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TECHNICAL MEMORANDUM

IRWP Seasonal Storage Project Implementation Plan

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Background and Purpose

This Technical Memorandum (TM) identifies the activities required to design, construct and commission the storage ponds and associated appurtenances and an approximate timeline for completing these activities. A generic implementation plan is included, which is inclusive for all of the proposed storage sites. The implementation plan identifies the tasks required to develop the pond sites and provides a descriptive overview of the tasks and the temporal relationship between the tasks.

Conclusions and Recommendations

Construction of proposed project facilities at each of the sites involves extensive earthwork operations. The ease and potential success of earthwork operations is highly dependent upon local recent precipitation and weather conditions. The anticipated typical construction season for implementation of project facilities would start at the beginning of May and end around the beginning of November.

Based on information available at this time, the projects could be operational within 5 years after notice to proceed. This allows 18 months to 2 years of design and permitting prior to construction. A minimum of 18 months would be required to provide for the necessary permitting and biological assessments. Additional site investigations would be provided for the preliminary and final design and occur simultaneously with the permitting.

The West College and Alexander Valley Road Sites are not considered in this TM because of findings from the geotechnical investigations indicating uncertainty related to potential impacts from liquefaction, fault zones, and/or landslides and the appropriate measures to mitigate for these potential hazards. Based on the geotechnical findings at these sites, both are considered infeasible as defined by CEQA Guidelines, as described in the TM *Geotechnical Evaluation, November 2007*.

In addition, the storage ponds at the Petaluma Hill Road Site have storage capacities of less than 50 MG each and are costly to construct due to site constraints such as high groundwater levels and faults across the site. The present worth costs per million gallon for these ponds are more than four times greater than the ponds at the other five sites. The substantially higher costs make it doubtful that the project could be successfully financed or that it is economically feasible to implement at this time. Therefore, the Petaluma Hill Road sites would not meet the Project's primary Project Objectives and it is not recommended for further study.

Methodology

A generic implementation plan is provided in Table 1 that identifies the major tasks and timelines required to design, permit, construct, and commission of any of the proposed storage ponds. Each of the identified tasks is briefly described below.

Additional Site Investigation/ Design and Permitting (27 months)

Additional site investigations are needed to perform detailed design of the proposed storage ponds and would ideally occur after the rainy season. Detailed design would begin while the site investigations are completed and would continue afterwards, over a total period of about 27 months.

As described in the TM *Regulations and Approvals for Storage Alternatives, November 2007* time must be incorporated in the schedule for permitting the facility prior to construction. A conservative estimate of 18 months has been included for completing applications and obtaining permits. The permitting process would likely be completed within the same timeframe as the design.

Bid Phase (3 months)

Solicitation of bids and awarding a contract to the low bidder would take approximately 3 months to complete. Advertisement for bids would take place after required permits and easements were obtained.

Mobilization (3 months)

Mobilization of construction equipment would begin in March of the construction year and would proceed for 3 months prior to the following tasks being started. The mobilization of equipment at any site would be related to the weather conditions at that time. Mobilization also includes securing staging areas for temporary storage of construction equipment, materials, office trailers, and utilities.

Drain Existing Ponds (2 months)

This task would be required for Alpha Farm where existing storage ponds are within the proposed pond footprint. The ponds would be empty and not be filled with recycled water in the ____ months prior to construction. The filling and draining of the ponds is dependent on weather and discharge constraints. Should discharge conditions require that the ponds

have recycled water in them prior to construction, they could likely be drained in 2 months during January and February prior to mobilization.

Demolition (2 months)

Demolition would be required at the City farm sites. The majority of the demolition would include removal of existing irrigation piping located within the proposed pond footprint. Other small structures and/or pavement could also be included in the demolition work. Asphalt, concrete and other construction debris could be recycled, while other debris, waste and trash materials could be delivered to an appropriate landfill facility of disposal.

Site Preparation (2 months)

Site preparation includes clearing and grubbing of the construction area for the ponds, pipelines and associated facilities, including topsoil stripping and stockpiling. The site would be prepared for the installation of the temporary controls and would be completed at the same time that demolition takes place during April and May.

Depending on availability of suitable organic and/or topsoil materials on site, these materials could be stockpiled and reused onsite. Vegetative materials could also be hauled offsite for processing and/or composting.

Temporary Controls (18-27 months)

Temporary controls include dewatering, erosion controls, access roads and preparation of construction water supply necessary for earthwork operations. Dewatering of the project site could be required depending on the weather and soil conditions at the start of construction. The temporary facilities would be ongoing during construction. At the end of each construction season, sites would be properly prepared for inclement weather and appropriate erosion control measures should be installed to protect completed work.

Outlet Works and Spillway (6 months)

This task includes the pond outlet works required to drain and fill the ponds during normal operations and the emergency spillway required to drain the pond under special circumstances. This 6-month period is split over two construction years and allows time for ordering materials and some installation beginning in July of the first construction season. The structures would be completed July through August of the following construction season as the embankments are being finalized.

Pump Stations (12 months)

Construction of a pump station is required at each pond site. This work would proceed concurrently with other construction activities associated with the conveyance piping and embankments and would take about 12 months to complete.

Conveyance Piping (6 months)

The conveyance pipeline is minimal for the sites since the connection point to tie into the reuse system is located, in most instances on the property. This work would proceed concurrently with other construction activities and would take about 6 months to complete.

Excavation (9 months)

Most of the excavated materials from the pond sites would be utilized in the embankment material. Approximately 2 percent of the total excavation would likely need to be hauled offsite for disposal as a spoil material. This disposal material would most likely be taken to a sanitary landfill. The ease and potential success of earthwork operations is highly dependent upon local precipitation and weather conditions. To avoid potential weather conflicts, earthwork operations would begin at the earliest in April and at the latest in November. Yearly variations in precipitation may shorten or extend the construction season. Suitable materials from excavation would be stockpiled on site for use in the embankment. Excavation would occur towards the end of the first construction year and the beginning of the second construction year.

Foundation Preparation (6 months)

The foundation soils for the embankment would need to be treated to address seepage/settlement/ stability issues. Specific requirements for overexcavation/replacement of unsuitable materials, keyways, grout curtains and vibro replacement, etc. are provided in the TM *Geotechnical Evaluation, November 2007.* The foundation preparation would take place during the first construction season as excavation is taking place.

Embankment (8-12 months)

The embankments would require significant quantities of earth materials. In addition to general earthfill for site grading and embankment construction, soil and rock materials with specific engineering properties would be necessary for specialized applications, including sand and gravel layers for drainage and infiltration features, such as chimney drains, blanket, finger and toe drains. Imported fill would also be needed on some sites to supplement onsite borrow where the embankment fill volume is less than the required cut.

Construction of the pond embankment would require import of some construction materials because sufficient materials are not available on site. The construction of the embankment is anticipated to begin in July of the first construction season and continue concurrently with excavation through the following construction season ending a month after excavation in August.

Liner (3 months)

All ponds would be lined to limit seepage losses from the pond bottom. Native soils with soil amendments would be used at the City farm sites. A geosynthetic clay liner would be used at the Petaluma Hill Road site. The liners would be constructed in the second construction year while the embankment is completed.

Riprap Erosion Protection (6 months)

The riprap erosion protection would be added to the pond as the liner system is constructed and continue after the liner is completed.

Site Restoration (2 months)

The site restoration would be completed after the pond is constructed and the permanent soil stabilization measures have taken effect. Site restoration includes restoring the temporarily disturbed areas to their original condition.

Commissioning (12 months)

Commissioning of the pond would consist of one full year of operation with observation of the pond and appurtenant facilities for performance as per the design intent and training of City staff.

Demobilization (2 months)

Demobilization would begin as construction and the site restoration work is completed, and includes removal of materials, equipment, temporary utilities and office trailers, and other temporary facilitiesfrom the construction site and staging areas.

Construction Observation (full construction period)

Construction observation would take place throughout the construction and commissioning periods. Observation activities would include construction management and inspection for general conformance with the construction documents and design intent. These activities would be phased out during the commissioning period as operators are trained and experienced for operations and maintenance of the facilities.

Implementation Plan

Overall Plan

The overall implementation plan is anticipated to be very similar for each of the proposed sites and lasting up to 5 years for design, permitting, construction, and commissioning. The construction seasons would vary slightly based on size of pond, and anticipated earthwork estimated in preliminary cut/fill calculations. The presence or lack of potential onsite borrow sources, particularly for earth materials needed in relatively large quantities such as general earthfill, low permeability soil and topsoil would affect the cost, constructability and economic viability of potential storage sites. An estimate of quantities and a conservative construction period was assumed for this technical memorandum, however conditions may change as a project moves into preliminary and final design which could shorten or lengthen implementation of a certain project as additional information becomes available.

Site Specific Requirements

Following is a short summary of specific site requirements as they differ from the general methodology outlined above.

Kelly Farm Site

The implementation plan for Kelly Farm site is similar to the overall general implementation plan.

Brown Farm Site

Brown Farm embankment construction has been estimated to be longer due to the increased import of material for the embankment. The schedule for the embankment construction at Brown Farm is considered to be 12 months over two construction seasons. Given the location of Brown Farm, assumed truck traffic could exceed 100 truck trips per day.

Alpha Farm Site

The implementation plan for Alpha Farm site is similar to the overall general implementation plan. Alpha Farm is the only site where draining of existing ponds is required.

TABLE 1

GENERIC IMPLEMENTATION SCHEDULE FOR PROPOSED SEASONAL STORAGE POND

IRWP Seasonal Storage Project – Implementation Plan

	Year 1				Year 2				Year 3				Year 4				Year 5				Year 6			
DESCRIPTION OF MAJOR TASKS	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Additional Site Investigation/Design& Permitting																								
Bid Solicitation and Award of Contract																								
Mobilization																								
Drain Existing Ponds (Alpha Farm only)																								
Demolition																								
Site Preparation																								
Temporary Controls																								
Outlet Works																								
Spillway																								
Pump Stations/Treatment																								
Conveyance Piping																								
Excavation																								
Foundation Preparation																								
Embankment																								
Interceptor Drains/Underdrains (WC)																								
Liner																								
Riprap Erosion Protection																								
Site Restoration																								
Commissioning																								
Demobilization																								
Construction Observation																								