RECLAMATION

Managing Water in the West

American Recovery and Reinvestment Act (ARRA)—Urbanized Canal Inspections Status Report

U.S. Department of the Interior
Bureau of Reclamation
Denver, Colorado

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Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Cover Photo: Urbanization adjacent to a Reclamation canal.

Acronyms and Abbreviations

ARRA	American Recovery and Reinvestment Act
CMP	corrugated metal pipe
CRID	controlled reach identification
DSIS	Dam Safety Information System
ERI	electrical resistivity imaging
GIS	Global Information System
GP	Great Plains Region
IR	infrared
LC	Lower Colorado Region
NMAS	National Map Accuracy Standards
MP	Mid-Pacific Region
MSS	Multi-Spectral Scanner
O&M	Operations and Maintenance
PAR	population at risk
Policy	Policy and Administration Office
PN	Pacific Northwest Region
Reclamation	Bureau of Reclamation
RO&M	Review of Operation and Maintenance
SP	self-potential
SOW	Statement of Work
TPEC	Technical Proposal Evaluation Committee
UC	Upper Colorado Region

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Executive Summary

In February 2009, American Recovery and Reinvestment Act (ARRA), Public Law 111-5, was signed into law, and the Bureau of Reclamation (Reclamation) was funded $10 million for inspection of canal reaches in urbanized areas.

The funding assisted Reclamation in reviewing the condition of canals where urbanization and increases in population density within close proximity to canals were identified. The number of canals required an extensive staffing effort beyond Reclamation's immediate capability. To implement the legislation, Reclamation contracted with several private sector companies to perform these inspections on over 1,000 miles of urbanized canals. Contracted activities included aerial and onsite inspection activities.

Observations made during the inspections, which related to the condition of the canal included: seepage areas, animal burrows, detrimental vegetation, surface erosion/voids, distressed corrugated metal pipe (CMP) and other embankment penetrations, sloughing/lining damage, and restricted cross drainage.

Based on the number of observations, Reclamation performed an initial "triage" to indicate a relative need and timing for any attention or follow-up actions to be taken on each canal reach based on the impacts of urbanization. The triage was used to help develop formal Operations and Maintenance (O&M) recommendations from the observations.

As a result of the ARRA funded inspections, Reclamation made 507 O&M recommendations. Most Reclamation canals are operated and maintained by operating entities such as water districts, authorities, or cooperatives. Reclamation staff is coordinating with these respective operating entities responsible for O&M. As of September 2014, the operating entities have completed 197 of these 507 recommendations.

When all outstanding follow-up inspection reports are received and associated O&M recommendations are developed, Reclamation staff will review the recommendations from all the inspection reports for that urban canal reach. Based on this overall review, Reclamation staff will determine if additional activities are needed—either from the operating entities as further O&M recommendations or as Reclamation's programmatic changes to address improvements to the Reclamation urban canal inspection process to address the continuing challenges that urbanization poses for Reclamation's canals.

A complete Urbanized Canal Final Report will be compiled to document the accomplishments of the urbanized canal inspections and the resulting programmatic development. The report will detail the initiation, implementation, and enhancements of the Review of Operation and Maintenance of Urbanized Canals. This report will be completed in the summer of 2015.

ARRA Legislation

The American Recovery and Reinvestment Act (ARRA), Public Law 111-5, was signed into law in February 2009 to "promote economic recovery." This authorized the Federal Government to invest in infrastructure enhancements to provide long-term economic benefits to the nation.

The ARRA law provided Federal funds to numerous agencies, including Reclamation, to boost the economy while delivering programmatic results. ARRA specifically provided Reclamation with $10 million to inspect canal reaches located in urbanized areas. The ARRA legislation reads, "*Provided further, That not less than $10,000,000 of the funds provided under this heading shall be used for a bureau-wide inspection of canals program in urbanized areas.*"

Canals in Urbanized Areas

Many Reclamation canals were constructed in rural agricultural areas to deliver irrigation water. With a few exceptions, the operation and maintenance (O&M) of these canals and associated facilities were contracted to operating entities such as water districts, authorities, or cooperatives that depend on the canals and associated facilities for water deliveries.

Figure 1. Urbanization near a Reclamation canal.

Over the years, increasing populations and the development and expansion of communities near the canals have resulted in the urbanization of historically agricultural areas (Figure 1). As a result, some of Reclamation's canals pose a potential risk to urbanized areas if a failure were to occur. Reclamation identified this change and established a list of canals in urbanized areas requiring increased inspection.

Implementation of Legislation

Reclamation was one of many Federal agencies using ARRA funds to contract work with small businesses to advance economic growth. Reclamation contracted with private sector companies to perform ARRA funded inspections of urbanized canals. As required in the legislation, Reclamation reported on a quarterly basis the allocation, obligation, and expenditure of ARRA funds while performing the urban canal inspections.

Reclamation's Policy and Administration Office (Policy) coordinated implementation of the inspection of urbanized canals. This included the development of internal guidance to delineate the comprehensive inspection process. The guidance described work to be performed by inspection contractors and the methods for Reclamation to process the inspection observations and create formal O&M recommendations to be completed by the operating entity. In addition, Policy outlined the process for Reclamation to determine the need for follow up inspections as well as prioritize the maintenance and repair of canal reaches within the urbanized canal inventory.

Policy developed criteria to guide Reclamation staff through the steps of initiating inspections to processing inspection results. A flowchart was developed to:

- Determine what canals qualified in the urban canal inventory
- Delineate the phases of the inspection process
- Assist with determining the need for follow-up inspection activities

Policy also lead an effort to educate the public about this inspection effort. Policy developed tools to assist local Reclamation offices promote public outreach. These included question and answer type sheets to educate the public on urbanized canals and how Reclamation would spend the ARRA funds to inspect urbanized canals. Reclamation developed press releases and fact sheets to notify the public of inspections that would be performed on urban canal reaches in their vicinity.

Preliminary Inspection Activities

The objectives of the urbanized canals inspections were multifaceted, with an emphasis to provide necessary data to ensure that canal reaches continue to provide authorized project benefits while reducing risk to the public. The objectives of urban canal inspections were to:

- Provide comprehensive baseline observations and data regarding the condition of inventoried urbanized canals

- Provide a basis for formal O&M recommendations which specify required action by the operating entity and/or Reclamation O&M staff

- Determine the need for any follow-up inspection activities to obtain additional data for specified areas

- Provide a basis for enhancements to the existing Review of Operation and Maintenance (RO&M) program specific to urbanized canals

Establishing Comprehensive Inspection Standards

Reclamation determined that the ARRA canal inspection activities should be implemented within the existing RO&M Program. The RO&M program provides oversight by performing field examinations to review how facilities are maintained by assessing the condition of the facilities and the processes used to maintain them. Reclamation uses its own subject matter experts who are not directly associated with the maintenance of the respective facilities to perform the field examination under the RO&M program. Based on observations made during RO&M field examinations, O&M recommendations are generated and categorized to address deficiencies identified during field inspections.

The contracted onsite inspections were designed to be similar to internally conducted RO&M inspections with two notable exceptions: Reclamation implemented additional inspection criteria specific to the inspection of urban canals and Reclamation staff developed all O&M recommendations based on the results of the contracted inspections.

Reclamation's urban canal inspection checklist helped establish a more comprehensive inspection process. Since onsite inspections were performed by multiple contractors, Reclamation developed a standardized inspection checklist for each contractor to collect the same information on all urbanized canal reaches. Moreover, the inspection checklist ensured that all features of the canal structure were comprehensively observed. An inspection report format was also developed for contractors to produce consistent, thorough inspection reports on all ARRA inspected urban canal reaches.

Establishing the Inventory of Urbanized Canal Reaches

Prior to ARRA legislation, Reclamation established an initial inventory of "canals of concern," to identify canals impacted by increasing urbanization. Canals of concern included canal reaches in urban areas that had flow capacity greater than 200 cubic feet per second and were constructed in fill sections or hanging along a hillside, creating the hazard potential to cause loss of life or significant property damage in the event of a failure.

As a result of this program under ARRA, Reclamation was able to better define specific canal reaches by determining which sections of the canal could be “controlled" from an operational standpoint. A controlled reach is that section of the canal identified by the water contained between structures, including checks, wasteways, diversion dams, etc., where the structures can be used to control or limit the amount of water to be discharged in the event of a failure. Figure 2 shows a controlled reach diagram.

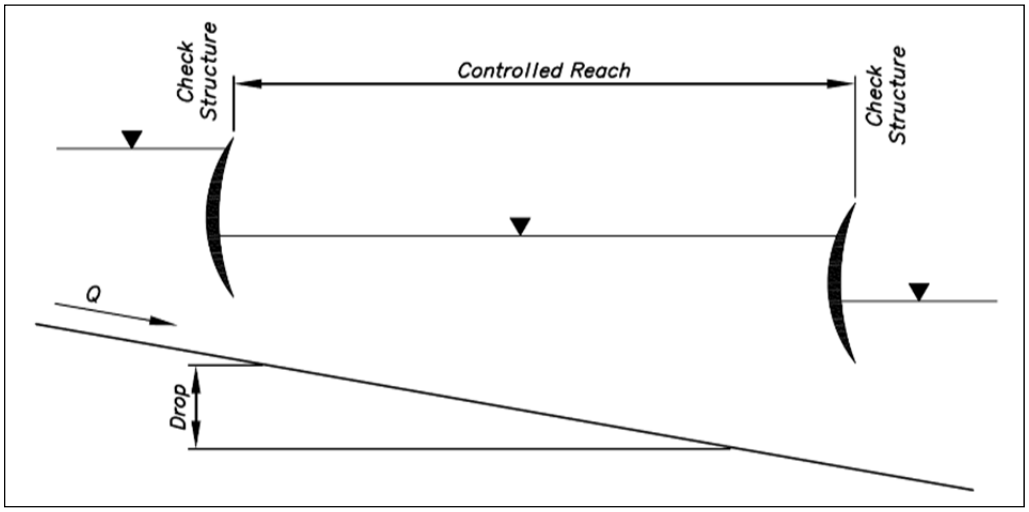

Figure 2. Controlled reach diagram.

Defining and inventorying canal reaches using the controlled reach approach assisted in determining canal operations, communication, and notification procedures related to emergency shutdowns, thereby reducing or limiting the extent of damages or other consequences, in the event of a canal breach. Each controlled urbanized canal reach in the inventory was assigned a unique number or controlled reach identification (CRID) number. Depending on the number of control structures in the canal, an urbanized canal could have multiple CRIDs.

Due to the increased population and the development of communities near the canals, Reclamation’s canals are considered urbanized where it is determined the failure could result in a population at risk (PAR). PAR is defined as the estimated number of people within the inundation zone as a result of water released from a canal failure. To establish the urbanized canal inventory, Reclamation refined the criteria to include:

- Failure would result in an estimated PAR greater than 100, or
- An estimated property damage greater than $1,000,000.

The minimum level of property damages as a result of flooding impacts was based on Federal Emergency Management Agency Publication 333, which was used in assigning dam hazard potential classifications.

Additionally, Reclamation applied discretion to add canal reaches to the inventory that did not meet either of the minimum criteria, but were included based on sound engineering judgment factors. Engineering judgment factors included:

- Type of structure (e.g., fill, cut, partial cut/fill)
- Cross drainage issues
- Levee protection
- Topography
- Flow rate or canal capacity
- Controllable volume of water in canal reach
- Previous or historical problems
- Canal operation duration
- Possible impacts to public health
- Impacts on public or private medical, educational, transportation facilities or other facilities of special consideration.

Figure 3. Urbanized canal reach.

As a result, 266 urbanized control reaches totaling approximately 1,000 miles of Reclamation canals were identified in the urbanized canal inventory (see Appendix A, ARRA Inventory of Urbanized Canals and Resulting Triage). ARRA funded aerial and onsite inspections were performed on all the canals in the urbanized canal inventory.

ARRA Funded Inspections

Reclamation used ARRA funding to competitively contract with private sector engineering firms to perform urban canal inspection services. Reclamation developed statement of works (SOW)s and independent government cost estimates for each inspection type to be performed by the contractors. The SOWs detailed the type of work and the level of effort to perform the inspections. The SOWs described that onsite inspections were to be performed by registered professional engineers using the Government-provided inspection checklist. Reclamation developed a database to store the contractors' onsite inspection observations. The SOWs required the

contractors to enter all of the inspection observations and data into this Reclamation database.

Reclamation used a list of qualified contractors to seek competitive proposals for canal inspection contracts. The contractors' proposals were evaluated by a Reclamation Technical Proposal Evaluation Committee (TPEC), which provided proposal review to recommend technically capable bidders to the contracting officer. Consistent with the Federal Acquisition Regulations, the contracting officer determined contract award based on the TPEC recommendations and the best value proposed to the government.

Using ARRA funds, Reclamation awarded contracts to perform aerial and onsite inspections. Both inspections were performed on all the canals in the urban canal inventory. Aerial inspections included data collection, processing, and analysis of the aerial inspection data. To observe all features of the canals, onsite inspections of urbanized canal reaches were performed both in watered up and dry or low-water conditions.

Aerial Inspections

Reclamation issued two contracts for aerial inspection activities using an airborne, 5-band, Multi-Spectral Scanner (MSS). To verify the technology before proceeding with all five regions, the first contract was with the Lower Colorado (LC) Region (for the Arizona and Southern California canals) during September-October 2009. The LC Region was selected due to the timing of contract award and canal operation period, Airborne remote sensing data were collected over approximately 116 miles of urbanized canal reaches. The contract award to Aero-Metric, Inc. was approximately $200,000.

A second contract was issued for the collection of aerial data over approximately 950 miles of urban canal reaches in the Pacific Northwest (PN), Mid-Pacific (MP), Upper Colorado (UC), LC, and Great Plains (GP) Regions in late June through mid-July 2010 between June 1 and July 30, 2010. The contract award to Aero-Metric, Inc. was approximately $1,300,000.

Aerial imagery collected for each controlled canal reach, was required to meet National Map Accuracy Standards (NMAS) for 1:12,000 scale, for accurate display in Global Information System (GIS). The imagery was acquired between the hours of 11 a.m. and 3 p.m. local standard time to record conditions of maximum temperature difference between water in the canals and the adjacent earthen and concrete materials. For quality control, imagery collection was undertaken when weather, cloud cover, wind, light, and atmospheric conditions were favorable for obtaining sharp, clear, well-defined images.

To ensure complete canal reach coverage, the contractor was directed to capture and deliver additional imagery at a minimum of 500 feet at both ends of each controlled canal reach. The imagery data were collected on both sides of the canal, within 1,000 feet of canal centerline.

Raw data files, recorded in the aircraft, were calibrated and analyzed to identify suspected canal seepage areas or other anomalies. Five-band image data files were created from the raw data set consisting of red, green, blue, near infrared, and thermal infrared bands. The collected imagery provided an up-to-date snapshot of current urbanization, vegetation, seepage, and other concerns, which could not be obtained using other available imagery.

As a result of the contractor's analysis, over 3,000 areas were identified, located, and described so further investigation or verification could be performed by Reclamation personnel. Figure 4 shows an example of thermal infrared (IR) imagery that indicates potential canal seepage next to the embankment.

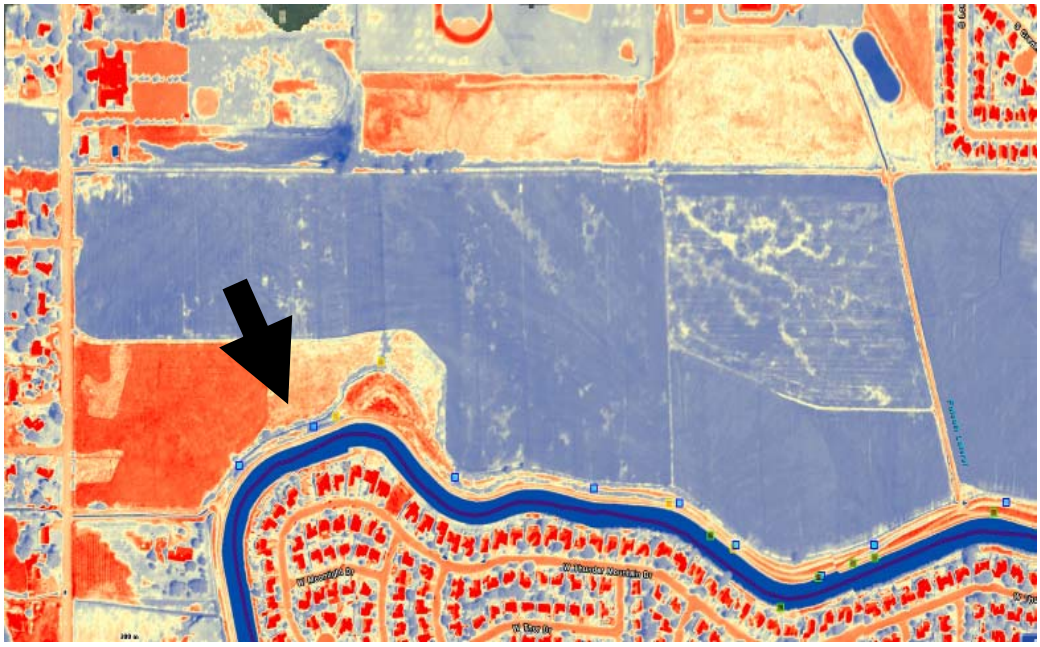

Figure 4. Thermal IR imagery.
Arrow highlights potential canal seepage.

Onsite Inspections

Reclamation's onsite inspections involved two phases of activities. The first phase was the inspections of canal reaches in a watered-up condition, and the second phase was performing inspections in a dry or low water condition. The watered-up and dry or low water inspections provided a comprehensive evaluation while requiring contractors to traverse the entire length of the canals detailing all observations.

The watered-up inspections contract was awarded to Basepoint Design Corporation on December 2009 for approximately $3,000,000. The objective of the watered-up inspections was to inspect the canal from the operating water surface to the outside of the canal embankment to identify issues such as seepage, freeboard encroachment, flow restrictions, turbulence, vegetation, whirlpools, embankment, lining concerns, sloughing, or animal burrows.

The dry or low water inspections contract was awarded to RockSol Consulting Group, Inc. in July 2010 for approximately $2,300,000. The dry or low water inspection contract scope of work was smaller than the watered-up contract scope of work due to the inability to draw down some canal reaches. The dry or low water inspections examined the inside of the canal prism that is not readily visible when the canal is used for delivery during the irrigation season. Dry or low water inspections look for issues such as animal burrows, vegetative root penetrations, invert scour, buildup, lining damage, voids, debris, or sloughing (Figure 5).

Figure 5. Contractor performing onsite inspection in low water conditions on a Reclamation canal.

Reclamation staff coordinated all of the onsite inspections, and operating entity personnel were invited to accompany all contractors during the onsite inspections. Reclamation staff provided background information and Job Hazard Analysis for each contractor's inspection team. At the conclusion of each inspection, the contractors' inspection personnel held an outbriefing meeting to highlight observations with Reclamation and operating entity staff.
In some cases, observations made during the watered-up and dry or low water inspections required follow-up inspections to better understand identified issues at specific canal reaches. The follow-up inspections included detailed examinations and geophysical inspections.

Processing Inspection Observations

The contractors submitted a completed inspection checklist and a narrative report for each canal reach and entered the data into Reclamation's database for each inspection. Upon receipt of the aerial data and onsite inspection reports from the contractors, Reclamation reviewed and interpreted the data and observations generated during the contractors' inspections.

GIS Application

To assist with processing aerial and onsite inspection results, Reclamation developed a GIS application to view the aerial inspection data and to spatially display the contractors' onsite observation data on a GIS map. The GIS application was vital to display the thermal and IR data collected during the aerial inspections. Reclamation examined these data to distinguish areas of ponding water and potential seepage. The display of thermal and IR data also helped Reclamation determine the extent of potential seepage areas.

All onsite observations were recorded in the Reclamation database, by latitude and longitude coordinates, allowing an accurate spatial display of observations and associated photographs within the GIS application. Using GIS allowed Reclamation to recognize trends and potential areas of concern from the contractors' observations.

Reclamation used aerial inspection imagery and verified with onsite inspection observations to locate and establish areas of actual and potential seepage to determine the need for follow up investigations at specific locations. Figure 6 is a screen shot of the GIS application displaying all onsite watered-up inspection observations. The blue boxes indicate the contractor's observations, and clicking on the blue box provides descriptions and photos for each specific observation.

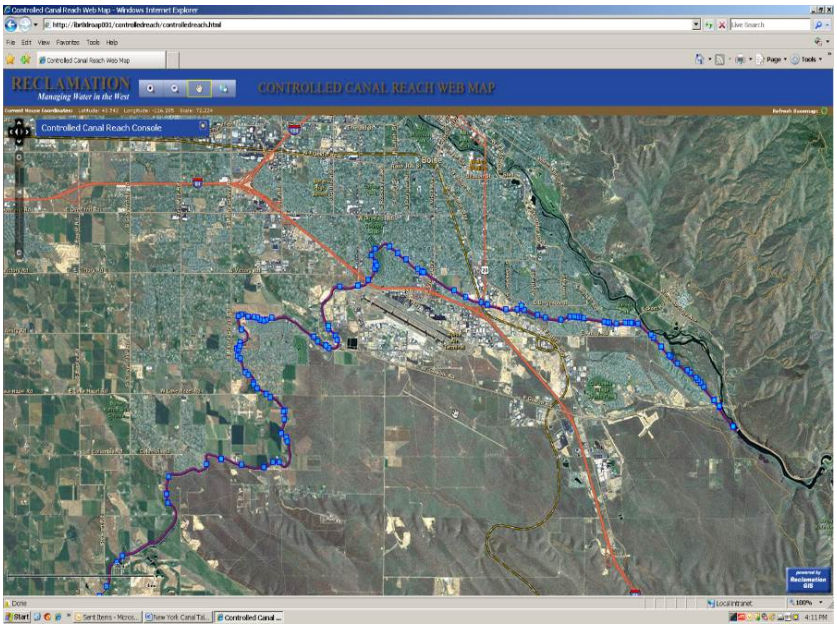

Figure 6. Screen shot of an urban canal reach on the GIS application.

Classification Based on Observations

Inspections performed with ARRA funds resulted in observations that allowed Reclamation to analyze important data on the condition of its urbanized canals. Reclamation developed a "triage" system to classify the level of attention each controlled urban canal reach required based on the observations generated during the contractors' inspection activities. The triage system used a qualitative matrix to evaluate the nature of issues or observations and their consequence of failure to determine whether an urbanized canal reach should be classified as Immediate Follow Up, Follow Up Monitoring, or Status Quo category.

- **Immediate Follow Up** is defined as a canal reach where observations indicate new or significant deficiencies which require immediate follow up inspections, additional analysis, and corrective action if appropriate, to ensure structural safety, operational integrity of the canal reach, or safety of the operating personnel or public.

- **Follow Up Monitoring** is defined as a canal reach where observations indicate potential or past moderate deficiencies where follow up monitoring or inspections or analysis is recommended to determine the need for remedial measures if appropriate to prevent or reduce further damage, preclude possible operational failure of the canal reach, or reduce risk to the safety of the operating personnel or public.

- **Status Quo** is defined as a canal reach where observations indicate that issues are nonexistent or minor in significance, and no follow up inspections, additional analysis, or extra monitoring will be necessary beyond routine monitoring or inspections.

Reclamation staff evaluated the urban canal reaches based on the watered up inspection observations and the dry or low water inspection observations to determine an overall triage classification for each CRID (See Appendix A, ARRA Inventory of Urbanized Canals, and Resulting Triage). Table 1 shows the results of the triage classification of all of the inspected CRIDs based on the aerial and onsite inspections.

Table 1. Triage Summary

Category	Number of Inspected CRIDs
Immediate Follow Up	95
Follow Up Monitoring	78
Status Quo	93

Approximately 500 miles of Reclamation's controlled urban canal reaches were categorized as Immediate Follow Up. Canal reaches identified as Immediate Follow Up were scheduled for follow-up inspections and activities based on the nature of the issues.

Follow-Up Inspections

Based on the urban canal reaches' triage classification and observations made during the inspections, Reclamation determined the need to perform follow up inspections to gather additional information on suspect seepage areas. Reclamation utilized sonar and geophysical inspections based on operational constraints of the individual canals.

Sonar Inspections

Sonar inspections were performed on canals that deliver water year around and cannot be dewatered. Sonar technology was used to inspect areas with suspected concrete liner damage at locations with identified seepage. The scanning sonar system is capable of detecting broken, cracked, or offsets in concrete lining despite the turbidity of canal water. Approximately $85,000 was obligated and expended to perform sonar inspections as an alternative to divers performing underwater inspections. Sonar inspections were performed on 3 urban canal reaches in the MP Region.

Cracks and displacements in the concrete liner observed during the sonar inspections were identified for repair (Figure 7). The sonar inspections also verified areas of concrete integrity that did not require repairs.

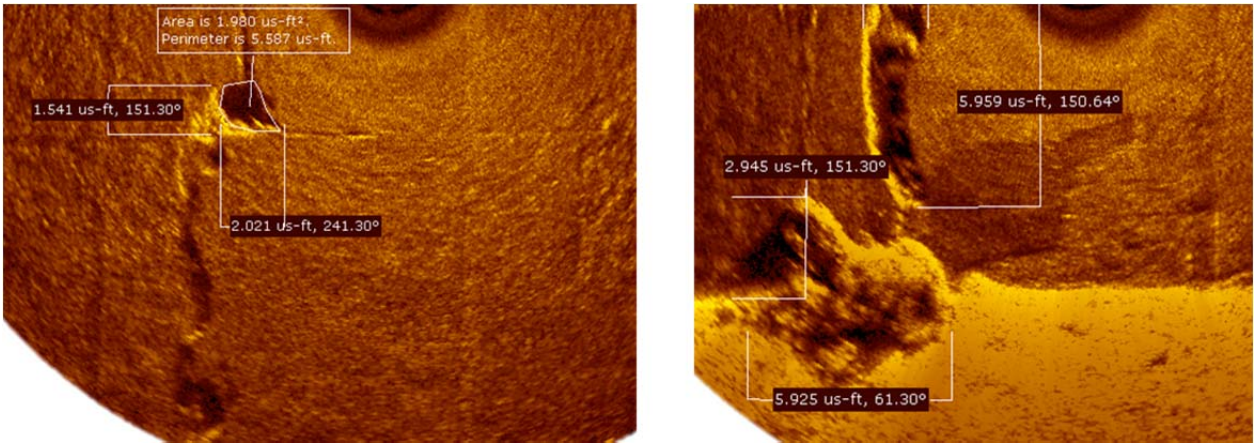

Figure 7. High-resolution sonar images of areas missing concrete. In the left image, the sonar was located 3 ft. below the water surface. In the right image, the sonar was located about 9 ft. above the canal invert.

Geophysical Inspections

Geophysical inspections were performed based on the data from aerial and on site observations. Canal reaches were identified during the watered-up inspections because seepage was observed. In some cases, this included reaches that historically

experienced seepage and repairs. Aerial inspection imagery was used to confirm specific seepage locations.

Approximately $720,000 was obligated and expended in performing geophysical inspections at specific locations of urban canal reaches with identified seepage to gather further information on specific seepage areas. Geophysical inspections provided additional information to determine the extent of seepage paths through the canal embankments and foundations, as well as verify the sources of seepage. Geophysical inspections were performed on approximately 40 urban canal reaches in the PN, MP, UC, and LC Regions.

Geophysical inspections used electrical resistivity imaging (ERI) instrumentation, and self-potential (SP) profiling along the suspected seepage areas of the canal embankments and foundations. The geophysical data were collected on the canal embankment crest—which also typically serve as the O&M road. Figure 8 shows the typical placement of ERI rods and cables for the collection of geophysical data along a suspected seepage area on a canal embankment.

Figure 8. Collecting geophysical data on a suspected seepage area in a canal embankment.

Geophysical data were collected in 2012. Subsequently, a local engineering consulting firm was contracted outside of ARRA funds to complete the collection and analysis of geophysical data, and complete reports to characterize seepage paths and seepage mechanisms. The contract to complete the analysis and reporting on the geophysical inspections will be complete on December 31, 2014. Further details describing the results of the geophysical inspections will be contained in the Urbanized Canal Final Report in 2015.

Summary of Inspection Observations

The onsite inspections resulted in more than 6,000 observations related to the condition of the canal. The observations could be grouped into several consistent categories, including: seepage areas, animal burrows, vegetation, surface erosion/voids, distressed corrugated metal pipe (CMP) and other pipe penetrations, sloughing/lining damage, and restricted cross drainage.

Seepage

Seepage is the movement of water from the canal through the canal embankment or foundation soils (Figures 9 and 10). Seepage water flows in between the soil particles in what are known as seepage paths. If the velocity of the seepage water is great enough it can cause internal erosion or movement of soil particles with the water and result in piping, and sinkholes in the embankment.

Figure 9. Active seepage area near the outside of the canal embankment.

Figure 10. Ponded water and moist soil near toe of the canal embankment.

Animal Burrows

Animal burrows pose a potential threat to the integrity of canal embankments (Figures 11 and 12). Rodents that burrow through canal embankments can create a path for canal water to exit the canal through the embankment, resulting in seepage and internal erosion of the embankment.

Figure 11. Large and small diameter animal burrows on the outside of the canal embankment.

Figure 12. Large and small diameter animal burrows on the inside of the canal prism.

Vegetation

Roots from trees and woody vegetation pose a potential threat to the integrity of canal embankments (Figures 13 and 14).

Roots have the potential to loosen the compacted soils of the canal embankment. Decaying roots can create seepage paths through the embankment, which can lead to seepage and internal erosion of the embankment. In addition, excessive or dense vegetation creates inviting habitat for burrowing rodents. Further, it can obscure inspections and observations of surface conditions.

Figure 13. Trees growing on inside of canal prism; note roots.

Figure 14. Large and dense trees growing on the outside slope of the canal embankment.

Surface Erosion/Voids

Surface erosion is the external erosion of embankment soil as a result of water or wind (Figures 15 and 16). External erosion may result from intense rain events creating voids or surface erosion on the embankment crest or slopes. Surface erosion can cause slumping or collapse of the embankment slopes.

Figure 15. Void on the crest of the canal embankment.

Figure 16. Erosion of outer slope of the canal embankment.

Distressed CMP/Pipe Penetrations

Distressed or corroding CMP and other pipes penetrating the embankment pose a potential threat to the integrity of embankments by creating a seepage path for water through the embankment (Figures 17 and 18). CMP pipes that corrode and have holes allow the water from the CMP to exit the pipe and seep along the exterior of the CMP which can result in piping and internal erosion of the embankment.

Figure 17. Pipe penetration through the canal embankment.

Figure 18. CMP pipe penetrating the canal embankment.

Sloughing/Lining Damage

Winds resulting in waves in the canal water may result in surface erosion or sloughing on the interior slopes of the canal embankment (Figures 19 and 20). Sloughing can cause slipping and slumping of the embankment. Canal lining protects the canal from surface erosion. When canal lining is damaged, it allows water to move behind the liner and scour or erode the unprotected areas of the interior embankment slopes of the canal.

Figure 19. Distressed canal lining on the inside slope of the canal prism observed during dry inspection.

Figure 20. Sloughing of the outside slope of the canal embankment.

Restricted Cross Drains

The cross drain allows drainage water to cross from the high side to the low side of the canal without interrupting the canal supply. When a cross drain becomes plugged or restricted and can no longer flow drainage water as designed, it creates the potential for the drainage water to enter the canal and not exit. During storm events, restricted cross drains can cause an excess amount of water to collect in the canal and result in overtopping.

Figure 21. Plugged corrugated metal pipe culvert that is limiting cross drainage.

From Observations to Recommendations

Reclamation staff reviewed observations generated by the contractors' inspections, and developed O&M recommendations which are tracked until completed. While developing O&M recommendations, Reclamation worked with operating entities to refine the O&M activities required to mitigate the issues observed during the onsite inspections.

O&M recommendations within the RO&M program are categorized as 1, 2, or 3 based on the urgency of repairs. The categorization of O&M recommendations are based on the results of a qualitative assessment of the likelihood of a potential failure event based on a deficiency type, and the consequences of the potential event.

Formal recommendations identified as category 1 or category 2 are tracked until completion in an established Reclamation information system, Dam Safety Information System (DSIS) that is currently used to track existing RO&M recommendations.

Implementing Recommendations

As a result of the ARRA funded inspections, 507 category 2 O&M recommendations were developed. It is anticipated that additional O&M recommendations will be created when all observations and geophysical inspection reports are evaluated.

Based on the triage classification of the urban canal reaches, both short-term and long-term actions have been prioritized. Based on funding, operational seasons, and performance periods, many short-term actions have been completed. However, there are some recommendations which will require engineering design and additional resources to implement corrective actions, resulting in a long-term completion schedule that is tracked in DSIS.

Reclamation continues to conduct follow-up activities to prepare a basis for corrective actions. In some situations, risk-based studies and analysis have been initiated to evaluate alternatives and, recommend implementation of preferred corrective actions.

The operating entities implement formal recommendation actions as part of their O&M on the canals. For example, during a watered up inspection, a seepage area was identified. During the next off-season, the operating entity initiated lining of the canal to mitigate the seepage. Figure 22 is a photo of the operating entity installing liner on a canal to repair a seepage area.

Figure 22. Operating entity performing repairs to address a seepage area.

As of September 2014, 197 of the 507 of the recommendations developed from ARRA funded inspections have been completed.

Synopsis of ARRA Inspections

The ARRA funding to inspect urban canals strengthened Reclamation's ability to respond to the effect of changes in population demographics on its infrastructure. Approximately, $8,600,000 was utilized for contracting of various inspections on Reclamation's urban canals, with $1,400,000 used to administer the inspection contracts. The ARRA funded inspection activities assisted Reclamation to establish a general condition of canals in urban areas within a shorter period of time. The triage

system allowed Reclamation to evaluate the nature of observations and determine the need for appropriate follow up activities, including the development of O&M recommendations to mitigate pertinent deficiencies based on the impacts of urbanization.

Follow-up activities are currently being processed and reports are being completed. As geophysical reports are received, Reclamation staff will review the technical results and develop O&M recommendations in the same manner as previously performed with the onsite inspection observations. Reclamation will collaborate with the operating entity in determining the O&M recommendations that will be tracked in DSIS until completed.

Next Steps

Due to the increasing growth of population near its canals, Reclamation has enhanced the standards by which urbanized canals must be inspected and O&M recommendations are created. Once all outstanding reports associated with the urbanized canals follow-up activities are received and processed, Reclamation staff will perform a programmatic review of the cumulative recommendations and develop necessary changes to agency policy, requirements, and guidance for monitoring, inspecting, and performing the O&M of canals in urbanized areas.

A complete Urbanized Canal Final Report will be compiled to document the accomplishments of the urbanized canal inspections and resulting programmatic development. The report will detail the initiation, development, and implementation of the RO&M of Urbanized Canals. This report is expected to be completed in the middle of 2015.

Appendix A – ARRA Inventory of Urbanized Canals and Resulting Triage

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
PN	145	A line Canal	BOISE PROJECT	0.6	SQ
PN	146	New York Canal	BOISE PROJECT	5.3	IFU
PN	147	New York Canal	BOISE PROJECT	2.7	IFU
PN	148	New York Canal	BOISE PROJECT	2.6	IFU
PN	149	New York Canal	BOISE PROJECT	18.6	IFU
PN	150	Mora	BOISE PROJECT	1.9	FUM
PN	151	Mora	BOISE PROJECT	2.5	FUM
PN	152	Notus	BOISE PROJECT	9.5	FUM
PN	154	Potholes Canal 2.6 to 22.7 Mile Check	COLUMBIA BASIN PROJECT	20.7	FUM
PN	155	West Canal 6.6 Mile Check to 20 Mile Check	COLUMBIA BASIN PROJECT	14.8	IFU
PN	156	West Canal 26 Mile Check to 36 Mile Check	COLUMBIA BASIN PROJECT	9.2	FUM
PN	157	West Canal	COLUMBIA BASIN PROJECT	12.5	FUM
PN	158	Crooked River Distribution	CROOKED RIVER PROJECT	2.3	SQ
PN	159	Crooked River Distribution	CROOKED RIVER PROJECT	1	SQ
PN	160	Crooked River Diversion	CROOKED RIVER PROJECT	8.3	FUM
PN	161	North Unit Main	DESCHUTES PROJECT	37.7	FUM
PN	162	North Unit Main	DESCHUTES PROJECT	0.3	SQ
PN	163	North Unit Main	DESCHUTES PROJECT	0.3	FUM
PN	164	North Unit Main	DESCHUTES PROJECT	1.2	FUM
PN	165	Feeder Canal	GRAND COULEE PROJECT	1.7	SQ
PN	166	Main Canal East	MICHAUD FLATS PROJECT	1.7	SQ
PN	167	B Canal	MINIDOKA PROJECT	2	SQ
PN	168	B Canal	MINIDOKA PROJECT	2.5	FUM
PN	169	C Canal	MINIDOKA PROJECT	0.7	FUM
PN	170	North Side Main Canal	MINIDOKA PROJECT	0.6	FUM
PN	171	Ashland	ROGUE RIVER BASIN PROJECT	6.3	FUM
PN	172	Talent	ROGUE RIVER BASIN PROJECT	7.3	FUM
PN	173	Talent	ROGUE RIVER BASIN PROJECT	1.9	SQ
PN	174	Talent	ROGUE RIVER BASIN PROJECT	3.8	SQ
PN	175	Hermiston Cold Springs Feed Canal	UMATILLA BASIN PROJECT	24.4	IFU
PN	176	Hermiston A-Line Canal	UMATILLA BASIN PROJECT	3.8	FUM
PN	177	Hermiston A-Line Canal	UMATILLA BASIN PROJECT	2.2	FUM
PN	178	Hermiston A-Line Canal	UMATILLA BASIN PROJECT	0.8	SQ
PN	179	Hermiston Maxwell Canal	UMATILLA BASIN PROJECT	10	FUM
PN	180	Cascade Canal	YAKIMA PROJECT	1.1	FUM
PN	181	Cascade Canal	YAKIMA PROJECT	3.3	FUM
PN	182	Cascade Canal	YAKIMA PROJECT	5.1	FUM
PN	183	Roza Main Canal	YAKIMA PROJECT	59.3	FUM
PN	184	Prosser Canal	YAKIMA PROJECT	13.8	SQ

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
PN	185	Snipes Mtn Canal	YAKIMA PROJECT	0.3	FUM
PN	186	Snipes Mtn Canal	YAKIMA PROJECT	2.3	FUM
PN	187	Sunnyside Canal	YAKIMA PROJECT	1.1	SQ
PN	188	Sunnyside Canal	YAKIMA PROJECT	1.5	SQ
PN	189	Sunnyside Canal	YAKIMA PROJECT	1.3	SQ
PN	190	Sunnyside Canal	YAKIMA PROJECT	15.5	FUM
PN	191	Upper Wapatox Canal	YAKIMA PROJECT	0.1	SQ
PN	192	Upper Wapatox Canal	YAKIMA PROJECT	0.2	IFU
PN	193	Upper Wapatox Canal	YAKIMA PROJECT	2.3	FUM
PN	194	Upper Wapatox Canal	YAKIMA PROJECT	0.2	FUM
PN	195	Upper Wapatox Canal	YAKIMA PROJECT	0.6	FUM
PN	196	Upper Wapatox Canal	YAKIMA PROJECT	1.1	FUM
PN	197	Upper Wapatox Canal	YAKIMA PROJECT	0.8	FUM
PN	198	Upper Wapatox Canal	YAKIMA PROJECT	1.6	FUM
PN	199	Upper Wapatox Canal	YAKIMA PROJECT	0.8	FUM
PN	200	Upper Wapatox Canal	YAKIMA PROJECT	0.5	FUM
PN	201	Upper Wapatox Canal	YAKIMA PROJECT	0.3	FUM
PN	202	Black Canyon Main	BOISE PROJECT	14.6	SQ
PN	203	West Canal -Bifurcation to High Hill Check (6.6)	COLUMBIA BASIN PROJECT	5.9	FUM
PN	204	C Canal	MINIDOKA PROJECT	3.1	SQ
PN	205	West Extension Main Canal	UMATILLA PROJECT	1.4	SQ
PN	206	West Extension Main Canal	UMATILLA PROJECT	0.7	SQ
PN	207	Kennewick Main Canal	YAKIMA PROJECT	3.3	FUM
PN	208	Kennewick Main Canal	YAKIMA PROJECT	0.8	SQ
PN	209	Kennewick Main Canal	YAKIMA PROJECT	2.4	SQ
PN	210	Kennewick Main Canal	YAKIMA PROJECT	7	FUM
PN	262	West Extension Main Canal	UMATILLA BASIN PROJECT	1.6	SQ
PN	263	West Extension Main Canal	UMATILLA BASIN PROJECT	23.3	FUM
PN	264	Hermiston A-Line Canal	UMATILLA BASIN PROJECT	3.9	SQ
PN	265	Mora	BOISE PROJECT	3.9	FUM
PN	266	Deer Flat Low Line	BOISE PROJECT	2.51	FUM
PN	267	Deer Flat Low Line	BOISE PROJECT	13.99	IFU
MP	56	Contra Costa Canal	CENTRAL VALLEY PROJECT	3.97	IFU
MP	57	Contra Costa Canal	CENTRAL VALLEY PROJECT	0.75	IFU
MP	58	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.13	IFU
MP	59	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.2	IFU
MP	60	Contra Costa Canal	CENTRAL VALLEY PROJECT	3.07	FUM
MP	61	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.56	IFU
MP	62	Contra Costa Canal	CENTRAL VALLEY PROJECT	2.22	IFU
MP	63	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.6	FUM
MP	64	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.65	IFU

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
MP	65	Contra Costa Canal	CENTRAL VALLEY PROJECT	3.46	IFU
MP	66	Contra Costa Canal	CENTRAL VALLEY PROJECT	2.63	IFU
MP	67	Contra Costa Canal	CENTRAL VALLEY PROJECT	3.26	IFU
MP	68	Contra Costa Canal	CENTRAL VALLEY PROJECT	2.45	IFU
MP	69	Contra Costa Canal	CENTRAL VALLEY PROJECT	0.79	IFU
MP	70	Contra Costa Canal	CENTRAL VALLEY PROJECT	1.34	IFU
MP	71	Contra Costa Canal	CENTRAL VALLEY PROJECT	0.92	FUM
MP	72	Contra Costa Canal	CENTRAL VALLEY PROJECT	3.7	FUM
MP	73	Corning	CENTRAL VALLEY PROJECT	4.55	IFU
MP	74	Delta Cross Channel	CENTRAL VALLEY PROJECT	1.59	*
MP	75	Delta Cross Channel	CENTRAL VALLEY PROJECT	0.92	*
MP	76	Delta Mendota Canal	CENTRAL VALLEY PROJECT	8.76	FUM
MP	77	Delta Mendota Canal	CENTRAL VALLEY PROJECT	4.84	IFU
MP	78	Delta Mendota Canal	CENTRAL VALLEY PROJECT	4.6	IFU
MP	79	Delta Mendota Canal	CENTRAL VALLEY PROJECT	4.26	IFU
MP	80	Delta Mendota Canal	CENTRAL VALLEY PROJECT	5.58	IFU
MP	81	Delta Mendota Canal	CENTRAL VALLEY PROJECT	5.79	IFU
MP	82	Delta Mendota Canal	CENTRAL VALLEY PROJECT	5.71	IFU
MP	83	Delta Mendota Canal	CENTRAL VALLEY PROJECT	6.02	IFU
MP	84	Delta Mendota Canal	CENTRAL VALLEY PROJECT	5.24	IFU
MP	85	Folsom South	CENTRAL VALLEY PROJECT	14.6	IFU
MP	86	Folsom South	CENTRAL VALLEY PROJECT	10.2	IFU
MP	87	Friant Kern Canal	CENTRAL VALLEY PROJECT	5.5	IFU
MP	88	Friant Kern Canal	CENTRAL VALLEY PROJECT	23.02	IFU
MP	89	Friant Kern Canal	CENTRAL VALLEY PROJECT	17.52	IFU
MP	90	Friant Kern Canal	CENTRAL VALLEY PROJECT	14.97	IFU
MP	91	Friant Kern Canal	CENTRAL VALLEY PROJECT	7.96	IFU
MP	92	Friant Kern Canal	CENTRAL VALLEY PROJECT	8.97	IFU
MP	93	Friant Kern Canal	CENTRAL VALLEY PROJECT	7.45	IFU
MP	94	Friant Kern Canal	CENTRAL VALLEY PROJECT	8.61	IFU
MP	95	San Luis Canal	CENTRAL VALLEY PROJECT	15.88	IFU
MP	96	San Luis Canal	CENTRAL VALLEY PROJECT	10.87	IFU
MP	97	Tehama Colusa	CENTRAL VALLEY PROJECT	2.98	FUM
MP	98	Tehama Colusa	CENTRAL VALLEY PROJECT	4.98	IFU
MP	99	Tehama Colusa	CENTRAL VALLEY PROJECT	6.2	FUM
MP	100	Tehama Colusa	CENTRAL VALLEY PROJECT	5.93	FUM
MP	101	Tehama Colusa	CENTRAL VALLEY PROJECT	5.12	IFU
MP	102	Tehama Colusa	CENTRAL VALLEY PROJECT	5.5	IFU
MP	103	Tehama Colusa	CENTRAL VALLEY PROJECT	4.77	IFU
MP	104	Tehama Colusa	CENTRAL VALLEY PROJECT	4.89	FUM
MP	105	Tehama Colusa	CENTRAL VALLEY PROJECT	5.35	IFU
* Removed from the inventory, because it does not meet the definition of an urbanized canal reach.					

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
MP	106	A Canal	KLAMATH PROJECT	9.15	IFU
MP	107	A-3 Lateral	KLAMATH PROJECT	6.75	IFU
MP	108	C Canal	KLAMATH PROJECT	1.27	FUM
MP	109	C Canal (C flume)	KLAMATH PROJECT	2.31	IFU
MP	110	D Canal	KLAMATH PROJECT	0.5	IFU
MP	111	D Canal	KLAMATH PROJECT	0.97	FUM
MP	112	N Canal	KLAMATH PROJECT	0.45	FUM
MP	113	L-Line	NEWLANDS PROJECT	1.05	IFU
MP	114	L-Line	NEWLANDS PROJECT	1.9	IFU
MP	115	L-Line	NEWLANDS PROJECT	1.91	FUM
MP	116	S-Line	NEWLANDS PROJECT	1.67	IFU
MP	117	S-Line	NEWLANDS PROJECT	1.63	IFU
MP	118	T-Line	NEWLANDS PROJECT	1.37	SQ
MP	119	T-Line	NEWLANDS PROJECT	0.42	SQ
MP	120	T-Line	NEWLANDS PROJECT	0.89	SQ
MP	121	T-Line	NEWLANDS PROJECT	1.06	SQ
MP	122	Truckee Canal	NEWLANDS PROJECT	2.9	IFU
MP	123	Truckee Canal	NEWLANDS PROJECT	5.67	IFU
MP	124	Truckee Canal	NEWLANDS PROJECT	2.92	IFU
MP	125	Truckee Canal	NEWLANDS PROJECT	3.96	IFU
MP	126	V-Line	NEWLANDS PROJECT	0.98	IFU
MP	127	V-Line	NEWLANDS PROJECT	1.12	IFU
MP	128	V-Line	NEWLANDS PROJECT	0.54	IFU
MP	129	V-Line	NEWLANDS PROJECT	1.12	IFU
MP	130	V-Line	NEWLANDS PROJECT	1.31	IFU
MP	131	V-Line	NEWLANDS PROJECT	0.04	FUM
MP	132	Putah South	SOLANO PROJECT	3.49	SQ
MP	133	Putah South	SOLANO PROJECT	2.41	FUM
MP	134	Putah South	SOLANO PROJECT	1.71	SQ
MP	135	Putah South	SOLANO PROJECT	2.06	SQ
MP	136	Putah South	SOLANO PROJECT	2.98	FUM
MP	137	Putah South	SOLANO PROJECT	2.39	IFU
MP	138	Putah South	SOLANO PROJECT	2.32	IFU
MP	139	Putah South	SOLANO PROJECT	2.43	IFU
MP	140	Putah South	SOLANO PROJECT	2.54	IFU
MP	141	Putah South	SOLANO PROJECT	2.31	IFU
MP	142	Putah South	SOLANO PROJECT	1	SQ
MP	143	Robles Casitas	VENTURA PROJECT	2.59	IFU
MP	144	Robles Casitas	VENTURA PROJECT	0.38	SQ
MP	283	Madera Lat. 6.2	CENTRAL VALLEY PROJECT	21.15	IFU
MP	284	Madera Lat. 24.2	CENTRAL VALLEY PROJECT	5.5	FUM
LC	5	All American Canal	BOULDER CANYON PROJECT	19.5	SQ

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
LC	6	All American Canal	BOULDER CANYON PROJECT	1.3	SQ
LC	7	All American Canal	BOULDER CANYON PROJECT	4.9	FUM
LC	8	Coachella Canal	BOULDER CANYON PROJECT	1.7	SQ
LC	9	Coachella Canal	BOULDER CANYON PROJECT	5.5	FUM
LC	10	Coachella Canal	BOULDER CANYON PROJECT	1.1	FUM
LC	11	Coachella Canal	BOULDER CANYON PROJECT	4.2	SQ
LC	12	Coachella Canal	BOULDER CANYON PROJECT	1.7	SQ
LC	13	Coachella Canal	BOULDER CANYON PROJECT	1.8	SQ
LC	14	Fanin-McFarland	CENTRAL ARIZONA PROJECT	7.2	SQ
LC	15	Hayden-Rhodes	CENTRAL ARIZONA PROJECT	5.9	SQ
LC	16	Hayden-Rhodes	CENTRAL ARIZONA PROJECT	6.2	SQ
LC	17	Hayden-Rhodes	CENTRAL ARIZONA PROJECT	6.9	SQ
LC	18	Hayden-Rhodes	CENTRAL ARIZONA PROJECT	5.8	SQ
LC	19	Hayden-Rhodes	CENTRAL ARIZONA PROJECT	0.8	SQ
LC	20	A Canal	GILA PROJECT	2.5	SQ
LC	21	Arizona	SALT RIVER PROJECT	1.7	FUM
LC	22	Arizona	SALT RIVER PROJECT	6.6	SQ
LC	23	Grand	SALT RIVER PROJECT	1.5	SQ
LC	24	South Canal	SALT RIVER PROJECT	6.9	SQ
LC	25	South Canal	SALT RIVER PROJECT	3	SQ
LC	26	Tempe	SALT RIVER PROJECT	1.2	SQ
LC	27	Western Canal	SALT RIVER PROJECT	1.6	SQ
LC	28	Western Canal	SALT RIVER PROJECT	0.9	SQ
LC	29	Western Canal	SALT RIVER PROJECT	0.6	SQ
LC	30	Western Canal	SALT RIVER PROJECT	0.9	SQ
LC	31	East Main	YUMA PROJECT	2.7	SQ
LC	32	East Main	YUMA PROJECT	2	SQ
LC	33	East Main	YUMA PROJECT	0.6	SQ
LC	34	East Main	YUMA PROJECT	0.7	SQ
LC	35	East Main	YUMA PROJECT	0.7	SQ
LC	36	East Main	YUMA PROJECT	1	SQ
LC	37	East Main	YUMA PROJECT	0.9	SQ
LC	38	East Main	YUMA PROJECT	0.4	SQ
LC	39	West Main	YUMA PROJECT	1.8	SQ
LC	40	A Canal	GILA PROJECT	1.9	SQ
LC	41	A Canal	GILA PROJECT	0.6	SQ
LC	42	Grand	SALT RIVER PROJECT	2.3	FUM
LC	43	East Main	YUMA PROJECT	3	FUM
LC	44	Thacker	YUMA PROJECT	0.4	SQ
LC	45	Thacker	YUMA PROJECT	0.35	SQ
LC	46	Thacker	YUMA PROJECT	0.27	SQ
LC	47	Thacker	YUMA PROJECT	0.28	SQ

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
LC	48	Thacker	YUMA PROJECT	0.5	SQ
LC	49	Thacker	YUMA PROJECT	0.5	FUM
LC	50	Thacker	YUMA PROJECT	0.23	SQ
LC	51	Thacker	YUMA PROJECT	0.45	SQ
LC	52	West Main	YUMA PROJECT	0.7	SQ
LC	53	West Main	YUMA PROJECT	2.3	FUM
LC	54	West Main	YUMA PROJECT	0.8	SQ
LC	55	West Main	YUMA PROJECT	0.7	SQ
LC	268	B Canal	GILA PROJECT	0.75	SQ
LC	269	B Canal	GILA PROJECT	0.99	SQ
LC	270	B Canal	GILA PROJECT	1.23	SQ
LC	271	B Canal	GILA PROJECT	0.76	SQ
LC	272	Cocopah Canal	YUMA PROJECT	1.45	FUM
LC	273	Cocopah Canal	YUMA PROJECT	1.32	SQ
LC	274	Cocopah Canal	YUMA PROJECT	0.52	FUM
LC	275	Hayden-Rhodes Aqueduct	CENTRAL ARIZONA PROJECT	6.4	SQ
LC	276	Grand Canal/CrossCut	SALT RIVER PROJECT	0.6	SQ
LC	277	Arizona Canal	SALT RIVER PROJECT	2.6	FUM
LC	278	Western Canal	SALT RIVER PROJECT	2.4	SQ
LC	279	All American Canal	BOULDER CANYON PROJECT	15.39	SQ
UC	211	Cottonwood Creek &	EMERY COUNTY PROJECT	0.9	SQ
UC	212	Cottonwood Creek &	EMERY COUNTY PROJECT	1.1	SQ
UC	214	Government Highline Canal	GRAND VALLEY PROJECT	12.7	FUM
UC	215	Government Highline Canal	GRAND VALLEY PROJECT	15.1	FUM
UC	217	Hyrum-Mendon Canal	HYRUM PROJECT	7.8	FUM
UC	218	Belen Highline	MIDDLE RIO GRANDE PROJECT	11.1	IFU
UC	219	Belen Highline	MIDDLE RIO GRANDE PROJECT	9.3	IFU
UC	220	Belen Highline	MIDDLE RIO GRANDE PROJECT	5.2	IFU
UC	221	Peralta Main	MIDDLE RIO GRANDE PROJECT	3.9	IFU
UC	222	Peralta Main	MIDDLE RIO GRANDE PROJECT	2.5	FUM
UC	223	Peralta Main	MIDDLE RIO GRANDE PROJECT	1	IFU
UC	224	Peralta Main	MIDDLE RIO GRANDE PROJECT	9.1	FUM
UC	225	Ogden-Brigham Canal	OGDEN RIVER PROJECT	9.4	FUM
UC	237	Strawberry Valley Highline Canal	STRAWBERRY VALLEY PROJECT	2.5	FUM
UC	238	Strawberry Valley Highline Canal	STRAWBERRY VALLEY PROJECT	4.7	FUM
UC	241	Selig Canal	UNCOMPAHGRE PROJECT	3.4	IFU
UC	242	South Canal	UNCOMPAHGRE PROJECT	11	IFU
UC	244	Gateway Canal	WEBER BASIN PROJECT	1.1	SQ
UC	245	Gateway Canal	WEBER BASIN PROJECT	0.7	FUM
UC	246	Gateway Canal	WEBER BASIN PROJECT	0.5	FUM

Region	Controlled Reach Identification Number (CRID #)	Canal Name	Reclamation Project	Controlled Reach Length (miles)	Original ARRA Triage
UC	247	Gateway Canal	WEBER BASIN PROJECT	0.8	SQ
UC	248	Gateway Canal	WEBER BASIN PROJECT	0.9	SQ
UC	249	Gateway Canal	WEBER BASIN PROJECT	0.6	SQ
UC	250	Gateway Canal	WEBER BASIN PROJECT	0.9	SQ
UC	251	Gateway Canal	WEBER BASIN PROJECT	0.7	FUM
UC	252	Gateway Canal	WEBER BASIN PROJECT	0.3	SQ
UC	253	Gateway Canal	WEBER BASIN PROJECT	0.9	FUM
UC	254	Gateway Canal	WEBER BASIN PROJECT	0.4	SQ
UC	255	Gateway Canal	WEBER BASIN PROJECT	0.6	FUM
UC	256	Layton Canal	WEBER BASIN PROJECT	1.3	SQ
UC	257	Willard Canal	WEBER BASIN PROJECT	0.9	FUM
UC	258	Willard Canal	WEBER BASIN PROJECT	8.3	IFU
UC	259	Fire Mountain Canal	PAONIA PROJECT	2.1	IFU
UC	260	Fire Mountain Canal	PAONIA PROJECT	10.3	IFU
UC	261	Fire Mountain Canal	PAONIA PROJECT	20.5	IFU
UC	281	Strawberry Valley Highline Canal	STRAWBERRY VALLEY PROJECT	4.3	IFU
UC	282	Strawberry Valley Highline Canal	STRAWBERRY VALLEY PROJECT	1.3	IFU
GP	1	Helena Valley	PICK-SLOAN MISSOURI BASIN PROGRAM	2	SQ
GP	2	Charles Hansen Feeder Canal	COLORADO-BIG THOMPSON PROJECT	5.95	SQ
GP	3	Dosdson South	MILK RIVER PROJECT	1.5	FUM
GP	4	Altus Canal	W.C. AUSTIN PROJECT	3.2	SQ