Central Oregon Irrigation District Smith Rock-King Way Infrastructure Modernization Project

Final Watershed Plan-Environmental Assessment

July 2020

United States Department of Agriculture, Natural Resources Conservation Service – Lead Federal Agency in cooperation with the Deschutes Basin Board of Control and Central Oregon Irrigation District

Prepared by Farmers Conservation Alliance

Final Watershed Plan-Environmental Assessment for the Central Oregon Irrigation District Smith Rock-King Way Infrastructure Modernization Project

Lead Agency: United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Oregon

Sponsoring Local Organization: Deschutes Basin Board of Control (DBBC) (lead sponsor) and Central Oregon Irrigation District (COID) (co-sponsor).

Authority: This Final Watershed Plan-Environmental Assessment (Plan-EA) has been prepared under the Authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law [PL] 83-566). The Plan-EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, PL 91-190, as amended (42 United States Code [U.S.C.] 43221 et seq.).

Abstract: This document is intended to fulfill requirements of the NEPA and to be considered for authorization of PL 83-566 funding of the COID Infrastructure Modernization Project (project). The project seeks to improve water conservation, water delivery reliability, and public safety for irrigation infrastructure in Oregon's Deschutes Basin. The project would include piping and pressurizing approximately 7.9 miles of COID's Pilot Butte Canal and laterals. Total estimated project costs are $42,306,000 of which 31 percent would be paid by the sponsors and other non-federal funding sources. The estimated amount to be paid through NRCS PL 83-566 funds is $29,003,000.

Comments: Comments submitted in response to this Notice of Availability must be received within 15 days of the date of publication. Submit comments and inquiries to: Gary Diridoni, USDA/NRCS, 1201 NE Lloyd Blvd, Suite 900, Portland, OR 97232, (503) 414-3092 or gary.diridoni@usda.gov.

Non Discrimination Statement: In accordance with federal civil rights law and USDA civil rights regulations and policies, the USDA, its agencies, offices, employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

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Watershed Plan Agreement

between the

Deschutes Basin Board of Control

(Referred to herein as the lead sponsor)

and the

U.S. Department of Agriculture,

Natural Resources Conservation Service

(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsor for assistance in preparing a plan for works of improvement for the Central Oregon Irrigation District (COID) Infrastructure Modernization Project, State of Oregon, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Sections 1001 to 1008, 1010, and 1012); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, there has been developed through the cooperative efforts of the sponsors and NRCS a watershed project plan and environmental assessment for works of improvement for the COID Infrastructure Modernization Project, State of Oregon, hereinafter referred to as the watershed project plan or plan, which plan is annexed to and made a part of this agreement.

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the sponsors hereby agree on this watershed project plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this plan and including the following:

1. Term. The term of this agreement is for the installation period and evaluated life of the project (104 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.

2. Costs. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of works of improvement.

3. Real Property. The sponsor will acquire such real property as will be needed in connection with the works of improvement. The amounts and percentages of the real property acquisition costs to be borne by the sponsors and NRCS are as shown in the cost-share table in Section 5 hereof.

The sponsor agrees that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency that will continue to maintain and operate the development in accordance with the operation and maintenance agreement.

4. Uniform Relocation Assistance and Real Property Acquisition Policies Act. The sponsors hereby agree to comply with all the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. Section 4601 et seq. as further implemented through regulations in 49 Code of Federal Regulations [CFR] Part 24 and 7 CFR Part 21) when

acquiring real property interests for this federally assisted project. If the sponsor is legally unable to comply with the real property acquisition requirements, it agrees that, before any federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance.

5. Cost-share for Watershed Project Plans. The following table will be used to show cost-share percentages and amounts for watershed project plan implementation.

Cost-share Table for Watershed Operation or Rehabilitation Projects					
Works of Improvement	**NRCS**		**Sponsor**		**Total**
	Percent	**Cost**	**Percent**	**Cost**	**Cost**
					Cost-Shareable Items[1/]
Agricultural Water Management	68%	$24,900,000	32%	$11,502,000	$36,402,000
Sponsors Engineering Costs	75%	$892,000	25%	$297,000	$1,189,000
Subtotal: Cost-Sharable Costs	69%	$25,792,000	31%	$11,799,000	$37,591,000
			Non-Cost-Sharable Items[2/]		
NRCS Technical Assistance/Engineering	100%	$2,460,000	0%	$0	$2,460,000
Project Administration[3/]	67%	$751,000	33%	$376,000	$1,127,000
Permits	0%	$0	100%	$1,128,000	$1,128,000
Subtotal: Non-Cost-Share Costs	68%	$3,211,000	32%	$1,504,000	$4,715,000
Total[4/]:	69%	$29,003,000	31%	$13,303,000	$42,306,000

Installation costs explanatory notes:

1/ The cost-share rate is the percentage of the average cost of installing the practice in the selected plan for the evaluation unit. During project implementation, the actual cost-share rate must not exceed the rate of assistance for similar practices and measures under existing national programs.

2/ If actual non-cost-sharable item expenditures vary from these figures, the responsible party will bear the change.

3/ The sponsors and NRCS will each bear the costs of project administration that each incurs. Sponsor costs for project administration include relocation assistance advisory service.

4/ The sponsors will acquire with other than Watershed Protection and Flood Prevention Act funds, such real property as will be needed in connection with the works of improvement. The value of real property is eligible as in-kind contributions toward the sponsors' share of the works of improvement costs. In no case will the amount of an in-kind contribution exceed the sponsors' share of the cost for the works of improvement. The maximum cost eligible for in-kind credit is the same as that for cost sharing.

6. Land Treatment Agreements. The sponsors will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their

land. The sponsors will ensure that 50 percent of the land upstream of any retention reservoir site is protected before construction of the dam. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsors will encourage landowners and operators to continue to operate and maintain the land treatment measures after the long-term contracts expire, for the protection and improvement of the watershed.

7. Floodplain Management. Before construction of any project for flood prevention, the sponsors must agree to participate in and comply with applicable federal floodplain management and flood insurance programs. For plans approved as of the date of this revised manual, the sponsor is required to have development controls in place below low and significant-hazard dams prior to NRCS or the sponsor entering into a construction contract.

8. Water and Mineral Rights. The sponsors will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

9. Permits. The sponsors will obtain and bear the cost for all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

10. NRCS Assistance. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

11. Additional Agreements. A separate agreement will be entered into between NRCS and the sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. Amendments. This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the sponsors have failed to comply with the conditions of this agreement or when the program funding or authority expires. In this case, NRCS must promptly notify the sponsors in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsors or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the sponsors having specific responsibilities for the measure involved.

13. Prohibitions. No member of or delegate to Congress, or resident commissioner, may be admitted to any share or part of this plan or to any benefit that may arise therefrom; but this provision may not be construed to extend to this agreement if made with a corporation for its general benefit.

14. Operation and Maintenance (O&M). The sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by performing the work or arranging for such work, in accordance with an O&M agreement. An O&M agreement will be entered into before federal funds are obligated and will continue for the project life (100 years). Although the sponsors' responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement, the sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. Emergency Action Plan. Prior to construction, the sponsors must prepare an emergency action plan (EAP) for each dam or similar structure where failure may cause loss of life or as required by state and local regulations. The EAP must meet the minimum content specified in NRCS Title 180, *National Operation and Maintenance Manual*, Part 500, Subpart F, Section 500.52, and meet applicable State agency dam safety requirements. NRCS will determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the structure. EAPs must be reviewed and updated by the sponsors annually.

16. Nondiscrimination Provisions. In accordance with federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, USDA, its agencies, offices, employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

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By signing this agreement, the recipient assures the USDA that the program or activities provided for under this agreement will be conducted in compliance with all applicable federal civil rights laws, rules, regulations, and policies.

17. Certification Regarding Drug-Free Workplace Requirements (7 CFR Part 3021). By signing this Watershed Agreement, the sponsors are providing the certification set out below. If it is later determined that the sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled substance means a controlled substance in schedules I through V of the Controlled Substances Act (21 U.S.C. Section 812) and as further defined by regulation (21 CFR Sections 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of *nolo contendere*) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the federal or state criminal drug statutes;

Criminal drug statute means a federal or non-federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including (i) all direct charge employees, (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant, and (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement, consultants or independent contractors not on the grantees' payroll, or employees of subrecipients or subcontractors in covered workplaces).

Certification:

A. The sponsors certify that they will or will continue to provide a drug-free workplace by—

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition.

(2) Establishing an ongoing drug-free awareness program to inform employees about—

(a) The danger of drug abuse in the workplace.

(b) The grantee's policy of maintaining a drug-free workplace.

(c) Any available drug counseling, rehabilitation, and employee assistance programs.

(d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

(3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1).

(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee must—

(a) Abide by the terms of the statement; and

(b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than 5 calendar days after such conviction.

(5) Notifying NRCS in writing, within 10 calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the federal agency has designated a central point for the receipt of such notices. Notice must include the identification numbers of each affected grant.

(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4)(b), with respect to any employee who is so convicted—

(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a federal, state, or local health, law enforcement, or other appropriate agency.

(7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1), (2), (3), (4), (5), and (6).

B. The sponsors may provide a list of the sites for the performance of work done in connection with a specific project or other agreement.

C. Agencies will keep the original of all disclosure reports in the official files of the agency.

18. Certification Regarding Lobbying (7 CFR Part 3018)

A. The sponsors certify to the best of their knowledge and belief, that—

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the undersigned must complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The sponsors must require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients must certify and disclose accordingly.

B. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. Section 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

19. Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions (7 CFR Part 3017).

A. The sponsors certify to the best of their knowledge and belief, that they and their principals—

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;

(2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph A(2) of this certification; and

(4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (federal, state, or local) terminated for cause or default.

B. Where the primary sponsors are unable to certify to any of the statements in this certification, such prospective participant must attach an explanation to this agreement.

20. Clean Air and Water Certification.

Applicable if this agreement exceeds $100,000 or a facility to be used has been subject of a conviction under the Clean Air Act (42 U.S.C. Section 7413(c)) or the Federal Water Pollution Control Act (33 U.S.C. Section 1319(c)) and is listed by the U.S. Environmental Protection Agency (USEPA), or is not otherwise exempt.

A. The project sponsoring organizations signatory to this agreement certify as follows:

(1) Any facility to be utilized in the performance of this proposed agreement is (____), is not (_x_) listed on the Environmental Protection Agency List of Violating Facilities.

(2) To promptly notify the NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.

(3) To include this certification, including this subparagraph, in every nonexempt subagreement.

B. The project sponsoring organizations signatory to this agreement agree as follows:

(1) To comply with all the requirements of Section 114 of the Clean Air Act as amended (42 U.S.C. Section 7414) and Section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in Section 114 and Section 308 of the Air Act and the Water Act, issued there under before the signing of this agreement by NRCS.

(2) That no portion of the work required by this agreement will be performed in facilities listed on the USEPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until USEPA eliminates the name of such facility or facilities from such listing.

(3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the agreement is being performed.

(4) To insert the substance of the provisions of this clause in any nonexempt subagreement.

C. The terms used in this clause have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. Section 7401 et seq.).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et seq.).

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in Section 110 of the Air Act (42 U.S.C. Section 7414) or an approved implementation procedure under Section 112 of the Air Act (42 U.S.C. Section 7412).

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by Section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by Section 307 of the Water Act (33 U.S.C. Section 1317).

(5) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a sponsor, to be utilized in the performance of an agreement or subagreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location will be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

21. Assurances and Compliance.

As a condition of the grant or cooperative agreement, the sponsor assures and certifies that it is in compliance with and will comply in the course of the agreement with all applicable laws, regulations, executive orders, and other generally applicable requirements, including those set out below which are hereby incorporated in this agreement by reference, and such other statutory provisions as a specifically set forth herein.

State, Local, and Indian Tribal Governments: OMB Circular Nos. A-87, A-102, A-129, and A-133; and 7 CFR Parts 3015, 3016, 3017, 3018, 3021, and 3052.

Nonprofit Organizations, Hospitals, Institutions of Higher Learning: OMB Circular Nos. A-110, A-122, A-129, and A-133; and 7 CFR Parts 3015, 3017, 3018, 3019, 3021 and 3052.

22. Examination of Records.

The sponsors must give NRCS or the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to this agreement, and retain all records related to this agreement for a period of 3 years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

23. Signatures

DESCHUTES BASIN BOARD OF CONTROL

The signing of this plan was authorized by a resolution by the DBBC governing body and adopted at an official meeting held on

July 8, 2020 at [Redmond], Oregon.

By: _____ Date: 7.8.20

Craig Horrell, Chairman Deschutes Basin Board of Control

c/o: DBBC Chair
2024 NW Beech Street
Madras, OR 97741

CENTRAL OREGON IRRIGATION DISTRICT

The signing of this plan was authorized by a resolution by the COID governing body and adopted at an official meeting held on

July 8, 2020 at [Redmond], Oregon.

By: _____ Date: 7.8.20

Craig Horrell, Manager Central Oregon Irrigation District

1055 SW Lake CT
Redmond, OR 97756

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

_____ Date: 07/08/2020

Ron Alvarado, State Conservationist Natural Resources Conservation Service

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Suite 900
Portland, OR 97232

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Office of Management and Budget (OMB) Fact Sheet

Summary Watershed Plan-Environmental Assessment Document For Central Oregon Irrigation District Infrastructure Modernization Project Lower Crooked Subwatersheds: Osborne Canyon-Crooked River, North Unit Main Canal, McAllister Slough-Crooked River Deschutes County, Oregon Oregon 2nd Congressional District	
Authorization	PL 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et. Seq.) 1954
Lead Sponsor	Deschutes Basin Board of Control
Proposed Action	The proposed action would pipe and pressurize a portion of Central Oregon Irrigation District's (COID) Pilot Butte Canal (PBC) system of canals and laterals in the Smith Rock-King Way Area that are owned and operated by the District.
Purpose and Need	The purpose of this project is to improve water conservation in District-owned infrastructure, improve water delivery reliability to District patrons, and improve public safety on approximately 7.9 miles of the District-owned PBC and laterals. Implementation of the proposed action would meet PL 83-566 Authorized Project Purpose (v), Agricultural Water Management, through irrigation water conservation and more reliable agricultural water supply delivery. Federal assistance through PL 83-566 would support the District in addressing the following watershed problems and resource concerns: water loss in District conveyance systems, water delivery and operation inefficiencies, instream flow for fish and aquatic habitat, and risks to public safety from open irrigation canals. Implementation of the proposed action would address the sponsors' objectives and goals to reduce seepage loss and provide better-managed water diversions for farm use; support agricultural land use; improve streamflow for fish, aquatic, and riparian habitat; and increase public safety.
Description of the Preferred Alternative	Under the Preferred Alternative, approximately 7.9 miles of the District-owned and operated PBC and laterals in the COID system would be converted to gravity and pump-pressurized pipe.
Project Measures	Under the Preferred Alternative, project sponsors would install approximately 7.9 miles of pressurized pipe. Additionally, 42 turnouts would be upgraded to pressurized delivery systems and 2 pressure reducing valve stations (PRVs) would be installed to alleviate high pressures within the system. Construction of the Preferred Alternative would occur in 2 project groups over the course of 4 years.

Resource Information			
Subwatersheds	**12-digit Hydrologic Unit Code**	**Latitude and Longitude**	**Subwatershed Size**
Osborne Canyon-Crooked River	170703051101	44.248873, -121.356289	42,387 acres

North Unit Main Canal	170703051005	44.065108, -121.415720	11,451 acres
McAllister Slough-Crooked River	170703051006	44.235075, -121.452157	27,371 acres
Subwatershed Total Size	81,209 acres		
Watershed Planning Area Size	1,285 acres (Acreage surrounding the PBC and laterals that are part of the proposed action)		
Climate and Topography	The project is located in the rain shadow of the Cascade mountain range. COID's annual average precipitation is 10-14 inches. The average high temperature for July is 82 degrees Fahrenheit and average low temperature for December is 23 degrees Fahrenheit. The land within the District is slightly undulating with an average elevation of 3,504 feet above mean sea level.		

Land Use (Watershed Planning Area)	**Use**	**Acres**
	Agriculture	704
	Developed	74
	Non-Developed Areas	507

Land Ownership Central Oregon Irrigation District (Watershed Planning Area)	**Owner**	**Percentage**
	Private	100%
	State-Local	0%
	Federal	0%

Population and Demographics	The Preferred Alternative would be constructed within Deschutes County but in close proximity to Crook County and Jefferson County, Oregon. The population of Deschutes County was 166,622, or 56 people per square mile, in 2015. The population growth rate of the county between 2005 and 2015 was 14 percent. The population of the State of Oregon grew by about 8 percent in the same time period.

Population and Demographics		**Deschutes County**	**Jefferson County**	**Crook County**	**Oregon**
	Population 2015	166,622	22,061	20,956	3,939,233
	Unemployment Rate	4.1%	5.4%	6.1%	4.1%
	Median Household Income	$51,223	$46,366	$37,106	$51,243

Relevant Resource Concerns	Resource concerns identified through scoping were water conservation and quality, groundwater, aquatic and fish resources, soil and geologic resources, visual resources, cultural resources, recreation, socioeconomics, wetlands, terrestrial wildlife, and vegetation resources.

Alternatives

Alternatives Considered	Twelve alternatives were considered; 10 were eliminated from full analysis because they did not address the purpose and need for action or because they became unreasonable due to cost, logistics, existing technology, social, or environmental reasons. The No Action Alternative and Piping Alternative were analyzed in full.					
No Action Alternative	Under the No Action Alternative, COID would continue to operate and maintain the majority of its existing canal, lateral and pipe system in its current condition. The District would continue to slowly pipe its system, with the expectation that they would be able to receive $3 million every year for the next 4 years. Over 4 years, approximately 2.3 miles of COID's system would be piped.					
Proposed Action	Under the Piping Alternative, COID would replace approximately 7.9 miles of the PBC and laterals with gravity and pump-pressurized buried pipe. The Piping Alternative has been identified as the National Economic Development (NED) Plan and is also the Preferred Alternative.					
Project costs	**Public Law 83-566 funds**		**Other funds**		**Total**	
Construction	68%	$24,900,000	32%	$11,502,000	$36,402,000	100%
Engineering	75%	$892,000	25%	$297,000	$1,189,000	100%
SUBTOTAL COSTS	69%	$25,792,000	31%	$11,799,000	$37,591,000	100%
Technical assistance	100%	$2,460,000	0%	$0	$2,460,000	100%
Relocation	Not applicable					
Real property rights	Two acres would need to be acquired for the connection to NUID at an estimated cost of $1,500. This is included in "Other Funds" under construction costs.					
Permitting	0%	$0	100%	$1,128,000	$1,128,000	100%
Project administration	67%	$751,000	33%	$376,000	$1,127,000	100%
Annual O&M	Not applicable					
TOTAL COSTS	69%	$29,003,000	31%	$13,303,000	$42,306,000	100%
Mitigation, Minimization, and Avoidance Measures	There are no additional, separate mitigation features considered for implementation of the proposed action apart from project best management practices. The Sponsoring Local Organization would work closely with partners and contractors to incorporate applicable avoidance and minimization measures into the proposed action to reduce potential temporary short-term adverse effects which would be identified at the restoration activity action project scale.					
Project Benefits						
Project Benefits	Implementation of the Preferred Alternative would improve water delivery reliability for COID's patrons, save an estimated 29.4 cubic feet per second (9,392 acre-feet) from seepage loss during the irrigation season, pass an estimated 9,392 acre-feet of water to NUID, release and protect an estimated 30.3 cubic feet per second for instream uses					

	during the non-irrigation season, reduce COID's O&M costs, reduce electricity costs from pumping, and improve public safety.	
Number of Direct Beneficiaries	74	
Other Beneficial Effects-Physical Terms	Implementation of the Preferred Alternative would have long-term beneficial effects on agricultural water availability, water quality, and habitat for fish and wildlife.	
Damage Reduction Benefits	**Project Group***	
	1	**2**
Other- Reduced O&M	$2,000	$1,000
Other- Pumping Cost Savings	$1,000	$1,000
Other- North Unit Irrigation District Agricultural Benefits	$288,000	$49,000
Other- Instream Value	$511,000	$87,000
Other- Oregon Spotted Frog Support	$459,000	$77,000
Avg Annual Benefit	$1,261,000	$215,000
Benefit cost ratio	1.52	2.13

*Project Group refers to groupings of the PBC and laterals that would undergo construction during the same period. Project Group 1 includes installing 32 upgraded patron turnouts; installing 1 pressure reducing valve; and piping 1.2 miles of the G-4 Lateral, 2.9 miles of the PBC, and 1.0 miles of the J Lateral. Project Group 2 includes installing 10 upgraded patron turnouts; installing 1 pressure reducing valves; and piping 1.2 miles of the PBC and 1.6 miles of the J Lateral.

Period of Analysis

Installation Period (years)	4 years total (2 years for Project Group 1; 2 years for Project Group 2)
Project Life	100 years for each project group

Funding Schedule

Year—Project Group	**Public Law 83-566**	**Other Funds**	**Total**
2020-2022 — 1	$28,481,000	$10,207,000	$38,688,000
2023-2024 — 2	$522,000	$3,096,000	$3,618,000

Environmental Effects

The Preferred Alternative would be planned, designed, and installed to have long-term net-beneficial effects on water quantity, water quality, ESA-listed species and their habitats, as well as other aquatic species that have similar environmental requirements. Practices that improve waterbodies associated with District operations

would assist in instream flow restoration goals for threatened or endangered species including Oregon spotted frog, Middle Columbia River steelhead trout, and bull trout.

The implementation of the Preferred Alternative to improve water conservation, water delivery reliability, and public safety may result in minor, unavoidable, short-term adverse effects such as impacts to recreation and vegetation along the PBC and laterals. Most short-term adverse effects would result from construction activities in the project area.

There would be long-term minor adverse effects on wildlife and artificial wetland habitat within the project; the removal of the PBC and lateral systems in the project area as a water source could change the distribution patterns of wildlife within the project area and opportunistic hydrophytic vegetation growing along 7.9 miles of canals would be permanently removed. However, following construction, BMPs for ecological restoration would be followed and there would be an increase in native, upland vegetation in the project area, returning the project area to a more natural state. Loss of existing artificial wetland and riparian habitat would be offset by enhancement of naturally functioning wetland and riparian habitat in the Deschutes River. The sponsors would implement BMPs and identified minimization measures to avoid adverse effects.

Other long-term impacts include improvement to public safety and alterations to the visual landscape following elimination of 7.9 miles of the open PBC and laterals.

Major Conclusions	The implementation of the Preferred Alternative would improve water delivery reliability for COID's patrons, save an estimated 29.4 cubic feet per second from seepage loss, pass an estimated 9,392 acre-feet of water to NUID which would be released and protected for instream uses during the non-irrigation season at a rate of 30.3 cubic feet per second, reduce COID's O&M costs, reduce electricity costs from pumping, and improve public safety.
Areas of Controversy	There have been no areas of controversy identified.
Issues to be Resolved	None
Evidence of Unusual Congressional or Local Interest	Comments on the Preliminary Investigative Report were received from one state representative (Knute Buehler, District 54), Oregon Department of Environmental Quality, U.S. Fish and Wildlife Service, U.S. Forest Service-Deschutes National Forest, local non-governmental organizations, and individuals. Comments on the Draft Plan-EA were received from the City of Bend, U.S. Fish and Wildlife Service, Bureau of Reclamation, local non-governmental organizations, and individuals.
Compliance	Is this report in compliance with executive orders, public laws and other statues governing the formulation of water resource projects? Yes _X__ No____

1 Introduction

Aging infrastructure, growing populations, shifting rural economies, and changing climate conditions have increased pressure on water resources across the western United States (U.S.). Within the Deschutes Basin, irrigated agriculture is the main out-of-stream water use. It primarily relies on 100-year-old infrastructure to divert, store, and deliver water to farms and ranches. In recent years, the eight irrigation districts within the Deschutes Basin have focused on improving water resources with the goal of addressing environmental needs for instream flows while still delivering enough water to district patrons (Figure 1-1).

Central Oregon Irrigation District (herein referred to COID or the District) is a senior water right holder in the Deschutes Basin. The District operates and maintains two separate canal systems, the Pilot Butte Canal (PBC) system, which consists of 178 miles of canals, laterals, and pipelines, and the Central Oregon Canal system, which consists of over 222 miles of canals, laterals, and pipelines. The majority of this infrastructure is open, earthen, dug channels. Approximately 25 percent of the water diverted through COID's PBC and laterals[1] currently seeps into the porous, volcanic geology or evaporates prior to reaching farms.

The District is committed to implementing water conservation measures. In addition to completing two System Improvement Plans (SIPs) in 2016 and 2017, which collectively considered piping the District's conveyance system,[2] the District has also pursued on-the-ground water conservation projects to provide a permanent solution to system-wide water losses (Crew 2016; Crew 2017). Although some improvements have been made, aging and outdated infrastructure continues to contribute to water delivery insecurity for out-of-stream users and limit streamflow due to the need to divert more water than is delivered, affecting water quality and aquatic habitat along the Deschutes River. The PBC and laterals in the District have become a public safety risk to more people as the surrounding areas have urbanized. Aging infrastructure also affects the financial stability of COID and its patrons as the District must find new approaches to fund growing maintenance needs.

If approximately 7.9 miles of COID's water distribution system in the Smith Rock-King Way area of the District were modernized and more efficient, up to 9,392 acre-feet of water annually would be protected instream in the Deschutes River. The water would be protected instream during the non-irrigation season under Oregon law in perpetuity. Patrons would continue receiving their deliveries, supporting local agriculture and the local economy. Improving irrigation infrastructure offers an opportunity to conserve water, increase reliability of water delivery to farms, enhance streamflow and habitat conditions for fish and aquatic species in the Deschutes Basin, reduce risks to public safety from open irrigation canals, and reduce operation and maintenance (O&M) costs for the District.

[1] The PBC is the main canal that water is diverted into from the Deschutes River, and "laterals" refer to the smaller canals that branch off the PBC.

[2] The scope of the proposed project only covers a portion of District infrastructure. The engineering details and costs of the proposed project in this Watershed Plan-Environmental Assessment (Plan-EA) are slightly different than those presented in the SIPs. Therefore, the specific pipe diameters and costs from the SIPs are not referenced in this Plan-EA.

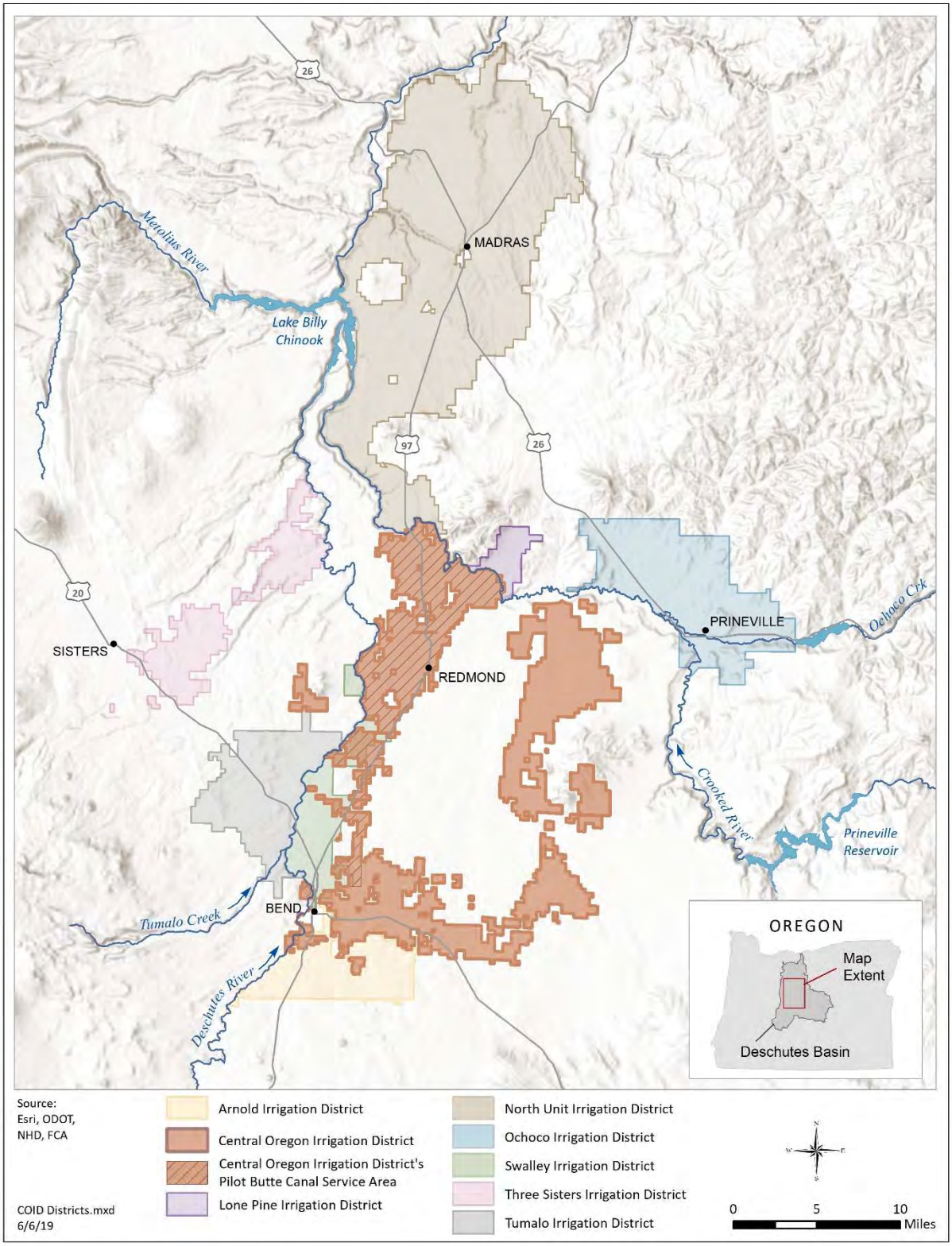


Figure 1-1. Irrigation districts within the Deschutes Basin.

1.1 Watershed Planning Area

The Watershed Planning Area is based on the irrigation problem area, where canal seepage and conveyance inefficiencies are occurring.[3] It includes 1,285 acres of land crossed by and adjacent to the proposed project. The Watershed Planning Area is primarily located within the Osborne Canyon-Crooked River subwatershed (Hydrologic Unit Code [HUC] 170703051101) with a small portion of the Watershed Planning Area falling in McAllister Slough-Crooked River (HUC 170703051006) and North Unit Main Canal subwatersheds (HUC 170703051005) (Table 1-1). The subwatersheds are located within the larger Lower Crooked watershed (HUC 17070305) (Figure 1-2).

Waterbodies with the potential to be affected by the project in the Watershed Planning Area fall within the Lower Crooked watershed and the Upper Deschutes watershed (HUC 17070301). Within the upper Deschutes watershed, portions of the Deschutes River are called the upper Deschutes River (from River Mile [RM] 226 to RM 165) and the middle Deschutes River (from RM 165 to RM 120). This distinction is based on reservoir operations and irrigation diversions that affect the river's hydrology.

Table 1-1. Watershed Planning Area Subwatersheds.

Subwatershed	12-digit HUC	Subwatershed Size (acres)	Watershed Planning Area Falling within the Subwatershed (acres)
Osborne Canyon-Crooked River	170703051101	42,387	1,206
North Unit Main Canal[1]	170703051005	11,451	75
McAllister Slough-Crooked River	170703051006	27,371	4

Note:

[1] The North Unit Main Canal is not a natural waterway and is not hydrologically connected to the adjacent lands. The North Unit Main Canal has no irrigation water deliveries south of Smith Rock State Park and is not designated to collect stormwater flows from adjacent lands.

1.2 Project Area

The project area, which is located in the Watershed Planning Area, describes where COID Infrastructure Modernization Project (herein referred to as the proposed action or project) activities would occur (Figure 1-3). The project area is approximately 7.9 miles long and located at the northernmost downstream end of the PBC. The District refers to this part of its system as the Smith Rock-King Way area. The project area includes portions of the PBC, J Lateral, and G-4 Lateral. Seven and a half miles of the project area consist of COID's rights-of-way (ROWs) and easements that contain existing COID infrastructure. Within the remaining 0.4 mile of the project area (shown on Figure 1-3), there is no existing COID infrastructure, but there is the potential for pipe to be installed as part of the project.

[3] The requirements and description of the Watershed Planning Area is defined by the National Watershed Program (NWP) Handbook 600.4 (2).

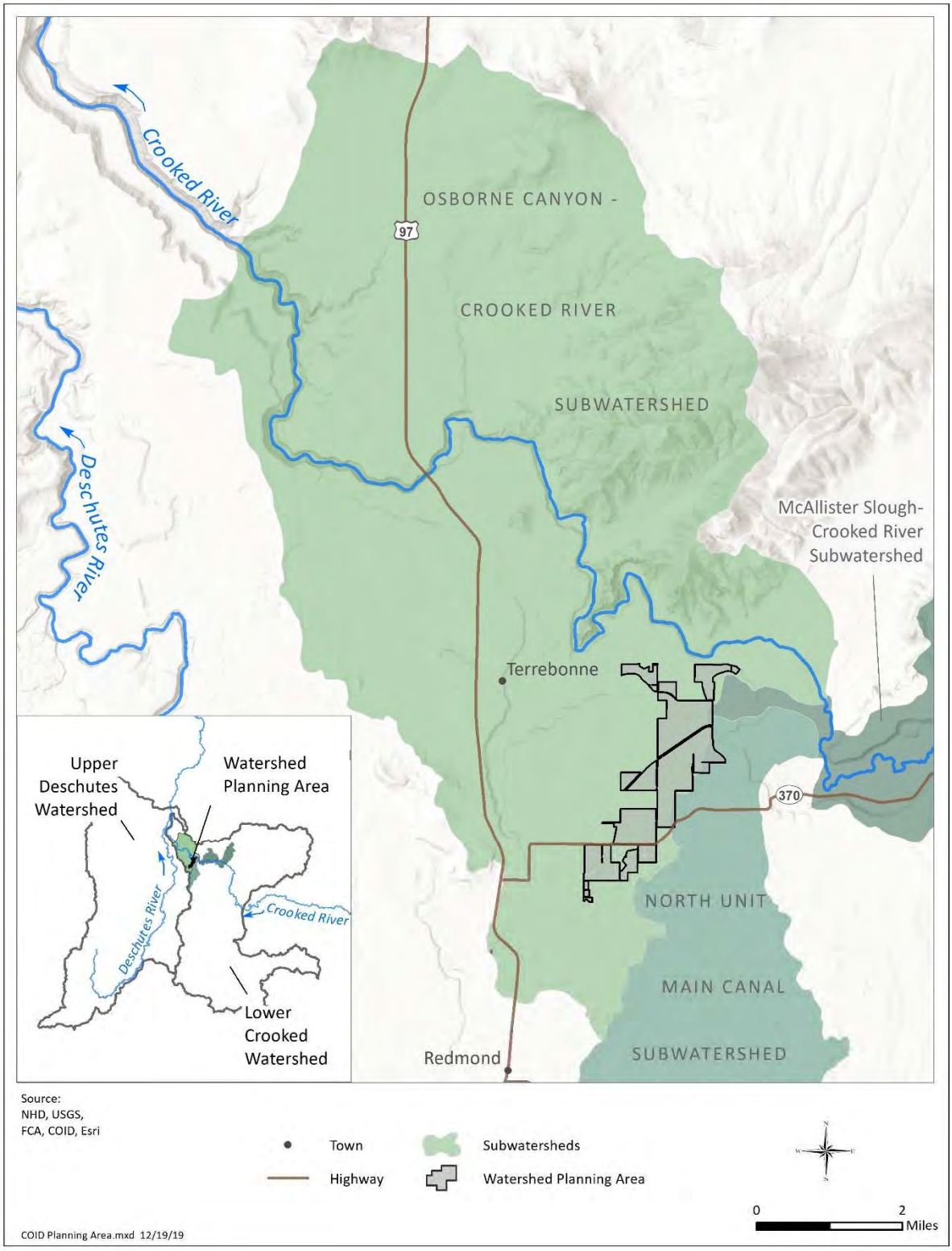


Figure 1-2. The Central Oregon Irrigation District Watershed Planning Area.

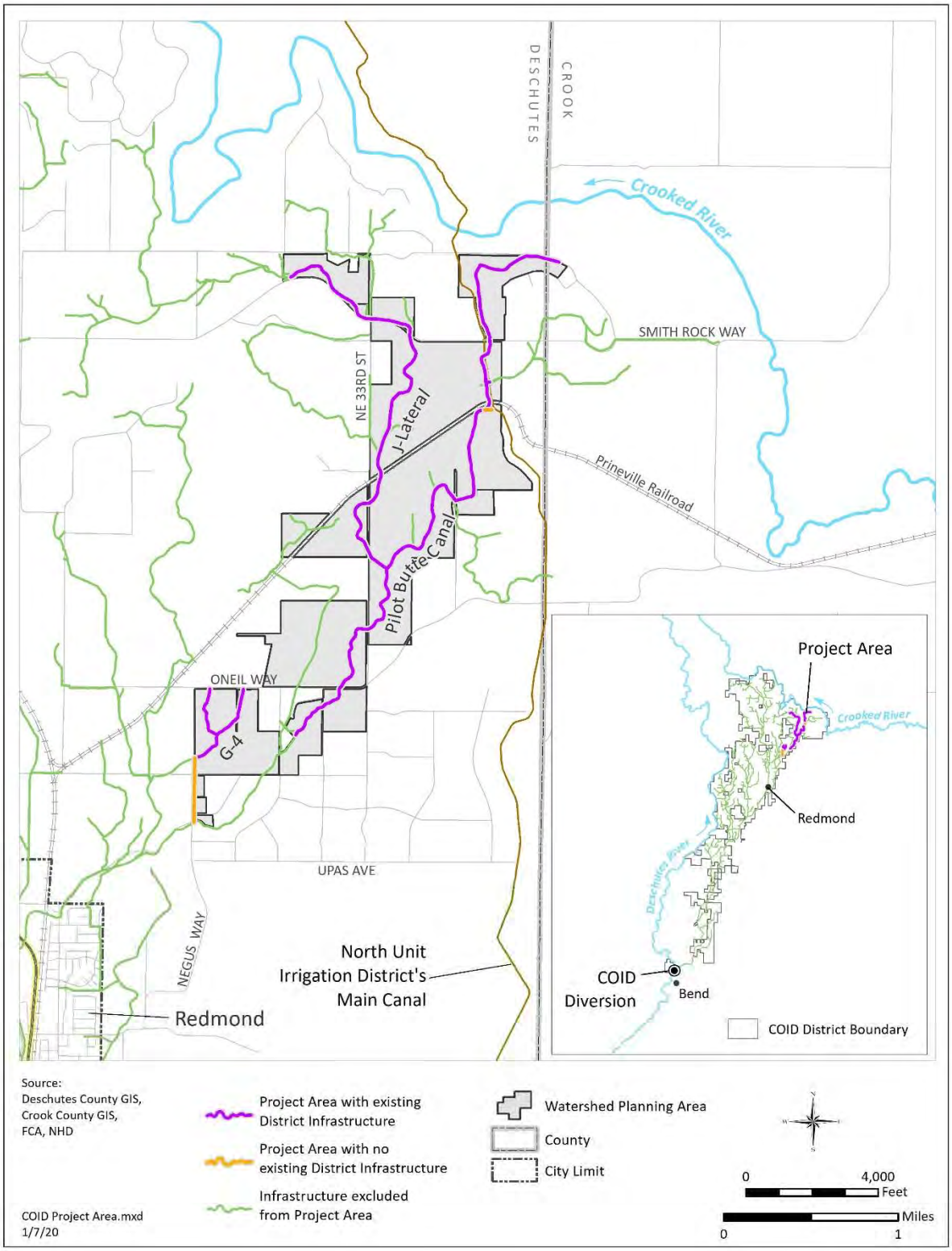


Figure 1-3. The Central Oregon Irrigation District Infrastructure Modernization Project Area.

1.3 Current Infrastructure

The District has 26,000 acre-feet of stored water rights in Crane Prairie Reservoir,[4] located in the upper reaches of the Upper Deschutes watershed, which also stores water for other irrigation districts. Crane Prairie Reservoir Dam is owned by the U.S. Bureau of Reclamation (Reclamation). The dam is operated by COID, with maintenance shared among Lone Pine Irrigation District (LPID), Arnold Irrigation District (AID), and COID. Water from Crane Prairie Reservoir is released throughout the irrigation season and is conveyed through Wickiup Reservoir (a storage reservoir for North Unit Irrigation District [NUID]) and down the Deschutes River.

The District diverts water from the Deschutes River at two points: the Central Oregon Canal diversion (RM 171) and the PBC diversion at North Canal Dam (RM 164.8). This Final Watershed Plan-Environmental Assessment (Plan-EA) only addresses the water and infrastructure associated with the PBC diversion. During peak irrigation season, the District may divert up to 509 cubic feet per second (cfs) from the PBC diversion. The diversion has powered head gates and an agency-compliant fish screen to protect both upstream and downstream migrating fish (Biota and R2 2013).

Water is transported from the PBC diversion at North Canal Dam (RM 164.8) north through the PBC. Water is delivered to patrons directly from the PBC as well as through an extensive system of laterals that branch off the PBC. Water is transported through the PBC approximately 21.6 miles from the PBC diversion before reaching the northernmost point of the project area (Figure 1-4). The PBC and laterals in the project area are open, earthen dug channels. Patron turnouts from the PBC and laterals are gate-regulated and weir-measured by COID field staff.

In addition to serving its patrons, COID delivers water through the PBC to LPID's Lone Pine weir near the northern end of the PBC. LPID holds a live flow water right for up to 29.1 cfs, measured at the Lone Pine weir (approximately 2,100 feet upstream of the end of the PBC). LPID supplements its live flow water right with a storage water right in Crane Prairie Reservoir in accordance with the Revised 1938 Inter-District Agreement.[5] COID also spills water from the PBC into NUID's Main Canal near Smith Rock. At a minimum, COID delivers 4 cfs of water (resulting from CW-81[6]) and any additional water in the PBC system to the North Unit Main Canal[7] (where it is counted as NUID's water right by the Oregon Water Resources Department [OWRD]). A minimal amount of water may, depending on canal flow, spill into the Crooked River (Section 4.9.2.5).

The PBC and laterals within the project area lose an estimated 29.4 cfs of water[8] (9,392 acre-feet) annually during the irrigation season due to a combination of seepage related to (1) the condition of

[4] This volume of storage is in reference to terms per the Revised 1938 Inter-District Agreement. The 2016 Settlement Agreement (see Section 4.9.2.1 for more information on this agreement) reduced COID's available storage to 5,000 acre-feet through July 2019, or when the Habitat Conservation Plan ([HCP]; Section 6.14.2.2) is approved by the U.S. Fish and Wildlife Service (USFWS), unless extended by the written mutual agreement of the districts.

[5] The Revised 1938 Inter-District Agreement refers to changes in the allocation of stored water in Crane Prairie Reservoir for irrigation use and operations of Crane Prairie Dam that have been set in place as response to the 2016 Settlement Agreement (see Section 4.9.1 for more information on this agreement).

[6] CW-8 is a conserved water project. See section 4.9.1 for more details.

[7] The improvements and appurtenances that comprise the North Unit Main Canal are owned by the United States.

[8] These losses are derived from two loss assessments and are estimated for the peak irrigation season when diversion rates are the highest (May 15 to September 14), as well as the District's assumption that there was additional loss in those reaches that was not captured in the measurements (Horrell personal communication, June 25, 2019a). See Appendix D for information on water loss in the system.

the distribution system and porous nature of the underlying geology and (2) evaporation. The District's SIP details water loss associated with specific canals and laterals (COID 2016).

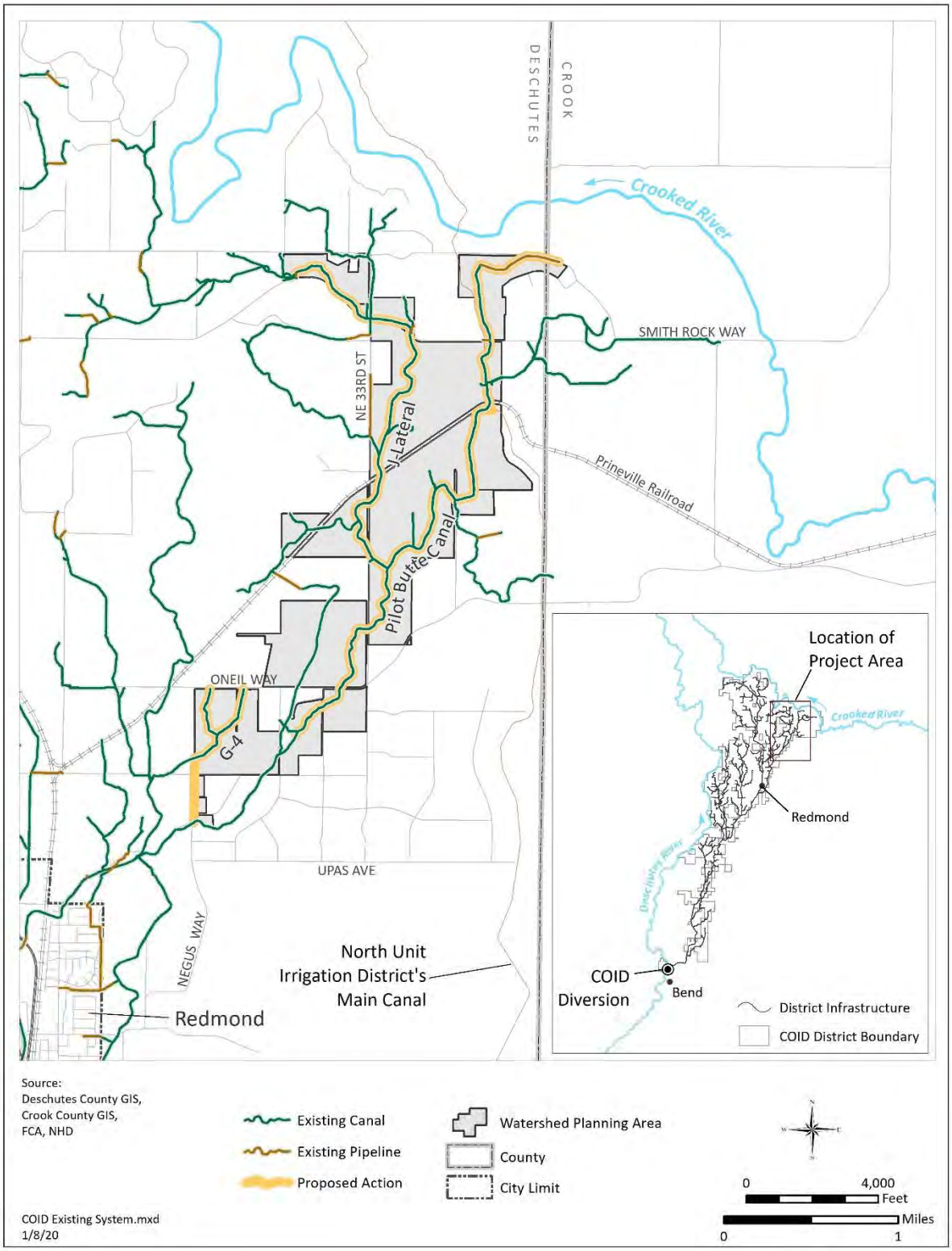


Figure 1-4. Central Oregon Irrigation District current infrastructure.

1.4 Decision Framework

This Plan-EA has been prepared to assess and disclose the potential effects of the project. This Plan-EA is required to apply for federal funding through the Watershed Protection and Flood Prevention Program, Public Law (PL) 83-566, authorized by Congress in 1954 (herein referred to as PL 83-566). The Natural Resources Conservation Service (NRCS) is the lead federal agency for this Plan-EA and is responsible for review and issuance of a decision in accordance with the National Environmental Policy Act (NEPA). NEPA requires that Environmental Impact Statements (EISs) are completed for projects utilizing federal funds and that significantly affect the quality of the human environment. When a proposed project is not likely to result in significant impacts requiring an EIS, but the activity has not been categorically excluded from NEPA, an agency can prepare an EA to assist them in determining whether there is a need for an EIS (See 40 Code of Federal Regulations [CFR] 1501.4, 1508.9; 7 CFR 650.8.). For purposes of NEPA compliance, the intent of this Plan-EA is to determine if the project, as proposed, significantly affects the quality of the human environment.

This Plan-EA utilizes a tiering approach. Tiering is a staged approach to NEPA as described in the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 – 1508). Broad programs and issues are described in initial analyses, while site-specific proposals and impacts are described in subsequent site-specific studies. The tiered process permits the lead agency to focus on issues that are ripe for decision and exclude from consideration issues already decided or not yet ripe. Tiering eliminates repetitive discussions of the same issues through incorporating by reference the general discussions.

NRCS has determined the need for a Plan-EA to analyze the effects of the proposed action under PL 83-566 watershed authority. Due to the multi-year project group approach, this Plan-EA does not identify the specific details associated with the engineering design and construction activities that would be required to implement the proposed action. Instead, this document intends to present an analysis in sufficient detail to allow implementation of a proposed action within the designated project. If the analysis demonstrates that the project does not significantly affect the quality of the human environment, minimal additional NEPA analysis would be required.

The proposed action is planned to be completed in project groups.[9] Consistent with the tiering process as described above, prior to the implementation of each project group, an onsite Environmental Evaluation (EE) review would occur using the Form NRCS-CPA-52, Environmental Evaluation Worksheet. The EE process would determine if that particular project group meets applicable project specifications and whether the site-specific environmental effects are consistent with those as described and developed in this Plan-EA. This process provides information for the Responsible Federal Official to determine if the proposed action has been adequately analyzed and if the conditions and environmental effects described in a Plan-EA are still valid. Where the impacts of the narrower project-specific action are identified and analyzed in a Plan-EA, no further analysis would occur and the Plan-EA would be used for purposes of the pending action.

If it is determined based on the findings of the EE that the Plan-EA is not sufficiently comprehensive, not adequate to support further decisions, or if resource concerns or effects have

[9] Project groups refer to groupings of the PBC and laterals that would undergo construction during the same period. The project groups identified in the SIP (COID 2016) are not identical to the project groups identified in this Plan-EA.

not been adequately evaluated, a separate project group-specific supplemental Plan-EA would be prepared.

This Plan-EA has been prepared to meet NEPA requirements[10] as well as program and environmental review requirements specific to NRCS federal investments in water resources projects.[11] Some considerations and analyses in this Plan-EA are strictly NRCS program requirements; they are not required by NEPA. These differences are identified throughout this Plan-EA.

[10] The Plan-EA has been prepared in accordance with applicable CEQ regulations for implementing NEPA (40 CFR 1500–1508), U.S. Department of Agriculture's (USDA) NEPA regulations (7 CFR Part 650), NRCS Title 190 General Manual Part 410, and the NRCS National Environmental Compliance Handbook Title 190 Part 610 (May 2016).

[11] The Plan-EA has been prepared in accordance to the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G), the 2013 Principles and Requirements for Federal Investments in Water Resources (NRCS 2013), guidelines in the 2015 NRCS National Watershed Program Manual (NWPM; NRCS 2015a), and the 2014 NRCS National Watershed Program Handbook (NWPH).

2 Purpose and Need for Action

The purpose of this project is to improve water conservation in approximately 7.9 miles of District-owned infrastructure, improve water delivery reliability to District patrons within the project area, and improve public safety on up to approximately 7.9 miles of District-owned PBC and laterals.

Federal assistance is needed to support the District in addressing water loss in District infrastructure, water delivery and operation inefficiencies, diminished instream flows that limit fish and aquatic habitat, and public safety risk caused by open canals. These topics are further discussed in Section 2.1.

To meet NRCS requirements for a federal investment in a water resources project, the project must meet the Federal Objective set forth in the Water Resources Development Act of 2007 and be an authorized project purpose under Sections 3 and 4 of PL 83-566.

Per the Federal Objective, water resource investments including the proposed action put forth in this plan should: "reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems" (NRCS 2013).

The proposed project would be eligible for funding under PL 83-566 requirements under Authorized Project Purpose (v), Agricultural Water Management,[12] due to the proposed project's focus on irrigation water conservation and more reliable agricultural water supply delivery.

2.1 Watershed Problems and Resource Concerns

2.1.1 Water Loss in District Conveyance Systems

Currently, the PBC and laterals in the project area lose an estimated 29.4 cfs of water (9,392 acre-feet annually) during the irrigation season to seepage and evaporation. Details of water losses and demands can be found in the District's SIP (COID 2016).

2.1.2 Water Delivery and Operations Inefficiencies

The District's antiquated, open, and unlined PBC and laterals make it difficult to deliver the correct amount of water to patrons at the correct time, particularly early and late in the irrigation season when water rights require the District to divert water at a reduced rate. At these reduced flow rates, small changes in streamflow at the diversion can have a large impact on when water is available at each point of delivery,[13] and patrons may receive inconsistent flows. For example, a point of delivery near the end of a lateral may receive no water in the morning and excess water in the evening. Even with highly skilled and trained staff, efficient deliveries to patrons are hindered as water loss in the system must be accounted for and changes to diversion rates can take multiple days before successfully meeting demand.

[12] A description of Authorized Purposes can be found in 390-NWPM, Part 500, Subpart A, Section 500.3B.

[13] A "point of delivery" refers to a location on a canal or lateral where the irrigation district delivers water from its system to a patron.

Open canal and lateral systems require additional water, known as carry water, to facilitate an optimal schedule of flow through the system and ensure that the necessary volume of water reaches all points of delivery based on patrons' needs and water rights. Although the District works closely with patrons' irrigation schedules, if patrons do not use all the water scheduled for their delivery, excess water may spill onto non-productive lands at the ends of the conveyance system, into NUID's canal system, or into the Crooked River.

Operating and maintaining the District's open PBC and laterals requires staff to clean the ditches, clean debris from trash racks, and adjust flows to patrons. The District serves small-sized parcels through a canal and lateral system originally designed for larger parcels. Roughly 40 percent of all tax lots served by the PBC and laterals in the project area are 5-acre or smaller parcels. The smaller water deliveries required by smaller parcels are more sensitive to fluctuations in system operations due to changes in streamflow, diversion amounts, or other patrons' deliveries. The District's unpressurized canal and lateral system compounds these challenges. Therefore, District staff invest proportionally more time to manage water delivery for these smaller-sized parcels than they would for larger parcels.

2.1.3 Instream Flow for Fish and Aquatic Habitat

The Deschutes River and its tributaries experience low streamflow every year due to the storage and diversion of water for agricultural use. Resource agencies have identified streamflow alteration as a primary concern in the Deschutes River (UDWC 2014). Historically, the spring-fed Deschutes River had relatively consistent streamflow seasonally and annually (DRC 2012). Reservoir operations result in low winter streamflow and high summer streamflow in the Deschutes River upstream from COID's diversion. The combined diversions of the six irrigation districts and the cities that divert water in or near the City of Bend lead to low spring, summer, and fall streamflow in the Deschutes River downstream from COID's diversion.

The Deschutes River and its tributaries support many fish, bird, and wildlife species. These species include Oregon spotted frog (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*), both of which are listed as threatened under the Endangered Species Act (ESA), and several sensitive species such as steelhead trout, redband trout, and Chinook salmon. Low streamflow in the Deschutes River limits habitat for many of these species. In turn, reduced habitat increases competition between aquatic species, which often favors non-native brown trout over native redband trout and can concentrate fish populations and increase susceptibility to predators and disease.

The Deschutes River is listed as an impaired waterway under Section 303(d) of the Clean Water Act (CWA)[14] because it does not meet one or more of the State of Oregon's water quality standards for salmon and trout, as well as other beneficial uses. Water management along the entire length of the Deschutes River affects temperature, dissolved oxygen, pH, and other water quality parameters, which in turn affects habitat conditions.

Streamflow is strongly correlated with critical physical and biological characteristics of a river (National Research Council 2002). Low streamflow can expose the channel bed and riverbanks, which facilitates increased erosion and fine sediment delivery following freeze-thaw processes and increased spring streamflow (RDG 2005). Low streamflow in late fall, winter, and early spring associated with upstream reservoir storage limits riparian vegetation in the Deschutes River (RDG

[14] "Clean Water Act" became the common name with the 1972 amendments to the Federal Water Pollution Control Act" of 1948.

2005). As riparian areas become hydrologically disconnected from their adjacent stream due to consistently low streamflow, they lose many of their ecological functions. Reestablishing a more natural hydrologic regime would allow the river channel to supply water to riparian areas and support riparian plant communities and aquatic habitat (National Research Council 2002).

2.1.4 Risks to Public Safety

The open PBC and laterals pose a risk to public safety during the irrigation season. In addition to multiple instances of injury, several drowning deaths and near drowning instances have occurred in the COID and adjacent district canals in 1996, 1997, 2004, 2016, and 2018 (Flowers 2004; Matsumoto 2016; Beechem 2018).

During the summer, water depths in the District's PBC and laterals range between 2 to 6 feet, with water velocities up to 6 feet per second and flows of up to 500 cfs. These conditions make it difficult for a healthy, strong adult to stand in or climb out of a canal without assistance. A child or non-/weak-swimmer would have an even higher risk of drowning in a canal with these attributes. If a person or animal falls into a District canal, they could have serious difficulty gaining hold on the banks in order to climb out due to the volume and speed of the moving water. Barriers or fences at the top bank of the canals are not currently installed.

The failure of earthen canals and laterals and risk of localized flooding is also a concern for the District. In 2005, a breach on the Central Oregon Canal lost a quarter-million gallons of water and flooded parts of eight homes in southwest Bend (Minoura 2005).

In 2015, Deschutes County was the fastest growing county in Oregon based on the Oregon Population Report (PSU 2015). Public safety risks associated with the open PBC and laterals will continue to grow as the county's population grows.

2.2 Watershed and Resource Opportunities

The following resource opportunities would be realized through implementation of the project.

- Improve streamflow, water quality, habitat, and habitat availability in the Deschutes River downstream from Wickiup Reservoir by protecting 100 percent of the water saved instream during the non-irrigation season;
- Reduce the O&M involved in delivering irrigation water to COID patrons;
- Minimize the potential for flooding, injury, and loss of life associated with the open COID PBC and laterals in the project area;
- Reduce energy costs through partial pressurization[15] of water deliveries to patrons, which would decrease patron reliance on pumping; and
- Support and maintain existing agriculture through enhanced water supply reliability and improved water management.

[15] Depending on the location of their turnout in the project, some patrons would receive water that is fully pressurized and would no longer require the use of an on-farm pump to irrigate. Other patrons would receive pressurized water but not at a pressure level high enough that allows for the removal of their on-farm pumps.

3 Scope of the Plan-EA

3.1 Agency, Tribal, and Public Outreach

Federal, state, and local agencies and representatives, as well as non-governmental organizations, received an invitation to participate in scoping this Plan-EA. Advertisements announcing the scoping period and associated scoping meeting were placed in two local and regional newspapers in addition to multiple online locations including NRCS's website, the District's website, and Deschutes Basin Board of Control's (DBBC) website. Additionally, the scoping meetings were featured by KTVZ Channel 21 and KBND News.

Tribal consultation was conducted in accordance with the National Historic Preservation Act (NHPA) of 1966 and Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments, to maintain NRCS' government-to-government relationship between Native villages and tribes. NRCS sent a letter to the Confederated Tribes of Warm Springs (CTWS) requesting input and notifying them of the scoping process. CTWS responded and requested that they be consulted during the planning phase of COID's Smith Rock-King Way Infrastructure Modernization Project.

3.2 Scoping Meeting

A scoping meeting was held on July 10, 2017, at the Redmond Grange at 707 SW Kalama Avenue, Redmond, Oregon. Presenters at the meeting included Tom Makowski, NRCS; Craig Horrell, Manager of COID; Margi Hoffmann, Farmers Conservation Alliance (FCA); and Bridget Moran, U.S. Fish and Wildlife Service (USFWS). The presentations covered the financial assistance available through PL 83-566, the purpose of and need for the project, the Plan-EA process, and how the public could get involved. After the presentations, attendees asked questions and provided comments for the public record. The meeting was attended by 121 people, excluding staff from COID, NRCS, USFWS, and FCA.

3.3 Scoping Comments

Scoping comments were accepted from July 10 to July 24, 2017. Comments were submitted via the following methods:

- At the public meeting on July 10, 2017;
- Email, watershed@coid.org (no longer active) or margi.hoffman@fcasolutions.org; and
- Mail, FCA, Attention Watershed Plan-EA, 11 3rd Street Suite #101, Hood River, OR 97031; and
- Phone, FCA, 541-716-6085.

Table 3-1 presents comments received during the scoping period and where they are addressed in this Plan-EA. Federal, state, tribal, and local agency consultation and other public participation activities are further described in Section 7 of this Plan-EA.

Table 3-1. Public Scoping Comment Summary.

Comment Received	Section Where Comment is Discussed
Importance of instream flows for the health of the Deschutes River, its tributaries, and the associated fish, aquatic species, and general wildlife	Sections 4.9.2 and 6.9
Request to permanently commit 100 percent of water conserved through the project instream	Section 6.9.2
Amount of water conserved by project, mechanism by which water would be conserved, and how the conserved water would be distributed in the Deschutes River	Section 6.9.2
Whether conserved water would be used for groundwater mitigation credits	Table 3-2 and Section 6.9.2.4
Request to quantify the public cost per cfs of water conserved	Appendix D, National Economic Development Analysis
Request to work with farmers to adopt on-farm water conservation measures as a result of pressurized delivery	Section 5.2.1
Importance of preparing for the potential effects of climate change	Section 6.9.2
Concern for wildlife along the PBC and laterals	Sections 4.12 and 6.12
Concern for private ponds and associated wildlife	Table 3-2
Concern for groundwater and aquifer recharge, and water availability for private wells	Sections 4.9.4 and 6.9.2.4
Concern for vegetation along the PBC and laterals, especially mature trees	Sections 4.7.1 and 6.7.2.1
Removal cost and responsibility of trees that do not survive the project	Section 8.3.1
Concern for property values of the adjacent landowners	Appendix D, National Economic Development Analysis
Request to avoid any new irrigation on previously unirrigated land	Section 6.9.2.1
Cost effectiveness and engineering considerations of a top down versus bottom up piping design	Section 8.7.2
Effect on water meters and measuring water use	Section 5.3.2
Effect of project cost on District water rates	Section 8.7.6
Effect on maintenance and access roads along canals	Section 8.3.1
Recreation possibilities, trail development, and proximity to private homes	Sections 4.5 and 6.5.2
Effect on patron deliveries, including amount of water and timing	Section 5.3.2
Ability of patrons to lease their water to other users or for other purposes	Table 3-2

Comment Received	Section Where Comment is Discussed
Relation of the project to hydroelectric development	Table 3-2
Relation of the project to the floodplain	Table 3-2

3.4 Identification of Resource Concerns

Resource concerns identified through scoping comments include aquatic resources, cultural resources, groundwater, fish, recreation, socioeconomics, soils, surface water, terrestrial wildlife, vegetation, visual resources, water quality, and wetlands.

Table 3-2 provides a summary of resource concerns and their relevance to the proposed action. Resource items determined not relevant to the proposed action have been eliminated from detailed study, and those resources determined to be relevant have been carried forward for analysis.

Table 3-2. Summary of Resource Concerns for the Central Oregon Irrigation District Infrastructure Modernization Project.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Air			
Air Quality		X	Review of Oregon Department of Environmental Quality air quality data indicates that the entire project area is in attainment for all criteria pollutants. Emissions from equipment associated with implementation of proposed action activities would occur; however, such emissions are considered negligible when compared to background levels and the application of best management practices (BMPs).
Geology and Soils			
Geology		X	Geology is not a relevant resource. There are no fault lines or other geologic considerations that would affect the proposed project.
Soils	X		Soils could be affected by construction of the proposed project.
Erosion		X	No relevant impact to erosion. With implementation of BMPs, any impacts during construction would be temporary.
Prime Farmlands	X		Prime farmlands occur in the project area and could be affected by the project.
Human Environment			

Environmental Justice		X	The proposed action is not located near any racial, socioeconomic, or environmental justice groups, and therefore would comply with EO 12898.
Cultural Resources	X		Consultation with the State Historic Preservation Office (SHPO) and Tribes is required for compliance with Section 106.
Land Use	X		Construction and operation of the project could affect land use.
National Parks and Monuments		X	No National Parks or Monuments occur in the project area or would be affected by implementation of the project.
Noise		X	No relevant impact to noise. With implementation of BMPs, noise impacts during construction would be negligible and temporary.
Parklands		X	There are no public parks within the project area.
Public Safety	X		Drowning risk in open canals could be beneficially affected.
Recreation Trails	X		No trails occur in the project area. Bikeways could be temporarily affected.
Visual Resources	X		Visual resources of the project area could be affected by project construction where open canals would be altered.
Socioeconomics			
Local and Regional Economy	X		The proposed action involves an expenditure of public funds that could affect the local and regional economy. An evaluation of the effects of providing NRCS funding is included.
National Economic Development (NED)	X		A NED analysis has been completed (see Appendix D) as required by the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.
Vegetation			
Invasive Species/Noxious Weeds	X		Construction activities could spread noxious weeds and/or create conditions for them to establish.
Mature Trees	X		Direct and indirect effects on mature trees could occur.
Special Status/Threatened or Endangered Species		X	No special status, threatened, or endangered plant species have been observed in the project area and no designated critical habitat occurs in the project area.
Water			

Coastal Zones		X	No coastal zones occur within or near the project area.
Coral Reefs		X	No coral reefs occur within or near the project area.
Floodplain Management		X	The proposed action does not occur in the 100-year floodplain as represented by the Federal Emergency Management Agency's Flood Insurance Rate Maps (FEMA 2017) and would not directly or indirectly support floodplain development.
Groundwater Mitigation Credits		X	The proposed action would not create groundwater mitigation credits.
Groundwater Quality		X	Groundwater quality would not be affected by the proposed action.
Groundwater Quantity, Aquifer Recharge	X		Construction and operation of the project could affect recharge.
Hydroelectric Development		X	The proposed action does not consider developing hydroelectric facilities.
Hydrology	X		Reduced seepage and water conserved instream could affect hydrology.
Private Water Features and Ponds		X	The proposed action would not remove or modify private water features and ponds.
Public Water Supply		X	The proposed action would not affect public water supply.
Regional Water Resources Plans	X		Implementation of the proposed action would trigger changes to existing water resource management plans for upstream reservoirs. These modifications would allocate more water instream.
Surface Water Quality	X		Implementation of the proposed action could result in long-term effects by increasing river flows.
Water Leasing	X		Implementation of the proposed action could involve instream water leasing.
Water Rights	X		Implementation of the proposed action could result in the creation of instream water leases.
Wild and Scenic Rivers	X		Reaches of the Deschutes River upstream and downstream from the District's diversion are designated as a Wild and Scenic River and would be indirectly affected by the proposed action.
Wetlands and Riparian Areas			
Wetlands and Riparian Areas	X		Non-jurisdictional wetlands and riparian areas could be affected by the project.
Fish and Wildlife			
Bald and Golden Eagle Protection Act	X		Habitat for bald eagles and golden eagles could occur in the project area.

Endangered Species	X		The proposed action would not affect the yellow-billed cuckoo, northern spotted owl, endangered gray wolf, or their designated critical habitat due to species habitat preferences and range. These species are not carried forward for consideration and analysis in this Plan-EA. The Oregon spotted frog, bull trout, and their critical habitats are known to occur in waterways (not including ditches/irrigation canals) that could be affected by the project.
Essential Fish Habitat		X	The Magnuson-Stevens Act established requirements for including Essential Fish Habitat (EFH) descriptions in federal fishery management plans, and it requires federal agencies to consult with NMFS on activities that may adversely affect EFH (PL 104-297). EFH can include all streams, lakes, ponds, wetlands, and other viable waterbodies, and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding, or growth to maturity. As the project would not affect EFH, consultation under the Magnuson Stevens Act is not required.
Fish and Fish Habitat	X		The proposed action could affect fish habitat in the waterbodies associated with District operations.
General Wildlife and Wildlife Habitat	X		Construction and operation of project components could affect wildlife in the vicinity.
Migratory Bird Treaty Act species	X		Construction and operation of project components could affect migratory birds.

4 Affected Environment

The following subsections describe the existing ecological, physical, biological, economic, and social environment of the project area and areas that are currently affected or have the potential to be affected by operation of the PBC and laterals that are part of the project. The project area is defined in Section 1.2. Where effects on resources extend beyond the COID boundary, additional analysis is provided.

4.1 Cultural Resources

This section describes available information regarding archaeological and historical resources, collectively referred to as "cultural resources," in the project area. Cultural resources are defined as physical or other expressions of human activity or occupation. Pursuant to the NHPA of 1966, as amended, federal agencies must consider the potential effect of an undertaking on "historic properties," which refers to cultural resources listed in, or eligible for listing in, the National Register of Historic Places. Recommendations of eligibility require consultation with the Oregon State Historic Preservation Office (SHPO), and a determination of effects must be agreed upon by the consulting parties. A finding of "historic properties adversely affected" requires that the consulting parties enter into a Memorandum of Agreement (MOA) with stipulations for certain actions and timelines that mitigate the adverse effect and are acceptable to all the consulting parties. Adverse effects on historic properties could include physical destruction; alteration through repair or maintenance; removal from original location; neglect; visual, audible, or atmospheric changes; transfer, lease, or sale. The purpose of the MOA is to ensure effects on cultural resources as a result of the proposed action are successfully mitigated.

4.1.1 Historical Resources

In 2014, a reconnaissance-level survey for historic resources was conducted for the District, including the project area and the Central Oregon Canal system (Hetzel 2014). The survey covered approximately 44,800 acres and consisted of background research, an on-the-ground survey of canals, laterals, ditches, and other assets in the District, and resulted in the creation of geospatial maps and data. The information from the survey was used to identify eligible and non-eligible features in the District, including within the project area. This study, in combination with findings from a previous project, resulted in a determination from SHPO that the entire District, including the project area, is eligible for listing in the National Register of Historic Places as an historic district.

The 2016 Multiple Property Document entitled Carey and Reclamation Act Irrigation Projects in Oregon, 1901-1978, describes the historical context of the District and the associated property types (Hetzel 2016).

The Deschutes Irrigation and Power Company began construction of the PBC in 1903 with private funding under the Carey Desert Land Act of 1894, governing irrigation ROWs (Carey Act). The PBC was completed in 1905, and many improvements continued to be made in the following years, such as construction of the North Canal Dam in 1912 (NPS 2015).

4.1.2 Management of Cultural Resources

Memorandum of Agreement

The District, Reclamation, and Oregon SHPO signed an MOA in 2014 (Agreement #R14MA13733) for piping a segment of the I-Lateral (not part of this project) that also outlined the requirements for

compliance with Section 106 or Oregon Revised Statute (ORS) 538.653 for future piping of the remainder of the canals, laterals, sublaterals, and ditches within the District (SHPO 2014).

The MOA includes certain implementing actions to ensure future District improvements comply with Section 106 requirements. These implementing actions include:

- An inventory of all District facilities and infrastructure, including the contributing and non-contributing features in the District (mostly completed in 2014);
- Development of a Programmatic Agreement between the District, Reclamation, and Oregon SHPO (completed in 2019);
- Development of a Multiple Property Document describing these features (completed in 2016); and
- Preservation and interpretation of contributing segments to be listed in the National Register of Historic Places (completed in 2016 and 2017), including public display and signage.

4.2 Land Use

4.2.1 Land Ownership

All lands traversed by and adjacent to the project area are privately owned. The District has a legal ROW or easement for all existing infrastructure in the project area. The ROW underlying the PBC was granted under the Carey Act and extends 50 feet on each side of the canal from the toe of the bank, for a total width of 100 feet plus the width of the canal.

4.2.2 Land Uses

Land use within the majority of the project area consists of irrigation water conveyance and O&M of the irrigation water conveyance system (e.g., PBC and laterals). District infrastructure is accessed through maintenance roads in the ROW and easements. Lands falling within the project area that currently do not contain COID infrastructure, but where new infrastructure would potentially be installed, are not used for agricultural production.

The proposed action crosses and is adjacent to a combination of agricultural lands, non-cultivated scrub lands, and low-intensity developed open spaces (primarily county roads). Appendix E provides a detailed breakdown of the proposed action lengths crossing different land use classes. All of the agricultural land adjacent to the project area and served by the project is zoned as Exclusive Farm Use.[16]

The PBC and laterals that are part of the proposed action serve approximately 74 COID patrons and 718 irrigated acres within the District. Patrons served by the project's PBC and laterals primarily grow alfalfa, hay, pasture, grains, and field crops.

The proposed action also has the potential to affect agricultural lands in NUID. NUID serves 961 patrons and approximately 59,000 acres of productive farmland. The primary crop types in NUID are alfalfa, hay, bluegrass seed, winter grain, carrot seed, and pasture. Approximately 55 percent of the U.S. domestic market and 45 percent of the global market carrot seed production is grown in Jefferson County, with most of it occurring in the Culver and Madras areas that fall within NUID

[16] The Exclusive Farm Use zoning designation is meant to maintain the agricultural economy of the state and ensure adequate food production. The county is required to inventory and protect farmlands under Statewide Goal 3, Agricultural Land, ORS 215 and Oregon Administrative Rule (OAR) 660-033.

(OSU 2020). In 2012, the Jefferson County's agricultural commodity sales contributed more than $260 million to the Central Oregon economy (Headwaters Economics 2017).

4.3 Public Safety

The open PBC and laterals in the project area pose a risk to public safety when they carry water. During the summer months when irrigation water is flowing at peak volume in the canals, water depths range between 2 and 6 feet and velocities range up to 5 feet per second. These conditions result in areas of deep, swift water that can make it difficult for a child or an adult to get to safety and can result in tragic outcomes. In COID and adjacent district canals, drowning deaths or near drowning instances have occurred in 1996, 1997, 2004, 2016, and 2018 in addition to multiple instances of injury (Flowers 2004; Matsumoto 2016; Beechem 2018).

4.4 Recreation

There are no formally established trails or parks within the project area. The District's PBC and laterals do not contain fish due to functioning fish screens at the District's diversion on the Deschutes River. Use of the PBC and laterals to fish, swim, float, or pursue any other activity that is not a function of the District is prohibited. Any use of the District's maintenance roads other than for O&M purposes is prohibited.

4.4.1 Biking

Biking occurs on public roads that cross the project area. Sections of the Northeast Redmond Bikeway and part of the Deschutes County Bikeway intersect the project area in a few locations (Deschutes County 2017).

4.4.2 River Activities

The Deschutes and Crooked Rivers provide opportunities for many types of recreational activities, including rafting, kayaking, floating, stand up paddle boarding, and fishing. The Bend Whitewater Park located upstream of the North Canal Dam at the Colorado Avenue dam provides opportunities to tube, kayak, and surf on the Deschutes River. Crane Prairie and Wickiup Reservoirs are destination recreation areas for fishing, camping, and nature viewing.

Two stretches of river associated with project operations are designated as Recreation River Areas through the Oregon Scenic Waterways Act (ORS 390.826): (1) the Deschutes River from the northern Urban Growth Boundary of the City of Bend at approximately RM 161 downstream to Tumalo State Park at approximately RM 158; (2) the Deschutes River from Harper Bridge at RM 190.6 to the intersection of the Deschutes National Forest boundary at RM 184.8. These two scenic waterway reaches have been designated Recreational River Areas due to their accessibility and are managed to allow for compatible recreational uses (see Section 4.13 for further discussion).

4.5 Socioeconomic Resources

This section describes the socioeconomic conditions for the areas that could be affected by the proposed action in Deschutes, Jefferson, and Crook Counties.

4.5.1 Population

The project area falls primarily within Deschutes County, with a small section in Crook County. Jefferson County is located in near proximity and has the potential to be indirectly affected by the

proposed action. Nearby cities and towns include Redmond, Bend, Terrebonne, and Prineville. Generally, the area has seen stable growth over a recent 10-year period (2005 to 2015; see Table 4-1). The Oregon Office of Economic Analysis estimates that by 2040, Deschutes County could reach a population of 241,223, Crook County could reach a population of 26,117, and Jefferson County could reach a population of 29,413 (OEA 2013).

Table 4-1. Population Characteristics by City, County, and State.

Area	Year 2000 Population (number of people)[1]	Year 2015 Population (number of people)[2]	Population Growth Rate 2000 to 2015	Year 2015 Population per Square Mile (number of people)
Cities and Towns				
Redmond	20,010	27,450	37%	1,635
Bend	70,330	87,017	24%	2,615
Terrebonne	1,469	1,182	-20%	326
Prineville	7,356	9,266	26%	849
Counties				
Deschutes	143,490	166,622	14%	56
Jefferson	19,009	22,061	16%	12
Crook	19,182	20,956	9%	7
State				
Oregon	3,631,440	3,939,233	8%	40

Source: [1] U.S. Census Bureau 2005; [2] U.S. Census Bureau 2015

4.5.2 Area Employment and Income

Table 4-2. presents the labor force characteristics for Deschutes County, Jefferson County, Crook County, and the State of Oregon in 2017. Unemployment in Deschutes County is equal to the state average; however, both Jefferson and Crook Counties have higher unemployment rates. Agriculture, forestry, fishing and hunting, and mining occupations make up of 3.3 percent of the employment rate in Deschutes County, 10.2 percent in Jefferson County, and 5.5 percent in Crook County (U.S. Census Bureau 2016).

Table 4-2. Labor Force Characteristics in the State of Oregon, Deschutes County, Jefferson County, and Crook County, 2017.

Indicator	Deschutes County	Jefferson County	Crook County	Oregon (State)
Labor Force	93,444	10,133	9,617	2,104,077
Employed	89,625	9,589	9,035	2,017,292
Unemployed	3,820	544	582	86,786
Unemployment Rate	4.1%	5.4%	6.1%	4.1%

Source: U.S. Bureau of Labor Statistics 2017

Household income and persons living in poverty are summarized in Table 4-3. Information is presented for two income indicators: median household income and per capita income. Median income in Deschutes County is the same as median income in the State of Oregon; both are comparable to the median income in the U.S. Incomes in Jefferson and Crook Counties are lower than both the State of Oregon and the U.S. by at least 9 percent. The percentage of persons living in poverty in Deschutes County is similar to that of the U.S., but slightly lower than the State of Oregon. Both Jefferson and Crook Counties have a higher percentage, by about 5 percent, of persons in poverty than Deschutes County, the State of Oregon, and the U.S.

Table 4-3. Income and Poverty Rates in the State of Oregon, Deschutes County, Jefferson County, and Crook County, 2015.

Indicator	Deschutes County	Jefferson County	Crook County	Oregon (State)	United States
Median Household Income	$51,223	$46,366	$37,106	$51,243	$53,889
Per Capita Income	$29,158	$21,341	$21,496	$27,684	$28,930
Persons in Poverty	14.6%	20.5%	19.4%	16.5%	15.5%

Source: U.S. Census Bureau 2015

4.5.3 Agricultural Statistics

Table 4-4 presents summarized agricultural information for Deschutes, Jefferson, and Crook Counties from the 2012 and 2017 U.S. Department of Agriculture (USDA) Census of Agriculture. The top crop item in these counties by acreage is forage (defined as all hay and haylage, grass silage, and greenchop). The top livestock item in these counties by inventory is cattle and calves.

Table 4-4. Agricultural Statistics for Deschutes, Jefferson, and Crook Counties.

Agricultural Statistic	Deschutes County			Jefferson County			Crook County		
	2012[1]	2017[2]	Percent Change	2012[1]	2017[2]	Percent Change	2012[1]	2017[2]	Percent Change
Number of Farms	1,283	1,484	16%	474	397	-16%	551	620	13%
Land in Farms (acres)	131,036	134,600	3%	817,051	792,920	-3%	822,676	799,845	-3%
Harvested cropland (acres)	23,648	25,356	7%	43,955	48,092	9%	41,128	49,167	20%
Average Size of Farm (acres)	102	91	-11%	1,724	1,997	16%	1,493	1,290	-14%
Median Size of Farm (acres)	20	11	-45%	69	80	16%	50	40	-20%
Market value of products sold	$20,570,000	$28,769,000	40%	$65,032,000	$67,438,000	4%	$42,298,000	$44,563,000	5%
Crop Sales	$11,127,000	$16,543,000	49%	$47,249,000	$54,792,000	16%	$13,562,000	$12,094,000	-11%
Livestock Sales	$9,442,000	$12,226,000	29%	$17,783,000	$12,645,000	-29%	$28,736,000	$32,470,000	13%

Source: [1] USDA 2012; [2] USDA 2017

4.6 Soils

The most common soil in the project area is Deschutes sandy loam (NRCS 2015b). These soils are very loose and sensitive to lateral soil movement and erosion.

Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by the forces of water, wind, or gravity (NRCS 2018). In general, water-induced soil erosion occurs within open canals and laterals and may cause issues with water quantity and quality, as well as canal failure and flooding (Reclamation 2017a).

4.6.1.1 Farmland Classification

NRCS has developed technical soil groups that are associated with a particular soil type and a soil's rating for agricultural commodity production (NRCS 2015b). NRCS soil groupings within the project area and lands served by the project's PBC and laterals are about 50 percent prime farmland if irrigated and 50 percent farmland of statewide importance.

4.7 Vegetation

4.7.1 Common Vegetation

The common natural upland vegetation found within the project area includes western juniper, big sagebrush and low sagebrush, rabbit brush, wild rye and bunch grasses, and other plant species such as forbs commonly found in the dry Central Oregon steppe environment (Hartzell-Hill, personal communication, July 18, 2017). Agricultural crop grasses and forbs have also established along sections of the PBC and laterals that are adjacent to agricultural activities. Appendix E provides a list of common vegetation in the area.

The District performs annual mowing along the main canal and main laterals where canal roads and conditions allow for wheel tractor access. In areas where it is necessary, weed eating, tree removal, and delimbing is performed. On a 2-to-3-year basis, canals are cleared of encroaching vegetation (grasses, reeds, shrubs).

A fringe of hydrophytic (water-loving) plants occurs sporadically along the margins of the top of the canal bank in some areas and is represented predominately by species such as bulrush, black cottonwood, and willow. Where present, this vegetation is a few feet wide in scattered locations and does not function as a habitat type due in part to infrastructure maintenance activities. During the warmer months of July and August, submerged aquatic plants (species of pond weed and algae) thrive in the slower-flowing segments of the canal system and are mechanically removed by COID (Hartzell-Hill personal communication July 18, 2017).

4.7.2 Special Status Species

No ESA endangered, threatened, species of concern, candidate plant species or their designated critical habitats, or Oregon special status plant species are known to occur within the project area. The majority of the project area lies within Deschutes County, where three special status species potentially occur: federal candidate whitebark pine (*Pinus albicaulis*); Oregon threatened pumice grape-fern (*Botrychium pumicola);* and federal species of concern, Oregon threatened Peck's milkvetch (*Astragalus peckii)* (ODA 2017a, 2020). Based on the USFWS Information for Planning and Consultation (IPaC) database, District observations, the Oregon Department of Agriculture (ODA) identification of species population centers, and the elevation and plant communities these species

generally inhabit, it is unlikely that any of the special status species would occur within the project area. Therefore, these special status plant species are not discussed further.

4.7.3 Common and Noxious Weeds

The Deschutes Basin Board of County Commissioners determines a weed to be noxious if it is "injurious to public health, agriculture, recreation, wildlife, or any public or private property," and "impacts and displaces desirable vegetation"; Furthermore, it is recognized that certain noxious weeds are so pervasive that they have been classified by ORS 569.350 to be a menace to public welfare (ODA 2017b). A variety of noxious weeds including bull thistle and cheat grass are found within the project area. Appendix E lists the noxious and common weeds found in the project area.

In the spring and fall of each year, COID applies herbicide along the PBC where ditch roads are accessible and also spot-sprays noxious weeds on the opposite side of the canal. Depending on budget and scheduling, COID may also spray large laterals, with a focus on noxious weeds. In addition, COID mows within its ROW in spring through summer as scheduling allows.

The District routinely contracts with the Deschutes County Vegetation Management (and occasionally other qualified contractors) for weed treatment. Aquatic weeds, such as yellow floating heart, cannot be treated with herbicide in the PBC and laterals during irrigation season because the water is used for crop irrigation (Hartzell-Hill personal communication, July 18, 2017). For this reason, the open PBC and laterals present opportunities for the spread of noxious weeds.

4.8 Visual Resources

4.8.1 Regional Context

Located in northeast Deschutes County, the project area is part of a larger regional setting valued by residents and visitors for its open spaces, including extensive farms and forests and scenic views. The Deschutes County Comprehensive Plan, adopted in Ordinance 2011-003, identified the scenic resources in the county as, "… high mountain peaks, open meadows, riparian corridors, wetlands and forests. These areas contribute to the high quality of life for county residents" (Deschutes County 2011).

4.8.2 Project Area and Adjacent Landscape

The PBC and laterals generally lie flat against the landscape; in some sections of the project area, the PBC and laterals are a few feet lower than the landscape level. Therefore, the canal and lateral banks are indistinguishable from other landscape features in these areas (Figure 4-1). In addition to the PBC and laterals, the project area includes surrounding vegetation and a dirt or gravel maintenance road. Herbaceous vegetation, grasses, shrubs, and trees growing within the project area can obscure the view of the PBC and laterals from adjacent lands.

Figure 4-1. The Pilot Butte Canal. In areas where the canals lie flat or are below the landscape, the Pilot Butte Canal and laterals cannot always be seen from the road or adjacent lands.

Views of the PBC and laterals change throughout the year. During the irrigation season, the PBC and laterals carry water. Outside of the irrigation season, they do not carry water and are usually dry. Four times outside of the irrigation season the District provides "stock runs"[17] when it delivers water through the system to fill patrons' ponds. Although the canals are not naturally formed waterways, some viewers may consider them to be water features during the irrigation season.

The project area runs through agricultural and undeveloped lands. Throughout these lands, the visual landscape elements of the irrigation distribution system (position and path of canals, laterals, and banks through the surrounding area) vary greatly. The PBC and laterals are more visually dominant through some areas, while in other areas the canal features are obscured by vegetation. Some rural residences are located adjacent to the project area. The open PBC and laterals can be seen from some rural residences and public road crossings (Figure 4-2).

In 0.4 mile of the project area where there would be new lateral alignments, there are currently no visible canals or laterals; the land is undeveloped and has a road ROW.

[17] "Stock run" refers to when the District runs water through their system during the non-irrigation season to provide water to patrons for stock such as cattle.

Figure 4-2. The Pilot Butte Canal looking northwest from the intersection of Smith Rock Way and NE 33rd Street in an agricultural area outside Terrebonne.

4.9 Water Resources

The proposed action would affect water used for District operations, surface water hydrology, surface water quality, and groundwater.

4.9.1 District Operations and Water Rights

4.9.1.1 District Water Rights

The PBC and laterals in the project area serve 718 acres of irrigated lands.

The District is a senior water right holder on the Deschutes River. The District diverts live flow from the Deschutes River under Certificate 83571, which carries 1900 and 1907 priority dates, to meet the majority of its water needs. The District also holds supplemental storage rights on Crane Prairie Reservoir, located upstream from the District's diversions on the Deschutes River. The District has historically been able to meet its water needs during most years through live flow or with the addition of stored water.

Crane Prairie Reservoir is federally authorized for irrigation and state authorized for multiple purposes, including instream flows for fish and wildlife. Three irrigation districts hold water rights to store a combined 50,000 acre-feet in the reservoir: LPID (10,500 acre-feet), AID (13,500 acre-feet), and COID (26,000 acre-feet). However, in 2016 a Stipulated Settlement Agreement (herein referred to as the 2016 Settlement Agreement) between the irrigation districts, Reclamation, and the Center for Biological Diversity limited the total water available from Crane Prairie Reservoir for irrigation use to 12,000 acre-feet annually until July 31, 2019 or the time the Habitat Conservation Plan (HCP; see Section 6.14.2 for more information regarding the HCP) is approved (*Center for Biological Diversity et al.* v. *U.S. Bureau of Reclamation and Arnold Irrigation District et al.* 2016).

In response to the 2016 Settlement Agreement, COID, LPID, and AID approved the Reservoir Storage Allocation Agreement (AID, COID, and LPID 2019) allocating the 12,000 acre-feet

annually amongst themselves until December 31, 2020, or the time the HCP is approved (COID and NUID 2017). Additionally, COID and NUID approved the Agreement for Provision of Irrigation Water (2017; Appendix E), implementing short-term changes to operational rules of Crane Prairie Dam and Reservoir. Collectively, these two agreements are herein referred to at the Revised 1938 Inter-District Agreement.

COID's live flow water rights identify three seasons, each with different delivery rates (Table 4-5). These delivery rates are lower in season 1 and season 2 than in season 3. Supplemental stored water may be needed during season 1 and season 2 to accommodate modern irrigation practices that require full delivery to operate (i.e., pivots) and to accommodate changes from historical cropping (i.e., potato crop has converted to primarily hay).

Table 4-5. Certified Delivery Rates and Irrigation Season Dates for the Pilot Butte Canal.

Season	Start Date	End Date	Start Date	End Date	Season Duration (days)	Certified Delivery Rate (cfs)	Percent of Full Rate
1	April 1	April 30	Oct. 1	Oct. 26	56	196.7	40.5 %
2	May 1	May 14	Sept. 15	Sept. 30	30	268.3	54.0 %
3 (1900)	May 15	Sept. 14	N/A	N/A	122	365.8	
3 (1907)	May 15	Sept. 14	N/A	N/A	122	146.6	100.0 %

Notes:
N/A = Not Applicable

4.9.1.2 District Operations

Central Oregon Irrigation District

The District diverts both live flow and stored water from the Deschutes River near Bend, Oregon, to meet its patrons' water needs. On average, 95 percent of this water comes from live flow in the Deschutes River. Another 5 percent comes from storage in Crane Prairie Reservoir.

The District holds 1,370 cfs of live flow water rights in the Deschutes River, and it primarily diverts this water at two diversions. The Central Oregon Canal diversion diverts water into the Central Oregon Canal at RM 171. The PBC diversion diverts water into the PBC at RM 164.8. Implementation of the proposed action would occur only along the PBC and laterals within the project area, as discussed in Section 1.2.

Crane Prairie Reservoir is located several miles downstream from the headwaters of the Deschutes River at Little Lava Lake. Although Reclamation owns the reservoir, daily responsibility for O&M has been transferred to and is financed by COID. Water from Crane Prairie Reservoir is released throughout the year. During the irrigation season, water is released as necessary to supply the Districts' water rights. As the operator of Crane Prairie Dam and Reservoir, COID is responsible for operating in a manner consistent with the Revised 1938 Inter-District Agreement.

COID water used for irrigation is conveyed from Crane Prairie Reservoir, down the Deschutes River, through Wickiup Reservoir, and then north through the Deschutes River to one of the District's two primary diversions.

Lone Pine Irrigation District

In addition to serving its patrons, COID delivers water to LPID at the northern end of the PBC, within the project area. COID delivers this water at the Lone Pine Weir. LPID holds a live flow water right for up to 29.1 cfs with a priority date of 1900. LPID supplements its live flow right with water released from Crane Prairie Reservoir in accordance with the Revised 1938 Inter-District Agreement for a maximum diversion rate of 43.5 cfs. COID personnel operate and manage the Lone Pine Weir throughout the irrigation season in accordance with water delivery orders requested by LPID.

Infrequently, COID operationally spills water into the Crooked River (RM 27.7) at the Lone Pine Weir. The Lone Pine Weir spillway is used only in emergencies, and it operates less than once a year.

North Unit Irrigation District

Additionally, COID is responsible for delivering water to NUID at the NUID spillway within the project area. As a result of conserved water project CW-81, the District currently delivers 4 cfs of its water from the PBC to the NUID spillway (approximately 3,000 feet upstream from the end of the PBC), plus any excess water in the system. This water is reported to the OWRD, credited to NUID, and then an equal volume of water is released as beneficial use from Wickiup Reservoir during the non-irrigation season.

4.9.2 Surface Water Hydrology

Waterbodies associated with District operations are presented in Table 4-6 and shown on Figure 4-3. The upstream end of Lake Billy Chinook, at the confluence of the Deschutes, Crooked, and Metolius Rivers, serves as the downstream boundary of the area associated with District operations.

Table 4-6. Waterbodies Associated with District Operations.

Name	Reach	Size	Tributary To	Project Nexus
Crane Prairie Reservoir	N/A	55,300 acre-feet	N/A	COID holds 26,000 acre-feet of stored water rights in this reservoir.
Upper Deschutes River	Crane Prairie Reservoir (RM 238.5) to Wickiup Reservoir (RM 233.5)	N/A	Releases from District reservoir affect flows in this reach.	Releases from Crane Prairie Reservoir affect flows in this reach.
Wickiup Reservoir	N/A	200,000 acre-feet	N/A	COID irrigation water is conveyed through Wickiup Reservoir.
Upper Deschutes River	Wickiup Reservoir (RM 226.8) to North Canal Dam (RM 164.8)	N/A	Columbia River	Releases from Crane Prairie and Wickiup Reservoir affect flows in this reach.
Middle Deschutes River	North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	N/A	Columbia River	COID's diversion affects flows in this reach.
Crooked River	Crooked River (RM 27.7) to mouth	N/A	Deschutes River, confluence at Lake Billy Chinook (RM 120)	The COID PBC system terminates near the Crooked River, operationally spilling to the Crooked River.

Notes:
N/A = Not Applicable

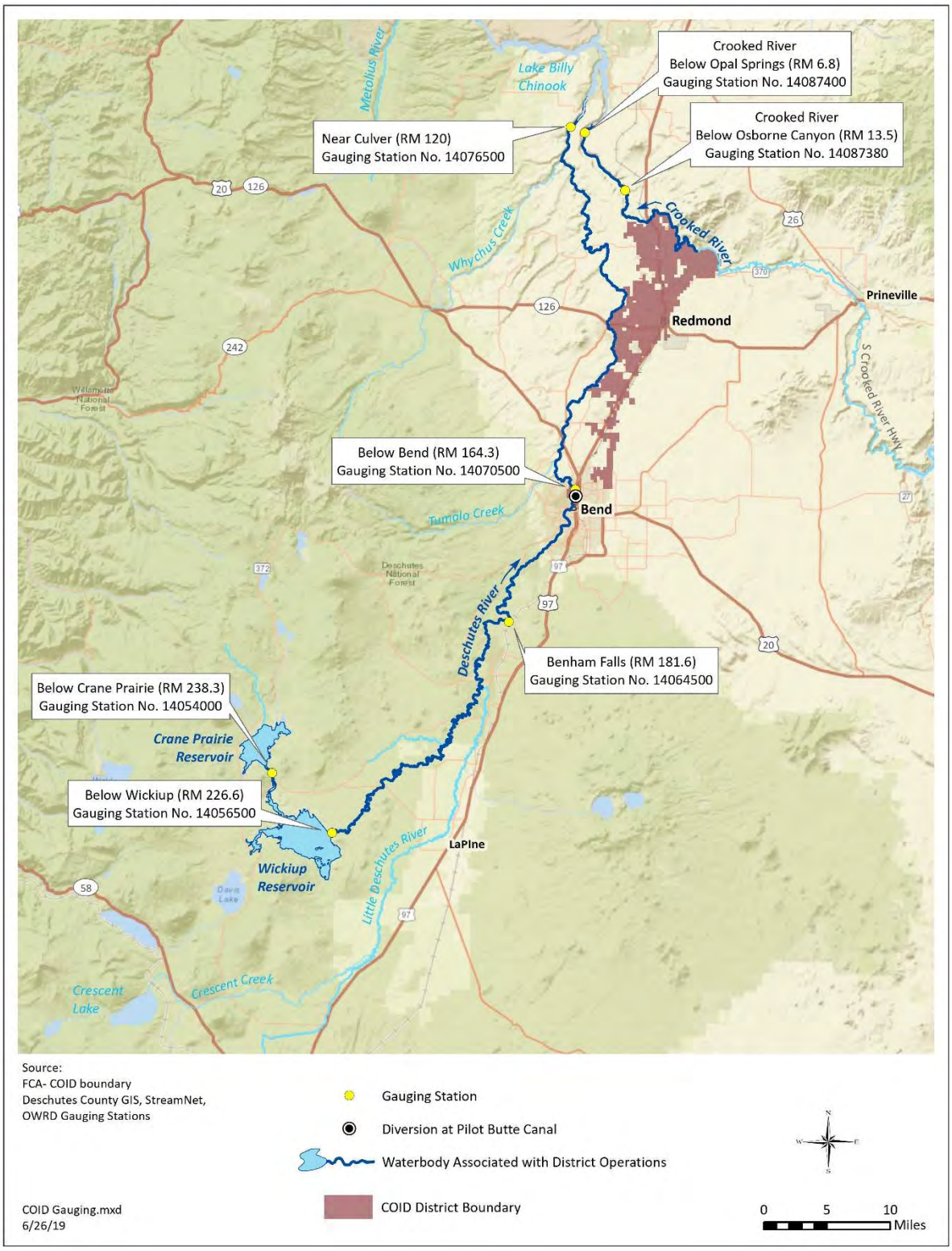


Figure 4-3. Waterbodies and gauging stations associated with District operations.

Historically, the spring-fed Deschutes River had relatively consistent streamflow seasonally and annually (DRC 2012). Hydrologic conditions in the Deschutes River have changed with the construction and operation of reservoirs, dams, and diversions on the river and its tributaries. Water is now managed for irrigation use, resulting in lower flows downstream from reservoirs during the storage season (i.e., late fall, winter, and early spring), higher flows downstream from reservoirs during the irrigation season (April to October), and lower flows downstream from irrigation diversions during the irrigation season.

As part of the 2016 Settlement Agreement, COID and other districts that store water in Crane Prairie and Wickiup Reservoirs agreed to maintain a minimum of 100 cfs in the Deschutes River outside the irrigation season (*Center for Biological Diversity et al.* v. *U.S. Bureau of Reclamation and Arnold Irrigation District et al.* 2016).[18] These conditions have been maintained since the expiration of the 2016 Settlement Agreement (July 2019) in compliance with the 2017 and 2019 Biological Opinion for Reclamation dam operations and will be maintained until the adoption of the HCP (Reclamation 2017b; Reclamation 2019; USFWS 2019b; USFWS 2019c). Water released under these conditions is not legally protected instream.

The upper Deschutes Basin has experienced a general drying trend for several decades (Gannett and Lite 2013) and is susceptible to future changes in precipitation and the amount and timing of spring runoff (Shelton and Fridirici 2001). Models suggest that increased rain and a decrease in snowpack combined with an accelerated rate of spring snowmelt will have a greater influence on the future water supply in the area; these changes will make managing the water supply more difficult (Shelton and Fridirici 2001; Reclamation 2016). This trend has potential for a decrease in annual mean streamflow as well as decreases in groundwater discharge to spring-fed streams (Gannett and Lite 2013).

The following sections summarize surface water hydrology in each waterbody and provide graphs to display the daily average[19] baseline streamflow prior to and following the 2016 Settlement Agreement. The daily average baseline streamflow prior to the 2016 Settlement Agreement includes available data from water years[20] noted below each graph. The daily average baseline streamflow following the 2016 Settlement Agreement includes data from the 2016 to 2017 water year. Figure 4-3 presents the stream gauges included in the surface water hydrology area that were used for these analyses.

4.9.2.1 Crane Prairie Reservoir

Crane Prairie Dam is operated in coordination with Wickiup Dam and Reservoir, in accordance to the Revised 1938 Inter-District Agreement. Storage and releases are directed by the Oregon Watermaster and executed by COID personnel. The 2016 Settlement Agreement required a portion of the water stored by COID, LPID, and AID to be dedicated to Oregon spotted frog purposes, limiting irrigation use of water among the districts to 12,000 acre-feet annually.

[18] The Reservoir Storage Allocation Agreement is separate from the 2016 Settlement Agreement. The Reservoir Storage Allocation Agreement discloses the allocation of water stored in Crane Prairie Reservoir to the irrigation districts, whereas the 2016 Settlement Agreement discloses minimum instream flows in the Deschutes River downstream from Wickiup Reservoir.

[19] Average streamflow represents the 50 percent exceedance streamflow.

[20] A water year is defined as the 12-month period from October 1 through September 30.

4.9.2.2 Wickiup Reservoir

Wickiup Reservoir is 5 miles downstream from Crane Prairie Dam and relies on snowmelt, releases from Crane Prairie Reservoir, and precipitation for inflow. The OWRD Regional Watermaster releases water from Wickiup Reservoir throughout the year through an accounting arrangement whereby the storage accounts for COID, NUID, LPID, and AID are balanced over the course of the irrigation season. During the irrigation season, water is released as directed by the OWRD Regional Watermaster and operated by NUID personnel. The water is conveyed through the Deschutes River to COID's, AID's, or NUID's diversion in Bend at the North Canal Dam (RM 164.8). During the non-irrigation season, water is released from the reservoir to meet the districts' commitments under the 2016 Settlement Agreement.

4.9.2.3 Deschutes River (RM 238.5) to the PBC diversion at North Canal Dam (RM 164.8)

Reservoir releases, tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in the reaches of the Deschutes River between Crane Prairie Reservoir (RM 238.5) to Wickiup Reservoir (RM 233.5) and Wickiup Reservoir (RM 226.8) to North Canal Dam (RM 164.8). Crane Prairie Reservoir and Wickiup Reservoir operations contribute to lower winter streamflow and higher summer streamflow in these reaches (Figure 4-4 and Figure 4-5). A portion of the streamflow enters into the groundwater aquifer through the porous volcanic riverbed and banks upstream from the City of Bend.

Outside of the irrigation season, irrigation districts have historically released at least 20 cfs from Wickiup Reservoir. As a result of the 2016 Settlement Agreement (see Section 4.9.1.1 for more information about this agreement), the districts agreed to voluntarily maintain a minimum of 100 cfs in the upper Deschutes River, downstream from Wickiup Reservoir, during the non-irrigation season until July 31, 2019, or the time the HCP is approved. These additional water releases are not legally protected instream.

Figure 4-4 and Figure 4-5 display the Deschutes River's daily average baseline streamflow prior to the 2016 Settlement Agreement (1985 to 2015) and the daily average baseline streamflow following the Settlement Agreement (October 2016 to September 2018). Data for streamflow prior to the 2016 Settlement Agreement represent the 1985 through 2015 water years. Data for streamflow following the 2016 Settlement Agreement represent the October 2016 through September 2018 water year.

The Deschutes River downstream from Wickiup Dam to the PBC Diversion has instream water rights as identified in Table 4-7 and Appendix E. OWRD holds these instream water rights[21] in trust to support public uses such as recreation, pollution abatement, navigation, and maintenance and enhancement of fish and wildlife and their habitats (ODFW 1997).

[21] Instream rights are enforced like all other water rights. By law, instream applications cannot take away or impair any legally established water use having an earlier priority date (ODFW 1997).

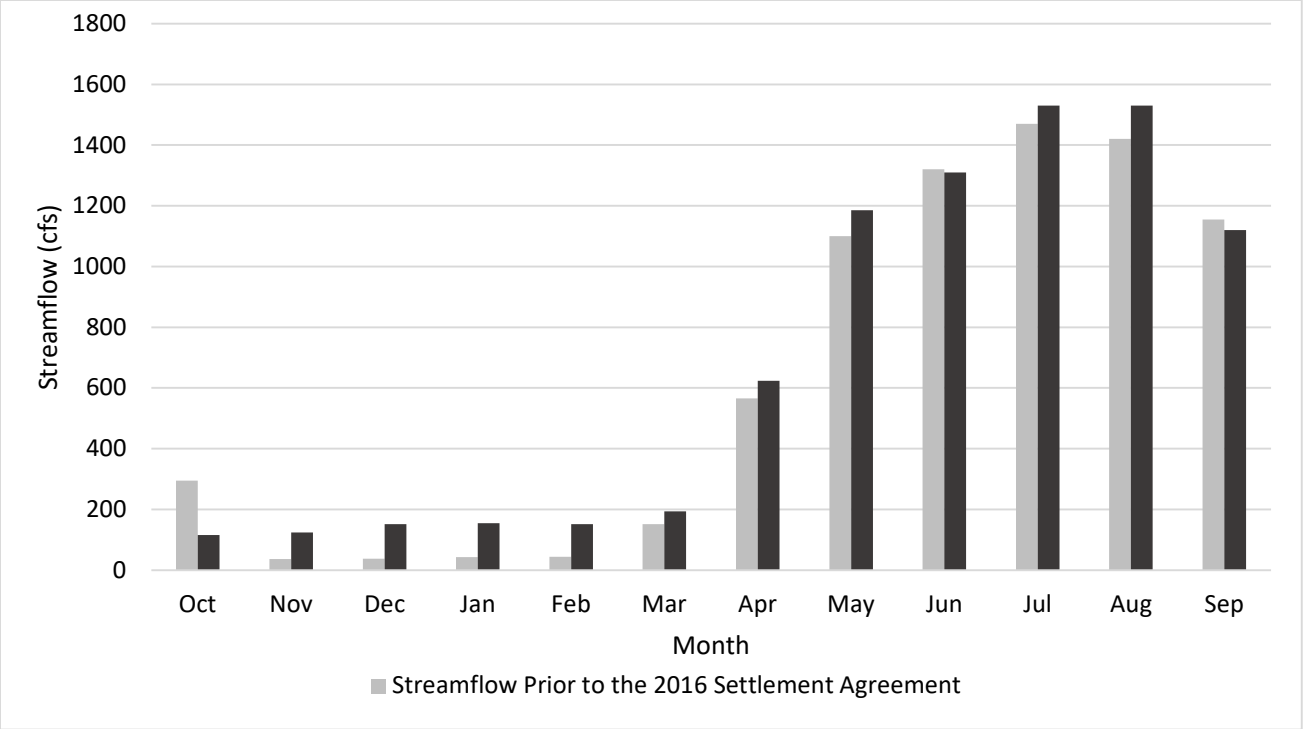


Figure 4-4. Streamflow in the Deschutes River downstream from Wickiup Reservoir at OWRD Gauge No. 14056500.

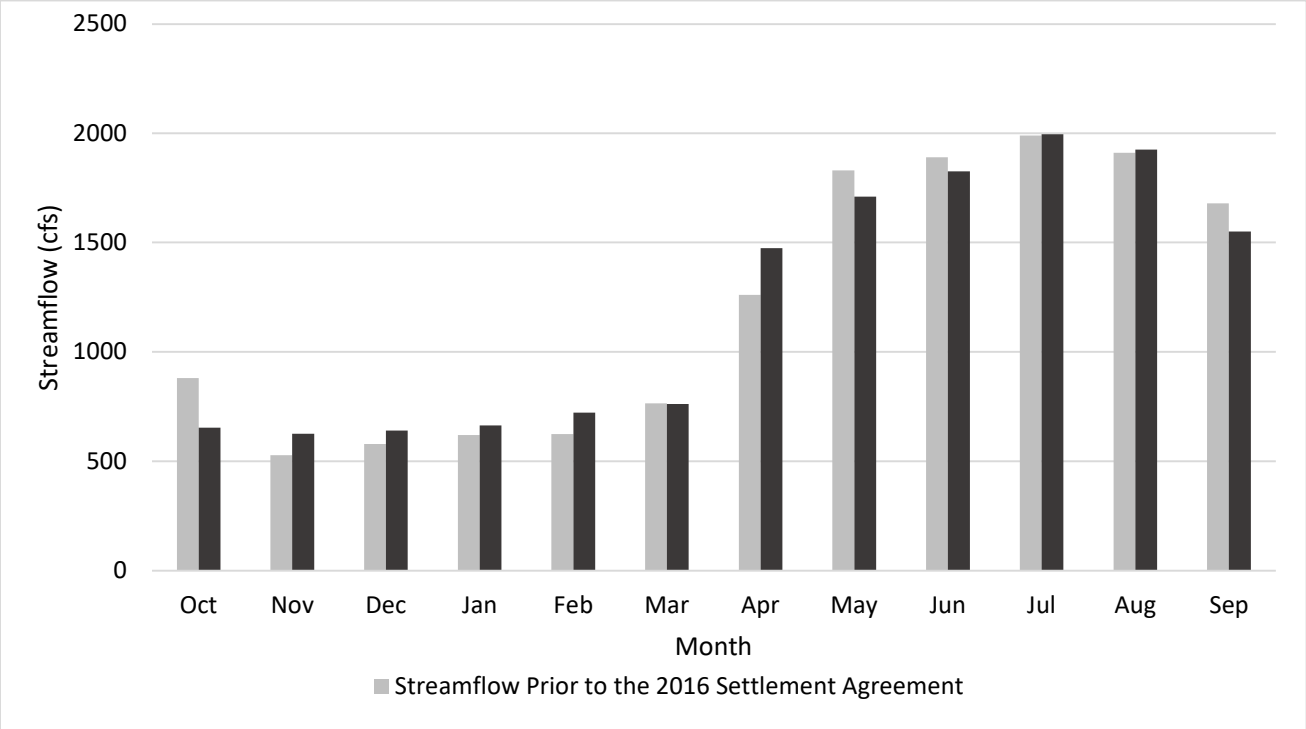


Figure 4-5. Daily average streamflow in the Deschutes River at Benham Falls at OWRD Gauge No. 14064500.

Table 4-7. Instream Water Rights in the Deschutes River between Wickiup Reservoir and North Canal Dam.

Certificate	River Miles Associated with Certificate	Year-Round Rate (cfs)
#59776	RM 226.8 to RM 192.5	300
#59777	RM 192.5 to RM 190.4	400
#59778	RM 190.4 to RM 164.8	660

4.9.2.4 Deschutes River, PBC diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)

Central Oregon, Arnold, Lone Pine, North Unit, and Swalley Irrigation Districts divert water from the Deschutes River at the City of Bend, influencing streamflow patterns in the Deschutes River between North Canal Dam (RM 164.8) and Lake Billy Chinook (RM 120). Historically, these irrigation districts maintained a minimum of 30 cfs instream in this reach under a voluntary agreement. Extensive conservation efforts by the irrigation districts and their partners starting in the 2000s have enhanced streamflow during the irrigation season. Following the 2016 Settlement Agreement, the irrigation districts have maintained approximately 130 cfs downstream from their diversions at the City of Bend during the summer irrigation season.

Figure 4-6 displays the Deschutes' streamflow downstream from the City of Bend. Shown by month and measured in cfs, the figure demonstrates the daily average baseline streamflow prior to the 2016 Settlement Agreement (1985 to 2015) and the daily average baseline streamflow following the 2016 Settlement Agreement (October 2016 to September 2018).

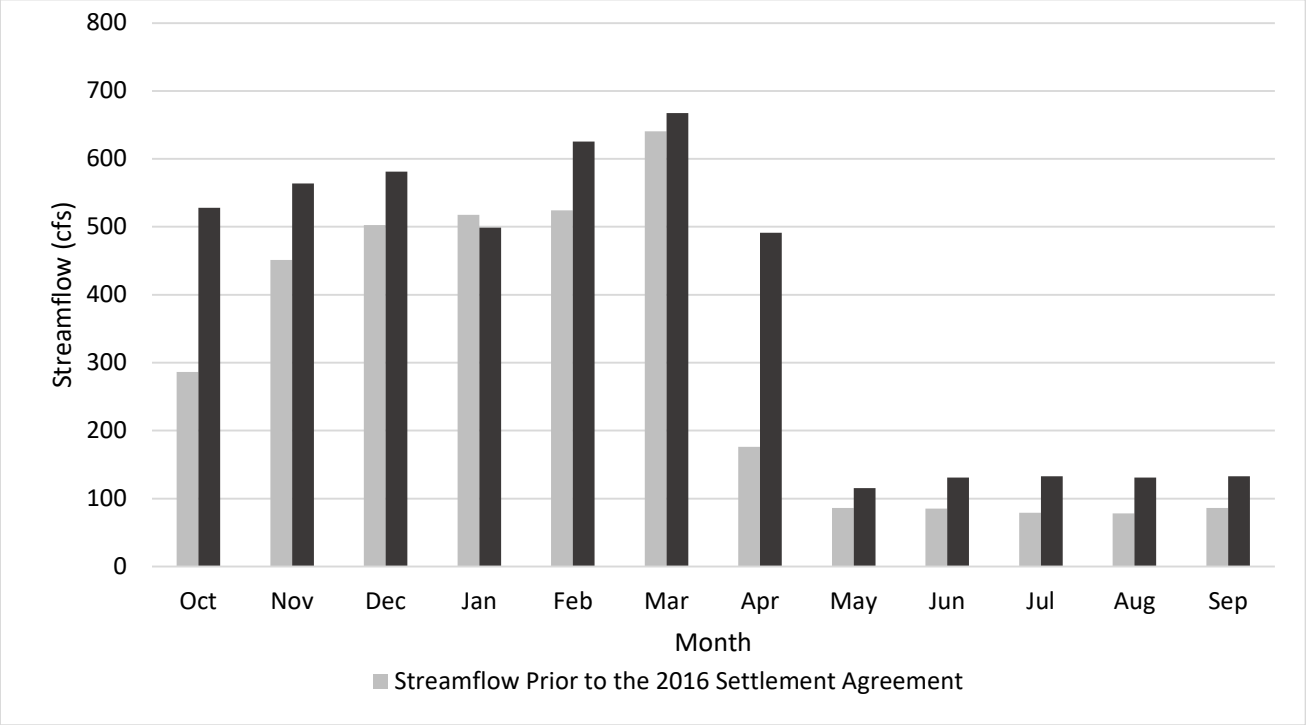


Figure 4-6. Daily average streamflow in the Deschutes River downstream from the City of Bend at OWRD Gauge No. 14070500.

The Oregon Department of Fish and Wildlife's (ODFW) pending water right in this reach identifies a year-round flow of 250 cfs for fish, wildlife, their habitat quality, or recreation from the North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120) (Appendix E).

4.9.2.5 Crooked River (RM 27.7) to Lake Billy Chinook (mouth)

The Crooked River is a tributary to the Deschutes River with a confluence at Lake Billy Chinook. Reservoir releases from Ochoco and Prineville Reservoirs, tributary inflows, irrigation diversions, and groundwater interactions drive streamflow in this reach. COID has one operational spillway within the project area at the Lone Pine Weir to the Crooked River (RM 27.7). This spillway is used only in emergency situations.

4.9.3 Surface Water Quality

The Oregon Department of Environmental Quality (ODEQ) maintains a list of all surface waters in the state that are considered impaired because they do not meet water quality standards under Section 303(d) of the CWA (33 United States Code [U.S.C.] 1251 et seq.). The 2012 303(d) list is effective for CWA purposes. All waterbodies associated with District operations are included on Oregon's 303(d) list for not meeting state water quality standards for aquatic weeds or algae, temperature, dissolved oxygen, pH, sedimentation, turbidity, chlorophyll a, *Escheria coli (E. Coli)*, and biological criteria (Table 4-8).

Table 4-8. Impaired Waterbodies Associated with District Operations.

Waterbody Name	River Mile Associated with District Operations	Parameters Included on Oregon's 303(d) List
Crane Prairie Reservoir	N/A	Aquatic Weeds or Algae
Wickiup Reservoir	N/A	Aquatic Weeds or Algae
Deschutes River	Crane Prairie Dam (RM 238.5) to Wickiup Reservoir (RM 233.5)	Temperature
Deschutes River	Wickiup Reservoir (RM 226.8) to PBC diversion at North Canal Dam (RM 164.8)	Temperature Dissolved oxygen pH Sedimentation Turbidity Chlorophyll a
Deschutes River	PBC diversion at North Canal Dam (RM 164.8) to Lake Billy Chinook (RM 120)	Temperature Dissolved oxygen
Crooked River[1]	RM 27.7 to the mouth (RM 0)	Temperature Dissolved oxygen pH *E. Coli* Biological criteria

Notes:
N/A = Not Applicable
[1] Chlorophyll a is also listed on the 303(d) list for the Crooked River from RM 0 to RM 5. However, this stretch is considered Lake Billy Chinook and therefore is not included in this section.
Source: ODEQ 2012

Water management in the Deschutes Basin has altered seasonal streamflow patterns, increasing streamflow above historic levels in some reaches and decreasing streamflow below historical levels in other reaches. Low streamflow affects water quality in the Deschutes River by exacerbating temperature and dissolved oxygen problems. In addition, water quality often dictates the spread and extent of invasive aquatic species, and these problems interact synergistically to degrade wildlife habitat within and around the Deschutes River. The following sections describe existing 303(d)-

listed impairments in the waterbodies associated with District operations. ODEQ is required to develop total maximum daily loads for rivers and streams in the upper Deschutes Basin (these impairments may extend upstream or downstream of the reaches included in Table 4-8).

4.9.3.1 Temperature

The Deschutes River and the Crooked River do not meet stream temperature criteria within the area associated with District operations (Table 4-8). The temperature criterion that applies throughout the area is 64.4 degrees Fahrenheit [°F]). These standards are set to protect designated beneficial uses within the Deschutes Basin including salmon and trout rearing and/or migration, public and private domestic water supply, wildlife and hunting, and aesthetic quality (ODEQ 1995). Elevated stream temperatures affect aquatic species, including native fish, by exacerbating conditions that cause stress and disease, raise their metabolism, and reduce growth rates. Low streamflow, reduced streamside vegetation, and widened channels can all contribute to elevated stream temperatures.

4.9.3.2 Dissolved Oxygen

The Deschutes River and the Crooked River do not meet Oregon's standards for dissolved oxygen (Table 4-8). In the Deschutes River, the dissolved oxygen levels in all reaches are not high enough to meet Oregon's standards during trout spawning season from January 1 to May 15 and do not meet Oregon's standards year-round from Deschutes RM 171.7 to RM 223.3 (ODEQ 2012). In the Crooked River, the dissolved oxygen levels in these reaches are not high enough to meet Oregon's standards year-round (ODEQ 2012). Low dissolved oxygen levels can affect aquatic life by reducing habitat quality and quantity, changing behavior, or reducing growth rates. Excess nutrient inputs, associated algae growth and die-off, and elevated stream temperatures can all contribute to lower dissolved oxygen levels.

4.9.3.3 pH

pH is a measure of the acidity or alkalinity of a waterbody. The Deschutes River 2.2 miles above the PBC diversion (RM 164.8) and all of the Deschutes River from the PBC diversion (RM 164.8) to Lake Billy Chinook (RM 120) exceeds Oregon's pH standard with higher, or more alkaline, pH values (ODEQ 2012; Table 4-8). The Crooked River from RM 27.7 to the mouth does not meet Oregon's pH standards during the summer (ODEQ 2012). Higher pH can affect aquatic life by changing the solubility or biological availability of chemicals in the water.

4.9.3.4 Chlorophyll a

Chlorophyll a is a specific type of chlorophyll that is measured to evaluate the amount of algae in a waterbody. Monitoring chlorophyll levels is a direct way of tracking algal growth; surface waters that have high chlorophyll conditions typically correlate with high levels of nutrients, commonly phosphorus and nitrogen. In the Deschutes River between RM 189.4 and RM 168.2, Chlorophyll a levels exceed Oregon's standard during the summer (ODEQ 2012). The ODEQ set this standard to protect multiple uses in the river, including resident fish and aquatic life, water supply, aesthetics, livestock watering, and fishing.

4.9.3.5 Sedimentation

Sedimentation refers to deposits of silt, sand, or other small particles in a river. In the Deschutes River, 54 miles between Wickiup Reservoir (RM 226.8) and the PBC diversion (RM 164.8) do not meet Oregon's standards for sedimentation (ODEQ 2012; Table 4-8). The ODEQ set this standard to protect resident fish and aquatic life and salmonid fish spawning and rearing in the river. In the Deschutes River, lower winter flows and higher summer flows have contributed to increased bank erosion. Increased bank erosion contributes to increased sediment in the river. The river carries this

sediment downstream and deposits it along the riverbed. Deposited sediment can affect fish and aquatic life by reducing the quantity and quality of available habitat.

4.9.3.6 Turbidity

Turbidity is a measure of water cloudiness. In the Deschutes River, 54 miles between Wickiup Reservoir (RM 226.8) and the PBC diversion (RM 164.8) do not meet Oregon's turbidity standard during the spring and summer (ODEQ 2012; Table 4-8). This standard is set to protect aesthetics, resident fish and aquatic life, and water supply in the river. Suspended sediment, algae, and other suspended or dissolved materials contribute to increased turbidity.

4.9.3.7 E. Coli

E. coli is a bacterium that indicates fecal contamination. Due to *E. coli*'s ability to indicate the presence of human pathogens, the bacteria are used as an indicator for fecal contamination. In the Crooked River, the *E. coli* levels in all reaches associated with District operations exceed Oregon's standards during the summer (ODEQ 2012; Table 4-8). ODEQ set this standard to protect multiple uses in the river including recreation and domestic purposes. High levels of bacteria can cause human illness.

4.9.3.8 Biological Criteria

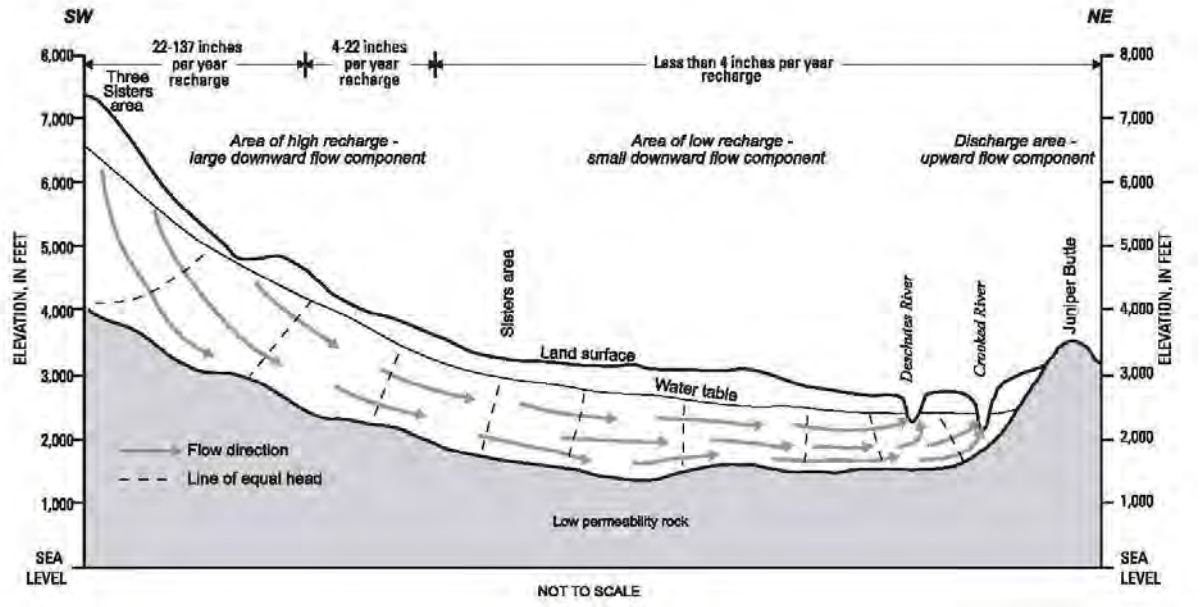
The biological criteria parameter on the 303(d) list indicates that a waterbody does not meet standards for biological integrity of aquatic communities (primarily macroinvertebrates). The Crooked River does not meet Oregon standards year-round for biological criteria (ODEQ 2012; Table 4-8). Aquatic communities, which are 60 percent or less of the expected reference community, indicate that the waterbody is of insufficient water quality to support aquatic species and are therefore an area of concern.

4.9.3.9 Aquatic Weeds or Algae

The aquatic weeds and algae parameter on the 303(d) list indicate that a waterbody has received health advisories for harmful algal blooms. Crane Prairie Reservoir and Wickiup Reservoir have been issued health advisories for exceeding toxicity levels (ODEQ 2012; Table 4-8). ODEQ set this standard to protect multiple uses in the waterbodies. Harmful algal blooms can produce toxic substances, which pose danger to people and animals that drink or come into contact with affected waters.

4.9.4 Groundwater

Groundwater associated with District operations is primarily limited to the upper Deschutes Basin and is bounded on the north by the Crooked River, Jefferson Creek, the Metolius River, the Deschutes River, and Trout Creek; on the east by the geological change between the Deschutes Formation and the much less permeable John Day Formation; on the south by the drainage that divides the Deschutes Basin and the Fort Rock and Klamath Basins; and on the west by the Cascade Mountain Range (Figure 4-7).



Notes:
Flow generally moves east then north before discharging to the streams along the edge of the Cascade Range or the streams and rivers near the confluence of the Metolius, Deschutes, and Crooked Rivers.
Source: Gannett et al. 2001

Figure 4-7. Precipitation recharge in the Deschutes Basin Regional Aquifer.

Within the upper Deschutes Basin, precipitation in the Cascade Range provides up to 3,500 cfs of annual groundwater recharge. Inflows from outside the upper Deschutes provide up to an additional 850 cfs of recharge. Canal leakage across the region provides up to approximately 411 cfs of additional recharge based on 2008 data (Gannett et al. 2001; Gannett and Lite 2013). Since the publication of the report, subsequent canal lining and piping projects have further reduced recharge from canal leakage.

Groundwater generally flows east and then north through the basin. Approximately half of this groundwater discharges into streams through springs along the edge of the Cascade Mountains. The remainder of this groundwater discharges into streams and rivers near the confluence of the Metolius, Deschutes, and Crooked Rivers (Gannett et al. 2001; Figure 4-7).

Due to the porous geology of the area, groundwater levels and stream discharge are associated with movement of water between surface and groundwater systems. The rivers, streams, and irrigation canals in the upper Deschutes watershed all show seepage losses indicative of the area's permeable geology (Gannett et al. 2001). The PBC and laterals within the project area lose an estimated 29.4 cfs of water[22] (9,392 acre-feet annually) due to a combination of seepage related to (1) the condition of the distribution system and porous nature of the underlying soil and rock and (2) evaporation. The water that is lost as canal seepage from the District's PBC and laterals likely enters the regional groundwater system that discharges near or into Lake Billy Chinook.

[22] These losses are derived from two loss assessments and are estimated for the peak irrigation season when diversion rates are the highest (May 15 to September 14), as well as the District's assumption that there was additional loss in those reaches that was not captured in the measurements (Horrell personal communication, June 25, 2019a). See Appendix D for information on water loss in the system.

Cascade Range aquifers in the upper Deschutes Basin have experienced a general drying trend since the 1950s. Climate oscillations remain the primary driver of these declines (Gannett et al. 2001; Gannett et al. 2003). A U.S. Geological Survey (USGS) study between 1997 and 2008 investigated the influence of canal lining, groundwater pumping, and climate on water-level trends in the region. The study found an approximate 5- to 14-foot decline in groundwater levels in the central part of the region, which includes the proposed project area (Gannett and Lite 2013). The study found that 60 to 70 percent of the measured decline was associated with climate variations, 20 to 30 percent of the measured decline was associated with increased groundwater pumping, and 10 percent was associated with canal lining and piping (Gannett and Lite 2013). At the basin-scale, natural fluctuations in groundwater discharge largely mask the effects of development on discharge from the regional aquifer (Gannett et al. 2001).

4.10 Fish and Aquatic Resources

The affected environment for fish and aquatic species includes waterbodies that are associated with COID operations (Table 4-8).

4.10.1 General Fish and Aquatic Species

The District's canals do not support game fish, salmonids, or threatened and endangered aquatic species. Fish screens compliant with ODFW standards were installed on the North Canal Dam (RM 164.8) in 2004. These fish screens separate water diverted for consumptive use from water left instream and prevent any fish from entering the District's irrigation conveyance system.

There are 22 species of fish documented in the waterbodies associated with District operations (Appendix E). All 22 of these fish species are potentially present in the Deschutes River from Steelhead Falls (RM 128) to Lake Billy Chinook (RM 120) and in the Crooked River from RM 27.7 to its confluence with Lake Billy Chinook. Lake Billy Chinook is formed through the impoundment of the Crooked, Deschutes, and Metolius Rivers at the Pelton Round Butte Dam Complex. The summer steelhead, Chinook salmon, and sockeye salmon in these waterbodies are part of a reintroduction effort that began in 2009 to mitigate for blocked fish passage at the Pelton Round Butte Dam Complex (ODFW and CTWS 2008). Partners actively manage fish passage at the dam complex as a part of this effort.

Chinook and sockeye salmon are unable to navigate Steelhead Falls at RM 128, which creates the uppermost distribution limit for salmon in the Deschutes River. Summer steelhead are able to pass upstream of Steelhead Falls but are unable to navigate upstream of Big Falls at RM 132. Big Falls is considered the uppermost limit of anadromous fish distribution (ODFW 1996). Within the reach of the Crooked River that is associated with District operations (RM 0 to 27.7), there was one fish passage barrier, the Opal Springs Dam at RM 6.7, which was the second-highest-priority fish passage barrier in the state of Oregon. Upstream and downstream fish passage has been restored at the dam, eliminating the need for trap and haul methods.

Both indigenous and introduced fish species are potentially present in the Deschutes River. Mountain whitefish and redband trout are indigenous salmonid species found in the Deschutes River from North Canal Dam (RM 164.8) to the upper end of Lake Billy Chinook (RM 120). Bridgelip sucker, chiselmouth, largescale sucker, longnose dace, northern pike minnow, and sculpin species are indigenous, non-salmonid species found between Big Falls (RM 132) and Lake Billy Chinook (RM 120). Brook trout, brown trout, and rainbow trout are introduced salmonid species

that are also found in the Deschutes River waterbodies associated with COID operations. Brown trout and brook trout were introduced to the Deschutes Basin by state and federal agencies in the early 1900s. Rainbow trout is a managed species that has been stocked in the Deschutes River and its lakes and tributaries for over 100 years. In the 1990s, ODFW adopted the Wild Fish Policy and stopped stocking rivers with hatchery-origin coastal rainbow trout to protect populations of native redband trout (ODFW 1996, Bohling et al. 2017). Rainbow trout are still found in areas of the Deschutes River.

The Crooked River from Lake Billy Chinook (RM 0) to RM 27.7 is expected to have similar fish species as the Deschutes River between North Canal Dam and Lake Billy Chinook. In 2004, USGS conducted visual assessments of fish assemblages in reaches of the Crooked River from RM 7.8 to RM 19.6. Mountain whitefish, sculpin species, dace species, chiselmouth, three-spined stickleback, rainbow trout, and northern pike minnow were observed during these snorkel surveys (Torgersen et al. 2007). Since the late 1800s, changes to the Deschutes and Crooked Rivers' surface water flows, construction of fish passage barriers, and reservoir management have created a very different aquatic environment with resulting changes to the fish species assemblages.

From September to November, Wickiup Reservoir operations rapidly reduce outflow into the upper Deschutes River and release a regulated low flow during the non-irrigation season to promote winter water storage. Fall reductions in outflow from Wickiup Reservoir historically caused streambeds and streambanks, especially inside channel habitats, to become dewatered and exposed, diminishing suitable habitat for fish and other aquatic species (DRC 2012; Starcevich and Bailey 2017). One example is the side channels near Lava Island (RM 173.6). Since 2014, either ODFW staff or the District has organized a yearly volunteer operation to salvage surviving fish in response to channel dewatering and high fish mortality following the Wickiup Reservoir fall outflow reduction (Jennings 2016). In 2014, the majority of the 7,000 fish rescued were identified as native, juvenile redband trout and less than 1 percent non-native brown trout, which may have important management implications (Starcevich et al. 2015; Jennings 2016).

During the remainder of the non-irrigation season, the regulated low flows in the main channel of the upper Deschutes can exacerbate cold water temperatures and, in severe winters, may enable ice formation instream. Extremely cold and icy conditions may induce long periods of stress, promote direct mortality, or cause fish to crowd into deeper pools where they may be more susceptible to predation (Starcevich et al. 2015; DRC 2012).

In contrast, elevated water temperatures in the upper and middle Deschutes River during the irrigation season negatively affect salmonid growth and survival (Recsetar et al. 2012). The availability of cold water refugia for temperature-sensitive fish species is important when river temperatures rise above acceptable standards. Water temperatures that are out of the normal range for a given fish species can increase physiologic stress, increase susceptibility to predators, and influence growth rates, feeding, metabolism, and development. Water temperature changes in the affected area are described in Section 4.9.3.1.

In addition to fish, other aquatic species are potentially found within or along waterbodies (not including the irrigation ditches) that are associated with District operations. These other aquatic species include bullfrog (*Lithobates catesbeianus*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris regilla*), and long-toed salamander (*Ambystoma macrodacylum*). The western toad, Pacific treefrog, and long-toed salamander are native to Oregon and may be present in open irrigation canals and adjacent banks where there is suitable vegetation (S. Wray, personal communication, November 17, 2017). The bullfrog is considered an invasive species that was introduced to Oregon

in the early 1900s (Snow and Witmer 2010). All these amphibians are listed as species of least concern by the International Union for Conservation of Nature (IUCN 2017).

4.10.2 Federally Listed Fish and Aquatic Species

Federally listed fish and aquatic species that are known to occur in the waterbodies associated with District operations are Oregon spotted frog, steelhead, and bull trout (USFWS 2019a). None of these species is known to occur within the PBC and laterals within the project area.

USFWS lists Oregon spotted frog as threatened under the ESA. The Oregon spotted frog and its designated critical habitat occur in the Deschutes River upstream of the City of Bend (RM 173) including Wickiup and Crane Prairie Reservoirs (Appendix E). USFWS has identified Primary Constituent Elements (PCEs) for Oregon spotted frog critical habitat (81 *Federal Register* 29335, 2016). PCEs represent the biological and physical features that are essential to the conservation of a species and describe habitat components that support one or more life stages of the species. PCEs for Oregon spotted frog describe areas that have appropriate water depths and refuge from predators, aquatic connectivity, and absence of non-native predators. A detailed list of Oregon spotted frog Critical Habitat PCEs is provided in Appendix E.

USFWS also lists bull trout as threatened under the ESA, and critical habitat is designated. Bull trout are known to be present in the Deschutes River from Big Falls (RM 132) to Lake Billy Chinook (RM 120) (ODFW 2005, 1996) and in the Crooked River from its confluence with Lake Billy Chinook upstream to the Opal Springs Dam (RM 6.7) (USFWS 2010). Designated critical habitat for bull trout occurs in the Deschutes River from Big Falls (RM 132) to Lake Billy Chinook (RM 120) and the Crooked River from the LPID headgate spillway downstream to Lake Billy Chinook (RM 27.7) (Appendix E). The PCEs for bull trout describe habitat that has aquatic connectivity, complex habitat structure, water temperatures ranging from 35.6 °F to 59°F, natural variability in streamflow, a sufficient food base, and the absence of non-native predatory and competing fish (70 *Federal Register* 56211, 2005). A detailed list of Critical Habitat PCEs for bull trout is provided in Appendix E. Although critical habitat for bull trout is designated in the Deschutes River from Big Falls to Lake Billy Chinook, a 2014 study found no evidence of bull trout in this section of the Deschutes River (Starcevich 2016).

Steelhead populations are listed as threatened under the ESA and are present within the area affected by the project (Appendix E). However, the population in the Deschutes River (Middle Columbia River steelhead) is classified as a non-essential experimental population (NEP) under Section 10(j) of ESA and critical habitat is not designated (76 *Federal Register* 28715, 2011). Because of this classification, and because the NEP is located outside of a National Wildlife Refuge System and a National Park System, the population is treated as "proposed for listing" under ESA Section 7 (76 *Federal Register* 28715, 2011; 81 *Federal Register* 33416, 2016).

4.10.3 State Listed Species

The ODFW maintains a list of native wildlife species in Oregon that have been determined to be either threatened or endangered according to criteria set forth by rule Oregon Administrative Rule (OAR) 635-100-0105 (ODFW 2019). There are no threatened, endangered, or candidate fish or aquatic species known to occur within the waterbodies associated with COID operations or within the project area.

4.11 Wetland and Riparian Areas

Wetland and riparian areas affected by District operations occur in three areas: the project area, 25.5 miles of the North Unit Main Canal between NUID's diversion at North Canal Dam and the COID spill into the North Unit Main Canal, and 149.5 miles of natural waterbodies associated with District operations (Table 4-6).

Wetlands perform a number of valuable functions including water storage, water filtration, and biological productivity. They can also support complex food chains that provide sources of nutrients to plants and animals and provide specialized habitat for a wide variety of aquatic and terrestrial species. Wetlands in the area associated with the proposed action may be subject to federal or state regulations depending on their characteristics. Within the State of Oregon, wetlands are managed under two regulations, the CWA, and Oregon Removal-Fill Law.

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the CWA with the oversight of the U.S. Environmental Protection Agency (USEPA). This law regulates the dredge or fill of wetlands over which the USACE has jurisdiction (or "jurisdictional wetlands").

Section 404 of the CWA defines wetlands as "those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1986).

The Oregon Department of State Lands (ODSL) implements the Removal-Fill Law (ORS 196.800-990), which regulates the removal or fill of material in wetlands or waterways, requiring any person who plans to "remove or fill" material within "waters of the state" to obtain a permit from ODSL.

Per the Oregon Removal-Fill statute OR 141-085-0515(9), an irrigation ditch is not jurisdictional under Oregon Removal-Fill permitting if it meets both of the following (ODSL 2013):

- The ditch is operated and maintained for the primary purpose of irrigation; and
- The ditch is dewatered[23] outside of the irrigation season except for isolated puddles in low areas.

Language provided in the 1986 Final Rule for Regulatory Programs of the Corps of Engineers (1986 Final Rule) identified that irrigation ditches are generally not considered Waters of the U.S. for the purpose of determining CWA Section 404(f)(1)(C) applicability. However, USEPA reserved the "right to determine on a case-by-case basis if any of these waters are "Waters of the United States…" including, "…irrigation ditches excavated on dry land…" (USACE 1986). In 2006, a "significant nexus" jurisdiction standard from Rapanos v. United States (547 U.S. 715 2006) was established, which has been used to determine if identified waters are "Waters of the United States." In 2015, the Clean Water Rule: Definition of "Waters of the United States" (2015 Final Rule; 80 FR 37053) was published and provided clear exclusions for certain types of ditches. However, in September 2019, the 2015 rule was repealed and, pending further action of the court, the pre-2015 regulations are expected to be reenacted.

Riparian areas are transition zones between waterbodies and adjacent upland areas that support hydrophytic vegetation that is dependent upon the hydrology of the waterbody. Riparian areas are

[23] "Dewatered" means that the source of the irrigation water is turned off or diverted from the irrigation ditch. A ditch that is dewatered outside of the irrigation season may be used for temporary flows associated with stormwater collection, stock water runs, or fire suppression.

defined by Section 404 of the CWA as "areas next to or substantially influenced by water. These may include areas adjacent to rivers, lakes, or estuaries" (USEPA 2015). Riparian areas are typically associated with high-water tables due to the close proximity to aquatic ecosystems, certain soil characteristics, and a range of vegetation that requires free water or conditions that are moister than normal (Oakley et al. 1985).

4.11.1 Project Area

Water typically flows through the PBC and laterals during the irrigation season (April to October). Water may also occasionally flow through these canals outside of the irrigation season for stock water deliveries or be present as standing water following rain or snow events. Hydrophytic plants are sometimes found along the banks of the PBC and laterals within the project area, or in adjacent low-lying areas outside of the project area, as the hydrology provided by the PBC and laterals can create favorable growing conditions during a portion of the year.

Through analysis of the National Wetland Inventory (NWI)[24] geographic information systems data (USFWS 2016) and aerial imagery, two potential sites were identified as Freshwater Emergent Wetlands within or adjacent to the project area that could be affected by implementation of the proposed project. The NWI data is used as a first-step approach in identifying and evaluating potential wetlands in the project area. Jennifer Moffitt, NRCS Resource Soil Scientist, performed an informal off-site wetland inventory of the two areas and determined that these are artificial wetlands and not jurisdictional under federal or state regulation.

4.11.2 North Unit Main Canal

Vegetation along the North Unit Main Canal is minimal due to NUID's vegetation management program; however, wetland and riparian areas adjacent to the canal[25] are influenced by the available water gained through seepage as water is passed through the canal as part of NUID operations. Construction would not occur within or adjacent to the North Unit Main Canal; however, the proposed action would affect the amount of water available to wetlands and riparian areas adjacent to the canal.

4.11.3 Wetland and Riparian Areas Along Natural Waterbodies Associated with District Operations

Wetlands are found within and sporadically adjacent to Crane Prairie Reservoir, Wickiup Reservoir, and the 149.5 miles of Deschutes and Crooked Rivers associated with District operations. The types of wetlands that are found include marshes and wet meadows that are dominated by herbaceous plants, and swamps dominated by herbaceous plants, shrubs, or trees (UDWC 2003). Riparian areas of varying size and quality occur adjacent to natural waterbodies associated with District operations. Low streamflow in late fall, winter, and early spring associated with upstream reservoir storage limits riparian vegetation in the Deschutes River (RDG 2005). Low streamflow along these reaches can expose the channel bed and riverbanks, facilitating increased erosion and fine sediment delivery following freeze-thaw processes and increased spring streamflow (RDG 2005). Because streamflow is strongly correlated with critical physical and biological characteristics of the river, it influences the functions of associated riparian areas (National Research Council 2002). As riparian areas become

[24]The NWI code uses the Cowardin classification system. For further information about Cowardin classifications, refer to *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et. al 1979).

[25] Through analysis of the NWI geographic information systems data (USFWS 2016) and aerial imagery, 29 potential sites were identified as Freshwater Emergent Wetlands adjacent to the NUID Main Canal.

hydrologically disconnected from their adjacent stream channels, they lose many of their ecological functions.

4.12 Wildlife Resources

4.12.1 General Wildlife

Generally, wildlife present within the project area consists of habitat generalists or edge species with the ability to adapt or exploit the agricultural environment. These species are tolerant to disturbance and include deer, coyote, skunk, grey squirrel, raccoon, and red-tailed hawk (Blair 1996; Ditchkoff et al. 2006; McKinney 2002; Shochat et al. 2006).

Wildlife within the project area may use the canal and lateral system as a water source and dispersal corridor. Additionally, where not cleared, vegetation along the PBC and laterals can provide food, cover, and breeding sites for many wildlife species throughout the year. Appendix E contains a list of wildlife species that are likely to occur in the project area.

4.12.2 MBTA/BGEPA Species

Multiple bird species potentially occur within the project area some of which are protected under the Migratory Bird Treaty Act (MBTA) or the Bald and Golden Eagle Protection Act (BGEPA). Although migratory birds are known to travel through the project area and its vicinity, limited habitat is provided within the project area and COID's ROW due to maintenance activities that remove vegetation on an annual basis. Appendix E has a list of MBTA/BGEPA species that potentially occur within the project area.

USFWS maintains a database of known golden and bald eagle nesting sites. The area along the Crooked River, between Smith Rock State Park and the Crooked River Bridge, is the only known eagle territory within a half-mile of the proposed project (J. Cordova, personal communication, April 19, 2018). No other eagle (bald or golden) territories are known to be within a half-mile of the proposed project (J. Cordova, personal communication, April 19, 2018), although it is also possible that a nest could be located near irrigation ponds and/or a proposed pipeline during implementation of the project.

4.12.3 Federally Listed Species

A review of available USFWS data showed no federal threatened, or endangered terrestrial wildlife species, designated critical habitat, or federal species of concern with potential to occur within the project area. Federally listed aquatic species are discussed in 4.10.2.

4.12.4 State Listed Species

ODFW maintains a list of native wildlife species in Oregon that are either threatened or endangered according to criteria set forth by rule (OAR 635-100-0105) (ODFW 2019). There are no state-listed terrestrial species known to occur within the project area.

4.13 Wild and Scenic Rivers

Three federally designated Wild and Scenic Rivers (PL 90-542; 16 U.S.C. 1271 et seq.) have the potential to be affected by the proposed project:

- The Deschutes River from Wickiup Reservoir (RM 226.8) to the Bend Urban Growth boundary at the southwest corner of Section 13, T.18 S., R.11 E.[26] (approximately RM 172) is classified as Scenic[27] and Recreational[28] with Outstandingly Remarkable Values (ORVs) including: Cultural, Fish, Geologic, Recreation, Scenery, Wildlife, and Vegetation. The upper Deschutes River has no sections classified as Wild (USDA 1996a).
- The Deschutes River from Odin Falls (RM 139.9) to the upper end of Lake Billy Chinook (RM 120) is classified as Scenic with ORVs including: Cultural, Fish, Geologic, Recreation, Scenery, Wildlife, Hydrology, Botanical/Ecological, and Wilderness (BLM 1992).
- The Crooked River from the National Grasslands boundary (RM 25.8) to Dry Creek (RM 8) is classified as Recreational with ORVs including: Geologic, Recreation, Scenery, Wildlife, Hydrology, and Botanical/Ecological (BLM 1992).

Additional information regarding the ORVs is provided in Appendix E.

The overall goals of the Wild and Scenic River Management Plans (USDA 1996a; BLM 1992) are to maintain the current character of the river area and provide long-term protection and enhancement of its ORVs. Additional goals include protecting and enhancing instream and land-based biological, cultural, and physical resources; and providing for appropriate recreational use and public access while maintaining the wild and scenic nature of the river (USDA 1996a; BLM 1992). Recommended streamflow presented in these plans are presented in Table 4-9.

Table 4-9. Recommended Flows presented in Wild and Scenic Management Plans.

Waterbody Name	Reach	Recommended Flows[1]
Upper Deschutes River	Below Wickiup Reservoir (RM 226.8)	Minimum: 300 cfs[2]
		Maximum: 1500 cfs[2]

Notes:
[1] The Wild and Scenic Rivers Act states that the Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the county's more outstanding free-flowing river, however, designation does not affect existing water rights or the existing jurisdiction of states and the federal government over waters as determined by established principles of law.
[2] The recommended flows shown in this chart describes Option 5, the preferred option, as presented in the Upper Deschutes Wild and Scenic River Record of Decision and Final Environmental Impact Statement (USDA 1996b).

[26] Dimensions of a quarter section include township (T), and range (R). Township measures the distance north or south from the base line. Range measures east or west from the principal meridian.

[27] The section from the north boundary of Sunriver to Lava Island Camp is classified as Scenic, defined as, "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads" (USDA 1996a).

[28] The sections from Wickiup Dam to the northern boundary of Sunriver and the section from Lava Island to the Bend Urban Growth Boundary are classified as Recreational, defined as, "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past" (USDA 1996a).

In addition to federally designated Wild and Scenic Rivers, several reaches of the Deschutes River that have the potential to be affected by the proposed project are designated Oregon State Scenic Waterways (ORS 390.826). These locations, with specific exclusions and classifications, are detailed in Table 4-10.

Table 4-10. Designated Oregon Scenic River Waterways Associated with District Operations.

Waterbody Name	Classification	Reach
Upper Deschutes River	Scenic River Area[1]	From RM 224.5 to RM 204, with the exception of Pringle Falls (RM 217.5 to RM 216.5)
	Scenic River Area	From the Deschutes National Forest boundary in Section 20, T19S, R11E (approximately RM 184.8) to the Bend UGB (approximately RM 172)
	River Community Area[2]	From RM 226.4 to approximately RM 224.5; from RM 217.5 to RM 216.8; from RM 204 to about RM 199; and from RM 172 to RM 171
	Recreational River Area[3]	From RM 190.6 to approximately RM 184.8
Middle Deschutes River	Scenic River Area	From Deschutes Market Road (approximately RM 157) to the south boundary of the Wilderness Study Area (approximately RM 131), with the exception of the Clines Falls Dam and powerhouse between State Highway 126 Bridge (RM 144.9) and RM 144 and the Crooked River Ranch River Community Area (RM 131.5 to RM 129.9)
	River Community Area	From RM 164 to approximately RM 161; from RM 131.5 to RM 129.9; and from RM 125.25 to RM 124.3
	Recreational River Area	From the northern Bend Urban Growth Boundary (RM 161) to Tumalo State Park (RM 158)
	Natural River Area[4]	From the south boundary of the Wilderness Study Area at approximately RM 131 to Lake Billy Chinook (RM 120), except for RM 131.5 to RM 129.9

Notes:
[1] Those designated Scenic waterways or segments with related adjacent lands and shorelines still largely primitive and largely undeveloped, except for agriculture and grazing, but accessible in places by roads. These classified areas will be administered to maintain or enhance their high scenic quality, recreational value, and fishery and wildlife habitat, while preserving their largely undeveloped character and allowing continuing agricultural uses.
[2] Those designated areas of a Scenic waterway where density of structures or other developments already exist and precludes application of a more restrictive classification.
[3] Those designated Scenic waterways that are readily accessible by road or railroad and that allow a wide range of compatible, river-oriented, public, and outdoor-recreation opportunities, to the extent that these do not substantially impair the natural beauty of the scenic waterway or diminish its aesthetic, fish and wildlife, scientific, and recreational values.
[4] Those designated Scenic waterways that are generally inaccessible except by trail or the river, with related adjacent lands and shorelines essentially primitive. These classified scenic waterways will be administered to preserve their natural, wild, and primitive condition, essentially unaltered by the effects of humans, while allowing compatible recreational uses, other compatible existing uses, and protection of fish and wildlife.
Source: ORS 390.826

5 Alternatives

5.1 Formulation Process

A large number of alternatives were initially considered in the Preliminary Investigative Report (PIR). The formulation of alternatives followed CEQ regulations for implementing NEPA and numerous USDA-NRCS watershed planning policies. Scoping comments were also incorporated into the formulation of alternatives. Their inclusion included the reevaluation of alternatives initially dismissed from consideration in the PIR where the public provided new information to consider in the alternative evaluation process.

When formulating an alternative, it was first determined whether the alternative met the project's purpose. The project's purpose is to: improve water conservation in District infrastructure, improve water delivery reliability for District patrons within the project area, and improve public safety along District infrastructure (Section 2). After considering whether the alternative met the project's purpose, the alternative was further analyzed for four criteria: completeness, effectiveness, efficiency, and acceptability (1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies [P&G] 1.6.2c). Some of the initial alternatives considered did not meet the formulation criteria and were eliminated from further analysis (Appendix D.2).

5.2 Alternatives Eliminated from Detailed Study

The following subsections describe alternatives that met the formulation criteria, but after further consideration were not analyzed in detail as viable alternatives. Alternatives that did not address the purpose and need for action or became unreasonable because of cost, logistics, existing technology, or environmental reasons were removed from consideration (National Watershed Program Manual [NWPM] 501.37; P&G 6.5b). Appendix D presents additional information on alternatives that were eliminated due to cost.

5.2.1 On-Farm Efficiency Upgrades

On-farm efficiency upgrades refer to patrons upgrading their on-farm infrastructure to use irrigation technologies that provide a more precise application of water. On-farm infrastructure is distinct from the District's PBC and laterals because it is owned and operated by patrons. Once delivered by the District and arriving on-farm, water can either be released to flow over the land for flood irrigation or stored in a holding pond and later pumped out for sprinkler irrigation systems. Typical on-farm irrigation systems include center-pivots, wheel-lines, hand-lines, K-lines, drip systems, and flood irrigation. Each irrigation system has a different application efficiency (i.e., its ability to deliver the irrigation water to the crop root system across the full field being irrigated). Farms within the District are irrigated through flood irrigation (26.9 percent of the total acreage in COID), center-pivot (23.5 percent), and wheel-line (21.6 percent) (COID 2018).

Voluntary programs to increase on-farm water use efficiency by other agencies and organizations are ongoing within the District and the Deschutes Basin. However, on-farm efficiency upgrades would not meet the project purpose. Water loss due to seepage would still occur in District infrastructure as would operational inefficiencies. There would be no improvement in public safety along District infrastructure, as the canals would remain open. On-farm efficiencies would not meet the other purpose and needs of the project to improve water delivery reliability and public safety. Because the

PBC and laterals would remain open, improving water delivery reliability would not be met due to operational efficiencies, and public safety would remain an issue.

If PL 83-566 funds were used to develop and implement on-farm efficiency upgrades, the use of these funds would require the District to complete an SHPO/National Register of Historic Places analysis for each individual property owner. It would potentially put the District into a position of having to mitigate cultural resources on private property and could result in COID having to develop long-term maintenance or preservation agreements on lands not subject to District control. This approach is logistically complex and would increase project costs. While COID's Resolution 2014-7, Protection of District Water Rights Beyond the District's Points of Delivery, allows the District to improve private irrigation infrastructure, the policy is only intended to address delivery barrier issues that could jeopardize the beneficial use of water. The on-farm efficiency upgrade alternative was eliminated from further study because it does not meet the purpose and need of the project and would be logistically unreasonable.

5.2.2 Canal Lining

Canal lining would involve covering the bottom and sides of the currently open PBC and laterals with a geotextile liner and shotcrete to prevent water from seeping into the underlying soils and rock. Canal lining would require sub-grade preparation, geotextile liner installation, and application of a layer of shotcrete to protect the geotextile liner.

Lining would increase water velocity in the PBC and laterals because the shotcrete cover is a smoother surface than the existing underlying rock. This makes the sides of the canal and laterals slippery and more difficult for anyone who might accidently fall in the water to be able to climb out. To address the increased public safety concerns caused by the installation of lining, standard chain link fence with a 3-wire barbed wire cap would be installed along the length of the PBC and laterals to prevent public access to the channel, increase public safety, and reduce District liability. In channels deeper than 2 feet, safety ladders would be installed every 750 feet to provide the opportunity for human and animal escape.

The canal lining alternative would meet the project purpose of conserving water and improving public safety. Lining would reduce water loss from seepage by up to 14.3 cfs during the irrigation season (4,568 acre-feet annually), and fences and ladders would increase public safety. Water loss in an open, lined system is estimated to be 10 percent based on studies of canal lining (Swihart 2002). Lined canals, however, are vulnerable to tears or cracks in the lining; seepage from torn or cracked lined canals is similar to that from unlined canals.

The lining materials would be expected to have a lifespan of 33 years before needing to be replaced. Before replacement, as the system aged it would likely require progressively increasing maintenance to account for lining cracks and tears.

Capital costs of canal lining were estimated based on the size of the existing open PBC and laterals, and material unit costs were based on the experience of nearby Three Sisters Irrigation District. Annual operating costs associated with canal lining were estimated based on COID's current operating budget, with a 25 percent increase in equipment, maintenance, and labor costs due to the relatively fragile nature of a lined canal compared to an unlined canal. Assuming a 33-year design life, the estimated capital costs, replacement costs, and annual O&M costs are $29,405,000 for Project Group 1 and $12,910,000 for Project Group 2 over 100 years (2019 U.S. dollars). Based on this cost, canal lining was eliminated from further study (see Appendix D.3 for cost details).

5.2.3 Piping Private Laterals

Piping private laterals refers to converting patron-owned, open laterals to piped laterals from the District's point of delivery to the point of use on-farm. Private laterals are owned and operated by patrons; the District does not have responsibility for the operation or maintenance of private laterals.

This alternative would have the same logistical complexities as discussed in Section 5.2.1, which make this alternative unreasonable.

Piping private laterals, similar to on-farm irrigation upgrades, would meet the project purpose of conserving water. However, it would not meet the purpose to improve water delivery reliability or public safety because the District-owned PBC and laterals would remain open. Piping private laterals was eliminated from further study because it would not fully meet the purpose of the project and would be logistically unreasonable.

5.2.4 Combination of Alternatives

A combination of the eliminated alternatives was rejected based on the same reasons the alternatives were eliminated individually: both on-farm efficiency upgrades and piping private laterals were eliminated due to their inability to meet the project purpose and logistical complexities.

5.3 Alternatives Description

Of the project alternatives that were considered for the COID's Infrastructure Modernization Project, two were selected for further evaluation:

- No Action (Future without project)—Limited improvements to existing open PBC and laterals occur with incremental funding; and
- Piping Alternative—Replace the existing open PBC and laterals within the project area with a closed conduit pipeline system.

These alternatives are discussed further in the following sections and include only COID-owned infrastructure.

5.3.1 No Action (Future without Federal Funding)

Under the No Action Alternative, federal funding through PL 83-566 would not be available to implement the project. The District would continue to operate and maintain its existing canal, lateral, and pipe system in its current condition. However, even in the absence of federal funding, the District would pursue other funding sources to begin piping the PBC beginning with the tail end of the system. Over the next 4 years,[29] the District would pursue grants and loans totaling approximately $3,000,000 per year for piping.

Based on the funding the District would pursue for piping and current District priorities, the No Action Alternative represents piping 2.3 miles of Project Group 1 (see Figure 5-1). This would cost the District $12,720,000.

[29] A period of 4 years was selected because the District views this as a reasonably foreseeable timespan to have reasonable certainty of the funding mechanisms and amounts that are available for piping (C. Horrell, personal communication, November 18, 2019b). The District's ability to obtain funding for piping beyond the next few years is not certain to occur.

The No Action Alternative would not meet the purpose and need. Piping would occur only in isolated sections of the project area; therefore, water loss to seepage and evaporation in District infrastructure, water delivery and reliability for farmers, streamflow and habitat conditions for fish and aquatic species, and public safety would not improve enough to meet the sponsors' objectives.

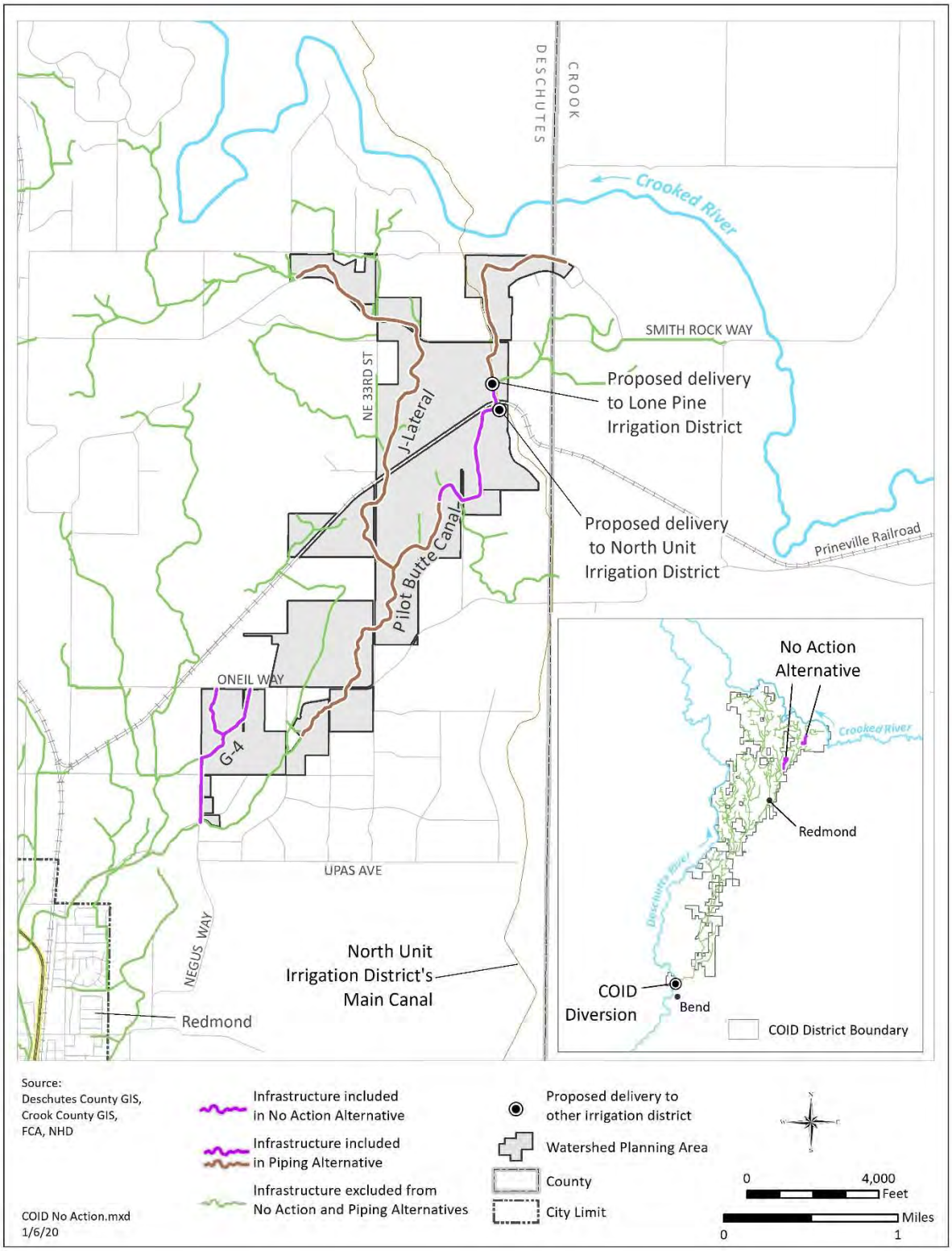


Figure 5-1. The No Action Alternative.

5.3.2 Piping Alternative (Future with Federal Funding)

Under the Piping Alternative, federal funding through PL 83-566 would be available. The District would pipe approximately 7.9 miles of its system including the tail end of the PBC, the G-4 Lateral, and a segment of the J Lateral (Figure 5-2). A new segment of pipe would be installed with a new point of delivery to pass water to the NUID Main Canal. A new turnout would also be added to allow for a change in the location of LPID's delivery. On the G-4 Lateral, a booster pump would be installed to provide pressurization to patrons on the lateral.

The delivery system would be piped with high-density polyethylene (HDPE) solid-wall pipe ranging in diameter from 8 to 48 inches. HDPE pipes were selected because they are resistant to pressure from water hammer and have high tensile strength. During installation, HDPE pipes are welded together, minimizing the need for expensive fittings and thrust blocks. HDPE pipe is easy to install, bendable, retains its properties between -220 °F and 180 °F, and has a design life of 100 years. It is also less susceptible to damage due to freezing water compared to other piping materials.

At the time of preparation of this Plan-EA, the District is considering several pipe materials for the high-pressure 102- and 108-inch diameter pipes associated with the project. The District is evaluating the cost effectiveness and constructability of these materials prior to selecting one of them. For the purpose of this Plan-EA, the large diameter pipes were conservatively costed based on an average price of currently available HDPE, steel, and fiberglass pipes (M. Wharry, personal communication, December 19, 2019).[30] A design life of 50 years for the large diameter pipes was also included in the National Economic Development (NED) calculation.[31] Appendix D.4 and D.5 provides more information on piping materials that were considered.

The selection of either HDPE, steel, or fiberglass material for 102- and 108-inch diameter pipes at project implementation would not change the project effects described in Section 6 of this Plan-EA, as determined through the tiered decision framework approach outlined in Section 1.4. The District would select a pipe material based on the material's constructability and cost-effectiveness at the time of implementation. At the time of project implementation, the material selected would meet both the NED cost-effectiveness requirements and construction requirements for the project. The NRCS State Conservationist would possess the final discretion to select the appropriate piping material.

Under this alternative, 42 District turnouts would be upgraded from open canal turnouts to pipe turnouts to allow the District to deliver water to patrons served off newly installed pipes. These turnouts would include an accurate water meter measurement device. Additionally, a small bridge would be constructed to carry both the L Lateral pipe and LPID delivery pipe across the North Unit Main Canal.

Construction of the Piping Alternative would occur in 2 project groups over the course of 4 years. Construction would occur during the non-irrigation season (October to April), with Project Group 1 construction beginning as early as the 2020 non-irrigation season. Construction of each project group is anticipated to require two non-irrigation seasons to complete.

[30] Market prices for HDPE, steel, and fiberglass pipe fluctuate frequently; therefore, this analysis used an average price across these materials. Market volatility related to COVID-19 has increased the magnitude of these price fluctuations, and using the average price rather than point-in-time market prices allows for a more durable analysis.

[31] Steel and fiberglass in some cases have been shown to have a lifespan of approximately 50 years.

Construction of the Piping Alternative would include mobilization and staging of construction equipment, delivery of piping to construction areas, excavation of trenches, fusing of pipelines, placement of pipe, compaction of backfill, and restoration and reseeding of the disturbed areas. Pipe installation would require storage areas for pipe, construction equipment, and other materials. Areas that have been previously disturbed and that are accessible through existing access routes would be used when possible.

The PBC and laterals identified for piping would be accessed from COID's existing maintenance roads when possible. Existing maintenance roads and overland access routes commonly used for O&M may require some improvements for use during construction. In some locations, temporary overland travel routes within COID's existing ROW and easements would be necessary to access certain laterals that do not have established maintenance roads. To facilitate restoration, temporary travel routes would be left in their natural condition, with only minimal alteration when necessary to allow travel during construction.

Vegetation clearing before construction, vegetation and weed management during construction, and reseeding after construction of COID's ROW and easements would be completed according to COID's current vegetation management practices and NRCS's Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). During construction, vegetation clearing would be minimized to the extent practicable. Trees would only be removed if there was no other alternative to access the construction site or they posed a safety threat to construction crews working in the canal or lateral trench.

O&M under the Piping Alternative would consist of an ongoing pipe inspection program that would systematically cover the entire system over a period of several years (most likely a 10-year cycle). During the irrigation season (April to October), work would be performed on an as-needed basis. Outside of the irrigation season, COID would perform system component maintenance and/or repairs to District meters, valves, and air and vacuum infrastructure.

The Piping Alternative contributes to the sponsors' objectives as follows:

- Improve water conservation: Full implementation of this alternative would reduce water loss from canal seepage and evaporation by an estimated 29.4 cfs (9,392 acre-feet) of water throughout the entire irrigation season.
- Improve water delivery reliability to patrons and farms within the project area: A piped and pressurized or partially pressurized system greatly increases conveyance efficiency, allowing patrons to adjust their deliveries to take the amount of water that they need when they need it and eliminating operational spills. This alternative would immediately improve water delivery reliability for the patrons served by the G-4 Lateral by providing these patrons with pressurized deliveries.
- Enhance streamflow and habitat conditions for fish and aquatic species: Following the completion of each project group and the verification and measurement of the total water savings, COID would incrementally pass 100 percent of the water saved from the project to NUID. In return, NUID would incrementally protect an equal volume of water in the Deschutes River below Wickiup Reservoir. Streamflow and habitat conditions along the Deschutes River would benefit from this protected water. Upon completion of the proposed action, 30.3 cfs (9,392 acre-feet)[32] would be released during the non-irrigation season to build

[32] Spread across the non-irrigation season (November 1 to March 31), 9,392 acre-feet would allow up to 30.3 cfs to be released from Wickiup Reservoir. Refer to Section 6.9.2.2 for more information.

on the minimum winter flows established by the 2016 Settlement Agreement (see Section 4.9 and Section 6.10.2 for more details).

- Improve public safety within the project area: After completion, the project would improve public safety along 7.9 miles of the District's conveyance system. All open canals and laterals in the project area would be converted to buried pipe. This would decrease the risk of drowning, flooding, and other serious accidents associated with open canals.
- Reduce O&M costs: A piped system would eliminate the need to inspect, repair, and remove obstructions from the open PBC and laterals in the project area. This alternative would reduce the need for staff to manually adjust diversion amounts within the project area. Additionally, the piping installed would provide full pressurization for patrons served by the G-4 Lateral and partial pressurization for other patrons, which would reduce patron pumping.

The estimated project installation cost for the Piping Alternative would be $37,591,000. With additional project administration and technical assistance costs, the total project cost would be $42,306,000.

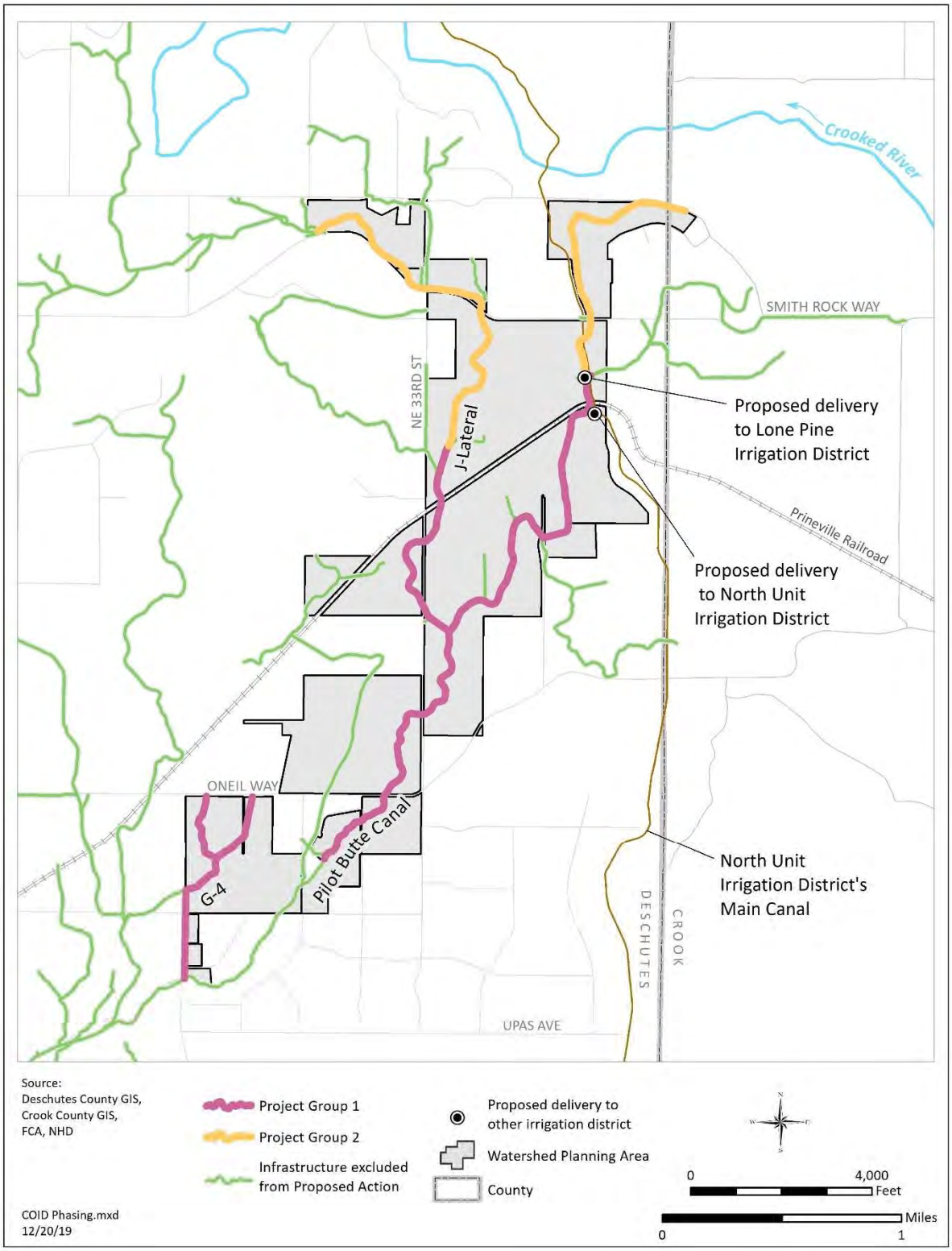


Figure 5-2. The Piping Alternative.

5.4 Summary and Comparison of Alternatives

Table 5-1 compares the No Action/Future without Project (Alternative 1) and the Piping Alternative (Alternative 2). The table summarizes measures addressed as well as environmental, social, cultural, and economic effects.

Table 5-1. Summary and Comparison of Alternatives.

Watershed Plan Element	Item or Concern	Alternative 1: No Action	Alternative 2: Piping Alternative (NED Recommended)
Measures to Address	Habitat for fish and wildlife	Instream water lease of up to 3.7 cfs below Wickiup Reservoir would have negligible improvements to water quality and habitat enhancement during the non-irrigation season.	Instream water lease of up to 30.3 cfs below Wickiup Reservoir would improve water quality and enhance habitat during the non-irrigation season.
	Public safety	Approximately 2.3 miles of the PBC and laterals would be replaced with underground pipe, which would reduce the risk for drowning, flooding, or other serious accident.	Approximately 7.9 miles of the PBC and laterals would be replaced with underground pipe, which would reduce the risk for drowning, flooding, or other serious accident.
	Water delivery reliability for agriculture	Water delivery reliability for agriculture would improve slightly for irrigators within the District. Pressurized water would be available to some patrons within the District.	Water delivery reliability for agriculture would improve for irrigators within the District. Pressurized water would be available to some patrons within the District.
Installation Costs	NRCS Contribution	$0	$29,003,000
	Sponsoring Local Organization Contribution[1]	$12,720,000	$13,303,000
	Total	$12,720,000	$42,306,000
	[1] These contribution include sponsor responsibility for road crossings, bridge removal, bridge installation, and railroad crossings. Local sponsors are responsible for all costs including engineering, design, and construction associated with the referenced activities.		
	Project Group 1[1]		
NED Account	Average Annual Cost		
	Installation	$360,000	$764,000
	O, M, & R[2]	$61,000	$66,000
	Total	$421,000	$830,000
	Annual Benefits[3]	$220,000	$1,261,000
	Annual Costs[4]	$421,000	$830,000
	Annual Net Benefits[5]	$-201,000	$431,000
	Project Group 2[6]		
NED Account	Average Annual Cost		
	Installation	$0	$100,000
	OM&R[2]	$0	$1,000

	Total	$0	$101,000
	Annual Benefits[3]	$0	$215,000
	Annual Costs[4]	$0	$101,000
	Annual Net Benefits[5]	$0	$114,000
	Notes: [1] All Costs and Benefits presented in this table for the No Action Alternative are the change between the No Action Alternative and the current baseline condition because under the No Action Alternative piping would occur. All Costs and Benefits of the Piping Alternative are included as a change from the No Action Alternative. [2] Operation, maintenance, and replacement (OM&R) for the Piping Alternative includes the replacement of large diameter piping. A decrease in O&M costs of the canals and laterals for the Piping Alternative was included in the benefits, rather than the costs. The OM&R costs also incorporates other costs including: increased pumping costs from increased depth to groundwater due to reduced recharge and associate increase in carbon and energy. [3] Annual Benefits for the Piping Alternative represent benefits in addition to those shown in the No Action Alternative. For both the No Action and Piping Alternatives, quantified benefits include instream flow benefits, Oregon spotted frog benefits, reduced O&M costs, NUID agricultural benefits, and reduced energy costs from patron irrigation pumping. [4] Annual Costs for the Piping Alternative represent costs in addition to those shown in the No Action Alternative. [5] Annual Net Benefits for the Piping Alternative represent net benefits in addition to those shown in the No Action Alternative. [6] No piping would occur under Project Group 2 for the No Action Alternative.		
Environmental Quality Account	**Soils**		
	Soils	Minor effects from ongoing erosion of the PBC and laterals.	Minor, short-term effects during construction. Beneficial effects from reduction in soil erosion in the PBC and laterals.
	Prime Farmlands	No effect	Beneficial effects in the long term from improved water reliability.
Environmental Quality Account	**Water**		
	Surface Water Quality	Negligible, long-term improvements within 303(d) listed stream for temperature, dissolved oxygen, pH, sedimentation, turbidity, chlorophyll a, *E.coli*, or biological criteria. Negligible, long-term beneficial effects on irrigation water quality delivered to patrons by preventing contaminants in agricultural tailwater, such as herbicides and pesticides from entering the District's PBC and laterals.	Potential for minor to moderate, long-term improvement within 303(d) listed stream for temperature, dissolved oxygen, pH, sedimentation, turbidity, chlorophyll a, *E.coli*, or biological criteria. Minor, long-term beneficial effects on irrigation water quality delivered to patrons by preventing contaminants in agricultural tailwater, such as herbicides and pesticides from entering the District's PBC and laterals.
	Surface Water Quantity	Instream water lease of up to 3.7 cfs below Wickiup Reservoir during the non-irrigation season would have negligible effects on streamflow in the Deschutes River.	Instream water lease of up to 30.3 cfs below Wickiup Reservoir during the non-irrigation season would have moderate beneficial effects on streamflow in the Deschutes River.
	Groundwater Quantity	Reduction to recharge by approximately 1,253 acre-feet annually.	Reduction to recharge by approximately 10,280 acre-feet annually.

	Regional Water Resources Plan	Instream water leasing aligns with goals and objectives of regional water resources plans.	Instream water leasing aligns with goals and objectives of regional water resources plans.
	Conserved Water	Potential to save up to 3.6 cfs or 1,145 acre-feet currently lost through seepage and evaporation in the PBC and laterals.	Potential to save up to 29.4 cfs or 9,392 acre-feet of water currently lost through seepage and evaporation in the PBC and laterals that would be protected instream for environmental purposes.
	Water Rights	NUID would receive the water saved from the project during the irrigation season (up to 3.6 cfs or 1,145 acre-feet) In response, NUID would legally protect the same volume of water through instream leases in the Deschutes River downstream from Wickiup Reservoir during the non-irrigation season.	NUID would receive the water saved from the project during the irrigation season (up to 29.4 cfs or 9,392 acre-feet). In response, NUID would legally protect the same volume of water in the Deschutes River through instream leases downstream from Wickiup Reservoir during the non-irrigation season.
	Water Leasing	Through agreements, the instream leases created by NUID in response to the water saved from the project (up to 1,145 acre-feet or 3.7 cfs to be released outside of the irrigation season, downstream from Wickiup Reservoir), would continue and be renewed indefinitely, or until Oregon's authorities allow for a permanent change in water rights.	Through agreements, the instream leases created by NUID in response to the water saved from the project (up to 9,392 acre-feet or 30.3 cfs to be released outside of the irrigation season, downstream from Wickiup Reservoir), would continue and be renewed indefinitely, or until Oregon's authorities allow for a permanent change in water rights.
	Wild and Scenic Rivers	No effect	No direct effects on Wild and Scenic Rivers and State Scenic Waterways designations.
Environmental Quality Account	**Wetland and Riparian Areas**		
	Wetlands	Negligible effect; wetlands directly impacted or eliminated are limited to the non-jurisdictional man-made canals themselves. Negligible beneficial effects on wetlands along 121.8 miles of the Deschutes River which may experience some benefit from improved streamflow. Potential for negligible, indirect effects on wetlands along 27.7 miles of the Crooked River downstream of the LPID spillway once spills are eliminated, and in the middle Deschutes River and lower Crooked River due to reduced spring discharge.	Minor effect; wetlands directly impacted or eliminated are limited to the non-jurisdictional man-made canals themselves. Minor beneficial effects on wetlands along 121.8 miles of the Deschutes River which may experience some benefit from improved streamflow. Potential for minor, indirect effects on wetlands along 27.7 miles of the Crooked River downstream of the LPID spillway once spills are eliminated, and in the middle Deschutes River and lower Crooked River due to reduced spring discharge.
	Riparian Areas	Negligible beneficial effects in the long term to riparian areas along 121.8 miles of the Deschutes River. Potential for negligible, indirect effects on riparian areas along 27.7 miles of the Crooked	Minor beneficial effects in the long term to riparian areas along 121.8 miles of the Deschutes River. Potential for minor, indirect effects on riparian areas along 27.7 miles of

		River downstream of the LPID spillway once spills are eliminated, and in the middle Deschutes River and lower Crooked River due to reduced spring discharge.	the Crooked River downstream of the LPID spillway once spills are eliminated, and in the middle Deschutes River and lower Crooked River due to reduced spring discharge.
Environmental Quality Account	**Fish and Wildlife**		
	BGEPA	No effect; construction would occur outside the USFWS-approved buffer distances. If construction is needed within the buffer distance, it would occur outside the nesting season.	No effect; construction would occur outside the USFWS-approved buffer distances. If construction is needed within the buffer distance, it would occur outside the nesting season.
	Terrestrial Endangered and Threatened Species	No effect	No effect
	Fish and Fish Habitat	Sixty-two miles of fish habitat in the upper Deschutes from Wickiup Dam to North Canal Dam would experience negligible, beneficial, indirect effects during the non-irrigation season. No effect on fish or their habitat in the middle Deschutes or Crooked River.	Long-term beneficial effects due to 62 miles of improved fish habitat in the upper Deschutes from Wickiup Dam to North Canal Dam during the non-irrigation season. Negligible, beneficial, indirect effects in the middle Deschutes from North Canal Dam to Lake Billy Chinook during the non-irrigation season. Negligible, beneficial, indirect effects on fish and their habitats in the Crooked River.
	Aquatic Endangered and Threatened Species	No effect	No effect on bull trout or steelhead populations. Negligible effect on Oregon spotted frog due to water protected instream during the non-irrigation season.
	General Wildlife and Wildlife Habitat	Negligible, long-term effects due to removal of water sources for wildlife and potential change to the distribution patterns of wildlife which would occur over time. Reseeding with native vegetation would increase habitat for some species, and increased streamflow would improve riparian habitat along the Deschutes River.	Minor, long-term effects due to removal of water source for wildlife and potential change to the distribution patterns of wildlife which would occur over time. Reseeding with native vegetation would increase habitat for some species, and increased streamflow would improve riparian habitat along the Deschutes River.
	MBTA Species	No effect; construction would occur outside the nesting period for migratory birds of concern (April 15–July 31) and raptors (Feb–July).	No effect. Construction would occur outside the nesting period for migratory birds of concern (April 15–July 31) and raptors (Feb–July).
Environmental Quality Account	**Vegetation**		
	General Vegetation	Negligible effect	Minor effects on vegetation due to disturbance during construction and increased vegetation following reseeding.

	Noxious Weeds	Negligible effect	Minor, beneficial effects over the long-term resulting from decreased noxious weeds transport.
	Special Status Species	No effect	No effects expected. If surveys detect plants in the project area, there would be negligible long-term effects based on proposed mitigation measures.
Environmental Quality Account	**Human Environment**		
	Land Use	Negligible effect	Negligible to minor effects on land use within the project area due to potential short-term interruptions to access and use during construction and the acquisition of a new easement and small area of land. Negligible effect on land use adjacent to the project area.
	Public Safety	Negligible effect	Minor effect on public safety because there would be less possibility of a serious accident associated with canals and laterals in the project area.
	Recreation	Negligible effect	Minor, short-term effects on bikeways in the project area during construction.
	Socioeconomics	Minor, beneficial short-term effects on employment and income in Deschutes County from construction activities. Moderate, beneficial long-term effects on agricultural production and related farm household income.	Minor, beneficial short-term effects on employment and income in Deschutes County from construction activities. Moderate, beneficial long-term effects on agricultural production and related farm household income.
	Historic, Cultural, and Scientific Resources	Effects on cultural resources would be determined based on any remaining surveys. Effects would require consultation with SHPO and implementation of appropriate mitigation measures, which would be identified before construction and completed concurrent with or after construction.	Effects on cultural resources would be determined based on any remaining surveys. Effects would require consultation with SHPO and implementation of appropriate mitigation measures, which would be identified before construction and completed concurrent with or after construction.
Other Social Effects Account	Visual Resources	Negligible effect	Minor, short-term effects due to construction activities. Minor, long-term effects due to change in appearance from open canals and riparian plants to buried pipe with upland vegetation.
	Tribal, Religious, Sacred, or Cultural Site	No anticipated effects	No anticipated effects; an unanticipated discovery plan would be followed to avoid adverse effects.
Regional Economic	Local Jobs During Construction	40	130

Development Account	Annual Jobs from Recreation	N/A	Magnitude/direction of recreation visitation impacts are not known, so no RED benefits quantified.
	Other Economic Sector Jobs	0	10
	Beneficial Effects[1] Annualized (Millions, 2019$)		
	Region	$0.3	$0.9
	Rest of Nation	Some ripple income/employment effects expected, but not estimated.	Some ripple income/employment effects expected, but not estimated.
	Adverse Effects Annualized[2] (Millions, 2019$)		
	Region	$0	$0.1
	Rest of Nation	$0.4	$1.2
	[1] Beneficial effects include only those related to labor income and do not include the net economic benefits quantified in the NED. [2] This includes only direct costs (no indirect/induced costs are included).		

Notes:
N/A = Not Applicable

6 Environmental Consequences

This section presents an evaluation of the environmental consequences of the No Action Alternative and the Piping Alternative on each resource discussed in Section 4. The intensity and duration of effects on each resource were evaluated using either a quantitative or qualitative approach. The intensity of an effect was classified as negligible, minor, moderate, or major. The duration of an effect was classified as temporary, short-term, or long-term, where the time period of an effect is dependent on the resource. Appendix E presents the intensity threshold matrix used to categorize and define the range of expected effects.

6.1 Cultural Resources

For either alternative, the District would use the framework established in the MOA to develop mitigation measures to minimize effects on cultural resources and ensure compliance with Section 106 of the NHPA.

6.1.1 No Action (Future without Project)

6.1.1.1 Archaeological Resources

Under the No Action Alternative, effects on archaeological resources would be assessed based on surveys and a determination from SHPO. COID would conduct cultural resource surveys for any ground-disturbing activities that may affect previously undisturbed soils. If archeological resources are inadvertently discovered during ground disturbing activities, the District would follow unanticipated discovery procedures described in Appendix E and consult with SHPO.

6.1.1.2 Historical Resources

Under the No Action Alternative, effects on historical resources would be assessed based on surveys and a determination from SHPO. In areas that have individually eligible features, further consultation would occur between the District and SHPO. Effects on cultural resources would be minimized by the implementation of mitigation measures as identified through consultation with SHPO.

6.1.2 Piping Alternative

6.1.2.1 Archaeological Resources

Effects on archaeological resources from the Piping Alternative would be assessed based on surveys and a determination from NRCS and SHPO. COID would conduct cultural resource surveys for any ground disturbing activities that may affect previously undisturbed soils. Specifically, the new G-4 Lateral alignment and new connection to NUID would require surveying. If archeological resources are inadvertently discovered during ground disturbing activities, the District would follow unanticipated discovery procedures described in Appendix E and consult with SHPO.

6.1.2.2 Historical Resources

Effects on historical resources from the Piping Alternative would be assessed based on surveys and a determination from NRCS and SHPO. In areas that have individually eligible features, further consultation would occur between the District, NRCS, and SHPO. Effects on cultural resources would be minimized by the implementation of mitigation measures as identified through consultation with SHPO. Based upon previous mitigation measures implemented by other districts in the Deschutes Basin, if mitigation were to be required it could include actions such as working with the historic society to create a board with documentation and photos of the canal and laterals,

which would be available at the District's office and on the District's website, and creating a sign and kiosk. The potential cost of mitigation for effects on cultural resources has been included in the project cost.

6.2 Land Use

6.2.1 No Action (Future without Project)

The No Action Alternative would have a negligible effect on land use within and adjacent to the project area, as well as lands served by the project. The majority of the District's PBC and laterals would continue to operate as an open system. District O&M and improvement activities including limited piping would continue and follow COID's current construction and best management practices (BMPs). Water that was saved by piping and passed to NUID would support existing agricultural land uses in NUID.

6.2.2 Piping Alternative

The Piping Alternative would have negligible to minor effects on land use in the project area. The ROW and easements would continue to be used for the conveyance of irrigation water and O&M. During system O&M, the presence of District staff would decrease in the ROW and easements, as they would no longer need to patrol the PBC or laterals in the project area. The Piping Alternative would be consistent with the Deschutes County zoning designations and corresponding comprehensive plan.

All construction would occur in the District ROW or easement, and adjacent landowners would be notified. A new easement parallel to a county road would be secured for the realignment of the G-4 Lateral. Additionally, approximately 2 acres of non-cultivated land would be purchased at the northern end of the project area for construction of a new connection between the PBC and NUID's Main Canal. After construction, ground that was disturbed in the project area would be reseeded with a mix of native grasses and forbs.

Implementation of the Piping Alternative would support the existing agricultural land use. Current zoning designations and planning goals would also be supported. Construction would take place outside of the irrigation and growing season, and there would be no interruption to water deliveries. There would be negligible effects on agricultural land served by the project during or after construction.

The Piping Alternative would also have no direct effects on agricultural land served by NUID during or after construction. The water that COID would pass to NUID would support existing agricultural land use.

6.3 Public Safety

6.3.1 No Action (Future without Project)

Under the No Action Alternative, the majority of the PBC and laterals in the project area would be left open and the drowning risk would remain. In areas where open canals were replaced by pipes, public safety risk may negligibly decrease; however, these effects would occur at slow pace and small scale. The risk of drowning, flooding, and other serious accidents would increase as urban and suburban areas grow and surround more of the District.

6.3.2 Piping Alternative

During construction of the Piping Alternative, public safety would be affected by vehicle and heavy equipment traffic entering and leaving the project area. Construction traffic could interact with motor vehicles, pedestrians, and bicyclists traveling along roads that intersect the project area. Standard safety protocols and BMPs would be followed during construction to minimize any risk to public safety; therefore, only a minor, short-term effect on public safety is anticipated during construction.

Once fully completed, the Piping Alternative would decrease the drowning risk from the District's open canals and laterals in the project area because all would be converted to buried pipe. The risk of drowning in private ditches and private ponds would remain unchanged in the Watershed Planning Area. This alternative would also decrease any potential flooding risk from project area canal breaches and overflow, and the durability of the pipe would increase seismic resiliency. The Piping Alternative would result in a minor effect on public safety because although there would be decreased risks to drowning and flooding, it would only be within the project area.

6.4 Recreation Resources

6.4.1 No Action (Future without Project)

Under the No Action Alternative, there would be negligible effects on recreation due to piping. These effects would be similar to the District's previous piping projects and would be dependent on the vicinity of the piping to recreation areas.

6.4.2 Piping Alternative

Construction would have minor, short-term effects for bikeway users because of reroutes or delays. Since construction would occur during the winter season when use is lowest, these effects are anticipated to be minor.

During construction, recreational activities along and on the Deschutes and Crooked Rivers would not be affected. After construction, activities along and on the Deschutes River, including recreational fishing, kayaking, and river surfing, would be indirectly affected during the non-irrigation season by an increase in streamflow. Additionally, the Piping Alternative would have no effect on recreational activities such as fishing, camping, and nature viewing that occur on or around Crane Prairie and Wickiup Reservoirs.

6.5 Socioeconomic Resources

To estimate the total economic effects of the No Action Alternative and Piping Alternative in terms of jobs and income supported, this analysis uses a 2015 IMPLAN economic impact model of Deschutes County.[33]

[33] Total construction expenditures were modeled in IMPLAN Construction Sector 57, construction of new commercial structures, including farm structures.

6.5.1 No Action (Future without Project)

Implementation of the No Action Alternative would have a minor, beneficial short-term effect on employment and income in Deschutes County from construction activities, and a moderate, long-term beneficial effect on agricultural production and related farm household income in the county.

Under the No Action Alternative, the $12.2 million in construction expenditure is expected to be experienced over 4 years, supporting approximately 40 jobs and $1.8 million in income annually across the 4-year construction period (annualized over 104 years,[34] this equates to approximately $0.3 million in annualized average income benefits). Of these impacts, approximately 25 jobs and $1.3 million in annual income are in the construction sector (direct impacts), while the remaining 15 jobs and $0.6 million income are in other sectors. In addition to enhancing instream flow, water conservation under the No Action Alternative is expected to slightly enhance agricultural productivity in NUID, with regional economic effects at less than 5 jobs and less than $0.1 million in income annually.

6.5.2 Piping Alternative

Implementation of the Piping Alternative would have a minor, beneficial short-term effect on employment and income in Deschutes County from construction activities, and a moderate, long-term beneficial effect on agricultural production and related farm household income in the County.

6.5.2.1 Regional Economic Development

The Piping Alternative construction expenditures of $42.3 million would support construction sector jobs and income, as well as economic ripple effects increasing jobs and income in other economic sectors in Deschutes County. The $42.3 million in construction expenditure is spread over 4 years, supporting approximately 130 jobs and $6.2 million in average income over the 4-year construction period (annualized over 104 years this equates to approximately $0.7 million in annualized average income benefits). Of these impacts, approximately 90 jobs and $4.3 million in annual income are in the construction sector (direct impacts), while the remaining 40 jobs and $1.9 million income are in other sectors.

In addition to enhancing instream flow, water conservation under the Piping Alternative is expected to enhance agricultural productivity in NUID, with regional economic effects at approximately 10 jobs and $0.3 million in income annually. The NED Analysis in Appendix D provides further information on agricultural productivity.

The Piping Alternative would also result in reduced O&M expenses for COID and its patrons. However, there are not anticipated effects on District wages and employment. Reduced O&M and pumping costs may largely result in a small income transfer between COID patrons, COID staff, and the local construction/repair/electricity sectors. As such, there are expected to be limited regional economic development effects of this reduced expenditure (i.e., less than the rounding margin of error), so effects are not quantified in this regional economic development analysis.

[34] Note that each project has a 100-year life; however, since construction takes 4 years, benefits extend out to Year 104, so the analysis period is 104 years.

6.6 Soils

6.6.1 No Action (Future without Project)

Under the No Action Alternative, the continued operation of the majority of the canal system in the project area would have minor effects on soils. Ongoing erosion of the PBC and laterals would persist. Where piping would occur, construction activities associated with soil excavation, pipe placement, and pipe burial would cause minor, short-term effects on soils due to erosion and localized changes in the soil profile where the construction activities occur; however, these effects would be minimized due to implementation of BMPs.

6.6.2 Piping Alternative

Under the Piping Alternative, soils would be disturbed, vegetation would be cleared, and backfilling and grading would occur. Clearing, compaction, and construction would increase soil erosion and sedimentation potential. BMPs would be implemented to minimize erosion and contain runoff onsite; BMPs could include silt fencing, straw wattles, geotextile filters, and applying water to disturbed soils to prevent wind erosion.

During construction, soils adjacent to canals would be impacted due to construction equipment access and staging. Existing maintenance roads within the ROW and easements would provide access to most of the project area. Excavation for pipe placement would occur primarily in existing canals. Excavation outside of existing canals would occur along approximately 2,000 feet for the new alignment of the G-4 Lateral, which parallels a road, and along approximately 70 feet for the new connection between the PBC and NUID's Main Canal. Where topsoil is excavated, it would be segregated from subsoil prior to any excavation and backfilling. After pipe installation, the subsoil would be replaced first and topsoil would be replaced on the ground surface.

After construction, the pipe would be buried and the project area would be re-contoured. Disturbed areas would be reseeded with a mix of native grasses and forbs in consultation with NRCS. Overall, minor, short-term effects on soil resources are anticipated because BMPs would be in place and the effect would occur on small portions of the larger project area over time. Over the long term, soil erosion would be reduced where buried pipeline would replace open canals.

Farmland Classification

The open delivery system in the project area would be converted to a piped system with partial pressurization available for patrons. Pressurization could facilitate on-farm improvements that could increase crop quality and yields (USEPA 2016), which is important for lands classified as prime farmland if irrigated. In addition, piping the PBC and laterals prevents sediment and other contaminants, such as herbicides and pesticides, from entering the water supply for COID patrons. As a result, soil quality could improve with reduced pollutants in the irrigation water.

No long-term effect would be expected to any federal or state-level farmland designations. Minor, short-term effects on agriculturally important soils would be expected during construction, but adherence to BMPs would minimize these effects. There could be a beneficial effect on farmlands due to improved irrigation water delivery reliability.

6.7 Vegetation

6.7.1 No Action (Future without Project)

Under the No Action Alternative there would be a negligible effect on general vegetation and noxious weeds due to the small area of disturbance and BMPs that would be implemented. There are no special status species in the project area, and therefore there would be no effect on special status species.

6.7.2 Piping Alternative

6.7.2.1 General Vegetation

Construction of the Piping Alternative would involve trenching for pipe placement along approximately 7.9 miles of primarily existing canals, disturbance of lands adjacent to canals for construction equipment access, and use of the existing ROW or easement for movement and staging of construction equipment and materials.

During construction, existing maintenance roads within the ROW would provide access to most of the project area. Given that the pipe segments would be installed in 50- or 100-foot lengths, some temporary travel routes within the project area would be necessary along the PBC and laterals that are not accessible by existing roads. To the extent practicable, the selection of construction areas adjacent to canals and travel routes would consider existing vegetation and would avoid mature trees.

Construction activities associated with the Piping Alternative would temporarily disturb surrounding vegetation. During construction, herbaceous, shrub, and woody vegetation along the canals, laterals, turn-outs, and within the project area would be disturbed through activities such as clearing, crushing, and digging. Mature trees, however, would rarely be removed, and only if they presented a safety risk to crews during construction. Opportunistic hydrophytic plants that occur sporadically along the margins of the PBC and laterals would be permanently removed.

After construction, there would be a net increase in herbaceous vegetation because the area above the pipe would be recontoured with topsoil and—except for a double track dirt/maintenance trail for District access—vegetated with a seed mix of native grasses and forbs. The seed mix would be chosen in consultation with NRCS. Although some trees and shrubs that are dependent upon the canal for water may not survive construction of the Piping Alternative, prior experience with piping projects suggests that 70 to 80 percent of the well-established trees within the project area would survive after piping with active irrigation by the property owner. Past experience shows that 20 to 30 percent of the trees that do not normally survive in such a location without the canal did not survive after piping. Generally, vegetation within the project area would return to an upland type, such as was present prior to construction of the canal. Additionally, the 7.9 miles of the open PBC and laterals fragmented small animal habitat. Once piped, fragmentation on the landscape would be reduced and small animal habitat would have greater connectivity.

Over the project's life, vegetation within the ROW and easements would be maintained according to the District's vegetation management program and NRCS's Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000). Trees would not be permitted to establish above the buried pipe or within ROWs because roots may interfere with future system maintenance.

Implementation of the Piping Alternative would have a minor effect on vegetation because disturbance occurs over about 1 percent of the District and measures designed to minimize effects on vegetation would be implemented (other measures are identified in Section 8.5).

6.7.2.2 Noxious Weeds

Soils exposed during construction would create temporarily susceptible areas where weeds could establish themselves. The movement of construction vehicles could provide opportunities to transport weeds to new locations. During construction, the contractor would utilize BMPs such as avoiding unnecessary ground disturbances and using erosion control measures that are free of weeds and weed seeds.

Once construction is complete, the piped system no longer presents opportunities for aquatic noxious weeds in the project area to be washed to other areas of the District. During O&M, weeds would be managed according to the protocol in NRCS's Oregon and Washington Guide for Conservation Seedings and Plantings (NRCS 2000).

Implementation of the Piping Alternative would have a minor, beneficial effect on noxious weeds over the long-term because the spread of noxious weeds during construction would be controlled through BMPs, and the conversion to a piped system would reduce the spread of noxious weeds through the open canals system.

6.8 Visual Resources

Effects on visual resources occur when project activities visually stand out from the existing landscape or introduce disruptive visual characteristics. The visibility of the activity or modification and the sensitivity of the viewer influence the magnitude of the effect. For example, there would be less effect from an action surrounded by thick vegetation or an action that blends into the landscape. This visual analysis was based on evaluations of aerial and ground-based photographs of the proposed project sites and preliminary design information.

The evaluation of visual effects considered whether construction activities could substantially degrade the existing visual character or quality of the site or surrounding area, as well as the duration over which any such changes would occur. Because of their short-term nature, construction activities were considered to have a minor effect on visual quality.

Actions with long-term visual effects such as constructing new or altered structures, grading roads, removing trees, and introducing new sources of light and glare can permanently alter the landscape in a manner that could affect the existing visual character or quality of the area, depending on the perspective of the viewer. Since damaging visual resources such as trees and other features typically constitute a long-term effect, the potential for project implementation to damage visual resources was evaluated solely as a long-term effect, differentiated from construction-related effects.

6.8.1 No Action (Future without Project)

Under the No Action Alternative, there would be no changes to visual resources across the majority of the project area, and residents and visitors would continue to see the open PBC and laterals from public and private viewpoints. In the 2.3 miles that would be piped under the No Action Alternative, effects would be similar to previous piping projects and would be determined by the topography and viewshed of the piped areas.

6.8.2 Piping Alternative

Under the Piping Alternative, construction activities, including use of heavy equipment and pipe laying, would be visible to residents, motorists, and recreationists adjacent to the project area. Vegetation would be cleared within the project area where pipe is installed or access for construction equipment is necessary. Disturbance to existing mature trees in the project area would be minimized to the extent possible. Trees growing along the edge of the open PBC and laterals would only be removed if they posed a safety risk to crews working within the project area. There would be minor, short-term effects on visual resources because construction activities would draw attention to the setting. However, similar large equipment is used for agricultural production and in-canal maintenance, and it is therefore not an uncommon feature in the landscape. Construction would be scheduled in the winter off-season during daytime hours, and BMPs would further minimize any visual disruptions.

After construction, areas adjacent to the canal would be restored to near-prior contours, and the area over the pipe would be graded to blend with the remainder of the ROW or easement. Disturbed areas where the PBC and laterals were converted to open pipe would be planted with a seed mix of native grasses and forbs selected in consultation with NRCS. Disturbed areas where new alignments would be constructed would be returned to their prior appearance. Across the majority of the project area where the PBC and laterals currently exist, the view would change from an open channel (with or without water depending on the season) to a corridor of native upland vegetation including any trees that previously existed and were not removed during construction. The visual change for recreationists and property owners was not monetized due to insufficient data; further discussion can be found in Appendix D.

Overall, the Piping Alternative would have a minor effect on visual resources because the revegetated corridor would blend in with the natural landscape following revegetation and new alignments would return to their original visual appearance.

6.9 Water Resources

6.9.1 No Action (Future without Project)

Under the No Action Alternative, replacing open canal and laterals with buried pressurized pipes would reduce seepage losses in COID's PBC system by up to 3.6 cfs. Following the completion of the proposed project, this water would continue to be diverted at COID's PBC diversion. COID would pass all of this water from COID's conveyance system to NUID's conveyance system during the irrigation season. In return, NUID would release and legally protect an equal volume of water for instream use in the Deschutes River below Wickiup Reservoir during the non-irrigation season. COID and NUID piloted a similar movement of water in 2019-2020 following the completion of the Siphon Power Property Piping Project (COID 2017; OWRD 2020).[35]

[35] If Oregon law, administrative rule, or their interpretations were to change (e.g., allowing the permanent transfer of saved water instream, referenced in Section 6.9.1.1), COID would ensure that the approach to moving water and/or water rights following the completion of the proposed project would have the same effects on water resources as the approach evaluated in this Plan-EA.

Release rates for this water would be determined as stakeholders in the area continue to develop flow models that analyze the effects of different release rates/schedules on aquatic habitat. The total amount conserved would not change; however, based upon conservation need, the time the allotment of water is provided instream may change, fulfilling COID's conservation obligation.

6.9.1.1 Water Rights

Completion of the No Action Alternative would affect COID and NUID patrons by supporting the delivery of water to fulfill their water rights throughout the irrigation season. No effect would occur to COID patron's certificated rate and duty. This alternative would reduce NUID patron's dependence on water stored in Wickiup Reservoir to fulfill their water rights. Water delivery to LPID would not be affected, no water saved by the project would be used to irrigate new acreage, and no water saved by the project would be used to create groundwater mitigation credits.

Water Passed from COID to NUID

Following the completion of the project, COID would pass all of the water saved by the proposed project from COID's conveyance system to NUID's conveyance system during the irrigation season. COID and NUID would enter into a new agreement outlining how this water would move between their systems prior to construction of the proposed project. An existing agreement between the two districts (COID and NUID 2017; Appendix E) provides an example of such an agreement. COID and NUID piloted the movement water between their conveyance systems in 2019 to 2020 following the completion of the Siphon Power Property Piping Project (COID 2017).

Protecting Water Released by NUID to the Deschutes River

Following the completion of the project, NUID would legally protect the water released from Wickiup Reservoir through an instream lease under Oregon water law (ORS 537.348 [2] and OAR 690-077). The water leased instream would retain the same priority date as the originating water right (Certificate 51229). The instream lease would protect water in the Deschutes River downstream from Wickiup Reservoir during the non-irrigation season (i.e., in the late fall, winter, and early spring). Instream Lease No. 1770, which protected water instream in 2019 to 2020 following the completion of COID's Siphon Power Property Piping Project, provides an example of this approach (OWRD 2019, 2020). Once an instream lease were approved by OWRD, the leased portion of NUID's water right would be not be available for use by NUID or its patrons.

Oregon statute allows for NUID's storage water rights to be permanently transferred instream (ORS 537.348; Appendix A [Public Comment Submission #10, Exhibit F]). However, OARs need further clarity to allow these storage water rights to be permanently transferred instream (Appendix A [Public Comment Submission #10, Exhibit F]). An agreement would be established specifying that these instream leases would be renewed in perpetuity or until the State of Oregon provided the clarity needed for a permanent change.

Water released by NUID during the non-irrigation season would be in addition to the recently increased minimum winter flows of 100 cfs in the Deschutes River downstream from Wickiup Reservoir.

6.9.1.2 Surface Water Hydrology

Following completion of the No Action Alternative, instream leasing would overall have negligible, long-term beneficial effects on the waterbodies associated with District operations.

Upon completion of the No Action Alternative, NUID would release 1,145 acre-feet of water from Wickiup Reservoir to the Deschutes River during the non-irrigation season. Release rates for this

water would be determined as stakeholders in the area continue to develop their understanding of the effects of different release rates and schedules on fish and aquatic resources. The following assumptions were used in this analysis:

- Releases would occur at a constant rate over COID's non-irrigation season (October 26 to April 1).
- Losses would be accounted for along Deschutes River as identified on COID's water right. These losses include a 12.5 percent channel loss from Wickiup Reservoir to Benham Falls and a 7 percent channel loss from Benham Falls to the City of Bend.

Effects on individual reaches are identified below.

Crane Prairie Reservoir

The No Action Alternative would have no effect on Crane Prairie Reservoir.

Wickiup Reservoir

The No Action Alternative would have negligible, long-term effects on Wickiup Reservoir because there would only be a slight change in active storage volume. 1,145 acre-feet of storage water rights in Wickiup Reservoir would be changed to instream use. This change would reduce the reservoir's active storage volume available for irrigation by 0.4 percent.

The operations and release schedule of the reservoir may change in the future as a result of changes to the Revised 1938 Inter-District Agreement and the implementation of the HCP that occur separately from this project. However, water conserved through this project would remain allocated to instream beneficial uses during the non-irrigation season.

Deschutes River from Wickiup Reservoir (RM 226.8) to the PBC Diversion (RM 164.8)

The No Action Alternative would have negligible, long-term beneficial effects in this reach of the Deschutes River. This alternative would increase streamflow in the Deschutes River during the non-irrigation season by 3.7[36] cfs below Wickiup Reservoir, 2.6 cfs at Benham Falls, and 2.4 cfs at North Canal Dam. This streamflow would be additive to the 100 cfs already being released during the non-irrigation season in accordance with the 2016 Settlement Agreement.

ODFW has multiple instream water rights for this reach (see Table 4-7) that are not always met during the non-irrigation season. This additional streamflow would assist in meeting these junior water rights (Appendix E).

Deschutes River from the PBC Diversion (RM 164.8) to Lake Billy Chinook (RM 120)

The No Action Alternative would have negligible, long-term beneficial effects in this reach of the Deschutes River. This alternative would increase streamflow in this reach of the Deschutes River by an estimated 2.4 cfs during the non-irrigation season.

ODFW has a pending instream water right for this reach (see Table 4-7), which is usually met during the non-irrigation season.

As described in Section 6.9.2.4, the No Action Alternative would have minor effects on groundwater recharge in the project area. A portion of the seepage eliminated by the No Action

[36] Spread across the non-irrigation season (November 1 to March 31), 1,145 acre-feet would allow up to 3.7 cfs to be released from Wickiup Reservoir. Due to the geology of the Upper Deschutes Basin, OWRD accounts for water losses in certain river reaches and is described in these sections with said adjustments incorporated into the flow rates.

Alternative would have otherwise entered the regional aquifer groundwater and/or affected discharges in this reach of the river. However, previous studies (Gannett et al. 2001) have shown that groundwater discharge (and associated streamflow) would not respond immediately to reduction in canal leakage, but gradually as the water table drops and approaches a new equilibrium. Due to this reduction in groundwater discharge, there would likely be a negligible effect on the amount of streamflow in this reach of the Deschutes River.

Crooked River from RM 27.7 to Lake Billy Chinook (mouth)

Implementation of the No Action Alternative would have negligible, long-term effects on the Crooked River from RM 27.7 to Lake Billy Chinook (mouth) due to the reduced groundwater discharge. Similar to the Deschutes River between the PBC diversion and Lake Billy Chinook, changes in canal and lateral seepage would occur as a result of project implementation and would affect groundwater discharge into the lower Crooked River. These changes are described in Section 6.9.1.4.

The District operationally spills water at the Lone Pine Weir to the Crooked River located at RM 27.7. Following completion of the No Action Alternative, the District would not eliminate the spillway at the Lone Pine Weir and the District would continue operationally spilling water to the Crooked River.

District Operations and Water Supply

Implementation of the No Action Alternative would benefit District operations and water supply. Patrons receiving water from the new pipelines would benefit from an on-demand system, meaning that the system would operate with the flow rate and pressure required by farm irrigation systems with time duration and frequency decided by the farmers. Converting to a piped conveyance system would allow for improved system operation, better control structures, and more responsive management. In the area's water-scarce environment, the proposed action would help to provide a more certain water supply to NUID's farmers without increasing either Districts' diversion.

The No Action Alternative would also affect NUID's operations. Following implementation of the project, NUID would reduce the amount of water that it diverts from the Deschutes River into the NUID Main Canal by an amount equal to the amount saved by the proposed action. This rate would continue to be diverted from the Deschutes River into the PBC and conveyed into NUID's Main Canal. NUID's reduced diversion rate provides additional water savings by reducing seepage from the NUID Main Canal between the NUID diversion and the COID spill. This change in water delivery operations results in an annual volume savings of 108 acre-feet that benefits NUID patrons.

6.9.1.3 Surface Water Quality

The annual release of 1,145 acre-feet from Wickiup Reservoir following construction of the No Action Alternative would have negligible effects on surface water quality in the Deschutes River. The Deschutes River would benefit from the increased streamflow similar to that described in Section 6.9.2.3 but at a much smaller scale.

Construction of the No Action Alternative would not eliminate the Lone Pine Weir operational spill and, therefore, would not reduce the release of nonpoint source pollutants and warm temperature tailwater into the river system.

6.9.1.4 Groundwater

Implementation of the No Action Alternative would have minor, long-term effects on groundwater in the vicinity of the project area and the NUID main canal downstream from the NUID diversion

to the Crooked River. No groundwater resources would be extracted or consumptively used as part of this alternative; however, piping 2.3 miles of the PBC and laterals would affect groundwater hydrology associated with canal and lateral seepage. Canal and lateral piping would reduce seepage by 1,145 acre-feet annually during the irrigation season. Reduced flow in NUID's Main Canal would further reduce seepage by 108 acre-feet annually, for a total reduction in groundwater recharge of approximately 1,253 acre-feet per year.[37]

Prior studies have found that canal lining and piping has a relatively small effect on groundwater recharge in the upper Deschutes Basin (Gannett and Lite 2013; Gannett et al. 2001; Gannett et al. 2003). Extrapolating from prior study data (Gannett and Lite 2013), the average relationship between canal seepage and groundwater levels in the central part of the Deschutes Basin is approximately 1 foot of groundwater elevation drop per 377,000 acre-feet of reduced canal seepage.

Implementation of the No Action Alternative would reduce canal seepage, and associated groundwater recharge by up to approximately 1,253 acre-feet annually[37] in this part of the Deschutes Basin. On average, for this part of the Deschutes Basin, this decrease in recharge translates into a decreased groundwater elevation of approximately 0.01 foot annually. Localized effects on groundwater would differ throughout the area. Over the course of 100 years, this annual drop results in a cumulative decreased average groundwater elevation of 0.27 foot. These effects would be most prominent at shallow depths closest to canals and attenuate with increasing depth (Gannet and Lite 2013).

6.9.2 Piping Alternative

Under the No Action Alternative, replacing open canal and laterals with buried pressurized pipes would reduce seepage losses in COID's PBC system by up to 29.4 cfs. Following completion of the proposed project, this water would continue to be diverted at COID's PBC diversion. COID would pass all of this water from COID's conveyance system to NUID's conveyance system during the irrigation season. In return, NUID would release and legally protect an equal volume of water for instream use below Wickiup Reservoir during the non-irrigation season. COID and NUID piloted a similar movement of water in 2019 to 2020 following completion of the Siphon Power Property Piping Project (COID 2017).

The amount of water passed from COID's conveyance system to NUID's conveyance system and released from Wickiup Reservoir to the Deschutes River would increase incrementally as each project group of the proposed project were completed.[38]

[37] FCA assumes that, as a result of the project, diversion rate reductions of up to 3.6 cfs would occur in the NUID Main Canal. The 2016 NUID System Loss Assessment estimated that the loss in the NUID Main Canal, from the NUID Diversion at North Canal Dam to the COID Spillway, is 9.46 percent (NUID 2017); therefore, including these losses, an additional reduction to groundwater recharge of about 108 acre-feet per year would occur, for a total reduction in groundwater recharge of approximately 1,253 acre-feet per year.

[38] If Oregon law, administrative rule, or their interpretations were to change (e.g., allowing the permanent transfer of saved water instream, referenced in Section 6.9.1.1), COID would ensure that the approach to moving water and/or water rights following the completion of the proposed project would have the same effects on water resources as the approach evaluated in this Plan-EA.

6.9.2.1 Water Rights

Effects on water rights following the construction of the Piping Alternative would be the same as the effects described for the No Action Alternative. Please refer to Section 6.9.1.1 for a discussion of these effects.

6.9.2.2 Surface Water Hydrology

All environmental effects on surface water hydrology are assumed beneficial. Following completion of the Piping Alternative, the water protected instream would overall have moderate, long-term beneficial effects on the waterbodies associated with District operations.

Upon completion of the project, NUID would release 9,392 acre-feet of water from Wickiup Reservoir to the Deschutes River during the non-irrigation season. Release rates for this water would be determined as stakeholders in the area continue to develop their understanding of the effects of release rates and schedules on fish and aquatic resources. The following assumptions were used in this analysis:

- Releases would occur at a constant rate over COID's non-irrigation season (October 26 to April 1).
- Losses were accounted for along Deschutes River as identified on COID's water right. These losses include a 12.5 percent channel loss from Wickiup Reservoir to Benham Falls and a 7 percent channel loss from Benham Falls to the City of Bend.

Effects on individual reaches are identified below.

Crane Prairie Reservoir

The Piping Alternative would have no effect on Crane Prairie Reservoir.

Wickiup Reservoir

The Piping Alternative would have minor, long-term effects on Wickiup Reservoir. 9,392 acre-feet of storage water rights in Wickiup Reservoir would be changed to instream use. This would reduce the reservoir's active storage volume available for irrigation by 4.6 percent.

Deschutes River from Wickiup Reservoir (RM 226.8) to the PBC Diversion (RM 164.8)

The Piping Alternative would have minor to moderate, long-term beneficial effects in this reach of the Deschutes River. This alternative would increase streamflow in the Deschutes River during the non-irrigation season by 30.3 cfs below Wickiup Reservoir,[39] 26.6 cfs at Benham Falls, and 24.7 cfs at North Canal Dam. This streamflow would be additive to the 100 cfs already being released during the non-irrigation season in accordance with the 2016 Settlement Agreement.

ODFW has multiple instream water rights for this reach (see Table 4-7) that are not always met during the non-irrigation season. This additional streamflow would assist in meeting these junior water rights (Appendix E).

Deschutes River from the PBC Diversion (RM 164.8) to Lake Billy Chinook (RM 120)

The Piping Alternative would have minor, long-term beneficial effects in this reach of the Deschutes River. This alternative would increase streamflow in this reach of the Deschutes River by an

[39] Spread across the non-irrigation season (November 1 to March 31), 9,392 acre-feet would allow up to 30.3 cfs to be released from Wickiup Reservoir. Due to the geology of the Upper Deschutes Basin, OWRD accounts for water losses in certain river reaches and is described in these sections with said adjustments incorporated into the flow rates.

estimated 30.3 cfs during the non-irrigation season. ODFW has a pending instream water right for this reach (see Table 4-7), which is usually met during the non-irrigation season.

As described in Section 6.9.2.4, the Piping Alternative would have minor effects on groundwater recharge in the project area. A portion of the seepage eliminated by the Piping Alternative would have otherwise entered the regional aquifer groundwater and/or affected discharges in this reach of the river. Gannett et al. (2001) have shown that groundwater discharge (and associated streamflow) would not respond immediately to reduction in canal leakage, but gradually as the water table drops and approaches a new equilibrium. Therefore, there is a potential for reduction in groundwater discharge in this reach of the Deschutes River.

Crooked River from RM 27.7 to Lake Billy Chinook (mouth)

Implementation of the Piping Alternative would have negligible, long-term effects on the Crooked River from RM 27.7 to Lake Billy Chinook (mouth) due to the reduced groundwater discharge and reduced operational spills. The District operationally spills water at the Lone Pine Weir to the Crooked River located at RM 27.7. Following construction, the District would eliminate the spillway at the Lone Pine Weir and the District would no longer operationally spill water to the Crooked River. ODFW has an instream water right in this reach that is met year-round.

Similar to the Deschutes River from the PBC diversion to Lake Billy Chinook, changes in canal and lateral seepage would occur as a result of project implementation and would affect groundwater discharge into the lower Crooked River. These changes are described in Section 6.9.2.4.

District Operations and Water Supply

Implementation of the Piping Alternative would benefit District operations and water supply. The Lone Pine Weir would no longer be used. Patrons receiving water in the project area would benefit from receiving water from an on-demand system, meaning that the system would operate with the flow rate and pressure required by farm irrigation systems with time duration and frequency decided by the farmers (Calejo et al. 2007). Converting to a piped conveyance system would allow for improved system operation, better control structures, and more responsive management. In the area's water-scarce environment, COID could provide more reliable water supply to NUID's farmers without increasing either Districts' diversion.

The Piping Alternative would also affect NUID's operations. Following the implementation of the project, NUID would the amount of water that it diverts from the Deschutes River into the NUID Main Canal by an amount equal to the amount saved by the proposed action. This rate would continue to be diverted from the Deschutes River into the PBC and conveyed into NUID's Main Canal. NUID's reduced diversion rate provides additional water savings by reducing seepage from the NUID Main Canal between the NUID diversion and the COID spill. This reduction in seepage results in an annual volume savings of 888 acre-feet that benefit NUID patrons. A quantification of this benefit can be found in the NED in Appendix D.

6.9.2.3 Surface Water Quality

Construction of the Piping Alternative would have negligible, temporary adverse effects on water quality within the project area. Eroded soil from construction sites could be carried to nearby streams during construction and immediately post-construction when the irrigation season begins.

Following implementation of the Piping Alternative, minor to moderate, long-term improvements on water quality within the Deschutes River could occur due to increased streamflow. Effects on water quality would be entirely beneficial.

The proposed action would increase late fall, winter, and early spring streamflow in the Deschutes River from Wickiup Reservoir (RM 226.8) to Lake Billy Chinook (RM 120). This additional streamflow would improve water quality in river reaches associated with District operations which currently do not meet water quality standards under Section 303(d) of the CWA (33 U.S.C. 1251 et seq.). Section 4.9.3 (Table 4-8) has a more detailed description of these impaired reaches. Irrigation modernization has been identified in the Middle Deschutes Agricultural Management Area Plan, 2016, and the Upper Deschutes Agricultural Water Quality Management Area Plan, 2016 as voluntary measures that can be implemented to address water quality issues and support beneficial uses of the Deschutes River.

Selection of the Piping Alternative would be particularly responsive to the current water quality issues related to streambank stability, sedimentation, and scour below Wickiup Dam. The higher flows during the non-irrigation season would contribute to a more wetted channel, a reduction in streambank erosion from freeze-thaw processes, and reduced sediment loads downstream (B. Hodgson, personal communication, August 16, 2018).

Following implementation of the Piping Alternative, negligible, long-term effects on water quality within the Crooked River could occur due to the potential of reduced discharge from groundwater and operational spills. Following completion of the proposed action, the Lone Pine Weir spillway would no longer be necessary, thus reducing the release of nonpoint source pollutants and warm temperature tailwater into the river system.

Following implementation of the Piping Alternative, minor, long-term effects on the water quality of irrigation water delivered to COID patrons could occur. Piping the PBC and laterals prevents contaminants, such as herbicides, pesticides, and animal waste, from entering the water supply for COID patrons down gradient.

6.9.2.4 Groundwater

Implementation of the Piping Alternative would have minor, long-term effects on groundwater in the vicinity of the project area and the NUID main canal downstream from the NUID diversion to the Crooked River. No groundwater resources would be extracted or consumptively used as part of this project; however, piping approximately 7.9 miles of the PBC and laterals would affect groundwater hydrology associated with canal and lateral seepage. Canal and lateral piping of the PBC and laterals would reduce seepage by 9,392 acre-feet annually, during the irrigation season. Reduced flow in NUID's Main Canal would further reduce seepage by 888 acre-feet annually[40] (see Section 6.9.2.2).

A 2013 study by the USGS estimated the effects on groundwater recharge from changes in climate (reduced precipitation), groundwater pumping, and canal lining and piping. Using data from 1997 to 2008, the study indicated that since the mid-1990s, groundwater levels have dropped by approximately 5 to 14 feet in the central part of the Deschutes Basin[41] (Gannett and Lite 2013). This study also indicated that approximately 10 percent of this decline in groundwater levels,

[40] FCA assumes that, as a result of the project, diversion rate reductions of up to 29.4 cfs would occur in the NUID Main Canal. The 2016 NUID System Loss Assessment estimated that the loss in the NUID Main Canal, from the NUID Diversion at North Canal Dam to the COID Spillway, is 9.46 percent; therefore, including these losses, an additional reduction to groundwater recharge of about 888 acre-feet per year would occur, for a total reduction in groundwater recharge of approximately 10,280 acre-feet per year.

[41] The central part of the Deschutes Basin includes the area north from Benham Falls to Lower Bridge, and east from Sisters to the community of Powell Butte.

approximately 0.5 to 1.4 feet, was due to canal lining and piping during this period. This was modeled as the result of reducing the recharge from irrigation canal leakage by 58,000 acre-feet per year.

Assuming a uniform increase in canal lining and piping over the 12-year study period, the decreased canal seepage was 4,833 acre-feet in 1997, increasing each year by another 4,822 acre-feet until the reduced canal seepage in 2008 was 58,000 acre-feet. Cumulatively, this represents 377,000 acre-feet of reduced recharge from canals over the 12-year study period. This data suggests the average relationship between canal seepage and groundwater levels in the central part of the Deschutes Basin is approximately 1 foot of groundwater elevation drop per 377,000 acre-feet of reduced canal seepage (Gannett and Lite 2013).

Implementation of the Piping Alternative would reduce canal seepage, and associated groundwater recharge, by up to approximately 10,280[40] acre-feet annually in this part of the Deschutes Basin. On average, for this part of the Deschutes Basin, this decrease in recharge translates into a decreased groundwater elevation of approximately 0.03 foot annually. An important caveat is that localized effects on groundwater would differ throughout the area. Over the course of 100 years, this annual drop results in a cumulative decreased average groundwater elevation of 2.73 feet. These effects would be most prominent at shallow depths closest to canals and attenuate with increasing depth (Gannet and Lite 2013).

In addition, changes in canal and lateral seepage account for only a small portion of changes in groundwater recharge seen in this part of the Deschutes Basin. Climate and increased groundwater pumping are the primary factors affecting groundwater levels in the region. The USGS estimated that the combined effects of climate and groundwater pumping accounted for approximately 90 percent of the observed decrease in groundwater levels in the region, and canal piping and lining accounted for 10 percent of that decrease (Gannett and Lite 2013).

A NED benefit cost analysis has been completed to evaluate the benefits and costs of the Piping Alternative (Section 8.9; Appendix D). The cost of groundwater recharge was included in this analysis. The analysis combines the decreased groundwater elevation for each year in the 100-year analysis period with the estimated volume of groundwater pumping in the central Deschutes Basin to estimate the total increased costs of groundwater pumping in the basin over time (Sussman et al. 2017).

6.10 Fish and Aquatic Resources

6.10.1 No Action (Future without Project)

6.10.1.1 General Fish and Aquatic Species

Under the No Action Alternative, ODFW-compliant fish screens would continue to be utilized at District diversions, and the PBC and laterals would not provide fish habitat; therefore, there would be no effect on fish and aquatic species within the project area.

This alternative would restore 3.7 cfs of streamflow during the non-irrigation season below Wickiup Reservoir. This change would increase the baseline streamflow by 3 percent to the upper Deschutes. Although instream habitat for fish and aquatic species would improve under the No Action Alternative, the beneficial effects on habitat and indirectly to fish and aquatic species would be negligible.

6.10.1.2 Federally Listed Fish and Aquatic Species

Under the No Action Alternative, habitat supporting Oregon spotted frog populations may see negligible improvement. Because bull trout and steelhead populations reside in downstream waterbodies where minimal increases of instream flow would have little to no effect on habitat, the habitat supporting these populations would likely not change from its current state.

6.10.2 Piping Alternative

6.10.2.1 General Fish Species

ODFW-compliant fish screens at District diversions would continue to be utilized under the Piping Alternative. Because the screens prevent fish from entering the project area, the Piping Alternative would have no effect on fish within the project area.

Under the Piping Alternative, the District's allocation of up to 30.3 cfs of water over the non-irrigation season would increase instream flow and moderately improve the streamflow regime and water quality of the upper Deschutes River, benefiting habitat for fish species (Section 6.9.2.2). The allocated water would be protected through an instream lease and would be released from Wickiup Reservoir into the upper Deschutes River (Section 6.9.2.2). This action would increase base level, non-irrigation season flows from a mean daily discharge of approximately 100 cfs in 2017[42] to approximately 130.3 cfs. This action would also assist ODFW in meeting its instream, year-round target of 250 cfs (Section 6.9.2.2; Golden and Aylward 2006).

The water returned instream from the Piping Alternative would alleviate some of the adverse effects of low winter streamflow on fish between Wickiup Reservoir and North Canal Dam. Available habitat and habitat suitability, for example, would increase for fish in the winter months as would macroinvertebrates which are a critical food source for fish (B. Hodgson, personal communication, August 16, 2018). Extreme cold water temperatures that can result in freezing events and bank erosion during the winter months would also be moderated due to increased water volume (B. Hodgson, personal communication, August 16, 2018).

Of the 30.3 cfs of protected water released from Wickiup Reservoir into the upper Deschutes, 24.7 cfs would pass through North Canal Dam into the middle Deschutes (see Section 6.9.2.2) during the non-irrigation season. However, because winter streamflow in the middle Deschutes River ranges between 450-1,200 cfs due to the contributions of tributaries and natural springs, the addition of 24.7 cfs would not likely affect fish and their habitats.

The Piping Alternative would have negligible effects on fish and aquatic species habitat in the Crooked River from RM 27.7 to the mouth of Lake Billy Chinook due to reduction or elimination of operational spills (Section 6.9.2.2). The resulting changes in water quality and quantity are described in Section 6.9.2.2 and 6.9.2.3 and are anticipated to have beneficial effects on fish habitat that may not be measurable (L. Mork, personal communication, August 10, 2018; B. Hodgson, personal communication, August 16, 2018).

[42] Prior to the 2016 Settlement Agreement, regulated flows during December and January averaged approximately 143 cfs and could drop below 50 cfs for consecutive months through winter (2017 hydrograph data retrieved from Reclamation's hydromet website https://www.usbr.gov/pn/hydromet/wygraph.html WICO gauge; OWRD historical streamflow station ID 14056500; Starcevich et al. 2015). See Section 4.9.2.3.

6.10.2.2 General Aquatic Species

Common aquatic species such as western toad, Pacific treefrog, and long-toed salamander have been known to use the open PBC and laterals. During implementation of the Piping Alternative, construction activities could kill or injure these individuals, and following implementation, habitat that is currently available to common aquatic species in the open PBC and laterals would be lost. The current habitat, however, is low-quality, available only at times when the canals carry water, and is not considered critical to the long-term survival of these species (S. Wray, personal communication, November 17, 2017). The invasive bullfrog species also utilizes the open PBC and laterals and would be impacted during construction.

Following completion of the Piping Alternative, improved streamflow and water quality during the non-irrigation season would have indirect beneficial effects on aquatic species within the waterbodies affected by District operations. The moderately increased instream flow in the Deschutes River during the non-irrigation season would improve aquatic species habitat in the upper Deschutes River, Wickiup Dam (RM 226.8) to North Canal Dam diversion (RM 164.8), but would likely have no effect on aquatic species in the middle Deschutes River, North Canal Dam diversion (RM 164.8) to Lake Billy Chinook (RM 120), or the Crooked River from RM 27.7 to Lake Billy Chinook (mouth). The impacts are similar to those seen with general fish species (Section 6.10.2.1; B. Hodgson, personal communication, August 16, 2018).

6.10.2.3 Federally Listed Fish and Aquatic Species

The ESA establishes a national program for the conservation of threatened and endangered species, and the preservation of the ecosystems on which they depend. The ESA is administered by USFWS for wildlife and freshwater species and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the ESA, called "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7, federal agencies must consult with USFWS when any action the agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species.

Within the affected area, the federally listed Oregon spotted frog occurs in Crane Prairie Reservoir, Wickiup Reservoir, and the upper Deschutes River. Water released from Wickiup Reservoir as a result of the Piping Alternative would increase streamflow during the non-irrigation season (Section 6.9.2.1). This action would have a long-term benefit for Oregon spotted frog and its critical habitat in the upper Deschutes. All PCEs of the Oregon spotted frog critical habitat would benefit from the Piping Alternative in this reach (Appendix E). Because the Piping Alternative would not affect Crane Prairie Reservoir levels, there would be no effect on Oregon spotted frog populations in this waterbody. Changes to Wickiup Reservoir levels as a result of the Piping Alternative are negligible and therefore would have negligible impacts to Oregon spotted frog populations in this waterbody. This action is consistent with the recommendations of USFWS Oregon Spotted Frog Biological Opinion (Reclamation 2017b). The project would move towards USFWS streamflow restorations goals to benefit the Oregon Spotted Frog. However, due to the quantity of water that would be protected instream, effects on the frog would be negligible. Informal consultation has been initiated. USFWS concurrence with a "May Affect-Not Likely to Adversely Affect" determination is anticipated.

Bull trout critical habitat is located within the affected area (Appendix E), and bull trout are known to forage in the middle Deschutes during the non-irrigation from Big Falls (RM 132) to Lake Billy

Chinook (RM 120). In this reach, however, increased instream flow during the non-irrigation season, as a result of the Piping Alternative, would have no effect on bull trout because the magnitude of the increased streamflow would not be sufficient to produce a discernable effect on bull trout populations or PCEs identified in the critical habitat designations (75 *Federal Register* 200, 2010). Consequently, NRCS has determined that no effects would occur to federally designated critical habitat for bull trout and Section 7 consultation under the ESA is not warranted for this species.

The Middle Columbia River steelhead population can potentially access the Deschutes River as far upstream as Big Falls (RM 132, Section 4.2.1). Similar to the effects on bull trout, changes to streamflow or water quality as a result of the Piping Alternative would have no effect on the steelhead population. Because Middle Columbia River steelhead in the waterbodies affected by District operations are considered a NEP, are treated as "proposed for listing" under Section 10(j) of ESA (76 *Federal Register* 28715, 2011), and implementation of the Piping Alternative is not likely to jeopardize the continued existence of the species (76 *Federal Register*. 28715, 2011; 81 *Federal Register* 33416, 2016; Section 4.10.2; Section 8.5.3), NRCS has determined that Section 7 consultation with NMFS under ESA is not warranted (Section 8.5.3).

6.11 Wetlands and Riparian Areas

6.11.1 No Action (Future without Project)

Under the No Action Alternative, the District would pipe up to 2.3 miles of the open PBC and laterals. Effects on wetlands and riparian areas along canals and pipelines would be similar to previous piping projects and would be dependent on the areas in the vicinity of the project.

6.11.2 Piping Alternative

Project Area

Through analysis of the NWI geographic information systems data (USFWS 2016) and aerial imagery, 2 potential sites were identified as Freshwater Emergent Wetlands within or adjacent to the project area that could be affected by implementation of the proposed project. Of the 2 potential sites, 1 intersects the J lateral, while the other is located adjacent to the PBC. The NWI data is used as a first-step approach in identifying and evaluating potential wetlands in the project area. In October 2019, the District visited the identified sites and documented the characteristics of the sites through photographs and written descriptions. This documentation was provided to Jennifer Moffitt, NRCS Resource Soil Scientist. Jennifer Moffitt then performed an informal off-site wetland inventory of the two areas and determined that these are artificial wetlands and are not jurisdictional wetlands based on a review of the exemptions under the Oregon Removal-Fill statute (OAR 141-085-0515(9)) and language provided in the 1986 Final Rule (see Section 4.11 for language).

During construction, there could be potential for temporary adverse effects, such as sedimentation from stormwater runoff and accidental fuel spills. Implementation of BMPs such as silt fencing would be utilized to minimize effects.

Construction would result in the permanent fill of the PBC and laterals in the project area. Seasonal opportunistic hydrophytic plants that sporadically occur within and directly adjacent to the PBC and laterals would be removed or buried during excavation, fill, placement of pipe, or other construction activity. Following construction, the District would follow appropriate reclamation procedures in order to revegetate disturbed areas as uplands.

After completion of pipe installation, seepage losses would be eliminated, potentially limiting the water available to adjacent wetlands if they are dependent upon canal seepage for hydrology. Additionally, wetlands in the project area do provide some wildlife habitat that would be permanently changed to upland areas after project construction.

Because the effects of this alternative could reduce water availability to wetlands and hydrophytic vegetation occurring near or adjacent to the project area, minor effects are assumed to occur to wetland habitat within the project area.

The Piping Alternative would have no effect on excavated irrigation water storage ponds that occur adjacent to the project area and the hydrophytic vegetation along these ponds would not be disturbed.

North Unit Main Canal

As described in Section 6.9.2, the project would result in reduced flow rates in the North Unit Main Canal (up to 29.4 cfs). Vegetation along the North Unit Main Canal is minimal due to NUID's vegetation management program however, wetlands along or adjacent to the canal may see a reduction in available water that is currently lost through seepage (an estimated 2.78 cfs[43]). These losses are small when compared to the total canal flow (820 cfs at the main point of diversion from the Deschutes River during peak irrigation season [NUID 2017]). Therefore, the Piping Alternative may have a negligible effect on wetlands and riparian areas along or adjacent to the canal.

Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations

Following construction of the Piping Alternative, the project area would become a closed system and the Lone Pine Weir spillway would no longer be necessary. Although this spillway is used only occasionally in emergency situations, eliminating this spill would reduce the release of nonpoint source pollutants and warm temperature tailwater into the river system. Eliminating this spill would also decrease the available water to riparian[44] vegetation at the site of the spill and wetlands and riparian areas along the Crooked River downstream of the spill (RM 27.7). However, as this spill is used only occasionally in emergency situations, vegetation in the area is most likely dependent on other water sources; therefore, effects on wetland and riparian areas along the Crooked River would be negligible.

The proposed action would result in improvements in water quality and habitat function in the 116.8 miles of natural riverine systems downstream of Wickiup Reservoir as a result of increased streamflow during the non-irrigation season; however, due to the volume of increased flows, effects on adjacent wetlands and riparian areas are expected to be minor. This protected streamflow would contribute towards a more natural hydrologic regime. Restablishing a more natural hydrologic regime in these reaches could allow the river channel to supply water to wetlands and riparian areas via infiltration through channel banks thus enhancing wetland and riparian function by facilitating processes such as surface and groundwater exchange, physical and chemical transformations, and supporting riparian plant communities.

[43] The 2016 NUID System Loss Assessment estimates that the loss in the NUID Main Canal from the NUID Diversion at North Canal Dam to the COID Spillway is 9.46 percent. Therefore, 9.46 percent of 29.4 cfs is 2.78 cfs.

[44] Through an analysis of the NWI geographic information systems data (USFWS 2016), no wetlands at the site of the Lone Pine Weir operational spill were identified.

The Piping Alternative would have no effect on streamflow between Crane Prairie Reservoir and Wickiup Reservoir; therefore, no effect on wetlands and riparian areas along these 5 miles of natural riverine system are expected to occur. The operations and release schedule of the reservoir may change in the future as a result of changes to the Revised 1938 Inter-District Agreement and the implementation of the HCP that occur separately from this project.

Based on this information, the Piping Alternative would have long-term, negligible to minor, beneficial effects on wetlands and riparian areas along the natural waterbodies associated with District operations.

Wetland and Floodplain Compliance

The replacement of an open channel with a pipe is considered an irrigation exemption under USACE Regulatory Guidance Letter No. 07-02 Exemption for Construction or Maintenance of Irrigation Ditches and Maintenance of Drainage under Section 404 Part 323.4(a)(3) of the CWA. Under this exemption, no Nationwide Permit is required for the disturbance to wetlands within the project area. In addition, Jennifer Moffitt, NRCS Resource Soil Scientist, conducted an informal off-site wetland inventory of the two potential areas and determined that these are artificial wetlands and not subject to federal or state jurisdiction (see Appendix E for supporting documentation).

EO 11988 requires federal agencies to avoid to the extent possible the long- and short-term effects associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The PBC and laterals in the Piping Alternative are not located within the 100-year floodplain and would be compliant with EO 11988.

6.12 Wildlife Resources

6.12.1 No Action (Future without Project)

Under the No Action Alternative, negligible effects on wildlife along the PBC and laterals are expected because activities and effects would be similar to but smaller in scale than those under the Piping alternative described below.

6.12.2 Piping Alternative

During construction, terrestrial wildlife could experience noise disturbance due to heavy equipment operation or habitat removal due to tree cutting and other vegetation removal. Canals are located in agricultural areas where heavy equipment use is commonplace; therefore, most wildlife in the area is accustomed to noise and these disturbances are anticipated to be minor.

Wintering or migrating birds would be minimally affected by construction disturbance because they have the flexibility to move away from disturbances to other suitable areas. There is no expected effect on breeding migratory songbirds or waterbirds as construction activities would occur outside the nesting season.

The District would follow USFWS guidelines to ensure minimal disturbance to bald or golden eagles nesting near the project area. The critical nesting period for bald and golden eagles is January 1 through August 31. No known golden eagle nests are located near the project area, and, although no bald eagle nests are documented, it is possible that a bald eagle nest could be located near the project area (J. Cordova, personal communication, August 29, 2017). The District would continue to work with USFWS to ensure that appropriate buffers are maintained between project construction

activities and active nests or that construction in areas with known nests is avoided during the critical nesting period.

As the PBC and lateral systems in the project area are piped, a linear loss of surface water and some of the vegetation associated with the open canals would occur. Although species native to Central Oregon may utilize the system of canals and laterals, these features are not naturally occurring and only support those species that are able to accommodate a level of human interaction (i.e., urban adaptors). The removal of these water sources could alter the distribution patterns of wildlife within the project area. However, because the Piping Alternative would be implemented over time, ungulates and other terrestrial wildlife would have ample time to adjust to the conditions and find new water sources. This alternative would have no effect on excavated irrigation water storage ponds served by the project and these ponds would still allow for summer drinking water and habitat for wildlife.

Canals and laterals can also have adverse effects on wildlife due to risk of drowning and the barrier that they create to terrestrial movement (Beier et al. 2008). The proposed project would eliminate that risk and remove that barrier in the project area.

At the population level, the Piping Alternative is expected to have no effect on species that may currently utilize the open canals.

Construction activities would cause short-term, negligible effects on wildlife due to increased human presence. Regarding long-term effects, piping of irrigation systems would potentially reduce human presence through the project area, as fewer trips to maintain ditches and headgates would be necessary. This would result in less human–wildlife conflicts and improve seclusion for wildlife. In addition, the Piping Alternative could remove barriers to ungulates and other terrestrial wildlife within the project area as open canals are converted to buried pipelines.

Project implementation would provide increased instream flows in the Deschutes River downstream from Wickiup Dam that could enhance riparian habitat. Improved streamflow would allow more consistent access to water for hydrophytic plants, and this would in turn enhance riparian wildlife habitat. Overall, the Piping Alternative would have a minor, long-term effect on general wildlife in the project area. Unavoidable effects on wildlife would be minimized using BMPs.

The Piping Alternative would have no effect on threatened or endangered terrestrial species. As noted in Sections 4.12.3 and 4.12.4, no federally or state designated species or federally designated critical habitat occurs within the project area. Effects on federally or state designated species, or federally designated critical habitats within waterbodies affected by District operations are discussed in Section 6.10.2.3.

6.13 Wild and Scenic Rivers

6.13.1 No Action (Future without Project)

Under the No Action Alternative, there would be no effect on the Wild and Scenic or State Scenic Waterways designation or the free-flowing condition of the designated reaches identified in Section 4.13. Activities associated with the No Action Alternative would be similar to but smaller in scale than those described in the Piping Alternative.

6.13.2 Piping Alternative

Implementation of the Piping Alternative would have no effect on the Wild and Scenic or State Scenic Waterways designation or the free-flowing condition of the designated reaches affected by District operations. Construction activities would not occur in the designated reaches (see Section 4.13 for a description of the project area), and the increased streamflow during the non-irrigation season, protected through an agreement between COID and NUID (see Section 6.9.2.1), is expected to be consistent with Wild and Scenic River management goals (USDA 1996a; BLM 1992). The proposed action would have beneficial effects on some of the qualities that support these designations. Specifically, any effect of increased streamflow would be an enhancement to fish, recreation, scenery, wildlife, hydrological, and botanical/ecological or vegetative values.

Discharge from cold-water springs to the middle Deschutes and lower Crooked Rivers may be impacted by the reduction of canal and lateral groundwater seepage. However, the effects on hydrological Outstanding Remarkable Values impacted by cold-water springs would be negligible due to the magnitude of groundwater reduction, described in Section 6.9.2.4. Outstanding Remarkable Values unrelated to river flow, including cultural, geologic, and wilderness, would be unaffected by the proposed action.

Since adverse effects are not expected to occur in the designated Wild and Scenic River reaches or in the State Scenic Waterways, consultation with Oregon Parks and Recreation Department, U.S. Bureau of Land Management (BLM), U.S. Forest Service, or USFWS is not warranted.

6.14 Cumulative Effects

6.14.1 Past Actions

Past actions are summarized as land development activities that include irrigated agriculture (consisting of construction of the canal system, previous piping projects, and diversions), urban and suburban development, industrial land and water uses, commercial development, water diversions for non-agricultural uses, transportation infrastructure, and restoration projects. The nature and extent of these past actions and how they have influenced the existing environment are described for each resource in Section 4.

The first documented canal in COID's system was dug in 1903 to provide water to surrounding farms and ranches for crops and livestock. The PBC was constructed by 1905 and the Central Oregon Irrigation Company was formalized in 1910, which then became COID in 1917. Seven other irrigation districts were developed within the Deschutes Basin during the early 20th century, collectively altering the hydrology of the Deschutes River and its tributaries. Over time there has been increasing pressure to reduce the effects of irrigation needs on the natural water cycle in the Deschutes Basin.

6.14.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are presently underway, either because they are under construction or are occurring on an ongoing basis. Reasonably foreseeable future actions generally include those actions formally proposed or planned, or highly likely to occur based on available information. Various sources, including local, state, and federal agency websites and city and county staff, were consulted to obtain information about current and potential future development in the project area. The following sections describe these current

actions and reasonably foreseeable future actions. This list is not comprehensive, and other actions may be taking place or may take place in the future.

6.14.2.1 Land Use and Development

Ongoing agricultural activities, including farming and grazing in the project area, are not expected to change from current conditions. Land use development in the project area would continue to be managed according to the Deschutes County Comprehensive Plan and Deschutes County zoning regulations, and the City of Redmond Community Development Department. Land development activities are expected to continue into the future, and would include agricultural, residential, commercial, and industrial land uses, as well as maintenance of public lands for their intended uses.

6.14.2.2 Habitat Conservation Plan

The District, other irrigation districts in the Deschutes Basin, and the City of Prineville are working with state and federal agencies, local municipalities, and environmental groups to develop a multi-species HCP for the upper Deschutes Basin for listed species and those that may become listed during the 20- to 50-year life of the HCP: Oregon spotted frog, bull trout, chinook salmon, steelhead salmon, and sockeye salmon. The HCP is anticipated to be completed in 2020. The draft HCP was published for public review in October 2019. Covered activities included:

- Storage and release of irrigation water from:
  - Crane Prairie Reservoir
  - Wickiup Reservoir
  - Crescent Lake Reservoir
  - Ochoco Reservoir
- Diversion of irrigation water
- Irrigation return flows
- City of Prineville water use activities.

6.14.2.3 Deschutes Basin Irrigation District Modernization

Other irrigation districts in the Deschutes Basin are working to pipe their infrastructure, and would implement projects similar to those proposed by COID in this Plan-EA. Two districts (Tumalo Irrigation District [TID] and Swalley Irrigation District [SID]) have authorized Plan-EAs. TID plans to pipe approximately 68.8 miles of its canals and laterals over the course of 11 years. SID plans to pipe approximately 16.6 miles of its canals and laterals over the course of 7 years. The district most likely to obtain necessary funding and permitting in the next 2 years is LPID. LPID plans to pipe approximately 11.3 miles of its canals and laterals over the course of 3 years. This project is contingent on the availability of funding.[45] These three districts are anticipated to cumulatively convert approximately 96.3 miles of open canals and ditches to piped systems and save up to 74.2 cfs of water that would otherwise be lost to seepage and evaporation.[46]

[45] The Ochoco Irrigation District, AID, and NUID are also interested in pursuing PL 83-566 funding and are beginning the Watershed Planning process. The potential saved water and extent of the project are still being determined.

[46] Not all water saved would be protected instream. Table 6-1 presents the expected water to be conserved instream.

6.14.3 Cumulative Effects by Resource

6.14.3.1 Cultural Resources

Cultural resources in the project area have likely been affected due to past, present, and ongoing development activities such as agriculture, land development, forestry, and any other ground disturbing projects. Like the proposed action, other reasonably foreseeable future actions in the vicinity of the project area have the potential to disturb previously undiscovered cultural resources. The implementation of mitigation measures as identified through consultation with SHPO would address any adverse effects on cultural resources individually and cumulatively. Cumulative effects on cultural resources from the proposed action in combination with other past, present, and reasonably foreseeable projects are therefore considered moderate.

6.14.3.2 Land Use

The project area has been substantially altered over the past century by a variety of human activities, including agricultural development, livestock grazing, urban and suburban development, and road construction. Implementation of the proposed action would support existing land uses, as would implementation of future actions, including the HCP and additional irrigation district modernization. Since these actions would collectively support existing land uses, implementation of the proposed action would have negligible cumulative effects on land use.

6.14.3.3 Public Safety

Past and ongoing operation of agricultural equipment and vehicle traffic in the project area would continue to create risks to public safety, but these risks are not expected to change from current conditions. Implementation of additional irrigation piping would improve public safety by reducing the risk of drowning in open canals that were piped as part of the project. In combination with past, present, and reasonably foreseeable future actions, the proposed action is anticipated to have minor cumulative effects on public safety.

6.14.3.4 Recreation

Canals in the proposed action do not support any recreational pursuits; however, increased streamflow resulting from implementation of the proposed action would have a negligible, indirect effect on recreation in areas away from these canals. In waterbodies associated with District operations, climate variability and other ongoing actions would likely drive any effects on recreational activities; implementation of the proposed action on recreation would have no cumulative effects on Crane Prairie Reservoir, no effect cumulative effects on Wickiup Reservoir, and negligible effects on river activities occurring on or along the Deschutes River. Past, ongoing, and future land uses and developments in the project area would be expected to support recreation in the same way that it is currently supported. Given ongoing and future actions, including climate variability and anticipated implementation of the HCP, the cumulative effects of the proposed action on recreational resources would be negligible.

6.14.3.5 Soils

Past, ongoing, and future actions in the surrounding area that affect soils include agricultural uses, land development, and water management activities, as discussed above. The amount of soil affected by the proposed action is small compared to the area affected by other past, present, and reasonably foreseeable future actions in the area; the proposed action would have minor, cumulative effects on geology and soils.

6.14.3.6 Socioeconomic Resources

Past actions including agricultural and other land development, and recently completed projects, have had minor effects on socioeconomics. There are no other known future projects that would affect socioeconomic resources in Deschutes County or Crook County. Although gentrification may have a minor effect on Deschutes County and Crook County over the lifespan of the proposed project, this process would not affect the trajectory of the project. Since the effects on socioeconomics from the proposed action are considered minor, the cumulative effects on socioeconomics from the proposed action in combination with other past, present, and reasonably foreseeable projects are also considered minor.

6.14.3.7 Vegetation

Agricultural activities, livestock grazing, vegetation control along roads, and urban and suburban development are responsible for most of the past and ongoing effects on vegetation in the project area and in the region. Livestock grazing can introduce and spread weed species, degrade native vegetation communities, and trample riparian and wetland areas. In addition, vegetation control activities generally include herbicide applications to control vegetation and noxious weeds, and the mechanical cutting of vegetation. The amount of vegetation that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, vegetation control along roads, and other utility corridors in the area. In addition, these past actions are not expected to change measurably from current conditions, resulting in minor cumulative effects.

6.14.3.8 Visual Resources

Past land use actions have changed the visual character of the project area. Agricultural and development activities have altered the visual resources in the region by removing native vegetation, adding new infrastructure, and creating increased human activity within the landscape. These types of actions are anticipated to continue into the future in the project area and expand as the region is one of the fastest growing in the state and nation. There would be minor effects on the developed and rural visual character of the landscape in the project area, resulting in minor cumulative effects when combined with other past, present, and reasonably foreseeable future actions.

6.14.3.9 Water Resources

Past actions over the last 120 years that have affected water resources include urban and agricultural development, road construction, road maintenance, and other irrigation projects. Since the early 1990s there has been increasing interest in conserving water and restoring streamflow to the Deschutes River. The District and other Deschutes Basin irrigation districts have implemented various water conservation projects. These recent, past efforts have included piping existing irrigation canals, on-farm conservation, water management changes, and changes to crop production, which have resulted in increased streamflow in the Deschutes River (Section 4.9.2) but decreased seepage to the groundwater table (Section 4.9.4).

Ongoing and reasonably foreseeable future actions that could affect water resources include additional irrigation piping projects being considered by other Deschutes area irrigation districts that divert water from the Deschutes River (Table 6-1), on-farm water conservation work, and implementation of the HCP. These actions, accompanied by the proposed action, would cumulatively increase streamflow in the Deschutes River and its tributaries, resulting in moderate cumulative effects on water resources.

Table 6-1. Potential Water Conserved Instream from other Public Law 83-566 Projects[1] occurring in the Deschutes Basin.

Irrigation District	Total Water Conserved Instream (cfs)[2]	Reach Affected[1,2]
Tumalo Irrigation District	48	Approximately 30 cfs would be allocated to Tumalo Creek during the irrigation season and 18 cfs would be allocated to Crescent Creek during the non-irrigation season. Both creeks are tributaries of the Deschutes River.
Swalley Irrigation District	15.2	The entire 15.2 cfs would be allocated to the Middle Deschutes River, from RM 164.8 to RM 120, during the irrigation season.
Lone Pine Irrigation District	5.2	The entire 5.2 cfs would be allocated to the Upper and Middle Deschutes River, from RM 226.8 to RM 120, during the irrigation season.

Notes:
[1] The numbers presented for Swalley and Tumalo Irrigation Districts are from Plan-EAs, which have already been authorized and reasonably foreseeable to occur. LPID has identified the proposed water savings in a preliminary Draft Plan-EA due to be available for public review in 2020.
[2] Flows allocated instream during the irrigation season are shown as maximum flows and may be reduced during the shoulder season depending on the Districts' water right. Flows allocated instream during the non-irrigation season are shown as a flat rate (cfs). See each District's Plan-EA for more information regarding the timing and location of instream flows.

Reasonably foreseeable irrigation canal and lateral piping projects throughout the Deschutes Basin may contribute to a reduction in groundwater levels. On the eastern side of the Deschutes River, seepage from COID's canals most likely percolates to shallow aquifers, where it may be extracted for groundwater consumption, or ultimately discharge into the Deschutes River (Gannett et al. 2017). Because of its near vicinity to COID on the eastern side of the Deschutes River, SID's ongoing project may affect groundwater within COID. TID's ongoing project and LPID's reasonably foreseeable project are not proximal to COID and therefore would likely have no effect on groundwater levels in COID. For reference, TID's project is located on the west side of the Deschutes River and LPID is located on the north side of the Crooked River (Figure 1-1). In the next 50 years, if SID and COID's irrigation piping projects are implemented to the fullest extent, groundwater levels are locally expected to decline 2.18 feet[47] (Section 6.9.2, Groundwater). In conjunction with the effects of climate variability, COID's project would have a minor cumulative effect on local groundwater levels (Section 4.9.4; Gannett and Lite 2013). The effects of local groundwater reduction due to piping would be mitigated by increased streamflow during the non-irrigation season, some of which would likely infiltrate into the regional aquifer.

[47] This assumes that SID's project will reduce local groundwater recharge by 6,171.52 acre-feet per year.

Water quality could be affected due to nonpoint source pollution such as erosion and runoff associated with ongoing and potential construction and land development activities, including the proposed irrigation piping projects. The proposed action would be constructed when there is no water in the canal system; construction practices for proposed similar projects are anticipated to be similar. Proposed cumulative actions would contribute to water quality improvements anticipated from the reduction in erosion from the District's canals and increasing streamflow in waterbodies affected by District operations.

The implementation of the proposed action and other reasonably foreseeable future actions is anticipated to have a moderate cumulative effect on water resources, as implementation of irrigation piping projects could reduce groundwater infiltration, increase streamflow, and improve water quality.

6.14.3.10 Fish and Aquatic Species

Past actions including road construction, road maintenance, and urban and suburban development projects would have minor effects on fish in combination with the proposed action. The potential effects from these past projects in COID and the Deschutes Basin, such as sediment entering waterbodies or aquatic habitat disturbance, would be temporary and likely complete before construction of the proposed action.

Because COID's irrigation diversions are screened and the conveyance systems do not provide adequate habitat for fish and aquatic species, implementation of the Piping Alternative would not have a direct effect on fish and aquatic species in the irrigation infrastructure. Irrigation diversions and reservoir operations are responsible for most of the past and ongoing direct and indirect effects related to water availability and seasonality on fish communities and associated riverine habitat in the area affected by District operations.

Ongoing land use activities in the project area are not expected to change from current conditions. Future land developments and irrigation district modernization projects may cause indirect effects on fish, such as sediment inputs or aquatic habitat disturbance, and could potentially affect waters within the same watershed as the proposed action. However, reasonably foreseeable future actions are all proposed for improving aquatic habitat conditions. These actions include the HCP and installation of other irrigation piping projects in the Deschutes Basin.

Implementation of the proposed action, when combined with other future actions, is anticipated to have a moderate, beneficial cumulative effect on fish, aquatic species, and available habitat for these species. Implementation of other irrigation piping projects could have an additive effect on the amount of water conserved.

6.14.3.11 Wetlands and Riparian Areas

Past actions that may have affected wetlands, riparian areas, and floodplains consist of the original construction of the irrigation canals as well as agricultural activities, livestock grazing, vegetation control, and development. Seepage from the PBC and laterals has contributed to localized vegetation and 3 Freshwater Emergent Wetlands, Riparian (USFWS 2016) within or adjacent to the project area. The proposed project would reduce the amount of water available to vegetation and these potential wetland features during the irrigation season. These sites, however, are expected to be non-jurisdictional (Section 6.11.2). Reasonably foreseeable future actions in the project area that could affect vegetation along irrigation canals include agricultural activities, livestock grazing, vegetation control along roads and utility corridors, and urban and suburban development. Changes to riparian area vegetation in the project area caused by the proposed action would be minor

compared to these activities. The cumulative effect of the proposed action and other past, present, and reasonably foreseeable future projects on wetlands and opportunistic hydrophytic vegetation is expected to be minor.

Of several foreseeable irrigation infrastructure modernization projects in the Deschutes Basin, COID would be the only project to increase streamflow in the upper and middle Deschutes during the non-irrigation season. Streamflow increase would have beneficial impacts to riparian vegetation and Oregon spotted frog habitat in the upper Deschutes and negligible impacts to riparian vegetation and Oregon spotted frog habitat in Wickiup Reservoir. The proposed action, when combined with other future actions, is anticipated to have minor, beneficial effects on riparian vegetation.

Cumulative effects in the lower Crooked River and NUID canals as a result of COID's project or other foreseeable projects is expected to be negligible.

6.14.3.12 Wildlife

Agriculture, urban, and suburban development have affected wildlife and wildlife habitat in the project area since the late 1800s. Agricultural activities have substantially altered the habitat in the region by removing native vegetation communities in some areas and diverting streamflow. Livestock grazing occurs in much of the region around the project area and can result in the introduction and spread of weed species, the degradation of native habitat, and trampling of riparian and wetland areas. Some native habitats have been replaced with disturbance-tolerant or introduced species assemblages that may support different wildlife than previously existed. These ongoing activities would continue to affect wildlife and wildlife habitat in the project area.

Some wildlife currently uses the PBC and laterals as a water source. Implementation of the proposed action would cause wildlife to find other water sources, as they did prior to installation of the canals, but would also create connected habitat corridors through which wildlife could travel. Since effects of the proposed action on wildlife would happen incrementally over the 4 years to complete the project, animals would be able to adapt. Furthermore, because other past, present, and reasonably foreseeable future actions affect wildlife across a broad geographic area in the Deschutes Basin, the cumulative effect on wildlife from implementation of the proposed action would be minor.

In addition, vegetation control activities, including herbicide applications to control noxious weeds and the mechanical cutting of vegetation, are ongoing actions that contribute to wildlife habitat changes. In conjunction with past and ongoing agricultural activities, livestock grazing, vegetation control, and urban and suburban development in the area, the proposed action would have a negligible cumulative effect on wildlife habitat available.

6.14.3.13 Wild and Scenic Rivers

Sections of the Deschutes River have been designated as Wild and Scenic under the National Wild and Scenic River Act and a section of the Deschutes River is also designated as an Oregon State Scenic Waterway. These designations aim to protect these areas from changes that generally alter the scenic, recreational, and ecological qualities of these areas. Changes to the current and future management of these sections of rivers, which are located within areas affected by District operations, is expected to be negligible. These Wild and Scenic waterways would continue to be managed by federal and state agencies consistent with their designations.

The implementation of the proposed action would have a minor effect on hydrological ORVs impacted by cold water springs fed by groundwater from canal seepage. The cumulative effects of

the proposed project and other reasonably foreseeable projects on hydrological ORVs would also be minor. Other, non-hydrological ORVs, would not be impacted.

7 Consultation, Coordination, and Public Participation

The District and its partners planned and conducted numerous agency coordination and public involvement activities throughout the development of the Plan-EA. These activities included public scoping meetings, informational sessions, presentations, press announcements, and frequent correspondence with federal, state and local resource agencies, agriculture interests, and other interest groups and individuals. The project development process was designed to work collaboratively with partners, agencies, tribes, and stakeholders to ensure transparency and cooperation towards a solution that fits within the framework of the purpose and need for action.

A PIR (FCA 2017) was prepared to provide sponsors, local partners, agencies, and the public with information to evaluate the goals and objectives of the project. During the development of the PIR, project sponsors conducted initial consultation with natural resource agencies and stakeholders in the Deschutes Basin.

Public participation activities prior to preparation of the Plan-EA included:

Announcements for the public scoping meeting and scoping comment period

- NRCS public notice (June 16, 2017) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1333630
- These public notices were also published in the Capital Press Ag Weekly Newspaper and the Bend Bulletin. Ads were published in the Capital Press once a week for 3 weeks; ads were published in the Bend Bulletin twice a week for 3 weeks.
- NRCS press release (June 19, 2017) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEPRD1334010
- KTVZ Channel 21 news story (June 19, 2017) http://www.ktvz.com/news/irrigation-district-canal-piping-plans-up-for-public-input/551703403
- DBBC Facebook post (June 21, 2017)
- Bend Bulletin article (June 26, 2017) http://www.bendbulletin.com/localstate/5400420-151/change-coming-to-central-oregon-irrigation-districts
- District letter mailed to all patrons (June 30, 2017)
- NRCS letter to CTWS for invitation to public scoping meetings and offer to set up consultation with the tribe, signed by the NRCS State Conservationist (June 30, 2017)
- Bend Bulletin guest column (July 6, 2017) by Craig Horrell, COID Manager http://www.bendbulletin.com/opinion/5427265-151/guest-column-watershed-plan-needs-public-involvement?referrer=section
- KBND News article (July 6, 2017) http://kbnd.com/kbnd-news/local-news-feed/312557
- FCA Facebook post (July 6, 2017)
- District website announcement (July 7, 2017)
- NRCS Oregon Twitter post (July 10, 2017)
- DBBC Facebook post (July 20, 2017)

COID community information meeting

- June 14, 2017 6:00 p.m. at The Pump House, 8320 N Hwy 97, Terrebonne, Oregon 97760

- The meeting was held to educate customers on upcoming irrigation district improvement projects and to answer questions. Topics discussed were upcoming modernization projects, benefits, and timelines.

Public involvement website

A website was launched on June 16, 2017, to inform the public and share project information. Oregonwatershedplans.org includes the following information:

- Overview of NRCS' PL 83-566 funding program
- Overview of NEPA and EA public participation process
- Frequently Asked Questions about the EA process
- Background on the District, the Draft Plan-EA and appendices, the PIR and appendices, and presentations and handouts from public meetings
- Contact information and how to submit public comments
- Email signup option for more information; subscribers receive updates over the course of project development

Public information session/environmental stakeholder meeting

- June 22, 2017 6:00 p.m. at Trinity Episcopal Church, 469 NW Wall St, Bend, Oregon 97701
- Members of the public were invited to hear an overview of NRCS PL 83-566 funding program, NEPA and the EA process, and an overview of the proposed project scope and water conservation need. Attendees had an opportunity to ask questions and were given the oregonwatershedplans.org website for more information about how they can participate in the EA process.
- Presenter: Margi Hoffmann, FCA
- COID Public Scoping Meeting
- July 10, 2017 from 5:30 p.m. to 7:00 p.m. at Redmond Grange 707 SW Kalama Avenue, Redmond, Oregon 97756
- Participants had an opportunity to learn more about the proposed irrigation improvements and discuss their comments, ideas and concerns.
- Presenters:
  - Tom Makowski, NRCS
  - Craig Horrell, Manager, COID
  - Margi Hoffmann, FCA
  - Bridget Moran, USFWS

Basin Study Work Group Steering Committee Meeting (open to the public)

- July 13, 2017, at Deschutes Services Building, 1300 NW Wall Street, Bend, Oregon 97701
- Participants heard about the PL 83-566 funding opportunity, the proposed irrigation improvements, and were given information on how to submit comments for the public record.
- Presenter: Brett Golden, FCA

Central Oregon Irrigation District Board Meetings (open to the public)

- The District Board has discussed PL 83-566 funding and related projects at Board meetings since June 2016. Board meetings are typically held the second Tuesday of every month, and

the District occasionally holds additional meetings and open houses. Past and future meetings can be found at http://coid.org/.

Informational materials available to the public

- PIR and Appendices, made available prior to public scoping meetings.
- Four-page public handouts, made available prior to public scoping meetings.
- Meeting presentation slides, made available after public scoping meetings.

7.1 List of Persons and Agencies Consulted

The following lists include persons and agencies with a vested interest in the Plan-EA or those consulted during the planning process. This includes agencies that provided formal or required consultation, or individuals who were conferred with and who provided substantial input. Coordination with state and local agencies has been ongoing since project inception.

Local entities that have land ownership or a shared resource within the Watershed Planning Area:

- City of Redmond
- Crook County
- Deschutes County
- Jefferson County

Agencies that have been involved with the project include the following state and federal resource agencies:

- Oregon Department of Agriculture (ODA)
- Oregon Department of Environmental Quality (ODEQ)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of State Lands (ODSL)
- Oregon Governor's Office
- Oregon Water Resources Department (OWRD)
- Oregon Watershed Enhancement Board (OWEB)
- Oregon State Historic Preservation Office (SHPO)
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management (BLM)
- U.S. Bureau of Reclamation (Reclamation) was consulted and has opted not to be a cooperating agency for the EA
- U.S. Fish and Wildlife Service (USFWS)

Tribes that have been consulted regarding the project include:

- Confederated Tribes of Warm Springs (CTWS)

Other stakeholders for this project include:

- COID patrons
- Adjacent landowners
- Central Oregon Land Watch
- Coalition for the Deschutes

- Deschutes River Conservancy
- Interested public
- Trout Unlimited
- Upper Deschutes Watershed Council
- WaterWatch of Oregon

Table 7-1 describes communications with agency personnel that were consulted during development of the Plan-EA.

Table 7-1. Agency Consultation Record.

Date	Contact, Agency	Communication
October 21, 2016	Bridget Moran, USFWS	• Overview of PL 566 Watershed Planning program • Overview of Tumalo, Swalley, and Central Oregon proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
November 6, 2016	Kyle Gorman, OWRD	• Overview of PL 566 Watershed Planning program • Overview of Tumalo, Swalley, and Central Oregon proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
December 2, 2016	Brett Hodgson, ODFW	• Overview of PL 566 Watershed Planning program • Overview of Tumalo, Swalley, and Central Oregon proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
January 6, 2017	Greg Ciannella, OWEB	• Overview of PL 566 Watershed Planning program • Overview of Tumalo, Swalley, and Central Oregon proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs
January 27, 2017	Kyle Gorman, OWRD	• Overview of PL 566 Watershed Planning program • Overview of Tumalo, Swalley, and Central Oregon proposed SIPs • Discussion of basin-wide fish and wildlife concerns/needs

Date	Contact, Agency	Communication
June 14, 2017	Bridget Moran, USFWS	• Overview of ESA
June 23, 2017	Bridget Moran, USFWS	• Overview of Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts • Overview of PIRs • Overview of the Public Scoping meetings on July 6th (Tumalo and Swalley) and July 10th (Central Oregon)
July 6, 2017	Bridget Moran, USFWS Tom Makowski, NRCS Annette Liebe, Oregon Governor's Office Rob DelMar, ODOE Kelly Hill, ODEQ Kyle Gorman, OWRD Ian Johnson, Oregon SHPO Jessica Gabriel, Oregon SHPO Tom DiCorcia, BO Brett Hodgson, ODFW	• Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts • Overview of PIRs • Overview of public participation website – oregonwatershedplans.org • Overview of Public Participation meetings July 6 (Tumalo & Swalley) and July 10 (Central Oregon)
July 2017	Eric Nigg, ODEQ	• Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts • Overview of PIRs • Overview of public participation website – oregonwatershedplans.org • Overview of Public Participation meetings July 6 (Tumalo & Swalley) and July 10 (Central Oregon)
July 11, 2017	Annette Liebe, Oregon Governor's Office	• Update on Tumalo, Swalley, and Central Oregon Irrigation District Watershed Plans
July 20, 2017	Paul Henson, State Supervisor, USFWS Bridget Moran, USFWS	• Letter from NRCS to USFWS requesting PL 83-566 ESA consultation
July 20, 2017	Bridget Moran, USFWS	• Overview of Watershed Planning process next steps for Tumalo, Swalley, and Central Oregon Irrigation Districts • HCP process and next steps

Date	Contact, Agency	Communication
August 11, 2017	Teal Purrington, BLM Alice Beals, Oregon Parks and Recreation Department	• Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts and public agency managed lands within the project area
August 14, 2017	Sasha Sulia, BPRD	• Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts and public agency managed lands within the project area
August 17, 2017	Nancy Pustis, ODSL	• Overview of the Watershed Planning process for Tumalo, Swalley, and Central Oregon Irrigation Districts and public agency managed lands within the project area
August 29, 2017	Jerry Cordova, USFWS	• Discussion of eagle habitat and construction mitigation for Tumalo, Swalley, and Central Oregon Irrigation Districts
October 5, 2017	Annette Liebe, Oregon Governor's Office Kyle Gorman, OWRD Ami Keiffer, Business Oregon Tom Rowley, Business Oregon Bridget Moran, USFWS	• Update on HCP process • Update on Basin Study Work Group process • Update on PL 83-566 Watershed Plans for Tumalo, Swalley, and Central Oregon Irrigation Districts • Update on Section 106 & Section 7 compliance
June 19, 2018	Bridget Moran, USFWS	• Identified need to review the effects of instream flow in the Deschutes Basin on Oregon spotted frog

Date	Contact, Agency	Communication
August 16, 2018	Brett Hodgson, ODFW	• Discussion about COID's modernization plan and the effects of adding water instream on general fish and aquatic species
December 17, 2018	Bridget Moran, USFWS Jennifer O'Reilly, USFWS	• Discussion about allocation of instream flow in the upper Deschutes and effects on Oregon spotted frog to initiate informal Section 7 ESA consultation and compliance
September 17, 2019	Gregg Garnett, Reclamation Christine Horting-Jones, Reclamation Nancy Coleman, Reclamation Tom Heintzman, Reclamation	• Discussion about Reclamation participation in the planning process, cultural resources, and use of Reclamation ROW.
December 6, 2019	Bridget Moran, USFWS Jennifer O'Reilly, USFWS	• Discussion about potential saved water and allocation of instream flow in the upper Deschutes and effects on Oregon spotted frog
March 5, 2020	Kathy Ferge, NRCS Bobby Bruno, CTWS	• Discussion regarding COID Infrastructure Modernization Project and Plan-EA
April 14, 2020	Bridget Moran, USFWS Jennifer O'Reilly, USFWS	• Emails regarding potential saved water and allocation of instream flow in the upper Deschutes and effects on Oregon spotted frog

7.2 Review of Draft EA

NRCS published the proposed Draft Plan-EA on oregonwatershedplans.org for public review on January 16, 2020 for a 30-day comment period ending on February 18, 2020. During the comment period, NRCS hosted a public outreach meeting on February 3, 2020. Specific public outreach activities for the Draft Plan-EA included:

- NRCS Public Notice (January 16, 2020): https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1530014
- NRCS News Release (January 16, 2020): https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEPRD1530017

- COID newsletter to patrons (January 16, 2020)
- COID website announcement (January 16, 2020)
- Bend Bulletin public notice (January 16, January 23, January 30, 2020)
- FCA emails to stakeholder list (January 16, January 30, February 13, 2020)
- KTVZ News story (January 16, 2020): https://ktvz.com/news/2020/01/15/comments-sought-meeting-set-on-redmond-area-canal-piping-project/
- Public outreach meeting (February 3, 2020) from 6:00 p.m. to 7:00 p.m. at the Terrebonne Community School, 1199 B Ave, Terrebonne, OR 97760

NRCS sent an initial letter to the CTWS Tribal Historic Preservation Officer outlining the project and initial planning. NRCS followed up with CTWS on March 30, 2020, to complete tribal consultation.

Comments on the Draft Plan-EA were submitted in person at the public meeting, by email to centraloregon.id.comments@gmail.com, online at oregonwatershedplans.org, and by mail to Farmers Conservation Alliance, 101 State St, Hood River, OR 97031.

During the review period 27 comments on the proposed Draft Plan-EA were received. These comments were received from individuals, non-governmental organizations (Central Oregon Land Watch, Water Watch, Trout Unlimited), the City of Bend, USFWS, and Reclamation.

NRCS has reviewed all public comments and has made changes, as appropriate, to the final Plan-EA based on those comments and internal review. Each comment received consideration in the development of the final rule. According to the NEPA Handbook 6.9.2.1, substantive comments do one or more of the following:

- Question, with reasonable basis, the accuracy of information in the EIS or EA.
- Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis.
- Present new information relevant to the analysis.
- Present reasonable alternatives other than those analyzed in the EIS or EA.
- Cause changes or revisions in one or more of the alternatives.

A summary of recurring comments received on the Draft Plan-EA are listed below. For a full list of comments and responses, see Appendix A.

- Effect on local groundwater levels and private wells from reduced groundwater recharge.
- Request that water saved by the project use a different mechanism for protection instream.
- Request that all water saved by the project be verified after implementation.
- Request that additional alternatives be considered.
- Effect on wildlife along the canal and laterals from piping.
- Effect on trees and vegetation along the canal and laterals from piping.
- General support for water that would be conserved by the project.

8 Preferred Alternative

8.1 Selection and Rationale for the Preferred Alternative

NRCS has selected the Piping Alternative as the Preferred Alternative,[48] based on its ability to meet the purpose and need for the project and provide the most beneficial effects on environmental and social resources. The Preferred Alternative is the only alternative that meets the purpose and need, funding requirements, and NED benefit-cost ratio requirements. The Piping Alternative is the NED Plan[49] that would most maximize net economic benefits. The District has agreed that the Piping Alternative is their Preferred Alternative.

The Piping Alternative does not represent an endpoint to improving the use and conveyance of water throughout the District; rather, it is one step that would facilitate and complement other methods for improving water conservation and/or delivery reliability in COID.

8.2 Measures to be Installed

COID would replace approximately 7.9 miles of its system with gravity-pressurized buried pipe. The new pipes would remain in the same alignment as the original ditches except a segment of the G-4 Lateral and a new segment connecting the PBC to NUID's Main Canal. Pipes would range in diameter from 8 to 108 inches. The PBC and J Lateral would be gravity pressurized and a booster pump would be installed at the start of the G-4 Lateral to provide pressurized water.

In total, 42 turnouts would be upgraded to pressurized delivery systems. Modifications to each turnout would include a pressure relief valve, an appropriately sized tee from the mainline or lateral, a gear-actuated plug valve, a magnetic meter, a combination air and vacuum relief valve, and associated hardware and spool pipe segments (COID 2016).

The improvements described above would be split into two project groups as summarized in Table 8-1. Section 5.3.2 provides more detailed information on construction and O&M of the Preferred Alternative.

Table 8-1. Proposed Piping for the Preferred Alternative within Central Oregon Irrigation District.

	Project Components		
Project Group	**Length of Piping (miles)**	**Upgraded Turnouts**	**Pressure Reducing Valves**
1	5.1	32	1
2	2.8	10	1
Total	**7.9**	**42**	**2**

[48] The Preferred Alternative is defined in the NWPH as, "The option and course of action that the [Sponsoring Local Organization] and NRCS agree best addresses the stated purpose and need" (NRCS 2014).

[49] The "NED Plan" is defined in the NWPH as "The plan alternative that reasonably maximizes the net national economic benefits in dollars (P&G Section 1.6.3). Net economic benefits are benefits minus costs and are not the same as the benefit-cost ratio."

8.3 Minimization, Avoidance, and Mitigation Measures

Project design features and BMPs that would be applied during construction of the Preferred Alternative to avoid and minimize effects on environmental and social resources are described below.

8.3.1 Construction

- If a feature or element that is, or may be, individually eligible for listing in the National Register of Historic Places is documented by a cultural resource specialist, consultation would occur between the District, NRCS, and SHPO under standard Section 106 review processes (36 CFR 800).
- The Unanticipated Discovery Plan described in Appendix E would be followed if cultural resources were encountered during construction.
- If any of the project groups discharge into a public waterbody, a 1200-C permit would be obtained and an Erosion and Sediment Control Plan and stormwater BMPs would be implemented as required of the permit.
- Adjacent landowners would be provided a construction schedule prior to beginning construction.
- Access to residences and farms would be maintained during construction.
- Construction would be confined within the existing ROW and easements whenever possible to preserve existing vegetation and private property. The ROW and easements would be clearly marked in the field prior to construction.
- Construction would occur during the non-irrigation season so that there is no water within the canals.
- Construction would occur during the daytime to minimize disturbance to any recreationists, landowners, or other individuals in the vicinity of the construction area.
- Construction limits would be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Temporary travel routes and construction staging areas would be selected to minimize effects on vegetation and avoid mature trees to the extent practicable.
- The condition of roadways and work zones would be communicated to travelers via the District's website, messaging system, or other communication channels.
- Standard construction safety procedures and traffic control measures would be employed to reduce the risk of collisions between construction vehicles and other vehicles, pedestrians, or bicyclists while construction is ongoing.
- Appropriate emission control devices would be required for all construction equipment.
- When needed, water or other dust suppressants would be used on unpaved roads and areas of ground disturbance to minimize dust and any effects on air quality.
- Silt fencing, straw wattles, geotextile filters, straw bales, or other erosion control measures would be used to minimize soil erosion and prevent soil erosion from entering water bodies during construction. Erosion control measures would be free of weeds and weed seeds.
- Project construction activities would be conducted in accordance with the project's spill prevention and cleanup plan. In times of burn bans or wildfire concerns, each crew would have a fire suppression kit.

- Construction would occur outside of the USFWS-approved buffer distances for bald and golden eagle nests. If construction occurs within the recommended buffer distance, it would occur outside of the nesting season. Should a previously unknown active bald or golden eagle nest be found within the buffer distance during construction, construction would be paused and consultation with a local USFWS biologist would occur to determine how to proceed.
- The District would construct the project outside the primary nesting period for migratory birds of concern (April 15 through July 31) and raptors (February 15 through July 31). For rare occasions where project construction occurs during a primary nesting period, construction work would operate outside of the recommended buffer distance of any known nests. Should an active nest be found, construction would be paused and a consultation with a local USFWS biologist would occur to determine the following steps.
- In appropriate cases and under consultation with ODFW, ramps would be placed in open pipeline trenches during construction to avoid the potential for wildlife to become trapped overnight.
- After construction, the project area would be re-contoured and planted with a seed mix of native grasses and forbs. Planting would be done in consultation with NRCS.

8.3.2 Operations and Maintenance

- Vegetation within the ROW and easements would be maintained according to COID's vegetation management program and NRCS Oregon and Washington's Guide for Conservation Seedings and Plantings (NRCS 2000).
- Water saved from the Piping Alternative would be protected instream, released from Wickiup Reservoir, and would increase instream flows in the Deschutes River during the non-irrigation season.

8.4 Land Rights and Easements

To the extent possible, the Preferred Alternative and construction activities would be located entirely within the District's existing ROW and easements. Prior to construction the District would assess the existing easements for the construction segment and work with adjacent landowners.

Not all the Preferred Alternative would be located within the District's existing easements. The new alignment connecting the PBC and North Unit Main Canal, approximately 250 feet, would cross a piece of undeveloped land that the District intends to purchase.[50] The new alignment would also require entering NUID's ROW. Prior to construction COID would obtain a long-term easement agreement from Reclamation and NUID.

The new alignment for the G-4 Lateral, approximately 0.4 miles, would be constructed in an existing country road easement. The District would secure the final long-term easement agreement with the County prior to beginning construction. Following pipeline installation, as-built surveys would be completed and attached to easements.

[50] Two acres would need to be acquired for the connection to NUID at an estimated cost of $1,500. This is included in the cost analysis.

8.5 Permits and Compliance

As discussed in Section 8.2, the Preferred Alternative would be implemented in two project groups. Permitting specific to each project group would be conducted at the time that funding is available for implementation. Prior to implementing each project group, NRCS would complete an onsite EE utilizing NRCS CPA-52 form. This process would determine if that project group meets the applicable project specifications and other conditions as developed in this Plan-EA and assess the environmental effects of any alternatives to the project group. If it is determined that there are significant issues or concerns, or if resource concerns have not been adequately evaluated through the programmatic approach in this Plan-EA, a separate analysis and appropriate agency consultation would be prepared as necessary.

Further, COID would acquire all necessary permits prior to construction as appropriate, including the permits discussed in the following subsections, as applicable.

8.5.1 Local and County

- **Deschutes County, Jefferson County, and Crook County Planning**: Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval prior to construction.
- **Deschutes County Floodplain Administrator**: All work would be outside of the 100-year floodplain; no permitting requirement has been identified.

8.5.2 State

- **Department of Environmental Quality**: The National Pollutant Discharge Elimination System program, implemented by ODEQ, would require a stormwater permit for construction activities including clearing, grading, excavation, materials or equipment staging and stock piling that would disturb 1 or more acres of land and have the potential to discharge into surface waters or conveyance systems leading to surface waters of the state. The project groups of the Preferred Alternative would each disturb more than 5 acres, but none have the potential to discharge into waters of the state.
- **Oregon Water Resources Department**: To change the place of use, character of use, and/or point of diversion/appropriation of a water right, a water right change application must be approved by OWRD. NUID would submit water rights change applications in alignment with the process described in Section 6.9.2.1. These applications and their approval would not be required prior to project construction.
- **Department of State Lands**: The ODSL implements the Removal-Fill Law (ORS 196.800-990), which regulates the removal or fill of material in wetlands or waterways, requiring any person who plans to "remove or fill" material within "waters of the state" to obtain a permit from ODSL. In October 2019, the District visited the identified sites and documented the characteristics of the sites through photographs and written descriptions. This documentation was provided to Jennifer Moffitt, NRCS Resource Soil Scientist. Jennifer Moffitt then performed an informal off-site wetland inventory of the two areas and determined that these are artificial wetlands and not jurisdictional based on a review of the exemptions under the Oregon Removal-Fill statute (OAR 141-085-0515(9)). Therefore, NRCS has determined that consultation with ODSL to obtain a permit is not necessary.
- **Oregon Fish Passage Law:** Since August 2001, the owner or operator of an artificial obstruction located in waters in which native migratory fish are currently or were historically

present must address fish passage requirements prior to certain trigger events, such as the construction, installation, replacement, extension, or repair of culverts, roads, or any other hydraulic facilities. Laws regarding fish passage are found in ORS 509.580 through ORS 509.910 and in OAR 635, Division 412. A functioning ODFW and National Oceanic and Atmospheric Administration–NMFS approved contemporary fish screen is present at COID's irrigation diversion; therefore, no fish are present within the existing PBC and laterals, and no additional consultation or permitting is required.

8.5.3 Federal

- **National Historic Preservation Act Section 106**: Pursuant to 36 CFR Part 800 of the NHPA (1966, as amended in 2000), and the regulations of the Advisory Council on Historic Preservation implementing Section 106 of the NHPA (54 U.S.C. 306108), federal agencies must consider the potential effect of an undertaking on "historic properties" listed in, or eligible for listing in the National Register of Historic Places.
- The District would use the framework established in its MOA with SHPO to develop mitigation measures to minimize effects on cultural resources and ensure compliance with Section 106 of the NHPA. Effects on historical resources would be assessed based on surveys and a determination from NRCS and SHPO. In areas that have features eligible for the National Register of Historic Places, further consultation would occur between the District, NRCS, and SHPO.
- **Clean Water Act**: The USACE administers Section 404 and Section 401 of the CWA with the oversight of the USEPA.
- **Section 404**: Under Section 404(f)(1)(C) of the CWA, discharges of dredged or fill material associated with construction or maintenance of irrigation ditches, or the maintenance (but not construction) of drainage ditches, are not prohibited by, or otherwise subject to, regulation under Section 404. Discharges of dredged or fill material associated with siphons, pumps, headgates, wingwalls, weirs, diversion structures, and such other facilities as are appurtenant to and functionally related to irrigation ditches are included in the exemption for irrigation ditches. Under 33 CFR 323.4(a)(1)(iii)(C)(1)(i), "[c]onstruction and maintenance of upland (dryland) facilities such as ditching and tiling, incidental to the planting, cultivating, protecting, or harvesting of crops, involve no discharge of dredged or fill material into Waters of the United States, and as such never require a Section 404 permit." The construction and maintenance of irrigation ditches and maintenance of drainage ditches may require the construction and/or maintenance of a farm road. Subsection 404(f)(1)(E) exemption for discharges of dredged or fill material associated with the construction or maintenance of farm roads applies where such related farm roads are constructed and maintained in accordance with BMPs. However, in 33 CFR 323.4(a)(6) and 40 CFR 232.3(c)(6), there must be assurance that flow and circulation patterns and chemical and biological characteristics of Waters of the United States are not impaired, that the reach of the Waters of the United States is not reduced, and that any adverse effect on the aquatic environment would be otherwise minimized.
- Should USACE determine that the project has potential for a significant impact to a Water of the United States, an individual permit would be required. Individual permits are reviewed by the USACE, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines, regulations promulgated by USEPA.

- Should USACE determine that the project would only have minimal adverse effects, a general permit would be required. General permits are issued on a nationwide, regional, or state basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to process with little or no delay, provided that the general or specific conditions for the general permit are met.
- In October 2019, the District visited the identified sites and documented the characteristics of the sites through photographs and written descriptions. This documentation was provided to Jennifer Moffitt, NRCS Resource Soil Scientist. Jennifer Moffitt then performed an informal off-site wetland inventory of the two areas and determined that these are artificial wetlands and not jurisdictional based on a review of language provided in the 1986 Final Rule (see Section 4.11 for language). Therefore, NRCS has determined that consultation with USACE to obtain a permit is not necessary.

- **Section 401**: Section 401 of the CWA authorizes the ODEQ to review proposed activities or facilities that require a federal permit and that may discharge into the waters of Oregon. Please see Section 8.5.2, ODEQ, for additional discussion.

- **Farmland Protection Policy Act:** The Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*) directs federal agencies to identify and quantify adverse effects of federal programs on farmlands. The Act's purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses. All work would be done within COID's ROW or easements and not disturb adjacent agricultural land. The project would support agricultural productivity and the intention of the Act.
- **Endangered Species Act:** The ESA establishes a national program for the conservation of threatened and endangered species and the preservation of the ecosystems on which they depend. The ESA is administered by the USFWS for wildlife and freshwater species, and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions. Section 7 of the ESA, called "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7 of the ESA, federal agencies must consult with USFWS when any action the agency carries out, funds, or authorizes (such as through a permit) *may affect* a listed endangered or threatened species.

- Due to the location of bull trout populations at the very downstream end of the area affected by District operations, bull trout would not be affected by implementation of the Piping Alternative under consideration. Consequently, Section 7 consultation under the ESA as amended is not warranted for this species. Additionally, it has been determined that the project would not affect the PCEs identified for critical habitat for bull trout (70 *Federal Register* 56211, 2005). Therefore, it has been determined by NRCS that no effects would occur to federally designated critical habitat for bull trout.
- Implementation of the preferred alternative may affect, but is not likely to adversely affect, Oregon spotted frog because of entirely beneficial actions. Communications with USFWS under Section 7 of the ESA has been initiated.
- The Middle Columbia River steelhead population, present in the Deschutes River and Crooked River upstream from the Pelton Round Butte Dam complex, is classified as a NEP under section 10(j) of ESA and is treated as "proposed for listing" because of their location

outside of a National Wildlife Refuge System or a National Park System. Federal agencies are not required to consult with NMFS because the action alternatives are entirely beneficial and would not likely jeopardize the continued existence of the species proposed to be listed. NRCS, therefore, has determined that engagement with NMFS to obtain a conference report is not necessary (76 *Federal Register* 28715, 2011; 81 *Federal Register* 33416, 2016).

- **Magnuson Stevens Act:** The Magnuson-Stevens Act established requirements for including Essential Fish Habitat (EFH) descriptions in federal fishery management plans and requires federal agencies to consult with NMFS on activities that may adversely affect EFH (Pub. L. No. 104-297). EFH can include all streams, lakes, ponds, wetlands, and other viable waterbodies, and most of the habitat historically accessible to salmon necessary for spawning, breeding, feeding or growth to maturity. As the project would not affect EFH, consultation under the Magnuson Stevens Act is not required.
- **Safe Drinking Water Act**: Since the project would have no direct discharge to groundwater, permitting under the Safe Drinking Water Act is not required.
- **Migratory Bird Treaty Act:** The MBTA implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 U.S.C. 703–712). Under the Act, taking, killing, or possessing migratory birds, or taking, destroying, or possessing their eggs or nests, is unlawful. The Act classifies most species of birds as migratory, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove.
- **Bald and Golden Eagle Protection Act**: The BGEPA prohibits the taking or possessing of, and commerce in, bald and golden eagles, with limited exceptions (16 U.S.C. 668–668d). The Act only covers international acts or acts in "wanton disregard" of the safety of bald or golden eagles.

8.6 Costs

Table 8-3 presents the total project cost of $42,306,000 for the Preferred Alternative. PL 83-566 funds would support $29,003,000 of the total project cost where the remainder of the cost, $13,303,000 would be contributed by other, non-federal funds. Table 8-4 itemizes the costs for each project feature and the distribution of how the costs would be shared by the sponsors and NRCS for each cost item.

Construction costs account for all material, labor, and equipment necessary for the installation of piping associated with the Preferred Alternative. These costs were estimated based on costs for similar installations at irrigation districts in Central Oregon. The planning construction costs are estimated using the best available information about the project at the time of drafting the Plan-EA.

Engineering costs were estimated as a percentage of the cost of construction. The percentage applied for engineering costs ranged depending on the scale of the particular pipe installation. The costs presented are planning level estimates and do not reflect final costs. Detailed designs and construction cost estimates would be completed prior to initiating the project. Final construction costs would only reflect the time and materials to perform the work.

8.7 Installation and Financing

The following sub-sections present further details regarding the installation and financing of the Preferred Alternative.

8.7.1 Framework for Carrying out the Plan

The Preferred Alternative would be implemented in a planned sequence as discussed in Section 8.7.2. The responsibilities of NRCS and the sponsors for the project are outlined in Section 8.7.3. No cost-shared on-farm measures are involved with this project; therefore, the responsibilities of individual participants do not need to be discussed. No preconditions are anticipated for installing the project.

8.7.2 Planned Sequence of Installation

The District would obtain all approvals and permits for the project prior to the start of construction. The project would be implemented in two project groups as presented in Table 8-2. The entire project would be completed over a 4-year period commencing in 2020 and ending by 2024. The District developed an appropriate project-phasing schedule that focused on sections of the system with high seepage loss but also worked within engineering and funding constraints to meet District, patron, and community development needs.

Table 8-2. Preferred Alternative Planned Sequence of Installation.

Construction Year	Project Group	Canal or Lateral	Miles
2020-2022	1	G-4 Lateral	1.2
		J Lateral	1.0
		PBC	2.9
2023-2024	2	J Lateral	1.6
		PBC	1.2
Total			**7.9**

8.7.3 Responsibilities

NRCS is responsible for leading the planning efforts, providing engineering design and construction oversight assistance, and certifying completion of the project. The District would be responsible for engineering design, project administration, environmental permitting, contracting, and construction implementation. The District has the needed authorities as an irrigation district organized under ORS 545 and has agreed to exercise those authorities to implement the actions described in the Plan-EA.

8.7.4 Contracting

The piping and partial pressurization of the delivery system would be completed using NRCS funding mechanisms. The District would be primarily responsible for overseeing and administering the construction of the project in coordination with NRCS.

8.7.5 Real Property and Relocations

The majority of construction would take place in COID's existing ROWs and easements. In segments where there would new alignments, COID would obtain easement agreements or purchase the property as described in Section 8.4.

8.7.6 Financing

NRCS would provide 69 percent of the total project cost for the Preferred Alternative through PL 83-566 funding. The District is responsible for the remaining 31 percent of the costs, including funds that are not eligible under the NWP. Table A in the NED presents annual installation costs of each project piping group and the proportion of funding through NRCS and COID.

The District has a strong history of securing public and private funding through grants, loans, and patron assessments. Funding would be provided through a mix of grants, loans, and patron assessments. If necessary, approximately 31 percent of the project would be financed in this manner. For financing, COID would apply for funding through the ODEQ Clean Water State Revolving Fund. The District expects that funding from this source would be at an interest rate of 2.5 percent with a 0.5 percent annual fee paid on the remaining loan balance. These financing costs are not included in the NED analysis. The District does not anticipate changing per acre annual rates or the overall base assessment fee as a result of any capital improvement project that is fully funded through grants.

O&M costs after project completion would be provided through the revenues of COID. O&M costs would not increase due to the project and would be budgeted on an annual basis.

NRCS reserves the authority and right to discontinue or reduce program benefits based on changes in agency priorities, funding availability, or the failure of the District to fulfill the provisions of their agreement.

8.7.7 Conditions for Providing Assistance

Conditions for the District to receive program funds for the implementation of the proposed project include completion of a Final Watershed Plan-EA, NRCS issuing a Finding of No Significant Impact, and authorization of funding by the Chief of NRCS. The Chief of NRCS acts on behalf of the Secretary of the Interior to ensure the project meets 16 U.S.C. 1005.

8.8 Operation, Maintenance, and Replacement

The District would be responsible for the O&M of the project for the extent of its design life, as well as any associated replacement costs and activities that could occur. Prior to construction a separate O&M agreement, based on NRCS's National O&M Manual, would be made between NRCS and the District. The agreement would continue through the design life of the project and could be modified with NRCS's approval.

Project sponsors and NRCS would make annual inspections of project measures to assure the quality of ongoing O&M. The District would oversee scheduling O&M inspections and be responsible for any necessary work. The District's O&M would consist of an annual pump inspection program, pump performance tests every few years, and a pipe inspection program that would inspect piped areas every few years.

The proposed system would continue its current operation schedule of April to October, in which work would be performed on an as-needed basis. During the winter months, outside of the

operation time, the District would perform system component maintenance including valve battery changes, magnetic meter maintenance, District operational valve maintenance, air and vacuum valve maintenance, pressure reducing station filter maintenance, and valve repairs. The District would expand their current vegetation and weed management to include the areas on top of the newly piped system. All procedures would be followed as specified in the O&M agreement between project sponsors and NRCS.

8.9 Economic and Structural Tables

A summary of the economic analysis of the Preferred Alternative (NED Alternative) and No Action Alternative is provided in Section 5.4. The full NED Analysis can be found in Appendix D. The Piping Alternative represents the future with federal funding through PL 83-566. The No Action Alternative represents the future if the District was not to receive federal funding. Because the District plans to pipe some of its irrigation canals, even in the absence of federal funding through PL 83-566, the No Action Alternative includes benefits and costs that differ from current conditions. In Appendix D, detailed analysis of the benefits and costs of the No Action and the Piping Alternative individually compared to the current, baseline, conditions can be found. The tables below represent the benefits and costs of the Piping Alternative over the No Action Alternative. Table 8-3 (NWPM 506.11, Economic Table 1) presents the projected installation costs and the percentages of costs to be shared by the District and NRCS for each Project Group.

Table 8-4 presents the project's cost distribution across project groups as well as the proportion of PL 83-566 funding and other funding sources. The average annual NED costs are shown in Table 8-5. The costs shown are the annual costs for the Piping Alternative above the No Action Alternative which is further discussed in Section 3 of the NED in Appendix D.

Table 8-3. Economic Table 1—Estimated Installation Cost of the Piping Alternative, Water Resource Project Measures, Deschutes Watershed, Oregon, 2019$.[1,2]

Works of Improvement	Unit	Number			Estimated cost (dollars)						
					Public Law 83-566 Funds			Other Funds[3]			
		Federal land	Non-Federal land	Total	Federal Land NRCS	Non-Federal Land NRCS	Total	Federal land	Non-Federal land	Total	Total
Project Group 1	Feet	0	26,905	26,905	$0	$28,481,000	$28,481,000	$0	$10,207,000	$10,207,000	$38,688,000
Project Group 2	Feet	0	14,670	14,670	$0	$522,000	$522,000	$0	$3,096,000	$3,096,000	$3,618,000
Total project	Feet	**0**	**41,575**	**41,575**	**$0**	**$29,003,000**	**$29,003,000**	**$0**	**$13,303,000**	**$13,303,000**	**$42,306,000**

Note: Figures may not sum due to rounding. Prepared December 2019

1/ Price Base: 2019 dollars.

2/ Project costs prepared by KPFF Consulting Engineers and Black Rock Consulting, Inc. in 2019 dollars with additional project administration and technical assistance costs included based on NRCS-OR guidance.

3/ Other Funds includes sponsor responsibility for road crossings, bridge removal, bridge installation, real property acquisition, and railroad crossings. Local sponsors are responsible for all costs including engineering, design, and construction associated with the referenced activities.

Table 8-4. Economic Table 2 —Estimated Piping Alternative Cost Distribution, Water Resource Project Measures, Deschutes Watershed, Oregon, 2019$.[1,2]

Works of Improvement	Installation Costs—Public Law 83-566 Funds				Installation Cost—Other Funds[3]				Total
Piping	Construction	Engineering	Project Admin[4]	Total Public Law 83-566	Construction	Engineering	Project Admin[4]	Total Other	
Project Group 1	$24,800,000	$787,000	$2,894,000	$28,481,000	$8,568,000	$262,000	$1,377,000	$10,207,000	$38,688,000
Project Group 2	$100,000	$105,000	$317,000	$522,000	$2,934,000	$35,000	$127,000	$3,096,000	$3,618,000
TOTAL COSTS	**$24,900,000**	**$892,000**	**$3,211,000**	**$29,003,000**	**$11,502,000**	**$297,000**	**$1,504,000**	**$13,303,000**	**$42,306,000**

Notes: Totals may not sum due to rounding. Prepared: December 2019

1/ Price base: 2019 dollars.

2/ Project costs prepared by KPFF Consulting Engineers and Black Rock Consulting, Inc. in 2019 and including additional project administration and technical assistance costs. Of total estimated costs, 75 percent has been allocated for construction and 25 percent for engineering.

3/ Other Funds includes sponsor responsibility for road crossings, bridge removal, bridge installation, real property acquisition, and railroad crossings. Local sponsors are responsible for all costs including engineering, design, and construction associated with the referenced activities.

4/ Project Admin includes project administration, technical assistance costs and permitting costs.

Table 8-5. Economic Table 4—Estimated Average Annual NED Costs for Piping Alternative Over the No Action Alternative, Deschutes Watershed, Oregon, 2019$.[1]

Works of Improvement[2]	Project Outlays (Amortization of Installation Cost)	Other Direct Costs[2]	Total
Project Group 1	$764,000	$66,000	$830,000
Project Group 2	$100,000	$1,000	$101,000
Total	**$864,000**	**$67,000**	**$931,000**

Note: Totals may not sum due to rounding. Prepared December 2019

1/ Price base: 2019 dollars amortized over 100 years at a discount rate of 2.75 percent.

2/ Other direct costs include the uncompensated economic losses due to changes in resource use or associated with installation, operation, or replacement of project structures. Other direct costs are presented for large diameter pipe replacement and increased pumping costs elsewhere in the basin from reduced groundwater recharge (i.e., seepage from unlined canals), and any replacement, energy, and maintenance costs associated with the booster pump. This does not include operations, maintenance, and repair costs because these decline under the Piping Alternative, so these are presented as a benefit. Because carbon emissions in Project Group 1 increase under the Piping Alternative, the cost of carbon emissions is included as another direct cost for Project Group 1 (carbon emissions do not substantially change for Project Group 2).

The Preferred Alternative damage reduction benefits included agricultural yields, power cost savings, public safety avoided costs, and avoided carbon emissions. Table 8-6 (NWPM 506.20, Economic Table 5a) presents the average annual watershed protection damage reduction benefits across all project groups.

Using the resulting benefits and costs from Table 8-5 and Table 8-6, Table 8-7 (NWPM 506.21, Economic Table 6) presents a comparison of the NED average annual benefits and average annual costs.

Table 8-6. Economic Table 5a—Estimated Average Annual Watershed Protection Damage Reduction Benefits of Piping Alternative Over the No Action Alternative for Central Oregon Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2019$.[1]

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-related	Non-Agricultural-related
Project Group 1		
On-Site Damage Reduction Benefits		
Other - Reduced O&M	$2,000	
Other - Pumping Cost Savings	$1,000	
NUID Agricultural Benefits	$288,000	
Subtotal	$291,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions)[2]		$0
Instream Flow Value		$511,000
Support to Oregon Spotted Frog		$459,000
Subtotal		$970,000
Total Quantified Benefits	**$291,000**	**$970,000**
Project Group 2		
On-Site Damage Reduction Benefits		
Other - Reduced O&M	$1,000	
Other - Pumping Cost Savings	$1,000	
	$49,000	
Subtotal	$51,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions)[2]		$0
Instream Flow Value		$87,000
Support to Oregon Spotted Frog		$77,000
Subtotal		$164,000
Total Quantified Benefits	**$51,000**	**$164,000**

Note: Totals may not sum due to rounding. Prepared December 2019

1/ Price Base: 2019 dollars amortized over 100 years at a discount rate of 2.75 percent

2/ These benefits would also accrue to local residents, but the majority of the value would be experienced outside the proposed project area.

Table 8-7. Economic Table 6— Comparison of Average Annual NED Costs and Benefits of the Piping Alternative Over the No Action Alternative, Central Oregon Irrigation District Watershed Plan, Deschutes Watershed, Oregon, 2019$.[1]

Works of Improvement	Agriculture-Related			Non-agricultural			Average Annual Benefits	Average Annual Cost [2]	Benefit–Cost Ratio
	Reduced O&M	Pumping Cost Savings [3]	NUID Agricultural Benefits	Carbon Value [3]	Instream Flow Value	Oregon Spotted Frog			
Project Group 1	$2,000	$1,000	$288,000	$0	$511,000	$459,000	$1,261,000	$830,000	1.52
Project Group 2	$1,000	$1,000	$49,000	$0	$87,000	$77,000	$215,000	$101,000	2.13
Total	**$3,000**	**$2,000**	**$337,000**	**$0**	**$598,000**	**$536,000**	**$1,476,000**	**$931,000**	**1.59**

Note: Totals may not sum due to rounding. Prepared December 2019

1/ Price Base: 2019 dollars amortized over 100 years at a discount rate of 2.75 percent

2/ From Economic Table 4

3/ In cases where energy costs and carbon emissions are higher under the Piping Alternative than under the No Action Alternative, those costs are included as other direct costs in Table 8-5 rather than benefits in this table.

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10 List of Preparers

Under the direction of NRCS, the Plan-EA was primarily developed by Farmers Conservation Alliance and its subcontractor Highland Economics. The staff responsible for preparation of the Plan-EA is included in Table 10-1.

Table 10-1. List of Preparers.

Name	Title	Education	Professional Experience	Area Responsible For
Farmers Conservation Alliance Watershed Plan-EA Team				
Kristin Alligood	Program Specialist	Ph.D. Biology B.A. Neuroscience	4 years	Fish and Aquatic Species, Vegetation, Cumulative Effects
Raija Bushnell	Program Specialist	M.P.A Natural Resource Policy M.S.E.S Natural Resource Management B.A. Political Science	6 years	Land Use, Recreation, Visual, Vegetation, Alternatives, Introduction, Purpose and Need
Brett Golden	Program Manager	M.E.M Environmental Management A.B. Environmental and Evolutionary Biology	11 years	General
Kate Hart	Program Specialist	M.S. Earth Science B.S. Earth Science	4 years	Geology and Soils, Alternatives, General GIS
David McKay	Program Specialist	M.P.A. Environmental Policy B.A. Political Science	5 years	Introduction, Purpose and Need, Cultural, Public Scoping
Amanda Schroeder	Program Specialist	B.S. Natural Resource Management	4 years	Water Resources, Wetlands, Wildlife, Wild and Scenic Rivers, Socioeconomics
Jenny Severson	GIS Specialist	B.S. Environmental Science	10 years	Spatial Analysis
Alexis Vaivoda	Team Lead	M.S. Environmental Science B.S. Biology	16 years	Fish and Aquatic Species, Cultural Resources, Public Safety
NRCS – Oregon				

Name	Title	Education	Professional Experience	Area Responsible For
Gary Diridoni	Natural Resource Specialist	Fisheries Management Graduate Certificate B.S. Wildlife Management B.S. Interdisciplinary Studies, Ecosystem Conservation	16 years	General
Tom Makowski	Assistant State Conservationist-Watershed Resources and Planning	Ph.D. Rural Sociology M.S. Social Psychology B.S. Recreation Resource Management	30 years	General
Lakeitha Ruffin	Agricultural Economist	M.S. Agricultural Economics B.S. Agricultural Economics	8 years	Economic and Socioeconomic Analysis, Alternative Analysis, Overall Watershed Planning
Employees from Firms Under Contract with Farmers Conservation Alliance				
Company	**Name**	**Education**	**Years of Experience**	**Area of Responsibility**
Highland Economics	Barbara Wyse	M.S. Environmental and Natural Resource Economics B.A. Environmental Sciences and Policy	13 years	Economic Analysis
Highland Economics	Winston Oakley	M.S. Applied Economics B.S. Environmental Sciences, Policy, and Management	4 years	Economic Analysis
ERM	Sandy Slayton	M.A. Ecology B.A. Environmental Science	15 years	General

11 Distribution List

A Notice of Availability for the Plan-EA will be distributed to federal, state, and local agencies, community representatives, and area non-governmental organizations.

Governmental organizations and agencies to be notified:

- City of Bend
- City of Redmond
- Crook County
- Deschutes County
- Jefferson County
- Oregon Governor's Office
- Oregon Department of Agriculture (ODA)
- Oregon Department of Environmental Quality (ODEQ)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of State Lands (ODSL)
- Oregon Water Resources Department (OWRD)
- Oregon Watershed Enhancement Board (OWEB)
- Business Oregon
- Oregon State Historic Preservation Office (SHPO)
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management (BLM)
- U.S. Bureau of Reclamation (Reclamation)
- U.S. Fish and Wildlife Service (USFWS)

Other organizations and individuals to be notified:

- COID patrons
- Bend Parks and Recreation
- Central Oregon Land Watch
- Coalition for the Deschutes
- Deschutes River Conservancy
- Upper Deschutes Watershed Council
- Trout Unlimited
- WaterWatch of Oregon
- Interested public

In accordance with EO 13175, Consultation and Coordination with Indian Tribal Governments, NRCS will contact the Confederated Tribes of Warm Springs (CTWS) regarding the availability of the Plan-EA.

The names of private stakeholders and members of the public who will receive notice of the Plan-EA are not listed for privacy.

12 Acronyms, Abbreviations, and Short-forms

°F	degrees Fahrenheit
AID	Arnold Irrigation District
BGEPA	Bald and Golden Eagle Protection Act
BLM	United States Bureau of Land Management
BMP	best management practice
Carey Act	Carey Desert Land Act of 1894, governing irrigation rights-of-way
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
COID	Central Oregon Irrigation District
CTWS	Confederated Tribes of Warm Springs
CWA	Clean Water Act
DBBC	Deschutes Basin Board of Control
District	Central Oregon Irrigation District
EA	Environmental Assessment
EE	Environmental Evaluation
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FCA	Farmers Conservation Alliance
HCP	Habitat Conservation Plan
HDPE	high-density polyethylene
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Consultation
LPID	Lone Pine Irrigation District
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
N/A	not available
NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NED	National Economic Development

NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NUID	North Unit Irrigation District
NWPH	National Watershed Program Handbook
NWPM	National Watershed Program Manual
NWI	National Wetland Inventory
O&M	operation and maintenance
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OM&R	operation, maintenance, and replacement
OMB	Office for Management and Budget
ORS	Oregon Revised Statute
ORV	Outstandingly Remarkable Value
OWEB	Oregon Watershed Enhancement Board
OWRD	Oregon Water Resources Department
P&G	1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PBC	Pilot Butte Canal
PCE	Primary Constituent Element
PIR	Preliminary Investigative Report
PL	Public Law
PL 83-566	Watershed Protection and Flood Prevention Program, Public Law 83-566
project	COID Infrastructure Modernization Project
proposed action	COID Infrastructure Modernization Project
Reclamation	United States Bureau of Reclamation
RM	River Mile
ROW	right-of-way
SHPO	State Historic Preservation Office
SIP	System Improvement Plan
USACE	United States Army Corps of Engineers

U.S./US	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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