

Reclamation Manual

Directives and Standards

Subject:	Canal Hazard Program
Purpose:	To provide requirements and procedures for uniform implementation of the inventory and inspection of canal reaches located in urban areas in addition to the Reclamation Manual Directive and Standard (D&S), <i>Review of Operation and Maintenance (RO&M) Program Examination of Associated Facilities (Facilities Other Than High- and Significant-Hazard Dams)</i> (FAC 01-04). The benefits of this D&S include inventory and inspection activities of urban canals, protecting the Federal investment, asset management, and public interests.
Authority:	Reclamation Project Act of 1902 (Act of June 17, 1902, 32 Stat. 388) and amendatory and supplementary acts; American Recovery and Reinvestment Act of 2009, Section 2, Division A, Title IV-Energy and Water Development (Pub. L. 111-5); Omnibus Public Land Management Act of 2009, Section 1, Title IX, Subtitle G-Aging Infrastructure (Pub. L. 111-11; 43 USC 510)
Approving Official:	Director, Dam Safety and Infrastructure
Contact:	Asset Management Division (86-67200)

1. **Introduction.** Reclamation's canals were originally constructed through relatively unpopulated areas in the Western United States. Today, some of Reclamation's canals are subject to the spread of urban development and now pose a potential risk to populated areas in the event of a failure. As a result, Reclamation has established the Canal Hazard Program (CHP) which provides requirements for inventory and inspection activities of canal reaches located in urban areas.
2. **Applicability.** This D&S applies to all Reclamation staff and offices having jurisdiction and oversight responsibility for Reclamation-owned canal reaches, where the improper operation or failure of the canal would result in a significant risk to population and/or significant property damage as defined in paragraph 10.L.
3. **Goals and Objectives.** The goals and objectives for canal reach inventory and inspection activities are to satisfy the following purposes:
 - A. Continue to provide authorized project benefits and current public benefits from all canal reaches;
 - B. Identify potential risks through inspections, and minimize the risk to public safety, welfare, and property damage through recommendations¹;

¹This information may be used by Reclamation to determine eligibility for funding under Pub. L. 111-11.

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- C. Ensure each canal reach is operated and maintained properly and effectively;
 - D. Ensure operating and emergency management procedures are adequate and current;
 - E. Maintain familiarity with the canal, and provide training to Reclamation staff and operating entities;
 - F. Verify compliance with contract provisions related to safe and reliable operation of each canal; and
 - G. Promote technical exchange of information.
4. **Programmatic Reviews.** Dam Safety and Infrastructure will implement reviews to verify the adequate and consistent implementation of requirements set forth under this D&S, as part of the CHP.
- A. **Annual Review.** Dam Safety and Infrastructure will perform an annual review on a minimum of 10 percent of urban canal reaches inspected within each region. Reviews will include an assessment of inspection reports and the related development and tracking of recommendations. The reviews will include, but are not limited to:
 - (1) determining if current inventory and inspection processes are implemented effectively, and assure that operation and maintenance (O&M)-related issues and concerns are being addressed in a timely and responsible manner;
 - (2) evaluating the consistency of compliance with Reclamation-wide required inspection and recommendation processes established in this D&S; and
 - (3) verifying recommendations are documented and tracked to completion.
 - B. **Post-Event Review.** Dam Safety and Infrastructure will lead a post-event review which will be performed by Reclamation staff following an urban canal reach incident or failure. The post-event review will include, but is not limited to:
 - (1) a review of applicable documents related to the canal reach, including drawings, Standing Operating Procedures (SOP), canal Emergency Action Plan (EAP), previous inspection reports, recommendations, and their status;
 - (2) an onsite inspection performed by staff from the Asset Management Division (AMD), the Technical Service Center (TSC), or the regional/area offices, with participation determined by the impact of the event;
 - (3) interviewing operating entity personnel, Reclamation O&M field staff, and others involved in the detection and repair of the incident or failure; and

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- (4) development of a post-event report, including lessons learned, with distribution to the affected regional/area office and other Reclamation staff involved in urban canal activities, as appropriate.

5. Inventory.

A. **Inventory Requirements.** Each region will maintain the Enterprise Asset Registry - Urban Canal Asset Class for all urban canals under their jurisdiction. Known changes to required data elements will be updated within six months of the inspection which documents the changes. Urban and non-urban canals will be evaluated for potential addition or removal from the CHP during their required inspections. Changes to Population at Risk (PAR), property damage potential, and sound engineering judgment will be used to identify any necessary changes. Changes to the inventory will be as indicated in Paragraphs 5.C. and 5.D. The inventory will identify, at a minimum, the following data elements:

- (1) project name;
- (2) canal name;
- (3) canal reach name/number or location description;
- (4) Canal Reach Identification (CRID);
- (5) canal reach milepost (beginning and ending), latitude/longitude, stationing, and length of the reach;
- (6) engineering judgment factors considered to qualify as an urban canal, if applicable
- (7) design flow for the canal reach;
- (8) maximum operational flow, and operational flow restrictions for the canal reach;
- (9) description of canal lining and condition;
- (10) typical operating season;
- (11) occurrence of past issues or failures;
- (12) current Urban Canal Condition Classification (UCCC);
- (13) target inspection frequency; and
- (14) next and last target inspection dates.

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- B. Engineering Judgment Factors.** When using engineering judgment to identify canal reaches to be included in the urban canal inventory, each region will use information for the canal reach contained in past field examinations or inspection reports and the engineering judgment of the staff involved in field activities. The determination to include additional canal reaches in the inventory will depend on a variety of factors that affect the probability and consequence of failure including, but not limited to:
- (1) canal prism section stability and integrity;
 - (2) cross-drainage issues;
 - (3) storm water drainage;
 - (4) operations, including operational limitations or flow restrictions;
 - (5) topography;
 - (6) seismicity of the area;
 - (7) seepage;
 - (8) rodents, including burrowing animals;
 - (9) vegetation along the canal alignment;
 - (10) utilities or other crossings beneath the canal;
 - (11) flow rate;
 - (12) volume of water within canal reach;
 - (13) previous problems/historical difficulties;
 - (14) annual canal operations duration;
 - (15) possible impacts to public health or safety;
 - (16) critical infrastructure, medical, educational, or transportation facilities, or other facilities of special consideration;
 - (17) security vulnerabilities; and
 - (18) urban development.
- C. Adding a Canal Reach to the Urban Canal Inventory.** The addition of a new canal reach to the urban canal inventory must be documented by formal memorandum. The

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area office will initiate the memorandum documenting that the area and regional offices concur that the canal reach either meets the definition of an urban canal reach or is being added to the urban canal inventory based on sound engineering judgment factors. The memorandum shall include the inventory data listed in Paragraph 5.A, excluding the CRID and UCCC. Copies of this memorandum will be retained by the area and regional offices, and a copy will be sent to the Director, Dam Safety and Infrastructure, Attention: 86-67200 (asset-mgt-div@usbr.gov). Upon receipt of the memorandum, AMD will issue a CRID number for the new urban canal reach and create a corresponding entry in the Enterprise Asset Registry.

- D. **Removing an Urban Canal Reach from the Inventory.** When a canal reach does not meet the definition of an urban canal, it must be removed from the inventory. The area office will initiate a memorandum documenting the area and regional offices concur the canal reach, specified by CRID, no longer meets the definition of urban canal reach, and that sound engineering judgment would not require that the canal reach be retained on the urban canal reach inventory. Copies of this memorandum will be retained by the area and regional offices, and a copy will be sent to the Director, Dam Safety and Infrastructure, Attention: 86-67200 (asset-mgt-div@usbr.gov). Upon receipt and review of the memorandum, AMD will update the Enterprise Asset Registry accordingly.

6. Onsite Inspections.

- A. **Onsite Inspections Requirements.** Onsite inspections of urban canals will be performed to inspect and observe the pertinent areas of the urban canal reach in a comprehensive manner. Onsite inspections of each urban canal reach will be conducted, to the extent possible, as part of regular RO&M Program field examinations of related canal systems. However, it is recognized that separate inspections of these reaches will be required.
- (1) **Personnel Qualifications.** Onsite inspections will be conducted by Reclamation RO&M-qualified regional and/or area office staff and in coordination with operating entity personnel, as applicable. If additional resources are desired or required, possible options include Reclamation staff of the TSC, another regional office, area office, or other qualified personnel.
 - (2) **Outreach with Operating Entity.** Once a scheduled onsite inspection is proposed for a particular canal reach, the regional/area office will notify the responsible operating entity of the anticipated inspection plans, the specific reach/location to be inspected, and any other information regarding the inspection that would be of interest and benefit to the entity. This notification will also include an invitation for the entity to participate in the inspection.
 - (3) **Job Hazard Analysis (JHA).** To help ensure the safety of personnel conducting the onsite inspections, the responsible area/field office will prepare a JHA for

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each canal reach to be inspected. If more than one canal reach is to be inspected on a particular canal, only one JHA is required to be prepared to cover all reaches. The JHA will address all potential safety hazards for activities anticipated and provide acceptable methods, procedures, and equipment to safely accomplish the activities. The JHA will be provided to each inspection team participant prior to the inspection to allow review of the JHA and to obtain necessary safety equipment. The JHA will be reviewed by the onsite inspection team members at the urban canal site during the entrance briefing for the inspection and signed by all participants in the inspection. Signing the JHA will indicate acknowledgment of the provisions and intention to comply with the JHA during the inspection. Any non-Reclamation participants declining to sign the JHA will be so noted on the JHA. Should unforeseen circumstances arise during the inspection that are not specifically covered in the JHA or where an interpretation is required, the responsible area/field office representative participating in the inspection, in consultation with the operating entity, as applicable, will make the final decision on whether and how to proceed. Ultimately, each individual of the inspection party is responsible for his/her own safety.

- (4) **Inspection Scheduling.** The regional/area office will schedule the inspection of each urban canal reach in the “watered-up” or “wet” condition to allow observations and evaluations related to operational issues and possible seepage conditions. An inspection will also be performed in the “dewatered” or “dry” condition, as the regional/area office determines necessary. Inspections are allowed to be scheduled alternately in the “watered-up” and “dewatered” conditions, provided that the inspections are made under conditions to properly evaluate seepage and operational issues in an appropriate and timely manner.
- (5) **Inspection Frequency.** The frequency of routine onsite inspections of urban canal reaches under the CHP Program will be no more than three years. The specific frequency will be based on the responsible regional/area offices’ determination of the canal’s current field conditions, the O&M performance by the responsible operating entity, and the potential consequences involved. For canal reaches classified as poor, as defined in Paragraph 10.K.(3) of this D&S, a more frequent inspection interval is required, as determined by the responsible regional/area office. This more frequent inspection interval will be maintained until corrective actions are implemented satisfactorily to improve the canal’s UCCC or O&M practices. A more frequent inspection frequency will also be maintained as determined by the responsible regional/area office based on the potential consequences of a particular urban canal reach.
- (6) **Inspection Preparation.** Prior to performing onsite inspections, the Reclamation inspection team members will review pertinent information related to the canal reach to be inspected. This will include but is not limited to the following:

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- (a) previous inspection checklists and inspection reports;
 - (b) past recommendations for the CRID and their current status;
 - (c) the current canal EAP; and
 - (d) design drawings, as-built drawings, and SOPs (or other applicable operating documents).
- (7) **Canal Reach Areas.** Onsite inspections performed by walking and traversing the canal embankments and adjacent areas and documenting observations are required for all inspections. These inspections can be limited to only specific sections of each reach, provided that they include, as a minimum, all of the identified “fill” sections that, if they were to fail, would have an impact on the urban areas, or as based on sound engineering judgment. In addition, the “RO&M Field Examination Guidelines” and the “Inspection Checklist” may be used as supplementary discretionary guidance for conducting these inspections. A copy of “RO&M Field Examination Guidelines” and the “Inspection Checklist” are available from Director, Dam Safety and Infrastructure, Attention: 86-67200 (asset-mgt-div@usbr.gov).
- (8) **Recommendations.** Recommendations will be developed by Reclamation staff based on a review of deficiencies observed during the inspection, their consequence to the integrity of the canal, and the potential risk they pose. Recommendations are to be developed and tracked according to Paragraph 7.A.(3).
- (9) **Canal EAP.** Urban canals fall under FAC 01-01 Emergency Management Program for Water Impoundment Structures and require a written “Canal EAP” (per [FAC 01-01](#)) to address potential incidents and failures. It is acceptable for one canal EAP to include multiple CRIDs within a canal or to be included as an annex to a dam EAP. FAC 01-01 - Appendix A, *Emergency Action Plan Content Requirements* defines the purpose and scope, roles and responsibilities, and canal EAP format and content. As an integral part of the onsite inspection, the current status of the canal EAP will be reviewed for adequacy according to the criteria below, and the results documented in the inspection report. Additional requirements beyond those listed here will be reviewed under the emergency management program office.
- (a) **Up to Date.** Determine if there is a properly labeled “Canal EAP” associated with the CRID and that is has been reviewed for accuracy within the past 12 months.

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- (b) **Basic Content.** Determine if the EAP contains instructions for Detection, Classification, and Notification to reduce risk to populations downstream of the CRID.
 - (c) **Initiating Conditions.** Evaluate the initiating conditions in the EAP document to determine adequacy for the purposes of identifying potential concerns and providing a framework for severity classification and notification.
- (10) **Close Out Meeting.** At the conclusion of each inspection, a close out meeting with the operating entity will be conducted to discuss and summarize the inspection, specific observations and findings, and proposed recommendations. If circumstances do not allow a meeting to take place at the conclusion of the inspection, appropriate follow-up communications with the operating entity will take place prior to completion of the draft inspection report.
- (11) **Inspection Report.** Following the inspection process, the inspection report will be prepared according to Paragraph 7.
- B. **Follow-up Activities.** Depending on the condition classification of each canal reach, additional follow-up activities will be warranted in the form of technical analysis. Technical analysis includes but is not limited to, geotechnical, geophysical, hydraulic, and canal design considerations, or other inspection or assessment actions, as deemed necessary by the regional/area office, for investigation of identified issues related to a particular canal reach. The extent and type of additional technical analysis will be dependent on the potential for failure and related consequences identified as part of the inspection results and recommendations made by the regional/area offices.
7. **Inspection Reporting.** A separate CHP inspection report for each urban canal will be prepared even if the inspection was conducted as part of a regular RO&M Program field examination. When conducted together, it is acceptable to include the CHP inspection report as an attachment to the regular RO&M Program field examination report. It is acceptable to include the reporting of multiple CRIDs for a related canal system within a single inspection report.
- A. **Report Content.** Content of the inspection report will encompass all pertinent information observed during the inspection. Documentation is to note the description and location of all identified issues along each canal reach that could affect its integrity. As a minimum, the narrative inspection report will include:
- (1) an executive summary of the inspection, including a discussion of significant observations noted in the observation table;
 - (2) a complete observation table, including observations that result in formal recommendations as well as observations that do not warrant a recommendation;

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at a minimum, it is to include each location, description of conditions/deficiencies, formal recommendation number (if applicable), and reference photo number;

- (3) a list of all outstanding recommendations on the CRID, and their current status following discussion at the inspection close out meeting;
- (4) a list of all new recommendations resulting from the current inspection;
- (5) a summary of past performance issues, operational incidents, or failures as noted on the checklist;
- (6) a list of all information and documents reviewed in conjunction with the inspection;
- (7) operational and weather data at the time of the inspection which may have an impact on field observations;
- (8) the date(s) of the inspection;
- (9) the names, organizations, offices, and contact information of all participants in the inspection;
- (10) current UCCC, as outlined in Paragraph 11.K. in this D&S;
- (11) verification of canal EAP content and currency, and that a communications drill was performed in the past 12 months;
- (12) representative photographs of the canal reach which document pertinent conditions and observations for future reference; and
- (13) conclusion statement, summarizing observations related to the UCCC.

B. Inspection Report Format. A recommended format for the inspection report is provided in the report template. A copy of the inspection report template can be obtained from Director, Dam Safety and Infrastructure, Attention: 86-67200 (asset-mgt-div@usbr.gov).

C. Recommendation Categorizing and Tracking. Current recommendation categories and tracking will be the same as utilized for other RO&M Program field examinations and related O&M recommendations, as outlined in FAC 01-04. In order to efficiently track the completion of recommendations related to specific urban canal reaches, each formal recommendation will have the number of the CRID appended upon its entry into the Dam Safety Information System (DSIS). Recommendations including preliminary cost estimates and scheduled completion dates will be tracked until

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completion in DSIS². Recommendations will be entered into DSIS, within 90 days following inspection report transmittal.

- D. **Peer Review.** A peer review of the inspection report's content and completed checklist will be made by Reclamation staff that is familiar with the CHP. The peer reviewer's name, signature, and date will be included on the report.
 - E. **Report Transmittal and Distribution.** Final inspection reports will be transmitted within 120 days of the inspection date by the responsible regional or area office which authorizes the report. Minimum distribution will consist of one electronic copy to the Director, Dam Safety and Infrastructure, Attention: 86-67200 (asset-mgt-div@usbr.gov); and copies to the responsible regional director, the responsible area manager, other involved offices and parties in the inspection, including the responsible operating entity.
8. **Annual Reclamation Urban Canals Assessment Report.** AMD will provide the Deputy Commissioner, Operations a Canal Hazard Program Annual Assessment Report to summarize the accomplishments and assess the effectiveness of the urban canal activities performed under the CHP in the previous fiscal year. The report will be a compilation of information provided in the annual summary reports from each region as well as an assessment of periodic review activities. The report will be submitted by April 30 of the following fiscal year. The report will include the following:
- A. **Inventory.** Summarize the number of CRIDS in each region and their UCCC.
 - B. **Recommendations.** Summarize the status of category 1 and category 2 recommendations from previous years.
 - C. **EAP Implementation.** Summarize the status of EAPs in place for the CRIDS.
 - D. **Program Accomplishments.** Review accomplishments of the urban canal activities under the CHP. Address any improvements implemented as a result of the previous year's report.
 - E. **Program Compliance.** Summarize compliance with requirements outlined under this D&S.

²Reclamation O&M contracts with transferred works operating entities include the authority to require the completion of O&M-related work including formal recommendations. When formal recommendations are not completed as scheduled, the operating entity neglects their contract obligation, and Reclamation has the authority to self-perform the recommended work and back charge the incurred costs to the operating entity. Category 1 and 2 recommendations that are not completed as scheduled will reduce the ability of the operating entity to qualify for emergency extraordinary maintenance extended repayment as authorized in Pub. L. 111-11.

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- F. **Improvements.** Identify opportunities for improvement to existing urban canal activities and provide recommendations for Reclamation Manual release revisions.
 - G. **Post-Event Review.** Review of the effectiveness of post-event response and activities within the affected offices and implementation of lessons learned throughout Reclamation.
9. **Funding Requirements.**
- A. **Inspections and Related Activities.** Inspections of canal reaches, and related activities will be funded with non-reimbursable Reclamation appropriations, similar to other current RO&M Program activities, under the Examination of Existing Structures (EES) Program.
 - B. **Follow-up Activities.** Technical follow-up activities outlined in Paragraph 6.B. of this D&S will be funded with non-reimbursable Reclamation appropriations under the EES Program.
 - C. **Corrective Actions.** Unless specifically authorized, the costs for any corrective actions on these canal reaches, including completion of recommendations interpreted to be project O&M activities, including replacements, instrumentation, and future monitoring, will be reimbursable by operating entities and project beneficiaries to the extent required by current project O&M allocations and contracts.
 - D. **Participation by Operating Entities.** All costs incurred by the operating entities in participating in the inspections and related activities outlined in this D&S, unless otherwise noted, will be borne by the entities.
10. **Definitions.**
- A. **Canal.** A channel, usually open, that conveys water by gravity and is an associated facility as defined in FAC 01-04.
 - B. **Canal Reach Identification (CRID) Number.** A unique numerical integer that identifies and is used for tracking a specific urban canal reach within the CHP inventory. The CRID number will be assigned by AMD at the request of the area office.
 - C. **Emergency Action Plan (EAP).** A written plan containing response procedure that guides personnel to quickly respond to an incident at a dam or other water impoundment structure to initiate intervention actions and notify public safety agencies of any threat of flooding to populations at risk.
 - D. **Incident.** An uncontrolled release of water from a canal regardless of the cause; including adverse seepage conditions and other near failure events.

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- E. **Inundation Zone.** The estimated area located below a canal that is potentially subject to flooding, in the event of the canal's failure.
- F. **Inventory.** A compilation of all urban canal CRIDs, including documentation of additions and deletions, which meet the minimum requirements outlined in paragraph 5.A.
- G. **Population at Risk (PAR).** The estimated number of people within the inundation area as a result of water released from a canal should it fail. The value is based on the estimated number of people within dwellings, buildings, cars, camping areas, etc. that are inside the inundation zone.
- H. **Property Damage.** The estimated cost of asset damage directly attributable to a canal failure, including but not limited to: buildings, structures, utilities, and infrastructure. It does not include the loss of crop productivity due to loss of irrigation capability, nor does it include indirect costs due to loss of services to or use of buildings and structures.
- I. **Recommendation.** An action required by facility management to implement a Reclamation O&M practice, local practice, or industry standard; or a suggested improvement.
- J. **Standing Operating Procedure (SOP).** A comprehensive single-source document covering all aspects of dam and reservoir operation and maintenance and emergency procedures. Its purpose is to ensure adherence to approved operating procedures.
- K. **Urban Canal Condition Classification (UCCC).** An assessment of the current general condition of each urban canal CRID will be performed by regional and area office staff following a scheduled or emergency canal inspection. The classification is meant to assess and characterize the condition of a particular CRID, and the corrective action required to address identified canal issues. The classification will be determined based on inspection observations, engineering judgment, and the culmination of outstanding and new O&M recommendations to determine if the CRID will be classified as good, fair, or poor³.
- (1) **Good.** A canal reach is classified as good where observations and recommendations indicate it has no or minor deficiencies, structural deterioration or corrective actions required; only routine monitoring is required; and

³If a CRID is identified as poor or fair, the area office should review Reclamation Manual D&S, *Extended Repayment of Extraordinary Maintenance Costs* (PEC 05-03) to establish if the CRID is potentially eligible for advanced funding and extended repayment under the authority of §9603 of Pub. L. 111-11. If the CRID is identified as potentially eligible, the area office is to coordinate with its regional office to identify available funding and develop a formal request for a determination of eligibility from the Commissioner, in accordance with the requirements of PEC 05-03.

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recommendations (if any) are category 2 recommendations that do not pertain to the performance or integrity of the canal condition.

- (2) **Fair.** A canal reach is classified as fair where observations and recommendations indicate it has some deficiencies or structural deterioration; corrective action is required to maintain structural integrity, operational reliability, or to prevent or reduce further damage, or possible failure; specific monitoring is required in addition to routine monitoring; and at least one category 2 recommendation pertaining to the performance or integrity of the canal condition.
- (3) **Poor.** A canal reach is classified as poor where observations and recommendations indicate significant deficiencies or advanced structural deterioration; immediate corrective action is required to restore: structural integrity, operational reliability, or to prevent failure; increased and frequent monitoring is required; and has at least one category 1 recommendation or multiple category 2 recommendations pertaining to the performance or integrity of the canal condition.

L. **Urban Canal Reach.** An urban canal reach is delineated by the water contained between two structures including checks, wasteways, diversion dams, etc. where the structures may be used to control or limit the amount of water to be lost in the event of a failure. An urban canal reach is defined as either of the following:

- (1) **Criteria-Defined.** A canal reach where failure would result in an estimated PAR greater than 100 and/or an estimated property damage of greater than \$5,000,000.
- (2) **Defined by Engineering Judgment.** A canal reach determined by the responsible regional/area office to be classified as an urban canal reach, based on sound engineering judgment factors, listed in Paragraph 5.B.

M. **Urban Canal Reach Issue.** An identified concern that, if not resolved, could lead to a failure or malfunction of an urban canal resulting in an uncontrolled release of water that would place the public and/or property at risk.

11. **Review Period.** The originating office will review this release at least every 4 years.

RECLAMATION MANUAL TRANSMITTAL SHEET

Effective Date: _____

Release No. _____

Ensure all employees needing this information are provided a copy of this release.

Reclamation Manual Release Number and Subject

Summary of Changes

NOTE: This Reclamation Manual release applies to all Reclamation employees. When an exclusive bargaining unit exists, changes to this release may be subject to the provisions of collective bargaining agreements.

Filing instructions

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Filed by: _____

Date: _____