DRAFT

Recycled Water Feasibility Study

Prepared for

Byron-Bethany Irrigation District

July 2001

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Byron-Bethany Irrigation District Recycled Water Feasibility Study

Introduction

The Byron-Bethany Irrigation District (BBID) provides water supplies for agricultural and industrial uses within its boundaries. In the near future, BBID will provide raw water supplies for potable water uses in the Mountain House development.

As BBID continues to meet the needs of water customers inside district boundaries, the potential will exist for integrating recycled water supplies into the overall water resources supply mix for the district. At least initially, a potential source of recycled water is the planned tertiary-treated effluent to be generated from the Mt. House Community Services District (MHCSD). The integration of recycled water supplies into the BBID water resources mix may yield benefits for both the district and MHCSD.

The purpose of this recycled water feasibility study is to investigate opportunities for utilizing various sources of recycled water as part of BBID's overall water resources mix. This phase of the recycled water feasibility plan focuses on evaluating the ability to use the recycled water from MHCSD; however, the plan will be flexible so future evaluations could consider other sources of recycled water (e.g., from a future Tracy Hills development).

Why Consider Recycled Water Supplies?

As noted, the district maintains an excellent water resources supply for its customers. This water supply is grounded in pre-1914 water rights supplies within the Delta. This water supply is adequate to meet current and projected future needs. The district has a long history of being a good steward of its water resources supply and district facilities. Maintenance of water rights and the continued maintenance and development of district facilities are key policy objectives of the Board of Directors.

With the planned urbanization of portions of the district's lands, and the natural evolution of the district from a purely agricultural/industrial user base to an agricultural/industrial/municipal water supplier, there is the potential to build on the district's long history of wise water use. The integration of potentially available recycled water supplies is a logical extension of the district's water services to its customers. If feasible to implement, the use of recycled water supplies may increase the flexibility and long-term reliability of existing supplies.

Calpine Corporation is evaluating the siting of a power production facility within district boundaries. If implemented, the East Altamont Energy Center (EAEC) will be an additional industrial-based customer and will need water supplies for cooling and process water makeup uses. A potential additional water resource for the EAEC would be a recycled water supply.

As discussed later, the potential to effectively use available recycled water supplies generated from district development may have a secondary benefit for the urban areas. This secondary benefit, which may be significant, would accrue through the reduced discharge of recycled water supplies to area receiving water streams. The potential magnitude of this benefit, and the resulting value attributed to the benefit, will be briefly explored. However, a complete determination of the potential secondary benefit gained from reduced discharges will be accomplished only through negotiations with interested stakeholders.

Background Information

Current District Development

BBID is a multicounty special district established under state law primarily to provide water to lands in Alameda County, Contra Costa County, and San Joaquin County. Currently, the district primarily provides agricultural water supplies in its service area, with one current industrial user. Unimin Corporation uses water supplies for district aggregate mining and processing.

The distribution system is segregated into two divisions: the Byron Division (north of the Banks Intake Channel) and the Bethany Division (south of the Banks Intake Channel). Open canals and pump stations are the primary distribution system infrastructure, but major portions of the system include pipelines to deliver water supplies to district customers (Exhibit 1).

As noted previously, the community of Mountain House is planned for development inside district boundaries. The general limits of the community is shown on Exhibit 1. The district will provide water supplies as the development proceeds through a dedicated pump station on the Intake Channel and conveyance pipeline to the community's water treatment plant. These facilities are also shown on Exhibit 1.

District Water Supplies

BBID maintains pre-1914 water rights for diverting of water supplies from the Delta. Based on the water rights opinion from the district's Special Water Counsel, the district has approximately 60,000 acre-feet of water each year, based on their water rights posting.

The district currently diverts all its water supplies from the intake channel to the Banks Pumping Plant, a major facility of the State Water Project. The two district diversions are located downstream of the Skinner Fish Screen. Drought has never impaired the district's ability to divert water for users inside district boundaries.

The water quality is good for intended uses, both now and in the future. Current agricultural and limited industrial use water quality requirements are well within the historic water quality provided by the district. A significant amount of water quality information is available from data collected by the State Water Project. A summary of that information has been reviewed, focusing on general water quality parameters as they apply to current and potential future agricultural and industrial uses. Other water quality

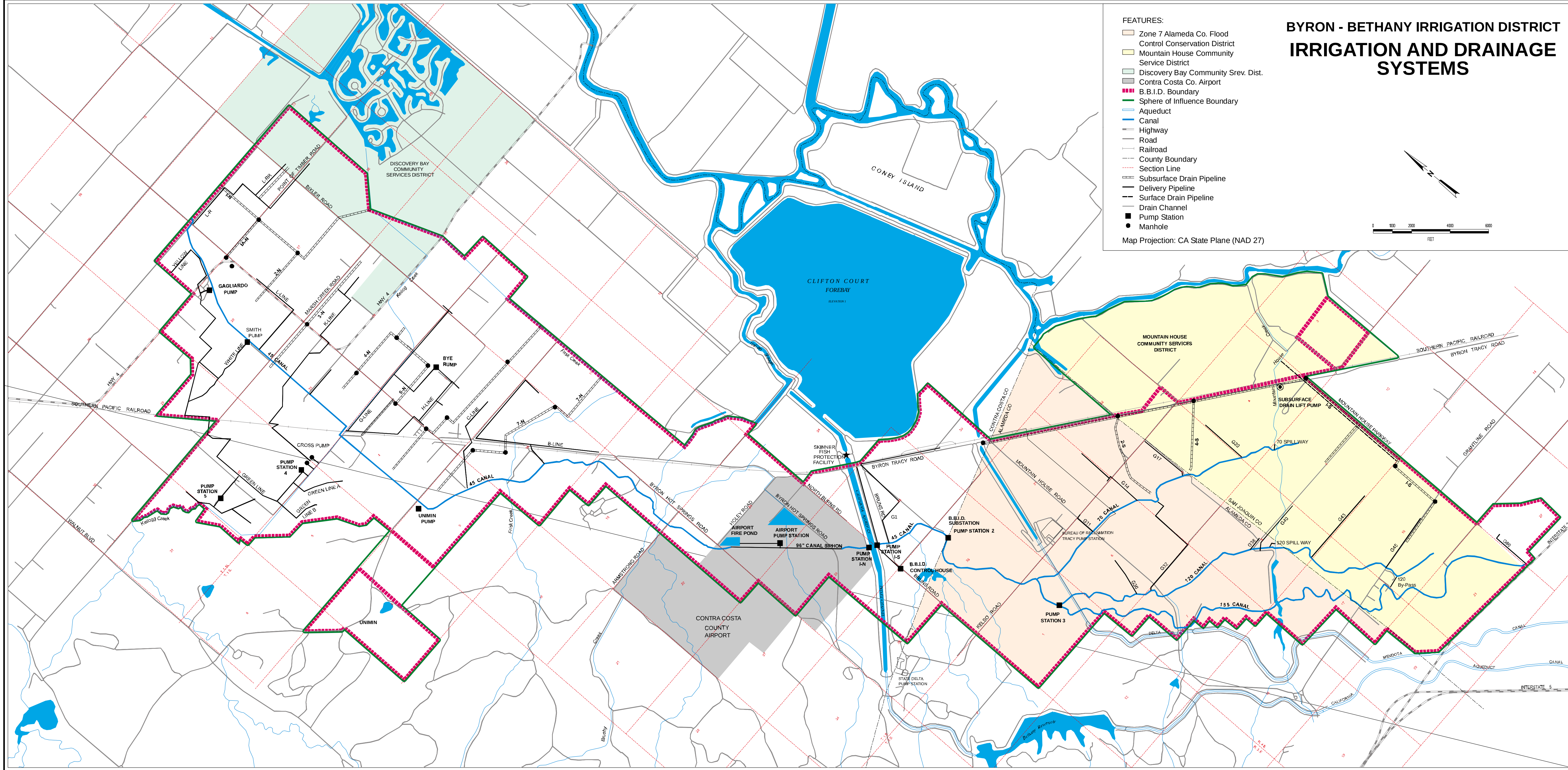

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Exhibit 1
District Facilities
Recycled Water Feasibility Study

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parameters, such as turbidity and organic chemical information, are available but not relevant to the recycled water feasibility study.

The water quality of the district's supplies is variable, depending on the time of year and background hydrology of the Delta (i.e., dry versus wet years). For purposes of this study, the variability of water quality by month is less important. To demonstrate the potential range of water quality, however, a range of water quality data for the district is summarized in Exhibit 2.

EXHIBIT 2
Approximate BBID Water Quality

Parameter	Range of Water Quality Data (mg/L)
Total dissolved solids	110 to 300
Alkalinity	40 to 95
Arsenic	0.001 to 0.003
Boron	<0.1 to 0.4
Bromide	0.04 to 0.21
Calcium	11 to 25
Total organic carbon	3 to 7
Chloride	18 to 67
Copper	<0.005 to 0.02
Hardness	48 to118
Magnesium	2 to14
Selenium	<0.001 to 0.001
Sodium	17 to 65
Sulfate	14 to 59

Note: Based on monthly grab sample data collected from the Intake Channel during 1995, 1996, and 1997 (through August) (ECO:LOGIC, January 1998). Information is supplemented with grab sample data collected from Intake Channel in July 1999 (Precision Enviro-Tech Samples, July 1999).

mg/L milligrams per liter

Historic Diversions/Distribution of Water Supplies

Historic diversions of district water supplies have varied, depending on a number of factors. These factors include weather patterns, agricultural market conditions, improvements to the efficiency of district-conveyance facilities, improvements of irrigation efficiency for on-farm irrigation systems by district farmers, and development of agricultural lands.

Deliveries to district lands are segregated between the Byron Division and the Bethany Division. Records of this distribution of water deliveries have been maintained by the district since 1998. Exhibit 3 summarizes the average distribution of water deliveries between the Byron and Bethany Divisions.

EXHIBIT 3
Average Distribution of Water Supply Deliveries to Byron and Bethany Division (acre-feet/month)

Month	Byron Division	Bethany Division
January	100	10
February	0	0
March	160	50
April	1,000	700
May	2,700	1,700
June	3,700	3,300
July	3,200	3,600
August	2,100	3,700
September	1,300	1,600
October	400	300
November	0	0
December	0	0
Total	**14,660**	**14,960**

Based on average deliveries for the 1998 to 2000 period. This distribution of water deliveries will change as the Mountain House development proceeds in the Bethany Division.

Future Potential District Development

BBID's central location to the urban centers of Brentwood, Tracy, and the Livermore Valley (and subsequent Bay Area) has made the area a candidate for urban development, such as the planned Mountain House community. At buildout, Mountain House is projected to provide housing and employment opportunities for a population of approximately 44,000. This community is scheduled to develop over 20 to 40 years, depending on market conditions (ECO:LOGIC Engineering, January 1998).

In addition to Mountain House, the district has annexed the lands of the Tracy Hills development. This development, also a planned residential/light industrial community, has a potential build-out of approximately 5,500 residential units (PMC, July 2000). If implemented, the district will provide water supplies for the Tracy Hills area in a manner similar to the Mountain House development.

The district's unique proximity to urban centers also makes it a potential location for future industrial development. Depending on the type of industrial development, varying amounts of water resources will be required.

One example of the potential for future industrial development inside the district is the EAEC. The proposed facility would be located in the northeast corner of Alameda County, northeast of Alamont Pass on Kelso Road. The facility would be built on a 50-acre site adjacent to the Western Area Power Administration's electrical substation on Kelso Road.

The EAEC would use natural gas for fuel and could produce up to 1,100 megawatts of electricity, enough to power 1 million homes.

Potential Available Recycled Water Supplies

Due to the existing urbanization around the district is (Tracy, Brentwood, and Discovery Bay), an assortment of recycled water supplies is in the geographically wide area. However, this study is focused on potentially utilizing recycled water supplies generated within district boundaries. Additional institutional issues and added costs are associated with the use of recycled water supplies from outside the district. These limitations effectively preclude, for the foreseeable future, the logical development of recycled water supplies from outside district boundaries.

Inside district boundaries are three potential sources of future recycled water supplies. They are the Mountain House development, Tracy Hills development, and community of Byron.

The community of Byron uses groundwater to meet its water requirements. Wastewater flows are treated through a centralized sanitary sewer / treatment system consisting of pond treatment. This treatment method does not provide adequate treatment levels for reuse without the addition of significant treatment infrastructure. The lack of any significant wastewater infrastructure, or a plan to develop this infrastructure in the foreseeable future, effectively precludes planning on recycled water flows from the Byron community in this feasibility study.

The Tracy Hills development has a plan to reuse essentially all its available water supplies. In this regard, the use of recycled water will be maximized in these areas of the district. However, due to the distance between the Tracy Hills development and the majority of the district's agricultural lands or industrial customers, the use of Tracy Hills recycled water supplies outside the development is limited.

The Mountain House development is in proximity of a majority of the district's agricultural lands. As shown in Exhibit 1, the planned Mountain House development will be predominately in San Joaquin County in the southeastern portion of the district. Since this development is underway, potential recycled water supplies generated from the community provide the logical source of recycled water for district consideration.

The City of Tracy currently produces 8.5 million gallons per day (mgd) of recycled water. The city projects this recycled water production will increase to approximately 16 mgd during the next 15 years. Currently, the city treats the water to secondary effluent levels and discharges to the Old River pursuant to their National Pollution Discharge Elimination System (NPDES) permit. However, since this water is not generated in the service area of the district, use of recycled water from Tracy would likely require additional institutional arrangements between the city and the district. In addition, the cost of infrastructure necessary to deliver recycled water to the district from the city would be prohibitive.

Available Recycled Water Quantity

Water supplies from BBID will be delivered to MHCSD for treatment and use in the Mountain House development. The MHCSD will also provide the wastewater collection and treatment infrastructure for the community.

MHCSD will treat wastewater from the development to meet stringent standards outlined in Title 22 for unrestricted nonpotable reuse. This procedure requires secondary treatment followed by enhanced coagulation, filtration, and disinfection. Discussions with MHCSD indicate that treatment processes for the initial phase of development will consist of pond treatment with dissolved air floatation (DAF) coagulation, effluent filtration, and chlorine contact for disinfection. As the development proceeds, wastewater treatment processes will convert to a sequencing batch reactor system as the means of accomplishing secondary treatment.

MHCSD estimates that at buildout, the total amount of recycled water will be approximately 5.4 mgd (approximately 5,000 to 7,000 acre-feet a year). The Phase 1 development will begin with Neighborhood F (1 of 12 planned neighborhoods in the community), representing a potential average annual flow of approximately 0.5 mgd (500 to 800 acre-feet a year) (telephone conversation, J. Houser).

MHCSD plans on recycling part of the available recycled water supply. Estimates provided by MHCSD indicate that approximately 300 acres of land in the community will receive recycled water under current plans. These areas are focused on parks in two future neighborhoods and a planned golf course.

To assess the potential availability of recycled water supplies for use in the district, MHCSD provided an estimate of its monthly needs and total monthly supplies. Exhibit 4 summarizes this analysis for buildout conditions.

EXHIBIT 4
Summary of Potential Available Water Supplies From MHCSD (acre-feet)

	Available Supply at Buildout		Community	Potentially Available Supply for BBID at Buildout Conditions	
Month	Minimum	Maximum	Needs	Minimum	Maximum
January[1]	510	700	--	510	700
February[1]	460	650	--	460	650
March	370	610	30	340	580
April	360	590	90	270	500
May	370	560	150	220	410
June	360	500	200	160	300
July	370	515	240	130	275
August	370	515	215	155	300
September	360	500	150	210	350

EXHIBIT 4
Summary of Potential Available Water Supplies From MHCSD (acre-feet)

	Available Supply at Buildout		Community	Potentially Available Supply for BBID at Buildout Conditions	
Month	**Minimum**	**Maximum**	**Needs**	**Minimum**	**Maximum**
October	370	560	80	290	480
November[1]	500	600	--	500	600
December[1]	510	650	--	510	650
Total	**4,910**	**6,950**	**1,155**	**3,755**	**5,795**

Source: Facsimile communication from ECO:LOGIC, October 23, 2000.

[1] Values developed based on professional experience. Not provided by ECO:LOGIC.

Currently, MHCSD plans only limited storage of recycled water supplies. The predominate method of disposing recycled water will be through direct discharge to Old River.

The Mountain House community will develop over time. Accordingly, the production of recycled water will vary as the development occurs. Based on discussions with the Mountain House developer, the community is projected to develop at approximately a linear basis from now through 2020 (which is the projected date of buildout for the community). To approximate the potential availability of recycled water supplies during this 20-year buildout period, flow projections were distributed on a linear basis. Exhibit 5 summarizes results of that analysis. However, the actual availability of recycled water will depend on the development of the community, which will be driven in large part by the market forces affecting residential construction and occupation in the area.

EXHIBIT 5
Projected Development of Recycled Water Availability From MHCSD (all units acre-feet except where noted)

Month	2000	2005	2010	2015	2020 (Buildout)
January	0	151	303	454	605
February	0	139	278	416	555
March	0	123	245	368	490
April	0	119	238	356	475
May	0	116	233	349	465
June	0	108	215	323	430
July	0	111	221	332	443
August	0	111	221	332	443
September	0	108	215	323	430
October	0	116	233	349	465

EXHIBIT 5
Projected Development of Recycled Water Availability From MHCSD (all units acre-feet except where noted)

Month	2000	2005	2010	2015	2020 (Buildout)
November	0	138	275	413	550
December	0	145	290	435	580
Total	**0**	**1,483**	**2,965**	**4,448**	**5,930**
Average Daily Flow (mgd)	0	1.3	2.6	4.0	5.3

No flow currently developed in 2000.
Arithmetic average flows (between minimum and maximum values reported in Exhibit 4) used to represent 2020 conditions, based on discussions with MHCSD.

Available Recycled Water Quality

Since the MHCSD has not started to process recycled water from the Mountain House community (since development is just beginning), no water quality data is available. However, water quality data is available from two wastewater treatment facilities in the City of Tracy and the Delta-Diablo Sanitation District (DDSD) in Pittsburg that draw water supplies predominately from the Delta. This data, along with projections provided by the MHCSD, assess the quality of the recycled water.

DDSD has evaluated the potential recycled water use by industries in its service area and has determined it to be feasible. Many recycled water studies have been prepared by DDSD in the past, and recycled water is currently being utilized within its service area.

Likewise, the City of Tracy has evaluated the feasibility of implementing recycled water projects. Generally, cost tradeoffs do not favor recycling water from Tracy, given the relatively low cost of river discharge and the proximity of the treatment plant from recycled uses within the city. A study is underway for the city that evaluates the potential to reuse water on the surrounding agricultural lands.

Water quality information was collected from both DDSD and the City of Tracy to assist in this study. In addition, limited projections of recycled water quality from the MHCSD were developed as part of the river discharge investigations for the Regional Water Quality Control Board (RWQCB). A summary of the various recycled water quality data is provided in Exhibit 6.

EXHIBIT 6
Summary of Potential Recycled Water Quality Data (mg/l, except where noted)

Parameter	DDSD Data	Tracy Data	MHCSD Estimates
Total dissolved solids	760 to 1040	900 to 1,100	550 to 620 (a)
Specific conductance, umho/cm		1,500 to 1,700	890 to 960
Boron		0.5 to 1.0	

EXHIBIT 6
Summary of Potential Recycled Water Quality Data (mg/l, except where noted)

Parameter	DDSD Data	Tracy Data	MHCSD Estimates
Sodium	230	180 to 230	110
Calcium	35	45 to 60	55
Magnesium	25	15 to 30	25
Sodium adsorption ratio, no units	7	6	3 to 4
Potassium	15	20	
Chloride	270	270 to 300	130
Nitrogen (total N)	5	5 to 8	6
Bicarbonate	150		205
Sulfate	130	160 to 200	
Silica	25	30	
Selenium		<0.001	

Notes:
(a): Estimate developed based on standard conversion factor of TDS ~ EC x 0.64, where TDS is measured in mg/l and EC is measured in umho/cm.

Sources:
DDSD Data—Montgomery Watson, May 1993.
Tracy Data—Analytical laboratory analyses provided by City of Tracy.
MHCSD Data—ECO:LOGIC, July 1997.

For agricultural uses, the recycled water quality projected for the MHCSD falls within a range of "increasing problems" as described in FAO-29 publication *Water Quality for Agriculture*. Due to the increased levels of salts and sodium adsorption ratio, yield reductions would be expected if the recycled water were used directly on sensitive crops (such as vineyards). However, most pasture and forage crops exhibit a higher tolerance to salinity and other constituents (such as sodium, boron, and chloride). With these types of salt-tolerant crops, the recycled water quality projected for the MHCSD would likely be acceptable for agricultural use without blending, assuming that increased management was used to monitor the salt balance in the root zone. An additional way to mitigate the potential water quality effects for agricultural uses would be to blend the recycled water supply with the district's water supply (for example, in the 45 Main South Canal).

The applicability of the projected water quality for industrial uses will depend on the industrial user. Since Unimin uses the district water supply for aggregate mining and processing, the water quality projected for the MHCSD is considered adequate. Discussions with Calpine Corporation also indicate that the water quality projected for the MHCSD could be used for cooling water supplies and further treated for process makeup water.

The applicability of the projected MHCSD water quality for landscape uses is generally acceptable for salt-tolerant plantings. Ornamental plants that are intolerant of increased

salinity, sodium, boron, or chlorides should not be planted. Management of the salt balance in the root zone is an important consideration for use at a golf course. MHCSD may want to consider using potable water supplies for greens and tee boxes, as these grasses can be more susceptible to salt burn if water balance is not optimized.

The recycled water quality reported for the City of Tracy is lower in quality than what is projected for the MHCSD. This increased level of salt, chloride, sodium, and boron is attributed to the use of groundwater supplies as part of the City's overall potable water supply mix. The potable water supplies for Mountain House will consist entirely of district water, which is of significantly better water quality than the groundwater sources for these constituents.

Stakeholder Feedback

A key component of this study has been the assessment of stakeholder perspectives associated with the development of recycled water supplies within the district. This section provides a summary of the feedback received through interviews and telephone conversations with the stakeholders.

District General Manager

The General Manager supports the evaluation of recycled water supply development for the district. Its use for industrial customers may be a significant positive attribute for using recycled water.

Any development of recycled water supplies will need to be accomplished with no financial impacts to district customers. The district's water rights supplies adequately meet the projected needs of the district, both now and in the future (including the projected water supply required for the EAEC, if implemented).

District Board of Directors

Continued evaluation of the recycled water supply should be pursued, assuming its development can be implemented with no impacts to district customers. The Board recognizes the potential benefits that may accrue to the MHCSD associated with the reuse of recycled waters from the community (instead of discharge to Old River in the future).

MHCSD Staff

The concept of developing a recycled water system with the district is supported by MHCSD staff. MHCSD indicated that the required flows for the identified uses within the community would take priority over diverting flows to the district; however, there will clearly be recycled water available in the future as the community develops. The aspects of cost sharing associated with the development of a recycled water system would need to be reviewed with the district, should the recycled water program appear feasible.

Area Water Supply Interests

Discussions were held with Contra Costa Water District's (CCWD) General Manager about the general concepts of developing recycled water supplies within BBID. These concepts were supported by CCWD, as they may have a beneficial impact on Delta water quality.

Key Agricultural Interests within District

Discussions with key agricultural interests within the district about the feasibility of using recycled water yielded the following feedback:

- There was some apprehension regarding the use of recycled water supplies within the district.
- It was recognized that use of recycled water may be appropriate for certain crop types, and inappropriate for others.
- Blending of recycled water supplies with other district water supplies was reviewed. More information on this concept is needed, such as the amount of blending anticipated.
- In general, district members were willing to listen to more information regarding the feasibility of developing recycled water.

Calpine Corporation

As the potential major industrial customer for water supplies in the district, the Calpine Corporation was approached for feedback on the use of recycled water supplies. Calpine indicated that the EAEC process could be developed to utilize recycled water supplies, or some blend of recycled water / district water supply. As a potential future customer of the district, Calpine would work with district staff to evaluate the applicability of recycled water for the EAEC. Calpine will include the future potential to utilize recycled water in its environmental documentation to the California Energy Commission for the EAEC.

RWQCB/Department of Health Services Staff

Discussions with representatives of both the RWQCB and the California Department of Health Services have indicated that there would be no significant issues associated with using recycled water for either irrigation or industrial uses within the district. The appropriate treatment required for the type of use as specified in Title 22 would be necessary to allow recycling within the district.

Alternatives for Using Recycled Water

Description of Potential Alternatives

As a means of assessing the feasibility of developing a recycled water supply for the district, the following alternatives were configured:

- Alternative 1—Agricultural Blending
- Alternative 2—Direct Agricultural Use
- Alternative 3—Direct Industrial Use

A brief description of each alternative is provided in the sections below.

Alternative 1—Agricultural Blending

Blending the recycled water supply from MHCSD on a pattern of use that mirrors the agricultural diversions of the district provides the most implementable means of distributing recycled water to agricultural customers. Since the diversions to both divisions of district customers occurs at the Intake Channel, the maximum amount of blending could be accomplished by delivering recycled water to both the 45 Main South and North canals near the Intake Channel. There may be practical limitations to delivering recycled water to the Byron Division, given the need to cross the Intake Channel with a recycled water pipeline.

A blending option for agricultural reuse is deemed the most implementable because of water quality limitations. Although the projected water quality for the MHCSD recycled water would be acceptable for salt-tolerant crops, a blended supply would have even lower water quality restrictions. Therefore, the blended supply would be more useable within the district (even for less tolerant crops).

As shown in Exhibits 4 and 5, the recycled water supplies are available year-round. However, as evidenced in Exhibit 3, the diversions for agricultural uses essentially halt in the winter months, when there is limited agricultural demand for the water supply. Therefore, delivery to district canals would not be needed. Instead, the recycled water supply would be stored or discharged to the river by MHCSD. Based on typical storage ratios for agricultural reuse systems, approximately 7-to 8-months worth of recycled water would be required to significantly reduce the need to discharge. In this instance, an approximate storage volume of 4,000 to 4,500 acre-feet would be needed at maximum flow conditions (assuming the projected uses within the Mountain House community).

Alternative 2—Direct Agricultural Reuse

One option for using recycled water supplies within the district would be to deliver the available supply to a specific area of the district for direct use (i.e., without any blending). As noted previously, a salt-tolerant cropping mix would be required, along with increased agricultural management to monitor the salt balance within the root zone.

It is believed that unless a specific landowner expresses interest in obtaining the recycled water supply (instead of district supplies), this alternative is not implementable. It is not anticipated that this interest will be expressed by the various landowners within the district, given the availability, affordability, and superior water quality of the district's own supplies.

This alternative could be implemented by MHCSD if it acquired an easement or outright ownership of agricultural lands in proximity to the community for reuse. This approach is in effect what MHCSD is implementing for the initial development of the community. No discharge will be made to the river for the initial development; instead, the recycled water will be used to irrigate adjacent lands owned by the master developer. To fully utilize the available supply from MHCSD, approximately 1,200 to 1,500 acres of land (with forage crops) would be required to use all of the available supplies. In addition, a storage reservoir

in the same capacity as described for Alternative 1 would be needed to fully use the recycled water supply and significantly reduce the need for river discharge.

Alternative 3—Industrial Use

A third option for implementing recycled water use within the district would be to develop a program to deliver recycled water supplies to district industrial users. Since the Unimin Corporation is on the far western boundaries of the district and on the north side of the Intake Channel, it is not practical to develop a system to deliver recycled water to Unimin.

The site for the EAEC is significantly closer to the MHCSD wastewater treatment facility, making it a more logical choice for this alternative (assuming the EAEC is developed). Based on discussions with Calpine, the projected water quality from MHCSD could be conditioned for use within the EAEC. However, the costs of conditioning this water supply would be greater than the costs projected for using the district supply. The projected water requirement for the EAEC is approximately 4,600 acre-feet/year, which is within the projected limits of available supply projected at buildout from MHCSD (refer to Exhibit 3). However, because of the reduced availability of supplies in the summer from MHCSD (due to the use of recycled water within the community), continued use of the district's water supply for the EAEC would be required periodically throughout the year.

Recycled Water Infrastructure Requirements

Alternative 1—Agriculture Blending Infrastructure Requirements

For the purposes of this study, it was assumed that agricultural blending would occur only within the Bethany Division. To maximize the blending of the recycled water, the blending would occur within the Main Canal 45 South near the Bruns Road crossing.

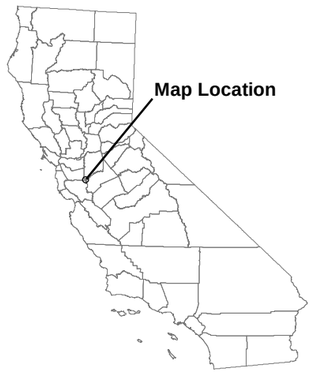
A 24-inch-diameter pipeline would be required to deliver the available flows from the MHCSD to the Main Canal at Bruns Road. Exhibit 7 presents the assumed routing of this recycled water pipeline, based on field reconnaissance of the available routes. This pipeline is approximately 6.8 miles long and traverses within or adjacent to Bethany Road, Byron Highway, and Bruns Road. A pump station with approximately 7,800 gpm capacity would be required at the MHCSD wastewater treatment plant.

For the purposes of this study, the addition of storage at the MHCSD has not been included. This approach was taken because the availability of land for the storage reservoir in the area is uncertain.

Alternative 2—Direct Agricultural Use Infrastructure Requirements

No specific infrastructure requirements were developed at this time for this alternative. Because of the site-specific nature of this alternative (i.e., a specific landowner or group of landowners come forward to use the water exclusively), it is not possible to define the infrastructure requirements. The requirements would include a pump station and transmission pipeline from the MHCSD treatment plant to the reuse site. On-site irrigation system improvements may be necessary to fully utilize the recycled water supply and to effectively manage this application.

EAEC



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Scale is Approximate

Exhibit 7
Agricultural Blending Alternative
Recycled Water Feasibility Study

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Alternative 3—Industrial Use Infrastructure Requirements

The infrastructure requirements for this alternative were developed assuming that the EAEC would be developed and would use the maximum amount of available recycled water from MHCSD. As noted previously, there would still be a need to deliver District water supplies to the EAEC with this alternative, as there are times during the year (primarily in the summer) when there is insufficient available supplies from MHCSD to meet the EAEC requirements (even under buildout conditions).

A 24-inch-diameter pipeline would be required to deliver the available flows from the MHCSD to the EAEC along Mountain House Parkway. Exhibit 8 presents the assumed routing of this recycled water pipeline, based on field reconnaissance of the available routes. This pipeline is approximately 4.6 miles long and traverses within or adjacent to Bethany Road, Byron Highway, and Mountain House Parkway. A pump station with approximately 7,800 gpm capacity would be required at the MHCSD wastewater treatment plant.

For the purposes of this initial feasibility study, the addition of storage at the MHCSD has not been included. This approach was taken at this phase of the study since the availability of land for the storage reservoir in the area is uncertain.

Estimated Costs

To develop an approximate range of costs associated with implementing the recycled water alternatives described in this study, an order-of-magnitude construction cost estimate was prepared. This estimate was based on typical cost-curve data and previous experience with conveyance system costs in the general area. The estimate is order-of-magnitude in nature, which would be expected to have a range of +30 to –50 percent of the final construction cost.

In addition to the estimated construction costs for the alternatives, additional costs associated with project implementation were estimated. These costs would include environmental documentation and permitting, land acquisition, preliminary and final design, construction administration and inspection, and legal costs. These costs were added on a percentage basis to the estimated construction costs, to develop a range of expected capital costs for the project.

EAEC

Map Location

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2000 0 2000

Scale is Approximate

Exhibit 8
Direct Industrial Reuse Alternative
Recycled Water Feasibility Study

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Exhibit 9 summarizes the results of this cost analysis for the project alternatives.

EXHIBIT 9
Estimated Capital Costs

Cost Component	Alternative 1	Alternative 3
Pump station	$500,000	$500,000
Pipeline	$5,900,000	$4,030,000
Accessways	$100,000	$100,000
Line valves	$100,000	$100,000
Air release valves	$25,000	$25,000
Electrical system improvements	$300,000	$300,000
Subtotal	$6,925,000	$5,055,000
Construction Contingency (20%)	$1,385,000	$1,010,000
Subtotal Construction Cost	$8,310,000	$6,065,000
Other Project Costs		
Mobilization	$620,000	$450,000
Right-of-way acquisition	$50,000	$50,000
Environmental documentation	$250,000	$250,000
Design, plans, and specifications (10%)	$830,000	$610,000
Administration and inspection (10%)	$830,000	$610,000
Subtotal—Other Costs	$2,580,000	$1,970,000
Total Project Costs	**$10,890,000**	**$8,035,000**

Construction costs based on May 2001 cost conditions.

Institutional Requirements

Water Rights/Instream Flow Requirements

Implementation of recycled water programs is commonplace throughout the state. In general, the use of recycled water is viewed favorably as a means of emphasizing conservation, while also reducing the potential water quality impacts that result to surface water receiving streams due to discharges.

In some instances, however, the State Water Resources Control Board (SWRCB) has implemented restrictions on using recycled water supplies. These restrictions have arose because of the potential reduction in instream flows that would have resulted through the implementation of recycled water programs in instances where the discharge streams were "effluent-dominated." Rulings by the SWRCB in the past 5 years have resulted in an increased allocation to instream flow benefits associated with recycled water discharges, to

the extent that in some instances, the reduction in discharge (and subsequent reuse of the water) was partially limited.

In the instance of the MHCSD/BBID program, should it be developed, it is expected that there would not be an issue with instream flow requirements. This is because there is no discharge of recycled water being made to the receiving waters from MHCSD, because the community is not yet developed. Absent this prior discharge, it is believed very unlikely that the SWRCB would require a discharge to protect a currently non-existent instream flow benefit.

Agricultural Community Perspectives

In recent years, there has been an increased perception in some parts of the statewide agricultural community that the practices of using recycled water are not amenable with good agricultural management. This perspective has been evidenced, in part, in the legislative prohibition of recycled water supply usage within Delta areas. This perspective has also been evidenced in periodic positions taken by various food processing corporations in California and in other states. In some instances, food processors have been reluctant to accept crops that have been grown using recycled water supplies.

At the MHCSD, the treatment processes planned will result in a recycled water quality that is essentially pathogen free and suitable for unrestricted reuse. This water quality is currently being used in many locations for agricultural crops, and, in some instances, for direct-pick produce (e.g., Monterey/Salinas River area, Orange County/Irvine Ranch, and Santa Rosa). It represents the treatment standard for agricultural reuse within the state.

However, the perspectives of the agricultural community will be significant for the successful implementation of recycled water on agricultural crops. If the district wishes to further implement an agricultural option, it is recommended that additional time be spent with the agricultural interests to review the water quality and suitability of the supply for a wide variety of uses.

Contractual Requirements

As the water purveyor in the area, the district has the responsibility to develop and deliver water supplies to its customers. If a recycled water supply were to be integrated into the district's overall water supplies (either to agricultural blending or direct industrial use), a contractual relationship would be required between the district and MHCSD. This contractual relationship would define the mutual requirements of the two parties, including cost sharing of both capital and annual cost components for the system. The contract should also define the respective requirements of the district and MHCSD with regard to requirements placed on the system by the RWQCB and the Department of Health Services (DHS).

Evaluation of Potential Alternatives

Both Alternatives 1 and 3 offer an opportunity to integrate a potentially available recycled water supply from the MHCSD into the district's overall water resources mix. Alternative 1 is more costly to implement than Alternative 3 given the increased transmission pipeline

size and length, but it provides the recycled water supply to the largest customer base within the district. Alternative 3, as configured with the assumed development of the EAEC, provides the district with an opportunity to deliver recycled water to the primary industrial user within the district.

Both alternatives increase the overall flexibility and reliability of the district's water supply, although Alternative 1 would extend this benefit to a broader range of district customers. Institutional limitations (stakeholder concerns) are more likely to be managed with Alternative 3, since the district would be dealing with one customer for the recycled water supply (Calpine Corporation).

Neither Alternative 1 nor 3 were found to have any fatal flaws at this stage of the analysis. It is likely that the environmental documentation of either alternative would be straightforward.

Conclusions and Recommendations

Recommended Alternative

It is recommended that the district continue to develop the direct industrial use alternative (Alternative 3) as the initial alternative for consideration of using recycled water. By focusing the initial development on the EAEC opportunity, the district will be able to start with a single, major customer and potentially build the program in the future.

Implementation Recommendations

Following acceptance of this feasibility by the Board of Directors, the following implementation steps are recommended for the recycled water program.

Review Results of Report with Major Stakeholders

The district should review the results of the recycled feasibility report with the Calpine Corporation and the MHCSD. These meetings should focus on discussing the remaining issues associated with implementation. A memorandum of understanding could be developed to outline the process by which the project would proceed to full implementation.

Review/Revise Board Policies and Rules and Regulations

It is likely that the Board should adopt refinements to district policies, rules, and regulations that would provide guidance on the development and implementation of recycled water projects within the district. These policies should identify the district as the purveyor of recycled water supplies within its boundaries. In addition, rules and regulations that address water use standards for recycling, recycled water pricing, and rate impacts on existing customers will be appropriate.

Refine Cost Estimates and Engineering Issues

The feasibility study is based on a conceptual level of engineering development. As more detailed discussions with Calpine Corporation and MHCSD occur, there will be a need to refine the engineering issues and estimated construction costs associated with the project. This additional refinement of engineering issues (e.g., is there a desire on the part of

MHCSD to include storage in the project components?) will also be necessary to complete a detailed project description for subsequent environmental documentation.

Perform Environmental Documentation of Project

The degree of environmental documentation required for the project is still to be determined. Coordination with Calpine is necessary, since it will also be preparing environmental documentation (through the California Energy Commission) for the EAEC. It is possible that the Calpine environmental documentation would address all of the potential impacts (believed to be limited) associated with using recycled water at the EAEC.

Implement Agreements for Water Service

Following the completion of environmental documentation for the project, the district would then be in a position to negotiate agreements with both Calpine and MHCSD. These agreements would specify the specific terms, including cost allocation provisions, for developing the recycled water project.

Design, Construct, and Startup System

Once the agreements with MHCSD and Calpine have been completed, the district can design, construct, and start up the system.

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