Phase 2 BNR/Tertiary Treatment Project

Final Draft Preliminary Design Report Summary
Including Accepted Recommendations from Value Engineering Study

INTRODUCTION

The following is a summary of the Phase 2 Biological Nutrient Removal (BNR)/Tertiary Treatment (Phase 2) Project based on updates to the Draft Preliminary Design Report (PDR). These updates resulted from on-going refinements by City of Modesto (City) staff and the design team (Carollo Engineers, Associated Engineering Group, L Street Architects, and Kleinfelder West) as well as incorporating elements from the Value Engineering Study Report (RMC Water and Environment).

PROJECT PURPOSE

The primary purpose of the Phase 2 Project is to achieve compliance with the new discharge permit for effluent discharges to the San Joaquin River. The new permit, issued by the Regional Water Quality Control Board (RWQCB) in April 2008, requires the City to achieve more restrictive discharge limits for ammonia by June 14, 2013[1]. The City is in the process of initiating efforts to extend the established compliance date. Until such an extension is adopted by the RWQCB, no certainty can be provided for an extended compliance schedule. Accordingly, it is prudent to proceed with implementation of Phase 2 on a schedule consistent with completing design, construction, and achieving operational compliance by June 14, 2013. Should discussions with the RWQCB prove successful, and the compliance date is subsequently extended, the Phase 2 design/construction schedule and associated cash flow would be adjusted at that time.

Although this project includes elements that will eventually accommodate expansion in three additional modular phases (i.e., buildings sized adequately for future equipment, etc.), the Phase 2 project is driven primarily by permit requirements, and will provide only limited capacity for new development. According to current growth projections, when Phase 2 is completed the City will have adequate treatment capacity through the year 2018 (see Attachment 1). The modular nature of future phases also provides flexibility to accommodate regionalization opportunities with nearby communities.

[1] The discharge permit wording is inconsistent in establishing the compliance date for ammonia compliance, which is the key "trigger" for the Phase 2 project. One section of the permit indicates that the compliance date is April 24, 2013. Another section more clearly states that the compliance date is June 14, 2013. The later date was used in developing the project schedule. The compliance date will be confirmed with RWQCB staff.

The BNR/tertiary treatment process to be used for the Phase 2 project as well as all subsequent expansion phases, will achieve standards consistent with California Title 22 for unrestricted, non-potable water re-use. As a result, water recycling opportunities, including landscape irrigation, agricultural irrigation, process cooling water, and other uses will become available to the City as a means of using effluent as a key water resource.

PROJECT DESCRIPTION

Phase 2 will provide 12.6 mgd of BNR/tertiary treatment. All facilities will be located at the Jennings Road treatment site. The source water for Phase 2 will be primary effluent from the Sutter Avenue Primary Treatment Facility. Primary effluent will be intercepted upstream of the Phase 1A diversion point, and upstream of the existing secondary treatment system. Flow will be diverted to the Phase 2 facilities at a constant rate. This approach minimizes costs for the treatment facilities by avoiding the need to design for peak flow conditions.

The treatment process for Phase 2 will be the membrane bioreactor (MBR) process - the same process currently being constructed for Phase 1A. The MBR process contains two steps. The first step is the activated sludge process, which takes place in the BNR aeration basins. The BNR aeration basins grow the biomass (bacteria and microorganisms) that provides treatment. The second step is to separate out the solids and clean water from the biomass. This is achieved with membranes. The MBR system will be designed to remove biochemical oxygen demand, and the nutrients ammonia and nitrates/nitrites. Filtered water that has passed through the membranes will be disinfected with UV light radiation. The final effluent will be discharged to the river or used for recycling purposes. A new effluent pipeline will be installed to convey final effluent from the treatment facilities to the current point of discharge at the San Joaquin River. Space will be reserved for a future recycled water pump station. In addition to the treatment facilities, Phase 2 will include a new operations center to provide space for administrative and operations staff.

The Attachment 2 presents a preliminary site layout for Phase 2 as well as existing facilities and future phases. The total project cost of the Phase 2 project as developed for the PDR is estimated to be $134.3 million.

VALUE ENGINEERING STUDY REPORT

The City retained RMC Water and Environment, an independent consultant, to perform value engineering (VE) of Phase 2 based on information presented in the Draft Preliminary Design Report. The study, published on May 14, 2009, identified 29 VE alternatives with a potential construction cost savings of $22.1 million.

After review, City staff and the design team accepted or agreed to consider further 18 of the 29 VE alternatives, representing a construction cost savings of approximately $8.5 million. In addition, the VE team offered 32 design suggestions, of which 23 were accepted or agreed to be considered, which resulted in an increase in construction cost of about

$800,000. Overall, the VE effort resulted in a net construction cost savings of approximately $7.7 million.

Several of the VE recommendations were not accepted and/or were determined to be infeasible because of the following:

- Conflicts with established design requirements.
- Overall project reliability or serviceability would be reduced.
- The proposed concept of not providing building space or other accommodations for future phases would have resulted in significantly increased costs for future phases.

Attachments 3 and 4 present a summary of recommended VE alternatives and design suggestions, along with the responses from the design team.

PROJECT COST

The estimated total Phase 2 project cost, after including accepted VE recommendations, is $126.6 million. A breakdown of the costs for the project elements is included as Attachment 5.

IMPLEMENTATION SCHEDULE TO ACHIEVE COMPLIANCE DATE

The implementation schedule for Phase 2 is required to meet the discharge permit compliance date of June 2013. The critical milestones are as follows:

Predesign Report Completed:	May 27, 2009
Begin Final Design:	June 2009
Complete Final Design:	March 2010
Bidding:	April - May 2010
Begin Construction:	July 2010
Facilities Operationally Complete:	February 2013
Start-Up and Final Commissioning:	June 2013

ANTICIPATED REQUESTED COMPLIANCE DATE EXTENSION

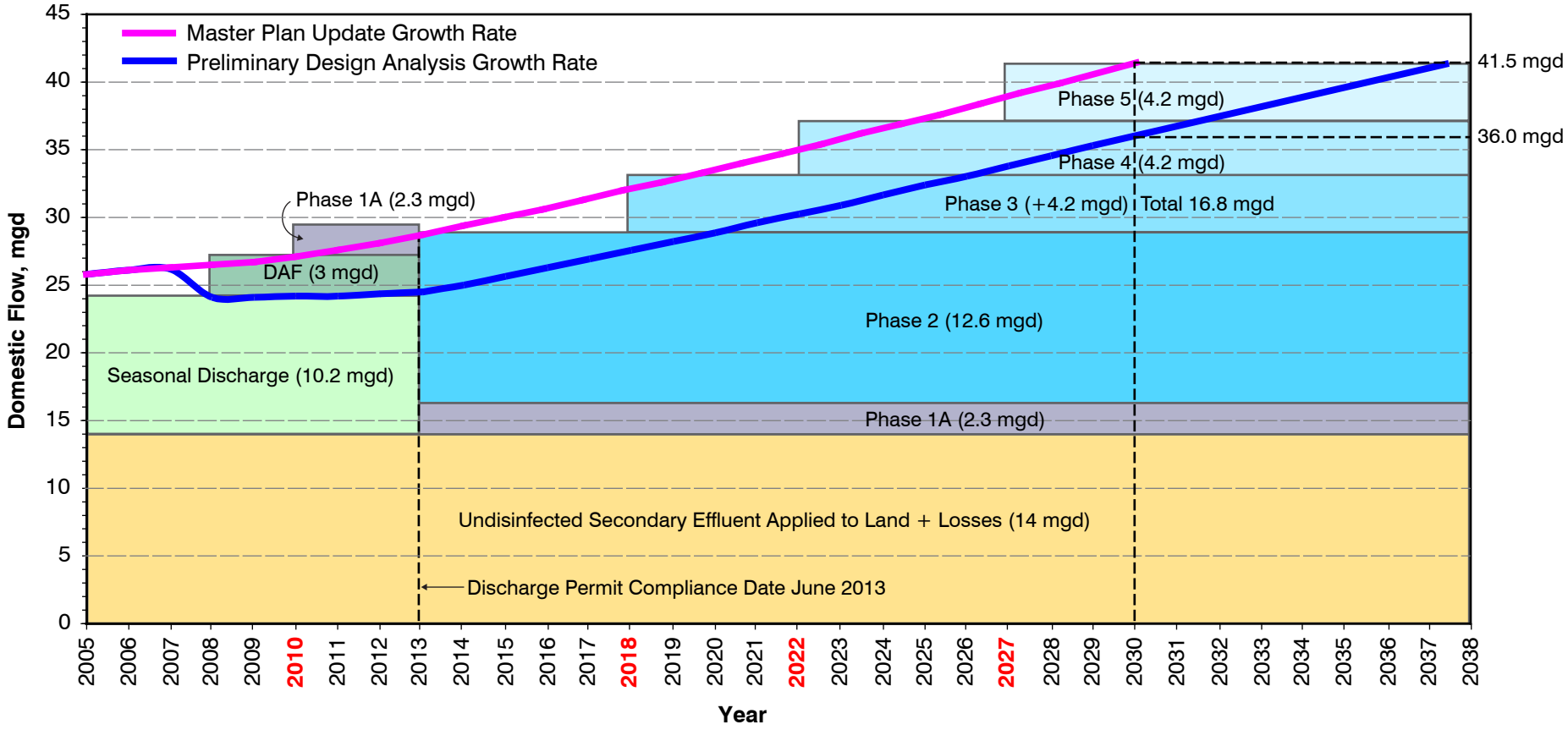
The above schedule was developed for the worst-case scenario that the current compliance date for ammonia will remain in effect. The schedule is aggressive and does not allow appropriate time for required design and construction activities and the potential delays often associated with construction projects of this size and complexity. As such, the previously outlined schedule represents unnecessary risk to the City for meeting the current

compliance date. In March of 2009, representatives from the City met with RWQCB staff to discuss the possibility of extending the compliance date. Although an extended date was not established, the representatives of the agencies indicated that such an extension may be feasible. Now that the draft PDR is complete, City staff intends to formally request an extension of the compliance schedule contained in the permit for the ammonia limit. As part of the formal request, City staff also intend to meet again with RWQCB staff to propose a reasonable and feasible new compliance date The City's formal request should be submitted to the RWQCB by July of this year to allow sufficient time for the RWQCB to respond and prepare the appropriate permit modifications for public review and RWQCB consideration. At this time, City staff anticipates that a compliance schedule extension of 24 months will be requested, which, if accepted, would extend the compliance date to June 14 2015. Justification for the time extension will include the following elements:

- Time to perform ammonia water-effects studies. The discharge permit includes provisions for a "reopener" to perform an analysis for site-specific objectives for ammonia in the receiving water. The studies may provide justification for a higher ammonia limit. If this proves to be the case, the design of the BNR facilities may change, and additional time would be required to effect these changes.
- Time to allow for unknowns. Unanticipated delays are common for projects of the size and complexity such as the Phase 2 project. The implementation schedule outlined in the previous section does not include an allowance for unanticipated delays. Potential delays may include major equipment production or delivery problems, contractor bid protests, holdups in receiving project financing from the state revolving fund loan or from bonds, additional time for plant startup, and training of City staff.
- Financial hardships. Since the City's initial meeting with the Regional Board in March 2009, the economy has slumped further. In addition, the City has been hard hit with high unemployment and one of the highest forecloure rates in the state. An extension of time to comply with the discharge permit limits would substantially reduce the near-term cash flow requirements to fund the project and reduce the financial burden on the City's existing rate payers.
- Time to secure project financing. The City is pursuing a State Revolving Fund loan or bond financing for the project. Due to current economic conditions, there are restrictions in the availability of funds. As the economy recovers, more money may be availble for lending, and bonding rates could be more favorable. If econmomic conditions improve in the next few years, the City will be in a better position to secure more reasonable financing.

If the 24-month schedule were granted by the State, the revised critical milestones would be as follows:

Predesign Report Completed:	May 27, 2009
Begin Final Design:	June - July 2009
Complete Final Design:	October 2010
Bidding:	November 2010 - January 2011
Begin Construction:	February 2011
Facilities Operationally Complete:	March 2015
Start-Up and Final Commissioning:	June 2015



Attachment 1
PROJECTED PHASING
OF BNR/TERTIARY PROJECT

mo509sum_f1-6887.ai

Scale: 1"= 170'

FIXED FILM REACTOR NO. 1 (E)

AERATION MAINTENANCE SHOP (E)

PRIMARY EFFLUENT PUMP STATION (E) PHASE 1A

FIXED FILM REACTOR NO. 3 (E)

FIXED FILM REACTOR NO. 2 (E)

FIXED FILM REACTOR NO. 2 (TO BE ABANDONED)

FINE SCREENS (E) PHASE 1A

OXIDATION DITCH (E) PHASE 1A

ELECTRICAL BLDG (E) PHASE 1A

MEMBRANE TANKS (E) PHASE 1A

IN VESSEL UV (E) PHASE 1A

DIVERSION VALVES (E) PHASE 1A

UV ELECTRICAL BLDG (E) PHASE 1A

FACILITIES KEY

NEW (PHASE 2)

- 01 OPERATIONS CENTER
- 02 PRIMARY EFFLUENT PUMP STATION NO. 2 (WITHIN EXISTING FFR PUMP STATION)
- 03 FINE SCREENS
- 04 BNR AERATION AND MBR BASINS
- 05 BLOWER BUILDING (SWGR23 AND MCC23)
- 06 RAS PUMP STATION
- 07 WAS PUMP STATION
- 08 MEMBRANE SUPPORT EQUIPMENT BUILDING (SWGR24 AND MCC24)
- 09 MCC21 ELECTRICAL BUILDING
- 10 UV BUILDING (MCC25)
- 11 MAIN ELECTRICAL BUILDING (SWGR21, 22, and MCC22)
- 12 2W PUMP STATION
- 25 RELOCATED COMPOST FACILITIES
- 26 PE JUNCTION BOX
- (E) EXISTING FACILITY OR BUILDING

FUTURE (PHASE 3, 4, 5)

- 14 FUTURE BNR AERATION AND MBR BASINS
- 16 FUTURE PRIMARY CLARIFIERS AND PUMP STATION
- 17 FUTURE ANAEROBIC DIGESTER FACILITIES
- 18 FUTURE MEMBRANE SUPPORT BUILDING
- 19 FUTURE FINE SCREENS
- 20 FUTURE R.O. DESALINATION FACILITIES
- 21 FUTURE DRYING BEDS
- 22 FUTURE RAS PUMP STATION
- 24 FUTURE BNR/TERTIARY PROCESS FACILITIES

Phase 1A | Phase 2 | Phases 3-5 | Future Facilities for Regional Treatment Plant

LEGEND

- Phase 1A
- Phase 2
- Phases 3-5
- Future Facilities for Regional Treatment Plant

Attachment 2
PRELIMINARY SITE LAYOUT
BNR/TERTIARY TREATMENT FACILITIES

mo509sum_f2-6887.ai

Attachment 3

Design Engineer Responses to Value Engineering Recommended VE Alternatives

Alternative No.	Recommended Proposals Idea No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
1.0	ES-1	Drop solar power	$1,639,000	X			Solar Power was added to provide renewable energy to offset some of the additional power requirements that result from the new treatment system. However, due to low power rates, solar power is not yet cost effective and it is not a critical element for Phase 2. Therefore, it will not be included in this project.	**-$1,645,000**
2.2	ES-3	Eliminate dual feed; Use pond storage	$987,000	X			Without dual power feeds to the main switchgear, the treatment processes will be vulnerable to power outages. However, during a power outage, and assuming the primary effluent is still being pumped to the Jennings Road Facility, the flow would be discharged to the treatment ponds. This would have only a minor impact on the overall tertiary treatment capacity. If the power outage lasts more than 8 hours, the membrane tanks need to be drained and refilled with clean water to protect the membranes. Standby generators should be provided to power the non potable water system, the fire pump (about 125 KW), Ops Center SCADA (about 125 KW), drain pumps to empty the MBR tanks, and allow continuous wetting of the membrane fibers (total power requirement of about 600 KW). Net savings shown include the added cost of the standby generators.	**-$965,000**
3.0	ES-4	Eliminate double ended equipment	$1,420,000		X		Without dual power feeds, a total power shutdown would be required to service and maintain the electrical switchgear. Servicing of the main switchgear is required every 2 years, and the power shutdown period would last about 3 days. We believe a shut down of this duration would disrupt the biological process and the membrane system, requiring several days to recover and a significant impact on operator labor.	**$0**
4.0	ES-6	Convert radial distribution to loop distribution	$380,000		X		Loop distribution is less reliable than radial distribution. The radial system will allow one part of the system to be out of service when the remaining system is powered.	**$0**
5.0	ES-7	Combine blower building with SWGR 21 Electrical Building	$250,000	X	X		We do not recommend combining the main electrical and the blower building because the electrical room would become too large. However, we can combine MCC-22 and SWGR-21 in a single building. The cost savings are shown for this concept.	**-$130,000**
6.0	ES-8	Eliminate utility style protection system	$99,000	X			The protection system will be simplified.	**-$148,000**
7.0	ES-9	Eliminate multi-tier surge suppression system	$238,000		X		The multi-tier surge suppression was based on IEEE recommendations for higher reliability of the electrical system. We could reduce the level of surge suppression and just provide surge suppression at the main SWGR-21. However, this change would reduce the level of protection on the secondary service side, and therefore, we do not recommend accepting this change.	**$0**
8.0	ES-11	Do not install switch gear enclosures provision for future expansion.	$1,741,000	X			We will delete provisions in the switchgear for future expansions. However, the electrical building dimensions will not be reduced.	**-$1,728,000**
9.0	ES-16	Revise TID service routing to east to decrease duct bank length	$23,000		X		The proposed routing for the TID service was designed to maximize the use of the site and allow space for future expansions. We believe that the proposed change would increase the cost.	**$0**
10.0	ES-17	Use buss duct from transformers to main service in lieu of conduit	-$24,000		X		This proposed change is not required and would likely increase the cost.	**$0**
11.0	ES-18	Eliminate Electrical Building 21. Put MCC 21 in existing Fixed Film Reactor electrical building.	$1,339,000		X		MCC 21 Bldg is required because there is not enough physical space inside the existing electrical bldg. for the FFR Pumps. Therefore a new building is required. See idea ES-7 for saving resulting from combining electrical buildings.	**$0**

Design Engineer Responses to Value Engineering Recommended VE Alternatives

Alternative No.	Recommended Proposals Idea No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
12.0	CP-7	Eliminate UV splitter box	$52,000	X	X		The flow splitting structure, flow meters, and flow trimming valves were included in the original design because hydraulics is one of the most critical elements of the UV system. The flow splitting structure provides a hydraulic break and allows flow to split to the UV channels in operation regardless of downstream conditions. The magnetic flow meters were included because Title 22 requires metering of flow to each UV channel. Alternatively, the flow splitting structure, flow meters, flow trimming valves, and piping could be replaced with an influent channel and three parallel channels equipped with motorized weir gates and Parshall flumes. The Parshall flumes will serve a dual purpose to split the flow to each channel and channels would control flow split. The Parshall flumes will meter flow to each channel and provide flow measurement at each channel. The new splitter structure would be adjacent to the UV building, eliminating the need for process piping. This alternative will not provide any cost savings but will simplify the design.	**$120,000**
13.0	SA-1	Hang air pipe under T walkway eliminate Y wall. Revise blower discharge piping layout. Relocate 54" header	$549,000	X			After reviewing, the T-wall configuration will require a T-wall that is elevated above the outer wall to avoid the air piping being submerged into the mixed liquor. A L-wall configuration was chosen instead. The 54 inch header was reduced to a 36" header and relocated to the north end of the aerobic zones. Saves about 180 CY neglecting increased wall height and reduced wall thickness. Cost of grating vs pipe supports is about equal.	**-$400,000**
14.0	SA-2	Reduce number of diffuser grids from seven to four.	$237,000	X		X	The size and number of grids in the aeration basin have not yet been optimized. We will include tapered aeration, and optimize the number of drop legs and associated grids. We expect that there will be less than seven but possibly more than four because of the large size of the aeration basin	**-$241,000**
15.0	SA-6	Decrease height of blower building by 2 feet	$24,000	X			With the reduced header piping, it is possible to reduce the height by about 2 feet since no overhead crane will be required.	**-$21,000**
18.0	TE-1	Reduce size of pipe from 48" to 36". Build second pipe in future as required.	$2,004,000		X		Even though City would save some money for Phase 2, the City would pay more money in the long term by installing two parallel pipes	**$0**
20.3	TE-5	Do not bury pipe just submerge and anchor it	$2,161,000			X	Even though crossing the facultative ponds would reduce the length of the pipe, this solution creates the risk of contamination of the final disinfected effluent with undisinfected wastewater in the facultative ponds. Any defects in the piping, such as a cracked pipe or offset joint could cause contamination and a violation of the discharge permit. In addition, the submerged pipe would be under water and inaccessible unless the ponds were shut down and emptied. For an alternative approach, we will evaluate using an alternative materials (i.e., HDPE) instead of RCP or steel pipe to lower the pipeline costs. We will also consider installing the pipeline above grade on supports instead of burying the pipe.	**$0**
21.0	LI-9	Eliminate 42" pipeline and junction box	$682,000		X		In order to maximize the use and capacity of the BNR/Tertiary Plant, this junction box is required. Connecting downstream could, at certain times of the year, result in lower BOD levels that would be less than the required to maintain a 5/1 BOD/TKN ratio for the denitrification process.	**$0**

Design Engineer Responses to Value Engineering Recommended VE Alternatives

Alternative No.	Recommended Proposals Idea No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
22.2	CS-3	Reconfigure Site Parallel to Compost Facility	$3,360,000	X		X	This appears to be feasible, but this only defers the cost for relocating the compost facility from Phase 2 to Phase 3. A coordination meeting should be scheduled with the Compost Consortium to discuss the creation of a buffer zone (e.g.. A 100-ft separation on the east edge of the Phase 2 BNR Site and add fencing to minimize the possibility of materials blowing into the aeration basins and potentially causing damage to the MBR.	**-$2,000,000**
24.2	DP-4	Reduce UV building height by 4 feet.	$51,000		X		The building height was determined by UV module removal requirements. Removal requirements are vendor specific so this recommendation will be reevaluated once a UV vendor is selected.	**$0**
25.0	DP-5	Reduce size of the electrical room to match equipment needs. Approximately 20%	$277,000	X			The UV electrical room could be reduced by about 200 sq ft (about 11% of the building area), if Wedeco is selected as the UV vendor. The size of the room is largely determined by the size of the UV electrical equipment supplied by the UV vendor. The size of the room will be reevaluated after the UV vendor is selected.	**-$78,000**
26.0	DP-7	Lower floor between column line G&J to grade. Move wall at K to J and slide door west and pits east.	$69,000	X	X		The floor elevation will remain the same so the UV channels and cleaning tanks can be accessed at one level. A 24' x 13' section of this area will be at grade to provide a loading area for equipment. The tanks pits will be moved west and the slide door will be moved east. Overall, the North/South length of the building will be reduced by about 10.5'. The top of CIP concrete wall/ bottom of masonry elevation will be remain the same.	**-$140,000**
27.0	DP-9	Lower electrical room floor to grade, between wall lines A & C.	$34,000		X		This change will not be made for the following reasons: (1) the floor was designed to be at a higher elevation than the water surface elevation in the channels to protect the electrical equipment from flooding. (2) lowering the floor will require longer conduits and will complicate the conduit design. (3) a staircase will be required to provide access between the electrical room and process area. There is not enough space in this room for a staircase.	**$0**
28.0	RS-2	Locate permeate pumps outside.	$847,000	X			We will locate the permeate pumps outdoors, but under a sun canopy. The reduced size of the Membrane Support Bldg. may also eliminate the need for a concrete diaphragm on the steel deck.	**-$1,038,000**
							The sun shade canopy will result in additional cost. For the permeate pumps 4,836 sqft @ $30.00 per sqft. For the chemical storage area, 1,665 sqft @ $40.00 per sqft. The design of the canopy should include features to finish the exposed ceiling and recess lights to avoid exposed beams or trusses, or recesses where birds could perch.	**$340,000**
29.0	RS-20	Reconfigure and resize the RAS wet well deaeration basin to optimize scum removal and reduce volume for DO control	$987,000		X		The RAS wet well and de-aeration tank was designed to serve two purposes: to remove air from the RAS and to provide a "wide spot in the line" with a 5 minute detention time to control the flow output of the permeate pumps. Moving the de-aeration tank to the north would defeat the second purpose.	**$0**
30.0	RS-22	Relocate the 54" air header and raise the membrane tank influent gate to facilitate the transport of scum from the aeration basins to the membrane tanks.	$245,000	X			We will move the blower building and move the air piping to the North West size of the Aeration Basins. However, this will require changes in the walkways which will need to be raised and that will increase the capital cost of the project. A submerged opening is required for entrance into the membrane tanks.	**-$157,000**

Design Engineer Responses to Value Engineering Recommended VE Alternatives

Alternative No.	Recommended Proposals Idea No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
31.0	RP-4	Thin out the walls of the aeration basins from 2' and 1' 8"; to 1'6" all around. Thin bottom slab from 36" to 24"	$2,062,000	X			A wall thickness of 1'-6" is acceptable. The bottom slab will remain at a thickness of 3'-0" to provide ballast against flotation from the design groundwater level. The design groundwater level is at elevation 50.	**-$329,000**
32.0	M-4	Use 8 inch instead of 12" block	$195,000		X	X	8" CMU OK on small masonry buildings. Limit wall to 14'-8" top of steel roof.	**$0**
33.0	M-8	Go from 5000 to 4500 psi Class A concrete	$203,000		X		The specified mix design is 4000 psi with a 564 lb of minimum cementous material (this is 6 sacks of cement or flyash). It is not uncommon for the redi-mix supplier to use more. The specified mix proportions typically yield a workable mix that results in durable concrete. Less cement may result in a difficult to place mix without admixtures or higher water-cement ratio. Admixture cost versus cement cost may not be cost efficient. Higher w/c ratio is not acceptable for water bearing structures.	**$0**
		Total Estimated Savings By VE Team	***$22,131,000***				**Net Savings Resulting from VE Accepted Recommendations**	**-$8,560,000**

Attachment 4

Design Engineer Responses to Value Engineering Recommended Design Suggestions

Design Suggestion No.	Recommended Design Suggestion No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
1.0	ES-10	Reorganize power so future load is only provided to future facilities	**Design Suggestion**	**X**			The proposed system was designed to be expanded in the future and was sized for the build-out, including space allowances in some of the electrical rooms for additional MCCs and spare electrical cabinets. We can provide electrical systems solely for Phase 2 which would significantly reduce costs. However, future phases 3, 4,and 5 will need to provided their own electrical system independent from Phase 2, and costs for the subsequent phases would be higher. This requires a decision by the City.	**-$263,000**
2.0	ES-12	Specify 18 pulse VFD for package equipment systems	**Design Suggestion**	**X**			We have specified 18-pulse VFD for all motors on VFD above 50 HP. The high speed blower manufacturers provide their own VFD but they do not provide 18-pulse VFDs. Special harmonic filters will be specified.	**$0**
3.0	ES-15	Be aware of classified areas in primary screening and influent pumping.	**Design Suggestion**	**X**			This is correct and we are aware of this requirement. This is a final design feature and NEC code compliance	**$0**
4.0	CP-1	Eliminate proprietary software platform for the purchased equipment	**Design Suggestion**		**X**		City is already using Allen Bradley PLC software programming. This project and future project will be designed around this PLC software as it would be difficult to integrate multiple programming platforms as part of the SCADA system, and create problems for the staff.	**$0**
5.0	CP-2	Eliminate proprietary software for entire facility	**Design Suggestion**		**X**		City has used HSQ for all of their SCADA system, city wide and using HSQ is the only logical solution.	**$0**
6.0	CP-4	Utilize wireless protocol for remote locations i.e. effluent pump station.	**Design Suggestion**			**X**	This issue will be evaluated in Phase 2 Final design. We will evaluate if adding wireless communication to remote control station, e.g., the River PS is a viable and reliable option. The City is currently adding a new communication antenna at Jennings Rd. to improve communication with the Sutter Ave. WWTP controls. This antenna should facilitate the implementation of this design suggestion.	**$0**
7.0	CP-9	Provide firewall access for high speed internet for use by appropriate vendors.	**Design Suggestion**	**X**			This feature was already planned as part of the final design to allow remote secure access by equipment vendors for the MBR and UV equipment. City IT staff will coordinate those needs and allow access to the PLCs using secure communication protocols.	**$0**
8.0	CP-10	Clarify connection between Phase 1A and Phase 2A data highway; does loop topology provide adequate reliability.	**Design Suggestion**			**X**	Loop system (fiber optics) is designed to provide communication paths for SCADA, PLC, PC and Security networks. Fibers will be dedicated to each communication network based on Modesto IT department standards/protocols. Fiber will be routed throughout the Phase 1A, Phase 2 and existing Jennings Pond facilities to allow communications with all data connections on-site. Fiber routes will be in separate conduits within ductbanks, and in & out of buildings. All Security, SCADA, and PLC communication systems will originate locally. Short-term data storage is local and is accessible throughout Jennings network. Long-term data storage will occur remotely and will be the verified data point for all connections outside of Jennings site. Microwave communication will connect the Jennings facilities to Sutter Plant and City PC network. The Jennings facilities can be controlled, monitored and data accessed locally should the respective off-site communications networks be intentionally or inadvertently disconnected from the remote sites.	**$0**
9.0	SA-3	Review blower sizing based on final design BOD loadings	**Design Suggestion**		**X**		Blower sizing will be optimized in the final design. Final design loadings remain at 400 mg/L. See comments under RP-10.	**$0**
10.0	SA-8	Provide intake plenum including filtration at blower building.	**Design Suggestion**	**X**			Already planned as part of final design. Not shown on PDR Dwg	**$0**

Design Engineer Responses to Value Engineering Recommended Design Suggestions

Design Suggestion No.	Recommended Design Suggestion No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
11.0	LI-1	Use submersible pumps dry pit to eliminate problems from potential flooding	**Design Suggestion**			**X**	Immersible" dry pit type pumps with motors that can be submerged for brief period can be used instead of dry pit pumps. However, Immersible pumps are typically more expensive than standard dry pit pumps, and are slightly less efficient. Some Immersible pumps on the market clog easily, so it will be important to prepare specifications that can exclude these manufacturers. The proposal suggestion will be finalized during Final Design.	**$0**
12.0	LI-3	Hydraulic control may be required for Fixed Film Reactor recirculation.	**Design Suggestion**			**X**	This design suggestion is not a Phase 2 project improvement.	**$0**
13.0	LI-5	Install a minimum of 3 influent pumps. 02 MO1 and G006 drawing in conflict.	**Design Suggestion**		**X**		Design includes one duty pump that will provide all of the firm capacity. The second pump is a standby pump. A third pump would be added to handle future flows	**$0**
14.0	CS-8	Allow for diversion of diluted primary effluent to Phase 1A oxidation ditch.	**Design Suggestion**		**X**		This will require approx 200 feet of 12" pipeline from Phase 2 PE effluent to Phase 1A. Will result in additional cost.	**$0**
15.0	CS-13	Improve truck routing for deliveries	**Design Suggestion**			**X**	Revisions to the site access roads will be re-evaluated during the final design phase.	**$0**
16.0	DP-10	Convert electrical to a 4 wire system from a 3 wire to comply with manufacturer requirements.	**Design Suggestion**			**X**	The addition of a 4-wire (I.e., with neutral) will be based on the selection of the UV vendor. The selected UV vendor will determine the electrical requirements for the project. If a 4-wire system is required, the cost would be increased by about 10% increase for the MCC.	**$45,000**
17.0	DP-12	Provide plant air and pneumatic operators on UV effluent valves for emergency bypass	**Design Suggestion**	**X**			Already included as part of the Design	**$0**
18.0	DP-13	Locate UV vendors PLCs at the basins with interface to plant SCADA.	**Design Suggestion**			**X**	The vendor PLC for the UV equipment will be located inside the electrical room of the UV Bldg. The PLC cabinet must be located in a climate control environment to protect the electronic from both moisture and excess heat. If located near the UV channels, the PLC would require it's own AC system as the UV process area is not climate controlled. We could consider adding a remote HMI screen located in the UV room which would help with operation, and especially during maintenance of the UV equipment when trouble shooting potential problems with lamps. This recommendation will be considered when the UV vendor is selected.	**$5,000**
19.0	RS-4	Add provision to waste from the membrane tanks	Design Suggestion	**X**			We will move the WAS pumps to withdraw WAS from the membrane tanks (RAS) which has a higher concentration that the ML	**$0**
20.0	RS-7	Relocate screen to aeration basin effluent	Design Suggestion	**X**			We will consider moving the moving the screens from the RAS - Deaeration tank located downstream from the membrane tanks to instead be located upstream of the membrane tank and will be located in the ML distribution channel	**$152,000**
21.0	RS-13	Install drain pump large enough to drain basin in 15 minutes or less.	Design Suggestion	**X**			We will increase the capacity of the drain pumps to quicken the rate of drainage of the membrane tanks. However, this will require large pumps which will likely increase the capital cost of the project.	**$134,000**
22.0	RS-17	Locate membrane vendors PLCs at the basins with interface to plant SCADA.	Design Suggestion	**X**			The main MBR Vendor PLC should be located in a climate controlled environment to prolong the equipment life. Outdoor installation will require a more expensive PLC cabinet with AC control. Remote control panels (one panel for every two MBR tanks) will be located closer to equipment. Final location will be coordinated with the selected MBR vendor during final design.	**$15,000**
23.0	RS-18	Add maintenance dip tank in lay down area for membrane cassettes	Design Suggestion	**X**			We will add a dip tank to store a membrane cassette during maintenance. However, this will require an additional concrete tank which will slightly increase costs.	**$23,000**
24.0	RP-1	Reconfigure anoxic basin baffle walls and provide free discharge from the second zone to the aeration basin	Design Suggestion	**X**			Submerged dividing walls will be provided at each aeration compartment to allow foam to travel down the length of the basins to facilitate collection and removal of the foam.	**$0**

Design Engineer Responses to Value Engineering Recommended Design Suggestions

Design Suggestion No.	Recommended Design Suggestion No.	Description	Estimated Savings by VE Team	Accepted by Design Engineer	Not Accepted by Design Engineer	To be Evaluated during Final Design	Comments	Estimated Cost from Change (- = saving; + = additional cost)
25.0	RP-3	Increase the size of the pumps for draining the aeration basins or connect to membrane drain pumps	Design Suggestion	X			The capacity of the drain pumps will be increased to quicken the rate of drainage of the membrane tanks. However, this will require large pumps which will likely increase the capital cost of the project.	**$24,000**
26.0	RP-5	Add two baffle walls in the aeration basins to divide into 4 aerobic zones for better process performance.	Design Suggestion	X			Divider walls OK. Provide hole at bottom large enough to maintain water at same elevation on both sides of wall. Concrete walls are preferred. Wood or FRP will require big columns and the baffles will be designed to fail in an earthquake.	**$194,000**
27.0	RP-6	Eliminate the aeration basin scum skimmers and remove scum in the membrane influent channel.	Design Suggestion	X			The aeration basin scum skimmers will be eliminated and the scum/foam removal will be done in the membrane influent channel wit the aid of the screens.	**-$323,000**
28.0	RP-10	Basins presently sized at 400 mg/l. Install provision to blend influent with pond water, resulting in lower blended BOD, smaller basins and reduced process.	Design Suggestion		X	X	The data shows that there are a significant number of days with BOD above 400 mg/L. In the past BOD values have been as high as 950 mg/L during the first two weeks at the beginning and end of the canning season. If the City desires to maintain operation of the BNR/tertiary facilities at full capacity during these periods, the primary effluent could be diluted with flow from the recirculation channel. This would require a recirculation channel intake structure, pump station, mixing box and pipeline, at an estimated costs of $1,945,000. Given the high cost of this feature, it is recommended that instead of providing blending, the city could reduce the primary effluent feed flow to the BNR/tertiary plant, thereby reducing the BOD loadings to treatable levels during this time. Provisions to add a Pump Station to provide dilution if needed to	**$783,000**
29.0	M-5	Do all remedial earth work for all phases in the initial stage of construction.	Design Suggestion		X		The additional cost for earthwork for future phases does not appear justifiable, and this approach would be inconsistent with the decision to defer power feeds to future phases.	**$0**
30.0	M-6	Deliver project design build to meet project schedule	Design Suggestion		X		This would likely increase the overall project cost and at this time the project overall schedule doesn't show that Design-Build is a necessary delivery method.	**$0**
31.0	M-7	Include early completion bonus in contract documents	Design Suggestion		X		City cannot offer these types of incentives	**$0**
32.0	M-9	Construct scalping plant at Sutter avenue facility	Design Suggestion		X			**$0**
							Net Additional Cost due to Design Suggestions	**$789,000**

Attachment 5

PROJECT :	**BNR/TERTIARY EXPANSION PHASE 2 - Cost Summary**			
Client:	**City of Modesto**			
JOB # :	**6887P.10**	**DATE :**	5/19/2009	
LOCATION :	**Modesto, CA**	**BY :**	APB/JMP	

ELEMENT NO.	DESCRIPTION		TOTAL	
			PDR	**After VE**
1	PE JUNCTION BOX AND PE PUMP STATION No.2		$ 774,000	$ 774,000
2	FINE SCREENS		$ 2,887,000	$ 2,887,000
3	BNR MIXING BOX		$ 1,187,000	$ 1,187,000
4	DE-AERATION BASIN/RAS WET WELL, RAS AND WAS PS		$ 3,077,000	$ 3,092,000
5	BNR AERATION BASINS		$ 9,155,000	$ 8,436,000
6	BLOWER BUILDING		$ 2,996,000	$ 2,982,000
7	MBR BASINS AND MBR SUPPORT BUILDING		$ 18,795,000	$ 18,430,000
8	IN-CHANNEL UV DISINFECTION AND UV BUILDING		$ 4,101,000	$ 4,039,000
9	OPERATIONS CENTER		$ 2,084,000	$ 2,084,000
10	2W PUMP STATION		$ 308,000	$ 308,000
11	YARD PIPING AND YARD STRUCTURES		$ 4,502,000	$ 5,025,000
12	EFFLUENT PIPELINE		$ 5,535,000	$ 5,535,000
13	SITE CIVIL		$ 1,055,000	$ 1,055,000
14	COMPOST RELOCATION		$ 1,926,000	$ 589,000
15	ELECTRICAL		$ 11,608,000	$ 9,496,000
16	INSTRUMENTATION		$ 3,570,000	$ 3,545,000
17	ALTERNATIVE ENERGY PV		$ 1,100,000	$ -
18	EFFLUENT RIVER PUMP STATION		$ 2,000,000	$ 2,000,000
18	NEW WAS INLET		$ 125,000	$ 125,000
	TOTAL DIRECT COST		**$ 76,785,000**	**$ 71,589,000**
	ESTIMATE CONTINGENCY	15%	$11,518,000	$10,738,000
	Subtotal		$ 88,303,000	$ 82,327,000
	GENERAL CONDITIONS	12%	$10,596,000	$9,879,000
	GENERAL CONTRACTOR OH&P	8%	$7,064,000	$6,586,000
	ESCALATION TO MID-POINT OF CONSTRUCTION	7.2%	$6,314,000	$5,887,000
	SALES TAX (on equipment only)	8.4%	$2,572,000	$2,398,000
	OPINION OF TOTAL CONSTRUCTION COST		**$ 114,849,000**	**$ 107,077,000**
	ENGINEERING: PLANNING - PERMITTING - DESIGN - BIDDING -ESDC -CMS		$14,930,000	$14,930,000
	OWNER'S RESERVE FOR CHANGE ORDERS		$4,594,000	$4,594,000
	ESTIMATED OPINION OF TOTAL PROJECT COST		**$134,373,000**	**$126,601,000**