City of Riverside

WASTEWATER COLLECTION AND TREATMENT FACILITIES INTEGRATED MASTER PLAN

VOLUME 4: WASTEWATER TREATMENT SYSTEM
CHAPTER 13: PROPOSED EXPANSION PLAN AND SITE LAYOUT

FINAL
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PROPOSED EXPANSION PLAN AND SITE LAYOUT

13.1 PURPOSE

This chapter summarizes the proposed expansion plan and site layout for the Regional Water Quality Control Plant (RWQCP) liquid handling facilities to treat a flow of 52.2 mgd in 2025 on an annual average basis. The purpose of this chapter is to present the proposed site layout, flow schematic, and hydraulic profile for the liquid handling facilities. The expansion plan and layout for solids treatment facilities are discussed in detail in Volume 8 – Solids Treatment and Handling.

13.2 CONCLUSIONS AND RECOMMENDATIONS

- Based on the evaluations performed in Chapters 1 to 12 of this volume, a revised RWQCP site layout and flow schematic have been developed for expansion to 52.2 mgd on an annual average basis.
- In addition to a site layout and flow schematic, the hydraulic profile is updated with the new flow distribution, including the addition of the new structures and the new piping.

13.3 BACKGROUND

Since July 2006, several project meetings have been held to discuss process alternatives for the wastewater treatment system for the 52.2-mgd expansion. Based on the decisions at the meetings, the selected expansion for the RWQCP liquid processes is summarized as follows:

- Preliminary Treatment: A new 15-mgd annual average flow headworks facility will be built.
- Primary Treatment: Four circular primaries to treat 32 mgd on an annual average basis will be built to replace the Plant 1 primary clarifiers and expand primary capacity. Both the Plant 1 and Plant 2 primaries will be covered and a biofilter will be used for odor control.
- Primary Effluent Equalization: Two primary effluent equalization basins with a total volume of 12.1 MG will be built.
- Secondary Treatment: A 32-mgd Membrane Bioreactor (MBR) facility will be installed in two phases. The first phase will expand the Plant 1 secondary treatment facilities from 20 to 26 mgd. The second phase will expand the secondary facilities from 26 to 32 mgd.

- Tertiary Treatment: Because high-quality filtrate from MBRs does not require tertiary filtration and the existing filters have adequate capacity for the Plant 2 secondary effluent, new tertiary facilities are not required.
- Disinfection: A new Chlorine Contact Basin (CCB) of 8 mgd on annual average basis will be built.
- Plant Utilities and Support Facilities: The Public Address (PA) system will be replaced. A new maintenance building and parking lot expansion will be installed. In addition, the flood protection levee may have to be raised.

13.4 SITE LAYOUT

Based on the evaluations performed in Chapters 1 to 12 of this volume, a revised RWQCP site layout and flow schematic have been developed for expansion to 52.2 mgd, on an annual average basis. Figure 13.1 shows the proposed layout of the new liquid stream, solids, odor control, and support facilities.

The new Plant 1 primaries and primary sludge pumping and thickening facilities will be located in the area of the abandoned Plant 1 sludge beds and the demolished trickling filters. Primary effluent equalization basins will be installed where the abandoned Plant 1 secondary clarifiers and the abandoned chlorine contactor are located. The new headworks facility will be at the location of the existing Plant 1B primaries. A biofilter for the Plant 1 and Plant 2 primaries and the new headworks will be located at the site of existing Plant 1A primaries. MBR modules will be installed in the retrofitted Plant 1 secondary clarifiers. An additional basin will be added to the Plant 1 aeration basins. A new CCB will be located on the west side of CCB3. Solids treatment facilities, including sludge thickening facilities and an acid-phase digester, are described in Volume 8 - Solids Treatment and Handling.

New pipes and connections will be needed for the new facilities. Figure 13.2 shows the approximate locations of the major piping for the liquid stream processes. A primary influent splitter box for the new Plant 1 primaries will be needed. Distribution boxes will be needed to divert primary effluent to the primary effluent equalization basins for both Plant 1 and Plant 2. Primary effluent equalization pumps will be used to pump the equalized stream to either Plant 1 or Plant 2 during off-peak hours. Fine screens will be installed upstream of the Plant 1 aeration basins for the MBR. A new pipe will be provided between the aeration basins and the MBR units that will be located in the retrofitted Plant 1 secondary clarifiers. The new pipe will be installed to accommodate the increased Return Activated Sludge (RAS) flow that the MBR facility requires.

13.5 FLOW DISTRIBUTION

Besides changes to the structures and piping, flow distribution to the plant is also modified. Figure 13.3 shows the updated RWQCP flow schematic. It includes the new flow distributions to the different structures at the hourly peak influent flow condition.

Plant 1 and Plant 2 will have design capacities of 32.2 mgd and 20 mgd, respectively. The total design plant flow is 52.2 mgd on an average daily basis. Using a wet weather peaking factor of 2.2, the peak wet weather flow will be 114.8 mgd. In addition, there is 5.3 mgd of recycle stream flow that the plant will need to treat, which makes the total treatment flow approximately 120 mgd.

All unit processes upstream of the primary equalization basins, except the headworks, will treat the total 120 mgd, while the flow downstream of primary equalization is based on a peaking factor of 1.5, which limits the flow to approximately 80 mgd.

Since Plant 1 secondary treatment will be converted to an MBR operation, there will not be a requirement for tertiary filtration for the Plant 1 secondary effluent. With a maximum treatment capacity of 27.8 mgd, Tertiary Filters 1 through 10 can treat the majority of the Plant 2 secondary effluent. During peak flow, the remaining Plant 2 secondary effluent, approximately 3.4 mgd, can be treated by Tertiary Filters 11 through 16.

As shown in Figure 13.3, CCB1 and CCB2 will receive the flow from Filters 1 through 10 only, while CCB3 and the new CCB will receive the flows from the Plant 1 MBR effluent and part of the Plant 2 effluent from Filters 11 through 16.

13.6 HYDRAULICS

13.6.1 Hydraulic Profile

Figure 13.4 presents a hydraulic profile for the proposed facilities.

13.6.2 Changes to the Existing Structures

The hydraulic calculations show that a few modifications to the existing structures are required in order to make the hydraulics feasible. These include the following:

- Add a 24-inch flow control valve at the existing headworks.
- Increase the size of the Plant 1 aeration basin influent channel openings.
- Lower the Plant 1 aeration basin effluent weir.

Figure 13.4 Hydraulic Profile of RWQCP (with New Facilities)

- Increase the size of the Plant 1 secondary clarifier influent channel openings (clarifiers will be converted to house the membranes for the MBR process).
- Upsize the pipe that is connecting the Plant 2 aeration basin splitter box to the Plant 2 Secondary Clarifiers 5 and 6 from 42 inches to 52 or 54 inches.

Because addition of the MBR will reduce the flow to the tertiary filters, changes will not be required to the pipe that is currently connecting Junction Box 13A and Box 14. These changes would be required if conventional activated sludge and tertiary filtration were selected instead of the MBR.