U.S. Environmental Protection Agency (EPA) & Major Partners' Lessons Learned from implementing EPA's Portion of the American Recovery and Reinvestment Act: Factors Affecting Implementation and Program Success

Cost Estimating

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PURPOSE

This study seeks to examine the methods used for estimating costs of Clean Water and Drinking Water State Revolving Fund (CWSRF and DWSRF) and Superfund projects funded by the American Recovery and Reinvestment Act (ARRA). This study compares estimated costs to final project costs, with the objectives of capturing successful approaches, determining the factors that contributed to variations between estimated costs and final project costs, and identifying lessons learned.

METHODOLOGY

EPA contracted with Science Applications International Corporation (SAIC), and its subcontractor Toeroek Associates, Inc. to review both estimated and final costs of CWSRF, DWSRF and Superfund projects funded by ARRA. SAIC used two different approaches to review cost estimates and compare them to final costs, one for the CWSRF and DWSRF programs, and one for Superfund. One major reason for the different approaches was that the SRFs are primarily state-managed with cost estimates performed by localities and utilities using the grant funds for clean and waste water projects, while the Superfund sites were primarily federally managed.

For the SRF programs, SAIC performed the following activities: reviewed existing studies and information on cost estimates; conducted state focus groups and reviewed state files with project-specific data; analyzed nine individual projects' field change orders to assess their impacts on costs and scope; and analyzed the data obtained from the focus groups and file reviews.

For the Superfund program, SAIC reviewed existing studies and information on Superfund cost estimating; collected additional information on completed Superfund projects; interviewed EPA Superfund staff; and reviewed and analyzed collected information and interview results.

FINDINGS

Upon completion of this study, SAIC prepared several observations and noted lessons learned from the cost estimating process for EPA's consideration for both SRF and Superfund projects.

CLEAN WATER AND DRINKING WATER SRF PROGRAMS

- **The ARRA funding program favored projects that replaced existing infrastructure.** These relatively routine projects minimized the likelihood of costs increasing beyond original estimates and typically did not require significant environmental review. ARRA funds enabled much-needed maintenance of wastewater and water infrastructure, which often are the largest capital assets of many communities. An ample supply of qualified contractors and laborers for this type of work led to an increase in the number of competitive bids, which lowered costs.

- **Flexible scopes (e.g., replace aging pipelines in a generally defined area) allowed the quantity of work to expand or shrink to match the estimated cost.** The length of pipeline replaced or the number of meters installed could be increased or decreased to fully utilize the funding available without exceeding the funding amount.
- **Cost estimates for a project evolve over time and each successive cost estimate adds its own value to the process.** Accepted engineering practices are used to prepare cost estimates. These practices are uniform from state to state. Estimates become more accurate with each iteration, which provides useful information to the SRF programs. There is not some 'better' approach that could be used to prepare cost estimates. The tight time constraints created by the one-year deadline to be under contract often favored projects with more developed cost estimates.
- **States generally identified prevailing economic conditions as the most significant factor contributing to variances from costs estimates.** In the early part of the ARRA program, commercial construction dropped off significantly because of difficulty in obtaining loans for commercial and residential construction. This increased competition for municipal projects. Grantees received many more bids for ARRA-funded projects than they had previously received for similar projects. This increased competition reduced bid costs below earlier estimates.
- **States developed and implemented procedures to ensure ARRA loans closely matched estimated project needs.** The procedures implemented included: working with the grantees during project development to enable a better understanding of project goals and contribute their engineering experience in a collaborative manner; basing loan offers on project bid costs; providing contingency amounts for construction to account for unforeseen circumstances; using non-ARRA SRF funds for contingency amounts (money not used could be returned to the non-ARRA SRF account); encouraging grantees with excess available funding to utilize the excess money to improve the project (e.g., purchasing spare parts) while staying within allowable expenditures; and prohibiting the use of ARRA funds to cover cost over-runs.

SUPERFUND

- **The program has one standard method for cost estimating** but the accuracy of the bids is dependent on variables such as the quality of data known about the site. Factors that improve cost estimating include a better defined site with fewer unknowns, timing of the estimates (prepared closer to commencing the project) and understanding the extent of contamination.
- **Less complex sites lead to more accurate cost estimates**. Smaller and less complex sites or activities (e.g., road building) are easier to cost and lead to more accurate cost estimates.
- **Advanced sites with existing activities lead to more accurate cost estimates.** Even complex sites with remediation underway lead to better cost estimates then those initially presented in the Record of Decision (ROD). The extent of contamination is better understood by this point and the contractors are experienced with the site.
- **Superfund adapted more easily to ARRA deadlines and influx of funds.** The Superfund program adapted more easily to the influx of ARRA funding because it had ongoing and shovel-ready projects or projects that had been through the ROD process. This allowed for more accurate and timely cost estimating.

- **Existing contracting vehicles simplify award without changing scopes.** The process to award tasks was simplified as each Region had pre-existing remediation contracts/contractors in place, ready and experienced with many of the sites or types of projects.

RECOMMENDATION

Provide forum for successful approaches. States in the focus group discussions described several techniques used to minimize differences between cost estimates and final project costs. EPA could provide a forum for sharing these techniques among states.

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SECTION 1. INTRODUCTION

In February of 2009, Congress passed the American Recovery and Reinvestment Act, aimed primarily at making new jobs and saving old ones, stimulating economic activity and long-term growth, and fostering accountability and transparency in government spending. Of the $787 billion authorized in the Recovery Act, EPA was given $7.2 billion. EPA distributed the majority of its ARRA funds to states in grants and contracts to support clean water and drinking water projects, diesel emissions reductions, leaking underground storage tank cleanups, Brownfields development and Superfund cleanups. This was a massive undertaking for EPA. The administration of the funds, which were to be injected into the economy at an unprecedented pace, required that EPA develop or revise policies, processes and automated information systems. In the fall of 2011, EPA tasked Science Applications International Corporation (SAIC), and its subcontractor Toeroek Associates, Inc., to design and conduct a study to examine several components of EPA's implementation of ARRA. The SAIC Team studied three management topics - **Cost Estimating** processes, **Funds Management** processes, and **Systems** enhancement and development. The Team also looked at three topics geared more towards outcomes than management processes. These include the **Green Project Reserve** initiative, the use of ARRA funds to spur **Innovative Technologies**, and the use of ARRA funds to **Leverage Local Economic Benefits**. After completion of the research phase, the SAIC Team produced a series of six reports, each covering one of the six topics noted above. The Team also prepared a separate overarching summary report with an Executive Summary, containing highlights of each of the six reports, as well as a description of the goals and methodology for the entire study.

1.1 PURPOSE/OBJECTIVES OF THIS STUDY

This report describes the results of a study that examined the methods used for estimating project costs by funding recipients under ARRA and compared the estimated costs to final project costs. The objective of this cost estimating study was to capture successful approaches and to understand the factors that caused the variations in estimated costs. Because EPA provides grants based on estimated project costs, it is important the Agency obtain cost estimates that will reflect as accurately as possible what the final costs will be, and understand what factors may contribute to differences between estimated and final project costs. This study endeavored to identify the factors that had the greatest impact on variances between the cost estimate and final project cost. Broadly, the study attempted to answer the following:

- **Cost Estimating Approaches:** What cost estimating approaches do funding recipients use for developing project cost estimates, and why?
- **Cost Estimate Timing:** What effect does the timing of the cost estimate have on the project outcome?
- **Cost Variance Factors:** What cost factors influence differences between initial cost estimates and final costs?
- **Project Scope Changes:** What changes were made to the contract after award but prior to project completion as the result of scope changes such as field change orders?

- **Results/Impacts of Cost Changes:** What are the results and impacts of changes between initial cost estimates and final costs?
- **Lessons Learned:** What are the lessons learned in cost estimating practices?

1.2 BACKGROUND

The $7.2 billion from ARRA was the largest single investment of dollars in EPA's history and is almost twice EPA's historical annual grants awards of approximately $4 billion each fiscal year. Congress passed ARRA during a period of economic downturn and uncertainty. To rapidly stimulate the economy EPA faced tight deadlines to obligate and expend ARRA funds. EPA's largest ARRA appropriations – $6 billion for Clean Water and Drinking Water State Revolving Funds (CWSRFs and DWSRFs) – had to be put under contract by funding recipients within one year of ARRA passage (i.e., by February 17, 2010). This one year under-contract deadline was a great challenge to federal, state and local project CWSRF and DWSRF recipients trying to estimate project costs, because the component costs (i.e., labor, materials and energy) were fluctuating in a weak economy and the cost estimates had to be completed in the first year.

Approximately 91 percent of the ARRA funding of $7.2 billion received by EPA was for the Clean Water State Revolving Fund (CWSRF) (approximately $4 billion), Drinking Water State Revolving Fund (DWSRF) (approximately $2 billion), and Superfund programs ($600 million). Therefore, this study specifically focused on these three programs – Clean Water, Drinking Water and Superfund.

Cost estimates for clean water (i.e., wastewater treatment) and drinking water projects are typically based on past experience of the funding recipient, or others, in doing similar work. For example, a funding recipient planning a pipeline replacement project may base the estimate on other pipeline replacement work he or she has done. Adjustments can be made for differences in the length or size of the pipes in the new project. Other adjustments may be made for increases in contractor costs due to inflation, land acquisition, material cost increases, and associated costs such as insurance, engineering, contract administration and construction supervision. A contingency allowance is typically provided to cover unanticipated additional costs.

For Superfund projects, a cost estimate is developed for each remedial action alternative as part of the Feasibility Study. When the preferred alternative is selected, the cost estimate is refined as the remedial design is further developed. Costs of construction activities are typically estimated on an element-by-element basis. Contractor markups such as overhead and profit are generally included in these cost elements, rather than listed separately in the capital cost summary. Contractors also typically add a contingency as a percentage to the total cost of construction activities. Professional/technical services are typically estimated as a percentage of the total cost of construction activities plus contingency. Additional background on the Superfund program is provided in Section 3.2 Findings/Observations for the Superfund Program.

The intent of cost estimating is to have an estimate that accurately reflects what the final cost of the project will be. Problems occur when final costs differ significantly from the original estimated cost. If the actual costs end up higher than the original cost estimate, the funding recipient may require additional funding, or in extreme cases, may not be able to complete the project. In other cases, the actual costs may end up being lower than the estimated costs.

1.3 STUDY QUESTIONS

SAIC included a set of study questions in a scoping document for the Cost Estimating study. These questions are reproduced in Table 1. Table 1 contains overarching questions and more detailed questions intended to help answer the larger questions. The questions relate to cost estimating approaches, cost estimate timing, cost variance factors, and project scope changes for DWSRF and CWSRF projects as well as Superfund projects.

TABLE 1. STUDY QUESTIONS FOR COST ESTIMATING PRACTICES

STUDY QUESTIONS	FOCUS AREAS	DETAILED STUDY QUESTIONS
Cost Estimating Approaches: What cost estimating approaches do funding recipients use for developing project cost estimates, and why?	Cost Estimation Process	What were the estimates based on? For instance, standard construction tables, EPA guidance, similar work done at the same site or work done at other locations?
		Why do the funding recipients use their selected approaches versus other approaches?
		What are the pros and cons of these approaches as seen by the funding recipients?
Cost Estimate Timing: What effect does the timing of the cost estimate have on the project outcome?	Cost Estimate Timing	What was project status when the Recovery Act funding became available?
		What projects used already-developed cost estimates and applied for SRF funding?
		What projects had to develop cost estimates to apply for the Recovery Act funding?
		Was the cost estimate prepared before or after the project went for bid?
Cost Variance Factors: What cost factors influence differences between initial cost estimates and final costs?	Causes for Variance	For projects with cost decreases or increases, what factors influence these differences? For example, did any of the following factors cause cost differences? • Available contractor capacity • Contractor experience • Field change orders • Environmental factors (weather events) • Geographic locations • Material costs • Ongoing projects versus projects initiated with ARRA funding • Project timeframe • Project category • Schedule changes • Time lapse between design completion and construction start • Treatment site guidelines become more stringent (e.g., change in cleanup standards) • Unforeseen subsurface conditions.

STUDY QUESTIONS	FOCUS AREAS	DETAILED STUDY QUESTIONS
Project Scope Changes: What changes were made to the originally funded project?	Scope Changes	What changes were made to the contract after award but prior to project completion as the result of scope changes and field change orders?
		Did project changes affect project costs?
Results/Impacts of Cost Changes: What are the results and impacts of changes between initial cost estimates and final costs?	Cost Variance Impacts	What is the result if the final project cost is higher than the initial funded estimate? Is: • Additional funding sought? • The scope of the project changed? • The project schedule extended?
		For projects with no cost changes, how are project scopes adjusted so that the initial cost estimates or bids and final costs remain the same? Do other attributes vary (e.g., fewer feet of pipe installed, cubic feet of soil removed, water meters installed, etc.)?
Lessons Learned: What are the lessons learned in cost estimating practices?	Ways to Improve Cost Estimating Process	Do specific costing approaches lessen the potential for cost growth during project implementation?
		Does the project timing lessen the potential for cost growth during project implementation? For example, for a project which already has the cost estimate prepared when the funding becomes available, is there less potential for cost growth during project implementation?
		Do project characteristics (e.g., project category, project location) impact whether there is cost growth or cost decreases?
		What types of information does EPA need / want upfront to better understand the accuracy of the estimated costs of a project and the potential for costs impacts?

SECTION 2. METHODOLOGY

This section describes two major methodologies: one for the CWSRF and DWSRF programs (Section 2.1) and one for the Superfund program (Section 2.2). Both methodologies are designed to analyze projects for the purpose of identifying changes made to budgets and the reasons why such changes were made.

2.1 METHODOLOGY FOR CWSRF AND DWSRF PROGRAMS

The data collection methodology employed during the study consisted of these steps:

1. Reviewed existing documents and information.
2. Selected state(s) for focus group discussions.
3. Conducted state focus group discussions, reviewed state files for local project-specific cost data, and reviewed a select number of local ARRA projects for cost estimating and cost variance data.
4. Analyzed the state focus group discussion and file review results to support the study objectives.

2.1.1 REVIEW EXISTING DOCUMENTS

SAIC obtained and reviewed existing documents and data related to cost estimating and cost information. SAIC reviewed a full set of project-authorized budget data (accounting data including the regular non-ARRA SRF funding over a period of time) to identify patterns or anomalies that informed the subsequent interviews and analyses. In addition, SAIC reviewed EPA databases, published literature and other state information sources to gain information on cost estimating practices and a better understanding of the types of data available and where the data might be located (e.g., in Regional, state, or local funding recipient files).

2.1.2 SELECT STATES AND CONDUCT FOCUS GROUP DISCUSSIONS AND FILE REVIEWS

The states presented in Table 2 were selected for focus group discussions based on staff availability to engage in discussions with SAIC on the topic. Staffs of several states initially considered for inclusion because of the number and/or type of projects that were implemented within the state were unavailable to meet with researchers.

TABLE 2. STATES SELECTED FOR FOCUS GROUPS

State	No. of State Participants (Funding Recipients)	No. of CWSRF Projects	No. of DWSRF Projects
Iowa	8(1)	47	32
Louisiana	4	53	28
Montana	8(2)	31	34
New York	14	80	29
North Carolina	3(1)	56	74
Oklahoma	11*(1)	32	24

*One person was unable to attend, but provided written comments.

Therefore, the findings in this study are based primarily on responses from a limited number of state focus groups and are not necessarily representative of the entire population of states receiving ARRA funds for their SRF programs.

State focus group discussions were combined with review of the files that the states maintain on each project. In all states, this file review yielded insufficient information to answer the study's research questions. Subsequent to the focus group discussions, several states provided the researchers with cost information on ARRA-funded CWSRF and DWSRF projects that assisted in answering some of this study's research questions.

2.2 METHODOLOGY FOR THE SUPERFUND PROGRAM

The data collection methodology employed during the study for the Superfund program consisted of these steps:

1. Reviewed existing documents and information, and interviewed EPA staff.
2. Categorized Superfund projects.
3. Collected information on completed Superfund projects.
4. Reviewed and analyzed collected data and interview results.

The process for the Superfund study was similar to the SRF study, except that there were no focus group discussions. The Superfund program is implemented primarily by the EPA Regions, thus the SAIC Team sought information mainly from the Regions rather than states.

Please note that for the purposes of this study, the cost estimates being addressed are the cost estimates prepared in response to work assignments that were issued with ARRA funding for specific tasks that were part of individual site cleanup activities. The screening level cost estimates for the whole project covered under the Record of Decision were not addressed in this study.

2.2.1 REVIEWED EXISTING DOCUMENTS AND INTERVIEWED EPA STAFF

SAIC obtained and reviewed existing documents and data related to cost estimating and cost information for the Superfund program. EPA maintains a website for each Superfund project. These websites contain various documents as well as a project description, project timeframe, and the Remedial Project Manager and other site contacts.

In addition, SAIC interviewed EPA Regional staff (numbers listed in Table 3) having expertise (i.e., Subject Matter Experts or SMEs) regarding their understanding and knowledge of cost estimating practices in the Superfund programs, any cost estimating study questions specific to Superfund projects, and availability of information and data.

TABLE 3. REGIONS INTERVIEWED FOR SUPERFUND PROGRAM

EPA REGION	NO .OF PARTICIPANTS	NO. OF SUPERFUND PROJECTS RECEIVING ARRA FUNDING
Region 1	1	5
Region 2	1*	11
Region 6	1	3
Region 8	2**	7
Region 9	2	3

*This participant was originally interviewed for the Funds Management report but some of the information obtained during the interview applied directly to the cost estimating process and was used in this report as well.

** One of the two Region 8 staff was not interviewed formally, but provided written information and clarification on Region 8 projects.

2.2.2 CATEGORIZED SUPERFUND PROJECTS

CATEGORIZED BY COMPLETED PROJECTS

To inform the data collection process and EPA interviews, SAIC categorized completed Superfund projects included in this study using information provided to SAIC by EPA's Office of the Chief Financial Officer (OCFO) in a file titled *SF Stimulus Fund Plan - October 14 2011.pdf* and from EPA's Superfund project websites. A complete listing of completed Superfund projects by Region can be found in Appendix 1. While some of the listed Superfund projects were ongoing and have not been removed from the National Priorities List, the work funded by ARRA was deemed completed.

CATEGORIZED BY TYPE OF FUNDING MECHANISM

Superfund projects are funded by four types of funding mechanisms as follows:

- Cooperative Agreements (CAs) - Superfund Recovery Act remedial activities may be conducted through cooperative agreements with states, tribes or political subdivisions.
- Emergency and Rapid Response Services (ERRS) – ERRS contracts provide emergency, time-critical removal, and quick remedial response cleanup services. These regionally-based contracts provide cleanup personnel, equipment, and materials to contain, recover, or dispose of hazardous substances, and analyze samples, and provide for site restoration.
- Interagency Agreements (IAs) – Superfund remedial program activities conducted through IAs are typically agreements with the U.S. Army Corps of Engineers (USACE) for their support in the acquisition and management of remedial contracts.
- Remedial Action Contracts (RACs) – These contracts provide EPA Regional offices with technical assistance and resources for remedial investigation and feasibility studies; engineering services to design remedial actions; engineering evaluations and cost analyses for non-time critical removal actions, including issuing and managing subcontracts for construction of the selected remedy, and engineering services for construction oversight. Enforcement support is also provided with the oversight of the remedial investigations/feasibility studies, remedial designs, and remedial actions; negotiation support; and other technical assistance, including community relations, sampling and analytical support, and pre-design investigations.

This study was limited to the cost estimates developed by contractors when EPA utilized Remedial Action Contracts to conduct site cleanups. Emergency and Rapid Response contracts were not studied because no ARRA funds were used for these efforts. Cost estimates used for utilizing ARRA funds for Cooperative Agreements and Interagency Agreements also were not studied because of the difficulty in obtaining cost estimate information from agencies outside EPA. The cost estimates developed by the EPA Remedial Action Contractors in response to task orders under those contracts were the focus of SAIC's study.

CATEGORIZED BY PROJECT ACTIVITY

To inform the data collection process and EPA interviews, SAIC also categorized each project by the major type of ARRA-funded activity. Project activities include soil excavation, groundwater treatment, hazardous waste removal, and others, using information from EPA's Superfund project websites.

2.3 STUDY LIMITATIONS

SAIC was unable to acquire data and information related to cost estimating for each of the Superfund projects that received ARRA funding. SAIC did not identify any ERRS projects that utilized ARRA funding. Access to the cost estimating information for Cooperative Agreement or Interagency projects was typically maintained by the agency with which EPA had the agreement. This complicated the process of locating and obtaining access to data maintained by non-EPA entities. SAIC did collect limited Superfund Remedial Action Contract project data from Region 8 and has included it in the analysis. However, SAIC's

findings for the Superfund program primarily came from interviews of EPA program staff from several Regions.

Additional limitations are noted with regard to this study:

Lack of an Information Collection Request (ICR) specific to this study. The SAIC Team's collection of data from sources outside of EPA (such as state staff and funding recipients) was limited because there was no Information Collection Request (ICR) for this study. The SAIC Team addressed this limitation through state focus groups where a large number of state participants discussed their ARRA experience. The findings in this study, therefore, are based on responses from focus groups and are not necessarily representative of the entire population of states with ARRA projects.

Uncertainty introduced in the collection of subjective information. The interview and focus group process introduces uncertainty through the collection of subjective information provided by individuals relaying recollections/memories of activities conducted three years ago. The SAIC Team minimized the impact of the variability of individual responses on the overall data collection and analysis effort by conducting a large number of interviews and focus groups, and compiling and aggregating similar responses to identify patterns and themes.

Limited data reviewed on Superfund process. SAIC had the opportunity to interview only a handful of EPA Region Superfund staff regarding cost estimating. Additionally, this study had initially proposed file reviews of ARRA-funded Superfund projects. Unfortunately, SAIC was unable to obtain files from Regional staff and therefore unable to provide a quantitative analysis regarding cost estimating approaches and results. Specifically, SAIC asked to view assumptions memos submitted with contractor cost estimates for several of the ARRA-funded projects, but was unable to obtain access to them.

Lack of review by interviewee and focus group participants. This report summarizes the results of interviews and group discussions in the focus groups. The interviewers took notes but did not tape record the meetings. The findings in this report are based on comments from the participants but may not be the exact or actual words used by the participants. The findings represent the compilation, aggregation and summarization of one or multiple comments. Additionally, nothing in this report represents the official views of the agencies or organizations from which the participants are affiliated. While the SAIC Team contacted some states to seek clarifications on specific points after focus group meetings, there was no comprehensive review of the report findings by all focus group participants. The degree to which the report matches comments heard in focus groups or interviews cannot be quantitatively or qualitatively measured.

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SECTION 3. FINDINGS

Sections 3.1 and 3.2 include the findings and observations for cost estimating in the CWSRF and DWSRF programs and in the Superfund program, respectively. Each of these two sections is organized according to the overarching questions for this study as follows:

- Cost estimating approaches.
- Cost estimating timing.
- Cost variance factors .
- Project scope changes.
- Results/impacts of cost changes.
- Lessons learned and SAIC observations.

The information source for findings for the CWSRF and DWSRF programs is the state focus groups with the exception of project scope changes, for which SAIC conducted project-level analyses using detailed cost data obtained from funding recipients. (The CWSRF and DWSRF state focus group summaries, including data used for the findings, are included in Appendices 2 through 7.) The information source for findings/observations for the Superfund program is based on the EPA Regional staff interviews.

The overall big picture findings for this study are summarized in the right-most column of Table 4, shown below. The sections of the report following the table include a thorough discussion of the findings.

TABLE 4: COST ESTIMATING STUDY QUESTIONS WITH BIG PICTURE FINDINGS

OVERARCHING STUDY QUESTION – COST ESTIMATING APPROACHES	
Cost Estimating Approaches: *What cost estimating approaches do funding recipients use for developing project cost estimates and why?*	
DETAILED STUDY QUESTIONS	**BIG PICTURE FINDINGS**
What were the estimates based on? For instance, standard construction tables, EPA guidance, similar work done at the same site, or work done at other locations?	• **Funding recipients used accepted engineering cost estimating methods.** The approach involves breaking down the project into individual labor and material cost elements and then multiplying the number of units times the unit cost. For example, the cost of concrete is based on the number of cubic yards needed times the cost per cubic yard of concrete. All cost elements are then summed to determine the total project cost. • **Unit costs can come from a variety of sources** such as: RS Means, a national database with up-to-date labor, materials, and overhead costs; vendor quotes; historical cost data for similar work done at other locations; state databases of bid costs for other projects in the state; past experience at the project site; or the best professional judgment of the engineer.

	• **Engineer/funding recipient goes through a process of refining/improving the initial estimate.** States described various approaches used to work with the funding recipients to refine/improve the initial cost estimate. These approaches included providing planning assistance and implementing an iterative process for the funding recipient or providing short-term financing for planning, design, and early construction costs.
Why do the funding recipients use their selected approaches versus other approaches?	• **The basic cost estimating approach is a standard practice within the engineering profession.** Estimates done in this format are readily reviewable by SRF engineers. • **Grant recipients rely on their engineers or engineering consultants to provide estimates based on standard engineering practice.** They rely on the experience of the engineers to understand prevailing costs and identify the best available information to determine costs for their projects.
What are the pros and cons of these approaches as seen by the funding recipients?	• Because there is one accepted cost estimating approach accepted by the engineering community, there are **no identifiable pros and cons** associated with that approach.
OVERARCHING STUDY QUESTION - COST ESTIMATE TIMING	
Cost Estimate Timing: What effect does the timing of the cost estimate have on the project outcome?	
DETAILED STUDY QUESTIONS	**BIG PICTURE FINDINGS**
What was the project status when the Recovery Act funding became available?	• **State SRF programs used existing projects on their SRF lists as well as newly proposed projects to distribute ARRA Funding.** Many of the projects on the existing SRF lists were not eligible due to not being shovel-ready. • Some states used the ARRA program to specifically **target small communities that had not participated in existing SRF programs** since they lacked the matching funding for projects. • Public knowledge of the ARRA program before it became law **encouraged grantees to begin developing new project lists.**
What projects used already developed cost estimates and applied for ARRA* SRF funding? *ARRA was added to the original detailed study question to clarify that the question had always intended to address ARRA funding requests.	**CWSRF/DWSRF:** • **Project cost impacts related to project timing could not be determined** as states did not maintain or track in their files the data needed to analytically compare the cost differences observed for projects which already had cost estimates (prior to ARRA) to the projects for which cost estimates had to be developed. • **State assistance in refining cost estimates after applications were submitted complicated the issue of pinpointing when the cost estimates were developed.** **Superfund** • **Superfund cost estimates were prepared by Remedial Action Contractors after ARRA funds were received by EPA Regions.** These estimates were based on costs bid by the Remedial Action Contractors prior to the ARRA program.
What projects had to develop cost estimates to apply for the Recovery Act Funding?	
Was the cost estimate prepared before or after the project went to bid?	• **Based on focus group discussions at least some SRF projects had already gone to bid when the application went to bid.** In these cases, where there was a binding qualified contractor bid in hand at the time the application was submitted, the cost estimate proved extremely accurate.

	• Discussion during the focus groups indicated that for SRF projects **in which the cost estimates were prepared before going to bid, the bids were generally lower than the cost estimate** due to prevailing economic conditions. • Work Assignment or Task Order bids for Superfund projects done under Remedial Action Contracts were done after EPA Regions received ARRA funding allocations. This allowed **work scopes to be modified to match existing funding** through an iterative process between the EPA Remedial Program Manager (RPM) and the contractor. This process **resulted in accurate cost estimates.**
OVERARCHING STUDY QUESTIONS – COST VARIANCE FACTORS	
Cost Variance Factors: *What cost factors influence differences between initial cost estimates and final costs?*	
DETAILED STUDY QUESTION	**BIG PICTURE FINDINGS**
For projects with cost decreases or cost growth, what factors influence these differences? For example, did any of the following factors cause cost differences? • Available contractor capacity • Contractor experience • Field change orders • Environmental factors (weather events) • Geographic locations • Material costs • Ongoing projects versus projects initiated with ARRA funding • Project timeframe • Project category • Schedule changes • Time lapse between design completion and construction start • Treatment site guidelines become more stringent (e.g., change in cleanup standards) • Unforeseen subsurface conditions.	**CWSRF/DWSRF:** State focus groups identified the following factors that could impact project costs: • **Recession impact on labor costs** • **Unstable material costs** • **Limited contractor availability** • **Buy American provisions** • **Davis-Bacon provisions** • **Project type (non-linear versus linear)** • **Weather.** **Superfund:** EPA interviewees identified the following factors that could impact project costs: • **Lower contractor administration and overhead costs** • **Increased labor and level of effort** • **Expedited (shortened) cleanup schedules** • **Weaker economy** • **Increased annual funding from ARRA** • **Davis Bacon provisions** • **Weather.** State focus groups and EPA interviewees did not identify other factors as having an impact on cost differences. It should be noted that only a limited number of States and projects could be examined in this study. Other states or projects could have been impacted by additional factors.
OVERARCHING STUDY QUESTION – PROJECT SCOPE CHANGES	
Project Scope Changes: *What changes were made to the originally funded project?*	
DETAILED STUDY QUESTIONS	**BIG PICTURE FINDINGS**
What changes were made to the contract after award but prior to project completion as the result of field change orders?	CWSRF/DWSRF: Seven of nine individual CWSRF, DWSRF, and Brownfields ARRA-funded projects reviewed by SAIC had project scope changes documented in field change orders. SAIC reviewed and categorized the field changes for these nine projects, made after award but prior to project completion, into the following types:

	• **New materials/equipment** • **Change in project scope** • **Site conditions/excavation** • **Labor**
Did project changes affect project costs?	• Project changes affected project costs, both by sometimes decreasing costs and sometimes increasing costs. SAIC cannot identify any common factors in these project scope changes that specifically increased or decreased the overall project costs. • ***Superfund:*** **EPA interviewees noted minimal changes in Superfund project scopes**. One reason is that many of the sites had been studied for years, which limited unanticipated conditions when the construction began.
OVERARCHING STUDY QUESTION – RESULTS/IMPACTS OF COST CHANGES	
Results/Impacts of Cost Changes: *What are the results and impacts of changes between initial cost estimates and final costs?*	
DETAILED STUDY QUESTIONS	**BIG PICTURE FINDINGS**
What is the result if the final project cost is higher than the initial promissory agreement?* *"initial promissory agreement (the amount of the loan) has been substituted for "initial funded estimate" for clarity. The meaning of both phrases is the same.	• **Some State SRF programs had a provision that prohibited increases in the amount of the loan agreement.** If the amount of the loan were exceeded the recipient would have to make up the difference with non-SRF funding. **Essentially all projects that SAIC reviewed in the States studied had final costs equal to or less than the loan agreement.** • **States (except New York) tracked only the amounts that were charged against the loan agreement.** The other States had no documentation of non-loan expenditures on the projects. • **However, in cases where the final costs were projected to be greater than the loan amounts, states used various methods to address increased project cost:** o Reduce the project scope (e.g., cutting back on project components, taking out non-essentials) to align costs; o Reduce the project cost by substituting lower-cost items and materials; o Seek other non-SRF/non-ARRA funding sources to cover the cost difference; or o Apply for a supplemental SRF loan (which would require going through a new loan process). This last option was generally not feasible within the tight ARRA timeframes.
For projects with no cost changes, how are project scopes adjusted so that the initial cost estimates or bids and final costs remain the same? Do other attributes vary (e.g., fewer feet of pipe installed, cubic feet of soil removed, water meters installed, etc.)?	• By keeping project scopes flexible for projects involving pipeline replacement, meter installation, days of dredging, and cubic feet of soil removed, the **unit quantities could be increased or decreased to match the funding amounts.**

OVERARCHING STUDY QUESTION – LESSONS LEARNED	
Lessons Learned/Observations: *What are the lessons learned/observations in cost estimating practices?*	
DETAILED STUDY QUESTIONS	**BIG PICTURE FINDINGS**
Do specific costing approaches lessen the potential for cost growth during project implementation?	• **Because all cost estimates were prepared using standard, accepted engineering practices, there are no specific alternative approaches that would lessen the potential for cost growth.** The accuracy of the information put into the standard cost estimate preparation will greatly influence the accuracy of the result. • **States developed and implemented procedures to ensure ARRA loans closely matched estimated project needs.** The procedures implemented included: o Working with grantees during project development to enable better understanding of project goals and contribute their engineering experience in a collaborative manner. o Basing loan offers on project bid costs. o Providing contingency amounts for construction for unforeseen circumstances. o Using non-ARRA SRF funds for contingency amounts. o Encouraging grantees with excess available funding to use the excess for project extras o Prohibiting the use of ARRA funds to cover cost over-runs.
Does the project timing lessen the potential for cost growth during project implementation? For example, for a project which already has the cost estimate prepared when the funding becomes available, is there less potential for cost growth during project implementation?	**CWSRF/DWSRF:** • **Prevailing economic conditions (i.e., recession) was the most significant factor** in differences between cost estimates and final project costs. • **Most study group states addressed the timing issue by only granting loans based on accepted bids costs.** • **Preliminary and final engineering estimates were used for planning purposes** to make decisions about how many projects could be funded, and to what extent; however, actual loan amounts were not based on these estimates. • **Loan amounts based on the successful contractors bid submissions effectively eliminated the potential for significant cost growth during project implementation.** • **The use of appropriate contingency factors on construction funds effectively eliminated the possibility of additional ARRA funding being required.** **Superfund:** • **EPA Remedial Action Contractors prepared cost estimates at the time the ARRA funded work assignment was issued rather than rely on estimates done at the time the Record of Decision was issued.** • **Estimates done by contractors already familiar with the site, aware of current economic conditions for subcontractors,** and with a working knowledge of the unit costs at the site receiving ARRA funds were usually accurate. Knowledge of working conditions at the site and past experience doing equivalent work at the site reduced the possibility of cost growth.

Do project characteristics (e.g., project category, project location) impact whether there is cost growth or cost decreases?	• **Replacement or repair of existing drinking water or wastewater infrastructure is a very standard project**; contractors know what this work will cost and can prepare very accurate estimates. • **Projects where the quantity of output could be adjusted within the scope (defined by SAIC as linear projects) could be adjusted to prevent cost growth or cost decreases.** These linear project categories included pipeline replacements; meter installations; soil or sediment removal; or contaminated groundwater treatment. • **Projects where the scope was more rigid had a much greater likelihood of cost increase or decrease.** These project categories included treatment plant expansions or modifications; pump/motor replacements, and water storage tank additions or replacements. • Most focus groups agreed that complex projects were much likely to have cost increases than less complex projects.
What types of information does EPA need/want upfront to better understand the accuracy of the estimated costs of a project and the potential for cost impacts?	• **It would be desirable for EPA to obtain final project total cost information for EPA funded projects.** The states studied, except New York, only track the amount of the SRF loan expended, not total project cost. Total project cost would include grant recipient funds expended as well as funds received from non-EPA sources. This would enable EPA to better understand the accuracy of project cost estimates. • **It is not clear to the study team that additional information provided to EPA prior to project initiation would have benefited what were, in SAIC's judgment, very effective and beneficial programs.** SRF programs are managed by the states. Based on the states studied, the current programs effectively managed and distributed ARRA loans in a timely, effective, and efficient manner. Cost over-runs were rare. • Superfund programs studies made use of existing contractors at the sites that received ARRA funding. **Existing contracting vehicles simplified awards without changing scope.**

3.1 FINDINGS FOR CWSRF AND DWSRF PROGRAMS

3.1.1 COST ESTIMATING APPROACHES

All funding recipients in focus group states used the same method to develop initial cost estimates (i.e., a standard source of information such as RS Means, a national database with up-to-date labor, materials, and overhead costs, or historical cost data for similar work done at other locations). After the initial cost estimate was prepared, the engineer/funding recipient went through a process of refining/improving the estimate. States participating in the focus groups described various approaches used with the funding recipients to refine/improve the initial cost estimate.

State staff noted that states generally used engineering cost estimates to plan their loan disbursements, but the project bid costs were used as the basis for the loan *commitments*. States used the funding estimates to determine approximately how many projects they could fund, and generally prioritized the projects. Loan commitments were made following project bidding, when actual project costs were better defined. Bid costs represent a binding commitment by a contractor to complete the project for a fixed cost and therefore bid costs represent a far more accurate picture of what a project will cost.

State staff discussed various approaches (described below) that they used to improve the accuracy of cost estimates.

Use of experienced engineers and standardized procedures provided more accurate cost estimates. The majority of state staff noted that the engineers used by funding recipients were familiar with the majority of types of projects funded by ARRA and were experienced with estimating costs, resulting in good, accurate cost estimates. These engineers used standardized formats and electronic bidding tools to prepare their cost estimates.

Historical information maintained in a state database provided current and local information to use in developing cost estimates. Oklahoma (CWSRF program) and Montana reported that they maintain databases with historical cost information that can be used to support current and future cost estimation efforts. Upon award of contracts, the Oklahoma CWSRF staff enters all contract information into their database. Montana Department of Environmental Quality maintains a database of bid tabs from the preliminary engineering reports for all projects, and all engineers have access to the database. Contractors can obtain and use standard estimates from these bid tabs for items such as pipe installation.

Planning assistance and iterative process facilitated more accurate cost estimates. Montana provided $1.8 million in planning grants to develop preliminary engineering reports for projects. The objective of the planning grant process (which Montana continues to follow post-ARRA) is to ensure that the project is comprehensive and that problems are permanently addressed. As part of the planning grants, the engineers assess entire projects and work with the communities to define problems and identify best solutions. The SRF program coordinates the process and may assist the community in addressing other compliance and environmental issues. The SRF may make suggestions about what needs to be done; this helps the community be realistic in scoping and costing the project. This process results in better, more robust and cost effective projects. The planning and costing phase for projects can take up to two years based on factors such as regulation and policy changes or need for land acquisition. The process is iterative; the project plans evolve over time (while the overall cost estimating method remains the same, the inputs to the cost estimate become more detailed and refined over the course of the iterative process). Once the community has finalized the design with plans and specifications and these have been approved, the SRF loan is closed and funds are committed to the project.

Short-term financing approach resulted in accurate cost estimates. The state of New York used a unique approach of utilizing short-term financing followed by long term financing which they felt contributed to developing good cost estimates. Basically the New York State Environmental Facilities Corporation (EFC) offers both CWSRF and DWSRF clients the opportunity to finance planning, design and early construction costs through short-term financing programs. These are projects that have progressed into the planning phase, but are not ready for long-term financing. This program allows applicants to develop very accurate cost estimates before finalizing the long term project costs. Short term funding can be used for up to three years, at which point the state will reevaluate whether a project can be converted to long term financing. Short term funding would take a project through the design and bid phases, and into construction.

Allowing contingency reserve in cost estimates minimized the risk of unanticipated cost increases. SAIC observed that all of the focus group states allowed funding recipients to include a contingency in the cost estimate, which is typically some percentage of the overall construction costs (shown in Table 5). The purpose of the contingency is to provide dollars for additional unforeseen or unanticipated conditions in the project that occur during project implementation. In many cases, the contingency reserve provided for by the states allowed costs for individual items to increase while the project still remained within the overall estimated construction costs. As a result, if comparing the total project dollars expended to the

original cost estimate, the overall project may have stayed within the original cost estimate amount, but some project estimate cost elements may have changed.

If this contingency funding was not spent, it resulted in money being returned to the state (see also section 3.1.5 on Results/Impacts of Cost Changes). When ARRA money was returned, it was quickly reallocated to another project to meet the commitment of funds requirements in ARRA. Several states participating in the focus groups noted that they used ARRA funding to fund projects, but provided normal SRF funds to fund the contingency amount. Under this approach, if contingency money was not spent it could simply be returned to the SRF pool without the need to immediately recommit the funds.

TABLE 5. STATE CONTINGENCIES ALLOWED IN COST ESTIMATING

STATE	CWSRF	DWSRF
Iowa	No requirement for or cap on contingency. The only limit on contingency is that communities do not want to borrow more than absolutely necessary.	No requirement for or cap on contingency. The only limit on contingency is that communities do not want to borrow more than absolutely necessary.
Louisiana	10 percent.	10 percent.
Montana	May include contingency of 5 to 10 percent, which may be funded through local funds.	May include contingency of 5 to 10 percent, which may be funded through local funds.
New York	10 percent of construction cost estimates or 5 percent of bid amounts, whichever is applicable at the time of application filing.	10 percent of construction cost estimates or 5 percent of bid amounts, whichever is applicable at the time of application filing.
North Carolina	15 percent in initial cost estimate; 10 percent of construction costs in final cost estimate.	10 percent in initial cost estimate; 5 percent of construction costs in final cost estimate.
Oklahoma	15 percent for projects under $1 million; 10 percent for projects $1 million and over; no limit on projects that use unit price for cost estimation.	10 percent in engineering report, but can include 20 to 25 percent in individual line items.

3.1.2 COST ESTIMATING TIMING

A summary of the project status (timing of projects) as discussed in the state focus groups related to costs estimating is shown in Table 6. The information in this table shows whether the state funded existing projects (i.e., Existing Project List), in which case the initial cost estimate had already been developed, or solicited for new projects, in which case the cost estimates had not yet been developed.

TABLE 6. TIMING OF COST ESTIMATE PREPARATION

State	Existing Projects (Existing Cost Estimates)		New Projects (New Cost Estimates)		Comments
	CWSRF	DWSRF	CWSRF	DWSRF	
Iowa	X	X		X	Intended Use Plan (IUP) updated quarterly, allowing new projects to constantly enter the SRF program. DWSRF solicited green projects because they had not focused on that before.
Louisiana	X	X	X	X	Before ARRA, CWSRF did not have many projects on its list; the projects were often either old or not shovel-ready. CWSRF had already started soliciting applicants before ARRA was passed, but still held a separate solicitation for ARRA projects. When ARRA was passed, DWSRF already had a long list of applicants, but still solicited for additional ARRA projects.
Montana	X	X	X	X	Montana knew that ARRA was imminent and thus conducted a great deal of outreach with communities to help them prepare for ARRA. Some projects that received ARRA funds were new projects that began just in the ARRA year, whereas others were existing projects to which ARRA funding was added as another phase; all the ARRA funding was held as discrete for the particular phase.
New York	X	X	X		New York did not solicit for new DWSRF projects for ARRA, using only the existing DWSRF project list. Staff contacted each applicant and screened thoroughly for readiness, making sure projects really were shovel-ready.
North Carolina	X	X	X	X	Governor's office mandated two rounds of ARRA funding in case communities were able to propose new shovel ready projects.
Oklahoma	X	X	X	X	Most of CWSRF's ARRA projects were off-the-shelf existing projects, although some were very early in the process at the time ARRA was passed. A few of DWSRF's projects came from the existing lists, but most were new.

Project cost impacts related to project timing could not be determined. State approaches for funding projects involved use of existing projects with existing cost estimates, soliciting new projects for which cost estimates had to be developed, and various iterations between existing and new projects. State data were not available to analytically compare the cost differences observed for projects that already had cost estimates to the projects for which cost estimates had to be developed for ARRA funding. Therefore, SAIC could not respond to this question using state data.

SAIC did obtain some anecdotal information from the Montana and New York CWSRF and DWSRF staff regarding project timing. Montana staff stated that it was rare for projects to go over budget. However, if projects did go over budget, it was often due to the long time lapse between planning and the start of the project. Montana uses a variety of funding sources for projects, and this can take time to finalize. Inflation factors can affect costs as the project funding comes together over several years. The timing of land acquisition for environmental projects must also be taken into account. This is an iterative process that requires flexibility and communication, and allows for a valuable contribution by SRF staff who coordinate the effort, although the impact on final projects costs is difficult to quantify. Changes in project cost (due to changing/refining inputs) occur over the course of this iterative process. New York State staff reported that generally the first (i.e., earlier) projects under contract had lower bids than the later projects because there were fewer contractors available for the later projects. As a result of the competitive bidding process the lowest cost qualified contractors were utilized first. As the available capacity of these contractors was exhausted, the remaining work went to higher cost contractors.

3.1.3 COST VARIANCE FACTORS

To review cost deviations between original estimates and final costs, the SAIC team obtained data from five states that were part of the focus groups and analyzed the cost deviations for the CWSRF and DWSRF projects in each state. A summary of the cost deviations for CWSRF and DWSRF projects is shown in Table 7.

TABLE 7. SUMMARY OF COST DEVIATIONS (FROM STATE-PROVIDED DATA)

State	Range of Deviations of Final Costs From Promissory Note Amounts*		Average Deviation of Final Cost From Promissory Note Amounts*	
	CWSRF	DWSRF	CWSRF	DWSRF
Iowa	0 to -12%	0 to -15%	0%	-1%
Louisiana	Data not available	0 to -5%	Data not available	0%
Montana	0 to -13%	0 to -22%	-2%	-2%
North Carolina	0 to -33%	0 to -24%	-5%	-5%
Oklahoma**	0 to -14%	2 to -17%	-2%	-3%

*A positive number indicates the final cost was higher than the promissory note amount, while a negative number indicates the final cost was lower than the promissory note amount.

**Excludes four projects which had not been completed as of July 31, 2013, and for which final costs were thus not available.

As can be seen in the table, generally across the focus group states, the cost deviations of the final project costs from the promissory note amounts (based on the bid amounts) were negative, meaning that the final costs were less than the bid amounts. The only exception was the DWSRF program in Oklahoma which ranged from +2 to -17 percent. Similarly the average cost deviations for all of the states' CWSRF and DWSRF projects were either 0 percent or a negative percent.

It should be noted that the Iowa participants stated that they did not track project costs above the loan amounts, since such costs were not paid out of SRF funds. It is possible that other states also followed this practice and thus the upper end of the range of cost deviations may be understated for some states in

Table 7. However, the other focus group states either did not report any project cost over-runs or stated that over-runs were rare, so the maximum cost deviations reported in Table 7 should be for the most part accurate.

The state focus groups discussed several factors which may have impacted the final project costs (summarized below). Some factors listed below may have resulted in project cost increases and some in project cost decreases. However, no quantitative data were available to analyze which of the factors discussed specifically resulted in final project cost decreases or increases.

Impact of the recession on labor costs: Several states noted that while the project cost estimates were basically sound, funding recipients did not anticipate the impact that the recession was having on the municipal construction market. Several states reported that the recession drove labor costs down as many contractors had little or no work at the time ARRA passed. Iowa and Montana reported that there was little construction occurring in their states and many contractors were out of work at the time. Several Iowa contractors felt that without the municipal construction projects, there would have been no construction projects.

North Carolina reported that, because material and labor costs were rapidly changing, it became risky to estimate too low or too high. Pressure on contractors to replace lost private sector work pushed prices down even further. Bidding was very competitive and 'cut-throat' among the construction contractors. According to state staff, most contractors reduced labor rates and minimized profits; some may have cut costs in half just to keep staff working.

Impact of contractor availability: Contrary to the previous finding (Impact of the recession on labor rates), some states reported that limited contractor availability impacted project costs. Louisiana stated that the existing contractor base for the DWSRF program was overwhelmed by the speed and volume of work under ARRA, and that this caused some project delays as a result of limited availability. Louisiana's CWSRF program staff said that their contractors were not necessarily overwhelmed, but that costs may have increased slightly due to reduced contractor availability. New York reported that the early ARRA projects to get under contract generally had lower bids than the later projects because there were fewer contractors available for the later projects, so there was less competition for driving low bids.

Contractor Bankruptcy

In Montana some contractors and subcontractors bid so low that they went bankrupt during the middle of a project—there was so much competition for work that contractors were submitting bare-bones bids. Quality may also have been an issue with these inexperienced contractors. For many of the ARRA-funded projects, the funding recipients received more than 100 bids, where in the past they usually received far fewer bids.

Impact of unstable material costs: States also reported that, during the ARRA time frame, material costs were unstable. North Carolina reported that steel and concrete were expensive before 2009 due to the Chinese demand, thus making the costs unstable. North Carolina staff then stated that in 2009, material costs were significantly reduced due to the recession. Iowa reported that they saw a dramatic decrease in the price of steel as a result of the recession. Sometimes the material costs followed a 'tulip' pattern of

spiking, then dropping, then spiking again. Oklahoma reported that they were still seeing high bids at the beginning of ARRA due to increased costs resulting from the effects of Hurricanes Ike and Katrina.

Impact of the Buy American provisions: Several states reported that Buy American requirements contributed to differences between the cost estimates and the final project costs. Contractors and engineers did not budget time in their cost estimates and bids for Buy American research and verification, but then had to spend significant time on these efforts once the projects were underway. Iowa stated that Buy American sometimes resulted in changes of materials, which increased costs and required change orders; however, Iowa state staff did note that overall the bids were still lower than cost estimates. Oklahoma reported that there were often project delays due to having to wait on American-made products, sometimes up to four to six months.

Buy American provisions created additional challenges for contractors

States identified various issues with the requirement to utilize American-made products:

- Difficult to find, resulting in increased costs due to scarcity of product
- Some products were of lower quality and resulted in operational problems (e.g., flow meters)
- Contractors did not have established relationships with the suppliers so it took more time and effort to procure materials.
- The need to obtain certification that products were American made added complexity to the procurement process.

Impact of the Federal Labor Standards (Davis-Bacon Act) provisions: Most states participating in the focus groups did not note any issues or impacts on costs due to Davis-Bacon. Iowa state staff reported that Davis-Bacon was not really an issue to the communities, as it was already a pretty common requirement. Louisiana DWSRF program required all funding recipients to hire a Davis-Bacon administrator (an engineering consultant) to handle Davis-Bacon requirements; Louisiana CWSRF program did not require recipients to have a Davis-Bacon Administrator, but funded the position if the recipient did have one. Oklahoma was the only state to report that Davis-Bacon had actually caused problems due to wage rates changing very frequently, sometimes several times during the planning process. When the project finally got to construction, the state had to do change orders to cover the wage rate variances. Oklahoma also reported that Davis-Bacon wage rates had doubled or tripled in rural areas since ARRA started. The new rates appeared to be based solely on union wage rates. Before ARRA, wage rates were based on a mix of union and non-union rates and thus were lower.

Impact of non-linear project type: North Carolina representatives discussed the effect of linear versus non-linear projects on costs. Linear projects are projects which are bid in terms of feet of pipe ordered, or number of water meters installed. For these types of projects, there is a fixed cost per foot or per water meter (i.e., a unit cost). Many of the state's SRF projects were linear, and project quantities (e.g., feet of pipe ordered) could be varied within the scope of work. Therefore, adding more feet of pipe increased cost by a known amount (based on the unit cost). If a funding recipient found that their costs were decreasing or increasing compared to the bid amount for a linear project, the funding recipient could

adjust the project scope to match the available funding. Non-linear projects (e.g., treatment plant upgrades) are less straightforward to cost as there are many more items to include in the bid. However, North Carolina funding recipients were encouraged to use unspent funds from non-linear projects to purchase related project items such as emergency generators or spare parts. This allowed the project scope to change in order to use the available funding.

3.1.4 PROJECT SCOPE CHANGES

As part of this study, SAIC obtained and analyzed detailed project expenditure data for nine ARRA-funded projects in the DWSRF, CWSRF and the Brownfields programs to answer questions about project scope changes. The purpose of these analyses was to identify and categorize the types of changes occurring during project construction (i.e., factors) which impacted project costs using change order data for individual projects.

Table 8 provides a list of the selected case studies along with their locations and brief project descriptions. The Brownfields project, although not classified as an SRF project, was included because it involved a technology to manage storm water and therefore was similar to funded SRF projects.

TABLE 8. CASE STUDY LOCATION AND PROJECT DESCRIPTIONS

PROJECT NAME	LOCATION	PROJECT DESCRIPTION
Drinking Water State Revolving Fund Projects		
West End Drinking Water Reservoir	Hagerstown, Maryland	Partially replace 11 million gallon leaky, uncovered storage reservoir with 6.8 million gallon storage tank.
Amsterdam Drinking Water Treatment Plant Upgrades	Amsterdam, New York	Implement multiple equipment upgrades to existing conventional filtration plant to address drinking water violations for disinfection byproducts and lead.
Athens Drinking Water Distribution System Improvement	Athens, Ohio	Replace frequently failing distribution main line and upgrade related pump and electrical system.
Pine Bluffs Meter Installation	Pine Bluffs, Wyoming	Replace failing manual meters with radio signal meters, add meters to unmetered service lines, and move meter positions to connect with main line to enhance leak detection.
Clean Water State Revolving Fund Projects		
Town of Cape Charles Wastewater Treatment Plant Upgrades	Cape Charles, Virginia	Retrofit existing wastewater treatment facility with advanced treatment to reduce nitrogen and phosphorus concentrations in discharge and also provide water suitable for non-potable reuse (e.g., irrigation).
City of Hedrick Wastewater Treatment Plant Upgrade	Hedrick, Iowa	Construct new treatment plant to reduce ammonia discharges to meet new permit limits, rehabilitate and increase lift station capacity to prevent overflows during storm events, and replace conventional sludge drying bed with a reed bed.
Grant County Sanitary Sewer	Grant County,	Extend sewer service lines to new areas including a campground with an aging treatment plant and a mobile home park with a

PROJECT NAME	LOCATION	PROJECT DESCRIPTION
District Extension Project	Kentucky	failing treatment plant.
Santa Cruz County Reduction of Nonpoint Source Sediment and Pesticide Pollution	Santa Cruz County, California	Implement roadside integrated vegetation management plan to reduce pesticide application, mowing, and presence of invasive species.
Brownfields Project		
St. Paul Port Authority Beacon Bluff Assessment and Cleanup	St. Paul, Minnesota	Conduct site assessment and cleanup activities for former 3M production facilities and surrounding acreage and install 'next generation' regional stormwater infiltration basin to treat runoff from neighboring areas.

SAIC obtained expenditure breakdowns for the nine ARRA-funded projects in the form of contractor billing statements. The billing statements included line item accounts of the original bid items and their bid values, as well as line item accounts (in most cases) of the change order items and their values. From these billing statements, SAIC calculated the total project bid and change order values shown in Table 9 below. The change order impacts ranged from a decrease of 15.3 percent from the initial project bid value to an increase of 13.8 percent. Of the nine projects, change orders reflect net cost increases for four projects and net cost decreases for three projects. Data for two projects (i.e., the stormwater project in Santa Cruz, California and the Brownfields project in St. Paul, Minnesota) did not include change orders. Both of these projects primarily involved expenditures for services, which may be less likely to incur cost changes than the seven construction-related projects.

TABLE 9. CASE STUDY VALUES FOR PROJECT BIDS AND CHANGE ORDERS

Project Name	Project Type	Total Project Bid Value	Change Orders	
			Total Value (1)	Percentage of Bid Value
Drinking Water State Revolving Fund Projects.25				
West End (Maryland)	Storage	$5,456,540	-$237,943	-4.4%
Amsterdam (New York)	Treatment	$10,162,097	$949,344	9.3%
Athens (Ohio)	Piping	$777,441	$44,067	5.7%
Pine Bluffs (Wyoming)	Metering	$1,344,847	-$205,487	-15.3%
Clean Water State Revolving Fund Projects				
Cape Charles (Virginia)	Treatment	$14,737,000	$425,491	2.9%
Hedrick (Iowa)	Treatment	$3,370,423	-$6,442	-0.2%
Grant County (Kentucky)	Piping	$1,347,098	$185,361	13.8%
Santa Cruz (California)	Stormwater	$839,700	$0	0%
Brownfields Project				
St. Paul (Minnesota)	Redevelopment	$2,593,400	$0	0%

(1) The values for some projects are interim values and final change order amount may differ at project completion.

Figure 1 illustrates the change order impacts by project type. Three projects involved design and installation of treatment and three primarily involved installations of water piping or storage structures. Both of these project types had net cost increases or decreases, although net increases were more frequent. The variability of the impact that change orders had on project costs appears to diminish as project size increases. Change order impacts for the four smaller projects range from -15.3 to + 13.8 percent, while the range for the five larger projects is from -4.4 percent to +9.3 percent.

FIGURE 1. PERCENTAGE CHANGE IN PROJECT COST BY PROJECT TYPE

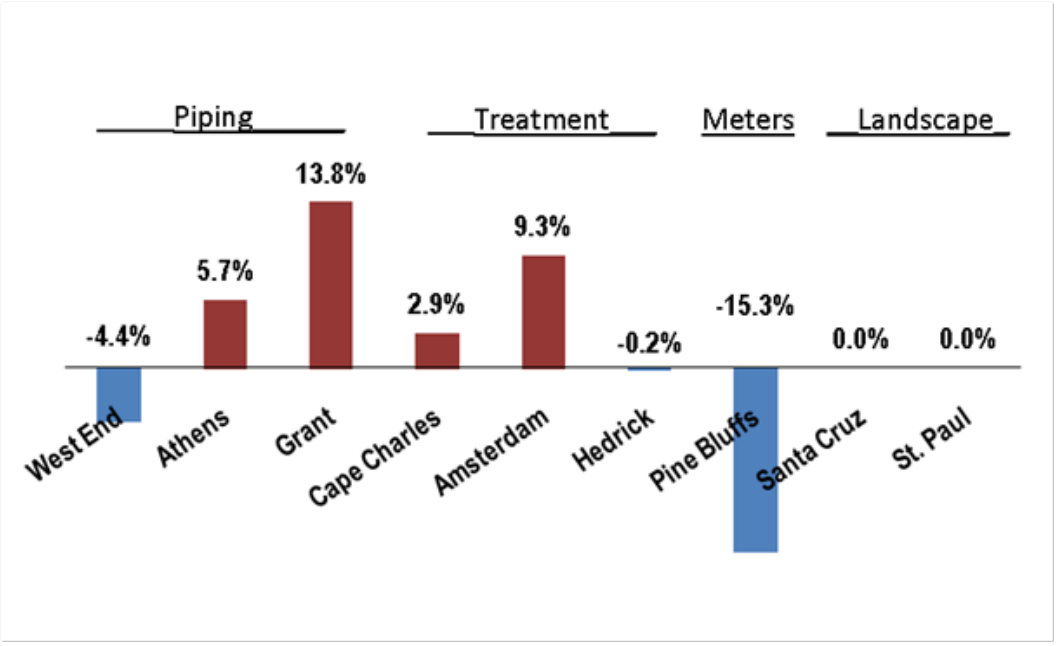


Table 10 provides a list of change order categories and identifies which projects had change orders that fell into each category. SAIC assigned categories to the change orders based on the descriptions provided in the contractors' project expenditure breakdowns as follows:

- The *new materials/equipment* category includes change orders that increased the quantity of items that were in the original bid, substituted like items for items in the original bid, or called for the use of alternate materials for items in the original bid.
- The *change in scope* category includes all change orders for the revision and/or modification of bid items/plans and revisions/modifications at the site that were not in the bid items/plans. It also includes all upgrades for items not in the original bid plan and changes in the size or capacity of items in the original bid.
- The *site conditions/excavation* category encompasses all 'ground work' including excavation, additional road work, additional paving and gravel work, and additional foundation work.
- The *labor* category was assigned to all change orders that were clearly labor-related (e.g., repair, install).

TABLE 10. TYPE OF COST VARIANCE FACTORS IDENTIFIED FOR PROJECT CHANGE ORDERS

Cost Variance Factors	Project Type	Change Order Impact	New materials/ equipment	Change in scope	Site conditions/ excavation	Labor
Drinking Water State Revolving Fund Projects						
West End (Hagerstown, Maryland)	Storage	-4.4%	+ / -	+ / -	+	+
Amsterdam (New York)	Treatment	9.3%	+	+	+	+
Athens (Ohio)	Piping	5.7%			+ / -	
Pine Bluffs (Wyoming)	Metering	-15.3%	+ / -	+		+
Clean Water State Revolving Fund Projects						
Cape Charles (Virginia)	Treatment	2.9%	+ / -	+ / -	+	+ / -
Hedrick (Iowa)	Treatment	-0.2%	+ / -	+		-
Grant County (Kentucky)	Piping	13.8%	+	+	+	
Santa Cruz (California)	Stormwater	0%	No change orders			
Brownfields Project						
St. Paul (Minnesota)	Redevelopment	0%	No change orders			

Note: A blank cell indicates that the data do not include a change order in that category.

+ indicates that project had at least one change order in that category that increased overall project cost

- indicates that project had at least one change order in that category that decreased overall project cost

+/- indicates that the projects had change orders that increased project costs for some changes and decreased project costs for other changes.

Seven of the nine case studies had identifiable change orders. The data sets for Santa Cruz and St. Paul did not include change orders. Symbols in Table 10 identify whether change orders increased or decreased project costs. A "+" symbol denotes that the project had at least one change order in that category that increased the overall cost of the project. Likewise, a "-"symbol denotes that the project had at least one change order that decreased the overall cost of the project.

No identified commonalities between project scope changes that increased or decreased the overall project costs. Based on the limited number of projects used in this study, SAIC could not identify any commonalities or trends related to the factors that increased or decreased the final costs. Although the majority of change orders increased the costs of the projects, there were many change orders that decreased the final project costs. One observation is that the vast majority of the change orders that resulted in cost reductions appeared to fall into the new materials/equipment category and are likely attributable to reductions in the price of bid items and the use of less expensive like items and materials for bid items.

3.1.5 RESULTS/IMPACTS OF COST CHANGES

Most focus group states reported that final project costs tended to come in close to the initial cost estimates and/or bid amounts for which the loans were awarded. However, this was not always the case, and final project costs for some projects came in below or above the loan amount. States reported that, where there were cost variances, often the final project cost came in below the loan amount. If costs changed before the loan was locked in (for example, if a more detailed cost estimate or the bid amount came in different from the initial cost estimate), this generally did not pose a problem, as states still had flexibility to deal with the changes. Funds could be shifted around, project scope and details could be adjusted, and additional engineering or environmental review could even be performed if necessary.

Once the loan was locked in, focus group states noted they had much less flexibility to address changes in costs. If the final cost came in lower than the loan amount, the state would often reduce the non-ARRA (base SRF) portion of the funds accordingly. Since ARRA funds were always expended first, this generally did not have an impact on the ARRA funding. One exception was New York, which essentially overcommitted ARRA funds to ensure that all of the funds would be expended. New York offered applicants space on a waiting list for ARRA funds and, if projects came in under bid, released the left-over money and transferred it to projects on this list. Oklahoma also stated that some of their projects were not able to use all of the ARRA money and as a result CWSRF had to redistribute some ARRA funds.

States identified options for projects where the final costs had the potential to be greater than the loan amounts. Several states reported they generally allowed funding recipients the following four options:

- Reduce the project scope (e.g., cut back on project components, take out non-essentials) to bring the cost into line.
- Reduce the project cost by substituting lower-cost items and materials.
- Find other non-SRF/non-ARRA funding sources to cover the cost difference.
- Apply for a supplemental SRF loan (which would require going through a whole new loan process); this last option was generally not feasible within the tight ARRA timeframes.

The Louisiana CWSRF staff reported supplementing approximately six projects with funds from their administrative fee fund, which they had been banking for several years. Montana sometimes employed a fifth option which involved dividing the project into phases.

New requirements and changing guidance required re-evaluation of costs and impacted project schedules. New York state staff reported schedule impacts due to the need to evaluate potential cost effects of new requirements and changing guidance. The SRF programs were often revising project budgets because of changing guidance from EPA, making it difficult to determine how much funding to allocate into the loans. In addition, the issuance of new requirements forced the state to re-evaluate the cost effects of the new requirements, bringing the project/loan approval process to a halt. Whenever there were questions on how to proceed with a project mid-stream, the State Environmental Facilities Corporation froze the disbursements, which compounded the funding recipients' worries, and potentially created tension with their best clients. As a result, the additional requirements and changing guidance prevented them from disbursing funds quickly, which delayed economic and environmental benefits to communities.

States also discussed approaches that they implemented to ensure that there were no impacts to final costs or that the impacts of changes to final costs were minimized (described herein).

States developed and implemented procedures to ensure that ARRA loans closely matched estimated project needs. For the majority of projects, state staff participating in the focus groups noted the ARRA loans exactly matched final project amounts. Where there was a difference between loan amounts and funds expended (see Table 5 above), the amounts returned to the states were typically less than five percent of the original loan amount. In no cases did the funding recipients go back to the state to request additional ARRA funding to complete the project. State ARRA funding rules often prohibited such requests. Projects could under-run, but not over-run ARRA funding.

States often provided a 'package' of loans to a funding recipient. Such a package might include an ARRA loan with principal forgiveness; an ARRA loan with a minimal interest requirement (e.g., 0.75 percent); an ARRA loan with a more traditional interest rate; a traditional SRF loan; or a loan from another non-SRF funding source. Because of these multiple components, it was sometimes difficult or impossible to track final project expenditures. For the most part, states in the focus groups only tracked spending of the amounts provided by their SRF program, including ARRA funding. In these cases, funding from other sources or grantee spending was not tracked by the state. However, in these cases ARRA funding components were often the lowest interest rate loans in the package. This ensured that ARRA funds were drawn down first and in their entirety, prior to utilizing other loan amounts. It also resulted in non-ARRA monies being used to adjust for any cost variances.

States encouraged funding recipients to use all the ARRA funds that were given them. When funds remained at the completion of fixed scope projects, funding recipients were encouraged to purchase additional items such as emergency generators or additional spare parts to avoid returning ARRA funds to the states.

3.1.6 SUMMARY OF LESSONS LEARNED/SAIC OBSERVATIONS ON CWSRF AND DWSRF COST ESTIMATING

SAIC prepared the following observations from the information and data collected for this study. These lessons learned/SAIC observations are provided to EPA to use when similar situations arise in which EPA receives a significant amount of funding which must be allocated and expended in a short timeframe.

- **The ARRA funding program favored projects that replaced existing infrastructure.** These relatively routine projects minimized the likelihood of costs increasing beyond those originally estimated. Wastewater and water infrastructure are the largest capital assets of many communities; ARRA funding enabled much-needed maintenance of these important assets. Replacing water or sewer pipes or pumps, or even installing water meters, typically do not require any significant environmental review. So called non-dig pipeline replacement methods use existing right-of-way and produce minimal surface disturbance and noise. Pump replacement inside existing structures has essentially no impact on the environment, other than to reduce power consumption. Not surprisingly in the focus group states the majority of the 520 projects done with ARRA funding involved existing infrastructure replacement. Some states reported they did not consider any project that had not been through the environmental review process for ARRA funding because of the time constraints the state had to meet. Replacement projects generally avoided the need for extensive environmental review, and minimized the

likelihood that unexpected conditions would be encountered during construction. The ample number of available and qualified contractors and laborers meant that competitive bidding provided a good value on infrastructure replacement projects.

- **Flexible scopes (e.g., replace aging pipelines in a generally defined area) allowed the quantity of work to match the estimated cost. These types of projects allowed the flexibility to reduce expenditures to meet funding, or to add work to expend all of the funds.** Projects involving pipeline replacement or water meter installation allowed for project scopes to be written in more general terms. The flexibility in scope allowed the feet of pipeline replaced, or the number of meters installed, to be increased or decreased to fully utilize the funding available without exceeding the funding amount.
- **Cost estimates for a project evolve over time. Each successive cost estimate adds its own value to the process.** Accepted engineering practices are used to prepare cost estimates. These practices are uniform from state to state. Estimates evolve (become more accurate) over time; each iteration provides useful information to the SRF programs. There is not some "better" approach that could be used to prepare cost estimates. The tight time constraints created by the 1-year deadline to be under contract often favored projects with more advanced cost estimates.
- **Preliminary cost estimates are used in the planning phase to compare project alternatives, and evaluate project financial feasibility.** These are often order of magnitude costs estimates. The states can use these estimates to develop funding plans, and may use the preliminary estimates to provide funding to carry the project through design, but not construction. During the design phase the cost estimates become significantly more refined. State engineers may work with a grantee throughout this process to assist in making the project viable and affordable. The project will be bid by prospective contractors at this point. Each contractor prepares his or her own cost estimate. These estimates are even more precise because the contractors know their own labor costs, and the profit margin they are willing to accept for the project. The accepted bid is used as the basis for determining the amount of loan funding that will be provided. Even though the bid costs are considered very accurate a contingency amount is added to the construction cost to account for unforeseen circumstances.
- **States generally identified prevailing economic conditions as the most significant factor contributing to variances from costs estimates.** In the early part of the ARRA program commercial construction dropped off significantly because of difficulty in obtaining loans for commercial and residential construction. This increased competition for municipal projects. Grantees received many more bids for ARRA funded projects than they had previously. This increased competition reduced bid costs below earlier estimates. Some states reported anecdotally that in the later stages of the program costs increased because the volume of ARRA spending reduced available contractor capacity.
- **States developed and implemented procedures to ensure ARRA loans closely matched estimated project needs.** The procedures implemented included:
    - Working with the grantees during project development to enable a better understanding of project goals and contribute their engineering experience in a collaborative manner.
    - Basing loan offers on project bid costs.
    - Providing contingency amounts for construction to account for unforeseen circumstances.

- Using non-ARRA SRF funds for contingency amounts. If some of the contingency money was not used it could be returned to the non-ARRA SRF account.
- Encouraging grantees with excess available funding to utilize the excess money to improve the project (e.g., purchasing spare parts) while staying within allowable expenditures.
- Prohibiting the use of ARRA funds to cover cost over-runs.

SAIC identified 520 completed SRF projects in the focus group states that used ARRA funding. None of the focus groups were able to recall any projects where the ARRA funded budget had been exceeded.

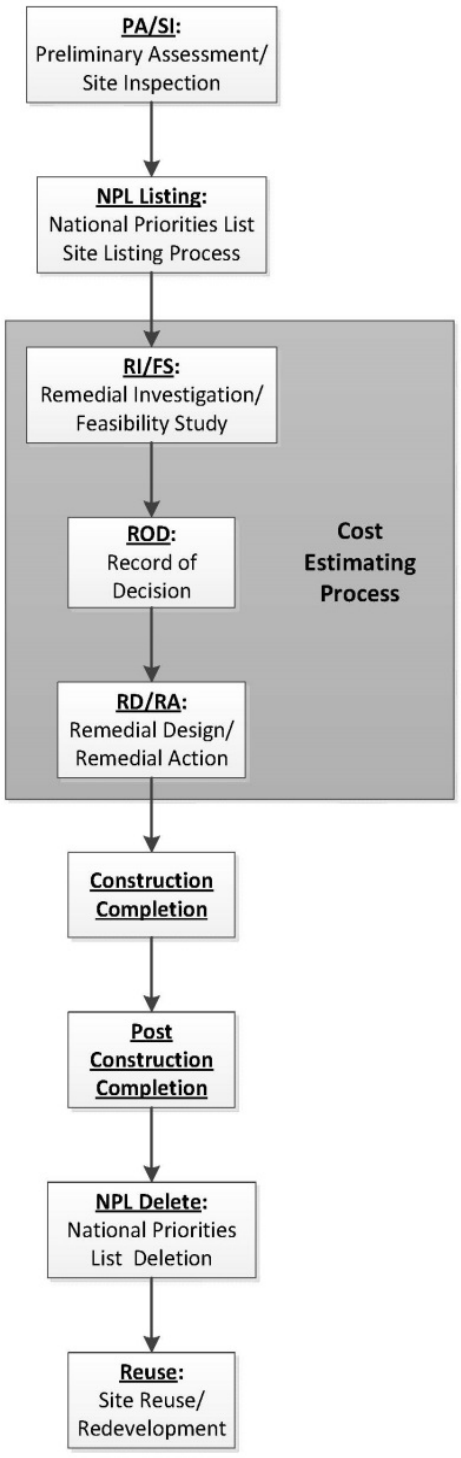
3.2 FINDINGS/OBSERVATIONS FOR THE SUPERFUND PROGRAM

As mentioned in Section 1.2 Background, the Recovery Act provided $600 million for Superfund remedial activities. ARRA funds were used to start new cleanup projects, or to accelerate cleanups at projects already underway. SAIC interviewed several EPA staff from four Regions who managed Superfund programs funded by ARRA. SAIC's findings are based primarily on these few but insightful interviews. The EPA staff interviewed were able to provide specific information on contracts EPA managed. These included Remedial Action Contracts where activities are performed by EPA contractors directly for EPA. For these contracts, cost estimates were prepared for and handled by EPA. Other ARRA funding was put into Cooperative Agreements which were managed by states and tribes and Interagency Agreements where the activities were managed by the U.S. Army Corps of Engineers (USACE). For CAs and IAs, cost estimates were managed by the implementing agency.

3.2.1 BACKGROUND

Figure 2 to the right shows the steps in the Superfund cleanup process. Cost estimates are developed at different stages of the Superfund process. Cost estimates developed during the Feasibility Study (FS) are primarily for the purpose of comparing remedial alternatives during the remedy selection process, not for establishing project budgets. At the FS stage, the design for the remedial action project is still conceptual, not detailed, and the cost estimate is considered to be 'order-of-magnitude.' This is analogous to the engineering cost estimate developed for the SRF application process. The subsequent cost estimate included in the Record of Decision (ROD) reflects any changes to the remedial alternative that occurs during the remedy selection process as a result of new information or public comment. This is somewhat analogous to the iterative process in the SRF process

FIGURE 2. SUPERFUND PROCESS



between state SRF personnel and the loan applicant. It allows for alternative actions to be compared and allows for public input, but is still only a screening level rather than detailed cost estimate. The screening-level cost estimate included in the ROD is *not* the focus of SAIC's study.

This study focused on the cost estimates used to provide ARRA funding to specific tasks that were part of individual site cleanup activities. The majority of Superfund sites are separated into Operable Units for which separate activities are undertaken as part of a Superfund site cleanup. ARRA funds were used for specific activities within Superfund sites. More specifically, the study was limited to the cost estimates developed by contractors when EPA utilized Remedial Action Contracts to conduct site cleanup. Emergency and Rapid Response contracts were not studied because no ARRA funds were used for these efforts. Cost estimates used for utilizing ARRA funds for Cooperative Agreements and Interagency Agreements were not studied because of the difficulty in obtaining cost estimate information from agencies outside EPA. The cost estimates developed by the EPA Remedial Action Contractors in response to task orders under those contracts (the RD/RA phase in the diagram above) is the focus of SAIC's study.

For ARRA, EPA HQ and the Regions worked together to select 51 projects for Recovery Act funding. Table 11 below shows the number of projects and funding for each Region. About half the projects were new projects in the sense that they had been through the RI/FS and perhaps had received a ROD and were awaiting funding. See Appendix 1 for a complete list of the ARRA-funded Superfund projects.

TABLE 11: NUMBER OF ARRA SUPERFUND PROJECTS AND FUNDING BY REGION

EPA Region	Number of Projects	Total ARRA Funding for Region
Region 1	5	$73,800,000
Region 2	11	$175,300,000
Region 3	4	$16,100,000
Region 4	7	$28,416,493
Region 5	4	$50,970,000
Region 6	3	$45,700,000
Region 7	4	$54,700,000
Region 8	7	$66,210,000
Region 9	3	$24,200,000
Region 10	3	$25,000,000
Total	**51**	**$560,396,493**

3.2.2 COST ESTIMATING APPROACHES

EPA Regional staff described the Superfund project cost estimating approach as follows.

The basis for the cost estimates in both SRF and Superfund programs can include a variety of sources, including cost curves, generic unit costs, vendor information, standard cost estimating guides, historical cost data, and estimates for similar projects. Upon receipt of ARRA funds, the Regional Superfund staff issued task orders or work assignments for the projects identified to be funded by ARRA to the Remedial Action Contractor (s) for that Region. A few EPA Regional staff noted that the cost estimates after the ROD are nearly 90 percent accurate because the contractors are experienced with the particular type of site and contaminants and the majority of the contaminants and issues are known at this point in the process. As for other ARRA-funded projects, the cost estimate submitted in response to the task order is based on standard engineering calculations, data tables, and cost estimating programs. For the EPA Region 6 Garland Creosoting project, the contractor used "RS Means" to develop the design and construction cost estimate, but other cost estimating methods are available. EPA requires that an industry-accepted cost estimating method be used for the project.

This represents a distinct difference in process between the state SRF Programs and the EPA Superfund program. The SRF programs give grant recipients the ability to solicit cost estimates (bids) from whatever contractor they choose. Numerous contractors can compete for the specific project, and the contract is usually awarded to the contractor providing the lowest bid if that contractor is judged to be qualified. Each contractor does his or her own estimate of what the project costs and bids accordingly. This project specific competition ideally results in the lowest cost to the funding recipient. Under the Superfund program, Remedial Actions Contractors are selected under a process in which they estimate the costs of conducting generic cleanup activities. These cost estimates (bids) are non-site or project specific. EPA then issues multi-year contracts to the lowest bidders. These generic contracts allow EPA to issue tasks for specific activities under these contracts.

Both programs utilize competition to achieve the lowest costs, but at a different point in time. In the SRF programs the competition is for a specific project, and only for the duration of that project. Competition for Remedial Action Contracts takes place every few years, and the results are used for multiple projects. The SRF process allows grant recipients to control the contractor selection for their specific project. The labor intensive preparation of bid specifications and bid (binding cost estimate) evaluations is limited to their project. In the Superfund process, competition occurs only once for a multi-year period during which many specific tasks to address multiple cleanup sites may be issued. The administrative burden of reviewing multiple bids for each issued task is reduced, and EPA has to deal with one contractor only to reach a mutually agreeable task award.

To initiate project implementation, the EPA remedial project manager (RPM)/task order manager prepares the statement of work (SOW) which goes to the contractor; the EPA RPM also prepares an independent government cost estimate (IGCE). The RPM uses a spreadsheet with built-in contractors' labor. EPA requires a cost assumptions memo (prepared for each task) that details how the contractor developed the cost estimate. The assumptions memo is very specific (e.g., includes details such as the depth and location of wells). The contractor includes a narrative describing the different types of labor (e.g. project engineer, junior engineer) required for the project. The contractor submits this with the workplan. SAIC asked to view assumptions memos for several of the ARRA-funded projects, but was unable to obtain access to them. EPA compares the contractor's cost estimate to EPA's IGCE and identifies

differences. EPA maintains a paper trail on their review of the cost estimate (i.e., technical evaluation memo). EPA's guideline is that the contractor's cost estimate and IGCE should be within +/- 20 percent. If the differences between the two estimates are greater than this amount a meeting between the RPM and contractor is held to resolve the difference. Adjustments to the scope may be needed to accomplish this reconciliation.

3.2.3 COST ESTIMATING TIMING

All Superfund projects funded by ARRA required a specific cost estimate and work plan in order for the work selected to receive the ARRA funding, because the ARRA funding had to be accounted for separately from other funds. There may have been some earlier cost estimates prepared for certain projects, but it is likely that for most projects a new cost estimate would be needed to respond to the task order. As a result, cost estimates should have reflected labor rates and costs in effect at the time of task order funding. This would have resulted in more accurate cost estimates as opposed to estimates prepared prior to the recession.

For example, In Region 1, five Superfund sites received ARRA funding. Three awards were new construction starts, and two were for existing construction. At one site, EPA had to seek a design and new cost estimate during ARRA (during the recession) which led to lower, more economical rates. Region 1 noted it could not really re-bid others, but was able to reduce long-term costs because the schedules were expedited.

With regard to the impact of timing of the cost on the project outcome, generally EPA staff and funding recipients noted that the project outcomes did not differ depending on when the project was costed. If the bids came in lower than previously estimated in the ROD estimates, normally due to the economy, sometimes the funding was used to increase the level of effort to expedite the schedules or transferred to another ARRA site within the Region. More of this is discussed in the next section.

3.2.4 COST VARIANCE FACTORS

As noted earlier, for the purposes of this report, the initial cost estimate is assumed to be that provided to EPA by the contractor in response to the task order or work assignment issuance. From the interviews, SAIC heard anecdotally the following factors that influenced differences between initial cost estimates and final costs. The SAIC Team inferred that the majority of differences between the final cost and original cost estimates were lower overall. Unfortunately, SAIC was unable to obtain data from the Superfund files as had initially been anticipated. The following factors affected final costs:

- Lower contractor administration and overhead costs due to shortened project schedules
- Expedited (shortened) cleanup schedules
- Weaker economy reduced construction costs.

For many of the existing sites that received an influx of funds from ARRA, EPA saw the rate of contractor spending for labor increased (overall) because more level of effort was sourced with the additional ARRA funding for a shorter term. ARRA funds had to be obligated and expended within shortened deadline. As a result, this shortened the schedule for cleanup. For example, the schedule for the Summitville site (EPA Region 8) was expedited and work finished sooner. The level of effort increased, but it was offset by a

decreased overhead from reducing the time needed to lease equipment. Some sites in Region 8 finished three to four years sooner, with about $1.5M in savings overall from the estimated budgets. Much of the cost savings were in the area of contractor administration, as some contracts in Region 8 went from five years to two years. There were also savings from the saved inflation expenses, leased equipment (as mentioned before) and electrical savings from construction trailers.

With regard to the additional ARRA Davis-Bacon provision, the Regional staff interviewed did not note any particular examples of where these provisions were factors leading to cost variances. This may be because many of the RAC contractors were already familiar with Davis-Bacon requirements. Also, since Superfund involves more remediation than construction, SAIC heard from the funds management focus group participants that Buy American did not apply to many Superfund activities.

3.2.5 PROJECT SCOPE CHANGES

Based on the interviews, Regional Superfund managers noted that there were minimal changes of scope to the originally funded project. For Region 8, the majority of changes related to expediting the schedules. Table 12 below presents the cost differentiation for the Region 8 sites including the de-obligation amounts as the costs came in lower than originally estimated. For Region 9, the ARRA-funded portion of the Sulphur Bank Mine site was a very narrowly scoped project (i.e., the scope was final design and construction of a paved road). Many of the existing sites had been well studied by the time they were funded, limiting the unknowns once construction began. For Region 9, even though there were some complexities related to this work including addressing endangered species and archeological sites, the basic construction was very conventional and buffered any small scope changes that occurred.

TABLE 12. COMPLETED REGION 8 ARRA-FUNDED SUPERFUND SITE FUNDING DETAILS

Region 8 Superfund Site	ARRA Award Amount (Rounded)	Final ARRA Expended Amount or Amount to Date (Rounded)	De-obligation Amount (Rounded)*	Comment
Summitville Mine ARRA	$17 M	$16.95 M	**$40.5 K**	
ARRA Arsenic Trioxide				
Remedial Design	$1.238 M	$1.203 M	**$34.9 K**	Expedited schedules
Remedial Action	$8.45 M	$6.25 M	**$2.2 M**	
CO Central City/ Clear Creek				
Remedial Action	$2.16 M	$2.15 M	**$5.6 K**	Expedited schedules
Remedial Design	$1.4 M	$1.396 M	**$400**	

*Not all unexpended funds were de-obligated.

An example of cost change, but limited scope change, was the Region 6 Garland Creosoting project. EPA used the "Remedial Action (RA) Reserve" line item of 15 percent of total costs for the Garland site because of an extended period of bad weather. Because the contractor could not work during this weather, he asked for an equitable adjustment for lost profit during downtime. This equitable adjustment was covered by the RA reserve.

Process to Address Work/Cost Changes

The contractor completes and submits a "Field Change Form" when he encounters unexpected conditions on the site. For example, in the Texarkana project (EPA Region 6), the contractor found concrete pads that had to be removed (not included the original estimate), which required a change in project scope. The field change form describes work being changed and the reason for the change; the contractor also states that the change does not modify the period of performance or cost estimate. These field changes are paid out of the Remedial Action (RA) Reserve line. Region 6 staff can also make a period of performance change if necessary

The changes are eventually put in as a task order modification by the EPA Contracting Officer. Region 6 noted that the modifications most likely need to be renegotiated if the increased costs exceed the 15 percent RA Reserve amount. However, the Region 6 staff person had not encountered this situation. The Garland project, which finished in August 2011, included 11 field change orders, which is about the average for that type of project. However, it was one of the wettest and coldest winters in many years, suggesting that weather has an impact on costs and schedules. As noted above, Region 6 experienced cost changes due to weather. Region 6 also noted that if changes increase the total costs to a number greater than the original cost estimate, they will go through the following process:

1. RPM develops the scope and IGCE
2. EPA's Contracting Officer sends the scope to the contractor
3. EPA receives revised cost estimate, revised workplan and assumptions memo from the contractor
4. EPA approves or rejects.

The decision depends on whether EPA can secure additional funds to cover the change order or must decrease the scope of another part of the project to offset the increase. If funds are not available, then the project is usually de-scoped, but will remain within budget. Region 6 staff indicated that another way to explain this is that the project is authorized to spend up to 85 percent of obligated funds on project initiation. As things change, field change orders may be approved up to the remaining 15 percent contingency. If something changes that result in exceeding the 15 percent contingency, the scope will be changed to show this and the contractor has to submit a new workplan.

3.2.6 RESULTS/IMPACTS OF COST CHANGES

ARRA Funds Expedited Project Schedules Resulting in Cost Savings. In general, for Regions 1, 6, 8, and 9, there were minimal impacts to the projects that resulted in cost differences. Where the Regions experienced cost savings, they either transferred the funds to another ARRA funded Superfund site within their Region in collaboration with HQ or the funds were sent back to the US Treasury. Region 8 returned approximately $1M to the Treasury.

ARRA Funds Facilitated Early Closure (Completed Work) at Superfund Sites. Another result of this Recovery Act funding influx was the closure (i.e., work completed) of many sites. For Region 8, five of the seven funded sites were closed and completed ahead of schedule. Most of those are in the process or have already signed maintenance manuals/agreements or long-term remedial action phase agreements with the State.

For the Ten Mile Creek Superfund project in Region 8, the project is near complete (98 percent) and as of this writing costs are at only 91 percent of budget. EPA Regional staff noted the subcontractor costs were coming in lower than what was originally anticipated, but cannot pinpoint the exact explanation for this.

3.2.7 SUMMARY OF LESSONS LEARNED/SAIC OBSERVATIONS ON SUPERFUND COST ESTIMATING

SAIC prepared the following observations from the information and data collected for this study. These lessons learned/SAIC observations are provided to EPA to use when similar situations arise in which EPA receives a significant amount of funding which must be allocated and expended in a short timeframe.

- **One standard method for cost estimating.** SAIC observed, based on the information collected through the interviews and data collected through websites, that contractors generally follow industry-wide accepted cost estimating methods. However, the accuracy of the bids is dependent on variables such as the quality of data known about the site. Factors that improve cost estimating include a better defined site with fewer unknowns, timing of the estimates (prepared closer to commencing the project) and understanding the full extent of contamination.
- **Less complex sites lead to more accurate cost estimates**. As noted above, the smaller and less complex sites or activity (e.g., road building) were easier to cost and led to a more accurate cost estimate.
- **Advanced sites with existing activities lead to more accurate cost estimates.** Even complex sites with remediation underway also led to better cost estimates than those initially presented in the ROD as the extent of contamination is better understood by this point and the contractors are experienced with the site.
- **Superfund adapted more easily to ARRA deadlines and influx of funds.** SAIC observed that the Superfund program adapted more easily to the influx of ARRA funding because it had ongoing and shovel-ready projects or projects that had been through the ROD process. This allowed for more accurate and timely cost estimating.
- **Existing contracting vehicles simplify award without changing scopes.** The process to award tasks was simplified as each Region had pre-existing RAC contracts/contractors in place, ready and experienced with many of the sites or types of projects.

3.3 RECOMMENDATION

Provide forum for successful approaches. States in the focus group discussions described several techniques used to minimize differences between cost estimates and final project costs. EPA could provide a forum for sharing these techniques among states.

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APPENDIX 1: COMPLETED ARRA SUPERFUND PROJECTS BY REGION, FUNDING MECHANISM, AND PROJECT ACTIVITY

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COMPLETED ARRA FUNDED SUPERFUND PROJECTS BY REGION AND PROJECT ACTIVITY

Region	Site Name	New Start or Ongoing Project	Major Project Activity Funded by ARRA
1	ELIZABETH MINE	New Start	Removal of surface and ground water
1	HATHEWAY & PATTERSON	New Start	Hazardous waste disposal
1	NEW BEDFORD HARBOR	Ongoing	Dredging and water treatment
1	OTTATI AND GOSS	Ongoing	In-situ chemical oxidation treatment
1	SILRESIM CHEMICAL CORPORATION	New Start	Soil removal and vapor treatment
2	CORNELL-DUBILIER ELECTRONICS	Ongoing	Soil treatment
2	EMMELL'S SEPTIC LANDFILL	New Start	Soil treatment
2	HORSESHOE ROAD	Ongoing	Soil treatment
2	IMPERIAL OIL COMPANY	New Start	Soil treatment
2	LAWRENCE AVIATION INDUSTRIES, INC.	Ongoing	Groundwater treatment
2	MONITOR DEVICES, INC.	New Start	Groundwater treatment
2	OLD ROOSEVELT FIELD	New Start	Groundwater treatment
2	PRICE LANDFILL	New Start	Groundwater treatment
2	ROEBLING STEEL COMPANY	Ongoing	Contaminated sediment removal and dredging
2	VINELAND CHEMICAL COMPANY	Ongoing	Sediment treatment
2	WELSBACH/GENERAL GAS MANTLE CO.	Ongoing	Soil treatment
3	ATLANTIC WOOD INDUSTRIES	New Start	Soil treatment, excavation and dredging
3	CROSSLEY FARM	New Start	Groundwater treatment facility construction
3	HAVERTOWN PCP	New Start	Soil excavation and groundwater treatment
3	STANDARD CHLORINE OF DELAWARE, INC.	Ongoing	Hazardous waste disposal and groundwater treatment
4	BRUNSWICK WOOD PRESERVING	Ongoing	Containment cap construction
4	ESCAMBIA WOOD – PENSACOLA	Ongoing	Containment cap construction
4	GMH ELECTRONICS	New Start	Water line construction
4	SIGMON'S SEPTIC TANK SERVICE	New Start	Soil excavation and treatment
4	TOWER CHEMICAL	New Start	Soil excavation and offsite disposal
4	UNITED METALS, INC.	New Start	Soil excavation and treatment

Region	Site Name	New Start or Ongoing Project	Major Project Activity Funded by ARRA
4	WOOLFOLK	Ongoing	Soil excavation and treatment
5	CONTINENTAL STEEL CORP.	Ongoing	Not specified/multiple activities
5	JACOBSVILLE SOIL CONTAMINATON	New Start	Clean up and restoration of residential homes
5	OUTBOARD MARINE CORP.	New Start	Demolition, soil excavation, hazardous waste disposal
5	SOUTH MINNEAPOLIS SOIL CONTAMINATION	New Start	Clean up and restoration of residential homes
6	GARLAND CREOSOTING	New Start	Groundwater treatment
6	GRANTS CHLORINATED	New Start	Construction of groundwater treatment remedy
6	TAR CREEK	Ongoing and New Start	Voluntary relocation efforts of area residents
7	CHEROKEE COUNTY	Ongoing	Mine waste excavation, consolidation, capping, and re-vegetation
7	MADISON COUNTY MINES	Ongoing	Soil excavation, replacement, and disposal
7	OMAHA LEAD	Ongoing	Soil treatment
7	ORONGO-DUENWEG MINING BELT	Ongoing	
8	ARSENIC TRIOXIDE SITE	Ongoing	Design ($1,800,000); Groundwater treatment ($12,000,000)
8	BOUNTIFUL	New Start	Installation of groundwater extraction and monitoring wells, and construction of a water treatment system
8	CENTRAL CITY, CLEAR CREEK	Ongoing	Multiple activities ($2,160,000)/ Design water treatment plant ($1,400,000)
8	EUREKA MILLS	Ongoing	Not specified/multiple activities
8	GILT EDGE	Ongoing	Grout unlined portions of the clean-water ditches and repair/replace existing liners
8	SUMMITVILLE MINE	New Start	Construction of water treatment plant
8	UPPER TENMILE CREEK MINING AREA	Ongoing and New Start	Soil excavation
9	FRONTIER FERTILIZER	Ongoing	Construction of an in-place

Region	Site Name	New Start or Ongoing Project	Major Project Activity Funded by ARRA
			ERH system to treat pesticide-contaminated soil and groundwater
9	IRON MOUNTAIN MINE	Ongoing	Dredge, treat and dispose of heavy metal-contaminated sediment
9	SULPHUR BANK MERCURY MINE	New Start	State and community involvement (working with the EIC)
10	BUNKER HILL	Ongoing	Expedite residential cleanup program
10	COMMENCEMENT BAY/RUSTON	New Start	Not specified/multiple activities
10	WYCKOFF-EAGLE HARBOR	Ongoing	Soil and groundwater treatment

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APPENDIX 2: IOWA STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN IOWA'S SRF PROGRAMS

SRF PROGRAM OVERVIEW

In Iowa, both the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) programs are administered by the Iowa Department of Natural Resources (IDNR). Table IA - 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE IA – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN IA'S CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Administered by Iowa Department of Natural Resources (IDNR).	Administered by Iowa Department of Natural Resources (IDNR).
Applicant first submits a facility plan, as well as an application for inclusion in the Intended Use Plan (IUP). Documents include a cost estimate developed and certified by a licensed professional engineer with engineering, design, construction, administration and legal costs, plus a contingency.	Applicant first submits a preliminary engineering report, as well as an application for inclusion in the Intended Use Plan (IUP). Documents include a cost estimate developed and certified by a licensed professional engineer with engineering, design, construction, administration and legal costs, plus a contingency.
No requirement for or cap on contingency. The only limit on contingency is that communities do not want to borrow more than absolutely necessary.	No requirement for or cap on contingency. The only limit on contingency is that communities do not want to borrow more than absolutely necessary.
Cost estimate goes into the IUP for planning purposes, but loan is not awarded at this point.	Cost estimate goes into the IUP for planning purposes, but loan is not awarded at this point.
Once listed on IUP, applicant is eligible to apply for SRF loan; all applicants who are on the IUP and meet the loan requirements receive SRF funds.	Once listed on IUP, applicant is eligible to apply for SRF loan; all applicants who are on the IUP and meet the loan requirements receive SRF funds.
No formal loan commitment letter sent to applicant; SRF waits until applicant goes to bid, then closes loan agreement based on winning bid.	No formal loan commitment letter sent to applicant; SRF waits until applicant goes to bid, then closes loan agreement based on winning bid.
SRF engineer determines what is approvable and what is not approvable for a loan; in addition to doing engineering reviews of projects, SRF also does environmental reviews for their applicants.	SRF engineer determines what is approvable and what is not approvable for a loan; in addition to doing engineering reviews of projects, SRF also does environmental reviews for their applicants.
To select which projects received ARRA funds, looked at project readiness, environmental priority (although this was a lower factor than normal due to the tight timelines of ARRA), and developed criteria to rate disadvantaged communities. Used utility rates to help determine whether communities were disadvantaged: smaller, more disadvantaged communities had higher utility rates because they had fewer people paying in.	To select which projects received ARRA funds, looked at project readiness, environmental priority (although this was a lower factor than normal due to the tight timelines of ARRA), and developed criteria to rate disadvantaged communities. Used utility rates to help determine whether communities were disadvantaged: smaller, more disadvantaged communities had higher utility rates because they had fewer people paying in.
Tried to spread money out and reach as many communities as possible. Funded 47 CWSRF projects.	Tried to spread money out and reach as many communities as possible. Funded 32 DWSRF projects.
Gave out 50% of ARRA funds as principal forgiveness.	Gave out 50% of ARRA funds as principal forgiveness.

CWSRF	DWSRF
Each project received 20-40% of their funding as ARRA funds principal forgiveness, with a cap for principal forgiveness of $1 million on green projects and $2 million on infrastructure projects. Projects funded with a mix of ARRA funds in the form of principal forgiveness, ARRA funds in the form of loans (3% interest rate), and base program funds in the form of loans (3% interest rate). Used mix-and-match approach with some projects receiving funds from all three sources and some receiving funds from just two of the sources. Allowed SRF to leverage ARRA money to do much more work, resulting in a total of roughly $150 million in projects (between CW and DW SRF) being funded with a mix of ARRA and non-ARRA funds.	Each project received 20-40% of their funding as ARRA funds principal forgiveness, with a cap for principal forgiveness of $1 million on green projects and $2 million on infrastructure projects. Projects funded with a mix of ARRA funds in the form of principal forgiveness, ARRA funds in the form of loans (3% interest rate), and base program funds in the form of loans (3% interest rate). Used mix-and-match approach with some projects receiving funds from all three sources and some receiving funds from just two of the sources. Allowed SRF to leverage ARRA money to do much more work, resulting in a total of roughly $150 million in projects (between CW and DW SRF) being funded with a mix of ARRA and non-ARRA funds.
Did not take the 4% of ARRA funds set aside for administration; used 100% of ARRA funds for projects, not for administration.	Took ARRA funds set aside for administration several years after the fact.

IDNR already had their infrastructure projects identified before ARRA came out; they update their IUP quarterly, which allows new projects to constantly come into the SRF program.

ARRA allowed the SRF programs to reach smaller communities than they had traditionally. For DWSRF and CWSRF infrastructure projects, principal forgiveness was given only to the smaller, poorer communities. Larger communities that were not given principal forgiveness did not lose interest in the SRF programs because they could still get loans at lower interest rates than market rates. They used base program funds, not ARRA funds. Larger communities generally had more options than smaller communities because they were aware of other funding sources.

Factors Affecting Cost Estimates

IDNR noted that most projects had bids (on which the loans were based) come in below the original cost estimates. Staff saw a dramatic change in prices downward after the economic crash—for example, steel prices were down. In addition, bids generally came in lower than the cost estimates because there was so little construction going on in the state at the time. Before 2008 and 2009, cost estimates were going up rapidly due to escalating steel prices. After that, costs decreased dramatically.

The final project costs tended to be very close to the bid amounts on which the loans were awarded. If the recipient spent less than the full amount of the loan, SRF would sometimes receive requests from the recipient to do more. Such requests could be approved, but would not be at the top of SRF's priority list and, thus, SRF tried to discourage such requests. In addition, any additions to the project would have to be within the scope of the original project; e.g., if a sewer project that covered four blocks came in under the loan amount, the recipient could not add another two blocks because that would be outside the scope of the original project. However, most often, if a project's final cost came in lower than the bid amount, SRF reduced the non-ARRA (base SRF) portion of funds. About half of SRF's loans released loan funds at the end of the project; in such cases, SRF then recalculated amortization.

If the recipient went above their loan amount, they did not receive additional funds. Instead, they had to either find other funding sources or go back to SRF for a supplemental loan, which would require going through a whole new loan process. IDNR did issue change orders, but only up to the amount of the original loan; change orders could not increase the loan amount, which was still capped. SRF tried to encourage applicants to think of such contingencies early in the loan process, so that SRF could do any additional environmental review that might be necessary at the beginning of the project. They could be flexible about the project scope before the loan agreement was signed, but much less so afterwards.

IDNR said that their SRF programs are mature programs. Any time EPA adds new requirements that don't apply to other programs and agencies, it makes SRF less desirable to communities. SRF said that the fewer strings attached to the loan, the better; after all, it's just a loan, and SRF doesn't want to be non-competitive. IDNR treats SRF basically as a business; they try to meet the applicant's schedule. EPA HQ recognized Iowa as a model state for the SRF program, and plans to use them as a template in future.

The impact in Iowa is illustrated in the following data provided by IDNR for the Clean Water program. Table IA - 2 shows the requested project funding based on preliminary engineering estimates, the promissory note agreement (loan amount) based on bid costs plus 10 percent of construction costs, and the final expended loan amount (actual project cost) for Clean Water projects.

The final project costs for CWSRF projects ranged from 12 percent lower than to equal to the promissory note (loan) amounts, with the average being 1 percent lower than the loan amounts; the final project costs equaled the promissory note amounts for 45 of the 47 projects. Table IA – 2. Iowa Clean Water Program ARRA Funding

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
City of Ankeny	$4,544,000	$4,544,000	$0	0%
City of Baxter	$1,279,000	$1,279,000	$0	0%
City of Baxter	$2,825,000	$2,825,000	$0	0%
City of Boone	$1,016,000	$1,016,000	$0	0%
City of Boyden	$116,000	$116,000	$0	0%
City of Cascade	$181,000	$181,000	$0	0%
City of Chariton	$1,008,000	$1,008,000	$0	0%
City of Charles City	$2,871,000	$2,871,000	$0	0%
City of Council Bluffs	$361,000	$361,000	$0	0%
City of Council Bluffs	$918,000	$918,000	$0	0%
City of Delhi	$1,517,000	$1,517,000	$0	0%
City of Donahue	$970,000	$970,000	$0	0%

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
City of Dubuque	$2,139,000	$2,139,000	$0	0%
City of Dyersville	$1,488,000	$1,488,000	$0	0%
City of Elgin	$1,007,000	$1,007,000	$0	0%
City of Elkader	$4,107,000	$4,107,000	$0	0%
City of Emmetsburg	$1,410,000	$1,274,000	-$136,000	-10%
City of Garner	$4,235,000	$4,235,000	$0	0%
City of Garwin	$1,167,000	$1,167,000	$0	0%
City of Hedrick	$303,000	$303,000	$0	0%
City of Hedrick	$2,261,000	$2,261,000	$0	0%
City of Keokuk	$4,264,000	$4,264,000	$0	0%
City of Knoxville	$3,926,000	$3,926,000	$0	0%
City of Leon	$5,723,000	$5,723,000	$0	0%
City of Little Rock	$236,000	$236,000	$0	0%
City of Low Moor	$338,000	$338,000	$0	0%
City of Macedonia	$527,000	$527,000	$0	0%
City of Maharishi Vedic City	$1,117,000	$1,117,000	$0	0%
City of Maquoketa	$150,000	$150,000	$0	0%
City of Milton	$491,000	$491,000	$0	0%
City of New Hartford	$473,000	$473,000	$0	0%
City of Newton	$684,000	$605,000	-$79,000	-12%
City of Osage	$572,000	$572,000	$0	0%
City of Ottumwa	$7,426,000	$7,426,000	$0	0%
City of Pleasantville	$476,000	$476,000	$0	0%
Pocahontas County DD #65	$1,368,000	$1,368,000	$0	0%
City of Princeton	$1,244,000	$1,244,000	$0	0%
City of Rock Valley	$5,895,000	$5,895,000	$0	0%
City of Sac City	$6,793,000	$6,793,000	$0	0%
City of Saint Charles	$1,584,000	$1,584,000	$0	0%
City of Sioux Rapids	$553,000	$553,000	$0	0%

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
City of Spencer	$2,000,000	$2,000,000	$0	0%
City of Stockton	$267,000	$267,000	$0	0%
City of Stuart	$1,323,000	$1,323,000	$0	0%
City of Sutherland	$1,313,000	$1,313,000	$0	0%
City of Toledo	$3,871,000	$3,871,000	$0	0%
City of Urbana	$5,393,000	$5,393,000	$0	0%

The impact in Iowa is illustrated in the following data provided by IDNR for the Drinking Water program. Table IA - 3 shows the requested project funding based on preliminary engineering estimates, the promissory note agreement (loan amount) based on bid costs plus up to 10 percent of construction costs, and the final expended loan amount (actual project cost) for Clean Water projects.

The final project costs for DWSRF projects ranged from 15 percent lower than to equal to the promissory note (loan) amounts, with the average being 1 percent lower than the loan amounts; the final project costs equaled the promissory note amounts for 29 of the 32 projects.

TABLE IA – 3. IOWA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Baxter Energy Efficiency Project	$340,000	$340,000	$0	0%
Boone Energy/Water Efficiency Project	$250,000	$250,000	$0	0%
Burlington Drinking Water Project	$2,966,000	$2,966,000	$0	0%
Central Iowa Water Association Water Efficiency Project	$3,946,000	$3,946,000	$0	0%
Charles City Water Efficiency Project	$504,000	$504,000	$0	0%
Crawfordsville Drinking Water Project	$407,000	$407,000	$0	0%
De Soto Drinking Water Project	$1,087,000	$1,087,000	$0	0%

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Denison Water Efficiency Project	$537,000	$537,000	$0	0%
Dubuque Water Efficiency Project	$8,676,000	$8,676,000	$0	0%
Eldon Drinking Water Project	$550,000	$550,000	$0	0%
Eldora Drinking Water Project	$300,000	$300,000	$0	0%
Fairfax Water Efficiency Project	$174,000	$153,000	-$21,000	-12%
Floyd Drinking Water Project	$400,000	$399,000	-$1,000	0%
Fort Madison Drinking Water Project	$11,672,000	$11,672,000	$0	0%
Hartley Drinking Water Project	$2,600,000	$2,600,000	$0	0%
Hubbard Drinking Water Project	$828,000	$703,000	-$125,000	-15%
Hudson Water Efficiency Project	$229,000	$229,000	$0	0%
Keokuk Drinking Water Project	$5,380,000	$5,380,000	$0	0%
Keosauqua Drinking Water Project	$500,000	$500,000	$0	0%
Ladora Water Efficiency Project	$74,000	$74,000	$0	0%
Lamoni Drinking Water Project	$487,000	$487,000	$0	0%
Laurens Drinking Water Project	$1,154,000	$1,154,000	$0	0%
Muscatine Energy Efficiency Project	$466,000	$466,000	$0	0%
North English Water Efficiency Project	$103,000	$103,000	$0	0%
Rathbun Regional Water Drinking Water Project	$4,644,000	$4,644,000	$0	0%
Renwick Drinking Water Project	$1,130,000	$1,130,000	$0	0%

Borrower	Promissory Note (Bid Costs Plus Up to 10% Contingency)	Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Salix Drinking Water Project	$418,000	$418,000	$0	0%
Sergeant Bluff Drinking Water Project	$5,989,000	$5,989,000	$0	0%
Stratford Drinking Water Project	$775,000	$775,000	$0	0%
Tama Drinking Water Project	$1,191,000	$1,191,000	$0	0%
Urbandale Water Efficiency Project	$1,671,000	$1,671,000	$0	0%
Wyoming Drinking Water Project	$785,000	$785,000	$0	0%
			Average	-1%

The accuracy reflected in the small differences between the promissory note amounts (which reflect the initial cost estimates or bid costs) and final project costs for both CWSRF and DWSRF projects is attributable to five primary factors:

1. The engineers preparing cost estimates were familiar with the majority of types of ARRA-funded projects and were seasoned at estimating costs.
2. The engineers used standardized formats and electronic bidding tools to prepare their cost estimates.
3. Bid costs are typically fixed price bids. They represent a commitment by the winning contractor to complete the project with the available funding. Bid costs are binding for a short duration, typically 90 days. Thus they most closely represent current labor and materials costs.
4. Many of the projects were "linear" in that project quantities (e.g., linear feet of pipe replaced or number of water meters installed) could be varied within the scope of work. As a result, projects could be adjusted to match the available funding.
5. For "non-linear" projects (e.g., treatment plant upgrades) loan recipients were encouraged to use unspent funds to purchase related project items such as emergency generators or spare parts. This allowed the project scope to utilize available funding.

REFERENCES

Clean Water Loan Program web page, Iowa Department of Natural Resources web site, http://www.iowasrf.com/program/clean_water_loan_program/.

Drinking Water Loan Program web page, Iowa Department of Environmental Quality web site, http://www.iowasrf.com/program/drinking_water_loan_program/.

Memorandum re Focus Group Meeting with Iowa Department of Natural Resources, Des Moines, IA, April 4, 2013.

APPENDIX 3: LOUISIANA STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN LOUISIANA'S SRF PROGRAMS

SRF PROGRAM OVERVIEW

In Louisiana, the Clean Water State Revolving Fund (CWSRF) is administered by the Louisiana Department of Environmental Quality (LDEQ), while the Drinking Water State Revolving Fund (DWSRF) is administered by the Louisiana Department of Health and Hospitals (LDHH). Table LA – 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE LA – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN LA'S CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Administered by the Louisiana Department of Environmental Quality.	Administered by the Louisiana Department of Health and Hospitals.
Applicant submits application with cost estimate, including engineering, design, construction, inspection and legal costs.	Applicant submits application with cost estimate, including engineering, design, construction, inspection and legal costs.
Contingency is 10%.	Contingency is 10%.
Application may or may not include engineering report.	
Upon approval of the application, CWSRF allocates funds to the project equal to the applicant's cost estimate.	Upon approval of the application, CWSRF allocates funds to the project equal to the applicant's cost estimate.
The project and the funds allocation are then added to the State's Intended Use Plan (IUP).	The project and the funds allocation are then added to the State's Intended Use Plan (IUP).
For the most part, CWSRF allocated ARRA funds to recipients equal to what they requested in the cost estimates in their applications.	For the most part, DWSRF allocated ARRA funds to recipients equal to what they requested in the cost estimates in their applications.
If bids came in higher than the cost estimate, Change Orders were sometimes used to adjust the project scope.	
In selecting projects to fund, CWSRF's base priority ranking system does not consider income, geographic location (other than stream impairments), nor whether the project is shovel ready.	

For ARRA, CWSRF revised their priority ranking system. They wanted to make sure the projects could be completed within the tight timeframes involved; thus, they cut anything that was not shovel ready[1]. They also wanted to give priority to disadvantaged communities that could not normally afford to borrow from the program, so they looked at different variables—median income of the community, geographic location, need, age of system, stream impairments, etc. They also tried to distribute funds to as wide a geographic area around the state as possible. Finally, they looked at the cost of the project, trying to maximize work product with available funds. In the end, CWSRF distributed $43 million of ARRA funds across 53 projects, located in 45 of the state's 60 parishes.	For ARRA, DWSRF eliminated projects if they did not meet a categorical exclusion, as they would take too long otherwise. In some cases, they worked with the applicants to carve out a piece of a larger project that would meet categorical exclusion so that they could fund these smaller pieces. They also used internal deadlines to decrease the number of projects. They funded 28 projects, with 12 consultants who were new to the program; only three projects on their list were not funded.
CWSRF allocated all ARRA funds as principal forgiveness and did not keep any funds for administration.	DWSRF gave away only a little more than half of their ARRA funds in the form of principal forgiveness. DWSRF allocated funds to projects as a combination of ARRA and non-ARRA (base program) funds in the form of grants and loans, with 30% (up to a maximum of $1 million) in the form of principal forgiveness—the balances were loaned. The grant/loan combinations made accounting easier when projects came in under budget, as they could shift funds as needed.
In 2008, before ARRA was passed, CWSRF did not have many projects on their list; the projects they did have were mostly either old or not shovel-ready. They had already started soliciting applicants before ARRA came out, to speed up the program. When ARRA was passed, CWSRF held a separate solicitation for ARRA projects.	When ARRA came out, DWSRF already had a long list of applicants, but they still solicited for additional ARRA projects. DWSRF also had to decrease the number of applicants who would receive funds, but not by as many as CWSRF did.

CWSRF

With ARRA, CWSRF followed Congress's recommendation and changed their focus to allocate ARRA funds to recipients who could not otherwise afford grants—rural areas, small, poor and disadvantaged communities. They received 284 applicants. Many of these were new applicants and new engineering firms that were not familiar with the program requirements. As a result, CWSRF had to walk them through each step of the application process.

Almost all of CWSRF's projects were line, pump, collection system or treatment plant rehabilitations. The average value of projects was approximately $750 thousand - $1 million. The largest project, the West Monroe green project, was funded at $4.5 million; the smallest project was roughly $100,000.

[1] For purposes of ARRA, CWSRF defined shovel ready as: (a) projects qualifying for categorical exclusion from NEPA (to avoid delays associated with NEPA); (b) projects having 100% plans and specifications already prepared; or (c) easy projects such as replacing lift station pumps, which could be planned and completed quickly, even if 100% plans and specifications were not already prepared.

CWSRF did not use multiple funding sources for projects in most cases. However, the West Monroe wastewater recycling facility was jointly funded with DWSRF and received $4.75 million ARRA funds in principal forgiveness, plus a $1.2 million loan from their base program funds. In addition, CWSRF did not require local funding matches.

DWSRF

DWSRF awarded roughly $27 million in ARRA funds, with $315,000 kept for administration; approximately $19 million was awarded in the form of principal forgiveness.

Factors Affecting Cost Estimates

CWSRF

CWSRF received a broad spectrum of cost estimates from applicants. When project bids came in, some hit the mark, while others came in high or low compared to the application cost estimates, with approximately equal numbers being too high and too low and overall averaging roughly on the mark. Out of the total $43 million ARRA award amount, they only went over by $385,722.

For projects where the bid came in under the cost estimate, recipients spent the entire award amount by finding other uses for the excess funds, such as through the purchase of smaller items like generators. CWSRF encouraged this, as they did not want to take back money; fortunately, their loan documents were generally written to be broad in scope, which gave them flexibility for spending the excess funds.

CWSRF representatives in the focus group said that for projects where the bid came in over the cost estimate, this was generally due to either poor bids, field adjustments or unforeseen problems; for example, CWSRF said their contractors were somewhat overwhelmed by the speed and volume of work under ARRA, and that costs may have increased slightly due to availability issues. CWSRF was sometimes able to accommodate the increase by using other funds; otherwise, they had to issue change orders to reduce the project scope. CWSRF supplemented approximately six projects with funds from their administrative fee fund, which they had been banking for several years.

DWSRF

DWSRF reported that most project bids were equal to the cost estimate; a few were slightly under, but none were over. When the project bids were below the cost estimate, the organization purchased small items like generators to spend the rest of the money, similar to the CWSRF program. DWSRF said the existing contractor base was overwhelmed to some degree and that this caused some project delays due to availability issues.

The impact on the DWSRF program in Louisiana is illustrated in the following data provided by LDEQ. Table LA - 2 shows the base promissory note agreement (loan amount) (excluding contingency), loan contingency, and total promissory note agreement (loan amount) based on estimated costs plus contingency for Drinking Water projects. Data on the initial grantee estimated costs were not available for Louisiana's DWSRF program; however, DWSRF has stated that these cost estimates were used to determine, and thus are close to, the loan amounts.

The final project costs for DWSRF projects ranged from 5% lower than to equal to the promissory note (loan) amounts, with the average being equal to the loan amounts; the final project costs equaled the

promissory note amounts for 23 of the 28 projects. The accuracy reflected in the small differences between the promissory note amounts (which reflect the initial cost estimates or bid costs) and final project costs is attributable to five primary factors:

1. The engineers preparing cost estimates were familiar with the majority of types of ARRA-funded projects and were seasoned at estimating costs.
2. The engineers used standardized formats and electronic bidding tools to prepare their cost estimates.
3. Bid costs are typically fixed price bids. They represent a commitment by the winning contractor to complete the project with the available funding. Bid costs are binding for a short duration, typically 90 days. Thus they most closely represent current labor and materials costs.
4. Many of the projects were "linear" in that project quantities (e.g., linear feet of pipe replaced or number of water meters installed) could be varied within the scope of work. As a result, projects could be adjusted to match the available funding.
5. For "non-linear" projects (e.g., treatment plant upgrades) loan recipients were encouraged to use unspent funds to purchase related project items such as emergency generators or spare parts. This allowed the recipients to utilize available funding.

TABLE LA – 2. LOUISIANA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Total Promissory Note Agreement (Estimated Costs Plus 10% Construction Contingency Plus Other Costs*)	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Ascension Consolidated Utilities District	$1,000,000	$1,000,000	$0	0%
Bayou Des Cannes Water System	$2,222,520	$2,222,520	$0	0%
Buckeye Water District #50	$1,142,000	$1,142,000	$0	0%
Calcasieu Parish WWD #8	$641,000	$641,000	$0	0%
City of Alexandria	$4,390,000	$4,390,000	$0	0%
City of Baker	$4,200,000	$4,200,000	$0	0%
City of Blanchard	$3,657,000	$3,657,000	$0	0%
City of Bogalusa	$5,000,000	$5,000,000	$0	0%
City of Franklin	$2,705,000	$2,705,000	$0	0%
City of Mansfield	$4,120,000	$4,120,000	$0	0%
City of Morgan City	$3,984,000	$3,984,000	$0	0%
City of Natchitoches	$5,000,000	$5,000,000	$0	0%
City of Ruston	$3,334,000	$3,334,000	$0	0%
City of Shreveport	$11,000,000	$10,692,302	-$307,698	-3%
City of Thibodaux	$6,400,000	$6,400,000	$0	0%
City of Ville Platte	$4,050,000	$4,050,000	$0	0%

Borrower	Total Promissory Note Agreement (Estimated Costs Plus 10% Construction Contingency Plus Other Costs*)	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
City of Westlake	$2,900,000	$2,900,000	$0	0%
Desoto Parish WWD #1	$2,360,000	$2,360,000	$0	0%
East Allen Parish WWD	$1,285,000	$1,285,000	$0	0%
Gardner Community Water Association	$1,410,000	$1,333,946	-$76,054	-5%
Iberville WWD #2	$3,250,000	$3,206,142	-$43,858	-1%
Kolin Ruby-Wise Water District 11A	$550,000	$550,000	$0	0%
New Orleans Sewerage & Water Board	$3,400,000	$3,400,000	$0	0%
Savoy Swords Water System	$886,000	$870,481	-$15,519	-2%
Southwest Allen Parish Waterworks	$995,000	$995,000	$0	0%
Town of Pollock	$530,000	$530,000	$0	0%
Town of Walker	$520,000	$520,000	$0	0%
United Water System	$952,000	$940,895	-$11,105	-1%
			Average	0%

*Other costs include legal fees, administrative and engineering fees, inspection fees, etc.

REFERENCES

Louisiana Department of Environmental Quality web site, Clean Water State Revolving Fund page, http://www.deq.louisiana.gov/portal/DIVISIONS/FinancialServices/CleanWaterStateRevolvingFund.aspx.

Louisiana Department of Health and Hospitals web site, Drinking Water Revolving Loan Fund page, http://new.dhh.louisiana.gov/index.cfm/page/431/n/285.

Memorandum re Focus Group Meeting with Louisiana Department of Environmental Quality, Baton Rouge, LA, March 15, 2013.

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APPENDIX 4: MONTANA STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN MONTANA'S SRF PROGRAMS

PROGRAM OVERVIEW

In Montana, the technical and programmatic elements of both the Clean Water State Revolving Fund (CWSRF) program (aka, the Water Pollution Control State Revolving Fund program) and the Drinking Water State Revolving Fund (DWSRF) program are administered by the Montana Department of Environmental Quality (MDEQ). The Department of Natural Resources and Conservation (DNRC) issues the State's general obligation bonds and makes loans to the project borrowers. Cooperatively, DEQ and DNRC administer the State Revolving Fund Loan Programs. Table NC - 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE MT – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN MT'S CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Technical and programmatic elements administered by Montana Department of Environmental Quality (MDEQ).	Technical and programmatic elements administered by Montana Department of Environmental Quality (MDEQ).
General obligation bonds and loans administered by Montana Department of Natural Resources and Conservation.	General obligation bonds and loans administered by Montana Department of Natural Resources and Conservation.
Applicant for funding from SRF program submits application to request inclusion on the Priority List and in the Intended Use Plan (IUP). Application includes rough cost estimate based on two-page questionnaire, including engineering, construction, legal and administrative costs; at this stage, applicant may not even have an engineer on the project.	Applicant for funding from SRF program submits application to request inclusion on the Priority List and in the Intended Use Plan (IUP). Application includes rough cost estimate based on two-page questionnaire, including engineering, construction, legal and administrative costs; at this stage, applicant may not even have an engineer on the project.
Annual IUP process begins in May or June to identify projects which may need SRF funding in the upcoming year; list is completed by July 1st. Ranking on Priority List is based on water quality and/or public health impacts and financial needs. Project remains on List until it has been completed, regardless of funding source(s) used to finance project.	Annual IUP process begins in May or June to identify projects which may need SRF funding in the upcoming year; list is completed by July 1st. Ranking on Priority List is based on water quality and/or public health impacts and financial needs. Project remains on List until it has been completed, regardless of funding source(s) used to finance project.
Once applicant listed on IUP, it is eligible to apply for an SRF loan. Loans are typically offered on a first-come, first-served basis until demand exceeds available funds. However, lower ranked projects may be funded before higher ranked projects if higher ranked project is not ready to proceed, as long as the funds are available. Generally, Montana has enough money to fund all projects. Some projects stay at the top of the IUP for several years because city does not take action to move forward.	Once applicant listed on IUP, it is eligible to apply for an SRF loan. Loans are typically offered on a first-come, first-served basis until demand exceeds available funds. However, lower ranked projects may be funded before higher ranked projects if higher ranked project is not ready to proceed, as long as the funds are available. Generally, Montana has enough money to fund all projects. Some projects stay at the top of the IUP for several years because city does not take action to move forward.

CWSRF	DWSRF
To request SRF loan funding, the applicant submits a "Uniform Application Supplement;" these applications are accepted year-round and the IUP is updated three to four times per year, depending on when communities submit projects.	To request SRF loan funding, the applicant submits a "Uniform Application Supplement;" these applications are accepted year-round and the IUP is updated three to four times per year, depending on when communities submit projects.
After application is submitted, applicant hires engineer to develop Preliminary Engineering Report (PER), which includes a more detailed cost estimate. This cost estimate may include contingency (usually 5- 10%), which may be funded through local funds. Montana also gives out planning grants to support development of the PER. Montana provided $1.8 million in planning grants for preliminary engineering reports to assess entire project and work with community to define problems and identify best solutions. The objective of planning grants is to ensure that the project is comprehensive and "fixes" any problems for the long term; this also gives them better projects. Communities have to apply for planning grants, which may come from DEQ or from other agencies.	After application is submitted, applicant hires engineer to develop Preliminary Engineering Report (PER), which includes a more detailed cost estimate. This cost estimate may include contingency (usually 5- 10%), which may be funded through local funds. Montana also gives out planning grants to support development of the PER. Montana provided $1.8 million in planning grants for preliminary engineering reports to assess entire project and work with community to define problems and identify best solutions. The objective of planning grants is to ensure that the project is comprehensive and "fixes" any problems for the long term; this also gives them better projects. Communities have to apply for planning grants, which may come from DEQ or from other agencies.
At this stage of planning, anomalies are identified and the design is adjusted before the final design is developed. SRF coordinates this process and may assist the community to address other issues, such as compliance and environmental issues. SRF may make suggestions about what needs to be completed; tries to look at complete picture including compliance status, and works with communities to adjust user rates and charges.	At this stage of planning, anomalies are identified and the design is adjusted before the final design is developed. SRF coordinates this process and may assist the community to address other issues, such as compliance and environmental issues. SRF may make suggestions about what needs to be completed; tries to look at complete picture including compliance status, and works with communities to adjust user rates and charges.
The planning and costing phase for construction projects can typically take up to two years, based on factors such as regulation and policy changes or need for land acquisition. Thus, it becomes an iterative process where project plans and costs develop and change over time. SRF coordinates conference calls with applicants to ensure schedules are met, scopes are defined, user rates and charges practices are included in plan, and to perform technical reviews. Funding for land purchases, if necessary, may come from another agency. The applicant may need to lease land or obtain right-of-way. All these planning activities occur simultaneously. Often an environmental document is needed, so SRF ensures that all agencies that would be involved are included from outset. Any other funding agencies that may be involved are also included on these calls.	The planning and costing phase for construction projects can typically take up to two years, based on factors such as regulation and policy changes or need for land acquisition. Thus, it becomes an iterative process where project plans and costs develop and change over time. SRF coordinates conference calls with applicants to ensure schedules are met, scopes are defined, user rates and charges practices are included in plan, and to perform technical reviews. Funding for land purchases, if necessary, may come from another agency. The applicant may need to lease land or obtain right-of-way. All these planning activities occur simultaneously. Often an environmental document is needed, so SRF ensures that all agencies that would be involved are included from outset. Any other funding agencies that may be involved are also included on these calls.
Once the final design (including plans and specifications) and final cost estimate have been developed and approved, the loan is closed and funds are committed to project. The SRF loan program cooperates with other Montana funding programs to ensure project funding is available when it is needed. The recipient then advertises for construction bids.	Once the final design (including plans and specifications) and final cost estimate have been developed and approved, the loan is closed and funds are committed to project. The SRF loan program cooperates with other Montana funding programs to ensure project funding is available when it is needed. The recipient then advertises for construction bids.

CWSRF	DWSRF
To meet obligation criteria, SRF used ARRA funds only on "shovel ready" projects which had already been through pre-design and engineering costing. Projects that were not shovel ready would have taken too long to coordinate within short ARRA timeframes; cities had to use base funds for such projects. This may have conflicted with some of base program criteria for funding priority. For example, tight ARRA time frame meant that projects had to be ready to go, whereas other projects might have had a greater need but weren't ready to go. However, some of these projects never would have moved forward without ARRA.	To meet obligation criteria, SRF used ARRA funds only on "shovel ready" projects which had already been through pre-design and engineering costing. Projects that were not shovel ready would have taken too long to coordinate within short ARRA timeframes; cities had to use base funds for such projects. This may have conflicted with some of base program criteria for funding priority. For example, tight ARRA time frame meant that projects had to be ready to go, whereas other projects might have had a greater need but weren't ready to go. However, some of these projects never would have moved forward without ARRA.
The state wanted to spread ARRA funds around as much as possible, so decided on a $750,000 ARRA cap per project, in form of either principal forgiveness or loans. This provided enough funding to be useful to each project, but still spread monies out to as many localities as possible and encouraged "new client" localities to apply for loans/grants from state and other agencies to become familiar with the process. SRF also wanted a good distribution among types of funding recipients.	State wanted to spread ARRA funds around as much as possible, so decided on a $750,000 ARRA cap per project, in form of either principal forgiveness or loans. This provided enough funding to be useful to each project, but still spread monies out to as many localities as possible and encouraged "new client" localities to apply for loans/grants from state and other agencies to become familiar with the process. SRF also wanted a good distribution among types of funding recipients.
In addition, Montana used ARRA stimulus, especially in form of principal forgiveness, as an opportunity to encourage many small communities to upgrade and fix water systems and come into compliance. Many communities would never have been able to do this without ARRA. Recipients used ARRA money first, before any other funding sources. Recipients used ARRA principal forgiveness grant funds first, then loans so that ARRA funds were expended within required timeframes.	In addition, Montana used ARRA stimulus, especially in form of principal forgiveness, as an opportunity to encourage many small communities to upgrade and fix water systems and come into compliance. Many communities would never have been able to do this without ARRA. Recipients used ARRA money first, before any other funding sources. Recipients used ARRA principal forgiveness grant funds first, then loans so that ARRA funds were expended within required timeframes.

Montana had advanced notification that ARRA was coming and thus conducted a great deal of outreach with communities and projects to help them prepare for ARRA. Some projects that received ARRA funds were new projects that began just in the ARRA year, whereas others were existing projects to which ARRA funding was added as another phase; all the funding was held as discrete for the particular phase.

The majority of SRF projects in Montana are funded by several agencies, with caps to grants from the various agencies. For SRF loans, the cap is typically $1.3 million or $1.5 million. Projects are phased so that the grant needed fit the available funding. Before ARRA, SRF funding awarded was about $30 million per year. ARRA added $38 million. This enabled the state to give out more grants, as opposed to larger grants. ARRA enabled the state to put together funding packages for much larger projects, using funds from other sources to leverage the ARRA funds. Cities were able to do more because of the extra money available, expanding the scope of projects to meet the available funding, such as by adding water meters to existing projects with the extra funding.

Factors Affecting Cost Estimation

The contractors in Montana have a great deal of experience with SRF projects, so their bids tend to be realistic. However, if bids come in lower than expected, then SRF can do more in the community. Before project closeout, if there were under-runs, SRF assessed the project's needs and could potentially add more to the project (such as buying more main replacement) or perhaps allow purchase of a back-up generator or other piece of equipment that would best service the locality's needs with regards to the specific project. If the entire funded amount was not spent, the loan amount could also be reduced by that much.

SRF found it rare for projects to go over budget. If projects did go over budget, it was often due to the long time lapse between planning and the start of the project. Montana uses a variety of funding sources for projects, and this can take time to pull together. Inflation factors can affect costs as the project funding comes together over several years. So planning cannot address a lot of issues. In addition, there is often not enough funding to do all the planning. For instance, land acquisition cannot be included in the planning process. Also, much of the environmental work needs to be done after the planning process; the several involved federal and state agencies all have different agendas. The logistics of when the environmental work and land acquisition can happen also have to be taken into account. This is an iterative process that needs flexibility and communication, and is somewhat of an art. Changes in project cost occur over the course of this iterative process, and this needs to be explained to the public upfront. In addition, the overall cost of SRF projects in Montana has been going up due to the need to meet new treatment standards for nutrient removal. It used to be that $2-3 million was a big wastewater project; now that is a small amount. Other factors, such as oil and gas development which creates demand for additional wastewater treatment, may also contribute to increasing costs.

In addition, unknowns can result in additional costs. Competition, the biggest unknown, can have a huge impact on the market. During high growth times, unit costs went way up, resulting in underestimation of final project costs. During the recession and ARRA, though, final project costs generally came in under the estimates due to intense competition among the contractors. To account for potential changes in costs over the course of the project, the applicant could choose to go with a conservative higher cost estimate, but this can have a downside: the community may decide not to move forward when the project is so expensive. The project can also lose credibility if the initial cost seems too high.

In those few cases where the final project costs did come in above the loan amounts, the state could usually cover the costs using other non-ARRA funding sources. Alternatively, a decision could be made to phase the project, cut back on project components and/or take out non-essential items.

SRF stated that the ARRA stimulus greatly helped Montana. Without ARRA, some large wastewater projects under enforcement would not have been able to get projects done. The smaller communities also could not have afforded a loan or even the cost of mobilization of a construction project. Montana has many low income areas and many projects sat on the shelf for years until ARRA came along; many of the smaller towns had not seen a major construction project in twenty years. O&M labor and power costs also make it difficult for smaller communities to deal with wastewater treatment. In addition, many small rural communities don't have full time public works directors, clerks, mayors, etc. These roles are considered their "second jobs" alongside their other full-time jobs. Therefore, they are not dedicated to particular systems and programs, were not familiar with the SRF programs and practices and had to be trained to receive the ARRA funding.

SRF worked hard to educate the communities on how to submit applications, ensure rates and charges are in place, address health and safety with regards to construction projects, and coordinate and hold public meetings and liability training sessions. Many rural communities had not had rate increases or any drinking water construction projects for over 20 years, and thus were unaware of the process. For example, SRF consulted with the localities and encouraged one locality to buy out a deteriorating trailer park complex, as a result of which the locality became a water and sewer district and could apply for SRF loans to install and update the systems.

ARRA also aided the Montana contractor community. Due to the recession, many contractors were out of work at the time; ARRA funding provided work for both existing and new contractors. During the ARRA timeframe, when the recession was at its peak, many contractors underbid (mostly by cutting out profits) on projects to get the job and keep crews busy. Both the state and contractors claim that ARRA saved many contractors from bankruptcy. However, some contractors and subcontractors bid so low that they went bankrupt during the middle of a project—there was so much competition for work that contractors were submitting bare-bones bids. This may also have served to undercut project quality. Many of the ARRA projects received over 100 bids, whereas in the past, projects may have received around ten bids. This increase in the number of bids required more review and response on the part of DEQ and DNRC.

The state made an effort to spread contracting dollars to not just the biggest and most well-known contractors. They even provided contracts to former 'developers' who were out of work. However, this caused more management issues for SRF when localities used contractors (many from the residential or commercial development side) who were not used to the SRF contracts program, as SRF had to educate and train these contractors with regards to the process, administrative paperwork, etc. Quality may also have been an issue with these inexperienced contractors.

Another benefit that Montana's SRF program has seen as a result of ARRA, is that they are seeing repeat business. Localities that benefitted from ARRA and learned how to apply for SRF funding are now coming back for more funding for additional projects.

The impact in Montana is illustrated in the following data provided by MDEQ for CWSRF projects. Table MT - 2 shows the promissory note agreement (loan amount) based on estimated costs plus contingency and final project costs for Clean Water projects. Data on the grantee estimated costs were not available for Montana's CWSRF program; however, CWSRF has stated that final grantee cost estimates are what were used to determine, and thus are close to, the loan amounts.

The final project costs for CWSRF projects ranged from 13 percent lower than to equal to the promissory note (loan) amounts, with the average being 2 percent lower than the loan amounts; the final project costs equaled the promissory note amounts for 24 of the 31 projects.

TABLE MT – 2. MONTANA CLEAN WATER PROJECTS ARRA FUNDING

Borrower	Total Promissory Note Agreement (Estimated Costs Plus Construction Contingency)	CWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Billings, City of	$750,000	$750,000	$0	0%
Bozeman, City of	$750,000	$750,000	$0	0%
Butte/Silver Bow Co.	$750,000	$750,000	$0	0%
Columbia Falls, City of	$750,000	$750,000	$0	0%
Conrad, City of	$750,000	$750,000	$0	0%
Deer Lodge, City of	$750,000	$750,000	$0	0%
Dutton, Town of	$750,000	$750,000	$0	0%
East Helena, City of	$324,350	$324,350	$0	0%
Fairfield, Town of	$641,000	$641,000	$0	0%
Glendive, City of	$61,000	$61,000	$0	0%
Great Falls, City of	$750,000	$700,516	-$49,484	-7%
Hamilton, City of	$750,000	$750,000	$0	0%
Hardin, City of	$750,000	$750,000	$0	0%
Helena, City of	$750,000	$750,000	$0	0%
Laurel, City of	$750,000	$750,000	$0	0%
Lewis & Clark County Law Academy	$750,000	$750,000	$0	0%
Lewistown, City of	$379,900	$359,059	-$20,841	-5%
Livingston, City of	$750,000	$750,000	$0	0%
Lockwood WSD	$750,000	$750,000	$0	0%
Missoula County - WYD	$750,000	$750,000	$0	0%
Missoula, City of (Rattlesnake)	$750,000	$750,000	$0	0%
Plains, Town of	$502,000	$443,290	-$58,710	-12%
Sacred Lodge, City of	$511,186	$492,043	-$19,143	-4%
Ronan, City of	$294,800	$294,800	$0	0%
Shelby, City of	$750,000	$750,000	$0	0%
St. Regis WSD	$103,100	$103,100	$0	0%
Townsend, City of	$750,000	$749,529	-$471	0%
Virginia City, Town of	$388,000	$375,837	-$12,163	-3%
Whitefish, City of	$128,000	$114,911	-$13,089	-10%
Winifred, Town of	$559,400	$559,400	$0	0%
Wisdom WSD	$326,800	$282,880	-$43,920	-13%
			Average	-2%

The impact in Montana is illustrated in the following data provided by MDEQ for Drinking Water projects. Table MT - 3 shows the promissory note agreement (loan amount) based on estimated costs plus contingency and final project costs for Drinking Water projects. Data on the grantee estimated costs were not available for Montana's DWSRF program; however, DWSRF has stated that the final grantee cost estimates are what were used to determine, and thus are close to, the loan amounts.

The final project costs for DWSRF projects ranged from 22 percent lower than to equal to the promissory note (loan) amounts, with the average being 2 percent lower than the loan amounts; the final project costs equaled the promissory note amounts for 29 of the 35 projects.

TABLE MT – 3. MONTANA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Total Promissory Note Agreement (Estimated Costs Plus Construction Contingency)	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Belgrade, City of	$750,000	$750,000	$0	0%
Billings III, City of	$750,000	$750,000	$0	0%
Black Eagle WSD	$225,000	$225,000	$0	0%
Butte/Silver Bow Co.	$750,000	$715,530	-$34,470	-5%
Chester, Town of	$448,000	$448,000	$0	0%
Columbus, Town of	$750,000	$750,000	$0	0%
Cut Bank, City of	$750,000	$750,000	$0	0%
Elk Meadows WD	$750,000	$750,000	$0	0%
Essex WSD	$357,246	$357,246	$0	0%
Fort Benton, City of	$631,000	$630,019	-$981	0%
Glendive, City of	$357,000	$357,000	$0	0%
Great Falls, City of	$750,000	$630,019	-$119,981	-16%
Havre, City of	$350,000	$350,000	$0	0%
Helena, City of	$750,000	$750,000	$0	0%
Homestead Acres	$393,997	$393,997	$0	0%
Jette Meadows WSD	$750,000	$750,000	$0	0%
Kevin, Town of	$680,000	$680,000	$0	0%
Lewis & Clark County	$46,000	$46,000	$0	0%
Manhattan, Town of	$230,000	$230,000	$0	0%
Miles City, City of	$750,000	$750,000	$0	0%
Missoula County	$572,400	$487,679	-$84,721	-15%
Mountain Water Company	$750,000	$750,000	$0	0%
Pablo WSD	$750,000	$750,000	$0	0%
Polson, City of	$750,000	$750,000	$0	0%

Borrower	Total Promissory Note Agreement (Estimated Costs Plus Construction Contingency)	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Seeley Lake W&S District	$750,000	$750,000	$0	0%
Shelby	$750,000	$750,000	$0	0%
Superior, Town of	$298,000	$298,000	$0	0%
Three Forks, City of	$170,000	$170,000	$0	0%
Troy, Town of	$500,000	$500,000	$0	0%
University of Montana	$750,000	$750,000	$0	0%
Upper/Lower River Rd WSD	$500,000	$500,000	$0	0%
Virginia City, Town of	$430,000	$425,749	-$4,251	-1%
Virginia City, Town of, II	$48,000	$37,450	-$10,550	-22%
Whitefish, City of	$270,000	$270,000	$0	0%
Wilderness Plateau WSD	$263,000	$263,000	$0	0%
			Average	-2%

The accuracy reflected in the small differences between the promissory note amounts (which reflect the initial cost estimates or bid costs) and final project costs for both CWSRF and DWSRF projects is attributable to six primary factors:

1. The engineers preparing cost estimates were familiar with the majority of types of ARRA-funded projects and were seasoned at estimating costs. Cost estimating for Drinking Water and Clean Water projects is not new, and the Montana community is close-knit. The contractors are well-known and experienced; there are 12 to 15 engineering firms that the state works with regularly on Drinking Water and Clean Water projects. These companies have a great deal of experience in the state and are thus able to develop thorough and accurate planning documents. Montana uses their planning grants to assist localities in hiring an engineer for design and cost estimates, to ensure they submit a robust application. They then work with the community to figure out how to get the work done with the available funds, for instance, by building only a metal building instead of a brick building, cutting out nonessential elements or phasing projects.
2. The engineers used standardized formats and electronic bidding tools to prepare their cost estimates. SRF stated that the PERs are the real key to realistic cost estimates. SRF keeps all the bid tabs for all the projects they have ever had, and all engineers have access to them, so they can be very precise in developing their cost estimates. For example, contractors will generally use standard estimates (bid tabs) for items such as pipe installation. They can add some contingency if they think there might be difficult issues; however, SRF has never encountered a big issue that caused major project cost differences. Partly this is due to good communication between the state and the consultants.
3. Montana SRF avoids cost variances and minimizes cost over-runs by looking realistically at project scope. The PER is their best estimate at the planning stage. When the PER comes in, the state reviews the applicant's plans and costs, discusses the project with the community and helps

them become more realistic. The state believes their understanding of community finances helps them develop more realistic cost estimates, and know what the community will be able to afford; they may decide to phase the project if the cost is high. This is followed by pre-design. At this stage, there is enough funding in the project to do more environmental and land acquisition planning. If the site has to be changed, the environmental planning also has to be changed. This is an iterative process. In addition, the scope may need to change by the time of the final design to meet the funding limit, but if it does, the process starts over. In the end, though, projects generally meet their cost estimates because the projects can be downsized if needed or lower cost items can be substituted.

4. Bid costs are typically fixed price bids. They represent a commitment by the winning contractor to complete the project with the available funding. Bid costs are binding for a short duration, typically 90 days. Thus they most closely represent current labor and materials costs.
5. Many of the projects were "linear" in that project quantities (e.g., linear feet of pipe replaced or number of water meters installed) could be varied within the scope of work. As a result, projects could be adjusted to match the available funding.
6. For "non-linear" projects (e.g., treatment plant upgrades) loan recipients were encouraged to use unspent funds to purchase related project items such as emergency generators or spare parts. This allowed the project scope to utilize available funding.

REFERENCES

Montana State Revolving Fund Programs web page, Montana Department of Environmental Quality web site, http://www.deq.mt.gov/wqinfo/srf/default.mcpx.

Water Pollution Control State Revolving Fund Loans web page, Montana Department of Environmental Quality web site, http://www.deq.mt.gov/wqinfo/srf/WPCSRF/default.mcpx.

Drinking Water State Revolving Fund web page, Montana Department of Environmental Quality web site, http://www.deq.mt.gov/wqinfo/srf/DWSRF/default.mcpx.

October 25 Meeting Notes from Focus Group Meeting with Montana Department of Environmental Quality, Rapid City, MT, October 25, 2012.

25Oct 2012 MT Focus Group, Documentation of Focus Group, Cost Estimating and Green Project Reserve,

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APPENDIX 5: NEW YORK STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN NEW YORK'S SRF PROGRAMS

CWSRF AND DWSRF

Program Overview

Under ARRA, New York received the largest total Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) allotment of any state, at $524 million. Approximately $435 million was provided to the CWSRF, and $86 million for the DWSRF (New York State Environmental Facilities Corporation, 2011).

In New York, the CWSRF is administered jointly by the New York State Environmental Facilities Corporation (EFC) and the New York State Department of Environmental Conservation (DEC), while the DWSRF is administered jointly by the EFC and the New York State Department of Health (DOH). The EFC is a public benefit corporation formed to provide low-cost capital and expert technical assistance for environmental projects in New York State. EFC administers the financial aspects of the CWSRF and DWSRF. Applications for CWSRF and DWSRF financing are submitted to EFC, the financing is obtained through EFC, and repayments are made to EFC. DOH manages the technical review for DWSRF projects. For the DWSRF, DEC and DOH accepts pre-application forms and technical reports; scores, ranks, and lists projects on the IUP; and reviews technical documents for both the pre-application and the complete application.

The New York State EFC offers both CWSRF and DWSRF clients the opportunity to finance planning, design and early construction costs through short-term financing programs. These are projects that have progressed into the planning phase, but are not ready for long-term financing. This program allows applicants to develop very accurate cost estimates before finalizing the long-term project costs. Short-term funding can be used for up to three years, at which point the state will reevaluate whether a project can be converted to long-term financing. Short-term funding would take a project through bid and into construction (SAIC, 2013).

The CWSRF program provides low-interest rate financing terms to eligible recipient entities for projects that reduce, eliminate or prevent water pollution. The New York State Department of Environmental Conservation (DEC) administers the program. As the financings are repaid, the money becomes available for new projects and the funds continue to revolve. The CWSRF provides up to a 50% interest rate subsidy, which saves communities money on interest costs.

The DWSRF program provides low-interest rate financing terms, as well as hardship grants for publicly and privately owned community water system projects that provide safe, affordable drinking water. The program is administered by EFC and the New York State Department of Health (DOH). Like the CWSRF, as the financings are repaid, the money becomes available for new projects. The DWSRF provides a 33⅓% interest rate subsidy, which saves communities money on interest costs.

SRF program capitalization grants are issued from USEPA to New York State, for which the State is required to provide 20 percent in matching funds. New York State distributes these federal and state moneys to DEC and DOH to administer the programs. DEC and DOH in turn distribute these moneys to EFC to provide financial assistance to eligible recipients. EFC invests the federal and state capitalization grant moneys and uses interest earnings on these and other funds to subsidize by one-third or one-half the

interest on the financings it provides. Financial assistance under the SRF program may be provided directly from the grant funds, from the proceeds from the issuance of bonds, repayments and/or interest earnings (New York State Environmental Facilities Corporation, 2011).

Project listing is the first step to obtaining financing through either SRF. The project applicant submits appropriate SRF Project Listing Forms that provide the information necessary for EFC staff to accurately score the project and list it on the Annual Project Priority List (PPL) as required by state regulations. The eligible project costs to be listed are based on documented values from engineering reports, plans and specifications, bid awards, etc. EFC staff rate projects and include eligible projects in a draft IUP. The amount of any outside grants, loans or subsidies must be subtracted from the submitted request; thus, the requested amount for a project is not necessarily the full anticipated cost of the project. Attachment 1 provides an example of the level of costing information sought from applicants for both the DWSRF and the CWSRF (New York State Environmental Facilities Corporation, 2013).

The submittal of an acceptable project schedule is a prerequisite to being listed in the IUP. The schedule must demonstrate that all necessary items required for financing of the project will be completed in time to enable project financing within the effective period of the IUP. The IUP shows the estimated SRF long-term financing amount needed for each project within the effective period of the IUP, and it is expected that the financing requested in any application will not exceed that amount. The amount shown on the IUP and requested in the application includes all eligible costs for which financing will be requested, including: planning, design, construction, project inspection, equipment, force account, legal, fiscal, bond counsel, contingencies and estimated issuance costs. Awarded grants from third-party sources are not included in the project financing amount. No more than the amount shown on the IUP can be financed in the current fiscal period unless funds are available or become available through project cost reductions, by-passing, or new funding sources. If the application amount exceeds the funds available, part or all of the project financing may have to be postponed.

New York's CWSRF regulations require that at least 3 percent of the funds available be used in each NYSDEC Region, with Regions 5 and 6 combined.

Table NY - 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE NY – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN NY'S CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Administered by New York State Environmental Facilities Corporation (EFC) and the New York State Department of Environmental Conservation (DEC)	Administered by New York State Environmental Facilities Corporation (EFC) and the New York State Department of Health (DOH)
Uses Project Listing Form, with cost estimate budget (includes blanks for engineering, equipment land acquisition, contingencies, work force, administration and legal costs, and issuance costs).	Uses Project Listing Form, with cost estimate budget (includes blanks for engineering, equipment land acquisition, contingencies, work force, administration and legal costs, and issuance costs).
Provides up to a 50 percent interest rate subsidy.	Provides a 33⅓ percent interest rate subsidy.
Solicited new projects in addition to those already on the IUP list.	Did not solicit new projects; used the existing IUP list.
Cost estimate goes into Intended Use Plan (IUP) for planning purposes.	Cost estimate goes into IUP for planning purposes.

During the focus group, state SRF staff provided two lists of projects funded by ARRA. The first list (Table NY-2) includes projects that were converted to long term projects using ARRA funds (both drinking water and clean water projects are included in the list). Table NY-3 consists of a list of completed Green Innovations Grants Program (GIGP) projects funded by ARRA. EFC worked with the New York State Energy Research and Development Authority (NYSERDA) to identify those features of the ARRA eligible projects that met the Green Project Reserve (GPR) requirements. In addition, EFC sought new projects that met the definition of GPR as part of GIGP. The GIGP received requests for over $280 million for various CWSRF eligible projects (New York State Environmental Facilities Corporation, 2009).

Most New York ARRA-funded projects also received funding from other sources. ARRA funding was often applied for to cover only a specific part of a project, rather than an entire project. In addition, the state's practice was to transfer money from projects with bids that came in under the estimate to other projects waiting in line. In effect, this practice over-committed ARRA funds to ensure that all the ARRA funds would be spent. The state then offered the funding to projects on a "B" list for ARRA funds. For these reasons, it is not possible to readily compare the initially estimated cost of a project with the final cost of the project.

TABLE NY-2: ARRA ROLL REPORT – SRF BASE PROJECTS CONVERTED TO LONG TERM

Community	Initial IUP Amount	Application Amount	Short-Term Funding Amount	Long-Term Funding Amount	Total Project Amount
Albion	$2,600,000	$3,569,738	$2,415,914	$1,133,561	$2,427,261
Briarcliff Manor	$18,799,238	$28,277,800	$17,380,476	$8,933,163	$18,167,216
Brookhaven	$10,400,000	$10,358,145	$10,150,490	$5,090,138	$11,326,065
Caneadea	$4,000,000	$7,661,000	$6,881,170	$3,418,316	$7,569,311
Granville	$1,600,000	$1,300,000	$1,274,890	$154,879	$1,346,033
Middletown	$33,703,400	$30,949,519	$27,317,343	$10,682,105	$27,773,156
Niagara Falls Public Water Authority	$5,500,000	$10,500,129	$10,941,906	$6,111,412	$11,630,213
Owasco	$2,160,000	$1,595,673	$1,677,563	$896,507	$1,717,708
Patchogue	$3,500,000	$5,509,850	$8,800,396	$3,839,087	$10,990,955
Plattsburgh	$5,166,225	$5,300,000	$4,673,299	$2,351,952	$4,872,817
Richfield Springs	$875,000	$5,400,000	$5,570,650	$1,269,173	$5,663,378
Richland	$11,960,000	$11,960,000	$10,383,003	$4,959,204	$10,536,315
Rutland	$3,000,000	$2,763,250	$4,299,000	$2,386,437	$5,669,844
Schodack	$1,100,000	$954,382	$827,657	$430,170	$843,931
Weedsport	$4,259,000	$6,145,000	$5,198,756	$2,145,121	$5,198,756
Total	$108,622,863	$132,244,486	$117,792,512	$53,801,225	$125,732,959

* Numbers are rounded to the nearest dollar. Totals were calculated and then rounded to the nearest dollar.

TABLE NY-3: COMPLETED GIGP PROJECTS

Community	Requested Amount	ARRA Award Amount	Estimated Total Project Cost (including other funding sources)
Amherst	$151,200	$127,577	$143,697
Bard College	$1,777,050	$1,590,825	$1,928,583
Bath Electric, Gas and Water Systems	$1,749,600	$437,400	$486,000
Beacon	$233,100	$233,100	$259,000
Chemung	$821,527	$747,823	$956,310
Cooperstown	$886,500	$368,887	$416,829
Dutchess County WWA	$61,692	$61,692	$76,441
Glens Falls	$1,334,134	$1,334,134	$5,573,978
Greenwood Lake	$13,514	$17,339	$20,530
Greenwood Lake	$596,250	$405,837	$464,400
Hoosick Falls	$100,350	$84,364	$103,238
Jasper	$117,000	$170,325	$189,380
Johnstown	$4,895,000	$6,044,132	$10,922,450
La Grange	$405,900	$365,309	$507,970
Lindenhurst Library	$333,900	$191,632	$220,124
Millbrook	$144,000	$196,650	$220,950
New York State Office of Parks, Recreation and Historic Preservation	$598,500	$539,917	$648,000
Oakfield	$86,850	$135,000	$150,000
Ogdensburg	$1,089,360	$1,019,302	$1,347,391
Orleans	$367,650	$208,078	$231,198
Port Byron	$107,705	$104,262	$169,036
Richland	$585,000	$585,000	$976,400
Roeliff Jansen Community Library	$320,000	$320,000	$435,324
Rome	$250,000	$246,683	$287,845
Roxbury	$384,500	$347,267	$385,852
Sharon Springs	$203,148	$203,148	$247,950
Speculator	$12,503	$10,933	$12,148
Tioga Soil and Water	$736,132	$736,131	$857,108
Tonawanda	$342,000	$231,201	$287,700
Troy	$450,000	$450,000	$501,970
Westchester	$234,000	$184,294	$211,711
Wurtsboro	$201,438	$201,438	$557,338
Total	$19,589,502	$17,899,680	$29,796,851

* Numbers are rounded to the nearest dollar. Totals were calculated and then rounded to the nearest dollar.

Factors Affecting Cost Estimates

The major factor identified by the SRF staffs that contributed to developing good cost estimates is the opportunity to finance planning, design and early construction costs through short-term financing programs. Short-term financing allows applicants to develop very accurate cost estimates before finalizing the long term project costs. Short-term funding can be used for up to three years, at which point the state will reevaluate whether a project can be converted to long-term financing. Short-term funding would take a project through bid and into construction (SAIC, 2013).

For ARRA**,** the SRF programs were dealing with two diametrically opposing forces when it came to cost estimation: speed and additional requirements. Every time new requirements came out, it forced them to back up and reevaluate costs. Things were happening at breakneck speed, but would then come to a screeching halt as the effects of new requirements were evaluated. Whenever there were questions on how to proceed with a project mid-stream, EFC would freeze the disbursements, which compounded the sub-recipients' worries, and potentially created tension with their best clients, but they saw no other way to handle it. As a result, the additional requirements prevented them from disbursing funds quickly, which reduced cash flow in the impacted communities.

In addition, many of the estimates for high tech items were way off, because technology is hard to estimate. For example, the contractor might estimate $5000 for a technology, while the final cost would end up being only $250, and then the community was disappointed when they did not get the full $5000.

The SRF programs were often revising project budgets on almost a daily basis based on the changing guidance from EPA, making it hard to figure out how much funding to grant. Unforeseen things happened during construction and affected the budget, sometimes after the February 17, 2010 deadline. These circumstances required a lot of back and forth with EPA to fix the issue.

If projects came in under bid, the SRF programs often took the left-over money from those projects and transferred it to other projects waiting in line. They essentially over-committed ARRA funds so they could make sure that they would expend it all. They offered applicants space on a "B" list for ARRA funds, and told these applicants that they had to start getting ARRA-ready if they wanted to get this money.

Generally, the early projects to get under contract had lower bids than the later projects, because there were fewer contractors available for the later projects, so they could charge more. This should be taken into account if ARRA were to be repeated in future.

The SRF programs reported that one of the positive outcomes from ARRA is that they have had repeat ARRA clients come back with offers for new projects that they claim they can do quickly and at lower costs due to their prior experience with dealing with ARRA. Also as a result of ARRA, projects are now actually becoming 'shovel-ready' prior to asking for money.

On the downside of ARRA, the SRF programs said they had one client say they wished they had never taken the ARRA grant, even though it was a 90 percent grant program; the rules just changed too many times or were never clear enough. They also had one client contractor (for a GIGP grant) that submitted a price increase due to the burdens imposed by ARRA. In addition, the SRF programs are starting to see projects turn away from their programs, as some of the more sophisticated communities can obtain private loans with many less strings attached. The current rate environment is providing the opportunity for more private financing.

If ARRA were to be repeated in the future, the SRF programs said they would consider funding fewer projects at higher amounts; the effort involved in dealing with all of the requirements for so many projects as they did under ARRA was overly cumbersome. In addition, the SRF programs felt that the best way to get money out to recipients quickly is with less regulation. They could understand needing the regulations for new programs, but the CWSRF and DWSRF programs are already successful, well-established programs, and they really did not need all of these extra ARRA regulations in place.

Findings

1. New York's practice of offering short term loans to help develop the project results in better cost forecasting and more accurate long term project cost estimates. SRF staff believes this method contributed greatly to accurate ARRA cost estimates.
2. To ensure that all ARRA funding would be utilized, the state often took money from projects that came in under the bid and transferred it to other projects waiting in line for funding.
3. The state's funding practices make it difficult to compare initial cost estimates with final project costs.
4. SRF staff stated that former ARRA recipients have returned with offers for new projects that they claim they can do quickly and at lower costs due to their prior experience with dealing with ARRA.
5. As a result of ARRA, recipients now come to the state with projects that are actually shovel-ready prior to asking for money.

REFERENCES

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SAIC. (2013, January 15). New York Focus Group Notes taken at meeting with New York State Environmental Facilities Corp. Albany.

ATTACHMENT 1

Project Budget and Construction Costs from CWSRF Municipal Application Form

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IV. PROJECT BUDGET AND CONSTRUCTION COSTS

A. TOTAL PROJECT BUDGET FOR CWSRF PROJECTS

Please add line items to the budget as needed. Refer to the Instructions for an explanation of the need to submit signed contracts or agreements prior to release of CWSRF disbursements. If you have additional questions, please either call EFC or refer to the Intended Use Plan.

COST CATEGORY	COLUMN A TOTAL PROJECT COSTS	COLUMN B INELIGIBLE COSTS AND/OR COSTS TO BE PAID BY SOURCES OTHER THAN CWSRF
1. Total Construction Costs	$	$
2. Engineering Costs (Firm Name and Date)	$	$
	$	$
	$	$
	$	$
3. Other Expenses a) Local Counsel	$	$
b) Bond Counsel	$	$
c) Work Force		
- Technical	$	$
- Administrative	$	$
d) Fiscal Services	$	$
e) Net Interest	$	$
f) Miscellaneous (please describe)		
	$	$
	$	$
	$	$

4. Equipment	$	$
5. Land Acquisition	$	$
6. Contingencies	$	$
7. Subtotal - Project Costs	$	$
8. Less: Other Sources	$	
9. Subtotal – Project Costs to be Financed	$	
10. Issuance Costs		
a) Direct Expenses [1]	$	
b) State Bond Issuance Charge [2]	$	
11. SUBTOTAL Issuance Costs (sum of 10.a & b)	$	
12. TOTAL (sum of Project Costs and Issuance Costs Subtotals; 9&11)	$	

1. Direct Expenses (10 a) equal 1.0% of Subtotal - Project Costs to be Financed (9).

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APPENDIX 6: NORTH CAROLINA STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN NORTH CAROLINA'S SRF PROGRAMS

CWSRF AND DWSRF

Program Overview

In North Carolina, both the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) programs are administered by the North Carolina Department of Environment and Natural Resources (NCDENR). An applicant for funding from one of the SRF programs must first submit an application for a grant/loan. Table NC - 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE NC – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN NC'S CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Administered by Division of Water Quality, Infrastructure Section.	Administered by Division of Water Resources, Public Water Supply Section.
Uses Common Application Form, with cost estimate budget (includes blanks for engineering, design, construction, permitting, land surveying, easement preparation, administration and legal costs, and contingency).	Uses Common Application Form, with cost estimate budget (includes blanks for engineering, design, construction, permitting, land surveying, easement preparation, administration and legal costs, and contingency).
Contingency is 15 percent in initial cost estimate.	Contingency capped at 10 percent in initial cost estimate.
Contingency is 10 percent of construction costs in final cost estimate.	Contingency is 5 percent of construction costs in final cost estimate.
Engineering report NOT required with application; required later IF project approved for funding.	Preliminary engineering report required with application.
All applications must be received by March 1st of every year.	Applications are accepted year-round; applications received as of September 30th each year are considered for awards.
Notice of Intent to Fund letter sent within 30 days of receipt of application; applicants then conduct next three steps: engineering report submittal, permitting and plans and specifications submittal, (eventually) contracting information submittal.	
Cost estimate goes into Intended Use Plan (IUP) for planning purposes.	Cost estimate goes into IUP for planning purposes.
After engineering report and plans and specifications have been approved, and project bids have been received, program awards loan.	After engineering report and plans and specifications have been approved, and project bids have been received, program awards loan.
Established a cap of $3 million ARRA funds per project.	Established a cap of $3 million on consolidation projects and $1.5 million on non-consolidation projects..

During ARRA, the North Carolina SRF programs received more loan applications than they could fund with ARRA money. As a result, SRF allocated ARRA funds to the top 25 to 30 percent of applicants, based on

ranking/prioritization criteria contained in the application appendices and shovel readiness. Whether or not projects required environment reviews was also a factor in the decision-making, as environmental reviews could delay the shovel-readiness of projects.

The state Governor's office wanted to ensure that ARRA funding was dispersed as far and wide as possible, to municipalities throughout the state. To this end, the Governor's office mandated that DNR's SRF programs conduct two rounds of funding, so that some funds would be reserved in case localities were able to coordinate additional shovel ready projects at a later date;. North Carolina was the only state to do this. The first round of funding allocations occurred in April 2009 and the second round in June 2009. Roughly two-thirds of the funding was allocated in the first round, with the remainder allocated in the second round. DNR stated that this was not the best approach since it delayed getting projects into an already tight timeline, and that they would not separate the funding if they had it to do over again. ARRA added about $70 million to North Carolina's SRF programs.

Both SRF programs waived the closing fees for all projects. Principal forgiveness enabled small localities to participate in the SRF program, particularly during a recession when many projects of lower priority were being shelved; it allowed disadvantaged communities to upgrade their systems (e.g., extend sewerage to un-sewered areas). ARRA also enabled North Carolina to fund larger and smaller projects than normal.

Factors Affecting Cost Estimates

The engineers used by the recipients were familiar with the majority of types of projects funded by ARRA and were seasoned at estimating costs, resulting in very good cost estimates. They used standardized formats and electronic bidding tools to prepare their cost estimates. While the estimates were basically sound, they did not anticipate the impact that the recession was having on the municipal construction market. During the ARRA time frame, material and labor costs were unstable. Steel and concrete were expensive due to the Chinese demand, thus making the costs unstable (pre-2009). The costs followed a "tulip" pattern of spiking, then dropping then spiking again. With the onset of the recession private sector construction, particularly in the housing sector, essentially dried up. In 2009, materials costs were significantly reduced, as were labor costs. It thus became risky to estimate too low or too high, and bidding competition pushed prices down even further. Bidding was very competitive and "cut-throat" among the construction contractors. According to state employees interviewed, most contractors reduced labor rates and minimized profits; some may have cut costs in half just to keep staff working.

The impact in North Carolina is illustrated in the following data provided by NCDENR. Table NC-2 shows the requested project funding based on preliminary engineering estimates, the promissory note agreement (loan amount) based on bid costs plus 10 percent of construction costs, and the final expended loan amount (actual project cost) for Clean Water projects. Note that for some projects, grantee estimates and bid costs were the same. The SAIC Team assumes that for these projects bid costs had already been received at the time the application was submitted. (State staff interviewed indicated that some applications already reflected project bid costs.) There were 17 such projects. The remaining 37 projects all had bid costs lower than the original estimated project cost. As shown in Table NC-2, those project loans ranged from 2 percent to 46 percent below the original project estimates, with the average project coming in 16 percent lower than the original estimate. Table NC-2 also shows that project final costs ranged from 0 percent to 33 percent under budget. No project experienced a budget over-run. The average project came in 4.6 percent under budget.

TABLE NC-2. NORTH CAROLINA CLEAN WATER PROGRAM ARRA FUNDING

Borrower	Grantee Estimated Cost	Promissory Note Agreement (Bid Costs plus 10% Construction Contingency)	Deviation of Promissory Note from Original Estimate	% Change from of Original Estimate	Final Paid Amount (From State Spreadsheet)	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Asheville, City of	$454,500	$263,403	-$191,097	-42%	$258,764	-$4,639	-2%
Black Mountain, Town of	$412,840	$384,385	-$28,455	-7%	$377,085	-$7,300	-2%
Bryson City, Town of	$166,524	$166,524	$0	0%	$166,524	$0	0%
Buncombe County MSD	$1,029,600	$707,346	-$322,254	-31%	$672,980	-$34,366	-5%
Burgaw, Town of	$4,000,000	$4,000,000	$0	0%	$4,000,000	$0	0%
Burlington, City	$65,000	$65,000	$0	0%	$65,000	$0	0%
Carolina Beach, Town of	$1,000,000	$822,515	-$177,485	-18%	$822,515	$0	0%
Carolina Beach, Town of	$2,300,000	$1,686,234	-$613,766	-27%	$1,642,245	-$43,989	-3%
Caswell Beach, Town of	$3,000,000	$3,000,000	$0	0%	$3,000,000	$0	0%
Chadbourne, Town of	$1,212,491	$959,555	-$252,936	-21%	$902,483	-$57,072	-6%
Charlotte, City of	$2,194,900	$1,570,740	-$624,160	-28%	$1,570,740	$0	0%
Charlotte, City of	$577,555	$316,442	-$261,113	-45%	$296,546	-$19,896	-6%
Charlotte, City of	$1,346,382	$778,081	-$568,301	-42%	$778,081	$0	0%
Columbus, Town of	$280,600	$160,162	-$120,438	-43%	$150,146	-$10,016	-6%
Conover, City of	$1,727,025	$1,727,025	$0	0%	$1,727,025	$0	0%
Cove City, Town of	$1,250,000	$723,503	-$526,497	-42%	$482,748	-$240,755	-33%
Dover, Town of	$1,100,000	$1,004,457	-$95,543	-9%	$915,876	-$88,581	-9%
Eden, City of	$714,303	$714,303	$0	0%	$624,973	-$89,330	-13%
Fayetteville, City of	$557,000	$500,095	-$56,905	-10%	$464,503	-$35,592	-7%
Fayetteville, City of	$600,000	$539,261	-$60,739	-10%	$536,692	-$2,569	0%
Gastonia, Town of	$308,532	$185,466	-$123,066	-40%	$159,077	-$26,389	-14%

Borrower	Grantee Estimated Cost	Promissory Note Agreement (Bid Costs plus 10% Construction Contingency)	Deviation of Promissory Note from Original Estimate	% Change from of Original Estimate	Final Paid Amount (From State Spreadsheet)	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Graham, City of	$1,000,000	$791,792	-$208,208	-21%	$791,792	$0	0%
Hertford, Town of	$854,187	$765,025	-$89,162	-10%	$751,816	-$13,209	-2%
Hickory, City of	$1,938,000	$1,938,000	$0	0%	$1,602,291	-$335,709	-17%
High Point, City of	$1,798,500	$1,367,134	-$431,366	-24%	$1,307,509	-$59,625	-4%
Highlands, Town of	$746,517	$746,517	$0	0%	$746,517	$0	0%
Highlands, Town of	$3,000,000	$2,790,143	-$209,857	-7%	$2,304,251	-$485,892	-17%
Kure Beach, Town of	$619,442	$526,541	-$92,901	-15%	$432,660	-$93,881	-18%
Lake Lure, Town of	$3,000,000	$2,559,588	-$440,412	-15%	$2,559,588	$0	0%
Liberty, Town of	$300,000	$255,674	-$44,326	-15%	$242,569	-$13,105	-5%
Marion, City of	$2,601,364	$2,601,364	$0	0%	$2,503,073	-$98,291	-4%
Mebane, City of	$230,000	$192,225	-$37,775	-16%	$192,225	$0	0%
Mecklenburg County	$2,576,000	$2,576,000	$0	0%	$2,493,625	-$82,375	-3%
Moore County	$3,000,000	$3,000,000	$0	0%	$2,924,850	-$75,150	-3%
Morehead City, Town of	$2,100,000	$1,290,000	-$810,000	-39%	$1,290,000	$0	0%
Murphy, Town of	$771,500	$737,800	-$33,700	-4%	$665,366	-$72,434	-10%
Pitt County	$1,802,264	$1,802,264	$0	0%	$1,733,441	-$68,823	-4%
Pittsboro, Town of	$2,634,800	$2,492,740	-$142,060	-5%	$2,432,170	-$60,570	-2%
Raleigh, City of	$1,526,640	$1,251,388	-$275,252	-18%	$1,138,022	-$113,366	-9%
Raleigh, City of	$465,735	$279,517	-$186,218	-40%	$279,517	$0	0%
Rhodhiss, Town of	$188,764	$184,627	-$4,137	-2%	$182,801	-$1,826	-1%
Rich Square, Town of	$1,728,180	$1,411,787	-$316,393	-18%	$1,362,488	-$49,299	-3%
Roxboro, City of	$465,548	$363,434	-$102,114	-22%	$346,511	-$16,923	-5%
Scotland Neck, Town of	$1,534,250	$1,181,256	-$352,994	-23%	$1,078,651	-$102,605	-9%

Borrower	Grantee Estimated Cost	Promissory Note Agreement (Bid Costs plus 10% Construction Contingency)	Deviation of Promissory Note from Original Estimate	% Change from of Original Estimate	Final Paid Amount (From State Spreadsheet)	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Selma, Town of	$180,000	$180,000	$0	0%	$180,000	$0	0%
Southport, City of	$2,618,000	$1,404,695	-$1,213,305	-46%	$1,404,695	$0	0%
Spindale, Town of	$791,941	$791,941	$0	0%	$791,941	$0	0%
Taylorsville, Town of	$1,017,923	$1,017,923	$0	0%	$1,010,301	-$7,622	-1%
Trinity, City of	$3,000,000	$2,403,400	-$596,600	-20%	$2,102,823	-$300,577	-13%
Troutman, Town of	$237,595	$237,595	$0	0%	$237,595	$0	0%
Tuckaseigee Water & Sewer Authority	$3,000,000	$3,000,000	$0	0%	$3,000,000	$0	0%
Watauga County	$580,000	$423,760	-$156,240	-27%	$390,860	-$32,900	-8%
Wilson, City of	$1,396,006	$1,187,539	-$208,467	-15%	$1,134,318	-$53,221	-4%
Youngsville, Town of	$919,280	$558,194	-$361,086	-39%	$549,172	-$9,022	-2%
			Average	-16%			

Data from Clean Water projects completed thru 10/30/2012.

The Drinking Water program had similar results, although data on the requested project funding was not available. Table NC-3 shows the promissory note agreement (loan amount) based on bid costs plus 10 percent of construction costs. The table compares these costs with the final expended loan amount for Drinking Water projects. The average under-run for drinking water projects was 4.6 percent, and ranged from 0 percent to 24 percent. This resulted in a total of $2,284,587 being returned to the state. These funds were used to fund additional projects. DWSRF representatives said that they did not recall any cost over-runs for ARRA projects.

TABLE NC-3. NORTH CAROLINA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Preliminary Budget (Loan Approval Granted)	Final Paid Amount	Difference (Excess Budget)	% Under Budget
Town of Green Level	$1,890,360	$1,854,154	$36,206	2%
Town of Linden	$321,850	$308,854	$12,996	4%
Town of Louisburg	$512,036	$390,040	$121,996	24%
Village of Alamance	$579,963	$511,940	$68,023	12%
Johnston County	$3,000,000	$3,000,000	$0	0%
Town of Blowing Rock	$2,000,262	$1,512,960	$487,302	24%
Greeneville Utilities Commission	$2,942,152	$2,942,152	$0	0%
Roanoke Rapids SD	$181,126	$166,025	$15,101	8%
South Granville W&S Authority	$206,670	$188,692	$17,978	9%
Town of Franklinton	$311,204	$293,558	$17,646	6%
Town of Littleton	$161,316	$144,578	$16,738	10%
Catawba County	$3,000,000	$3,000,000	$0	0%
Town of Cramerton	$495,227	$479,851	$15,376	3%
Town of Surf City	$83,792	$76,599	$7,193	9%
Onslow W & S Authority	$496,100	$496,100	$0	0%
Stanly County	$196,818	$196,818	$0	0%
Town of Maysville	$355,000	$355,000	$0	0%
Town of Ramseur	$258,786	$230,004	$28,782	11%
Clay County	$1,073,289	$1,073,289	$0	0%
Town of Andrews	$715,326	$688,428	$26,898	4%
Town of Murphy	$713,721	$658,325	$55,396	8%
Town of Montreat	$220,901	$220,901	$0	0%
Maggie Valley SD	$768,588	$748,913	$19,675	3%
Mitchell County	$1,569,263	$1,488,383	$80,880	5%
Town of Graham	$160,996	$146,861	$14,135	9%
Town of Gibsonville	$146,536	$122,596	$23,940	16%
Bessemer City	$95,374	$87,278	$8,096	8%
Greenville Utilities Commission	$48,982	$44,782	$4,200	9%

Borrower	Preliminary Budget (Loan Approval Granted)	Final Paid Amount	Difference (Excess Budget)	% Under Budget
County of Perquimans	$3,000,000	$2,795,220	$204,780	7%
Reigelwood Sanitary District	$100,255	$100,255	$0	0%
Town of Tarboro	$325,000	$293,530	$31,470	10%
City of Sanford	$1,807,166	$1,807,166	$0	0%
Town of Elizabeth City	$2,366,255	$2,366,255	$0	0%
City of Burlington	$141,286	$129,711	$11,575	8%
Town of Elon	$326,004	$290,283	$35,721	11%
Town of Spring Lake	$70,298	$70,298	$0	0%
Town of Warsaw	$1,815,000	$1,815,000	$0	0%
Northwestern Wayne Sanitary District	$381,575	$364,359	$17,216	5%
Eastern Wayne Sanitary District	$418,775	$333,446	$85,329	20%
Southwestern Wayne Sanitary District	$492,000	$399,190	$92,810	19%
Northwest Wayne Sanitary District	$689,000	$568,028	$120,972	18%
Goldston Gulf Sanitary District	$474,123	$456,867	$17,256	4%
Town of Farmville	$3,000,000	$3,000,000	$0	0%
Town of Pollocksville	$200,080	$163,304	$36,776	18%
City of Asheville	$412,996	$396,388	$16,608	4%
Onslow Water and Sewer Authority	$520,694	$484,092	$36,602	7%
Town of Holly Springs	$73,980	$67,067	$6,913	9%
Fork Township Sanitary District	$532,155	$463,348	$68,807	13%
Belfast-Patetown	$548,192	$496,646	$51,546	9%
Southeastern Wayne Sanitary District	$470,150	$426,651	$43,499	9%
Town of Columbia	$557,000	$491,401	$65,599	12%
Greene County	$3,000,000	$3,000,000	$0	0%
Warren County	$371,030	$365,142	$5,888	2%
Town of Kill Devil Hills	$112,522	$112,522	$0	0%
City of Clinton	$304,031	$285,699	$18,332	6%
City of Winston Salem	$16,078	$15,278	$800	5%
Town of Taylorsville	$204,000	$202,933	$1,067	1%
Rhonda	$1,428,807	$1,257,666	$171,141	12%
Energy United Water Corporation	$856,826	$856,826	$0	0%
Town of Sawmills	$235,226	$235,226	$0	0%
Town of Rutherford College	$155,142	$155,142	$0	0%

Borrower	Preliminary Budget (Loan Approval Granted)	Final Paid Amount	Difference (Excess Budget)	% Under Budget
Burke County	$512,929	$485,358	$27,571	5%
Town of Thomasville	$125,604	$118,709	$6,895	5%
City of Rocky Mount	$526,584	$495,727	$30,857	6%
Town of Montreat	$315,836	$315,836	$0	0%
Total	$49,392,237	$47,107,650	Average	6%
		Total Excess	$2,284,587	

Data from Drinking Water projects completed thru 10/30/2012.

The accuracy reflected in the small differences between bid costs and final project costs is attributable to five primary factors:

1. The engineers preparing cost estimates were familiar with the majority of types of ARRA-funded projects and were seasoned at estimating costs.
2. The engineers used standardized formats and electronic bidding tools to prepare their cost estimates.
3. Bid costs are typically fixed price bids. They represent a commitment by the winning contractor to complete the project with the available funding. Bid costs are binding for a short duration, typically 90 days. Thus they most closely represent current labor and materials costs.
4. Many of the projects were "linear" in that project quantities (e.g., linear feet of pipe replaced or number of water meters installed) could be varied within the scope of work. As a result, projects could be adjusted to match the available funding.
5. For "non-linear" projects (e.g., treatment plant upgrades) loan recipients were encouraged to use unspent funds to purchase related project items such as emergency generators or spare parts. This allowed the project scope to utilize available funding.

REFERENCES

Clean Water State Revolving Fund web page, North Carolina Department of Environment and Natural Resources web site, http://portal.ncdenr.org/web/wq/ifs/fap/cwsrf.

Drinking Water State Revolving Fund web page, North Carolina Department of Environment and Natural Resources web site, http://www.ncwater.org/pws/srf/Pages/dwsrf_program.htm.

North Carolina Focus Group Notes, taken at focus group meeting with North Carolina Department of Environment and Natural Resources, Raleigh, NC, November 8, 2012.

APPENDIX 7: OKLAHOMA STATE FOCUS GROUP SUMMARY

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COST ESTIMATION IN OKLAHOMA'S SRF PROGRAMS

SRF PROGRAM OVERVIEW

In Oklahoma, the Clean Water State Revolving Fund (CWSRF) program is administered by the Oklahoma Water Resources Board (OWRB), while the Drinking Water State Revolving Fund (DWSRF) program is administered by the Oklahoma Department of Environmental Quality (ODEQ). Table OK - 1 compares characteristics of the CWSRF and DWSRF programs.

TABLE OK – 1. CHARACTERISTICS OF ARRA IMPLEMENTATION IN OK CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER STATE REVOLVING FUND PROGRAMS

CWSRF	DWSRF
Administered by the Oklahoma Water Resources Board (OWRB).	Administered by the Oklahoma Department of Environmental Quality (ODEQ).
Applicant submits application with engineering report, including cost estimate of engineering, design, construction, inspection and legal costs.	Applicant submits application with engineering report, including cost estimate of engineering, design, construction, inspection and legal costs.
Contingency is 15% for projects under $1 million, or 10% for projects over $1 million, consistent with the Oklahoma Competitive Bidding Act (OCBA); applies to all stages of cost estimating.	Contingency in the engineering report is 10% contingency, but there can also be 20-25% padding on individual line items.
For projects that use unit price for cost estimation, OCBA does not set any limit on contingency; contingencies for these types of projects can be large to address possible scope changes or change orders.	
Cost estimate goes into Intended Use Plan (IUP) for planning purposes.	Cost estimate goes into Intended Use Plan (IUP) for planning purposes.
	Applicant submits construction plans and specifications, along with a refined cost estimate.
After engineering report has been approved, program takes project to OWRB for loan approval (binding commitment); no letter of binding commitment.	After plans and specifications have been approved, program takes the project to the ODEQ's Board for loan approval (aka, binding commitment); applicant receives letter of binding commitment.
Applicant submits plans and specifications (after loan approval) and advertises for bids.	Applicant prepares final cost estimate with 5% contingency and advertises for bids.
After winning bid determined, loan is closed, locking in dollar value of project.	After winning bid determined, loan is closed, locking in dollar value of project.
Once the contract is awarded, program enters contract information into database to support future cost estimation.	

CWSRF	DWSRF
Funded projects on a first-come, first-served basis—whoever was ready first was funded until ARRA funds ran out.	Imposed internal deadline for projects to receive ARRA funds: had to be shovel ready by June 16, 2009; shovel ready defined as project being ready to go to ODEQ Board for binding commitment (i.e., project had an approved engineering report and approved plans and specifications).
Combined ARRA funds with non-ARRA funds to leverage volume of projects that could be supported.	Combined ARRA funds with non-ARRA funds to leverage volume of projects that could be supported; ARRA funds given in the form of principal forgiveness upfront.
A few projects were 100% ARRA-funded, mostly creative/special/non-traditional projects—green roofs, rain gardens, stream bank restoration and studies of introducing supersaturated oxygen into lakes—that could be tied back to the CWA	

CWSRF

Most of CWSRF's ARRA projects were off-the-shelf existing projects, although some were very early in the process at the time ARRA was passed. To solicit new projects, CWSRF held a large meeting, invited potential applicants in and provided information on the ARRA grant process. For those who were ready to proceed, they then held additional meetings and provided additional information. CWSRF funded all of their 33 projects with ARRA funds.

DWSRF

A few of DWSRF's projects came from their existing lists, but most were new projects. The state contacted everyone on its Project Priority List (PPL) and IUP lists and held public meetings with all entities to provide information and solicit new projects. They then continued to meet with the applicants throughout the process. DWSRF also invited all the communities from their PPL to group meetings, at which they met with each of the communities individually by moving from table to table in a "speed dating" sort of arrangement. This helped to determine which communities could and could not make it through the grants process in time to meet ARRA deadlines. For example, if the community required a vote to approve spending money on improvements, that eliminated the community because the process would take too long.

If projects did not use all of their non-ARRA money, any unused funds were de-obligated. DWSRF did not track whether grant recipients used their own money in addition to DWSRF grant money, but said that funding recipients generally kept any local money used for projects separate from ARRA money to avoid the additional requirements from ARRA.

DWSRF provided assistance to small recipients of ARRA grants that otherwise would have found it difficult to meet the ARRA requirements, including:

- Showing recipients how to set up their files,
- Identifying the forms to use and how to fill out the applications,
- Walking them through the entire process,
- Providing training and setting up a database to track jobs, and
- Conducting Davis-Bacon interviews and all reporting for these recipients.

They used the 4% of ARRA funds set aside for administration for these efforts.

DWSRF had not done subsidies or principal forgiveness prior to ARRA (other than through their interest rates, which were lower than market rates), as this was not required before ARRA. Subsidies are now mandatory for DWSRF and currently they are focusing subsidies on regionalization projects, which are typically being offered 40 to 50 percent subsidies. The state is reaching the capacity of the program to give out subsidies and leverage money. Providing subsidies to help leverage projects takes money away from the program and hurts the program's ability to be self-supporting through repayment of revolving loans.

Factors Affecting Cost Estimates

CWSRF

CWSRF stated that most of the project bids came in under the original cost estimate. CWSRF was generally able to address these differences by reducing the non-ARRA funds for the project. However, some projects were not able to use all of the ARRA money and as a result CWSRF had to redistribute some ARRA funds.

CWSRF did have a few projects where the bids came in over the original cost estimate, but this was not a result of ARRA requirements. In one case, Guymon, the overage was due to an engineering error. In another case, Perkins, when the bid came in over the cost estimate, the contractor had to redo the bid using value engineering. In general, if the bids came in high, the applicants had the following three choices:

1. Go back to the Board for approval of the additional amount
2. Do a reassessment using value engineering or
3. Fund the additional amount with other funding sources (e.g., rural development grants, local funds).

A citizen complaint was filed on the Perkins, OK project, claiming that ARRA was costing money and increasing the cost of the project. Several resulting studies showed that ARRA did not increase the cost of the project.

The impact on the CWSRF program in Oklahoma is illustrated in the following data provided by OWRB. Table OK - 2 shows the promissory note agreement (loan amount) based on the cost estimate plus 10 percent or 15 percent contingency plus other costs[2], and the final expended loan amount (actual project cost) for CWSRF projects.

As shown in Table OK-2, project final costs ranged from 0 percent to 14 percent under budget. No project experienced a budget overrun; or if it did, the overrun was covered by other funding sources besides CWSRF. The average project came in 2 percent under budget.

[2] Other costs include bond counsel, local counsel, financial advisor, engineering, inspections, planning and environmental.

TABLE OK – 2. OKLAHOMA CLEAN WATER PROGRAM ARRA FUNDING

Borrower	Promissory Note Agreement (Estimated Costs Plus 10% or 15% Construction Contingency Plus Other Costs*)	Final Paid Amount (From State Spreadsheet)	Deviation of Final Paid Amount from Promissory Note Amount	% Change from Promissory Note Amount
Adair Municipal Authority	$1,400,000	$1,386,907	-$13,093	-1%
Ardmore Public Works Authority	$1,090,000	$1,055,077	-$34,923	-3%
Central Oklahoma Master Conservancy District – Phase I	$369,520	$369,520	$0	0%
Central Oklahoma Master Conservancy District – Phase II	$1,131,765	$1,107,117	-$24,648	-2%
Collinsville Municipal Authority	$550,000	$550,000	$0	0%
Del City Municipal Services Authority	$1,190,000	$1,188,293	-$1,707	-0.1%
Duncan Public Utilities Authority	$340,000	$320,436	-$19,564	-6%
El Reno Municipal Authority	$205,000	$204,493	-$507	-0.2%
Grand Lake Public Works Authority	$992,500	$992,500	$0	0%
Grove Municipal Services Authority	$1,900,000	$1,900,000	$0	0%
Guymon Utilities Authority	$1,335,000	$1,331,310	-$3,690	-0.3%
Harrah Public Works Authority	$1,930,000	$1,930,000	$0	0%
Henryetta Municipal Authority	$3,650,000	$3,312,815	-$337,185	-9%
Lawton Water Authority	$12,270,000	$11,652,406	-$617,594	-5%
Moore Public Works Authority	$3,943,482	$3,943,482	$0	0%
Muskogee Municipal Authority	$1,435,000	$1,435,000	$0	0%
Mustang Improvement Authority	$6,590,000	$6,266,994	-$323,006	-5%
Norman Utilities Authority	$7,640,000	$7,597,330	-$42,670	-1%
Oklahoma City Water Utilities Trust	$9,469,451	$8,167,735	-$1,301,716	-14%
Oklahoma Conservation Commission/OSU	$2,000,000	$2,000,000	$0	0%
Oklahoma Conservation Commission/OU	$86,500	$86,500	$0	0%

Borrower	Promissory Note Agreement (Estimated Costs Plus 10% or 15% Construction Contingency Plus Other Costs*)	Final Paid Amount (From State Spreadsheet)	Deviation of Final Paid Amount from Promissory Note Amount	% Change from Promissory Note Amount
Oklahoma Conservation Commission	$2,000,000	$2,000,000	$0	0%
Owasso Public Works Authority	$1,785,000	$1,785,000	$0	0%
Pawnee Public Works Authority	$1,275,000	$1,245,496	-$29,504	-2%
Perkins Public Works Authority	$7,225,000	$7,225,000	$0	0%
Piedmont Municipal Authority	$2,515,000	$2,417,572	-$97,428	-4%
Ponca City Utility Authority	$575,000	$567,296	-$7,704	-1%
Sperry Utility Services Authority	$390,000	$390,000	$0	0%
Stillwater Utilities Authority	$1,875,000	$1,875,000	$0	0%
Sulphur Municipal Authority	$10,200,000	$10,200,000	$0	0%
Tulsa City-County Library System	$202,800	$202,800	$0	0%
Tulsa Metropolitan Utility Authority (TMUA)	$7,350,000	$7,347,966	-$2,035	-0.03%
Walters Public Works Authority	$1,326,407	$1,250,809	-$75,598	-6%
			Average	-2%

*"Other Costs" include bond counsel, local counsel, financial advisor, engineering, inspections, planning and environmental.

DWSRF

At the beginning of ARRA, DWSRF was still seeing high bid estimates due to increased costs resulting from the lingering effects of Hurricanes Ike and Katrina; however, during ARRA, costs came down due to the economic collapse. DWSRF stated that, as a result, all of their projects came in with bids lower than the original cost estimates. Thus, while DWSRF initially had 23 projects that received ARRA funds, they were able to fund one additional project for a total of 24 projects funded with ARRA funds. This proved to be too large a workload for the Board to address at the same time, so they ended up spreading the projects over 4 months for Board approval.

ARRA brought in some new grant applicants for DWSRF. Oklahoma City and Tulsa, the two largest cities in Oklahoma, borrowed money from DWSRF for the first time. ARRA also allowed projects to be completed which would not have been done otherwise. Examples include McCurtain 8, which was on the shelf before ARRA due to cost, and installation of Automatic Meter Readers. DWSRF had a contentious case with one applicant that wanted to use performance-based contracting and thus use a non-bid contract. Non-bid contracts are allowed for energy, but do not fit with DWSRF projects.

For the DWSRF program, detailed data were available on bid and other costs. Tables

OK - 3 and OK - 4 show the data for the DWSRF program. Table OK – 3 shows the requested project funding based on preliminary construction cost estimates (including 10% contingency), construction bid amount, loan contingency, other costs, and the total bid amount. Table OK – 4 shows the amount of the promissory note agreement (loan amount) based on the estimate plus 5% contingency plus other costs

[3], and the final expended loan amount (actual project cost) for DWSRF projects.

Table OK – 3 shows that the amount of contingency in the bids ranged from 0 percent to 7 percent of the construction bid amount, with the average (and most frequent at 17 of 24 projects) contingency being 5 percent. Other costs[3] in the bids ranged from 0 percent to 24 percent of the construction bid amount, with the average being 11 percent. Other costs were 10 percent or less for 10 of the 24 projects; only one project had other costs exceeding 20 percent of the construction bid amount. Construction bid amounts ranged from 35 percent lower than to 20 percent higher than the preliminary construction cost estimate, with the average being 16 percent lower than the preliminary construction cost estimate and only 2 of the 24 projects having construction bids that were higher than the preliminary cost estimate. SAIC notes that one of the two projects with higher construction bids, McCurtain Co. RWD #8 was an pre-existing project taken off the shelf for ARRA, and thus the greater time length between the preliminary cost estimate and the construction bid may be a factor in the 20% higher construction bid. The other project with a higher construction bid, Stillwater (II), had a construction bid which was only 3% higher than the preliminary cost estimate, which still indicates good agreement with the preliminary cost estimate.

Total bid amounts (including contingency and other costs) ranged from 23 percent lower than to 41 percent higher than the preliminary construction cost estimate, with the average total bid being 3 percent lower than the construction cost estimate, indicating that contingency and other costs were largely offset by the lower construction bid costs.

[3] Other costs include bond counsel, local counsel, financial advisor, engineering, inspections, planning and environmental.

Table OK – 4 shows that promissory note amounts ranged from 22 percent lower than to 41 percent higher than the preliminary construction cost estimates, with the average being 3 percent lower than the preliminary construction cost estimate. Promissory note amounts ranged from 24 percent lower than to 25 percent higher than the total bid amounts, with the average being 1 percent lower than the total bid amount. Promissory note amounts were higher than the preliminary cost estimates for only 4 of the 24 projects and higher than the total bid amount for only 8 of the 24 projects, and were within $\pm$ 10 percent of the preliminary cost estimates for 18 of the 24 projects and within $\pm$10 percent of the total bid amounts for 20 of the 24 projects, indicating that the promissory note amounts largely were in line with both the preliminary cost estimates and the total bid amounts.

Final construction costs ranged from 31 percent lower than to 10 percent higher than construction bid amounts, with the average being equal to the construction bid amount; final construction costs for only 3 projects exceeded the construction bid amount plus contingency. Final project costs ranged from 17 percent lower than to 2 percent higher than the promissory note amounts, with the average being 3 percent lower than the promissory note amount. Final project costs were within $\pm$10 percent of the promissory note amounts for 18 out of 20[4] projects, and were higher than the promissory note amounts for only 3 of 20 projects (and those 3 exceed the promissory note amount by only 1 percent to 2 percent).

[4] Final project costs are not available for four projects which had not been completed by 7/31/13.

TABLE OK – 3. OKLAHOMA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Grantee Estimated Cost (Plus 10% Contingency and Other Costs*)	Construction Bid Amount	Loan Contingency	Other Costs*	Total Bid Amount	% Contingency of Construction Bid	% Other Costs* of Construction Bid	Differential of Total Bid Amount from Grantee Estimated Cost	% Change from Grantee Estimated Cost
Bartlesville (IV)	$9,820,000	$6,335,159	$317,341	$967,292	$7,619,792	5%	15%	-$2,200,208	-22%
Bixby (I)	$2,400,000	$1,894,510	$94,990	$170,000	$2,159,500	5%	9%	-$240,500	-10%
Bryan Co. RWD #2 (III)	$382,000	$319,623	$18,345	$52,132	$390,100	6%	16%	$8,100	2%
Duncan (IV)	$11,398,390	$10,327,726	$516,374	$319,450	$11,163,550	5%	3%	-$234,840	-2%
Elk City	$8,825,000	$7,282,698	$358,165	$1,101,859	$8,742,722	5%	15%	-$82,278	-1%
Enid (I)	$8,349,414	$7,673,635	$383,682	$353,659	$8,410,975	5%	5%	$61,561	1%
Frederick (I)	$4,500,000	$3,903,506	$204,994	$369,916	$4,478,416	5%	9%	-$21,584	-0.5%
Guymon (II)	$1,300,000	$1,048,136	$52,406	$128,202	$1,228,744	5%	12%	-$71,256	-5%
Healdton	$1,244,995	$1,035,005	$44,390	$165,100	$1,244,495	4%	16%	-$500	-0.04%
Henryetta**	$10,366,525	$8,031,791	$403,620	$1,051,050	$9,486,460	5%	13%	-$880,065	-8%
Lawton (III)	$4,700,000	$4,079,187	$203,960	$441,353	$4,724,500	5%	11%	$24,500	1%
Logan Co. RWD #2	$920,000	$749,896	$29,295	$112,285	$891,476	4%	15%	-$28,524	-3%
Mayes Co. RWD #3	$976,000	$768,729	$36,671	$92,600	$898,000	5%	12%	-$78,000	-8%
McCurtain Co. RWD #8	$5,000,000	$6,009,700	$402,932	$650,553	$7,063,185	7%	11%	$2,063,185	41%
Newcastle (I)	$2,325,235	$1,547,159	$107,788	$213,900	$1,868,847	7%	14%	-$456,388	-20%
Norman (I)	$15,766,010	$12,982,643	$612,507	$2,435,190	$16,030,340	5%	19%	$264,331	2%
Oklahoma City (I)	$7,634,177	$7,634,177	$363,532	$0	$7,997,709	5%	0%	$363,532	5%
Ponca City	$2,990,000	$2,433,914	$125,956	$399,010	$2,958,880	5%	16%	-$31,120	-1%

Borrower	Grantee Estimated Cost (Plus 10% Contingency and Other Costs*)	Construction Bid Amount	Loan Contingency	Other Costs*	Total Bid Amount	% Contingency of Construction Bid	% Other Costs* of Construction Bid	Differential of Total Bid Amount from Grantee Estimated Cost	% Change from Grantee Estimated Cost
Rogers Co. RWD #7	$759,000	$589,995	$29,000	$139,504	$758,499	5%	24%	-$501	-0.07%
Sand Springs**	$5,630,000	$4,088,515	$261,179	$144,750	$4,494,444	6%	4%	-$1,135,556	-20%
Stillwater (II)**	$10,541,825	$10,905,352	$527,116	$604,019	$12,036,487	5%	6%	$1,494,662	14%
Tulsa	$6,670,000	$4,476,528	$0	$634,339	$5,110,867	0%	14%	-$1,559,133	-23%
Wagoner (I)	$1,186,395	$999,750	$18,822	$103,679	$1,122,250	2%	10%	-$64,145	-5%
Washington Co. RWD #3**	$17,394,645	$15,839,295	$791,465	$768,145	$17,398,905	5%	5%	$4,260	-0.02%
					Average	5%	11%		-3%

* "Other Costs" include bond counsel, local counsel, financial advisor, engineering, inspections, planning and environmental information document (EID).

** Projects not completed as of 7/31/13 - costs shown are through 7/9/13.

TABLE OK – 4. OKLAHOMA DRINKING WATER PROGRAM ARRA FUNDING

Borrower	Promissory Note Agreement (Estimated Costs Plus 5% Construction Contingency Plus Other Costs**)	Deviation of Promissory Note Amount from Original Estimate	% Change from Original Estimate	Deviation of Total Bid Amount from Promissory Note	% Change from Total Bid Amount	Final Construction	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Bartlesville (IV)	$7,620,000	-$2,200,000	-22%	-$208	0%	$6,574,046	$7,483,088	-$136,912	-2%
Bixby (I)	$2,160,000	-$240,000	-10%	-$500	0%	$1,933,398	$2,006,122	-$153,87	-7%
Bryan Co. RWD #2 (III)	$382,000	$0	0%	$8,100	2%	$317,637	$382,000	$0	0%
Duncan (IV)	$11,245,000	-$153,390	-1%	-$81,450	-1%	$10,327,726	$11,245,000	$0	0%
Elk City	$8,825,000	$0	0%	-$82,278	-1%	$7,517,779	$8,686,856	-$138,144	-2%
Enid (I)	$8,345,000	-$4,414	0%	$65,975	1%	$6,901,645	$7,255,804	-$1,089,196	-13%
Frederick (I)	$4,500,000	$0	0%	-$21,584	0%	$4,101,146	$4,500,000	$0	0%
Guymon (II)	$1,255,000	-$45,000	-3%	-$26,256	-2%	$1,072,126	$1,270,000	-$15,000	1%
Healdton	$1,075,000	-$169,995	-14%	$169,495	14%	$865,010	$1,016,423	$58,577	-5%
Henryetta**	$9,500,000	-$866,525	-8%	-$13,540	0%	$8,122,740	$9,118,731	NA**	NA**
Lawton (III)	$4,725,000	$25,000	1%	-$500	0%	$4,283,147	$4,800,000	-$75,000	2%
Logan Co. RWD #2	$920,000	$0	0%	-$28,523.97	-3%	$749,896	$880,346	-$39,654	-4%
Mayes Co. RWD #3	$900,000	-$76,000	-8%	-$2,000	0%	$813,331	$893,543	$6,457	-1%
McCurtain Co. RWD #8	$7,038,410	$2,038,410	41%	$24,775.30	0%	$6,260,888	$5,817,366	$1,221,044	-17%
Newcastle (I)	$1,946,368	-$378,866.99	-16%	-$77,521,17	-4%	$1,547,159	$1,838,580	$107,788	-6%
Norman (I)	$14,000,000	-$1,766,009.50	-11%	$2,030,340	13%	$12,602,833	$13,820,904	-$179,096	-1%
Oklahoma City (I)	$7,634,177	$0	0%	$363,532.25	5%	$7,412,339	$7,412,339	$221,838	-3%

Borrower	Promissory Note Agreement (Estimated Costs Plus 5% Construction Contingency Plus Other Costs**)	Deviation of Promissory Note Amount from Original Estimate	% Change from Original Estimate	Deviation of Total Bid Amount from Promissory Note	% Change from Total Bid Amount	Final Construction	DWSRF Final Project Cost	Deviation of Final Cost from Promissory Note Amount	% Change from Promissory Note Amount
Ponca City	$2,990,000	$0	0%	-$31,120	-1%	$2,474,455	$2,801,057	$188,943	-6%
Rogers Co. RWD #7	$759,000	$0	0%	-$500.85	0%	$618,197	$741,711	$17,289	-2%
Sand Springs**	$5,630,000	$0	0%	-$1,135,556.43	-25%	$3,246,082	$3,391,332	NA**	NA**
Stillwater (II)**	$11,645,000	$1,103,174.52	10%	$391,487.63	3%	$10,917,084	***	NA**	NA**
Tulsa	$5,225,000	-$1,445,000	-22%	-$114,132.96	-2%	$4,782,881	$5,225,000	$0	0%
Wagoner (I)	$1,218,368	$31,972.97	-3%	-$96,118.17	-9%	$1,097,427	$1,233,446	-$15,078	1%
Washington Co. RWD #3**	$17,394,645	$0	0%	$4,259.68	0%	$16,626,000	$17,394,645	NA**	NA**
		Average	-3%		-1%				3%

* "Other Costs" include bond counsel, local counsel, financial advisor, engineering, inspections, planning and environmental information document (EID).

** Projects not completed as of 7/31/13 - costs shown are through 7/9/13.

REFERENCES

Clean Water State Revolving Fund Loans web page, Oklahoma Water Resources Board web site, http://www.owrb.ok.gov/financing/loan/cwsrfloans.php.

Drinking Water State Revolving Fund web page, Oklahoma Department of Environmental Quality web site, https://www.deq.state.ok.us/wqdnew/dwsrf/index.html.

Memorandum re Focus Group Meeting with Oklahoma Department of Environmental Quality, Oklahoma City, OK, February

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