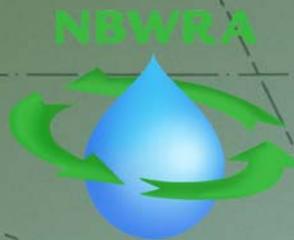


Sonoma County Water Agency and Bureau of Reclamation

Phase 3 Engineering and Economic/Financial Analysis Report North San Pablo Bay Restoration and Reuse Project

June 2008

Prepared in cooperation with:
North Bay Water Reuse Authority



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Executive Summary

Recognizing the growing need for an integrated and regional approach to water management, four wastewater utilities and one water agency in the North San Pablo Bay region of California have joined forces to plan a project that would considerably expand the use of recycled water region-wide.

The proposed North San Pablo Bay Restoration and Reuse Project (Project) would build on commitments to long-term inter-agency cooperation to address common needs related to reliable water supplies and enhanced environmental restoration. As implementation of the Project would likely require external funding assistance, the investigation and development of the Project is being carried out in conformance to the requirements of the U.S. Department of the Interior's Bureau of Reclamation Public Law 102-575, Title XVI, which provides a mechanism for Federal participation and cost-sharing in approved water reuse projects.

The five participating agencies have organized themselves under a Memorandum of Understanding (MOU) as the North Bay Water Reuse Authority (Authority). The Authority members include:

- The Las Gallinas Valley Sanitary District (LGVSD)
- The Novato Sanitary District (Novato SD)
- The Sonoma Valley County Sanitation District (SVCSD)
- The Napa Sanitation District (Napa SD)
- The Sonoma County Water Agency (SCWA).

North Marin Water District and Napa County are also providing technical and financial support to the Authority.

The Authority members undertook cooperative planning efforts over a 5-year period – including 19 technical workshops as well as monthly institutional workshops, with extensive outreach to potential Project stakeholders – to define shared issues and develop feasible alternatives toward definition of a region-wide recycled water project that would enable them to address those issues.

This report, representing part of the third phase of a three-phase planning effort, presents an engineering feasibility evaluation and economic and financial analysis of the proposed project. The report describes the Project area and the key water management problems and needs within the Project area, identifies water reuse opportunities in the Project area, develops and analyzes alternative measures that could address the identified water management needs, presents an overview of associated legal and institutional requirements, compares the alternatives, presents an

economic and financial analysis of the proposed Project, and discusses potential environmental effects of the Project.

In short, this report provides the engineering and economic studies that guide the Authority's selection of a recommended Project for funding and implementation. Along with the environmental documentation that is currently underway, these three elements will form the complete Project feasibility study report.

Project Setting and Future Conditions

As shown in Figure ES-1, the initial study area encompasses approximately 318 square miles of land within Marin, Sonoma, and Napa Counties. This region extends some 10 to 15 miles inland of the tidal San Pablo Bay, with a total population of over 270,000 in the major urban centers of San Rafael, Novato, Petaluma, Sonoma, and Napa. The region supports agriculture, including predominantly some of the premier wine-grape growing land in North America, as well as light industry, commercial and institutional uses, parklands, and residential areas. It is an area of natural and cultivated appeal and productivity, all proximate to the additional cultural attractions of the greater San Francisco Bay Area.

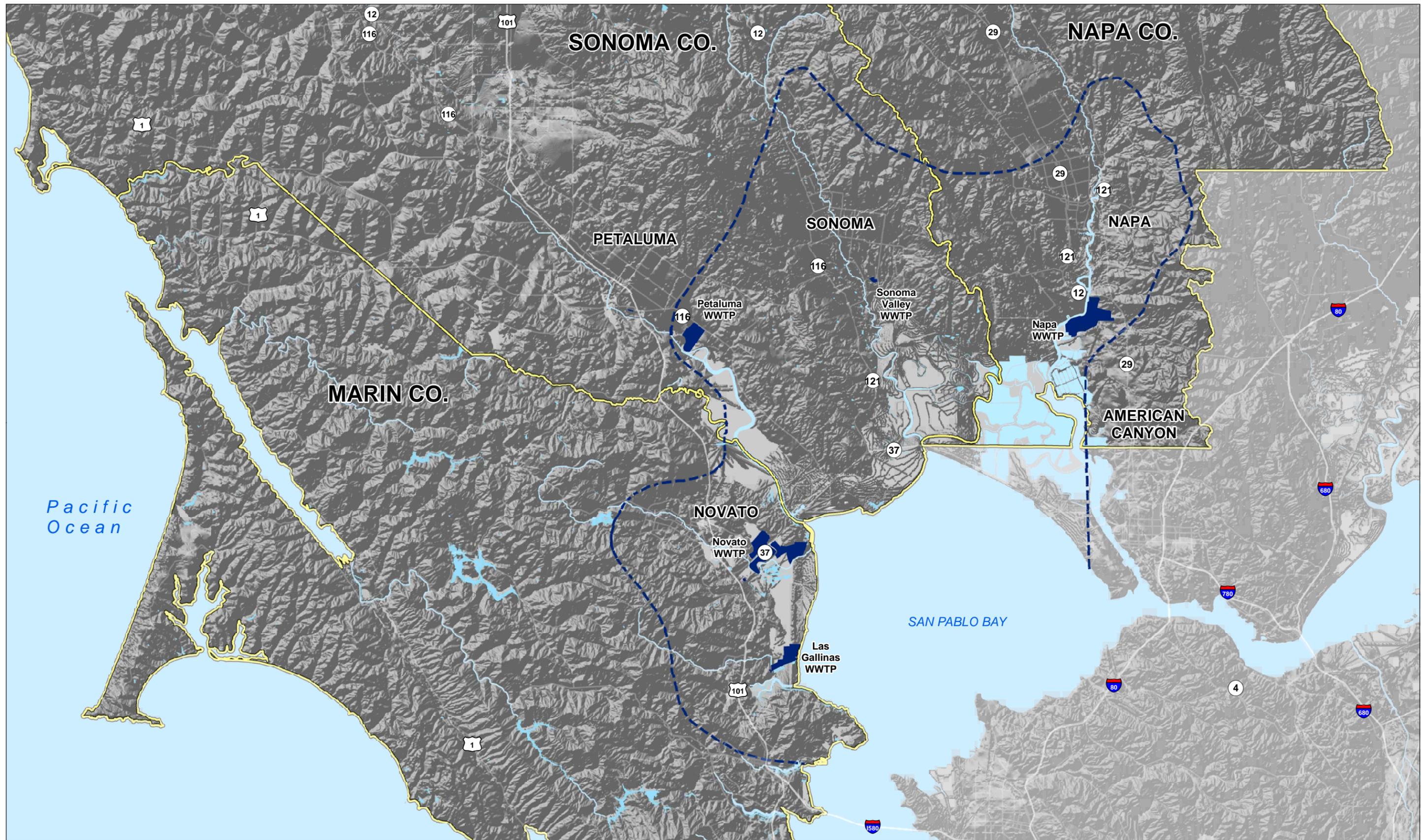
The waterways of this region – the Napa River, Sonoma Creek, and Petaluma River, as well as smaller streams, some of which support only seasonal flows – are tributary to the San Pablo Bay estuary. Although threatened until recently by development, the remaining tidal wetlands of the San Pablo Bay estuary serve in a vital ecological role as nurseries for fisheries and wintering areas for migratory waterbirds.

Local and regional planning projections indicate that there will be sustained pressures for residential growth in the study area, with estimates of 10-12 percent growth in most of the existing urban centers by the year 2020 (as compared to 2005 populations). Existing policies in principal cities will tend to favor concentrated rather than dispersed growth.

Agricultural land use is expected to remain relatively constant over a 20-year planning period, and all three County governments in the study area have explicit policies in place to protect agricultural lands. Given the high value of wine-grape culture, there is unlikely to be much change in the 75 percent of agricultural acreage committed to vineyards.

With the removal of Petaluma from the Project¹, total urban water use – including both residential and non-residential uses – in the study area is projected to increase from the 2005 level of 63,700 acre-feet per year (AFY) to about 72,800 AFY in 2020. Total water use for irrigation of agricultural lands is estimated at approximately 23,300 AFY at present.

¹ After initial evaluation was concluded for the Project, Petaluma decided not to participate in the Project. See Section 1.3 for a discussion of Petaluma's participation.



Basemap: U.S. Department of Agriculture, 2001

Legend

- - - Initial Study Area Boundary
- WWTPs

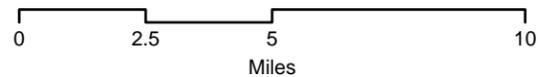


Figure ES-1
Initial Study Area

Meeting these water demands are sources that include surface water supplies (both internal and external to the study area), groundwater, and recycled water. SCWA supplies much of the study area with *surface water* conveyed from the Russian River and its tributaries in central Sonoma County, external to the study area. SCWA's reliable supplies to customers in the study area are 87,970 AF during a dry year.

Groundwater serves many agricultural users (and some residential users) as a primary source of supply and serves as a secondary source of supply for some urban users as well, notably the City of Sonoma and Valley of the Moon Water District. Although the total quantity of groundwater in the study area is unknown, groundwater pumping has been measured. The vast (80 percent) increase in pumping of groundwater in the past 30 years to support agricultural irrigation has resulted locally in groundwater outflow exceeding inflow, some impacts on groundwater quality, and a lowering of groundwater levels in some parts of the study area that are dependent on groundwater supplies.

Existing treatment and distribution infrastructure in the study area currently produce about 7,300 AFY of *recycled water* for irrigation and wetlands restoration purposes, which could increase to 11,250 AFY by 2020.

At first glance, average year and wet season conditions appear to yield sufficient water to meet total annual demand in the study area. This conclusion gives a distorted – and inaccurate – picture of water use in this area, however. In fact, the seasonal availability of some water sources (against the strong seasonality of agricultural demand), the potential for overdraft of groundwater with impacts on quality and quantity, and the growth pressures on the area's urban centers all argue for an effective, coordinated, and regional approach to the increased use of recycled water.

Problems and Needs

The water management concerns of the North San Pablo Bay study area can be summarized as follows:

- The agricultural economy, dominated by high-value vineyard agriculture, needs a highly reliable water supply to maintain and to expand its base.
- Urbanization of the greater San Francisco Bay area requires highly reliable water supplies.
- The vitally important estuarine ecosystem of the North San Pablo Bay area, which includes endangered species and vital wetlands, has been under intense pressure. Although protective and restorative measures are in place, the habitat requires a reliable supply of water.

- Surface waters are becoming less reliable sources of supply as they are already diverted by multiple users, have low flows in the summer (which coincides with the irrigation season), and can have low flows in dry years.
- Groundwater supplies are heavily pumped for agricultural and limited municipal uses and in some localities have marginal quality.

These concerns are all among those addressed in the planning issues originally agreed to by the participating agencies of the Authority.

Water Reuse Opportunities

The principal governing document for regulating the use of recycled water in California is the California Code of Regulations Title 22, Division 4, Chapter 3, commonly referred to as Title 22. Title 22 defines four levels of recycled water quality standards, with the most stringent being disinfected tertiary recycled water, which is suitable for unrestricted use in agricultural and landscape irrigation, as well as for environmental (wetlands) restoration.

These high-order uses are in fact the intended uses of recycled water under the Project. Some 34,000 acres of land in the study area appear suitable for irrigation, 75 percent of it being vineyards and the remainder comprising urban landscaping, dairy/pasturelands, other irrigated farmland, and orchards. The estimated maximum water use for irrigation of these lands in the study area is about 23,300 AFY at present.

The potential sources of disinfected tertiary recycled water are the four wastewater treatment plants (WWTPs) in the study area. The dry-season (June through October) discharge flows (in million gallons per day [mgd]) for these WWTPs are:

Recent WWTP Dry Weather Flows in North San Pablo Bay Study Area		
Wastewater Treatment Plant	2002 Average Dry Weather Flow	Existing or Currently Planned Tertiary Treatment Capacity
LGVSD WWTP	2.1 mgd	2.0 mgd currently delivered to Marin Municipal Water District for tertiary treatment
Novato SD WWTP	5.0 mgd	Existing capability for 0.5 mgd Title 22 disinfected tertiary treatment
SVCSD WWTP	2.6 mgd	Existing capability for 16.0 mgd Title 22 disinfected tertiary treatment
Napa SD WWTP	6.2 mgd	Existing capability for 8.8 mgd Title 22 disinfected tertiary treatment

All of the WWTPs deliver recycled water during the dry season, when the Regional Water Quality Control Board imposes restrictions on discharge of secondary effluent to waterways. SVCSD and Napa SD have the most extensive infrastructure in place for conveyance, storage and distribution of recycled water to local users. All the WWTPs currently have the capability to produce disinfected tertiary recycled water conforming to Title 22 requirements for unrestricted use. All of the agencies have

projects in various stages of planning and implementation to increase treatment capacity or plan to increase the local use of recycled water, if funding is available. Full implementation of those individual local projects would result in WWTP discharge and beneficial reuse at the following levels in 2020:

Potential Year 2020 WWTP Discharge and Beneficial Reuse Volumes in Study Area		
Wastewater Treatment Plant	WWTP Flow (AFY)	Beneficial Reuse (AFY)
LGVSD WWTP	3,671	902
Novato SD WWTP	8,673	1,015
SVCSD WWTP	5,506	3,000
Napa SD WWTP	9,800	4,540
TOTAL	27,650	9,457

The potential for use of recycled water in the study area is not limited by demand but rather by the limited capacity for tertiary treatment and by the lack of regional conveyance and storage networks that would deliver disinfected tertiary recycled water where and as needed. Acting individually and locally, the districts have only a very limited ability to maximize their potential for water reclamation and reuse. Adopting a regional outlook and plan, however, greatly expands the potential for beneficial water reuse by the Authority.

For purposes of developing and evaluating alternatives for a regional water recycling project, it is assumed that the WWTPs will have developed, at a maximum, the following capacities for producing Title 22 tertiary recycled water (increased to reflect the peak daily dry weather flow demands of the anticipated local users supplied by the WWTP), as a part of the overall Project investment and implementation. These values reflect the maximum treatment needed to implement the largest recycled water system. Actual treatment capacity will depend upon the alternative chosen.

Assumed Future Tertiary Treatment Capacity in WWTPs of the North San Pablo Bay Study Area	
Wastewater Treatment Plant	Assumed Maximum Tertiary Capacity for Project
LGVSD WWTP	3.1 mgd
Novato SD WWTP	10.4 mgd
SVCSD WWTP	16.0 mgd
Napa SD WWTP	17.9 mgd
TOTAL	47.4 mgd

These recycled water production values are assumed in the development and evaluation of Project alternatives, as described in the following section.

Formulation and Description of Project Alternatives

Working in close collaboration with the participating agencies of the Authority, the Project study team organized an array of Project options as characterized by existing, agency-identified, and potential recycled water projects in the study area; by the size of recycled water distribution network (basic regional, regional, and expanded regional) that would be involved; and by storage options (no new storage, partial storage, and full storage of recycled water supplies).

This process led to the formulation of six initial Project alternatives – one basic regional alternative, four expanded regional alternatives, and one interconnected regional system alternative. As each alternative had three possible storage options associated with it, there were a total of 18 alternatives considered.

Preliminary analysis indicated that the alternatives with “no new storage” would make insufficient use of recycled water to merit further consideration. Alternatives with “full storage”, on the other hand, would be prohibitively costly to implement. Consolidation and rationalization of the remaining six “partial storage” options left three action alternatives to be carried forward for feasibility analysis.

These three action alternatives are defined as follows:

- **Alternative 1 (Basic Regional System)** – The most basic regional system of the three Project action alternatives, putting first emphasis on the implementation of recycled water projects local to each WWTP. Under this alternative, no WWTPs are connected for joint treatment, storage, or distribution of combined recycled water. Area-wide, the recipients of recycled water include the urban users in Novato, the existing SVCSD reuse area, the Sonoma Valley Recycled Water Project, Carneros East area, the Napa Milliken-Sarco-Tulocay (MST) Creeks area, and the Napa Salt Marsh restoration area.
- **Alternative 2 (Regional System)** – A larger regional recycled water system that takes advantage of increased storage capacity and additional pipelines to distribute recycled water more widely throughout the Project area than could be achieved under Alternative 1. Interconnectivity between WWTPs occurs between SVCSD and Napa SD to serve the Napa Salt Marsh Restoration Area during the restoration period, and between Novato SD and LGVSD to serve the Sears Point Area. Area-wide, the recipients of recycled water include the Peacock Gap golf course, urban users in Novato, agricultural users in the Sears Point Area, the existing SVCSD reuse area, the Sonoma Valley Recycled Water Project, the Southern Sonoma area, Carneros East area, the Napa MST area, and the Napa Salt Marsh restoration area.
- **Alternative 3 (Interconnected Regional System)** – A regional system that connects all four wastewater treatment plants in the Project area, thereby maximizing reuse by potentially enabling recycled water from any WWTP to be delivered to any area that needs recycled water. In actual operation, each WWTP would put first priority on delivery of recycled water to local projects, with excess recycled water being sent into the regional recycled water delivery system for use in more distant

locations of the Project area. Areawide, the “local” recipients of recycled water would include the Peacock Gap golf course, urban users in Novato, the existing SVCSD reuse area, the Sonoma Valley Recycled Water Project, the Napa MST area, and the Carneros East area. The “regional” recipients would include the agricultural users in Sears Point, the Southern Sonoma Valley, and the Central Sonoma Valley areas, as well as the Napa Salt Marsh restoration area.

Within the alternatives described above, the Authority members have collectively prioritized the projects within their individual service areas to identify a phased implementation plan under any of the alternatives being considered. The first phase (Phase 1) of alternative implementation includes projects that each member agency has defined to a level of detail that allows both for project-level environmental review in other sections of the feasibility study, and short-term readiness for design, funding, and construction. Each treatment plant puts first priority on the delivery of recycled water to its local projects. Local projects include the Novato urban users, the Sonoma Valley Recycled Water Project, the Napa MST area, and the Napa Salt Marsh restoration area.

A fourth alternative, the “No Action Alternative”, assumes that there is no joint Project. It essentially represents the “current status” in which the potential need to develop additional potable water supplies continues to be a regional challenge, and additional treatment capacity and water recycling might occur strictly from the implementation of local plans for expansion, as funding is available.

Of the action alternatives, Alternative 1 has the lowest associated costs and provides the least recycled water supply; Alternative 3 has the highest costs and provides the greatest amount of recycled water. The differences in cost among the alternatives stems from the successively greater installation of pipelines, storage, treatment, and pumping facilities associated with each in turn.

The recycling benefits and costs of the alternatives are summarized below:

Summary of Recycling Capacity and Associated Costs of Alternatives of the North San Pablo Bay Restoration and Reuse Project					
Action Alternative	New Recycled Water Demand (Beneficial Reuse) Developed by the Alternative⁽¹⁾	Total Recycled Water Demand in the Project Area (w/Project)	Discharge to Bay	Estimated Capital Costs (millions)	Estimated Annual Operations & Maintenance Costs (millions)
No Action Alternative	0 AF	4,944 AF	22,711 AF	\$270 M	--
Alternative 1 – Basic Regional System	6,455 AF	11,329 AF	16,256 AF	\$210 M	\$1.8 M
Alternative 2 – Regional System	11,215 AF	16,159 AF	11,496 AF	\$378 M	\$2.8 M
Alternative 3 – Interconnected Regional System	12,725 AF	17,669 AF	9,986 AF	\$414 M	\$3.1 M

⁽¹⁾ The new recycled water demand developed by the alternatives represents total beneficial reuse to customers. Additional recycled water is available from SVCSD and Napa SD for the Napa Salt Marsh which is not included in these totals, as the amount of water needed for the Napa Salt Marsh is unknown at this time. Supplying recycled water to the Napa Salt Marsh would further reduce discharges to San Pablo Bay.

Legal and Institutional Requirements

The following issues define the principal legal and institutional framework of the Project.

- **Organizational structure** – For purposes of joint planning, the five participating entities of this Project have executed an MOU to work as the North Bay Water Reuse Authority, with SCWA acting as Administrative Agency on behalf of the Authority. The participants may agree to form a joint powers authority when the Project becomes operational.
- **Agency consultation** – The Authority has initiated informal “information discussions” with the federal, state, and local agencies that will be required to review Project plans for conformance to applicable laws and regulations, particularly with regard to environmental documentation. The Authority has also conducted outreach to water districts within whose service areas the Project would deliver recycled water, both for informational purposes and to determine their interest in participating in the Project.
- **Effects of recycled water use** – The Project would alter the disposition of recycled water by reducing discharge into the San Pablo Bay and its tributaries and instead providing increased recycled water supply to agricultural, urban, and habitat restoration uses. The main economic benefit of the Project, to be weighed against its estimated costs, would be to increase the reliability of water supplies for urban and agricultural irrigation. Environmental benefits include a reliable water supply for the Napa Salt Marsh and potentially improved water quality in San Pablo Bay and its tributaries for fisheries and wildlife habitat.
- **Water rights effects** – The Project will not affect the water rights of downstream water users, as water downstream of the participating communities is brackish and not suitable for most potable and irrigation purposes. Potential recipients of recycled water are protected by California Water Code from any loss of their existing rights to surface water supplies.
- **Regulatory requirements** – The study team has identified some 25 Federal, State, and local agencies as well as private utilities that must be contacted for purposes of Project review, coordination/consultation, and permitting. Federal and State regulatory requirements having greatest bearing on the Project include Title 22, the California Department of Fish & Game Code, and the California Water Code.

It is affirmed that the Project will not adversely affect any of the participating agencies’ contractual water supply obligations for recycled water; existing recycled water customers would continue to be served as they are now served.

Recommended Alternative

Based on the analysis presented, the Authority believes Alternative 1 is the most viable based on implementability, storage issues, and costs.

- Alternative 1 requires the least amount of system storage of the action alternatives, making use of existing storage or land available at the WWTPs. Implementing the larger recycled water distribution systems would require 1,400 to 1,800 AF of more storage.
- The capital costs of both Phase 1 of Alternative 1 and a fully-developed Alternative 1 are lower than the respective capital costs of the other alternatives. The cost of delivering recycled water must be cost effective for the member agencies to implement any alternative. Larger alternatives may be too costly (in terms of construction and environmental documentation) for the agencies to pursue without additional external funding at this time.
- At this time, implementation of Alternative 1 would begin with the projects identified as Phase 1, due to current funding opportunities. These projects have been recognized as those most ready for implementation due to the level of detailed analysis already prepared.

Economic and Financial Capability Analysis

The economic analysis evaluates whether the Project is cost-effective and would provide net economic benefits to the Authority region. The economic analysis uses the alternative cost method to determine water supply benefits of the Project. The Project's water supply benefits would occur by providing recycled water for urban landscape, agricultural, and environmental uses. The Project costs are compared to non-recycled projects that could potentially serve the same region and are indicative of new surface water supply costs for the region: the proposed Water Supply, Transmission, and Reliability Project (Water Project) for the Sonoma and Marin Counties portion of the Project area; and imported water to the MST area for the Napa County portion of the Project area². Due to current funding opportunities, the Project costs evaluated are for the first set of projects implemented under Alternative 1, referred to as the Phase 1 set of projects. The following table summarizes the results.

² Although these non-recycled water supply projects would not serve agricultural users in Sonoma Valley or environmental water needs in the Napa Salt Marsh, this analysis assumes that those non-recycled water projects are representative of water supply costs in the region. Therefore, the project costs are used as alternative cost measurements for agricultural and environmental water supplies.

Phase 1 and Non-Recycled Projects Summary Cost Comparison			
	Alternative 1 Phase 1	Water Project (Sonoma and Marin Counties Portion of Project area)	Import Water to MST Area (Napa County portion of Project area)
Total Capital Costs	\$121,000,000	\$174,479,487	\$95,700,000
Annual Capital Costs ⁽¹⁾	\$4,702,725	\$6,781,232	\$3,719,428
Annual O&M Costs	\$1,381,000	N/A ⁽²⁾	N/A ⁽²⁾
Total Annual Costs	\$6,083,725	\$6,781,232	\$3,719,428
Supply (AF)	4,645	3,613	1,937
Dollar per acre-foot	\$1,307	\$1,877	\$1,920

⁽¹⁾ Capital costs are annualized based on 50-year project life and 3 percent real discount rate.

⁽²⁾ Not available

The Project would be less expensive to implement relative to both non-recycled water projects; therefore, it would have net economic benefits to the region. Based on the alternative cost method, the water supply benefits of the project would be between \$1,877 and \$1,920 per acre-foot. The Project would also provide various indirect benefits, including improved groundwater quality and levels and reduced operational costs for the member agencies. The economic analysis concludes that the Project would result in net benefits to the region.

The financial capability analysis discusses a preliminary funding plan for the local cost share of the Project. The Authority members have not yet developed a firm financing plan. The federal share of funding is expected to be \$25 million. Preliminary discussions have indicated Authority members would finance the local share through State and local grants, if available, and loans and revenue bonds. Loans and bonds would be repaid primarily through user fees, both for wastewater service and for recycled water supply deliveries. Through signing the MOU, completing this feasibility study, and developing an environmental impact statement/environmental impact report, the Authority members have shown a commitment in implementing the Project. A final cost-sharing plan and a more thorough analysis of financial capability will be developed before a construction funding agreement with the United States is executed.