

TECHNICAL MEMORANDUM PS-1

30 May 1995

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Subject: Santa Rosa Subregional Long-term Wastewater Project:
Sizing Of New "S" Pump Station (To Transport Plant Effluent
To The New West County Or South County Storage Reservoir)
Ref. 723129.31006

INTRODUCTION

This technical memorandum sets forth the proposed design criteria for the proposed new "S" pump station which would transport plant effluent to the new west county or south county storage reservoir. These criteria will form the basis for this portion of the alternative project designs and the associated cost estimate.

The alternative projects which involve expansion of the Reclamation System require transport of Laguna Treatment Plant effluent to a new reservoir (or reservoirs) in the west or south county. It is currently envisioned that this will be accomplished by a new storage, or "S", pump station to be located to take suction from the existing effluent ponds located across from the plant (i.e., Meadowlane Ponds). This new "S" pump station will operate in conjunction with the existing "E" pump station which supplies plant effluent to the existing reclamation pipeline and storage ponds.

Because of the expected substantial construction cost for the new "S" pump station and for the transport pipeline to the storage reservoir, it is important to consider the proper sizing and features of these facilities. Because horsepower of the "S" pump station will be substantially larger than the existing "E" pump station (due to the longer pipeline and the higher head conditions), the annual operating pumping cost will also be substantially greater. Therefore, it is important to consider the proper sizing and operation of the pump station and pipelines in some detail.

To allow sizing of this new "S" pump station and pipeline, operation of the existing reclamation system and pump station has been investigated and the projected design

flowrate has been considered. City staff has been consulted about details of the existing system and initial proposals for the "S" pump station and pipeline.

The following discussion summarizes our preliminary assumptions, design criteria and conclusions based on our investigations and calculations for the sizing of the proposed new "S" pump station and transport pipeline to the new storage reservoir. These criteria will be incorporated into the planning level engineering and project designs in support of the EIR/EIS.

"S" PUMP STATION DESIGN CRITERIA, ASSUMPTIONS AND CONCLUSIONS

Based on our investigations, we present below our assumptions and conclusions in an itemized manner to outline the rationale for the sizing and operation of the proposed new "S" pump station.

1. The attached Effluent Pumping System Schematic shows the proposed new "S" pump station in relation to the existing "E" pump station and other reclamation system facilities. The proposed new facilities are shown in bold. The reclamation system irrigation demands are supplied either directly off the transport pipeline between the "E" pump station and the remote ponds (i.e., Alpha, Brown, Delta, etc) or from the ponds themselves. The existing "E" pump station has nine pumps available to handle the effluent leaving the plant and pump it either to the adjacent Meadowlane Ponds or to the more distant storage ponds. Each pump has 15 MGD capacity, so the system has been able to handle recent severe wet weather flowrates exceeding 80 MGD (the highest on record for the plant). The "E" pump station has an emergency power supply from the plant power station, and has a connection for use of a mobile generator, so sufficient power is available to maintain pumps in operation.
2. Therefore, the existing "E" pump station has adequate capacity and redundant pumps to reliably deliver projected future peak wet weather flowrates to the existing storage ponds. No modification of this pump station or its operation is expected as part of the long-term project.

The existing "E" pump station also has adequate emergency power supply to assure uninterrupted pumping capacity to handle average daily flowrates.

3. The existing reclamation system pipeline to the Poncia Pond (the most southern existing storage pond in the reclamation system), and the pond itself, is too small to act as an effective supply for location of the "S" pump station at the Poncia Pond site. Headloss through this 30" diameter line would be too severe with the anticipated design flowrate. Therefore, even for delivery to the new south county reservoir (further south than the Poncia Pond), the "S" pump station should be located at the existing Meadowlane Ponds which can provide adequate supply to serve the new pumps.

4. The new "S" pump station will not have to convey the full plant effluent flowrate. It can be sized to convey only handle the annual excess storage volume requirement for delivery to the new storage reservoir. This volume is equal to the additional storage capacity required to satisfy the annual water balance model (developed to predict storage volume and irrigation acreage requirements) for the irrigation reclamation and river discharge alternatives.
5. For cost efficiency, the "S" pump station will be assumed to fully fill the new reservoir gradually over the non-irrigation season, this being defined as the months of December through April. There is no advantage to filling the reservoir over a much shorter period because the water will only sit in this storage until it can be withdrawn for irrigation (it cannot be discharged to the Laguna or Russian River from the west county or south county reservoirs). The "S" pump station capacity, therefore, will be sized based on average monthly effluent volume expected over this 150 day period. Therefore, the nominal design capacity of the new "S" pump station is determined as the average rate to fill the net additional required storage capacity of 4,000 million gallons (based on the latest estimates of future ADWF and the results from the water balance model), as follows:

$$\frac{4,000 \text{ MG}}{150 \text{ DAYS}} = 26 \text{ MGD}$$

6. An analysis was made to determined if there would be a significant savings in operating cost realized by not operating the "S" pump station during the peak and partial peak energy demand periods over the pumping season, when the energy rate is higher. To pump the same amount of water over a shorter period of the day would require larger capacity pumps and a larger diameter pipeline. A present worth cost comparison was conducted to compare the two alternative design capacities of 26 MGD nominal pumping rate operating over 24 hours/day, versus 4/3 this pumping rate (i.e., 35 MGD) operating over 18 hours/day.

The analysis indicates that the savings in operating cost due to avoiding the peak energy demand time of day is not sufficient to cover the additional capital cost for the larger diameter pipeline and larger pump motors to handle the higher flowrate (i.e., 35 MGD versus 26 MGD) for less hours per day (i.e., 18 hours versus 24 hours). We conclude that the "S" pump station should be designed for 24 hours per day pumping at a nominal rate of 26 MGD.

7. The total pump station horsepower requirement for the new "S" pump station will be determined based on 26 MGD capacity and the hydraulic analysis for the pipeline route from the pump station to each of the individual candidate reservoirs. Preliminary calculations indicate that the "S" pump station total electrical demand will be nearly 2,500 horsepower.

8. It is proposed that the "S" pump station will have 4 pumps, each of one-third the pump station capacity. This will allow 3 pumps to handle the design flowrate, with a fourth pump for backup. The pumps will be vertical turbine type, supplied from an extension of the existing wetwell serving the "E" pump station (and a new gravity flow pipeline taking suction from Meadowlane Ponds "C" and "D"). See the attached system schematic.
9. The new "S" pump station must be served by a new electrical service because the existing service to the plant will (after current plant expansions are on-line) not have sufficient reserve capacity to handle this new load. The capacity and route for this new service will be identified in a future memorandum.
10. The existing "E" pump station will continue to operate as it does now, to supply the Meadowlane Ponds and the existing reclamation pipeline. The new "S" pump station will be supplied from the Meadowlane Ponds, to pump the water to the distant west county or south county reservoir. The two pump stations will be operated to satisfy the new storage curves proposed in a separate memorandum (TM-R3).
11. Because the existing plant cogeneration station and plant emergency power station are limited in capacity, it is proposed that the new "S" pump station will be provided standby power by connection to a dedicated diesel generator included in the "S" pump station design. We propose this generator be sized to handle two pumps, providing at least 17 MGD pumping capacity. Also, the station electrical panels should include provision for connection to a mobile power generator which could be brought to the site during extended power outages.
12. If irrigation turnouts are provided off the transport pipeline along its way from the "S" pump station to the storage reservoir (which is likely), then consideration must be given to keeping the line pressurized and supplied during the those periods when the "S" pump station may not be operated.

For the Lakeville Hillside, Adobe Road, Valley Ford, and Carroll Road candidate reservoirs, the pipeline to the reservoir will be kept pressurized and charged by the reservoir (i.e., the line passes through the dam). The new "S" pump station, therefore, need only be controlled manually, based on operator observation of level in the reservoir.

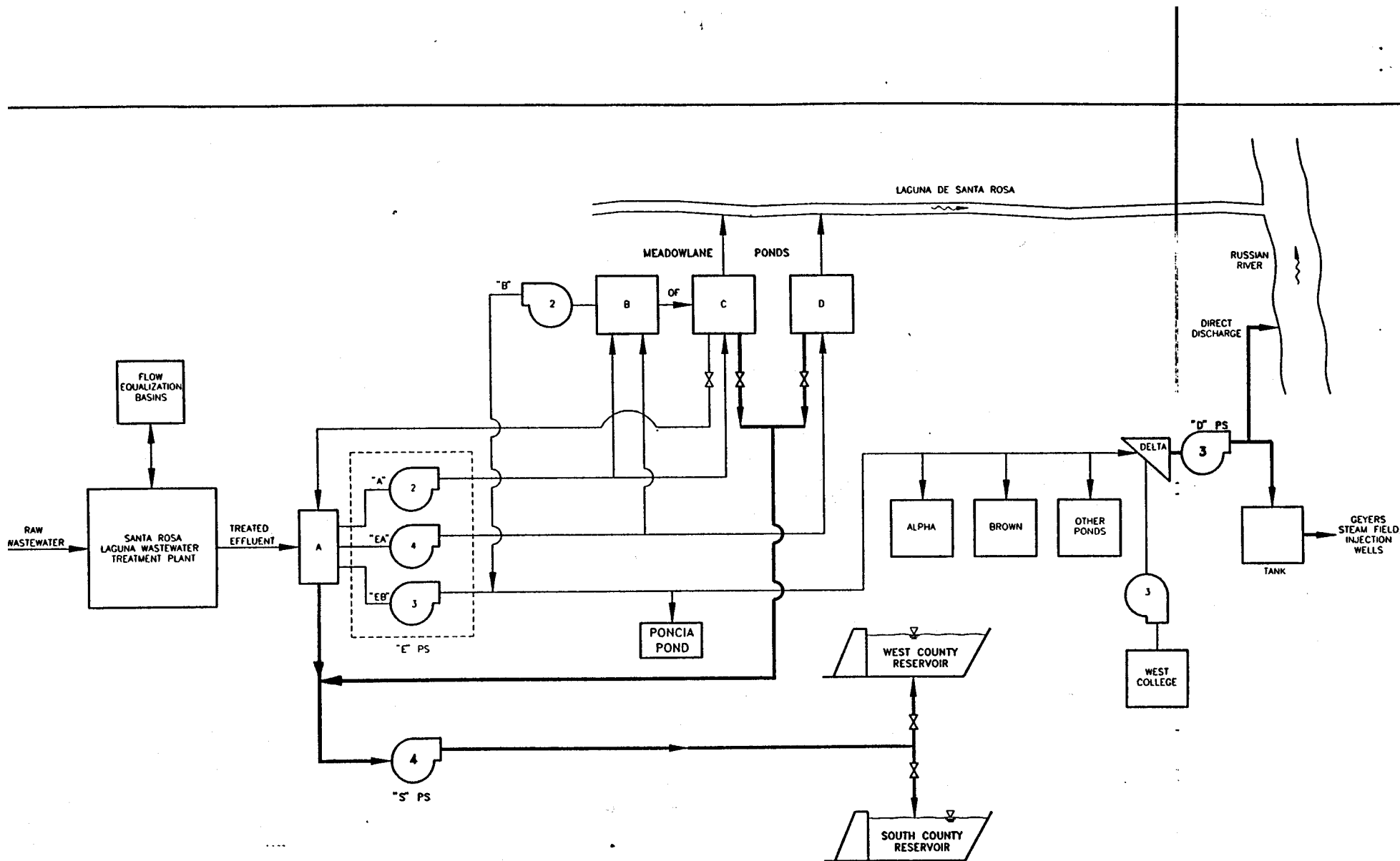
For the Sears Point, Tolay, Bloomfield, Two Rock and Huntley candidate reservoirs, the pipeline to the reservoir will pass over a ridge into the reservoir, so its full length will not be charged and pressurized by the reservoir head. The new "S" pump station, therefore, will need to be started by a low pressure sensor on the pipeline to assure the pipeline pressure and flow is maintained to supply intermediate irrigation turnouts. If one of these reservoirs is selected for construction, then at least one of the pumps in the "S" pump station will be available with variable speed control to better satisfy the irrigation demands without the need for frequent pump cycling.

In either case, automatic emergency shutdown of the "S" pump station will be provided based on excess discharge pressure or abnormally low discharge pressure.

13. If the "S" pump station serves more than one reservoir, flow will be directed to only one reservoir at a time. This will be selected by the operator, and controlled by the operator visiting the valve control station some miles from the plant. This practice is considered consistent with current practice of controlling flows, so a telemetry system for remote valve control is not proposed.


CONCLUSION

The proposed new "S" pump station will be designed based on the outlined design criteria presented above. The station will be located adjacent to the existing "E" pump station. Itemized design criteria, a simplified layout of the proposed station, and a cost estimate consistent with the criteria set forth above, will be presented in the engineering documents prepared in support of the EIR/EIS.



LEGEND:

EXISTING SYSTEM _____
 PROPOSED SYSTEM _____

		PROJECT NO. 723120		DATE		HARLAND BARTHOLOMEW AND ASSOCIATES		SANTA ROSA		SANTA ROSA LAGUNA WWTP		Sheet	
		DESIGNED BY R. AHLER		4/20		PARSONS ENGINEERING SCIENCE		SUBREGIONAL LONG-TERM		EFFLUENT PUMPING SYSTEM SCHEMATIC		HOME	
		DRAWN BY L. FLANDER		4/20		 PARSONS		WASTEWATER PROJECT				GEN-9	
DATE		REVISIONS		BY		CHECKED BY		OFFICES IN PRINCIPAL CITIES				Sheet #	