

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 regionwide.

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 as the North Bay Water Reuse Authority (Authority). The Authority members include:

- The Sonoma County Water Agency (SCWA), as Administrative Agency
- 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 Authority members undertook cooperative planning efforts over a 30-month period – including 17 bi-monthly technical workshops as well as monthly institutional workshops, with extensive outreach to potential Project stakeholders – to define shared objectives and develop feasible alternatives toward definition of a regionwide water reclamation and reuse project that would enable them to meet those objectives.

This report – representing the second phase of a three-phase planning effort – presents a draft engineering feasibility evaluation of the proposed project. The report describes the proposed 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, and presents an overview of associated legal and institutional requirements.

In short, this report establishes the basis for the detailed economic, environmental, and financial analyses to follow in the Authority's third phase of effort, analyses that

will lead to the Authority's confirmation of a recommended Project for funding and implementation.

Project Setting and Future Conditions

As shown in Figure ES-1, the 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 of the North American continent, 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 greater San Francisco.

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. 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.

Within the study area, total urban water use – including both residential and non-residential uses – is projected to increase from its current level of 75,684 acre-feet per year (AFY) to a year-2020 level of 86,722 AFY. Total water use for irrigation of agricultural lands is estimated at 34,428 AFY at present.

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* that is conveyed from the Russian River and its tributaries in central Sonoma County, external to the study area. This amounts to 212,920 AF during an average year and 87,970 AF during a dry year.

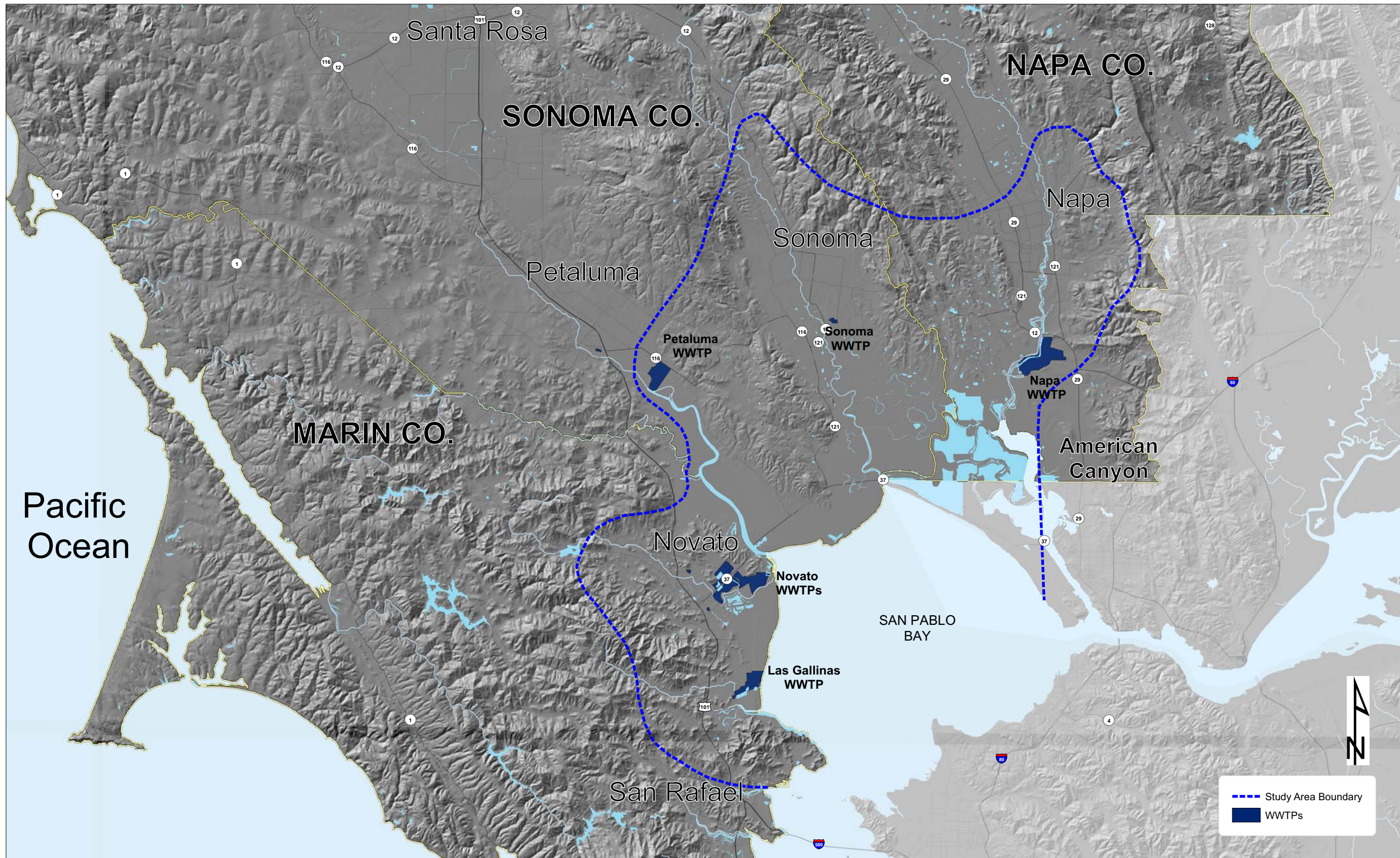


Figure ES-1
Study Area



Base Map: US Department of Agriculture, 2001

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 cities of Petaluma and Sonoma. Although the total quantity of groundwater in the study area is unknown, the vast (80 percent) increase in pumping of groundwater to support agricultural irrigation in the past 30 years 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 currently produce 10,013 AFY of *recycled water* for irrigation and wetlands restoration purposes, which could increase to 14,882 AFY by 2020. Completion of new facilities that are currently planned or under construction by the City of Petaluma, SVCSD, and Napa SD could increase this another 5,360 AFY by 2025.

At first glance, average-year and wet-season conditions would appear to yield sufficient water to meet total 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 problems and needs of the North San Pablo Bay study area can be summarized as follows:

- The agricultural economy, which is dominated by high-value vineyard culture, needs highly reliable water supply to maintain and to expand its base.
- Growing urbanization of the greater San Francisco Bay area imposes increasing demand on water supply and needs highly reliable sources of supply.
- The vitally important estuarine ecosystem of the North San Pablo Bay area, which includes endangered species and vital wetlands, has been under intense pressure and while protective and restorative measures are in place the habitat requires reliable flow of clean water.
- Surface water supplies are not 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 municipal uses and in some localities have marginal quality.

- Estuarine waters, rivers, and streams are affected by pollutants, resulting in limitations on discharges from wastewater treatment plants and the possibility of more stringent limitations in the future.

These problems are all among those addressed in the planning objectives 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 (CCR) 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 virtually 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 North San Pablo Bay Restoration and Reuse Project. Some 40,000 acres of land in the study area appears suitable for irrigation, 75 percent of it being vineyards and the remainder comprising dairy/pasturelands, other irrigated farmland, urban landscaping, and orchards. The estimated maximum water use for irrigation of these lands is 34,428 AFY.

The potential sources of disinfected tertiary recycled water are the six wastewater treatment plants (WWTPs) in the five wastewater agencies of the study area (including the City of Petaluma WWTP, even though the City is not a member of the Authority). The permitted dry-season discharge limit (in million gallons per day) on these WWTPs is:

| Existing WWTP Discharge Volumes in North San Pablo Bay Study Area | | |
|--|---|---|
| Wastewater Treatment Plant | NPDES Dry Season Discharge Limit | Comments |
| Las Gallinas Valley Sanitary District WWTP | 2.92 mgd secondary effluent | 1.0-1.5 mgd currently delivered to Marin Municipal Water District for tertiary treatment and re-use |
| Novato Sanitary District WWTPs (2) | 6.55 mgd secondary effluent (combined) | 1.0 mgd tertiary treatment plant planned for 2007 implementation |
| City of Petaluma WWTP | 5.2 mgd secondary effluent | 5.2-mgd tertiary treatment plant planned for 2007 implementation |
| Sonoma Valley County Sanitation District WWTP | 3.0 mgd secondary effluent | 16.0-mgd tertiary treatment plant planned for implementation |
| Napa Sanitation District WWTP | 15.4 mgd secondary effluent | Existing capability for 8.8 mgd Title 22 disinfected tertiary treatment |

All of the wastewater treatment plants practice reuse during the dry season, when the Regional Water Quality Control Board (RWQCB) imposes restrictions on discharge of secondary effluent to waterways. The SVCSD and Napa SD have the most extensive infrastructure in place for conveyance, storage and distribution of recycled water to local users. Only the Napa SD has 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, and all except LGVSD plan to increase the local use of recycled water. Full implementation of those individual local projects would result in WWTP discharge and beneficial re-use at the following levels in 2020:

| Potential Year-2020 WWTP Discharge Volumes and Beneficial Reuse in North San Pablo Bay Study Area (Local Uses Only) | | |
|--|------------------------|-------------------------------|
| Wastewater Treatment Plant | WWTP Flow (mgd) | Beneficial Reuse (AFY) |
| Las Gallinas Valley Sanitary District WWTP | 3.28 | 902.6 |
| Novato Sanitary District WWTPs (2) | 7.74 | 2,142.9 |
| City of Petaluma WWTP | 7.70 | 3,070.0 |
| Sonoma Valley County Sanitation District WWTP | 4.92 | 2,747.7 |
| Napa Sanitation District WWTP | 8.75 | 4,540.5 |
| TOTAL | 32.38 | 13,403.6 |

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, which would enable unrestricted use of recycled water for agricultural irrigation and wetlands habitat restoration, 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 in fulfillment of the agreed objectives of the Authority.

For purposes of developing and evaluating alternatives for a regional water recycling project, it is assumed that the WWTPs will have developed the following capacities for producing Title 22 tertiary recycled water (equal to each plant's average wet-weather flow plus one standard deviation), as a part of the overall Project investment and implementation:

| Assumed Future Tertiary Treatment Capacity in WWTPs of the North San Pablo Bay Study Area | |
|--|--|
| Wastewater Treatment Plant | Assumed Tertiary Capacity for Project |
| Las Gallinas Valley Sanitary District WWTP | 6.4 mgd |
| Novato Sanitary District WWTPs (2) | 13.7 mgd |
| City of Petaluma WWTP | 13.1 mgd |
| Sonoma Valley County Sanitation District WWTP | 9.5 mgd |
| Napa Sanitation District WWTP | 13.6 mgd |
| TOTAL | 56.3 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, proposed, and potential recycled-water projects (existing, proposed, and potential) in the study area; by the size of recycled-water distribution network (local, subregional, and 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 Project alternatives – one highly localized alternative, four subregional alternatives, and one fully 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 “Project alternatives” to be carried forward for feasibility analysis.

These three Project alternatives are defined as follows:

- **Alternative 1 (Localized System)** – The most highly localized of the three Project alternatives, putting first emphasis on the implementation of recycled water projects local to each WWTP. Only the LGVSD and the Novato SD WWTPs are connected for joint treatment and distribution of recycled water. Area-wide, the recipients of recycled water include the Peacock Gap golf course, urban users in Novato, agricultural users in the Sears Point area, urban landscape and agricultural users in the Petaluma South area, the existing SVCS reuse area, the Sonoma

Valley recycled water project, Carneros East area, the Napa Milliken-Sarco-Tuluca (MST) Creeks area, and the Napa salt marsh restoration area.

- **Alternative 2 (Subregional System)** – A subregional 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. As in Alternative 1, the LGVSD and Novato SD WWTPs are connected for joint treatment and distribution of recycled water. Additionally, there are new transmission mains (1) conveying recycled water from the LGVSD-Novato SD joint WWTP for connection with (and augmentation of) the Petaluma recycled-water system, and (2) connecting the SVCSD and Napa SD recycled-water systems, providing more flexibility and opportunity for delivery of recycled water to reuse areas. Areawide, the recipients of recycled water include the Peacock Gap golf course, urban users in Novato, agricultural and urban landscape users in the Sears Point and Petaluma South areas, the existing SVCSD reuse area, the Sonoma Valley recycled water project, Carneros East area, the Napa MST Creeks area, and the Napa Salt Marsh restoration area, as well as the Southern Sonoma Valley area in future.
- **Alternative 3 (Regional System)** – A fully regional system that connects all six wastewater treatment plants in the Project area, thereby maximizing reuse by 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 Creeks area, and the Carneros East area. The “regional” recipients would include the agricultural and urban landscape users in Petaluma South, the Southern Sonoma Valley, and the Central Sonoma Valley areas, as well as the Napa Salt Marsh restoration area.

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

Of the three “Project alternatives”, Alternative 1 has the lowest associated Project costs and provides the least recycling of wastewater; Alternative 3 has the highest costs and provides the greatest recycling of wastewater. The differences in cost among the three alternatives stems from the successively greater installation of pipelines and storage and pumping facilities associated with each in turn; the addition of tertiary treatment capacity is assumed to be the same for all three.

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

| Summary of Recycling Capacity and Associated Costs of Action Alternatives of the North San Pablo Bay Restoration and Reuse Project | | | | |
|---|----------------------------|-------------------------|------------------------------|---|
| Action Alternative | Total Reuse Service | Discharge to Bay | Overall Capital Costs | Overall Life-Cycle Costs¹ |
| Alternative 1 – Localized System | 21,720 AF | 12,605 AF | \$186.0M | TBD |
| Alternative 2 – Subregional System | 28,668 AF | 5,657 AF | \$265.7M | TBD |
| Alternative 3 – Regional System | 30,247 AF | 4,078 AF | \$301.9M | TBD |

1: To be determined during Phase 3.

In Phase 3 of Project effort, the Authority and its consultants will provide detailed analysis of the economic and environmental benefits and effects of these three action alternatives and the no-action alternative. The study team will also evaluate the financial capacity of the Project participating members to undertake the implementation of the Project and sustain its operation.

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 a Memorandum of Understanding 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 (JPA) 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 area 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 agricultural irrigation. The main environmental benefit, to be weighed against real or perceived environmental impacts, would be to improve water quality in San

Pablo bay and its tributaries by reducing the discharge of treated wastewater effluent.

- ***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 CCR, the California Fish & Game Code, the Federal Clean Water Act, the State Porter-Cologne Water Quality Control Act, 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.