

13 ATTACHEMENT 7: TECHNICAL JUSTIFICATION OF PROJECTS

Scoring for Attachment 7 will be based solely on the technical justifications of project(s) with respect to the claimed physical benefits (i.e., technical basis of the project and capability of yielding the benefits). Documentation may include, but is not limited to: technical reports, feasibility studies, needs assessments, expert opinion or local knowledge, journals, etc. The magnitude of physical benefits will not be scored under this criterion. Please note that the magnitude of project benefits relative to costs will be evaluated based on the information provided in Attachment 8.

Scoring will be based solely on the technical justifications of project(s) with respect to claimed physical benefits. Magnitude of physical benefits will not be scored under this criterion. However, physical benefits must be clearly described and quantified (if applicable) as points will be allocated based on the quality of the technical analysis and supporting documentation in consideration of the type of benefit claimed. Scoring is designed to not bias types or sizes of projects with respect to each other.

Did the applicant provide information that clearly identifies and describes the physical benefits of each project included in the Proposal?

Is the technical analysis appropriate and justified considering the size of the project and the type of benefit claimed?

13.1 Packwood Creek Recharge Project

Abstract: Packwood Creek flows is a historic creek system that flows through the southeast part of the City of Visalia. Kaweah Delta WCD manages surface water flows that enter the head of Packwood Creek near Oakes Basin and the head of Mill Creek. As the City was developed many of the City's storm drain system near Packwood Creek were piped to the Creek. This produces the scenario where during very wet times the Creeks flows can become limiting to the City's storm drain protection and water can back up in City streets. For this reason it is very important for the City to maintain adequate Creek capacity to accommodate City storm drain flows.

Tulare ID is most often the downstream water right holder that is scheduling flows through Packwood Creek into the northwestern portion of its service area. However, Packwood Creek is a very sandy natural channel with a high seepage rate. Tulare ID has an alternate conveyance facility called the Main Intake Canal that usually has sufficient capacity to convey supplies to the District and Tulare ID usually chooses not to divert waters into Packwood Creek in order to avoid the high seepage losses.

Over the last few years the City of Visalia, Kaweah Delta WCD and Tulare ID have worked together to develop regional projects that could develop additional groundwater recharge for the City of Visalia. The City relies completely on groundwater for their domestic water supply and so the reliability of those supplies is extremely important. As these three regional water management entities wrestled with the goal the Packwood Creek Recharge Project was born.

To be compliant with current State law the City has to show developed water supplies in order to justify planned City growth over the next several years. Although the cost to develop an additional 400 AF/year of groundwater recharge capacity is on the order of \$1.88 Million, these costs are small in terms of alternative projects. The pricing issue is driven by the City's need to have groundwater recharge efforts benefit the wells the City relies on, and these areas are either already developed to homes or are very expensive because they border the City where land is now valued at between \$20,000 – 40,000/acre. So the development of five new structures to increase the recharge capacity of the Packwood Creek channel made sense because the effort didn't require right-of-way acquisition, the City already had surplus surface water agreements with Project partners and the facility was in the right place to benefit the groundwater wells that support the City's domestic groundwater supply.

13.1.1.1 Existing Surplus Supply Agreements

13.1.1.1.1 Tulare ID

The City has an agreement with Tulare ID to encourage that district to deliver surface water supplies through Packwood Creek so that the seepage will benefit the City's groundwater resources. Through this agreement the City of Visalia will pay for the value of supplies lost to seepage through the City at the source water cost during times when there is available capacity in Packwood Creek (not a threat to the City's storm drain system) and when Tulare ID Main Intake Canal had sufficient capacity to divert desired supplies into the District without running Packwood Creek. This situation most often presents itself in normal to normal wet year types and has usually involved the delivery of Friant Division CVP surplus Class Two water to the City at costs of roughly \$35/AF. Please see **Appendix A of Attachment 3** for the agreement between the City of Visalia and Tulare ID.

It should be mentioned that the City of Visalia and Tulare ID have just formalized an exchange agreement that will deliver surface water to the Project facilities for much

longer periods during times when flows would not be continuing on to Tulare ID. The water is developed by an exchange for tertiary treated wastewater from the City's upgraded WWTP that will be constructed over the next two to three years. The exchanged amount available to the City will be on the order of 5,000 AF/month and during these times the Project facilities should be able to recharge approximately 1/5 of the total amount (or 1,000 AF/month). However because the WWTP has not yet been constructed the potential benefits from the exchange have not been included in the Project benefit tables.

13.1.1.1.2 Kaweah Delta WCD

Kaweah Delta WCD is a Friant Division CVP contractor, a Kaweah and St. Johns Rivers right holder and is a Project partner with the City of Visalia. Also Kaweah Delta WCD and the City of Visalia make up the Visalia Water Management Committee which works on joint projects for groundwater recharge in the area of the City. When surplus water supplies are available to Kaweah Delta WCD they are often made available to the City of Visalia. This is often because of the storm water basin capacity within the City of Visalia, however there are many times when the City cannot take advantage of these supplies because there is need to save capacity for approaching storms.

Kaweah Delta WCD also has access to other surplus water available to conserve at the site. This includes Kaweah Delta WCD's entitlement beyond historic diversion from their Kaweah River rights that could be used to conserve additional available surface waters through groundwater recharge.

13.1.1.2 Regional Groundwater Modeling

Kaweah Delta WCD has developed a regional groundwater model through efforts by Fugro West, Inc and has updated the effort on a regularly scheduled basis to understand the trends throughout the Kaweah Region over time (last update was to the Water Resource Investigation in 2007). The model is segmented in seven distinct areas and the area of the City of Visalia is somewhat in the middle of the Kaweah Delta WCD service area. The model has indicated that due to reduced surface water deliveries to the west of the Kaweah Region (SWP Table A deliveries to Tulare Lake Basin WSD from the Delta) the western portion of the Kaweah Region's depths to groundwater have been increasing. Also, as the San Joaquin River Restoration Settlement has begun to be implemented on the Friant Division CVP, long-term contractors have experienced reduced surface water supply availability due to interim flows being released to the San

Joaquin River. The information from Kaweah Regional groundwater monitoring matches with the local monitoring that is done in the Visalia area that shows that groundwater levels have been steadily dropping over time and the rate of decline has recently increased. This also suggests that groundwater overdraft in the area has also recently increased. **Appendix A of Attachment 7** is a figure summarizing the change in groundwater elevations from the Water Resource Investigation around the City of Visalia.

13.1.1.3 Packwood Creek HEC-RAS Model

In 2009 Kaweah Delta WCD in partnership with the City of Visalia and Tulare ID contracted for an analysis of the capacity of Packwood Creek and the evaluation of what flows and water elevations were safe to convey through the southeast part of the City given existing channel geometry and structures. A local Civil Engineering and Surveying firm was retained to survey cross-sections along a six mile section of Packwood Creek, take measurements on existing crossings and develop a HEC-RAS model on the Creek. The analysis of the Creek in HEC-RAS showed that the Creek was capable of flowing at normal depth up to approximately 200 CFS, which is consistent with the experience of the Tulare ID watermaster. Above that capacity some channel sections have insufficient freeboard and are at risk of overtopping. Also, the analysis identified several sections of the channel that appear to be smaller than others and would require bank modifications if additional capacity through the channel were desired.

A second part of the analysis was to evaluate the expansion of the use of rubble dams along the Creek to pool water in sections of the Creek and develop additional recharge capacity. This portion of the study suggested several new rubble dam locations to optimize the recharge potential along the Creek and estimated the pooled volumes behind each suggested site. **Appendix B of Attachment 7** is the Civil Engineering firm's memo on the Packwood Creek study.

13.1.1.4 Recharge Rate Pilot Test

In 2012, after the Project partners had met for some time to work on a project to increase the recharge in Packwood Creek, they decided to undertake a pilot test to establish a baseline for the seepage rate in Packwood Creek without rubble dams and then a modified test with rubble dams. Both tests were conducted by Kaweah Delta WCD's senior District engineer and the water master for the Kaweah and St. Johns

Rivers Association (who is a registered Civil Engineer). The first test was undertaken in February 2012 and was run for approximately a month. The results were that Packwood Creek between the Oakes Basin and the existing structure near South County Center Drive lost an average of 14 AF/day.

A second test was performed at the end of the irrigation season in September 2012. For this test several rubble dams were constructed in the areas where they were planned to be added. The dams were not very tall, but were on average approximately four feet tall. The second test was again run for approximately one month and the average seepage rate was 34 AF/day. Therefore the conclusion of the pilot test was that there was at least the potential for a project of this kind to develop an additional recharge capacity of 20 AF/day. **Appendix C of Attachment 7** is a summary document from the pilot test.

13.1.1.5 2012 WEEG Grant from USBR

In January 2012 Kaweah Delta WCD on behalf of the Project partners submitted a grant application to the US Department of the Interior, Bureau of Reclamation for a Water, Energy and Efficiency Grant through the WaterSMART program. This grant application was successfully selected for funding based on the potential for it to conserve surplus water supplies and make them beneficial to the City of Visalia and Kaweah Delta WCD. The application secured \$800,000 toward the project costs and started the Project partners on a path to implement the five structures in Packwood Creek within 24 months of the signed funding contract. **Appendix D of Attachment 7** is a copy of the signed funding agreement with the US Department of the Interior, Bureau of Reclamation.

13.1.1.6 Project Basis of Design

As the Project began further development a basis of design was undertaken with all of the Project partners. This document outlined the operational criteria by which the Project design would be guided. It was determined that the maximum design flow rate for the structure would be 350 CFS so that the largest envisioned channelized flow through the Creek would be manageable with the structures. However it was also determined that the maximum measured flow was 200 CFS and that operationally Tulare ID would be much more likely to deliver flows between 50 and 100 CFS when delivering supplies for the benefit of City groundwater recharge. The basis of design also determined that the structures would permanent concrete structures that did not allow for vehicular access across them, but rather had catwalks for operator access and

automated gates so that upstream water levels could be maintained and City residents could be protected even in stormy conditions. Further the project locations were determined through the basis of design as was the desire for each facility to relay remote monitoring information to the existing SCADA systems of each Project partner. **Appendix E of Attachment 7** is document describing the Packwood Creek Basis of Design.

13.1.1.7 Project Partner Control of Channel

As was mentioned before, Packwood Creek is a natural channel that conveys flood water and irrigation supplies. The Creek has prescriptive rights as an existing facility and Kaweah Delta WCD's legal counsel researched whether the development of new water control facilities within the existing Creek area was consistent with the legal rights currently controlled by the Project partners. His conclusion was that the development of the structures was within the rights of the Project partners and that no right-of-way would need to be acquired for the Project unless construction impacted areas outside of the existing facility. Therefore this became a project design feature, to be able to construct Project facilities within existing Creek property.

13.1.1.8 Average Days of Operation/Year

Records on the operation of the City of Visalia and Tulare ID's seepage agreement in and along Packwood Creek were investigated and obtained for the period of 2005 through 2011. Wastermaster records were evaluated for periods when the program was in operation and it appeared that generally flows were in the range of 70-80 CFS. From Watermaster records it appeared that the average annual number of days that the Packwood Creek program operated between 2005 – 2011 was 20 days per year.

13.1.1.9 Modified Water Surface Evaluation

After structure locations were agreed upon, topographic surveys were conducted to relate the new structure locations to the potential water surfaces that could be developed upstream of these facilities. The digital terrain model from the 2009 HEC-RAS model was combined with the more recent topographic survey information at the new structure sites to develop a new digital terrain model. This model and the project designs were used to evaluate ponded areas and wetted perimeter behind each structure at varying water depths. Also this model was used in conjunction with City of Visalia GIS storm drain information to evaluate the existing storm drain facilities that would need to be addressed so that new ponded water would not back up into them. A

normal flow depth for 80 CFS was conservatively used as the pre-project water surface condition and the ponded water surfaces above that were evaluated as the increased wetted perimeter and recharge area.

13.1.1.10 Calculated Recharge Estimates

The method followed to generate the seepage estimate was developed by the Department of Water of the Government of South Australia. Using the HEC-RAS and terrain model the seepage in Packwood Creek without structures was determined. Then, the additional seepage with the ponded water with the added structures was computed.

The seepage estimate equation was developed in 2002 and further tested and analyzed by the Government of South Australia in March 2011. **Appendix F of Attachment 7** is an article of the analysis performed by the Government of South Australia. There are varying equations based on differing cases. The case most applicable to this situation was Case 3 which is where “the channel sits within a low conductivity soil layer and is hydraulically disconnected from the water table.” The equation for this scenario is:

$$q = W_p K_{soil} \frac{(H_w + L_f + h_{we})}{L_f}$$

where:

- q = Seepage rate per foot of channel (SF/day/ft)
- W_p = Wetted perimeter of the channel (ft)
- H_w = Height of water in the channel (ft)
- K_{soil} = Vertical saturated hydraulic conductivity of the soil (ft/day)
- L_f = Thickness of the soil layer from the base of the channel (ft)
- h_{we} = Negative pressure head at the base of the soil layer (ft)

The vertical hydraulic conductivity of the soil used for this analysis was 0.5 feet per day. The thickness of the soil layer was set at 0.33 feet (four inches). The soil type was a sandy loam which typically has a negative pressure head of -0.82 feet.

For the normal flow depth seepage estimates (no structures) the resulting seepage between the five reaches was just under 15 AF per day. Adding in the ponded surface from the structures increased the seepage rate to 34.5 AF per day. This is an increase of 19.5 AF/day.

It should be mentioned that the City of Visalia and Tulare ID have just formalized an exchange agreement that will deliver surface water to the Project facilities for much longer periods during times when flows would not be continuing on to Tulare ID. The water is developed by an exchange for tertiary treated wastewater from the City's upgraded WWTP that will be constructed over the next two to three years. The exchanged amount that will be available to the City will be on the order of 5,000 AF/month and during these times the Project facilities should be able to recharge approximately 1/5 of the total amount (or 1,000 AF/month). However because the WWTP has not yet been constructed the potential benefits from the exchange have not been included in the Project benefit tables.

13.1.1.11 Development Costs

An Engineer's Estimate has been developed for the Packwood Creek Recharge Project that has developed expected Project development costs based on unit prices from recent similar efforts in the Region (see **Figure 13.1**).

13.1.1.12 Water Costs

Tulare ID has supplied surplus Class Two Friant Division CVP supplies to the City of Visalia for \$35/AF in the past. This water cost was used to evaluate project benefits and costs.

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Item No.	Item Description	Estimated Quantity	Per Unit Cost	Unit	Amount
Packwood Creek Improvements					
1	Control Structure #1 - Structural Concrete	60	\$ 1,500.00	CY	\$ 90,000
2	Control Structure #2 - Structural Concrete	60	\$ 1,500.00	CY	\$ 90,000
3	Control Structure #3 - Structural Concrete	60	\$ 1,500.00	CY	\$ 90,000
4	Control Structure #4 - Structural Concrete	60	\$ 1,500.00	CY	\$ 90,000
5	Construct Metal Catwalk	5	\$ 20,000.00	EA	\$ 100,000
6	F&I Automated Control Gates	5	\$ 90,000.00	EA	\$ 450,000
7	Misc. Earthwork	10,000	\$ 5.00	CY	\$ 50,000
SUBTOTAL					\$ 960,000
SCADA/Integration					
8	Site Integration	6	\$ 20,000.00	EA	\$ 120,000
SUBTOTAL					\$ 120,000
Main Intake Canal Turnouts					
9	To the St. Johns River	1	\$102,000	LS	\$ 102,000
10	To the Kaweah River	1	\$102,000	LS	\$ 102,000
11	To the TIC Canal	1	\$48,000	LS	\$ 48,000
SUBTOTAL					\$ 252,000
Packwood Creek Improvements Contingency			10	%	\$ 96,000
SCADA/Integration Contingency			10	%	\$ 12,000
Main Intake Canal Turnouts			20	%	\$ 50,400
Grand Total					\$ 1,490,400

Figure 13.1: Packwood Creek Recharge Project Cost Estimate

13.1.1.13 Operations & Maintenance Costs

Operation & Maintenance costs were discussed with the Kaweah Delta WCD Senior Engineer and were based on their standard practices. It was estimated that to maintain the five automated gates in the Project it would take one staff member approximately 8 hours at \$35/hour. Also, it was that it would require one staff member approximately 8 hours per year to operate the automated gates (during a 20 day run). These timeframes at the district staff operators rate total approximately \$600/year.

Also it was assumed that the automated gates would be operated on solar power with deep marine cell battery backups so that there would be no electric standby charge.

13.1.2 Project Physical Benefits

Application Table 9 for the Packwood Creek Recharge Project shows that prior to the Project, Packwood Creek was/is capable of an average annual recharge volume of 280 AF/year. Records from Project partners and the Kaweah and St. Johns Rivers Watermaster were reviewed to determine the number of days the City and Tulare ID partnered on seepage flows from 2005 to 2011. This period of time was an average of 20 days per year. The pre-project seepage rate is based on a pilot test conducted in 2012 as well as the Project partners experience operating the Packwood Creek channel for many years. The Packwood Creek Recharge Project would develop the ability in five locations along a 4.5 mile stretch of the Creek to pond water in the Creek and intentionally increase the seepage in these areas to recharge groundwater with available surplus supplies. After the project is developed that average annual recharge volume increases 400 AF/year. It is anticipated that the additional recharge will slow the rate of declining groundwater levels in the area and benefit groundwater pumpers through reduced pumping costs. Also, since the City of Visalia relies completely on pumped groundwater for the water supply delivered to City residents, this recharge will significantly improve the reliability of City water supplies during drought periods. However, the increased recharge volume is listed as the only water supply benefit to avoid double counting.

The Project life span was estimated to be 50 years, primarily linked to the concrete structures. The automated gates were assumed to be replaced after 25 years. These estimates are based on a combination of regional experience, manufacturer's information, and life expectancies listed in *Design and Operation of Farm Irrigation Systems*, ASAE Monograph No. 3, 1981 (pg 58). Given the annual recharge benefit, the project will increase recharge by a cumulative 20,000 AF over the anticipated life of the Project.

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Table 13-1: Packwood Creek Recharge Project Table 9

Table 9 – Annual Project Physical Benefits				
Project Name: <u>Packwood Creek Recharge Project</u>				
Type of Benefit Claimed: <u>Water Supply</u>				
Measure of Benefit Claimed (Name of Units): <u>Acre-Feet (AF)</u>				
Additional Information About this Measure: <u>Additional Amount of Water Recharged</u>				
(a)	(b)	(c)	(d)	
Physical Benefits				
Year	Without Project	With Project	Change Resulting from Project (c) – (b)	Cumulative Total of Physical Benefits
2012	280	680	400	400
2013	280	680	400	800
2014	280	680	400	1,200
2015	280	680	400	1,600
2016	280	680	400	2,000
2017	280	680	400	2,400
2018	280	680	400	2,800
2019	280	680	400	3,200
2020	280	680	400	3,600
2021	280	680	400	4,000
2022	280	680	400	4,400
2023	280	680	400	4,800
2024	280	680	400	5,200
2025	280	680	400	5,600
2026	280	680	400	6,000
2027	280	680	400	6,400
2028	280	680	400	6,800
2029	280	680	400	7,200
2030	280	680	400	7,600
2031	280	680	400	8,000
2032	280	680	400	8,400
2033	280	680	400	8,800
2034	280	680	400	9,200
2035	280	680	400	9,600
2036	280	680	400	10,000
2037	280	680	400	10,400

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Table 9 – Annual Project Physical Benefits				
Project Name: <u>Packwood Creek Recharge Project</u>				
Type of Benefit Claimed: <u>Water Supply</u>				
Measure of Benefit Claimed (Name of Units): <u>Acre-Feet (AF)</u>				
Additional Information About this Measure: <u>Additional Amount of Water Recharged</u>				
(a)	(b)	(c)	(d)	
Physical Benefits				
Year	Without Project	With Project	Change Resulting from Project (c) – (b)	Cumulative Total of Physical Benefits
2038	280	680	400	10,800
2039	280	680	400	11,200
2040	280	680	400	11,600
2041	280	680	400	12,000
2042	280	680	400	12,400
2043	280	680	400	12,800
2044	280	680	400	13,200
2045	280	680	400	13,600
2046	280	680	400	14,000
2047	280	680	400	14,400
2048	280	680	400	14,800
2049	280	680	400	15,200
2050	280	680	400	15,600
2051	280	680	400	16,000
2052	280	680	400	16,400
2053	280	680	400	16,800
2054	280	680	400	17,200
2055	280	680	400	17,600
2056	280	680	400	18,000
2057	280	680	400	18,400
2058	280	680	400	18,800
2059	280	680	400	19,200
2060	280	680	400	19,600
Last Year of Project Life	280	680	400	20,000
Comments:				

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13.1.3 Alternative Basin Project

13.1.3.1 Development Costs

The alternative basin avoided project is to develop a new basin in the southeastern part of Visalia where the recharge efforts would benefit the groundwater wells that the City relies on for domestic water supplies. An equivalent project would be capable of producing an equivalent daily recharge rate of 20 AF/day to the Packwood Creek Recharge Project. Average recharge rates for the City's basins is 0.25 AF/acre/day, so an 80 acre wetted area would be necessary to produce the 20 AF/day recharge rate. Assuming that the miscellaneous facilities would require another 5 acres the total facility would be 85 acres. Recent land sales and appraisals in the agricultural areas of southeast Visalia have cost \$25,000/acre. Using this land acquisition cost the alternative basin project property would cost \$2,125,000 (which is more than total project development costs for the Packwood Creek Recharge Project).

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
	<u>Recharge Basin Alternative</u>				
1	Mobilization/demobilization, bonds & insurance, worker protection, miscellaneous facilities and operations	1	LS	\$50,000	\$50,000
2	Land Acquisition	85	AC	\$25,000	\$2,125,000
3	Earthwork	125,000	CY	\$1.50	\$187,500
4	Structural Concrete	25	CY	\$1,000	\$25,000
5	Rip-Rap (18" thick)	250	SF	\$7.50	\$1,875
6	48" Diameter Canal Gate	1	EA	\$16,000	\$16,000
7	Trash Rack	1	LS	\$8,000	\$8,000
8	Pipeline (48" Diameter RGRCP)	56	LF	\$200	\$11,200
9	Energy Dissipaters	1	LS	\$7,500	\$7,500
10	Rip-Rap (18" thick)	250	SF	\$7.50	\$1,875
				Subtotal	\$2,433,950
	Contingency			10%	\$243,400
	Construction			SUBTOTAL:	\$2,677,350
	Design, Surveying, Environmental, Legal, etc.			6%	\$160,600
PRELIMINARY COST ESTIMATE:					\$2,837,950

Figure 13.2: Alternative Basin Project Cost Estimate

In order to be conservative on comparative costs, basin facilities were assumed to be very simple and that the project property proximate to Packwood Creek. A concrete diversion structure and a 48-inch piped discharge through a basin levee was envisioned as the only significant structure for the basin. This diversion structure would be outfitted with a sluice gate and flow meter so that diversion into the basin could be controlled and metered. This facility would be outfitted with SCADA so that Project partners could remotely monitor flows into the basin facility. Also the excavation for the basin was assumed to be limited to a cut/fill balance in order to be conservative with comparative costs (125,000 CY). This lead to an estimate of \$2,837,950 assuming a 10% construction contingency and 6% for the project design, surveying, environmental compliance and legal services.

13.1.3.2 Water Costs

The water supply for this facility would be no different than for the Packwood Creek Recharge Project. Tulare ID has supplied surplus Class Two Friant Division CVP supplies to the City of Visalia for \$35/AF in the past. This water cost was used to evaluate project benefits and costs.

13.1.3.3 Operations & Maintenance Costs

Operation & Maintenance costs were discussed with the Kaweah Delta WCD Senior Engineer and were based on their standard practices. Typical equipment for basin maintenance is the District's Challenger tractor and disk implement. The Challenger tractor costs \$65/hour and the Operator costs \$35/hour and an 80 acre basin. An 80 acre basin can be disked in approximately 40 hours and this is done twice a year to keep down weeds, totaling \$4,000/year.

Also it was estimated that to operate the basin facility for 20 days each year it would require a ditch tender for 8.6 hours with approximately totals \$300/year.

13.2 Well 15 Water Quality Project

13.2.1 Technical Justification

The City of Lindsay (Lindsay) currently has an annual water supply demand, on average, of 2,500 acre-feet. The principal source of supply to meet this demand comes from treated raw surface water from the Friant-Kern Canal. The decision to pursue treated surface water in lieu of groundwater was based on the long history of poor quality from groundwater wells drilled and developed in the area, an increase in the number of chemical constituents causing MCL violations and the costs associated with repeated failures to complete a well installation fully compliant with State and Federal drinking water standards. As Lindsay has chosen treated surface water as its principal source of supply to meet the demands of its customers, it has done so with the recognition that the source of surface supply has its own set of shortcomings. The supply is subject to reductions in available quantity due to several factors, including hydrologic conditions, outages due to both routine and emergency dam and canal conveyance facilities and treatability considerations which include introduction of chemicals for maintenance purposes which may lead to restricted use due to the presence of adverse concentrations of residual chemicals.

Due to the inability for Lindsay to offset demand from their Well No. 15, without issuing a mandated Boil Water Advisory as required by the California Department of Public Health (CDPH) in 2009, a review of potential alternative solutions and their estimated costs to allow Lindsay to meet CDPH's requirements under the Groundwater Rule, which occurs by achieving a 4-log inactivation of viruses was completed. This review was completed in an effort to salvage Well No. 15, which other than cyclic bacteriological contamination is a very dependable, high-volume producing well, versus securing a new well location and constructing a new well in or around the city limits with no guarantees that a comparable or superior well could be constructed.

The review of potential alternative solutions, which was conducted by Lindsay's Consultant Engineer, concluded that the goal of meeting CDPH's requirements under the Groundwater Rule could be achieved through three (3) different alternatives: a pipeline and sampling station project (proposed Project), a U.V. Disinfection project, and a Contact Tank, Booster Pump and Hydropneumatic Tank project. The U.V. Disinfection project alternative proposed the construction of an in-line, medium pressure UV system to treat the water being delivered from Well No. 15 at a disinfection dose of 40 mJ/cm² at an estimated construction cost of \$638,935. The Contact Tank, Booster

Pump and Hydropneumatic Tank project proposed the construction of a 207,000 gallon factory coated carbon steel water storage tank, a 10,000 gallon hydropneumatic tank and a multiple booster system and pipe manifold which would pump approximately 1,400 gpm, at an estimated construction cost of \$887,700. The pipeline and sampling station project, which is the proposed Project, proposed the construction of approximately 1,000 LF of eight (8) inch diameter pipeline, the abandonment of 1,000 LF of existing six (6) inch water main and the installation of three (3) climate controlled, continuous recording chorine analyzers at an estimated construction cost of \$384,800.

To ensure that the pipeline and sampling station project preferred alternative would work, a Chlorine Contact Time Study (Study) was accomplished for Lindsay in 2010 by Keller/Wegley Consulting Engineers which provided information to Lindsay relative to the utilization of their Well No. 15 as it pertained to the removal of the bacteriological contamination. The Study indicated the capability of the proposed alternative facilities to accomplish the retention of the produced water supply sufficiently to satisfy the minimum contact time requirement.

13.2.2 Project Physical Benefits

Summary of the types of physical benefits being claimed

The Well No. 15 Pipeline Segment and Sampling Stations Project (Project) is estimated to produce the following physical benefits over the remaining life-span of the well, which is estimated to be 35 years:

- 23,344 acre-feet of compliant and dependable water supply;
- The removal of the mandated Boil Water Advisory;
- The discontinuance of the public's perception of basis for and impacts of the Boil Water Advisory notice; and
- The energy savings over other sufficient and more costly alternatives.

Narrative description of all of the project's expected physical benefits

The estimated amount of 23,344 acre-feet of compliant and dependable water supply is based upon the following. Lindsay delivers annually (March to February), 2,500 acre-feet on average. The City holds a Central Valley Project (CVP) - Friant Division, Class 1 contract in the amount of 2,500 acre-feet. The Bureau of Reclamation has concluded that, on average during a normal year, only 85 percent of all Class 1 allocations will be met in the foreseeable future. In a typical ten (10) year period, the City should experience approximately six (6) years of normal contract deliveries from the Friant-

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Kern Canal and four (4) years of below normal (55% Class 1 was used for illustrative purposes) contract deliveries due to below normal contract supply and/or canal outage reasons. If deliveries do not achieve these levels, then the benefits of the Project are further increased.

A recent condition that provides illustration of the above-mentioned description is the 2012-2013 water year (March, 2012 to February, 2013). The 2012-2013 water year was classified as a normal-dry water year and allocation of Lindsay's Class 1 CVP – Friant Division contract amount was 57 percent of normal, which equated to 1,425 acre-feet of available surface water delivery from the Friant-Kern Canal. In addition, due to a non-native aquatic plant species growing in the Friant-Kern Canal, the operation of said canal was ceased for a 120 day period, during which Lindsay could not receive any deliveries of its 2012-2013 surface water supply. Due to the inability to delivery surface water supplies, Lindsay was forced to put Well No. 15 into full operation, issue a mandated Boil Water Advisory and deliver a non-compliant groundwater supply.

Another recent, yet on-going problem that Lindsay has had to deal with is the public's perception of the Boil Water Advisory. Prior to the Chlorine Contact Study, as described previously, CDPH required Lindsay to deliver the Boil Water Advisory notice to all customers, city-wide. This amount was reduced to 34 customers through protests filed by Lindsay with CDPH and was further reduced to five (5) customers following the results of the Chlorine Contact Study in 2010. While these reductions were a result of working with CDPH relative to technical compliance matters, the discontinuing of the BWA to certain parties, while remaining issued to other parties has caused considerable confusion and an overall distrust among certain customer elements. The Project's ability to have the BWA removed for all customers will go a long way toward rebuilding the trust that is an important element of operating a public water system.

The Project has a number of significant benefits over all other Project alternatives which would deliver comparable benefits. First, the fact that it incorporates an existing well facility means that that investment is not lost, nor does it have to have been duplicated in another installation. Duplication may require the drilling and development of a multiple number of wells to secure a compliant facility. If one could be found, an interconnecting pipeline to the existing distribution system would have to be constructed.

When compared to the UV Disinfection alternative, multiple Project benefits exist in addition to the initial capital cost differential. UV systems consume considerable amounts of power. As every acre-foot of developed water has to be treated, that cost is

extensive, a cost which is avoided completely with the recommended Project, as no additional power consumption is required. The UV Disinfection alternative also requires periodic lamp cleaning, lamp replacement and lamp ballast replacement, all of which add to the annual operating cost and are avoided with the recommended Project. The last avoided cost is the requirement to shade all of the facilities as the impact of the summer sun is to shorten the life of the facilities and to cause intermittent outages due to high electrical power cabinet temperatures.

When compared to the Contact Tank alternative, the benefits are also multiple. A site would have to be identified, or created, purchased and developed for the tank, pumping and electrical facilities. The small size in an agricultural area makes direct purchase of an existing parcel a difficult proposition and would take agricultural land out of production.

Increased operation and maintenance would also be a permanent expense due to the annual maintenance and periodic replacement of the anode packs necessary to protect the steel tanks. Power use would also increase due to the impressed current requirements and friction loss increases caused by the design of the system. The existing pump and motor serving Well No. 15 would have to be removed and replaced. Additional unavoidable maintenance costs would also be experienced for painting and periodic replacement of booster pumps and related electrical and controls support equipment.

13.2.3 Annual Physical Benefits

Table 9 has been completed to present the physically quantifiable benefits of the Project. The table provides the benefits in terms of acre-feet, which is the proper measurement stick. The table also indicates that, absent the Project, Lindsay remains short of compliant supply by the amount of the Project benefit. The component which cannot be measured and has been left out, is how many people are purchasing bottled water in lieu of utilizing the City supply due to lack of confidence in said supply. Lines which form waiting to fill bottles at bottled water fill stations are testimony to this impact, even if not measurable.

**KAWEAH RIVER BASIN IRWM GROUP
2013 IMPLEMENTATION GRANT PROPOSAL**

Kaweah Delta WCD

**Table 13-2: Well 15 Water Quality Project Table 9
Table 9 – Annual Project Physical Benefits**

Project Name: <u>Well 15 Water Quality Project</u>			
Type of Benefit Claimed: <u>Improved and Dependable Water Quality</u>			
Measure of Benefit Claimed (Name of Units): <u>Acre-Feet</u>			
Additional Information About this Measure:			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	94	94
2015	0	375	375
2016	0	375	375
2017	0	1125	1125
2018	0	1125	1125
2019	0	375	375
2020	0	375	375
2021	0	375	375
2022	0	1125	1125
2023	0	1125	1125
2024	0	375	375
2025	0	375	375
2026	0	375	375
2027	0	1125	1125
2028	0	1125	1125
2029	0	375	375
2030	0	375	375
2031	0	375	375
2032	0	1125	1125
2033	0	1125	1125
2034	0	375	375
2035	0	375	375
2036	0	375	375
2037	0	1125	1125
2038	0	1125	1125
2039	0	375	375
2040	0	375	375
2041	0	375	375
2042	0	1125	1125

**KAWEAH RIVER BASIN IRWM GROUP
2013 IMPLEMENTATION GRANT PROPOSAL**

Kaweah Delta WCD

Table 9 – Annual Project Physical Benefits			
Project Name: <u>Well 15 Water Quality Project</u>			
Type of Benefit Claimed: <u>Improved and Dependable Water Quality</u>			
Measure of Benefit Claimed (Name of Units): <u>Acre-Feet</u>			
Additional Information About this Measure:			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2043	0	1125	1125
2044	0	375	375
2045	0	375	375
2046	0	375	375
2047	0	1125	1125
2048 - Last Year of Project Life	0	1125	1125
<p>Comments: The City of Lindsay (City) delivers annually (March to February), 2,500 acre-feet on average. The City holds a Central Valley Project - Friant Division Class 1 contract in the amount of 2,500 acre-feet. The Bureau of Reclamation has concluded that on average during a normal year, only 85 percent of all Class 1 allocations will be met in the foreseeable future. In a typical ten (10) year period, the City will experience six (6) years of normal contract deliveries from the Friant-Kern Canal and four (4) years of below normal (55% Class 1 was used for illustrative purposes) contract deliveries due to below normal contract supply and/or canal outage.</p>			

ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX A

**Water Resources Investigation Groundwater Elevation Changes
near City of Visalia**

ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX B

**Civil Engineering Memo on Packwood Creek
Reconnaissance Study**

MEMORANDUM

To: Larry Dotson, PE
From: Richard Moss, PE, Randy Hopkins, PE
Subject: Packwood and Cameron Creeks Pool and Basin Reconnaissance Study
Date: August 10, 2010

BACKGROUND

The Kaweah Delta Water Conservation District (KDWCD) is working with the City of Visalia, CalWater and Tulare Irrigation District to develop a groundwater recharge program in the Visalia region. As part of this effort the agencies are considering using Packwood and Cameron creeks to convey water from the Kaweah or St. Johns rivers (originating from either the Kaweah River or CVP Friant-Kern Canal) to one or more basins for groundwater recharge. In-channel check structures could also be used to store water in the creeks to increase recharge.

A hydraulics and capacity analysis was previously performed on both Packwood and Cameron creeks along their alignments near and through the City of Visalia. A HEC-RAS model was developed for each creek to determine anticipated water surface elevations at various flow rates. In conjunction with the HEC-RAS models, profiles of each creek were developed to show potential capacity and freeboard issues at various flow rates.

PURPOSE AND SCOPE

KDWCD and the City of Visalia are considering the use of these two creeks for groundwater recharge and/or conveying surface water to recharge basins located along the creek alignments. By using existing check structures or constructing new ones at strategic locations along the creeks, pools could be developed to temporarily store water and to allow it to percolate into the aquifer or to allow the water to be diverted into adjacent basins for recharge.

A pool capacity analysis was performed for several pool alternatives along each creek alignment. Potential pool locations were identified that maximize the pool depth and length of pool upstream of the check structure. For each pool alternative, a conceptual opinion of probable construction cost was developed to weigh the cost and benefit of each pool alternative. The data used for the analysis was based on work developed from the previous hydraulic capacity analysis. In addition, existing and new basins were considered for recharge outside of the creek channels, and estimates of recharge capacity were determined.

ANALYSES

The analyses utilized the profiles developed from the previous topographic survey and HEC-RAS modeling. In addition, all estimates of recharge rates assume, for the limited purposes of this study, a continuous percolation rate of one-half foot per day and that all percolation occurs at the floor of the channel or basin, not on the embankments. This percolation rate is only an estimate to provide a sense of relative benefits between alternatives studied and should not be used for any other purpose until verified through actual field tests and studies. The pools, check structures, and recharge basins considered for this study along each creek are shown in the attached creek plan and profile drawings.

Pool Location Selection

The portions of each creek modeled in HEC-RAS were reviewed for suitability for water storage pools. Check structures were assumed to be required to create the pools. For the purposes of this study, “check structures” could refer to new concrete structures, existing concrete structures, temporary earthen dams, or existing bridges or culverts with new or existing board guides. It was assumed that the check structures should be located in areas easily accessed by District or City staff for operations and maintenance purposes. Other considerations for locating the check structures were the available channel freeboard, high water levels determined from the HEC-RAS model, depth of channel upstream of the potential check structure and the proximity of the site to provide benefits to the City’s groundwater.

To determine estimated pool volumes, channel cross sections from the HEC-RAS model were reviewed along with pool water surface elevations. Pool water surface elevations were selected to maintain at least one-foot of freeboard (when possible) in the channel. Channel cross-sectional areas were estimated every 1,000 feet along each pool, with most pools being approximately 6,000 to 8,000 feet long.

Seven potential pools were identified for Packwood Creek and four were identified for Cameron Creek. See the attached pool volume calculations for each creek. The pools identified in this study are summarized in the tables below:

Packwood Creek Pool Summary

<i>Location of Check (station)</i>	<i>Type of Check</i>	<i>Pool Water Surface Elev. (feet)</i>	<i>Length of Pool (feet)</i>	<i>Volume of Pool (acre-feet)</i>	<i>Est. Potential Monthly Recharge (acre-feet)</i>
6+00	(E) Check	306	6,400	11.9	37
56+00	(E) Check	313	8,300	19.0	34
143+00	New Check of Earthen Dam	321	5,200	7.7	20

208+00	New Check or Earthen Dam	330	7,500	13.2	27
280+00	New Check or Earthen Dam	336	5,500	9.7	20
300+00	New Check or Earthen Dam	340	7,000	15.2	24
376+00	New Check or Earthen Dam	348	6,500	15.0	26

Cameron Creek Pool Summary

<i>Location of Check (station)</i>	<i>Type of Check</i>	<i>Pool Water Surface Elev. (feet)</i>	<i>Length of Pool (feet)</i>	<i>Volume of Pool (acre-feet)</i>	<i>Est. Potential Monthly Recharge (acre-feet)</i>
142+00	New Check or Earthen Dam	328.5	3,800	5.8	21
203+00	New Check or Earthen Dam	336	6,900	11.3	50
280+00	New Check or Earthen Dam	344	7,000	12.2	44
325+00	New Check or Earthen Dam	349	4,500	13.1	24

Basin Location Selection

In addition to utilizing pools within the creek channels, basins near the creeks were also considered for recharge. A check structure would again be required to back water up to be diverted into conveyance facilities leading to the basins. Several existing basins (shown in light blue) along the Packwood Creek alignment that may be utilized for recharge, while it appears Cameron Creek has no existing adjacent basins. For purposes of estimating costs, it was assumed that a new connection facility between a creek and basin would be required, even if there is an existing connection facility, due to capacity limitations or original intended use. Several existing basins currently used as parks (shown in green) within the City of Visalia are either adjacent to or near Packwood Creek. However, these were not considered for recharge in all cases because of their current use as parks.

Packwood Creek Basin Summary

<i>Location of Basin (station)</i>	<i>Type (Name) of Basin</i>	<i>Approx. Basin Size (acres)</i>	<i>Est. Potential Monthly Recharge (acre-feet)</i>
56+00	Existing ("Police Station Basin")	7.2	110
71+00	Existing ("Food-4-Less" or "State" Basin)	1.4	20
106+00	New ("Stonebrook Park")	5	75
208+00	New	Up to 17	Up to 255
280+00	Existing basin/orchard	14	210
320+00	Existing ("Dooley Basin")	5.7	85
380+00	Existing/New (including "Blain Basin")	7.5 (existing) up to 100	110 up to 1,400
440+00	Existing ("Oaks Basin")	28	Up to 420

Cameron Creek Basin Summary

<i>Location of Basin (station)</i>	<i>Type (Name) of Basin</i>	<i>Approx. Basin Size (acres)</i>	<i>Est. Potential Monthly Recharge (acre-feet)</i>
325+00	New	Up to 80	Up to 1,200

For the purposes of this study, it was assumed new basins would only be constructed on undeveloped land of "significant" size.

Packwood Creek

There is a storm drain line that leads from the Stonebrook Park drainage facilities to Packwood Creek. It should be fairly easy to tie into this line and divert water from Packwood Creek into Stonebrook Park. The park would need to be reconfigured to allow a significant portion of the park to be flooded in the summertime. Clearly an effort would need to be made to mitigate the loss of park land. Some mitigation could be as park improvements incorporating the regular presence of water as an added park feature.

The new potential Packwood Creek basin at station 208+00 listed above is located on a large parcel near an existing mobile home park and railroad tracks which was previously a site of an olive processing plan. The owner of this parcel already has plans to develop this property but may be willing to consider a sale alternative in this down development economy. He has not been contacted.

The potential to expand the existing Blain Basins up to 100 acres has greater potential given the City of Visalia already owns this property. It is slated to be developed into a regional sports park, but given its prime location from a groundwater recharge standpoint, consideration should be given to using it as a recharge site, at least for interim use. It is also well located for potential use for storm water layoff for either Packwood Creek or Mill Creek.

Cameron Creek

Data from the topographic survey indicates that Cameron Creek is shallower than Packwood Creek, often making it more difficult to form a pool of significant volume using a check structure. However, the portion of Cameron Creek considered for this study is primarily within rural agricultural areas, allowing flexibility in selecting locations for siting and sizing recharge basins. Ideally, the connection facility between the creek and any recharge basin would be immediately upstream of a check structure to maximize water depth in the basin. General areas to consider recharge basins along Cameron Creek include immediately east of Lovers Lane to near station 330+00 just downstream of the creek’s headgate. Those areas would also allow for deeper pools when backed up with a new check structure.

A new basin location was selected near a new check structure (near station 325+00) that would put the additional recharge site in good proximity to the City’s current urban boundary. No contact with the current landowner has been made.

SUMMARY

Based on the available data and information, conceptual opinions of construction costs were developed for each check structure and pool option considered in this study (see the attached cost breakdowns for further details). A summary of pool improvement alternatives are shown in the tables below for each creek.

Packwood Creek Pool Costs

<i>Location of Check (station)</i>	<i>Volume of Pool (acre-feet)</i>	<i>Est. Check & Pool Improvement Costs (Permanent)</i>	<i>Est. Check & Pool Improvement Costs (Temporary)</i>
6+00	11.9	\$3,000	n/a
56+00	19.0	\$3,000	n/a
143+00	7.7	\$58,000	\$25,000
208+00	13.2	\$187,000	\$24,000
280+00	9.7	\$203,000	\$24,000
300+00	15.2	\$178,000	\$18,000
376+00	15.0	\$173,000	\$10,000

Cameron Creek Pool Costs

<i>Location of Check (station)</i>	<i>Volume of Pool (acre-feet)</i>	<i>Est. Check & Pool Improvement Costs (Permanent)</i>	<i>Est. Check & Pool Improvement Costs (Temporary)</i>
142+00	5.8	\$9,000	n/a
208+00	11.3	\$55,000	\$22,000
280+00	12.2	\$48,000	\$14,000
325+00	13.1	\$145,000	\$7,000

“Permanent” check and pool improvements include the construction of a permanent standalone concrete check structure with provisions for board guides. “Temporary” check and pool improvements include the construction of an earthen dam with a corrugated metal pipe (CMP) water control structure located within the dam. This control structure would likely consist of a large diameter CMP vertical riser half pipe with board guides, with a horizontal outlet pipe that would have the capability to convey nominal creeks flows without removing the dam. An example of such a structure is shown in **Figure 1** below.



Figure 1 – CMP Half Pipe Structure

In addition, it is estimated that most tie-in facilities used for connecting a creek to an adjacent basin would likely have construction costs in the range of \$100,000 to \$150,000, depending on size and capacity requirements.

NEXT STEPS

Additional work to further investigate the feasibility of creek and/or basin recharge activities includes:

- Performing geotechnical, insitu seepage, and/or flow measurement tests to verify the percolation rates within the creek channels and basins considered in this study in order to refine estimates of the amount of potential recharge capacity of the creeks and basins considered in this study;
- Refine construction estimates for check structures and basin tie-ins and prioritize projects to pursue and construct.

Additional topics to be explored include the need to meet the future conveyance demands of Tulare Irrigation District for these creeks and to assist the City of Visalia in utilizing these creeks as storm water control facilities:

- Reviewing how these creeks can best be used to allow Tulare Irrigation District to meet their future conveyance demands and identify necessary improvements. Some of this is expected to be accomplished as part of the Tulare Irrigation District's System Optimization Review Study currently underway;
- Reviewing how these creeks can best be integrated in the City of Visalia's storm water master plan.

Kaweah Delta Water Conservation District
 Packwood and Cameron Creeks Reconnaissance Study
Creek Pool Volume Estimates

Packwood Creek					
Check Sta: 6+00					
	Water surface elev:	306	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	639	300	184		
	1,000	300.4	185	73696	1.7
	2,000	300.6	105	145174	3.3
	3,000	301.4	106	105788	2.4
	4,000	302.5	69	87349	2.0
	5,000	303	58	63500	1.5
	6,000	304.8	15	36783	0.8
End	7,000			7548	0.2
			Total	519838	11.9
Check Sta: 56+00					
	Water surface elev:	313	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	5,500	304.3	353		
	6,000	304.8	230	116518	2.7
	7,000	305.8	177	203517	4.7
	8,000	306.7	146	161615	3.7
	9,000	307.6	102	124153	2.9
	10,000	308.9	74	88164	2.0
	11,000	309.8	49	61541	1.4
	12,000	310.5	29	39159	0.9
	13,000	311.4	21	24979	0.6
End	13,800			8278	0.2
			Total	827924	19.0
Check Sta: 143+00					
	Water surface elev:	321	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	14,500	314.3	120		
	15,000	315.6	105	78830	1.8
	16,000	317.3	93	98950	2.3
	17,000	316.9	77	85139	2.0
	18,000	318.9	25	51204	1.2
	19,000	320.1	12	18341	0.4
End	19,700			4089	0.1
			Total	336553	7.7

Kaweah Delta Water Conservation District
Packwood and Cameron Creeks Reconnaissance Study
Creek Pool Volume Estimates

Check Sta: 208+00					
	Water surface elev:		330	ft	
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	20,501	321.65	194		
	21,000	322	199	39375	0.9
	22,000	322.5	157	178374	4.1
	23,000	324.1	129	143137	3.3
	24,000	326.5	49	89144	2.0
	25,000	327	46	47666	1.1
	26,000	328.3	40	42753	1.0
	27,000	328.9	15	27092	0.6
End	28,000			7304	0.2
			Total	574844	13.2
Check Sta: 280+00					
	Water surface elev:		336	ft	
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	28,000	330	164		
	29,000	330.4	135	149779	3.4
	30,000	331.4	91	112817	2.6
	31,000	331.8	65	77803	1.8
	32,000	332.6	44	54743	1.3
	33,000	335.3	7	25644	0.6
End	33,500			1725	0.0
			Total	422512	9.7
Check Sta: 300+00					
	Water surface elev:		340	ft	
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	30,000	331.45	234		
	31,000	331.8	187	210886	4.8
	32,000	332.6	151	169217	3.9
	33,000	335.3	81	116098	2.7
	34,000	337.1	56	68685	1.6
	35,000	337.65	42	48915	1.1
	36,000	337.95	26	33974	0.8
End	37,000			13217	0.3
			Total	660992	15.2

**Kaweah Delta Water Conservation District
 Packwood and Cameron Creeks Reconnaissance Study
 Creek Pool Volume Estimates**

Check Sta: 376+00					
Water surface elev:		348	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	37,501	340	182		
	38,000	340.75	244	106404	2.4
	39,000	341.75	147	195585	4.5
	40,000	342.5	119	133179	3.1
	41,000	342.3	87	103253	2.4
	42,000	344.75	43	65250	1.5
	43,000	345.55	26	34887	0.8
End	44,000			13242	0.3
			Total	651799	15.0
Cameron Creek					
Check Sta: 142+00					
Water surface elev:		328.5	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	14,000	321.5	191		
	15,000	324.2	87	111219	2.6
	16,000	325.9	60	73349	1.7
	17,000	326.8	40	49903	1.1
End	17,800			16065	0.4
			Total	250536	5.8
Check Sta: 203+00					
Water surface elev:		336	ft		
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	20,000	330.1	178		
	21,000	331.6	140	111121	2.6
	22,000	332	108	123661	2.8
	23,000	333	59	83230	1.9
	24,000	334	66	62625	1.4
	25,000	334.1	48	57106	1.3
	26,000	334.6	32	39763	0.9
End	26,900			14266	0.3
			Total	491773	11.3

Kaweah Delta Water Conservation District
 Packwood and Cameron Creeks Reconnaissance Study
Creek Pool Volume Estimates

Check Sta: 280+00					
	Water surface elev:		344	ft	
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	28,037	337.5	233		
	28,993	339.14	151	183808	4.2
	30,000	339.9	103	128243	2.9
	31,000	340.05	70	86611	2.0
	32,000	341.55	51	60232	1.4
	33,000	342.2	36	43139	1.0
	34,000	343.5	10	22689	0.5
End	35,000			4914	0.1
			Total	529635	12.2
Check Sta: 325+00					
	Water surface elev:		349	ft	
	Sta	Floor Elev	Area	Volume (CF)	Volume (AF)
	32,335	341.2	228		
	33,000	342.2	199	141926	3.3
	34,000	343.5	156	177517	4.1
	35,000	343.9	126	140950	3.2
	36,000	346.4	50	87839	2.0
End	36,854			21399	0.5
			Total	569630	13.1



ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

KAWEAH DELTA WATER CONSERVATION DISTRICT
PACKWOOD AND CAMERON CREEKS RECONNAISSANCE STUDY
PACKWOOD CREEK CHECK STRUCTURES AND POND INTERTIES
 8/10/2010

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
<u>Station 6+00 Check Improvements (11.9 AF)</u>					
1	Raise left bank to maintain freeboard (150 LF)	200	CY	\$15	\$3,000
				Total	\$3,000
<u>Station 56+00 Check Improvements (19.0 AF)</u>					
2	Raise both banks to maintain freeboard (100 LF)	200	CY	\$15	\$3,000
				Total	\$3,000
<u>Station 143+00 (West St.) Check Improvements (7.7 AF)</u>					
<u>Earth Dam Option</u>					
3	Raise both banks to maintain freeboard (600 LF)	1,200	CY	\$15	\$18,000
4	Construct earth dam (include overexcavation and scarification)	50	CY	\$30	\$1,500
5	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$25,000
<u>Check Structure Option</u>					
6	Raise both banks to maintain freeboard (600 LF)	1,200	CY	\$15	\$18,000
7	Modify West Street culvert with board guides	1	LS	\$40,000	\$40,000
				Total	\$58,000
<u>Station 208+00 Check Improvements (13.2 AF)</u>					
<u>Earth Dam Option</u>					
8	Raise right bank to maintain freeboard (600 LF)	1,100	CY	\$15	\$16,500
9	Construct earth dam (include overexcavation and scarification)	70	CY	\$30	\$2,100
10	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$24,000
<u>Check Structure Option</u>					
11	Raise right bank to maintain freeboard (600 LF)	1,100	CY	\$15	\$16,500
12	Construct new check structure (no gates)	1	LS	\$150,000	\$150,000
13	Channel improvements around structure (lining, rip rap, etc.)	1	LS	\$20,000	\$20,000
				Total	\$187,000
<u>Optional for Basin Recharge</u>					
14	Construct tie-in to proposed basin south of creek	1	LS	\$110,000	\$110,000



ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

KAWEAH DELTA WATER CONSERVATION DISTRICT
PACKWOOD AND CAMERON CREEKS RECONNAISSANCE STUDY
PACKWOOD CREEK CHECK STRUCTURES AND POND INTERTIES
 8/10/2010

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
<i>Station 280+00 Check Improvements (9.7 AF)</i>					
<i>Earth Dam Option</i>					
15	Raise right bank to maintain freeboard (600 LF)	1,100	CY	\$15	\$16,500
16	Construct earth dam (include overexcavation and scarification)	70	CY	\$30	\$2,100
17	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$24,000
<i>Check Structure Option</i>					
18	Raise right bank to maintain freeboard (1100 LF)	2,200	CY	\$15	\$33,000
19	Construct new check structure (no gates)	1	LS	\$150,000	\$150,000
20	Channel improvements around structure (lining, rip rap, etc.)	1	LS	\$20,000	\$20,000
				Total	\$203,000
<i>Optional for Basin Recharge</i>					
21	Construct tie-in to existing orchard/basin east of creek	1	LS	\$110,000	\$110,000
<i>Station 300+00 Check Improvements (15.2 AF)</i>					
<i>Earth Dam Option</i>					
22	Raise both banks to maintain freeboard (450 LF)	700	CY	\$15	\$10,500
23	Construct earth dam (include overexcavation and scarification)	70	CY	\$30	\$2,100
24	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$18,000
<i>Check Structure Option</i>					
25	Raise left bank to maintain freeboard (450 LF)	500	CY	\$15	\$7,500
26	Construct new check structure (no gates)	1	LS	\$150,000	\$150,000
27	Channel improvements around structure (lining, rip rap, etc.)	1	LS	\$20,000	\$20,000
				Total	\$178,000



ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

KAWEAH DELTA WATER CONSERVATION DISTRICT
PACKWOOD AND CAMERON CREEKS RECONNAISSANCE STUDY
PACKWOOD CREEK CHECK STRUCTURES AND POND INTERTIES
 8/10/2010

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
<i>Station 376+00 Check Improvements (15.0 AF)</i>					
<i>Earth Dam Option</i>					
28	Raise both banks to maintain freeboard (150 LF)	200	CY	\$15	\$3,000
29	Construct earth dam (include overexcavation and scarification)	70	CY	\$30	\$2,100
30	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$10,000
<i>Check Structure Option</i>					
31	Raise both banks to maintain freeboard (150 LF)	200	CY	\$15	\$3,000
32	Construct new check structure (no gates)	1	LS	\$150,000	\$150,000
33	Channel improvements around structure (lining, rip rap, etc.)	1	LS	\$20,000	\$20,000
				Total	\$173,000
<i>Optional for Basin Recharge</i>					
34	Construct tie-in to existing basin north of creek	1	LS	\$110,000	\$110,000
35	Construct tie-in to existing basin south of creek	1	LS	\$110,000	\$110,000
36	Construct tie-in to proposed basins north of creek	1	LS	\$110,000	\$110,000
37	Construct tie-in to proposed basins south of creek	1	LS	\$110,000	\$110,000
				Total	\$440,000

NOTE(S):

Excludes mobilization/demobilization, bonds, insurance, etc.

Excludes costs for proposed basin construction.



ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

KAWEAH DELTA WATER CONSERVATION DISTRICT
PACKWOOD AND CAMERON CREEKS RECONAISSANCE STUDY
CAMERON CREEK CHECK STRUCTURES AND POND INTERTIES
 8/10/2010

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
<u>Station 142+00 Check Improvements (5.8 AF)</u>					
1	Raise left bank to maintain freeboard (500 LF)	600	CY	\$15	\$9,000
	Total				\$9,000
<u>Station 208+00 Check Improvements (11.3 AF)</u>					
	<u>Earth Dam Option</u>				
2	Raise both banks to maintain freeboard (800 LF)	1,000	CY	\$15	\$15,000
3	Construct earth dam (include overexcavation and scarification)	50	CY	\$30	\$1,500
4	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
	Total				\$22,000
	<u>Check Structure Option</u>				
5	Raise banks to maintain freeboard (800 LF)	1,000	CY	\$15	\$15,000
6	Modify Lovers Lane culvert with board guides	1	LS	\$40,000	\$40,000
	Total				\$55,000
<u>Station 280+00 Check Improvements (12.2 AF)</u>					
	<u>Earth Dam Option</u>				
7	Raise right bank to maintain freeboard (600 LF)	500	CY	\$15	\$7,500
8	Construct earth dam (include overexcavation and scarification)	50	CY	\$30	\$1,500
9	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
	Total				\$14,000
	<u>Check Structure Option</u>				
10	Raise right bank to maintain freeboard (600 LF)	500	CY	\$15	\$7,500
11	Modify Road 148 culvert with board guides	1	LS	\$40,000	\$40,000
	Total				\$48,000



ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

**KAWEAH DELTA WATER CONSERVATION DISTRICT
 PACKWOOD AND CAMERON CREEKS RECONNAISSANCE STUDY
 CAMERON CREEK CHECK STRUCTURES AND POND INTERTIES
 8/10/2010**

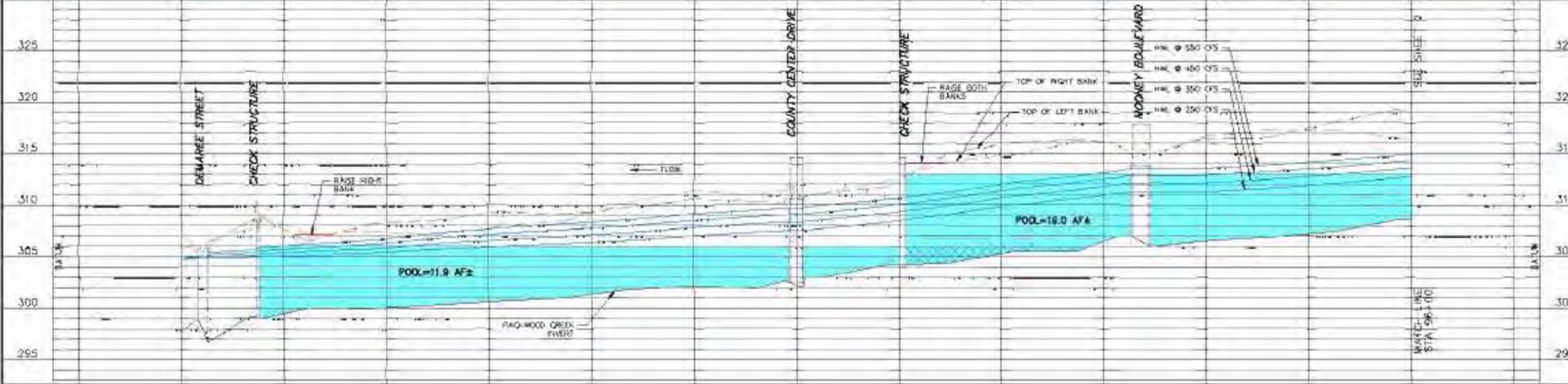
CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
<i>Station 325+00 Check Improvements (13.1 AF)</i>					
<i>Earth Dam Option</i>					
12	Construct earth dam (include overexcavation and scarification)	70	CY	\$30	\$2,100
13	Construct half pipe CMP riser	1	LS	\$5,000	\$5,000
				Total	\$7,000
<i>Check Structure Option</i>					
14	Construct new check structure (no gates)	1	LS	\$150,000	\$125,000
15	Channel improvements around structure (lining, rip rap, etc.)	1	LS	\$20,000	\$20,000
				Total	\$145,000
<i>Optional for Basin Recharge</i>					
16	Construct tie-in to proposed basin south of creek	1	LS	\$250,000	\$250,000

NOTE(S):

Excludes mobilization/demobilization, bonds, insurance, etc.

Excludes costs for proposed basin construction.



PACKWOOD CREEK HYDRAULIC STUDY
 KANEAH DELTA WATER CONSERVATION DISTRICT
 TULARE COUNTY

PACKWOOD CREEK
 PLAN & PROFILE 1

DESIGN CURVES
 LICENSE NO.
 DRAWN BY: VS
 CHECKED BY: ASC
 SCALE: AS SHOWN
 DATE: 08/10/2010
 JOB NO: 122810V1
 OWC NO:
 SHEET

08/10/2010

1 of 5



PROVOST & PRITCHARD
 10000 W. 10th Street, Suite 100
 Denver, CO 80202
 TEL: 303.733.8800
 FAX: 303.733.8801
 WWW.PROVOSTPRITCHARD.COM

08/10/2010
 REVISION
 DATE

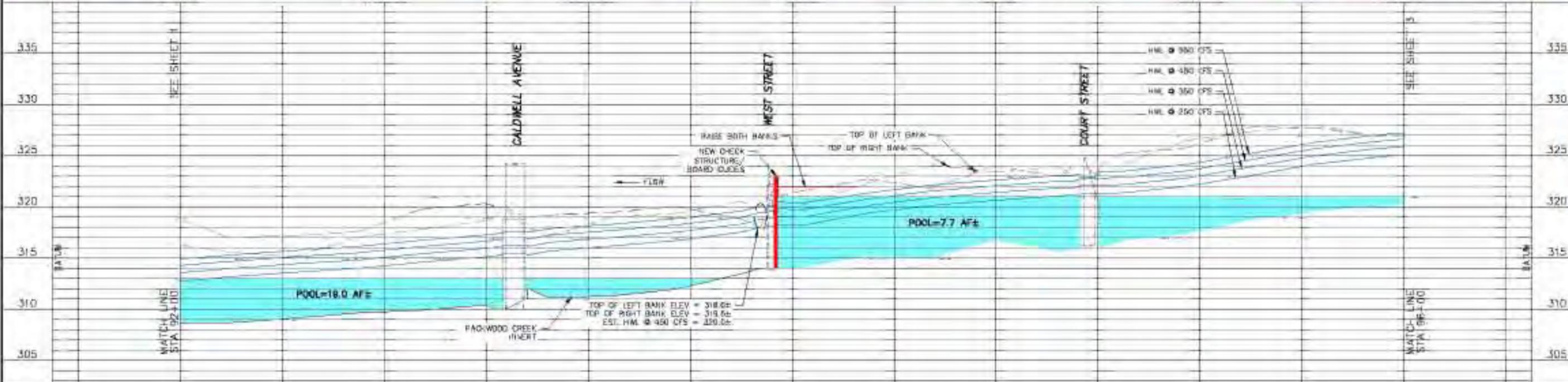
Packwood Creek
 Hydraulic Study
 KAREAH DELTA WATER CONSERVATION DISTRICT
 TULLARE COUNTY
 PLAN & PROFILE 2

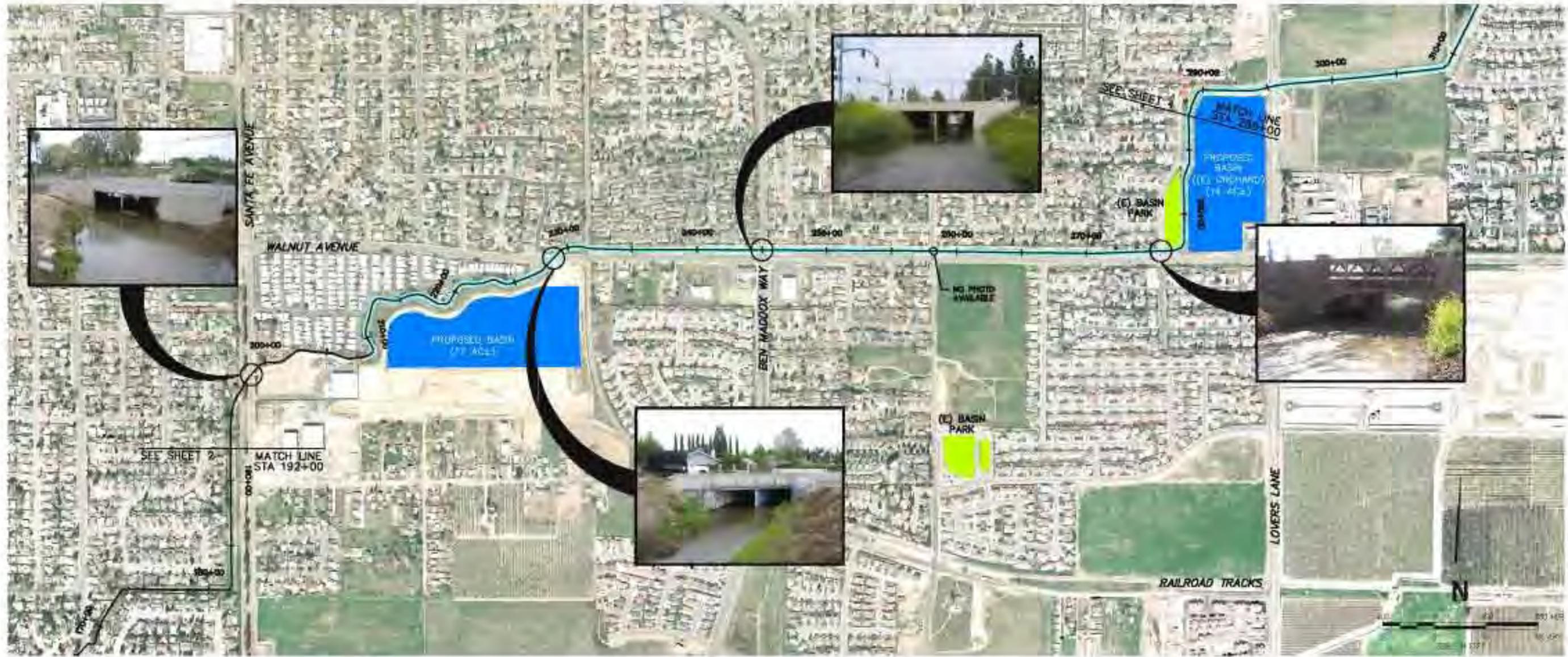
PROVOST & PRITCHARD
 An Engineering and Construction Company
 10000 W. 10th Street, Suite 100
 Denver, CO 80202
 TEL: 303.733.8800
 FAX: 303.733.8801
 WWW.PROVOSTPRITCHARD.COM

DESIGN ENGINEER:
 LICENSE NO:
 DRAFTED BY: VSL
 CHECKED BY: ASC
 SCALE: AS SHOWN
 DATE: 08/10/2010
 JOB NO: 122510V1
 SHEET NO:
 SHEET

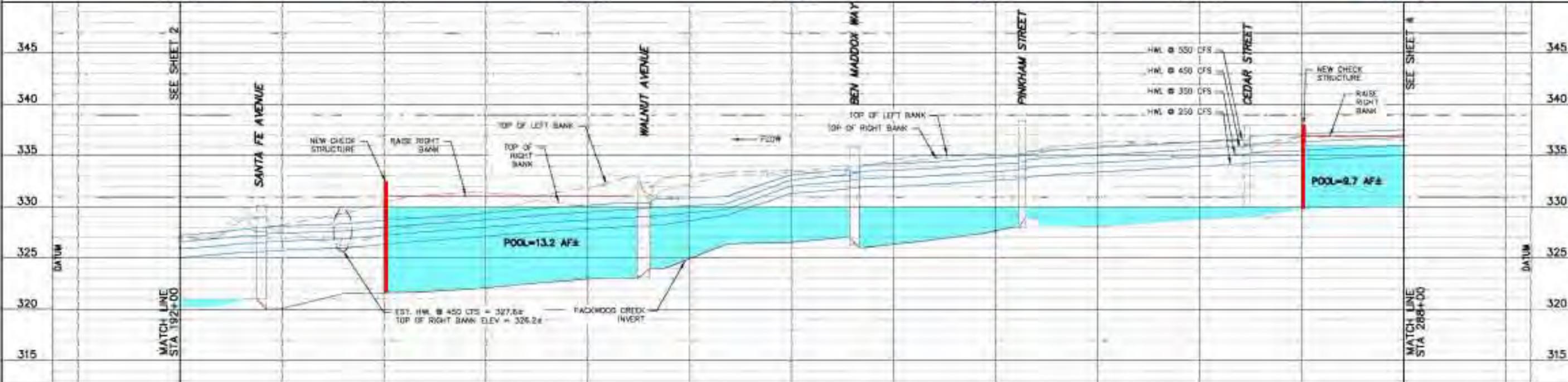
2 of **5**

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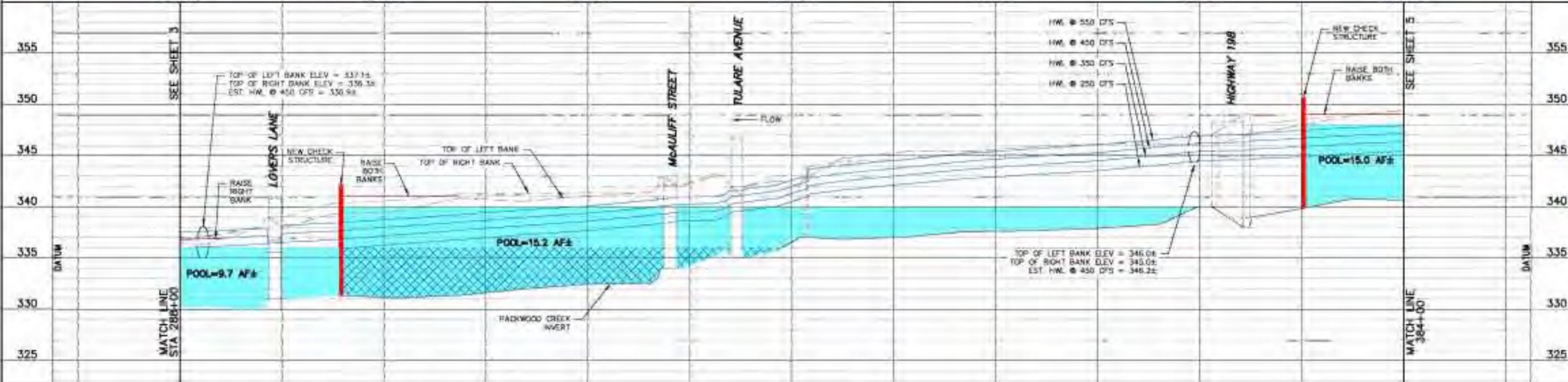
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PROVOST & PRITCHARD An Employee-Owned Company 2025 LUMINA AVENUE SUITE 200 TULARE, CA 95324 TEL: 559.938.1111 FAX: 559.938.1112 WWW.PROVOSTANDPRITCHARD.COM		KAREN DELTA WATER CONSERVATION DISTRICT TULARE COUNTY	PACKWOOD CREEK HYDRAULIC STUDY	08/10/2010	NO. 3 SECTION BY DATE
3		5		PLAN & PROFILE 3	



288+00 304+00 320+00 336+00 352+00 368+00 384+00



PROPOST & PRITCHARD
 An Employee-Owned Company
 2025 ALONZA AVENUE
 SUITE 100
 TULARE, CALIFORNIA 95326
 TEL: 559.938.1111
 WWW.PPAC.COM

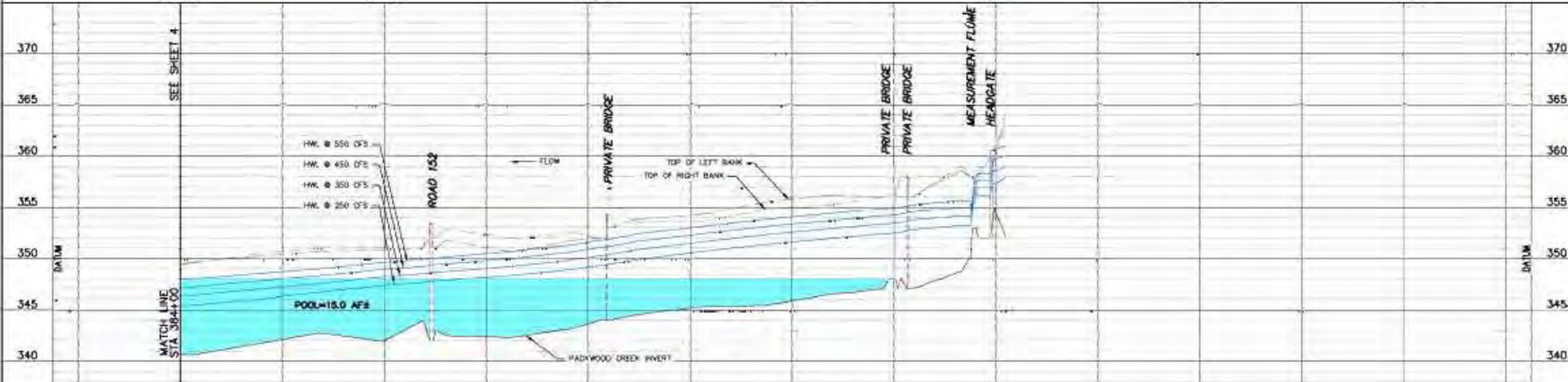
KAREN DELTA WATER CONSERVATION DISTRICT
 TULARE COUNTY
 PACKWOOD CREEK
 HYDRAULIC STUDY
 PLAN & PROFILE 4

08/10/2010
 REV. NO. 1
 BY: [Name]
 DATE: [Date]

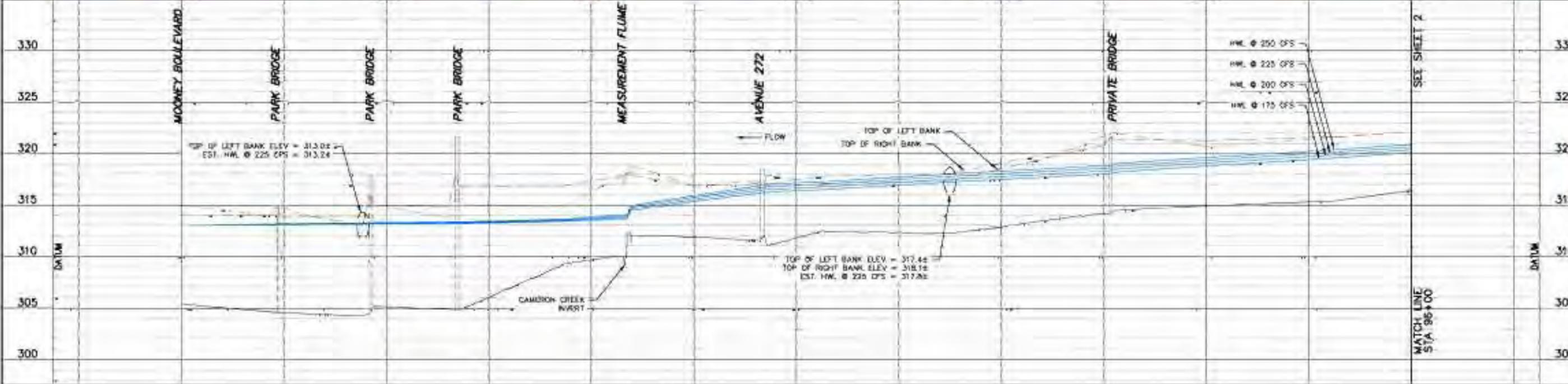
SHEET 4 OF 5



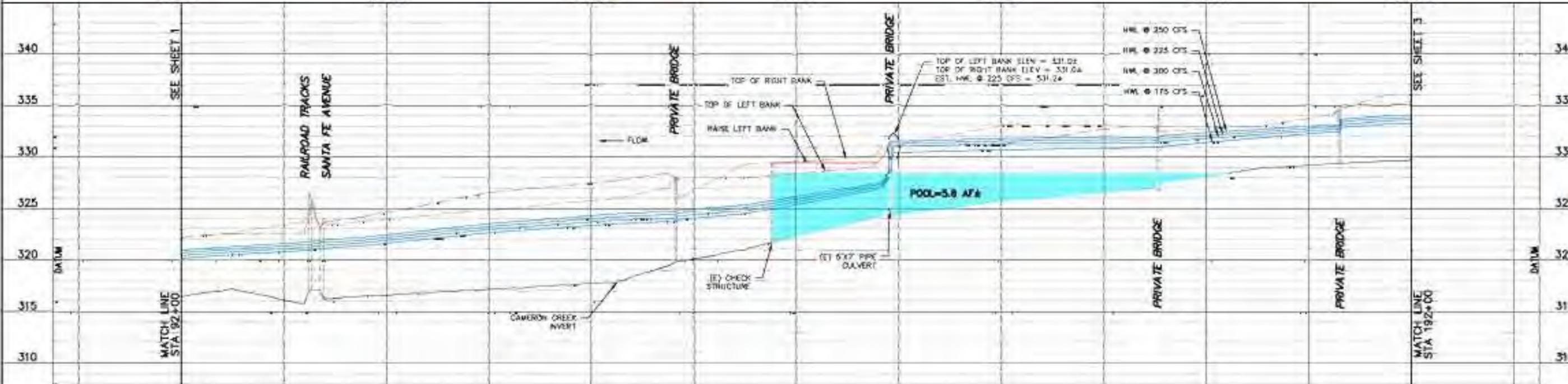
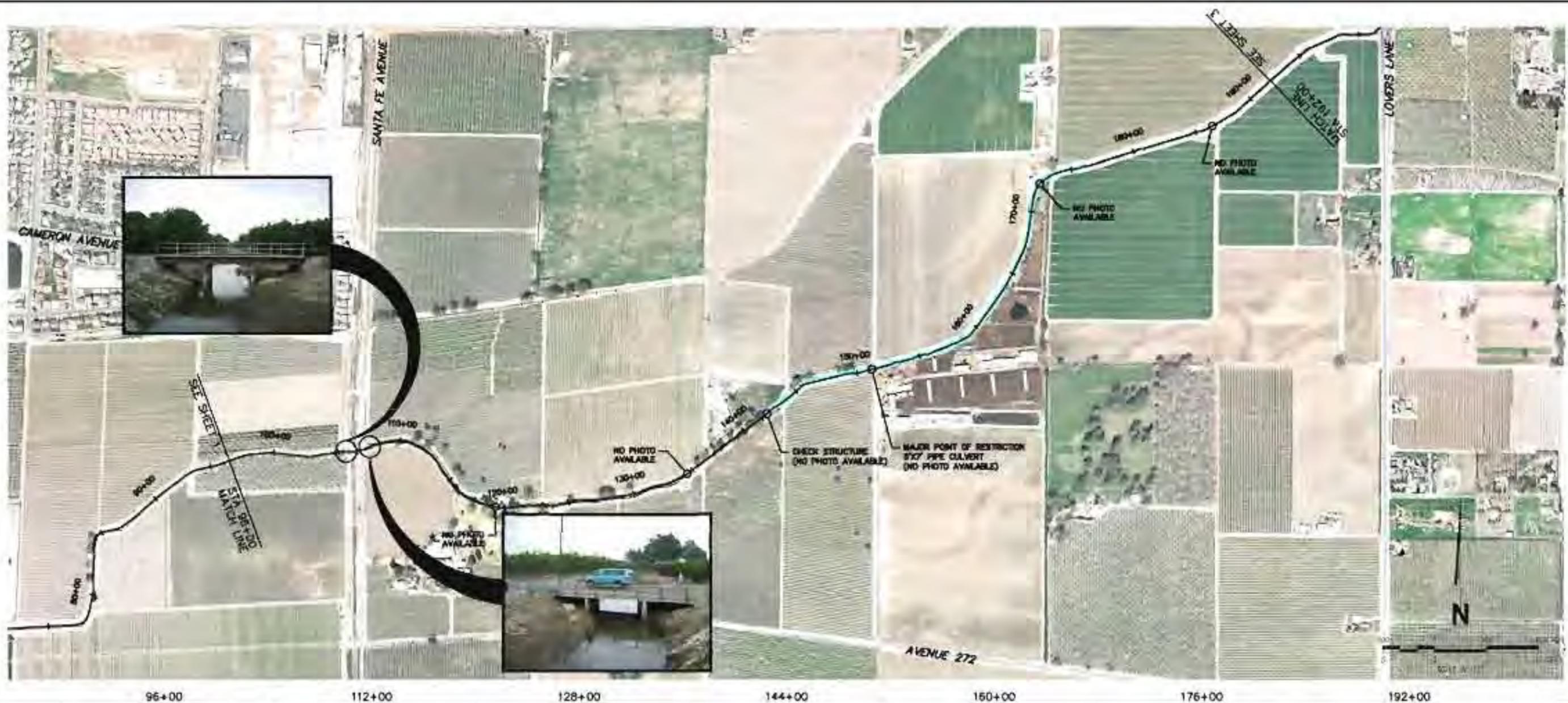
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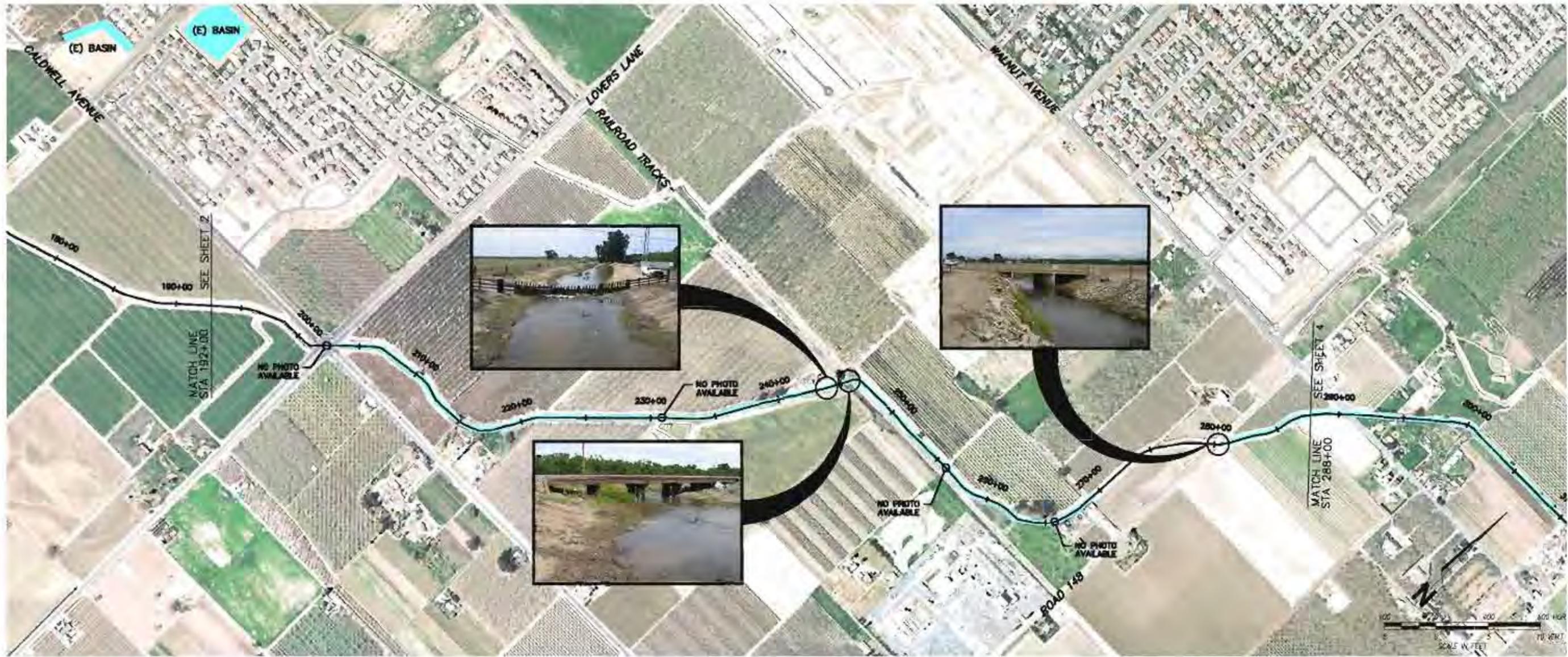
PROVOST & PRITCHARD AN EMPLOYEE OWNED COMPANY 365 S. W. 10th Ave., Suite 400 Ft. Lauderdale, FL 33304 (954) 576-1000		KANEAH DELTA WATER CONSERVATION DISTRICT TULARE COUNTY	08/10/2010	REVISION BY DATE
PACKWOOD CREEK HYDRAULIC STUDY		PLAN & PROFILE 5		
MATCH LINE STA 384+00		SEE SHEET 4		
POOL=18.0 AF				
HW @ 550 OFS HW @ 450 OFS HW @ 350 OFS HW @ 250 OFS				
PRIVATE BRIDGE PRIVATE BRIDGE				
MEASUREMENT FLUME HEADGATE				
WADSWOOD CREEK RIVER				
5				



CAMERON CREEK HYDRAULIC STUDY KANEAH DELTA WATER CONSERVATION DISTRICT TULARE COUNTY		NO. 08/10/2010 REVISION BY DATE
PROVOST & PRITCHARD CONSULTING ENGINEERS 205 ALVARADO STREET SUITE 200 TULARE, CA 95326 TEL: 559/325-1111 FAX: 559/325-1112		CAMERON CREEK PLAN & PROFILE 1
PROJECT NUMBER: 08/10/2010 PROJECT NAME: CAMERON CREEK HYDRAULIC STUDY DRAWN BY: [Name] CHECKED BY: [Name] SCALE: AS SHOWN DATE: 08/10/2010 JOB NO: 1220100 SHEET NO: 1 OF 4	1 OF 4	



CAMERON CREEK HYDRAULIC STUDY KANEAH DELTA WATER CONSERVATION DISTRICT TULARE COUNTY		08/10/2010	NO. BY DATE REVISION
PROVOST & PRITCHARD CONSULTING ENGINEERS An Employee Owned Company 305 S. ALTA STREET TULARE, CALIFORNIA 95321-4515 TEL: 559.328.2200 FAX: 559.328.2201 WWW.PROVOSTANDPRITCHARD.COM		CAMERON CREEK PLAN & PROFILE 2	
SCALE: AS SHOWN DATE: 08.10.2010 JOB NO: 1220100 SHEET NO:	DRAWN BY: JSC CHECKED BY: JSC DATE: 08.10.2010	2 of 4	



NO PHOTO AVAILABLE

NO PHOTO AVAILABLE

NO PHOTO AVAILABLE

NO PHOTO AVAILABLE

08/10/2010

REVISION

BY

DATE

CAMERON CREEK
HYDRAULIC STUDY
KAWAIAH DELTA WATER CONSERVATION DISTRICT
TULARE COUNTY

CAMERON CREEK
PLAN & PROFILE 3

PROVOST & PRITCHARD
ENGINEERS ARCHITECTS
2005 ALJUNA AVENUE
DUBLIN, CALIFORNIA 94568-1190
916.835.1100 FAX 916.835.2000 WWW.PPACON.COM

DESIGN ENGINEER:

LICENSE NO:

DRAFTED BY: VSL CHECKED BY: ASC

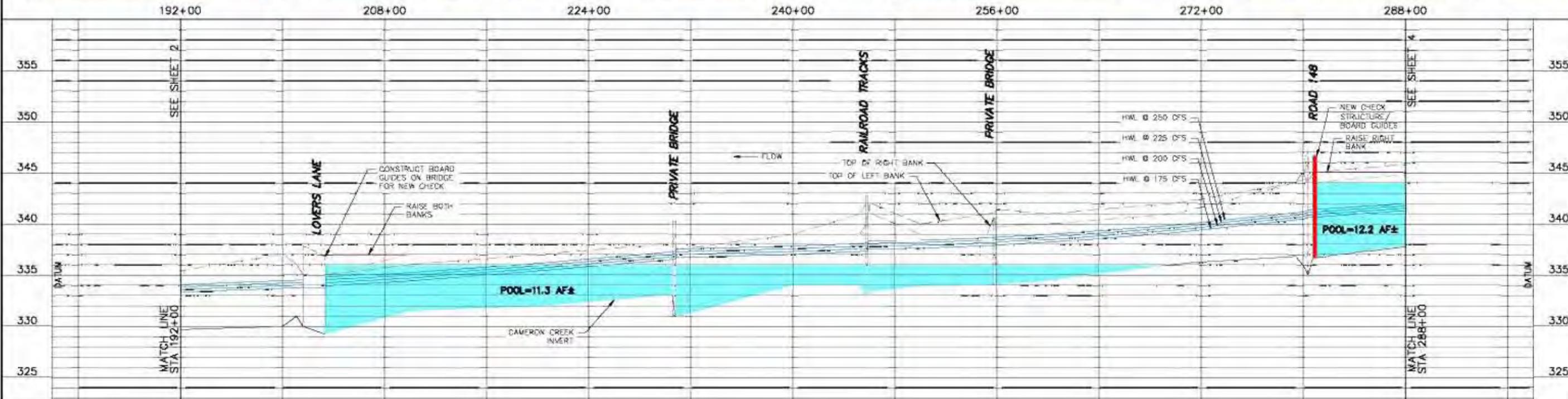
SCALE: AS SHOWN

DATE: 08/10/2010

JOB NO: 122510V1

DWG NO: SHEET

3 OF 4



POOL=11.3 AF±

POOL=12.2 AF±

NEW CHECK STRUCTURE BOARD GUIDES RAISE RIGHT BANK

HWL @ 250 DFS

HWL @ 225 DFS

HWL @ 200 DFS

HWL @ 175 DFS

TOP OF RIGHT BANK

TOP OF LEFT BANK

FLOW

ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX C

Packwood Creek Recharge Pilot Test Summary

PACKWOOD RECHARGE SUMMARY (2011)

PACKWOOD CREEK (WITH CHECK STRUCTURES)						
DATE	DIVERSION				LOSS (PACKWOOD RECHARGE)	
	PACKWOOD (cfs) (a.f.)		POLICE BASIN (cfs) (a.f.)		(cfs)	(a.f.)
6-Sep	17	34	0	0	17	34
7-Sep	17	34	0	0	17	34
8-Sep	20	40	3	6	17	34
9-Sep	17	34	4	8	13	26
10-Sep	21	42	4	8	17	34
11-Sep	21	42	4	8	17	34
12-Sep	22	44	5	10	17	34
13-Sep	22	44	5	10	17	34
14-Sep	26	52	6	12	20	40
15-Sep	26	52	9	18	17	34
16-Sep	21	42	8	16	13	26
17-Sep	20	40	9	18	11	22
18-Sep	30	60	11	22	19	38
19-Sep	30	60	9	18	21	42
20-Sep	26	52	8	16	18	36
21-Sep	22	44	9	18	13	26
22-Sep	28	56	8	16	20	40
23-Sep	27	54	9	18	18	36
24-Sep	26	52	9	18	17	34
25-Sep	26	52	7	14	19	38
26-Sep	28	56	7	14	21	42
27-Sep	26	52	8	16	18	36
28-Sep	26	52	8	16	18	36
29-Sep	26	52	8	16	18	36
30-Sep	0	0	6	12	-6	-12
1-Oct	0	0	3	6	-3	-6
2-Oct	0	0	0	0	0	0
TOTAL			325	752		

PACKWOOD CREEK (NO CHECK STRUCTURES)						
DATE	DIVERSION				LOSS (PACKWOOD RECHARGE)	
	PACKWOOD (cfs) (a.f.)		POLICE BASIN (cfs) (a.f.)		(cfs)	(a.f.)
10-Feb	20	40	0	0	20	40
11-Feb	20	40	0	0	20	40
12-Feb	15	30	9	18	6	12
13-Feb	16	32	9	18	7	14
14-Feb	16	32	9	18	7	14
15-Feb	15	30	9	18	6	12
16-Feb	15	30	9	18	6	12
17-Feb	11	22	9	18	2	4
18-Feb	17	34	7	14	10	20
19-Feb	18	36	9	18	9	18
20-Feb	18	36	10	20	8	16
21-Feb	20	40	11	22	9	18
22-Feb	20	40	11	22	9	18
23-Feb	17	34	10	20	7	14
24-Feb	0	0	7	14	-7	-14
25-Feb	0	0	0	0	0	0
TOTAL			222	171		

DAILY AVERAGE					
24	48	7	14	17	34

DAILY AVERAGE					
17	33	9	18	7	14



**NEWLY
INSTALLED
CHECK
STRUCTURE**



**MAXIMUM
RECHARGE
BY
POOLING
ZONES**

IN COMPARISON, WITH THE CHECK STRUCTURES INSTALLED WE WERE ABLE TO INCREASE RECHARGE SUPPLY AT HEADGATE CLOSE TO 30%, KEEP INLET FLOW INTO POLICE STATION BASIN AT OR BELOW AVERAGE INTAKE, DOUBLE THE (LOSS WATER) RECHARGE WATER THROUGH TOWN (ON AVERAGE) AND OVERALL EXTEND THE PROGRAM APPROX 10 DAYS WHILE KEEPING THE WATER LEVEL IN POLICE STATION BASIN AT A LEVEL COMFORTABLE FOR ALLOWABLE STORM WATER RUN-OFF.

ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX D

Funding Agreement with Bureau of Reclamation

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
ASSISTANCE AGREEMENT**

1A. AGREEMENT NUMBER R12AP20036		1B. MOD NUMBER		2. TYPE OF AGREEMENT <input checked="" type="checkbox"/> GRANT <input type="checkbox"/> COOPERATIVE AGREEMENT		3. CLASS OF RECIPIENT Special District Government (04)	
4. ISSUING OFFICE U.S. Department of the Interior Bureau of Reclamation Mid-Pacific Region Office 2800 Cottage Way, Room E-1815 Sacramento, California 95825-1898 DUNS: 098865801/EIN: 84-1024566				5. RECIPIENT Kaweah Delta Water Conservation District 2975 N. Farmersville Blvd. Farmersville, California 93223 Phone: (559) 747-5601 Fax: (559) 747-1989			
				EIN #:		94-2146824	
				County:		Tulare	
				DUNS #:		115086431	
				Congress. Dist:		20,21	
6. ADMINISTRATIVE POINT OF CONTACT Leanne Henderson Bureau of Reclamation 2800 Cottage Way, Room E-1815 Sacramento, California 95825-1898 Phone: (916) 978-4372 Fax: (916) 978-5175 Email: lhenderson@usbr.gov				7. RECIPIENT PROJECT MANAGER Larry Dotson Kaweah Delta Water Conservation District 2975 N. Farmersville Blvd. Farmersville, California 93223 Phone: (559) 747-5601 Fax: (559) 747-1989 Email: ldotson@kdwcd.com			
8. GRANTS OFFICER TECHNICAL REPRESENTATIVE Kevin Clancy Bureau of Reclamation 2800 Cottage Way, MP-400 Sacramento, California 95825 Phone: (916) 978-5223 Fax: (916) 978-5055 E-mail: kclancy@usbr.gov				9A. INITIAL AGREEMENT EFFECTIVE DATE: See Block 17a		9B. MODIFICATION EFFECTIVE DATE:	
				10. COMPLETION DATE: September 30, 2014			
11A. PROGRAM STATUTORY AUTHORITY Secure Water Act, Subtitle F of Title IX of the Omnibus Public Land Management Act of 2009, Public Law 111-11, Section 9504(a) (42 USC 10364)						11B. CFDA Number 15.507	
12. FUNDING INFORMATION		RECIPIENT OTHER		RECLAMATION		13. REQUISITION NUMBER 122050000D7	
Total Estimated Amount of Agreement		\$810,866.00		\$800,000.00		14A. ACCOUNTING AND APPROPRIATION DATA A10 19680006 KDWC A60 2050400 411G	
This Obligation		\$810,866.00		\$365,000.00			
Previous Obligation		\$0.00		\$0.00			
Total Obligation		\$810,866.00		\$365,000.00			
Cost-Share %		67%		33%		14B. TREASURY ACCOUNT FUNDING SYMBOL: 14X0680	
15. PROJECT TITLE AND BRIEF SUMMARY OF PURPOSE AND OBJECTIVES OF PROJECT Packwood Creek Water Conservation Project							
16a. Acceptance of this Assistance Agreement in accordance with the terms and conditions contained herein is hereby made on behalf of the above-named recipient BY _____ DATE _____				17a. Award of this Assistance Agreement in accordance with the terms and conditions contained herein is hereby made on behalf of the United States of America, Department of the Interior, Bureau of Reclamation BY _____ DATE _____			
16b. NAME, TITLE, AND TELEPHONE NUMBER OF SIGNER <input type="checkbox"/> Additional signatures are attached				17b. NAME OF GRANTS OFFICER Robert S. Lowry II			

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**Grant Agreement
Between
Bureau of Reclamation
And
Kaweah Delta Water Conservation District
For
Packwood Creek Water Conservation Project**

I. OVERVIEW AND SCHEDULE

1. AUTHORITY

This Grant Agreement (Agreement) is entered into between the United States of America, acting through the Department of the Interior, Bureau of Reclamation, hereinafter referred to as "Reclamation," and Kaweah Delta Water Conservation District, hereinafter referred to as the "Recipient" or "Grantee," pursuant to the Secure Water Act, Subtitle F of Title IX of the Omnibus Public Land Management Act of 2009, Public Law 111-11, Section 9504(a) (42 USC 10364). The following section, provided in full text, authorizes Reclamation to award this financial assistance agreement:

SEC. 9504. WATER MANAGEMENT IMPROVEMENT.

(a) AUTHORIZATION OF GRANTS AND COOPERATIVE AGREEMENTS.—

(1) AUTHORITY OF SECRETARY.—The Secretary may provide any grant to, or enter into an agreement with, any eligible applicant to assist the eligible applicant in planning, designing, or constructing any improvement—

(A) to conserve water;

(B) to increase water use efficiency;

(C) to facilitate water markets;

(D) to enhance water management, including increasing the use of renewable energy in the management and delivery of water;

(E) to accelerate the adoption and use of advanced water treatment technologies to increase water supply;

(F) to prevent the decline of species that the United States Fish and Wildlife Service and National Marine Fisheries Service have proposed for listing under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) (or candidate species that are being considered by those agencies for such listing but are not yet the subject of a proposed rule);

(G) to accelerate the recovery of threatened species, endangered species, and designated critical habitats that are adversely affected by Federal reclamation projects or are subject to a recovery plan or conservation plan under the Endangered Species Act of

1973 (16 U.S.C. 1531 et seq.) under which the Commissioner of Reclamation has implementation responsibilities; or

(H) to carry out any other activity—

(i) to address any climate-related impact to the water supply of the United States that increases ecological resiliency to the impacts of climate change; or

(ii) to prevent any water-related crisis or conflict at any watershed that has a nexus to a Federal reclamation project located in a service area.

(3) REQUIREMENTS OF GRANTS AND COOPERATIVE AGREEMENTS.—

(A) COMPLIANCE WITH REQUIREMENTS.—Each grant and agreement entered into by the Secretary with any eligible applicant under paragraph (1) shall be in compliance with each requirement described in subparagraphs (B) through (F).

(B) AGRICULTURAL OPERATIONS.—In carrying out paragraph

(1), the Secretary shall not provide a grant, or enter into an agreement, for an improvement to conserve irrigation water unless the eligible applicant agrees not—

(i) to use any associated water savings to increase the total irrigated acreage of the eligible applicant; or

(ii) to otherwise increase the consumptive use of water in the operation of the eligible applicant, as determined pursuant to the law of the State in which the operation of the eligible applicant is located.

(C) NONREIMBURSABLE FUNDS.—Any funds provided by the Secretary to an eligible applicant through a grant or agreement under paragraph (1) shall be nonreimbursable.

(D) TITLE TO IMPROVEMENTS.—If an infrastructure improvement to a federally owned facility is the subject of a grant or other agreement entered into between the Secretary and an eligible applicant under paragraph (1), the Federal Government shall continue to hold title to the facility and improvements to the facility.

(E) COST SHARING.—

(i) FEDERAL SHARE.—The Federal share of the cost of any infrastructure improvement or activity that is the subject of a grant or other agreement entered into between the Secretary and an eligible applicant under paragraph (1) shall not exceed 50 percent of the cost of the infrastructure improvement or activity.

(ii) CALCULATION OF NON-FEDERAL SHARE.—In calculating the non-Federal share of the cost of an infrastructure improvement or activity proposed by an eligible applicant through an application submitted by the eligible applicant under paragraph (2), the Secretary shall—

(I) consider the value of any in-kind services that substantially contributes toward the completion of the improvement or activity, as determined by the Secretary; and

(II) not consider any other amount that the eligible applicant receives from a Federal agency.

(iii) MAXIMUM AMOUNT.—The amount provided to an eligible applicant through a grant or other agreement under paragraph (1) shall be not more than \$5,000,000.

2. PUBLIC PURPOSE OF SUPPORT OR STIMULATION

This project will assist the Recipient in accomplishing its public purpose of conserving water and increasing water use efficiency by collecting non-storable storm and flood waters in the area and redirecting them to Packwood Creek where water can be recharged at 1,465 AF/yr. It will also benefit the public by restoring the Valley Oak Riparian Forest Habitat in the perimeter of Oakes Basin.

3. BACKGROUND AND OBJECTIVES

Background:

The Recipient has been a historical short-term water contractor (1955 to 1978) within the Friant Division of the Central Valley Project (CVP). The District also has a history of receiving and executing temporary contracts on a year-by-year basis and taking delivery of the Friant Division supplies if they are available. The Recipient has demonstrated a long-term diversion history of CVP water averaging approximately 28,800 AF/year (1955-1998).

In 1993, the Recipient began the Kaweah River Corridor Enhancement Study with funding from Reclamation. The purpose of this study was to evaluate the feasibility of integrating the management of water resources, including surface water, storm water and groundwater, with the management of biological resources, including habitats and the species that depend on those habitats, in the 23,000 acre Kaweah River delta. Phase 1 of the study involved identifying and assessing sites that could meet the Recipient's water and biological resource objectives. During Phase 2, the recommended sites from Phase 1 were evaluated for hydrogeologic and hydrologic capacity, habitat restoration potential, economic and site acquisition concerns, environmental compliance issues, water rights, and costs. Phase 1 and 2 of this study were funded by the Bureau and the Recipient is currently working on Phase 3 which is the development of a Habitat Conservation Plan/Natural Community Conservation Plan.

In 2010, the Recipient became a long-term CVP contractor in the Friant Division. This assignment was accomplished through a resource exchange with Ivanhoe Irrigation District (IID), where the recipient provided local surface water to IID and defined storage in Terminus Reservoir, and in exchange received entitlement to 1,200 AF of Class 1 water and 7,400 AF of Class 2 water. As part of having this contract, the Recipient is required to have a Water Management Plan (WMP). This document was completed in November of 2010 and accepted by Reclamation in January of 2011.

Most recently the Recipient was successful in applying for a FY2011 WaterSMART: Water and Energy Efficiency Grant. The \$918,500 provided by Reclamation will be used to develop the Paregien Basin, a \$1.850,000 project for water recharge and regulation with ancillary benefit for habitat, energy, and flood control.

Objectives:

The Kaweah Delta Water Conservation District's Packwood Creek Water Conservation Project (Project) is expected to have two main benefits. The first is a water supply benefit that will be attained through the conservation of non-storable storm and flood waters. The groundwater recharged through the Project will increase the reliability of groundwater resources in the area and will in part mitigate the overdraft of the City of Visalia. The second is a habitat improvement benefit that will be attained through restoration of Valley Oak Riparian Forest Habitat in the perimeter of Oakes Basin.

4. PERIOD OF PERFORMANCE AND FUNDS AVAILABILITY

This Agreement becomes effective on the date shown in Block 17a of Form 7-2279, United States of America, Department of the Interior, Bureau of Reclamation, Assistance Agreement. The Agreement shall remain in effect until the date shown in Block 10 of Form 7-2279, United States of America, Department of the Interior, Bureau of Reclamation, Assistance Agreement. The period of performance for this Agreement may only be modified through written modification of the Agreement by a Reclamation Grants Officer (GO).

No legal liability on the part of the Government for any payment may arise until funds are made available, in writing, to the Recipient by the Grants Officer. The total estimated amount of federal funding for this agreement is \$800,000.00 of which the initial amount of federal funds available is limited to \$365,000.00 as indicated by "this obligation" within Block 12 of Form 7-2279, United States of America, Department of the Interior, Bureau of Reclamation, Assistance Agreement. Subject to the availability of Congressional appropriations, subsequent funds will be made available for payment through written modifications to this agreement by a Reclamation Grants Officer.

5. SCOPE OF WORK AND MILESTONES

This Project is primarily a water conservation project that will utilize an upstream regulation basin (Oakes Basin) to store and regulate surplus waters into Packwood Creek, where 5 automated check structures in the Creek will maintain high water levels and maximize storage/recharge capabilities. SCADA improvements of remote monitoring of level and flow at these facilities will allow the District to operate as a cohesive unit, maximizing the water conservation and management potential. It is expected that the project could recharge 1,465 AF/yr, and will better manage 29,360 AF/yr. With this Project, the Recipient will be able to foster water marketing between the City of Visalia and Tulare Irrigation District (Tulare ID). An agreement between the two entities will allow for the City of Visalia to deliver tertiary treated wastewater to Tulare ID in exchange for Uncontrolled Season Water delivered back to City of Visalia from Tulare ID at a rate of 1 AF of uncontrolled water for every 2 AF of tertiary treated water delivered. When not being utilized by the above arrangement, the Recipient could utilize the Project to recharge surplus Kaweah River water, or facilitate transfers to the City of Visalia from Friant Division CVP water users as well as Kaweah and St. Johns Rivers water users. Habitat improvements will be accomplished by restoring Valley Oak Riparian Forest; up to an additional 230 plantings are proposed between Oak Trees and native plants. Utilizing this site, it

will ensure that this habitat remains preserved and under the control of the Recipient, be provided ample water supply, and provide favorable habitat for threatened and/or endangered and other wildlife into the foreseeable future. Additionally, the Project would increase renewable energy production at a hydroelectric facility jointly owned by the Recipient at Terminus Dam.

Primary program objectives include the following:

Objective 1 – Project Administration: Overall Project coordination. Communication and contract management with Reclamation. Request budget and contract revisions, if needed. Manage sub-consultants. Organize and attend progress meetings with stakeholders. Preparation of semi-annual progress reports and a final report.

Objective 2 – Environmental and Permitting: Prior to the construction efforts, the Recipient will need to obtain a 1602 Permit through the California Department of Fish and Game and a 404 permit through the Army Corps of Engineers; comply with the California Environmental Policy Act (CEQA), through what is anticipated to be a mitigated negative declaration; and provide the information necessary to Reclamation in complying with the National Environmental Policy Act (NEPA).

In addition to the above mentioned environmental and permitting documents, the Recipient will need to apply for and obtain a Storm Water Pollution Prevention Plan (SWPPP) through the State Water Resources Control Board and a Dust Control Plan (DCP) through the California Air Resources Board. All of these documents are standard in the area for any large construction effort where heavy machinery is necessary.

Objective 3 – Engineering/Inspection/Construction Staking: The two components of the Packwood Creek Water Conservation Project are at different design levels. Currently the Oakes Basin habitat improvement portion of the Project is at a 30% design level, and the Packwood Creek improvement portion can be categorized as a conceptual (10%) design. Surveying, as well as, preparation of final construction plans and specifications for earthwork, structures, habitat features and miscellaneous facilities are underway and are scheduled to be completed by December, 2012. Also, contract documents and bid solicitation documents will be developed for the Project. As part of the Project's design, easements will be acquired for each site.

The Recipient's engineering consultant will provide construction inspection and staking services. These services are anticipated to be on-going throughout the Project's construction. In addition to those services, the consulting engineer will also provide miscellaneous engineering services if needed, should any changes occur to the Project's design during construction.

Objective 4 – Construction of Facilities: The construction is anticipated to be completed through two competitively bid contracts. The first contract will be for the improvements at Oakes Basin; drilling a supply well and installing an irrigation system. The second contract will be for Packwood Creek improvements; the construction of four new automated check structures, the retrofitting of an existing check structure with an automated gate, and miscellaneous earthwork.

Once all of the proposed facilities are constructed, a Supervisory Control and Data Acquisition (SCADA) system will be developed, installed and integrated, so that the five automated check structures in Packwood Creek and the Oakes Basin site are incorporated into the existing SCADA network of the project proponents. This will allow for the remote monitoring of flow rates and water levels.

Project design is expected to be complete by December, 2012. CEQA will be completed by September 2012, followed by NEPA (December, 2012). The District expects to address CEQA with a Mitigated Negative Declaration (MND), and NEPA with a Finding of No Significant Impact (FONSI). Permitting is likely to be accomplished by December, 2012 as well. The Project will then be advertised for qualified contractors to bid on. Construction will be broken into two phases, to balance out fund distribution from Reclamation, and not exceed the \$750,000 maximum distribution of Funding Group II. Assuming a normal water year, Phase 1 is planned to begin in April, 2013, lasting roughly 3 months, to be completed by July, 2013. Phase 2 is planned to begin in April, 2014, lasting roughly 3 months, to be completed by July, 2014. This schedule will provide a 4 month buffer to be complete by the end of Reclamation's Fiscal Year 2014. See Attachment A for the complete Project Schedule.

6. RESPONSIBILITY OF THE PARTIES

6.1 Recipient Responsibilities

6.1.1 The Recipient shall carry out the Scope of Work in accordance with the terms and conditions stated herein. The Recipient shall adhere to Federal, state, and local laws, regulations, and codes, as applicable, and shall obtain all required approvals and permits. If the Scope of Work contains construction activities, the Recipient is responsible for construction inspection, oversight, and acceptance. If applicable, the Recipient shall also coordinate and obtain approvals from site owners and operators. The recipient shall provide a plan on how project monitoring will be used to demonstrate, verify, and report project performance. Post-project verification of water savings is required.

6.2 Reclamation Responsibilities

6.2.1 Reclamation will monitor and provide federal oversight of activities performed under this Agreement. Monitoring and oversight includes review and approval of financial status and performance reports, payment requests, and any other deliverables identified as part of the Scope of Work. Additional monitoring activities may include site visits, conference calls, and other on-site and off-site monitoring activities. At the Recipient's request, Reclamation may also provide technical assistance to the Recipient in support of the Scope of Work and objectives of this Agreement.

6.2.2 Reclamation shall work with the District to ensure all progress reports and request for reimbursement are prepared correctly. Reclamation will perform site visits annually at a minimum and perform a post award meeting once the grant is awarded.

7. BUDGET

7.1 Budget Estimate. The following table is the estimated budget for this Agreement. As federal financial assistance agreements are cost-reimbursable, the budget provided is for estimation purposes only. Final costs incurred under the budget categories listed may be either higher or lower than the estimated costs. All costs incurred by the Recipient under this agreement must be in accordance with any pre-award clarifications conducted between the Recipient and Reclamation, as well as with the terms and conditions of this agreement. Final determination of the allowability, allocability, or reasonableness of costs incurred under this agreement is the responsibility of the Grants Officer. Recipients are encouraged to direct any questions regarding allowability, allocability or reasonableness of costs to the Grants Officer for review prior to incurrence of the costs in question.

BUDGET ITEM DESCRIPTION	COMPUTATION \$/Unit and Unit Quantity		RECIPIENT FUNDING	RECLAMATION FUNDING	TOTAL COST
SALARIES AND WAGES-KDWCD					
District Engineer	\$48.43/hr	416	\$19,344	\$0	\$19,344
FRINGE BENEFITS -KDWCD					
District Engineer	\$15.20/hr	416	\$7,156	\$0	\$7,156
TRAVEL-			\$0	\$0	\$0
EQUIPMENT-			\$0	\$0	\$0
SUPPLIES/MATERIALS-			\$0	\$0	\$0
CONTRACTUAL/CONSTRUCTION:					
Engineering Fees	\$166,080/Contract	1	\$166,080	\$0	\$166,080
Packwood Creek Improvements	\$1,080,000/Contract	1	\$280,000	\$800,000	\$1,080,000
Oakes Basin Habitat Improvements	\$164,706/Contract	1	\$164,706	\$0	\$164,706
ENVIRONMENTAL AND REGULATORY COMPLIANCE:	Total Project Cost	4.1%	\$65,580	\$0	\$65,580
OTHER					
Contingencies ³	Packwood Improvements	10%	\$108,000	0	\$108,000
TOTAL DIRECT COSTS			\$810,866	\$800,000	\$1,610,866
INDIRECT COSTS					6
TOTAL PROJECT COSTS			\$810,866	\$800,000	
PERCENT AGE OF COSTS			.3%	49.7%	

7.2 Cost Sharing Requirement

At least 50% non-federal cost-share is required for costs incurred under this Agreement. If pre-award costs are authorized, reimbursement of these costs is limited to federal cost share percentage identified in this agreement.

7.3 Pre-Award Incurrence of Costs

The Recipient shall be entitled to reimbursement for costs incurred on or after July 1, 2011 which if had been incurred after this Agreement was entered into, would have been allowable, allocable, and reasonable under the terms and conditions of this Agreement.

7.4 Allowable Costs (2 CFR Part §225)

Costs incurred for the performance of this Agreement must be allowable, allocable to the project, and reasonable. The following Office of Management and Budget (OMB) Circular, codified within the Code of Federal Regulations (CFR), governs the allowability of costs for Federal financial assistance:

2 CFR Part 225 (OMB Circular A-87), "Cost Principles for State, Local, and Indian Tribal Governments"

Expenditures for the performance of this Agreement must conform to the requirements within this Circular. The Recipient must maintain sufficient documentation to support these expenditures. Questions on the allowability of costs should be directed to the GO responsible for this Agreement.

The Recipient shall not incur costs or obligate funds for any purpose pertaining to operation of the program or activities beyond the expiration date stated in the Agreement. The only costs which are authorized for a period of up to 90 days following the project performance period are those strictly associated with closeout activities for preparation of the final report.

7.5 Changes (43 CFR §12.70).

(a) *General.* Grantees and subgrantees are permitted to rebudget within the approved direct cost budget to meet unanticipated requirements and may make limited program changes to the approved project. However, unless waived by the awarding agency, certain types of post-award changes in budgets and projects shall require the prior written approval of the awarding agency.

(b) *Relation to cost principles.* The applicable cost principles (see 43 §12.62) contain requirements for prior approval of certain types of costs. Except where waived, those requirements apply to all grants and subgrants even if paragraphs (c) through (f) of this section do not.

(c) *Budget changes.*

(1) *Nonconstruction projects.* Except as stated in other regulations or an award document, grantees or subgrantees shall obtain the prior approval of the awarding agency whenever any of the following changes is anticipated under a nonconstruction award:

(i) Any revision which would result in the need for additional funding.

(ii) Unless waived by the awarding agency, cumulative transfers among direct cost categories, or, if applicable, among separately budgeted programs, projects, functions, or activities which exceed or are expected to exceed ten percent of the current total approved budget, whenever the awarding agency's share exceeds \$100,000.

(iii) Transfer of funds allotted for training allowances (i.e., from direct payments to trainees to other expense categories).

(2) *Construction projects.* Grantees and subgrantees shall obtain prior written approval for any budget revision which would result in the need for additional funds.

(3) *Combined construction and nonconstruction projects.* When a grant or subgrant provides funding for both construction and nonconstruction activities, the grantee or subgrantee must obtain prior written approval from the awarding agency before making any fund or budget transfer from nonconstruction to construction or vice versa.

(d) *Programmatic changes.* Grantees or subgrantees must obtain the prior approval of the awarding agency whenever any of the following actions is anticipated:

(1) Any revision of the scope or objectives of the project (regardless of whether there is an associated budget revision requiring prior approval).

(2) Need to extend the period of availability of funds.

(3) Changes in key persons in cases where specified in an application or a grant award. In research projects, a change in the project director or principal investigator shall always require approval unless waived by the awarding agency.

(4) Under nonconstruction projects, contracting out, subgranting (if authorized by law) or otherwise obtaining the services of a third party to perform activities which are central to the purposes of the award, *unless included in the initial funding proposal*. This approval requirement is in addition to the approval requirements of 43 §12.76 but does not apply to the procurement of equipment, supplies, and general support services.

(e) *Additional prior approval requirements.* The awarding agency may not require prior approval for any budget revision which is not described in paragraph (c) of this section.

(f) *Requesting prior approval.*

(1) A request for prior approval of any budget revision will be in the same budget format the grantee used in its application and shall be accompanied by a narrative justification for the proposed revision.

(2) A request for a prior approval under the applicable Federal cost principles (see §12.62) may be made by letter.

(3) A request by a subgrantee for prior approval will be addressed in writing to the grantee. The grantee will promptly review such request and shall approve or disapprove the request in writing. A grantee will not approve any budget or project revision which is inconsistent with the purpose or terms and conditions of the Federal grant to the grantee. If the revision, requested by the subgrantee would result in a change to the grantee's approved project which requires Federal prior approval, the grantee will obtain the Federal agency's approval before approving the subgrantee's request.

7.6 Modifications

Any changes to this Agreement shall be made by means of a written modification. Reclamation may make changes to the Agreement by means of a unilateral modification to address administrative matters, such as changes in address, no-cost time extensions, or the addition of previously agreed upon funding. Additionally, a unilateral modification may be utilized by Reclamation if it should become necessary to suspend or terminate the Agreement in accordance with 43 CFR 12.83.

All other changes shall be made by means of a bilateral modification to the Agreement. No oral statement made by any person, or written statement by any person other than the GO, shall be allowed in any manner or degree to modify or otherwise effect the terms of the Agreement.

All requests for modification of the Agreement shall be made in writing, provide a full description of the reason for the request, and be sent to the attention of the GO. Any request for project extension shall be made at least 45 days prior to the expiration date of the Agreement or the expiration date of any extension period that may have been previously granted. Any determination to extend the period of performance or to provide follow-on funding for continuation of a project is solely at the discretion of Reclamation.

8. KEY PERSONNEL

8.1 Recipient's Key Personnel

The Recipient's Project Manager for this Agreement shall be:

Larry Dotson
Kaweah Delta Water Conservation District

2975 N. Farmersville Blvd.
Farmersville, California 93223
Phone: (559) 747-5601
Fax: (559) 747-1989
Email: ldotson@kdwcd.com

Changes to Key Personnel require compliance with 43 CFR 12.70(d)(3).

8.2 Reclamation's Key Personnel

8.2.1 Grants Officer (GO):

Robert S. Lowry II
Bureau of Reclamation
2800 Cottage Way, Room E-1815
Sacramento, California 95825-1898
Phone: (916) 978-5115
Fax: (916) 978-5175
Email: rlowry@usbr.gov

(a) The GO is the only official with legal delegated authority to represent Reclamation. The GO's responsibilities include, but are not limited to, the following:

- (1) Formally obligate Reclamation to expend funds or change the funding level of the Agreement;
- (2) Approve through formal modification changes in the scope of work and/or budget;
- (3) Approve through formal modification any increase or decrease in the period of performance of the Agreement;
- (4) Approve through formal modification changes in any of the expressed terms, conditions, or specifications of the Agreement;
- (5) Be responsible for the overall administration, management, and other non-programmatic aspects of the Agreement including, but not limited to, interpretation of financial assistance statutes, regulations, circulars, policies, and terms of the Agreement;
- (6) Where applicable, ensures that Reclamation complies with the administrative requirements required by statutes, regulations, circulars, policies, and terms of the Agreement.

8.2.2 Grants Officer Technical Representative (GOTR):

Kevin Clancy
Bureau of Reclamation

2800 Cottage Way, MP-400
Sacramento, California 95825
Phone: (916) 978-5223
Fax: (916) 978-5055
E-mail: kclancy@usbr.gov

(a) The GOTR's authority is limited to technical and programmatic aspects of the Agreement. The GOTR's responsibilities include, but are not limited to, the following:

- (1) Assist the Recipient, as necessary, in interpreting and carrying out the scope of work in the Agreement;
- (2) Review, and where required, approve Recipient reports and submittals as required by the Agreement;
- (3) Where applicable, monitor the Recipient to ensure compliance with the technical requirements of the Agreement;
- (4) Where applicable, ensure that Reclamation complies with the technical requirements of the Agreement;

(b) The GOTR does not have the authority to and may not issue any technical assistance which:

- (1) Constitutes an assignment of additional work outside the scope of work of the Agreement;
- (2) In any manner causes an increase or decrease in the total estimated cost or the time required for performance; or
- (3) Changes any of the expressed terms, conditions, or specifications of the Agreement.

9. REPORTING REQUIREMENTS AND DISTRIBUTION

9.1 Noncompliance. Failure to comply with the reporting requirements contained in this Agreement may be considered a material non-compliance with the terms and conditions of the award. Non compliance may result in withholding of payments pending receipt of required reports, denying both the use of funds and matching credit for all or part of the cost of the activity or action not in compliance, whole or partial suspension or termination of the Agreement, recovery of funds paid under the Agreement, withholding of future awards, or other legal remedies in accordance with 43 CFR §12.83.

9.2 Financial Reports. Financial Status Reports shall be submitted by means of the SF-425 and shall be submitted according to the Report Frequency and Distribution schedule below. All financial reports shall be signed by an Authorized Certifying Official for the Recipient's organization.

9.3 Monitoring and reporting program performance (43 CFR §12.80)

(a) *Monitoring by grantees.* Grantees are responsible for managing the day-to-day operations of grant and subgrant supported activities. Grantees must monitor grant and subgrant supported activities to assure compliance with applicable Federal requirements and that performance goals are being achieved. Grantee monitoring must cover each program, function or activity.

(b) *Nonconstruction performance reports.* The Federal agency may, if it decides that performance information available from subsequent applications contains sufficient information to meet its programmatic needs, require the grantee to submit a performance report only upon expiration or termination of grant support. Unless waived by the Federal agency this report will be due on the same date as the final Financial Status Report.

(1) Grantees shall submit annual performance reports unless the awarding agency requires quarterly or semi-annual reports. However, performance reports will not be required more frequently than quarterly. Annual reports shall be due 90 days after the grant year, quarterly or semi-annual reports shall be due 30 days after the reporting period. The final performance report will be due 90 days after the expiration or termination of grant support. If a justified request is submitted by a grantee, the Federal agency may extend the due date for any performance report. Additionally, requirements for unnecessary performance reports may be waived by the Federal agency.

(2) Performance reports will contain, for each grant, brief information on the following:

(i) A comparison of actual accomplishments to the objectives established for the period. Where the output of the project can be quantified, a computation of the cost per unit of output may be required if that information will be useful.

(ii) The reasons for slippage if established objectives were not met.

(iii) Additional pertinent information including, when appropriate, analysis and explanation of cost overruns or high unit costs.

(3) Grantees will not be required to submit more than the original and two copies of performance reports.

(4) Grantees will adhere to the standards in this section in prescribing performance reporting requirements for subgrantees.

(c) *Construction performance reports.* For the most part, on-site technical inspections and certified percentage-of-completion data are relied on heavily by Federal agencies to monitor progress under construction grants and subgrants. The Federal agency will require additional formal performance reports only when considered necessary, and never more frequently than quarterly.

(d) *Significant developments.* Events may occur between the scheduled performance reporting dates which have significant impact upon the grant or subgrant supported activity. In such cases, the grantee must inform the Federal agency as soon as the following types of conditions become known:

(1) Problems, delays, or adverse conditions which will materially impair the ability to meet the objective of the award. This disclosure must include a statement of the action taken, or contemplated, and any assistance needed to resolve the situation.

(2) Favorable developments which enable meeting time schedules and objectives sooner or at less cost than anticipated or producing more beneficial results than originally planned.

(e) Federal agencies may make site visits as warranted by program needs.

(f) *Waivers, extensions.*

(1) Federal agencies may waive any performance report required by this part if not needed.

(2) The grantee may waive any performance report from a subgrantee when not needed. The grantee may extend the due date for any performance report from a subgrantee if the grantee will still be able to meet its performance reporting obligations to the Federal agency.

9.4 Report Frequency and Distribution. The following table sets forth the reporting requirements for this Agreement. Please note the first report due date listed for each type of report.

REQUIRED REPORTS	Interim Reports	Final Report
Performance Report		
Format	No specific format required. See content requirements within Section 9.3 (43 CFR 12.80) above.	Summary of activities completed during the entire period of performance is required. See content requirements within Section 9.3 (43 CFR 12.80) above.
Reporting Frequency	Semi-Annual	Final Report due upon completion of Agreement's period of performance
Reporting Period	October 1 through March 31 and April 1 through September 30.	Entire period of performance
Due Date*	Within 30 days after the end of the Reporting Period	Within 90 days after the completion date of the Agreement
First Report Due Date	The first performance report is due for reporting period ending March 31, 2013	N/A
Submit to:	GO and GOTR	GO and GOTR
Federal Financial Report		
Format	SF-425 (all sections must be completed)	SF-425(all sections must be completed)

Reporting Frequency	Semi-Annual	Final Report due upon completion of Agreement's period of performance
Reporting Period	October 1 through March 31 and April 1 through September 30.	Entire period of performance
Due Date*	Within 30 days after the end of the Reporting Period	Within 90 days after the completion date of the Agreement
First Report Due Date	The first performance report is due for reporting period ending March 31, 2013	N/A
Submit to:	GO and GOTR	GO and GOTR

* If the completion date is prior to the end of the next reporting period, then no interim report is due for that period. Instead, the Recipient is required only to submit the final financial and performance reports, which will cover the entire period of performance including the last abbreviated reporting period.

10. REGULATORY COMPLIANCE

The Recipient agrees to comply or assist Reclamation with all regulatory compliance requirements and all applicable State, Federal, and local environmental and cultural and paleontological resource protection laws and regulations as applicable to this project. These may include, but are not limited to, the National Environmental Policy Act (NEPA), including the Council on Environmental Quality and Department of the Interior regulations implementing NEPA, the Clean Water Act, the Endangered Species Act, consultation with potentially affected Tribes, and consultation with the State Historic Preservation Office.

Certain environmental and other associated compliance are Federal responsibilities, and will occur as appropriate. Reclamation will identify the need for and will complete any appropriate environmental compliance requirements, as identified above, pertinent to Reclamation pursuant to activities specific to this assisted activity. Environmental and other associated compliance shall be completed prior to the start of this project. As such, notwithstanding any other provision of this Agreement, Reclamation shall not provide any funds to the Recipient for Agreement purposes, and the Recipient shall not begin implementation of the assisted activity described in this Agreement, until Reclamation provides written notice to the Recipient that all applicable environmental and regulatory compliance analyses and clearances have been completed and that the Recipient may begin implementation of the assisted activity. If the Recipient begins project activities that require environmental and other regulatory compliance approval, such as construction activities, prior to receipt of written notice from Reclamation that all such clearances have been obtained, then Reclamation reserves the right to unilaterally terminate this agreement for cause.

11. AGRICULTURAL OPERATIONS

The Recipient shall not use any associated water savings to increase the total irrigated acreage of the Recipient or otherwise increase the consumptive use of water in the operation of the Recipient, as determined pursuant to the law of the State in which the operation of Recipient is located.

12. TITLE TO IMPROVEMENTS

If the activities funded under this Agreement result in an infrastructure improvement to a federally owned facility, the Federal Government shall continue to hold title to the facility and improvements to the facility.

13. OPERATION AND MAINTENANCE COSTS

The non-Federal share of the cost of operating and maintaining any infrastructure improvement funded through this Agreement shall be 100 percent.

14. LIABILITY

(a) In General.—Except as provided under chapter 171 of title 28, United States Code (commonly known as the “Federal Tort Claims Act”), the United States shall not be liable for monetary damages of any kind for any injury arising out of an act, omission, or occurrence that arises in relation to any facility created or improved under this Agreement, the title of which is not held by the United States.

(b) Tort Claims Act.—Nothing in this section increases the liability of the United States beyond that provided in chapter 171 of title 28, United States Code (commonly known as the “Federal Tort Claims Act”).

II. RECLAMATION STANDARD TERMS AND CONDITIONS - STATES, LOCAL GOVERNMENTS, AND FEDERALLY RECOGNIZED INDIAN TRIBAL GOVERNMENTS

1. REGULATIONS

The regulations at 43 CFR, Part 12, Subparts A, C, E, and F, are hereby incorporated by reference as though set forth in full text. The following Office of Management and Budget (OMB) Circulars, as applicable, and as implemented by 43 CFR Part 12, are also incorporated by reference and made a part of this Agreement. Failure of a Recipient to comply with any applicable regulation or circular may be the basis for withholding payments for proper charges made by the Recipient and/or for termination of support.

1.1 Colleges and Universities that are Recipients or sub-recipients shall use the following:

2 CFR Parts 215 and 220 (Circular A 21), "Cost Principles for Educational Institutions"

Circular A 110, as amended September 30, 1999, "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations" (Codification by Department of Interior, 43 CFR 12, Subpart F)

Circular A-133, revised June 27, 2003, "Audits of States, Local Governments, and Non-Profit Organizations"

1.2 State, Local and Tribal Governments that are Recipients or sub-recipients shall use the following:

2 CFR Part 225 (Circular A 87), "Cost Principles for State, Local, and Indian Tribal Governments"

Circular A 102, as amended August 29, 1997, "Grants and Cooperative Agreements with State and Local Governments" (Grants Management Common Rule, Codification by Department of Interior, 43 CFR 12, Subpart C)

Circular A-133, revised June 27, 2003, Audits of States, Local Governments, and Non-Profit Organizations"

1.3 Nonprofit Organizations that are Recipients or sub-recipients shall use the following:

2 CFR Part 230 (Circular A 122), "Cost Principles for Non-Profit Organizations"

Circular A 110, as amended September 30, 1999, "Uniform Administrative Requirements for Grants and Agreements With Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations" (Codification by Department of Interior, 43 CFR 12, Subpart F)

Circular A-133, revised June 27, 2003, "Audits of States, Local Governments, and Non-Profit Organizations"

1.4 Organizations other than those indicated above that are Recipients or sub-recipients shall use the basic principles of OMB Circular A-110 (Codification by Department of Interior, 43 CFR 12, Subpart F), and cost principles shall be in accordance with 48 CFR Subpart 31.2.

1.5 43 CFR 12.77 sets forth further regulations that govern the award and administration of subawards by State governments.

2. PAYMENT

2.1 Payment Standards. (43 CFR §12.61)

(a) *Scope.* This section prescribes the basic standard and the methods under which a Federal agency will make payments to grantees, and grantees will make payments to subgrantees and contractors.

(b) *Basic standard.* Methods and procedures for payment shall minimize the time elapsing between the transfer of funds and disbursement by the grantee or subgrantee, in accordance with Treasury regulations at 31 CFR part 205.

(c) *Advances.* Grantees and subgrantees shall be paid in advance, provided they maintain or demonstrate the willingness and ability to maintain procedures to minimize the time elapsing between the transfer of the funds and their disbursement by the grantee or subgrantee.

(d) *Reimbursement.* Reimbursement shall be the preferred method when the requirements in paragraph (c) of this section are not met. Grantees and subgrantees may also be paid by reimbursement for any construction grant. Except as otherwise specified in regulation, Federal agencies shall not use the percentage of completion method to pay construction grants. The grantee or subgrantee may use that method to pay its construction contractor, and if it does, the awarding agency's payments to the grantee or subgrantee will be based on the grantee's or subgrantee's actual rate of disbursement.

(e) *Working capital advances.* If a grantee cannot meet the criteria for advance payments described in paragraph (c) of this section, and the Federal agency has determined that reimbursement is not feasible because the grantee lacks sufficient working capital, the awarding agency may provide cash or a working capital advance basis. Under this procedure the awarding agency shall advance cash to the grantee to cover its estimated disbursement needs for an initial period generally geared to the grantee's disbursing cycle. Thereafter, the awarding agency shall reimburse the grantee for its actual cash disbursements. The working capital advance method of payment shall not be used by grantees or subgrantees if the reason for using such method is the unwillingness or inability of the grantee to provide timely advances to the subgrantee to meet the subgrantee's actual cash disbursements.

(f) *Effect of program income, refunds, and audit recoveries on payment.*

- (1) Grantees and subgrantees shall disburse repayments to and interest earned on a revolving fund before requesting additional cash payments for the same activity.
- (2) Except as provided in paragraph (f)(1) of this section, grantees and subgrantees shall disburse program income, rebates, refunds, contract settlements, audit recoveries and interest earned on such funds before requesting additional cash payments.

(g) *Withholding payments.*

- (1) Unless otherwise required by Federal statute, awarding agencies shall not withhold payments for proper charges incurred by grantees or subgrantees unless—
 - (i) The grantee or subgrantee has failed to comply with grant award conditions, or
 - (ii) The grantee or subgrantee is indebted to the United States.
- (2) Cash withheld for failure to comply with grant award condition, but without suspension of the grant, shall be released to the grantee upon subsequent compliance. When a grant is suspended, payment adjustments will be made in accordance with §12.83(c).
- (3) A Federal agency shall not make payment to grantees for amounts that are withheld by grantees or subgrantees from payment to contractors to assure satisfactory completion of work. Payments shall be made by the Federal agency when the grantees or subgrantees actually disburse the withheld funds to the contractors or to escrow accounts established to assure satisfactory completion of work.

(h) *Cash depositories.*

- (1) Consistent with the national goal of expanding the opportunities for minority business enterprises, grantees and subgrantees are encouraged to use minority banks (a bank which is owned at least 50 percent by minority group members). A list of minority owned banks can be obtained from the Minority Business Development Agency, Department of Commerce, Washington, DC 20230.
- (2) A grantee or subgrantee shall maintain a separate bank account only when required by Federal-State Agreement.
 - (i) *Interest earned on advances.* Except for interest earned on advances of funds exempt under the Intergovernmental Cooperation Act (31 U.S.C. 6501 et seq.) and the Indian Self-Determination Act (23 U.S.C. 450), grantees and subgrantees shall promptly, but at least quarterly, remit interest earned on advances to the Federal agency. The grantee or subgrantee may keep interest amounts up to \$100 per year for administrative expenses.

2.2 Payment Method

Requesting Payments -- Requests for advance or reimbursement may be made by the following methods:

(1) SF-270, Request for Advance or Reimbursement - Recipients may submit an original and properly certified SF-270 form to the GO. Requests for reimbursement may be submitted on a monthly basis or more frequently if authorized by the (GO). Recipients may not request advance payments for anticipated expenses that are greater than one month in advance of the request.

(2) SF-271, Outlay Report and Request for Reimbursement for Construction Programs - The SF-271 shall be used for construction Agreements paid by the reimbursement method, letter of credit, electronic funds transfer, or Treasury check advance, except where the advance is based on periodic requests from the Recipient, in which case the SF-270 shall be used. This request may be submitted on a quarterly basis, but no less frequently than on an annual basis. Recipients may submit an original, properly certified SF-271 form to the GO.

(3) Automated Standard Application for Payments (ASAP) - Recipients may utilize the Department of Treasury ASAP payment system to request advances or reimbursements. ASAP is a Recipient-initiated payment and information system designed to provide a single point of contact for the request and delivery of Federal funds. Recipient procedures must minimize the time elapsing between the drawdown of federal funds and the disbursement for agreement purposes.

Recipients interested in enrolling in the ASAP system, please contact Dee Devillier at 303-445-3461 or Sheri Oren at 303-445-3448.

3. PROCUREMENT STANDARDS (43 CFR §12.76)

(a) *States.* When procuring property and services under a grant, a State will follow the same policies and procedures it uses for procurements from its non-Federal funds. The State will ensure that every purchase order or other contract includes any clauses required by Federal statutes and executive orders and their implementing regulations. Other grantees and subgrantees will follow paragraphs (b) through (i) in this section.

(b) *Procurement standards.*

(1) Grantees and subgrantees will use their own procurement procedures which reflect applicable State and local laws and regulations, provided that the procurements conform to applicable Federal law and the standards identified in this section.

(2) Grantees and subgrantees will maintain a contract administration system which ensures that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders.

(3) Grantees and subgrantees will maintain a written code of standards of conduct governing the performance of their employees engaged in the award and administration of contracts. No employee, officer or agent of the grantee or subgrantee shall participate in selection, or in the award or administration of a contract supported by Federal funds if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when:

(i) The employee, officer or agent,

(ii) Any member of his immediate family,

(iii) His or her partner, or

(iv) An organization which employs, or is about to employ, any of the above, has a financial or other interest in the firm selected for award. The grantee's or subgrantee's officers, employees or agents will neither solicit nor accept gratuities, favors or anything of monetary value from contractors, potential contractors, or parties to subagreements. Grantee and subgrantees may set minimum rules where the financial interest is not substantial or the gift is an unsolicited item of nominal intrinsic value. To the extent permitted by State or local law or regulations, such standards or conduct will provide for penalties, sanctions, or other disciplinary actions for violations of such standards by the grantee's and subgrantee's officers, employees, or agents, or by contractors or their agents. The awarding agency may in regulation provide additional prohibitions relative to real, apparent, or potential conflicts of interest.

(4) Grantee and subgrantee procedures will provide for a review of proposed procurements to avoid purchase of unnecessary or duplicative items. Consideration should be given to consolidating or breaking out procurements to obtain a more economical purchase. Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach.

(5) To foster greater economy and efficiency, grantees and subgrantees are encouraged to enter into State and local intergovernmental agreements for procurement or use of common goods and services.

(6) Grantees and subgrantees are encouraged to use Federal excess and surplus property in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs.

(7) Grantees and subgrantees are encouraged to use value engineering clauses in contracts for construction projects of sufficient size to offer reasonable opportunities for cost reductions. Value engineering is a systematic and creative analysis of each contract item or task to ensure that its essential function is provided at the overall lower cost.

(8) Grantees and subgrantees will make awards only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement.

Consideration will be given to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

(9) Grantees and subgrantees will maintain records sufficient to detail the significant history of a procurement. These records will include, but are not necessarily limited to the following: rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price.

(10) Grantees and subgrantees will use time and material type contracts only—

(i) After a determination that no other contract is suitable, and

(ii) If the contract includes a ceiling price that the contractor exceeds at its own risk.

(11) Grantees and subgrantees alone will be responsible, in accordance with good administrative practice and sound business judgment, for the settlement of all contractual and administrative issues arising out of procurements. These issues include, but are not limited to source evaluation, protests, disputes, and claims. These standards do not relieve the grantee or subgrantee of any contractual responsibilities under its contracts. Federal agencies will not substitute their judgment for that of the grantee or subgrantee unless the matter is primarily a Federal concern. Violations of law will be referred to the local, State, or Federal authority having proper jurisdiction.

(12) Grantees and subgrantees will have protest procedures to handle and resolve disputes relating to their procurements and shall in all instances disclose information regarding the protest to the awarding agency. A protestor must exhaust all administrative remedies with the grantee and subgrantee before pursuing a protest with the Federal agency. Reviews of protests by the Federal agency will be limited to:

(i) Violations of Federal law or regulations and the standards of this section (violations of State or local law will be under the jurisdiction of State or local authorities) and

(ii) Violations of the grantee's or subgrantee's protest procedures for failure to review a complaint or protest. Protests received by the Federal agency other than those specified above will be referred to the grantee or subgrantee.

(c) *Competition.*

(1) All procurement transactions will be conducted in a manner providing full and open competition consistent with the standards of §12.76. Some of the situations considered to be restrictive of competition include but are not limited to:

(i) Placing unreasonable requirements on firms in order for them to qualify to do business,

(ii) Requiring unnecessary experience and excessive bonding,

- (iii) Noncompetitive pricing practices between firms or between affiliated companies,
 - (iv) Noncompetitive awards to consultants that are on retainer contracts,
 - (v) Organizational conflicts of interest,
 - (vi) Specifying only a “brand name” product instead of allowing “an equal” product to be offered and describing the performance of other relevant requirements of the procurement, and
 - (vii) Any arbitrary action in the procurement process.
- (2) Grantees and subgrantees will conduct procurements in a manner that prohibits the use of statutorily or administratively imposed in-State or local geographical preferences in the evaluation of bids or proposals, except in those cases where applicable Federal statutes expressly mandate or encourage geographic preference. Nothing in this section preempts State licensing laws. When contracting for architectural and engineering (A/E) services, geographic location may be a selection criteria provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.
- (3) Grantees will have written selection procedures for procurement transactions. These procedures will ensure that all solicitations:
- (i) Incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description shall not, in competitive procurements, contain features which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured, and when necessary, shall set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible. When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a “brand name or equal” description may be used as a means to define the performance or other salient requirements of a procurement. The specific features of the named brand which must be met by offerors shall be clearly stated; and
 - (ii) Identify all requirements which the offerors must fulfill and all other factors to be used in evaluating bids or proposals.
- (4) Grantees and subgrantees will ensure that all prequalified lists of persons, firms, or products which are used in acquiring goods and services are current and include enough qualified sources to ensure maximum open and free competition. Also, grantees and subgrantees will not preclude potential bidders from qualifying during the solicitation period.

(d) *Methods of procurement to be followed* —(1) *Procurement by small purchase procedures.* Small purchase procedures are those relatively simple and informal procurement methods for securing services, supplies, or other property that do not cost more than the simplified acquisition threshold fixed at 41 U.S.C. 403(11) (currently set at \$150,000). If small purchase procedures are used, price or rate quotations shall be obtained from an adequate number of qualified sources.

(2) Procurement by *sealed bids* (formal advertising). Bids are publicly solicited and a firm-fixed-price contract (lump sum or unit price) is awarded to the responsible bidder whose bid, conforming with all the material terms and conditions of the invitation for bids, is the lowest in price. The sealed bid method is the preferred method for procuring construction, if the conditions in §12.76(d)(2)(i) apply.

(i) In order for sealed bidding to be feasible, the following conditions should be present:

(A) A complete, adequate, and realistic specification or purchase description is available;

(B) Two or more responsible bidders are willing and able to compete effectively and for the business; and

(C) The procurement lends itself to a firm fixed price contract and the selection of the successful bidder can be made principally on the basis of price.

(ii) If sealed bids are used, the following requirements apply:

(A) The invitation for bids will be publicly advertised and bids shall be solicited from an adequate number of known suppliers, providing them sufficient time prior to the date set for opening the bids;

(B) The invitation for bids, which will include any specifications and pertinent attachments, shall define the items or services in order for the bidder to properly respond;

(C) All bids will be publicly opened at the time and place prescribed in the invitation for bids;

(D) A firm fixed-price contract award will be made in writing to the lowest responsive and responsible bidder. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs shall be considered in determining which bid is lowest. Payment discounts will only be used to determine the low bid when prior experience indicates that such discounts are usually taken advantage of; and

(E) Any or all bids may be rejected if there is a sound documented reason.

(3) Procurement by *competitive proposals*. The technique of competitive proposals is normally conducted with more than one source submitting an offer, and either a fixed-price or cost-reimbursement type contract is awarded. It is generally used when conditions are not appropriate for the use of sealed bids. If this method is used, the following requirements apply:

(i) Requests for proposals will be publicized and identify all evaluation factors and their relative importance. Any response to publicized requests for proposals shall be honored to the maximum extent practical;

(ii) Proposals will be solicited from an adequate number of qualified sources;

(iii) Grantees and subgrantees will have a method for conducting technical evaluations of the proposals received and for selecting awardees;

(iv) Awards will be made to the responsible firm whose proposal is most advantageous to the program, with price and other factors considered; and

(v) Grantees and subgrantees may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby competitors' qualifications are evaluated and the most qualified competitor is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E firms are a potential source to perform the proposed effort.

(4) Procurement by *noncompetitive proposals* is procurement through solicitation of a proposal from only one source, or after solicitation of a number of sources, competition is determined inadequate.

(i) Procurement by noncompetitive proposals may be used only when the award of a contract is infeasible under small purchase procedures, sealed bids or competitive proposals and one of the following circumstances applies:

(A) The item is available only from a single source;

(B) The public exigency or emergency for the requirement will not permit a delay resulting from competitive solicitation;

(C) The awarding agency authorizes noncompetitive proposals; or

(D) After solicitation of a number of sources, competition is determined inadequate.

(ii) Cost analysis, i.e., verifying the proposed cost data, the projections of the data, and the evaluation of the specific elements of costs and profits, is required.

(jii) Grantees and subgrantees may be required to submit the proposed procurement to the awarding agency for pre-award review in accordance with paragraph (g) of this section.

(e) *Contracting with small and minority firms, women's business enterprise and labor surplus area firms.* (1) The grantee and subgrantee will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

(2) Affirmative steps shall include:

(i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(ii) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

(iii) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;

(iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises;

(v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and

(vi) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (e)(2) (i) through (v) of this section.

(f) *Contract cost and price.*

(1) Grantees and subgrantees must perform a cost or price analysis in connection with every procurement action including contract modifications. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, grantees must make independent estimates before receiving bids or proposals. A cost analysis must be performed when the offeror is required to submit the elements of his estimated cost, e.g., under professional, consulting, and architectural engineering services contracts. A cost analysis will be necessary when adequate price competition is lacking, and for sole source procurements, including contract modifications or change orders, unless price reasonableness can be established on the basis of a catalog or market price of a commercial product sold in substantial quantities to the general public or based on prices set by law or regulation. A price analysis will be used in all other instances to determine the reasonableness of the proposed contract price.

(2) Grantees and subgrantees will negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is

performed. To establish a fair and reasonable profit, consideration will be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.

(3) Costs or prices based on estimated costs for contracts under grants will be allowable only to the extent that costs incurred or cost estimates included in negotiated prices are consistent with Federal cost principles (see §12.62). Grantees may reference their own cost principles that comply with the applicable Federal cost principles.

(4) The cost plus a percentage of cost and percentage of construction cost methods of contracting shall not be used.

(g) Awarding agency review.

(1) Grantees and subgrantees must make available, upon request of the awarding agency, technical specifications on proposed procurements where the awarding agency believes such review is needed to ensure that the item and/or service specified is the one being proposed for purchase. This review generally will take place prior to the time the specification is incorporated into a solicitation document. However, if the grantee or subgrantee desires to have the review accomplished after a solicitation has been developed, the awarding agency may still review the specifications, with such review usually limited to the technical aspects of the proposed purchase.

(2) Grantees and subgrantees must on request make available for awarding agency pre-award review procurement documents, such as requests for proposals or invitations for bids, independent cost estimates, etc. when:

(i) A grantee's or subgrantee's procurement procedures or operation fails to comply with the procurement standards in this section; or

(ii) The procurement is expected to exceed the simplified acquisition threshold and is to be awarded without competition or only one bid or offer is received in response to a solicitation; or

(iii) The procurement, which is expected to exceed the simplified acquisition threshold, specifies a "brand name" product; or

(iv) The proposed award is more than the simplified acquisition threshold and is to be awarded to other than the apparent low bidder under a sealed bid procurement; or

(v) A proposed contract modification changes the scope of a contract or increases the contract amount by more than the simplified acquisition threshold.

(3) A grantee or subgrantee will be exempt from the pre-award review in paragraph (g)(2) of this section if the awarding agency determines that its procurement systems comply with the standards of this section.

(i) A grantee or subgrantee may request that its procurement system be reviewed by the awarding agency to determine whether its system meets these standards in order for its system to be certified. Generally, these reviews shall occur where there is a continuous high-dollar funding, and third-party contracts are awarded on a regular basis.

(ii) A grantee or subgrantee may self-certify its procurement system. Such self-certification shall not limit the awarding agency's right to survey the system. Under a self-certification procedure, awarding agencies may wish to rely on written assurances from the grantee or subgrantee that it is complying with these standards. A grantee or subgrantee will cite specific procedures, regulations, standards, etc., as being in compliance with these requirements and have its system available for review.

(h) *Bonding requirements.* For construction or facility improvement contracts or subcontracts exceeding the simplified acquisition threshold, the awarding agency may accept the bonding policy and requirements of the grantee or subgrantee provided the awarding agency has made a determination that the awarding agency's interest is adequately protected. If such a determination has not been made, the minimum requirements shall be as follows:

(1) *A bid guarantee from each bidder equivalent to five percent of the bid price.* The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his bid, execute such contractual documents as may be required within the time specified.

(2) *A performance bond on the part of the contractor for 100 percent of the contract price.* A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

(3) *A payment bond on the part of the contractor for 100 percent of the contract price.* A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

(i) *Contract provisions.* A grantee's and subgrantee's contracts must contain provisions in paragraph (i) of this section. Federal agencies are permitted to require changes, remedies, changed conditions, access and records retention, suspension of work, and other clauses approved by the Office of Federal Procurement Policy.

(1) Administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate. (Contracts more than the simplified acquisition threshold)

- (2) Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be effected and the basis for settlement. (All contracts in excess of \$10,000)
- (3) Compliance with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60). (All construction contracts awarded in excess of \$10,000 by grantees and their contractors or subgrantees)
- (4) Compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR Part 3). (All contracts and subgrants for construction or repair)
- (5) Compliance with the Davis-Bacon Act (40 U.S.C. 276a to 276a-7) as supplemented by Department of Labor regulations (29 CFR Part 5). (Construction contracts in excess of \$2000 awarded by grantees and subgrantees when required by Federal grant program legislation)
- (6) Compliance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor regulations (29 CFR Part 5). (Construction contracts awarded by grantees and subgrantees in excess of \$2000, and in excess of \$2500 for other contracts which involve the employment of mechanics or laborers)
- (7) Notice of awarding agency requirements and regulations pertaining to reporting.
- (8) Notice of awarding agency requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.
- (9) Awarding agency requirements and regulations pertaining to copyrights and rights in data.
- (10) Access by the grantee, the subgrantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (11) Retention of all required records for three years after grantees or subgrantees make final payments and all other pending matters are closed.
- (12) Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15). (Contracts, subcontracts, and subgrants of amounts in excess of \$100,000)

(13) Mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94-163, 89 Stat. 871).

4. EQUIPMENT (43 CFR §12.72)

(a) *Title.* Subject to the obligations and conditions set forth in this section, title to equipment acquired under a grant or subgrant will vest upon acquisition in the grantee or subgrantee respectively.

(b) *States.* A State will use, manage, and dispose of equipment acquired under a grant by the State in accordance with State laws and procedures. Other grantees and subgrantees will follow paragraphs (c) through (e) of this section.

(c) *Use.*

(1) Equipment shall be used by the grantee or subgrantee in the program or project for which it was acquired as long as needed, whether or not the project or program continues to be supported by Federal funds. When no longer needed for the original program or project, the equipment may be used in other activities currently or previously supported by a Federal agency.

(2) The grantee or subgrantee shall also make equipment available for use on other projects or programs currently or previously supported by the Federal Government, providing such use will not interfere with the work on the projects or program for which it was originally acquired. First preference for other use shall be given to other programs or projects supported by the awarding agency. User fees should be considered if appropriate.

(3) Notwithstanding the encouragement in §12.65(a) to earn program income, the grantee or subgrantee must not use equipment acquired with grant funds to provide services for a fee to compete unfairly with private companies that provide equivalent services, unless specifically permitted or contemplated by Federal statute.

(4) When acquiring replacement equipment, the grantee or subgrantee may use the equipment to be replaced as a trade-in or sell the property and use the proceeds to offset the cost of the replacement property, subject to the approval of the awarding agency.

(d) *Management requirements.* Procedures for managing equipment (including replacement equipment), whether acquired in whole or in part with grant funds, until disposition takes place will, as a minimum, meet the following requirements:

(1) Property records must be maintained that include a description of the property, a serial number or other identification number, the source of property, who holds title, the acquisition date, and cost of the property, percentage of Federal participation in the cost of the property, the location, use and condition of the property, and any ultimate disposition data including the date of disposal and sale price of the property.

(2) A physical inventory of the property must be taken and the results reconciled with the property records at least once every two years.

(3) A control system must be developed to ensure adequate safeguards to prevent loss, damage, or theft of the property. Any loss, damage, or theft shall be investigated.

(4) Adequate maintenance procedures must be developed to keep the property in good condition.

(5) If the grantee or subgrantee is authorized or required to sell the property, proper sales procedures must be established to ensure the highest possible return.

(e) *Disposition.* When original or replacement equipment acquired under a grant or subgrant is no longer needed for the original project or program or for other activities currently or previously supported by a Federal agency, disposition of the equipment will be made as follows:

(1) Items of equipment with a current per-unit fair market value of less than \$5,000 may be retained, sold or otherwise disposed of with no further obligation to the awarding agency.

(2) Items of equipment with a current per unit fair market value in excess of \$5,000 may be retained or sold and the awarding agency shall have a right to an amount calculated by multiplying the current market value or proceeds from sale by the awarding agency's share of the equipment.

(3) In cases where a grantee or subgrantee fails to take appropriate disposition actions, the awarding agency may direct the grantee or subgrantee to take excess and disposition actions.

(f) *Federal equipment.* In the event a grantee or subgrantee is provided Federally-owned equipment:

(1) Title will remain vested in the Federal Government.

(2) Grantees or subgrantees will manage the equipment in accordance with Federal agency rules and procedures, and submit an annual inventory listing.

(3) When the equipment is no longer needed, the grantee or subgrantee will request disposition instructions from the Federal agency.

(g) *Right to transfer title.* The Federal awarding agency may reserve the right to transfer title to the Federal Government or a third part named by the awarding agency when such a third party is otherwise eligible under existing statutes. Such transfers shall be subject to the following standards:

(1) The property shall be identified in the grant or otherwise made known to the grantee in writing.

(2) The Federal awarding agency shall issue disposition instruction within 120 calendar days after the end of the Federal support of the project for which it was acquired. If the Federal awarding agency fails to issue disposition instructions within the 120 calendar-day period the grantee shall follow 12.72(e).

(3) When title to equipment is transferred, the grantee shall be paid an amount calculated by applying the percentage of participation in the purchase to the current fair market value of the property.

5. SUPPLIES (43 CFR §12.73)

(a) *Title.* Title to supplies acquired under a grant or subgrant will vest, upon acquisition, in the grantee or subgrantee respectively.

(b) *Disposition.* If there is a residual inventory of unused supplies exceeding \$5,000 in total aggregate fair market value upon termination or completion of the award, and if the supplies are not needed for any other Federally sponsored programs or projects, the grantee or subgrantee shall compensate the awarding agency for its share.

6. INSPECTION

Reclamation has the right to inspect and evaluate the work performed or being performed under this Agreement, and the premises where the work is being performed, at all reasonable times and in a manner that will not unduly delay the work. If Reclamation performs inspection or evaluation on the premises of the Recipient or a sub-Recipient, the Recipient shall furnish and shall require sub-recipients to furnish all reasonable facilities and assistance for the safe and convenient performance of these duties.

7. AUDIT (31 U.S.C. 7501-7507)

Non-Federal entities that expend \$500,000 or more in a year in Federal awards shall have a single or program-specific audit conducted for that year in accordance with the Single Audit Act Amendments of 1996 (31 U.S.C. 7501-7507) and revised OMB Circular A-133. Federal awards are defined as Federal financial assistance and Federal cost-reimbursement contracts that non-Federal entities receive directly from Federal awarding agencies or indirectly from pass-through entities. They do not include procurement contracts, under grants or contracts, used to buy goods or services from vendors. Non-Federal entities that expend less than \$500,000 a year in Federal awards are exempt from Federal audit requirements for that year, except as noted in A-133, §___.215(a), but records must be available for review or audit by appropriate officials of the Federal agency, pass-through entity, and General Accounting Office (GAO).

8. ENFORCEMENT (43 CFR §12.83)

(a) *Remedies for noncompliance.* If a grantee or subgrantee materially fails to comply with any term of an award, whether stated in a Federal statute or regulation, an assurance, in a State plan or application, a notice of award, or elsewhere, the awarding agency may take one or more of the following actions, as appropriate in the circumstances:

- (1) Temporarily withhold cash payments pending correction of the deficiency by the grantee or subgrantee or more severe enforcement action by the awarding agency,
- (2) Disallow (that is, deny both use of funds and matching credit for) all or part of the cost of the activity or action not in compliance,
- (3) Wholly or partly suspend or terminate the current award for the grantee's or subgrantee's program,
- (4) Withhold further awards for the program, or
- (5) Take other remedies that may be legally available.

(b) *Hearings, appeals.* In taking an enforcement action, the awarding agency will provide the grantee or subgrantee an opportunity for such hearing, appeal, or other administrative proceeding to which the grantee or subgrantee is entitled under any statute or regulation applicable to the action involved.

(c) *Effects of suspension and termination.* Costs of grantee or subgrantee resulting from obligations incurred by the grantee or subgrantee during a suspension or after termination of an award are not allowable unless the awarding agency expressly authorizes them in the notice of suspension or termination or subsequently. Other grantee or subgrantee costs during suspension or after termination which are necessary and not reasonably avoidable are allowable if:

- (1) The costs result from obligations which were properly incurred by the grantee or subgrantee before the effective date of suspension or termination, are not in anticipation of it, and, in the case of a termination, are noncancellable, and,
- (2) The costs would be allowable if the award were not suspended or expired normally at the end of the funding period in which the termination takes effect.

(d) *Relationship to Debarment and Suspension.* The enforcement remedies identified in this section, including suspension and termination, do not preclude grantee or subgrantee from being subject to "Debarment and Suspension" under E.O. 12549 ((2 CFR 29.5.12 and 2 CFR 1400, Subpart C).

9. TERMINATION FOR CONVENIENCE (43 CFR §12.84)

Except as provided in 43 CFR §12.83 awards may be terminated in whole or in part only as follows:

(a) By the awarding agency with the consent of the grantee or subgrantee in which case the two parties shall agree upon the termination conditions, including the effective date and in the case of partial termination, the portion to be terminated, or

(b) By the grantee or subgrantee upon written notification to the awarding agency, setting forth the reasons for such termination, the effective date, and in the case of partial termination, the portion to be terminated. However, if, in the case of a partial termination, the awarding agency determines that the remaining portion of the award will not accomplish the purposes for which the award was made, the awarding agency may terminate the award in its entirety under either §12.83 or paragraph (a) of this section.

10. DEBARMENT AND SUSPENSION (2 CFR §1400)

The Department of the Interior regulations at 2 CFR 1400—Governmentwide Debarment and Suspension (Nonprocurement), which adopt the common rule for the governmentwide system of debarment and suspension for nonprocurement activities, are hereby incorporated by reference and made a part of this Agreement. By entering into this grant or cooperative Agreement with the Bureau of Reclamation, the Recipient agrees to comply with 2 CFR 1400, Subpart C, and agrees to include a similar term or condition in all lower-tier covered transactions. These regulations are available at <http://www.gpoaccess.gov/ecfr/>.

11. DRUG-FREE WORKPLACE (2 CFR §182 and §1401)

The Department of the Interior regulations at 2 CFR 1401—Governmentwide Requirements for Drug-Free Workplace (Financial Assistance), which adopt the portion of the Drug-Free Workplace Act of 1988 (41 U.S.C. 701 et seq, as amended) applicable to grants and cooperative agreements, are hereby incorporated by reference and made a part of this agreement. By entering into this grant or cooperative agreement with the Bureau of Reclamation, the Recipient agrees to comply with 2 CFR 182.

12. ASSURANCES AND CERTIFICATIONS INCORPORATED BY REFERENCE

The provisions of the Assurances, SF 424B or SF 424D as applicable, executed by the Recipient in connection with this Agreement shall apply with full force and effect to this Agreement. All anti-discrimination and equal opportunity statutes, regulations, and Executive Orders that apply to the expenditure of funds under Federal contracts, grants, and cooperative Agreements, loans, and other forms of Federal assistance. The Recipient shall comply with Title VI or the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and any program-specific statutes with anti-discrimination requirements. The Recipient shall comply with civil rights laws including, but not limited to, the Fair Housing Act, the Fair Credit Reporting Act, the Americans

with Disabilities Act, Title VII of the Civil Rights Act of 1964, the Equal Educational Opportunities Act, the Age Discrimination in Employment Act, and the Uniform Relocation Act.

Such Assurances also include, but are not limited to, the promise to comply with all applicable Federal statutes and orders relating to nondiscrimination in employment, assistance, and housing; the Hatch Act; Federal wage and hour laws and regulations and work place safety standards; Federal environmental laws and regulations and the Endangered Species Act; and Federal protection of rivers and waterways and historic and archeological preservation.

13. COVENANT AGAINST CONTINGENT FEES

The Recipient warrants that no person or agency has been employed or retained to solicit or secure this Agreement upon an Agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide offices established and maintained by the Recipient for the purpose of securing Agreements or business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability or, in its discretion, to deduct from the Agreement amount, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee

14. TRAFFICKING VICTIMS PROTECTION ACT OF 2000 (2 CFR §175.15)

Trafficking in persons.

(a) Provisions applicable to a recipient that is a private entity.

(1) You as the recipient, your employees, subrecipients under this award, and subrecipients' employees may not

(i) Engage in severe forms of trafficking in persons during the period of time that the award is in effect;

(ii) Procure a commercial sex act during the period of time that the award is in effect; or

(iii) Use forced labor in the performance of the award or subawards under the award.

(2) We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity —

(i) Is determined to have violated a prohibition in paragraph a.1 of this award term; or

(ii) Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either

(A) Associated with performance under this award; or

(B) Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," as implemented by our agency at 2 CFR part 1400.

(b) *Provision applicable to a recipient other than a private entity.* We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity—

(1) Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or

(2) Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is either

(i) Associated with performance under this award; or

(ii) Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," as implemented by our agency at 2 CFR part 1400.

(c) *Provisions applicable to any recipient .*

(1) You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.

(2) Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:

(i) Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and

(ii) Is in addition to all other remedies for noncompliance that are available to us under this award.

(3) You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.

(d) *Definitions .* For purposes of this award term:

(1) "Employee" means either:

(i) An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this award; or

(ii) Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

(2) "Forced labor" means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

(3) "Private entity":

(i) Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.

(ii) Includes:

(A) A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).

(B) A for-profit organization.

(4) "Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. 7102).

15. NEW RESTRICTIONS ON LOBBYING (43 CFR §18)

The Recipient agrees to comply with 43 CFR 18, New Restrictions on Lobbying, including the following certification:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Recipient, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying" in accordance with its instructions.

(c) The Recipient shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

16. UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (URA) (42 USC § 4601 *et seq.*)

(a) The Uniform Relocation Assistance Act (URA), 42 U.S.C. § 4601 *et seq.*, as amended, requires certain assurances for Reclamation funded land acquisition projects conducted by a Recipient that cause the displacement of persons, businesses, or farm operations. Because Reclamation funds only support acquisition of property or interests in property from willing sellers, it is not anticipated that Reclamation funds will result in any “displaced persons,” as defined under the URA.

(b) However, if Reclamation funds are used for the acquisition of real property that results in displacement, the URA requires Recipients to ensure that reasonable relocation payments and other remedies will be provided to any displaced person. Further, when acquiring real property, Recipients must be guided, to the greatest extent practicable, by the land acquisition policies in 42 U.S.C. § 4651.

(c) Exemptions to the URA and 49 CFR Part 24

(1) The URA provides for an exemption to the appraisal, review and certification rules for those land acquisitions classified as “voluntary transactions.” Such “voluntary transactions” are classified as those that do not involve an exercise of eminent domain authority on behalf of a Recipient, and must meet the conditions specified at 49 CFR § 24.101(b)(1)(i)-(iv).

(2) For any land acquisition undertaken by a Recipient that receives Reclamation funds, but does not have authority to acquire the real property by eminent domain, to be exempt from the requirements of 49 CFR Part 24 the Recipient must:

- (i) provide written notification to the owner that it will not acquire the property in the event negotiations fail to result in an amicable agreement, and;
- (ii) inform the owner in writing of what it believes to be the market value of the property

(d) Review of Land Acquisition Appraisals. Reclamation reserves the right to review any land

appraisal whether or not such review is required under the URA or 49 CFR § 24.104. Such reviews may be conducted by the Department of Interior's Appraisal Services Directorate or a Reclamation authorized designee. When Reclamation determines that a review of the original appraisal is necessary, Reclamation will notify the Recipient and provide an estimated completion date of the initial appraisal review.

17. CENTRAL CONTRACTOR REGISTRATION AND UNIVERSAL IDENTIFIER REQUIREMENTS (2 CFR 25, APPENDIX A)

A. Requirement for Central Contractor Registration (CCR)

Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another award term.

B. Requirement for Data Universal Numbering System (DUNS) Numbers

If you are authorized to make subawards under this award, you:

1. Must notify potential subrecipients that no entity (*see* definition in paragraph C of this award term) may receive a subaward from you unless the entity has provided its DUNS number to you.
2. May not make a subaward to an entity unless the entity has provided its DUNS number to you.

C. Definitions

For purposes of this award term:

1. *Central Contractor Registration (CCR)* means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the CCR Internet site (currently at <http://www.ccr.gov>).
2. *Data Universal Numbering System (DUNS) number* means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at <http://fedgov.dnb.com/webform>).
3. *Entity*, as it is used in this award term, means all of the following, as defined at 2 CFR part 25, subpart C:
 - a. A Governmental organization, which is a State, local government, or Indian Tribe;
 - b. A foreign public entity;
 - c. A domestic or foreign nonprofit organization;
 - d. A domestic or foreign for-profit organization; and

- e. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

4. *Subaward*:

- a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
- b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, *see* Sec. 11.210 of the attachment to OMB Circular A-133, “Audits of States, Local Governments, and Non-Profit Organizations”).
- c. A subaward may be provided through any legal agreement, including an agreement that you consider a contract.

5. *Subrecipient* means an entity that:

- a. Receives a subaward from you under this award; and
- b. Is accountable to you for the use of the Federal funds provided by the subaward.

18. PROHIBITION ON TEXT MESSAGING AND USING ELECTRONIC EQUIPMENT SUPPLIED BY THE GOVERNMENT WHILE DRIVING

Executive Order 13513, *Federal Leadership On Reducing Text Messaging While Driving*, was signed by President Barack Obama on October 1, 2009 (ref: <http://edocket.access.gpo.gov/2009/pdf/E9-24203.pdf>). This Executive Order introduces a Federal Government-wide prohibition on the use of text messaging while driving on official business or while using Government-supplied equipment. Additional guidance enforcing the ban will be issued at a later date. In the meantime, please adopt and enforce policies that immediately ban text messaging while driving company-owned or rented vehicles, government-owned or leased vehicles, or while driving privately owned vehicles when on official government business or when performing any work for or on behalf of the government.

ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX E

Packwood Creek Recharge Project Basis of Design

Visalia Water Management Committee

Basis of Design Report

for

Packwood Creek Control Structures

Job No. 122512V2

November 19, 2012

Prepared By:

Accepted By:



Kaweah Delta Water Conservation District

Date

City of Visalia

Date

Tulare Irrigation District

Date

VWMC Basis of Design Report

Packwood Creek Control Structures

1. Introduction

Kaweah Delta Water Conservation District (KDWCD) has been awarded an USBR Fiscal Year 2012 Water and Energy Efficiency Grant to construct 4 new check structures, and modify 1 existing check structure, within Packwood Creek. This project was conceived through a cooperative program for surface water and groundwater management between the City of Visalia (City) and KDWCD, known as the Visalia Water Management Committee (VWMC), and it will be the VWMC that contributes the matching funds for the grant. While not a member of the VWMC, Tulare Irrigation District (TID) is often involved to provide input as their facilities and resources are usually involved. The concept was further refined in a study entitled "Packwood and Cameron Creeks Pool and Basin Reconnaissance Study" completed by Provost and Pritchard Consulting Group dated August 10, 2010. This study identified strategic locations that would allow for the pooling and recharging of water.

The purpose of this Basis of Design report is to document our current understanding of the project, and outline the criteria we will use in our design. Currently, the structures are envisioned to be equipped with automated gates capable of maintaining high water levels in the channel. The creek will essentially be used as a linear recharge basin to improve the groundwater levels for the City. Additionally, the gates must be able to open completely to allow free flow during flood events.

2. Operational/ Site Conditions

- A. There are 3 flow regimes the structures must be designed for:
 - i. Maintaining a high water level at the structure to maximize recharge rates
 - ii. Controlling an irrigation flow of 150 CFS desired by TID
 - iii. Passing 350 CFS flood flows without significantly impacting upstream water levels
- B. Existing flow rate into Packwood Creek is controlled through a headgate off of the Kaweah River.
- C. The miscellaneous earthwork mentioned in the grant application was intended for site improvements, and not for the raising of banks to final grade upstream. If bank raising is required, a cost will be sought from the selected contractor, but the work will be conducted under a separate scope and contract.
- D. Incorporate consistency between structures, as possible.
- E. 15-foot wide drive banks are desired
- F. Consideration will need to be given to backhoe access should board guides be used in conjunction with an automated gate. Board guides should be located to eliminate the need for a drivable deck as practicable.
- G. A quick release mechanism will be considered should board guides be used in conjunction with the automated gate.

VWMC Basis of Design Report

Packwood Creek Control Structures

- H. The project will be publicly bid and constructed by a general contractor and not by KDWCD, TID, or City staff.
- I. Site location will need to consider structure proximity to mature trees. Trees have the potential to impact construction, inhibit sunlight for solar power, and conflict with the City's Valley Oak protection ordinance.
- J. A portion of the City's storm drain system discharges directly into Packwood Creek. The City staff is concerned with the portions that discharge between Lovers Lane and Check #5. There is a potential that the Creek's elevated water level may cause water to backup and surface through storm drain inlets and impact the flows of nuisance waters into the Creek. There is also a concern of road subsidence from prolonged charging of the storm drain pipelines. **These concerns must be addressed before the City will sign off on the project.**

3. Right-Of-Way

Preliminary research has been performed in the form of reviewing APN maps, record maps, and deeds to affected properties. It has been identified that easements do exist on some properties, but it has not been identified who these easements have been granted to, and what rights accompany these easements. To further understand the encumbrances on the property it is suggested that a preliminary title report or Chain of Title guarantee be obtained. Of course, this will come once the proposed sites are confirmed, and at the direction of the KDWCD's counsel and the City Attorney.

4. Utilities

It is unknown at this time what utilities exist at the sites. Utility companies will be contacted, and the topographic survey will attempt to capture surface features such as poles, pedestals, utility boxes, etc.

5. Engineering Criteria

- A. **Design Flow** – TID has required that the structures will need to be designed to control at least 150 CFS. The structures must also be designed to pass the flood flow obligation of 350 CFS. The 350 CFS does not need to be regulated by the automated gate.

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- B. **Gate selection** – KDWCD has already expressed an interest in using an Aqua Systems 2000 (AS2I) Langemann gate. The Langemann gate can measure flow rate in non submerged conditions, and has built-in automated control capability to control either flow or level. Another option is an AS2I Lopac gate. This gate maintains upstream water level, but cannot measure flow. The Lopac gate would only be considered for Checks #2, 3 and 4, where flow measurement is not necessary. See the attached brochures (**Attachment 6**). AS2I will be consulted to determine the appropriate size of gate to use. If a Langemann gate does not work within the available limits of Check #5, other options will be considered that may allow for automated flow control without major structure modifications.
- C. **Water levels** – The desire of the VWMC is to maintain a high water level in Packwood Creek to maximize recharge potential. However, the structures will be designed with enough open area as to not significantly increase the existing water level during flood flow events.
- D. **Geometry** – Maintain similar to existing, except for immediately downstream and upstream where earthwork may be necessary to transition from channel to structure geometry. This transitioning may require some slope stabilization.
- E. **Soils** – A geotechnical investigation will be performed for this project to evaluate soil types, bearing capacity, and creep ratios for piping potential.
- F. **Sedimentation** – Sedimentation and debris have accumulated upstream of the existing Check #5. Since sediment build up is probable at the proposed sites, this will become a criterion for evaluation when selecting gate type. If Langemann gates are used, it may require that slide gates are also installed to allow the sediment to pass.
- G. **Flow Measurement** – Flow measurement is currently not available, except at the head of Packwood Creek. Flow measurement will be necessary at Checks #1 and 5 to quantify the amount of water recharged between the two structures. It is not necessary to have flow measurement at the intermediate Checks #2, 3, and 4. Flow measurement can be incorporated as part of the Langemann gate. Flow measurement capability of the gate is limited in a submerged condition. This will be considered when determining gate length. Since flow measurement is not needed at Checks #2, 3, and 4, Lopac gates will be investigated at these sites.
- H. **Controls/Communication** – It is understood that KDWCD, City of Visalia, and TID all have existing SCADA networks. It is planned that the sites will be remotely monitored by all entities, however only KDWCD and TID will have the ability to remotely control. Input will be needed from all three entities when this step in the design is reached.

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Packwood Creek Control Structures

- I. **Operation** – Default mode for gate operation will be upstream level control. During flood flows the gate will be completely lowered to allow the flood flows to pass mostly unobstructed. The possibility and ease of switching to flow control will be investigated with the gate manufacturer as TID has expressed an interest to operate in flow control under certain circumstances.
- J. **Electricity** – Langemann gates and associated SCADA systems are normally solar powered and electrical service is not required, but the gate and SCADA can be hardwired if desired. At this time it is unclear whether or not electrical power is readily available in the vicinity of the proposed gates. It will be assumed that the solar power option will be used, however, conduits will be placed should it be desired to hardwire in the future. It should also be noted that obtaining electrical service would likely take a considerable amount of time. Also, KDWCD has measures against solar panel theft that will be employed if deemed necessary.
- K. **Demolition** – At this time, existing Check #5 is assumed stable and will continue to be used. If as-built information is available, it will be reviewed to assure its original structural design can withstand any proposed modification. There are no known facilities near the remaining four sites, so the only demolition will be the clearing and grubbing of vegetation, and the removal of unsuitable earthen material.
- L. **Construction Access** –The limits of construction activities will need to be determined, as well as local staging areas and any temporary construction easements.
- M. **Safety** – Site fencing will be modeled after recent improvements by the City at Mill Creek near McAuliff Avenue.
- N. **SWPPP and DCP** – Given the distance between sites, it is believed that a waiver for a Storm Water Pollution Prevention Plan (SWPPP) and Dust Control Plan (DCP) can be acquired for this project. Factors contributing to the waiver are 1) if the agencies can accept these as discrete projects and 2) whether or not the project is constructed during a wet period.
- O. **Permits** – In addition to the permits mentioned above, USACE 404, RWQCB 401, and a DFG 1602 permits are required. Gibson and Skordal will move forward with the 404 and 401, including wetland delineation, once project locations are firm. P&P will pursue the 1602 permit.

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6. Site Selection

All of the proposed sites of the original study are identified as Checks #1-5 in **Figure 1** below. These sites have been reviewed based on preliminary data (map research, aerial imagery, coarsely interpolated cross sections, etc), as well as a site visit by KDWCD, the City, TID, and P&P on September 7, 2012. Following the site visit, P&P was asked to evaluate the locations of Checks #1, 3 and 4. The currently proposed locations are identified on the map as, Checks #1A, 2, 3A, 4B, and 5. The following discussion clarifies the final structure location, how it was arrived upon, and design specifics of that site.

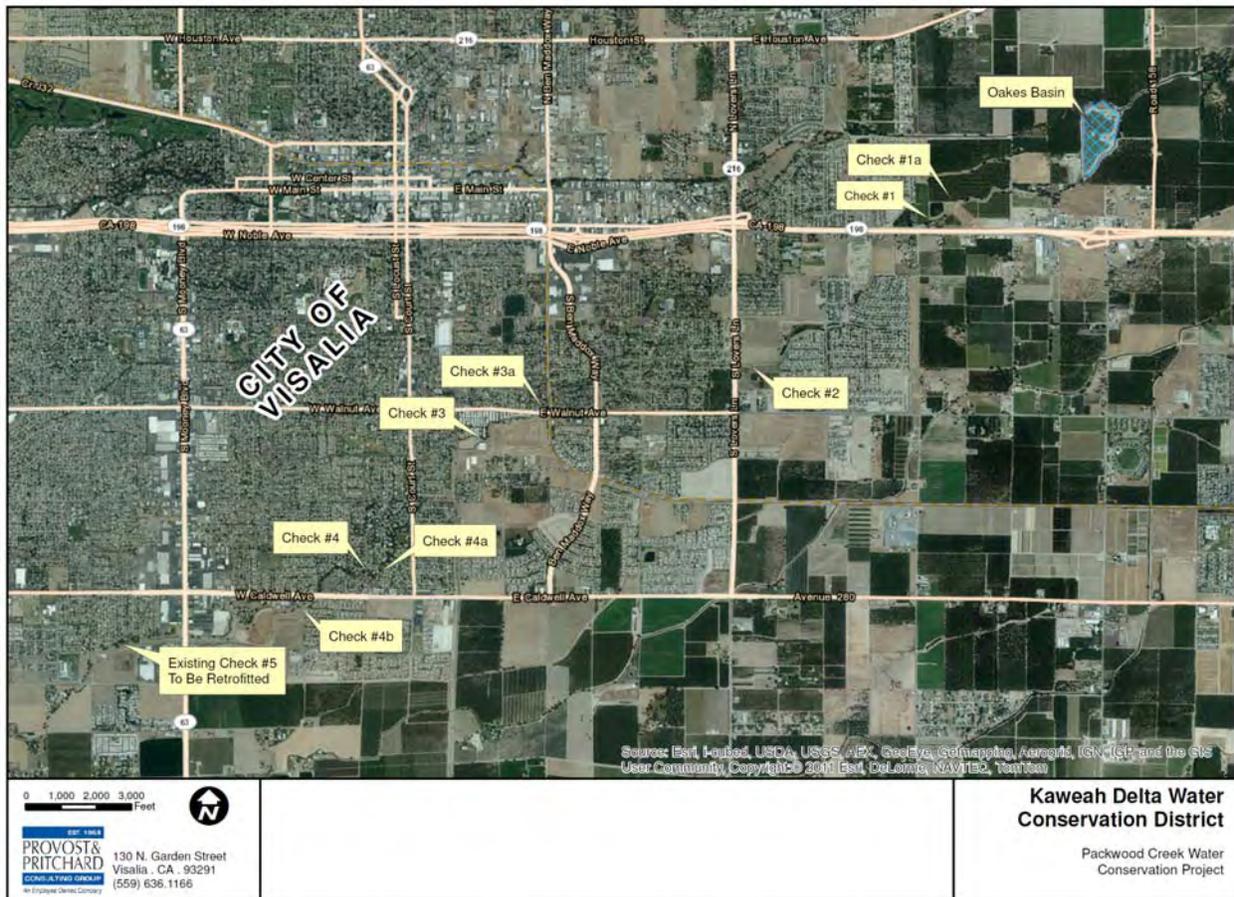


Figure 1. Check Structure Locations (All Considered)

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Packwood Creek Control Structures

- A. **Check #1** – The original location of Check #1 was just upstream of where the Oakes Ditch Pipeline discharges into Packwood Creek. It has since been understood that this location is within a the future Highway 198 and Road 148 interchange project by both Caltrans and the City.

The structure has been relocated approximately 900 feet upstream of the original location, and is identified as Check #1A on **Figure 1**. This places it roughly 50 feet upstream of the future road project. This site still has the potential to deliver water to future basins, and will be in a section of creek that is fully owned by the City. **Attachment 1** provides detail on both the Check #1 and Check #1A sites.

Table 1. Check #1a Characteristics

Pool Elevation	349
Pool Volume	12.4 AF
Pool Length	6,000 LF
Water Depth at Structure	8 Ft

- B. **Check #2** – The location of this check has remained unchanged from the original study (see **Attachment 2** for map). It is located wholly within one privately owned parcel. Thus an easement would have to be obtained from only one landowner. It was considered to move it downstream of Lovers Lane to a portion owned by the City. However, the grade change was too great. This check structure will also function to provide the head necessary to deliver the water through the turnout at Kiwanis Park Basin (formerly known as Dooley Basin).

Table 2. Check #2 Characteristics

Pool Elevation	340
Pool Volume	15.2 AF
Pool Length	6,800 LF
Water Depth at Structure	8 Ft

- C. **Check #3** – The original location of Check #3 was just upstream of Santa Fe Avenue. The northern bank of Packwood Creek at this location is considerably lower than the southern bank (approximately 3.5'). This location would require major earthwork in a confined area to bring to final grade. There are also many mature trees on the north bank that may impact construction. In addition, this site straddled two parcels with different owners.

The proposed location is just upstream of Walnut Avenue, roughly 2,350 feet upstream of its original location, and is identified as Check #3A on **Figure 1**. Minimal earthwork would be required to the banks, and the proposed location has better access and visibility. Additionally, the entire width of Packwood Creek in the proposed location appears to be owned by the County of Tulare. Although the south side of Walnut had advantages for constructability, it was

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decided that having a culvert directly upstream was undesirable, as was the potential risk of flooding Walnut Avenue. **Attachment 3** provides detail on both the Check #3 and Check #3A sites.

Table 3. Check #3A Characteristics

Pool Elevation	332
Pool Volume	10.4 AF
Pool Length	7,000 LF
Water Depth at Structure	8 Ft

- D. **Check #4** – The original location of Check #4 was just upstream of West Avenue, in a heavily populated area. In this section there are also many mature trees that have the potential to cause construction issues as well as block out direct sunlight for solar powered operation. It was then relocated to roughly 300 feet upstream, in a section clear of vegetation, and at a more consistent cross section. However, a site visit deemed this a poor location, and a consensus was made to investigate the temporary rubble dam location downstream of Caldwell Avenue.

The proposed location (identified as Check #4B on **Figure 1**) is now roughly 2,600 ft downstream of the original location identified in the hydraulic study, and is near the temporary rubble dam location. In the proposed location, the land appears to be wholly owned by the City of Visalia. Moving the structure downstream will impact the backwater potential of Check #5. **Attachment 4** provides detail on the Check #4, Check #4A, and Check #4B sites.

Table 4. Check #4B Characteristics

Pool Elevation	318
Pool Volume	9.2 AF
Pool Length	6,100 LF
Water Depth at Structure	8 Ft

- E. **Check #5** – This is an existing structure located just upstream of County Center Drive (see **Attachment 5**). There are two bays with weir board guides at this location that reach the bottom of the structure, each 5.5' wide (overall width with center pier is 12'). Higher weirs exist on either side, for higher flows. It is assumed that the existing concrete is structurally sound; however, as-built drawings will be sought. The exposed aggregates will be sealed with a grout or epoxy. At this location it is likely that an automated gate will be placed in each of the two bays (see the Langemann Gate of **Attachment 6**).

VWMC Basis of Design Report

Packwood Creek Control Structures

Table 5. Check #5 Characteristics

Pool Elevation	313
Pool Volume	18.1 AF
Pool Length	6,050 LF
Water Depth at Structure	8.5 Ft

Channel Profiles with Finalized Locations – With the check structures at the final locations as described above, a hydraulic profile was created (See **Attachment 7**). As seen in **Attachment 7**, at 0 CFS, there is a discontinuity in the pool between Check #3 and Check #4. This is due to Check #3 being relocated upstream, and Check #4 being relocated downstream. However, when the channel is modeled with the proposed check structure at 150 CFS, continuity is created between pools, and the check structures are effectively pooling water above the normal water level. In the future, a check structure between Check #3 and Check #4 would create continuity between all pools at 0 CFS. The importance of continuity between pools is to utilize as much of the creek as possible during pooled recharge to maximize infiltration.

It appears there is overtopping of the channel banks at Check #2 and Check #5. This will be confirmed when the detailed topographic survey is performed, and will be addressed by either lowering the target water level or raising the channel banks.

VWMC Basis of Design Report Packwood Creek Control Structures

ATTACHMENTS

- 1 – Check #1 Exhibits
- 2 – Check #2 Exhibits
- 3 – Check #3 Exhibits
- 4 – Check #4 Exhibits
- 5 – Check #5 Exhibits
- 6 – Aqua Systems 2000, Inc. Brochures (Langemann and Lopac Gate)
- 7 – Channel Hydraulic Profiles

REFERENCES

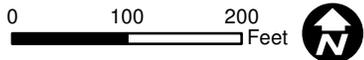
Provost and Pritchard Consulting Group, Packwood and Cameron Creeks Pool and Basin Reconnaissance Study, August 10, 2010

Provost and Pritchard Consulting Group, Draft Basis of Design Report for Packwood Creek Control Structures, August 9, 2012

Attachment 1
Check #1 Exhibits



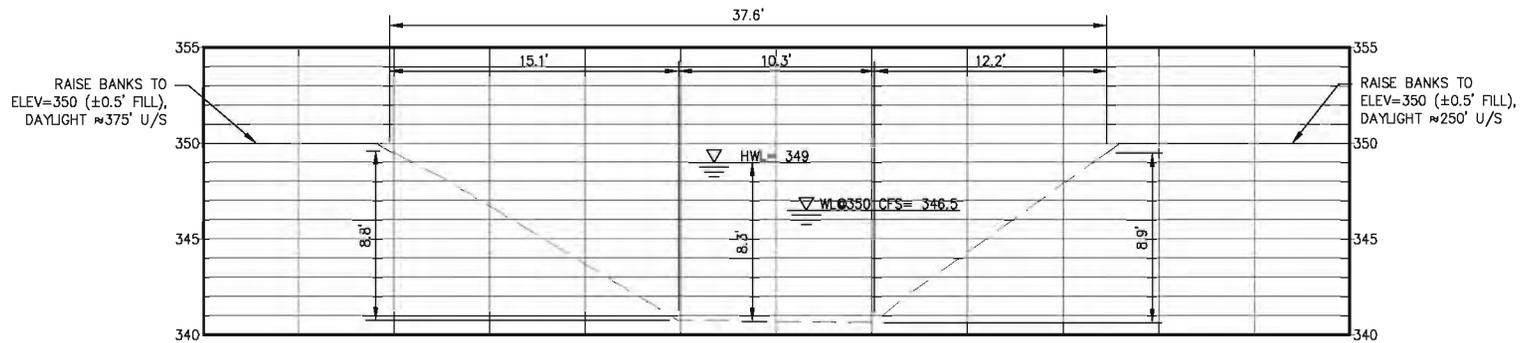
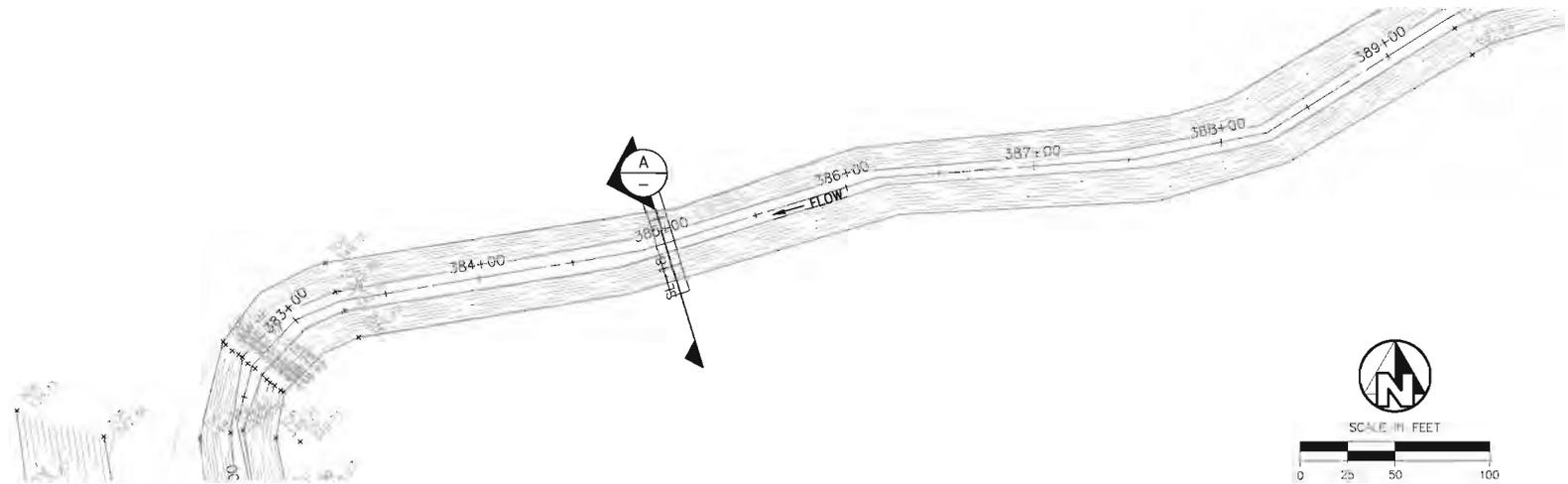
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Check 1 and 1a



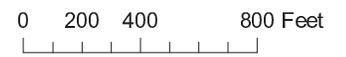
A SECTION SCALE IN FEET

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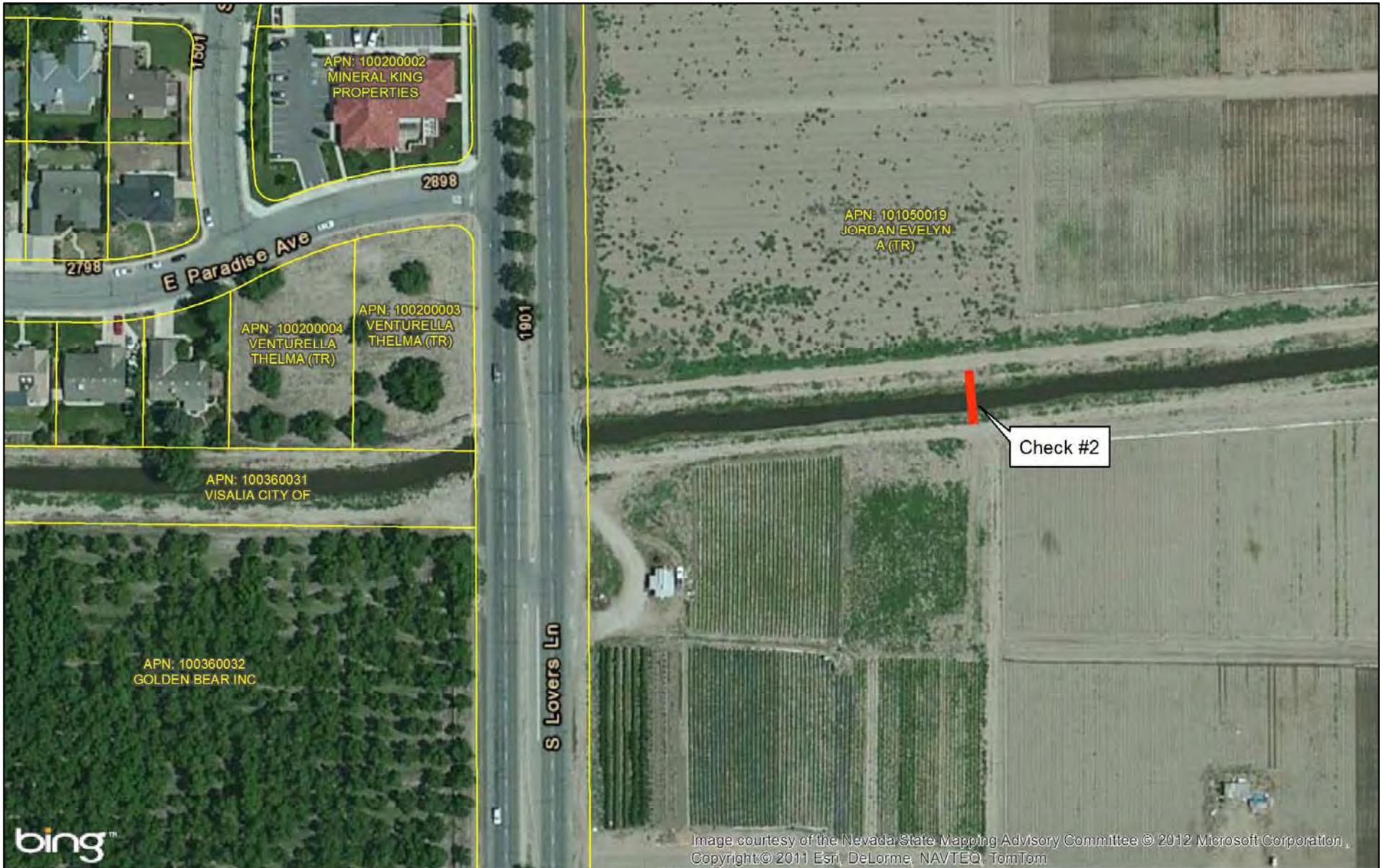


Legend					
	CITY LIMITS		STREETS		RD 148 PROPOSED CENTERLINE
	STATE RIGHT OF WAY		RAILROAD		SCE EXISTING 150' RIGHT OF WAY
	WATERWAYS		RD 148 PROPOSED RIGHT OF WAY		SCE TOWER CENTERLINE
			PARCELS		PROPOSED TOWER

SCE TOWER LOCATIONS AND PROPOSED ROAD 148 ALIGNMENT

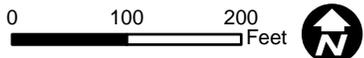


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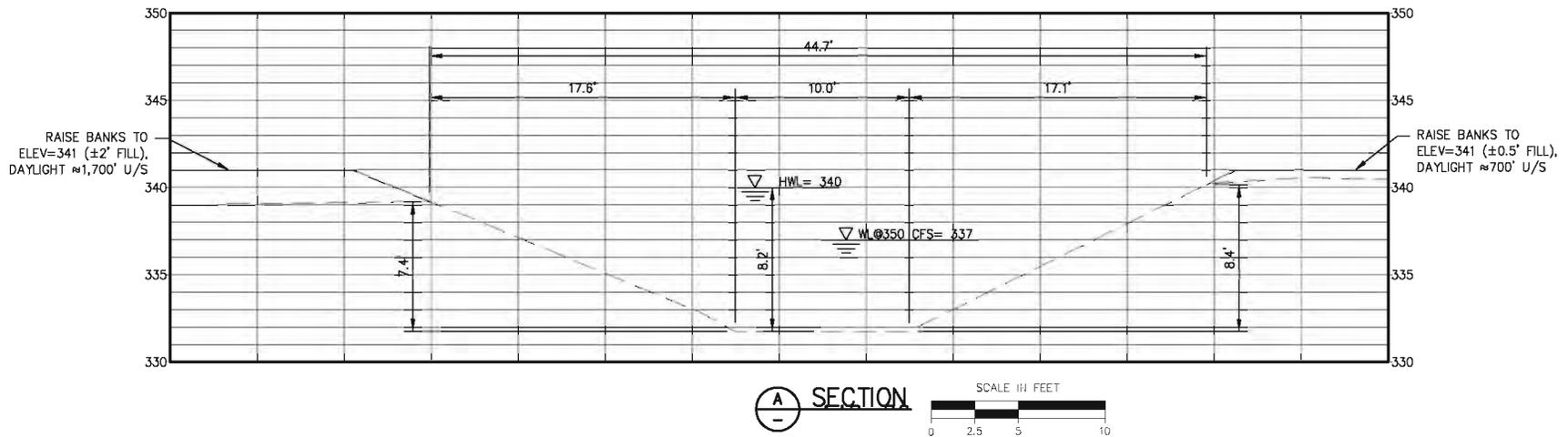
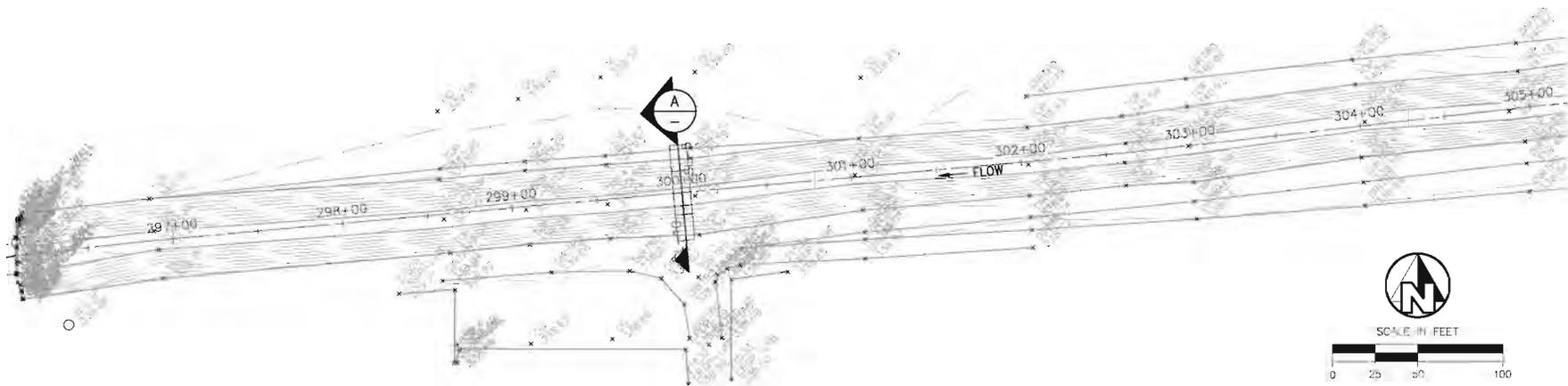


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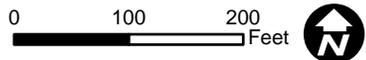
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Check 2



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Attachment 3
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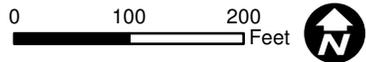
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Check 3



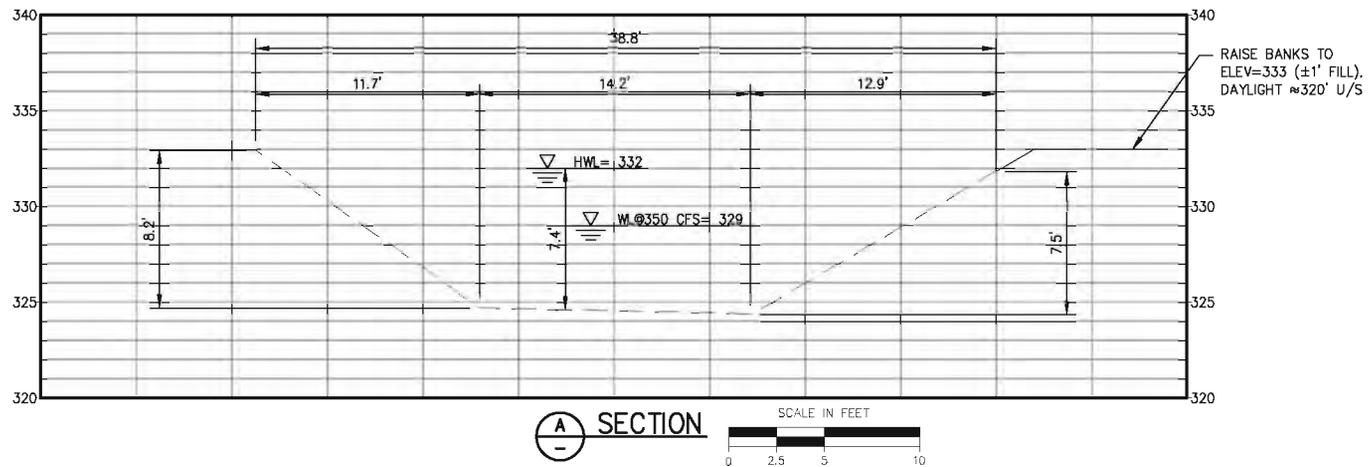
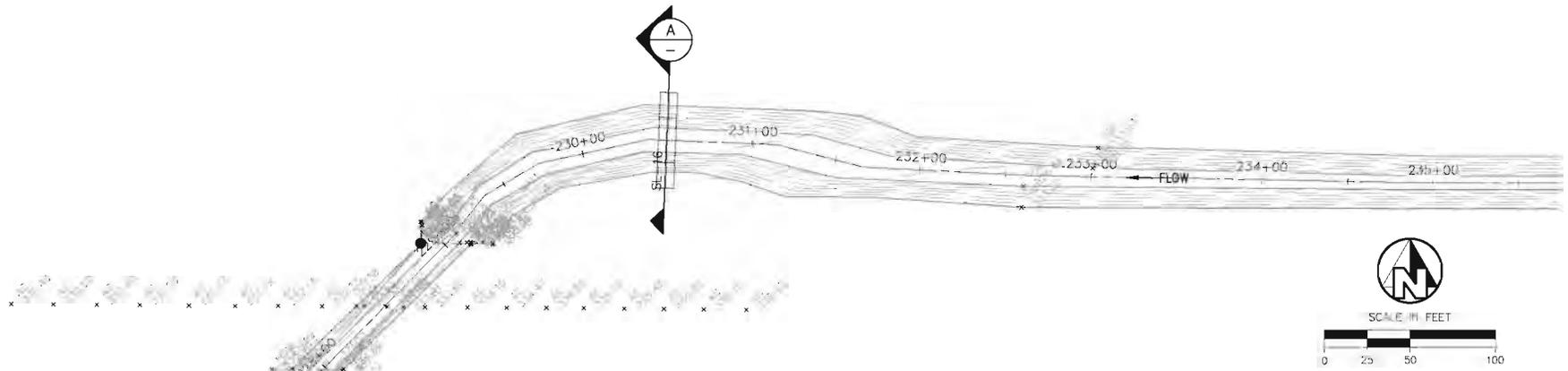
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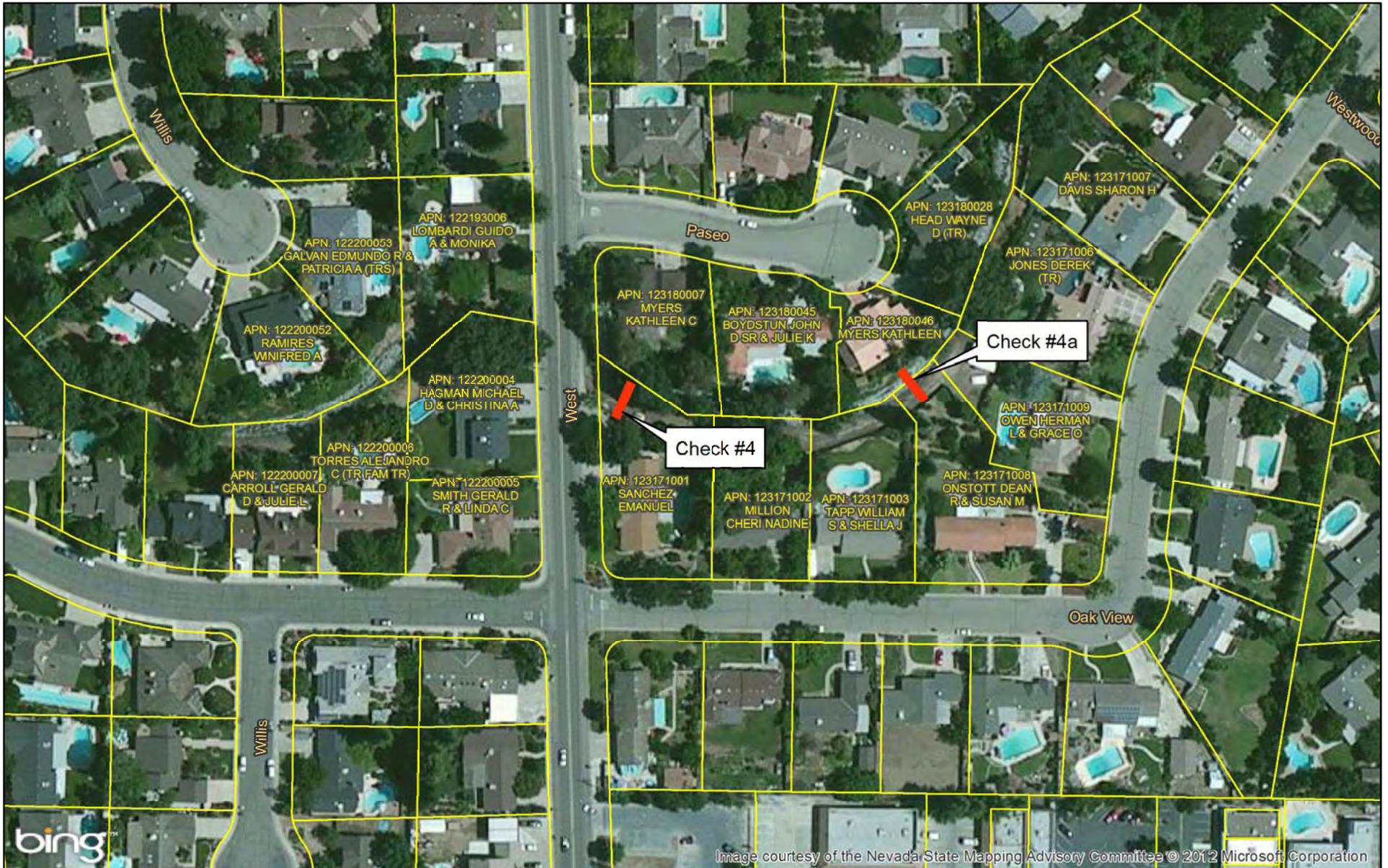
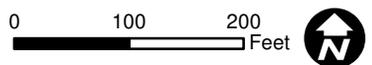


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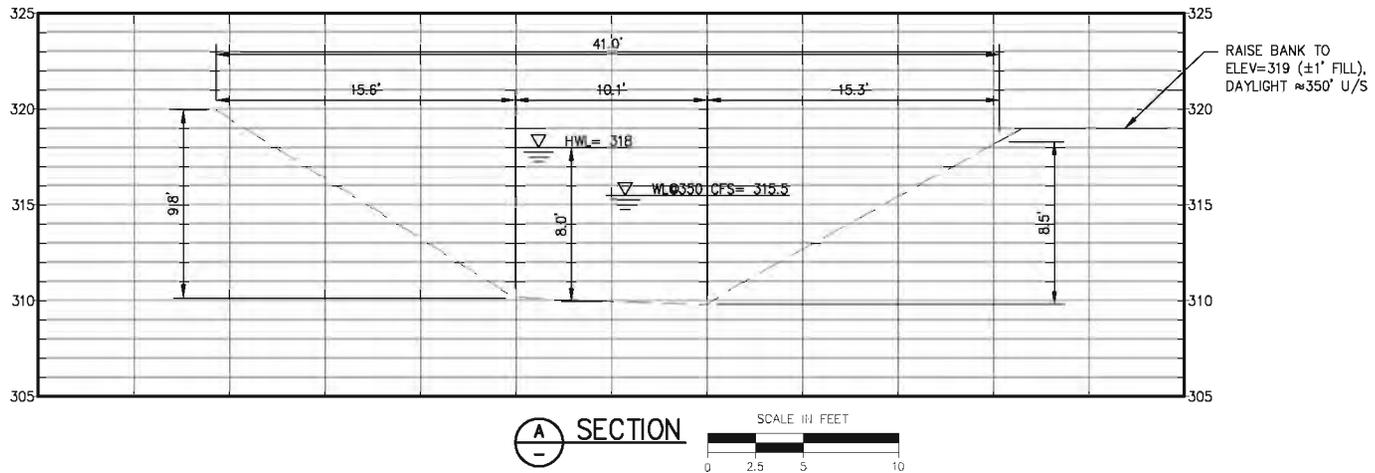
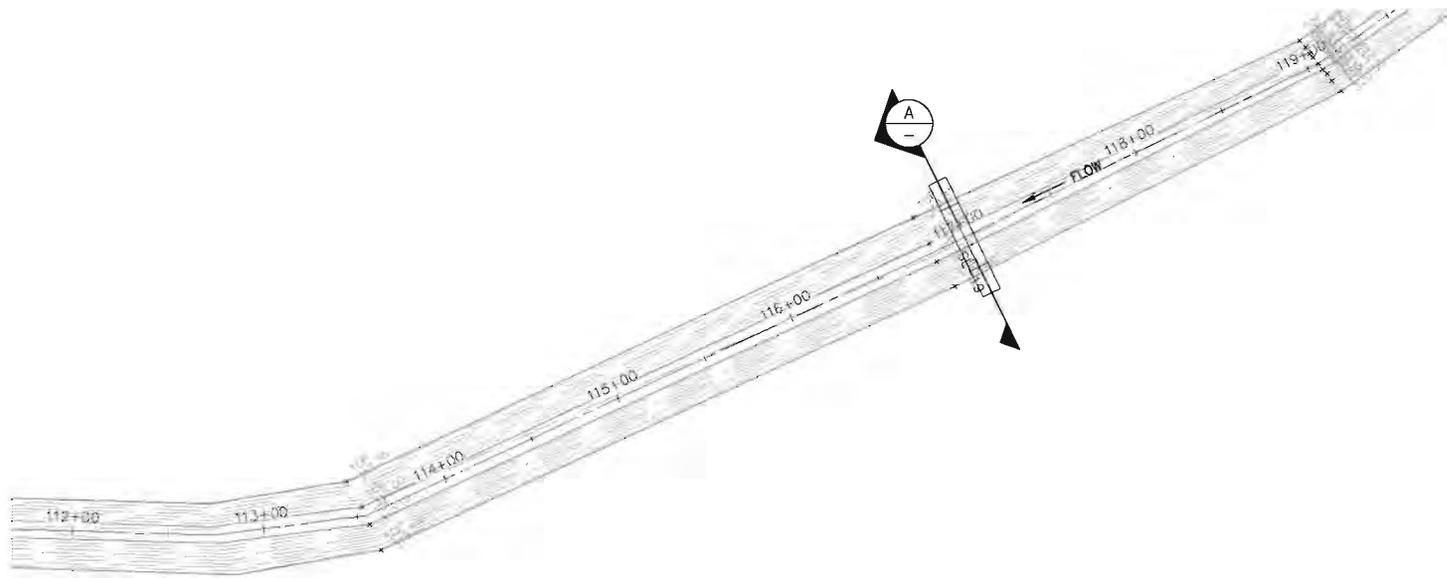
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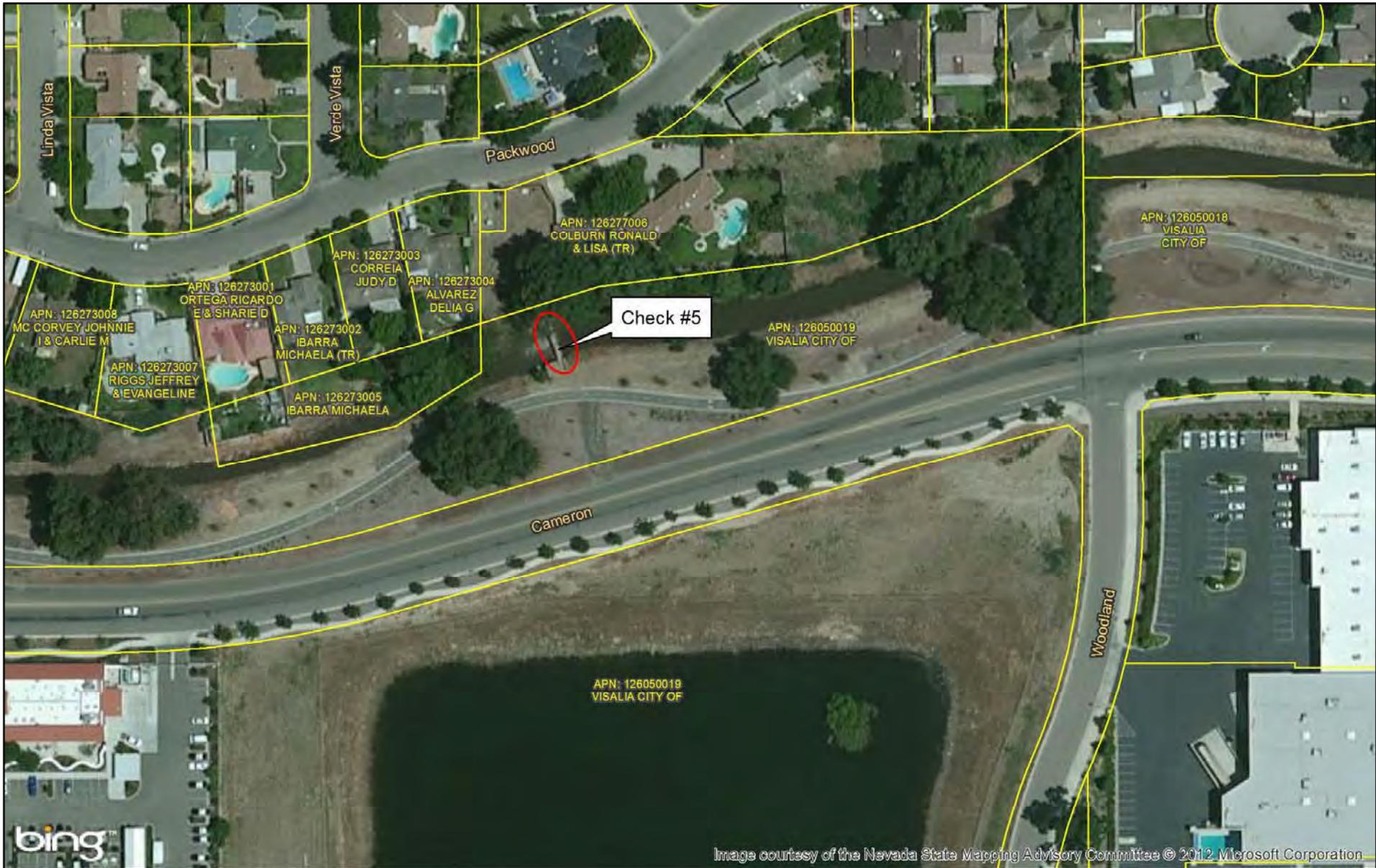


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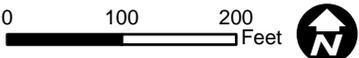
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Attachment 5
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Check #5

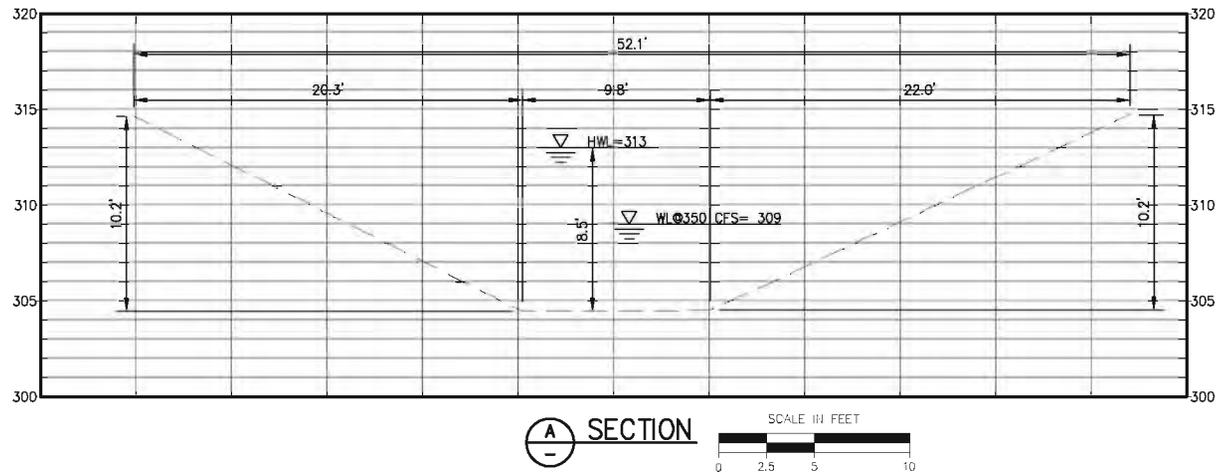
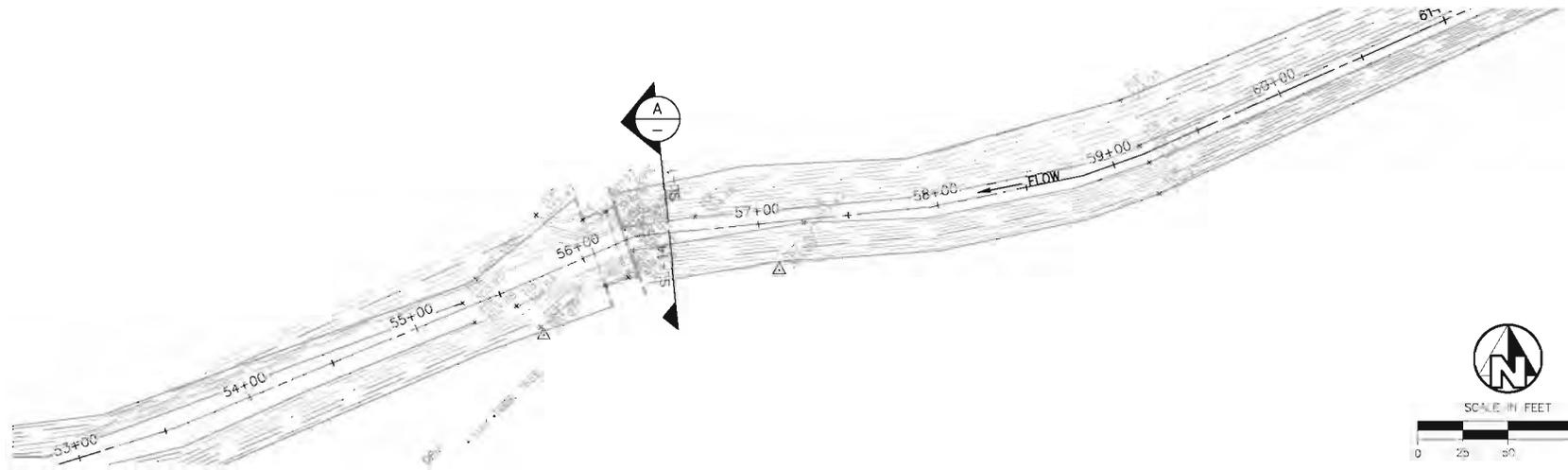


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Attachment 6
Langemann Gate Brochure

Product Information Sheet

Langemann® Gate

Invented by Peter Langemann, the Langemann Gate was developed through a cooperative effort between *St. Mary River Irrigation District*, Peter Langemann and **Aqua Systems 2000 Inc. (AS2I)**. The Langemann gate, used in conjunction with one of **AS2I's** controllers, provides solutions to a host of water control problems.

The patented design has gained recognition due to its simplicity, overshot technology, and low power requirements.



Advantages:

- **Superior trash management.**
- **Low power requirements:** The unique distribution of water pressure afforded by the gate configuration and the low friction operating components provide for remarkably low power requirements.
- **Precise positioning:** The Langemann Gate provides positive linear movement in either direction. Convenient staff gauge placement and the linear relationship of the gate and water level provides reliable operating information.
- **Ease of installation:** All but the very large gates are fully assembled for shipping. A small crew and a suitably sized crane can install a gate in a couple of hours.

Application Suitability:

A Langemann Gate with controller can either:

- Maintain a constant upstream water level (such as in a check structure) or
- Provide a pre-determined constant flow to downstream users (such as a turnout)

Applications:

- Irrigation check structures.
- Turnout structures.
- Spillway structures.
- Diversions structures.
- Water and sewage treatment plants.
- Flood control structures.

Features:

- 3CR12 stainless steel.
- Stainless steel gate pin.
- Tuffcast rollers.
- Nylon idlers and hinge pin.
- Waterproof roller chain in and omega configuration.
- Efficient helical worm speed reducer.
- NEMA 4/12 electrical panel.
- Overload relay.
- Limit switch.
- Motor starter.
- 12 or 24 Vdc operation for reliability.
- Inconspicuous solar panel.

Options:

- 304 stainless steel components where aggressive water is encountered
- Operation modes:
 - - Manual (hand-crank)
 - - Manual Electric
 - - Automated (upstream level or flow control)
- Integrated stilling well.

LANGEMANN GATE DETAILS



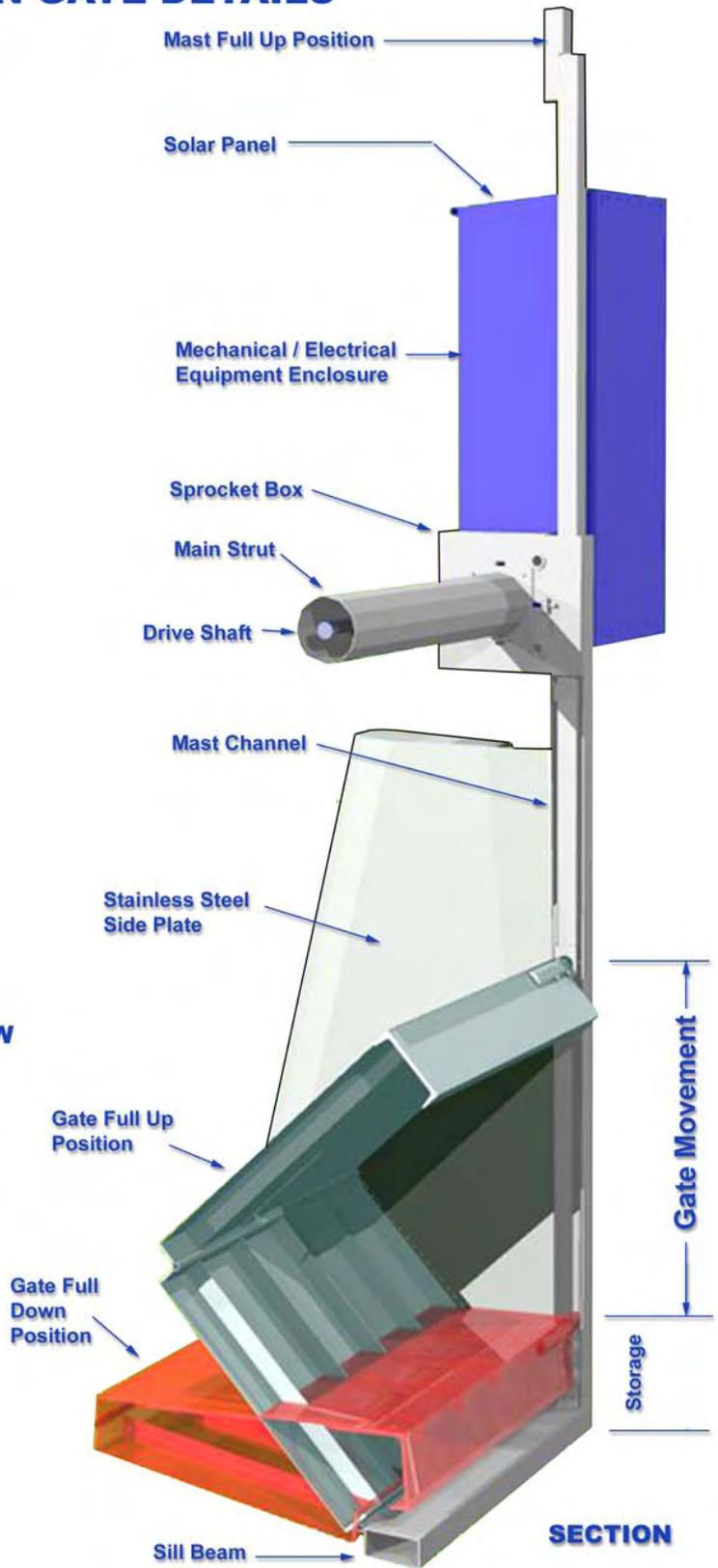
CLOSED GATE - UPSTREAM VIEW



CLOSED GATE - DOWN STREAM VIEW



OPEN GATE - UPSTREAM VIEW



SECTION

Product Information Sheet

Hydra - LOPAC® Gate

US Patent # 7,114,878 Canadian Patent pending

The LOPAC gate was developed by Peter Langemann in the 1980's to assist tail end irrigators in managing widely fluctuating water supplies. A number of installations have operated successfully for the past couple of decades. *Aqua Systems 2000 Inc. (AS2I)* has combined the simplicity of the LOPAC with a hydraulic actuator to provide a flexible and economical solution to water control problems in small to medium sized canals.

Applications:

- Irrigation check structures.
- Spillway structures.
- Diversions structures.
- Fish screening structures.

Advantages:

- Superior trash management.
- Low power requirements.
- Reliable and accurate control.
- Ease of Installation: LOPAC gates are fully assembled for shipping and are typically dropped into existing stop-log guides.



Features:

- 3CR12 stainless steel.
- Hydraulic actuation.
- Environment friendly oil.
- Manual electric operation.
- NEMA 3 electrical panel.
- Motor starter, overload relay, limit switch.
- Independent high-level emergency assist.
- 12 Vdc battery operation for reliability.
- Solar powered.

Options:

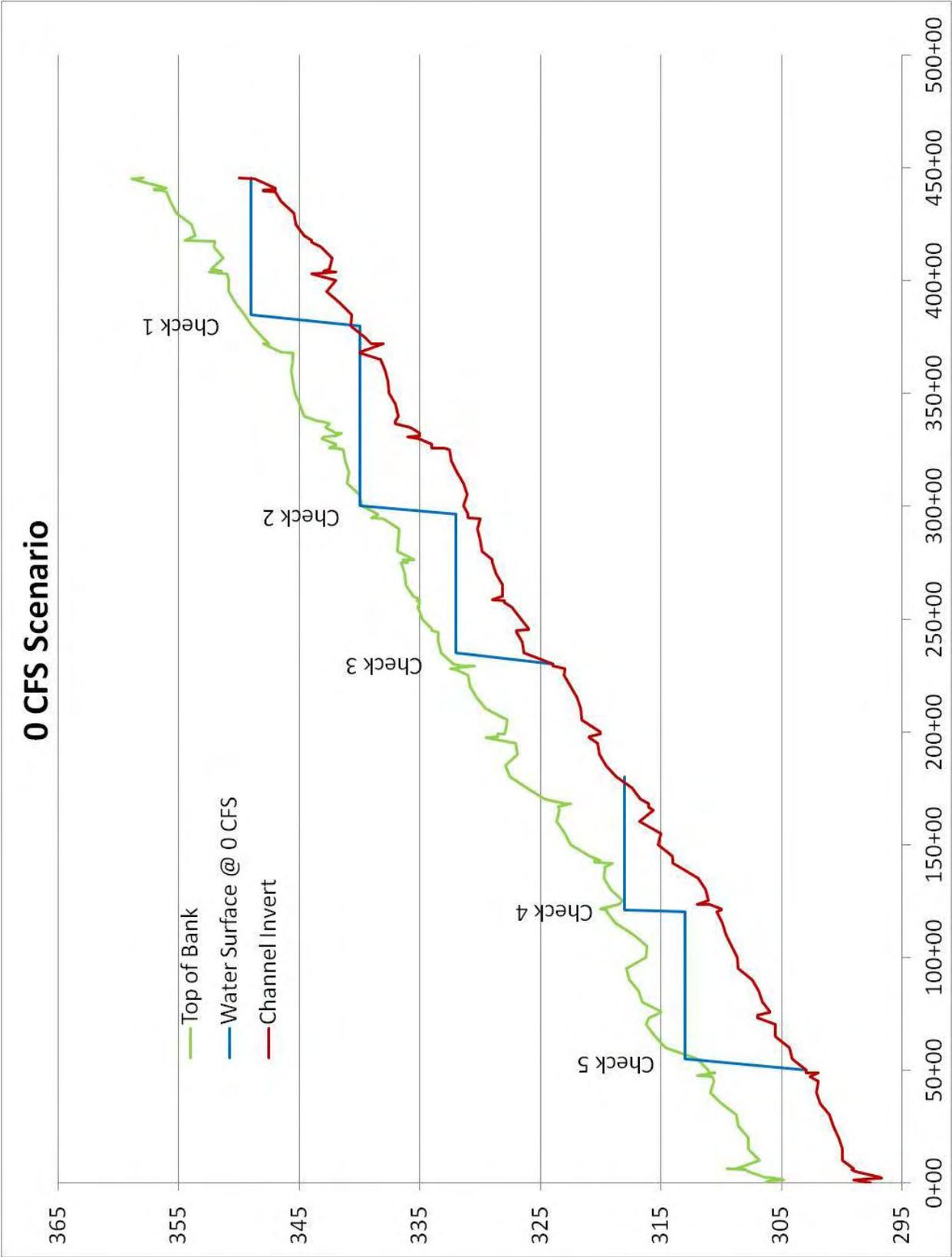
- 304 stainless steel components where aggressive water is encountered.
- Operation modes:
 - Hydraulic:
 - Automated:
 - Screw jack
 - Manual (hand crank).
 - Manual electric.
 - Automated.

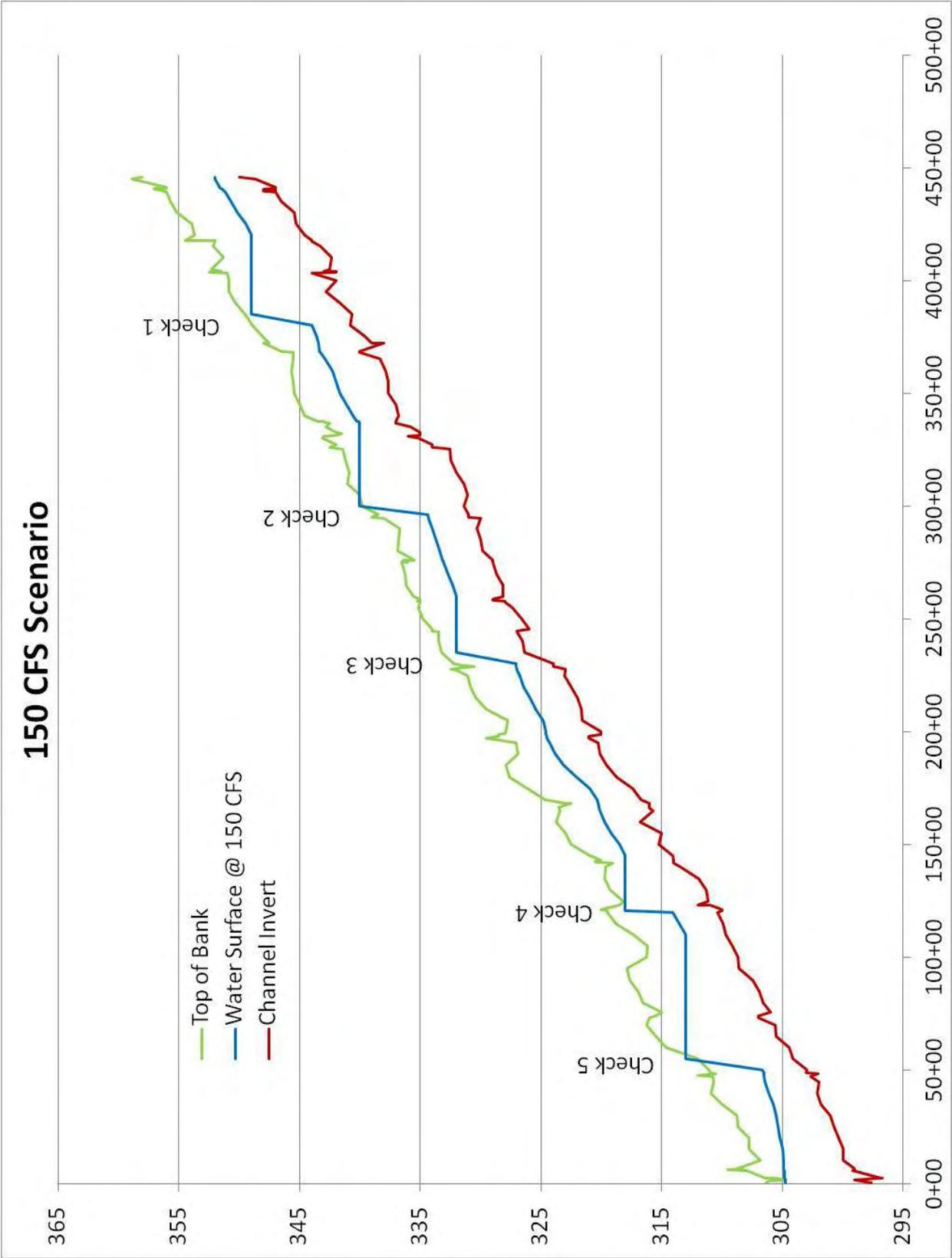
www.as2i.net

Aqua Systems 2000 Inc.

1-800-315-8947

Attachment 7
Channel Hydraulic Profiles





ATTACHMENT 7 – TECHNICAL JUSTIFICATION

APPENDIX F

**Packwood Creek Recharge Project Seepage Analysis
Methodology**

TECHNICAL NOTE 2011/04

Department for Water

SIMPLE ANALYTIC METHODS FOR ESTIMATING CHANNEL SEEPAGE FROM CONSTRUCTED CHANNELS IN THE UPPER SOUTH EAST OF SOUTH AUSTRALIA

Leanne Morgan, Graham Green and Cameron Wood

March, 2011

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INTRODUCTION

This document outlines a methodology for estimation of seepage losses from proposed channels as part of the Coorong South Lagoon Flow Restoration Project (CSLFRP). The CSLFRP has investigated options for diverting significant volumes of water from the drainage network of the South East northwards to the Coorong using a combination of purpose-built floodways and existing flow paths. The methods outlined in this document form part of the Hydrological Modelling component of the CSLFRP project, in which simple methods suitable for use within GIS were required to estimate transmission losses from proposed channels as part of a broader assessment of volumes that could be delivered to the Coorong South Lagoon.

The methods are simple analytic mathematical models for one dimensional flow under steady state conditions and assume homogeneity and isotropy in the aquifer, the underlying aquitard and the overlying soil layer. They are suitable for use in the low lying sections of the study area (Figure 4), where the extant conditions are a shallow water table within an unconfined Tertiary Limestone Aquifer (TLA) overlain by a relatively low conductivity soil layer of variable thickness. The TLA is composed of a fine to coarse calcarenite sandstone with abundant shell fragments (Cobb and Brown, 2000). It is underlain at significant depth by an aquitard of low permeability Tertiary marls and black carbonaceous clays (Brown, 2000).

The methods have been divided into three cases, based on the variety of physical conditions in the field. The applicability of each case is dependent on the location of the channel and regional watertable in relation to the lower conductivity soil layer which overlies the aquifer.

Worked examples are provided for each of the three methods presented. These examples, using low and high range parameters values, demonstrate the large range of seepage loss estimates that are possible with the plausible range of field parameter values. It is important when these methods are applied, that the sensitivity of the derived results to the parameter values is examined and that the range of uncertainty in channel seepage estimates is acknowledged.

This is an initial assessment and the methodology may alter as more data about soil and aquifer characteristics in the study area become available.

METHODS

Case 1. Saturated flow: The channel intersects the aquifer and the watertable is shallow

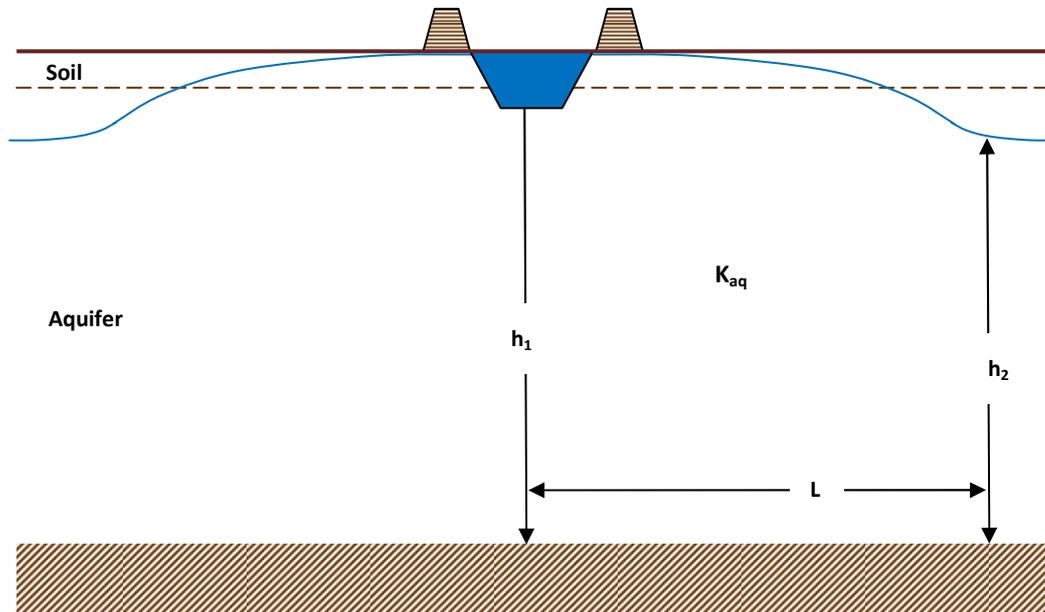


Figure 1. Channel seepage where the channel intersects the aquifer and the watertable is shallow (Case 1). Note, the watertable is depicted as forming a convex parabola away from the channel, in accordance with the boundary conditions of the Dupuit equation and neglecting evaporation from the watertable.

The terminology used within the above conceptual model refers to the following:

- Soil – A low conductivity layer of variable thickness at ground surface
- Aquifer – The unconfined Tertiary Limestone Aquifer (TLA), which is of relatively high hydraulic conductivity compared to the overlying soil
- Aquitard – The Lower Tertiary Confining Bed, assumed in this analysis to be impermeable

Case 1 applies when the channel intersects the aquifer, the watertable is below the water level in the channel and there is saturated flow between the channel and the aquifer (Figure 1). In this case seepage from the channel can be estimated using the Dupuit equation, which describes steady flow through an unconfined aquifer resting on a horizontal impervious surface (Fetter, 2001).

The Dupuit equation assumes horizontal flow. For channel seepage this assumption is valid when the depth to the watertable from the water level in the channel, which here is assumed to be at ground surface, is less than approximately twice the width of the channel (Bouwer, 2002). The proposed channel widths in the study area are between 5m and 35m. Therefore the depth to the watertable needs to be less than 10m from the ground surface for the assumption of horizontal flow to be valid. The average depth to the watertable is generally less than 6m in low lying areas (Figures 5 and 6), which is where the proposed channels will be located (David Way [DWLBC] 2010, pers. comm.). Therefore, the assumption of horizontal flow is reasonable and the Dupuit equation is applicable.

Using the Dupuit equation (Fetter, 2001) and assuming symmetry across the channel, seepage loss from the channel is given by:

$$q = \frac{K_{aq}(h_1^2 - h_2^2)}{L} \quad (1)$$

Where:

- q is the seepage rate per metre of channel (m²/d),
- K_{aq} is the hydraulic conductivity of the aquifer (m/d)
- h_1 is the hydraulic head elevation (m) of the water in the channel (see Figure 1) calculated using the base of the TLA as a datum. In this document the value of h_1 is estimated by adding the saturated thickness of the TLA, the depth to watertable and the level of the water in the channel above (or below) the ground surface.
- h_2 is the hydraulic head (m) in the aquifer a distance L from the channel, where the watertable is unaffected by the channel flow (Figure 1). The head is calculated using the base of the TLA as a datum. In the examples below, the value of h_2 is estimated from the saturated thickness of the aquifer.

It is important to note that the value of L can only be determined through field work but has been assumed to be 250m in this document, in line with assumptions made by AWE (2009a). Bouwer (1965) used a distance of ten times the width of the base of the channel for L . While this approach incorporates channel size it is still an arbitrary value and would ideally be refined through field work.

Example calculations

The following calculations illustrate the use of the Dupuit equation for Case 1 using a range of parameter values.

In the area of interest, the average depth to the watertable ranges between 0m and 6m (see Figure 5). The range of saturated thickness (based on drill hole records) is approximately 15 m to 185 m (Figure 6).

The groundwater flow model developed by Keith Brown (2000) for the confined aquifer in South East of South Australia reported hydraulic conductivity values for the unconfined aquifer in the area of interest ranging between 5 m/d and 120 m/d, while reported values derived from pump tests range from 15 m/d to 150 m/d (Fennel and Stadter, 1992).

- Example 1. Low range

To calculate channel seepage at a location where saturated thickness is 15 m, depth to watertable is 1m and water in the channel is at ground surface (therefore $h_1 = 15 + 1 + 0 = 16$ m, $h_2 = 10$ m), K_{aq} is 5 m/d and L is 250 m. The seepage loss per metre of channel is:

$$q = \frac{K_{aq}(h_1^2 - h_2^2)}{L} = 5 \frac{(16^2 - 15^2)}{250} = 0.62 \text{ m}^2/\text{d} = 0.62 \text{ KL/d/m}$$

- Example 2. High range

To calculate channel seepage at a location where saturated thickness is 185m, depth to watertable is 6m, water in the channel is at ground surface (therefore $h_1=185 + 6 + 0=191\text{m}$, $h_2=100\text{m}$), K_{aq} is 150 m/d and L is 250m. The seepage loss per metre of channel is:

$$q = \frac{K_{aq}(h_1^2 - h_2^2)}{L} = 150 \frac{(191^2 - 100^2)}{250} = 1354 \text{ m}^2/\text{d} = 1354 \text{ KL/d/m}$$

Case 2. Saturated flow: The channel sits within the soil layer and the watertable is in the soil layer

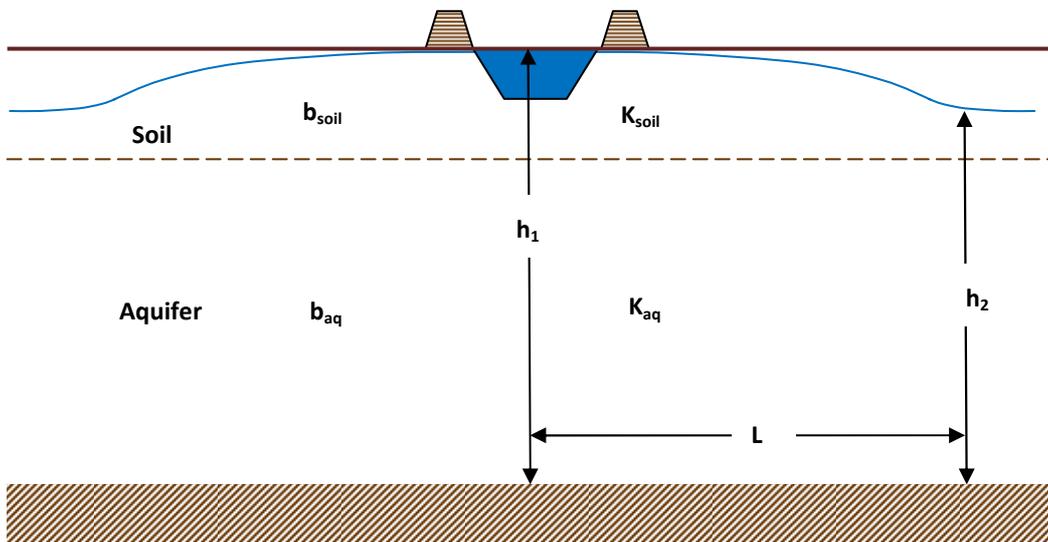


Figure 2. Channel seepage where the channel sits within the soil layer and the water table is in the soil layer (Case 2). Note the watertable is depicted as forming a convex parabola away from the channel, in accordance with the boundary conditions of the Dupuit equation and neglecting evaporation from the watertable.

This case applies when the channel sits within the soil layer, with at least 0.5m of soil below the bottom of the channel, and the watertable is within the soil layer. There is saturated flow below the channel, above a layer of impermeable material (Figure 2).

This is similar to Case 1, and the Dupuit equation (1) applies. However, in this case, an average hydraulic conductivity of the soil and aquifer, K_{av} should be used. A suitable formula for the average hydraulic conductivity of a two-layer soil and aquifer system under saturated conditions is as provided by Bear (1979) (cited in Brunner et al., 2009):

$$K_{av} = \left(\frac{1}{b_{soil} + b_{aq}} \left(\frac{b_{soil}}{K_{soil}} + \frac{b_{aq}}{K_{aq}} \right) \right)^{-1} \quad (2)$$

Where,

- K_{aq} is the hydraulic conductivity of the aquifer (m/d)
- K_{soil} is the hydraulic conductivity of the soil (m/d)
- b_{soil} is the thickness of the soil layer (m)
- b_{aq} is the thickness of the aquifer layer (m)

Example calculations

The following calculations illustrate the use of the Dupuit equation for case 2 using a range of parameter values.

In the area of interest, the average depth to the watertable ranges between 0 m and 6 m (see Figure 5). The range of saturated thickness is approximately 15m to 185m (see Figure 6).

A potential range of soil hydraulic conductivities between 0.05 m/d and 2.8 m/d were reported by AWE (2009). A range of aquifer hydraulic conductivities between 5 m/d and 150 m/d were reported by Brown (2000) and Fennell and Stadter (1992).

- Example 3. Low range

To calculate seepage per metre of channel at a location where saturated thickness is 15m, depth to watertable is 1m, water in the channel is at ground surface (therefore $h_1 = 15 + 1 + 0 = 16$ m, $h_2 = 10$ m), $K_{av} = 0.11$ m/d* and $L = 250$ m:

$$q = \frac{K_{av}(h_1^2 - h_2^2)}{L} = 0.11 \times \frac{(16^2 - 10^2)}{250} = 0.014 \text{ m}^2/\text{d} = 0.014 \text{ KL/d/m}$$

- Example 4. High range

To calculate seepage per metre of channel at a location where saturated thickness is 185 m, depth to watertable is 4 m, water in the channel is at ground surface (therefore $h_1 = 185 + 4 + 0 = 189$ m, $h_2 = 100$ m), $K_{av} = 40.1$ m/d** and $L = 250$ m:

$$q = \frac{K_{av}(h_1^2 - h_2^2)}{L} = 40.1 \times \frac{(189^2 - 100^2)}{250} = 240 \text{ m}^2/\text{d} = 240 \text{ KL/d/m}$$

* Calculated assuming a soil layer thickness (b_{soil}) of 5m and aquifer thickness (b_{aq}) of 6m, with K_{soil} of 0.05m/d and K_{aq} of 5m/d, $K_{av} = (1/(b_{soil} + b_{aq})*(b_{soil}/K_{soil} + b_{aq}/K_{aq}))^{-1} = (1/(5 + 6) \times (5/0.05 + 6/5))^{-1} = 0.11$ m/d

** Calculated assuming a soil layer thickness (b_{soil}) of 5m and aquifer thickness (b_{aq}) of 100m, with K_{soil} of 2.8m/d and K_{aq} of 120m/d, $K_{av} = (1/(b_{soil} + b_{aq})*(b_{soil}/K_{soil} + b_{aq}/K_{aq}))^{-1} = (1/(5 + 100) \times (5/2.8 + 100/120))^{-1} = 40.1$ m/d

Case 3. Unsaturated flow: The channel sits within a low conductivity soil layer and is hydraulically disconnected from the watertable

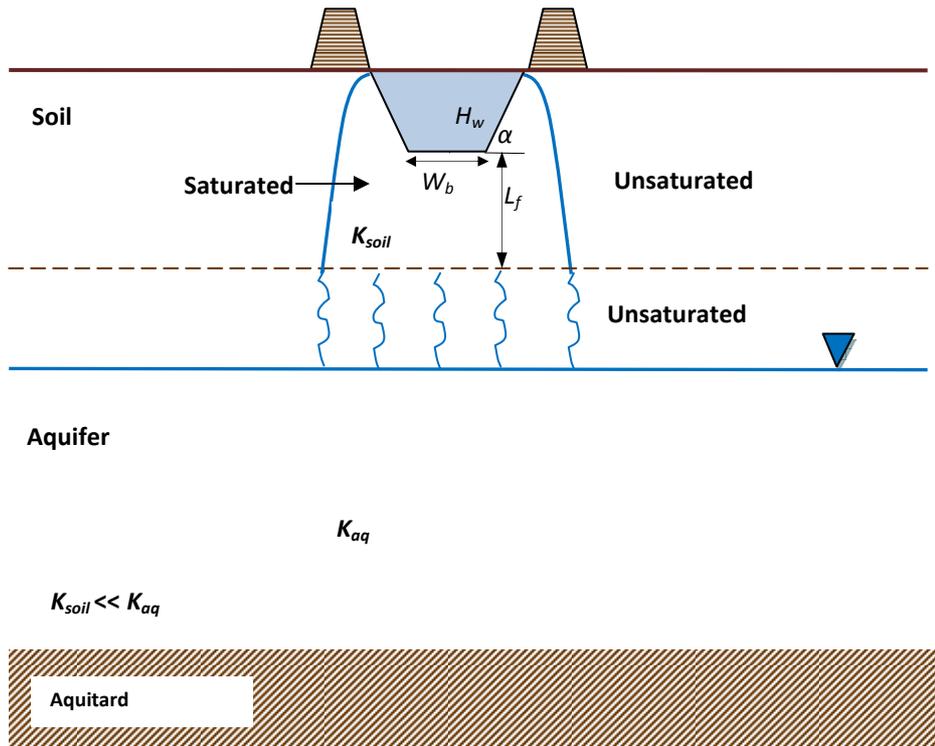


Figure 3. Channel seepage under unsaturated flow (Case 3)

This case applies when the channel sits within the low conductivity soil layer and there is at least 0.5m of soil below the bottom of the channel. There is saturated flow from the channel through the soil layer. The watertable is below the soil layer and as water will move more quickly in the high conductivity aquifer than through the low conductivity soil layer, unsaturated flow conditions will occur in the aquifer above the watertable. This results in a situation where the flow from the channel is disconnected from the watertable. The seepage rate from the channel is independent of the location of the watertable and can be calculated by applying Darcy's Law to the soil layer and considering the negative pressure head at the base of the soil, as outlined by Bouwer (2002):

$$q = W_p K_{soil} \frac{(H_w + L_f - h_{we})}{L_f} \quad (3)$$

Where:

- q is the seepage rate per metre of channel (m^2/d)
- W_p is the wetted perimeter of the channel (m). This can be calculated using the equation:

$$W_p = W_b + 2H_w / \sin \alpha$$

Where W_b is the width of the channel base,

H_w is the height of water in the channel, and

α is the angle that the channel sides meet the horizontal

- K_{soil} is the vertical saturated hydraulic conductivity of the soil (m/d)
- L_f is the thickness of the soil layer from the base of the channel (m)¹
- h_{we} is the negative pressure head at the base of the soil layer, typical values can be found in Table 1.

Table 1. Typical values of negative pressure head h_{we} (m) (Bouwer, 2002)

Soil type	Negative pressure head h_{we} (m)
Fine sands	-0.15
Loamy sands –sandy loams	-0.25
Loams	-0.35
Structured clays	-0.35
Dispersed clays	-1.00

Example calculations

The following calculations illustrate the use of this method for case 3 over a range of parameter values. A potential range of soil hydraulic conductivities between 0.05 m/d and 2.8 m/d was reported by AWE (2009b). The proposed channel widths are between 5m and 35m and height of water in the channels is between 1m and 3m (David Way [DWLBC] 2010, pers. comm.).

- Example 5. Low range

For a channel with $\alpha = 45^\circ$, $W_b = 20$ m and $H_w = 2$ m, the wetted perimeter is $W_p = 25.7$ m. If the channel sits within a structured clay (with K_{soil} of 0.05 m/d and h_{we} of -0.35 m) that extends for 3 m from the base of the channel ($L_f = 3$ m), the seepage loss per metre of channel can be calculated as:

$$q = W_p K_{soil} \frac{(H_w + L_f - h_{we})}{L_f} = 25.7 \times .05 \times \frac{(2 + 3 + .35)}{3} = 2.25 \text{ m}^2/\text{d}$$

$$= 2.25 \text{ KL/d/m}$$

- Example 6. High range

For a channel with $\alpha = 45^\circ$, $W_b = 20$ m and $H_w = 2$ m, the wetted perimeter is $W_p = 25.7$ m. If the channel sits within a loam (with K_{soil} of 1.0 m/d and h_{we} of -0.15 m) that extends for 1 m from the base of the channel ($L_f = 1$ m), the seepage loss per metre of channel can be calculated as:

$$q = W_p K_{soil} \frac{(H_w + L_f - h_{we})}{L_f} = 25.7 \times 1.0 \times \frac{(2 + 1 + .15)}{1} = 80.9 \text{ m}^2/\text{d}$$

$$= 80.9 \text{ KL/d/m}$$

¹ Within the given equation L_f is used in the denominator to approximate the flow length. It is acknowledged that the flow length from the sides of the channel will be greater than L_f . However, using L_f as an approximation of the flow length will result in a small over estimation of seepage (especially for wide and shallow channels) and is therefore a conservative approach.

It is important to note that following the onset of channel seepage the watertable may form a mound beneath the channel. This may result in the disconnected condition (with unsaturated flow) as represented in Figure 3 changing to a connected condition (with saturated flow) as represented in Figure 2 and then an approach similar to that outlined within Case 2 should be applied.

LIMITATIONS

The simple analytic methods provided here are suitable for use in estimating seepage volumes from constructed channels in the study area, which is in the Upper South East of South Australia. In view of the range of values for several variables used in the example calculations, the large variation in the seepage rates calculated in these examples is not unexpected. The implication of these large variations in derived seepage rates is that errors in channel loss estimates can potentially be very large if the values of key variables are not constrained. The range of values of these variables can be constrained by careful selection of values from existing data sets for the locations where the methods are being applied, or by in-field measurement of these variables.

It is also important to note that seepage losses are transient by nature, especially under shallow watertable conditions. A more detailed analysis that incorporates transient effects is also recommended.

ADDITIONAL FIGURES

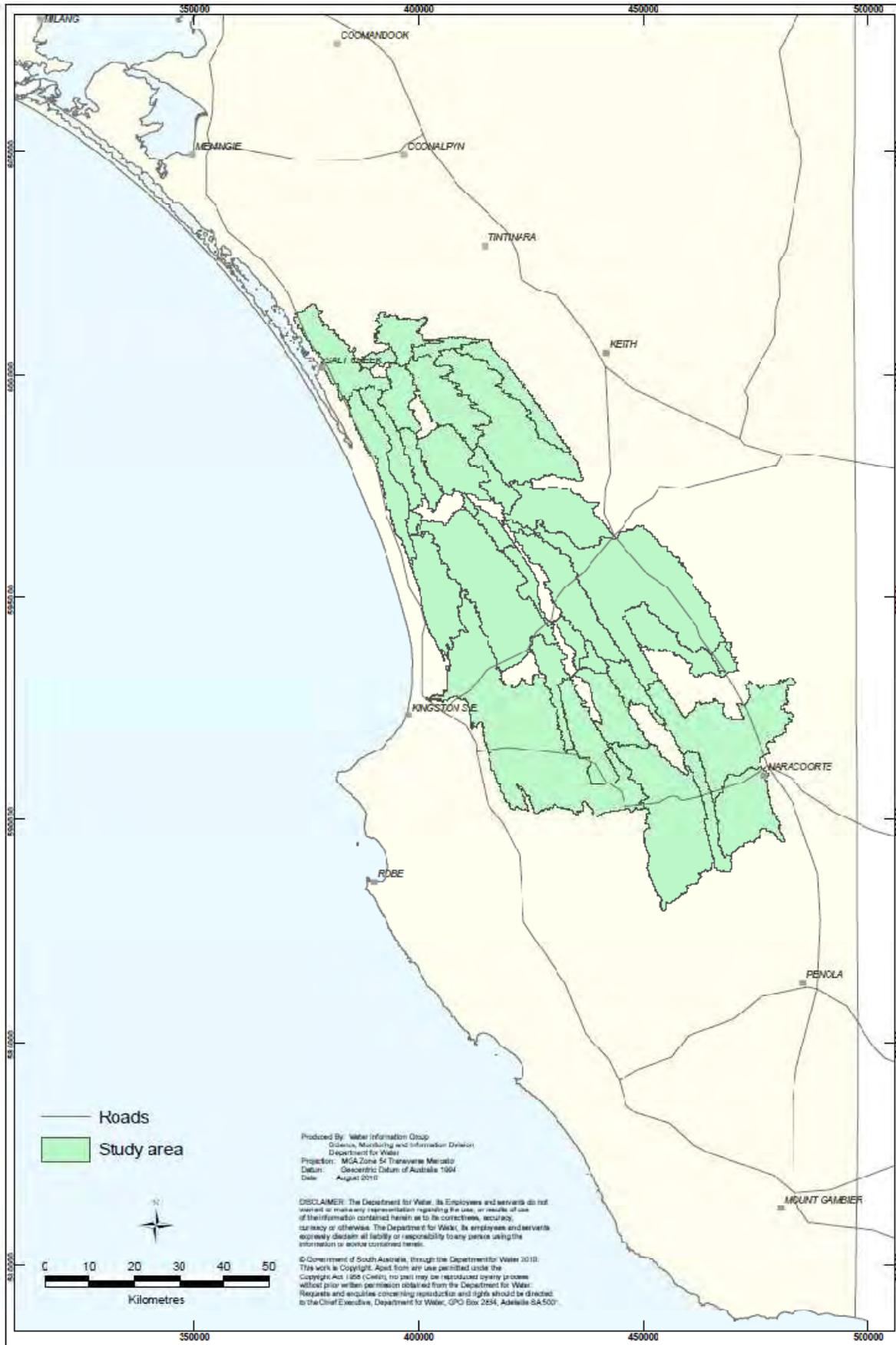


Figure 4. Study area location

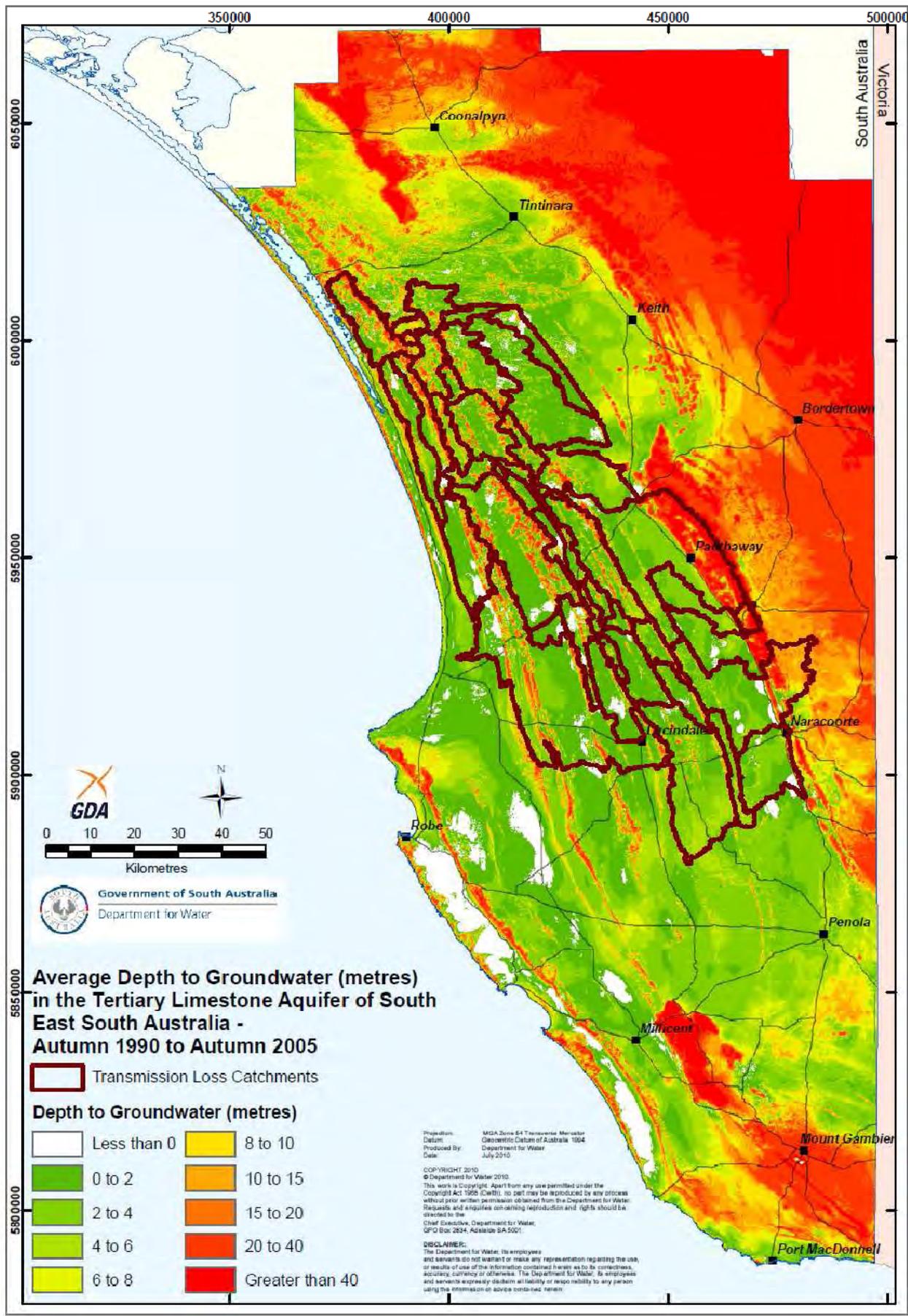


Figure 5. Average depth to watertable - Autumn 15 year average, modified from SKM (2009)

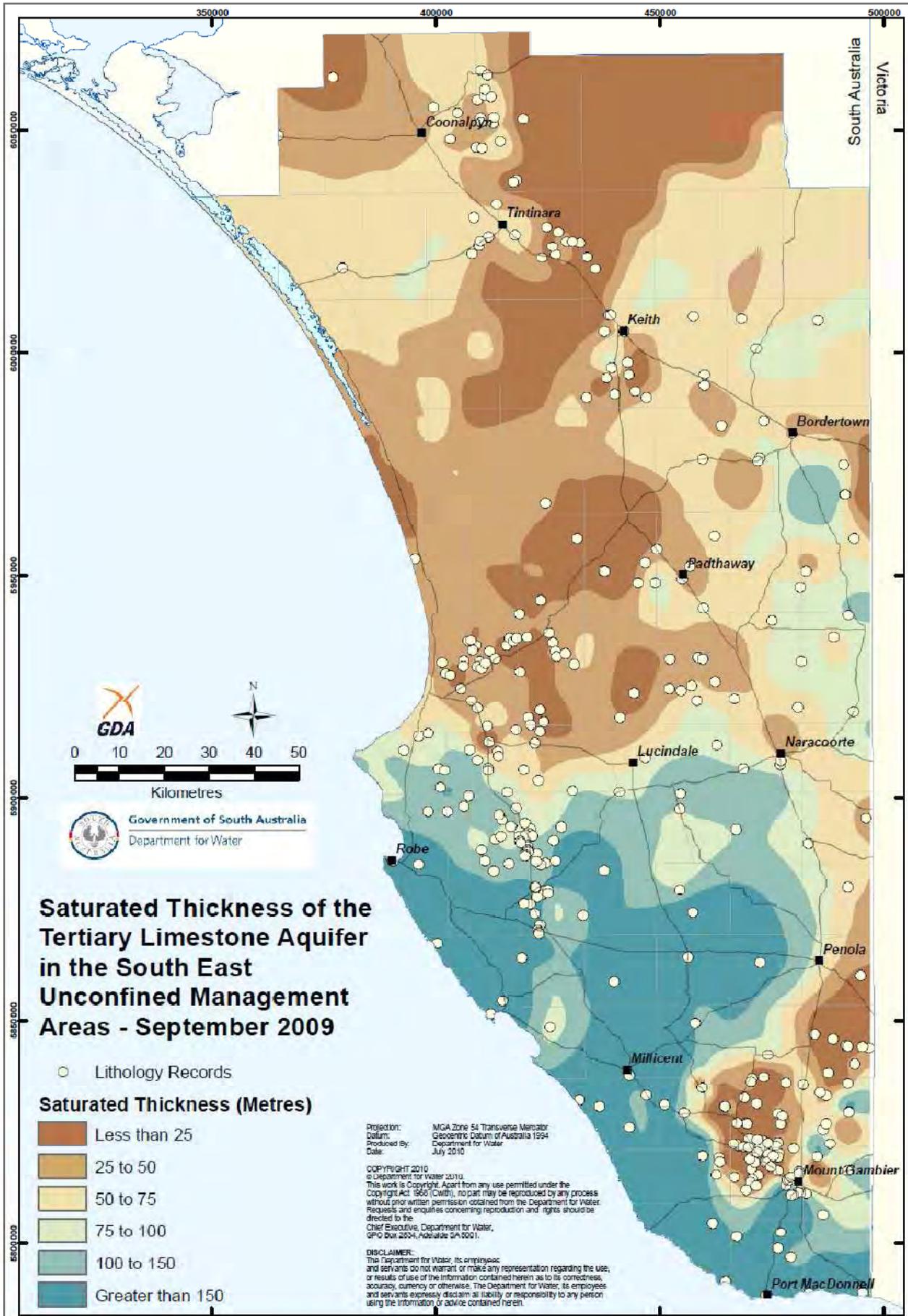


Figure 6. Saturated thickness of the unconfined aquifer (SKM, 2009)

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