

FINAL REPORT

**Phase 2 Project Definition
Scoping Study Report**



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**CDM
Smith**

Executive Summary

The Phase 2 Project Definition Scoping Study was conducted to assist the North Bay Water Reuse Authority's (NBWRA's) existing and potential new members in determining whether to proceed to the next steps in the scoping studies, feasibility-level engineering analysis, environmental documentation, and financial analysis for Phase 2 of the North Bay Water Reuse Program (NBWRP). The purpose of the Phase 2 studies is to explore options for recycled water use and, as feasible, to develop a program expanding recycled water use within the North San Pablo Bay region beyond the projects currently being constructed as Phase 1 of the NBWRP.

ES.1 Scoping Study Process

The Project Definition Scoping Study is the second step in a proposed series of scoping studies under Phase 2 of the NBWRP. The Phase 2 scoping study process is shown in Figure ES-1.

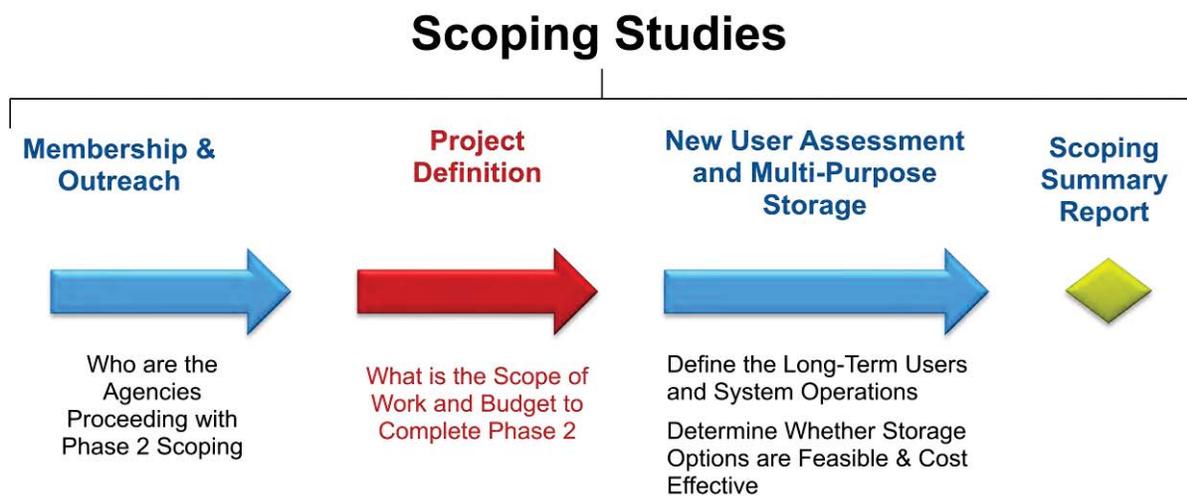


Figure ES-1
NBWRP Phase 2 Scoping Study Process

The first scoping study, Membership and Outreach, identified the potential partners for studies to expand the NBWRP beyond Phase 1. The Membership and Outreach process and subsequent conversations with interested agencies resulted in several new agencies partnering with the NBWRA in the Project Definition Scoping Study: Marin County; Marin Municipal Water District (MMWD); City of Petaluma; and the City of American Canyon. The City of Sonoma contributed directly to Sonoma Valley County Sanitation District's (SVCSD's) participation in this study.

The Project Definition Scoping Study consisted of the tasks detailed below: two engineering planning tasks; two financial related topics; discussion of benefits; and the scope of work to complete a feasibility study based on the preliminary list of engaged agencies. This Project Definition Scoping Study Report is intended to provide preliminary information on the potential size and costs of Phase 2 project construction and the potential costs to complete feasibility studies and environmental analysis.

- **Conceptual Level Operational Analysis** – determine seasonal storage needs, potential integration with Phase 1 facilities, and general points of delivery.
- **Preliminary Identification of Program and Costs for Design and Construction** – develop an order of magnitude-level estimate of cost based on conceptual level layouts of storage, conveyance, and distribution facilities.
- **Initiation Fee for New Participants** - define a range of financial options under which a new agency may become a fully vested participating member.
- **Conceptual Level Project Benefits** – identify the programmatic benefits of potential Phase 2 projects to justify local and federal expenditures.
- **Scope of Work for Full Phase 2 Feasibility, Economic, and Environmental Studies** – prepare scope of work for future studies.

A second financial task, Review of Members' Ability to Meet Non-Federal Cost Share, was to prepare a preliminary assessment of the capacity of participating and new agencies to take on construction projects following Phase 1 commitments. However, as the NBWRA moved through the Project Definition Scoping Study process, this task was postponed because the detail regarding which projects and agencies are to be included in future Phase 2 studies and the potential costs per agency are still too preliminary at this point. This analysis will be revisited during the potential feasibility study phase, when projects and partners are more clearly defined.

Following the Project Definition Scoping Study, the New User Assessment and Multi-Purpose Storage Scoping Study would focus on the specific users, opportunities for partnerships between agencies for reuse projects, and an expanded list of potential demands beyond the preliminary list provided by the agencies in this study, as well as address the specific aspects of developing new seasonal storage in concert with creating habitat enhancements.

ES.2 Findings

The findings of the Project Definition Scoping Study include a summary of identified potential Phase 2 projects, preliminary analysis of operations, preliminary construction costs for the Phase 2 projects, and the scope of work to complete scoping studies and feasibility studies to allow for Phase 2 program implementation. Costs for these future studies are not included in this report as the level of effort, and therefore costs, cannot be determined until the included agencies and projects are more clearly defined. The potential "initiation costs" for new agencies to join the NBWRA and the approach to maximize the NBWRA's programmatic benefits are also summarized below. Lastly, future activities have been identified which are required should the NBWRA choose to continue through the Phase 2 scoping study process and into the feasibility study phase.

ES.2.1 Potential Projects

Six existing NBWRA member agencies participated in the Project Definition Scoping Study: Las Gallinas Valley Sanitary District (LGVSD); Novato Sanitary District (Novato SD); Sonoma County Water Agency; SVCSD; Napa County; and Napa Sanitation District (Napa SD). Five additional agencies participated in the Phase 2 study: Marin County; MMWD; City of Petaluma; City of Sonoma (directly with SVCSD); and the City of American Canyon. Collectively, these agencies are referred to in this report as "participating agencies."

Seven agencies have initially identified 20 potential Phase 2 projects through the Project Definition Scoping Study. Figure ES-2 presents the locations of the Phase 2 projects, shown in yellow. For reference, each agency’s existing recycled water projects are shown in blue and NBWRP Phase 1 projects are shown in red. The potential Phase 2 projects are listed in Table ES-1 and described in more detail in Section 3.1.

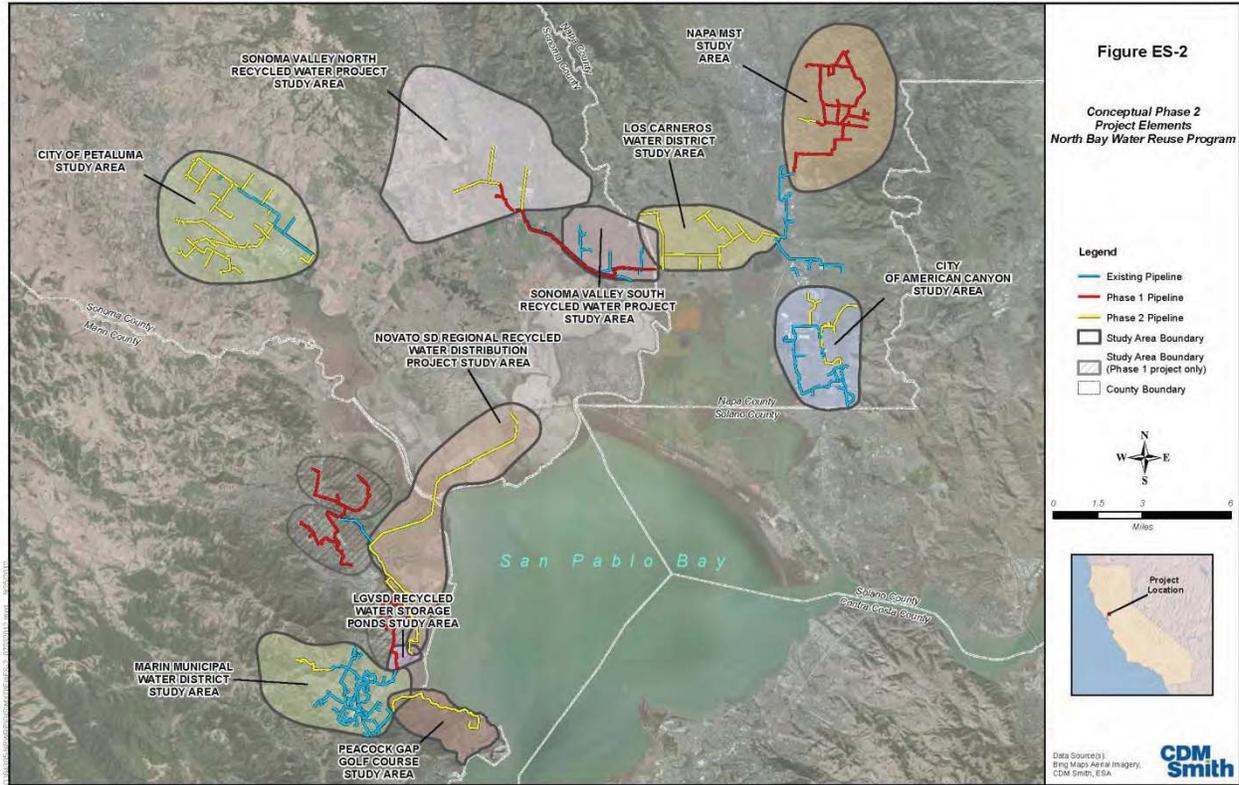


Figure ES-2
Conceptual Phase 2 Project Elements

Table ES-1. Potential NBWRP Phase 2 Projects

Agency	Potential Projects
MMWD	<ul style="list-style-type: none"> • Peacock Gap Extension • Peacock Gap Area • Lucas Valley Extension • Recycled Water Treatment Plant (RWTP) Expansion
LGVSD	<ul style="list-style-type: none"> • Additional Storage Ponds • Recycled Water Facility Expansion
Novato SD	<ul style="list-style-type: none"> • Regional Recycled Water Distribution Project • Transmission Pipeline to LGVSD • Replace Existing Outfall Pipe with Recycled Water Wetland
City of Petaluma	<ul style="list-style-type: none"> • Local Recycled Water Distribution
SVCS	<ul style="list-style-type: none"> • Sonoma Valley North Recycled Water Project • Sonoma Valley South Recycled Water Project
Napa SD	<ul style="list-style-type: none"> • Los Carneros Water District (LCWD) Project • Milliken-Sarco-Tulocay (MST) Tulocay Pipeline • Increase Filter Capacity • Additional Storage • Increase Pump Station Capacity
City of American Canyon	<ul style="list-style-type: none"> • Green Island Road Project • Tower Road Project • Private Vineyard Project

ES.2.2 Supply, Demand, and Conceptual Operation

The Project Definition Scoping Study determined the available recycled water supply from each participating wastewater agency and tabulated the water demands for Phase 1 and Phase 2 projects on an annual and monthly basis. The net flow, after completion of Phase 1 projects, available to meet potential Phase 2 demands was calculated and is summarized in Table ES-2. Section 3.2 provides more detail for each participating agency.

Table ES-2. Summary of Recycled Water Supplies and Demand in the NBWRP Study Area

Total estimated 2010 effluent flow by all agencies	16,162 acre-feet per year (AFY)
Phase 1 annual demands based on Phase 1 Feasibility Study	7,826 AFY
Net effluent flow available for Phase 2 projects	8,237 AFY
Phase 2 total demands for all potential projects	5,726 AFY

As shown in Table ES-2, significant recycled water supply is available on an annual basis to meet the currently identified potential Phase 2 water demands. However, Phase 1 projects minimized the use of seasonal storage to meet the peak irrigation needs in the summer and early autumn. Consequently, a significant amount of the summer season¹ recycled water flows are used by the Phase 1 projects and are not available for Phase 2 projects. Most of the net flow is available during the winter when demands are low to non-existent.

An operations review of the available supplies versus projected demands demonstrated the need for seasonal storage to meet the potential future Phase 2 demands. Based on monthly average water demand, up to 5,364 acre-feet of seasonal storage could be needed to effectively use existing supplies (after Phase 1 project needs) to meet Phase 2 demands. This storage could be developed by changing the function of existing regulating ponds at water reclamation plants, creating new seasonal storage sites similar to what exists at SVCS facilities, revised use of existing farm ponds, or potentially through groundwater recharge.

This stage in the analysis only addresses the individual recycled water suppliers and projects. As discussed in Section ES.1, future scoping studies will look at regional opportunities and synergies between agencies and geographies to meet the potential Phase 2 demands.

ES.2.3 Phase 2 Project Costs

A reconnaissance-level construction cost estimate was prepared, in accordance with the Bureau of Reclamation's (Reclamation's) Title XVI guidelines, for the potential Phase 2 projects identified by the agencies. The cost estimating approach was the same as used for the Phase 1 Feasibility Study. Although feasibility-level costs estimating approaches were applied, the level of detail for the project layouts and descriptions were available at a reconnaissance-level of detail; therefore, the estimates of costs can only be considered reconnaissance-level in this report.

The unit costs used to develop the Phase 1 cost estimates were updated to reflect a February 2012 Engineering News Record's Construction Cost Index and were reviewed by the agencies participating in the Project Definition Scoping Study. A few of the unit costs are based on an evaluation of recent construction cost experience by each of the agencies. Only the major components were incorporated in the cost estimates, including distribution pipelines, treatment plant improvements, system storage

¹ The "summer" season, when effluent discharged is not permitted, may vary between the participating wastewater agencies.

components, and distribution pump stations. The estimates also include allowance, contingency, and non-contract costs such as engineering, legal and license fees, and engineering construction services.

Table ES-3 summarizes the opinion of probable total project capital costs for each of the potential Phase 2 projects identified in Table ES-1. Section 4.2 presents more detail on the cost estimates for each project, approach and methodology, and assumptions. These preliminary cost estimates include the following elements:

- Construction costs for distribution pipelines, pump stations, storage, and wastewater treatment plant upgrades prepared using the unit cost factors;
- Reclamation’s prescribed allowance for additional work that may be identified during additional design phases and for overruns on quantities, changed site conditions, change orders, etc.; and
- Reclamation’s prescribed estimate for non-contract costs for the services provided by consultants/contractors in support of the project.

Table ES-3. Summary of Phase 2 Conceptual Projects Preliminary Cost Estimates

Agency	Projects	Opinion of Probable Total Project Capital Costs	Summary by Agency
MMWD	Peacock Gap Extension	\$8,100,000	\$20,470,000
	Peacock Gap Area	\$4,730,000	
	Lucas Valley Extension	\$1,730,000	
	Recycled Water Treatment Plant Expansion	\$5,910,000	
LGVSD	Additional Storage Ponds	\$17,490,000	\$22,550,000
	Recycled Water Facility Expansion	\$5,060,000	
Novato SD	Regional Recycled Water Distribution Project	\$35,290,000	\$57,620,000
	Transmission Pipeline to LGVSD	\$9,640,000	
	Replace Existing Outfall Pipe with Recycled Water Wetland	\$12,690,000	
City of Petaluma	Local Recycled Water Distribution	\$24,150,000	\$24,150,000
SVCSD	Sonoma Valley North Recycled Water Project	\$4,440,000	\$9,650,000
	Sonoma Valley South Recycled Water Project	\$5,210,000	
Napa SD	LCWD Project	\$22,080,000	\$37,320,000
	MST Tulocay Pipeline	\$880,000	
	Increase Filter Capacity	\$8,440,000	
	Additional Storage	\$3,380,000	
	Increase Pump Station Capacity	\$2,540,000	
City of American Canyon	Distribution Pipelines	\$7,460,000	\$12,570,000
	Storage Pond and Pumps	\$4,910,000	
	Storage Reservoir (steel)	\$200,000	
Total		\$184,330,000	

Note: Section 4.2 presents more detail on the cost estimates for each project, approach and methodology, and assumptions.

ES.2.4 Phase 2 Feasibility Study Scope of Work

The future scope of work to complete the next scoping study, the scoping study report, and the feasibility studies are discussed in Section 4.1 and presented in detail in Appendix A. The major task headings and their purpose are summarized in Table ES-4.

Table ES-4. Summary of Phase 2 Study Scopes of Work

Category	Major Task	Purpose
Scoping Studies	New User Assessment and Multi-Purpose Storage Scoping Study	Define the long-term users, system operations, inter-regional partnership opportunities, and storage requirements. Determine whether seasonal storage options are feasible and cost effective.
	Scoping Study Report	Summarize the three Phase 2 scoping studies.
Feasibility Studies	Alternatives Development	Develop and rank alternatives for the Phase 2 program.
	Engineering Study	Define the selected alternative at feasibility-level design layouts and costs.
	Financial Evaluation	Evaluate how the participating agencies will meet the financial demands of Phase 2.
	Environmental Evaluation	Analyze the potential effects of the Phase 2 alternatives on the local and regional environment.

ES.2.5 Initiation Fee

The initiation fee analysis defined a range of financial options under which a new agency may become a fully vested, participating member of the NBWRA. The ultimate decision on the NBWRA initiation fee for new agencies, if any, is at the discretion of the current NBWRA members and is subject to revision. The decision may take into account not only the findings of this analysis but also political and institutional considerations. The purpose of the initiation fee is to provide parity for the ratepayers who invested in Phase 1, with a goal to not exceed the amount existing members paid for developing the NBWRP. Section 5 and Appendix B present more details of the initiation fee study.

ES.2.6 Future Benefits

A broader definition and quantification of program benefits would provide the NBWRA with broader public and institutional support and greater potential for accumulating funding support from multiple sources to help defray agency and ratepayer costs for project implementation.

The NBWRA members and the region could derive significant additional benefits from modest, but fundamental, changes in the approach to Phase 2. As described in Section 6, this entails a broadening of scope that transitions the NBWRP from individual recycled water projects towards a regional-scale reuse program. This direction accomplishes the objectives of both local member agencies and Reclamation, the program's Federal funding partner, by demonstrating how recycled water, developed and managed as supply, can benefit all needs and users in the North Bay. More information on these potential benefits and the future studies needed to quantify them is available in Appendix C.

ES.2.7 Recommended Future Activities

The Phase 2 Project Definition Scoping Study illustrates the potential volumes of recycled water supply and the initial list of projects that could be implemented to meet regional water needs, reduce discharges, and enhance the environment. The purpose of the report was to share the potential projects

being considered by the agencies, identify the potential total costs of such an expanded program, and to develop the path forward.

However, this reconnaissance-level analysis only provides preliminary insight into the issues and challenges towards implementing expanded reuse beyond Phase 1. Questions remain regarding technical issues with the potential projects and institutional issues for the NBWRA as it considers moving forward with the subsequent Phase 2 scoping study and report.

The following sections present these remaining issues. The scope of work items summarized in Table ES-4 have been developed to address the technical issues in a logical step-wise approach that meets the Reclamation criteria and supports the decision-making process of the NBWRA on proceeding with, and Reclamation in potentially funding, a Phase 2 program.

NBWRA Organization Issues

In order to proceed with Phase 2 scoping and feasibility studies, significant organizational, financial, and institutional questions, such as the following, must be addressed:

- Which agencies will engage in further studies to complete analysis of a Phase 2 NBWRP?
- Are the reconnaissance-level costs for Phase 2 projects greater than potential funding given that total Phase 1 construction costs were limited to \$100 million in the federal authorization?
- How will the NBWRA organize to conduct both Phase 1 and Phase 2 projects that have different agencies engaged?
- What NBWRA organizational activities are needed for Phase 2 studies versus Phase 1 implementation activities?

Technical Issues

Technical questions remaining to be addressed are summarized below. The recommended Phase 2 Scoping Study and Feasibility Studies tasks shown in Table ES-4 are designed to address these questions.

- Determine whether the initial list of Phase 2 projects provided by the agencies in this report is complete. *[New User Assessment and Multi-Purpose Storage Scoping Study]*
- Identify subregional partnership opportunities that may provide efficiencies and cost savings. *[New User Assessment and Multi-Purpose Storage Scoping Study]*
- Identify a broad range of potential additional projects that could expand the opportunities and benefits of a Phase 2 program. *[New User Assessment and Multi-Purpose Storage Scoping Study]* Potential new uses for water reuse in the region could include:
 - Agricultural;
 - Urban irrigation – parks greenbelts, industrial complexes;
 - Other environmental restoration;
 - Recreation;

- Groundwater recharge;
 - In-lieu stream flow;
 - Indirect potable reuse; and
 - Direct potable reuse.
- Identify the role of reuse in mitigating groundwater overdraft or salinity intrusion. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
 - Quantify the role and volume of storage to implement greater reuse in the NBWRP. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
 - Determine the locations, layouts, costs, and implementation constraints for new seasonal storage required to meet Phase 2 demands. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
 - Define the regional alternatives and screen them to determine the most cost effective and implementable program to take to feasibility-level engineering. ***[Alternatives Development of Feasibility Study]***
 - Estimate the total value of NBWRP activities to the region. Assess how the role recycled water plays in supporting the many and diverse uses of water in the region can be quantified and how the true value of recycled water and what it does for the North Bay can be understood. ***[Alternatives Development of Feasibility Study]***
 - Define benefits accrued to the environment when existing users of stream diversions or groundwater pumping are switched to reuse. ***[Alternatives Development of Feasibility Study]***
 - Determine the feasibility-level engineering analysis and cost estimates to select the final alternative. ***[Engineering Study of the Feasibility Study]***
 - Assess whether the local agencies have the funds to complete the required studies. ***[Financial Evaluation of Feasibility Study]***
 - Identify the potential impacts of and, if needed, mitigation required to implement the selected alternative. ***[Environmental Evaluation of the Feasibility Study]***

Additional Study Topics

Several additional study topics were identified through the review and comment process for the Draft Project Definition Study Report. These topics will be addressed in the New User Assessment and Multi-Purpose Storage Scoping Study in the tasks associated with exploring subregional partnerships and identifying any additional demand types and users.

- Collaborate with Marin County watershed programs for Novato Creek and Miller Creek.
- Evaluate LGVSD participation in MMWD's Peacock Gap Extension project to allow for conveyance of treated wastewater to a potential new deep water discharge outfall in San Pablo Bay.
- Assess most feasible and cost effective facility for expanded capacity to serve MMWD.

- Evaluate optimization of existing LGVSD storage ponds for use as a habitat resource and for adapting to climate change effects.
- Evaluate options for storage in upper Lucas Valley.

In summary, the Phase 2 scoping studies and feasibility study have been designed to address the key issues and questions and lead the potential Phase 2 projects to funding, design, and implementation. The scoping study process has built-in stop/go decision points to allow the NBWRA agencies to incrementally, and at relatively low cost, determine if a complete feasibility study process should be initiated. The proposed next scoping study (New User Assessment and Multi-Purpose Storage Scoping Study) will provide the NBWRA with critical information and insights. Given the multi-agency cost sharing and potential for a cost share with Federal funding, this study is a cost-effective approach for an individual agency to address these key questions and issues regarding expanded reuse in the North Bay.