Alternative 2 consists of rehabilitating the Fittje PS to deliver water to the Relift Canal.

Alternative 1 – PS No. 3 Modifications (Preferred Alternative)

- Main Canal Outlet Structure – A typical concrete turnout structure has been assumed for the project. Recent bid costs for a similar structure were used in the cost estimate.
- Canal Gate, Operator and Control – A canal gate with an electric-operated actuator was included in the project concept. It is our understanding that the gate would need to be operated in conjunction with operation of pumps to reduce the potential of water with high total dissolved solids (TDS) backflowing into the SLC. Additional coordination with the Department of Water Resources (DWR) is required to confirm acceptable configurations and operations. This may require modeling to assure that high TDS water does not enter the SLC or possibly the closure of the existing gates at the SLC entrance.
- Pipeline from Outlet Structure to PS No. 3 Box – A 200 foot, 48-inch diameter RCP would be installed from the outlet structure to the PS No. 3 concrete box. There is sufficient slope to adequately convey 50 cfs through this size pipeline.
- PS No. 3 Box Modifications – The pipeline will connect to the existing concrete box structure. The box structure was expanded in 1993 to serve the Relift Canal. Under this alternative, the existing pumping units that pump out of this box structure will convey the supplemental water to the Relift Canal. As mentioned above, DWR may require additional isolation measures for this supplemental water. A stop log frame or weir and gates could possibly be added to the structure, but additional design is required to determine the configuration and constructability issues.

Alternative 2 – Fittje PS Rehabilitation

As an alternative to the connection to the PS No. 3, the Fittje PS could be rehabilitated to convey the flow from the Main Canal to the Relift Canal as originally designed. As

mentioned previously, the Fittje PS is in a similar state as the Kaljian PS with the exception that the electrical cables are still present at the pump station. Without a further detailed assessment of the pumping units, motors, valving, and electrical/controls system, we have applied similar but reduced cost estimates as derived for the Kaljian PS. The pumps are slightly smaller in size and have one less pump stage.

Option 2 – 100 cfs Conveyance Capacity Design

Many of the project components from the 50 cfs conveyance option are similar for the 100 cfs option. In some cases the components are the same. For components that are different (usually the only difference is a larger size) the distinction is noted in the bullet lists below.

Kaljian PS

- Pump, Motor, and Valving Rehabilitation – To achieve the 100 cfs conveyance flow, a total of three pumps, motors and valves need to be rehabilitated. Based on a WaterCAD hydraulic model of the pump station using the factory pump curves, the three pumps should be capable of pumping 100 cfs.
- Electrical System Rehabilitation – A third set of conductors will need to be installed to connect the additional pump and additional work at the MCC is envisioned.
- Surge Tank and Manifold Piping Rehabilitation – No significant changes for this component.

Kaljian Pipeline

- Alternative 1, Spot Coating Repair of 63-inch Pipeline – No change from the 50cfs Option.
- Alternative 2, Rehabilitate or Remove and Replace Existing 63-inch Pipeline – The following alternatives were explored:
    - Alternative 2A - Perform the abrasive blast and coating repair for the entire pipeline (using V&A's estimated costs). This alternative is costly and would not greatly extend the service life of the pipeline.
    - Alternative 2B - Pull the maximum size pipeline that would fit into the existing pipeline. Based on a cursory review, a 48-inch diameter restrained joint ductile iron pipe (HP LOK – restraining mechanism is within the bell and spigot) may fit into the existing pipeline. This alternative is also costly and the smaller diameter would restrain the maximum flow conveyed. Additional research is needed to determine if this alternative is feasible.
    - Alternative 2C – Install a cured-in-place pipe (CIPP) in the existing pipeline. This alternative would provide the maximum conveyance flow, but based on an initial discussion with Southwest Pipeline and Trenchless Corporation, the costs of this system would start at $500/foot and could go up to $1,000/foot.
    - Alternative 2D (Preferred Alternative) – Based on this cursory analysis it appears that the removal of the existing pipeline and the installation of a

54-inch diameter concrete mortar lined and coated (CMLC) steel pipeline would be the preferred alternative (additional pipeline options should be considered during the preliminary design). The cost of this alternative is similar to the alternatives above. The other advantages are that the pipe would be brand new and provide the design conveyance capacity.

- Rehabilitate the Cathodic Protection System – No changes from the 50cfs Option.
- SLC Crossing Rehabilitation – No changes from the 50 cfs Option.

Main Canal Rehabilitation

- Segment 1 – The estimated water depth in the canal is approximately 2 to 4 feet deep depending upon the canal's prism. It is unknown at this preliminary phase whether the canal maintains a sufficient slope without subsided sections that could cause the water surface to overtop the canal; a topographic survey will be needed to assess the canal prism, and a HEC-RAS hydraulic model is needed to determine hydraulic constraints. Additional earthwork may be required to address any conveyance issues discovered through this analysis.
- Segment 2 – No changes to the canal construction is envisioned for this segment. The three culverts along this segment are estimated to be approximately 54-inch in diameter.
- Segment 3 – No changes.
- Segment 4 – Based on the 100 cfs, the pipeline alternatives for Segment 4 would need to be increased to approximately 72-inch diameter. This pipeline size may be reduced or increased based on the results of the survey and hydraulic model. With this size pipeline, a canal alternative should be further investigated to reduce costs.
- Segment 5 – No changes from the 50 cfs Option.
- Canal Lining – No changes from the 50 cfs Option.

Fittje PS Rehabilitation

To achieve a design flow of 100 cfs, two additional pumps, motors, and valves will need to be rehabilitated.

For this design flow it is assumed that PS No. 3 could not be modified without significant reconstruction of the forebay structure. Further investigation may be warranted during preliminary design to determine if this alternative is feasible.

SUMMARY OF CAPITAL COST ESTIMATES

A summary table with the lower and upper end cost estimates by option is provided as Table 1. Details of the cost estimate for each option are contained in **Attachment 3** and **4**. The following are some observations of the cost estimates:

- Pending the confirmation of DWR's supplemental water isolation requirements, the PS No. 3 modifications is the less expensive option of delivering water to the Relift Canal, for the 50 cfs Option.

- The cost of removing and replacing the existing Kaljian Pipeline with a new pipeline for 100 cfs capacity is approximately double the cost of inserting a smaller capacity, 36” pipeline into the existing 63” pipeline.

Table 1: Capital Cost Estimate Summary

	Option 1 - 50 cfs		Option 2 - 100 cfs	
Item	**Lower End Estimate**	**Upper End Estimate**	**Lower End Estimate**	**Upper End Estimate**
General - Mobilization, Misc. Facilites, etc.	$ 310,000	$ 510,000	$ 430,000	$ 765,000
Kaljian Pump Station Rehabilitation	640,000	1,187,500	890,000	1,692,500
Kaljian Pipeline Rehabilitation	1,072,900	2,435,000	1,072,900	4,243,000
Main Canal Rehabilitation	1,711,802	1,775,302	2,090,802	2,234,302
Conveyance to Relift Canal	195,000	615,000	1,160,000	1,160,000
Total Construction Cost	$ 3,929,702	$ 6,522,802	$ 5,643,702	$ 10,094,802
Contingency (20%)	$ 785,940	$ 1,304,560	$ 1,128,740	$ 2,018,960
Subtotal	$ 4,715,642	$ 7,827,362	$ 6,772,442	$ 12,113,762
Design, Surveying, Construction Admin., and Environmental (15%)	$ 707,346	$ 1,174,104	$ 1,015,866	$ 1,817,064
TOTAL CAPITAL COST	**$ 5,400,000**	**$ 9,000,000**	**$ 7,800,000**	**$ 13,900,000**

ITEMS FOR FURTHER INVESTIGATION

The following are items that warrant further investigation in order to more accurately determine which alternatives are viable and to better assess the potential costs:

- The delivery method and infrastructure for the supplemental water is not evaluated in this investigation.
- To obtain a more accurate pump and motor rehabilitation cost estimate, pumps and motors would need to be removed, disassembled and evaluated by a pump repair company.
- Pipeline rehabilitation or replacement alternatives under Option 2 should be further investigated as cost information from vendors and contractors tended to have a wide range.
- A topographic survey and HEC-RAS hydraulic model of the Main Canal should be performed to better determine the earthwork and lining estimates and the size of the culverts and pipelines.
- For Segment 4 of the Main Canal, the pipeline alignment will need to be investigated with the landowners. Once a topographic survey and HEC-RAS model have been performed, the pipeline diameter can be accurately determined. If the pipeline is larger in size, a canal alternative should be investigated to reduce cost.
- The isolation of supplemental water from SLC water needs to be investigated to understand DWR’s potential requirements for backflow prevention.

- Discharging supplemental water into the SLC at the Kaljian Pipeline crossing could be further investigated with DWR. This would eliminate the need to rehabilitate the Main Canal and the Fittje PS/PS No. 3 work.

CONCLUSIONS

The range of capital cost estimates have been prepared to assist the District in determining which option meets the goals of the District. The cost ranges from $5M (million) to $9M for the 50 cfs conveyance option and $8M to $14M for the 100 cfs option. As mentioned above, there are multiple items that should be further investigated to better estimate the overall costs of the project.

Attachments

Attachment 1	Project Concept Aerial Map Exhibit
Attachment 2	Pump Station Nameplate Data
Attachment 3	Cost Estimate 50 cfs Alternative
Attachment 4	Cost Estimate 100 cfs Alternative
Appendix A	SLWD Kaljian Pipeline Condition Assessment Letter by V&A Consulting Engineers
Appendix B	Photo Album

Cotton Gin Rd

165

CCID Main Canal

Kaljian Pump Station
Original Design Capacity: 130 cfs
Option 1: 50 cfs
Option 2: 100 cfs

Outside Canal

Delta-Mendota Canal

5

Kaljian Pipeline
63" Dia. Steel
9,100 LF

Pole Line Rd

1

Exising Outfall

2

Segment 1
Existing Canal
9,100 ft.

Main Canal

4

California Aqueduct/San Luis Canal

Eagle Field Rd

Segment 2
New Canal
approx. 3,950 ft.

Segment 3
Existing Canal
1,200 ft.

2

3

#1

#2

Segment 4
New Pipe (2 options)
Alternative 1 - 1,850 ft.
Alternative 2 - 2,550 ft.

Segment 5
Existing Canal
7,500 ft.

Alternative 1
Pump Station
No. 3

2

4

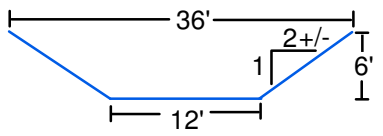
Alternative 2
Fittje Pump
Station

Relift Canal

Nees Ave

Paul Negra Rd

Notes:
(1) Pipe buckled on east side of Aqueduct crossing.
(2) All open canal to be lined with geomembrane liner.
(3) 1,700 ft of existing canal has been filled in and an orchard has been planted over the alignment.
(4) Average Main Canal Cross Section:



0 1,500 3,000 Feet

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Pump Station
Exisitng Pipeline
Proposed Pipeline
Existing Canal
Section Lines

Aerial Imagery - NAIP 2012

Kaljian Conveyance System Rehabilitation

Attachment 1
Project Concept Aerial Map

San Luis Water District

4/16/2014 : W:\Clients\San Luis Water District-1493\149313B1-Kaljian PP and Conveyance\GIS\Map\Kaljian Conveyance Facility Map.mxd

Attachment 2
Kaljian Conveyance System Rehabilitation
Pump Station Nameplate Data

Kaljian Pump Station
Voltage = 2300

Unit	Manuf.	Model	Serial	Stages	GPM	CFS	Head	RPM	HP	Discharge Pipe
1	BJ	48RXL	723005	2	24400	54.3	220	700	1500	30"
2	BJ	37KXH	731-690324?	2	16500	36.7	222	720	1000	30"
3	BJ	39RXL	362403	2	15700	35.0	208	885	900	30"
4	BJ	39RXL	362402	2	15700	35.0	208	885	900	30"
5	BJ	32KXH	562410	2	11250	25.1	208	885	700	24"

Fittje Pump Station
Voltage = 2300

Unit	Manuf.	Model	Serial	Stages	GPM	CFS	Head	RPM	HP	Discharge Pipe
1	BJ	28KXL	362404	1	9000	20.0	139	1185	350	18"
2				Nameplate missing						18"
3	BJ	37KXL	362406	1	17500	39.0	139	885	900	30"
4	BJ	37KXL	74150435	1	17500	39.0		885	900	30"
5	BJ	28KXL	74150500	1	8500	18.9	146	1160	350	20"
Spare	BJ	37KXL	362405	1	15700	35.0	139	885	900	

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Attachment 3

Estimated Project Costs

Kaljian Conveyance System Rehabilitation
Option A - 50 cfs

			Alternative 1 - Lower End Cost		Alternative 2 - Upper End Cost	
Work or Material	**Estimated Quantity**	**Unit**	**Cost Unit Price**	**Cost Item Total**	**Cost Unit Price**	**Cost Item Total**
General						
Mobilization, Bonds and Insurance (5% of Capital Costs)	1	LS	$180,000	$180,000	$300,000	$300,000
Miscellaneous Facilities and Operations (2.5% of Capital Costs)	1	LS	$90,000	$90,000	$150,000	$150,000
Worker Protection	1	LS	$40,000	$40,000	$60,000	$60,000
			Subtotal	$310,000	*Subtotal*	$510,000
Kaljian Pump Station Rehabilitation						
Electrical/Controls Rehab	1	LS	$25,000	$25,000	$50,000	$50,000
Run New Wiring for Pumps	2	EA	$10,000	$20,000	$20,000	$40,000
Surge Tank Recoating	4,500	SF	$20	$90,000	$20	$90,000
Manifold Recoating	1	LS	$25,000	$25,000	$37,500	$37,500
Valving and Operator Rehab	2	EA	$10,000	$20,000	$30,000	$60,000
Pump Rehab	2	EA	$160,000	$320,000	$350,000	$700,000
Motor Rehab/Rewind	2	EA	$70,000	$140,000	$105,000	$210,000
			Subtotal	$640,000	*Subtotal*	$1,187,500
Kaljian Pipeline Rehabilitation						
Alt. 1 - 25% of ex. 63" Pipeline Coating	2,260	LF	$415	$937,900		$0
Alt. 2 - Insert 36" Fusible PVC Pipe	9,040	LF		$0	$250	$2,260,000
Rehab Cathodic Protection System	1	LS	$95,000	$95,000	$95,000	$95,000
San Luis Canal Crossing Rehab	1	LS	$40,000	$40,000	$80,000	$80,000
			Subtotal	$1,072,900	*Subtotal*	$2,435,000
Main Canal Rehabilitation						
Seg. 1 - Ex. Canal Rehab	9,100	LF	$10	$91,000	$10	$91,000
Seg. 2 - New Canal	12,882	CY	$6	$77,292	$6	$77,292
Seg. 2 - Property Acquisition	4.5	AC	$15,000	$68,010	$15,000	$68,010
Seg. 2 - 3-42" RCP Culverts	3	EA	$6,000	$18,000	$6,000	$18,000
Seg. 3 - Ex. Canal Rehab	1,200	LF	$10	$12,000	$10	$12,000
Seg. 4 - Alt. 1, New 48" RCP	1,850	LF	$200	$370,000		$0
Seg. 4 - Alt. 2, New 48" RCP	2,550	LF	$0	$0	$170	$433,500
Seg. 5 - Ex. Canal Rehab	7,500	LF	$10	$75,000	$10	$75,000
Canal Lining (46 SF/LF)	1,000,500	SF	$1.00	$1,000,500	$1.00	$1,000,500
			Subtotal	$1,711,802	*Subtotal*	$1,775,302
Delivery of Water to the Relift Canal						
Alt. 1 - PS 3 Modifications						
Main Canal Outlet Structure	1	LS	$40,000	$40,000		$0
Canal Gate, Operator and Controls	1	LS	$75,000	$75,000		$0
42" RCP from Canal to PS 3 Box	200	LF	$150	$30,000		$0
PS 3 Box Modifications	1	LS	$50,000	$50,000		$0
			Subtotal	$195,000	*Subtotal*	$0
Alt. 2 - Fittje PS Rehabiliation						
Electrical/Controls Rehab	1	LS		$0	$25,000	$25,000
Surge Tank Recoating	2,500	SF		$0	$20	$50,000
Valving and Operator Rehab	2	EA		$0	$20,000	$40,000
Pump and Motor Rehab	2	EA		$0	$250,000	$500,000
			Subtotal	$0	*Subtotal*	$615,000
TOTAL CONSTRUCTION COST				$3,929,702		$6,522,802
CONTINGENCIES		20%		$785,940		$1,304,560
SUBTOTAL				$4,715,642		$7,827,362
Design, Surveying, Construction Admin., and Environmental		15%		$707,346		$1,174,104
TOTAL CAPITAL COST:				**$5,423,000**		**$9,001,000**
Difference between Alternative 1 and 2:				$3,578,000		

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Attachment 4

Estimated Project Costs

Kaljian Conveyance System Rehabilitation
Option B - 100 cfs

			Alternative 1 - Lower End Cost		Alternative 2 - Upper End Cost	
Work or Material	**Estimated Quantity**	**Unit**	**Cost Unit Price**	**Cost Item Total**	**Cost Unit Price**	**Cost Item Total**
General						
Mobilization, Bonds and Insurance (5% of Capital Costs)	1	LS	$260,000	$260,000	$470,000	$470,000
Miscellaneous Facilities and Operations (2.5% of Capital Costs)	1	LS	$130,000	$130,000	$235,000	$235,000
Worker Protection	1	LS	$40,000	$40,000	$60,000	$60,000
			Subtotal	$430,000	*Subtotal*	$765,000
Kaljian Pump Station Rehabilitation						
Electrical/Controls Rehab	1	LS	$25,000	$25,000	$50,000	$50,000
Run New Wiring for Pumps	3	EA	$10,000	$30,000	$20,000	$60,000
Surge Tank Recoating	4,500	SF	$20	$90,000	$20	$90,000
Manifold Recoating	1	LS	$25,000	$25,000	$37,500	$37,500
Valving and Operator Rehab	3	EA	$10,000	$30,000	$30,000	$90,000
Pump Rehab	3	EA	$160,000	$480,000	$350,000	$1,050,000
Motor Rehab/Rewind	3	EA	$70,000	$210,000	$105,000	$315,000
			Subtotal	$890,000	*Subtotal*	$1,692,500
Kaljian Pipeline Rehabilitation						
Alt. 1 - 25% of ex. 63" Pipeline Coating	2,260	LF	$415	$937,900		$0
Alt. 2 - Remove and Replace w/ 54" CMLC Steel Pipe	9,040	LF		$0	$450	$4,068,000
Rehab Cathodic Protection System	1	LS	$95,000	$95,000	$95,000	$95,000
San Luis Canal Crossing Rehab	1	LS	$40,000	$40,000	$80,000	$80,000
			Subtotal	$1,072,900	*Subtotal*	$4,243,000
Main Canal Rehabilitation						
Seg. 1 - Ex. Canal Rehab	9,100	LF	$10	$91,000	$10	$91,000
Seg. 2 - New Canal	12,882	CY	$6	$77,292	$6	$77,292
Seg. 2 - Property Acquisition	5	AC	$15,000	$68,010	$15,000	$68,010
Seg. 2 - 3-54" RCP Culverts	3	EA	$9,000	$27,000	$6,000	$18,000
Seg. 3 - Ex. Canal Rehab	1,200	LF	$10	$12,000	$10	$12,000
Seg. 4 - Alt. 1, New 72" RCP	1,850	LF	$400	$740,000		$0
Seg. 4 - Alt. 2, New 72" RCP	2,550	LF		$0	$350	$892,500
Seg. 5 - Ex. Canal Rehab	7,500	LF	$10	$75,000	$10	$75,000
Canal Lining (46 SF/LF)	1,000,500	SF	$1.00	$1,000,500	$1.00	$1,000,500
			Subtotal	$2,090,802	*Subtotal*	$2,234,302
Delivery of Water to the Relift Canal						
Fittje PS Rehabiliation						
Electrical/Controls Rehab	1	LS	$30,000	$30,000	$30,000	$30,000
Surge Tank Recoating	2,500	SF	$20	$50,000	$20	$50,000
Valving and Operator Rehab	4	EA	$20,000	$80,000	$20,000	$80,000
Pump and Motor Rehab	4	EA	$250,000	$1,000,000	$250,000	$1,000,000
			Subtotal	$1,160,000	*Subtotal*	$1,160,000
TOTAL CONSTRUCTION COST				$5,643,702		$10,094,802
CONTINGENCIES		20%		$1,128,740		$2,018,960
SUBTOTAL				$6,772,442		$12,113,762
Design, Surveying, Construction Admin., and Environmental		15%		$1,015,866		$1,817,064
TOTAL CAPITAL COST:				**$7,788,000**		**$13,931,000**
Difference between Alternative 1 and 2:				$6,143,000		

Kaljian Conveyance System Rehabilitation
Option A - 50 CFS / Minimal Impact to Crop Yield

Blending Calculation:

	Flow Rate (cfs)	% of Total Flow	EC (µmhos/cm)	Boron (mg/L)
Kaljian PS				
Well Water [1]	-	0%	2,020	3.00
Drain Water [2]	7	5%	5,647	6.00
DMC Water [3]	28	19%	541	0.20
Kaljian Total Flowrate	35	23%		
SLC Water [4]	114	77%	436	0.20
Total Flow	**149**	**100%**		

	EC (µmhos/cm)	Boron (mg/L)
Blended Water Quality	**700**	**0.47**
WQ Target, No Yield Reduction if less than: [5]	667	0.50
WQ Target, Potential Yield Reduction [5]	1,000	0.75

Total Annual Flow, af:

Operating Months (Apr-Sept), mon.	6
Well Water	-
Drain Water	2,528
DMC Water	10,112
SLC Water	41,244
Total Annual Flow, af	**53,884**

Total Annual Cost:

	Lower End Capital Cost Estimate	Upper End Capital Cost Estimate
Capital Cost	$ 5,400,000	$ 9,000,000
Interest Rate	4%	4%
Term, year [6]	20	20
Annualized Capital Cost	$ 397,341	$ 662,236
Annual Well Water Cost, $55 /af	$ -	$ -
Annual Kaljian Elect. Cost ($0.12/kWh) [7]	$ 548,415	$ 548,415
Total Annual Project Cost	$ 945,757	$ 1,210,651
Cost per Acre-ft of Project Yield, $/af	**$ 374**	**$ 479**

NOTES:

[1] Water quality sample on 4/28/2014

[2] Average water quality at Charleston Drainage PS 2

[3] Average water quality at DMC Check 21 from April thru June 2011

[4] Average water quality at Aqueduct Check 21 from 1994 thru 2003

[5] See tables for specific crops to be affected. If EC is greater than the Potential Yield Reduction target, some crop yields are reduced by 10%. If boron concentration greater than Potential Yield Reduction target, some crops will be impacted.

[6] Assumes project is used annually

[7] Kaljian Elect. Cost is based on 231 ft of pumping head.

Energy/Green House Gases Calculations

Project Life (Years) 40

	Energy Calculations										GHG		
Location	**AFY**	**GPM**	**Head FT**	**Efficiency**	**HP**	**Pump Hours**	**kW**	**kWh/Year**	**kWh/AF**	**kWh for Project Life**	**lbs of CO2/Yr**	**Metric Ton CO2/Year**	**Metric Ton for Project Life**
Delta Pumping	2,300	1,428	350	65%	194	8,760	145	1,269,000	552	50,760,000	918,756	459	18,400
Kaljian Project	2,300	1,428	231	80%	104	8,760	78	681,000	296	27,240,000	493,044	247	9,900
Difference/Savings			**119**		**90**		**67**	**588,000**	**256**	**23,520,000**	**425,712**	**213**	**8,500**
Partial Benefit (2015)								**49,000**	**21**	**1,960,000**	**35,476**	**18**	**708**
Kaljian Project in 2015								**1,220,000**	**530**	**48,800,000**	**883,280**	**442**	**17,692**

Note

$$\frac{GPM \times FT}{3960 \times e} = HP$$

lbs of CO2/Year = [kwH/AF]*0.724

California Climate Action Registry General Verification Protocol

Verifying Entity-Wide Greenhouse Gas Emissions

Version 3.0 | August 2008

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World Resources Institute

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Abbreviations and Acronyms

CARB	California Air Resources Board
CARROT	Climate Action Registry Reporting Online Tool
CDF	California Department of Forestry and Fire Protection
CEMS	Continuous Emissions Monitoring Systems
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COI	Conflict of Interest
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
N_2O	nitrous oxide
PFC	perfluorocarbon
RFA	Request for Applications
SAR	IPCC Second Assessment Report (1996)
SF_6	sulfur hexafluoride
TA	Technical Assistance Provider
TAC	Technical Advisory Committee
TAR	IPCC Third Assessment Report (2002)

Part I Introduction

1.1 Overview

The California Climate Action Registry created this General Verification Protocol to provide California Registry-approved verifiers with clear instructions for executing a standardized approach to the independent verification of greenhouse gas (GHG) emissions baselines and annual emissions reported by California Registry participants. This standardized approach defines a verification process that promotes the relevance, completeness, consistency, accuracy and transparency of emissions data reported to the California Registry. While this Protocol is written for verifiers, California Registry participants who are interested in understanding and preparing for the verification process may also find it useful.

This Protocol is intended to be used in combination with the California Registry's General Reporting Protocol and web-based calculation and reporting tool (CARROT—Climate Action Registry Reporting Online Tool). **Approved verifiers will verify participants' GHG emissions reports to the standards of the California Registry's General Reporting Protocol, and sector-specific protocols using the process outlined in this General Verification Protocol**.

At a minimum, each emissions report must contain all of an entity's emissions of CO_2 in the state of California for a calendar year, reported in five categories: indirect emissions from purchased electricity, imports of steam, district heating/cooling, and direct emissions from mobile combustion, stationary combustion, manufacturing processes, and fugitive emissions. Where a participant is reporting their U.S. emissions, the report must contain all of their emissions nationally. Starting with the fourth year of reporting, each emissions report must contain all emissions of all six greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6).

Emissions reports may also contain other information about an organization and its emissions that does not require verification. For instance, this could include information about a company's environmental goals, programs, policies, etc. Participants may also choose to report other indirect emissions, like business travel or employee commuting. In the emissions reports, optional information will be clearly distinguished from information that is verified.

Activities for each specific verification will differ based on the length and complexity of a participant's emissions report, but the verification process will include at least the following steps:

- Case-by-case evaluation of Conflict of Interest
- Scoping and planning a participant's verification activities
- Conducting verification activities
    1. Identifying emissions sources
    2. Reviewing methodologies and management systems
    3. Verifying emission estimates
- Preparing a participant's Verification Report and Verification Opinion

- Submitting a participant-authorized electronic Verification Form and Verification Activity Log to the California Registry via CARROT

Upon completion of the above steps, the California Registry will review the emissions report before accepting a participant's verified emissions report into its emissions database. This process is repeated every year of an organization's participation in the California Registry.

To help decrease the potential for conflict of interest between a verifier and a participant, a verifier can verify the same participant for a maximum of six consecutive years. After six years, a participant must choose another verifier for at least three years. After that time, the original verifier would again be eligible to verify the participant's emissions for up to six consecutive years.

The California Registry assumes that the verifiers will use their best professional judgment when conducting verification activities.

1.2 Organization of this General Verification Protocol

This General Verification Protocol is divided into four parts which outline the necessary steps a verifier must follow to initiate and complete the verification of a participant's emissions report.

Part I, *Introduction* (this section), provides a brief overview of the purposes and requirements of the verification process, describes the principles of verification, highlights important definitions, and answers some key questions.

Part II, *Preparing for Verification*, focuses on activities that take place prior to beginning verification activities, including bidding for a contract with participants, determining conflict of interest, negotiating a contract with participants, providing required notifications, and designing appropriate verification activities for each participant.

Part III, *Core Verification Activities*, provides guidance on conducting the primary activities that the verifier will complete, including: identifying sources, reviewing management systems and methodologies, and verifying emission estimates.

Part IV, *Completing the Verification Process*, covers procedures for completing the verification process including: preparing a Verification Report and Verification Opinion, completing the Verification Form to submit a participant's verified data to the California Registry, and recording and retaining proper records.

1.3 Principles of Verification

The purpose of verification is to provide an independent review of data and information being submitted to the California Registry to ensure that they meet minimum quality criteria. To fulfill this purpose, the independent verification process maintains the criteria of completeness, consistency, accuracy, comparability and transparency as its underlying principles.

Relevance. Verification should ensure that GHG inventories submitted to the California Registry appropriately reflect the GHG emissions of the entity and include emissions information produced in accordance with the program rules on defining reporting boundaries and sources.

Completeness. Verification should ensure accounting of all material GHG emissions sources and activities within the specified scope of the participant's inventory (a minimum of 95%). Baseline and annual emissions results should include all sources for which the participant is responsible.

Consistency. An emissions report should allow for meaningful comparison of emissions performance over time and across similar organizations. Independent verification should ensure that consistent methodologies and measurements are used between the baseline results and annual emissions results. Additionally, changes to participant emission baselines are verified to ensure appropriate comparisons.

Accuracy. Entity-wide reported data should be within the materiality threshold of 5% of the verifier's estimate of total emissions. Calculations and estimates need to be as accurate as possible to prevent material errors.

Transparency. Verification should be a transparent exercise. The data used for verification and the verification activities should be clearly and thoroughly documented to allow for outside review by the California Registry or potential review by the State of California (the State) in the context of overseeing verification activities.

1.4 Verification Principles and Definitions

1.4.1 Verification Standard

Verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. If a participant is reporting process or fugitive emissions, a separate industry-specific protocol may also be used and cited, where available. Some participants may wish to use their GHG emissions report for additional purposes such as registering in another registry, participating in emissions trading schemes, crediting programs, etc., and thus may add additional standards for verification.

1.4.2 Minimum Quality Standard

A verified emissions report submitted to the California Registry must be free of material misstatements, achieving a level of at least 95% accuracy. It is possible that during the verification process, differences will arise between the emissions totals estimated by participants and those estimated by verifiers. Differences of this nature may be classified as either material (significant) or immaterial (insignificant). A discrepancy is considered to be material if the overall reported emissions differ from the overall emissions estimated by the verifier by 5% or more. A difference is immaterial if it is less than 5%.

1.4.3 Reporting Uncertainty vs. Inherent Uncertainty

When evaluating participants' emissions reports, verifiers are to determine if the reporting uncertainty (vs. the inherent uncertainty) is less than the minimum quality standard.

Reporting uncertainty entails the mistakes made in identifying emissions sources, managing data or information, and calculating GHG emissions. Inherent uncertainty refers to scientific uncertainty associated with measuring GHG emissions. The California Registry is aware that there is inherent uncertainty in emissions factors and measurement of activity data through metering and instrumentation (even after the calibration of meters and other data collection methods are verified as accurate), but determining scientific accuracy is not the focus of the California Registry or its General Reporting Protocol.

1.5 Professional Judgment

Approved verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. The California Registry asks verifiers to use their professional judgment when executing the verification activities described in this General Verification Protocol. The purpose of the verifier approval process is to find verification firms that demonstrate, through their staff's professional qualifications and relevant GHG experience, their ability to render sound professional judgments about GHG emissions reports.

Application of a verifier's professional judgment is expected in the following areas:

- Implementation of verification activities with appropriate rigor for the size and complexity of a participant's organization and with regard to the uncertainty of calculations associated with the participant's emissions sources;
- Review of the appropriateness of a participant's GHG emissions tracking, monitoring, and management systems for providing information to the California Climate Action Registry;
- Evaluation of participant compliance with the California Registry's General Reporting Protocol;
- Assessment of methods used for estimating emissions from sources for which the General Reporting Protocol does not provide specific guidance, such as process and fugitive emissions, and indirect emissions from sources other than electricity, imported steam, district heating/cooling; and
- Appraisal of assumptions, and estimation methods and emission factors that are selected as alternatives to those provided in the General Reporting Protocol.

The General Verification Protocol and training provided by the California Registry are intended to explain to the verifier the California Registry's guidelines and expectations and thus what types of professional judgments are appropriate for this program. In addition to these resources, verifiers may contact the California Registry at any time for clarification of California Registry guidelines, expectations and policies.

1.6 Conflict of Interest

In order to ensure the credibility of the emissions data reported to the California Registry and its potential utility under any future regulatory regime, it is critical that the verification process is completely independent from the influence of the participant submitting the emissions report. While conducting verification activities for California Registry participants, verifiers must work in a credible, independent, nondiscriminatory and transparent manner, complying with applicable state and federal law and the current version of the State of California's *Conflict of Interest Process and Requirements for State and California Registry-Approved Verifiers*. This document is posted on the California Registry's website**.**

Any pre-existing relationship between the verifier and participant must be acknowledged to the California Registry, which will evaluate the potential for a conflict of interest (COI) between the two organizations.

Verifiers must provide information to the California Registry about its organizational relationships and internal structures for identifying potential conflicts of interest

(organizational COI). Then, on an individual basis, the California Registry will review any pre-existing relationship between a verifier and participant and will assess the potential for conflict of interest (case-by-case COI). When the California Registry determines there is a low risk of COI, the participant and verifier can finalize negotiations of their contract. Following completion of a verification, the verifier must monitor for the next year if any new business relationship may create a COI (emerging COI).

As an added protection, a verifier may provide verification services to a California Registry participant for, at most, six consecutive years. After a six-year period, the California Registry participant must engage a different verifier. The original verifier may not provide verification services to that participant for three years. This three year hiatus begins with any lapse in providing annual verification services to a California Registry participant.

In the event that a verifier violates these conditions, the California Registry, in consultation with the State and at its discretion, may disqualify an approved verifier for a period of up to five years.

This conflict of interest clause does not preclude a verifier from engaging in consulting services for other clients that participate in the California Registry for whom the verifier does not provide any verification activities.

Part II Preparing for Verification

2.1 Verification Process Overview

Before any verification activities begin, a number of procedural steps must be taken to ensure that the obligations and responsibilities of both the verifier and participant are clear.

The following summary of the major steps of verification is provided as a reference.

1. **Verifier receives California Registry approval**: Verifier meets all accreditation requirements and completes a California Registry-sponsored verification training workshop.

2. **Participant selects verifier**: Participant contacts one or more State/California Registry-approved verifiers to discuss verification activities. Participant selects an organization to verify its GHG emissions results and begins to negotiate contract terms.

3. **Verifier submits case-specific Evaluation of Conflict of Interest (COI) and State Notification Form**: After a participant chooses a verifier, the verifier must submit a Conflict of Interest Evaluation and State Notification Form to the California Registry to establish that the likelihood of a COI between parties is low or that risk of any conflict can be sufficiently mitigated by the verifier. The form must be submitted at least 10 working days prior to the first scheduled verification meeting.

4. **California Registry sends COI determination to verifier**: The California Registry reviews the Evaluation of COI Form and supporting information to determine the level of risk associated with the proposed participant/verifier relationship, and notifies the verifier of its determination.

5. **Verifier & participant finalize contract**: When the California Registry provides a favorable COI determination between a participant and verifier, verifiers may finalize their contract with a participant.

6. **Verifier conducts verification activities**: Verifier follows the guidance in the General Verification Protocol to evaluate a participant's annual GHG emissions report.

7. **Verifier prepares Verification Report and Verification Opinion for participant**: Verifier prepares a detailed summary (Verification Report) of the verification activities for the participant. Verifier also prepares a Verification Opinion for participant's review, prior to sending opinion electronically to the California Registry via CARROT.

8. **Verifier & participant discuss Verification Report and Opinion**: Verifier meets with participant to discuss Verification Report and Opinion.

9. **Verifier completes Verification Form via CARROT**: Once authorized by a participant, a verifier completes the Verification Form via CARROT. Participant then submits the original Verification Opinion to the California Registry.

10. **California Registry Conducts Final Review**: California Registry reviews the Verification Opinion and Verification Activity Log and evaluates the participant's

emissions reports. Once accepted by the California Registry, a participant's aggregated entity-level emissions become available to the public via CARROT.

Even in multi-year verification contracts, verifiers must repeat steps 3-11 for each annual verification before submission to the California Registry.

2.2 Becoming an Approved Verifier

Only those firms approved by the California Registry, the State or those involved in the American National Standards Institute (ANSI) accreditation program may provide verification services to California Registry participants. In order to become approved, a verifier must complete a two-step process: 1) Obtain accreditation as a GHG verifier from either the California Air Resources Board or from the American National Standards Institute (or other approved accreditation body as specified on the California Registry website) and 2) achieve California Registry approval by attending a verification training workshop facilitated by the California Registry.

Information on ANSI GHG Verifier Accreditation is available at www.ansi.ghg.org.

Information on CARB GHG accreditation is available at arb.ca.gov.

The second step of the approval process requires that lead verifiers one of the California Registry's verification training workshops. A lead verifier is any verifier from the firm who will sign their firm's Verification Opinion. After completing the training workshop, the verification firm becomes an "approved verifier." Following the training session, the California Registry will provide verifiers with a notification of their full approval. Upon receiving this notice, a firm may approach current or prospective California Registry participants to market their services and capabilities, and advertise that they are "approved verifiers for the California Climate Action Registry". All approved verifiers are listed on the California Registry's website.

Approvals are valid for three years from the date of the California Registry approval. At the end of this period, the California Registry will send a notification to each firm's primary contact. If for any reason the State, ANSI or the California Registry finds that a verifier has failed to meet the standards of either the General Reporting Protocol or the General Verification Protocol, it may disqualify a verifier for a period of up to five years.

2.3 Updates to the General Verification Protocol

Periodically, the California Registry may update the General Verification Protocol. The California Registry will advise all verifiers of any changes, and any new requirements that may affect them. Where any changes are significant, the California Registry may require that lead verifiers attend the next verification training workshop.

2.4 Adding or Deleting Designated Staff

During the application process, verification firms will identify all staff members who will be designated verifiers for the California Registry. An applicant who is State-approved may add or delete staff to their roster. To add or delete designated staff after being approved, the verifier should submit the Designated Staff Form (available on the California Registry's Verifiers Only webpage), with the names and contact information for any personnel changing from the roster, and note if staff are to be deleted or added to the roster. When adding staff, the firm should describe each individual's job classifications, relevant experience, education, academic degrees, professional licenses for technical staff members and their respective roles.

2.5 Bidding on a Verification Contract

The California Registry recommends that those participants with complex GHG emissions reports solicit competitive bids for verification services from at least three approved verifiers. Those participants with simpler GHG emissions reports who do not seek, or are not eligible for, batch verification may wish to secure competitive bids or may wish to sole source the verification contract in order to reduce costs and expedite the verification process.

When preparing to send out a request for bids from verifiers, participants should first review the list of approved verifiers and select some (or all) as prospective bidders. Due to the possibility of access to proprietary information, participants may want to send each prospective bidder a non-disclosure agreement. The California Registry suggests that participants distribute requests for bids to prospective verifiers only after they have received a signed non-disclosure agreement from verifiers.

The California Registry recommends that participants include the following information in their requests for bids from verifiers:

1. The expected contract duration;
2. A general description of the participant's organization;
3. The geographic boundaries of the participant's emissions report;
4. The number and locations of facilities and operations;
5. The GHGs reported in the participant's emissions report;
6. The emission source categories (and possibly emission sources) in the participant's emissions report;
7. The password to a read-only (Reviewer) version of the participant's emissions report in CARROT; and
8. A list and description, by category, of how emissions data is organized and calculated (either using CARROT or another methodology).

The California Registry suggests that participants request that commercial proposals from potential verifiers include the following components:

1. History and description of verification company;
2. Explanation of core competencies;
3. Proposed price for verification services;
4. Proposed staff;
5. Statement of verifier liability;
6. Confidentiality policy; and
7. Duration of contract.

The California Registry expects only limited variation in the technical proposals since all of the approved verifiers are trained to implement the California Registry's standardized verification process.

2.6 Conflict of Interest (COI)

2.6.1 Objective of the Conflict of Interest Process

This COI process was developed by the State of California and adopted, with modifications, by the California Registry to assess the risk of potential COI between verifiers and California Registry participants. This process gives verifiers the ability to demonstrate that their organization is capable of identifying and mitigating situations that would impair their ability to render an impartial verification opinion.

Through this process, applicants and any partners must demonstrate:

1. Clearly-defined organizational boundaries, internal structures, and relationships with other companies that have management or financial control over the applicant.
2. The presence of internal mechanisms to identify and mitigate organizational and personal COIs with any potential clients.
3. The ability to be objective in providing verification activities.

To protect the credibility and rigor of the California Registry verification process, the relationship between verifiers and California Registry participants must not create or appear to create a COI. While conducting verification activities for California Registry participants, the verifier must work in a credible, independent, nondiscriminatory and transparent manner, complying with applicable state and federal law and the current version of the California Registry's conflict of interest process

2.6.2 Process and Requirements

In the verification process, all verifiers must demonstrate they do not have significant conflicts of interest with participants:

1. **Organizational COI** – in the application process, each verifying organization shows that they have internal mechanisms in place that help maintain their objectivity in verification activities.

2. **Case-by-Case COI** – in each case where verification services are requested, before a contract is signed with a participant, each verifier demonstrates that any pre-existing relationship between the verifier and participant will not impair impartiality in verifying a GHG emissions report.

3. **Emerging COI** – for a period of one year following a verification, verifiers will monitor their relationship with the participant to ensure impartiality has been protected in the verification process.

These are each discussed in greater detail below.

2.6.2.1 Organizational COI

As part of the application process, a verifier has already documented the ability of its organization to identify and react to COI due to organizational relationships. Verifiers have also submitted the form *Conflict of Interest Declaration of Ability and Intent to Comply*, declaring the applicant and each partner's ability to subsequently perform and submit a case-

by-case evaluation of COI to the California Registry. This form also conveys the applicant's intent to comply with the California Registry's COI process and requirements.

2.6.2.2 Case-by-Case COI

As an early step in the contract negotiation process between verifiers and participants, a verifier must demonstrate on a case-by-case basis that it, its partners, and the individuals performing verification activities do not have any actual or potential conflict of interest with the California Registry participants for which it has been selected to carry out verification functions.

A verifier will have a high risk of COI if the verifier and participant share any management, or if any of the California Registry participant's managers of GHG-related activities were previously employed with or by the verifier within the last three years, or vice versa. A verifier will have a high risk of COI if the verifier or its related companies (e.g., parent company, subsidiaries of a parent company, affiliates) has provided any GHG management or advocacy services (as identified on the list below) to the California Registry participant within the last three years. If a verifier has performed these services, they have a high potential COI, as they would be: 1) verifying their own work, 2) performing management functions for the client, or 3) acting as an advocate for the client. Where a high risk of COI is determined, the verifier is not approved to conduct the verification.

2.6.2.3 Incompatible Services

- Designing, developing, implementing, or maintaining a GHG emissions inventory
- Designing or developing GHG information systems
- Developing GHG emissions factors or other GHG-related engineering analysis
- Designing energy efficiency, renewable energy, or other projects which explicitly identify GHG reductions as a benefit
- Preparing or producing GHG-related manuals, handbooks, or procedures specifically for the California Registry participant
- Appraisal services of carbon or GHG liabilities or assets
- Brokering in, advising on, or assisting in carbon or GHG-related markets
- Management over health, environment and safety functions
- Legal and expert services unrelated to California Registry verification

If the verifier identifies a potential or actual COI, the verifier must also submit a plan to avoid, neutralize, or mitigate the COI situation. The California Registry will review the information submitted to determine if the verifier provided enough information to make a COI determination. If not, the California Registry may request additional information. Once the information is found to be complete, the California Registry will review and evaluate the case, and will issue a written determination within ten working days.

Once the case-by-case evaluation is complete, a verifier may provide verification services to a California Registry participant for, at most, six consecutive years. After a six-year period, the California Registry participant must engage a different verifier. The original verifier may not again provide verification services for at least three years. This three-year period is triggered following any lapse in providing annual verification services to a California Registry participant.

This cycling of verifiers will help to avoid potential COI situations due to lengthy and ongoing relationships. Also, this guarantees that another firm will review material previously reviewed by another verifier, thus providing another "check" on the consistency and appropriateness of professional judgments made.

2.6.2.4 Emerging COI

Verifiers agree to monitor their activities for one year after the verification, and seek the approval of the California Registry and the State before entering into arrangements or relationships during that time that may present COI. The verifier may not enter into any contract with a California Registry participant or related entity that the California Registry and/or the State determines would create an unacceptable level of risk of COI.

In order to obtain this determination, the verifier must submit *Form COI-AB: Notification of Verification Activities And Request for Evaluation of Potential for Conflict of Interest Between Verifier and California Registry Member* (available on the California Registry's Verifiers Only webpage) to the California Registry detailing the specifics of their situation and request a determination. The California Registry will use a similar procedure to determine the risk for COI during that period.

2.6.2.5 Confidentiality

The California Registry will enter into confidentiality agreements with verifiers and California Registry participants as necessary to evaluate potential COI. Any organization that must provide confidential information to support the evaluation should clearly indicate what information is confidential, and the California Registry will follow its standardized procedures to do its utmost to protect confidential business information.

2.7 Negotiating a Contract with the Participant

After a verifier has been selected by a California Registry participant, the two parties should negotiate and complete contract terms. This contract is exclusively between the participant and the verifier, and the particulars of any given contract are at the discretion of the two parties. However, contracts for verification services typically include the following components:

- **Scope of the Verification Process.** This component of the contract should outline the exact geographic and organizational boundaries of the participant's emissions inventory to be examined. This should, but may not necessarily, match the boundaries used in the GHG emissions report to the California Registry. This scope should indicate whether a participant's California-only emissions are included or if both California and U.S. emissions are included. It should also identify whether the participant has used the management control, equity share, or other methods based on contractual relationships to determine organizational boundaries.

- **Confirmation of Approved Verifier Status.** This is a simple statement that the verifier has been approved by the California Registry to verify emissions reports covering the scope listed above.

- **Verification Standard.** Verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. If a participant is reporting process or fugitive emissions, a separate industry-specific protocol may also be used and cited, where available. Some participants may wish to use their GHG emissions report for additional purposes such as, registering in another registry, participating in emissions trading schemes, crediting programs, etc., and thus may add additional requirements into their contract for verification.

- **Non-Disclosure Terms.** The verifier and the participant should agree in advance on methods for identifying and protecting proprietary and confidential business data that may be revealed during verification.

- **Site Access.** The verifier and the participant should agree in advance to the time, place, and conditions of a verifier's site visits, if any are required.

- **Documentation and Data Requirements.** The verifier and participant should agree on how and when the participant will provide activity and emissions data to the verifier. The range of required documentation will largely be determined by the size and complexity of participant operations, and whether the participant has used the online calculation tools available through CARROT.

- **Period of Performance.** The period of performance for verification services may be up to six years. Where a participant's operations do not significantly change from year to year, they may wish to work with a verifier on a three-year cycle. However, the participant has discretion as to whether to sign a one or multi-year contract.

- **Performance Schedule.** Participants and verifiers may wish to agree on a schedule to complete the verification process and for the verifier to deliver a Verification Report and Verification Opinion. Verification should be completed by October 31 of the same calendar year when the emissions report was submitted.

- **Payment Terms.** Typical payment terms include total value, schedule of payments, and method of payment (e.g., electronic funds transfer).

- **Re-Verification Terms.** If the verifier identifies material misstatements, the participant may choose to revise its GHG emissions report. At that time, the participant may ask the verifier to re-verify the portions of the report with material misstatements or seek verification from another provider. *A verifier may not provide guidance, technical assistance, or implementation work on the remediation of material misstatements, as this constitutes consulting services and results in a conflict of interest.* Contracts should also specify the length of time a participant will have to correct material misstatements.

- **Liability.** All verifiers are subject to minimum liability associated with completing the verification per the terms of the verification contract. The participant may require and the verifier may agree to additional liability under this contract.

- **Contacts.** Parties should identify technical leads for both the participant and verifier, as well as responsible corporate officials of each party.

- **Dispute Resolution.** Both parties must state their consent to submit irreconcilable differences for review to the California Registry-convened Dispute Resolution Committee.

- **Acknowledgement of State Site Visits.** Both parties must sign an acknowledgement that, on a random basis, the State may accompany a verifier for purposes of monitoring the verification process.

2.8 Batch Verification

In an effort to minimize the transaction costs of verification for small organizations with relatively simple emissions, the California Registry will contract with an approved verifier to

undertake the verification work for interested participants with limited GHG emissions. The California Registry calls this batch verification. Emissions reports verified under batch verification must meet the same standards as non-batch reports. Eligible participants include those with:

- Less than 500 metric tons of CO_2e emissions per year;
- No significant process or fugitive emissions (significance threshold is 5% of total CO_2e emissions) ;
- Indirect emissions from purchased electricity at four or fewer sites; and/or
- Direct emissions from five or fewer passenger vehicles only; and/or
- Direct emissions from stationary combustion at one site.

Upon the recommendation of the batch verifier, the California Registry reserves the right to deem a participant's GHG emissions inventory too complex for batch verification. The California Registry also reserves the right to grant batch verification eligibility on a case-by-case basis.

2.8.1 Procedures

Each year, the California Registry will solicit competitive bids for batch verification services from all eligible approved verifiers.

Participants interested in batch verification will contact the California Registry to express their interest. After confirming the participant's eligibility, the California Registry will keep track of interested participants.

Each participant will sign a standardized contract with the verifier that has been developed by the California Registry. If participants require non-standard contract language, they cannot participate in batch verification.

Once the contracts are signed, the California Registry will work with the verifier to identify all necessary documentation, as requested by the verifier and as required in the General Reporting and General Verification Protocols. The California Registry will collect the necessary supporting documentation from the participants and forward it to the verifier. It is expected that batch verification will not require a site visit, but will consist of document review and telephone interviews.

The verifier will contact each participant to understand their operations. Then, the batch verifier will review and assess the emissions reports and documentation and prepare the Verification Report and Opinion. The verifier will then discuss the findings with each participant and upon authorization, will submit the electronic Verification Form to the California Registry via CARROT.

To minimize any potential conflict of interest, the California Registry will contract with a batch verifier on an annual basis and the designated batch verifier will perform all eligible verifications for that calendar year of emissions. The batch verifier will be ineligible to bid on batch verification for the following three years. Because of this term limit, the limited nature of emissions and operations of the participant and the elevated level of oversight by the California Registry, the potential for COI is deemed low, and the requirement to request determination of COI is waived.

2.9 Notification of Planned Verification Activities

After verifiers and participants have completed contract terms, the verifier must notify both the California Registry and the State of California 10 business days prior to the beginning of verification activities, using Form D, *Notification of Verification Activities*. This form is available on the California Registry's Verifiers Only webpage. Notification should include:

- Verifying company information;
- Participant information;
- Year and types of greenhouse gas emissions data being verified;
- Schedule of verification activities; and
- Names of approved staff members conducting the verification activities

This notification period is necessary to allow the State the opportunity to accompany verifiers on visits to participants' sites. The State will observe, evaluate, and report on the quality and consistency of verification activities. A verifier that does not provide proper notification to the California Registry and the State may be disqualified as an approved verifier.

2.10 Kick-off Meeting with the Participant

After contract terms have been completed and the California Registry and State have been notified of planned verification activities, verifiers should conduct a kick-off meeting with participants. For some verifications, this may consist of a telephone call. The agenda for that meeting should include:

1. Introduction of the verification team;
2. Review of verification activities and scope;
3. Transfer of background information and underlying activity data (See Table 2); and
4. Review and confirmation of the verification process schedule.

Based on the information provided in agenda items 2 and 3, the verifier should determine the most effective, efficient, and credible detailed verification approach tailored to the particular characteristics of the participant.

2.11 Online Reporting

All participants must report their emissions using the California Registry's online calculation tool, CARROT. Participants may also opt to use CARROT to calculate their indirect emissions and direct emissions from stationary and mobile combustion. Where participants have used CARROT to calculate their emissions, the verifier needs to verify that data have been collected properly and entered accurately. The verifier should assume CARROT's calculations are correct and do not need to re-calculate the emissions. Due to the time savings, this should result in a less expensive and expedited verification process.

It is the participant's responsibility to provide the verifier with access to CARROT. A verifier will have read-only access to the participant's Total Emissions Summary, which provides a detailed summary of all the information that the participant has reported. Because the verifier needs to be able to evaluate any operational changes, access is also provided to the previous year's total emissions summary, as well as emissions reported in the baseline year if this has been specified and if it is different than the current emissions year. For example, for a participant who has set a baseline year of 2002, has reported data from 2002 – 2006, and is contracting with a verifier for evaluation of their 2007 emissions; the verifier will be able to access their 2007 report, their 2006 report, and their 2002 report. They would have public access to emissions reported in the intervening years.

Additional assistance with navigating and using CARROT is provided in the California Registry's Verification Training Workshops and by contacting the California Registry at 213-891-1444 or **help@climateregistry.org**. Verifiers may also request temporary access to CARROT for training purposes.

Part III Core Verification Activities

3.1 Overview

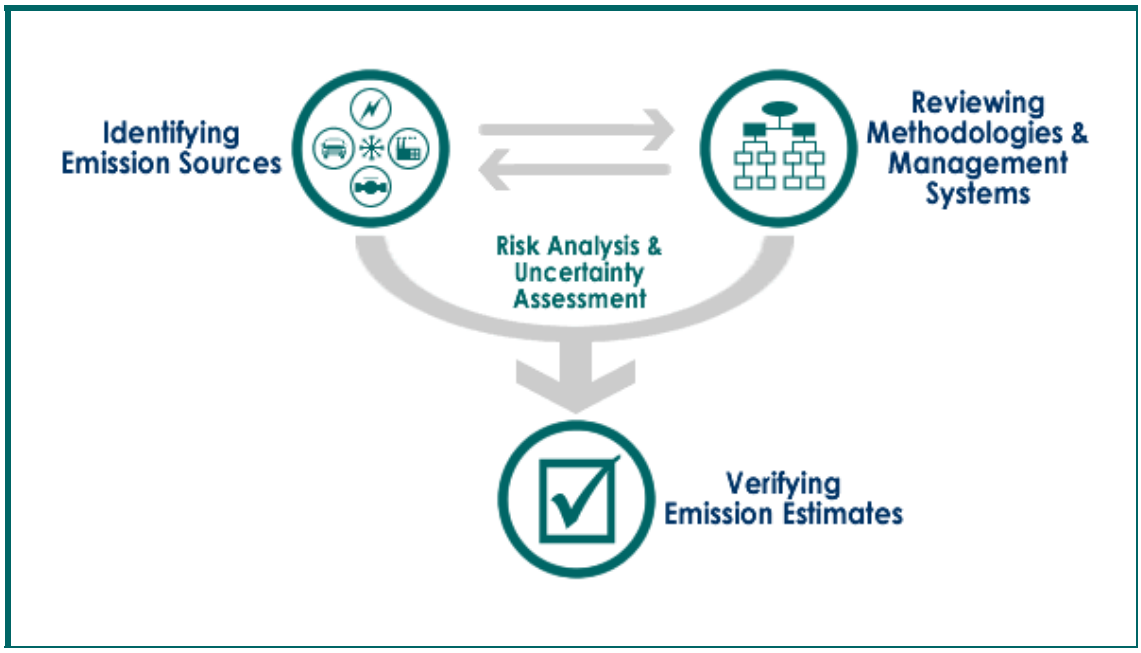
Once verifiers have completed the preparations for verification, they are ready to begin the core verification activities.

The core verification activities include three primary elements:

1. Identifying emissions sources in five emission source categories (indirect, mobile, stationary, process, and fugitive emissions);
2. Understanding management systems and estimation methods used; and
3. Verifying emission estimates.

The core verification activities are a risk assessment and data sampling effort aimed at ensuring that no material sources are excluded and that the risk of error is assessed and addressed through appropriate sampling and review. The complete core verification process is illustrated in Figure 1 below.

Figure 1. The Core Verification Process



3.2 Verification Activities Based on Participant Characteristics

Verifiers must apply the verification activities consistently for all participants. However, based on the size and complexity of participants' operations and management systems, verification activities and the duration of the process will vary. The documents that will need to be

reviewed during verification will also vary depending on the nature of the emission sources contained in the participant's emissions report.

3.2.1 Determining Appropriate Verification Activities

To guide verifiers in their determination of appropriate verification activities, the California Registry divides participants into three general groups, based on the level of effort necessary to verify their emissions. The characteristics of the verification approach for each of these groups are listed below. Of course, verifiers are expected to use their professional judgment to augment or narrow these approaches based on uncertainty in emissions estimates and other items affecting material accuracy.

Group 1: Small participants with simple operations. This group includes participants who have only the following material emissions sources:

- Indirect emissions from electricity consumption, steam imports, and district heating/cooling at four or fewer buildings; and/or
- Direct emissions from stationary combustion at one site; and/or
- Direct emissions from five or fewer passenger vehicles.

In an effort to minimize verification costs, small participants who also have total emissions that are less than 500 metric tons of CO_2e per year may elect to be batch verified with similar organizations. The California Registry will assist this batch of participants in bidding and negotiating contracts with the verifier. Standard terms and conditions will apply for all contract elements. Verification for these participants will usually not require a site visit, but rather, activities will be conducted via a telephone interview.

Alternatively, small participants may choose to contract out verification services through a sole source procurement or competitive bidding process.

Group 2: Larger participants with more complex operations. These include participants with only the following material emissions sources:

- Indirect emissions from electricity consumption, steam imports, and district heating/cooling at more than four sites;
- Direct emissions from stationary combustion at more than one site;
- Direct emissions from more than five vehicles; and/or
- No material process or fugitive emissions.

For these participants, most verifications will require at least one site visit. Additional visits may be required when characteristics of the participant changes between reporting periods (e.g., new sites, changed location, began new operations). Site visits are used to ensure that all material GHG emission sources have been included and appropriately accounted for in the greenhouse gas emissions report.

Group 3: Participants with process or fugitive emissions. For participants with material process or fugitive emissions or other emissions not covered above, verification activities must be more detailed. Because these emission calculations are not currently included in the General Reporting Protocol, the verifier is required to use their

professional judgment as to the appropriateness of the calculations used by the participant.

3.3 Verification Cycle

For participants whose operations do not change significantly, verification can be a three-year cycle. In Year 1, a verifier will need to form a detailed understanding of a participant's operations and resulting GHG emissions. If there have been no significant changes in a participant's boundaries, GHG emissions sources and/or management systems, a verifier may streamline and expedite the verification activities in Years 2 and 3 by focusing on verifying emissions estimates. To ensure data integrity, all of the core verification activities should be completed again in Year 4, followed by streamlined activities in Years 5 and 6.

The minimum core verification activities for each year are:

Year 1: Identify emission sources, review management systems, verify emissions estimates

Year 2: Verify emissions estimates

Year 3: Verify emissions estimates

Year 4: Same as Year 1

3.4 California Registry's Expectations for Verification Activities

Through these verification activities, verifiers are to verify that the annual emissions reports submitted to the California Registry via CARROT meet the standards of the General Reporting Protocol:

1. The participant has reported all material emissions, broken out into the following five categories:
    - Indirect emissions from purchased electricity, imported steam, district heating/ cooling;
    - Direct emissions from mobile combustion;
    - Direct emissions from stationary combustion;
    - Direct emissions from process activities; and
    - Direct fugitive emissions.
2. Total emissions reported as de minimis are less than 5% of the total emissions.
3. From the fourth year of reporting to the California Registry, all material emissions from all six greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6) are reported.
4. All California emissions are identified separately from the rest of a participant's U.S. emissions, where the participant has chosen to report their U.S. emissions.
5. All emissions were emitted during the calendar year specified.

6. Reported emissions meet the minimum quality standard of 95% accuracy.

Emissions reports may also contain other information about an organization and its emissions that does not require verification. This could include, for instance, information about a company's environmental policies and goals, and emission reduction projects. Participants may also choose to report other optional indirect emissions (e.g., business travel, employee commuting). In the report generated by CARROT, optional information will be clearly distinguished from verified information.

To verify information is accurately reported, the verifier will want to review, at a minimum, the documents listed in Table 1. To facilitate this review, once the participant reports their emissions using CARROT, the participant and the verifier can generate a Verification Checklist. Based on the types and categories of emissions they have reported, CARROT will provide participants and verifiers with a list of documents they will need for verification.

Table 1. Documents to be Reviewed during Verification

Activity or Emissions Source	Documents
Identifying Emission Sources	
Emission Source Inventory	Facility Inventory
	Emission Source Inventory Stationary Source Inventory Mobile Source Inventory Fuel Inventory
Understanding Management Systems and Methodologies	
Responsibilities for Implementing GHG Management Plan	Organization Chart, Greenhouse Gas Management Plan, Documentation and Retention Plan
Training	Training Manual, Procedures Manual, Consultant Quals Statement
Methodologies	Protocols Used (if in addition to the California Registry's General Reporting Protocol)
Verifying Emission Estimates	
Indirect Emissions from Electricity Use	Monthly Electric Utility Bills, Emission Factors (if not default)
Direct Emissions from Mobile Combustion	Fuel Purchase Records, Fuel in Stock, Vehicle Miles Traveled, Inventory of Vehicles, Emission Factors (if not default)
Direct Emissions from Stationary Combustion	Monthly Utility Bills, Fuel Purchase Records, CEMs Data, Inventory of Stationary Combustion Facilities, Emission Factors (if not default)
Indirect Emissions from Cogeneration	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from Imported Steam	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from District Heating	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from District Cooling	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Direct Emissions from Process Activities	Raw Material Inputs, Production Output, Calculation Methodology, Emission Factors
Direct Fugitive Emissions	
Refrigeration Systems	Refrigerant Purchase Records, Refrigerant Sales Records, Calculation Methodology, Emission Factors
Landfills	Waste-in-Place Data, Waste Landfilled, Calculation Methodology, Emission Factors
Coal Mines	Coal Production Data Submitted to EIA, Quarterly MSHA Reports, Calculation Methodology, Emission Factors
Natural Gas Pipelines	Gas Throughput Data, Calculation Methodology, Emission Factors
Electric Transmission and Distribution	Sulfur Hexafluoride Purchase Records, Calculation Methodology, Emission Factors

Step 1: Identifying Emission Sources

Verifiers should review a participant's reported emission source inventories (facility, source, and fuel) to ensure that all sources are identified. Verifiers should then determine the GHGs that will result from the identified sources and estimate their magnitude. GHGs that are not required to be reported can be disregarded. Finally, verifiers should rank the remaining reported emissions by CO_2e (using the Global Warming Potentials [GWPs] contained in the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) - see Table 2, below) to assess the environmental risk associated with the emissions.

Table 2. GWPs from IPCC's Second Assessment Report

Greenhouse Gas	GWP (SAR, 1996)
CO_2	1
CH_4	21
N_2O	310
HFC-23	11,700
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-143a	3,800
HFC-152a	140
HFC-227ea	2,900
HFC-236fa	6,300
HFC-4310mee	1,300
CF_4	6,500
C_2F_6	9,200
C_4F_{10}	7,000
C_6F_{14}	7,400
SF_6	23,900

Source: U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003 (April 2005).

When the emission source inventory is complete, verifiers should review participant's GHG emissions report and document answers to the following questions to assess if the GHG emissions report reflects the geographic, organizational, and operational scope of the participant:

1. Does the GHG emissions report include all processes and facilities under the management control of the participant? If not, why?

2. Does the report include all sources of GHG emissions within the geographic and organizational boundaries of the participant?

3. Does the report include all applicable types of GHGs from each emission source within the geographic and organizational boundaries of the participant?

4. Have any mergers, acquisitions, or divestitures occurred during the current reporting year? Have any activities been outsourced in the current year? If yes, has the participant specified a baseline? If so, has it been adjusted?

After these questions have been answered, verifiers will be able to determine if the GHG emissions report accurately reflects the geographic, organizational, and operational scope of the participant. Once all emission sources have been identified, verifiers may proceed to Step 2 to review the calculation methods used and the management systems employed.

Step 2: Reviewing Methodologies and Management Systems

After the scope and comprehensiveness of the participant's emission sources has been confirmed, verifiers should review the methodologies and management systems that the participant used to calculate their emissions. This is principally a risk assessment exercise, in which the verifier must weigh the relative complexity of the scope of the participant's emissions, the participant's methodologies and management systems used to prepare the GHG emissions report, and the risk of calculation error as a result of reporting uncertainty or misstatement. Through these steps, the verifier should determine the appropriateness of the management systems to provide required data to the California Registry. For example, the absence of a comprehensive GHG management system for a participant with a single retail

outlet and solely indirect emissions from electricity purchases may not add significant risk of material misstatement. In contrast, a large vertically-integrated manufacturing company with facilities in 31 states would require a much more robust management system for tracking and reporting its GHG emissions.

A verifier's general review of a participant's GHG management systems should document answers to the following questions:

1. Are calculation methodologies/procedures used to manage GHG emissions at the source level? Are they appropriate given the uncertainty/risk associated with the emissions? Are these methodologies/procedures standard within this industry?

2. Are appropriate methods used to manage and implement entity-wide GHG emissions reporting programs? If the participant has more than one facility, are the emissions data correctly aggregated and monitored?

3. Is someone responsible for managing and reporting GHG emissions? Is this individual qualified to perform this function?

4. Is appropriate training provided to personnel assigned to GHG emissions reporting duties? If the participant relies on external staff to perform required activities, are the contractors qualified to undertake such work? Is there internal oversight to assure quality of the contractor's work?

5. Are appropriate documents created to support and/or substantiate activities related to GHG emissions reporting activities, and is such documentation retained appropriately? For example, is such documentation maintained through reporting plans or procedures, utility bills, etc.?

6. Are the mechanisms used to measure and review the effectiveness of GHG emissions reporting programs appropriate for this purpose? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?

Verifiers should also consider how the participant's management systems are designed to support reporting five categories of emission sources (indirect, mobile, stationary, process and fugitive). Consequently, in reviewing a participant's Total Emissions Report, verifiers should document answers to the following questions:

1. Does the management system capture the diversity of the sources that comprise each emission category? For example, are there multiple types of vehicles and other transportation devices that require different emission estimation methodologies?

2. Does the system capture all the diversity of GHGs emitted from each emission source category?

3. Has the participant used the default emission factors and standardized estimation methods in the California Registry's General Reporting Protocol to calculate emissions in each source category? Has the participant or its technical assistance provider developed estimation methods independently? If the participant uses alternative emission factors, are they documented and explained appropriately?

4. Does the participant's GHG management systems appropriately track emissions in all of the emission source categories?

Once the verifier has assessed the overall risk associated with the management systems, the risks should be assessed in conjunction with the weighted CO_2e estimates determined in Step 1 (Identifying Emission Sources). Verifiers should then identify the areas with the greatest potential for material misstatements (either based on volume of emissions, lack of management systems, or both) to determine the best risk-based strategy to identify a representative sample of emissions to recalculate.

Step 3: Verifying Emission Estimates

Based on a participant's identified emission sources, management systems, and corresponding risk profile of GHG emissions, verifiers should select a representative sample of calculations to verify and sites to visit. Sampling procedures may entail conducting site visits, but should include reviewing documents such as utility bills or emissions monitor results, and recalculating emission estimates based on underlying activity data. In Table 3, below, the California Registry specifies the minimum number of sites that should be visited based on the size of the entity. The verifier should use professional judgment to assess if additional visits are needed.

Table 3. Minimum Site Visit Sample Size

Total Sites	Minimum Sample Size
2-10	30%
11-25	20%
26-50	15%
51-100	10%
101-250	5%
251-500	3%
501-1,000	2%
Over 1,000	1-2%

3.5 Potential Site Visits by the State of California

As part of the State of California's oversight of the verification process, the State will randomly accompany verifiers on site visits. The California Registry's enabling legislation directed the State to observe the verifier during verification visits, evaluate whether the participant has a GHG accounting program consistent with California Registry-approved procedures and protocols, and evaluate the reasonableness of the emissions information being reported. The State may send an employee or a contractor to accomplish this responsibility. The purpose of any site visit is to oversee the verifier's activities, and to evaluate the reasonableness of the participant's reported data. The State will report on its findings to the California Registry.

To accomplish this, during a site visit, the State will need to access the same information and sources as that of the verifier. The State will work with the verifier and participant to obtain this access. This may involve requesting access to on-site locations that may have GHG emission sources or related activities and participant information, data, records, or copies of records; observing verifiers during any exchange of participant data or data analyses; and/or asking the verifier to provide specific information related to their on-site and off-site data analyses. The State will also make every effort to not impede the normal activities of either the participant or the verifier. All costs for the State site visit are borne by the State.

Before the end of a site visit, the State will discuss its preliminary observations and evaluations with the verifier and participant. The State will also contact and discuss with the verifier and participant any findings that identify either party before reporting this to the California Registry.

As the Participant requests, a representative from the State, and/or the Verifier that will view confidential information should sign the Standard Nondisclosure Agreement (NDA). Rules covering State confidentiality can be found in the *California Code of Regulations, Title 20, Sect. 2501 et seq*.

3.6 Targeted Review & Recalculation of GHG Emissions

The California Registry does not expect nor require verifiers to review all of the participant's documents and recheck all their calculations. To ensure that data meet a minimum quality standard on an entity-wide basis, verifiers should concentrate their activities in the areas that have the greatest uncertainty and amount of emissions. Verifiers should calculate emissions for these sources and compare those calculations to emission levels reported by the participant. If they are free of material misstatement (have a difference of <5%), the verifier should declare that the participant's report conforms to the California Registry's Protocols.

If the reported data is not free of material misstatement, the verifier should include this information in its Verification Report and should complete its sampling effort of other sources. Once verifiers have confirmed that a sample of data is free of material misstatements, they should estimate total emissions and confirm that all material GHG emissions are reported.

3.7 De Minimis Emissions

De minimis emissions are a quantity of GHG emissions from one or more sources, for one or more gases, that when summed equal less than 5% of an organization's total CO_2e emissions. The percentage applies to California emissions for the purposes of California-only emissions reporting, and applies to U.S. emissions for national reporting. Participants have some discretion in choosing which sources and/or GHGs are de minimis, but are expected to disclose all de minimis emission sources in their emissions report. Verifiers should review participant's documentation and explanation of how de minimis emissions were calculated to confirm that not more than 5% of total CO_2e emissions are considered de minimis.

3.8 Identifying Material or Immaterial Misstatements

In order for verifiers to verify a GHG emissions report, a sample of data must be free of material misstatement. It is possible that during the verification process differences will arise between the emissions estimated by the participant and those estimated by the verifier. Differences of this nature may be classified as either material or immaterial. A discrepancy is considered to be material if the overall reported emissions differ from the overall emissions estimated by the verifier by 5% or more. A difference is immaterial if this difference is less than 5%.

A verifier's verification of emissions estimates should document the answers to the following questions:

1. Are the reported electricity, steam, and district heating and cooling use consistent with utility bills?

2. Is the reported total stationary fuel use by fuel type consistent with the fuel use records?

3. Is the reported total consumption of fuels in motor vehicles consistent with available documentation and by vehicle type? If the entity calculates transportation emissions based on vehicle mileage, is the reported vehicle mileage consistent with vehicle mileage records?

4. Are the reported process and fugitive emissions consistent with activity data or maintenance records?

5. Are the emission factors used by the participant appropriate? If California Registry default factors are not used, do the alternative emission factors provide increased accuracy? Is their derivation and explanation of increased accuracy properly documented and reasonable?

6. Does a sample of the participant's calculations agree with your re-calculated direct (mobile, stationary, process and fugitive) and indirect emissions estimates? Have you documented your process for determining the appropriate sampling plan?

7. Are all material GHG emissions included? Are all emissions that are considered de minimis emissions documented and reported as such?

8. Are the current year's reported emissions significantly different from the prior year's emission levels? If so, what has changed from prior years?

9. Has the accumulated change in reported emissions, since the last baseline update, changed by more than ten (10) percent? If so, has the baseline, if any, been recalculated?

10. Are there any discrepancies between your emissions estimates and the participant's material?

Once verifiers have reviewed these activities and answered these questions, they are ready to complete the verification process.

Part IV Completing the Verification Process

4.1 Overview

Once a verifier has completed reviewing a participant's annual GHG emissions report, they must do the following to complete the verification process:

1. Complete a detailed Verification Report, and deliver it to the participant;
2. Prepare a concise Verification Opinion, and deliver it to the participant;
3. Conduct an exit meeting with the participant to discuss the Verification Report and Verification Opinion and determine if material misstatements (if any) can be corrected. If so, the verifier and participant should schedule a second set of verification activities after the participant has revised the GHG emissions report.
4. Submit an electronic Verification Form and Verification Activity Log to the California Registry via CARROT;
5. Return important records and documents to the participant for retention.

4.2 Completing a Verification Report

4.2.1 Verification Report Content

The Verification Report is a confidential document that is shared between a verifier and a participant, and is only available to the California Registry or the public at the participant's request.

The Verification Report should include the following elements:

- The scope of the verification process undertaken;
- The standard used to verify emissions (this is the California Registry's General Reporting Protocol, but may also include other protocols or methodologies for those sources for which the California Registry has yet to provide detailed guidance);
- A description of the verification activities, based on the size and complexity of the participant's operations;
- A list of emission sources identified, including de minimis sources;
- A description of the sampling techniques and risk assessment methodologies employed for each source;
- An evaluation of whether the participant's annual GHG emissions report is in compliance with the California Registry's General Reporting Protocol;
- A comparison of the participant's overall emissions estimates with the verifier's overall emissions estimates;

- A list of material misstatements, if any;
- A list of immaterial misstatements, if any; and
- A general conclusion to be reflected in the Verification Opinion.

4.2.2 Quality Assurance Check

When the Verification Report is completed, it should be forwarded to an independent senior reviewer within the verifier's firm for a quality assurance check. No Verification Report should be forwarded to a participant until it has had an independent internal review.

4.2.3 Participant Review of Verification Report

Once a participant receives a Verification Report from their verifier, they should have at least 30 days to review and comment on the Verification Report. At the end of that review, the verifier and the appropriate official at the participant's organization should hold an exit meeting to discuss the nature of any material or immaterial misstatements.

4.3 Preparing a Verification Opinion

Verifiers should prepare a Verification Opinion using the template shown in Figure 2. The Verification Opinion is a simple confirmation of the verification activities and outcomes for all stakeholders (participants, verifiers, the California Registry, and the public). The Verification Opinion must also follow the same internal review process as the Verification Report and consequently must be reviewed by an independent senior reviewer within the verifier's firm, and signed by a designated lead verifier. An electronic version of this template is available on the California Registry's Verifiers Only webpage or may be obtained from the California Registry by emailing **help@climateregistry.org**.

4.4 Verification Activity Log

In order to assess the consistency of professional judgments that verifiers have been asked to make, verifiers should also complete a Verification Activity Log (Table 4 below) and submit a completed copy to the California Registry, along with the electronic Verification Form, in CARROT.

Table 4 includes a step-by-step outline of the standardized verification activities that all verifiers must consider. Not all activities are required of all participants or during each year, depending on a participant's specific circumstances, but verifiers should review this list and note "not applicable" (or "N/A") where appropriate. The table also includes a series of yes/no questions. Any "no" response should be explained, without revealing a participant's confidential information.

The California Registry will consider both the Verification Opinion and the answers in Table 4 in its final review of emissions data, before accepting a participant's report into the California Registry. An electronic version is available for download in CARROT, on the California Registry's Verifiers Only webpage, and from the California Registry by emailing **help@climateregistry.org**.

Table 4. Verification Activity Log

Verifier Company:		
California Registry Participant:		
Preparing for Verification	**Date Achieved**	
Bid on a Verification Contract		
Request determination of COI from California Registry		
Negotiate Contract with California Registry Participant		
Notify State of California and California Registry of Planned Verification Activities		
Conduct Kick-off Meeting With Participant		
Plan Verification Activities Based on Participant Characteristics		
Core Verification Activities **Identify Emission Sources**	**Date Achieved**	
Identify and list all facilities in the entity		
Identify and list all emission sources (indirect, mobile, stationary, process and fugitive)		
Identify and list all fuel types		
Rank all sources by magnitude on a carbon dioxide equivalent basis		
Assess any changes in geographic and organizational boundaries		
	Yes	**No**
1. Does the GHG emissions report include all processes and facilities under the management control of the participant?		
2. Does the report include all sources of GHG emissions within the geographic and organizational boundaries of the participant?		
3. Does the report include all applicable types of GHGs from each emission source within the geographic and organizational boundaries of the participant?		
4. Have any mergers, acquisitions, or divestitures occurred during the current reporting year?		
5. Have any activities been outsourced in the current year?		
6. If a baseline has been specified, has it been adjusted accordingly?		
7. Does the GHG emissions report include all processes and facilities under the management control of the participant?		
Review Methodologies and Management Systems	**Date Achieved**	
Evaluate procedures and systems for preparing emissions report		
Evaluate personnel and training for preparing emissions report		
Consider the uncertainty associated with methodologies and management systems		
	Yes	**No**
8. Are appropriate calculation methodologies/procedures used to manage GHG emissions at the source level? Are they appropriate given the uncertainty/risk associated with the emissions?		
9. Are appropriate methods used to manage and implement entity-wide GHG emissions reporting programs?		
10. If the participant has more than one facility, is the emissions data correctly aggregated and monitored?		
11. Is someone responsible for managing and reporting GHG emissions?		
12. Is that person qualified to do so?		
13. Is appropriate training provided to personnel assigned to GHG emissions reporting duties? If the participant relies on external staff to perform required activities, are the contractors' qualified to undertake such work?		
14. Are appropriate documents created to support and/or substantiate activities related to GHG emissions reporting activities, and is such documentation retained appropriately?		
15. Are appropriate mechanisms used to measure and review the effectiveness of GHG emissions reporting programs? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?		

16. Does the system account for the diversity of the sources that comprise each emission category? For example, are there multiple types of vehicles and other transportation devices that require different emission estimation methodologies?		
17. Do you know the diversity of GHGs emitted from each emission source category?		
18. Has the participant used the default emission factors and standardized estimation methods in the California Registry's General Reporting Protocol to calculate emissions in each source category?		
19. Has the participant or its technical assistance provider developed estimation methods independently?		
20. If participant uses alternative emission factors, are they documented and explained appropriately?		
21. Does the participant's GHG management system appropriately track emissions in all of the emission source categories?		
Assess Risk of Material Misstatement Associated with Management Systems/Procedures	**Date Achieved**	
Develop sampling procedures for sources based on risk of material misstatement		
Verify Emission Estimates		
Confirm total fuel consumption		
Confirm vehicle miles traveled		
Confirm that appropriate emission factors are used. If not default factors, ensure the derivation and explanation of increased accuracy is properly documented		
Calculate direct (mobile, stationary, process & fugitive) & indirect emissions based on sampling procedures		
Compare estimates from sample calculations to reported emissions		
Determine if there are any discrepancies between sample calculation and reported emissions		
Confirm that all material GHG emissions are included (that all emissions not included are either de minimis or not required)		
Determine if Discrepancies are Material or Immaterial	**Yes**	**No**
22. Based on the following table, have you visited an appropriate number of sites?		

Total Sites	Minimum Sample Size
2-10	30%
11-25	20%
26-50	15%
51-100	10%
101-250	5%
251-500	3%
501-1,000	2%
Over 1,000	1-2%

Total number of sites:_____
Total number visited:_____

23. Are the reported electricity, steam, and district heating and cooling use consistent with utility bills?		
24. Is the reported total stationary fuel use by fuel type consistent with the fuel use records?		
25. Is the reported total consumption of fuels in motor vehicles consistent with available documentation and by vehicle type? If the entity calculates transportation emissions based on vehicle mileage, is the reported vehicle mileage consistent with vehicle mileage records?		
26. Is the reported process and fugitive emissions consistent with activity data or maintenance records?		
27. Are the emission factors used by the participant appropriate? If California Registry default factors are not used, ensure that alternative emission factors provide increased accuracy and that the derivation and explanation of increased accuracy is properly documented and reasonable.		
28. Does a sample of the participant's calculations agree with your re-calculated direct (mobile, stationary, process & fugitive) & indirect emissions estimates? Have you documented your process for determining the appropriate sampling plan?		
29. Are all material GHG emissions included? Are all emissions that are considered de minimis emissions documented as such?		
30. Are the current year's reported emissions significantly different from the prior year?		
31. Has the accumulated change in reported emissions, since the last baseline update, changed by more than 10%? If so, has the baseline, if any, been recalculated?		
32. Are discrepancies between your emissions estimates and the participant's immaterial?		
Completing the Verification Process	**Date Achieved**	
Prepare a detailed Verification Report and submit to participant		
Prepare a Verification Opinion and submit to participant		
Conduct exit meeting with participant to discuss Verification Report & Opinion		
Provide records to participant for retention		

4.5 Completing the Verification Contract

4.5.1 Exit Meeting

Verifiers should prepare a brief summary presentation of their verification findings for the participant's key personnel. At the exit meeting, verifiers and participants might exchange lessons learned about the verification process and share thoughts for improving the verification process in the future. Verifiers and participants may wish to consider joint feedback to the California Registry.

The goals of this meeting should be:

- Acceptance of the Verification Report and Opinion (unless material misstatements exist and can be remediated, in which case the verification contract may need to be revised and a second verification process scheduled). If the participant does not wish to retain the verifier for the re-verification process, the verifier shall turn over the participant's relevant documentation to the participant within 30 days.

- Authorization for the verifier to complete the Verification Form in CARROT.

If the verifier is under contract for verification activities in future years, the verifier and participant may wish to establish a schedule for the next year's verification activities.

Figure 2. Sample Verification Opinion

[*Insert Verification Firm Logo*]

California Climate Action Registry Verification Opinion

Name of Verification Firm: _____

This is to verify that _____ [*Name of Member Organization*] has had its greenhouse gas emissions report covering the period January 1, _____ [*Insert Reporting Year*] to December 31,_____ [*Insert Reporting Year*] verified according to the California Climate Action Registry's General Verification Protocol against a standard of the California Registry's General Reporting Protocol.

Organizational Boundary of Verification

☐ Financial Management Control ☐ Operational Management Control ☐ Equity Share

GHGs Verified

☐ CO_2 ☐ CH_4 ☐ N_20 ☐ HFCs ☐ PFCs ☐ SF_6

Total Direct Emissions: _____

Total Indirect Emissions: _____

Geographic Scope of Verification

☐ California Emissions ☐ U.S. Emissions

Baseline Year (if specified)

_____ (Direct) _____ (Indirect) Year, if specified

Verification Opinion

☐ Verified without Qualification

☐ Unable to Verify

Attestation

_____ _____

[*Insert Name*], Lead Verifier Date

_____ _____

[*Insert Name*], Senior Internal Reviewer Date

Authorization

I _____ [*Name of Member Representative*] authorize the above named verifier to submit this Verification Opinion to the California Climate Action Registry for _____ [*Name of Member Organization*].

_____ _____

[Member Representative Signature] Date

4.5.2 Limits to Verifier Feedback

If a participant's emissions report is not verifiable due to material misstatements, a *verifier must not provide guidance on how to remediate the identified misstatements*. Such guidance would be considered a consulting activity and therefore, a conflict of interest. However, verifiers may provide any existing documentation that may be useful to participants in preparing remediation plans. A verifier should also enumerate any shortcomings in a participant's GHG tracking and management systems.

The California Registry will retain the participant's unverified emissions report in the California Registry database for up to two years pending verification. After two years, if the emissions report is still not verifiable, the California Registry will render the emissions report inactive.

4.6 Submitting the Verification Opinion to the California Registry

Once the Verification Opinion is complete and has been authorized by the participant, the verifier must complete the Verification Form and Verification Activity Log electronically in CARROT and the participant must email a Portable Document File (PDF) copy of the fully executed verification opinion to help@climateregistry.org. The participant may also elect to send a hard copy of the verification opinion with wet signatures to the address listed below:

Verification Opinion
California Climate Action Registry
523 W. Sixth Street, Suite 428
Los Angeles, CA 90014

Once the California Registry receives an electronic or hard copy of the Verification Opinion, the California Registry will perform a final review of the emissions report in CARROT. When successful, the participant's report will be formally accepted into the California Registry database and the annual verification process will be completed.

*Note: Participants are *not* required to submit their Verification Opinions to the California Registry for the first two years of their participation. However, it is important to note that a participant's emissions data will not be considered accepted by the California Registry unless the California Registry receives a Verification Opinion indicating a "verified without qualification" assessment.

4.7 Record Keeping and Retention

While the California Registry views the verification process essentially as a private exchange between the verifier and the participant, the verifier should remind the participant to retain sufficient records to enable an ex-post verification of the participant's emissions. The California Registry recommends that the following records be retained for a minimum of seven years as specified by contract with the participant.

Verifiers should retain hard and electronic copies, as applicable, of:

- The participant's GHG emissions report (printable from CARROT);
- The Verification Report; and
- The Verification Opinion.

The participant should maintain the following documentation for a minimum of seven years:

- Contact information for the lead verifier and a responsible corporate officer at the participant's organization;
- A general description of the participant's organization;
- The geographic boundaries;
- The number of facilities and operations assessed in the verification activities;
- The GHGs evaluated;
- The sources of emissions identified;
- Assessment of emission factors, demonstrating greater accuracy if not default emission factors;
- Copies of fuel use, mileage, or other activity data records used in sample recalculations;
- Verification methodology used based on the size and complexity of the participant;
- Sampling procedures for selecting site visits;
- Dates of site visits;
- The verifier's evaluation of the participant's management systems; and
- The verifier's estimates of the participant's emissions.

Copies of the original activity data records are necessary to perform an ex-post verification.

4.8 Timeline of Verification Process

Incorporating all of the steps and procedures involved in reporting, reviewing and verifying credible emissions data may be a lengthy process. The following table gives you an overview of the consecutive steps and necessary lapses of time between steps in the verification process.

Table 5. Verification Process Timeline

Activity	Elapsed Time
Preparing for Verification	
Contacted by participant to submit proposal for services	Where no consulting activities for 3 years prior to contract
Selected by participant	Varies
Submit request for case-by-case determination of COI to California Registry	Prior to contract negotiation
California Registry evaluates case and issues notification of low risk for COI	One month
Negotiate contract with participant	Varies
Notify State of California and California Registry of verification activities	One month
Core Verification Activities	
Begin verification activities	Maximum one year
Completing the Verification Process	
Submit Verification Report and Opinion to participant	Varies
Participant reviews Verification Report and Opinion and returns comments to verifier	One month
Verifier discusses findings with participant	Varies
Participant authorizes submission of electronic Verification Form to the California Registry	By October 31 of data year +1
Monitor emerging COI	One year
Verifier cannot provide consulting services to participant	One year
Participant chooses a new verifier	After a maximum of six years

Glossary

Applicant	A firm, or lead firm (if part of a team), responding to a State-issued RFA for Verifiers.
Baseline	Datum against which to measure greenhouse gas emissions performance over time, usually annual emissions in a selected base year.
Batch Verification	Verification process arranged by the California Registry for multiple participants with relatively simple GHG emissions (less than 500 tons of CO_2e emissions and typically only indirect emissions from electricity consumption and/or direct emissions from stationary or mobile combustion).
Verification	The process used to ensure that a given participant's greenhouse gas emissions inventory (either the baseline or annual result) has met a minimum quality standard and complied with the California Registry's procedures and protocols for calculating and reporting GHG emissions.
Verified Member	A California Registry participant that has submitted at least one verified annual emissions report to the California Registry.
Verifier	A firm or team of firms that has been State- and California Registry-approved to conduct verification activities under the California Registry program. A verifier may also refer to a single employee within a State- and California Registry-approved firm who conducts verification activities.
CO_2 equivalent*	(CO_2e) The quantity of a given GHG multiplied by its total global warming potential. This is the standard unit for comparing the degree of harm which can be caused by different GHGs.
Conflict of Interest	A situation in which, because of other activities or relationships with other persons or organizations, a person or firm is unable or potentially unable to render an impartial Verification Opinion of a potential client's greenhouse gas (GHG) emissions, or the person or firm's objectivity in performing verification activities is or might be otherwise compromised.
Datum	A reference or starting point.
De Minimis	A quantity of greenhouse gas emissions from one or more sources, for one or more gases, which, when summed equal less than 5% of an organization's total CO_2e emissions.
Direct Emissions	Emissions from sources that are owned or controlled by the reporting organization.
Emerging COI	A potential or actual COI situation that arises, or becomes known, during verification or for a period of one year after the completion of verification activities.

Emission Factor*	A factor relating activity data and absolute GHG emissions.
Equity Share	Fractional percentage or share of an interest in an entity based either on ownership interest, or on some other contractual basis negotiated among the entity's stakeholders.
Fugitive Emissions*	Unintended or incidental emissions of GHGs from the transmission, processing or transportation of fossil fuels or other materials, such as HFCs from refrigeration leaks, SF_6 from electric power distribution equipment, methane from mined coal, CO_2 emitted incidentally with geyser steam and/or fluid used in geothermal generating facilities.
Global Warming Potential*	(GWP) The ratio of radiative forcing (degree of harm to the atmosphere) that would result from the emission of one unit of a given GHG to one unit of CO_2.
Greenhouse Gases	(GHGs) For the purposes of the California Registry, GHGs are the six gases identified in the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_20), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).
Indirect Emissions	Emissions that are a consequence of the actions of a reporting entity, but are produced by sources owned or controlled by another entity.
Inherent Uncertainty	The scientific uncertainty associated with measuring GHG emissions due to limitations on monitoring equipment, or measurement methodologies.
Lead Verifier	An individual who has completed a California Registry-sponsored verification training workshop and who has the authority to sign a verification firm's Verification Opinion.
Management Control	The ability of an entity to govern the operating policies of another entity or facility so as to obtain benefits from its activities.
Material misstatement	An error (for example from an oversight, omission or miscalculation) that results in the reported quantity being significantly different from the true value to an extent that will influence performance or decisions.
Member	A California Registry participant that is preparing its annual GHG emissions report, but has not yet submitted its verified report to the California Registry.
Minimum Quality Standard	Data that is free of material misstatements, and meets the California Registry's minimum level of accuracy of at least 95%.
Mobile Combustion*	Burning of fuels by transportation devices such as cars, trucks, airplanes, vessels, etc.
Organizational COI	Instances where the ability to render objective GHG verification services may be affected by the services provided by, shared management and/or financial resources with, or other situations created by a parent company or other related entities.

Outsourcing*	The contracting out of activities to other businesses.
Partner	An organization working through a lead firm (applicant) to respond to a State-issued RFA for Verifiers. A partner may or may not be a related entity. If the applicant submits an application wherein staff or financial capability is shared with either a parent firm or subsidiary of a parent firm, then that parent or subsidiary is considered a partner. If the applicant is part of a larger organization, but the application does not include any staff or financial capability from the larger organization, then the larger organization is not considered a partner.
Personal COI	A relationship of an employee or a partner employee that may impair the objectivity of the employee in performing a verification.
Process Emissions	Emissions from physical or chemical processing rather than from combustion, such as CO_2 emissions from cement manufacturing and PFC emissions from aluminum smelting.
Related Entity	An organization that is linked to the verifier by: common ownership or directors, contractual arrangement, a common name, informal understanding, or other means such that the related organization has a vested interest in the outcome of an assessment or has a potential ability to influence the outcome of an accredited management system assessment, greenhouse gas validation, or verification.
Reporting Uncertainty	The errors made in identifying emission sources and managing and calculating GHG emissions. This differs from inherent uncertainty due to incomplete understanding of climate science or a lack of ability to measure greenhouse gas emissions.
Stationary Combustion*	Burning of fuels to generate electricity, steam, or heat.

**Definitions of key terms obtained from "The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard," World Business Council for Sustainable Development and World Resources Institute, Switzerland, March 2004.*

Key Questions

Verifier Approval: *Who may qualify as a verifier?*

Only those firms accredited by the California Registry, the State of California, or The Climate Registry may provide verification services to California Registry participants

To become approved, a verifier must complete a two-step process: 1) Obtain accreditation as a GHG verifier from either the California Air Resources Board or from the American National Standards Institute (or other approved accreditation body as specified on the California Registry website) and 2) achieve California Registry approval by attending a verification training workshop facilitated by the California Registry.

Information on the ANSI GHG Verifier Accreditation is available at www.ansi.ghg.org. Information on CARB GHG accreditation is available at arb.ca.gov.

Applicants who wish to be qualified as approved verifiers need to demonstrate experience in GHG verification and verification of financial data, technical data, quality control, and/or environmental management systems. Verifiers must also demonstrate the means to accept financial liability for verification activities undertaken for a participant. *Firms providing verification services to a participant may not provide any non-verification services that create a high risk of COI to the same participant for three years prior to and one year after verification.*

Liability: *What liability will a verifier incur? What liability coverage must a verifier accept?*

At a minimum, a verifier is responsible for planning a participant's verification activities, conducting the verification activities, preparing a Verification Report and Opinion, and submitting authorized Verification Opinions to the California Registry via CARROT. If a California Registry-approved verifier fails to complete the contracted activities, they may be financially liable for the cost of hiring a different California Registry-approved verifier to complete a proper verification from start to finish (as defined in the contract between a verifier and a participant). The verifier may incur additional liability based on the negotiated terms of the contract. This liability may include the future value of GHG emissions or emission reductions, damages, or any other element agreed to by the verifier and the participant.

In their initial application, verifiers must demonstrate the means to accept financial liability for verification activities undertaken for a California Registry participant, specify such liability in any contract for verification activities, and make adequate arrangements (e.g., professional liability insurance coverage) to cover liabilities arising from its activities or operations. However, verifier liability may also be limited in the contract with the California Registry participant.

Resolution of Disputes: *What recourse is available if the participant does not accept the findings of the verification?*

There may be instances where a verifier and a participant cannot agree on identification of material misstatements and/or the findings of the Verification Opinion. In such instances, both parties can request the Dispute Resolution Committee, composed of qualified representatives from California state agencies, the California Registry, and one non-voting verifier, who serves pro bono on an annual, rotating basis. The participant and the verifier will

each pay a filing fee equal to 5% of the participant's annual membership fee to submit the matter to the Dispute Resolution Committee.

The Dispute Resolution Committee will interview the participant and the verifier, review the area of dispute and reach a unanimous, binding decision concerning verifiability. The California Registry will notify the verifier and the participant of the Committee's decision. Thus, as part of contract negotiations, each California Registry participant and verifier will need to sign a form agreeing to this Dispute Resolution policy.

"Batch Verification": *How does it work? How will it affect bidding, contracting, and the overall verification process?*

In an effort to minimize the transaction costs of verification, the California Registry will help eligible participants with simple GHG emissions contract for "batch verification". Eligible participants have relatively simple GHG emissions (indirect emissions from purchased electricity and/or emissions from limited stationary and mobile sources) and produce less than 500 metric tons of CO_2e per year.

In batch verification, the California Registry will work with one verifier each year to verify the emissions reports of multiple organizations at one time. Emissions must be verified to the standards of the General Reporting Protocol. Because of the nature of the emissions, batch verification activities will consist of document review and phone conversations, but will not require a site visit. The California Registry will assist in negotiating a standardized contract and a flat fee for each organization. Standardizing the contract language will help to minimize the transaction costs of verification for small, office-based organizations.

A new batch verifier will be chosen each year. This finite verifier term is to minimize the risk from COI and to eliminate the cost associated with a case by case COI.

Verification Deadlines: *What is the deadline for completing the verification process?*

Emissions should be reported to the Registry no later than June 30 following the emissions year. Verification should be completed by October 31 following the emissions year. For instance, 2008 emissions should be reported by June 30, 2009 and verified by October 31, 2009.

Verification Report and Verification Opinion: *What are the Verification Report and Verification Opinion and how are they different?*

The Verification Report is a detailed report that a verifier prepares for a participant. The Verification Report should describe the scope of the verification activities, standards used, emission sources identified, sampling techniques, evaluation of a participant's compliance with the General Reporting Protocol, assumptions, and a list of material and immaterial misstatements, if any. The Verification Report is a confidential document between the verifier and the participant, and is only shared with the California Registry or the public at the participant's request.

The Verification Opinion is a brief, one-page summary of the verifier's findings that simply states if the participant's emissions report is verifiable or not. The Verification Opinion is submitted in hard copy by the verifier to the participant for approval.

Verification and Remediation: *What if a participant's emissions report is not verified?*

After completing verification activities, the verifier will prepare a Verification Report and forward it to the responsible official representing the participant. The responsible official includes anyone authorized by the participant to approve the GHG emissions report for submission to the California Registry and will typically be a corporate official or the technical manager of the verification contract.

If the verifier identifies material misstatements that prevent a favorable Verification Opinion, those material misstatements should be listed and described in the Verification Report. If possible, the participant may correct those material misstatements and resubmit the emissions report for verification within a reasonable amount of time. The participant may seek technical assistance to correct material misstatements but the verifier may not provide such technical assistance as it would constitute non-verification services, and create a conflict of interest.

The California Registry will retain the participant's unverified data in the California Registry database for up to two years, pending correction. After that time, the participant will need to re-enter the data.

Confidentiality: *Are the results of the verification kept confidential? Will emissions data be kept confidential?*

All aggregated entity-level emissions data and metrics reported to the California Registry will be available to the public. However, the California Registry will keep confidential all reported emissions, activity data, methodologies, and emissions factors that are reported at facility, project, or source levels. Confidential information will only be accessible to the participant, the California Registry, and the verifier, unless the participant allows others access to such information or wishes to have it available to the public. In instances where the State of California accompanies verifiers on site visits, the State may have access to confidential information as needed to oversee verification activities and evaluate the reasonableness of the participant's data and systems to track emissions. Representatives from the State, the Verifier, and the Participant who will view confidential information will all be required to sign the Standard Nondisclosure Agreement (NDA). As noted in an earlier question, the Verification Report is a private document between a participant and verifier, while the Verification Opinion is shared with the California Registry. A majority of the contents of the Verification Opinion will also be shared with the public.

General Verification Protocol Revision Policy: *Will this General Verification Protocol change over time? How can verifiers provide feedback to the California Registry?*

The California Registry expects to regularly review, revise, update, and augment this General Verification Protocol. The California Registry invites all parties, verifiers, California Registry participants, California State agencies, and the public to provide insights and experiences that will help improve the General Verification Protocol. Anyone with suggestions or concerns is encouraged to contact the California Registry at any time at 213-891-1444 or by email at info@climateregistry.org**.**

Stakeholders will also be able to present suggestions directly to the California Registry's Board of Directors for consideration at their meetings. All suggestions and requests for modifications must be made by utilizing the "Protocol Comment Form" available on the California Registry's website at **www.climateregistry.org/protocols**.

California Registry-Approved Technical Assistance Providers: *What role do they play?*

Some participants may desire outside assistance, either in terms of expertise or human resources, to collect, document and report their emissions to the California Registry and/or otherwise manage their GHG emissions. To assist participants in identifying a firm qualified to help them, the State and the California Registry approve firms qualified to serve as technical assistance providers (TAs). Participants are not required to use only approved TAs. However, approved companies have been approved as firms experienced in providing GHG emissions services, and many of them have attended California Registry-sponsored training sessions. Where a participant has retained the services of a TA, the participant may ask the TA to play a role in the verification process. Neither the California Registry nor the State is responsible for any consulting services or recommendations they may provide, nor do they specify any role that TAs should or should not play.

All firms approved as verifiers also are automatically qualified to act as TAs. However, a firm cannot provide both technical assistance and verification services to the same client at the same time.

Role of California State Agencies: *What is the relationship between the California Registry and state agencies?*

The Registry was established by California statute as a non-profit voluntary registry for greenhouse gas emissions inventories, to help organizations establish GHG emissions baselines against which any future GHG emission reduction requirements may be applied. The State of California was directed to offer its best efforts to ensure that participants receive appropriate consideration for early actions in the event of any future state, federal or international GHG regulatory scheme.

The California Registry and state agencies work together and keep each other informed about current activities. The State of California continues to provide technical guidance to the California Registry and plays a direct oversight role in the verification process. The California Registry gives great weight to state agency guidance and relies in large part on these recommendations when developing California Registry policies, procedures and tools, including reporting and verification protocols and the online reporting tool. However, final policy and technical decisions are made independently by the California Registry's Board of Directors.

Updated Emissions Reports: *Once a report has been verified, will it ever change?*

Following verification of an annual GHG emissions report, there may be situations in which a verified report may change. A participant may wish to add information beyond the minimum reporting standards (add non-CO_2 gases during the first three years of reporting, report facilities outside of California, change the emission factor used, etc.). Participants can update their report at any time. However, any changes will need to be re-verified, and this information will need to be documented in CARROT. As understanding and sophistication of GHG accounting principles develops, the California Registry may elect to update accounting principles (e.g., alternate emission factors, Global Warming Potentials). Where participants have used CARROT to calculate their emissions, these changes do not need to be re-verified.

CARROT: *Am I required to use CARROT to communicate with the California Registry?*

Participants are required to report their emissions to the California Registry using CARROT. The participant-entered annual GHG emissions report generated by CARROT is the document on which the verifier provides its Verification Opinion to the California Registry. The Verification Opinion is submitted in separately by the participant. Verifiers are not restricted to only communicating with the California Registry via CARROT, but must use the online tool to submit an electronic Verification Form and Verification Activity Log. Questions about using CARROT may be directed to the California Registry at 213-891-1444 or **help@climateregistry.org**.

Additional Questions?

If you have any questions regarding GHG emissions reporting or verification under the California Registry Protocols, please contact the California Registry by phone (213-891-1444) or email (**help@climateregistry.org**).

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California Climate Action Registry
523 West Sixth Street, Suite 428
Los Angeles, California 90014
Tel: 213 891 1444
Email: info@climateregistry.org
www.climateregistry.org

Reduced Total Dissolved Solids (TDS), Selenium and Boron Loads to the San Joaquin River/DMC

Amount Discharge to SJR, AF During Winter Months	**120**

Constituent	Boron (B) mg/L	Selenium (SE) mg/L	EC umhos	Field EC umhos
Monthly Average (4/1/11 to 4/1/14)	6.12	0.09	5226.24	5126.59
lb/day Discharge to SJR	1,973	28	1,078,352	1,057,791
lb/day Discharge to SJR (2015)	1,315	19	718,901	705,194
Partial Benefits for 2015 Construction is finished in November 27, 2015.	658	9	359,451	352,597

Notes:

$$\frac{lbs}{year} = \frac{mg}{L} \times \frac{8.245\,\frac{lbs}{MG}}{\frac{mg}{L}} \times 0.325851\,\frac{MG}{AF} \times \frac{120\ AF}{year}$$

TDS (mg/L) = 0.64 x EC (umhos)

CH-2 is a combination of tile water & possibly some tail water that is recirculated at Charleston Pump Station 2 (CH-2), data is monthly averages					
Sump	Date	Boron (B) mg/L	Selenium (SE) mg/L	EC umhos	Field EC umhos
CH-2	3/1/2000	5.30	0.1000	5464	5299
	4/1/2000	5.50	0.0884	5475	5351
	5/1/2000	6.30	0.0906	5233	5563
	6/1/2000	6.80	0.0719	5080	5337
	7/1/2000	8.00	0.0984	6000	5700
	8/1/2000	6.10	0.0786	5600	5397
	9/1/2000	8.40		6200	6351
	2/1/2001	7.60	0.1200	5900	6482
	3/1/2001	7.09	0.1045	6100	6190
	4/1/2001	6.93	0.0996	5878	5934
	5/1/2001	6.10	0.0818	5417	5503
	6/1/2001	9.00	0.1255	6600	7080
	7/1/2001	6.40		5100	5698
	8/1/2001	9.20	0.0882	6100	6595
	2/1/2002	4.70	0.0850	5070	5130
	3/1/2002	5.70	0.1055	6100	5718
	4/1/2002	5.70	0.1053	5546	5555
	5/1/2002	6.00	0.1172	5838	5933
	6/1/2002	7.10	0.1205	5663	5951
	7/1/2002	7.40	0.1716	6640	6851
	8/1/2002	6.40	0.1047	5800	5827
	9/1/2002	9.50	0.1345	7300	7033
	3/1/2003	5.96	0.1077	5948	5794
	4/1/2003	4.86	0.0978	5403	5383
	5/1/2003	5.10	0.1202	6045	5463
	6/1/2003	6.54	0.1293	6487	6536
	7/1/2003	5.45	0.1903	6209	6688
	8/1/2003	6.91	0.0937	5723	5682
	3/1/2004	5.60	0.1305	6124	
	4/1/2004	6.70	0.1117	5978	
	5/1/2004	6.70	0.1496	6949	
	6/1/2004	5.40	0.1743	5698	
	7/1/2004	5.00	0.1942	5852	
	8/1/2004	4.52	0.1495	5398	
	9/1/2004	3.50	0.0659	4301	
	10/1/2004	4.10	0.0665	4817	
	11/1/2004	4.10	0.0751	4986	
	12/1/2004	4.20	0.0708	5011	
	1/1/2005	5.80	0.0962	5818	
	2/1/2005	6.00	0.0984	5355	

CH-2 is a combination of tile water & possibly some tail water that is recirculated at Charleston Pump Station 2 (CH-2), data is monthly averages					
Sump	Date	Boron (B) mg/L	Selenium (SE) mg/L	EC umhos	Field EC umhos
	3/1/2005	5.40	0.1182	5402	
	4/1/2005	5.10	0.1246	5063	
	5/1/2005	6.40	0.1348	6375	
	6/1/2005	5.40	0.1911	6225	
	7/1/2005	5.80	0.0715	4670	
	8/1/2005	5.90	0.0732	4807	
	9/1/2005	4.30	0.0742	4969	
	10/1/2005	4.90	0.0741	5023	
	11/1/2005	4.50	0.0759	4723	
	12/1/2005	4.60	0.0799	4884	
	1/1/2006	4.74	0.0942		5164
	2/1/2006	5.62	0.0848		4970
	3/1/2006	6.54	0.0830		6124
	4/1/2006	7.04	0.0934		6278
	5/1/2006	6.23	0.0836		5826
	6/1/2006	5.15	0.0679		5178
	7/1/2006	3.88	0.0502		3320
	8/1/2006	3.71	0.0448		2780
	9/1/2006	6.68	0.0840		5112
	10/1/2006	5.92	0.0841		5374
	11/1/2006	3.08	0.0474		4501
	12/1/2006	4.24	0.0762		4582
	1/1/2007	4.34	0.0686		4459
	2/1/2007	5.67	0.0888		6267
	3/1/2007	6.95	0.0975		6260
	4/1/2007	6.18	0.0852		5864
	5/1/2007	7.15	0.1108		6387
	6/1/2007	5.15	0.0991		4816
	7/1/2007	5.40	0.1091		5391
	8/1/2007	5.73	0.0908		5011
	9/1/2007	6.65	0.0628		5231
	10/1/2007	6.35	0.0730		5338
	11/1/2007	7.44	0.0900		5789
	12/1/2007	7.36	0.1134		5980
	1/1/2008	6.68	0.1042	5814	6127
	2/1/2008	4.82	0.0584	5232	5170
	3/1/2008	5.83	0.1484	5929	5546
	4/1/2008	5.60	0.1300	6158	4475
	5/1/2008	6.51	0.0648		5266
	6/1/2008	6.50	0.0639		5101
	7/1/2008	5.88	0.0732		5542
	8/1/2008	7.56	0.0615		5266
	9/1/2008	7.09	0.0507		5241
	10/1/2008	5.10	0.0758		5100

CH-2 is a combination of tile water & possibly some tail water that is recirculated at Charleston Pump Station 2 (CH-2), data is monthly averages					
Sump	Date	Boron (B) mg/L	Selenium (SE) mg/L	EC umhos	Field EC umhos
	11/1/2008	5.49	0.0784		4945
	12/1/2008	6.74	0.0857		6133
	1/1/2009	6.39	0.1254	5167	5219
	2/1/2009	5.24	0.0736	4554	4609
	3/1/2009	5.73	0.0819	5166	5034
	4/1/2009	5.48	0.0767	5082	4930
	5/1/2009	7.06	0.0893	5742	5711
	6/1/2009	7.63	0.0887	5798	5670
	7/1/2009	9.43	0.0695	6074	6083
	8/1/2009	9.24	0.0493	5791	5425
	9/1/2009	8.30	0.0466	5535	5344
	10/1/2009	6.61	0.0703	5200	4927
	11/1/2009	6.02	0.0663	5062	4791
	12/1/2009	6.26	0.0660	5028	4803
	1/1/2010	6.39	0.1254	5167	5219
	2/1/2010	5.24	0.0736	4554	4609
	3/1/2010	5.73	0.0819	5166	5034
	4/1/2010	5.48	0.0767	5082	4930
	5/1/2010	7.06	0.0893	5742	5711
	6/1/2010	7.63	0.0887	5798	5670
	7/1/2010	9.43	0.0695	6074	6083
	8/1/2010	9.24	0.0493	5791	5425
	9/1/2010	8.30	0.0466	5535	5344
	10/1/2010	6.61	0.0703	5200	4927
	11/1/2010	6.02	0.0663	5062	4791
	12/1/2010	6.26	0.0660	5028	4803
	1/1/2011	6.63	0.0756	5376	5204
	2/1/2011	4.65	0.0478	4146	5675
	3/1/2011	5.23	0.0729	4756	5082
	4/1/2011	7.42	0.1003	6157	5883
	5/1/2011	5.36	0.1116	5248	5065
	6/1/2011	4.62	0.1026	4801	4978
	7/1/2011	4.34	0.0698	4418	4390
	8/1/2011	4.95	0.0764	4516	4272
	9/1/2011	4.65	0.0398	3864	3390
	10/1/2011	6.08	0.0689	5392	4729
	11/1/2011	4.91	0.0757	5443	5243
	12/1/2011	5.34	0.0652	5178	4506
	1/1/2012	4.68	0.0764	4889	4128
	2/1/2012	5.50	0.0954	5283	5176
	3/1/2012	6.03	0.0914	5685	5480
	4/1/2012	6.88	0.0723	5693	5443
	5/1/2012	6.10	0.0931	5625	5483

Historical Water Quality at Charleston Pump Station 2

CH-2 is a combination of tile water & possibly some tail water that is recirculated at Charleston Pump Station 2 (CH-2), data is monthly averages					
Sump	Date	Boron (B) mg/L	Selenium (SE) mg/L	EC umhos	Field EC umhos
	6/1/2012	6.83	0.1244	6243	5796
	7/1/2012	6.35	0.0854	5403	5258
	8/1/2012	6.08	0.0545	4867	4721
	9/1/2012	7.41	0.0940	6183	5864
	10/1/2012	6.23	0.0848	5367	5141
	11/1/2012	5.43	0.0904	5219	4801
	12/1/2012	5.44	0.1090	4033	5051
	1/1/2013	4.70	0.1261	1564	5196
	2/1/2013	5.70	0.1316	3199	5451
	3/1/2013	6.15	0.0882	5485	5155
	4/1/2013	7.05	0.0989	5995	4994
	5/1/2013	5.97	0.1398	6148	5769
	6/1/2013	6.42	0.1246	6044	5260
	7/1/2013	7.46	0.0519	5495	4990
	8/1/2013	7.72	0.0423	5495	4812
	9/1/2013	8.00	0.0734	6021	5707
	10/1/2013	7.76	0.0873	6128	5981
	11/1/2013	5.33	0.0674	4607	4537
	12/1/2013	7.85	0.0620	5610	5591
	1/1/2014	6.73	0.0615	5229	5148
	2/1/2014	7.86	0.0664	5630	5079
	3/1/2014	6.31	0.0680	5143	4933
	4/1/2014	4.78	0.1293	6071	6283

From:	Lon Martin
To:	Lon Martin
Subject:	Fw: Fwd: Delta-Mendota Canal - water quality in the lower DMC
Date:	Thursday, July 10, 2014 12:17:08 PM
Attachments:	image.png dmc mp 88-60R_11 Apr 2014_tailwater pump.jpg dmc mp 88-60R_11 Apr 2014_sump.jpg dmc mp 88-60R_11 Apr 2014.jpg dmc mp 88-60R_11 Apr 2014_google earth image.jpg DMC MP 88.60R inflow of bad water 11 April 2014.kmz

---

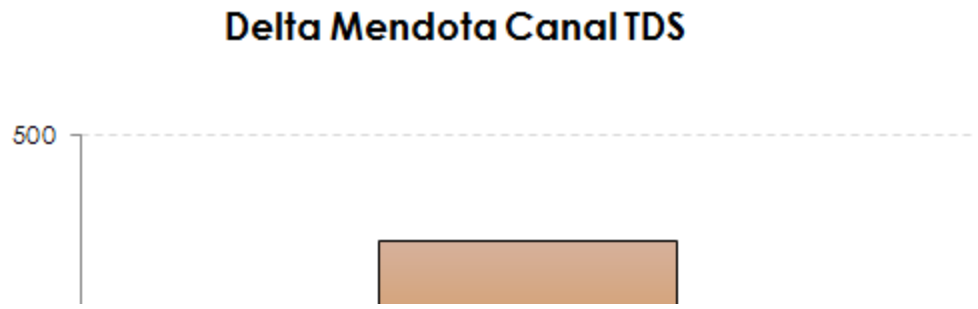
On Tuesday, April 15, 2014 10:29 AM, Martin McIntyre <mcintyre.martin@gmail.com> wrote:

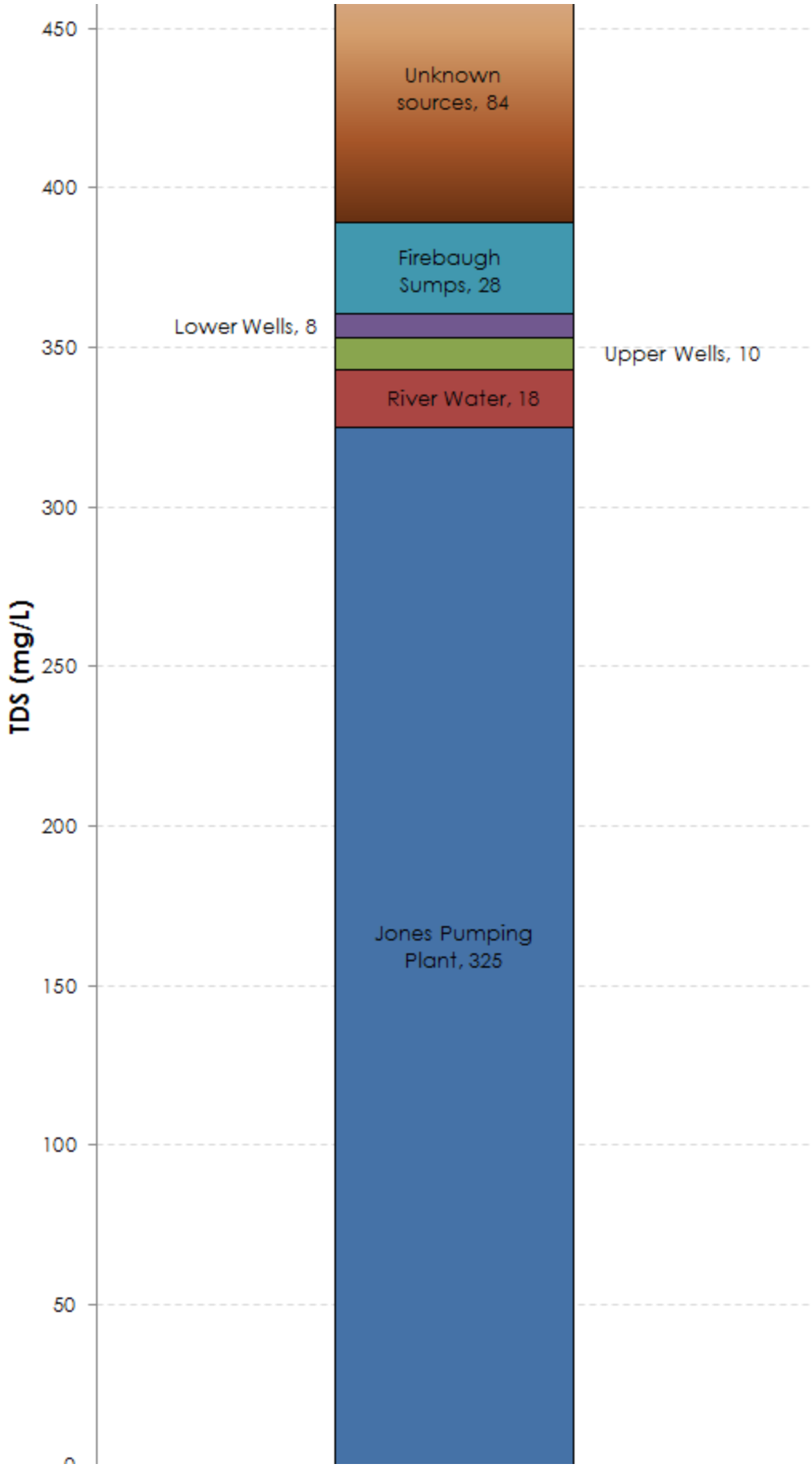
---------- Forwarded message ----------
From: **EACOCK, MICHAEL** <meacock@usbr.gov>
Date: Tue, Apr 15, 2014 at 10:23 AM
Subject: Delta-Mendota Canal - water quality in the lower DMC
To: Mizuno Frances <frances.mizuno@sldmwa.org>
Cc: Martin McIntyre <mcintyre.martin@gmail.com>, Gutierrez Janet <jgutierrez@slwd.net>, Dennis Falaschi <dfalaschi@aol.com>, Stacy Brown <sbrown@usbr.gov>, Duane Stroup <dstroup@usbr.gov>, Jeffrey Papendick <jpapendick@usbr.gov>

Hi Frances

Here are three pictures of the box culvert at DMC Milepost 88.60R where water is flowing into the canal. The water is from a tailwater lateral ditch and two pumps. The EC of the water entering the canal was 6160 uS/cm, and probably contains selenium, boron, and other trace metals.

At this time, the two Panoche wells are off, as well as four of the six Firebaugh sumps. This uncontrolled inflow is causing a large increase in salinity in the canal and will prevent other Warren Act pump-ins from occurring. Please contact me if you have any questions.




TDS (mg/L)
450
400
350
300
250
200
150
100
50
0
Unknown sources, 84
Firebaugh Sumps, 28
Lower Wells, 8
Upper Wells, 10
River Water, 18
Jones Pumping Plant, 325

Michael C. S. Eacock (Chris)
Project Manager/Soil Scientist
U.S. Bureau of Reclamation
South-Central California Area Office
1243 N Street
Fresno, California 93721
Telephone: 559 487 5133
Mobile: 559 408 1602
E-Mail: meacock@usbr.gov

CHARLESTON DRAINAGE DISTRICT

Flow Characteristics

Tile Recirculation & Ag Drainage (acre feet)

		Potential Tile & Drain Water Flows		
DP	**METER TYPE**	**AF**	**LBS. SE.**	**SE. Conc mg/L**
Tile and Drain Flows During Agricultural Season				
R5	FLOW	167	37	0.082
R2	FLOW	130	57	0.160
R6	FLOW	119	32	0.097
R8	FLOW	118	45	0.140
TEX2	FLOW	98	6	0.022
R4	FLOW	90	23	0.093
TEX1	FLOW	77	27	0.130
R7	FLOW	58	27	0.170
R3	FLOW	25	11	0.160
LG1	GRAVITY	310	36	0.043
ATC G1	GRAVITY	157	39	0.092
L2	METER	687	265	0.142
L3	METER	88	58	0.243
T1	METER	24	13	0.200
SL1	METER	13	7	0.200
Typical Drain Flows to San Joaquin River via SJRIP				
Drains to DMC	Winter Flows	120		
Total		**2,281**	**682**	**0.110**

Appendix 2.2 – Orestimba Creek Recharge and Recovery Project Supporting Documentation

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

San Joaquin River Exchange Contractors
Del Puerto Water District
Orestimba Recharge and Recovery Project
Pond Evaluation with Recovery Wells
Case 1: 20 acre site; 21 inch Recovery Pipeline

Draft

27-Jul-15

Bid Item No.		Item Description	Estimated Quantity	Unit	Unit Price	Amount
Bid Items						
1		Mobilization/demobilization, Bonds, Insurance & Permits (5%)	1	LS	$41,000	$ 41,000
2		Worker Protection (1%)	1	LS	$8,000	$ 8,000
3		Miscellaneous Facilities & Operations (3%)	1	LS	$25,000	$ 25,000
4		SWPPP BMP Installation and Maintenance (1%)	1	LS	$8,000	$ 8,000
		General Site Cleanup, Demolition, & Existing Pipeline				
6		Clearing and Grubbing	20	AC	$850	$ 17,000
7		Repair Existing 18-inch Pipeline	1	LS	$10,000	$ 10,000
		Earthwork				
8		Levee Earthwork 2-10 Acre Ponds (2 ft Deep end-levee,10:1 external & 10:1 internal slopes, 10 ft drive bank), Bottom 500' x 1,800'	13,500	CY	$8	$ 108,000
9		Reconstruct Existing Ditch	2,500	LF	$5	$ 13,000
10		*Inlet for Pond*				
		1-15" PVC Pipeline per pond	200	LF	$42.00	$ 8,400
		F& I Ultrasonic Doppler Flow Meter	2	EA	$7,000	$ 14,000
		Concrete Cut off Collar w/wire mesh	2.2	CY	$1,500	$ 3,300
		Drop Boxes (utilize existing boxes)	2	EA	$0	$ -
		12" Pvc Pipe for Culverts as needed (utilize existing pipe)	60	LF	$0	$ -
11		*Recovery Wells*				
		Recovery Well Construction (300 ft deep)	1	EA	$100,000	$ 100,000
		Well Equipping (1,450 gpm)	1	EA	$100,000	$ 100,000
		New PG&E Service	1	LS	$25,000	$ 25,000
		F&I Flow Meters	1	EA	$7,000	$ 7,000
		F&I Pump Discharge Appurtenances,	1	LS	$10,000	$ 10,000
		F&I 21-inch PVC Discharge Piping	6,400	LF	$59	$ 378,000
		General Basin Improvements				
12		Basin Staff Gauge (Utilize Existing Staff Gages)	2	EA	$0	$ -
13		Construct and Install Shallow Monitoring Well	3	EA	$10,000	$ 30,000
		Construction Subtotal				**$ 910,000**
		Construction Contengency			**15%**	**$ 137,000**
		Total Construction Costs				**$ 1,047,000**

Summary of Costs			
Legal & Admin	*3%*	$	32,000
Construction Testing, Review, and Management	*2%*	$	21,000
Final Design Engineering, Surveying and Environmental	*10%*	$	105,000
Permitting		$	25,000
Land Acquisition		$	220,000
Total Project Costs		**$**	**1,450,000**
Estimated Life Cycle Costs on Annual Basis			
Project Life (years)			30
Equivalent Annual Cost (0% interest)			48,300
Groundwater Recovery ($30/AF)		$	9,030
Annual O&M ($5/AF)		$	2,260
Total Annual Costs		$	59,590
Project Recharge (AF)			1,812
Project Yield Leave Behind (AF)	25%		453
Average Annual Project Yield (AF)[1]			452
Average Annual Project Yield Leave Behind	33%		151
Annual Project Yield Costs ($/Af)[2]		**$**	**132**

Note:

1. Project Yield is based upon water recovered from wells which was recharged from flood flows from the San Joaquin and Kings Rivers, in addition to supplies from other potential stakeholders such as Grasslands Water District, Del Puerto Water District, etc.1/3 years recharge 1/3 recovery. Orestimba creek flows are not included as part of the Project Yield. (requires water rights filing)

2. Project Yield costs does not include the costs of purchasing water intended for recharge, range $0 to $30/AF

Job No. 3495 13B2

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MEMORANDUM

To: Chris White, CCID
Steve Chedester, SJRECWA

From: Rick Iger, Owen Kubit

Subject: Orestimba Creek Recharge and Recovery Project, Initial Review of Draft Fatal Flaw Analysis

Date: November 26, 2013

Introduction

This memorandum documents a fatal-flaw analysis for the proposed Orestimba Creek Recharge and Recovery Project. The project would involve diverting Orestimba Creek flows and other imported water supplies onto lands near Orestimba Creek for groundwater banking. The study area is illustrated on **Attachment 1**. Following are discussions on the need for the project, project description, potential project partners, local geology, potential water supplies, flood control benefits, potential project sites (including gravel pits), environmental issues, a fatal flaw analysis, and process to move forward.

Background of the Exchange Contractors

The San Joaquin River Exchange Contractors Water Authority (SJRECWA or Authority) is a Joint Powers Authority that was formed in 1992 and began operations in 1993. The member agencies include Central California Irrigation District (CCID), Columbia Canal Company (CCC), Firebaugh Canal Water District (FCWD), and San Luis Canal Company (SLCC). The total acreage of the agencies is as follows:

- CCID – 145,000 ac
- CCC – 16,000 ac
- FCWD – 22,000 ac
- SLCC – 47,000 ac

The member agencies' Pre-1914 and Riparian Rights on the San Joaquin and Kings Rivers date to the late 1870's. Approximately 240,000 acres of land is irrigated in four counties. Surface water allocation is 840,000 acre-feet for a normal year and 650,000 acre-feet for a critical year. Under terms of the exchange agreement with the US Bureau of Reclamation (Reclamation or USBR), the primary source of supply is delivered by Reclamation from the CVP system and is primarily based on conditions at Shasta Reservoir. As such SJRECWA supplies must be conveyed through the Sacramento-San Joaquin Rivers Delta.

Exchange Contractors Current Issues

The Water Conservation/Water Transfers program began in 1993 and has progressively grown to the current amount of 80,000 acre-feet. Proceeds from these transfers are invested into District wide and on-farm conservation programs, totaling over $90M to date. These monies are set aside for additional grower and district water conservation programs and capital improvements. Member Entity Conservation Measures provides annual transfers of up to 80,000 acre-feet during non-critical years only.

During normal years, some member entities are concerned about conveyance capacity during peak summer irrigation months and others are concerned about developing water supply yield during Critical Water Supply Years. In addition, salinity of surface water supplies can be a concern during certain months.

During Critical Years the Exchange Contractors surface supplies are reduced by about 23%, or 190,000 acre-feet. To a certain extent each member agency can rely on in-district pumping, however, during these years there is a supply shortfall of over 10,000 acre-feet. Additionally Exchange Contractors are concerned with: 1) capacity limitations in the Delta; 2) a change in Reclamation policies which have provided for flexibility in shifting spring to summer deliveries; 3) water quality from the DMC into the Mendota Pool, 4) conveyance capacity if sources are switched to the San Joaquin River; 5) San Luis Reservoir low point and associated conveyance prorations; and 6) potential spills of supplies when San Luis Reservoir is in eminent risk of spilling carryover supplies stored by Reclamation and individual districts.

As a result of these concerns the Exchange Contractors have identified two primary goals; increase supplies by 50,000 acre feet per year, and increase instantaneous conveyance capacity by 300 cubic feet per second (cfs).

Project Description

Several water storage projects were identified in studies conducted by the Exchange Contractors. Orestimba Creek alluvial fan was identified as one of the areas warranting further investigation. The Orestimba Creek Recharge and Recovery Project would include construction of groundwater banking facilities along Orestimba Creek between the Delta Mendota Canal (DMC) and the Eastin Water District Boundary. The Orestimba Creek and DMC would be used to convey water to and from the bank. Project water supplies could include surface water from Central California Irrigation District (CCID) and Del Puerto Water District (DPWD), Orestimba Creek flows, and high flows in the Kings River and San Joaquin River. Water wells to recover the stored supplies could be located throughout the area near recharge facilities as well as along the DMC and CCID Main Canal. The purpose of the project is to provide a place to store high flow and carryover supplies which would be regulated to provide a critical year water supply and provide water to meet peak demands in the summer.

Potential Project Partners

Potential project partners include Del Puerto Water District or other water agencies that wish to participate. There may also be an interest from the City of Newman in obtaining up to 4,000 AF/year of better quality water. Recharged water could potentially be sent

to Newman through a new pipeline and Newman would, in exchange, pump and deliver groundwater to participating irrigation/water districts.

Project Location Map

The project study area includes the reach of Orestimba Creek from the DMC to approximately Highway 33 (see **Attachment 1**). Recharge and recovery could potentially occur within several miles of the Creek, depending on the cost and feasibility of new conveyance facilities. **Attachment 2** shows the locations of dairy parcels, gravel pit parcels, and irrigation/water districts in the area.

Geology

The soils in the Orestimba Creek area include coarse to fine grained sand and gravels interbedded with silts and discontinuous clays. Soils with the highest infiltration rate are found in the vicinity of the stream channel.

Little groundwater level data is available for the upper aquifer because most wells tap both the upper and lower aquifer and provide composite groundwater levels. However, the following estimates were made:

1. Groundwater depths along the creek are deepest in the southwest portion of the study area (near California Aqueduct) and get shallower in the eastern end, near Eastin Water District;
2. In wet years depths range from about 75 feet (southwest end) to 35 feet (northeast end);
3. In dry years the depths are about 90 feet (southeast end) and 60 feet (northeast end).

Ken Schmidt and Associates (KSA) estimated the available storage capacity to be 15,000 to 25,000 acre-feet. However, groundwater depths are higher in wet years when most recharge would likely be performed. This may limit the size of recharge basins. Multiple smaller basins that are spread out may be necessary.

Due to the potential for high groundwater levels, and lack of existing wells that only tap the upper aquifer, a network with dedicated monitoring wells would be needed. Site selection would need to consider the presence of nearby septic systems, swimming pools, dairy lagoons, and active gravel mining operations.

KSA estimated recharge rates of 0.5 to 1.0 feet/day in gravel pits. These estimates may be conservative given the coarse-grained nature of the soils and potential for both lateral and vertical seepage. Infiltration rates of 0.5 feet/day were assumed in project simulations.

In the future, proposed mine reclamation plans will be reviewed to see if they are compatible with groundwater recharge.

Gravel Pits

Several gravel pits on land owned by Marks and Escobar are located along Orestimba Creek (see **Attachment 2**). These could potentially be used for recharge. The Riddle

Mine Company has also purchased three parcels south of Orestimba Creek that they plan to develop into gravel pits. According to KSA, the creek bed and gravel mining areas along Orestimba Creek would be considered "hydrogeologically suitable for intentional recharge". Coarse-grained deposits are predominant to a depth of at least 100 feet. Aggregate excavations are considered particularly hydrogeologically favorable, because they extend below fine-grained surficial deposits (when present). Intentional recharge projects could be done on lands not proposed for mining, but soil borings are necessary to evaluate subsurface conditions and shallow restricting layers.

Other Potential Recharge Sites

Riddle has purchased several properties for future gravel pit development (see **Attachment 2**). One parcel located along Orestimba Road is near the City of Newman and could be used to store water for Newman if they become a partner.

Another alternative it to place gabion structures in Orestimba Creek to spread out the flow, increase the wetted footprint, and increase recharge. This would require a streambed alteration permit which may be difficult to obtain due to changes in the stream channel as well as flow velocities.

The project could also include in-lieu recharge of delivered water supplies in Del Puerto Water District or Eastin Water District.

High nitrate concentrations may be present in certain areas, especially near the Stewart and Jaspar Poultry Ranch and Nyman, Bradford and Kristi Dairy. The project would need to be designed and operated so it does not move nitrate plumes onto other properties. However, the project also provides an opportunity to clean up the nitrate plumes if pumped concentrations are acceptable for agricultural water supply.

Water Resources

Local Creek Flows

Stream flow data along Orestimba Creek is measured with stream gauges near the California Aqueduct and where the stream meets the San Joaquin River. Records show that flow increases in a downstream direction due to inflow from small tributaries, irrigation spills, and irrigation drainwater. Therefore, the stream seepage cannot be calculated using the difference between the two flows. Creek flows at the California Aqueduct are available from 1932 to the present, and flows at the San Joaquin River are available from 1992 to the present. Flows typically occur between November and April. No flow was recorded in 12 of the past 75 years at the California Aqueduct. Average annual flows at the California Aqueduct were 14,300 AF between 1992 and 2013, and flows occurred on average 112/days per year. A separate water rights permit would need to be filed for each diversion point. This could potentially delay the project several months or years. Potential fatal flaws include:

1) Creek flows reach the San Joaquin River, so a detailed analysis of the impacts on the San Joaquin River will be needed if these projects move forward.

2) The public and special interest groups could become aware of the water rights application and file protests.
3) Some landowners along the creek have riparian water rights, but it is believed that few of them use this right. However, a new water right would be junior to these existing rights, and the permit would be limited to flows beyond the demands of the riparian growers along the creek.

Alternatively, the Exchange Contractors could develop an agreement with the riparian water rights holders to divert and recharge their water, in exchange for providing a firm water supply from other sources.

Kings River and San Joaquin River
Surplus Kings River and San Joaquin River waters could be used at the projects. These waters cannot be physically delivered to the project but could be sent by exchange, or they could be pumped and used by Exchange Contractors near Mendota Pool, who would send an equivalent amount of water to the project. This would only be feasible when there are irrigation water demands near Mendota Pool. A simulation of historical Kings River high flow data shows that Kings River water would be available on average for 121 days in one-third of years. San Joaquin River high flows will change from historical records due to the River Restoration, and available water needs to be quantified using the results of new modeling studies. In a separate study potential reversing of the DMC to Orestimba Creek is being evaluated. This would allow San Joaquin and Kings River floodwater to be delivered directly to the site.

Exchange Contractors Surplus Water
These could include end of year water that has not been used or other surplus water supplies. These still need to be quantified.

Other Water Supplies
Other water supplies include could be provided by Del Puerto Water District or other water agencies that wish to partner and deliver their own water to the project. Such supplies could include; carryover evacuation from San Luis Reservoir, CVP 215 water, and district supplies above a certain percentage of annual allocation that is dedicated to develop a dry year supply.

A hydrologic simulation and estimated project yield will be performed after all of the potential water supplies are identified and quantified.

Flood Control
Water flows in Orestimba Creek are generally considered a nuisance and cause flooding during large storms and wet years. The project could be designed to provide some level of flood protection, which could increase public support for the project. Also flows may occur at times the San Joaquin River is already at flood stage, so decreasing inflows could benefit SJR conditions downstream.

A 2008 USACE study identified peak flows for various storm durations and frequencies on Orestimba Creek. A December 2012 study by the USACE evaluated potential

solutions to flooding along Orestimba Creek including the City of Newman. The alternatives included levees, dams, and channels to relieve flooding. Some of the alternatives could be beneficial or detrimental to the proposed recharge and recovery project, and coordination with USACE will be needed in the next phase. This report includes some important background information and data that could be useful to the proposed project.

Environmental

Potential environmental issues include endangered species, cultural resources, contaminated soil and groundwater, groundwater ordinances and streambed alteration.

The Geotracker database was used to locate 'known' contamination sites in the area (see **Attachment 3**). Two leaking underground storage tanks are located within potential recharge areas, but both sites are considered 'closed', which indicates they have been repaired, removed and/or remediated.

An endangered species map was developed using data from the California Natural Diversity Database (see **Attachment 4**). The map shows several endangered species have been identified along the Creek east of Delta Mendota Canal. None are known in the study area. However, some may be identified if field biological surveys are performed.

A cultural resources records search did not identify any resources in the area, although most of the area has not been formally surveyed. Orestimba means '*meeting place'* in a Native American language, so there may be cultural resources in the area.

A groundwater ordinance has been adopted by Stanislaus County, but it has many exceptions, and would not apply to recharge projects or projects within a water or irrigation district that have a Groundwater Management Plan.

Major permitting issues could include obtaining water rights for Orestimba Creek water, and a streambed alteration permit for constructing check structures on the creek. If endangered species or cultural resources are found they could complicate project development, but may not be fatal flaws.

Potential Project Sites

Three potential project sites were initially evaluated and are shown on **Attachment 1**. **Attachments 5, 6 and 7** show close up maps of each site. They include 1) Large 17-acre pit near Orestimba Creek; 2) Series of small pits near Orestimba Creek; and 3) a 20 or 40 acre recharge basin on the Riddle property. The Riddle property sites could take advantage of an existing abandoned pipeline to convey water to the site.

Cost Estimate/Project Yield

The estimated project costs and yields are shown in the table below. The project simulation is shown on **Attachments 8, 9 and 10.**

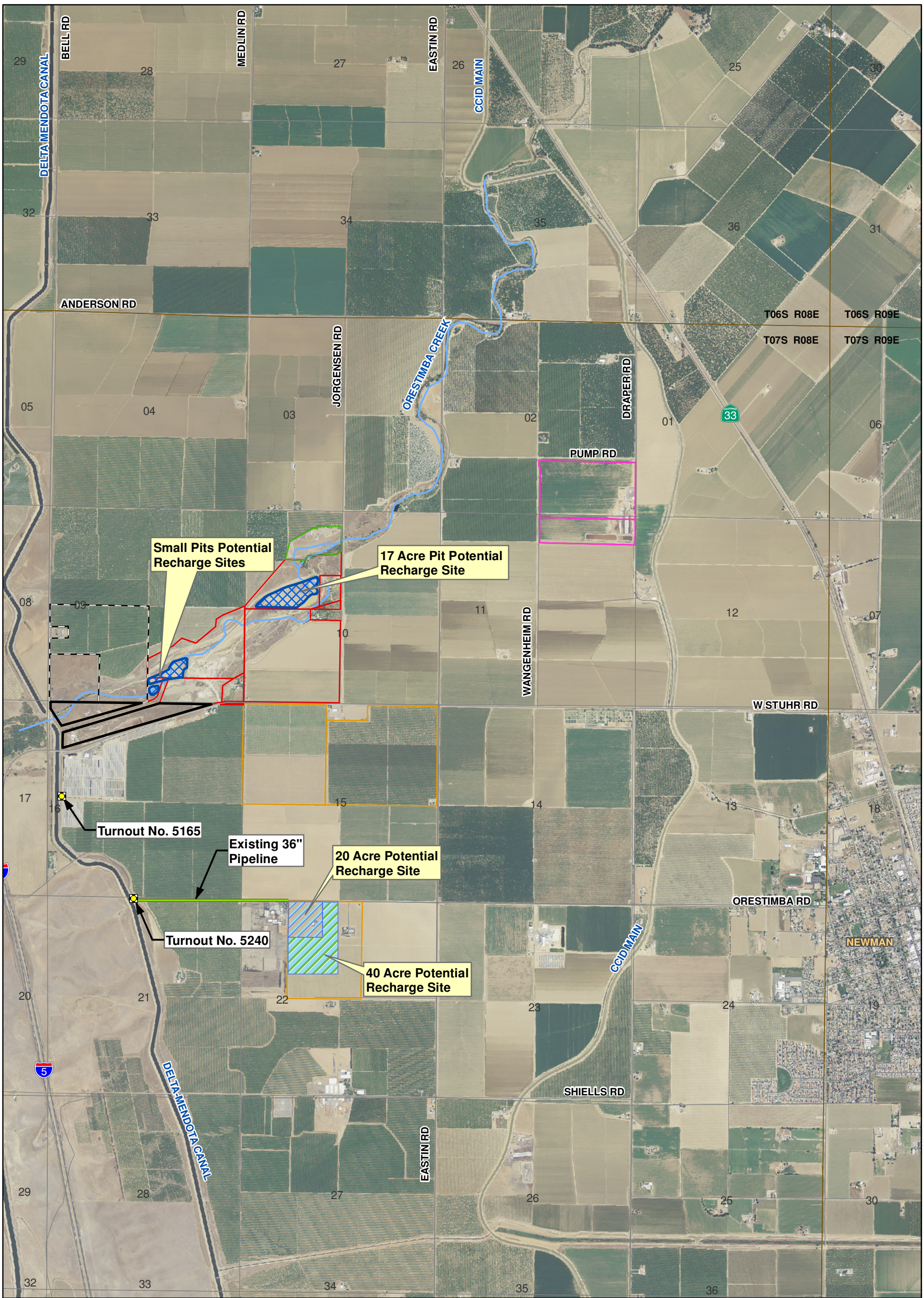
Project	Acres	Capital Cost	Unit Cost ($/AF)	Avg. Annual Yield (AF)	Max. Wet Year Recharge (AF)	Max. Dry Year Recovery (AF)
Riddle (Existing Pipeline)	20	$1,287,000	$131	500	1,500	1,700
Riddle (New Pipeline)	40	$3,411,000	$150	1,000	3,000	3,300
Small Pits	8	$2,189,000	$306	300	900	1,700
Large Pit	17	$1,343,000	$135	500	1,500	1,700

Fatal Flaw Matrix

Issue	Fatal Flaw
Permitting and environmental issues	Streambed Alteration Permit
Stanislaus County Groundwater Ordinance	Project is exempt if performed in a District and under a local Groundwater Management Plan
Suitable recharge sites	Several gravel pits and Riddle properties could be good sites. Need permission from gravel companies and desire to lease or sell Riddle property.
Groundwater storage potential	Groundwater mounding may limit recharge potential. Other groundwater users may pump and use recharged water.
Groundwater quality	Unlikely, but need to avoid moving nitrate plumes.
Available water supplies	Several water supplies available. Some may overlap in availability. Need external partners or Exchange Contractor surplus water to help make project viable.
Impacts to adjacent landowners (shallow groundwater)	Unlikely if projects are operated to keep groundwater from getting into root zone
Project economics	Unit costs $131 to $306/AF

Process to Move Forward

- Develop detailed scope of work for feasibility study
- Meet with USACE to discuss flood control options and working on joint project
- Meet with potential project partners including Del Puerto, Eastin, City of Newman, SLDMWA and regulators
- Contact land owners of potential recharge sites to get recharge potential data (soil auguring).
- Provide recommendations for geotechnical investigations



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Poultry Ranch
Dairy Parcels
Gravel Pit Parcels
Property for Sale
Properties of Interest

Aerial Imagery - NAIP 2012

Orestimba Creek Recharge & Recovery Project Study Area

Vicinity Map
Potential Recharge Sites

San Joaquin River Exchange Contractors Water Authority

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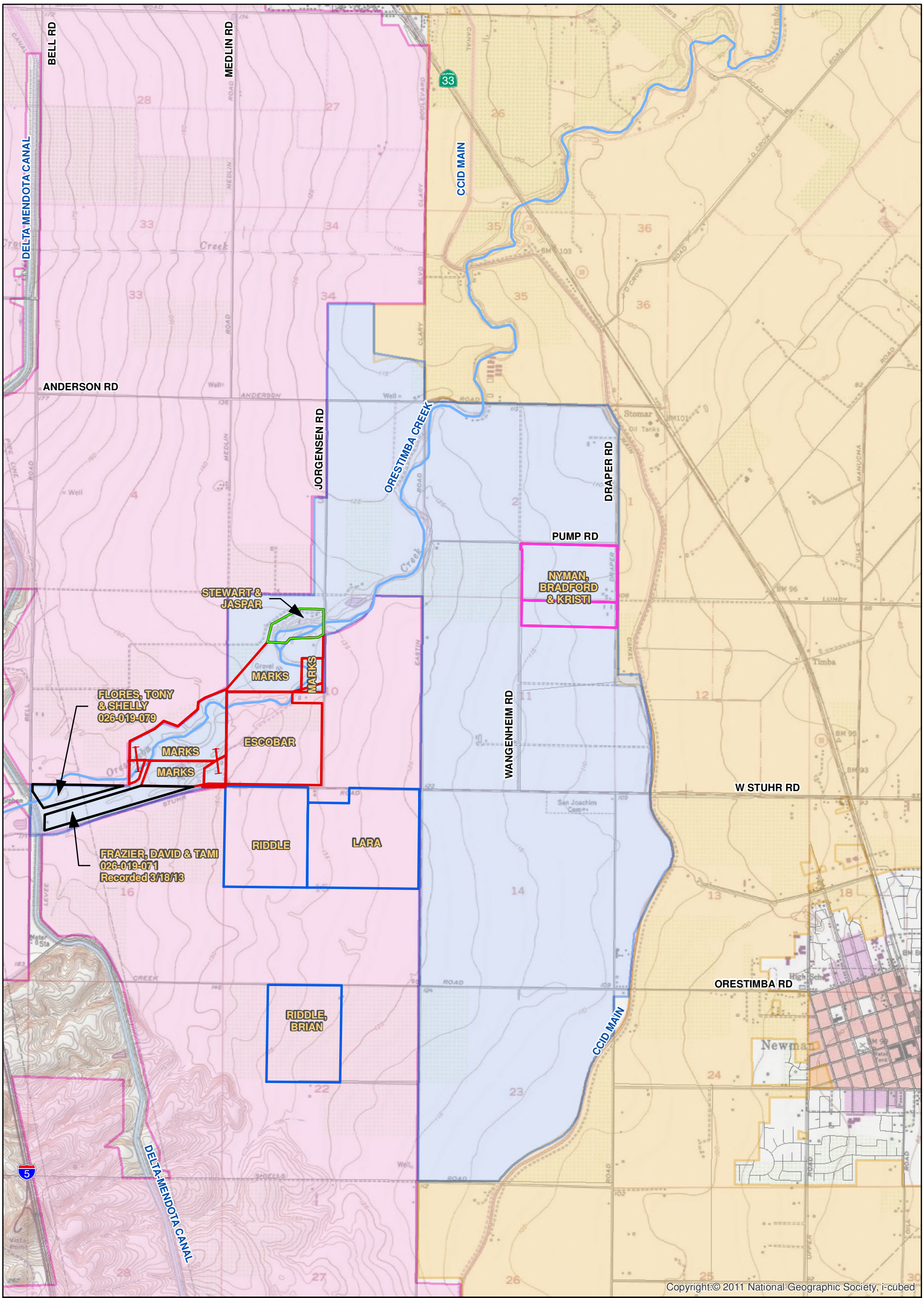

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- Poultry Ranch
- Dairy Parcels
- Gravel Pit Parcels
- Riddle Mining Co. (Proposed Gravel Pits)
- Orestimba Creek
- Property for Sale
- Eastin Water District
- Del Puerto Water District
- Central Californa Irrigation District

Note: Recovery wells can be placed outside of Recharge Study area.

USGS Topo 24k - Newman and Crows Landing

Orestimba Creek Recharge & Recovery Project Study Area

San Joaquin River Exchange Contractors Water Authority

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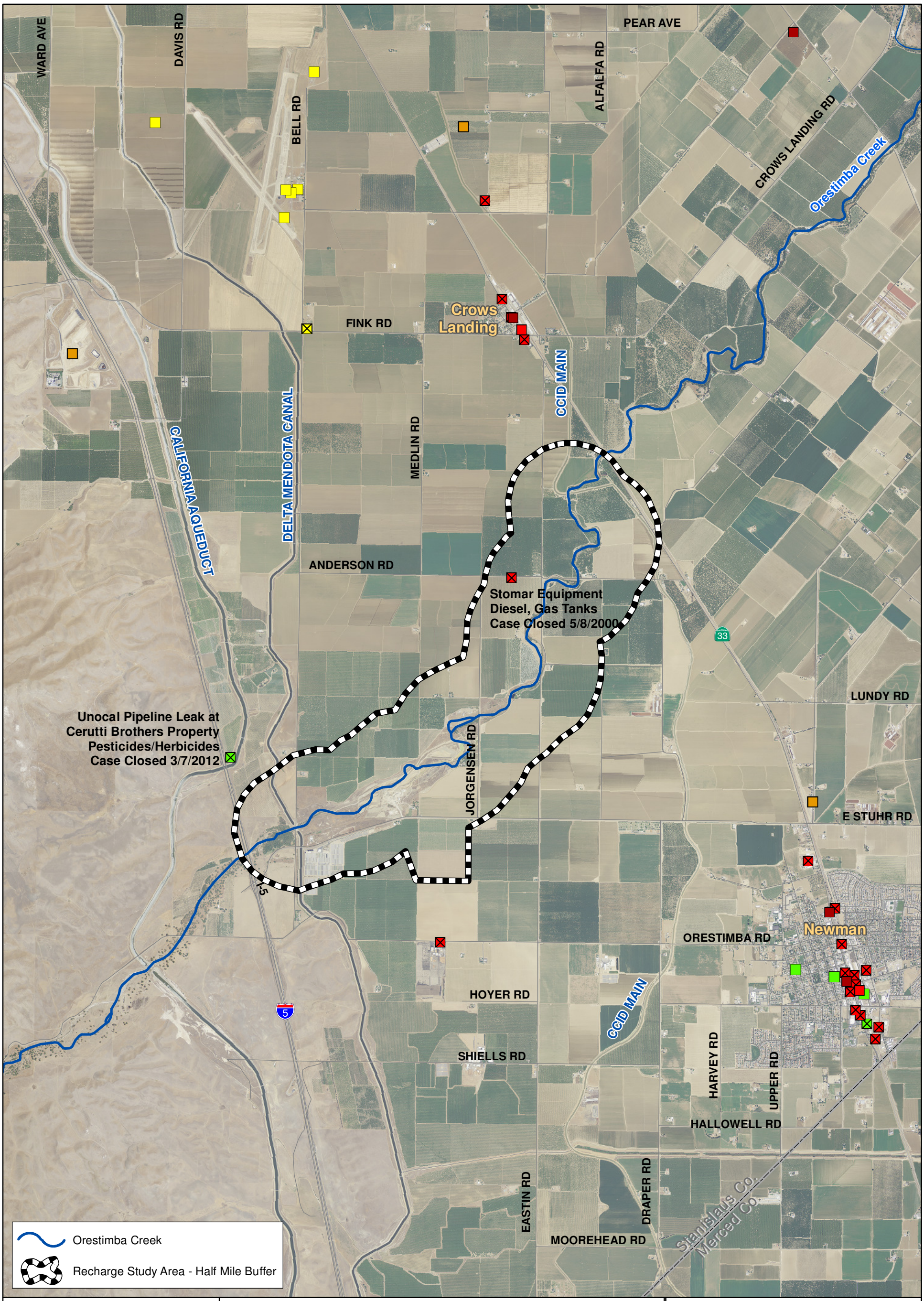

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Geotracker Records ☒ Signifies a Closed Site

- Military Sites
- Other Cleanup Sites
- Land Disposal Sites
- LUST (Leaking Underground Storage Tank)
- UST (Permitted Underground Storage Tank)

Aerial Imagery - NAIP 2012

Orestimba Creek Recharge & Recovery Project Study Area

Environmental Cleanup Records
Geotracker Results 6/19/2013

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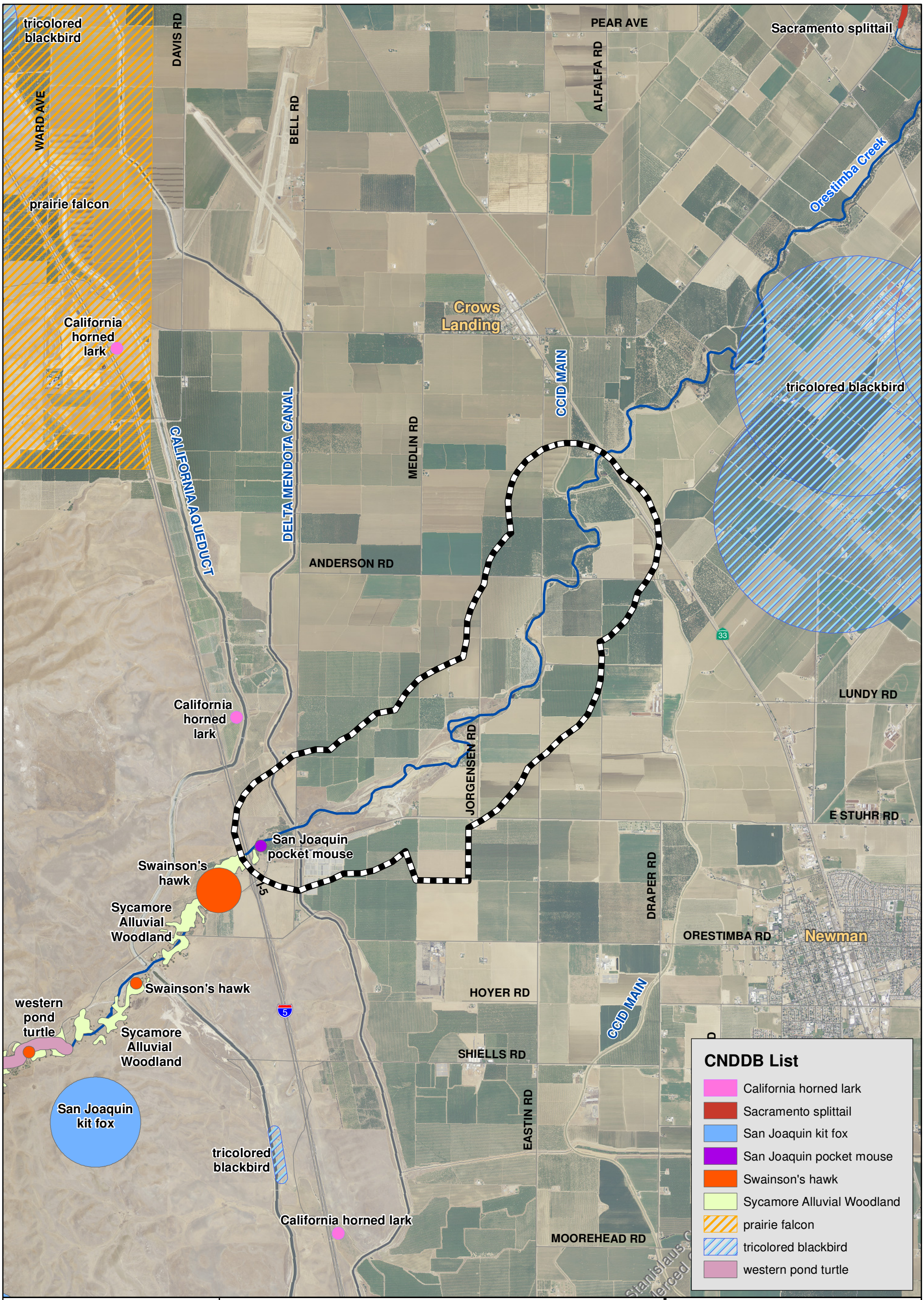

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Legend

Orestimba Creek

Study Area - Half Mile Buffer

Aerial Imagery - NAIP 2012

Orestimba Creek Recharge & Recovery Project Study Area CNDDB Map

San Joaquin River Exchange Contractors Water Authority

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Legend

Orestimba Creek

17 Acre Pit Potential Recharge Site

Aerial Photo - USDA NAIP 2010

Orestimba Creek Recharge & Recovery Project Study Area

17 Acre Pit
Potential Recharge Site

San Joaquin River Exchange Contractors Water Authority

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Legend

- Orestimba Creek
- Small Pits Potential Recharge Sites
- Property for Sale
- Property of Interest
- Marks, Henry

Aerial Imagery - NAIP 2010

Orestimba Creek Recharge & Recovery Project Study Area

Small Pits
Potential Recharge Site

San Joaquin River Exchange
Contractors Water Authority

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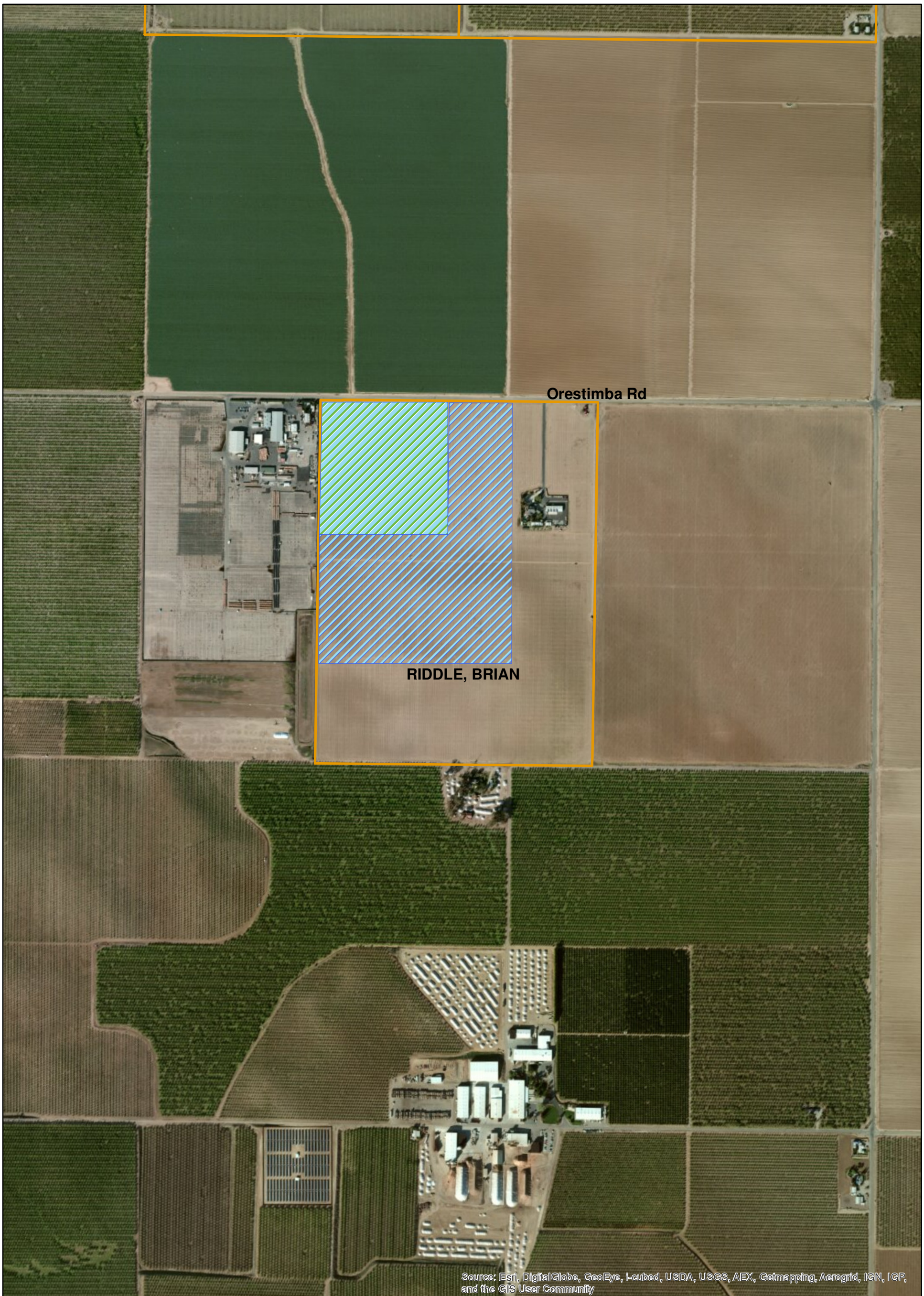

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Legend

40 Acre Site

20 Acre Site

Aerial Photo - USDA NAIP 2012

Orestimba Creek Recharge & Recovery Project Study Area

Riddle Property
Potential Recharge Site

San Joaquin River Exchange Contractors Water Authority

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San Joaquin River Exchange Contractors Water Authority
Orestimba Creek Recharge and Recovery Projects
Project Water Supplies

Proposed Recharge Site Description			Diversion Rate/Infiltration Capacity		Annual Water Supplies (AF)[2]			
Creek	**Project**	**Acres**	**(AF/day)[1]**	**(cfs)**	**Creek Flows[3, 4, 5]**	**San Joaquin and Kings River[6]**	**Other Water Supplies[7]**	**Total (rounded)**
Orestimba	Riddle (Existing Pipeline)	20	10	5	0 AF	427 AF	100 AF	**500 AF**
	Riddle (New Pipeline)	40	20	10	0 AF	853 AF	200 AF	**1,100 AF**
	Small Pits	8	4	2	45 AF	171 AF	40 AF	**300 AF**
	Large Pit	17	9	4	95 AF	341 AF	80 AF	**500 AF**

Notes:

1) All sites assumed to have recharge rates of 0.5 ft/day
2) Deliveries are based on the ability of site to recharge water and do not account for temporary basin or pit storage
3) Riddle properties have no ability to receive Orestimba Creek flows
4) Orestimba Creek flows are based on evaluation of flows at USGS Gauge # 11274500 (Orestimba Creek near Newman, CA) after reduction of 150 cfs for natural creek recharge
5) Orestimba Creek and Los Banos Creek flows generally occur in the winter and are assumed to not coincide with River flood flows
6) San Joaquin and Kings River Flows based on Graph in Steiner model[7.a] that states water available = $-0.01 \times (\text{diversion cfs})^2 + 85.372 \times (\text{diversion cfs})$
   6.a) Steiner model predicts that Kings and San Joaquin River water will be available on average 43 days/year
7) Other water supplies from SJRECWA and potential partners (Del Puerto WD, Grasslands WD, etc.) are assumed to be available on average 10 days/year, outside of the period of River flows

San Joaquin River Exchange Contractors Water Authority
Orestimba Creek Recharge and Recovery Projects
Project Yields

Creek	Project	Acres	Unit Cost ($/AF)	Avg. Annual Yield (AF)	Maximum Dry Year Recovery (AF)
Orestimba	Riddle (Existing Pipeline)	20	$131	500	1,700
	Riddle (New Pipeline)	40	$150	1,000	3,300
	Small Pits	8	$306	300	1,700
	Large Pit	17	$135	500	1,700

Notes:
1) Yield includes water deliveries minus 10% for evaporation and groundwater migration
2) Project yield values are rounded to the nearest 100
3) Analysis does not include the cost to purchase water that is recharged
4) Analysis based on 0.5 feet/day anticipated long-term recharge rate. Initial rate may be higher and then reduce due to mounding.
5) Maximum dry year recovery based on continuous pumping for 10 months and assumes sufficient water in storage

San Joaquin River Exchange Contractors Water Authority
Orestimba Creek Recharge and Recovery Projects
Maximum Dry Year Recovery

Creek	Project	Average Annual Yield (AF)	No. Recovery Wells	Well Capacity		Max Days of Pumping/Yr	Maximum Dry Year Recovery (AF)
				(gpm)	(AF/day)		
Orestimba	Riddle (Existing Pipeline)	500	1	1,250	5.5	300	1,700
	Riddle (New Pipeline)	1,000	2	1,250	5.5	300	3,300
	Small Pits	300	1	1,250	5.5	300	1,700
	Large Pit	500	1	1,250	5.5	300	1,700

Notes: 1) Yield includes water deliveries minus 10% for evaporation and groundwater migration
2) Project yield values are rounded to the nearest 100
3) Maximum dry year recovery based on well pumping capacity and assumes sufficient water in storage

DPWD and CCID Orestimba Creek Recharge and Recovery Project - Energy Calculations

From Chris Linneman from Summers Engineering and confirmed by Richard Bichette (RMC)

$$\frac{GPM \times FT}{3960 \times e} = HP$$

ENTER NUMBERS IN BLUE

	AFY	GPM
Gallon per minute calculation	500	310

Location	GPM	Head (ft)	Efficiency	HP	kWh/y	MWh/y	30 Lifecycle kWh	30-year MWh
Delta Pumping	500	186	65	36	236,112	236	7,080,000	7,080
Local	500	107	80	17	110,360	110	3,310,000	3,310
Difference						126	3,770,000	3,770
								(rounding error - 3880)

Greenhouse Gasses

Scenario	lbs of CO2	Metric Ton CO2	30 year
Without Project	170,945	78	2,326
With Project	79,901	36	1,087
Difference		42	1,260

Electricity

	Months	Total Electricity (MWh/y)
Not Constructed	3	708
Constructed	9	993
Weighted Average =		142
	Benefit =	94

Greenhouse Gasses

	Months	Total Electricity (MWh/y)
Not Constructed	3	233
Constructed	9	326
Weighted Average =		47
	Benefit =	31

California Climate Action Registry General Verification Protocol

Verifying Entity-Wide Greenhouse Gas Emissions

Version 3.0 | August 2008

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The California Registry would like to thank and acknowledge the many experts who have helped make both the General Verification Protocol and the California Registry a reality. While it is impossible to properly acknowledge everyone who contributed to this document, the following organizations have provided valuable guidance and insightful feedback throughout the duration of this project:

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California Energy Commission Registry Workgroup

California EPA

CH2M Hill

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Lawrence Berkeley National Laboratory

National Resources Defense Council – Convened State Registry Collaborative

Pew Center on Global Climate Change

Science Applications International Corporation (SAIC)

U.S. Department of Energy

U.S. Energy Information Administration (1605b Program)

U.S. Environmental Protection Agency

U.S. EPA Climate Leaders

World Business Council for Sustainable Development

World Resources Institute

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Version 1 of the General Verification Protocol was released in October 2002. Version 2 was released in July 2003. Version 3 was released in August 2008.

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Abbreviations and Acronyms

CARB	California Air Resources Board
CARROT	Climate Action Registry Reporting Online Tool
CDF	California Department of Forestry and Fire Protection
CEMS	Continuous Emissions Monitoring Systems
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COI	Conflict of Interest
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
N_2O	nitrous oxide
PFC	perfluorocarbon
RFA	Request for Applications
SAR	IPCC Second Assessment Report (1996)
SF_6	sulfur hexafluoride
TA	Technical Assistance Provider
TAC	Technical Advisory Committee
TAR	IPCC Third Assessment Report (2002)

Part I Introduction

1.1 Overview

The California Climate Action Registry created this General Verification Protocol to provide California Registry-approved verifiers with clear instructions for executing a standardized approach to the independent verification of greenhouse gas (GHG) emissions baselines and annual emissions reported by California Registry participants. This standardized approach defines a verification process that promotes the relevance, completeness, consistency, accuracy and transparency of emissions data reported to the California Registry. While this Protocol is written for verifiers, California Registry participants who are interested in understanding and preparing for the verification process may also find it useful.

This Protocol is intended to be used in combination with the California Registry's General Reporting Protocol and web-based calculation and reporting tool (CARROT—Climate Action Registry Reporting Online Tool). **Approved verifiers will verify participants' GHG emissions reports to the standards of the California Registry's General Reporting Protocol, and sector-specific protocols using the process outlined in this General Verification Protocol**.

At a minimum, each emissions report must contain all of an entity's emissions of CO_2 in the state of California for a calendar year, reported in five categories: indirect emissions from purchased electricity, imports of steam, district heating/cooling, and direct emissions from mobile combustion, stationary combustion, manufacturing processes, and fugitive emissions. Where a participant is reporting their U.S. emissions, the report must contain all of their emissions nationally. Starting with the fourth year of reporting, each emissions report must contain all emissions of all six greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6).

Emissions reports may also contain other information about an organization and its emissions that does not require verification. For instance, this could include information about a company's environmental goals, programs, policies, etc. Participants may also choose to report other indirect emissions, like business travel or employee commuting. In the emissions reports, optional information will be clearly distinguished from information that is verified.

Activities for each specific verification will differ based on the length and complexity of a participant's emissions report, but the verification process will include at least the following steps:

- Case-by-case evaluation of Conflict of Interest
- Scoping and planning a participant's verification activities
- Conducting verification activities
    1. Identifying emissions sources
    2. Reviewing methodologies and management systems
    3. Verifying emission estimates
- Preparing a participant's Verification Report and Verification Opinion

- Submitting a participant-authorized electronic Verification Form and Verification Activity Log to the California Registry via CARROT

Upon completion of the above steps, the California Registry will review the emissions report before accepting a participant's verified emissions report into its emissions database. This process is repeated every year of an organization's participation in the California Registry.

To help decrease the potential for conflict of interest between a verifier and a participant, a verifier can verify the same participant for a maximum of six consecutive years. After six years, a participant must choose another verifier for at least three years. After that time, the original verifier would again be eligible to verify the participant's emissions for up to six consecutive years.

The California Registry assumes that the verifiers will use their best professional judgment when conducting verification activities.

1.2 Organization of this General Verification Protocol

This General Verification Protocol is divided into four parts which outline the necessary steps a verifier must follow to initiate and complete the verification of a participant's emissions report.

Part I, *Introduction* (this section), provides a brief overview of the purposes and requirements of the verification process, describes the principles of verification, highlights important definitions, and answers some key questions.

Part II, *Preparing for Verification*, focuses on activities that take place prior to beginning verification activities, including bidding for a contract with participants, determining conflict of interest, negotiating a contract with participants, providing required notifications, and designing appropriate verification activities for each participant.

Part III, *Core Verification Activities*, provides guidance on conducting the primary activities that the verifier will complete, including: identifying sources, reviewing management systems and methodologies, and verifying emission estimates.

Part IV, *Completing the Verification Process*, covers procedures for completing the verification process including: preparing a Verification Report and Verification Opinion, completing the Verification Form to submit a participant's verified data to the California Registry, and recording and retaining proper records.

1.3 Principles of Verification

The purpose of verification is to provide an independent review of data and information being submitted to the California Registry to ensure that they meet minimum quality criteria. To fulfill this purpose, the independent verification process maintains the criteria of completeness, consistency, accuracy, comparability and transparency as its underlying principles.

Relevance. Verification should ensure that GHG inventories submitted to the California Registry appropriately reflect the GHG emissions of the entity and include emissions information produced in accordance with the program rules on defining reporting boundaries and sources.

Completeness. Verification should ensure accounting of all material GHG emissions sources and activities within the specified scope of the participant's inventory (a minimum of 95%). Baseline and annual emissions results should include all sources for which the participant is responsible.

Consistency. An emissions report should allow for meaningful comparison of emissions performance over time and across similar organizations. Independent verification should ensure that consistent methodologies and measurements are used between the baseline results and annual emissions results. Additionally, changes to participant emission baselines are verified to ensure appropriate comparisons.

Accuracy. Entity-wide reported data should be within the materiality threshold of 5% of the verifier's estimate of total emissions. Calculations and estimates need to be as accurate as possible to prevent material errors.

Transparency. Verification should be a transparent exercise. The data used for verification and the verification activities should be clearly and thoroughly documented to allow for outside review by the California Registry or potential review by the State of California (the State) in the context of overseeing verification activities.

1.4 Verification Principles and Definitions

1.4.1 Verification Standard

Verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. If a participant is reporting process or fugitive emissions, a separate industry-specific protocol may also be used and cited, where available. Some participants may wish to use their GHG emissions report for additional purposes such as registering in another registry, participating in emissions trading schemes, crediting programs, etc., and thus may add additional standards for verification.

1.4.2 Minimum Quality Standard

A verified emissions report submitted to the California Registry must be free of material misstatements, achieving a level of at least 95% accuracy. It is possible that during the verification process, differences will arise between the emissions totals estimated by participants and those estimated by verifiers. Differences of this nature may be classified as either material (significant) or immaterial (insignificant). A discrepancy is considered to be material if the overall reported emissions differ from the overall emissions estimated by the verifier by 5% or more. A difference is immaterial if it is less than 5%.

1.4.3 Reporting Uncertainty vs. Inherent Uncertainty

When evaluating participants' emissions reports, verifiers are to determine if the reporting uncertainty (vs. the inherent uncertainty) is less than the minimum quality standard.

Reporting uncertainty entails the mistakes made in identifying emissions sources, managing data or information, and calculating GHG emissions. Inherent uncertainty refers to scientific uncertainty associated with measuring GHG emissions. The California Registry is aware that there is inherent uncertainty in emissions factors and measurement of activity data through metering and instrumentation (even after the calibration of meters and other data collection methods are verified as accurate), but determining scientific accuracy is not the focus of the California Registry or its General Reporting Protocol.

1.5 Professional Judgment

Approved verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. The California Registry asks verifiers to use their professional judgment when executing the verification activities described in this General Verification Protocol. The purpose of the verifier approval process is to find verification firms that demonstrate, through their staff's professional qualifications and relevant GHG experience, their ability to render sound professional judgments about GHG emissions reports.

Application of a verifier's professional judgment is expected in the following areas:

- Implementation of verification activities with appropriate rigor for the size and complexity of a participant's organization and with regard to the uncertainty of calculations associated with the participant's emissions sources;
- Review of the appropriateness of a participant's GHG emissions tracking, monitoring, and management systems for providing information to the California Climate Action Registry;
- Evaluation of participant compliance with the California Registry's General Reporting Protocol;
- Assessment of methods used for estimating emissions from sources for which the General Reporting Protocol does not provide specific guidance, such as process and fugitive emissions, and indirect emissions from sources other than electricity, imported steam, district heating/cooling; and
- Appraisal of assumptions, and estimation methods and emission factors that are selected as alternatives to those provided in the General Reporting Protocol.

The General Verification Protocol and training provided by the California Registry are intended to explain to the verifier the California Registry's guidelines and expectations and thus what types of professional judgments are appropriate for this program. In addition to these resources, verifiers may contact the California Registry at any time for clarification of California Registry guidelines, expectations and policies.

1.6 Conflict of Interest

In order to ensure the credibility of the emissions data reported to the California Registry and its potential utility under any future regulatory regime, it is critical that the verification process is completely independent from the influence of the participant submitting the emissions report. While conducting verification activities for California Registry participants, verifiers must work in a credible, independent, nondiscriminatory and transparent manner, complying with applicable state and federal law and the current version of the State of California's *Conflict of Interest Process and Requirements for State and California Registry-Approved Verifiers*. This document is posted on the California Registry's website**.**

Any pre-existing relationship between the verifier and participant must be acknowledged to the California Registry, which will evaluate the potential for a conflict of interest (COI) between the two organizations.

Verifiers must provide information to the California Registry about its organizational relationships and internal structures for identifying potential conflicts of interest

(organizational COI). Then, on an individual basis, the California Registry will review any pre-existing relationship between a verifier and participant and will assess the potential for conflict of interest (case-by-case COI). When the California Registry determines there is a low risk of COI, the participant and verifier can finalize negotiations of their contract. Following completion of a verification, the verifier must monitor for the next year if any new business relationship may create a COI (emerging COI).

As an added protection, a verifier may provide verification services to a California Registry participant for, at most, six consecutive years. After a six-year period, the California Registry participant must engage a different verifier. The original verifier may not provide verification services to that participant for three years. This three year hiatus begins with any lapse in providing annual verification services to a California Registry participant.

In the event that a verifier violates these conditions, the California Registry, in consultation with the State and at its discretion, may disqualify an approved verifier for a period of up to five years.

This conflict of interest clause does not preclude a verifier from engaging in consulting services for other clients that participate in the California Registry for whom the verifier does not provide any verification activities.

Part II Preparing for Verification

2.1 Verification Process Overview

Before any verification activities begin, a number of procedural steps must be taken to ensure that the obligations and responsibilities of both the verifier and participant are clear.

The following summary of the major steps of verification is provided as a reference.

1. **Verifier receives California Registry approval**: Verifier meets all accreditation requirements and completes a California Registry-sponsored verification training workshop.

2. **Participant selects verifier**: Participant contacts one or more State/California Registry-approved verifiers to discuss verification activities. Participant selects an organization to verify its GHG emissions results and begins to negotiate contract terms.

3. **Verifier submits case-specific Evaluation of Conflict of Interest (COI) and State Notification Form**: After a participant chooses a verifier, the verifier must submit a Conflict of Interest Evaluation and State Notification Form to the California Registry to establish that the likelihood of a COI between parties is low or that risk of any conflict can be sufficiently mitigated by the verifier. The form must be submitted at least 10 working days prior to the first scheduled verification meeting.

4. **California Registry sends COI determination to verifier**: The California Registry reviews the Evaluation of COI Form and supporting information to determine the level of risk associated with the proposed participant/verifier relationship, and notifies the verifier of its determination.

5. **Verifier & participant finalize contract**: When the California Registry provides a favorable COI determination between a participant and verifier, verifiers may finalize their contract with a participant.

6. **Verifier conducts verification activities**: Verifier follows the guidance in the General Verification Protocol to evaluate a participant's annual GHG emissions report.

7. **Verifier prepares Verification Report and Verification Opinion for participant**: Verifier prepares a detailed summary (Verification Report) of the verification activities for the participant. Verifier also prepares a Verification Opinion for participant's review, prior to sending opinion electronically to the California Registry via CARROT.

8. **Verifier & participant discuss Verification Report and Opinion**: Verifier meets with participant to discuss Verification Report and Opinion.

9. **Verifier completes Verification Form via CARROT**: Once authorized by a participant, a verifier completes the Verification Form via CARROT. Participant then submits the original Verification Opinion to the California Registry.

10. **California Registry Conducts Final Review**: California Registry reviews the Verification Opinion and Verification Activity Log and evaluates the participant's

emissions reports. Once accepted by the California Registry, a participant's aggregated entity-level emissions become available to the public via CARROT.

Even in multi-year verification contracts, verifiers must repeat steps 3-11 for each annual verification before submission to the California Registry.

2.2 Becoming an Approved Verifier

Only those firms approved by the California Registry, the State or those involved in the American National Standards Institute (ANSI) accreditation program may provide verification services to California Registry participants. In order to become approved, a verifier must complete a two-step process: 1) Obtain accreditation as a GHG verifier from either the California Air Resources Board or from the American National Standards Institute (or other approved accreditation body as specified on the California Registry website) and 2) achieve California Registry approval by attending a verification training workshop facilitated by the California Registry.

Information on ANSI GHG Verifier Accreditation is available at www.ansi.ghg.org.

Information on CARB GHG accreditation is available at arb.ca.gov.

The second step of the approval process requires that lead verifiers one of the California Registry's verification training workshops. A lead verifier is any verifier from the firm who will sign their firm's Verification Opinion. After completing the training workshop, the verification firm becomes an "approved verifier." Following the training session, the California Registry will provide verifiers with a notification of their full approval. Upon receiving this notice, a firm may approach current or prospective California Registry participants to market their services and capabilities, and advertise that they are "approved verifiers for the California Climate Action Registry". All approved verifiers are listed on the California Registry's website.

Approvals are valid for three years from the date of the California Registry approval. At the end of this period, the California Registry will send a notification to each firm's primary contact. If for any reason the State, ANSI or the California Registry finds that a verifier has failed to meet the standards of either the General Reporting Protocol or the General Verification Protocol, it may disqualify a verifier for a period of up to five years.

2.3 Updates to the General Verification Protocol

Periodically, the California Registry may update the General Verification Protocol. The California Registry will advise all verifiers of any changes, and any new requirements that may affect them. Where any changes are significant, the California Registry may require that lead verifiers attend the next verification training workshop.

2.4 Adding or Deleting Designated Staff

During the application process, verification firms will identify all staff members who will be designated verifiers for the California Registry. An applicant who is State-approved may add or delete staff to their roster. To add or delete designated staff after being approved, the verifier should submit the Designated Staff Form (available on the California Registry's Verifiers Only webpage), with the names and contact information for any personnel changing from the roster, and note if staff are to be deleted or added to the roster. When adding staff, the firm should describe each individual's job classifications, relevant experience, education, academic degrees, professional licenses for technical staff members and their respective roles.

2.5 Bidding on a Verification Contract

The California Registry recommends that those participants with complex GHG emissions reports solicit competitive bids for verification services from at least three approved verifiers. Those participants with simpler GHG emissions reports who do not seek, or are not eligible for, batch verification may wish to secure competitive bids or may wish to sole source the verification contract in order to reduce costs and expedite the verification process.

When preparing to send out a request for bids from verifiers, participants should first review the list of approved verifiers and select some (or all) as prospective bidders. Due to the possibility of access to proprietary information, participants may want to send each prospective bidder a non-disclosure agreement. The California Registry suggests that participants distribute requests for bids to prospective verifiers only after they have received a signed non-disclosure agreement from verifiers.

The California Registry recommends that participants include the following information in their requests for bids from verifiers:

1. The expected contract duration;
2. A general description of the participant's organization;
3. The geographic boundaries of the participant's emissions report;
4. The number and locations of facilities and operations;
5. The GHGs reported in the participant's emissions report;
6. The emission source categories (and possibly emission sources) in the participant's emissions report;
7. The password to a read-only (Reviewer) version of the participant's emissions report in CARROT; and
8. A list and description, by category, of how emissions data is organized and calculated (either using CARROT or another methodology).

The California Registry suggests that participants request that commercial proposals from potential verifiers include the following components:

1. History and description of verification company;
2. Explanation of core competencies;
3. Proposed price for verification services;
4. Proposed staff;
5. Statement of verifier liability;
6. Confidentiality policy; and
7. Duration of contract.

The California Registry expects only limited variation in the technical proposals since all of the approved verifiers are trained to implement the California Registry's standardized verification process.

2.6 Conflict of Interest (COI)

2.6.1 Objective of the Conflict of Interest Process

This COI process was developed by the State of California and adopted, with modifications, by the California Registry to assess the risk of potential COI between verifiers and California Registry participants. This process gives verifiers the ability to demonstrate that their organization is capable of identifying and mitigating situations that would impair their ability to render an impartial verification opinion.

Through this process, applicants and any partners must demonstrate:

1. Clearly-defined organizational boundaries, internal structures, and relationships with other companies that have management or financial control over the applicant.
2. The presence of internal mechanisms to identify and mitigate organizational and personal COIs with any potential clients.
3. The ability to be objective in providing verification activities.

To protect the credibility and rigor of the California Registry verification process, the relationship between verifiers and California Registry participants must not create or appear to create a COI. While conducting verification activities for California Registry participants, the verifier must work in a credible, independent, nondiscriminatory and transparent manner, complying with applicable state and federal law and the current version of the California Registry's conflict of interest process

2.6.2 Process and Requirements

In the verification process, all verifiers must demonstrate they do not have significant conflicts of interest with participants:

1. **Organizational COI** – in the application process, each verifying organization shows that they have internal mechanisms in place that help maintain their objectivity in verification activities.

2. **Case-by-Case COI** – in each case where verification services are requested, before a contract is signed with a participant, each verifier demonstrates that any pre-existing relationship between the verifier and participant will not impair impartiality in verifying a GHG emissions report.

3. **Emerging COI** – for a period of one year following a verification, verifiers will monitor their relationship with the participant to ensure impartiality has been protected in the verification process.

These are each discussed in greater detail below.

2.6.2.1 Organizational COI

As part of the application process, a verifier has already documented the ability of its organization to identify and react to COI due to organizational relationships. Verifiers have also submitted the form *Conflict of Interest Declaration of Ability and Intent to Comply*, declaring the applicant and each partner's ability to subsequently perform and submit a case-

by-case evaluation of COI to the California Registry. This form also conveys the applicant's intent to comply with the California Registry's COI process and requirements.

2.6.2.2 Case-by-Case COI

As an early step in the contract negotiation process between verifiers and participants, a verifier must demonstrate on a case-by-case basis that it, its partners, and the individuals performing verification activities do not have any actual or potential conflict of interest with the California Registry participants for which it has been selected to carry out verification functions.

A verifier will have a high risk of COI if the verifier and participant share any management, or if any of the California Registry participant's managers of GHG-related activities were previously employed with or by the verifier within the last three years, or vice versa. A verifier will have a high risk of COI if the verifier or its related companies (e.g., parent company, subsidiaries of a parent company, affiliates) has provided any GHG management or advocacy services (as identified on the list below) to the California Registry participant within the last three years. If a verifier has performed these services, they have a high potential COI, as they would be: 1) verifying their own work, 2) performing management functions for the client, or 3) acting as an advocate for the client. Where a high risk of COI is determined, the verifier is not approved to conduct the verification.

2.6.2.3 Incompatible Services

- Designing, developing, implementing, or maintaining a GHG emissions inventory
- Designing or developing GHG information systems
- Developing GHG emissions factors or other GHG-related engineering analysis
- Designing energy efficiency, renewable energy, or other projects which explicitly identify GHG reductions as a benefit
- Preparing or producing GHG-related manuals, handbooks, or procedures specifically for the California Registry participant
- Appraisal services of carbon or GHG liabilities or assets
- Brokering in, advising on, or assisting in carbon or GHG-related markets
- Management over health, environment and safety functions
- Legal and expert services unrelated to California Registry verification

If the verifier identifies a potential or actual COI, the verifier must also submit a plan to avoid, neutralize, or mitigate the COI situation. The California Registry will review the information submitted to determine if the verifier provided enough information to make a COI determination. If not, the California Registry may request additional information. Once the information is found to be complete, the California Registry will review and evaluate the case, and will issue a written determination within ten working days.

Once the case-by-case evaluation is complete, a verifier may provide verification services to a California Registry participant for, at most, six consecutive years. After a six-year period, the California Registry participant must engage a different verifier. The original verifier may not again provide verification services for at least three years. This three-year period is triggered following any lapse in providing annual verification services to a California Registry participant.

This cycling of verifiers will help to avoid potential COI situations due to lengthy and ongoing relationships. Also, this guarantees that another firm will review material previously reviewed by another verifier, thus providing another "check" on the consistency and appropriateness of professional judgments made.

2.6.2.4 Emerging COI

Verifiers agree to monitor their activities for one year after the verification, and seek the approval of the California Registry and the State before entering into arrangements or relationships during that time that may present COI. The verifier may not enter into any contract with a California Registry participant or related entity that the California Registry and/or the State determines would create an unacceptable level of risk of COI.

In order to obtain this determination, the verifier must submit *Form COI-AB: Notification of Verification Activities And Request for Evaluation of Potential for Conflict of Interest Between Verifier and California Registry Member* (available on the California Registry's Verifiers Only webpage) to the California Registry detailing the specifics of their situation and request a determination. The California Registry will use a similar procedure to determine the risk for COI during that period.

2.6.2.5 Confidentiality

The California Registry will enter into confidentiality agreements with verifiers and California Registry participants as necessary to evaluate potential COI. Any organization that must provide confidential information to support the evaluation should clearly indicate what information is confidential, and the California Registry will follow its standardized procedures to do its utmost to protect confidential business information.

2.7 Negotiating a Contract with the Participant

After a verifier has been selected by a California Registry participant, the two parties should negotiate and complete contract terms. This contract is exclusively between the participant and the verifier, and the particulars of any given contract are at the discretion of the two parties. However, contracts for verification services typically include the following components:

- **Scope of the Verification Process.** This component of the contract should outline the exact geographic and organizational boundaries of the participant's emissions inventory to be examined. This should, but may not necessarily, match the boundaries used in the GHG emissions report to the California Registry. This scope should indicate whether a participant's California-only emissions are included or if both California and U.S. emissions are included. It should also identify whether the participant has used the management control, equity share, or other methods based on contractual relationships to determine organizational boundaries.

- **Confirmation of Approved Verifier Status.** This is a simple statement that the verifier has been approved by the California Registry to verify emissions reports covering the scope listed above.

- **Verification Standard.** Verifiers must verify participants' GHG emissions reports against the California Registry's General Reporting Protocol using the process outlined in this General Verification Protocol. If a participant is reporting process or fugitive emissions, a separate industry-specific protocol may also be used and cited, where available. Some participants may wish to use their GHG emissions report for additional purposes such as, registering in another registry, participating in emissions trading schemes, crediting programs, etc., and thus may add additional requirements into their contract for verification.

- **Non-Disclosure Terms.** The verifier and the participant should agree in advance on methods for identifying and protecting proprietary and confidential business data that may be revealed during verification.

- **Site Access.** The verifier and the participant should agree in advance to the time, place, and conditions of a verifier's site visits, if any are required.

- **Documentation and Data Requirements.** The verifier and participant should agree on how and when the participant will provide activity and emissions data to the verifier. The range of required documentation will largely be determined by the size and complexity of participant operations, and whether the participant has used the online calculation tools available through CARROT.

- **Period of Performance.** The period of performance for verification services may be up to six years. Where a participant's operations do not significantly change from year to year, they may wish to work with a verifier on a three-year cycle. However, the participant has discretion as to whether to sign a one or multi-year contract.

- **Performance Schedule.** Participants and verifiers may wish to agree on a schedule to complete the verification process and for the verifier to deliver a Verification Report and Verification Opinion. Verification should be completed by October 31 of the same calendar year when the emissions report was submitted.

- **Payment Terms.** Typical payment terms include total value, schedule of payments, and method of payment (e.g., electronic funds transfer).

- **Re-Verification Terms.** If the verifier identifies material misstatements, the participant may choose to revise its GHG emissions report. At that time, the participant may ask the verifier to re-verify the portions of the report with material misstatements or seek verification from another provider. *A verifier may not provide guidance, technical assistance, or implementation work on the remediation of material misstatements, as this constitutes consulting services and results in a conflict of interest.* Contracts should also specify the length of time a participant will have to correct material misstatements.

- **Liability.** All verifiers are subject to minimum liability associated with completing the verification per the terms of the verification contract. The participant may require and the verifier may agree to additional liability under this contract.

- **Contacts.** Parties should identify technical leads for both the participant and verifier, as well as responsible corporate officials of each party.

- **Dispute Resolution.** Both parties must state their consent to submit irreconcilable differences for review to the California Registry-convened Dispute Resolution Committee.

- **Acknowledgement of State Site Visits.** Both parties must sign an acknowledgement that, on a random basis, the State may accompany a verifier for purposes of monitoring the verification process.

2.8 Batch Verification

In an effort to minimize the transaction costs of verification for small organizations with relatively simple emissions, the California Registry will contract with an approved verifier to

undertake the verification work for interested participants with limited GHG emissions. The California Registry calls this batch verification. Emissions reports verified under batch verification must meet the same standards as non-batch reports. Eligible participants include those with:

- Less than 500 metric tons of CO_2e emissions per year;
- No significant process or fugitive emissions (significance threshold is 5% of total CO_2e emissions) ;
- Indirect emissions from purchased electricity at four or fewer sites; and/or
- Direct emissions from five or fewer passenger vehicles only; and/or
- Direct emissions from stationary combustion at one site.

Upon the recommendation of the batch verifier, the California Registry reserves the right to deem a participant's GHG emissions inventory too complex for batch verification. The California Registry also reserves the right to grant batch verification eligibility on a case-by-case basis.

2.8.1 Procedures

Each year, the California Registry will solicit competitive bids for batch verification services from all eligible approved verifiers.

Participants interested in batch verification will contact the California Registry to express their interest. After confirming the participant's eligibility, the California Registry will keep track of interested participants.

Each participant will sign a standardized contract with the verifier that has been developed by the California Registry. If participants require non-standard contract language, they cannot participate in batch verification.

Once the contracts are signed, the California Registry will work with the verifier to identify all necessary documentation, as requested by the verifier and as required in the General Reporting and General Verification Protocols. The California Registry will collect the necessary supporting documentation from the participants and forward it to the verifier. It is expected that batch verification will not require a site visit, but will consist of document review and telephone interviews.

The verifier will contact each participant to understand their operations. Then, the batch verifier will review and assess the emissions reports and documentation and prepare the Verification Report and Opinion. The verifier will then discuss the findings with each participant and upon authorization, will submit the electronic Verification Form to the California Registry via CARROT.

To minimize any potential conflict of interest, the California Registry will contract with a batch verifier on an annual basis and the designated batch verifier will perform all eligible verifications for that calendar year of emissions. The batch verifier will be ineligible to bid on batch verification for the following three years. Because of this term limit, the limited nature of emissions and operations of the participant and the elevated level of oversight by the California Registry, the potential for COI is deemed low, and the requirement to request determination of COI is waived.

2.9 Notification of Planned Verification Activities

After verifiers and participants have completed contract terms, the verifier must notify both the California Registry and the State of California 10 business days prior to the beginning of verification activities, using Form D, *Notification of Verification Activities*. This form is available on the California Registry's Verifiers Only webpage. Notification should include:

- Verifying company information;
- Participant information;
- Year and types of greenhouse gas emissions data being verified;
- Schedule of verification activities; and
- Names of approved staff members conducting the verification activities

This notification period is necessary to allow the State the opportunity to accompany verifiers on visits to participants' sites. The State will observe, evaluate, and report on the quality and consistency of verification activities. A verifier that does not provide proper notification to the California Registry and the State may be disqualified as an approved verifier.

2.10 Kick-off Meeting with the Participant

After contract terms have been completed and the California Registry and State have been notified of planned verification activities, verifiers should conduct a kick-off meeting with participants. For some verifications, this may consist of a telephone call. The agenda for that meeting should include:

1. Introduction of the verification team;
2. Review of verification activities and scope;
3. Transfer of background information and underlying activity data (See Table 2); and
4. Review and confirmation of the verification process schedule.

Based on the information provided in agenda items 2 and 3, the verifier should determine the most effective, efficient, and credible detailed verification approach tailored to the particular characteristics of the participant.

2.11 Online Reporting

All participants must report their emissions using the California Registry's online calculation tool, CARROT. Participants may also opt to use CARROT to calculate their indirect emissions and direct emissions from stationary and mobile combustion. Where participants have used CARROT to calculate their emissions, the verifier needs to verify that data have been collected properly and entered accurately. The verifier should assume CARROT's calculations are correct and do not need to re-calculate the emissions. Due to the time savings, this should result in a less expensive and expedited verification process.

It is the participant's responsibility to provide the verifier with access to CARROT. A verifier will have read-only access to the participant's Total Emissions Summary, which provides a detailed summary of all the information that the participant has reported. Because the verifier needs to be able to evaluate any operational changes, access is also provided to the previous year's total emissions summary, as well as emissions reported in the baseline year if this has been specified and if it is different than the current emissions year. For example, for a participant who has set a baseline year of 2002, has reported data from 2002 – 2006, and is contracting with a verifier for evaluation of their 2007 emissions; the verifier will be able to access their 2007 report, their 2006 report, and their 2002 report. They would have public access to emissions reported in the intervening years.

Additional assistance with navigating and using CARROT is provided in the California Registry's Verification Training Workshops and by contacting the California Registry at 213-891-1444 or **help@climateregistry.org**. Verifiers may also request temporary access to CARROT for training purposes.

Part III Core Verification Activities

3.1 Overview

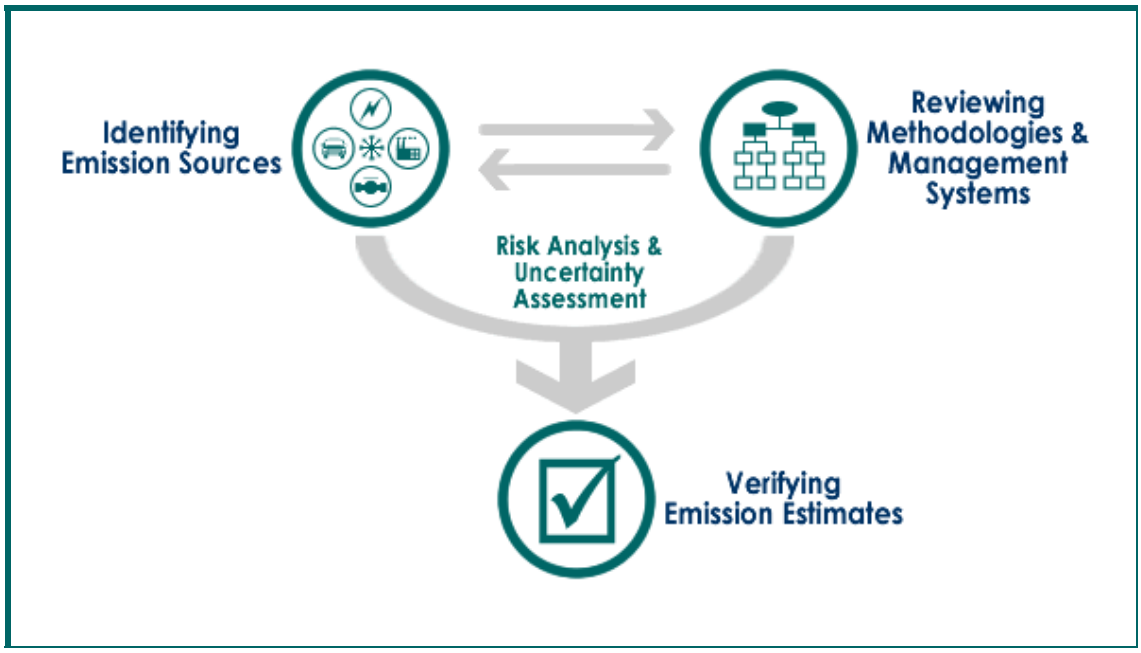
Once verifiers have completed the preparations for verification, they are ready to begin the core verification activities.

The core verification activities include three primary elements:

1. Identifying emissions sources in five emission source categories (indirect, mobile, stationary, process, and fugitive emissions);
2. Understanding management systems and estimation methods used; and
3. Verifying emission estimates.

The core verification activities are a risk assessment and data sampling effort aimed at ensuring that no material sources are excluded and that the risk of error is assessed and addressed through appropriate sampling and review. The complete core verification process is illustrated in Figure 1 below.

Figure 1. The Core Verification Process



3.2 Verification Activities Based on Participant Characteristics

Verifiers must apply the verification activities consistently for all participants. However, based on the size and complexity of participants' operations and management systems, verification activities and the duration of the process will vary. The documents that will need to be

reviewed during verification will also vary depending on the nature of the emission sources contained in the participant's emissions report.

3.2.1 Determining Appropriate Verification Activities

To guide verifiers in their determination of appropriate verification activities, the California Registry divides participants into three general groups, based on the level of effort necessary to verify their emissions. The characteristics of the verification approach for each of these groups are listed below. Of course, verifiers are expected to use their professional judgment to augment or narrow these approaches based on uncertainty in emissions estimates and other items affecting material accuracy.

Group 1: Small participants with simple operations. This group includes participants who have only the following material emissions sources:

- Indirect emissions from electricity consumption, steam imports, and district heating/cooling at four or fewer buildings; and/or
- Direct emissions from stationary combustion at one site; and/or
- Direct emissions from five or fewer passenger vehicles.

In an effort to minimize verification costs, small participants who also have total emissions that are less than 500 metric tons of CO_2e per year may elect to be batch verified with similar organizations. The California Registry will assist this batch of participants in bidding and negotiating contracts with the verifier. Standard terms and conditions will apply for all contract elements. Verification for these participants will usually not require a site visit, but rather, activities will be conducted via a telephone interview.

Alternatively, small participants may choose to contract out verification services through a sole source procurement or competitive bidding process.

Group 2: Larger participants with more complex operations. These include participants with only the following material emissions sources:

- Indirect emissions from electricity consumption, steam imports, and district heating/cooling at more than four sites;
- Direct emissions from stationary combustion at more than one site;
- Direct emissions from more than five vehicles; and/or
- No material process or fugitive emissions.

For these participants, most verifications will require at least one site visit. Additional visits may be required when characteristics of the participant changes between reporting periods (e.g., new sites, changed location, began new operations). Site visits are used to ensure that all material GHG emission sources have been included and appropriately accounted for in the greenhouse gas emissions report.

Group 3: Participants with process or fugitive emissions. For participants with material process or fugitive emissions or other emissions not covered above, verification activities must be more detailed. Because these emission calculations are not currently included in the General Reporting Protocol, the verifier is required to use their

professional judgment as to the appropriateness of the calculations used by the participant.

3.3 Verification Cycle

For participants whose operations do not change significantly, verification can be a three-year cycle. In Year 1, a verifier will need to form a detailed understanding of a participant's operations and resulting GHG emissions. If there have been no significant changes in a participant's boundaries, GHG emissions sources and/or management systems, a verifier may streamline and expedite the verification activities in Years 2 and 3 by focusing on verifying emissions estimates. To ensure data integrity, all of the core verification activities should be completed again in Year 4, followed by streamlined activities in Years 5 and 6.

The minimum core verification activities for each year are:

Year 1: Identify emission sources, review management systems, verify emissions estimates

Year 2: Verify emissions estimates

Year 3: Verify emissions estimates

Year 4: Same as Year 1

3.4 California Registry's Expectations for Verification Activities

Through these verification activities, verifiers are to verify that the annual emissions reports submitted to the California Registry via CARROT meet the standards of the General Reporting Protocol:

1. The participant has reported all material emissions, broken out into the following five categories:
    - Indirect emissions from purchased electricity, imported steam, district heating/ cooling;
    - Direct emissions from mobile combustion;
    - Direct emissions from stationary combustion;
    - Direct emissions from process activities; and
    - Direct fugitive emissions.
2. Total emissions reported as de minimis are less than 5% of the total emissions.
3. From the fourth year of reporting to the California Registry, all material emissions from all six greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6) are reported.
4. All California emissions are identified separately from the rest of a participant's U.S. emissions, where the participant has chosen to report their U.S. emissions.
5. All emissions were emitted during the calendar year specified.

6. Reported emissions meet the minimum quality standard of 95% accuracy.

Emissions reports may also contain other information about an organization and its emissions that does not require verification. This could include, for instance, information about a company's environmental policies and goals, and emission reduction projects. Participants may also choose to report other optional indirect emissions (e.g., business travel, employee commuting). In the report generated by CARROT, optional information will be clearly distinguished from verified information.

To verify information is accurately reported, the verifier will want to review, at a minimum, the documents listed in Table 1. To facilitate this review, once the participant reports their emissions using CARROT, the participant and the verifier can generate a Verification Checklist. Based on the types and categories of emissions they have reported, CARROT will provide participants and verifiers with a list of documents they will need for verification.

Table 1. Documents to be Reviewed during Verification

Activity or Emissions Source	Documents
Identifying Emission Sources	
Emission Source Inventory	Facility Inventory
	Emission Source Inventory Stationary Source Inventory Mobile Source Inventory Fuel Inventory
Understanding Management Systems and Methodologies	
Responsibilities for Implementing GHG Management Plan	Organization Chart, Greenhouse Gas Management Plan, Documentation and Retention Plan
Training	Training Manual, Procedures Manual, Consultant Quals Statement
Methodologies	Protocols Used (if in addition to the California Registry's General Reporting Protocol)
Verifying Emission Estimates	
Indirect Emissions from Electricity Use	Monthly Electric Utility Bills, Emission Factors (if not default)
Direct Emissions from Mobile Combustion	Fuel Purchase Records, Fuel in Stock, Vehicle Miles Traveled, Inventory of Vehicles, Emission Factors (if not default)
Direct Emissions from Stationary Combustion	Monthly Utility Bills, Fuel Purchase Records, CEMs Data, Inventory of Stationary Combustion Facilities, Emission Factors (if not default)
Indirect Emissions from Cogeneration	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from Imported Steam	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from District Heating	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Indirect Emissions from District Cooling	Monthly Utility Bills, Fuel and Efficiency Data from Supplier, Emission Factors (if not default)
Direct Emissions from Process Activities	Raw Material Inputs, Production Output, Calculation Methodology, Emission Factors
Direct Fugitive Emissions	
Refrigeration Systems	Refrigerant Purchase Records, Refrigerant Sales Records, Calculation Methodology, Emission Factors
Landfills	Waste-in-Place Data, Waste Landfilled, Calculation Methodology, Emission Factors
Coal Mines	Coal Production Data Submitted to EIA, Quarterly MSHA Reports, Calculation Methodology, Emission Factors
Natural Gas Pipelines	Gas Throughput Data, Calculation Methodology, Emission Factors
Electric Transmission and Distribution	Sulfur Hexafluoride Purchase Records, Calculation Methodology, Emission Factors

Step 1: Identifying Emission Sources

Verifiers should review a participant's reported emission source inventories (facility, source, and fuel) to ensure that all sources are identified. Verifiers should then determine the GHGs that will result from the identified sources and estimate their magnitude. GHGs that are not required to be reported can be disregarded. Finally, verifiers should rank the remaining reported emissions by CO_2e (using the Global Warming Potentials [GWPs] contained in the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) - see Table 2, below) to assess the environmental risk associated with the emissions.

Table 2. GWPs from IPCC's Second Assessment Report

Greenhouse Gas	GWP (SAR, 1996)
CO_2	1
CH_4	21
N_2O	310
HFC-23	11,700
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-143a	3,800
HFC-152a	140
HFC-227ea	2,900
HFC-236fa	6,300
HFC-4310mee	1,300
CF_4	6,500
C_2F_6	9,200
C_4F_{10}	7,000
C_6F_{14}	7,400
SF_6	23,900

Source: U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003 (April 2005).

When the emission source inventory is complete, verifiers should review participant's GHG emissions report and document answers to the following questions to assess if the GHG emissions report reflects the geographic, organizational, and operational scope of the participant:

1. Does the GHG emissions report include all processes and facilities under the management control of the participant? If not, why?

2. Does the report include all sources of GHG emissions within the geographic and organizational boundaries of the participant?

3. Does the report include all applicable types of GHGs from each emission source within the geographic and organizational boundaries of the participant?

4. Have any mergers, acquisitions, or divestitures occurred during the current reporting year? Have any activities been outsourced in the current year? If yes, has the participant specified a baseline? If so, has it been adjusted?

After these questions have been answered, verifiers will be able to determine if the GHG emissions report accurately reflects the geographic, organizational, and operational scope of the participant. Once all emission sources have been identified, verifiers may proceed to Step 2 to review the calculation methods used and the management systems employed.

Step 2: Reviewing Methodologies and Management Systems

After the scope and comprehensiveness of the participant's emission sources has been confirmed, verifiers should review the methodologies and management systems that the participant used to calculate their emissions. This is principally a risk assessment exercise, in which the verifier must weigh the relative complexity of the scope of the participant's emissions, the participant's methodologies and management systems used to prepare the GHG emissions report, and the risk of calculation error as a result of reporting uncertainty or misstatement. Through these steps, the verifier should determine the appropriateness of the management systems to provide required data to the California Registry. For example, the absence of a comprehensive GHG management system for a participant with a single retail

outlet and solely indirect emissions from electricity purchases may not add significant risk of material misstatement. In contrast, a large vertically-integrated manufacturing company with facilities in 31 states would require a much more robust management system for tracking and reporting its GHG emissions.

A verifier's general review of a participant's GHG management systems should document answers to the following questions:

1. Are calculation methodologies/procedures used to manage GHG emissions at the source level? Are they appropriate given the uncertainty/risk associated with the emissions? Are these methodologies/procedures standard within this industry?

2. Are appropriate methods used to manage and implement entity-wide GHG emissions reporting programs? If the participant has more than one facility, are the emissions data correctly aggregated and monitored?

3. Is someone responsible for managing and reporting GHG emissions? Is this individual qualified to perform this function?

4. Is appropriate training provided to personnel assigned to GHG emissions reporting duties? If the participant relies on external staff to perform required activities, are the contractors qualified to undertake such work? Is there internal oversight to assure quality of the contractor's work?

5. Are appropriate documents created to support and/or substantiate activities related to GHG emissions reporting activities, and is such documentation retained appropriately? For example, is such documentation maintained through reporting plans or procedures, utility bills, etc.?

6. Are the mechanisms used to measure and review the effectiveness of GHG emissions reporting programs appropriate for this purpose? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?

Verifiers should also consider how the participant's management systems are designed to support reporting five categories of emission sources (indirect, mobile, stationary, process and fugitive). Consequently, in reviewing a participant's Total Emissions Report, verifiers should document answers to the following questions:

1. Does the management system capture the diversity of the sources that comprise each emission category? For example, are there multiple types of vehicles and other transportation devices that require different emission estimation methodologies?

2. Does the system capture all the diversity of GHGs emitted from each emission source category?

3. Has the participant used the default emission factors and standardized estimation methods in the California Registry's General Reporting Protocol to calculate emissions in each source category? Has the participant or its technical assistance provider developed estimation methods independently? If the participant uses alternative emission factors, are they documented and explained appropriately?

4. Does the participant's GHG management systems appropriately track emissions in all of the emission source categories?

Once the verifier has assessed the overall risk associated with the management systems, the risks should be assessed in conjunction with the weighted CO_2e estimates determined in Step 1 (Identifying Emission Sources). Verifiers should then identify the areas with the greatest potential for material misstatements (either based on volume of emissions, lack of management systems, or both) to determine the best risk-based strategy to identify a representative sample of emissions to recalculate.

Step 3: Verifying Emission Estimates

Based on a participant's identified emission sources, management systems, and corresponding risk profile of GHG emissions, verifiers should select a representative sample of calculations to verify and sites to visit. Sampling procedures may entail conducting site visits, but should include reviewing documents such as utility bills or emissions monitor results, and recalculating emission estimates based on underlying activity data. In Table 3, below, the California Registry specifies the minimum number of sites that should be visited based on the size of the entity. The verifier should use professional judgment to assess if additional visits are needed.

Table 3. Minimum Site Visit Sample Size

Total Sites	Minimum Sample Size
2-10	30%
11-25	20%
26-50	15%
51-100	10%
101-250	5%
251-500	3%
501-1,000	2%
Over 1,000	1-2%

3.5 Potential Site Visits by the State of California

As part of the State of California's oversight of the verification process, the State will randomly accompany verifiers on site visits. The California Registry's enabling legislation directed the State to observe the verifier during verification visits, evaluate whether the participant has a GHG accounting program consistent with California Registry-approved procedures and protocols, and evaluate the reasonableness of the emissions information being reported. The State may send an employee or a contractor to accomplish this responsibility. The purpose of any site visit is to oversee the verifier's activities, and to evaluate the reasonableness of the participant's reported data. The State will report on its findings to the California Registry.

To accomplish this, during a site visit, the State will need to access the same information and sources as that of the verifier. The State will work with the verifier and participant to obtain this access. This may involve requesting access to on-site locations that may have GHG emission sources or related activities and participant information, data, records, or copies of records; observing verifiers during any exchange of participant data or data analyses; and/or asking the verifier to provide specific information related to their on-site and off-site data analyses. The State will also make every effort to not impede the normal activities of either the participant or the verifier. All costs for the State site visit are borne by the State.

Before the end of a site visit, the State will discuss its preliminary observations and evaluations with the verifier and participant. The State will also contact and discuss with the verifier and participant any findings that identify either party before reporting this to the California Registry.

As the Participant requests, a representative from the State, and/or the Verifier that will view confidential information should sign the Standard Nondisclosure Agreement (NDA). Rules covering State confidentiality can be found in the *California Code of Regulations, Title 20, Sect. 2501 et seq*.

3.6 Targeted Review & Recalculation of GHG Emissions

The California Registry does not expect nor require verifiers to review all of the participant's documents and recheck all their calculations. To ensure that data meet a minimum quality standard on an entity-wide basis, verifiers should concentrate their activities in the areas that have the greatest uncertainty and amount of emissions. Verifiers should calculate emissions for these sources and compare those calculations to emission levels reported by the participant. If they are free of material misstatement (have a difference of <5%), the verifier should declare that the participant's report conforms to the California Registry's Protocols.

If the reported data is not free of material misstatement, the verifier should include this information in its Verification Report and should complete its sampling effort of other sources. Once verifiers have confirmed that a sample of data is free of material misstatements, they should estimate total emissions and confirm that all material GHG emissions are reported.

3.7 De Minimis Emissions

De minimis emissions are a quantity of GHG emissions from one or more sources, for one or more gases, that when summed equal less than 5% of an organization's total CO_2e emissions. The percentage applies to California emissions for the purposes of California-only emissions reporting, and applies to U.S. emissions for national reporting. Participants have some discretion in choosing which sources and/or GHGs are de minimis, but are expected to disclose all de minimis emission sources in their emissions report. Verifiers should review participant's documentation and explanation of how de minimis emissions were calculated to confirm that not more than 5% of total CO_2e emissions are considered de minimis.

3.8 Identifying Material or Immaterial Misstatements

In order for verifiers to verify a GHG emissions report, a sample of data must be free of material misstatement. It is possible that during the verification process differences will arise between the emissions estimated by the participant and those estimated by the verifier. Differences of this nature may be classified as either material or immaterial. A discrepancy is considered to be material if the overall reported emissions differ from the overall emissions estimated by the verifier by 5% or more. A difference is immaterial if this difference is less than 5%.

A verifier's verification of emissions estimates should document the answers to the following questions:

1. Are the reported electricity, steam, and district heating and cooling use consistent with utility bills?

2. Is the reported total stationary fuel use by fuel type consistent with the fuel use records?

3. Is the reported total consumption of fuels in motor vehicles consistent with available documentation and by vehicle type? If the entity calculates transportation emissions based on vehicle mileage, is the reported vehicle mileage consistent with vehicle mileage records?

4. Are the reported process and fugitive emissions consistent with activity data or maintenance records?

5. Are the emission factors used by the participant appropriate? If California Registry default factors are not used, do the alternative emission factors provide increased accuracy? Is their derivation and explanation of increased accuracy properly documented and reasonable?

6. Does a sample of the participant's calculations agree with your re-calculated direct (mobile, stationary, process and fugitive) and indirect emissions estimates? Have you documented your process for determining the appropriate sampling plan?

7. Are all material GHG emissions included? Are all emissions that are considered de minimis emissions documented and reported as such?

8. Are the current year's reported emissions significantly different from the prior year's emission levels? If so, what has changed from prior years?

9. Has the accumulated change in reported emissions, since the last baseline update, changed by more than ten (10) percent? If so, has the baseline, if any, been recalculated?

10. Are there any discrepancies between your emissions estimates and the participant's material?

Once verifiers have reviewed these activities and answered these questions, they are ready to complete the verification process.

Part IV Completing the Verification Process

4.1 Overview

Once a verifier has completed reviewing a participant's annual GHG emissions report, they must do the following to complete the verification process:

1. Complete a detailed Verification Report, and deliver it to the participant;
2. Prepare a concise Verification Opinion, and deliver it to the participant;
3. Conduct an exit meeting with the participant to discuss the Verification Report and Verification Opinion and determine if material misstatements (if any) can be corrected. If so, the verifier and participant should schedule a second set of verification activities after the participant has revised the GHG emissions report.
4. Submit an electronic Verification Form and Verification Activity Log to the California Registry via CARROT;
5. Return important records and documents to the participant for retention.

4.2 Completing a Verification Report

4.2.1 Verification Report Content

The Verification Report is a confidential document that is shared between a verifier and a participant, and is only available to the California Registry or the public at the participant's request.

The Verification Report should include the following elements:

- The scope of the verification process undertaken;
- The standard used to verify emissions (this is the California Registry's General Reporting Protocol, but may also include other protocols or methodologies for those sources for which the California Registry has yet to provide detailed guidance);
- A description of the verification activities, based on the size and complexity of the participant's operations;
- A list of emission sources identified, including de minimis sources;
- A description of the sampling techniques and risk assessment methodologies employed for each source;
- An evaluation of whether the participant's annual GHG emissions report is in compliance with the California Registry's General Reporting Protocol;
- A comparison of the participant's overall emissions estimates with the verifier's overall emissions estimates;

- A list of material misstatements, if any;
- A list of immaterial misstatements, if any; and
- A general conclusion to be reflected in the Verification Opinion.

4.2.2 Quality Assurance Check

When the Verification Report is completed, it should be forwarded to an independent senior reviewer within the verifier's firm for a quality assurance check. No Verification Report should be forwarded to a participant until it has had an independent internal review.

4.2.3 Participant Review of Verification Report

Once a participant receives a Verification Report from their verifier, they should have at least 30 days to review and comment on the Verification Report. At the end of that review, the verifier and the appropriate official at the participant's organization should hold an exit meeting to discuss the nature of any material or immaterial misstatements.

4.3 Preparing a Verification Opinion

Verifiers should prepare a Verification Opinion using the template shown in Figure 2. The Verification Opinion is a simple confirmation of the verification activities and outcomes for all stakeholders (participants, verifiers, the California Registry, and the public). The Verification Opinion must also follow the same internal review process as the Verification Report and consequently must be reviewed by an independent senior reviewer within the verifier's firm, and signed by a designated lead verifier. An electronic version of this template is available on the California Registry's Verifiers Only webpage or may be obtained from the California Registry by emailing **help@climateregistry.org**.

4.4 Verification Activity Log

In order to assess the consistency of professional judgments that verifiers have been asked to make, verifiers should also complete a Verification Activity Log (Table 4 below) and submit a completed copy to the California Registry, along with the electronic Verification Form, in CARROT.

Table 4 includes a step-by-step outline of the standardized verification activities that all verifiers must consider. Not all activities are required of all participants or during each year, depending on a participant's specific circumstances, but verifiers should review this list and note "not applicable" (or "N/A") where appropriate. The table also includes a series of yes/no questions. Any "no" response should be explained, without revealing a participant's confidential information.

The California Registry will consider both the Verification Opinion and the answers in Table 4 in its final review of emissions data, before accepting a participant's report into the California Registry. An electronic version is available for download in CARROT, on the California Registry's Verifiers Only webpage, and from the California Registry by emailing **help@climateregistry.org**.

Table 4. Verification Activity Log

Verifier Company:		
California Registry Participant:		
Preparing for Verification	**Date Achieved**	
Bid on a Verification Contract		
Request determination of COI from California Registry		
Negotiate Contract with California Registry Participant		
Notify State of California and California Registry of Planned Verification Activities		
Conduct Kick-off Meeting With Participant		
Plan Verification Activities Based on Participant Characteristics		
Core Verification Activities **Identify Emission Sources**	**Date Achieved**	
Identify and list all facilities in the entity		
Identify and list all emission sources (indirect, mobile, stationary, process and fugitive)		
Identify and list all fuel types		
Rank all sources by magnitude on a carbon dioxide equivalent basis		
Assess any changes in geographic and organizational boundaries		
	Yes	**No**
1. Does the GHG emissions report include all processes and facilities under the management control of the participant?		
2. Does the report include all sources of GHG emissions within the geographic and organizational boundaries of the participant?		
3. Does the report include all applicable types of GHGs from each emission source within the geographic and organizational boundaries of the participant?		
4. Have any mergers, acquisitions, or divestitures occurred during the current reporting year?		
5. Have any activities been outsourced in the current year?		
6. If a baseline has been specified, has it been adjusted accordingly?		
7. Does the GHG emissions report include all processes and facilities under the management control of the participant?		
Review Methodologies and Management Systems	**Date Achieved**	
Evaluate procedures and systems for preparing emissions report		
Evaluate personnel and training for preparing emissions report		
Consider the uncertainty associated with methodologies and management systems		
	Yes	**No**
8. Are appropriate calculation methodologies/procedures used to manage GHG emissions at the source level? Are they appropriate given the uncertainty/risk associated with the emissions?		
9. Are appropriate methods used to manage and implement entity-wide GHG emissions reporting programs?		
10. If the participant has more than one facility, is the emissions data correctly aggregated and monitored?		
11. Is someone responsible for managing and reporting GHG emissions?		
12. Is that person qualified to do so?		
13. Is appropriate training provided to personnel assigned to GHG emissions reporting duties? If the participant relies on external staff to perform required activities, are the contractors' qualified to undertake such work?		
14. Are appropriate documents created to support and/or substantiate activities related to GHG emissions reporting activities, and is such documentation retained appropriately?		
15. Are appropriate mechanisms used to measure and review the effectiveness of GHG emissions reporting programs? For example, are policies, procedures, and practices evaluated and updated at appropriate intervals?		

16. Does the system account for the diversity of the sources that comprise each emission category? For example, are there multiple types of vehicles and other transportation devices that require different emission estimation methodologies?		
17. Do you know the diversity of GHGs emitted from each emission source category?		
18. Has the participant used the default emission factors and standardized estimation methods in the California Registry's General Reporting Protocol to calculate emissions in each source category?		
19. Has the participant or its technical assistance provider developed estimation methods independently?		
20. If participant uses alternative emission factors, are they documented and explained appropriately?		
21. Does the participant's GHG management system appropriately track emissions in all of the emission source categories?		
Assess Risk of Material Misstatement Associated with Management Systems/Procedures	**Date Achieved**	
Develop sampling procedures for sources based on risk of material misstatement		
Verify Emission Estimates		
Confirm total fuel consumption		
Confirm vehicle miles traveled		
Confirm that appropriate emission factors are used. If not default factors, ensure the derivation and explanation of increased accuracy is properly documented		
Calculate direct (mobile, stationary, process & fugitive) & indirect emissions based on sampling procedures		
Compare estimates from sample calculations to reported emissions		
Determine if there are any discrepancies between sample calculation and reported emissions		
Confirm that all material GHG emissions are included (that all emissions not included are either de minimis or not required)		
Determine if Discrepancies are Material or Immaterial	**Yes**	**No**
22. Based on the following table, have you visited an appropriate number of sites?		

Total Sites	Minimum Sample Size
2-10	30%
11-25	20%
26-50	15%
51-100	10%
101-250	5%
251-500	3%
501-1,000	2%
Over 1,000	1-2%

Total number of sites:_____
Total number visited:_____

23. Are the reported electricity, steam, and district heating and cooling use consistent with utility bills?		
24. Is the reported total stationary fuel use by fuel type consistent with the fuel use records?		
25. Is the reported total consumption of fuels in motor vehicles consistent with available documentation and by vehicle type? If the entity calculates transportation emissions based on vehicle mileage, is the reported vehicle mileage consistent with vehicle mileage records?		
26. Is the reported process and fugitive emissions consistent with activity data or maintenance records?		
27. Are the emission factors used by the participant appropriate? If California Registry default factors are not used, ensure that alternative emission factors provide increased accuracy and that the derivation and explanation of increased accuracy is properly documented and reasonable.		
28. Does a sample of the participant's calculations agree with your re-calculated direct (mobile, stationary, process & fugitive) & indirect emissions estimates? Have you documented your process for determining the appropriate sampling plan?		
29. Are all material GHG emissions included? Are all emissions that are considered de minimis emissions documented as such?		
30. Are the current year's reported emissions significantly different from the prior year?		
31. Has the accumulated change in reported emissions, since the last baseline update, changed by more than 10%? If so, has the baseline, if any, been recalculated?		
32. Are discrepancies between your emissions estimates and the participant's immaterial?		
Completing the Verification Process	**Date Achieved**	
Prepare a detailed Verification Report and submit to participant		
Prepare a Verification Opinion and submit to participant		
Conduct exit meeting with participant to discuss Verification Report & Opinion		
Provide records to participant for retention		

4.5 Completing the Verification Contract

4.5.1 Exit Meeting

Verifiers should prepare a brief summary presentation of their verification findings for the participant's key personnel. At the exit meeting, verifiers and participants might exchange lessons learned about the verification process and share thoughts for improving the verification process in the future. Verifiers and participants may wish to consider joint feedback to the California Registry.

The goals of this meeting should be:

- Acceptance of the Verification Report and Opinion (unless material misstatements exist and can be remediated, in which case the verification contract may need to be revised and a second verification process scheduled). If the participant does not wish to retain the verifier for the re-verification process, the verifier shall turn over the participant's relevant documentation to the participant within 30 days.

- Authorization for the verifier to complete the Verification Form in CARROT.

If the verifier is under contract for verification activities in future years, the verifier and participant may wish to establish a schedule for the next year's verification activities.

Figure 2. Sample Verification Opinion

[*Insert Verification Firm Logo*]

California Climate Action Registry Verification Opinion

Name of Verification Firm: _____

This is to verify that _____ [*Name of Member Organization*] has had its greenhouse gas emissions report covering the period January 1, _____ [*Insert Reporting Year*] to December 31,_____ [*Insert Reporting Year*] verified according to the California Climate Action Registry's General Verification Protocol against a standard of the California Registry's General Reporting Protocol.

Organizational Boundary of Verification

☐ Financial Management Control ☐ Operational Management Control ☐ Equity Share

GHGs Verified

☐ CO_2 ☐ CH_4 ☐ N_20 ☐ HFCs ☐ PFCs ☐ SF_6

Total Direct Emissions: _____

Total Indirect Emissions: _____

Geographic Scope of Verification

☐ California Emissions ☐ U.S. Emissions

Baseline Year (if specified)

_____ (Direct) _____ (Indirect) Year, if specified

Verification Opinion

☐ Verified without Qualification

☐ Unable to Verify

Attestation

_____ _____

[*Insert Name*], Lead Verifier Date

_____ _____

[*Insert Name*], Senior Internal Reviewer Date

Authorization

I _____ [*Name of Member Representative*] authorize the above named verifier to submit this Verification Opinion to the California Climate Action Registry for _____ [*Name of Member Organization*].

_____ _____

[Member Representative Signature] Date

4.5.2 Limits to Verifier Feedback

If a participant's emissions report is not verifiable due to material misstatements, a *verifier must not provide guidance on how to remediate the identified misstatements*. Such guidance would be considered a consulting activity and therefore, a conflict of interest. However, verifiers may provide any existing documentation that may be useful to participants in preparing remediation plans. A verifier should also enumerate any shortcomings in a participant's GHG tracking and management systems.

The California Registry will retain the participant's unverified emissions report in the California Registry database for up to two years pending verification. After two years, if the emissions report is still not verifiable, the California Registry will render the emissions report inactive.

4.6 Submitting the Verification Opinion to the California Registry

Once the Verification Opinion is complete and has been authorized by the participant, the verifier must complete the Verification Form and Verification Activity Log electronically in CARROT and the participant must email a Portable Document File (PDF) copy of the fully executed verification opinion to help@climateregistry.org. The participant may also elect to send a hard copy of the verification opinion with wet signatures to the address listed below:

Verification Opinion
California Climate Action Registry
523 W. Sixth Street, Suite 428
Los Angeles, CA 90014

Once the California Registry receives an electronic or hard copy of the Verification Opinion, the California Registry will perform a final review of the emissions report in CARROT. When successful, the participant's report will be formally accepted into the California Registry database and the annual verification process will be completed.

*Note: Participants are *not* required to submit their Verification Opinions to the California Registry for the first two years of their participation. However, it is important to note that a participant's emissions data will not be considered accepted by the California Registry unless the California Registry receives a Verification Opinion indicating a "verified without qualification" assessment.

4.7 Record Keeping and Retention

While the California Registry views the verification process essentially as a private exchange between the verifier and the participant, the verifier should remind the participant to retain sufficient records to enable an ex-post verification of the participant's emissions. The California Registry recommends that the following records be retained for a minimum of seven years as specified by contract with the participant.

Verifiers should retain hard and electronic copies, as applicable, of:

- The participant's GHG emissions report (printable from CARROT);
- The Verification Report; and
- The Verification Opinion.

The participant should maintain the following documentation for a minimum of seven years:

- Contact information for the lead verifier and a responsible corporate officer at the participant's organization;
- A general description of the participant's organization;
- The geographic boundaries;
- The number of facilities and operations assessed in the verification activities;
- The GHGs evaluated;
- The sources of emissions identified;
- Assessment of emission factors, demonstrating greater accuracy if not default emission factors;
- Copies of fuel use, mileage, or other activity data records used in sample recalculations;
- Verification methodology used based on the size and complexity of the participant;
- Sampling procedures for selecting site visits;
- Dates of site visits;
- The verifier's evaluation of the participant's management systems; and
- The verifier's estimates of the participant's emissions.

Copies of the original activity data records are necessary to perform an ex-post verification.

4.8 Timeline of Verification Process

Incorporating all of the steps and procedures involved in reporting, reviewing and verifying credible emissions data may be a lengthy process. The following table gives you an overview of the consecutive steps and necessary lapses of time between steps in the verification process.

Table 5. Verification Process Timeline

Activity	Elapsed Time
Preparing for Verification	
Contacted by participant to submit proposal for services	Where no consulting activities for 3 years prior to contract
Selected by participant	Varies
Submit request for case-by-case determination of COI to California Registry	Prior to contract negotiation
California Registry evaluates case and issues notification of low risk for COI	One month
Negotiate contract with participant	Varies
Notify State of California and California Registry of verification activities	One month
Core Verification Activities	
Begin verification activities	Maximum one year
Completing the Verification Process	
Submit Verification Report and Opinion to participant	Varies
Participant reviews Verification Report and Opinion and returns comments to verifier	One month
Verifier discusses findings with participant	Varies
Participant authorizes submission of electronic Verification Form to the California Registry	By October 31 of data year +1
Monitor emerging COI	One year
Verifier cannot provide consulting services to participant	One year
Participant chooses a new verifier	After a maximum of six years

Glossary

Applicant	A firm, or lead firm (if part of a team), responding to a State-issued RFA for Verifiers.
Baseline	Datum against which to measure greenhouse gas emissions performance over time, usually annual emissions in a selected base year.
Batch Verification	Verification process arranged by the California Registry for multiple participants with relatively simple GHG emissions (less than 500 tons of CO_2e emissions and typically only indirect emissions from electricity consumption and/or direct emissions from stationary or mobile combustion).
Verification	The process used to ensure that a given participant's greenhouse gas emissions inventory (either the baseline or annual result) has met a minimum quality standard and complied with the California Registry's procedures and protocols for calculating and reporting GHG emissions.
Verified Member	A California Registry participant that has submitted at least one verified annual emissions report to the California Registry.
Verifier	A firm or team of firms that has been State- and California Registry-approved to conduct verification activities under the California Registry program. A verifier may also refer to a single employee within a State- and California Registry-approved firm who conducts verification activities.
CO_2 equivalent*	(CO_2e) The quantity of a given GHG multiplied by its total global warming potential. This is the standard unit for comparing the degree of harm which can be caused by different GHGs.
Conflict of Interest	A situation in which, because of other activities or relationships with other persons or organizations, a person or firm is unable or potentially unable to render an impartial Verification Opinion of a potential client's greenhouse gas (GHG) emissions, or the person or firm's objectivity in performing verification activities is or might be otherwise compromised.
Datum	A reference or starting point.
De Minimis	A quantity of greenhouse gas emissions from one or more sources, for one or more gases, which, when summed equal less than 5% of an organization's total CO_2e emissions.
Direct Emissions	Emissions from sources that are owned or controlled by the reporting organization.
Emerging COI	A potential or actual COI situation that arises, or becomes known, during verification or for a period of one year after the completion of verification activities.

Emission Factor*	A factor relating activity data and absolute GHG emissions.
Equity Share	Fractional percentage or share of an interest in an entity based either on ownership interest, or on some other contractual basis negotiated among the entity's stakeholders.
Fugitive Emissions*	Unintended or incidental emissions of GHGs from the transmission, processing or transportation of fossil fuels or other materials, such as HFCs from refrigeration leaks, SF_6 from electric power distribution equipment, methane from mined coal, CO_2 emitted incidentally with geyser steam and/or fluid used in geothermal generating facilities.
Global Warming Potential*	(GWP) The ratio of radiative forcing (degree of harm to the atmosphere) that would result from the emission of one unit of a given GHG to one unit of CO_2.
Greenhouse Gases	(GHGs) For the purposes of the California Registry, GHGs are the six gases identified in the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_20), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).
Indirect Emissions	Emissions that are a consequence of the actions of a reporting entity, but are produced by sources owned or controlled by another entity.
Inherent Uncertainty	The scientific uncertainty associated with measuring GHG emissions due to limitations on monitoring equipment, or measurement methodologies.
Lead Verifier	An individual who has completed a California Registry-sponsored verification training workshop and who has the authority to sign a verification firm's Verification Opinion.
Management Control	The ability of an entity to govern the operating policies of another entity or facility so as to obtain benefits from its activities.
Material misstatement	An error (for example from an oversight, omission or miscalculation) that results in the reported quantity being significantly different from the true value to an extent that will influence performance or decisions.
Member	A California Registry participant that is preparing its annual GHG emissions report, but has not yet submitted its verified report to the California Registry.
Minimum Quality Standard	Data that is free of material misstatements, and meets the California Registry's minimum level of accuracy of at least 95%.
Mobile Combustion*	Burning of fuels by transportation devices such as cars, trucks, airplanes, vessels, etc.
Organizational COI	Instances where the ability to render objective GHG verification services may be affected by the services provided by, shared management and/or financial resources with, or other situations created by a parent company or other related entities.

Outsourcing*	The contracting out of activities to other businesses.
Partner	An organization working through a lead firm (applicant) to respond to a State-issued RFA for Verifiers. A partner may or may not be a related entity. If the applicant submits an application wherein staff or financial capability is shared with either a parent firm or subsidiary of a parent firm, then that parent or subsidiary is considered a partner. If the applicant is part of a larger organization, but the application does not include any staff or financial capability from the larger organization, then the larger organization is not considered a partner.
Personal COI	A relationship of an employee or a partner employee that may impair the objectivity of the employee in performing a verification.
Process Emissions	Emissions from physical or chemical processing rather than from combustion, such as CO_2 emissions from cement manufacturing and PFC emissions from aluminum smelting.
Related Entity	An organization that is linked to the verifier by: common ownership or directors, contractual arrangement, a common name, informal understanding, or other means such that the related organization has a vested interest in the outcome of an assessment or has a potential ability to influence the outcome of an accredited management system assessment, greenhouse gas validation, or verification.
Reporting Uncertainty	The errors made in identifying emission sources and managing and calculating GHG emissions. This differs from inherent uncertainty due to incomplete understanding of climate science or a lack of ability to measure greenhouse gas emissions.
Stationary Combustion*	Burning of fuels to generate electricity, steam, or heat.

**Definitions of key terms obtained from "The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard," World Business Council for Sustainable Development and World Resources Institute, Switzerland, March 2004.*

Key Questions

Verifier Approval: *Who may qualify as a verifier?*

Only those firms accredited by the California Registry, the State of California, or The Climate Registry may provide verification services to California Registry participants

To become approved, a verifier must complete a two-step process: 1) Obtain accreditation as a GHG verifier from either the California Air Resources Board or from the American National Standards Institute (or other approved accreditation body as specified on the California Registry website) and 2) achieve California Registry approval by attending a verification training workshop facilitated by the California Registry.

Information on the ANSI GHG Verifier Accreditation is available at www.ansi.ghg.org. Information on CARB GHG accreditation is available at arb.ca.gov.

Applicants who wish to be qualified as approved verifiers need to demonstrate experience in GHG verification and verification of financial data, technical data, quality control, and/or environmental management systems. Verifiers must also demonstrate the means to accept financial liability for verification activities undertaken for a participant. *Firms providing verification services to a participant may not provide any non-verification services that create a high risk of COI to the same participant for three years prior to and one year after verification.*

Liability: *What liability will a verifier incur? What liability coverage must a verifier accept?*

At a minimum, a verifier is responsible for planning a participant's verification activities, conducting the verification activities, preparing a Verification Report and Opinion, and submitting authorized Verification Opinions to the California Registry via CARROT. If a California Registry-approved verifier fails to complete the contracted activities, they may be financially liable for the cost of hiring a different California Registry-approved verifier to complete a proper verification from start to finish (as defined in the contract between a verifier and a participant). The verifier may incur additional liability based on the negotiated terms of the contract. This liability may include the future value of GHG emissions or emission reductions, damages, or any other element agreed to by the verifier and the participant.

In their initial application, verifiers must demonstrate the means to accept financial liability for verification activities undertaken for a California Registry participant, specify such liability in any contract for verification activities, and make adequate arrangements (e.g., professional liability insurance coverage) to cover liabilities arising from its activities or operations. However, verifier liability may also be limited in the contract with the California Registry participant.

Resolution of Disputes: *What recourse is available if the participant does not accept the findings of the verification?*

There may be instances where a verifier and a participant cannot agree on identification of material misstatements and/or the findings of the Verification Opinion. In such instances, both parties can request the Dispute Resolution Committee, composed of qualified representatives from California state agencies, the California Registry, and one non-voting verifier, who serves pro bono on an annual, rotating basis. The participant and the verifier will

each pay a filing fee equal to 5% of the participant's annual membership fee to submit the matter to the Dispute Resolution Committee.

The Dispute Resolution Committee will interview the participant and the verifier, review the area of dispute and reach a unanimous, binding decision concerning verifiability. The California Registry will notify the verifier and the participant of the Committee's decision. Thus, as part of contract negotiations, each California Registry participant and verifier will need to sign a form agreeing to this Dispute Resolution policy.

"Batch Verification": *How does it work? How will it affect bidding, contracting, and the overall verification process?*

In an effort to minimize the transaction costs of verification, the California Registry will help eligible participants with simple GHG emissions contract for "batch verification". Eligible participants have relatively simple GHG emissions (indirect emissions from purchased electricity and/or emissions from limited stationary and mobile sources) and produce less than 500 metric tons of CO_2e per year.

In batch verification, the California Registry will work with one verifier each year to verify the emissions reports of multiple organizations at one time. Emissions must be verified to the standards of the General Reporting Protocol. Because of the nature of the emissions, batch verification activities will consist of document review and phone conversations, but will not require a site visit. The California Registry will assist in negotiating a standardized contract and a flat fee for each organization. Standardizing the contract language will help to minimize the transaction costs of verification for small, office-based organizations.

A new batch verifier will be chosen each year. This finite verifier term is to minimize the risk from COI and to eliminate the cost associated with a case by case COI.

Verification Deadlines: *What is the deadline for completing the verification process?*

Emissions should be reported to the Registry no later than June 30 following the emissions year. Verification should be completed by October 31 following the emissions year. For instance, 2008 emissions should be reported by June 30, 2009 and verified by October 31, 2009.

Verification Report and Verification Opinion: *What are the Verification Report and Verification Opinion and how are they different?*

The Verification Report is a detailed report that a verifier prepares for a participant. The Verification Report should describe the scope of the verification activities, standards used, emission sources identified, sampling techniques, evaluation of a participant's compliance with the General Reporting Protocol, assumptions, and a list of material and immaterial misstatements, if any. The Verification Report is a confidential document between the verifier and the participant, and is only shared with the California Registry or the public at the participant's request.

The Verification Opinion is a brief, one-page summary of the verifier's findings that simply states if the participant's emissions report is verifiable or not. The Verification Opinion is submitted in hard copy by the verifier to the participant for approval.

Verification and Remediation: *What if a participant's emissions report is not verified?*

After completing verification activities, the verifier will prepare a Verification Report and forward it to the responsible official representing the participant. The responsible official includes anyone authorized by the participant to approve the GHG emissions report for submission to the California Registry and will typically be a corporate official or the technical manager of the verification contract.

If the verifier identifies material misstatements that prevent a favorable Verification Opinion, those material misstatements should be listed and described in the Verification Report. If possible, the participant may correct those material misstatements and resubmit the emissions report for verification within a reasonable amount of time. The participant may seek technical assistance to correct material misstatements but the verifier may not provide such technical assistance as it would constitute non-verification services, and create a conflict of interest.

The California Registry will retain the participant's unverified data in the California Registry database for up to two years, pending correction. After that time, the participant will need to re-enter the data.

Confidentiality: *Are the results of the verification kept confidential? Will emissions data be kept confidential?*

All aggregated entity-level emissions data and metrics reported to the California Registry will be available to the public. However, the California Registry will keep confidential all reported emissions, activity data, methodologies, and emissions factors that are reported at facility, project, or source levels. Confidential information will only be accessible to the participant, the California Registry, and the verifier, unless the participant allows others access to such information or wishes to have it available to the public. In instances where the State of California accompanies verifiers on site visits, the State may have access to confidential information as needed to oversee verification activities and evaluate the reasonableness of the participant's data and systems to track emissions. Representatives from the State, the Verifier, and the Participant who will view confidential information will all be required to sign the Standard Nondisclosure Agreement (NDA). As noted in an earlier question, the Verification Report is a private document between a participant and verifier, while the Verification Opinion is shared with the California Registry. A majority of the contents of the Verification Opinion will also be shared with the public.

General Verification Protocol Revision Policy: *Will this General Verification Protocol change over time? How can verifiers provide feedback to the California Registry?*

The California Registry expects to regularly review, revise, update, and augment this General Verification Protocol. The California Registry invites all parties, verifiers, California Registry participants, California State agencies, and the public to provide insights and experiences that will help improve the General Verification Protocol. Anyone with suggestions or concerns is encouraged to contact the California Registry at any time at 213-891-1444 or by email at info@climateregistry.org**.**

Stakeholders will also be able to present suggestions directly to the California Registry's Board of Directors for consideration at their meetings. All suggestions and requests for modifications must be made by utilizing the "Protocol Comment Form" available on the California Registry's website at **www.climateregistry.org/protocols**.

California Registry-Approved Technical Assistance Providers: *What role do they play?*

Some participants may desire outside assistance, either in terms of expertise or human resources, to collect, document and report their emissions to the California Registry and/or otherwise manage their GHG emissions. To assist participants in identifying a firm qualified to help them, the State and the California Registry approve firms qualified to serve as technical assistance providers (TAs). Participants are not required to use only approved TAs. However, approved companies have been approved as firms experienced in providing GHG emissions services, and many of them have attended California Registry-sponsored training sessions. Where a participant has retained the services of a TA, the participant may ask the TA to play a role in the verification process. Neither the California Registry nor the State is responsible for any consulting services or recommendations they may provide, nor do they specify any role that TAs should or should not play.

All firms approved as verifiers also are automatically qualified to act as TAs. However, a firm cannot provide both technical assistance and verification services to the same client at the same time.

Role of California State Agencies: *What is the relationship between the California Registry and state agencies?*

The Registry was established by California statute as a non-profit voluntary registry for greenhouse gas emissions inventories, to help organizations establish GHG emissions baselines against which any future GHG emission reduction requirements may be applied. The State of California was directed to offer its best efforts to ensure that participants receive appropriate consideration for early actions in the event of any future state, federal or international GHG regulatory scheme.

The California Registry and state agencies work together and keep each other informed about current activities. The State of California continues to provide technical guidance to the California Registry and plays a direct oversight role in the verification process. The California Registry gives great weight to state agency guidance and relies in large part on these recommendations when developing California Registry policies, procedures and tools, including reporting and verification protocols and the online reporting tool. However, final policy and technical decisions are made independently by the California Registry's Board of Directors.

Updated Emissions Reports: *Once a report has been verified, will it ever change?*

Following verification of an annual GHG emissions report, there may be situations in which a verified report may change. A participant may wish to add information beyond the minimum reporting standards (add non-CO_2 gases during the first three years of reporting, report facilities outside of California, change the emission factor used, etc.). Participants can update their report at any time. However, any changes will need to be re-verified, and this information will need to be documented in CARROT. As understanding and sophistication of GHG accounting principles develops, the California Registry may elect to update accounting principles (e.g., alternate emission factors, Global Warming Potentials). Where participants have used CARROT to calculate their emissions, these changes do not need to be re-verified.

CARROT: *Am I required to use CARROT to communicate with the California Registry?*

Participants are required to report their emissions to the California Registry using CARROT. The participant-entered annual GHG emissions report generated by CARROT is the document on which the verifier provides its Verification Opinion to the California Registry. The Verification Opinion is submitted in separately by the participant. Verifiers are not restricted to only communicating with the California Registry via CARROT, but must use the online tool to submit an electronic Verification Form and Verification Activity Log. Questions about using CARROT may be directed to the California Registry at 213-891-1444 or **help@climateregistry.org**.

Additional Questions?

If you have any questions regarding GHG emissions reporting or verification under the California Registry Protocols, please contact the California Registry by phone (213-891-1444) or email (**help@climateregistry.org**).

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MEMORANDUM

To: Owen Kubit

From: Tom Haslebacher

Subject: Orestimba Creek Hydrogeology

Date: November 26, 2013

Project Area Description

The Orestimba Creek Recharge Recovery Project encompasses the Orestimba Creek alluvial fan on both sides of the approximate 5 mile course of Orestimba Creek from its intersection with US Interstate 5 to its intersection with CA Hwy 33 (**Figure 1**).

Project Hydrology

Orestimba Creek is a west-side tributary to the San Joaquin River. Its drainage lies in western Stanislaus County, on the eastern slopes of the Diablo Range section of the Coast Range Mountains. Elevations vary from 45 feet above mean seal level (amsl) at the San Joaquin River to approximately 3600 feet in its watershed to the west.

Orestimba Creek is an ephemeral stream with its highest flows usually occurring in late winter. Its course is generally northeasterly. Flood flows spread over wide, undefined overflow areas typical of alluvial fans. Orestimba Creek is one of the few tributary streambeds to maintain a definite channel from the foothills to the San Joaquin River.

Normal annual precipitation ranges from 11.2 inches at Newman to over 18 inches in the higher elevations of the Orestimba watershed. Stream flow is typically between November and April. Drought conditions have a major effect on the stream resulting in 12 of 76 years of record showing no flow. Average annual flow where Orestimba crosses the CA Aqueduct was 12,300 acre-feet per year (1932-2007). Average annual flow at the Outside Canal was approximately 13,000 acre-feet per year during 1997 to 2008. (US Army Corps of Engineers, 2008)

- Normal annual precipitation ranges from 11.2 inches at Newman to over 18 inches in the higher elevations of the Orestimba watershed.
- 12 of 76 years of record showing no flow.
- Average annual flow where Orestimba crosses the CA Aqueduct was 12,300 acre-feet per year (1932-2007).

- Average annual flow at the Outside Canal was approximately 13,000 acre-feet per year during 1997 to 2008.

Subsurface Geologic Conditions

The following description of subsurface Geologic conditions is from Kenneth D. Schmidt and Associates (KSA), "Groundwater Conditions in and near The Eastin Water District," February 2000.

"Alluvial deposits comprise the aquifers beneath the western part of the San Joaquin Valley. Subsurface deposits tapped by most wells in the area west of Newman are termed the older alluvium and the Tulare Formation. The Tulare Formation crops out on some of the terraces near the Delta Mendota Canal (DMC), north of Orestimba Creek. A major confining bed is present beneath much of the west side of the San Joaquin Valley. This clay is termed the Corcoran Clay, and divides the groundwater into the Upper and lower aquifers. The Corcoran Clay is readily discernible from a number of the driller's logs and electric logs for wells in the area, due to its blue color and low electrical resistivity. The overlying and underlying deposits are usually tan or brown in color. The E-clay [Corcoran Clay] pinches out beneath the westerly part of the Eastin Water District."

"In terms of large-capacity wells, either consolidated sedimentary rocks at depth or the base of the fresh groundwater is considered the base of the usable aquifer beneath the District. Consolidated sedimentary rocks are present at relatively shallow depth (i.e. about 150 feet or less) …… near the DMC and I-5. These consolidated rocks include the Eocene Kreyenhagen Formation, the Oligocene Poverty Flat Formation, and the Miocene-Pliocene Neroly Formation. Sandstone, shale, and siltstone are predominant. The consolidated formations are of limited groundwater production potential. Several test holes and or wells between the DMC and Medln Road also have encountered the consolidated rocks. Most of the test holes or wells near the DMC are believed to have tapped deposits of the Neroly Formation. Page (1986) indicated that the base of the fresh groundwater (electrical conductivity less than 3,000 micromhos per centimeter at 25°C) was about 900 feet deep near Newman."

Three detailed geologic cross-sections (Cross Section Location Map, Figure 2; A-A', Figure 2; B-B', Figure 3; C-C', Figure 4) for the Orestimba Creek Recharge and Recovery Project are provided in: "Groundwater Conditions In And Near The Eastin Water District" (KSA, February 2000).

"Cross Section A-A' (**Figure 2**) extends from the Delta Mendota Canal, north of Orestimba Creek, to the southeast to the Main Canal near Orestimba Creek Road. Orestimba Creek is of particular interest in this evaluation due to its potential for intentional recharge. Thus this cross section was prepared specifically to pass through Orestimba creek and the south part of the Eastin Water District. Section A-A' indicates that the top of the consolidated sedimentary rocks that have been encountered near the west edge of the section dips relatively steeply to the east. Unconsolidated alluvium is

about 120 feet thick near the west edge and at least 400 feet thick beneath the central part of this section. Beneath the east part of the section, the unconsolidated alluvium is indicated to be more than 1,000 feet deep. The Corcoran Clay pinches out to the west near Medlin Road along this section. Where present, the clay thickens to the southeast along this section, from about 10 feet to 25 feet."

"Depth to water along this section in Spring 1983 ranged from about 20 feet near the east end to about 55 feet near Medlin Road. Depth to water in Fall 1992 ranged from about 60 feet near the east and to more than 90 feet west of Eastin Road. Deposits above the Fall 1992 water level southeast of Orestimba Creek along this section are indicated to be predominantly sand and gravel, except near the Main Canal. Fine grained deposits are predominant below the Fall 1992 water level and above the Corcoran Clay just southeast of the creek along this section. A static water level of 17 feet was measured in late 1979 in a test well (TH-5) that tapped the consolidated rocks north of Orestimba Creek and west of the DMC"

"Cross Section B-B' (**Figure 3**) extends from near Interstate 5 [I-5] to the northeast, through the northern part of the Eastin Water District, to near the Main Canal and Anderson Road. This section was specifically prepared to evaluate subsurface geologic conditions along and near Orestimba Creek, in terms of the potential for intentional recharge. Consolidated sedimentary rocks were encountered above a depth of about 100 feet near the DMC. The top of these rocks is less than 20 feet deep near I-5. The Corcoran Clay also pinches out to the west near Medlin Road along this section."

"Depth to water in Spring 1983 along the section ranged from about 20 feet near Main Canal to more than 50 feet west of Medlin Road. Depth to water in Fall 1992 ranged from about 60 feet near the Main Canal to about 110 feet near Medlin Road. Deposits above the Fall 1992 water level were primarily sand and gravel along this section west of Eastin Road. Several relatively thick, but discontinuous clay layers were present along this section, east of Eastin Road above the Fall 1992 water level. Below the water level and above the Corcoran Clay, fine-grained deposits were predominant along much of this section, except to the east near the Main Canal. Deposits below the Corcoran Clay generally become more coarse-grained to the northeast along this section."

"Cross Section C-C' (**Figure 4**) extends from north to south, through the Eastin Water District, generally along Eastin Road, thence southeast of the Main Canal. Orestimba Creek is near the north edge of this section. This section shows that the top of the Corcoran Clay deepens and the clay thickens to the north in the District. The Corcoran Clay is from about 20 to almost 60 feet thick along this section. Depth to water in Spring 1983 was about 35 feet near the north end of the section near Orestimba Creek, about 40 feet deep near Stuhr Road, and about 25 feet near the south end near the Main Canal. Depth to water in Fall 1992 was about 100 feet near the north end of the section, 90 feet near Stuhr Road and about 60 feet near the south end. Coarse-grained strata are predominant above the Fall 1992 water level along this section, except near

Stuhr Road. Coarse-grained strata are significant below the Corcoran Clay along this section.

- Section A-A' indicates that the top of the consolidated sedimentary rocks that have been encountered near the west edge of the section dips relatively steeply to the east.
- Unconsolidated alluvium is about 120 feet thick near the west edge and at least 400 feet thick beneath the central part of this section.
- "Depth to water along this section in Spring 1983 ranged from about 20 feet near the east end to about 55 feet near Medlin Road.
- Depth to water in Fall 1992 ranged from about 60 feet near the east and to more than 90 feet west of Eastin Road.
- Consolidated sedimentary rocks were encountered above a depth of about 100 feet near the DMC.

Soils

The soils of the Project area are typical of alluvial fan deposition. **Figure 5** details the top soils of the area. Note that the soils with the highest infiltration rates are found in the vicinity of the Orestimba Creek stream channel. Soils tending to higher clay content, finer grained and lower infiltration rates can be found to the northwest and to the south east.

- The soils with the highest infiltration rates are found in the vicinity of the Orestimba Creek stream channel.
- Soils tending to higher clay content, finer grained and lower infiltration rates can be found to the northwest and to the south east.

Regional Hydrogeologic Conditions

Aquifer Characteristics

The upper and lower aquifers of the Orestimba Creek area are composed of coarse to fine grained sands and gravels inter-bedded with silts and discontinuous clays. Separating the two aquifers is the Corcoran Clay which acts as a confining bed for the lower aquifer. The upper aquifer is considered unconfined. Most of the groundwater pumped is from either shallow wells tapping the upper aquifer, or deeper wells tapping both the upper and lower aquifers.

There are no published estimates of specific yield for the upper aquifer or storage coefficients for the lower aquifer. Kenneth D. Schmidt and Associates, in the above-referenced report, estimate a combined Transmissivity value, from a well tapping both upper and lower aquifers above a depth of 400 feet, as approximately 150,000 gallons per day per foot. Specific capacities for local wells vary from 63 to 113 gallons per

minute per foot of drawdown. Pumping rates for area wells range from about 1,500 to 2,600 gallons per minute.

- KSA estimated a combined Transmissivity value, from a well tapping both upper and lower aquifers above a depth of 400 feet, as approximately 150,000 gallons.

Groundwater Quality

Total dissolved solids (TDS) concentrations along the eastern portion of the study area (Main Canal) range from approximately 800 to 1000 milligrams per Liter (mg/L) and are lower towards Orestimba Creek (western and central portion of the study area) Boron concentrations in most wells vary from 0.3 to 0.6 mg/L. Nitrate levels vary between 27 to 110 mg/L, Chloride ranges between 710 to 1090 mg/L, and Sulfate concentrations vary between 150 to 220 mg/L. In general, groundwater quality is best in the northern portion of the study area and also around Orestimba Creek. Groundwater quality worsens to the southern portion of the study area. (KSA, 2000, 2010, and 2011)

- Groundwater quality is best in the northern portion of the study area and also around Orestimba Creek.
- Groundwater quality worsens to the southern portion of the study area.

Groundwater Levels

KSA describes groundwater levels for the Orestimba Creek project area for Spring 2008 in "Hydrogeologic Potential for Water Banking In or Near San Joaquin River Exchange Contractors Service Area", January 2011. "Water-level elevations ranged from about 70 feet above mean sea level to the west to 55 feet to the east. The overall direction of groundwater flow was away from the creek and toward the Main Canal to the east. This map is considered representative, except during drought periods (**Figure 6**). During droughts, a depression has normally been present beneath the Eastin Water District and the CCID well field to the east. Groundwater has flowed to the east beneath the Main Canal during these periods. Water levels in this area are generally shallow to the west near the DMC (less than 20 feet deep)." Depth to groundwater usually ranges from about 50 to 75 feet below ground surface (bgs), except for the period 1991-1996 (drought years) when water levels dropped to almost 90 feet bgs. (**Figure 7**).

- Water-level elevations ranged from about 70 feet above mean sea level to the west to 55 feet to the east.
- The overall direction of groundwater flow was away from the creek and toward the Main Canal to the east.
- During droughts, a depression has normally been present beneath the Eastin Water District and the CCID well field to the east. Groundwater has flowed to the east beneath the Main Canal during these periods.

Profiles A-A' and B-B' show changes in depth to water from upstream to downstream (generally west to east) and across the creek (generally south to north). The Profiles also compare depths in 1992, the end of a dry period, to 1998, rthe end of a wet period. The difference between those profiles is how much the water table rises as a result of the historic replenishment of the aquifer after a sustained dry period. This amount of space should be considered when determining available storage capacity for new projects.

Suitability for Recharge

The creek bed and gravel mining areas along Orestimba Creek, according to KSA, would be considered "hydrogeologically suitable for intentional recharge. Coarse-grained deposits are predominant to a depth of at least 100 feet. Aggregate excavations [gravel mining operations] are considered particularly hydrogeologically favorable, because they extend below fine-grained surficial deposits (when present). Intentional recharge projects could be done on lands not proposed for mining, but soil borings are necessary to evaluate subsurface conditions and shallow restricting layers."

The course of the creek bed also conforms to the axis of the regional groundwater mound. At this time, Orestimba Creek is the only recharge system in this area, groundwater flows away from its course to the north, east and southeast. Recharge associated with the existing mound would help to preserve the natural and regional groundwater flow regime.

Developing agreements with the gravel mining operations could provide areas ideally suited for recharge. Basins are already at least partially developed and there would not be a need to infiltrate surface water through "fine-grained surficial deposits" as described by KSA. By keeping the surface area of the ponds small, a greater depth of water could be developed which would provide a greater driving force (head) to maximize recharge. One issue that could potentially be troublesome is that the water table is at or near the bottom of some of the gravel mining operations. This may not be a problem as long as a great enough depth of water is maintained to infiltrate the unsaturated sediments above the water table. Nevertheless, this should be studied in greater detail.

Infiltration tests in the area were unattainable or do not exist. KSA developed the table below using an infiltration rate range of 0.5 to 1.0 feet per day.

Infiltration Rate (feet per day)	Recharge Area (acres)	Amount Recharged in 135 Days (acre-feet)
0.5	100	6,750
0.5	200	13,500
1.0	100	13,500
1.0	200	27,000

For a comparison of KSA's infiltration rates, a literature search was conducted to find similar areas and projects to the Orestimba project that may have actual calculated infiltration rates. One paper highlighted a study on a wadi in the Sultantate of Oman (Haimerle et al, 2002) and a study of infiltration and recharge within the Salt River of Arizona (Briggs and Werho, 1966). Haimerle et al conducted tests in the wadi using lysimiters and determined infiltration rates of 5.74 ft/day to 11.6 ft/day. They felt these rates, while correctly measured, should probably be much lower as their tests were not conducted long enough for the water to reach the water table, thus they were not operating under 100% saturated conditions. Briggs and Werho calculated their infiltration rates (0.7 ft/day to 1.4 ft/day) based upon a controlled release of water from an upstream reservoir due to an unusually large flow event. In this case, the riverbed and associated gravel pits were dry at the beginning of the release, but the release was long enough to produce 100% saturation of the sediments and its effect on the water table in the vicinity was monitored. The geology and stratigraphy of the Arizona study would probably be more similar to the Orestimba Project.

- The creek bed and gravel mining areas along Orestimba Creek, according to KSA, would be considered "hydrogeologically suitable for intentional recharge. Coarse-grained deposits are predominant to a depth of at least 100 feet.
- The course of the creek bed also conforms to the axis of the regional groundwater mound.
- KSA estimates infiltration rates range between 0.5 to 1.0 feet per day.

Data Gaps

A thorough review of all groundwater level monitoring programs by Del Puerto Water District, Eastin Water District and Central California Irrigation should be performed to determine those areas with insufficient coverage. Ideally, a relational database should be constructed and maintained to hold all historic and current groundwater level and quality data. This would allow easy access to data for generating hydrographs, water level contour maps (depth and elevation) and also water level change maps.

Geotechnical work needs to be performed in the vicinity of the stream channel and gravel mining operations to determine permeability, porosity and infiltration rates of these areas to be used for groundwater recharge programs.

Constant rate pumping tests should be performed in various areas to determine Transmissivity of the aquifer system. This data would be used to determine the most prolific portions of the aquifer away from the recharge facilities to best locate well fields and make pump in programs to the various canal systems of the area more efficient.

0 1,000 2,000 Feet

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Legend

Orestimba Creek

Study Area - Half Mile Buffer

Aerial Photo - USDA NAIP 2010

Orestimba Creek Recharge & Recovery Project Study Area

San Joaquin River Exchange Contractors Water Authority

W:\Clients\San Joaquin River Exch Contractors Auth -3495\349513B2-Orestimba Creek Recharge-Recovery\GIS\Map\Orestimba Creek Project.mxd

Figure 1

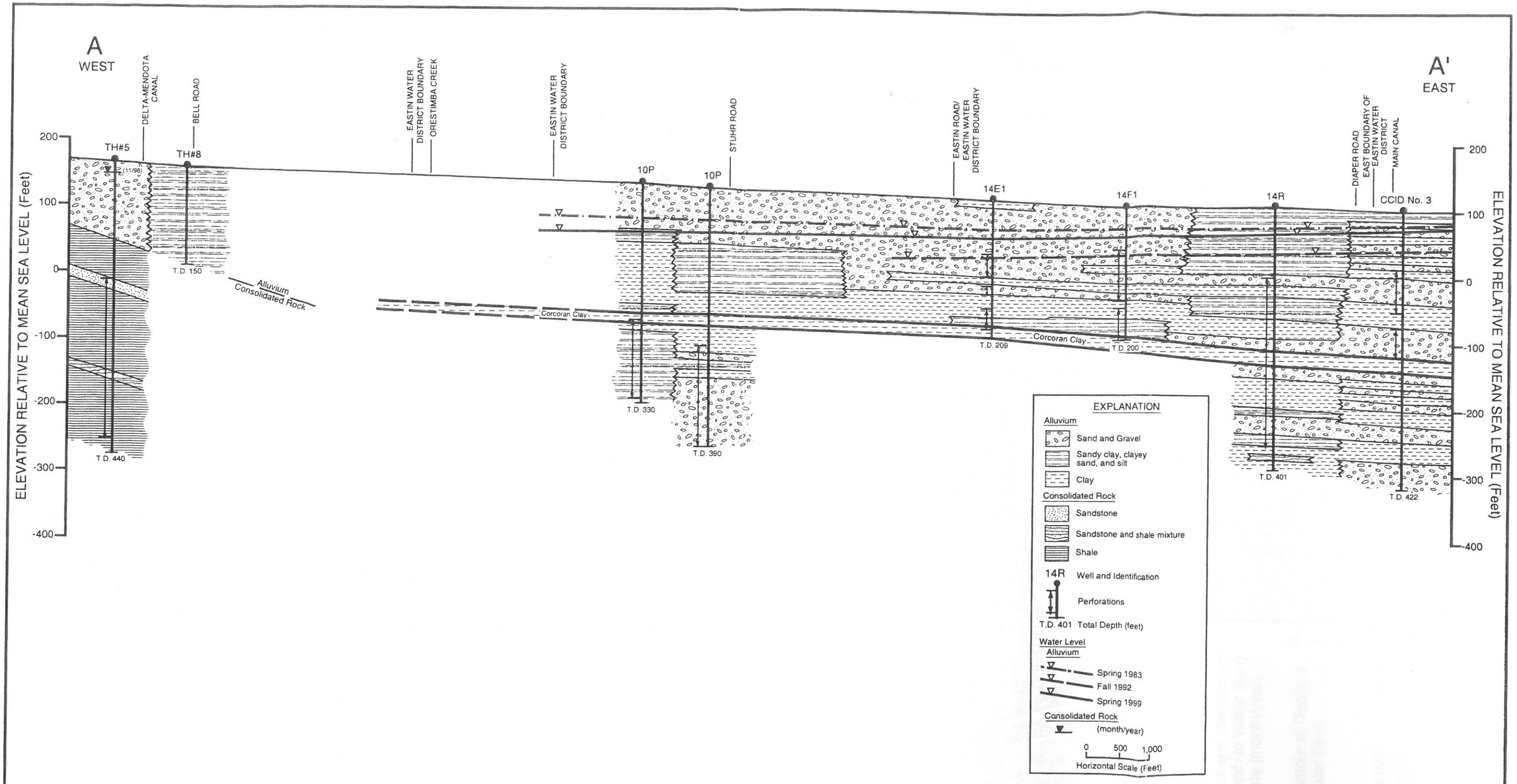


FIGURE 2 - SUBSURFACE GEOLOGIC CROSS SECTION A - A'

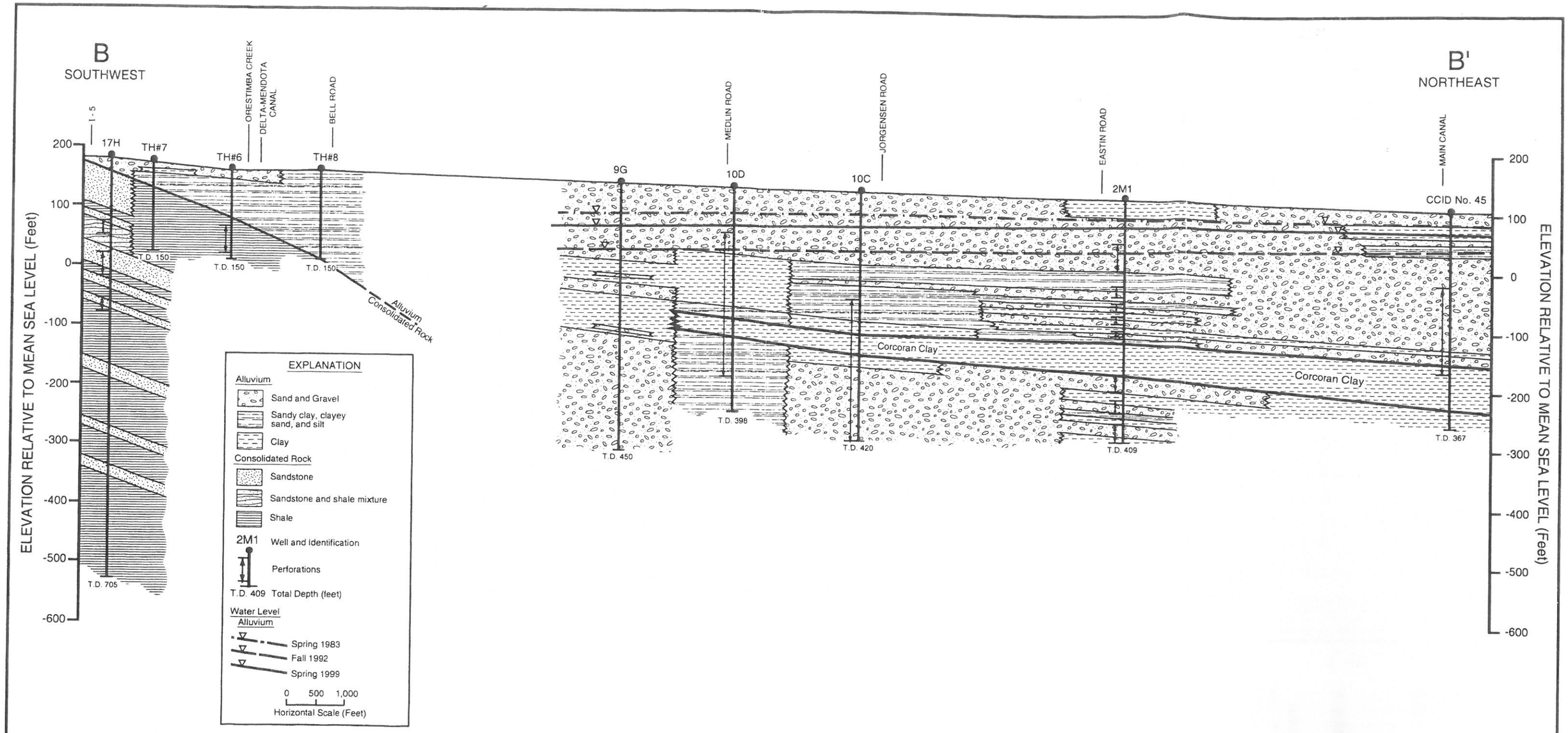


FIGURE 3 - SUBSURFACE GEOLOGIC CROSS SECTION B - B'

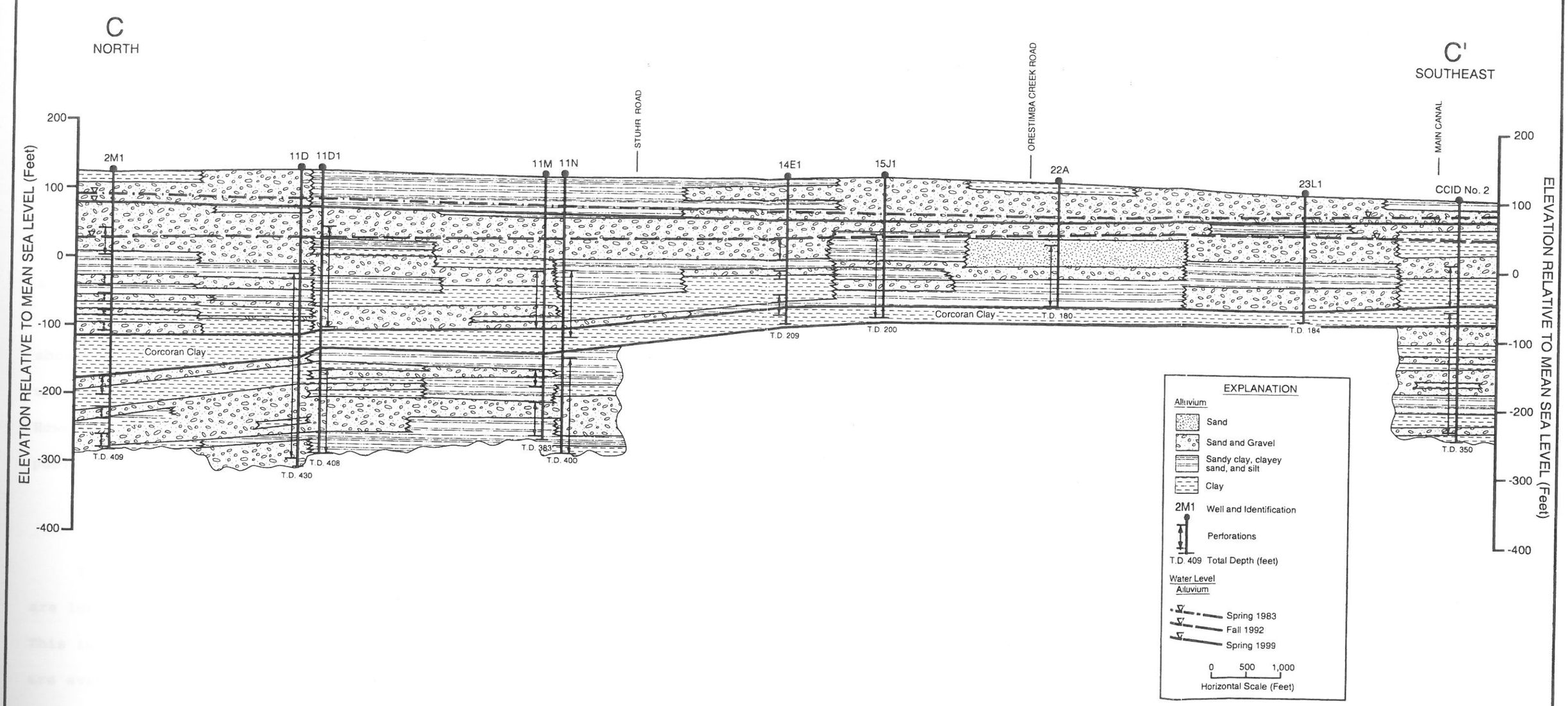
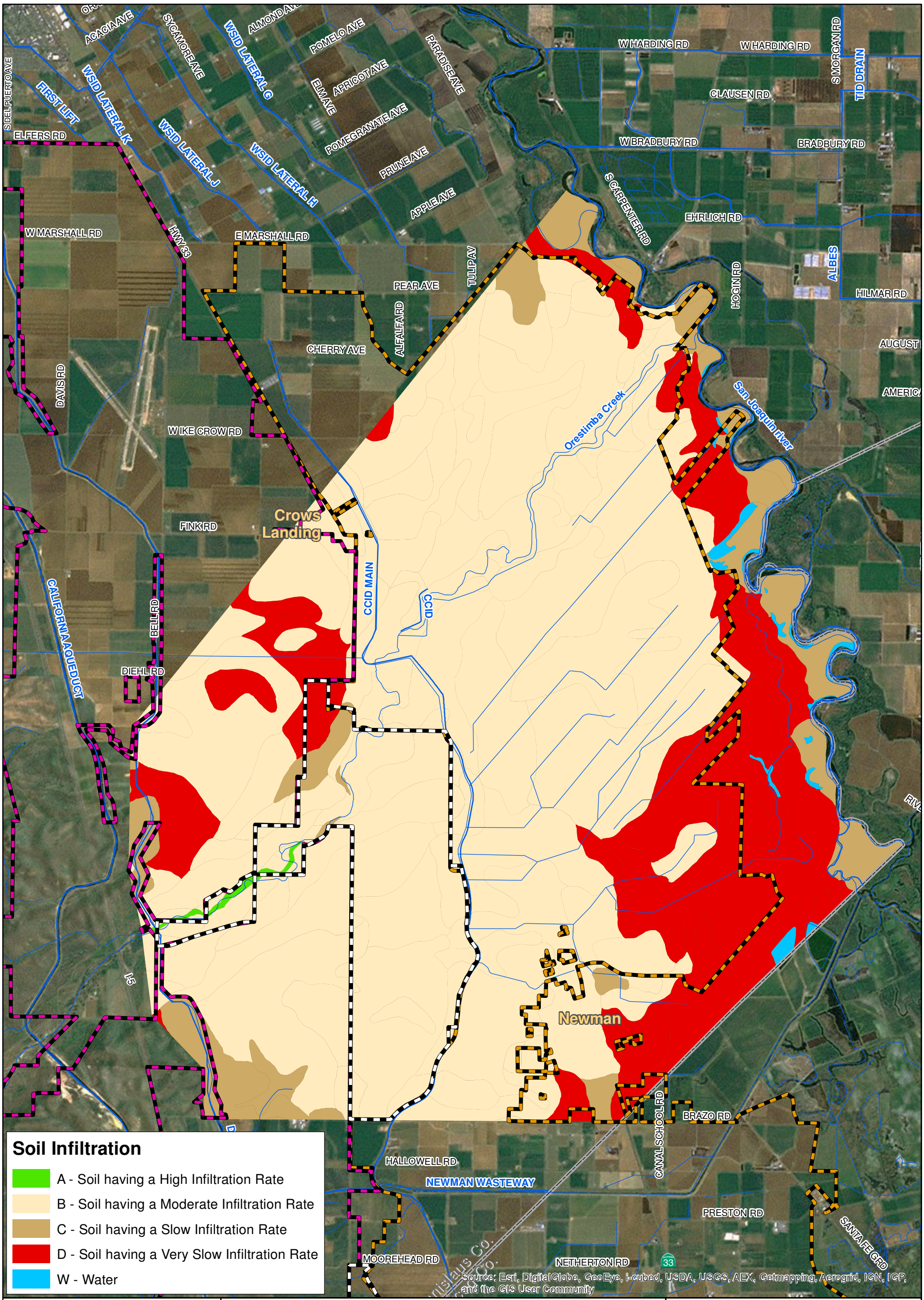


FIGURE 4 - SUBSURFACE GEOLOGIC CROSS SECTION C - C'



0 3,000 Feet

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Legend

- Eastin Water District
- Del Puerto Water District
- Central Californa Irrigation District

Aerial Photo - USDA NAIP 2010

Soil Infiltration Map

Orestimba Creek Area

Figure 5

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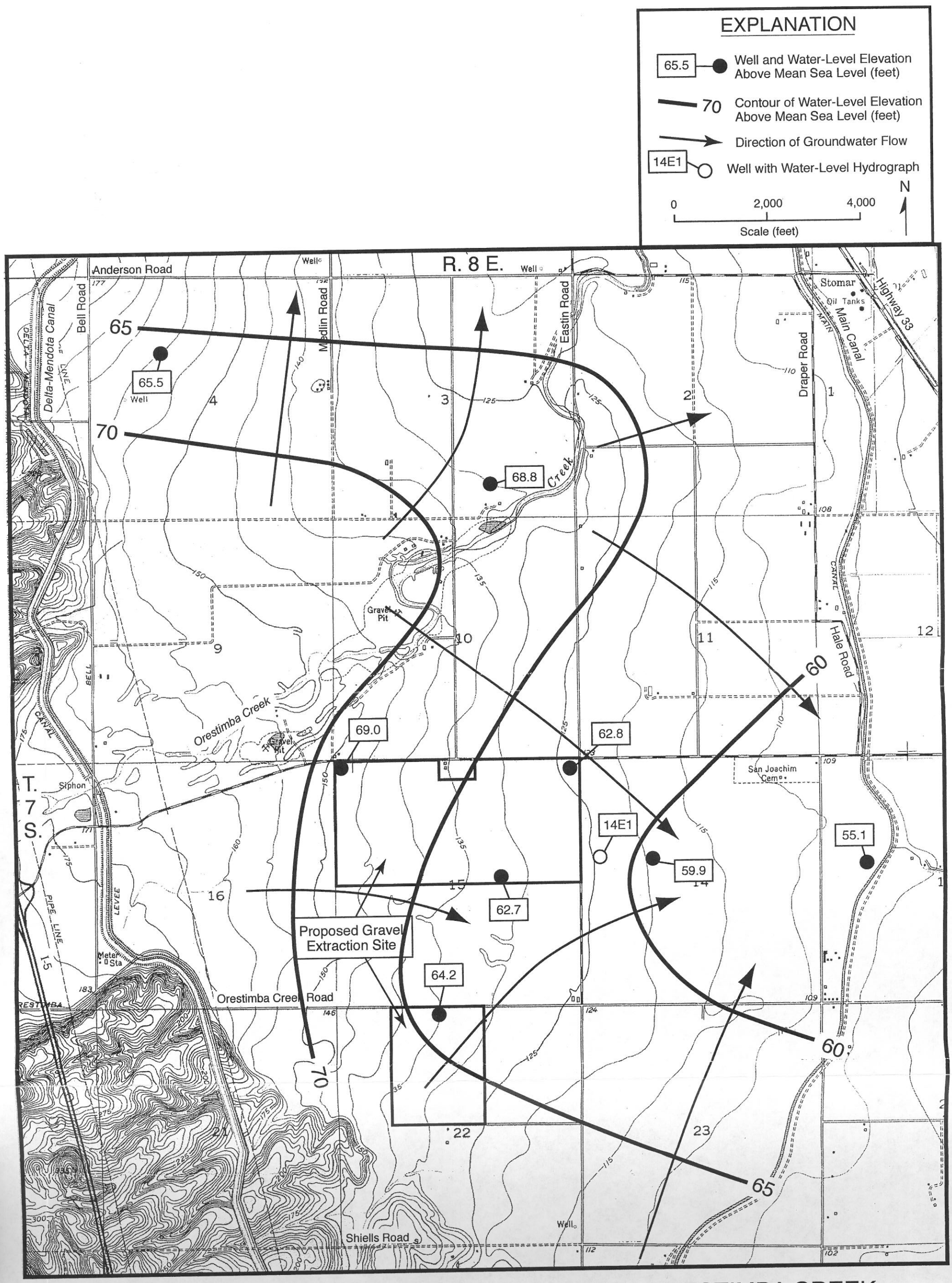
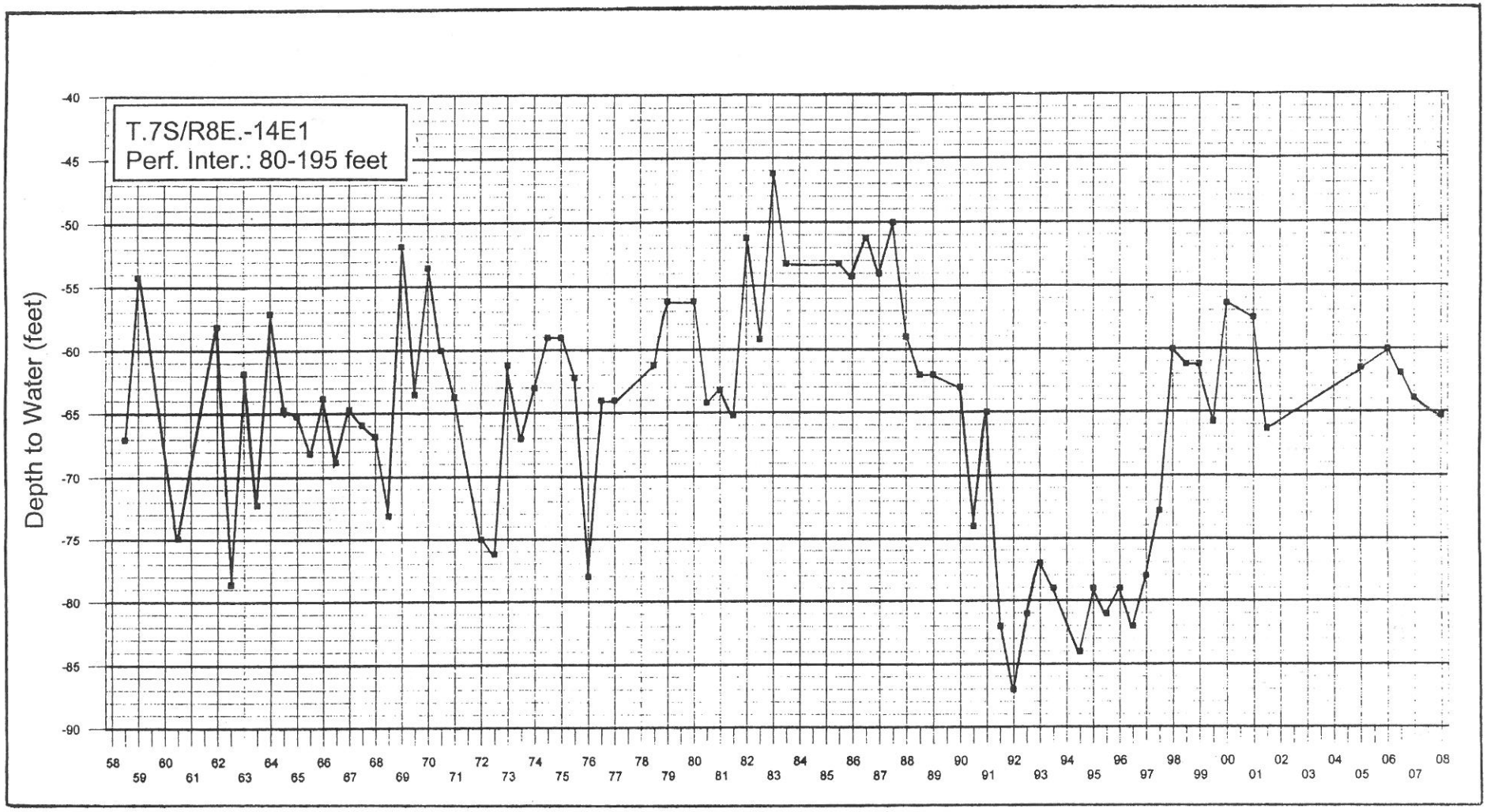


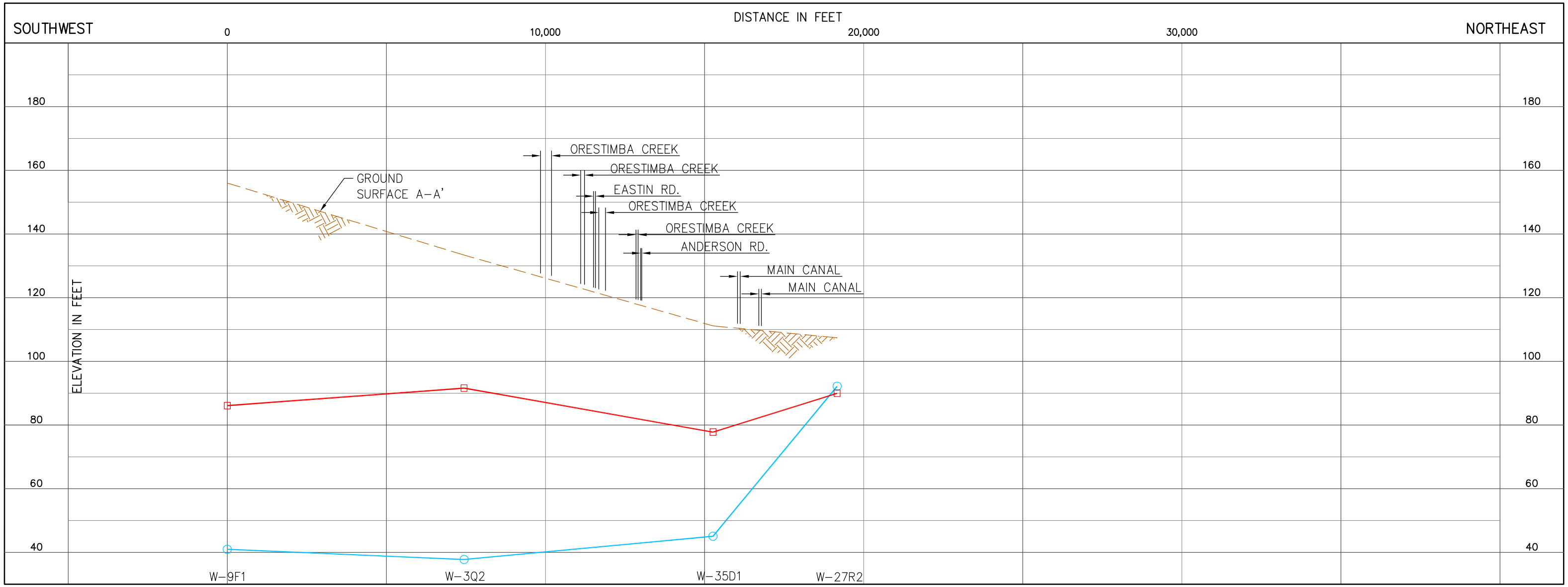
FIGURE 6 - WATER-LEVEL ELEVATION MAP FOR ORESTIMBA CREEK AREA FOR SPRING 2008

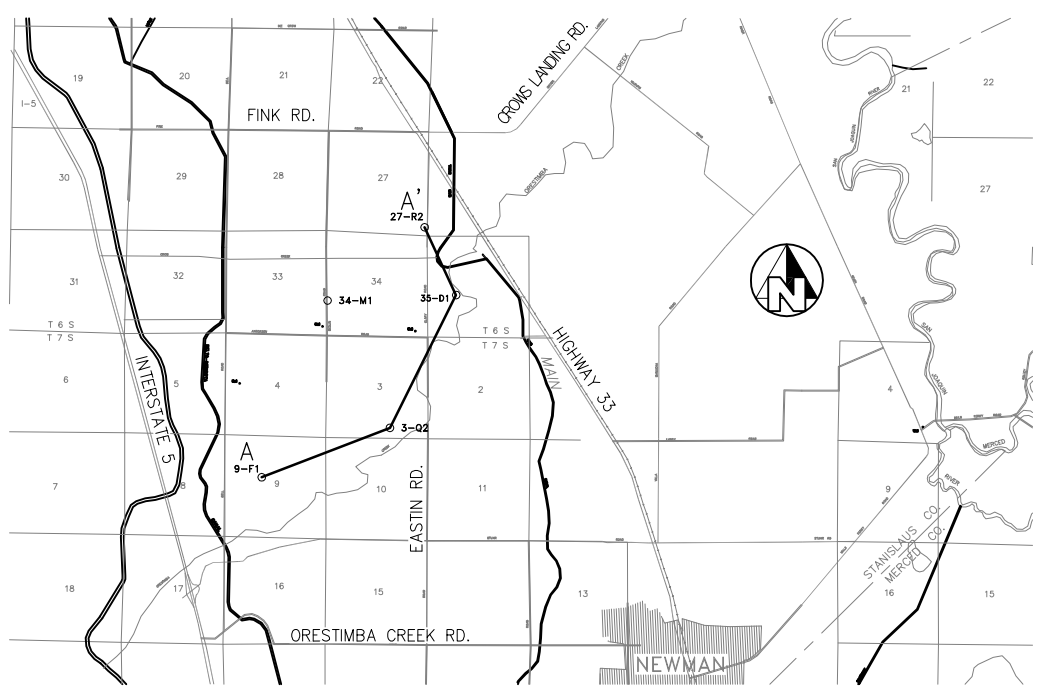


Modified from CCID

FIGURE 7-LONG-TERM WATER-LEVEL HYDROGRAPH FOR SUPPLY WELL IN ORESTIMBA CREEK AREA

WATER LEVEL PROFILE A–A'





SITE MAP
NOT TO SCALE

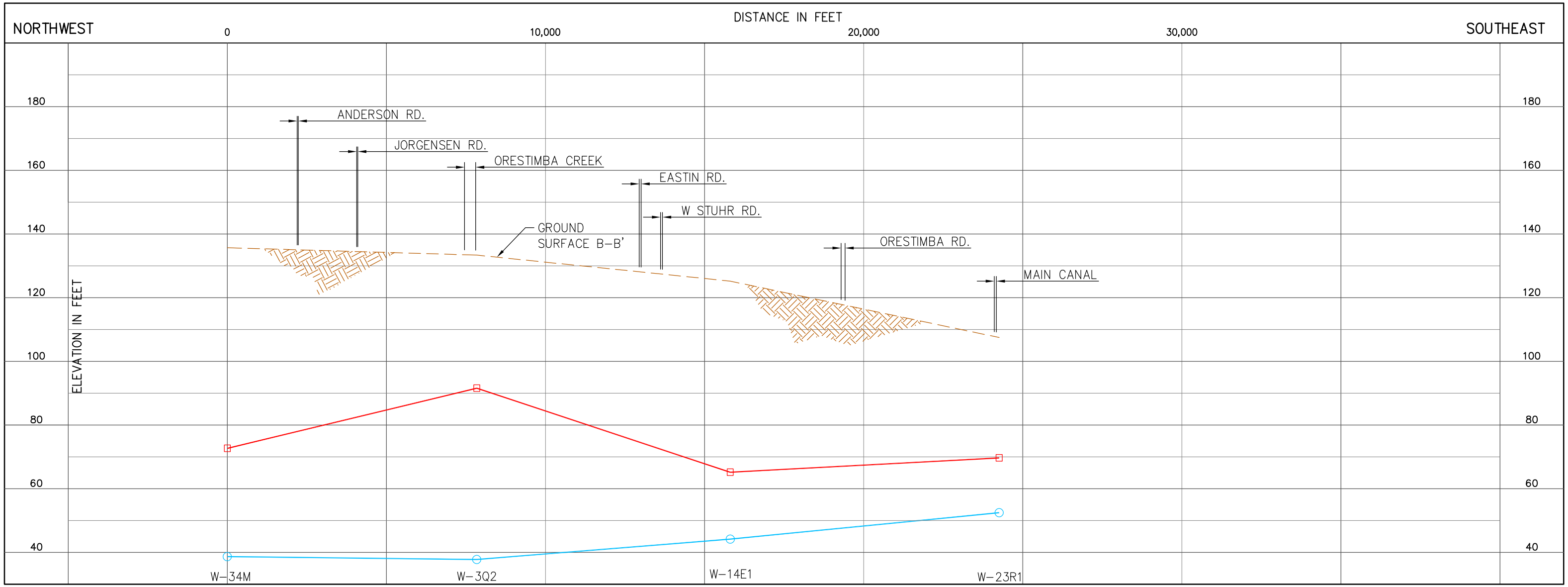
HORIZONTAL SCALE IN FEET
1" = 3000'
0 3,000

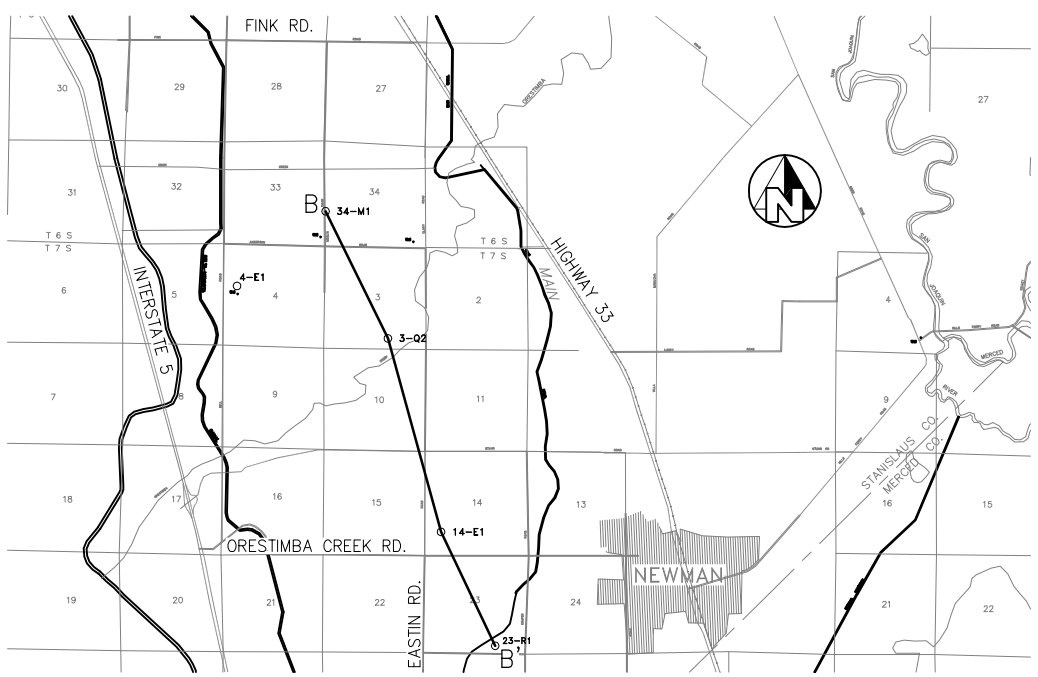
VERTICAL SCALE IN FEET
1" = 30'
0 30

LEGEND

- GROUND SURFACE A–A'
- A–A' GROUND WATER ELEVATION–1992
- A–A' GROUND WATER ELEVATION–1998

WATER LEVEL PROFILE B–B'





SITE MAP
NOT TO SCALE

HORIZONTAL SCALE IN FEET
1" = 3000'
0 3,000

VERTICAL SCALE IN FEET
1" = 30'
0 30

LEGEND

- GROUND SURFACE B–B'
- B–B' GROUND WATER ELEVATION–1992
- B–B' GROUND WATER ELEVATION–1998

Appendix 2.3 – Newman LID Project for Water Quality Improvement and Water Conservation Supporting Documentation

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DRAFT TECHNICAL MEMORANDUM

CITY OF NEWMAN STORM DRAIN CONVEYANCE ANALYSES

Date: April 22, 2013 Project # J13015

To: Garner Reynolds, Public Works Director
From: Alison Furuya, P.E.; Jeff Black, P.E.

INTRODUCTION

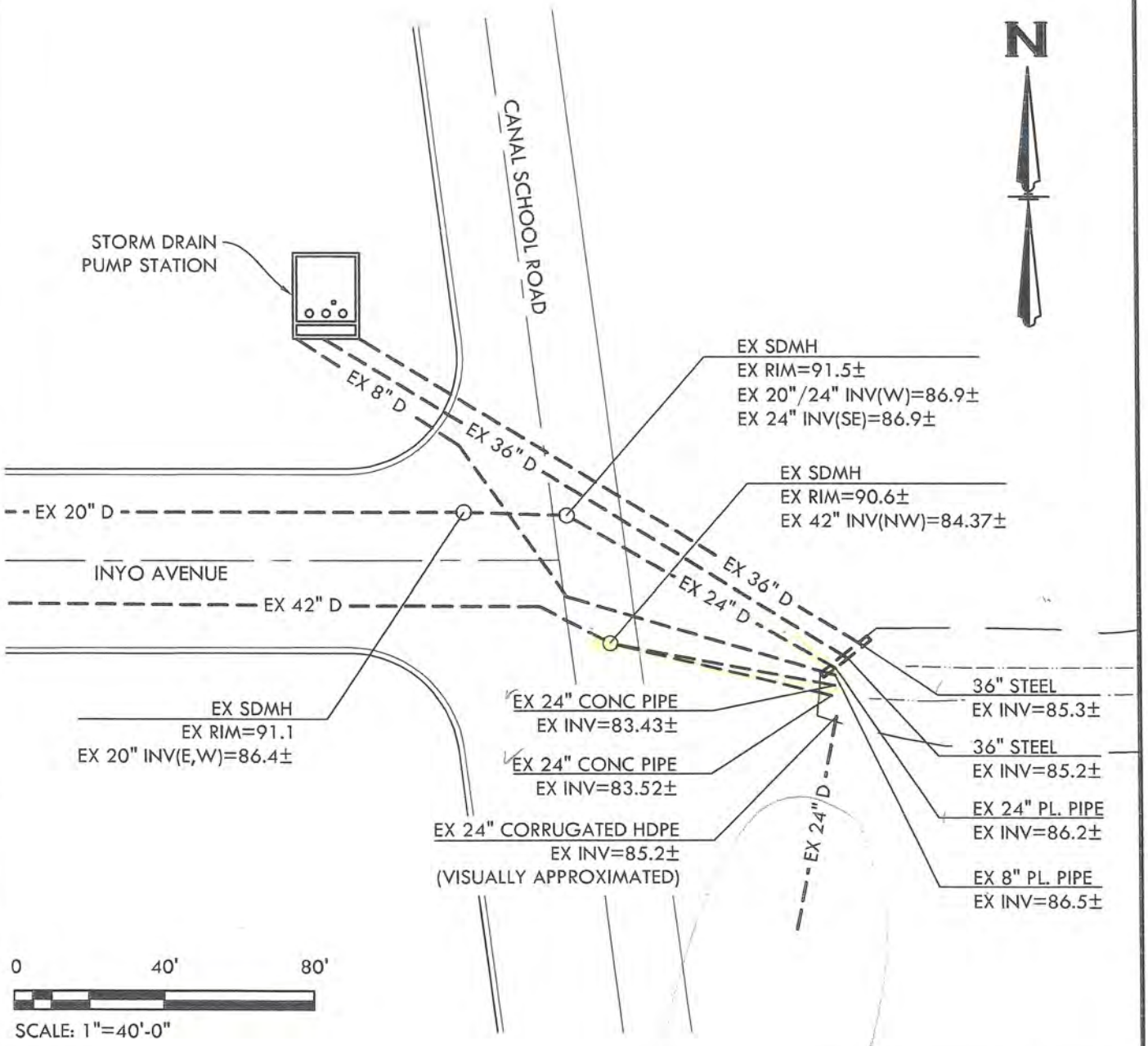
The City of Newman (City) has observed two existing drainage conditions which have raised concerns about potential design or construction deficiencies. The first condition occurs at Inyo Drain, an earthen channel which starts at the intersection of Inyo Avenue and Canal School Road and extends east. The second condition occurs at Sherman Park Basin, located near the intersection of Sherman Parkway and Hills Ferry Road. This Technical Memorandum (TM) summarizes the results of review and engineering analyses conducted for the conditions at Inyo Drain and Sherman Park Basin. Recommendations and comments are provided.

1.0 INYO DRAIN

1.1 Existing Conditions

The beginning of Inyo Drain, located at the intersection of Inyo Avenue and Canal School Road, receives flow from several storm drains. The major flow contributors to the channel are considered to be two 24-in pipes from Inyo Avenue (which combine into one 42-in drain further upstream) and two 36-in pipes from the storm drain pump station located at the northwest corner of Inyo Avenue and Canal School Road (referred to as Inyo Pump Station). The two 36-in pipes, a 24-in pipe, and an 8-in pipe connect to Inyo Drain at a headwall. The approximate inverts and location of the major storm drain contributors to Inyo Drain are presented in Figure 1. The water level in Inyo Drain is controlled by two downstream weirs which overflow into two 24-in corrugated metal pipes. The water level in the drain may also be influenced when the drain transitions to a 42-in culvert underneath an access road. An overview of Inyo Drain is provided in Figure 2.

CITY OF NEWMAN
STORM DRAIN CONVEYANCE ANALYSES



EXISTING STORM DRAIN PIPE

APPROXIMATE TOP OF CANAL

APPROXIMATE BOTTOM OF CANAL

FIGURE 1

INYO DRAIN AND CONTRIBUTING DRAINS

APRIL 23, 2013

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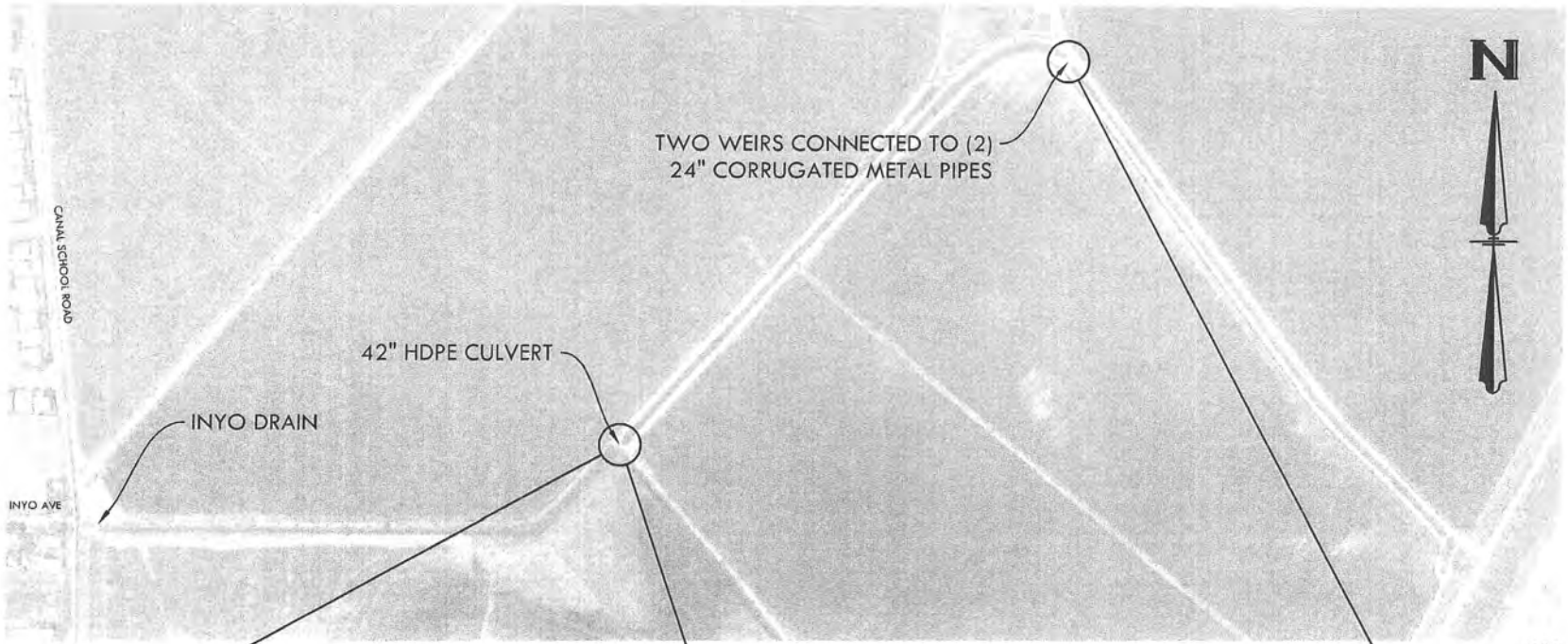
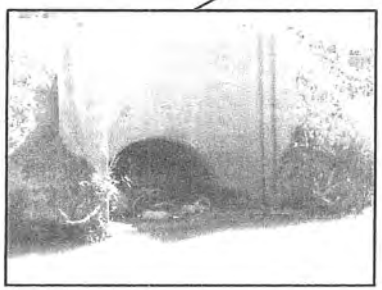
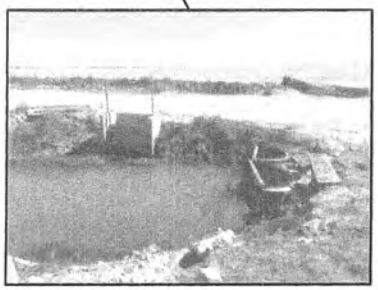
CITY OF NEWMAN
STORM DRAIN CONVEYANCE ANALYSES





WEST SIDE OF CULVERT

EAST SIDE OF CULVERT



WEIRS AND PIPE

FIGURE 2

INYO DRAIN

APRIL 26, 2013

BLACKWATER
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Design information for the major storm drains to Inyo Drain was reviewed and is summarized in Table 1. Design information for Inyo Pump Station is summarized in Table 2. Record design drawings indicate that the bottom of the drain is approximately 82.8 ft and that the ditch was designed to have 1:1 side slopes with a 10 foot bottom width and 30 foot top width [1,2]. Discrepancies between design drawings and field conditions were noted during site visits and a review of photos. The inverts provided in the record drawings indicate that the top of the 24-in pipes are above the invert of the 36-in pipes. However, field observations indicate that the tops of the 24-in pipes are below the 36-in pipe inverts. For this TM, the inverts of the 24-in pipes shown in Table 1 were assumed to be correct because this information appears to have been surveyed.

Table 1 - Design Criteria for Major Storm Drains to Inyo Drain

	Inyo Avenue Storm Drains		Inyo Pump Station Storm Drains	
Diameter, in	24	24	36	36
Slope, ft/ft	0.0152	0.0137	0.0058	0.0058
Material	Concrete	Concrete	Concrete	Concrete
Invert El. @ Inyo Drain	83.43	83.52	84.9	84.93

Sources: Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, November 04, 2001 (Sheet 19 of 20)

Table 2 - Design Criteria for Inyo Pump Station	
Number of Pumps	2
Design Total Dynamic Head (TDH), ft	12
Design Flow, gpm (per pump)	26,000

Note: Design TDH and flow were estimated based on the capacity of the 36-in outfall pipes, the motor size of 100 hp, and the invert elevations for the incoming and outgoing pipes to the pump station listed on Sheets 12 and 19 of the Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2001.

The following adverse conditions have been observed at Inyo Drain: 1) During heavy rainfall, the water level in Inyo Drain rises above the invert of the 24-in drains and has caused overflows in the upstream storm drainage system in the Lucas Ranch II subdivision; 2) Because of the orientation of the 36-in drain pipes at the entrance of Inyo Drain and the velocity in the pipes, erosion occurs at the entrance to the channel; and 3) Channel design capacity appears to be limited by channel geometry, maintained condition, and pipe inlet geometries.

Photos taken on February 12, 2013 and April 29, 2013 of Inyo Drain are presented in Photos 1 and 2, respectively. The downstream portion of the drain had been cleaned in late April 2013. The photos show the following:

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- The lower elevation of the 24-in Inyo Avenue Storm Drains with respect to the other storm drains.

- The 24-in Inyo Avenue Storm Drains are completely to partially submerged, even when flow in the drain is minimal.

- One of the 24-in Inyo Avenue Storm Drains was partially filled with sediment and rocks. City staff are planning to clean the line.

- The water level in Inyo Drain decreased noticeably after the downstream portion of the drain was cleaned based on the difference in water level between the two photos.

Before cleaning

Photo 1: Inyo Drain (February 12, 2013)

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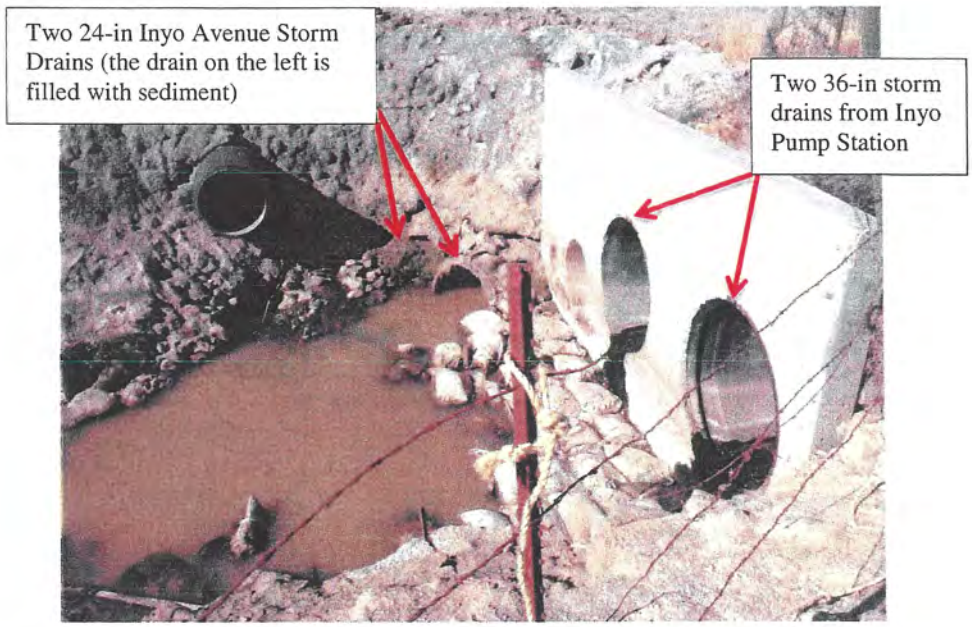

Photo 2: Inyo Drain (April 29, 2013)

1.2 Engineering Analysis

The following section describes the engineering analysis undertaken to address the two conditions.

Channel Geometry to Increase Inyo Drain Capacity

Using the available information for the storm drains and Manning's equation, the capacity of the Inyo Avenue Storm Drains and Inyo Pump Station Storm Drains was calculated and is summarized in Table 3. Appendix A includes detailed calculations. Manning's equation is provided below for reference.

$$Q\ (flow) = \frac{1.49}{n} r^{2/3} \sqrt{S}\, A$$

Where: n = Manning roughness coefficient
r = hydraulic radius
S = slope
A = area of flow

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Table 3 - Required Capacity for Inyo Drain	
Pipe	Flow, cfs
Inyo Avenue Storm Drain[a]	61.5
Inyo Pump Station Storm Drains[b]	114.1
Total	175.6

[a] Flow from Inyo Avenue Storm Drains includes the capacity of the two 24-in pipes, flowing 100% full. The capacity of the two 24-in Inyo Avenue storm drains was compared to the capacity of the upstream 42-in storm drain. Because the two 24-in storm drains are able to convey slightly more flow than the 42-in pipe, the capacity for those two lines was use for the Inyo Avenue Storm Drains.

[b] Flow from two 36-in Inyo Pump Station Storm Drains assumes two pumps running.

The combined capacity of the Inyo Avenue Storm Drain and Inyo Pump Station Storm Drain was equated to be the total capacity required for Inyo Drain. According to Manning's Equation, the flow conveyed by a channel is dependent on the roughness of the channel, the slope, and the shape of the channel. The following assumptions were used to calculate the water depth in Inyo Drain for various flows:

1. A Manning's Roughness coefficient of 0.035, typical for a stony, cobbled earth channel [3].

2. A uniform channel cross-section based on the historical record drawings (10 foot bottom width; 1:1 side slopes).

3. A uniform vertical slope. The channel slope was estimated based on available aerial photographs from Google Earth for the channel. The aerial photograph showed a 3 foot drop in elevation over a 2,000 foot distance.

Table 4 presents the approximate flow in the drain for various water depths.

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Table 4 - Capacity of Inyo Drain for Various Water Depths	
Water Depth, ft	Flow, cfs
2	52.6
3	105.8
3.5	138.7
4	175.8
5	263.3
6	369.0
7	493.9
8	638.8

According to the estimates, the design geometry of the drain should have sufficient capacity to convey the major flows with a water depth of 4 feet. Record design drawings indicate that with a water depth of 4 feet in the drain, overflows should not occur in Lucas Ranch. However, depths higher than 4 feet would potentially cause upstream overflows. Reasons for having a higher water depth in the drain or upstream overflows may be due to:

1. Downstream hydraulic controlling features (such as the 42-in culvert and weirs).
2. Overgrowth of vegetation and sediment buildup in the drain which increase the Manning's coefficient, reduce the cross-sectional area, and increase the bottom elevation of the drain.
3. One of the 24-in storm drains being filled with sediment, restricting the capacity of Inyo Drain (as seen in Photo 2).

Item 2 has recently been addressed and Item 3 will be addressed by City staff in the near future. With the completion of these two tasks, some of the issues at Inyo Drain may be resolved. Monitoring of the situation during the next winter season will determine if further analysis is necessary.

Channel Durability Improvements

The flow from the Inyo Pump Station Storm Drains has caused observable erosion on the sides of Inyo Drain. The calculated velocity from the 36-in Inyo Pump Station Storm Drains is approximately 8 feet per second. Erosion of the channel could be reduced by reducing the velocity from the pipes, changing the orientation of the flow to be parallel with the channel, or adding more erosion control. The following improvements would reduce erosion at this location:

1. Increase the width of the drain at this location.

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2. Extend the connecting storm drains and use fittings to modify the angle at which the pipes enter Inyo Drain. Backfill the area where the pipes are extended.

3. Add gunite slope protection or rip rap to the side slopes and bottom where the storm drains enter the drain.

During a site visit on April 29, erosion under the lower edge of the existing gunite slope protection was observed (see Photo 3).

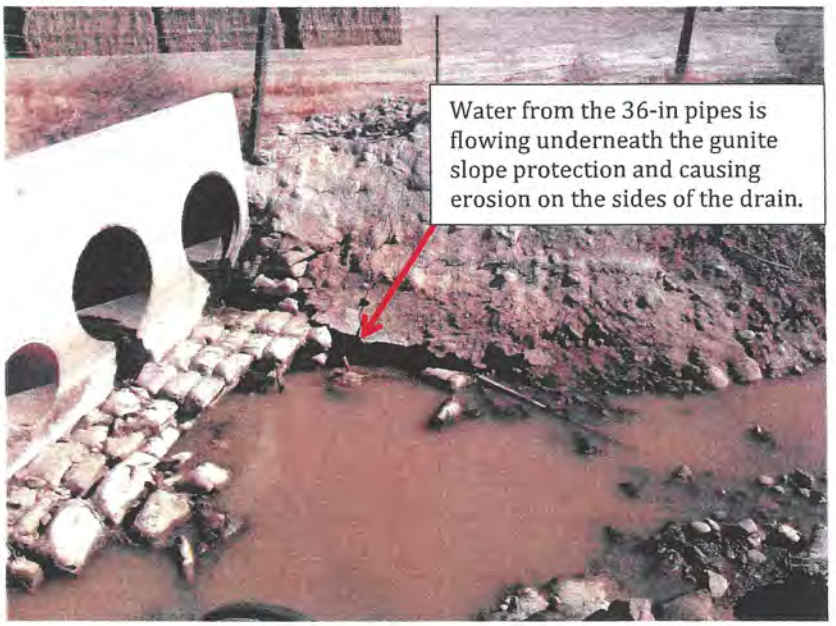

Photo 3: Erosion at Inyo Drain (April 29, 2013)

Application of additional slope protection in the lower portion of the drain is recommended for the near-term to minimize degradation of the drain and also address potential safety issues for maintenance personnel.

Potential Follow-up Tasks
The engineering analysis conducted for this TM used a simplistic methodology for determining improvements to the drain. Completion of the following follow-up tasks would allow for a more thorough analysis of the drain and/or improve the performance of the drain:

1. Increase maintenance of the downstream portions of Inyo Drain. Debris was observed at the 42-in culvert transition. Photos 1 and 2 illustrate the beneficial effect that maintenance can have on the water level in the drain.

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2. Clean the sediment and debris out of the southerly 24-in drain between the headwall and the upstream manhole where the two 24-in pipes transition to one 42-in pipe.

3. Monitor and note the water level in Inyo Drain during wet weather conditions. Water level information would assist in determining if the 24-in and 42-in drains are capacity limited.

4. Survey the channel to obtain more detailed information on the geometry and elevations of the drain.

5. Conduct a hydraulic analysis of the downstream 42-in culvert transition and 24-in weirs to determine the effect of these features on the water level in the channel.

6. Analyze the tributary watershed area to the 42-in storm drain on Inyo Avenue to determine if the storm drain has sufficient capacity.

7. Determine if the downstream weirs can be lowered.

2.0 SHERMAN PARK STORM DRAIN BASIN AND PUMPING STATION

2.1 Existing Conditions

Sherman Park Storm Drain Basin and Pumping Station was designed in 2001, as part of the Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch [4]. The basin receives flow from a storm drain channel located along Sherman Parkway, which is routed into a 54-in reinforced concrete pipe along Hills Ferry Road prior to entering the basin. Information regarding the tributary drainage area to the channel was not reviewed. Table 5 summarizes design criteria for the sizing of the storm drain retention facilities. Table 6 summarizes design criteria for the pump station. Standards used to develop the design criteria were not indicated on the available documents.

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Table 5- Sherman Ranch Storm Drain Basin Design Criteria		
Parameter	Unit	Value
Design Storm		50-year, 24-hour
Coefficient of Runoff (C)	-	0.372
Area	acres	222.04
Rainfall for Design Storm (R)	inches	2.18
Volume Required[a]	acre-feet	15
Volume Provided in Basin	acre-feet	12.8
Volume Provided in 54-in Pipeline	acre-feet	0.5
Volume Provided in Channel	acre-feet	6.3
Total Volume Provided	acre-feet	19.6

[a] Volume required calculated using the following equation: V = CAR/12
Source: Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch Subdivision, Associated Engineering, Inc., 12/6/04 (Sheet 8 of 12)

Table 6- Sherman Park Storm Drain Pump Station Design Criteria		
Parameter	Unit	Value
Number of pumps:	-	2
Wet well diameter:	feet	6 ft
Pump manufacturer and model:	-	Flygt NP3153x434
Design flow:	gpm	1,400
Design head	feet	29
Power requirements:	-	15 hp, 460V, 3 phase

Source: Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch Subdivision, Associated Engineering, Inc., 12/6/04 (Sheet 11 of 12)

Following a storm which delivered 0.94 inches and 1.34 inches of rain on December 22 and 23, 2012 (approximately equivalent to a 10-year storm), the storm drain basin was observed to be nearly full. City staff were interested in reviewing construction drawings and design calculations for the basin and pump station, and comparing the design criteria to published design standards.

4.2 Engineering Analysis

The design criteria for Sherman Park Storm Drain Basin and Pumping Station were compared to the Stanislaus County Standards and Specifications, 2007 Edition (County Standards). County Standards pertaining to storm drain basin and pump station design are summarized below and included in Appendix B.

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Storm Drain Basin Volume Design Criteria

Drainage facilities shall have the capacity to hold the total runoff from a 50 year frequency, 24 hours storm. The volume shall be determined with no allowance for percolation or outlet facilities using the following basic formula:

$$V = \frac{CAR}{12}$$

V: *Volume in acre-feet*

C: *Coefficient of Runoff*

A: *Area in acres (the total tributary area, expressed in acres, that will contribute runoff to the drainage system, regardless of the limits of the development under construction*

$R_{(50)}$: *2.33 times M.A.P. divided by 10.9*

M.A.P.: The mean annual precipitation for the design area in question. Coefficient is extrapolated from Plate 4-B.

Storm Drain Basin Pump Station Design Criteria

A drainage facility must be emptied of a 10 year event storm within 48 hours by outlet facilities providing positive drainage or through percolation...

The volume for the 10-year frequency, 24 hours storm shall be determined using the following formula:

$$V = \frac{CAR}{12}$$

V: *Volume in acre-feet*

C: *Coefficient of Runoff (values between 0.0 and 1.0 which are to be extrapolated from County Standards Table 4.2)*

A: *Area in acres (the total tributary area, expressed in acres, that will contribute runoff to the drainage system, regardless of the limits of the development under construction*

$R_{(10)}$: *1.88 times M.A.P. divided by 10.9*

M.A.P.: The mean annual precipitation for the design area in question. Coefficient is extrapolated from Plate 4-B.

Using the County Standards, volume and capacity requirements for the Sherman Park facilities were calculated. Table 7 summarizes the results of the calculations and compares the results to the design criteria for the facilities (presented in Tables 5 and 6). Detailed calculations are included in Appendix B.

605 Standiford Ave., Suite N • Modesto, CA 95350 • p. 209.322.1817 f. 209.222.4088

Table 7 - Comparison of Storm Drain Facility Calculations with Design Criteria			
Parameter	Unit	Calculated Value	Design Criteria
Required basin volume	acre-feet	14.9	15
Required pump station capacity	gpm	1,357	1,400

The following observations are noted from the review of design criteria for the facilities and the engineering analysis:

1. Calculations using the County Standards are similar to the design criteria for the facilities.

2. The calculated storage volume required for a 50-year, 24 hours storm is only 25 percent more than the calculated storage volume required for a 10-year, 24 hour storm (14.9 ac-ft versus 12.0 ac-ft, refer to Appendix B). Therefore the basin level may be higher than expected for storms which are less than the 50-year, 24 hour design storm.

3. The tributary area assumed in the design criteria was not reviewed as part of this analysis. If the tributary area was underestimated, the storage volume required would also be underestimated.

4. The Coefficient of Runoff (C) assumed in the design criteria was not reviewed as part of this analysis. C values from the County Standards for single family residences range from 0.35 (for residences over 1.5 acres) to 0.55 (for residences less than 6,000 square feet). The composite C value used for the design criteria was 0.372. A low C value would result in underestimating the storage volume.

5. The overall capacity of the Sherman Park drainage facilities could be increased by either adding storage or increasing the pump station capacity. Increasing the pump station capacity is probably the more cost effective option.

REFERENCES

[1] White, Frank M. *Fluid Mechanics*, McGraw-Hill, Inc. 2nd ed. 1986.

[2] Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch, Associated Engineering, Inc., December 6, 2004.

[3] White, Frank M. *Fluid Mechanics*, McGraw-Hill, Inc. 2nd ed. 1986.

[4] Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch, Associated Engineering, Inc., December 6, 2004.

APPENDIX A
INYO DRAIN
DETAILED CALCULATIONS

S = Slope in feet per foot
$ = Cubic feet per second
Q = Gallons

NORTH

INYO STREET

CANAL SCHOOL ℄

Install MH.

6 South of Inyo St ℄

Install MH

Install MH

Install MH

NOTE: AS BUILT DATA IS IN VERTICAL LETTERING.

CITY OF NEWMAN
STORM DRAIN
SCALE NOTED MAR 1964
DESIGN BY Oliver Deatsch RE 6693
CITY ENGINEER

END UNIT No. 1.

Sta 51+01.45, Inv. 85.92, Rim 93.34 (per writing in pencil)
Extrapolated invert from O'Dell info, 84.95

Sta 54+83, Inv. 85.30
Extrapolated invert from O'Dell info 84.81

Sta 58+93, Inv. 85.30
Extrapolated invert from O'Dell info, 84.65

Sta 63+10,
Inv. 84.8 (extrapolated from upstream and downstream inverts)
Extrapolated invert from O'Dell info, 84.50

Sta 66+40,
Inv. 84.40
O'Dell drawings list 84.37

42" No-Joint
54+83
Surface
42" Pipe.
85.56
47+00.80
West edge
85.90
54+82 85.30
85.28
51+01.45
West edge
54+99.19 MH
West edge
85.30
58+93.31 MH
West edge
As-Built Grade
63+05.01 MH
West edge
83.49
84.40
90
88
86
84
82
80
50
55
60
65
COMPRESSED
SHEET 1. OF 2

FILE - F. A. S.
... CO., S. F. CAL.
NO. 1000H-2

Source: City of Newman Storm Drain, City Engineer RE 6693, March 1964 (Sheet 1 of 2)

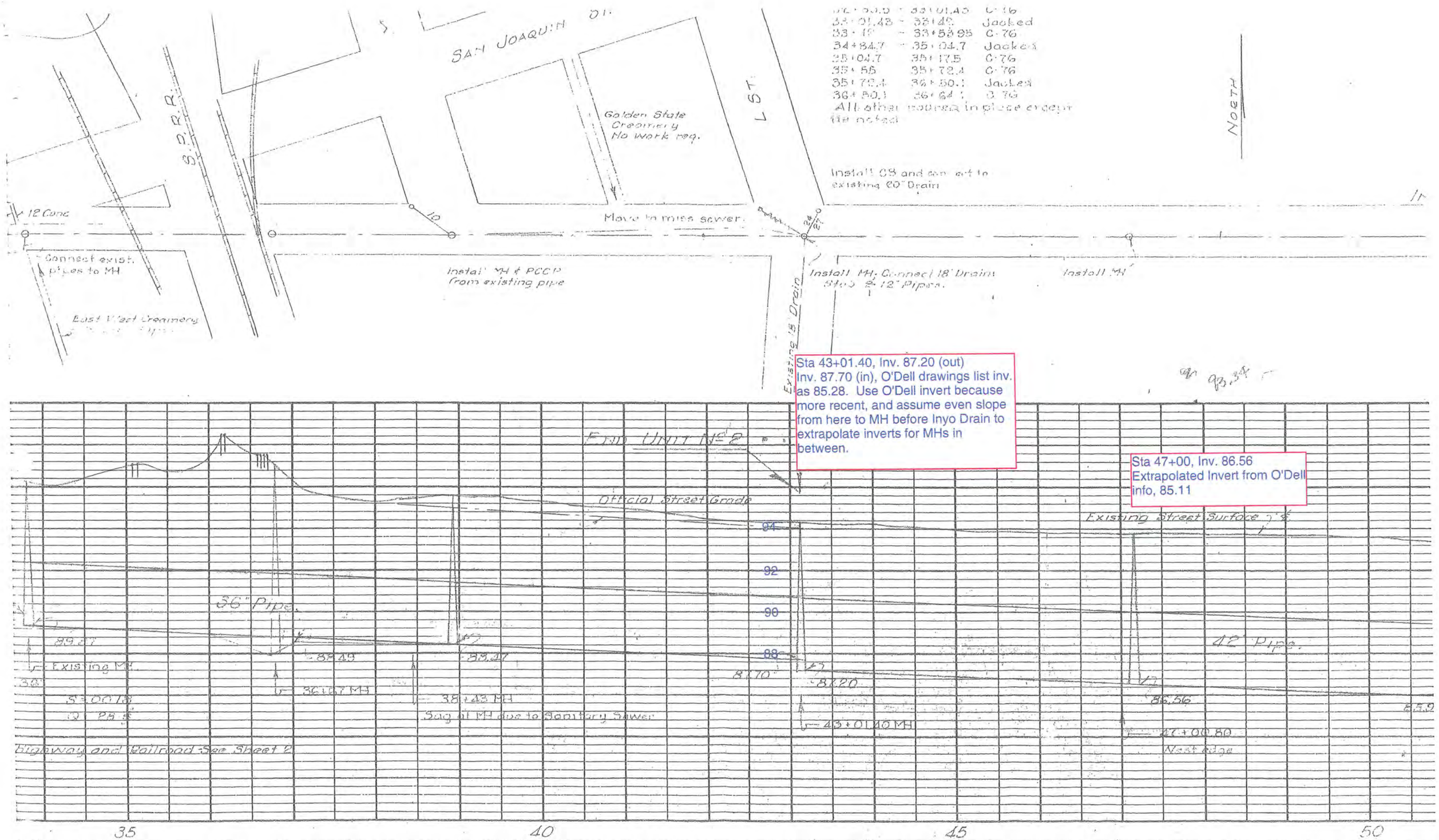
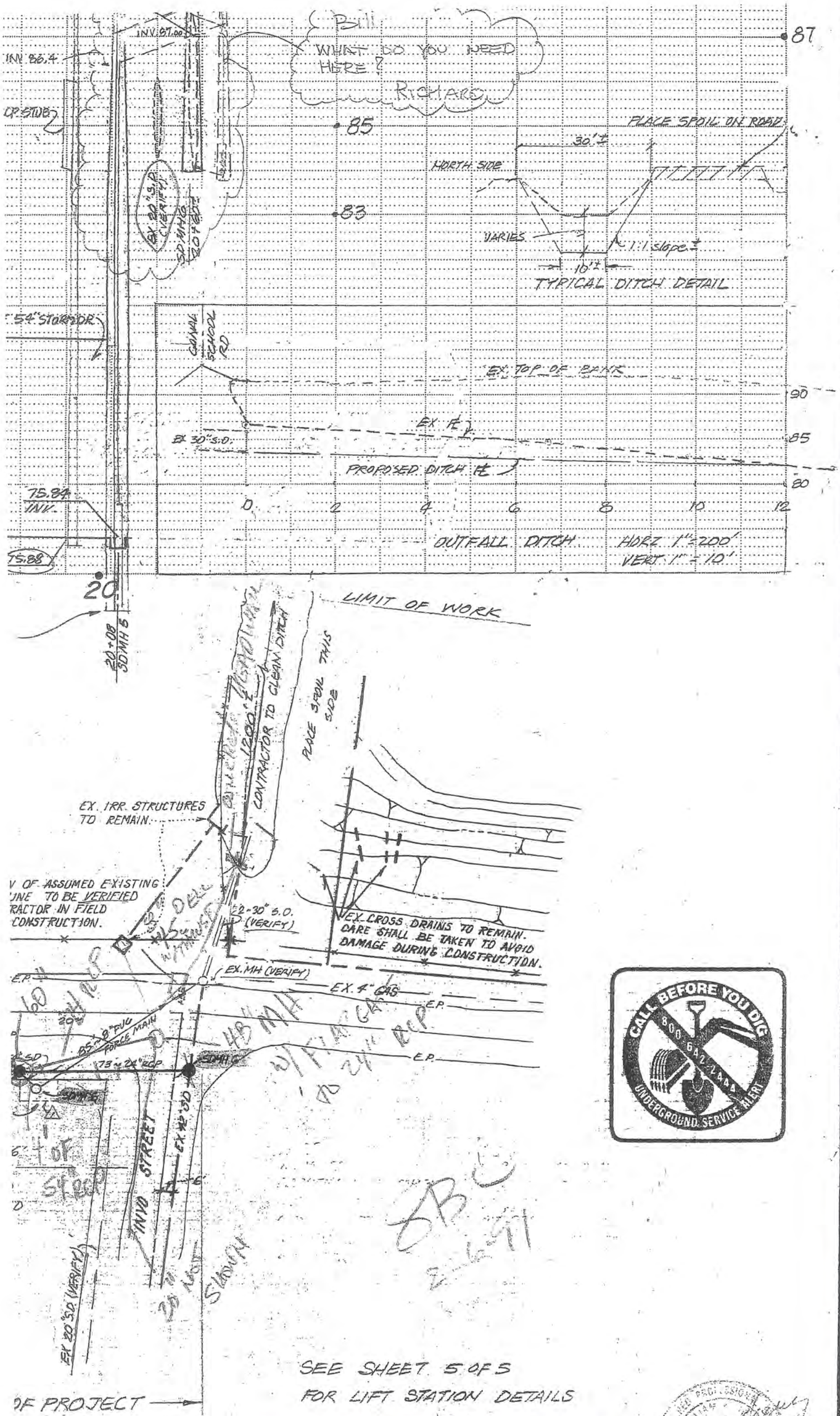


PLATE 2 - PLAN - PROFILE - F. A. S.
CLEARPRINT PAPER CO., S. F. CAL.

NO. 1000H-2



SEE SHEET 5 OF 5
FOR LIFT STATION DETAILS

Source: City of Newman Canal School Road Storm Drain, Garcia & Henry, Inc, 8-6-90, Sheet 4 of 5

LAND DEVELOPMENT & SURVEY
7423 MONTEREY ST., GILROY, CALIFORNIA (408) 847-3000
LIFT STA @ CANAL & INVO

1"=2' VERTICAL
1"=40' HORIZONTAL

10 11 12 13 14

CANAL SCHOOL ROAD
(SEE SHEET 12)

PROPOSED LIFT STATIONS, SEE VERONA OFF-SITE PUMP STATION PLANS FOR DETAILS.

PROPOSED SEWER LIFT STATION

SEE SHEET 12 FOR STORM DRAIN MH & PIPE PROFILES.

PROPOSED STORM DRAIN LIFT STATION

PROPOSED FENCE

EX.10"PL.PIPE
EX.INV.(SE)=89.0±

EX. SDMH
EX.RIM=91.1±
EX.24"INV.(N)=?
EX.20"INV.(E,W)=86.4±

FUTURE CURB AND GUTTER

EX. MAILBOX

EX.20"D

EX. MAILBOX

EX.SPD. LIMIT SIGN

EX.42"D

EX.GAS

EX.STOP SIGN

EX.GAS VAULT

EX. SDMH
EX.RIM=90.6±
EX.42"INV.(NW)=84.37±
EX.24"INV.(E)= ? ±
EX.24"INV.(E)= ? ±

APPROX. LOCATION OF EX. GAS LINE. CONTRACTOR TO VERIFY.

INYO AVENUE

EX. PUMP HOUSE/ PUMP & EL. PANEL

EX. 18" CONC. PIPE-END.

EX. 18" CONC. PIPE-TO N.

EX. 10" MET. PIPE-TO PUMP.

EX. 18" CONC. PIPE-TO S.

EX. CONC. IRR. BOX

APPROX. LOCATION OF EX.6"GAS. CONTRACTOR TO VERIFY.

EX. SDMH
EX.RIM=91.5±
EX.20"/24"INV.(W)=86.9±
EX.24"INV.(SE)=86.9±

EX.DEAD END SIGN

EX.GAS WARNING SIGN

EX.24"CONC.PIPE
EX. INV.=83.43±

EX.24"CONC.PIPE
EX. INV.=83.52±

REPLACE REMOVED PORTION OF EX. HEADWALL WITH CONCRETE HEADWALL (SEE SHEET 2)

EX.24"C.P.
EX.INV.=85.8±

EX.24"C.P.
EX.INV.=85.9±

EX. CONC. IRR. BOX

36"R.C.P.
TOP EL.=88.3±

36"R.C.P.
TOP EL.=88.2±

EX.24"PL.PIPE
EX.TOP EL.=88.2±

EX.8"PL.PIPE
EX.TOP EL.=87.2±

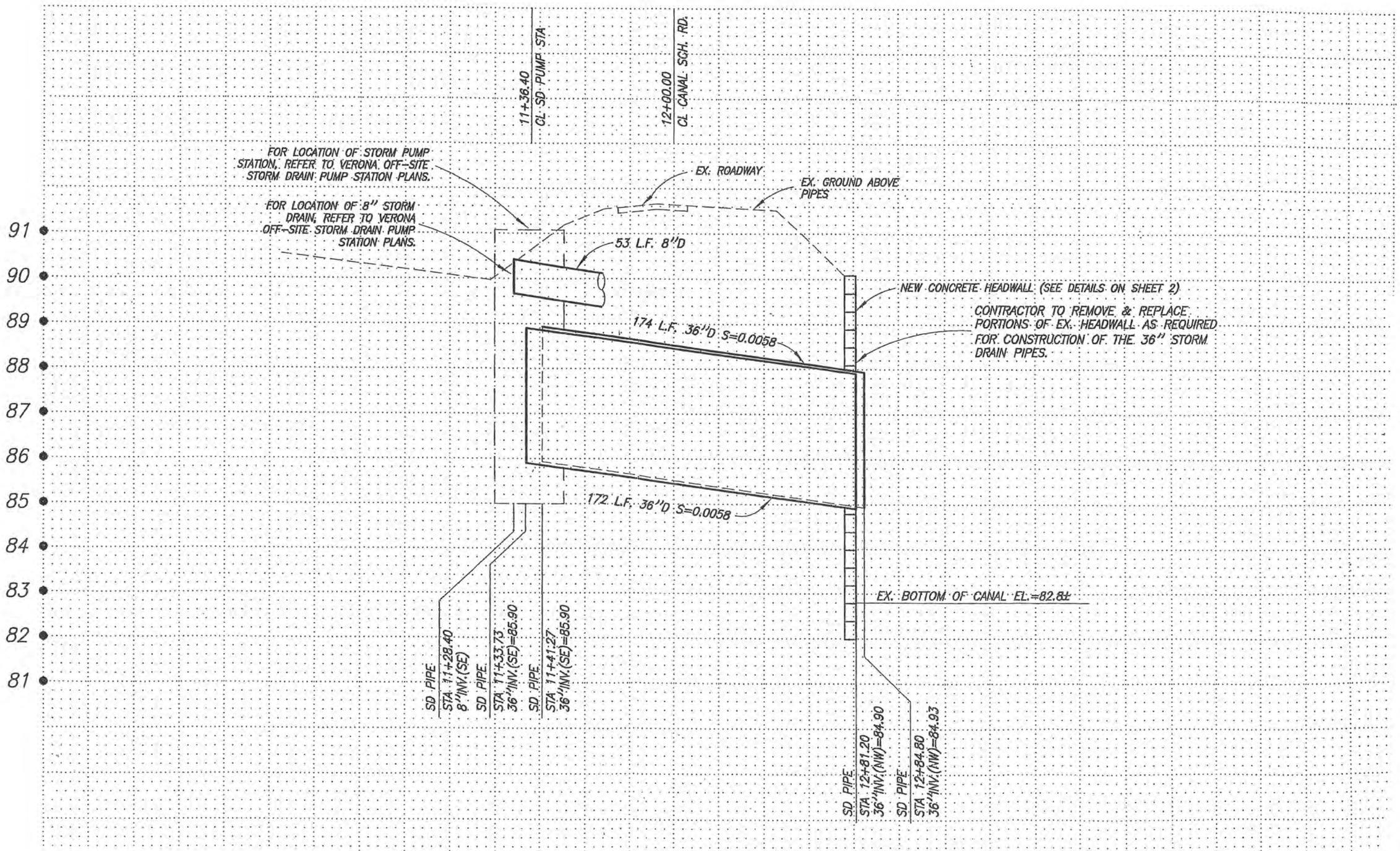
OUTFALL CANAL

SCALE: 1"=40'

STORM DRAIN PIPE OUTFALL DETAILS

REGISTERED PROFESSIONAL ENGINEER
RANDALL A. O'DELL
No. 29547
Exp. 3/31/03
CIVIL
STATE OF CALIFORNIA

CALL BEFORE YOU DIG
USA
800-227-2600


11+36.40
CL SD PUMP STA
12+00.00
CL CANAL SCH. RD.
FOR LOCATION OF STORM PUMP STATION, REFER TO VERONA OFF-SITE STORM DRAIN PUMP STATION PLANS.
FOR LOCATION OF 8" STORM DRAIN, REFER TO VERONA OFF-SITE STORM DRAIN PUMP STATION PLANS.
EX. ROADWAY
EX. GROUND ABOVE PIPES
53 L.F. 8"D
NEW CONCRETE HEADWALL (SEE DETAILS ON SHEET 2)
CONTRACTOR TO REMOVE & REPLACE PORTIONS OF EX. HEADWALL AS REQUIRED FOR CONSTRUCTION OF THE 36" STORM DRAIN PIPES.
174 L.F. 36"D S=0.0058
172 L.F. 36"D S=0.0058
EX. BOTTOM OF CANAL EL.=82.8±
91
90
89
88
87
86
85
84
83
82
81
SD PIPE
STA 11+28.40
8" INV.(SE)
SD PIPE
STA 11+33.73
36" INV.(SE)=85.90
SD PIPE
STA 11+41.27
36" INV.(SE)=85.90
SD PIPE
STA 12+81.20
36" INV.(NW)=84.90
SD PIPE
STA 12+84.80
36" INV.(NW)=84.93

Appendix A
Inyo Drain Calculations

Inyo Avenue Storm Drains

	Pipe A	Pipe B	42-in	Source
Diameter, in	24	24	42	
Downstream Invert	83.43	83.52		Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19
Downstream Top El	85.43	85.52		
Upstream Invert	84.37	84.37		Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19
Distance, ft	62	62		
Slope	0.0152	0.0137	0.0004	
Manning's n	0.0120	0.0120	0.0120	

Notes:
Upstream invert is assumed to be the invert of the 42-in line at the manhole
Distance was calculated based on Sheet 19 from the O'Dell drawings and the scale indicated.
Slope for 42-in was estimated using information from the City of Newman Storm Drain plans, designed by the City Engineer, March 1964 (Sheet 1 of 2). The invert @ Sta 47+00.80 is listed as 86.56 and the invert at Sta 51+01.45 is listed as 85.92.
Markings on the plans indicate that the installed slope may be less steep than originally designed.

Capacity Calculations:

			Pipe A			Pipe B			Pipe A + Pipe B		42-in		
d/D	Area/D^2	Hydraulic radius/D	Flow, cfs	Flow, gpm	Velocity, fps	Flow, cfs	Flow, gpm	Velocity, fps	Flow, cfs	Flow, gpm	Flow, cfs	Flow, gpm	Velocity, fps
0.50	0.3927	0.2500	15.13	6,790	9.63	14.39	6,790	9.16	29.52	13,580	10.64	4,776	2.2
0.60	0.4920	0.2776	20.33	9,122	10.33	19.33	9,122	9.82	39.65	18,244	14.30	6,417	2.4
0.70	0.5872	0.2962	25.33	11,368	10.78	24.09	11,368	10.25	49.42	22,736	17.82	7,997	2.5
0.80	0.6736	0.3042	29.58	13,274	10.98	28.13	13,274	10.44	57.70	26,549	20.81	9,338	2.5
0.90	0.7445	0.2980	32.24	14,472	10.83	30.66	14,472	10.30	62.91	28,943	22.68	10,180	2.5
0.99	0.7841	0.2665	31.52	14,147	10.05	29.98	14,147	9.56	61.50	28,295	22.17	9,952	2.3
1	0.7854	0.25	30.26	13,580	9.63	28.77	13,580	9.16	59.03	27,159	21.29	9,553	2.2

Notes:
Area and hydraulic radius from Appendix E, p.3-43, Civil Engineering Reference Manual for the PE Exam, sixth edition

Inyo Storm Drain Pump Station and Outfalls

Pump Station Data: duplex pump station
100 hp motor

Estimate pump station flow -

Invert of 54" pipe entering pump station	76.78	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 12, profile
Invert of 36" pipe exiting pump station	85.9	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19
Static lift required	9.12	
Estimated friction loss	2	
Estimated TDH	11.12	
Assumed motor efficiency	0.9	
Assumed pump efficiency	0.8	
Estimated flow	25,614 gpm	
	57.1 cfs	

Pump Station Outfall:

	Pipe A	Pipe B	Source
Diameter, in	36	36	
Downstream Top Elevation	88.3	88.2	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19, plan
Downstream Invert	84.9	84.93	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19, profile
Slope	0.0058	0.0058	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19, profile
Distance, ft	172	174	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19, profile
Upstream Invert	85.90	85.94	Calculated from profile information
Manning's n	0.0120	0.0120	

Capacity Calculations:

				Pipe A			Pipe B			Pipe A + Pipe B	
d/D	Liquid height, in	Area/D^2	Hydraulic radius/D	Flow, cfs	Flow, gpm	Velocity, fps	Flow, cfs	Flow, gpm	Velocity, fps	Flow, cfs	Flow, gpm
0.50	18.0	0.3927	0.2500	27.59	12,382	7.81	27.59	12,382	7.81	55.18	24,764
0.60	21.6	0.4920	0.2776	37.06	16,634	8.37	37.06	16,634	8.37	74.13	33,269
0.70	25.2	0.5872	0.2962	46.19	20,730	8.74	46.19	20,730	8.74	92.38	41,461
0.80	28.8	0.6736	0.3042	53.94	24,207	8.90	53.94	24,207	8.90	107.87	48,414
0.90	32.4	0.7445	0.2980	58.80	26,390	8.78	58.80	26,390	8.78	117.60	52,780
0.99	35.6	0.7841	0.2665	57.48	25,799	8.15	57.48	25,799	8.15	114.97	51,597
1	36	0.7854	0.25	55.18	24,764	7.81	55.18	24,764	7.81	110.35	49,527

Appendix A
Inyo Drain Calculations

Storm Drain Open Channel Flow Calculations

Notes from p. 5-6 of Civil Engineering Reference Manual Civil Engineering Reference Manual for the PE Exam, sixth edition:
The most efficient open channel should minimize the cross-sectional area for any given Manning coefficient, slope, and discharge. Therefore the hydraulic radius should be maximized.
Semicircular cross sections have the smallest wetted perimeter, and therefore the cross section with the highest efficiency is a semicircle.
Hydraulic radius is the area in flow divided by the wetted perimeter (does not include free fluid surface)
The most efficient rectangle is one which has a depth equal to one-half the width.

The most efficient cross section for a trapezoid will be one in which the depth is twice the hydraulic radius. The sides of such a trapezoid will be inclined at 60 degrees from the hoirzontal, and the flow area is half a hexagon.

Assumptions:
Using Google Earth, measured distance from start of Inyo Drain (at Inyo Avenue and Canal School Road) to downstream end of Inyo Drain at a road crossing

Distance	2000 ft	
Change in surface elevation	3 ft	(80 ft - 77 ft)
Slope	0.0015	
Approximate height of downstream weir:		
Elevation	77 ft	
Distance from ground to weir	3 ft	
Weir elevation	74 ft	

Manning's coefficient	0.035	p.601, Fluid Mechanics, Frank M. White roughness coefficient for stony, cobbles excavated earth channel
Bottom of canal	82.8	Improvement Plans, Lucas Ranch No. 2, Unit No. 1, O'Dell Engineering, 11/04/2011, Sheet 19, profile
Distance from bottom of canal to invert	0.63 ft	
Available depth	2.63 ft (bottom of canal to springline of pipe)	

Calculations for developing profile shown in Figure 3

Location	Distance from last point	Invert	Top of pipe	Slope	Diameter, in	Hydraulic Radius	Area in flow	Water Elevation (pre-existing) Height of water from downstream pipe invert	Existing water level elevation	Water depth in channel
Inyo Drain	0	83.43	85.43					5.5	88.93	6.13
MH #1	60	84.37	87.87	0.0156667	24	0.5	3.1	5.88	89.31	
MH#2	330	84.50	88.00	0.0004	42	0.875	9.6	6.12	89.55	
MH#3	417	84.65	88.15	0.0004	42	0.875	9.6	6.39	89.82	
MH#4	410	84.81	88.31	0.0004	42	0.875	9.6	6.66	90.09	
MH#5	382	84.95	88.45	0.0004	42	0.875	9.6	6.91	90.34	
(further upstream manholes on Inyo Avenue)										
MH#6	401	85.11	88.61	0.0004	42	0.875	9.6	7.18	90.61	
MH#7	399	85.28	88.78	0.0004	42	0.875	9.6	7.44	90.87	
	2399	0.91								

Overall slope	0.0004
Flow	21.29 cfs (equals capacity of pipe)

For a submerged outlet the upstream water level is calculated as: p520 of Civil Engineering Reference Manual

$$Q = C_d A_0 \sqrt{\frac{2g(h_1 - h_4)}{1 + \frac{29 C_d^2 n^2 L}{(rh)^{4/3}}}}$$

Appendix A
Inyo Drain Calculations

Where:	h1	upstream water level height, measured from the downstream invert elevation
	h4	downstream water level, measured from the downstream invert elevation
	Cd	discharge coefficient
	rh	hydraulic radius
	n	Manning's coefficient

Assume	Cd	0.82	p324, short tube (no separation), Civil Engineering Reference Manual, Table 3.10
	n	0.012	

Given the design bottom width and side slopes, determine the capacity of the channel for various water depths:

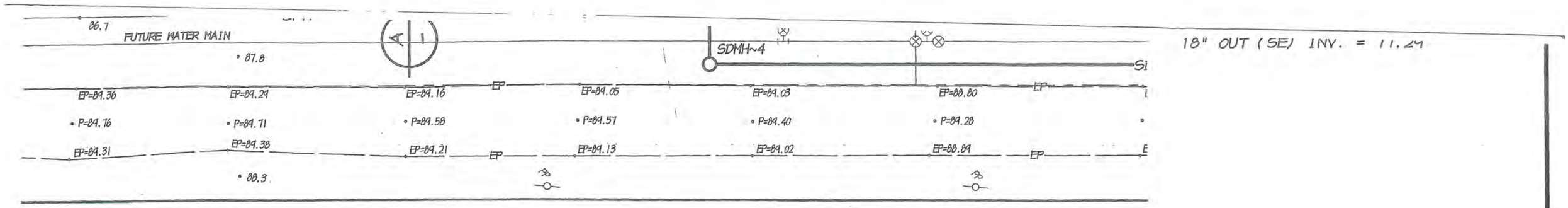
Side slope	1.00 to 1
Bottom width	10.00 ft

Depth (ft)	Top Width	Area in Flow	Wetted Perimeter	Hydraulic Radius	Flow, cfs	Flow, gpm	Velocity, fps	Drain Water Level Elevation (approximate)	Notes
2	14	24.00	15.66	1.53	52.61	23,610	2.19	84.80	
3	16	39.00	18.49	2.11	105.78	47,472	2.71	85.80	
3.5	17	47.25	19.90	2.37	138.66	62,229	2.93	86.30	Approimxate depth when 42" and (2) 36" pipes are at capacity
4	18	56.00	21.31	2.63	175.81	78,902	3.14	86.80	Approximate depth when (2) 24" and (2) 36" pipes are at capacity
5	20	75.00	24.14	3.11	263.28	118,159	3.51	87.80	
6	22	96.00	26.97	3.56	369.00	165,606	3.84	88.80	
7	24	119.00	29.80	3.99	493.86	221,646	4.15	89.80	
8	26	144.00	32.63	4.41	638.82	286,703	4.44	90.80	
9	28	171.00	35.46	4.82	804.82	361,203	4.71	91.80	
10	30	200.00	38.28	5.22	992.81	445,574	4.96	92.80	

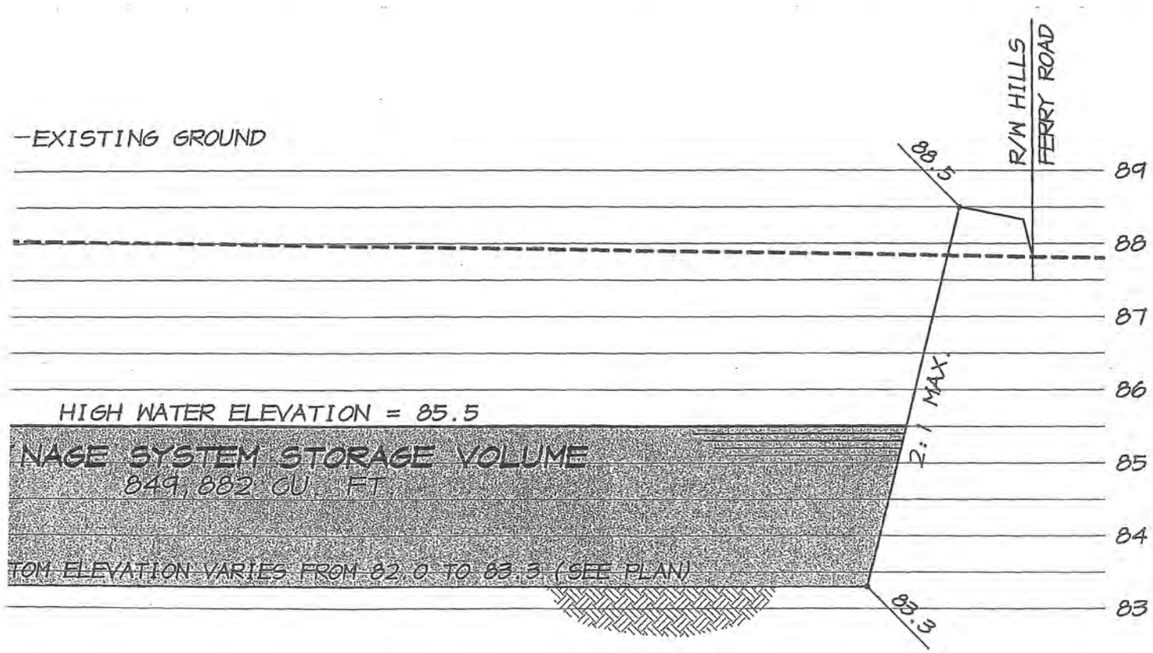
What is the maximum depth allowed in Inyo Drain before overflows occur in Lucas Ranch?
Assume storm drain is allowed to surcharge up to 1 foot below the minimum DI elevation. Minimum DI elevation is approximately 90 ft.
Add an extra 0.5 ft because we are calculating from the manhole in Inyo Avenue.
Maximum water elevation at MH#5 in Inyo Avenue = 88.50
Backcalculating, the height of the water from the pipe invert at Inyo Drain under submerged outlet conditions is 1.41 ft (= 6.91-5.5)

Therefore the maximum water elevation in the channel is 88.50 - 1.41 = 87.09, which equals a water depth in the drain of 4.29 ft (87.09 - 82.80)

APPENDIX B
SHERMAN PARK BASIN AND PUMP STATION
DETAILED CALCULATIONS
(INCLUDING APPLICABLE COUNTY STANDARDS SECTIONS)



BASIN



PICAL CROSS SECTION

SECTION A

SCALE: HORIZONTAL: 1"=20'
VERTICAL: 1"=2'

STORM DRAINAGE VOLUME SUMMARY

DRAINAGE SYSTEM SHALL BE DESIGNED TO DETAIN THE TOTAL RUNOFF VOLUME FROM A 50-YEAR, 24-HOUR STORM:

V = C A R / 12 WHERE: C = 0.372, A = 222.04 ACRES AND R = 2.18 IN. (ADJUSTED TO CITY OF NEWMAN)

V = 15.0 ACRE-FEET OF STORAGE REQUIRED

VOLUME PROVIDED IN BASIN = 12.8 AC-FT

VOLUME PROVIDED IN 54" PIPELINE = 0.5 AC-FT

VOLUME PROVIDED IN CHANNEL = 6.3 AC-FT

TOTAL VOLUME PROVIDED = 19.6 AC-FT

Source: Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch Subdivision, Associated Engineering, Inc., 12-6-04 (Sheet 8 of 12)

PLAN VIEW

CONCRETE PIT COVER

PERFORATED 4" P.V.C. STILLING WELL AND TRANSDUCER.

FINISH GRADE

VALVE VAULT

DISCHARGE PIPE

12" MIN.

CLEAN OUT

GATE VALVE

CHECK VALVE

FLEX COUPLER

PEA GRAVEL, 4" THICK MIN.

2" DRAIN PIPE

SAFETY CABLE

POWER CABLES

6 FT. DIA. MANHOLE SECTIONS TYPICAL.

INTERMEDIATE GUIDE RAIL SUPPORT AS PER MANUFACTURES SPECIFICATIONS.

2" STAINLESS STEEL GUIDE RAILS, SCH. 40

6" CAST IRON OUTLET PIPING

LIFTING CABLES, AS PER DETAIL

PERFORATED 4" P.V.C. STILLING WELL AND TRANSDUCER. SECURE THE 4" P.V.C. TO PIT USING 4 S.S. STRAPS AND 2 ~ ¼" x 4" S.S. ANCHOR BOLTS PER STRAP, TYP.

GROUT PUMP PIT TO CONCENTRATE FLUIDS AT THE PUMP AS RECOMMENDED BY THE PUMP MANUFACTURER.

PUMPING PIT, 6 FT. DIA. MANHOLE SECTION.

8" TYP.

SUBMERSIBLE PUMPS
2 FLYGT NP3153x434
1400 GPM @ 29' TDH. 15.0 HP. 460V. ~ 3 PH.

CONCRETE BASE REINFORCED WITH 2 LAYERS OF #5 BARS AT 9" O.C., EACH WAY.

SECTION VIEW

Source: Off-Tract Storm Drainage Improvement Plans for Hearthstone Ranch, Associated Engineering, Inc., 12-6-04 (Sheet 11 of 12)

RM DRAIN PUMP STATION

NO SCALE

Appendix B
Detailed Calculations for Sherman Ranch Storm Drain Basin and Pump Station
Using Stanislaus County Standards and Specifications, 2007 Edition

Storage volume: 50 year, 24 hour storm (See County Standards, Section 4.4a, page 4.4)
$V = CAR_{(50)}/12$

Calculations:		Source:
C	0.372	Used value from design criteria from Off-Tract Storm Drainage Improvement Plans for Hearthsone Ranch Subdivision, Associated Engineering Inc., 12/6/04, Sheet 11 of 12
A	222.04	Used value from design criteria from Off-Tract Storm Drainage Improvement Plans for Hearthsone Ranch Subdivision, Associated Engineering Inc., 12/6/04, Sheet 11 of 12
$R_{(50)}$	= 2.33*M.A.P./10.9	
	from Plate 4-B in County Standards, M.A.P. for Newman is approximately 10.1 inches	
	2.16	
V	14.9 ac-ft	STORAGE VOLUME REQUIRED FOR 50 YEAR, 24 HOUR STORM

Dewatering: Empty a 10 year event storm within 48 hours by outlet facilities providing positive drainage or through percolation (See County Standards, Section 4.4c, page 4.5)
Volume from 10-year, 24 hours storm is: $V = CAR_{(10)}/12$

Calculations:		Source:
C	0.372	Used value from design criteria from Off-Tract Storm Drainage Improvement Plans for Hearthsone Ranch Subdivision, Associated Engineering Inc., 12/6/04, Sheet 11 of 12
A	222.04	Used value from design criteria from Off-Tract Storm Drainage Improvement Plans for Hearthsone Ranch Subdivision, Associated Engineering Inc., 12/6/04, Sheet 11 of 12
$R_{(10)}$	= 1.88*M.A.P./10.9	
	from Plate 4-B in County Standards, M.A.P. for Newman is approximately 10.1 inches	
	1.74	
V	12.0 ac-ft	Volume from a 10-year, 24 hour storm

Pump capacity required 1,357 gpm

proposed improvement. All natural drainage must leave the improved area in the same state and condition as it was prior to relocating unless a special agreement, approved by the Engineer, has been executed with adjoining property owners.

Design storm methods shall be according to the Rational Method for design areas less than or equal to 400 acres. Storm runoff calculations for areas larger than 400 acres shall be computed using more advanced storm drain design methods (i.e. Unit Hydrograph Method as defined by the United States Army Corps of Engineers, Technical Release 55 (TR-55), etc).

The Manning equation shall be used to determine the capacity and friction losses of open channels and enclosed gravity conduits:

$$Q = VA = 1.486\,(R^{2/3})\,(S^{1/2})\,A / n$$

Where:
- Q = flow rate measured in cubic feet per second (cfs);
- A = cross sectional area of the flow in square feet (sf);
- V = flow velocity in feet per second (fps);
- R = hydraulic radius in feet (ft);
- S = slope of the hydraulic gradient in feet per foot (ft/ft);
- n = Manning coefficient.

Values of the Manning coefficient for various pipes and open channels are given in the Table 4.1 (see Table 4.1).

4.3 **PEAK FLOW RATE:** The peak flow rate shall be used to size pipes and culverts and shall be determined using the following rational formula:

$$Q = CIA$$

a. Peak Flow Rate (Q): Peak rate of flow in cubic feet per second.

b. Coefficient of Runoff (C): Values between 0.0 and 1.0 which are to be extrapolated from Table 4.2 (see Table 4.2).

c. Intensity (I): The average intensity of rainfall in inches per hour for a duration equal to the time of concentration (Tc) and is determined using the following formula:

$$I = Im \times \frac{M.A.P.}{10.9}$$

Where:

Im: Average intensity of rainfall in inches per hour for the Modesto rainfall gauging station. Coefficient is extrapolated from Plate 4-A using the calculated time of concentration (Tc).

Tc: The time of concentration or the sum of the overland flow and conduit flow times. The following table shows minimum travel times to be used when the calculated Tc is less than the minimum shown.

Land Use	**Minimum Travel Time**
Single family (0.5 to 1.0 acre)	30 min.
Single family (less than 0.5 acre)	20 min
Multi-family	20 min
Commercial & Industrial	10 min
Gutters	1 ft. / Sec

M.A.P.: The mean annual precipitation for the design area in question. Coefficient is extrapolated from Plate 4-B.

d. Area (A): The total tributary area, expressed in acres, that will contribute runoff to the drainage system, regardless of the limits of the development under construction.

4.4 DRAINAGE RETENTION: Drainage retention facilities shall be designed in conformance with the guidelines contained in these Standards and as a minimum shall comply with the criteria shown below:

Compliance with these standards does not relieve the designer, owner or developer of the responsibility to apply sound professional judgment to protect the health, safety and welfare of the general public. Special site conditions and environmental constraints and considerations may require a greater level of protection than otherwise required under these standards.

A minimum separation of five (5) feet measured from the bottom of the drainage retention facility, rock well, or on-site drainage facility to the water table surface elevation shall be provided. If design restrictions do not provide a 5 foot minimum separation from the basin bottom to the water table elevation, the Developer shall obtain prior written approval and authorization from Stanislaus County Department of Environmental Resources prior to construction.

All drainage retention facilities (i.e. basins/ponds) shall have a measuring device (tad-a-tail) to indicate water level as measured from the bottom of the basin.

The required storage volume needed for the design storm shall be determined as follows:

a. Volume (V): Drainage facilities shall have the capacity to hold the total runoff from a 50 year frequency, 24 hour storm. The volume shall be determined with no allowance for percolation or outlet facilities using the following basic formula:

$$V = \frac{CAR}{12}$$

V: Volume in acre-feet
C: Coefficient of Runoff (see section 4.3 part b)
A: Area in acres (see section 4.3 part d)
$R_{(50)}$: 2.33 times M.A.P. divided by 10.9 (for M.A.P. see Plate 4-B)

Where:

$$R_{(50)} = 2.33 \times \frac{M.A.P.}{10.9}$$

b. Elevation: Drainage retention facilities shall be designed so that a hydraulic grade line (HGL) extended from the drainage retention facility's highest water surface elevation (Z) shall be at least 6 inches below all tributary drainage inlets at their respective locations. The HGL at a given point shall be calculated using the following formula:

$$HGL = Z + Hf$$

HGL: Hydraulic grade line elevation in feet at a particular point.

Z: The top of pipe elevation at the point of discharge or the high water surface elevation of a drainage basin measured in feet.

Hf: Head loss in feet due to friction loss from a pipe. The friction loss shall be calculated using the following formula:

$$Hf = \frac{(3.022)(v)^{1.85}(L)}{(C)^{1.85}(D)^{1.165}}$$

v: Velocity of water in pipe in feet per second (assume pipe flowing full)

L: length of pipe in feet

D: Inside diameter of pipe in feet
C: Design coefficient based on pipe material. Coefficient to be extrapolated from Table 4.3

c. Dewatering: A drainage facility must be emptied of a 10 year event storm within 48 hours by outlet facilities providing positive drainage or

through percolation. If percolation is used, the percolation rate shall not be assumed. The percolation rate shall be based on the results of a soil's report investigation performed by a licensed geotechnical engineer.

The volume for the 10-year frequency, 24 hour storm shall be determined using the following formula:

$$V = \frac{CAR}{12}$$

V: Volume in acre-feet
C: Coefficient of Runoff (see section 4.3 part b)
A: Area in acres (see section 4.3 part d)
$R_{(10)}$: 1.88 times M.A.P. divided by 10.9 (for M.A.P. see Plate 4-B)

Where:

$$R_{(10)} = 1.88 \times \frac{M.A.P.}{10.9}$$

4.5 DISCHARGE APPROVAL AND PERMITS: It shall be the responsibility of the Developer to obtain written approval and encroachment permits from all agencies controlling the discharge of drainage into the receiving waterways.

These agencies shall include, but not be limited to the following:

a. Army Corps of Engineers
b. US Coast Guard
c. California Regional Water Quality Control Board
d. Department of Fish and Game
e. California State Lands Commission
f. California Department of Water Resources
g. Local regulatory irrigation districts

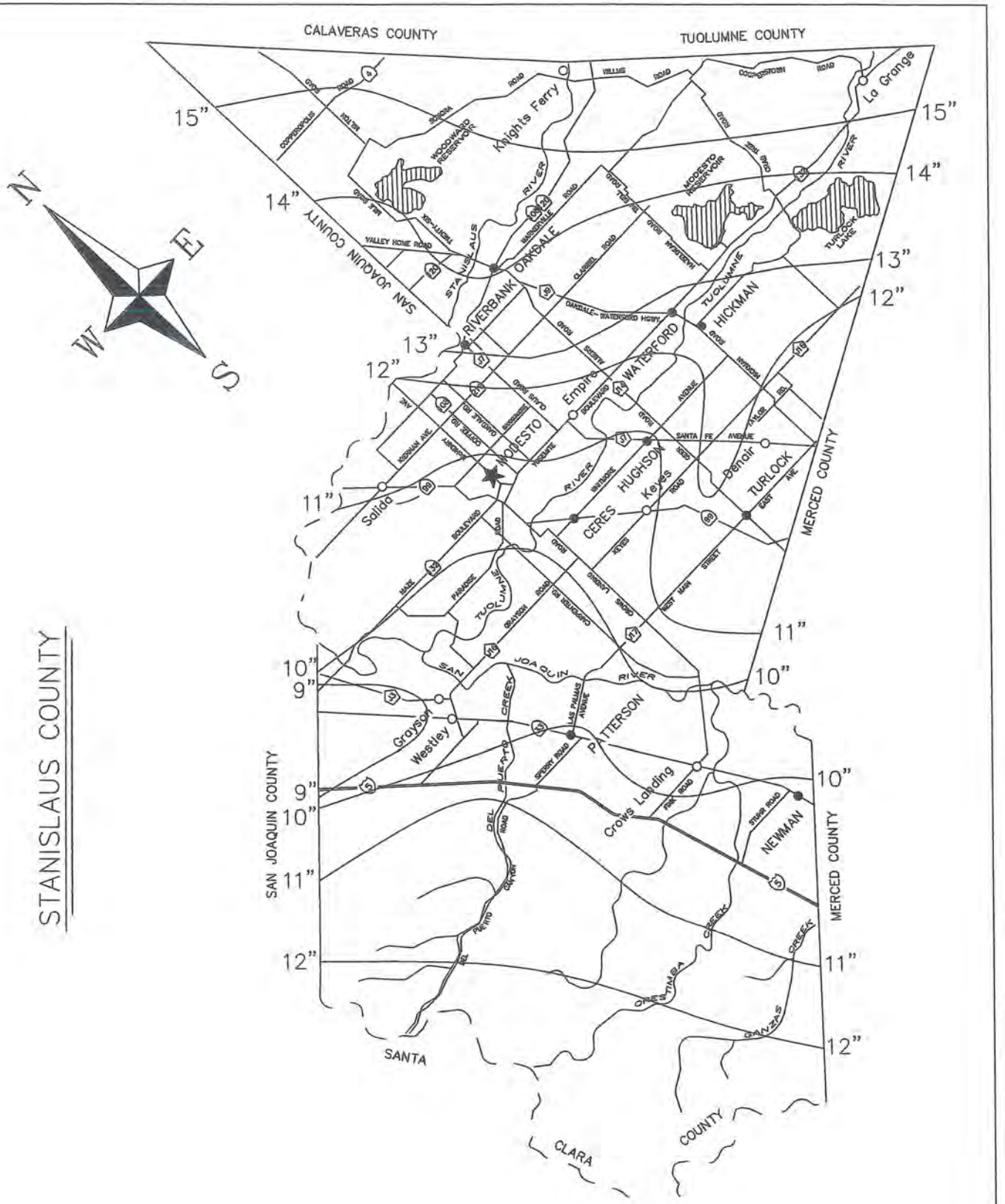
4.6 ROCK WELLS: Rock wells (vertical and horizontal), when approved by the Engineer, shall be constructed as shown on the plates contained in these Standards (Plate 4-D2). The rock wells shall be located at least 150 feet from domestic water wells. Individual rock wells shall have a 20 foot minimum horizontal separation from all other vertical rock wells. Rock wells shall store the volume from a 50 year frequency storm and be designed in the following manner:

a. Find Percolation Rate (PR): For design purposes this value shall not be assumed but must be determined by the design engineer by

TABLE 4.2

COEFFICIENT OF RUNOFF

Land Use Description	C
Pavement & Roofs	0.95
Compacted earth without pavement	0.80
Lawns, pasture and farmland	0.30
Single family residence:	
Over 1.5 acres	0.35
0.5 to 1.5 acres	0.45
6000 sf. to 0.5 acres	0.50
Less than 6000 sf.	0.55
Multi-family residence:	
Apts., condos, duplexes, & town homes	0.70
Commercial and industrial	0.90



STANISLAUS COUNTY

No.	Revised	By

Updated by P. Saini

Checked by S. Erickson

MEAN ANNUAL PRECIPITATION

COUNTY OF STANISLAUS

DEPARTMENT OF PUBLIC WORKS

Approved by

Director of Public Works

Date 01/02/2007

PLATE NO: 4-B

UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES
UC IPM Online
Statewide Integrated Pest Management Program

How to Manage Pests

California Weather Data: Station Description

| Station news | About the database | Weather menu |

Description of NEWMAN.C (NCDC #6168, Newman)

| Data: Daily ~ Averages |

Observer
MARGARET L. CARVALHO

Location
About 0.25 miles south of the Newman Post Office.
County: Stanislaus **Nearest City:** Newman
Latitude: 37 deg 18 min N **Longitude:** 121 deg 2 min W **Elevation:** 90 ft

Station and site characteristics

Available data
UC IPM database records begin/end: January 1, 1951 / about six months ago
Reporting interval: Daily
Stored variables:
Air Temperature, max/min: Daily max/min measured at 5 feet.
Air Temperature at observation time:
Precipitation: Daily total measured in 8 inch diameter gauge.
Weather Type: Observer's estimate of weather condition at observation time.
Variables with computed averages: precip, air temp

Details about reported variables

Air Temperature, max/min
Variable or Sensor: Daily max/min measured at 5 feet.
Height of Sensor: 5 feet
Backup Station #1 / #2 PATTERSON.A / KESTERSN.A
Averages Station Backup:NEWMAN.C
95% of possible values are stored for the period 01/01/1951 to 12/31/2010.

Air Temperature at observation time
Variable or Sensor:Air Temperature at observation time
94% of possible values are stored for the period 01/01/1951 to 12/31/2010.

Precipitation
Variable or Sensor: Daily total measured in 8 inch diameter gauge.
Backup Station #1 / #2 PATTERSON.A / KESTERSN.A
Averages Station Backup:NEWMAN.C
99% of possible values are stored for the period 01/01/1951 to 12/31/2010.

Weather Type
Variable or Sensor:Observer's estimate of weather condition at observation time.
5% of possible values are stored for the period 01/04/1951 to 02/24/1996.

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Statewide IPM Program, Agriculture and Natural Resources, University of California
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UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES

UC IPM Online

Statewide Integrated Pest Management Program

How to Manage Pests

California Weather Data: Report

| About the data | Weather menu |

Daily weather report for NEWMAN.C (NCDC #6168, Newman)

More about NEWMAN.C: Station description; **More data:** Daily ~ Averages

Time Period: November 1, 2012 to April 21, 2013, retrieved on April 22, 2013
Note: No data were available from station NEWMAN.C. See retrieval table.

DATE MM DD YYYY	OBS TIME HH:MM	PRECIP AMOUNT & TYPE (IN)	*	AIR TEMPERATURE MAX (F)	MIN	*	OBS	*	WIND DD SS	*	ETo (IN)	*	SOL RAD (LY)	*	SOIL T MAX MIN (F)	*	WX	*	RELATIVE HUMIDITY MAX	MIN	*	BULB TEMP WET DRY (F)	*	PAN EVAP (IN)	*
11-01-2012	23:59	0.07	1	64	51	1																			
11-02-2012	23:59	0.00	1	70	45	1																			
11-03-2012	23:59	0.00	1	74	44	1																			
11-04-2012	23:59	0.00	1	78	48	1																			
11-05-2012	23:59	0.00	1	79	47	1																			
11-06-2012	23:59	0.00	1	81	48	1																			
11-07-2012	23:59	0.00	1	79	50	1																			
11-08-2012	23:59	0.02	1	64	42	1																			
11-09-2012	23:59	0.02	1	55	38	1																			
11-10-2012	23:59	0.00	1	58	32	1																			
11-11-2012	23:59	0.00	1	58	34	1																			
11-12-2012	23:59	0.00	1	62	33	1																			
11-13-2012	23:59	0.00	1	68	36	1																			
11-14-2012	23:59	0.00	1	66	39	1																			
11-15-2012	23:59	0.00	1	67	39	1																			
11-16-2012	23:59	0.03	1	61	47	1																			
11-17-2012	23:59	0.18	1	63	53	1																			
11-18-2012	23:59	0.13	1	64	47	1																			
11-19-2012	23:59	0.00	1	66	46	1																			
11-20-2012	23:59	0.00	1	68	44	1																			
11-21-2012	23:59	0.00	1	65	48	1																			
11-22-2012	23:59	0.00	1	65	44	1																			
11-23-2012	23:59	0.00	1	66	38	1																			
11-24-2012	23:59	0.00	1	68	41	1																			
11-25-2012	23:59	0.00	1	65	38	1																			
11-26-2012	23:59	0.00	1	67	35	1																			
11-27-2012	23:59	0.00	1	59	37	1																			
11-28-2012	23:59	0.19	1	60	47	1																			
11-29-2012	23:59	0.01	1	59	45	1																			
11-30-2012	23:59	0.79	1	59	52	1																			
12-01-2012	23:59	0.09	1	58	48	1																			
12-02-2012	23:59	0.76	1	58	45	1																			
12-03-2012	23:59	0.00	1	61	39	1																			
12-04-2012	23:59	0.00	1	56	45	1																			
12-05-2012	23:59	0.31	1	55	47	1																			
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12-07-2012	23:59	0.00	1	61	40	1																			
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12-09-2012	23:59	0.01	1	61	32	1																			
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12-12-2012	23:59	0.04	1	52	37	1																			
12-13-2012	23:59	0.00	1	51	34	1																			
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12-15-2012	23:59	0.22	1	48	31	1																			
12-16-2012	23:59	0.00	1	50	37	1																			
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12-22-2012	23:59	0.94	1	49	41	1																			
12-23-2012	23:59	1.34	1	46	40	1																			
12-24-2012	23:59	0.00	1	54	32	1																			
12-25-2012	23:59	0.19	1	45	35	1																			
12-26-2012	23:59	0.06	1	54	36	1																			
12-27-2012	23:59	0.00	1	51	34	1																			
12-28-2012	23:59	0.00	1	43	29	1																			
12-29-2012	23:59	0.02	1	50	36	1																			
12-30-2012	23:59	0.00	1	51	31	1																			