

East Fork Irrigation District Infrastructure Modernization Project

Draft Watershed Plan-Environmental Assessment

Hood River County, Oregon

January 8, 2020

United States Department of Agriculture, Natural Resources Conservation Service – Lead Federal Agency in cooperation with East Fork Irrigation District

Prepared by Farmers Conservation Alliance

Draft Watershed Plan-Environmental Assessment for the East Fork Irrigation District
Infrastructure Modernization Project

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

Cooperating Agency: United States Department of Energy (USDOE), Bonneville Power Administration (Bonneville), Portland, Oregon; DOE/EA - 2118

Sponsoring Local Organization: East Fork Irrigation District (EFID)

Authority: This Watershed Plan-Environmental Assessment (Plan-EA) has been prepared under the Authority of the Watershed Protection and Flood Prevention Act of 1954, Public Law 83-566 (PL 83-566) and the Regional Conservation Partnership Program (RCPP), authorized by Subtitle I of Title XII of the Food Security Act of 1985, as amended by Section 2401 of the Agricultural Act of 2014. This Plan-EA has also been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, as amended (42 United States Code [U.S.C.] 43221 et seq.). The Bonneville Power Administration is a cooperating agency on this Plan-EA.

Abstract: This document is intended to fulfill requirements of NEPA and to be considered for authorization of PL 83-566 and RCPP funding of the EFID Infrastructure Modernization Project (project). The project seeks to improve water conservation, water delivery reliability, and public safety for irrigation infrastructure in Oregon's Hood River Basin. The project would include converting 56 miles of EFID's canals and laterals to a buried and pressurized pipeline. Total estimated project costs are \$68,711,000, of which \$37,737,000 would be paid by the sponsors and other non-federal funding sources. The estimated amount to be paid through NRCS PL 83-566 and RCPP funds through PL 83-566 Authority is \$30,974,000. The RCPP funds were authorized in 2018 and pertain to a single project group.

Bonneville Power Administration has been asked to cooperate on this EA due to Bonneville's proposed cost share funding of a discrete component of the project, specifically the Eastside Lateral Piping Project, through the Confederated Tribes of the Warm Springs (CTWS). The Eastside Lateral Piping Project would modernize approximately 6 miles of irrigation infrastructure and is expected to cost up to \$10 million to implement. Bonneville would provide CTWS with up to \$1 million to fund certain design work and materials for the Eastside Lateral Piping Project.

Comments: NRCS has completed this Draft Plan-EA in accordance with the NEPA and NRCS guidelines and standards. Reviewers should provide comments to NRCS during the allotted Draft Plan-EA review period. Comments must be submitted to NRCS during the allotted Draft Public Review Period (within 30 days of the public release of the Draft Plan-EA) and become part of the Administrative Record.

To submit comments, send via U.S. Mail to:

Farmers Conservation Alliance, Attention East Fork Watershed Plan-EA
102 State Street
Hood River, OR 97031

Or email: eastforkcomments@gmail.com

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, audiotope, 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.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender.

Watershed Agreement
between the
East Fork Irrigation District
(Referred to herein as the 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 East Fork Irrigation District 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 EA for works of improvement for the East Fork Irrigation District 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 sponsor 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 (110 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 (O&M) agreement.

4. Uniform Relocation Assistance and Real Property Acquisition Policies Act. The sponsors hereby agree to comply with all of 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-Sharable Items^{1/}					
Agricultural Water Management	42%	\$25,000,000	58%	\$34,607,000	\$59,607,000
Sponsor's Engineering Costs	75%	\$1,928,000	25%	\$643,000	\$2,571,000
Subtotal: Cost-Sharable Costs	43%	\$26,928,000	57%	\$35,250,000	\$62,178,000
Non-Cost-Sharable Items^{2/}					
NRCS Technical Assistance/Engineering	100%	\$3,237,000	0%	\$0	\$3,237,000
Project Administration ^{3/}	57%	\$809,000	43%	\$622,000	\$1,431,000
Permits	0%	\$0	100%	\$1,865,000	\$1,865,000
Subtotal: Non-Cost-Share Costs	63%	\$4,046,000	37%	\$2,487,000	\$6,533,000
Total:	45%	\$30,974,000	55%	\$37,737,000	\$68,711,000
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 sponsor 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 sponsor 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 sponsor 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 sponsor will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The sponsor will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsor 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 sponsor 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 sponsor 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 sponsor 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. Natural Resources Conservation Service 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 sponsor 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 sponsor has 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 sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor 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 sponsor 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. The sponsor will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually 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 sponsor's 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 sponsor acknowledges that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. Emergency Action Plan. Prior to construction, the sponsor 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 sponsor annually.

16. Nondiscrimination Provisions. In accordance with federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and 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.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

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 sponsor is providing the certification set out below. If it is later determined that the sponsor 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 sponsor certifies 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 sponsor 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 sponsor certifies 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 sponsor 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 sponsor certifies 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 sponsor is 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 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 U.S. Environmental Protection Agency (USEPA) List of Violating Facilities.

- (2) To promptly notify 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, USEPA, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the USEPA List of Violating Facilities.
- (3) To include substantially 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 the 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 USEPA 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, USEPA, 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: Office of Management and Budget (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

EAST FORK IRRIGATION DISTRICT

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

_____, at [_____], Oregon.

By:

Date: _____

John Buckley, Manager
East Fork Irrigation District
3500 Graves Rd
Hood River, OR 97031

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

Date: _____

Ron Alvarado, State Conservationist
Natural Resources Conservation Service
1201 NE Lloyd Blvd
Suite 900
Portland, OR 97232

Table of Contents

Table of Appendices	4
Table of Figures	4
Table of Tables	5
Office of Management and Budget (OMB) Fact Sheet.....	7
1 Introduction	13
1.1 Watershed Planning Area	15
1.2 Project Area	15
1.3 Current Infrastructure.....	18
1.4 Decision Framework.....	20
1.5 Bonneville’s Decision Framework	22
2 Purpose and Need for Action.....	23
2.1 Watershed Problems and Resource Concerns	24
2.1.1 Water Loss in District Conveyance Systems	24
2.1.2 Operations Inefficiencies and Water Delivery Reliability.....	24
2.1.3 Instream Flow for Fish and Aquatic Habitat	25
2.1.4 Risks to Public Safety	25
2.1.5 Sediment in Irrigation Water.....	26
2.2 Watershed and Resource Opportunities	26
2.3 Using Oregon’s Allocation of Conserved Water Program	26
3 Scope of the EA.....	28
3.1 Agency, Tribal, and Public Outreach	28
3.2 Scoping Meeting	28
3.3 Section Scoping Comments	28
3.4 Identification of Resource Concerns.....	30
4 Affected Environment	34
4.1 Cultural Resources.....	36
4.1.1 Cultural Context.....	36
4.1.2 Types of Impacts from Infrastructure Modernization.....	36
4.1.3 Cultural Surveys.....	36
4.2 Land Use	37
4.2.1 Land Ownership.....	37
4.2.2 Land Uses.....	37
4.3 Public Safety	39
4.4 Socioeconomic Resources.....	39
4.4.1 Population	39
4.4.2 Area Employment and Income	39
4.4.3 Agricultural Statistics	40

4.5	Vegetation.....	41
4.5.1	General Vegetation.....	41
4.6	Visual Resources.....	43
4.6.1	Regional Context.....	43
4.6.2	Project Area and Adjacent Landscape.....	43
4.7	Water Resources.....	44
4.7.1	Water Rights.....	48
4.7.2	Surface Water Hydrology.....	50
4.7.3	Surface Water Quality.....	54
4.7.4	Groundwater.....	58
4.8	Fish and Aquatic Resources.....	58
4.8.1	General Fish and Aquatic Species.....	60
4.8.2	Federally Listed Fish and Aquatic Species.....	62
4.8.3	State-Listed Species.....	63
4.9	Wetlands and Riparian Areas.....	65
4.9.1	Project Area.....	66
4.9.2	Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations.....	66
4.9.3	Floodplains.....	67
4.10	Wildlife Resources.....	67
4.10.1	General Wildlife.....	67
4.10.2	MBTA/BGEPA Species.....	68
4.10.3	Federally Listed Species.....	69
4.10.4	State-Listed Species.....	69
5	Alternatives.....	70
5.1	Formulation Process.....	70
5.2	Alternatives Eliminated from Detailed Study.....	70
5.2.1	On-Farm Efficiency Upgrades.....	70
5.2.2	Canal Lining.....	71
5.2.3	Piping with Other Materials.....	72
5.2.4	Combination of Alternatives.....	72
5.2.5	Cost Comparison of Eliminated Alternatives.....	72
5.3	Alternatives Description.....	73
5.3.1	No Action (Future without Federal Investment).....	73
5.3.2	Piping Alternative.....	73
5.4	Summary and Comparison of Alternatives.....	78
6	Environmental Consequences.....	82
6.1	Cultural Resources.....	82
6.1.1	No Action (Future without Federal Investment).....	82
6.1.2	Piping Alternative.....	82
6.2	Land Use.....	83
6.2.1	No Action (Future without Federal Investment).....	83

6.2.2	Piping Alternative.....	84
6.3	Public Safety	84
6.3.1	No Action (Future without Federal Investment)	84
6.3.2	Piping Alternative.....	84
6.4	Socioeconomic Resources	85
6.4.1	No Action (Future without Federal Investment)	85
6.4.2	Piping Alternative.....	85
6.5	Vegetation	86
6.5.1	No Action (Future without Federal Investment)	86
6.5.2	Piping Alternative.....	86
6.6	Visual Resources	89
6.6.1	No Action (Future without Federal Investment)	89
6.6.2	Piping Alternative.....	89
6.7	Water Resources	89
6.7.1	No Action (Future without Federal Investment)	89
6.7.2	Piping Alternative.....	91
6.8	Fish and Aquatic Resources	95
6.8.1	No Action (Future without Federal Investment)	95
6.8.2	Piping Alternative.....	96
6.9	Wetlands and Riparian Areas.....	100
6.9.1	No Action (Future without Federal Investment)	100
6.9.2	Piping Alternative.....	100
6.10	Wildlife Resources	102
6.10.1	No Action (Future without Federal Investment)	102
6.10.2	Piping Alternative.....	102
6.11	Cumulative Effects	103
6.11.1	Past Actions	104
6.11.2	Current and Reasonably Foreseeable Future Actions.....	104
6.11.3	Cumulative Effects by Resource	105
7	Consultation, Coordination, and Public Participation.....	111
7.1	List of Persons and Agencies Consulted	112
7.2	Review of the Draft EA	116
8	Preferred Alternative	117
8.1	Selection and Rationale for the Preferred Alternative.....	117
8.2	Measures to be Installed	117
8.3	Minimization, Avoidance, and Compensatory Mitigation Measures	118
8.4	Permits and Compliance.....	120
8.4.1	Local and County.....	120
8.4.2	State.....	120
8.4.3	Federal.....	121

8.5	Costs	123
8.6	Installation and Financing.....	124
8.6.1	Framework for Carrying out the Plan.....	124
8.6.2	Planned Sequence of Installation.....	124
8.6.3	Responsibilities.....	125
8.6.4	Contracting.....	125
8.6.5	Real Property and Relocations.....	125
8.6.6	Financing.....	125
8.6.7	Conditions for Providing Assistance	126
8.7	Operation, Maintenance, and Replacement	126
8.8	Economic and Structural Tables	127
9	References	134
10	List of Preparers	140
11	Distribution List.....	142
12	Acronyms, Abbreviations, and Short-forms	144
13	Index	146
14	Appendices A-E	147

Table of Appendices

- Appendix A. Comments and Responses
- Appendix B. Project Maps
- Appendix C. Supporting Maps
- Appendix D. Investigation and Analysis Report
- Appendix E. Other Supporting Information

Table of Figures

Figure 1-1.	Irrigation districts within the Hood River basin.....	14
Figure 1-2.	The four subwatersheds comprising the East Fork Irrigation District watershed planning area....	16
Figure 1-3.	Location of the East Fork Irrigation District Infrastructure Modernization Project area.	17
Figure 1-4.	The District’s diversion weir, fish ladder, and intake facilities on the East Fork Hood River at river mile 6.6.....	18
Figure 1-5.	The District’s sand trap facility located 0.4 mile from the diversion at the start of the Main Canal.	19
Figure 1-6.	Coanda type fish screens installed at the end of the District’s sand trap settling bays.	20
Figure 4-1.	Ecosystem services concept diagram for the East Fork Irrigation District Infrastructure Modernization Project	35
Figure 4-2.	Land ownership within and in the vicinity of East Fork Irrigation District.....	38
Figure 4-3.	Examples of vegetation along the Eastside Canal (left photo) and Main Canal (right photo) in East Fork Irrigation District.....	42
Figure 4-4.	The Eastside Canal along Wells Drive and orchards in East Fork Irrigation District.....	44
Figure 4-5.	Waterbodies associated with District operations and locations of streamflow gaging stations.....	47

Figure 4-6. Average historical summer streamflow and projected future streamflow in the lower East Fork Hood River below the EFID diversion based on climate simulations..... 51

Figure 4-7. Estimated median streamflow in the East Fork Hood River and state instream water rights at the Middle Fork Hood River confluence (RM 0). 52

Figure 4-8. Estimated 80 percent exceedance monthly streamflow in the East Fork Hood River and state instream water rights at the Middle Fork Hood River confluence (RM 0)..... 53

Figure 4-9. Critical habitat designated for bull trout, coho, steelhead, and Chinook in the East Fork Irrigation District watershed planning area..... 64

Figure 5-1. The Piping Alternative project groups for the East Fork Irrigation District Infrastructure Modernization Project 76

Figure 6-1. A section of the Central Lateral Pipeline 9 years after construction..... 88

Figure 6-2. Vegetation along a buried District lateral pipeline 5 years after construction. 88

Table of Tables

Table 1-1. East Fork Irrigation District Watershed Planning Area. 15

Table 3-1. Public Scoping Comment Summary. 29

Table 3-2. Summary of Resource Concerns for the East Fork Irrigation District Infrastructure Modernization Project. 30

Table 4-1. Population Characteristics by City, County, and State..... 40

Table 4-2. Labor Force Characteristics in Hood River County and the State of Oregon, 2017..... 40

Table 4-3. Income and Poverty Rates in Hood River County, Oregon State, and United States, 2017..... 40

Table 4-4. Agricultural Statistics for Hood River County..... 41

Table 4-5. Crops Grown in East Fork Irrigation District. 41

Table 4-6. General Vegetation within East Fork Irrigation District. 43

Table 4-7. Waterbodies Associated with District Operations. 46

Table 4-8. Major End Spills in Waterbodies Associated with EFID Operations. 48

Table 4-9. State Instream Water Rights in Waterbodies Associated with EFID Operations. 50

Table 4-10. Impaired Waterbodies Associated with District Operations..... 55

Table 4-11. Fish Species in Waterbodies Associated with District Operations..... 61

Table 4-12. Federally Listed Fish Species in the Hood River Basin..... 62

Table 4-13. Wildlife Species Likely to Occur within the Project Area.¹..... 68

Table 4-14. Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act Species Potentially Occurring within the Project Area. 69

Table 5-1. Net Present Value of Alternatives Eliminated Due to Cost.¹..... 73

Table 5-2. Summary and Comparisons of Alternatives..... 78

Table 7-1. Agency Consultation Record. 114

Table 8-1. Summary of the District Canals and Laterals to be Piped under the Preferred Alternative..... 118

Table 8-2. Construction Timeline and Installation Costs by Funding Source for the Piping Alternative, Hood River Watershed, Oregon, 2019\$¹ 125

Table 8-3. Economic Table 1—Estimated Installation Cost of the Piping Alternative, Water Resource Project Measures, Hood River Watershed, Oregon, 2019\$. 128

Table 8-4. Economic Table 2 —Estimated Piping Alternative Cost Distribution, Water Resource Project Measures, Hood River Watershed, Oregon, 2019\$. 129

Table 8-5. Economic Table 4—Estimated Average Annual NEE Costs, Hood River Watershed, Oregon, 2019\$.¹ 130

Table 8-6. Economic Table 5a—Estimated Average Annual Watershed Protection Damage Reduction Benefits East Fork Irrigation District Watershed Plan, Hood River Watershed, Oregon, 2019\$.	131
Table 8-7. Economic Table 6— Comparison of Average Annual NEE Costs and Benefits, East Fork Irrigation District Watershed Plan, Hood River Watershed, Oregon, 2019\$.	133
Table 10-1. List of Preparers.....	140

Office of Management and Budget (OMB) Fact Sheet

Summary Watershed Plan-Environmental Assessment Document For East Fork Irrigation District Infrastructure Modernization Project Middle Columbia-Hood Basin Subwatersheds: Lower East Fork Hood River, Neal Creek, Odell Creek-Hood River, and Indian Creek-Hood River Hood River County, Oregon Oregon 2nd Congressional District	
Authorization	PL 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et seq.) 1954 and the RCPP, authorized by Subtitle I of Title XII of the Food Security Act of 1985, as amended by Section 2401 of the Agricultural Act of 2014.
Lead Sponsor	East Fork Irrigation District (EFID)
Proposed Action	The EFID Infrastructure Modernization Project is a large agricultural water conveyance efficiency project. The proposed action would pipe and pressurize 56 miles of EFID’s canals and laterals.
Purpose and Need	<p>The purpose of this project is to improve water conservation in District infrastructure, improve water delivery reliability, and increase public safety of District-owned canals and laterals.</p> <p>The proposed action would meet PL 83-566 Authorized Project Purpose (v), Agricultural Water Management, through irrigation water conservation, water quality improvement, and more reliable agricultural water supply.</p> <p>Federal assistance through PL 83-566 and RCPP would support the District in addressing the following watershed problems and resource concerns: water loss in District conveyance systems; water delivery and operations inefficiencies; instream flow for fish and aquatic habitat; risks to public safety from open irrigation canals; sediment in irrigation water; and projected decline in future watershed yield during the irrigation season.</p> <p>The proposed action would support agricultural production in an area where environmental concerns, public safety, and the projected impact of climate trends on water supply necessitate federal action. The proposed action addresses the need to reduce conveyance water loss in District infrastructure and provide better-managed water diversion for farm use; improve streamflow for fish, aquatic, and riparian habitat; and increase public safety. These measures would serve to stretch the supply of water for agriculture by increasing the reliability and efficiency of water delivered for irrigation while permanently reducing the amount of water diverted, and legally protecting saved water instream.</p> <p>Funding the proposed action would help fulfill Bonneville’s obligation to mitigate under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 §§ <i>et seq.</i>) (Northwest Power Act) for effects of the development and operation of the federal hydroelectric dams in the Columbia River basin on fish and wildlife, fulfill commitments to CTWS, and minimize harm to natural and human resources, including species listed under the Endangered Species Act (ESA).</p>
Description of the Preferred Alternative	Under the Preferred Alternative, 56 miles of District-owned canals and laterals in the EFID system would be converted to high-density polyethylene (HDPE) gravity-fed pressurized buried pipe.

Project Measures	Under the Preferred Alternative, the project sponsor would replace canals and laterals with HDPE pipe; install 61 pressure reducing valves; and upgrade 384 turnouts for pressurized water delivery. Additionally, a sedimentation basin would be installed close to the diversion. Construction of the Preferred Alternative would occur in 3 project groups over the course of 10 years.		
Resource Information			
Subwatersheds	12-digit Hydrologic Unit Code	Latitude and Longitude	Subwatershed Size
Lower East Fork Hood River	170701050706	45.5188469, -121.582468	27,146 acres
Neal Creek	170701050701	45.58036939, -121.502756	19,713 acres
Odell Creek-Hood River	170701050702	45.62660139, -121.596705	20,905 acres
Indian Creek-Hood River	170701050703	45.67596815, -121.531906	10,018 acres
Subwatershed Total Size	77,782 acres		
East Fork Irrigation District Size	16,160 acres ¹		
Climate and Topography	The project is located along the eastern slopes of the Cascade Mountain range in the Hood River Valley. Annual average precipitation is 31 inches. The average high temperature for July is 81 degrees Fahrenheit and average low temperature for January is 28 degrees Fahrenheit. The irrigated land within EFID varies from flat to moderately sloping, with an average elevation of 930 feet above mean sea level.		
Land Use East Fork Irrigation District (total 16,160 acres)	Use	Acres	
	Agriculture	9,607	
	Developed	4,849	
	Undeveloped	1,704	
Land Ownership East Fork Irrigation District (total 16,160 acres)	Owner	Percentage	
	Private	91.3% (14,759 acres)	
	State-Local	8.7% (1,401 acres)	
	Federal	None	
Population and Demographics	The Preferred Alternative would occur within Hood River County, Oregon. In 2017, the population of Hood River County was 23,377, or 45 people per square mile. The population growth rate of the county was 4.6 percent between 2010 and 2017. The population of the State of Oregon grew by 8.1 percent over the same period.		

¹ In this Plan-EA the District's area is reported as 16,160 acres, which was calculated using geographic information system (GIS) data provided by EFID. Other documents report the area of the District as 15,150 acres.

Population and Demographics		Hood River County	Oregon
	Population 2017	23,377	4,142,776
	Unemployment Rate 2017	3.6 %	4.1 %
	Median Household Income 2017	\$63,951	\$60,123
Relevant Resource Concerns	Resource concerns identified through scoping were water conservation and quality, surface and ground water, aquatic and fish resources, visual resources, land use, cultural resources, socioeconomics, wetlands, terrestrial wildlife, and vegetation.		
Alternatives			
Alternatives Considered	Eleven alternatives were initially considered; nine were eliminated from full analysis because they did not address the purpose and need for action, did not achieve the Federal Objective and Guiding Principles, 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, EFID would continue to operate and maintain its existing canal and pipe system in their current condition. The need for the project would still exist; and the District would only be able to modernize its infrastructure on a project-by-project basis as public funding became available. Public funding is not reasonably certain to be available under a project-by-project approach at a scale large enough to fully modernize the District’s infrastructure.		
Proposed Action	Under the Piping Alternative, EFID would replace 56 miles of canals and laterals with gravity pressurized HDPE buried pipe. The Piping Alternative has been identified as the National Economic Efficiency (NEE) plan and is also the Preferred Alternative.		
Mitigation, Minimization, and Avoidance Measures	<p>Land that could provide areas having seasonal wetland characteristics along 17.5 miles of open canals would be converted to upland vegetation. Project canals are not considered jurisdictional wetlands by state or federal agencies. The wetland characteristics that could occur in the canals have low function, and the loss would be offset by gains in water quantity, water quality, and habitat function in the project area’s natural riverine systems. The National Wetland Inventory (NWI) identifies approximately 42.2 acres of wetland features within and adjacent to canals and laterals that would be affected by the project (USFWS 2016). These have not been field verified. Wetland determinations and/or delineations would be conducted adjacent to canals in areas where work would occur prior to construction of each project group, and if present, wetlands would be avoided to the extent practicable.</p> <p>Consultation between the District, NRCS, and the Oregon State Historic Preservation Office (SHPO) for compliance with Section 106 of the National Historic Preservation Act (NHPA) would occur prior to project implementation. If eligible resources are documented in the project area by a cultural resource specialist, consultation would identify appropriate mitigation measures.</p> <p>For all project groups, ground disturbances would be limited to only those areas necessary to minimize effects on vegetation, wildlife, wetlands, land use, and visual resources. Where roads or access routes do not currently allow construction access, temporary access routes would be selected in a manner to minimize erosion and effects on vegetation and avoid the removal of trees. Stormwater best management practices would be employed during and</p>		

	after construction, and construction schedules would be determined to minimize disturbance to wildlife and the public. After construction, disturbed areas would be graded and replanted with a mix of native grasses and forbs to reduce the risk of erosion and spread of noxious weeds.					
Project costs	PL 83-566 funds		Other funds		Total	
Construction	\$25,000,000	42%	\$34,607,000	58%	\$59,607,000	(100%)
Engineering	\$1,928,000	75%	\$643,000	25%	\$2,571,000	(100%)
SUBTOTAL COSTS	\$26,928,000	43%	\$35,250,000	57%	\$62,178,000	(100%)
Technical assistance	\$3,237,000	100%	\$0	0%	\$3,237,000	(100%)
Relocation	Not applicable					
Real property rights	Not applicable					
Project administration	\$809,000	57%	\$622,000	43%	\$1,431,000	(100%)
Permitting	\$0	0%	\$1,865,000	100%	\$1,865,000	(100%)
Annual O&M	Not applicable					
TOTAL COSTS	\$30,974,000	45%	\$37,737,000	55%	\$68,711,000	(100%)
Project Benefits						
Project Benefits	The Preferred Alternative would improve water delivery reliability for EFID’s patrons, conserve up to 16.6 cubic feet per second (cfs) of water for instream and agricultural use, reduce EFID’s O&M costs, improve public safety, reduce on-farm pumping costs, and help address concerns about sediment content in irrigation water.					
Number of Direct Beneficiaries	EFID serves 990 patrons, all of which would directly benefit from the project.					
Other Beneficial Effects-Physical Terms	The Preferred Alternative would have beneficial effects on agricultural water availability, water quantity, water quality, and fish and wildlife habitat.					
Damage Reduction Benefits	Project Group*					
	1	2	3			
Other – Agricultural Yield Enhancement (Increased Net Returns)	\$91,000	\$760,000	\$522,000			
Other - Reduced O&M	\$119,000	\$200,000	\$0			
Other – Patron Pumping Cost Savings	\$134,000	\$91,000	\$54,000			
Other - Social Value of Carbon (Avoided Carbon Emissions)	\$3,000	\$1,000	\$1,000			

Water Conservation- Instream Flow Value	\$115,000	\$166,000	\$56,000
Total Quantified Benefits	\$462,000	\$1,218,000	\$633,000
Benefit to Cost Ratio	1.14	1.15	1.87
*Project group refers to groupings of canals and laterals that would undergo construction during the same period. Canals and laterals under each project group are as follows: 1. Eastside Service Area 2. Main and Dukes Valley Service Areas 3. Central Service Area			
Installation Period (years)	3	5	2
Project Life	100 years for each project group		
Funding Schedule			
Year—Project Group	PL 83-566	Other Funds	Total
2020-2023 1	\$10,522,000	\$3,600,000	\$14,152,000
2023-2028 2	\$19,967,000	\$20,389,000	\$40,356,000
2028-2030 3	\$455,000	\$13,748,000	\$14,203,000
Environmental Effects			
<p>The Preferred Alternative would be planned, designed, and installed to have long-term net beneficial effects on agricultural production, water quantity, water quality, public safety, Endangered Species Act listed fish species and their habitats, and other aquatic species. Long-term, adverse effects would include alterations to the visual landscape following the elimination of 17.5 miles of open irrigation canals; the conversion of approximately 36 acres of artificial wetlands and associated artificial riparian areas to upland habitat; and reduced streamflow in five tributary streams where streamflow is currently artificially augmented by irrigation end spills. The artificial wetlands and riparian areas consist of the irrigation canals and the vegetation growth supported by moist soils or seepage along the canal banks. Loss of existing artificial wetland and riparian habitat would be offset by enhancement of naturally functioning wetland and riparian habitat in the East Fork Hood River. Impacts to instream and riparian habitat from reduced streamflow in tributaries that would no longer receive end spills would be offset by improvement in water quality and the return of affected tributaries to a more natural hydrologic condition.</p> <p>Implementation of the Preferred Alternative to improve water conservation, water delivery reliability, and public safety may result in minor, short-term, adverse effects, such as impacts to vegetation along the canals. Most of these short-term adverse effects would result from construction activities in the project area. The Sponsor would work closely with partners, contractors, and affected landowners to incorporate measures to avoid and minimize short-term, adverse effects.</p>			

Major Conclusions	The Preferred Alternative would improve the reliability of water delivery for farmers; eliminate water loss from end spills, seepage, and evaporation in District infrastructure; enhance fish and aquatic habitat through greater instream flows; and improve public safety while supporting agriculture and improving the environmental quality of the East Fork Hood River, Hood River, and several Hood River tributaries.
Areas of Controversy	No areas of controversy have been identified.
Issues to be Resolved	None
Evidence of Unusual Congressional or Local Interest	Comments during the scoping period were received from the Confederated Tribes of Warm Springs, 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 <u> X </u> 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.). In Oregon’s Hood River basin, irrigated agriculture is the primary out-of-stream water use and relies on 100-year-old, open, unlined canals to deliver water to farms and orchards. In recent years, the improvement of water resources has been a focus of the five irrigation districts within the Hood River basin, with the goal of addressing environmental needs for instream flows while still delivering enough water to district patrons (Figure 1-1).

The Hood River basin is one of Oregon’s leading fruit growing regions, producing one third of the U.S. winter pear crop (Stampfli et al. 2012). The East Fork Irrigation District (herein referred to as EFID or the District) is the largest irrigation district in the basin and includes 16,160 acres, of which 9,607 acres are currently irrigated by 990 patrons. The District diverts its water supply from the East Fork Hood River for delivery to patrons through an 82.8-mile-long system of canals and laterals.² Approximately 18 percent of the water diverted is currently returned to surface waters as spill at the end of the canals and laterals. As a result, the District diverts more water than is required for irrigation to help ensure that water reaches all patrons throughout the District.

The District has made improvements to its infrastructure in recent decades and has legally protected 1.58 cubic feet per second (cfs) of conserved water in the East Fork Hood River, and another 0.52 cfs is pending for permanent instream use. Although some improvements have been made, EFID’s aging and outdated infrastructure contributes to water supply insecurity for agriculture and continues to affect aquatic habitat and water quality in the East Fork Hood River and several other tributaries. The District’s open canals present an ongoing public safety risk. The high natural sediment load in the EFID water source presents a maintenance challenge for the District and its patrons, and limits the on-farm use of high-efficiency sprinklers and drip emitters. Inefficient infrastructure also affects the financial stability of EFID, as the District must find new approaches to fund growing maintenance needs.

If EFID’s water distribution system were modernized and more efficient, the District would divert less water and leave more water instream in the East Fork Hood River. Returning a portion of the water saved through modernization would allow EFID to address fish and aquatic habitat concerns associated with low streamflow, and is required under the District’s Conserved Water Policy when over 25 percent of conservation project financing comes from public sources (Section 6.7.2). Improving irrigation infrastructure offers an opportunity to conserve water; save energy; increase the reliability of water delivery to farms; enhance streamflow, water quality, and aquatic habitat; reduce risks to public safety from open irrigation canals; and reduce operation and maintenance (O&M) costs for the District.

² “Laterals” refer to canals or pipelines that branch off from a main or larger canal or pipeline.

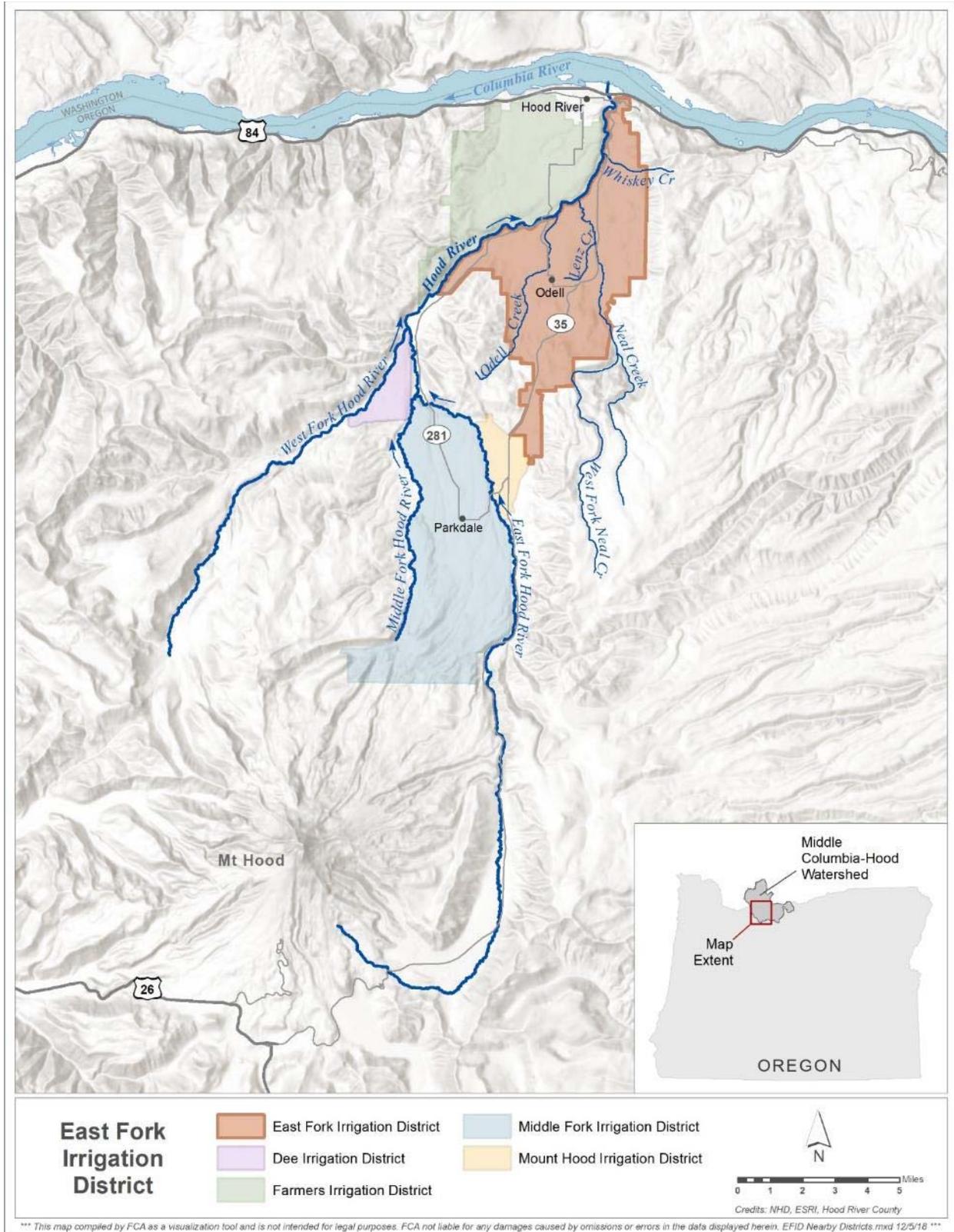


Figure 1-1. Irrigation districts within the Hood River basin.

1.1 Watershed Planning Area

The District’s service area and the EFID Infrastructure Modernization Project (herein referred to as project or proposed action) area are located in four subwatersheds: Neal Creek, Odell Creek-Hood River, Indian Creek-Hood River, and Lower East Fork Hood River (Figure 1-2). They are located within the larger Middle Columbia-Hood watershed (Hydrologic Unit Code 17070105) and cover a total of 77,780 acres. The four subwatersheds comprise the EFID Watershed Planning Area (Table 1-1).

Table 1-1. East Fork Irrigation District Watershed Planning Area.

Name	12-Digit Hydrologic Unit Code	Area (acres)
Neal Creek	170701050701	19,713
Odell Creek-Hood River	170701050702	20,905
Indian Creek-Hood River	170701050703	10,017
Lower East Fork Hood River	170701050706	27,145
	Total	77,780

1.2 Project Area

The project area is where construction activities would occur to modernize up to 56 miles of the District’s canals and laterals (Figure 1-3). Construction activities would occur within the District’s existing easements, except in limited areas where additional space may be needed on a temporary or permanent basis to accomplish the work. For example, approximately one-half mile of the pipeline that would replace the EC would not follow the existing canal alignment, but instead would follow a shorter route through both private land and county-owned forest land under a new easement. In such cases, the District would work with individual landowners to obtain permission for any land use outside of easements.

For the purposes of this Watershed Plan-Environmental Assessment (Plan-EA), the project area is defined as extending 50 feet on each side of the affected canals and pipelines, and 50 feet around the proposed 30,000 square foot sediment basin near the District’s diversion.

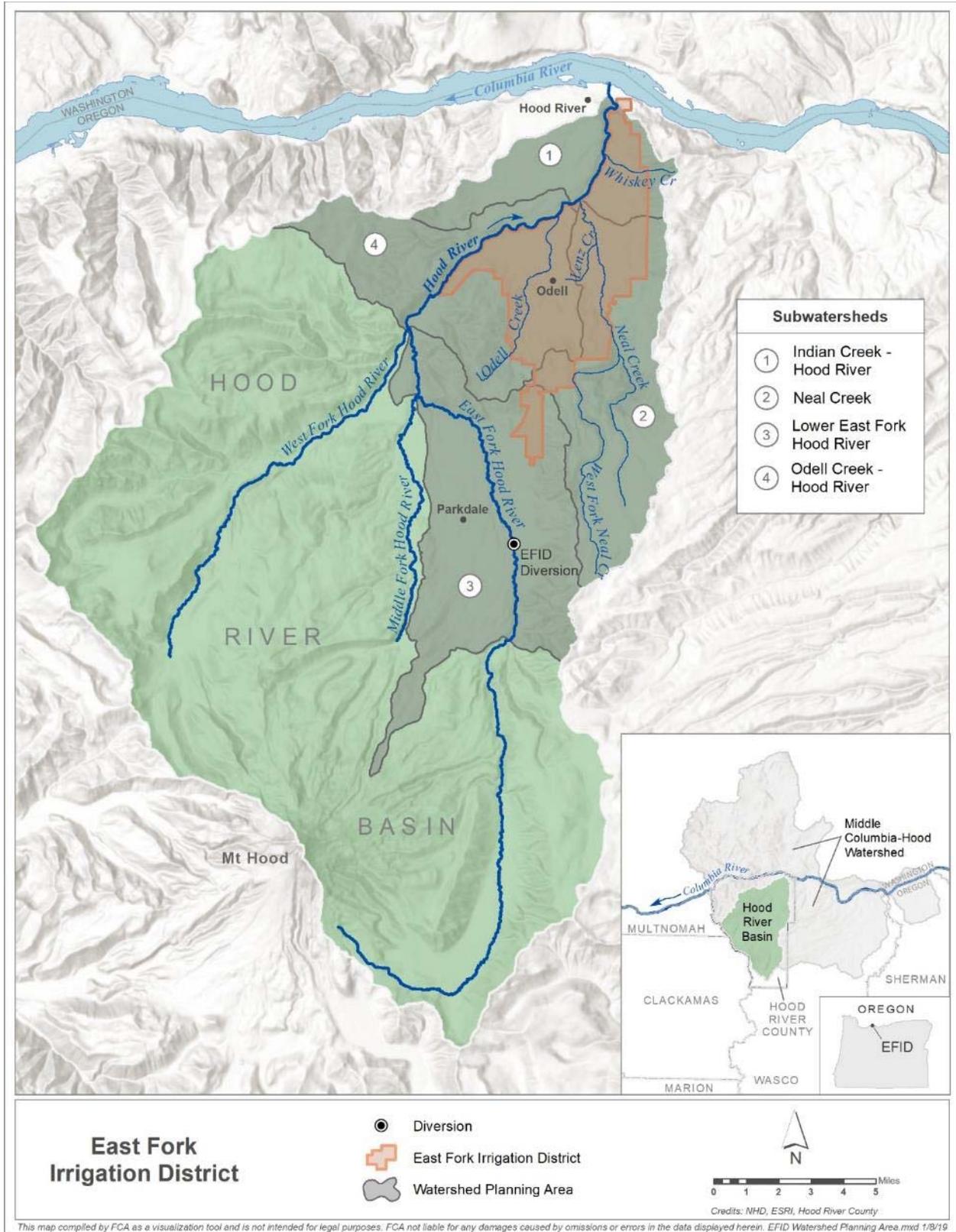


Figure 1-2. The four subwatersheds comprising the East Fork Irrigation District watershed planning area.

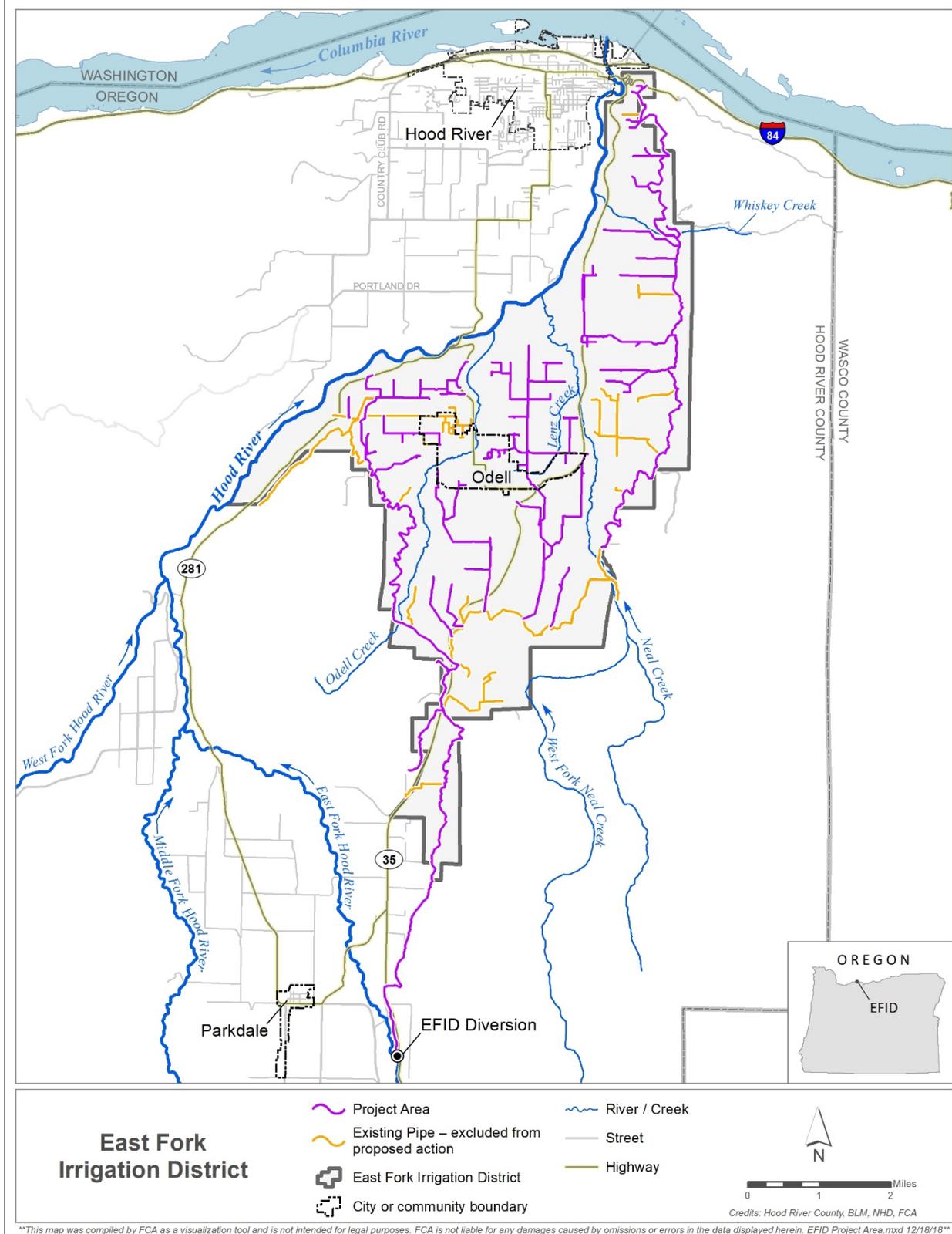


Figure 1-3. Location of the East Fork Irrigation District Infrastructure Modernization Project area.

1.3 Current Infrastructure

The District’s 82.8-mile irrigation conveyance system includes 64.9 miles of pipeline and 17.9 miles of open, unlined canals. System conveyance occurs through gravity. Many of the existing pipelines are not rated for pressurization, including segments of concrete pipeline. The District operates a single diversion at its headworks on the East Fork Hood River (River Mile [RM] 6.6). A rock push-up dam and wood headgate were replaced in 2013 with an Obermeyer weir, four steel headgates, and a vertical slot fish ladder (Figure 1-4). The District’s water rights allow for the diversion of up to 117.36 cfs from the East Fork Hood River. EFID also diverts water for the Mount Hood Irrigation District (MHID). MHID withdraws up to 12.65 cfs under its own water rights from two points along the EFID Main Canal into a fully piped distribution system. EFID has no reservoir storage and relies on live flow from the East Fork Hood River for irrigation water supply.



Source: Hood River Watershed Group, photographed in 2014

Figure 1-4. The District’s diversion weir, fish ladder, and intake facilities on the East Fork Hood River at river mile 6.6.

The East Fork Hood River’s high glacial sand and silt content requires that sediment be separated from irrigation water near the point of diversion. From the diversion, water is conveyed in an open channel to a large concrete sand trap structure with five settling bays (Figure 1-5), designed to separate, retain, and dispose of over 1,000 cubic yards of sand in an 8-hour period (Buell and Associates 2000). The sand trap settles coarse sand and some fine sand, while smaller particles pass through the system into the District’s canals (Wharry 2016). It is estimated that the trap is able to settle out 12 percent of the overall incoming sediment load (Christensen 2013). In a typical year, 10 to 13 thousand cubic yards of sand are sluiced from the trap (EFID 2011). A wide area in the channel upstream of the trap provides additional sand settling capacity. The District also maintains three additional in-canal settling basins at other locations throughout its system to limit sediment accumulation in its conveyance infrastructure. The total volume of all existing settling facilities is approximately 2.8 acre-feet (Wharry 2016).



Source: East Fork Irrigation District, photographed in 2010

Figure 1-5. The District’s sand trap facility located 0.4 mile from the diversion at the start of the Main Canal.

Fixed plate, semi-horizontal Coanda fish screens are installed at the downstream ends of the sand trap settling bays (Figure 1-6). These screens separate the water diverted for irrigation from the water and fish that are returned instream, preventing fish from entering the District’s canals and pipelines. Testing conducted in 1996 after screen and sand trap construction found no fish injuries or mortality of fish passing the screens; however, Coanda screens do not meet the National Oceanic and Atmospheric Administration (NOAA) Fisheries’ fish screening criteria and are regarded as experimental technology (NMFS 2011). Further discussion of fish screening is provided in Section 4.8.

From the sand trap and fish screen facility, the water diverted for irrigation enters EFID’s open Main Canal and is conveyed 6.8 miles north to a distribution center where the system splits into two laterals: the 4.5-mile Central Lateral Pipeline (CLP) and the 5-mile open Dukes Valley Canal (DVC). The DVC conveys water to the southwestern extent of the District via five lateral pipelines. Before entering the CLP, irrigation water flows through a large trash rack and over a traveling debris screen. The CLP supplies water to 10 District-owned, sub-lateral pipelines and to the open Eastside Canal (EC). The EC is 6.1 miles long and supplies water to seven District-owned piped laterals and transitions into the Whiskey Creek Pipeline. The system includes 536 turnouts that are gate-regulated and weir-measured by EFID field staff.

The conveyance system is fed entirely by gravity. The elevation in the District drops approximately 800 feet between the diversion and the northern limit of the District.

Approximately 78 percent, or 64.9 miles, of the District’s conveyance system has been piped. However, at least half of the District’s piping is outdated or is not rated to withstand the water pressures expected in an enclosed and pressurized delivery system.



Source: Hood River Watershed Group

Figure 1-6. Coanda type fish screens installed at the end of the District’s sand trap settling bays.

The District’s delivery infrastructure loses approximately 5,287 acre-feet of water annually through end spills at roughly 25 locations throughout the District. End spills are excess water released into ditches or streams at the termination of an unpressurized canal or lateral. Because the system is not fully pressurized, the District must divert this water to ensure a continual water supply for all patrons. A further discussion of system water losses is provided in Section 2.1.1.

1.4 Decision Framework

This Draft Plan-EA has been prepared to assess and disclose the potential effects of the proposed action. This Plan-EA is required to request federal funding through the Watershed Protection and Flood Prevention Act, Public Law 83-566, authorized by Congress in 1954 (herein referred to as PL 83-566). This program is managed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Through this program, NRCS provides technical and financial assistance to project sponsors such as states, local governments, and tribes to plan and implement authorized watershed project plans for watershed protection; flood mitigation; water quality improvements; soil erosion reduction; rural, municipal, and industrial water supply; irrigation; water management; sediment control; fish and wildlife enhancement; and hydropower. 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 using federal funds that

significantly affect the quality of the human and natural environment (individually or cumulatively). When a proposed project is not likely to result in significant impacts, but the activity has not been categorically excluded from NEPA, an agency can prepare an EA to assist them in determining whether an EIS is needed (see 40 Code of Federal Regulations [CFR] 1501.4 and 1508.9; 7 CFR 650.8).

EFID is partnered with NRCS to implement the proposed project within EFID's Watershed Planning Area under the watershed authority of the PL 83-566 program. For purposes of NEPA compliance, the intent of this Plan-EA is to provide a tiered approach for the implementation of the proposed action.

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 to 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 ready for decision. Tiering eliminates repetitive discussions of the same issues across site-specific project groups through incorporation by reference of the general discussions.

NRCS has determined the need for an EA to implement the proposed action under PL 83-566 watershed authority. Due to the broad spatial scale of this analysis, and 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 area with minimal additional NEPA analysis.

The proposed action is planned to be completed in project groups.³ Consistent with the tiering process as described above and before implementing each site-specific project, an on-site Environmental Evaluation (EE) review would occur using Form NRCS-CPA-52, Environmental Evaluation Worksheet. The EE would determine if that particular individual project 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 this Plan-EA are still valid. Where the impacts of the narrower project-specific action are adequately identified and analyzed in the broader NEPA document, no further analysis would occur and this Plan-EA would be used for purposes of the pending action.

If it is determined that this Plan-EA is not sufficiently comprehensive, is not adequate to support further decisions, or if resource concerns or effects have not been adequately evaluated through the programmatic approach, a separate site-specific supplemental EA would be prepared.

This Plan-EA has been prepared in accordance with applicable CEQ's regulations for implementing NEPA (40 CFR 1500–1508), USDA's NEPA regulations (7 CFR Part 650), NRCS Title 190 General

³ "Project group" refers to groupings of canals and laterals that would undergo construction during the same period. The project groups identified in the System Improvement Plan (SIP) (FCA 2018a) may differ from the project groups identified in this Plan-EA.

Manual Part 410, and NRCS' National Environmental Compliance Handbook Title 190 Part 610 (May 2016). This Plan-EA also meets the NRCS program policy of the 2015 NRCS National Watershed Program Manual (NWPM) (PL 83-566 Title 390, Parts 500-506) and guidance of the 2014 NRCS National Watershed Program Handbook (PL 83-566 Title 390, Parts 600-606). This Plan-EA serves to fulfill the NEPA and NRCS environmental review requirements for the proposed action.

Finally, in addition to the requirements and policies under NEPA listed above, the USDA will also conduct its analysis of this Plan-EA following the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G; USDA 2017), which the USDA uses as a common framework for evaluating USDA water resources investments (DR 9500-13).

1.5 Bonneville's Decision Framework

Bonneville Power Administration (Bonneville) is a federal power-marketing agency within the U.S. Department of Energy. Bonneville is governed by several organic statutes, including the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 United States Code [U.S.C.] 839 §§ *et seq.*) (Northwest Power Act). Among other things, the Northwest Power Act directs Bonneville to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the federal hydroelectric dams in the Columbia River basin from which Bonneville markets commercial power, and to do so in a manner consistent with the purposes of the Act and the Northwest Power and Conservation Council's Fish and Wildlife Program.

Although NRCS is the lead agency with responsibility for the completion of this Plan-EA, Bonneville is a cooperating agency for the development of this Plan-EA, because Bonneville is considering providing fish mitigation funding to the Confederated Tribes of Warm Springs (CTWS) to assist in implementation of the Eastside Lateral Piping Project, a subset of EFID's Infrastructure Modernization Project. The Eastside Lateral Piping Project would modernize approximately 6 miles of irrigation infrastructure and is expected to cost up to \$10 million to implement. Bonneville would provide CTWS with up to \$1 million in cost share for design work and materials as part of the Eastside Lateral Piping Project. The information in this Plan-EA, public comments, and its own expertise related to the project in making a decision will help Bonneville determine if the potential effects of Eastside Lateral Piping Project of the proposed action would be significant and warrant preparation of an EIS, or whether it is appropriate to complete a Finding of No Significant Impact (FONSI). If Bonneville determines that a FONSI is warranted, the FONSI will be posted on Bonneville's project website along with Bonneville's NEPA documents.

2 Purpose and Need for Action

The purpose of this project is to improve water conservation in District infrastructure, improve water delivery reliability, and increase public safety along District infrastructure.

The project is needed due to the following conditions, which are further discussed in Section 2.1:

- An estimated 18.3 percent of the water diverted by EFID from the East Fork Hood River is lost through end spills at the ends of the District’s open canals and unpressurized pipelines.
- It is difficult for the District to deliver the correct amount of water to patrons at the correct time due to open, unpressurized canals and laterals.
- The District diverts up to 85 percent of the natural flow of the East Fork Hood River, resulting in diminished habitat for fish and other aquatic life, as well as diminished water quality.
- Due to a high natural sediment load in the East Fork Hood River, the quality of irrigation water is poor for weeks to months each year. Sediment in irrigation water clogs filters, raises on-farm maintenance costs, and causes wear on high-efficiency sprinklers and drip irrigation systems.
- The District is concerned about the safety risk of open canals. Two drowning deaths occurred in the 1980s in the District’s canals, which pass through rural residences, orchards, public lands, and irrigated fields.

Additionally, Bonneville’s purpose and need for cost share funding to the project are as follows:

- Help fulfill Bonneville’s obligation through the Northwest Power Act to mitigate effects of the development and operation of federal hydroelectric dams in the Columbia River basin on fish and wildlife. The proposed action would constitute an enhancement project for Bonneville. Under the Northwest Power Act, “enhancement” is “a means of achieving offsite protection and mitigation” for fish and wildlife affected by development and operation of the hydroelectric facilities of the Columbia River and its tributaries. See 16 U.S.C. § 839b(h)(8)(A).
- Fulfill commitments to CTWS related to the proposed project that are contained in the 2008 Columbia River Basin Fish Accords Memorandum of Agreement among the CTWS, Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes and Bands of the Yakama Nation, the Columbia River Inter-Tribal Fish Commission, Bonneville, the U.S. Army Corps of Engineers (USACE), and U.S. Bureau of Reclamation, as extended in 2018 (Fish Accord Extension).
- Minimize harm to natural and human resources, including species listed under the Endangered Species Act (ESA).

Bonneville needs to respond to the CTWS’s request to fund a portion of the Eastside Lateral Piping Project as part of Bonneville’s commitment under the Fish Accord Extension.

In addition to the purpose and need stated above, 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, promote the Federal Guiding Principles (as identified in the PR&G), 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” (USDA 2013). Additionally, the project should seek to achieve the following Guiding Principles as identified by the federal government: Healthy and Resilient Ecosystems, Sustainable Economic Development, Floodplains, Public Safety, Environmental Justice, and Watershed Approach.

The proposed project would be eligible for funding under PL 83-566 requirements as an “Authorized Project Purpose (v), Agricultural Water Management”,⁴ through irrigation water conservation, water quality improvement, and more reliable agricultural water supply.

2.1 Watershed Problems and Resource Concerns

2.1.1 Water Loss in District Conveyance Systems

Currently, the District’s infrastructure loses an estimated 16.6 cfs (5,287 acre-feet annually) to end spills throughout the District, equal to 18.3 percent of the average amount of water that EFID diverts annually. End spill is excess water that is discharged to natural drainages near the termination of an open canal, lateral, or unpressurized pipeline. Because the system is not fully pressurized, EFID is required to maintain end spills to ensure a continual water supply for all patrons. Lesser but additional water losses may occur from seepage along the District’s open and unlined canals. Measurements of seepage losses within the District have been inconclusive due measurement problems associated with the large number of turnouts along the canals. Evaporation losses in EFID’s system are minor and were estimated to be 0.13 cfs (Wharry 2016). Detailed information on water losses and water demand can be found in the District’s System Improvement Plan (SIP) (FCA 2018a). Currently, there is a lack of adequate streamflow in the basin during the summer months to meet the competing demands for water (Reclamation 2015).

2.1.2 Operations Inefficiencies and Water Delivery Reliability

The District’s open canals and unpressurized pipelines make it difficult to deliver the correct amount of water to patrons at the correct time. EFID must maintain end spills so that a steady water supply can be delivered to all patrons regardless of the actual patron water demand. EFID staff currently monitor end spills that occur at approximately 25 locations throughout the District, adjusting the rate of diversion daily to limit water loss while ensuring sufficient deliveries at the ends of canals and pipelines. This task is challenging as patrons turn delivery gates (individual turnouts) on and off.

⁴ A description of Authorized Purposes can be found in 390-NWPM, Part 500, Subpart A, Section 500.3B.

Operating and maintaining the District’s century-old open canals requires staff to inspect and repair the canal banks; remove fallen tree limbs and other debris; remove sediment from canals and ditches; clean leaves, algae, and other debris from 12 District-owned screens; treat algae in canals; and adjust flows to patrons.

The District’s water supply is fed by snow and glacial melt on Mount Hood and spring sources. Snowpack in the Hood River basin has decreased since the 1920s, and Mount Hood’s glaciers have receded since the mid-1900s or earlier (Lillquist and Walker 2006). Continued glacial recession and declining snowpack are expected as a result of warmer temperatures predicted with the changing climate, with lower natural runoff in the spring and summer months when water uses are greatest (Reclamation 2015). Drought has occurred in 3 of the past 14 years and has required EFID, by voluntary request to patrons, to curtail water deliveries by 25 percent throughout the peak irrigation season to avoid depleting streamflow in the East Fork Hood River at its diversion.

2.1.3 Instream Flow for Fish and Aquatic Habitat

The Hood River and its tributaries support threatened and sensitive species, including steelhead trout, bull trout, Chinook and coho salmon, Pacific lamprey, and many other fish, bird, and wildlife species. In the Hood River basin, low streamflow is identified as a primary limiting factor for coho, steelhead, and Chinook populations, which are listed as threatened species under the ESA (NMFS 2013). The East Fork Hood River downstream of the EFID diversion is identified as the highest level of concern for water quantity and water quality in the basin (Shively 2006).

EFID typically diverts 75 percent—and up to 85 percent—of the available flow of the East Fork Hood River during the late summer. Low streamflow associated with water diversions limits the amount and quality of habitat for many fish and aquatic species, concentrates the proximity of predators and prey, increases competition for food and spawning sites, and contributes to warm water temperatures that are harmful to salmon and trout. Because streamflow is strongly correlated with critical physical and biological characteristics of a river, it also influences the functions of associated riparian areas (National Research Council 2002).

2.1.4 Risks to Public Safety

Open canals pose a safety risk for the public and EFID employees. Two drownings in EFID canals occurred in the 1980s involving an adult and a child in separate incidents (J. Buckley, EFID Manager, personal communication, September 24, 2018).

During the summer, water depths in EFID canals and laterals range between 2 to 4 feet, with velocities up to 5 feet per second. 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 a higher risk of drowning in a canal with these attributes. If a person or animal falls into a canal, they could have serious difficulty gaining a hold on the banks to climb out due to the volume and speed of the moving water. Barriers or fences are not currently installed at the top banks of the canals. The public safety risks from open canals can be expected to increase along with increased development within the District and continued population growth in Hood River County.

2.1.5 Sediment in Irrigation Water

The East Fork Hood River’s periodically heavy glacial sand and silt content requires that sediment be separated from irrigation water near the point of diversion. EFID operates a sand trap above its Main Canal near the diversion. Additional in-canal settling areas are used in three locations along the conveyance system, and in another location upstream of the sand trap, to limit sand accumulation in delivery infrastructure and limit the sand and silt content in irrigation water. Despite these facilities, the quality of irrigation water due to sediment is poor for weeks to months each year and is recognized as a limiting factor of EFID’s water supply (EFID 2011; Wharry 2016). As a result, filters are used at turnouts or on farms. At times, the high sand and silt content in the EFID water supply requires that filters be cleaned daily or even several times daily.

Sediment in irrigation water reduces the efficiency of irrigation systems on farms. Sand and silt erode sprinkler heads, clog drip emitters, and limit the potential for widespread use of highly efficient on-farm irrigation systems within the District. The sediment load in rivers such as the East Fork Hood River could increase with glacial retreat, reduced snow cover, and in extreme weather events that may cause more landslide activity in the upper East Fork Hood River (Huggel al. 2012).

2.2 Watershed and Resource Opportunities

The following list of opportunities to address watershed problems and resource concerns would be realized through project implementation. Quantification of these opportunities is provided in the respective sections of this Plan-EA. The project would realize the following opportunities:

- Eliminate end spills, allowing less water to be diverted from the East Fork Hood River while fulfilling patron water rights.
- Improve streamflow, water quality, and habitat conditions in the East Fork Hood River and the Hood River downstream from EFID’s diversion.
- Reduce O&M involved in delivering irrigation water to EFID patrons.
- Minimize the potential for injury and loss of life associated with the open EFID canals.
- Help increase future water supply security given competing demands for water and the projected decline in snowpack and summer streamflow associated with the changing climate.
- Reduce energy costs through pressurization, decreasing patron reliance on pumping.
- Support existing agriculture through improved water supply reliability, water management, and water quality.

2.3 Using Oregon’s Allocation of Conserved Water Program

The District has determined that the proposed action could save up to 16.6 cfs or 5,287 acre-feet of water annually that is currently lost through end spills. The District would use the State of Oregon’s Allocation of Conserved Water Program (Oregon Revised Statute [ORS] 537.470) to legally protect 75 percent of the total water saved by the project as instream flow in the East Fork Hood River

downstream from its diversion. The other 25 percent of the total water saved by the project would help EFID maintain a reliable supply of irrigation water for agricultural needs.⁵

The Conserved Water Program creates new water rights for water conserved as the result of an efficiency project (see Oregon Water Resources Department [OWRD] 2017 and Appendix E for more information about the Conserved Water Program). Through the Conserved Water Program, a new water right certificate would be issued to the District with the original irrigation season and priority date of 1895; this water right would reflect the reduced quantity of water needed after the project. An additional certificate with the same priority date would then be issued to the State of Oregon for the new instream water right. The water allocated instream would be legally protected against out-of-stream use; the District would no longer be able to divert the water. OWRD would continue to measure streamflow at existing diversions and stream gaging stations to ensure that the water conserved by the project remains instream.

⁵ The majority of irrigated land within the District is planted in crops grown by agricultural producers. A summary of water users by crop and acreage is provided in Table 4-5.

3 Scope of the EA

The scoping process followed the general procedures consistent with NRCS guidance and PL 83-566 requirements. Both NRCS procedures and NEPA regulations (40 CFR 1500 to 1508) require that NRCS use scoping early in the planning process to identify issues, concerns, and potential effects that require detailed analysis.

Using input obtained during scoping, NRCS refined the project to focus on relevant resource concerns and issues, and eliminated those that were not relevant from further detailed study. Relevant resource concerns were carried forward for further study and discussion.

3.1 Agency, Tribal, and Public Outreach

Federal, state, and local agencies and representatives, as well as non-governmental organizations, received an invitation to this Plan-EA scoping period. Advertisements announcing the scoping period and associated scoping meeting were placed in a local newspaper in addition to multiple online locations including NRCS’s website and the project website (see Section 7 for more details). Additionally, the District notified patrons of the scoping meeting and invited comments on the Draft Plan-EA.

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 with Native villages and tribes. NRCS sent a letter to the CTWS requesting input and notifying them of the scoping process. CTWS responded and requested that they be consulted during the planning phase of the project. Bonneville would conduct site-specific NHPA Section 106 consultation as appropriate during the project planning phase.

3.2 Scoping Meeting

A scoping meeting was held on October 18, 2018, at the Pine Grove Grange (2835 Van Horn Drive, Hood River, Oregon). Presenters at the meeting included Tom Makowski, NRCS; Kate Hart, Farmers Conservation Alliance (FCA); and Alexis Vaivoda, FCA. The presentations covered the financial assistance available through PL 83-566, the project purpose and need, the Plan-EA process, and ways in which the public could get involved. After the presentations, attendees asked questions and provided comments for the public record. A total of 36 people attended the meeting, excluding staff from EFID, NRCS, and FCA.

3.3 Section Scoping Comments

Scoping comments were accepted from October 3 to November 16, 2018. Comments were submitted via the following methods: at the public meeting and by email, online comment, mail, and phone.

Comments generally supported the project. Table 3-1 presents comment topics received and where they are addressed in this Plan-EA.

Table 3-1. Public Scoping Comment Summary.

Comment Topic	Section Where Topic is Discussed
Concern for the effect on District water rates	Section 8.7.6
Request for water meters on farm	Section 6.11.2
Request for on-farm water conservation	Section 5.2.1
Request for reservoir storage	Reservoir storage is not part of the proposed action. Section 4.7 discusses this.
Effect of project on silt levels in delivered irrigation water	Section 5.3.2
Whether enough sediment would be removed to use micro sprinklers and other on-farm efficiency projects	Section 5.3.2
Concern regarding sediment settling in pipes	Section 5.3.2
Concern for wildlife finding water sources once canals are piped	Section 6.10
Concern for stormwater, especially on the eastside	Section 6.7
Concern for vegetation along the project, especially mature trees	Section 6.5
Request to coordinate construction on the eastside with Crystal Springs Water District piping project	Section 6.11.3.2
Concern for seismic resilience of the project	Section 6.3.2
Request for information about the type of patron turnouts to be installed	Section 5.3.2
Concern whether relatively recently installed pipe needs to be replaced, especially Dethman Ridge Line and Paasch Pipeline, and if pressure reducing valves (PRVs) could be used instead	A review of the Paasch Pipeline in July 2019 determined that PRVs along the existing piping would not be adequate for pressurized deliveries. The Dethman Ridge Line would be reviewed during engineering design for Project Group 3.
Concern about using HDPE pipe	Section 5.3.2
Request to pipe Main Canal all the way to the diversion for future hydropower needs	Section 5.3.2
Request to include Hood River Residents Committee and Oregon Watershed Enhancement Board as interested parties	Section 7.1

3.4 Identification of Resource Concerns

Table 3-2 provides a summary of resource concerns identified through scoping and their relevancy to the proposed action. Resources determined to be non-relevant were eliminated from detailed study; resources determined to be relevant have been carried forward for analysis.

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

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Air			
Air Quality		X	Oregon Department of Environmental Quality (ODEQ) air quality data indicates that the entire project area is in attainment for all criteria pollutants. Emissions from equipment associated with construction 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	No relevant impact to geology.
Soils		X	No relevant impact to soils. With implementation of BMPs, any impacts during construction would be temporary.
Prime Farmlands		X	The project does not involve any change in land use or conversion of farmlands for development or construction of infrastructure.
Human Environment			
Environmental Justice	X		This project could improve instream habitat for Pacific salmon, Pacific lamprey, and tribal trust and treaty fisheries resources of the CTWS.
Cultural Resources	X		Consultation with the State Historic Preservation Office (SHPO) is required for compliance with Section 106 of the NHPA.
Land Use	X		Construction and operation of the project could affect land use.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
National Parks, Monuments, and Parklands		X	None occur in the project area or would be affected by the project.
Noise		X	No relevant impact to noise. With implementation of BMPs, noise impacts during construction would be negligible and temporary.
Public Safety	X		Drowning risk in open canals could be beneficially affected.
Recreation Trails		X	No trails occur in the project area.
Visual Resources	X		Visual resources in the project area could be affected 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 Efficiency (NEE)	X		A NEE analysis has been completed as required by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.
Vegetation			
Invasive Species/Noxious Weeds		X	No relevant impact. With implementation of BMPs, the spread of noxious weeds during construction would be avoided.
Mature Trees	X		Direct and indirect effects to mature trees could occur.
Special Status/Threatened or Endangered Species		X	None have been observed in the project area, and no designated critical habitat occurs in that area.
Water			
Coastal Zones		X	None present.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
Coral Reefs		X	None present.
Floodplain Management	X		Construction and operation of the sedimentation basin would occur in the 100-year floodplain.
Groundwater Quantity, Aquifer Recharge	X		Construction and operation of the project could affect recharge.
Hydrology	X		A change in end spills and seepage, as well as water conserved instream, could affect hydrology.
Private Water Features and Ponds		X	The proposed action would not remove or modify private water features or ponds.
Surface Water Quality	X		The proposed action could affect surface water quality by increasing river flows and by eliminating end spills.
Water Leasing		X	The proposed action would not affect patron leasing options.
Water Rights	X		The proposed action could indirectly affect water rights through use of the Allocation of Conserved Water Program.
Wild and Scenic Rivers		X	None present in the vicinity of District operations.
Wetlands and Riparian Areas			
Wetlands and Riparian Areas	X		Non-jurisdictional wetlands and riparian areas could be affected by the project.
Fish and Wildlife			
Migratory Birds and Eagles	X		Migratory birds and eagles could occur within the project area.
Endangered Species	X		Steelhead, bull trout, coho, and Chinook are known to occur in waterbodies that would be affected by the project.
Essential Fish Habitat (EFH)		X	Since the project would not adversely affect EFH, consultation under the Magnuson Stevens Act is not expected to be required.

Resource	Relevant to the proposed action?		Justification
	Yes	No	
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 of District operations.
Ecosystem Services			
Provisioning Services	X		Provisioning services supported by water quantity, quality, and availability could be impacted by the proposed action.
Regulating Services	X		Regulating services supported by water quantity, quality, and availability could be impacted by the proposed action.
Cultural Services	X		Cultural services supported by water quantity, quality, and availability could be impacted by the proposed action.

4 Affected Environment

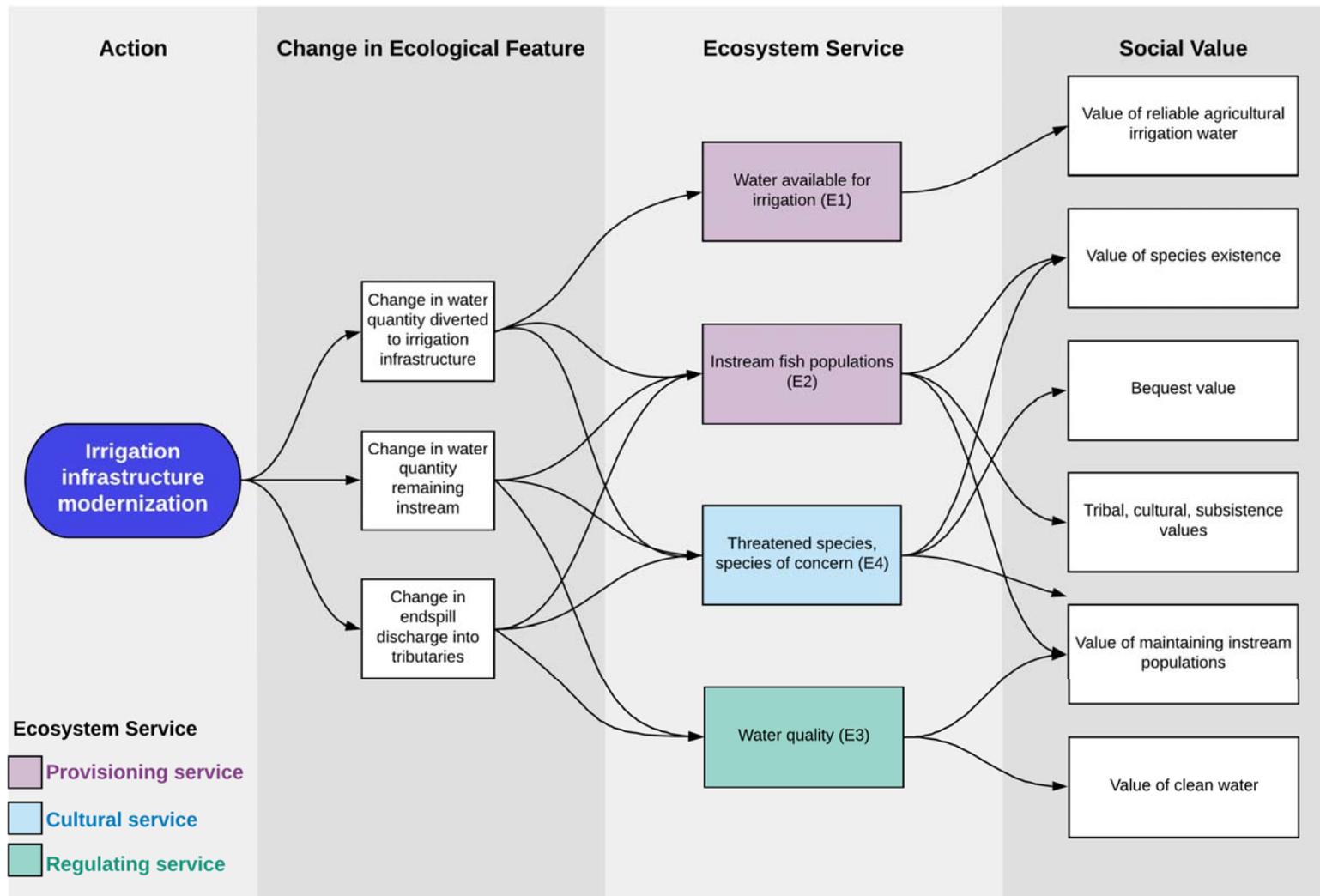
The following sections describe the existing ecological, physical, biological, economic, and social environment of the project area and areas that could be affected by operation of the EFID system. The project area is defined in Section 1.2.

Per requirements of the PR&Gs, where applicable, the ecosystem services associated with each resource are described. Ecosystem services refer to the benefits that people and their communities derive from their natural environment in which they live. Contributions to water consumption, buffering against crop failure through pollination, and providing places in which people value living are all examples of benefits that flow from nature to people. Because these ecosystem services contribute to people’s “health, wealth, and well-being,” but often cannot be quantified in the same way as services sold in marketplaces, federal investment into projects that could impact ecosystems and natural resources require an ecosystem services assessment to illuminate how management decisions will enhance, sustain, or degrade the benefits that nature provides (USDA 2017; Olander et al. 2018). An assessment of links between ecological function and social well-being helps ensure that beneficial and detrimental ecological impacts of a project are recognized and that detrimental impacts are minimized to the extent possible (EEA 2019).

Per federal guidance, ecosystem services in this Plan-EA are assessed based on three of the four service categories (USDA 2017):

- (1) Provisioning services: tangible goods provided for direct human use and consumption, such as food, fiber, water, timber or biomass;
- (2) Regulating services: services that maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe—examples include flood and disease control, water filtration, climate stabilization, or crop pollination;
- (3) Cultural services: services that make the world a place in which people want to live—examples include spiritual, aesthetic viewsheds, or tribal values; and
- (4) Supporting services: services that refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.

Figure 4-1 provides a concept diagram that highlights the ecosystem services that interact with District operations and provides a baseline for discussion in Section 6. The diagram links an action that would modernize District infrastructure with potentially impacted ecosystem features and the provisioning, regulating, and cultural services that these ecosystems provide to people. Supporting services are not evaluated in this Plan-EA because they give rise to and support the other three service categories (EEA 2019; USDA 2017).



Note: E1 to E4 refer to ecosystem services 1 to 4. These services are referenced and explained in more detail throughout Sections 4 and 6.

Figure 4-1. Ecosystem services concept diagram for the East Fork Irrigation District Infrastructure Modernization Project.

4.1 Cultural Resources

Section 106 of the NHPA requires federal agencies to consider the effects of federally funded projects on historic properties, commonly referred to as cultural resources, prior to the expenditure of federal funds. The NHPA defines an historic property as “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property or resource” (ACHP 2019).

4.1.1 Cultural Context

EFID is eligible for inclusion in the NRHP as an Historic District under Criterion A (36 CFR 60.4(a)) for its association with the development of irrigated agriculture in the Hood River region. Additionally, EFID is eligible for inclusion in the NRHP under Criterion C (36 CFR 60.4(c)) as a “significant and distinguishable entity whose individual components may lack individual distinction” (NPS 1995:20).^{6,7} The period of significance for EFID ranges from 1914 to 1917, when the majority of the EFID system was planned and built. This includes the system that EFID acquired from the East Fork Irrigation Canal Company in 1914.

4.1.2 Types of Impacts from Infrastructure Modernization

Each agency, or lead agency if a multi-agency project, would determine effects on historic properties for each of the site-specific projects and would consult with affected tribes and other parties to satisfy the NHPA requirements. During the design and development of these site-specific projects, measures to avoid, minimize, and mitigate effects on properties on or eligible for listing on the NRHP would be considered. Each agency would comply with Section 106 of the NHPA and any other applicable state or federal cultural resources laws.

The modernization actions envisioned in this Plan-EA include those noted in Section 5.3.2, Piping Alternative. These actions could impact both buried and aboveground cultural resources.

4.1.3 Cultural Surveys

A pedestrian survey and shovel tests for archaeological resources were completed for the EC by Archaeological Investigations Northwest, Inc. in 2019. The survey identified one refuse scatter of fragmented glass, four historic-period isolates, and one pre-contact isolate; all are recommended to be not eligible for listing in the NRHP. A finding of “No Historic Properties Affected” is recommended (AINW 2019). An aboveground survey of the EC for any historical resources is in development, as well as aboveground and belowground surveys of the DVC.

As mitigation for adverse effects, Bonneville will conduct an Intensive Level Survey to document the Main Line (Main Canal) of EFID and its associated features. The survey will identify and document construction dates, material types, and eligibility. The survey will also include an

⁶ Concurred by the Oregon State Historic Preservation Office (SHPO) on May 1, 2013 (Case No. 12-1871).

⁷ U.S. Department of the Interior, National Park Service, 1995. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. Washington, DC.

evaluation of significance and integrity, and make a determination of eligibility for the Main Canal. Because the Main Canal forms the core of the District’s conveyance system, a determination for the Main Canal will affect the eligibility of the remaining canals and laterals in the District. The Main Canal has been extensively altered over the years, which may make it ineligible. If the Main Canal is deemed ineligible by Bonneville cultural resource specialists, and the State Historic Preservation Office (SHPO) concurs, then the remainder of the District’s system could also likely be ineligible as a whole.

4.2 Land Use

4.2.1 Land Ownership

Within the project area, EFID’s easements traverse lands that are primarily privately owned. The majority of the project area (88 percent) is adjacent to privately owned land (Figure 4-2). Approximately 3.3 miles of the project area cross public land managed by Hood River County. Small sections of land managed by the Hood River Valley Parks and Recreation, State of Oregon, and federal government are also crossed by the project.

4.2.2 Land Uses

Land use within the project area consists of the conveyance of irrigation water as well as O&M of the irrigation water conveyance system. The proposed action crosses and is adjacent to a combination of agricultural lands, non-cultivated lands, and developed use. Appendix E provides a detailed breakdown of the proposed action lengths crossing different land use classes.

The majority of EFID patrons irrigate parcels smaller than 5 acres that are primarily zoned by Hood River County as Exclusive Farm Use (EFU).⁸ Appendix E provides a summary of the water users by acres served within the District. The primary crops grown in the District are pears, cherries, and apples (see Section 4.4.3).

⁸ The EFU designation is meant to preserve and maintain Oregon’s agricultural lands and the benefits they provide. The county is required to inventory and protect farmlands under Statewide Goal 3, Agricultural Land, ORS 215 and Oregon Administrative Rule (OAR) 660-033.

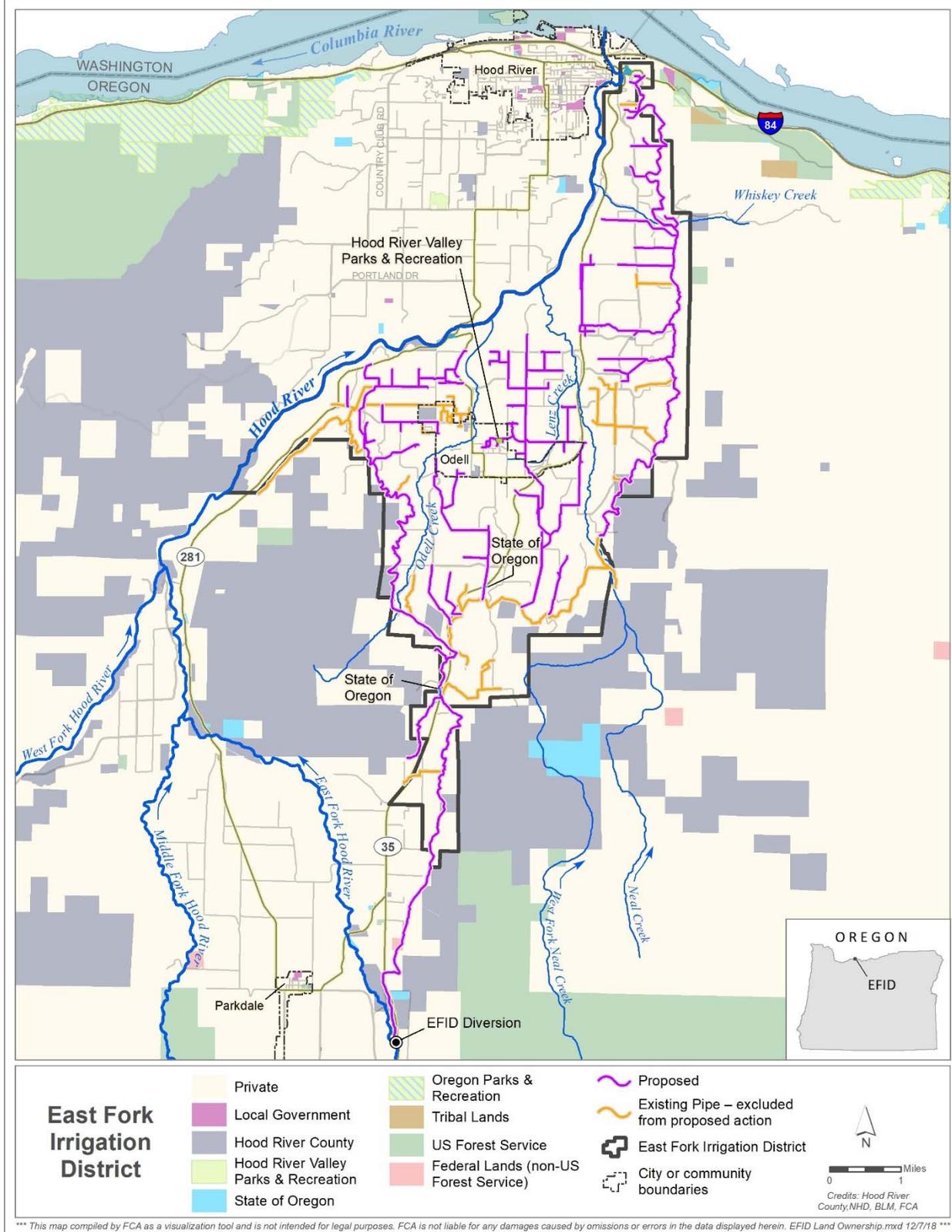


Figure 4-2. Land ownership within and in the vicinity of East Fork Irrigation District.

4.3 Public Safety

The District has 17.9 miles of open canals. Although most of these canals are on private land, they are accessible to local residents, farmworkers, and in some areas to the public. Approximately 3.5 miles of the open canal segments border county-owned forest land that is open to the public for hunting and other outdoor recreation. Open canals pose a risk to public safety when they carry water. Water depths in the District’s canals range between 2 to 4 feet during the irrigation season, with velocities up to 5 feet per second.

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 a higher risk of drowning in a canal with these attributes. If a person or animal falls into a canal, they could have serious difficulty gaining a hold on the banks to climb out to safety. Two drownings occurred in EFID canals in the 1980s involving the death of a child and an adult in two separate incidents (J. Buckley, EFID Manager, personal communication, September 24, 2018). Barriers or fences on the banks of the canals are not currently installed.

4.4 Socioeconomic Resources

4.4.1 Population

Hood River County experienced consistent population growth from 2010 to 2017 (Table 4-1). During this time, the county grew by 4.6 percent, while the state had a growth rate of 8.1 percent (U.S. Census Bureau 2017). Oregon Office of Economic Analysis estimates that by 2050, Hood River County could reach a population of 36,066 (OEA 2013).

4.4.2 Area Employment and Income

Table 4-2 presents the labor force characteristics for Hood River County and the State of Oregon in 2017. Unemployment in Hood River County is less than the state average by half a percent. Educational services, health care, and social assistance consist of 20 percent of the employment rate in Hood River County, while agriculture, forestry, fishing and hunting and mining make up 16 percent (U.S. Census Bureau 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. The median household income in Hood River County in 2017 was \$63,951, which is higher than the median income in the State of Oregon and the United States. The percentage of persons living in poverty in Hood River County was less than the State of Oregon and the United States.

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

Area	Year 2010 Population ¹	Year 2017 Population ²	Population Growth Rate 2010 to 2017 (%)	Year 2050 Population Forecast ³	Population Growth Rate 2017 to 2050 (%)
Hood River County	22,346	23,377	4.6%	36,066	54%
Cities and Towns					
Hood River	7,113	7,686	8.1%	--	--
Odell	2,255	2,478 ⁴	9.9%	--	--
Parkdale	311	528 ⁴	70%	--	--
State					
Oregon	3,831,072	4,142,776	8.1%	5,588,500	35%

¹ Source: U.S. Census Bureau 2010

² Source: U.S. Census Bureau 2017

³ Source: OEA 2013 (forecasts for Oregon Cities and Towns were not available)

⁴ Population for Odell and Parkdale were not available for 2017 (2016 data is shown)

Table 4-2. Labor Force Characteristics in Hood River County and the State of Oregon, 2017.

Indicator	Hood River County	Oregon (State)
Labor Force	14,359	2,103,478
Employed	13,841	2,016,722
Unemployed	518	86,757
Unemployment Rate	3.6%	4.1%

Source: U.S. Bureau of Labor Statistics 2017

Table 4-3. Income and Poverty Rates in Hood River County, Oregon State, and United States, 2017.

Indicator	Hood River County	Oregon (State)	United States
Median Household Income	\$63,951	\$60,123	\$60,336
Per Capita Income	\$29,595	\$30,410	\$31,177
Persons in Poverty	10.6%	13.2%	13.4%

Source: U.S. Census Bureau 2017

4.4.3 Agricultural Statistics

Hood River County is the world’s leading producer of Anjou pears (Oregon Encyclopedia 2019). In 2012, total agricultural product sales in Hood River County was \$77,117,000 (Table 4-4; USDA 2012). Tree fruits including pears, apples, and cherries represented 94 percent of the total market

value of products, and the average farm size was 47 acres. Within EFID, the most recent survey of crop types from 2008 to 2009 indicates that orchards (pears, cherries, apples) comprise approximately 75 percent of the irrigated acres (Table 4-5; EFID 2011).

Table 4-4. Agricultural Statistics for Hood River County.

Agricultural Statistic	2007	2012	Percent Change
Number of Farms	553	554	0%
Land in Farms (acres)	26,952	25,817	-4%
Average Size of Farm (acres)	49	47	-4%
Market Value of Products Sold	\$100,440,000	\$77,117,000	-23%
Average Sales per Farm	\$181,663	\$139,200	-23%

Source: USDA 2012

Table 4-5. Crops Grown in East Fork Irrigation District.

Crop	Area (acres)¹	Area (percent)
Pears	5,290	56%
Cherries	900	10%
Apples	880	9%
Blueberries	62	1%
Grapes	21	<0.25%
Grass, Pasture, Hay	1,450	15%
Other Orchards	100	1%
Urban and Schools Landscaping	750	8%
Total	9,453	100%

¹ Acreage from 2009 (EFID 2011)

4.5 Vegetation

4.5.1 General Vegetation

The District lies along the eastern foothills of the Cascade Mountains in the Columbia River Gorge, where native vegetation is characterized by Oregon white oak, ponderosa pine, and Douglas fir. Over the past century, agricultural land use has changed much of the native vegetation within EFID; as a result, the dominant upland vegetation today consists of fruit trees and pasture grasses. A mix of shrublands, grasslands, and Douglas fir, ponderosa pine, and white oak woodlands is common in undeveloped uplands along the District’s borders.

Within the canals and pipeline corridors in the project area, the type and density of vegetation varies widely from forest and brush to cultivated crops and grasses (Figure 4-3). Common vegetation includes native trees and shrubs including Ponderosa pine, Douglas fir, vine maple, Oregon grape, snowberry, and other plants as well as non-native plants such as reed canary grass, knapweed, and blackberry (Table 4-6). An unpaved maintenance access road limits vegetation alongside one bank of most EFID canals. In scattered locations, native hydrophytic (water tolerant) plants may be present along the margins of the canal banks represented by such species as black cottonwood, willow, and rushes. These areas do not function as a wetland habitat type due in part to maintenance activities. During the non-irrigation season, the District canals are maintained by grading, clearing, excavation, and bank repairs, and no vegetation is allowed to develop within the canals.

Vegetation types commonly found along the buried pipelines and associated easement areas within the project area consist of grass and cultivated crops (mostly pear trees). Orchards occupy or border a substantial portion of the project area. Typically, buried pipelines passing through orchards are overlain by mowed grass or a dirt track. No plant species that are federally listed or state listed as endangered or threatened, their designated critical habitats, or species of concern are known to occur within the project area.



Figure 4-3. Examples of vegetation along the Eastside Canal (left photo) and Main Canal (right photo) in East Fork Irrigation District.

Table 4-6. General Vegetation within East Fork Irrigation District.

Vegetation Species	Scientific Name
Big leaf maple	<i>Acer macrophyllum</i>
Black Cottonwood	<i>Populus balsamifera</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
Douglas spirea	<i>Spiraea douglasii</i>
Lodgepole pine	<i>Pinus contorta</i>
Oregon grape	<i>Mahonia aquifolium</i>
Oregon white oak	<i>Quercus garryana</i>
Ponderosa pine	<i>Pinus ponderosa</i>
Red alder	<i>Alnus rubra</i>
Reed canary grass (non-native)	<i>Phalaris arundinacea</i>
Snowberry	<i>Symphoricarpos albus</i>
Vine maple	<i>Acer circinatum</i>
Willow	<i>Salix spp.</i>

Source: C. Mead, Mount Hood National Forest Eastside Botanist
 U.S. Forest Service, personal communication, July 26, 2018

4.6 Visual Resources

4.6.1 Regional Context

The District is located in the Hood River Valley, which is dominated by the 11,249-foot snow-covered peak of Mount Hood and expanses of orchard trees. The Hood River Valley is bordered by dry grassy slopes of the Hood River Mountains to the east and the evergreen forests of the Cascade Mountain Range to the west. The Hood River Valley is well known for its scenic orchards where the fruit tree bloom lasts several weeks in April and May, drawing visitors from miles around. The northern border of EFID is within the Columbia River Gorge National Scenic Area. Designated by Congress in 1986, the Columbia River Gorge National Scenic Area is known for numerous waterfalls and for forest, mountain, and river views shaped by its geologic history. Its scenery includes rain forests, farmlands, and semi-arid grasslands.

4.6.2 Project Area and Adjacent Landscape

The District’s open canals generally lie flat against the landscape or a few feet lower than the landscape level. Within the project area, vegetation growing adjacent to canals and laterals can obscure the view of water flowing in the canals. Throughout the agricultural lands, the visual characteristics of the existing canals and lateral alignments varies. In most areas, the canal features are obscured by vegetation, or are hidden by sloping terrain or located at the back of larger agricultural tracts or residential properties. Most of the District’s open canals are visible to the public

only at a few road crossings or sporadically alongside minor roadways (Figure 4-4). In one area, an open canal segment is a visible water feature adjacent to the outdoor seating area of a restaurant.

Although the canals are not naturally formed waterways, some residents consider the presence of open channels with flowing water to be an amenity that provides a unique water feature on or near their property or an enjoyable view when they walk along maintenance roads aside the canals.

Viewers' experiences of open canals differ throughout the year. The District's irrigation season extends from mid-April through September, although water is diverted for frost control and spray purposes in March and October. During these months, the District's canals and laterals carry water. From November through February, the canals do not carry water except during large storms and are usually empty with occasional puddles or pools in low-lying areas and at locations where spring water enters the canals.

The District's pipelines are buried, and the associated pipeline corridors are generally indistinguishable from adjacent landscape features. The vast majority of the proposed project would occur on private lands where the District operates under easements granted for purposes that include irrigation system O&M.



Source: Google Earth Pro v. 7.3.2.5776; imagery date 9/3/2018

Figure 4-4. The Eastside Canal along Wells Drive and orchards in East Fork Irrigation District.

4.7 Water Resources

The primary demands on water resources in the Hood River basin include irrigation; potable water; hydropower; protection of aquatic life, particularly for ESA-listed fish; recreation; and scenic value. There are five irrigation districts in the basin, of which EFID is the largest. Potable water supply is provided from stream or spring sources and domestic wells, including municipal water supplies of the cities of The Dalles and Hood River, and operations of smaller utilities and water districts

servicing rural communities. Laurance Lake Reservoir in the Middle Fork Hood River subbasin is the largest of three major reservoirs in the basin with a volume of 3,565 acre-feet storage for irrigation (Reclamation 2015). The others are Kingsley and Lower Green Point reservoirs. The three reservoirs have a combined capacity of 4,553 acre-feet, or less than 1 percent, of the basin’s average annual discharge. None of these reservoirs are associated with EFID operations.

Hydrologic conditions in the Hood River have changed with the construction and operation of reservoirs and diversions on the river and its tributaries. Water management, primarily for irrigation, reduces natural streamflow downstream from reservoirs during the storage season (i.e., late fall, winter, and early spring) and downstream from diversions during the irrigation season (late spring to early fall). The total estimated consumptive diversion during the peak summer irrigation season is 296 cfs, or 40 percent, of the average natural flow of the Hood River (Stampfli 2008).

EFID’s water supply comes from the diversion of live flow of the East Fork Hood River. The District has no reservoir storage facilities and relies on natural streamflow produced by snow and glacial meltwater on Mount Hood and spring sources. Drought has limited the irrigation water supply in 3 of the last 14 years, when the District has asked patrons to voluntarily curtail water use to help the District keep water in the East Fork Hood River downstream of the diversion for threatened salmon and steelhead.⁹ Curtailment of water delivery by 25 percent has begun as early as mid-July and extended throughout the peak summer demand period.

The waterbodies that are affected by EFID operations are shown in Table 4-7 and Figure 4-5. The District’s diversion affects a total of 21.2 river miles: 6.6 river miles in the East Fork Hood River (RM 6.6 to RM 0) and 14.6 river miles in the Hood River from the confluence of the East Fork Hood River and Middle Fork Hood River to the Columbia River (RM 14.6 to RM 0). During the irrigation season, the District maintains end spills at approximately 25 locations. These end spills are piped to natural drainages and streams within the basin. While most end spills have a small flow rate, the District maintains end spills of 1 cfs or more at 7 locations. These larger end spills affect a total of approximately 13.4 river miles in 5 tributaries to the lower Hood River (Table 4-8).

Water flowing through the East Fork Hood provides the following ecosystem services:

- *Provisioning Service, Irrigation Water (Figure 4-1 [E1]):* As described in Sections 1.3 and 4.7.1, water from the East Fork Hood River is diverted into the District’s irrigation conveyance system and delivered to patrons for agricultural purposes. Water of the East Fork Hood River is primarily generated from annual snow and glacial melt on Mount Hood. As Mount Hood glaciers continue to recede and associated snowpack lessens, water as a provisioning service for the District will become scarcer and water curtailment may increase.

⁹ Through past conservation projects and requested voluntary curtailment by patrons, EFID was able to maintain at least 15 cfs in the river at its diversion during the 2015 and 2018 droughts, and 5 cfs during the 2005 drought.

- Regulating Service, Water Quality (Figure 4-1 [E3]):* The amount of water instream impacts water quality including temperature, turbidity, sediment, and pollutants. In general, low streamflow challenges a waterbody’s ability to resist warming because less water heats faster than more water. Because of this property, greater instream flow helps to keep water cool—an important factor for temperature sensitive, aquatic species living in these stream habitats (Section 4.8). Given pollutant input, less water also leads to higher concentration of pollutants than does more water. Therefore, greater streamflow also helps to dilute pollutants. However, while increasing streamflow generally improves water quality, an increase in streamflow from low quality end spills can be counterproductive if the quality of water spilled is low. Open irrigation canals can collect contaminants, including sediment and pollutants, and can become warmer than nearby waterbodies due to low volume in the canals. This provides a source for heat and contaminant transfer into waterbodies, resulting in lower stream water quality. Section 4.7.3 describes surface water quality in the waterbodies associated with District operations.

Table 4-7. Waterbodies Associated with District Operations.

Name	Reach	Tributary to	Relationship to District Operations
East Fork Hood River	East Fork Hood River from the EFID diversion at RM 6.6 to its confluence with the Middle Fork Hood River	Hood River	Diversion of up to 117.36 cfs affects streamflow and water quality in this reach.
Hood River	Hood River from Middle Fork Hood River (RM 14.6) to mouth	Columbia River	Diversion of up to 117.36 cfs affects streamflow and water quality in this reach.
West Fork Neal Creek	West Fork Neal Creek from RM 1.8 to confluence with Neal Creek	Neal Creek	End spill affects streamflow and water quality in this reach.
Neal Creek	Neal Creek from West Fork Neal Creek confluence (RM 5.8) to mouth	Hood River	End spill affects streamflow and water quality in this reach.
Odell Creek	Odell Creek from RM 2.3 to mouth ¹	Hood River	End spill affects streamflow and water quality in this reach.
Whiskey Creek	Whiskey Creek from RM 1.3 to mouth	Hood River	End spill affects streamflow and water quality in this reach.
Lenz Creek	Lenz Creek from RM 1.2 to mouth ¹	Neal Creek	End spill affects streamflow and water quality in this reach.

¹ Affected stream miles are approximate.

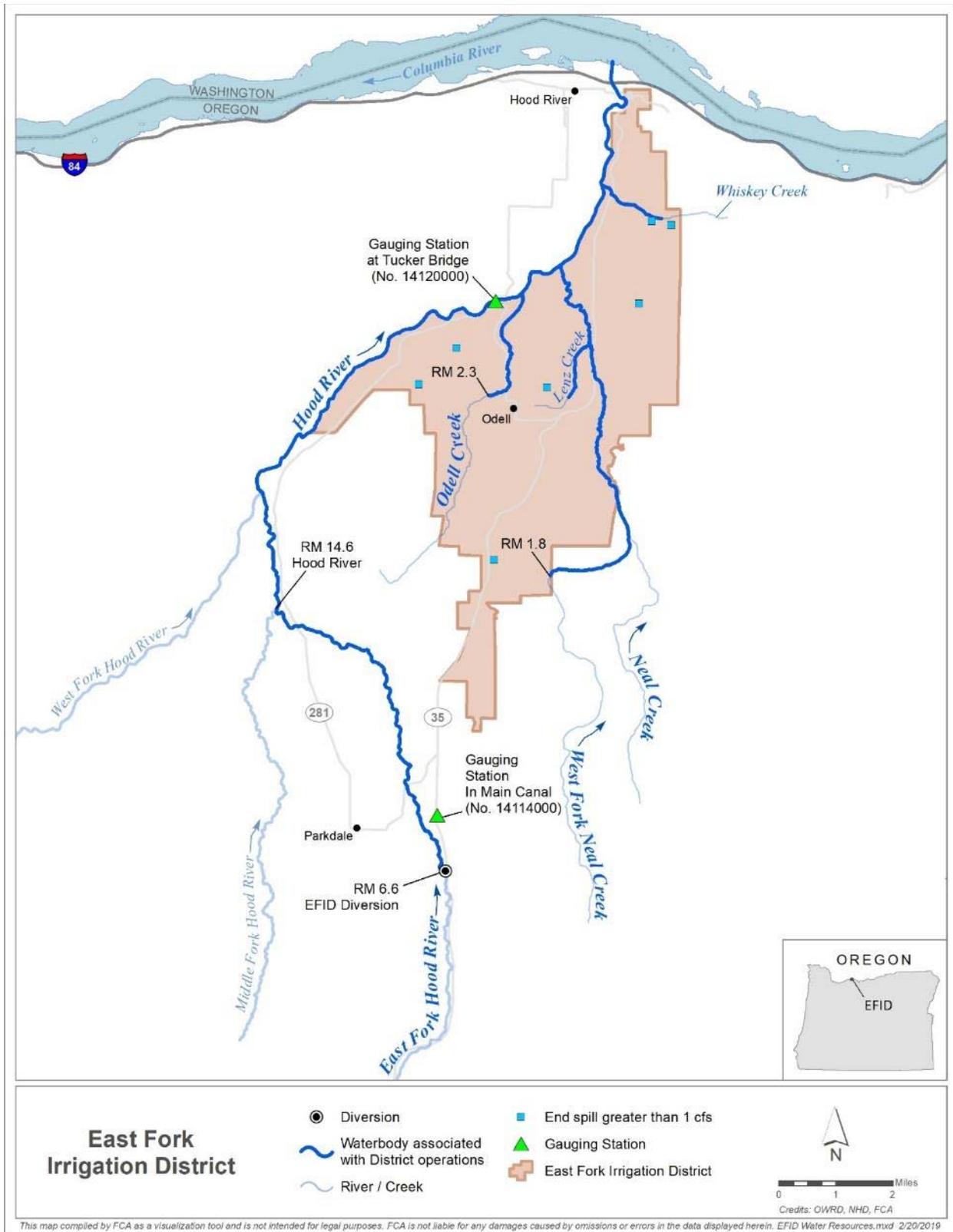


Figure 4-5. Waterbodies associated with District operations and locations of streamflow gauging stations.

Table 4-8. Major End Spills in Waterbodies Associated with EFID Operations.

Overflow Box Name	Receiving Waterbody	Affected River Miles (RM)	Average End Spill Rate (cfs) (year measured)	Average September Streamflow (cfs) (period of record)
Central Distribution	West Fork Neal Creek	RM 1.8 to RM 0	4.72 (2016)	Data not available
Eastside	Neal Creek	RM 5.8 to RM 0	1.50 (2016)	22 (2010- 2014)
Dethman	Lenz Creek	RM 1.3 to RM 0 (approximate)	3.02 (2016) 2.40 (2017)	Data not available
Whiskey Creek	Whiskey Creek	RM 1.3 to RM 0	2.99 (2016)	Data not available
Stricker	Whiskey Creek	RM 1 to RM 0	0.35 (2017)	Data not available
Marsh-Chamberlin	Odell Creek	RM 2.3 to RM 0 (approx.)	1.93 (2016)	11 (2011-2018)
Chamberlin Drive	Hood River	RM 7.2 to RM 0	1.10 (2016) 1.17 (2017)	308 (1989-2018)

Sources: FCA 2018a; Megan McKim, CTWS, unpublished streamflow data for Neal and Odell creek; U.S. Geological Survey (USGS) Surface-Water Monthly Statistics for Oregon, USGS 14120000 Hood River at Tucker Bridge Near Hood River, Oregon

4.7.1 Water Rights

4.7.1.1 District Water Rights

EFID diverts water from the East Fork Hood River for delivery to approximately 9,600 acres for agricultural, fire, and industrial purposes. The District also provides water for the MHID, which obtains up to 12.65 cfs from two locations along EFID’s Main Canal under its own water rights. The authorized irrigation season is from April 15 to September 30. Peak irrigation demand occurs in July and August.

EFID is the largest and second-most senior water right holder on the East Fork Hood River.¹⁰ The District holds 8 water rights on the East Fork Hood River that allow it to divert a total of 117.36 cfs of live flow for irrigation. Its largest single water right is for 104.5 cfs under Certificate 92000 with a priority date of November 25, 1895.

As noted previously, drought conditions have prompted a request for voluntary curtailment in EFID in 3 of the past 14 years (2005, 2015, and 2018). Had both EFID and MHID used their full legal water rights in late summer during the 2005 and 2015 droughts, the entire flow of the East Fork Hood River at the diversion would have been depleted.

¹⁰ The City of The Dalles has a water right with a priority date of August 1, 1870, on Dog River, an East Fork Hood River tributary located upstream of the EFID diversion. The city has diverted up to 8.5 cfs during the summer for municipal and other purposes (Christensen and Salminen 2013).

4.7.1.2 Instream Water Rights

In 1987, the Oregon legislature passed the Instream Water Rights Act and created a legal framework to establish instream water rights for the maintenance and enhancement of aquatic and fish life, wildlife, recreation, and other public values. OWRD is the only entity that may hold instream rights in Oregon. However, instream rights can be gifted to the state by anyone with a valid water right looking to lease their water rights instream or gift their water rights to the state for permanent instream use (Golden and Aylward 2006; Oregon Administrative Rule [OAR] 690-077). The law also allows the respective state departments of fish and wildlife, environmental quality, and parks and recreation to apply for instream water rights.

Instream water rights have a priority date and are regulated in the same way as other water rights. They do not take away or impair any legally established water rights having an earlier priority date than the instream right (OAR 690-077) and do not guarantee that a certain quantity of water will be present in the stream. Instream water rights are established at seven locations in the Hood River basin; however, they are consistently met at only two locations due to the presence of other, out-of-stream water rights with earlier priority dates.

Instream rights created through permanent water right transfers have the same priority date as the original right that was transferred instream. OWRD's water transfers program allows for a variety of instream transfers, including permanent transfers, temporary transfers, leases, and transfers of conserved water. Transfers of conserved water are facilitated through Oregon's Allocation of Conserved Water Program (OAR 690-018). Such transfers associated with EFID water conservation projects in recent years have modified the District's water rights by allocating part of the conserved water to instream use in accordance with a District-approved conserved water policy. Over the past 11 years, the District has saved 3.3 cfs of water as a result of piping over 11 miles of open canals. As of January 2019, it has permanently protected 1.58 cfs of the water saved in the East Fork Hood River using the Oregon Allocation of Conserved Water Program.¹¹ An additional transfer of water is in progress that, when finalized, would allocate another 0.525 cfs of conserved water to instream use. Piping and other conservation projects have been completed by all five major irrigation districts in the Hood River basin in recent decades. These projects have generally led to increased summer streamflow in affected streams due to conserved water being managed instream by the irrigation districts; however, only a small portion of the water savings has been permanently protected instream.¹²

Four waterbodies affected by District operations have junior instream water rights established by the state or pending instream water right applications for public use, specifically for the beneficial use of fish life and wildlife (OWRD 2018a; Christensen and Salminen 2013) (Table 4-9). Further details are included in Appendix E. State instream water rights in the East Fork Hood River are typically not met from late July to October each year (Figures 4-6 and 4-7).

¹¹ Instream Water Right Certificate 86005 and 91999.

¹² As of January 2019, 4.58 cfs of conserved water has been converted to an instream water right in the Hood River basin, with an additional 3.012 cfs pending (Teri Hranac, ORWD ACWP Administrator, personal communication, January 11, 2019).

Table 4-9. State Instream Water Rights in Waterbodies Associated with EFID Operations.

Waterbody	Certificate or Application	River Mile Location or Reach	Monthly Rate (cfs)	Priority Date
East Fork Hood River	Certificate #68457	RM 0 (at Middle Fork Hood River confluence)	100 to 150	November 3, 1983
East Fork Hood River	Application #IS-88322 (submitted by ODFW)	RM 0 (at Middle Fork Hood River confluence)	150 to 210	December 1, 2016
Hood River	Certificate #59679	RM 4.0 to RM 0	100 to 270	November 3, 1983
Hood River	Certificate #76155	RM 4.0 to RM 0	220 to 250 (May through October)	October 8, 1998
Neal Creek	Certificate #59681	RM 0 (at the mouth)	5 to 20	November 3, 1983

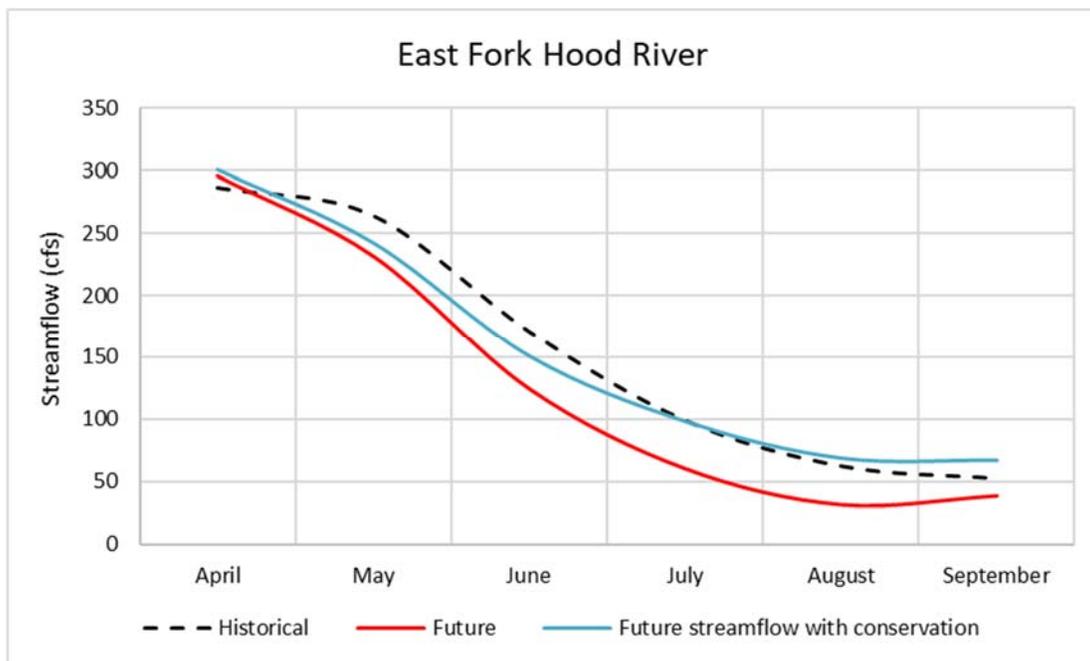
ODFW = Oregon Department of Fish and Wildlife

4.7.2 Surface Water Hydrology

The hydrology of the Hood River basin is characterized by highly variable streamflow and rapid runoff. The primary sources of surface water and springs are snowpack and glacial melt on Mount Hood. Snowmelt typically begins in April, while glacial melt contributing to streamflow generally occurs between July and October. Many basin tributaries have very low summer flows, while tributaries with glacial sources maintain higher flows. The average annual discharge in the Hood River is 930 cfs at Tucker Bridge (USGS 2019). The record flood at this gage is reported as 33,000 cfs (December 1964), while the minimum 7-day average streamflow was 155 cfs (September 1994) (ODA 2016).

Currently, streamflow in the basin is insufficient to meet competing demands for water during the summer months (Reclamation 2015). This imbalance is expected to be exacerbated by climate trends. Mount Hood’s glaciers have been receding since the mid-1900s or earlier, including the Newton-Clark glacier in the headwaters of the East Fork Hood River. The aerial extent of snowpack on April 1 each year from 1920 through 2009 has decreased by approximately 5 percent every 30 years (Reclamation 2015). Glacial recession and declining snowpack are expected to continue as a result of the warmer air temperatures predicted with changing climate (Phillippe 2008; Reclamation 2015). Basin runoff is predicted to increase in fall and winter and decrease in spring and summer when water uses are greatest. In the East Fork Hood River, the modeled future decline in average streamflow for May through September approached 30 percent for the period 2030 to 2059 compared to the period 1980 to 2009 (Reclamation 2015). Warmer temperatures will cause earlier snowmelt and increase the speed of glacial melting. Glacial melt currently provides between 50 and 70 percent of the basin’s streamflow during the critical summer water use period (Reclamation 2015). Once the Mount Hood glaciers fully recede, the basin will lose one of its largest water storage supplies (Reclamation 2015). Average streamflow in the lower East Fork Hood River under historic and future conditions is shown in Figure 4-6. Future streamflow is based on the median climate change scenario developed by the U.S. Bureau of Reclamation (Reclamation 2015) and is shown

with and without the proposed action and other likely conservation actions, including on-farm irrigation improvements.



Source: Salminen et al. 2016

Figure 4-6. Average historical summer streamflow and projected future streamflow in the lower East Fork Hood River below the EFID diversion based on climate simulations.

The following sections summarize surface water hydrology in the waterbodies associated with EFID operations.

4.7.2.1 East Fork Hood River

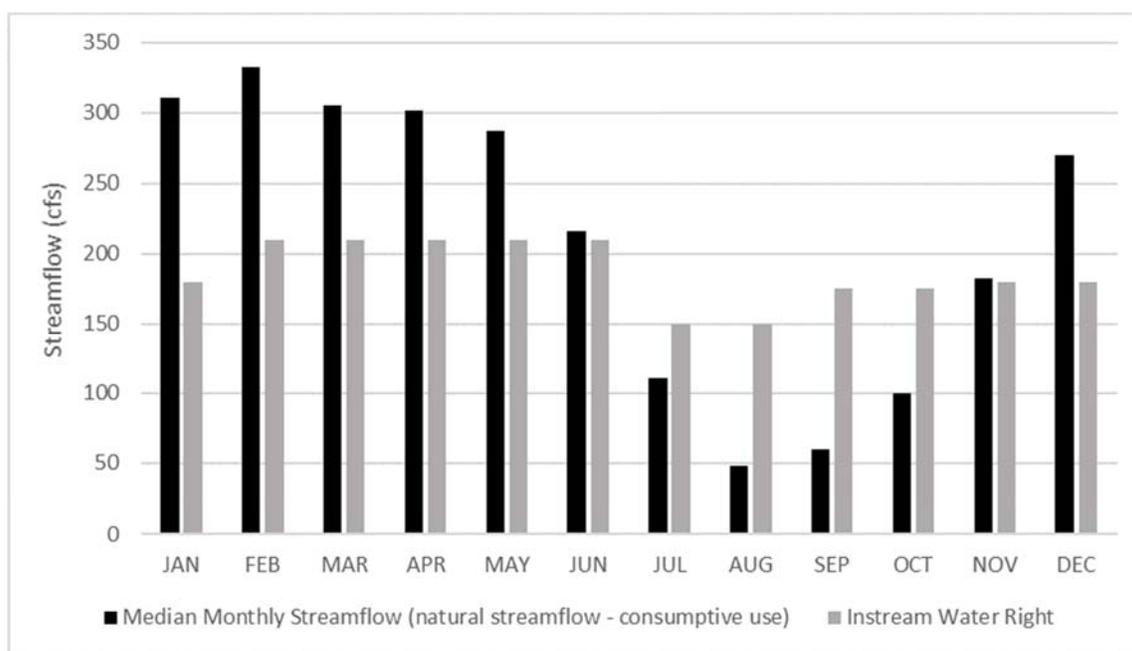
EFID's diversion reduces streamflow in the East Fork Hood River from the diversion to its Middle Fork Hood River confluence (RM 6.6 to RM 0). The river has no long-term stream gage; therefore, historical streamflow data is limited. Simulated natural monthly streamflow (i.e., without water diversions) at RM 0 averaged from 145 cfs in September to 383 cfs in March for water years 1980 through 2009 (Reclamation 2014a).

The District diverts up to 117.36 cfs and an annual average volume of 28,829 acre-feet of water for irrigation within EFID (FCA 2018a). During the late summer, EFID typically diverts approximately 75 percent, and up to 85 percent, of the available flow of the East Fork Hood River at the point of diversion. Streamflow is lowest in the bypass reach between the diversion structure and the point one half mile downstream where a small portion of the diverted water returns to the river from the District's sand trap and fish screen facility.¹³ Historically, the entire flow of the river could be diverted during drought periods, leaving the bypass reach dry and fish migration blocked. In 2013, a

¹³ The amount of diverted water returned to the river from the fish screens varies from approximately 5 cfs to 22 cfs depending on the amount of water diverted.

Memorandum of Understanding¹⁴ between EFID and CTWS established an interim minimum instream flow of 15 cfs for the bypass reach, while a multi-year study of adult fish passage conditions in the bypass reach was conducted to identify a permanent minimum flow level. Although a final report is not available, this study identified that a minimum of 27 cfs is required to maintain fish passage for adult Chinook salmon in the bypass reach (J. Buckley, EFID Manager, personal communication, January 10, 2019). Since 2013, EFID has been able to maintain at least 15 cfs in the bypass reach through a combination of water saved from completed conservation projects and voluntary water use reduction by patrons during drought events.

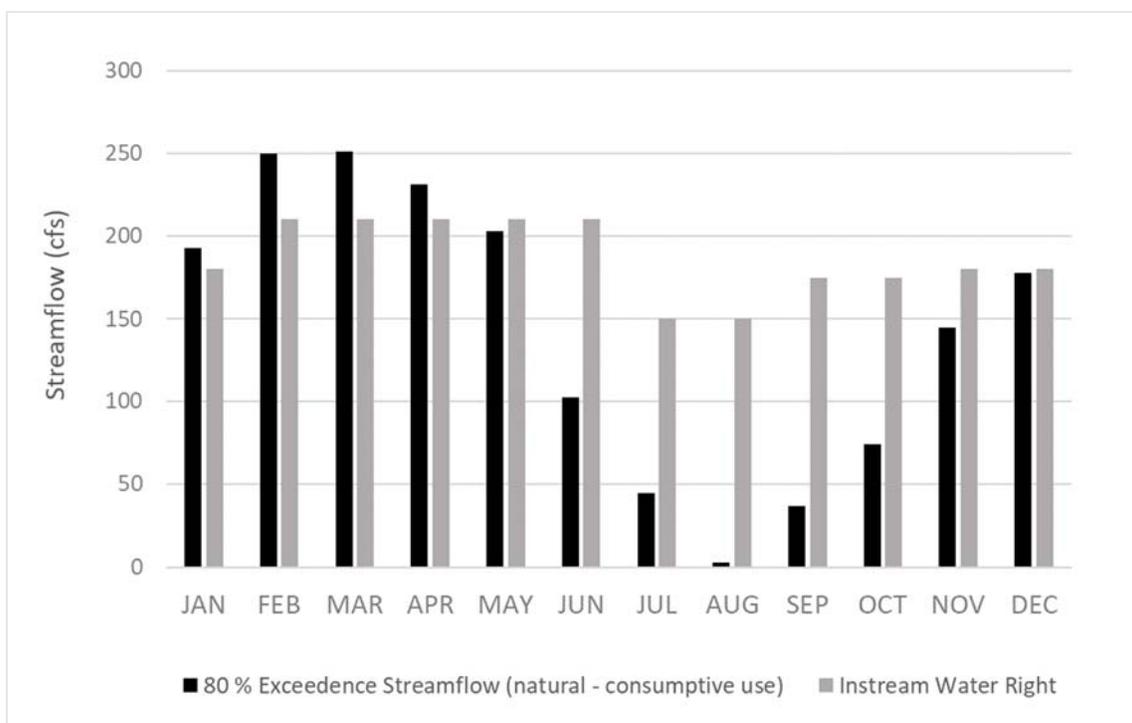
OWRD estimates of the monthly average streamflow at RM 0 under median (50 percent exceedance) and dry (80 percent exceedance) conditions are shown in Figure 4-6 and Figure 4-7 together with existing and pending state instream water rights. Streamflow measurements collected by the Oregon Department of Fish and Wildlife (ODFW) at RM 1 from 1996 to 2017 (Simpson 2018) indicate that the actual streamflow was greater than that estimated by OWRD; this is because OWRD estimates include the full use of all authorized consumptive water rights, a situation that does not always occur. For example, EFID has managed part of their water rights at times to remain instream past their diversion to benefit listed fish species.



Source: data from OWRD 2018a

Figure 4-7. Estimated median streamflow in the East Fork Hood River and state instream water rights at the Middle Fork Hood River confluence (RM 0).

¹⁴ The Memorandum of Understanding was associated with a partnership project for the design and construction of new headworks facilities.



Source: data from OWRD 2018a

Figure 4-8. Estimated 80 percent exceedance monthly streamflow in the East Fork Hood River and state instream water rights at the Middle Fork Hood River confluence (RM 0).

4.7.2.2 Hood River

EFID’s diversion of up to 117.36 cfs from the East Fork Hood River during the irrigation season also affects streamflow in the Hood River from the confluence of the East Fork Hood River and the Middle Fork Hood River to its mouth at the Columbia River (RM 14.6 to RM 0). The average monthly streamflow at the U.S. Geological Survey (USGS) gage No. 14120000 in Hood River at Tucker Bridge (RM 6) ranges from 303 cfs in September to 1,430 cfs in January for the years 1987 to 2016. The lowest average monthly flow in the Hood River during this period was 180 cfs in September 2005 during a severe drought year. Snowmelt generally begins during April.

4.7.2.3 EFID End Spill Overflows

An estimated 16.6 cfs of the water diverted by EFID is lost to end spills (overflows) that are maintained throughout the District to ensure that a continual water supply reaches all patrons (FCA 2018a). End spill is excess water that is discharged to natural drainages near the termination of an open canal, lateral, or unpressurized pipeline. End spill is required because the EFID conveyance system is predominantly an open canal system (Wharry 2016). Hydraulic modeling found that the District could save this water if its conveyance system was fully piped and pressurized (FCA 2018a). Piping projects completed in recent years have eliminated dozens of end spills in the District. Currently, approximately 25 end spills remain throughout EFID (J. Buckley, EFID Manager, personal communication, January 11, 2019). These end spills artificially augment streamflow in the receiving stream reaches during the irrigation season.

Discharge rates measured over the 2016 and 2017 irrigation season at the District’s seven largest end spill locations and the associated receiving waterbodies are shown in Table 4-8. The end spill discharge rates at each overflow box were highly variable and were not correlated with the diversion rate (FCA 2018b). Minor, unmeasured end spill occurs at approximately 18 other locations.

4.7.2.4 EFID Canals and Stormwater

The District’s open canals can affect local surface water hydrology by collecting and redirecting stormwater and snowmelt runoff during winter and spring months. This is known to occur in areas where the canals run along the foot of hillslopes and intercept numerous draws¹⁵ or natural drainage channels with intermittent flow. In such locations, open canals can modify the natural surface water hydrology and reduce flooding on orchard, road, and rural residential properties that have been developed down gradient of the canals following canal construction.

The District maintains approximately 10 drains in the canals at the bottom of the draws consisting of large pipes or culverts. The drains are sealed off when the canals are running during irrigation season. At the end of the irrigation season, EFID opens the drains to protect the canals from winter damage and allow runoff to flow into natural drainage channels at the bottom of the draws. During an extreme flood event, the capacity of the canals and the drain culverts can be overwhelmed and flooding of property can occur. Affected roads have at times included areas along Oregon Route 35, Eastside Road, and Central Vale Road (J. Buckley, EFID Manager, personal communication, December 5, 2018).

4.7.3 Surface Water Quality

Under Section 303(d) of the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.), the Oregon Department of Environmental Quality (ODEQ) is required to maintain a list of all surface waters in the state that are considered impaired because they do not meet water quality standards. These standards are set to protect designated beneficial uses. In the Hood River basin, beneficial uses include fish and aquatic life, irrigation, public and private domestic water supply, wildlife and hunting, hydropower, water contact recreation, fishing, boating, livestock watering, industrial use, and aesthetic quality (OAR 340-41-0160). The 2012 303(d) list is currently effective for CWA purposes. Six of the seven waterbodies affected by EFID’s operations are included on Oregon’s 303(d) list for not meeting water quality standards for one or more parameters (Table 4-10). Four of these waterbodies are identified as water quality limited for temperature by ODEQ, although the temperature listings were removed from the 303(d) list following the approval of ODEQ’s 2001 Western Hood Total Maximum Daily Load study by the U.S. Environmental Protection Agency (USEPA).

¹⁵A draw is a terrain feature similar to a valley on a smaller scale; although it is perpendicular to the ridgeline. A draw is usually etched in a hillside by water flow, is usually dry, but may contain an ephemeral stream.

Table 4-10. Impaired Waterbodies Associated with District Operations.

Waterbody Name	Listed Reach (river miles)	Parameters Included on Oregon’s 303(d) List	Water Quality Limited for Temperature
East Fork Hood River	RM 0 to RM 27.4	Beryllium, Biological Criteria, Copper, Iron, Thallium	Yes
Hood River	RM 0 to RM 14.6	Beryllium, Copper, Iron, Thallium	Yes
Lenz Creek	RM 0 to 1.8	Biological Criteria, Chlorpyrifos, Guthion, Iron, pH	No
Neal Creek	RM 0 to 5.6 RM 0 to 6.4 RM 0 to 11.1	Chlorpyrifos, Guthion, Iron Dissolved Oxygen Silver	Yes
West Fork Neal Creek	RM 0 to RM 9	Dissolved Oxygen	No
Whiskey Creek	RM 0 to RM 1.3	N/A	Yes

Source: ODEQ 2012; ODEQ 2017
 N/A = not applicable

Water management in the Hood River basin for irrigation reduces streamflow in spring, summer, and early fall. Low streamflow can affect water quality by raising water temperatures, reducing dissolved oxygen, and increasing the concentration of pollutants. EFID’s irrigation diversion reduces streamflow in the East Fork Hood River and the Hood River. Return flows known as end spills maintained by the District artificially increase streamflow during the irrigation season in several lower Hood River tributaries (Table 4-8). At the same time, these spills transfer glacial silt and heat to receiving streams, along with any contaminants such as pesticides and herbicides that may be present in canal water.

4.7.3.1 Temperature

Water temperature is one of the most important characteristics of an aquatic ecosystem, affecting dissolved oxygen levels, chemical processes, and the metabolism, growth, and reproduction of species. Many aquatic species can survive only within a limited temperature range. Temperatures above the water quality criteria that do not reach lethal levels are considered sub-lethal and can be stressful for cold water fish species such as salmon and trout and may lead to mortality. Fish mortality related to sub-lethal temperature effects is commonly attributed to the interaction of decreased metabolic energy for feeding, growth, or reproduction; increased exposure to pathogens (viruses, bacteria, and fungus), decreased food supply (impaired macroinvertebrate populations), and increased competition from warm water tolerant species (ODEQ 2001). Low streamflow can contribute to elevated water temperature. Other factors such as a lack of riparian vegetation and stream widening can also contribute to elevated stream temperatures.

Four streams affected by the District’s diversion and end spills do not meet stream temperature criteria, including the East Fork Hood River, Hood River, Neal Creek, and Whiskey Creek (Table 4-10). The applicable temperature criteria for protection of salmonid fish rearing is 64.4 degrees Fahrenheit (°F) in the East Fork Hood River, Whiskey Creek, and Neal Creek and 60.8 °F in the Hood River (ODEQ 2017). The 64.4 °F criterion is typically exceeded in the East Fork Hood River during the summer, with 7-day average daily maximum temperatures reaching 68° F upstream of the Middle Fork Hood River confluence (ODEQ 2017). Irrigation diversion greatly reduces streamflow in the lower river during the summer, contributing to the warm temperatures. Modeling simulations conducted by ODEQ indicated that without EFID’s diversion, the East Fork Hood River would be cooler by approximately 3.5 °F above the confluence with the Middle Fork Hood River, and the Hood River at its mouth would be cooler by 2 °F (ODEQ 2001).

End spills maintained by the District can increase temperatures in receiving streams. For example, continuous temperature monitoring during the 2009 to 2011 irrigation seasons found that the 7-day moving average daily maximum temperature in West Fork Neal Creek downstream of the EFID end spill discharge was approximately 5 °F warmer than the creek upstream of the discharge (Stampfli et al. 2012). During the study, the East Fork Hood River at the EFID diversion also was an average of 5 °F warmer than the spring-fed West Fork Neal Creek just above the end spill discharge point.

4.7.3.2 Biological Criteria

Under Oregon’s water quality standards, waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities. This standard is not met year-round in four of the seven waterbodies affected by District operations including Lenz Creek, Neal Creek, the Hood River, and the East Fork Hood River (Table 4-10). Toxic substances, sedimentation, excess nutrient inputs, associated algae growth and die-off, and elevated stream temperatures can result in detrimental changes in aquatic insects, crustaceans, worms, and other macroinvertebrates that live in the stream environment and support the food chain for many fish and wildlife species. Using data from reference sites, water quality impairment for biological criteria is based on the number and types of macroinvertebrates expected to be present in a waterbody under least-disturbed conditions.

4.7.3.3 Turbidity

Turbidity is a measure of the clarity of water. Effects on aquatic ecosystems include changes in primary production,¹⁶ interference with fish feeding, and the visual attributes of streams. End spills in the EFID system transfer silt from the glacially influenced East Fork Hood River to receiving streams, increasing water turbidity in Hood River tributaries including West Fork Neal, Neal, Odell, Whiskey, and Lenz creeks, which are naturally clear water streams. In the West Fork Neal Creek, monitoring indicated that turbidity increased by an average of 206 percent downstream of EFID’s end spill discharge over the 2009 to 2011 irrigation seasons (Stampfli et al. 2012). Total suspended solids were also higher downstream of the end spill discharge in Neal Creek.

¹⁶ Primary production is the rate at which plants and algae use photosynthesis to produce organic compounds in an ecosystem.

4.7.3.4 Guthion and Chlorpyrifos

Neal Creek and Lenz Creek do not meet the year-round criteria for the toxic substances Guthion and chlorpyrifos (Table 4-10). Guthion, also called azinphos-methyl, is a pesticide that was used on many crops including apples, pears, cherries, and others. Many of its former uses have been cancelled by the EPA, and its few remaining uses are being phased out. A voluntary Pesticide Stewardship Program is ongoing in the Hood River basin among fruit growers, Oregon State University, CTWS, Hood River Soil and Water Conservation District, and ODEQ. This program includes water quality monitoring, education, and other measures to improve pesticide application practices. Pesticide monitoring since the early 2000s has shown a significant reduction in most pesticide levels in Hood River tributaries (ODEQ 2018). However, the open canals in EFID are exposed to contamination by pesticide drift, fertilizer runoff, and accidental spills of fuels or other toxic substances. These contaminants can be transferred to streams through the end spills of canal water that are maintained by the District, increasing the risk of contamination in receiving streams.

4.7.3.5 Heavy Metals and pH

Four of the seven waterbodies affected by District operations are listed for one or more heavy metals: arsenic, lead, silver, thallium, iron, and copper (Table 4-10). Reported sources of heavy metals in the global environment include natural geologic processes as well as industrial, agricultural, pharmaceutical, domestic effluents, and atmospheric sources. Many of these metals can be an essential nutrient at trace levels, but are toxic to aquatic organisms, humans, and wildlife at higher concentrations. Open canals in EFID are at risk of contamination by agricultural and other sources of heavy metals. Contaminants can be transferred to streams through the end spills that are maintained by the District, increasing the risk of contamination. The potential for District operations to affect pH in waterbodies associated with EFID operations is likely low based on pH monitoring conducted from 2005 to 2011 in Neal Creek upstream and downstream of the end spill discharge, which detected no significant difference in pH level (Stampfli et al. 2012).

4.7.3.6 Dissolved Oxygen

Oregon's water quality standards for dissolved oxygen include criteria for freshwater supporting several types of aquatic life, including sensitive fish species and life stages. The criteria apply at different time periods throughout the year. Two of the waterbodies affected by District operations (West Fork Neal Creek and Neal Creek) do not meet the standards for dissolved oxygen (Table 4-10). Dissolved oxygen levels in Neal Creek are not high enough to meet the applicable criteria during the salmon and steelhead spawning season from October 15 to May 15 (ODEQ 2012). In the West Fork Neal Creek, dissolved oxygen levels are not high enough to meet the criteria for salmonid spawning from October 15 to June 15 (ODEQ 2012). Low dissolved oxygen can affect habitat suitability for fish and aquatic life, cause major shifts in the kinds of organisms found in waterbodies, reduce the growth rate and impair swimming ability of fish, and increase susceptibility to disease, among other effects. The solubility of oxygen in water decreases as water temperature increases; therefore, warmer water contains less dissolved oxygen content than cool water. Because the District's irrigation diversion and end spills have the potential to affect water temperatures, they may also indirectly affect dissolved oxygen levels. However, other factors such as excess nutrients, associated algae growth and die-off, and naturally low oxygen-content groundwater inflow can also contribute to lower dissolved oxygen levels.

4.7.4 Groundwater

Groundwater is not extensively developed in the Hood River basin; therefore, data regarding this resource are limited. Available reports include a groundwater report published by the State of Oregon (Sceva 1966) and the results of a water resources investigation published by the USGS (Grady 1983). Geologic mapping of the basin was completed in 2012 (McCloughry et al. 2012).

The project area overlaps with the gently sloping, lower elevation portion of the basin known as the Hood River Valley, which is underlain by the Columbia River basalt formation at depths ranging from the ground surface to hundreds of feet below ground surface (Grady 1983). Groundwater in this basalt generally occurs in the broken contact zone between individual lava flows. Wells in the Hood River Valley that draw from the Columbia River basalts are generally very productive, yielding from 70 to 400 gallons per minute (Keller 2011). Approximately 514 water supply wells in Hood River County were registered with OWRD as of August 2018 (OWRD 2018b). Of these wells, 412 were for domestic use, 22 were for irrigation, and 22 were for industrial use. The remainder were for community, thermal, and unstated uses, or abandoned. Completed well depths averaged 139 feet.

Surface water quality and quantity concerns could cause more irrigators to turn to groundwater in the future. Adjacent watersheds have observed significant groundwater declines due to over appropriation and the slow recharge of the Columbia River Basalt aquifers. An increase in wells tapped for irrigation could conceivably affect existing domestic wells in addition to surface water flows (Reclamation 2014a).

Recharge of groundwater in the Hood River Valley is primarily from precipitation and is estimated to be several inches per year (Keller 2011). An estimated water budget developed for a groundwater analysis in the Hood River Basin Study attributed 98 percent of annual aquifer inflow to precipitation (Reclamation 2015). Some of the recharged water returns to the rivers and streams as base flow, which provides cool water to streams and acts as an underground reservoir slowly releasing water to the stream (Salminen et al. 2016).

Unlined irrigation canals can contribute to groundwater through seepage, and seepage rates can vary widely depending on the geology and permeability of soils within the canal. Over time, many unlined canals will naturally seal with the deposit of silts and clays (Reclamation 2017). Studies of seepage losses along EFID canals have been limited and, as noted in Section 2.1.1, study results were inconclusive and could not be extrapolated to estimate seepage losses throughout the District (FCA 2018b).

4.8 Fish and Aquatic Resources

Since the development of agriculture in the late 1800s, the diversion of water, construction of reservoirs, land drainage, and other activities have affected the aquatic environment in the Hood River basin. Low streamflow and water quality impairments are recognized as key limiting factors for fish populations in the basin (Shively 2006; NMFS 2013).

The Hood River basin is part of 10 million acres of lands ceded to the United States by the CTWS. Under rights reserved by federal treaty, tribal members harvest salmon and steelhead from the Hood

River. Tribal fishing opportunity has become severely restricted because of low fish abundance and the need to protect weak or threatened stocks (Salminen et al. 2016). CTWS and the ODFW are actively engaged in efforts to recover fish populations in the basin through habitat restoration, hatchery supplementation, research and monitoring, and harvest management.

Given its gentle gradient, abundant gravel, and broad floodplain, the lower 6.6 miles of the East Fork Hood River downstream of the EFID diversion has the best potential spawning and rearing habitat in the river for salmon and steelhead (R. French, District Fish Biologist, ODFW, personal communication, August 8, 2018). The lower river is also identified as the highest waterbody of concern for water quantity and water quality in the entire Hood River basin (Shively 2006). Streamflow is lowest in the one half-mile bypass reach between the EFID diversion and the point where a portion of the diverted water returns to the river from the District's fish screen facility (RM 6.1). Shallow water and narrow stream width over gravel bars in the bypass reach are identified as a concern for fish passage in adult Chinook (McCanna and Eineichner 2012).

Fish and aquatic species in the East Fork Hood River provide the following ecosystem services:

- *Provisioning Service, Instream Fish Populations (Figure 4-1 [E2]):* The East Fork Hood River and Hood River downstream of EFID's diversion provide year-round fishing opportunities. Rainbow trout, other resident fish species, and, when available, salmon and steelhead provide recreational anglers with opportunities to harvest fish for consumption (WSR 2019). In addition, members of the CTWS have fishing rights and rely on the Hood River basin's fisheries resources for subsistence and ceremonial use.
- *Cultural Service, Threatened Species, Species of Concern (Figure 4-1 [E4]):* Waterbodies in the Hood River basin are home to federally listed threatened species of steelhead, coho, Chinook, and bull trout (Section 4.8.2). Pacific salmon are a premier cultural icon of the Pacific Northwest contributing to educational, recreational, and community values. Of particular importance are the contributions of Pacific salmon to native traditions and religious practices (Bottom et al. 2009). The Hood River basin is part of the ceded lands of the CTWS with usual and accustomed fishing stations. The basin provides subsistence and ceremonial fisheries for tribal members under fishing rights reserved by the treaty with the U.S. government (Treaty with the Tribes of Middle Oregon 1855 | 12 Stats., 963. Ratified Mar. 8, 1859).

Spring Chinook salmon are a special part of the CTWS and the tribes of the Columbia River's cultural and religious practices. The First Salmon Feast is part of Columbia Basin tribes' traditional religion celebrating spring Chinook, the first salmon to return of the year, and the central role of salmon and water in tribal health and culture (CRITFC 2019a). Salmon and steelhead populations have declined in recent decades because of impacts to habitat and other factors; however, since 1991, the CTWS has been working in the basin to rebuild these populations for conservation purposes and to provide consistent harvest opportunity (CTWS 2019).

The Hood River basin is also home to the Pacific lamprey. Like salmon, lamprey are a traditional food with cultural importance to CTWS members and are prized for their rich, fatty meat. They are often served alongside salmon at tribal feasts and celebrations (CRITFC 2019b). Populations of lamprey in the basin are currently low due to habitat impacts but

appear to be increasing in recent years after fish passage improvements in the Hood River and at Bonneville Dam on the Columbia River. Despite this improvement, the numbers of lamprey available for tribal harvest continue to be low. The effects of low population numbers have been documented as a loss of tribal culture. The decline in fishing opportunities in traditional areas has resulted in a break of the transfer of knowledge from older to younger tribal members about how to catch and prepare lamprey for drying and the loss of important myths and legends associated with lamprey (Close et al. 2002). Rebuilding Pacific lamprey in the Hood River basin is a CTWS goal so that tribal harvest can occur, and tradition and culture can be preserved.

4.8.1 General Fish and Aquatic Species

The Hood River basin has one of the most diverse assemblages of native anadromous and resident salmonids in Oregon. It includes populations of both summer and winter run steelhead, and spring and fall Chinook salmon. The original Hood River spring Chinook salmon population was extirpated in the 1970s. A reintroduction effort from the neighboring Deschutes River stock has been underway since 1993. However, the abundance and range of anadromous fish in the Hood River basin has declined compared to historical conditions.

Nineteen species of fish are known to occur in the basin (Table 4-11). Some or all of these species occur in the East Fork Hood River and in the other waterbodies affected by District operations. As noted previously, the District's water diversion affects the lower 6.6 miles of the East Fork Hood River and the full 14.6-mile length of the Hood River. In addition, five tributaries to the lower Hood River are affected by District's end spills (overflows) of approximately 1 to 5 cfs (Table 4-8).

Upstream fish passage at the EFID diversion weir is provided by a vertical slot fishway. A pipe system at this location was also installed to facilitate passage of Pacific lamprey. No artificial barriers to fish migration occur upstream of the EFID diversion in the East Fork Hood River. The uppermost limit of anadromous fish use extends to RM 26.6 based on ODFW mapping of steelhead distribution (ODFW 2019a). Pacific lamprey, a U.S. Fish and Wildlife Service (USFWS) Species of Concern, are recolonizing the Hood River basin and appear to be expanding their range within the East Fork Hood River. Juvenile lamprey were recently detected as far upstream as the EFID diversion (R. Gerstenberger, Fish Biologist, CTWS, personal communication, January 16, 2019).

Fixed-plate, Coanda-design screens are installed in the District's sand trap near its diversion to prevent fish and aquatic species from entering the irrigation canals. Coanda screens are regarded as experimental technology by NOAA Fisheries (NMFS 2011). Testing of EFID's fish screens following their construction in 1996 found no injuries or mortalities in juvenile steelhead and Chinook passing the fish screens (Buell and Associates 2000). However, in the future the District plans to replace the fish screens at a new location closer to the diversion with a screen design that fully meets NOAA Fisheries fish screen criteria.¹⁷

¹⁷ Fish screen replacement is not part of the proposed action.

Table 4-11. Fish Species in Waterbodies Associated with District Operations.

Fish Species	Scientific Name	Origin
Bridgelip sucker	<i>Catostomus columbianus</i>	Indigenous
Bull trout	<i>Salvelinus confluentus</i>	Indigenous
Brown bullhead	<i>Ameiurus nebulosus</i>	Introduced
Chinook salmon (spring and fall)	<i>Oncorhynchus tshawytscha</i>	Indigenous
Brook trout	<i>Salvelinus fontinalis</i>	Introduced
Brown trout	<i>Salmo trutta</i>	Introduced
Chiselmouth	<i>Acrocheilus alutacens</i>	Indigenous
Coastal cutthroat trout	<i>Oncorhynchus clarkii</i>	Indigenous
Coho salmon	<i>Oncorhynchus kisutch</i>	Indigenous
Dace species	<i>Rhinichthys</i> spp.	Indigenous
Largescale sucker	<i>Catostomus macrocheilus</i>	Indigenous
Mountain whitefish	<i>Prosopium williamsoni</i>	Indigenous
Northern pike minnow	<i>Ptychocheilus oregonensis</i>	Indigenous
Pacific lamprey	<i>Lampetra tridentata</i>	Indigenous
Rainbow trout	<i>Oncorhynchus mykiss irideus</i>	Indigenous
Sculpin species	<i>Cottus</i> spp.	Indigenous
Steelhead (summer and winter)	<i>Oncorhynchus mykiss</i>	Indigenous
Three-spined stickleback	<i>Gasterosteus aculeatus</i>	Indigenous
White sturgeon	<i>Acipenser transmontanus</i>	Indigenous

Source: Bonneville 1996; R. Gerstenberger, CTWS, personal communication, July 30, 2018

District canals do not provide functioning habitat for fish and aquatic life primarily because the canals are dewatered every year at the end of the irrigation season. A small number of fish may be able to survive in the canal over the winter at locations where a spring or seep maintains a deep enough pool year-round. For several years following the fish screen construction, electrofishing was conducted to salvage fish still trapped in the District’s canals. It is assumed that any fish remaining in the canals today may have originated either from fish that had evaded capture during electrofishing efforts, or from an unknown fish-bearing stream with a seasonal surface water connection to a canal, or from potential leakage in the seals around the District’s fish screens (R. French, District Fish Biologist, ODFW, personal communication, March 15, 2019). Fish are not known to occur in any of the District’s other canals.

In addition to fish, other aquatic, semi-aquatic, and amphibious species occur in waterbodies that are associated with District operations. These likely include water shrew, water vole, newt, and

salamander species, and may also include Pacific treefrog and Cascades frog (C. Fiedler, Fish and Wildlife Biologist, U.S. Forest Service, personal communication, July 25, 2018). These species are native to Oregon and may be present in irrigation canals and adjacent banks in the project area at locations with suitable vegetation and hydrology.

4.8.2 Federally Listed Fish and Aquatic Species

The ESA (16 U.S.C. 1531 et seq.), as amended in 1988, establishes a national program for the conservation of species listed as threatened and endangered, and the preservation of habitats on which they depend. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. Section 7 of the ESA, as amended, requires organizations to consult with NOAA Fisheries and/or the USFWS if listed species or designated critical habitat may be affected by a proposed federal action. If adverse impacts could occur, the ESA requires federal agencies to evaluate likely effects of the proposed action and ensure that it neither risks the continued existence of federally listed ESA species nor results in the destruction or adverse modification of designated critical habitat.

A list of aquatic species protected under the ESA that are known to occur or may occur in the seven waterbodies associated with District operations was obtained from *Federal Register* (FR) notices and the USFWS Information for Planning and Consultation website. Four fish species that are listed as threatened under the ESA occur in the Hood River basin (Table 4-12). All of these species occur in the Hood River, and are also known to occur in the East Fork Hood River with the potential exception of bull trout for which occurrence in the river is not well documented (USFWS 2002). One or more of the listed species may occur within other waterbodies affected by the project including Neal, West Fork Neal, Odell, Lenz, and Whiskey creeks (ODFW 2019a).

Table 4-12. Federally Listed Fish Species in the Hood River Basin.

Species Name (Endangered Species Unit or Distinct Population Segment)	Federal Status	Listing Date	Extinction Risk in the Hood River Basin
Hood River bull trout	Threatened	June 10, 1998	At Risk
Lower Columbia River Chinook (includes spring and fall populations)	Threatened	March 24, 1999	Very High
Lower Columbia River Coho	Threatened	June 28, 2005	Very High
Lower Columbia River steelhead (includes winter and summer populations)	Threatened	January 5, 2006	Very High - Summer steelhead Moderate - Winter steelhead

Source: NMFS 2013

Critical habitat for Lower Columbia River coho, Chinook, and steelhead is designated in each of the waterbodies affected by District operations except in Odell Creek (Figure 4-9). NOAA Fisheries has identified Primary Constituent Elements (PCEs) for critical habitat that represent the essential biological and physical features for the conservation of a species and describe habitat components

that support one or more life stages of the species (70 FR 52630, September 2, 2005). The PCEs for coho, Chinook, and steelhead describe habitat with water quantity and quality conditions supporting spawning, egg incubation, larval development, and migration; water quantity and floodplain connectivity supporting juvenile growth and mobility; shade; complex habitat structure and cover such as submerged and overhanging large wood; aquatic vegetation and boulders; and a sufficient food base supporting growth and maturation.

The USFWS has designated critical habitat for bull trout in the Hood River from its confluence with the Middle Fork Hood River downstream to the Columbia River (RM 14.6 to RM 0).¹⁸ USFWS has identified PCEs for bull trout critical habitat including aquatic connectivity, complex habitat structure, water temperatures no greater than 59 °F, natural variability in streamflow, a sufficient food base, and the absence of non-native predatory and competing fish (70 FR 56211, October 26, 2005).

An evaluation of the population viability status for ESA-listed fish species in the Hood River basin concluded that coho salmon, spring Chinook salmon, and summer-run steelhead populations currently have a very high risk of extinction, while winter-run steelhead have a moderate risk of extinction (NMFS 2013; ODFW 2010). Low streamflow, including reduced flows due to irrigation withdrawals, are identified as a primary limiting factor to the recovery of listed salmon and steelhead in the basin (NMFS 2013).

4.8.3 State-Listed Species

ODFW maintains a list of native fish and wildlife species in Oregon determined to be either “threatened” or “endangered” according to criteria set forth by OAR 635-100-0105 (ODFW 2019b). Lower Columbia River coho salmon are listed by Oregon as endangered and are present in waterbodies associated with EFID operations. There are no other Oregon-listed threatened, endangered, or candidate fish or aquatic species known to occur within the waterbodies associated with EFID operations or in the irrigation canals and laterals within the project area.

¹⁸ The 2.4-mile reach of the Hood River between the West Fork and Middle Fork confluences is sometimes also identified as part of the East Fork Hood River. The USGS National Hydrography data set and topography maps identify this reach as the East Fork Hood River, however, the USGS river mile notations for the East Fork Hood River place RM 0 at its confluence with the Middle Fork Hood River.

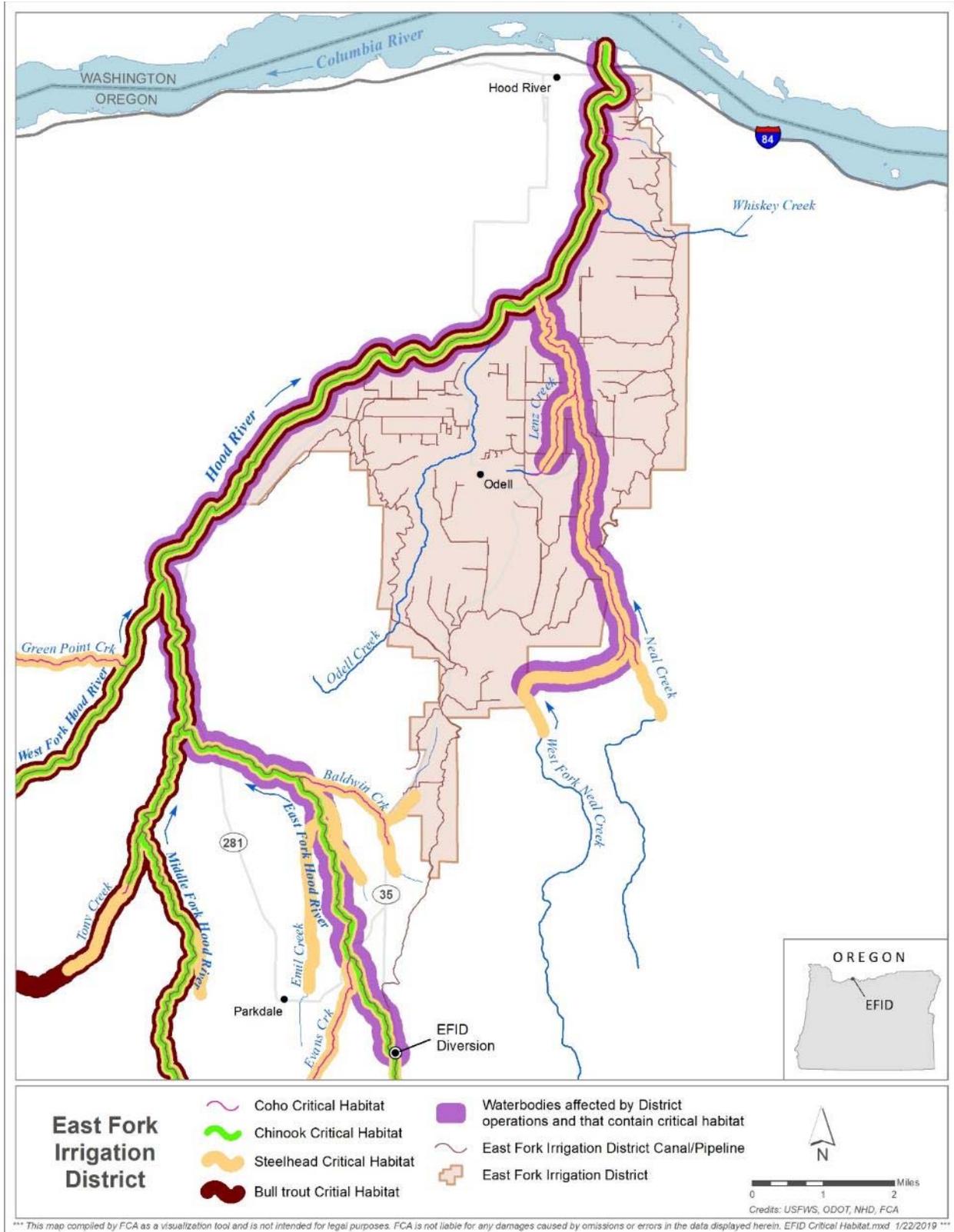


Figure 4-9. Critical habitat designated for bull trout, coho, steelhead, and Chinook in the East Fork Irrigation District watershed planning area.

4.9 Wetlands and Riparian Areas

Wetland and riparian areas affected by District operations occur in two areas: the project area and along 31.8 miles of natural waterbodies associated with District operations (Table 4-7; Figure 4-5). 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 specialized habitat for many aquatic and terrestrial species. Although there are many types of wetlands, they share three essential characteristics: an abundance of water, hydric (wetland) soils, and plants that grow in wetland conditions (ODSL 2015).

Wetlands in the area associated with the proposed action may be subject to federal or state regulations depending on their characteristics. In Oregon, wetlands are managed under two laws, the CWA and the Oregon Removal-Fill Law. The USACE administers Section 404 of the CWA with the oversight of the USEPA. This law regulates the dredge or fill of wetlands over which the USACE has jurisdiction (or “jurisdictional wetlands”). 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 regulated 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 dewatered¹⁹ outside of the irrigation season except for isolated puddles in low areas.

The 1986 Final Rule for “Regulatory Programs of the Corps of Engineers” indicated that irrigation ditches are generally not considered Waters of the United States 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 (Supreme Court 2006). 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 lands that occur along water courses and waterbodies. Typical examples include streambanks and lake shorelines. They are distinctly different from surrounding lands because of unique soil and vegetation characteristics that are strongly influenced by the presence of water (NRCS 1996).

¹⁹ “Dewatered” means that the source of the irrigation water is turned off or diverted from the irrigation ditch. A ditch that is dewatered outside the irrigation season may be used for temporary flows associated with stormwater collection, stock water runs, or fire suppression.

4.9.1 Project Area

The project area covers approximately 662 acres and is defined as 50 feet along either side of the canals and pipelines where construction would occur. Approximately 42.2 acres in the project area are identified as wetlands in the National Wetland Inventory (NWI) geographic information system (GIS) data (USFWS 2016). The NWI classifies 17 acres of these as artificial, seasonally flooded, riverine, and palustrine wetland features as “excavated by humans,” and the remaining 25 acres as natural wetlands. However, FCA conducted a further GIS analysis of the NWI mapping information to compare the NWI data to the EFID canal alignment data. That analysis indicated that most of the wetlands classified by the NWI as natural wetlands in the project area are instead EFID canals. When excluding the canals, an estimated 6.1 acres of natural wetlands may occur within the project area (FCA 2019). These natural wetlands are predominantly classified in the NWI as riverine and freshwater forested/shrub wetlands.

Water typically flows through EFID canals in the project area from March through October to supply agricultural uses of frost control, irrigation, and spray water. Water may also flow through these canals during the winter due to storm runoff or be present as standing water following rain or snow events. A few isolated pools that remain wet year-round may occur in one or more of the District’s canals. Although some irrigation canals may have hydrology and vegetation indicative of a wetland, they do not meet the functional criteria of wetlands and are not regulated as wetlands by ODSL or USACE. These canals meet exemptions under the Oregon Removal-Fill Law for specific agricultural activities in wetlands and other waters of the state. As part of construction permitting, a wetland delineation would be performed to determine the presence of jurisdictional wetlands.

Riparian vegetation and development of riparian habitat along the canals in the project area are either limited or absent because the canals do not have water year-round and are maintained to control or remove vegetation. In addition, a maintenance track or road typically runs along one bank of the canals, eliminating opportunity for tree and shrub growth.

4.9.2 Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations

Based on NWI data, natural wetlands are found sporadically along the East Fork Hood River and other waterbodies affected by District operations.

Riparian areas of varying width and quality also occur along natural waterbodies affected by District operations. Low summer streamflow associated with irrigation withdrawals may limit riparian vegetation along the East Fork Hood River downstream of EFID’s diversion. 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). Reestablishing a more natural hydrologic regime would supply water to riparian areas via infiltration through channel banks, thus enhancing riparian function by facilitating processes such as hyporheic exchange, physical and chemical transformations, and supporting riparian plant communities and aquatic habitat (National Research Council 2002).

4.9.3 Floodplains

The District's existing headwork facilities are located within the 100-year floodplain of the East Fork Hood River based on the Federal Emergency Management Agency's Flood Insurance Rate Maps for Hood River County. These facilities occupy approximately 4 acres of floodplain and include a diversion weir, fish ladder, sand trap, gravel access road, and the approach canal between the diversion and the sand trap. Construction of these facilities has altered natural floodplain processes such as sediment transport and deposition, flood storage, aquifer recharge, and fish and wildlife habitat development. In general, the effects on floodplain processes and functions have been local to the affected area. No other District facilities occur within the 100-year floodplain.

4.10 Wildlife Resources

4.10.1 General Wildlife

A variety of birds, mammals, reptiles, and other wildlife have the potential to occur in the project area and its vicinity. The native wildlife species that are most likely to occur in the project area are shown in Table 4-13. Wildlife species typically present in the project area are habitat generalists that utilize natural habitat areas within or bordering the agricultural environment. These species are generally tolerant to disturbance. Common examples include deer, coyote, skunk, raccoon, and red-tailed hawk (Blair 1996; Ditchkoff et al. 2006; McKinney 2002). Given the fragmented, disturbed nature of habitat within the project area, it likely supports a lower species diversity compared to native, intact, undisturbed habitat types.

Where not cleared, vegetation along the District's canals may provide food, cover, and breeding sites for some wildlife species throughout the year. Additionally, wildlife may also use the District's open canals as a water source and a travel or dispersal corridor. Other wildlife travel corridors are present along streams in the vicinity of the project area where riparian vegetation is dense or wide enough to provide hiding cover, and in forested areas that border the District. When flowing water is present, the canals can pose a migration barrier for small mammals. Wildlife drownings occur periodically in the District's canals, involving mostly fawns, squirrels, coyotes, skunks, and other small mammals (J. Buckley, EFID Manager, personal communication, October 10, 2018).

Deer and elk are typically highly migratory in response to seasonal conditions, although some occupy a smaller home range when close to an abundant food source, water, and adequate cover. Much of the canal length within EFID lies directly between residential properties and orchards, and may serve as an added attractant for wildlife and a source of human-wildlife conflict, especially for deer, elk, and the carnivores that prey on them (J. Thompson, ODFW District Wildlife Biologist, personal communication, December 5, 2018).

Table 4-13. Wildlife Species Likely to Occur within the Project Area.¹

Wildlife Species		Scientific Name
Mammals	Bat	<i>Vespertilionidae</i> spp.
	Cottontail rabbit	<i>Sylvilagus</i> spp.
	Coyote	<i>Canis latrans</i>
	Mountain lion	<i>Puma concolor</i>
	Mule deer	<i>Odocoileus hemionus</i> spp.
	Raccoon	<i>Procyon lotor</i>
	Rocky mountain elk	<i>Cervus elaphus nelsoni</i>
	Skunk	<i>Mephitis mephitis</i>
	Western gray squirrel	<i>Sciurus griseus</i>
Birds	American crow	<i>Apelocoma californica</i>
	Dark-eyed junco	<i>Junco hyemalis</i>
	Northern flicker	<i>Colaptes auratus</i>
	Red-tailed hawk	<i>Buteo jamaicensis</i>
	Rufous hummingbird	<i>Selasphorus rufus</i>
	Turkey vulture	<i>Cathartes aura</i>
	Western scrub jay	<i>Apelocoma californica</i>
Reptiles	Common garter snake	<i>Thamnophis sirtalis</i>
	Western rattlesnake	<i>Crotalus viridus</i>

Source: ODFW 2019c

¹ Partial list of wildlife species likely to occur in the project area.

4.10.2 MBTA/BGEPA Species

Many bird species have the potential to occur within the EFID 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 including bald eagles are known to occur in or near the project area, habitat availability and quality is limited due to agricultural land use and District canal maintenance activities that remove or control vegetation on an annual basis. A list of MBTA and BGEPA species that occur or may occur in the project area was obtained from USFWS and is shown in Table 4-14. Several of these species may be present in or near the project area for as little as one week during the year (USFWS 2018). No known bald or golden eagle nests are found in or near the project area based on available surveys (F. Issacs, Oregon Eagle Foundation, email communication December 6, 2018).

Table 4-14. Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act Species Potentially Occurring within the Project Area.

MBTA/BGEPA Species ¹	Scientific Name
Bald eagle	<i>Haliaeetus leucocephalus</i>
Brewer’s sparrow	<i>Spizella breweri</i>
California thrasher	<i>Toxostoma redivivum</i>
Clarke’s grebe	<i>Aechmophorus clarkii</i>
Golden eagle	<i>Aquila chrysaetos</i>
Great blue heron	<i>Ardea herodias fannini</i>
Lesser yellowlegs	<i>Tringa flavipes</i>
Lewis’s woodpecker	<i>Melanerpes lewis</i>
Marbled godwit	<i>Limosa fedoa</i>
Olive-sided flycatcher	<i>Cantopus cooperi</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Semipalmated sandpiper	<i>Calidris pusilla</i>
Peregrine falcon	<i>Falco peregrinus</i>
Western screech-owl	<i>Megascops kennicottii kennicottii</i>
Willow flycatcher	<i>Empidonax traillii</i>

Source: USFWS 2018

¹ Partial list of all migratory birds that potentially occur within the project area.

4.10.3 Federally Listed Species

USFWS maintains a list of wildlife species protected under the ESA that may occur in Hood River County (USFWS 2018). A review of the USFWS Information for Planning and Consultation data indicated that only one federally listed species, the northern spotted owl (threatened, 55 FR 26114), may occur in the project area. However, none of the project area overlaps with designated critical habitat for the northern spotted owl.

4.10.4 State-Listed Species

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 (OAR 635-100-0105) (ODFW 2019b). The state list together with information from the Oregon Explorer Natural Resources Digital Library shows there are no state-listed terrestrial species known to occur within the project area (Oregon State University 2018).

5 Alternatives

5.1 Formulation Process

The formulation of alternatives followed the CEQ’s regulations for implementing NEPA, and numerous USDA-NRCS watershed planning policies. Scoping comments were also incorporated into the formulation process of alternatives.

A large number of alternatives were initially considered. When formulating an alternative, it was first determined whether the alternative met the project purpose, which is to: 1) improve water conservation in District infrastructure, 2) improve water delivery reliability, and 3) improve public safety along district infrastructure (Section 2.1.4). After considering whether the alternative met the project purpose, the alternative was further analyzed for four criteria: completeness, effectiveness, efficiency, and acceptability (PR&G 6). Some of the initial alternatives considered did not meet the formulation criteria and were eliminated from further analysis (see Appendix D).

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, did not achieve the Federal Objective and Guiding Principles, or became unreasonable because of cost, logistics, existing technology, or environmental reasons were removed from consideration (NWPM 501.37, PR&G 6.5b). Section 5.2.5 provides a side-by-side comparison of the net present value for each of the alternatives that were eliminated due to cost.

5.2.1 On-Farm Efficiency Upgrades

On-farm efficiency upgrades refer to EFID patrons upgrading their on-farm infrastructure to use irrigation technologies that provide a more precise application of water. These technologies can have greater application efficiencies. On-farm infrastructure is distinct from District canals and laterals because it is owned and operated by patrons. Based on surveys in 2008 and 2013, it is estimated that farms within the District in 2013 were irrigated using hand line impact sprinklers (31 percent of the total irrigated acreage in EFID), solid set impact sprinklers (28 percent), solid set micro sprinklers (23 percent), and solid set rotator sprinklers (12 percent) (Christensen 2013). 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).

Voluntary programs to increase on-farm water use efficiency by other agencies and organizations are ongoing within the District and the Hood River basin. On-farm efficiency upgrades would not meet the purpose and need of the project. Water losses would still occur through end spills; canals would remain open; water delivery reliability would not be improved 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 a cultural resource analysis on a private tax lot-by-tax lot basis, as well as receive permission to then operate and maintain the system, including

acquiring easements to do so. This approach is logistically complex and would increase project costs. Furthermore, it would be logistically infeasible for EFID to carry out, operate, and maintain on-farm infrastructure owned by EFID patrons. The on-farm efficiency upgrade alternative was eliminated from further study because it would be logistically unreasonable, does not meet the purpose and need of the project, and does not achieve the Federal Objective and Guiding Principles.

5.2.2 Canal Lining

Canal lining would involve covering the bottom and sides of the currently open canals 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 across the District's 17.9 miles of open canals.

Lining would increase water velocity in the canals because the shotcrete cover is a smoother surface than the existing underlying soils and rock. This makes the sides of the canals slippery and more difficult for anyone who might accidentally 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 canals to prevent public access to the channel 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 improving public safety; fences and ladders would increase public safety. However, canal lining would only partially meet the project purpose of conserving water; while lining would reduce water loss from seepage, it would not reduce water loss from end spills. Seepage studies in EFID have been inconclusive, and reliable estimates of seepage loss are unavailable. Seepage loss in an open-lined system with a shotcrete cover is estimated to be 5 percent based on studies of canal lining performance in Central Oregon (Swihart and Haynes 2002). End spill water loss in EFID is estimated to be 18.3 percent of the water diverted, or 5,287 acre-feet annually.

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. Additionally, this alternative would require energy use and other pumping costs for farmers similar to their current operations.

Capital costs of canal lining were estimated based on the size of the existing open canals and laterals, and material unit costs were based on the experience of Three Sisters Irrigation District in Central Oregon. Annual operating costs associated with canal lining were estimated based on EFID's current operating budget, with a 30 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 for canal lining for each project group ranged from \$42,069,000 to \$80,107,000 (2019 dollars) over 100 years, which is twice the cost of the Piping Alternative. Based on this cost, canal lining was eliminated from further study (see Appendix D for cost details). Furthermore, canal lining does not meet the project purpose to improve water delivery reliability and does not achieve the Federal Objective and Guiding Principles.

5.2.3 Piping with Other Materials

Piping with steel or piping with polyvinyl chloride (PVC) was also explored. A cost analysis was completed for each alternative and can be found in Appendix D. In the cost analyses, the lengths, diameters, and range of pressure ratings used for these piping alternatives were estimated based on the engineering analysis completed in the District's SIP (FCA 2018a). The design life for steel and PVC was assumed to be 50 years and 33 years, respectively. Annual operating costs were also taken into consideration. Annual operating costs were estimated based on EFID's current operating budget and an assumption that equipment, maintenance, and labor costs would decrease 10 percent because a fully piped system would minimize the need to inspect, repair, and remove obstructions and make manual adjustments to the system.

The net present value for piping with steel, which includes capital costs, replacement costs, and annual O&M costs for each project group ranged from \$33,657,000 to \$97,467,000 (2019 dollars) over 100 years. The total net present value for steel is nearly twice the total net present value of the Piping Alternative.

For piping with PVC, PVC would be used for diameters up to 54 inches, and steel would be installed for a short section of 66-inch diameter pipe because PVC pipe is not manufactured in large diameters. The net present value of piping with PVC, which includes capital costs, replacement costs, and annual O&M costs for each project group ranged between \$28,536,000 to \$124,439,000 (2019 dollars) over 100 years. The total net present value of PVC is over twice the total net present value of the Piping Alternative.

Although piping with steel or PVC would meet the project purpose and achieve the Federal Objective and Guiding Principles, both alternatives were eliminated from further study due to the availability of high-density polyethylene (HDPE), a longer lasting material that would achieve the purpose and need at a lower cost (see Appendix D for steel and PVC cost details, pipe specifications, and PVC design life discussion).

5.2.4 Combination of Alternatives

A combination of the eliminated alternatives, and a combination of HDPE with any of the eliminated alternatives, were rejected based on the same reasons the alternatives were eliminated individually. The on-farm efficiency upgrade alternative was eliminated from further study because it is not consistent with PL 83-566 requirements, it would be logistically unreasonable, and it does not fully meet the purpose of the project and the Federal Objective and Guiding Principles. Canal lining, piping with steel, and piping with PVC were eliminated due to cost.

5.2.5 Cost Comparison of Eliminated Alternatives

Table 5-1 shows the net present value of the alternatives that were eliminated due to cost for each project group over a 100-year period (see Appendix D for a detailed breakdown of costs).

Table 5-1. Net Present Value of Alternatives Eliminated Due to Cost.¹

Project Group	Canal Lining	Steel Piping	PVC Piping
1	\$42,069,000	\$33,657,000	\$30,613,000
2	\$80,107,000	\$97,467,000	\$124,439,000
3	N/A	\$37,184,000	\$28,536,000

¹ Price base: 2019 dollars, amortized over 100 years at a discount rate of 2.75 percent. Costs are rounded to the nearest \$1,000.

5.3 Alternatives Description

Of the alternatives considered for EFID’s Irrigation Modernization Project, two were selected for further evaluation:

- No Action (Future without Federal Investment): The District would continue to operate and maintain its existing canal and pipe system. Improvements to irrigation infrastructure would only occur as public funding becomes available and are not reasonably certain to occur; and
- Piping Alternative: Replace existing open canals and aging pipe with an HDPE-pressurized pipeline system.

These alternatives are discussed below and include only EFID-owned infrastructure.

5.3.1 No Action (Future without Federal Investment)

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. The District would only be able to modernize its infrastructure on a project-by-project basis as public funding became available. This alternative assumes that modernization of the District’s system to meet the purpose and needs of the project would not be reasonably certain to occur.

The No Action Alternative would not meet the project purpose and need; water loss to end spills and seepage in District infrastructure, water delivery reliability for farmers, streamflow and habitat conditions for fish and aquatic species, public safety, and sediment levels in irrigation water would not improve. Since no water would be conserved or permanently allocated instream, the No Action Alternative would not achieve the Federal Objective to protect the environment, the Healthy and Resilient Ecosystem Guiding Principle, or the Sustainable Economic Development Guiding Principle.

5.3.2 Piping Alternative

Under the Piping Alternative, federal funding through PL-566 would be available, and the District would pipe and pressurize 56 miles of their system (Figure 5-1). This would include replacing up to 38.3 miles of existing pipeline made of piping material not rated for pressurization. The delivery system would be piped with HDPE pipe ranging in diameter from 4 to 54 inches, and a very short section of 66-inch diameter steel pipe (FCA 2018a). The Main Canal would be converted to a

48-inch and 54-inch dual HDPE pipeline, so low flows associated with spray water could be conveyed at adequate velocities.²⁰

HDPE pipes were selected because they are resistant to pressure from water hammer and have high tensile strength (Najafi et al. 2015). During installation, HDPE pipes are welded together; therefore, the need for expensive fittings and thrust blocks is minimized. 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.

Under this alternative, 61 pressure-reducing stations would be installed and 384 district turnouts would be upgraded to pressurized delivery. Seventy-seven percent of the District (7,350 acres) would receive fully pressurized water deliveries (40 to 100 pounds per square inch; FCA 2018a). Most remaining irrigated land within the District would receive partial pressurization, with the Main Canal service area having limited pressurization as a result of the 0.4-mile segment of canal that would remain open from the diversion to the sand trap (FCA 2018a). This segment would remain open to provide a bypass channel when the new sedimentation basin (described below) is taken offline for maintenance (Wharry 2016); to provide additional sand settling capacity; and to accommodate the potential future construction of a replacement fish screen facility.²¹

Since three in-canal settling basins would be eliminated when the District's canals are piped, a new sedimentation basin would be installed immediately downstream of the existing sand trap. The preliminary design for this element consists of an excavated off-channel pond 100-feet wide by 300-feet long with sloping sides surrounded by an earthen berm on three sides. The total design water depth is 9 feet and the surrounding berm height is 3 feet above the water surface. The approximate total water capacity is 4.93 acre-feet; the approximate water quantity impounded above grade is 1.3 acre-ft. A 36-inch diameter overflow pipe would empty to a 48-inch diameter bypass pipe to the river (see Appendix E for preliminary design drawings). The final design would follow all applicable NRCS engineering standards. The larger volume and longer settling time of the proposed sedimentation basin compared to the District's existing settling facilities is expected to prevent more sand and coarse silt from entering the District's delivery system while improving the quality of irrigation water.²² Accumulated sediment would be removed from the basin using an excavator and stockpiled or hauled off site. The existing sand trap would remain in place.²³

Construction of the Piping Alternative would occur in three project groups (Figure 5-1) over the course of 10 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. The

²⁰ A single 66-inch steel pipeline was considered, but the costs were comparable and steel is not expected to last as long as a dual HDPE pipeline.

²¹ Leaving this segment open would not reduce future hydropower generation capacity in the District because, if piped, any gained pressure would be eliminated at the sand trap and sedimentation basin (M. Bossler, FCA Water Resources Engineer, personal communication, July 24, 2019).

²² The proposed sedimentation basin is 7.8 times the volume of the existing sand trap (Wharry 2016). It is expected to settle at least 29.8 percent and potentially as much as 47.3 percent of sediment particles in the diverted water (FCA 2018a). For comparison, the existing sand trap is estimated to be able to settle out 12 percent of the overall incoming sediment load (Christensen 2013).

²³ The sand trap would remain in place for secondary sediment settling as needed and for use by the CTWS for several weeks each spring to acclimate and release hatchery fish as in the past.

construction of each project group is anticipated to require two to five non-irrigation seasons to complete.

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

Canals and laterals identified for piping would be accessed from EFID's existing maintenance roads when possible. Existing maintenance roads may require some improvements for use during construction. In some locations, temporary overland travel routes 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 altering when necessary to allow travel during construction. Construction of the sedimentation basin would include clearing of the land, pond and trench excavation, rock placement, concrete construction, and restoration and reseeded of the disturbed areas.

Vegetation clearing before construction, vegetation and weed management during construction, and reseeded after construction within EFID's easements would be completed according to the NRCS "Oregon & 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 were no other alternative to access the construction site or if they pose a safety threat to construction crews working in the canal or lateral trench.

O&M under the Piping Alternative would include 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 from April to October, work would be performed on an as-needed basis. Outside the irrigation season, EFID would perform system component maintenance and/or repairs to District meters, valves, and other infrastructure.

The Piping Alternative contributes to the project's purpose and need as follows:

- Improve water conservation: This alternative would eliminate all of the existing water losses from end spills, saving an estimated 16.6 cfs (5,287 acre-feet annually) and an additional unknown amount of seepage losses from open canals.²⁴ As a result, the conveyance efficiency of the District's infrastructure is anticipated to improve from its current estimate of 82 percent to nearly 100 percent.

²⁴ An additional, unquantified amount of water loss likely occurs from seepage along the District's open unlined canals. Seepage studies within the District have been inconclusive due to the large number of turnouts along canals, associated measurement errors, and other uncertainties. Canal seepage in EFID is not thought to be a major source of water loss given local geology and natural sealing of canal substrates over time through intrusion of silt and fine sediments.

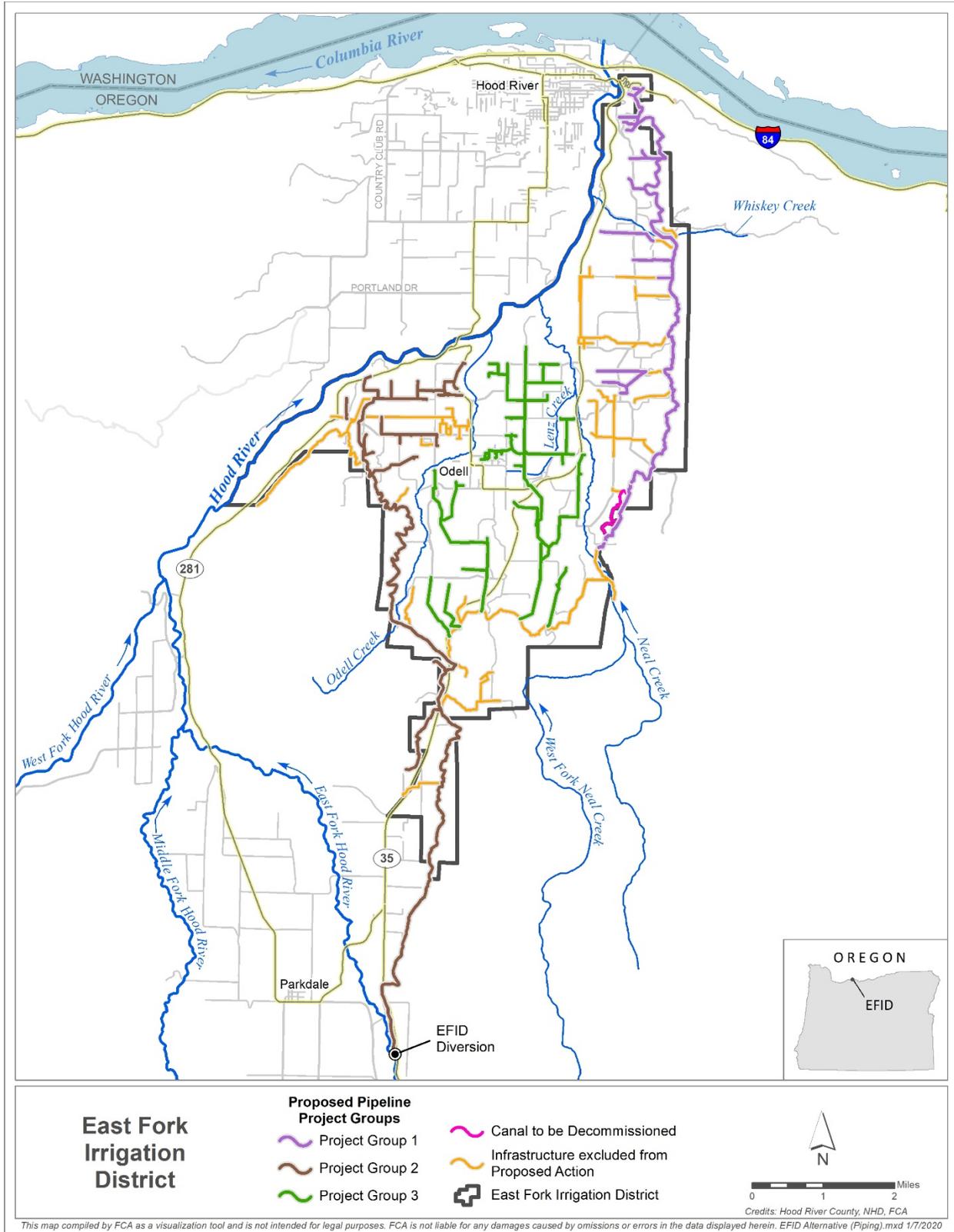


Figure 5-1. The Piping Alternative project groups for the East Fork Irrigation District Infrastructure Modernization Project.

- Improve operation inefficiencies and water delivery reliability: This alternative would immediately improve water delivery reliability for patrons in a majority of the District by providing pressurized deliveries. Under this alternative, up to 25 percent or 4.15 cfs (1,322 acre-feet annually) of conserved water would be allocated to the District to increase the reliability of irrigation water supply. The conserved water allocation for irrigation use would allow EFID to better meet irrigation demand in drought years. A piped and 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. A piped system would eliminate the need to inspect, repair, and remove obstructions from open canals and debris from screens. This alternative would greatly reduce the need for staff to manually adjust diversion and spill amounts throughout the system. Additionally, the pressurized pipeline would reduce patron pumping costs. Sediment management improvements would reduce the labor and equipment costs currently needed to remove sediment from multiple locations along the District's conveyance system.
- Improve streamflow and habitat conditions for fish and aquatic species: This alternative would enhance streamflow and habitat conditions for fish and aquatic species, including four federally threatened fish species, and would create instream water rights through the State of Oregon's Allocation of Conserved Water Program (ORS 537.470). The District would allocate 75 percent of the conserved water, or up to 12.45 cfs, to instream use during the irrigation season. The allocation would occur incrementally following completion of each project group and the verification and measurement of the water savings. Streamflow and water quality along 21.2 river miles in the East Fork Hood River and the Hood River would benefit incrementally, with the greatest benefit in the East Fork Hood River below the diversion.

Water quality would also improve in several other tributaries in the lower basin because this alternative would eliminate end spills of canal water discharged to natural drainages and streams. These end spills transport heat, glacial silt, and potentially pesticides and other contaminants into receiving streams.

- Improve public safety: Converting open canals to buried pipe would eliminate the risk of drowning, flooding, and other serious accidents associated with open canals.
- Limit sediment in irrigation water: The addition of a 30,000-square foot sedimentation basin would reduce the amount of sand and silt that enters the District's conveyance system, improving the quality of irrigation water.

The Piping Alternative achieves the Federal Objective to protect the environment by protecting and restoring streamflow in the Hood River. By improving operational efficiencies and eliminating end spills, thereby conserving water and improving water quality in Hood River tributaries, the Piping Alternative achieves the Federal Objective and Guiding Principle of sustainable economic development. The alternative also achieves the Guiding Principles of Healthy and Resilient Ecosystems by contributing to a more resilient ecosystem in the face of changing climate and the Guiding Principle of public safety through eliminating the public safety risks of open canals.

The estimated total installation project cost for the Piping Alternative is \$62,178,000. With additional project administration and technical assistance costs, the total project cost would be \$68,711,000.

5.4 Summary and Comparison of Alternatives

Table 5-2 compares the No Action Alternative (Alternative 1) and the Piping Alternative (Alternative 2). The table summarizes measures addressed as well as environmental, social, cultural, and economic effects.

Table 5-2. Summary and Comparisons of Alternatives.

	Alternative 1: No Action (Future without Federal Investment)	Alternative 2: Piping (NEE Recommended)
Alternative Plans		
Locally Preferred		✓
National Economic Efficiency		✓
Socially Preferred		✓
Guiding Principles		
Healthy and Resilient Ecosystems		✓
Sustainable Economic Development		✓
Floodplain		✓
Public Safety		✓
Environmental Justice		✓
Watershed Approach		✓
Provisioning Services—Trade-Offs		
Irrigation water	The District’s open canals would continue to lose water and make it difficult to deliver the right amount of water at the right time for farmers.	Would help provide more secure and reliable irrigation water for farmers.

	Alternative 1: No Action (Future without Federal Investment)	Alternative 2: Piping (NEE Recommended)
Instream fish species	Low streamflow past the District's diversion would continue to diminish habitat conditions for fish in the East Fork Hood River.	In total, 12.45 cfs of conserved water left instream would help improve habitat for fish, which would benefit fish populations. Spawning habitat would increase for federally listed Chinook and coho salmon, and rearing habitat would increase for federally listed steelhead trout.
Regulating Services—Trade-Offs		
Water quality	Low streamflow in the East Fork Hood River would continue to affect stream temperatures. End spills of canal water would continue to discharge warm water, glacial silt, and potentially pesticides or other contaminants into small tributaries to the lower Hood River.	In total, 12.45 cfs of conserved water left instream would help improve temperatures in the East Fork Hood River. Eliminating end spills would improve water quality in affected tributaries. The sedimentation basin would improve the quality of irrigation water by removing up to 35 percent more sand and silt compared to the District's existing sand trap facility.
Cultural Services—Trade-Offs		
Threatened species, species of concern	Low streamflow past the District's diversion would continue to impede recovery of three ESA-listed fish species in the East Fork Hood River as well as Pacific lamprey, a species of concern and traditional tribal food.	In total, 12.45 cfs of conserved water left instream would improve threatened fish and aquatic species habitat and may help improve their populations. Improving populations would benefit cultural, tribal, and religious values and bequest values.
Installation Costs		
Federal PL 83-566	\$0	\$30,974,000
Local only or Matching PL 83-566	\$0	\$37,737,000
Total	\$0	\$68,711,000

	Alternative 1: No Action (Future without Federal Investment)	Alternative 2: Piping (NEE Recommended)
Project Group 1¹		
Average Annual Cost		
Installation	\$0	\$406,000
O, M, & R ²	\$0	\$1,000
Total	\$0	\$407,000
Annual Benefits ³	\$0	\$462,000
Annual Costs ⁴	\$0	\$407,000
Annual Net Benefits ⁵	\$0	\$55,000
Annual Remaining Flood Damage	N/A	N/A
Project Group 2¹		
Average Annual Cost		
Installation	\$0	\$1,052,000
O, M, & R ²	\$0	\$10,000
Total	\$0	\$1,062,000
Annual Benefits ³	\$0	\$1,218,000
Annual Costs ⁴	\$0	\$1,062,000
Annual Net Benefits ⁵	\$0	\$156,000
Annual Remaining Flood Damage	N/A	N/A
Project Group 3¹		
Average Annual Cost		
Installation	\$0	\$332,000
O, M, & R ²	\$0	\$7,000
Total	\$0	\$339,000
Annual Benefits ³	\$0	\$633,000
Annual Costs	\$0	\$339,000
Annual Net Benefits ⁴	\$0	\$294,000

	Alternative 1: No Action (Future without Federal Investment)	Alternative 2: Piping (NEE Recommended)
Annual Remaining Flood Damage	N/A	N/A
N/A = not applicable		
¹ All costs and benefits presented in the table for the Piping Alternative are included as a change from the No Action Alternative. Costs and benefits for the No Action Alternative are shown as \$0 to represent there would be no change to the existing costs and benefits. ² O&M and replacement of the sedimentation basin. ³ For the Piping Alternative, a decrease in O&M costs of the canals and laterals was included in the benefits rather than the costs. Quantified benefits include instream flow benefits, agricultural yield benefits, reduced O&M costs, reduced carbon outputs, and reduced energy costs from pumping. ⁴ Annual net benefits shown for the Piping Alternative are the additional net benefits compared to the No Action Alternative.		
Regional Economic Impacts		
Local Jobs During Construction	No effect	75 jobs
Annual Jobs from agriculture (including direct/indirect/induced)	1,540 jobs	1,600 jobs
Beneficial Effects Annualized (million, 2019\$)¹		
Region	\$64.1	\$67
Rest of Nation	Some ripple income/employment effects expected, but not estimated.	Some ripple income/employment effects expected, but not estimated.
Adverse Effects Annualized (Millions, 2019\$)²		
Region	Not available	-\$0.6 (reduced OMR costs compared to No Action)
Rest of Nation	N/A	\$1.8
N/A = not applicable; OMR = operate, maintain, and replace		
¹ Beneficial effects include only those related to labor income, and do not include the net economic benefits quantified in the National Economic Efficiency (NEE). ² This includes only the direct costs (no indirect/induced costs are included).		

6 Environmental Consequences

This section evaluates the environmental consequences of the No Action Alternative and the Piping Alternative. The beneficial and adverse effects of the two alternatives on each resource in Section 4 were evaluated. The intensity of an adverse effect was classified as negligible, minor, moderate, or major. The duration of an effect was classified as temporary, short-term, or long-term. Appendix E presents the intensity threshold matrix used to categorize and define the range of expected effects.

6.1 Cultural Resources

6.1.1 No Action (Future without Federal Investment)

The District's ongoing O&M activities are not expected to affect historic or archaeological resources because these activities are expected to occur in previously disturbed areas.

6.1.2 Piping Alternative

NRCS has initiated consultation with SHPO for the proposed action by providing a project description and a map identifying the Area of Potential Effect.

In addition, Bonneville has executed a Memorandum of Agreement with SHPO to mitigate adverse effects on the EFID. The undertaking consisted of converting open irrigation canals to closed piped irrigation, and installation of a permanent water diversion, headworks, and fishway.

Effects on historic canal structures would be completed in compliance with the NHPA. The EFID is eligible for inclusion in the NRHP as an Historic District under Criterion A (36 CFR 60.4(a)) for its association with the development of irrigated agriculture in the Hood River region. Additionally, EFID is eligible for inclusion in the NRHP under Criterion C (36 CFR 60.4(c)) as a "significant and distinguishable entity whose individual components may lack individual distinction" (NPS 1995:20). The period of significance for EFID ranges from 1914 to 1917, when the majority of the EFID system was planned and built. This includes the system that EFID acquired from the East Fork Irrigation Canal Company in 1914. The integrity of the system as a whole has not been assessed.

Piping projects could impact the integrity of the irrigation ditches and may have an adverse effect on the resource. If projects are determined to constitute an adverse effect on the EFID Historic District, the Advisory Council on Historic Preservation (ACHP) would be notified and SHPO and appropriate consulting parties would be consulted to develop mitigation measures and a Memorandum of Agreement.

While a variety of cultural resources could be impacted by the modernization actions, it is likely the main impacts would be to build resources associated with EFID's irrigation infrastructure and historical agricultural practices. Overall effects on cultural resources are expected to be moderate. Minimization, avoidance, and mitigation measures developed through consultation under Section 106 of the NHPA would be used to offset site-specific project effects.

Minimization and avoidance are typically achieved by modifying the project design to lessen the amount or type of impacts proposed in areas where cultural resources are known to exist.

Sometimes protective measures can be incorporated into the project design and implementation that can also minimize or avoid affecting cultural resources. Other times creative implementation techniques can be explored and utilized. An example would be to use introduced fill to construct temporary access roads across an archaeological site to protect it from ground disturbance. Other methods might consist of using temporary fencing to restrict project activities from impacting adjacent cultural resources.

Post-review discovery plans may be used to communicate how to protect a site, when to stop work, and to outline the steps to take in the event a cultural resource is discovered or impacted during construction. In some cases, it may be that an impact to a cultural resource is unavoidable. For example, the focus of this modernization effort may directly affect features of EFID. In these circumstances, site-specific consultation with the consulting parties, including SHPO and interested tribes, is critical in developing the appropriate approach to avoid loss of valuable historic information and values.

Effects on cultural resources could be avoided, minimized, or mitigated after thorough evaluation and consultation with tribes, states, and other consulting parties.

The District is in the process of having a cultural resource specialist complete site surveys for historic and archaeological resources in the project area. If eligible resources are documented in the project area by a cultural resource specialist, consultation would occur between the District, NRCS, and SHPO to determine the effect on such resources and identify appropriate mitigation. Based upon previous mitigation measures implemented by other districts in the basin, if mitigation were to be required, it could include actions such as working with the historic society to create photographic documentation and an archival research document of the canal and laterals. Mitigation measures, if required, would be identified before construction and completed concurrent with or after construction. The potential cost of mitigation for effects on cultural resources is included in the project cost.

If historic resources, including human remains, are encountered during construction, an Inadvertent Discovery Plan would be followed. Construction would stop in the vicinity of the discovery, the area would be secured and protected, a professional archaeologist would assess the discovery, consultation with SHPO and NRCS cultural resources staff would occur as appropriate, and the appropriate tribes would be notified. Continuation of construction would occur in accordance with applicable guidance and law.

6.2 Land Use

6.2.1 No Action (Future without Federal Investment)

The No Action Alternative would not have a direct effect on land use within the project area and lands served by the District. The District's irrigation system would continue to operate as open canals and pipelines. Irrigated agriculture producers would continue to face increasing water supply uncertainty. Water supplies would continue to be unreliable, and agriculture producers may irrigate fewer acres of land or grow different crops in the future. Compounded with anticipated population

growth and potential developmental pressures, agricultural lands could be increasingly vulnerable to transitioning to a different land use.

The periodic use of herbicides to control nuisance algae in District canals would continue to be a concern to some patrons as this could affect organic farm certification. Periodically high levels of sand and silt in the water delivered to patrons would continue and may potentially increase as a result of climate impacts to glacial recession and on the frequency of landslides in the upper East Fork Hood River.

6.2.2 Piping Alternative

The Piping Alternative would have negligible effects on land use in the project area; easements would continue to be used for the conveyance of irrigation water and O&M, including installation of the sedimentation basin, and best management practices (BMPs) would be implemented. During system O&M, the presence of District staff would decrease in the easements, as they would no longer need to patrol the open canals.

All construction would occur in the District easements, and adjacent landowners would be notified. In limited areas, the District would work with landowners to obtain any new easements needed for the project. For example, approximately one-half mile of the pipeline that would replace the EC would not follow the existing canal alignment, but instead would follow a shorter route through both private land and county-owned forest land under a new easement. There would be no change in property ownership. 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 under the Piping Alternative. 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.

6.3 Public Safety

6.3.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the existing canals would remain open and the risk of drowning and injury would remain. The risk of drowning, flooding, and other serious accidents would increase as residential development and population grows and surrounds 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 through farmlands and urban and suburban zones along Oregon Route 35 and county and community 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.

This alternative would eliminate the drowning risk from open canals. This would result in beneficial effects on public safety since the possibility of a serious accident or loss of life associated with open canals would be eliminated in all but a 2,300-foot long section of canal inside the District's gated headworks area that would remain open for operational purposes. This alternative would also nearly eliminate any potential flooding risk from canal breaches and overflow, and the durability of the pipeline would increase seismic resiliency.

6.4 Socioeconomic Resources

To estimate the total economic effects of the No Action Alternative and Piping Alternative in terms of jobs and incomes supported, this analysis uses a 2015 IMPLAN economic impact model of Hood River County.²⁵

6.4.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the total economic activity supported by EFID agricultural production is estimated at approximately 1,540 jobs (approximately 1,210 jobs in agriculture and an additional 330 jobs in other economic sectors) and \$64.1 million in average annualized income (\$39.1 million in agricultural income and an additional \$25 million in income in other sectors benefiting from agricultural expenditures and income).

6.4.2 Piping Alternative

6.4.2.1 Regional Economic Impact

The Piping Alternative construction expenditures of approximately \$68.7 million would support construction sector jobs and income and would have economic ripple effects increasing jobs and income in other economic sectors in Hood River County. Economic ripple effects would result from the construction sector spending more on labor, materials, and services, which would spur increased sales and economic activity in other sectors (e.g., hardware stores and construction equipment businesses). Effects of construction sector spending in these other sectors are known as indirect effects. As household income rises in construction and indirectly affected economic sectors, household spending would also increase and generate increased economic activity in such sectors as retail, wholesale trade, personal services industries, and real estate (known as induced effects). Total job and income effect of the economic activity that would be supported are the sum of the direct effects (construction sector) and the indirect/induced effects (in other economic sectors).

The approximately \$68.7 million in construction expenditure would be spread over 10 years, supporting approximately 75 jobs and \$3 million in average income over the 10-year construction period (annualized over 110 years,²⁶ equating to approximately \$0.8 million in annualized average

²⁵ Total construction expenditures were modeled in IMPLAN Construction Sector 57, construction of new commercial structures, including farm structures.

²⁶ Note that each project has a 100-year life; however, since construction takes 10 years, the analysis period for all project groups is 110 years.

income benefits). Of these effects, approximately 55 jobs and \$2.2 million in annual income would be in the construction sector (direct effects), while the remaining 20 jobs and \$0.8 million income would be in other sectors.

The Piping Alternative is also expected to result in additional agricultural production due to increased water supplies that are expected to improve water supply reliability, which would decrease crop damages resulting from future projected water shortages due to climate change. Under this alternative, the average annual total economic activity supported by EFID agricultural production is estimated at approximately 1,600 jobs (approximately 1,250 jobs in agriculture and an additional 350 jobs in other economic sectors) and \$66.2 million in average annualized income (\$40.4 million in agricultural income and an additional \$25.8 million in income in other sectors benefiting from agricultural expenditures and income).

The Piping Alternative would also result in reduced O&M expenses for EFID and pumping costs for its patrons. However, there are no anticipated effects on District wages and employment. Reduced O&M and pumping costs may largely result in an income transfer between EFID patrons, EFID staff, and the local construction/repair/electricity sectors. As such, there are expected to be limited Regional Economic Impact effects of this reduced expenditure (i.e., less than the rounding margin of error) so effects are not quantified in this analysis. To the extent that increased flows enhance recreation and support additional recreation visitation and spending in Hood River County, the long-term, positive regional economic contribution of the project would be much larger, and vice versa.

The Piping Alternative would have a beneficial effect on employment and income in Hood River County from construction activities, and a beneficial effect on agricultural production and related farm household income in the County. A National Economic Efficiency (NEE) benefit cost analysis has been performed to evaluate the benefits of the Piping Alternative (Appendix D).

6.5 Vegetation

6.5.1 No Action (Future without Federal Investment)

Under the No Action Alternative, vegetation along the network of open irrigation canals and buried pipelines would persist and adjacent native upland vegetation would remain in its current condition. Ongoing maintenance along the District's system would have a minor effect on existing vegetation conditions in the project area.

6.5.2 Piping Alternative

6.5.2.1 General Vegetation

Vegetation within the project area may be disturbed by construction activities including clearing, excavation, and trenching for pipe placement; replacement of existing piping; disturbance of lands adjacent to canals and pipelines where required for construction equipment access or staging of equipment and materials; and clearing for the construction of a sedimentation basin facility.

During construction, existing access roads, lanes, and tracks within the District’s existing easements would provide access to most of the project area. Selection of construction areas and travel routes adjacent to canals and laterals would consider existing vegetation and avoid mature trees to the extent practicable. Herbaceous, shrub, and woody vegetation along the canals, laterals, and delivery turnouts within the project area would be temporarily disturbed through activities such as clearing and digging.

Construction of the sedimentation basin near the EFID diversion would clear an additional, partially forested area of approximately 1.1 acres. Construction of a new pipe alignment at the south end of the EC would clear approximately 0.7 acre of mature, mostly Douglas fir trees on county-owned forest land. Restoration of disturbed areas on this land would occur as negotiated with the Hood River County Forestry Department during the easement acquisition process.

After construction, the project area would be recontoured and all disturbed areas would be planted with a seed mix of native grasses and forbs (Figure 6-1 and Figure 6-2). For the large-diameter pipelines that would replace the open DVC, EC, and Main Canal, a layer of gravel or crushed rock would be placed over or alongside the buried pipeline to serve as an access road, and disturbed soils at the road margins would be planted with a seed mix of native grasses and forbs. Planting would occur in consultation with NRCS. Vegetation within the affected areas would return to that of the historic upland habitat. Some trees that are dependent upon the canal for water may not survive due to a lack of water following construction of the Piping Alternative.

In the long term, a net gain in native vegetation in the project area would occur because the overall project footprint after piping would generally be narrower than the footprint of the existing open canals with the adjacent maintenance tracks or roads. Over the project’s life, planted vegetation within the District’s easements would be maintained according to the NRCS “Oregon & Washington Guide for Conservation Seedings and Plantings” (NRCS 2000). Trees would not be allowed to establish above the buried pipe because roots may interfere with future O&M activities.

The Piping Alternative would have a minor, short-term effect on vegetation in the project area during construction because disturbance would occur on one percent of the District; over half the disturbance would occur on cultivated or developed land. Erosion control measures and materials would be free of weeds and weed seeds. Weeds would be managed according to the protocol in the NRCS “Oregon & Washington Guide for Conservation Seedings and Plantings” (NRCS 2000), and disturbed areas would be revegetated with native grasses and forbs in consultation with NRCS.



Figure 6-1. A section of the Central Lateral Pipeline 9 years after construction.



Source: Google Earth Pro v. 7.3.2.5776; imagery date 9/3/2018

Figure 6-2. Vegetation along a buried District lateral pipeline 5 years after construction.

6.6 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 of an effect from construction of a project feature that is surrounded by thick vegetation or that blends into the landscape than from one that is constructed in an open area.

This visual analysis was based on evaluations of aerial and ground-based photographs of the proposed project sites and preliminary design information. The duration over which any changes would occur was also considered.

6.6.1 No Action (Future without Federal Investment)

Under the No Action Alternative, there would be no changes to visual resources, and residents and visitors would continue to see open canals from public and private viewpoints.

6.6.2 Piping Alternative

Construction activities would have a negligible effect on visual resources because most construction would be short term and occur out of public view, and because large equipment commonly used for agricultural production and current canal maintenance is typically seen in project and surrounding areas.

After construction, the project area would be recontoured and all disturbed areas would be planted with a seed mix of native grasses and forbs. Rural residences that previously had views of open canals would have a view of a vegetated area similar to the surrounding landscape. In any areas where trees were removed, viewers would experience a change from seeing trees along an open canal to seeing a vegetated area.

Overall, the Piping Alternative would have a minor, long-term effect on visual resources in the project area because there are relatively few public viewpoints of the canals and the vegetated project area would blend in with the natural landscape.

6.7 Water Resources

6.7.1 No Action (Future without Federal Investment)

6.7.1.1 Water Rights

Under the No Action Alternative, the District would maintain its water rights at the current amount and would not create instream water rights through Oregon's Allocation of Conserved Water Program (ORS 537.470). A portion of the water diverted at the EFID diversion would continue to be spilled at the end of canals and laterals, and an additional unquantified portion would continue to seep into the ground before reaching any orchards and farms. The District would continue to call on its patrons to curtail irrigation during drought years, and as the climate warms, the frequency of curtailment requests may increase. Instream water rights would continue to be unmet in the East Fork Hood River during the irrigation season.

6.7.1.2 Surface Water Hydrology

During the irrigation season, streamflow in the lower East Fork Hood River (RM 6.6 to RM 0) would continue to be very low compared to natural levels as a result of the District's water diversion. The amount of streamflow in the river during the summer is predicted to decrease over time as a result of climate trends. The District would continue to divert more water than is directly used for irrigation to maintain the end spills that are required to ensure water delivery to all patrons. Streamflow in East Fork Hood River would continue to fall short of the instream water rights established to protect fish and wildlife, and no additional water would be permanently protected instream. End spill discharges of canal water maintained by the District would continue to alter the amount and variability of streamflow in affected tributaries. The District's open canals would continue to capture and redirect stormwater runoff from adjacent hillsides or intermittent streams at some locations in the project area.

6.7.1.3 District Operations and Water Supply

Under the No Action Alternative, current District operations would continue and provide the current level of water delivery reliability. The District would continue to lose an estimated 16.6 cfs, or 18.3 percent of the water that it diverts, through end spills. Pressurized water deliveries would not increase, and up to 4.15 cfs of the total water saved by piping would not be allocated to the District to benefit EFID patrons. Water management and water supply would become more challenging over time as a result of climate trends. According to climate modeling study of the Hood River basin, climate change is expected to result in water supply shortages of 10 to 12 percent in the EFID, or roughly 12.9 cfs occurring in 1 out of 10 years beginning in 2030 under the warmest and driest climate scenario, with greater shortages occurring less frequently (Reclamation 2014b). The actual shortage is expected to be larger since the study did not account for a recent agreement between EFID and CTWS to maintain at least 15 cfs instream in the bypass reach below the District's diversion (Section 4.7.2.1). When accounting for the minimum instream requirement, the total EFID future water supply shortage due to climate change under the No Action Alternative would be 22 percent or roughly 25.8 cfs²⁷ in 1 out of 10 years (Appendix D).

The sand and silt concentration in the water supply under the No Action Alternative would not improve and may increase as a result of future climate impacts to glacial recession and landslide activity along the upper East Fork Hood River. Furthermore, the District would not have enhanced sediment settling capacity to mitigate these impacts.

6.7.1.4 Surface Water Quality

The District's diversion would continue to affect stream temperatures in the East Fork Hood River and the Hood River (ODEQ 2001). End spills of canal water would continue to discharge heat and turbidity in Neal, West Fork Neal, Lenz, Whiskey, and Odell creeks and continue having the potential to transport herbicides, pesticides, and other contaminants to the aquatic ecosystem. Under

²⁷ EFID current system demand is 117 cfs based on its maximum diversion rate (2001-2017) (FCA 2018a). Subtracting the estimated 16.6 cfs of water lost through end spills in the conveyance system, the current EFID irrigation demand is approximately 100.4 cfs.

the No Action Alternative, District operations would continue to have minor to moderate impacts to surface water quality.

6.7.1.5 Groundwater

Continued District operations are not anticipated to affect groundwater resources. Precipitation is the major source of aquifer recharge in the Hood River basin, while canal seepage is estimated to contribute only 1 percent of the total recharge (Reclamation 2015).

Ecosystem services provided by water in the East Fork Hood River are impacted by the No Action Alternative in the following ways:

Provisioning Service, Irrigation Water: Under the No Action Alternative, there would be no effect on irrigation water because the amount of water diverted from the East Fork Hood River for irrigation purposes would largely remain the same. The District would continue to pipe open canals at a pace dependent on the availability of public funding, which is not reasonably certain to be available at a scale large enough to fully modernize the District's infrastructure. Any increase in irrigation water conveyance efficiency would, therefore, match the pace of this slow modernization if it occurs. Patrons would likely continue to participate in voluntary water cutbacks, particularly during the end of irrigation season and during drought years when surface water flow in the East Fork Hood River is low.

Regulating Service, Water Quality: Under the No Action Alternative, there would be no effect on water quality. Low streamflow in the East Fork Hood River downstream of the District's diversion would continue to contribute to water temperatures that are often warmer than state standards during the irrigation season. Low quality water from end spills would continue to contribute glacial turbidity, any non-source pollutants, and warm water to cool, smaller tributaries.

6.7.2 Piping Alternative

6.7.2.1 Water Rights

Following construction of the Piping Alternative, EFID would create permanent instream water rights in the East Fork Hood River through Oregon's Allocation of Conserved Water Program (ORS 537.470). The amount of water allocated instream through this program would be determined based on the amount of water saved throughout the irrigation season of April 15 to September 30. The District has estimated that the elimination of end spills under this alternative would save up to 16.6 cfs or 5,827 acre-feet annually. Under this alternative, the District would legally reduce their water right and protect 75 percent²⁸ of the total water saved instream, or up to 12.45 cfs. The District would allocate this water instream in increments after completing each project group, protecting this water downstream from EFID's diversion with a water right having the same priority date as the District's original 1895 right. Following the completion of each project group, EFID

²⁸ EFID's Conserved Water Policy, adopted in 2007 and amended in 2014, states that if more than 25 percent of the funds used to finance the conservation measures are from federal or state public sources and are not subject to repayment, the instream percentage will equal the percentage of public funds used to finance the conservation project. The District anticipates that 75 percent of the funding for the proposed action would be from public sources not subject to repayment.

would work with OWRD and its partners to verify and measure all water savings prior to creating instream water rights.

This alternative is expected to benefit patrons by helping to ensure the delivery of water rights throughout the irrigation season. As project groups are completed, 25 percent of the total water saved (estimated to be up to 4.15 cfs) would be allocated to the District and would remain on its original water right certificate for irrigation. The District would use this water to increase the reliability of its water supply and improve its resilience to projected climate impacts. Additionally, by delivering cleaner irrigation water, patrons would be able to use smaller sized nozzles in sprinkler systems, which would lead to more efficient on-farm water use (EFID 2014).

No impacts to any other water rights in the basin are anticipated, although the potential for impacts to other water rights in the basin would be evaluated by OWRD as part of the conserved water application process. In particular, no effects on water rights are anticipated due to the elimination of end spill discharges. No water rights have been issued on the District's end spill water, and no water rights rely on the specific contribution of end spill water (R. Wood, Watermaster, OWRD District 3, personal communication, June 18, 2019).

6.7.2.2 Surface Water Hydrology

Under the Piping Alternative, end spill discharges of water maintained by the District would be eliminated and would not continue to alter the amount and variability of streamflow in Neal, West Fork Neal, Whiskey, Odell, and Lenz creeks during the irrigation season. Numerous additional, minor end spills would not return to other surface waters in the lower basin. This change is anticipated to have a minor effect on surface water hydrology because the affected streams would return to a more natural flow regime.

Enclosing canals may change local stormwater or surface water runoff patterns along the project area at locations where a canal may accept water from natural drainages and seeps along hillsides. This alternative is anticipated to have a minor effect on surface water hydrology because drainage measures would be incorporated into the engineering design that consider existing land use, and where feasible, restore the natural runoff patterns.

To address the identified watershed problems and resource concerns related to fish and aquatic habitat, the District would allocate 75 percent of the total water saved, or up to 12.45 cfs, to instream water rights, improving streamflow in the East Fork Hood River and the Hood River during the irrigation season. The remaining 25 percent of the total water saved, or up to 4.15 cfs, would be allocated to the District, increasing the reliability of the water supply for irrigation. Additionally, as sections of the District become piped and pressurized, the conveyance system would convert to an on-demand system, allowing more water to remain instream when not being used. The increased streamflow would lessen the impact of diversion on the natural flow regime in these rivers and improve the functioning of the aquatic and riparian ecosystem. These increases would occur throughout the irrigation season but provide the greatest benefits during the low flow period from late July through September. Effects on individual reaches are identified below.

East Fork Hood River Bypass Reach (RM 6.6 to RM 6.1): The District’s allocation of conserved water to instream water rights would allow the District to increase its current minimum streamflow in the bypass reach below the diversion by up to 80 percent, resulting in a change from 15 cfs to 27 cfs. A recent study by CTWS identified 27 cfs as the minimum streamflow required for the passage of adult Chinook salmon in the bypass reach (see Section 4.8.2); therefore, this project would provide a specific benefit to fish passage for a threatened fish species as well as improve overall aquatic habitat conditions, resulting in a major beneficial effect on this reach of the river.

East Fork Hood River to confluence with the Middle Fork Hood River (RM 6.1 to RM 0): The District’s allocation of conserved water to instream water rights would increase the historic August monthly average streamflow in the lower East Fork Hood River by up to 15 percent.²⁹ Compared to the average August streamflow during the 2015 drought, streamflow would increase by up to 38 percent, while the minimum daily August flow would increase by up to 60 percent. This change in streamflow would have a moderate, beneficial effect on this reach of the river with the greatest beneficial effect in dry and drought periods.

Hood River from the East Fork Hood River and Middle Fork Hood River confluence to Whiskey Creek (RM 14.6 to RM 3): The District’s allocation of conserved water to instream water rights would increase the historic August monthly average streamflow at the Tucker Bridge stream gage in the Hood River by up to 3 percent.³⁰ Compared to the average August streamflow during the 2015 drought, the August monthly average would increase by up to 5 percent. This change in streamflow would have a measurable, minor beneficial effect on the Hood River.

Hood River from Whiskey Creek to the Columbia River (RM 3.0 to RM 0): Under the No Action Alternative, all of the estimated 16.6 cfs of end spill returns to the Hood River at points that are upstream of, or at, RM 3.0, with the majority of end spill returning through Odell, Neal, and Whiskey creeks. Under the Piping Alternative, up to 75 percent of the conserved water would remain instream while up to 25 percent or 4.15 cfs would be allocated for out of stream use for irrigation. As a result, this reach of the Hood River would experience a decline of up to 4.15 cfs or approximately 1 percent of August monthly average streamflow and up to 2.3 percent during extreme drought conditions such as those occurring in September 2005.

6.7.2.3 District Operations and Water Supply

Implementation of the Piping Alternative would benefit District operations and irrigation water supply. Patrons would benefit from an on-demand system that would operate with the flow rate and pressure required by on-farm irrigation systems with timing, duration, and frequency decided by the farmers (Calejo et al. 2008). Converting to a piped conveyance system would allow for improved system operation, greater system efficiency, and more responsive water management.

The Piping Alternative would result in a total water savings of up to 16.6 cfs, of which 4.15 cfs would be allocated to the District to benefit EFID patrons. In a basin where climate warming is predicted to reduce summer streamflow and intensify competing demands for water, EFID would be able to provide a more reliable water supply to patrons without increasing the amount of water

²⁹ Based on average August monthly streamflow of 85 cfs at RM 1 for the period 1996 to 2017. Data from Philip Simpson, ODFW.

³⁰ Average monthly streamflow of 358 cfs for the period 1996 to 2017. USGS Gage No. 14120000 Hood River at Tucker Bridge.

diverted. The projected water shortage in EFID from climate change impacts under the Piping Alternative would be 9 percent, or roughly 9.2 cfs at least 1 year every decade, compared to 22 percent (roughly 25.8 cfs) under the No Action Alternative (Appendix D and Section 6.7.1.2). While this alternative is not intended to eliminate all future drought and climate-related water shortages in EFID, it would reduce the severity of water shortages compared to the No Action Alternative.³¹

Enhanced sediment settling capacity under the Piping Alternative would limit the sand and silt concentration in the District's water supply and mitigate potential future climate-related increases in the East Fork Hood River's sediment load due to accelerated glacial recession and landslide activity.

6.7.2.4 Surface Water Quality

Additional streamflow would affect water quality in the East Fork Hood River which currently does not meet Oregon water quality standards and is listed as water quality limited under Section 303(d) of the CWA (33 U.S.C. 1251 et seq.). Section 4.7.3 provides more detail on water quality impairment in the East Fork Hood River and in other waterbodies affected by the Piping Alternative. Although the allocation of conserved water to an instream water right under this alternative would not provide a sufficient water volume to reduce temperatures enough to meet Oregon water temperature standards, the increased streamflow following completion of all project groups would likely improve water temperatures in the East Fork Hood River downstream of EFID's diversion while having a negligible effect on water temperature in the Hood River. Additional streamflow would also benefit wetland and riparian areas along these streams by improving their ecological function, subsequently enhancing water quality.

The Piping Alternative would eliminate approximately 25 end spill return flows to lower basin streams including Neal, West Fork Neal, Odell, Lenz, and Whiskey creeks and the Hood River. This end spill water is typically warmer than the receiving waterbody, has high glacial turbidity, and contains a high risk of nonpoint source contamination due to the interaction of the District's open canals with agricultural lands and roads. The potential for contaminant delivery to streams through air, wind, infiltration, runoff, and other pathways would continue; however, the risk of nonpoint source pollution from the irrigation system would be eliminated. This change would result in a negligible to moderate improvement in turbidity and temperature, with the most improvement expected in the Neal Creek system because of the volume of the end spill removed relative to streamflow in the creek.

Eroded soil from construction sites could be carried to nearby streams during construction and for a short time thereafter; however, the effect of construction activities on water quality is expected to be negligible and temporary because construction BMPs to control soil erosion would be used in the proposed action.

In summary, water quality would improve in the East Fork Hood River due to improved streamflow under the proposed action. The effect on water quality in the Hood River would be beneficial but negligible due to the small quantity of added streamflow relative to the volume of the river. Although streamflow in Neal, West Fork Neal, Odell, Whiskey and Lenz creeks would be reduced

³¹ Other District strategies to address future shortages include additional water savings from on-farm irrigation upgrades, a potential Hood River basin water bank, and a longer-term plan to develop reservoir storage.

during the irrigation season under this alternative, water quality would be expected to improve in these tributaries because end spills containing glacial silt, heat, and potentially herbicides, pesticides, and other nonpoint source contaminants would be eliminated.

6.7.2.5 Groundwater

No groundwater would be used as part of the Piping Alternative; however, piping the irrigation canals could affect groundwater by reducing canal seepage. This alternative is expected to have a negligible long-term effect on groundwater resources and wells in the project area because the vast majority of aquifer recharge in the basin is from precipitation as previously noted in Section 4.7.4

Ecosystem services provided by water in the East Fork Hood River are impacted by the Piping Alternative in the following ways:

Provisioning Service, Irrigation Water. There would be a moderate, long-term effect on irrigation water after implementation of the Piping Alternative. Water conveyance through closed pipe would improve efficiency by eliminating water loss due to end spills which, in turn, would allow the District to deliver a more reliable water supply to patrons while diverting less water from the East Fork Hood River. Modernization of District irrigation infrastructure would allow EFID to allocate up to 25 percent of the conserved water to improve the reliability of irrigation water supply, particularly during drought years (Section 6.7.2.1). Currently, the District undergoes voluntary curtailment of water during drought, which has occurred approximately 1 in 10 years, resulting in economic losses from decreased agricultural yield. The Piping Alternative would reduce the effect of future water shortages; enable the District to be more resilient to environmental changes; and reduce agricultural yield losses, which would provide an average economic annual benefit of \$1.36 million (see Appendix D for details).

Regulating Service, Water Quality. After modernization of District infrastructure, less water would need to be diverted from the East Fork Hood River to fulfill patron's water rights, leaving more water instream by eliminating end spills. Additional streamflow during the irrigation season would assist in regulating water temperature against hot, ambient temperatures in summer months, moving water temperatures towards ODEQ's temperature criteria for the East Fork Hood River and other affected waterbodies downstream (Section 4.7.3.1). Although elimination of end spill discharges would reduce streamflow in tributaries such as West Fork Neal Creek, an associated reduction in turbidity and pollutant risk would improve water quality in these waterbodies. For example, end spill discharges into West Fork Neal Creek were found to be warmer and more turbid than the creek upstream of the discharge location (Section 4.7.3.1). Quantitative data regarding water quality under the Piping Alternative is not available, however, eliminating poor water quality end spills would improve stream water quality and the instream resources that water quality regulates.

6.8 Fish and Aquatic Resources

6.8.1 No Action (Future without Federal Investment)

6.8.1.1 General Fish and Aquatic Species

The District would continue to divert water at the current rate from the East Fork Hood River for consumptive use and maintain end spills that return to streams in the lower Hood River basin. This

would continue to alter the natural streamflow regime in the East Fork Hood River, the Hood River, and the tributaries receiving end spills. Fish screens near the District diversion would continue their current function to prevent fish from entering the irrigation system from the East Fork Hood River. Ongoing water quality impacts from end spills would continue to affect fish and aquatic life in receiving streams. Under the No Action Alternative, habitat supporting general fish and aquatic species would be similar to current conditions. During the irrigation season, reduced streamflow in the lower East Fork Hood River would continue to diminish the availability of fish habitat, impede adult fish passage, and contribute to warmer temperatures for fish and aquatic species.

6.8.1.2 Federally Listed Fish and Aquatic Species

Under the No Action Alternative, designated critical habitat supporting ESA-listed threatened populations of Lower Columbia River steelhead, and coho and Chinook salmon, and Hood River bull trout, would remain similar to its current state except that habitat quantity and quality would be at greater risk from the projected warmer temperatures and lower summer streamflow associated with the changing climate. The minimum instream flow provided by the District in the East Fork Hood River at the EFID diversion would remain at its current level of 15 cfs. The District would not be able to provide the 27 cfs minimum flow that has been identified as necessary to maintain the upstream passage of adult Chinook through the bypass reach below the diversion (Eineichner 2018).

Ecosystem services provided by fish and aquatic species in the East Fork Hood River are impacted by the No Action Alternative in the following ways:

Provisioning Service, Instream Fish Populations: Harvest of anadromous fish would not be affected and would be available when runs are sufficiently large to sustain fishing. Rainbow trout would continue to be stocked in lakes and reservoirs to provide recreational fishing opportunity in the basin. Although ODFW and CTWS are working to restore anadromous fisheries in the basin, the pace is likely to be slow and limited by available instream habitat.

Cultural Service, Threatened Species, Species of Concern: Habitat supporting populations of threatened fish species would not be affected. Any improvement would depend on the future pace of modernization and streamflow restoration, for which the timing and certainty of implementation would be unknown. Habitat limitations for Pacific salmon and lamprey would continue to negatively affect fishing, community, health, cultural identity, subsistence, and religious tribal values.

6.8.2 Piping Alternative

6.8.2.1 General Fish and Aquatic Species

The District's allocation of up to 12.45 cfs of conserved water to instream water rights would improve streamflow and water quality in the lower East Fork Hood River downstream of the EFID diversion and in the Hood River, improving habitat for fish and aquatic species over 21.2 river miles. The lower East Fork Hood River is identified as the highest priority for streamflow restoration in the basin (Shively 2006). Streamflow would increase by up to 83 percent immediately below the diversion (RM 6.6) and by as much as 50 percent near the river mouth during the critical late

summer period.³² The additional streamflow would improve the quantity of suitable habitat for spawning, rearing, and migration of salmon and steelhead, and contribute to improved water quality and riparian habitat for these species. Resident fish species and their macroinvertebrate prey would also benefit from improved habitat with the additional streamflow. State instream water rights have been established in the East Fork Hood River to protect fish and wildlife resources. Currently, these junior water rights are not met during the latter half of the irrigation season. Although the allocation of up to 12.45 cfs to instream uses under this alternative would not be sufficient to meet the state instream rights during the summer months, it would help to decrease the magnitude of the shortfalls.

The Piping Alternative would have beneficial effects on fish and aquatic species in the Hood River from its confluence at the East and Middle Forks of the Hood River (RM 14.6) to the Columbia River because enhanced streamflow would increase the amount of available habitat, increase thermal resistance to stream heating, and reduce the potential discharge of contaminants from nonpoint sources of pollution through the elimination of end spills. The benefits to fish and their habitat would be realized incrementally following the completion of each project group and would continue to persist after the project is complete.

The District's fish screens would continue to prevent fish from entering the District's canals and pipelines from the East Fork Hood River. However, a small number of fish may occur within the larger canals from unknown sources (see Section 4.8.1). The District would consult with ODFW and CTWS prior to construction, and a fish salvage effort would likely be required to capture any fish in canals and return them to the East Fork Hood River. The effect of the Piping Alternative on any resident fish populations or macroinvertebrates and amphibians that may utilize the irrigation canals is expected to be minor. The habitat function provided by the canals is low given the absence of year-round flow, the annual mortality resulting from canal dewatering, canal maintenance activities, and because a fish salvage effort would be conducted in the canal prior to construction. Further, the increased streamflow provided under this alternative would improve habitat conditions for resident and anadromous fish and aquatic life within the East Fork Hood River and, to a minor extent, within the Hood River. Increased streamflow would incrementally reduce summer stream temperatures and would potentially increase riparian vegetation and shade levels along the East Fork Hood River.

After end spills are eliminated, streamflow during the irrigation season would be reduced in portions of Neal, West Fork Neal, Lenz, Odell, and Whiskey creeks, returning these streams to a more natural hydrologic regime (Section 6.7.2.2). This reduction in streamflow may decrease riparian vegetation growth along affected stream areas. Based on temperature monitoring in West Fork Neal Creek indicating that end spill water was an average of 5 °F warmer than the receiving stream (Section 4.7.3.1), any adverse effect from reduced riparian shade on water temperatures is anticipated to be offset by the removal of warm end spills. Removal of end spills would also remove a source of both glacial turbidity and nonpoint source contaminants, improving water quality in the

³² Compared to the current minimum instream flow requirement of 15 cfs in the bypass reach below the diversion, and to an observed 7-day low flow of 25 cfs at RM 1 above the confluence with the Middle Fork Hood River (8/17/2015 to 8/23/2015, data from Philip Simpson, ODFW).

receiving waterbodies. For example, available monitoring data suggests that removal of end spill could reduce water turbidity in West Fork Neal Creek by 7.6 Nephelometric Turbidity Units (Stampfli et al. 2012). Turbidity affects photosynthesis and the primary productivity that supports the food chain for aquatic species. Turbidity can reduce primary productivity even at very low levels (Lloyd 1987). In general, the improved water quality and return to a more natural flow regime under the Piping Alternative is expected to produce a net benefit to fish and aquatic species in the lower basin streams that are affected by end spill discharges.

6.8.2.2 Federally Listed Fish and Aquatic Species

The Piping Alternative would affect four federally listed, threatened fish species including Lower Columbia River coho and Chinook salmon (spring and fall populations), steelhead trout (summer and winter populations), and Hood River bull trout. Within the affected area, each of these species occurs in the Hood River from its confluence with its East and Middle forks (RM 14.6) to the Columbia River, and in the East Fork Hood River (RM 6.6 to RM 0) except potentially bull trout, which is not documented to occur in the East Fork Hood River above its confluence with the Middle Fork Hood River. Coho and steelhead are known to occur in Neal Creek and may occur in Odell Creek. Coho salmon have the potential to occur in Whiskey and Lenz creeks.

As noted in Section 4.8.2., coho, spring Chinook, and summer-run steelhead populations in the Hood River basin currently have a very high risk of extinction, while winter-run steelhead have a moderate risk of extinction (ODFW 2010). Low streamflow is identified as a primary limiting factor to the recovery of listed salmon and steelhead in the basin (NMFS 2013). The allocation of up to 12.45 cfs of conserved water under this alternative would enhance streamflow in the East Fork Hood River during the irrigation season, and permanently protect this water for instream use. This additional streamflow would improve the quantity of habitat suitable for coho spawning and migration, and for Chinook and steelhead spawning, rearing, and migration and would enhance water quality and riparian habitat for these species. Improved streamflow would also increase the quantity of habitat available for their macroinvertebrate prey. The allocation of 12.45 cfs would allow the District to raise its current, interim minimum instream flow target of 15 cfs in the half-mile long bypass reach downstream of EFID's diversion. Fish passage conditions for spring Chinook in the bypass reach are marginal at 15 cfs (McCanna and Eineichner 2012). A multi-year study conducted by CTWS indicates that a permanent minimum of 27 cfs is required to improve and maintain fish passage for adult Chinook (Eineichner 2018).

A modeling study of streamflow and fish habitat relationships was conducted in the East Fork Hood River by Normandeau Associates, Inc. (2014) and its results were used to further quantify the benefits to listed species of allocating 12.45 cfs for instream use under this alternative. Streamflow in the lower river downstream of the EFID diversion under dry conditions is typically 40 cfs or less during the spawning period for Chinook salmon and the onset of the spawning period for coho salmon. The study results indicated that even a 10 cfs increase from 40 cfs to 50 cfs would increase the area of suitable spawning habitat for Chinook by up to 34 percent and the area of suitable spawning habitat for coho by up to 23 percent. These study results also indicated that suitable juvenile rearing habitat area in the lower river would increase by up to 8 percent for steelhead and by

1 percent for Chinook, although suitable coho rearing habitat area would decline by 8 percent.³³ Overall, this action would benefit coho, Chinook, and steelhead and their critical habitat. All freshwater PCEs for coho, Chinook, and steelhead would benefit from the Piping Alternative (see Appendix E). The ESA Recovery Plan for Lower Columbia River Salmon and Steelhead (NMFS 2013) identifies a framework for conservation and recovery and a set of goals and actions for each listed population that, if implemented, would lead to recovery. The Piping Alternative would help meet the plan’s objectives to implement actions that conserve water and aid in restoring the natural flow regime.

This alternative is likely to have a negligible effect on bull trout because they are not documented to occur in the East Fork Hood River, where no critical habitat is designated for bull trout; and the change in streamflow downstream in the Hood River from the allocation of conserved water would not be sufficient to produce a discernable effect on the bull trout population or on the PCEs for this species in their designated critical habitat in the Hood River.

While the magnitude and direction of effect varies by the species, life stage, and stream reach affected, the Piping Alternative would generally have a moderate to major beneficial effect on federally listed fish species in the East Fork Hood River, and a negligible to minor beneficial effect in the Hood River and in the lower basin tributaries (Section 4.7.2) affected by District operations.

6.8.2.3 ESA Compliance

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 NOAA Fisheries 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 or NOAA Fisheries when any action that the federal agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species. Section 7 consultation with the Services would be conducted for federally listed Columbia River salmon and steelhead populations and Hood River bull trout because of the potential for project effects including beneficial effects on these species.

Ecosystem services provided by fish and aquatic species living in the East Fork Hood River are impacted by the Piping Alternative in the following ways:

Provisioning Service, Instream Fish Populations: Over the long-term, increased streamflow as a result of the Piping Alternative would improve habitat for resident and anadromous fish species during the irrigation season. Although data are not available to quantify improvements in fish populations with

³³ This result is attributed to the preference of juvenile coho for slow water velocities that can decrease in mid-channel areas as streamflow increases and be maintained only along the stream margins (Normandeau Associates, Inc. 2014). The availability of slow water habitat in both mid-channel and stream margin habitat is expected to increase following planned large woody debris placement in the lower East Fork Hood River (R. Gerstenberger, Fish Biologist, CTWS, personal communication, November 21, 2019).

increased streamflow, the benefits of allocating conserved water instream are evaluated in Appendix D. Furthermore, allocation of conserved water instream would likely assist in the recovery efforts of Pacific salmon and lamprey by ODFW and CTWS. Bolstering anadromous fish populations may allow for more consistent fishing for harvest and consumption.

Cultural Service, Threatened Species, Species of Concern: Following the project, the water allocated instream during the irrigation season would have a beneficial effect on instream habitat for Pacific salmon, a tribal trust and treaty fisheries resource of CTWS, and the Pacific lamprey, a tribal icon, which have been in decline for many decades. Instream habitat improvement would assist CTWS efforts to ensure that Pacific salmon and lamprey are not lost from local rivers and that cultural traditions would continue to be passed from one generation to another. At this time, quantification of these cultural ecosystem services is not available; however, benefits to Pacific salmon and lamprey would positively contribute to CTWS goals to enhance fishing, community, health, cultural identity, subsistence, and religious tribal values (Close et al. 2002; CTWS 2019).

6.9 Wetlands and Riparian Areas

6.9.1 No Action (Future without Federal Investment)

The No Action Alternative would have no effect on wetlands as the District’s canals would continue to exist as seasonal artificial wetlands and water diversion would continue to alter the natural hydrograph that supports natural wetlands along 6.6 miles of the East Fork Hood River downstream from EFID’s diversion. Conditions that have allowed hydrophytic plants to opportunistically grow along open canals and laterals would continue. Streamflow in five lower Hood River tributaries would continue to be artificially supplemented by end spills and potentially affect the growth of riparian vegetation along affected stream reaches.

6.9.2 Piping Alternative

6.9.2.1 Wetland and Riparian Areas in or Adjacent to the Project Area

Approximately 42.2 acres in the project area are identified as wetlands in the NWI GIS data (USFWS 2016). However, a further GIS analysis of the NWI mapping information indicated that most of the wetlands classified by the NWI as natural wetlands are instead EFID canals. When excluding the canals, a total of 36 acres of artificial wetlands and 6.1 acres of natural wetlands may occur within the project area (FCA 2019). The canals themselves are classified as seasonally flooded, artificial wetland features generally within the categories of “PUSC_x (Palustrine, Unconsolidated Shore, Seasonally Flooded, and excavated by humans)” or “R4SBC_x (Riverine, Intermittent, Streambed Seasonally, and excavated by humans)” (USFWS 2016). Most of the natural wetlands in or adjacent to the project area intersect the canal system and are classified as Freshwater Emergent Wetlands and/or Forested/Shrub Wetlands. These sites have not been field-verified and a wetland delineation has not been performed at the time of the development of this Plan-EA.

Canals within the project area are not anticipated to be jurisdictional wetlands based on a review of the exemptions under the Oregon Removal-Fill statute (OAR 141-085-0515(9)) and in language provided in the 1986 Final Rule for “Regulatory Programs of the Corps of Engineers” (see

Section 4.9). Consultation with USACE and ODSL would be completed prior to construction of each project group to ensure that these exemptions apply.

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

Opportunistic hydrophytic plants occurring in some areas along canal banks could be removed or buried during excavation, fill, placement of pipe, or other construction activity. Construction would permanently convert the open canals in the project area from artificial wetlands to vegetated upland areas, and the opportunity for hydrophytic plants to grow alongside canals would no longer exist. The canals themselves are not functioning wetland habitats due to their artificial flow and inundation pattern based on irrigation needs, and routine canal maintenance activities.

Completion of pipe installation could alter the hydrology of adjacent natural wetlands if they are dependent upon end spill or canal seepage for water. However, conversion of open canals to buried pipe could potentially improve the hydrology of those wetlands that transect the canals because the capture of surface water runoff in the canals would no longer occur. The Piping Alternative would have no effect on existing excavated ponds in or near the project area.

Overall, the Piping Alternative would have a minor effect on wetlands in or near the project area because most wetlands affected would be non-jurisdictional, man-made canals with low habitat function, and the District would follow appropriate reclamation procedures to revegetate disturbed areas as uplands. Disturbance to natural wetlands during construction activity would be avoided to the extent practicable, and any unavoidable effects on natural wetlands would be temporary and minimized through BMPs.

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. Coordination and consultation with USACE would occur prior to the implementation of each project group to confirm that canals and laterals within the project group meet exemption criteria.

6.9.2.2 Floodplain Areas in or Adjacent to the Project Area

Based on the available Federal Emergency Management Agency Flood Insurance Rate Maps for Hood River County, the proposed sedimentation basin construction site would occupy up to 1.1 acres of 100-year floodplain.³⁴ Construction activities for the sediment basin would include excavation and fill, realignment of approximately 150 feet of existing gravel access road, and removal of approximately two dozen trees and additional shrubs. The area that would be affected by these

³⁴ The District would work with a qualified engineer prior to further project review to precisely determine whether the construction site is located within the 100-year floodplain. This step was recommended by the Hood River County Floodplain Administrator (E. Walker, Hood River County Community Development Director, personal communication, November 26, 2019).

activities has been altered by past District construction and maintenance activities. The proposed action would not directly or indirectly support additional floodplain development. The sedimentation basin plan would be reviewed by all applicable local, state, and federal agencies to comply with floodplain rules and with EO 11988,³⁵ and mitigation requirements would be employed as required to address any floodplain impacts. The sediment basin would not require a County building permit, however the Hood River County Planning Department would review the project for compliance with both Floodplain and Stream Protection overlay zoning rules.

6.9.2.3 Wetland and Riparian Areas along Natural Waterbodies Associated with District Operations

Allocation of conserved water under this alternative would increase streamflow during the irrigation season in the East Fork Hood River and the Hood River by up to 12.45 cfs, contributing incrementally to a more natural flow regime for natural riverine wetlands and greater access to water to support hydrophytic riparian plants such as willow, cottonwood, alder, sedge, and rush. The elimination of end spills under this alternative would restore a more natural flow regime while reducing streamflow in several small lower Hood River tributaries during the irrigation season (Section 6.7). The reduction in available water may incrementally affect wetlands and riparian vegetation growth along these tributaries, however, the water quality risk from pollutants such as fertilizer, pesticides, and herbicides potentially contained in end spills of canal water would be reduced.

6.10 Wildlife Resources

6.10.1 No Action (Future without Federal Investment)

Under the No Action Alternative, the wildlife communities in the project area would continue to use the artificial wetlands with opportunistic hydrophytic plants created by the District's open canals. Low summer streamflow would continue to limit natural wetland and riparian habitat along the East Fork Hood River and potentially along the Hood River.

6.10.2 Piping Alternative

During construction, terrestrial wildlife could experience noise disturbance due to heavy equipment operation, habitat removal due to tree cutting and other vegetation removal, or injury due to collision with construction equipment or habitat removal. Most of the canal length to be piped and all pipelines to be replaced are in or adjacent to busy agricultural areas where heavy equipment use is commonplace; therefore, most wildlife in the area is accustomed to noise and the disturbances are anticipated to be minor.

Portions of the canals in the project area provide artificial, seasonal riverine wetlands and elements of riparian habitat, as well as a source of water for wildlife. As canals are piped and habitats shift from artificial wetlands to uplands, distribution patterns of wildlife within the area could change. Deer and elk could alter their land use or travel patterns in response to removal of these water

³⁵ 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.

sources and the vegetation they support. Densities of smaller animals' dependent on these habitats could decrease locally, and shift to more suitable habitat in the area.

Water is not a limiting factor for terrestrial wildlife in the project area and vicinity (J. Thompson, ODFW District Wildlife Biologist, personal communication December 6, 2018). Natural streams with perennial flow exist sufficiently close to the canals³⁶ and would provide alternative drinking water sources for wildlife. As this alternative would be implemented over time, ungulates and other terrestrial wildlife would have time to adjust and find new water sources. Vehicle collisions with wildlife would not increase as a result of canal piping because wildlife are not expected to be required to cross busy arterials to access alternative water sources. Although some species may use canals as a water source, canals and laterals can also have adverse effects on wildlife due to drowning mortality and the barrier that they present to movement for some terrestrial species (Beier et al. 2008). The Piping Alternative would remove such barriers and drowning hazards for terrestrial wildlife as canals are converted to buried pipelines.

No nest sites for bald or golden eagles are reported in or near the project area. In the unlikely event that an eagle nest or active raptor nest is observed in or near the project area, the District would work with a USFWS biologist to determine how best to operate within the project area to minimize any potential effects. Under the Piping Alternative there would be no permanent long-term effects on migratory birds and their habitat. Migratory birds, if present, may experience minor short-term disturbance and displacement during construction.

Construction activities would have short-term, minor effects on wildlife due to increased human presence. Human presence is already fairly high in the project area. Over the long-term, piping of irrigation systems could potentially reduce human presence in the project area, as fewer trips to maintain ditches and delivery gates would be required. This would improve seclusion for wildlife.

The Piping Alternative would have no effect on threatened or endangered terrestrial species. As noted in Sections 4.10.3 and 4.10.4, no federally or state designated species or federally designated critical habitat occurs within the project area or planning area with the exception of bull trout, steelhead, coho and Chinook, which are discussed in Section 6.8.

Allocation of up to 12.45 cfs of conserved water to instream use under this alternative would improve streamflow in the East Fork Hood River and the Hood River during the irrigation season. Improved streamflow would provide more consistent access to water for hydrophytic plants, and this would in turn enhance riparian vegetation and the associated wildlife habitat. Overall, the Piping Alternative would have a long-term, minor effect on wildlife in the project area.

6.11 Cumulative Effects

This section includes a description of past, current, reasonably foreseeable future actions, and cumulative effects organized by resource. Cumulative effects are defined as the impact to the environment which results from the incremental impact of an action when added to other past,

³⁶ The furthest distance from any point along a canal to a perennial stream is approximately 1.5 miles.

present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

6.11.1 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, and transportation infrastructure. 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 canals in EFID’s system date from 1895 or earlier when the East Fork Irrigation Canal Company—formed from the Valley Improvement Company—filed a Notice of Appropriation with OWRD to provide water to surrounding farms (EFID 2011). The District was organized in 1913 and began a program of 1) enlarging canals and ditches with teams of horses and by hand labor, 2) constructing wood stave and concrete pipelines, and later 3) replacing many of these pipelines with steel, asbestos cement, or PVC plastic pipelines. During dry and drought years in the past, the District diverted the entire flow of the river as was authorized under its senior water rights.

Four other major irrigation districts were developed within the Hood River basin during this timeframe, collectively altering the natural hydrology of the Hood River and its tributaries. These other irrigation districts are MHID, Farmers Irrigation District (FID), Dee Irrigation District (DID), and Middle Fork Irrigation District (MFID). These districts have invested significant resources to modernize their systems to fully piped and pressurized water delivery.

6.11.2 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.

6.11.2.1 Land Use and Development

Ongoing agricultural activities including fruit orchards and pasture 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 Hood River County Comprehensive Plan and Hood River County zoning regulations. Under current zoning, the majority of land in or near the project area is EFU land or forest, although residential or other development activities are expected to increase in the future where allowed. Crystal Springs Water District, a domestic water utility serving the EFID area and vicinity, plans to replace and upsize several of its water pipelines over the next 20 years. Public lands would continue to be maintained for their intended uses.

6.11.2.2 Other East Fork Irrigation District Modernization Goals

SIPs completed by the District include the potential addition of one or two small in-conduit hydroelectric generation stations to produce revenue for the District and clean energy for the region. The District has had a longtime goal to find a suitable site and construct a storage reservoir to reduce its reliance on natural streamflow and better meet future water supply needs given a highly variable snowpack and climate trends. The District also plans to replace its existing fish screen facility with a horizontal fish screen design, and to install a telemetry system to relay flow information from various points in the system and automatically adjust its diversion. Another long-term goal of the District is to establish a metering system that at a minimum could measure water usage at key points in the system. The installation of meters in the piping network at key laterals and branches would provide the District with water usage data over time that could be utilized to help prioritize future improvements, identify localized areas of leakage, and determine water use patterns (Wharry 2016).

6.11.2.3 Basinwide Irrigation District Modernization Goals

The four other major irrigation districts, the MHID, FID, DID, and MFID in the Hood River basin are either fully piped and pressurized, or working to complete full pressurization of their infrastructure at this time. DID and FID have allocated or plan to allocate up to 100 percent of the water saved as result of recent modernization projects to instream use. FID is currently working to increase storage in their Kingsley Reservoir, and MFID is working to complete fish passage improvements and increase storage at their Laurence Lake Reservoir³⁷. These districts have begun to pursue the necessary funding and permitting for these projects, which are scheduled for completion over the next 10 years. Each of these projects is contingent on the availability of funding.

6.11.2.4 Dog River Pipeline Replacement

The City of The Dalles plans to replace its aging municipal water supply pipeline, which conveys water that is diverted from Dog River, a small tributary entering the East Fork Hood River approximately 3.5 miles upstream of the EFID diversion. The pipeline capacity would be expanded from 12.4 cfs to 26.3 cfs to meet the City's future water demand (Eineichner 2018).

6.11.3 Cumulative Effects by Resource

Cumulative effects are considered for each resource in consideration of past, present, and reasonably foreseeable future actions.

6.11.3.1 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. Prior to construction of each project group, the District would hire a cultural resource specialist to

³⁷ These reservoirs are not associated with EFID operations.

complete surveys for historic properties in the project area. Mitigation measures for reasonably foreseeable future projects could be similar to any measures identified for the proposed action.

In addition, Bonneville has executed a Memorandum of Agreement with Oregon SHPO to mitigate adverse effects on the EFID. The undertaking consisted of converting open irrigation canals to closed piped irrigation, and installation of a permanent water diversion, headway, and fishway.

Effects on historic canal structures would be completed in compliance with the NHPA. EFID is eligible for inclusion in the NRHP as an Historic District under Criterion A (36 CFR 60.4(a)) for its association with the development of irrigated agriculture in the Hood River region. Additionally, EFID is eligible for inclusion in the NRHP under Criterion C (36 CFR 60.4(c)) as a “significant and distinguishable entity whose individual components may lack individual distinction” (NPS 1995:20).^{38,39} The period of significance for EFID ranges from 1914 to 1917, when the majority of the EFID system was planned and built. This includes the system that EFID acquired from the East Fork Irrigation Canal Company in 1914. The integrity of the system as a whole has not been assessed.

Piping projects could impact the integrity of the irrigation ditches and may have an adverse effect on the resource. If projects are determined to constitute an adverse effect on the EFID Historic District, the ACHP would be notified and SHPO and appropriate consulting parties would be consulted to develop mitigation measures and Memorandum of Agreement.

6.11.3.2 Land Use

The project area has been substantially altered over the past century by a variety of human activities, including agricultural development, livestock grazing, timber harvest activities, residential development, and road construction. EFID would coordinate with Crystal Springs Water District to explore whether an opportunity may exist to coordinate activity for planned domestic pipeline construction prior to construction of each project group in the proposed action. It has already initiated such coordination as requested by the Water District for a portion of Project Group 1. The proposed action and future irrigation modernization actions would support existing land uses. Since these actions would collectively support existing land use (predominantly agriculture), the proposed action would have negligible cumulative effects on land use.

6.11.3.3 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. Additional irrigation piping would improve public safety by eliminating the risk of drowning in open canals. In combination with past, present, and reasonably foreseeable future actions, the proposed action is anticipated to have minor cumulative effects on public safety.

³⁸ Concurred by the Oregon SHPO on May 1, 2013 (Case No. 12-1871).

³⁹ U.S. Department of the Interior, National Park Service. 1995 *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. Washington, DC.

6.11.3.4 Socioeconomic Resources

Past actions including agricultural development, other land development, and recently completed projects have had effects on socioeconomics. There are no other known future projects that would affect socioeconomic resources in Hood River County. 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.

6.11.3.5 Vegetation

Agriculture, forest management, transportation, and rural residential development have affected vegetation in the project area since the late 1800s. Agricultural activities have altered habitat in the region by removing native vegetation communities in some areas and replacing it with crops and fields, and by activities such as stream channelization and drain tile placement. Livestock pasture occurs in and around the project area and can result in the introduction and spread of weed species, degradation of native habitat, and trampling of riparian and wetland areas. Fire suppression has contributed to encroachment of Douglas fir stands within former native oak woodlands. These ongoing activities would continue to affect vegetation in the project area. Agricultural activities, forest management, 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. In addition, vegetation control activities generally include herbicide applications to control vegetation and noxious weeds, and 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 and forest management 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.

6.11.3.6 Visual Resources

Past land use actions have changed the visual character of the project area. Agricultural and development activities have altered visual resources in the region by removing native vegetation, adding new infrastructure, and creating increased human activity within the landscape. Within the project area, these types of actions are anticipated to continue and expand in the future. 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.

6.11.3.7 Water Resources

Past actions over the last 149 years, since the first water rights were developed in the basin, have affected water resources. These actions include urban and agricultural land development, road construction, reservoir development, water diversion, canal construction, as well as other land use practices and irrigation projects. The earliest water right priority date in the Hood River basin is August 1, 1870 held by the City of The Dalles for municipal supply. Since the late 1990s there has been increasing interest in conserving water in the Hood River. The District and other Hood River Valley irrigation districts have implemented various water conservation projects including piping existing irrigation canals, outreach and partnerships promoting on-farm conservation, and water

management changes that have contributed to increased streamflow in the Hood River. Water savings from infrastructure improvements and on-farm water use efficiency measures have increased the amount of water that is managed for instream use, and 4.58 cfs of this water to date has been legally protected instream within the basin by EFID and DID. EFID and FID have recently applied to OWRD to allocate an additional total of 2.025 cfs of conserved water for permanent instream use; these applications will be finalized within the next 5 years.

Further measures in EFID that are likely to occur following modernization include system metering with telemetry and continued outreach and partnership efforts to assist patrons with on-farm water use efficiency upgrades. Additional District goals that may be achieved in the future include the development of small in-conduit hydropower generation and reservoir storage.⁴⁰ These actions together with the Piping Alternative would affect streamflow and irrigation water supply in the East Fork Hood River and the Hood River. In-conduit hydropower is expected to have a negligible effect on streamflow since it would generate power with water already diverted for irrigation. A metering system is anticipated to have a minor effect since it would conserve additional water for instream and irrigation use. Construction of reservoir storage would have a minor effect on streamflow and a moderate effect on irrigation water supply as it would reduce winter and early spring streamflow while increasing water available for irrigation in the summer. These actions in combination with the proposed action are anticipated to benefit water resources and would help to mitigate the effects of climate trends on summer streamflow and irrigation water supply.

Planned actions by other irrigation districts and water utilities may affect streamflow and water supply in the basin. No reservoirs are connected with EFID operations, however, increases in water storage are planned by MFID at its Laurance Lake Reservoir, and by FID at its Greenpoint Reservoir. Voluntary cost-sharing, education, and technical assistance programs are ongoing in the basin to increase on-farm water use efficiency. These actions, accompanied by the proposed action, are expected to help mitigate the effects of water diversion and climate trends on summer streamflow while increasing the resiliency of irrigation water supplies. Crystal Springs Water District, which diverts water from springs on the East Fork Hood River above the EFID diversion, plans to construct a 550,000-gallon closed concrete reservoir to address water pressure and drinking water quality concerns and to upsize several of its pipelines to meet projected growth in water demand and for fire protection. Maximum water system demand (i.e., peak day diversion from its East Fork Hood River spring sources) is projected to increase modestly from 3.39 cfs in 2020 to 3.56 cfs in 2035 (Pace Engineers 2016). The City of The Dalles plans to expand the capacity of its Dog River Pipeline by 13.9 cfs to meet future water demand (Eineichner 2018). The City's water right allows for the diversion of all available streamflow in the Dog River (GSI 2014). In late summer and early fall, the City currently diverts the entire streamflow, typically 2.5 cfs to 3.5 cfs (D. Anderson, City of The Dalles, Public Works Director, personal communication, October 10, 2019). Therefore, any future increase in diversion associated with an expanded pipeline capacity is not expected to reduce streamflow in the Dog River, East Fork Hood River, or Hood River during the late summer low-

⁴⁰ Although there is no plan for reservoir construction at this time, it remains a District goal to have a moderately sized reservoir (e.g., 5 to 6 thousand acre-feet capacity) within the next 15 to 20 years if a feasible site and funding can be identified.

flow period. As a project mitigation measure, the City has proposed to release 0.5 cfs to Dog River past their diversion.

Most if not all canals elsewhere in the Hood River basin are already piped. Increased well development for residential or irrigation use in the basin may result in a minor local reduction in groundwater levels.

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 action. The proposed action would be constructed when there is no water in the canal system and construction BMPs would be used to avoid or minimize water quality effects; construction practices for other potential construction and development projects are anticipated to be similar. The proposed action is anticipated to contribute to water quality improvements from the elimination of end spills and increased streamflow in the East Fork Hood River.

The proposed action and other reasonably foreseeable future actions are anticipated to have a moderate cumulative effect on water resources; irrigation piping projects would eliminate water loss, increase the amount of water that is conserved in the Hood River basin, and improve water quality.

6.11.3.8 Fish and Aquatic Species

Past actions including agricultural development, railroad construction, road construction, road maintenance, timber harvest, and urban and residential development would have minor effects on fish in combination with the proposed action. The potential effects from these past projects in EFID and the Hood River basin, such as sediment entering waterbodies or aquatic habitat disturbance, would be temporary and likely complete before construction of the proposed action.

Because EFID's irrigation diversion is screened and the conveyance system does not provide functioning habitat for fish and aquatic species, the Piping Alternative would not have a direct effect on fish and aquatic species in the irrigation infrastructure itself. Irrigation diversion and end spill discharges are responsible for most of the past and ongoing direct and indirect effects on water quantity and quality for aquatic life and 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 would either improve aquatic habitat conditions or have a neutral effect. These future actions include upgrading EFID's existing fish screens with a horizontal screen that would fully meet current NOAA fish screen criteria; enhanced on-farm water use efficiency; modest increases in reservoir storage capacity to reduce reliance on diversion of live flow in summer; instream and riparian habitat restoration; and installation of small in-conduit hydropower stations.

The proposed action, when combined with other future actions, is anticipated to have a beneficial cumulative effect on fish, aquatic species, and available habitat for steelhead, Chinook, coho, and other species. Implementation of other irrigation efficiency, piping, and water conservation-related projects in the basin could have an additive effect on the amount of water conserved, and therefore would provide additional flexibility in managing water rights in the Hood River basin and may help to mitigate the effects of climate trends on streamflow and aquatic life.

6.11.3.9 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. Irrigation water flows in and along the banks of the canals and laterals has contributed to localized areas of hydrophytic and/or wetland vegetation within or adjacent to the project area. The proposed alternative 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 6.9.2). An estimated 6 acres of natural wetlands, most of which transect the canals, are known to occur within 100 feet of the project and may be affected by the project. While effects on these wetlands would be avoided, minimized, or mitigated, the project may have the potential to restore a more natural hydrologic pattern in those wetlands. 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.

6.11.3.10 Wildlife

Some wildlife currently use open canals as a drinking water source. While the proposed action would require wildlife to find other water sources, as they did prior to installation of the canals, it would also create connected habitat corridors through which wildlife could travel. Water is not considered a limiting factor for wildlife populations in the project area or the surrounding area. Since effects of the proposed action on wildlife would happen incrementally over the time required to complete the project, animals would be able to adapt. Additionally, because other past, present, and reasonably foreseeable future actions affect wildlife across a broad geographic area in the Hood River basin, the cumulative effect on wildlife from the proposed action would be minor.

In addition, vegetation control activities, including herbicide applications to control noxious weeds and mechanical cutting of vegetation, are ongoing actions that contribute to wildlife habitat changes. The amount of wildlife habitat that would be affected by the proposed action is small compared to the area affected by past and ongoing agricultural activities, livestock grazing, outdoor recreation, vegetation control, and urban and suburban development in the area. In addition, the intensity of these ongoing actions is not expected to change measurably in the future, resulting in minor additional cumulative effects.

6.11.3.11 Ecosystem Services

All reasonably foreseeable actions regarding modernization of irrigation infrastructure in the Hood River basin would work in concert to improve water conservation and water availability to irrigators. Past and ongoing actions described in the sections above have contributed to water availability for irrigators and instream flow. Past, ongoing, and reasonably foreseeable actions in the Hood River basin could all impact ecosystem services in the watershed. When combined with other future actions, the proposed action is anticipated to have a beneficial cumulative effect on all ecosystem services assessed.

7 Consultation, Coordination, and Public Participation

In the development of the Draft Plan-EA, the District and its partners planned and conducted a public scoping meeting, issued press announcements, and had frequent correspondence with federal, state, and local resource agencies, agriculture interests, and other interested 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 Preliminary Investigative Report (FCA 2018c) 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 Preliminary Investigative Report, project sponsors conducted initial consultation with natural resource agencies and stakeholders in the Hood River basin.

Public participation activities prior to release of the Draft Plan-EA included the following:

Public Announcements

- NRCS public notice (October 3, 2018)
<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/pnotice/?cid=nrcseprd1422829>
- Hood River News—three public notices (October 3, October 10, October 17, 2018)
- Postcard to District patrons (October 9, 2018)
- NRCS news release (October 11, 2018)
<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/releases/?cid=NRCSEP RD1423728>

Public Involvement Website

Information about the proposed project was added to Oregonwatershedplans.org, a website created to involve and inform the public. 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 Preliminary Investigative Report 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

7.1 List of Persons and Agencies Consulted

The following lists include persons and agencies with a vested interest in this 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 District include:

- City of Hood River
- Hood River County
- Hood River Soil and Water Conservation District
- Hood River Valley Parks and Recreation

Agencies that have been notified of or involved with the project include the following:

- Bonneville Power Administration (Bonneville)
- Oregon Department of Agriculture
- 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
- State Historic Preservation Office (SHPO)
- National Oceanic and Atmospheric Administration (NOAA) Fisheries
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Forest Service
- Wy’east Fire District

Tribes that have been consulted regarding the project include:

- Confederated Tribes of Warm Springs (CTWS)
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes and Band of the Yakama Nation

Other stakeholders that were notified about the project include:

- District patrons
- Columbia Gorge Fruit Growers

- Columbia Land Trust
- Oregon Water Resources Congress
- Farmers Irrigation District (FID)
- Middle Fork Irrigation District (MFID)
- Mount Hood Irrigation District (MHID)
- Thrive Hood River (formerly Hood River Residents Committee)
- Hood River Watershed Group
- WaterWatch of Oregon
- Trout Unlimited
- Interested public

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

Table 7-1. Agency Consultation Record.

Date	Contact, Agency	Communication
March 7, 2018	Rod French, ODFW	Description of EFID Coanda fish screen
June 6, 2018	Philip Simpson, ODFW	East Fork Hood River flow monitoring
July 25, 2018	Blayne Eineichner, Confederated Tribes of Warm Springs	Fish Species within waterbodies associated with district operations and reach of anadromous habitat
July 25, 2018	Christina Mead, U.S. Forest Service	Plants along irrigation canals East Fork Hood River Irrigation District
July 25, 2018	Chuti Fieldler, U.S. Forest Service	Potential aquatic and semi-aquatic species use of EFID irrigation canals
August 10, 2018	Bonnie Lamb, Oregon DEQ	303d listed waterbodies
September 14, 2018	Scott MacDonald, U.S. Forest Service	Firefighting and piping irrigation canals
September 18, 2018	Nancy Munn, NOAA	Programmatic consultation for NRCS project
October 24, 2018	Bonnie Lamb, Oregon DEQ	Information about Clean Water State Revolving Fund loans
November 26, 2018	Christina Mead, U.S. Forest Service	Requested review of a draft vegetation section of East Fork Draft Plan-EA
December 4, 2018	Jeremy Thompson, ODFW	Wildlife use of irrigation canals
December 12, 2018	John Buckley, EFID Cindy Thieman, Hood River Watershed Group Blayne Eineichner, CTWS Rachel Gebauer, NRCS Tom Makowski, NRCS	Discussion about cultural resources surveys, timeline, and next steps, particularly for the EC
January 7, 2019	Rachel Gebauer, NRCS Austin Green, CTWS Carey L. Miller, Confederated Tribes of the Umatilla Indian Reservation V. Kate Valdez, Confederated Tribes and Band of the Yakama Nation	Cultural resources consultation letters sent to SHPO, CTWS, Confederated Tribes of the Umatilla Indian Reservation, and Yakama Tribes

Date	Contact, Agency	Communication
March 12, 2018	Rachel Gebauer, NRCS Cindy Thieman, Hood River Watershed Group Blayne Eineichner, CTWS Tama Tochihara, Bonneville Israel Duran, Bonneville	Overview of Draft Plan-EA, planning for cultural resources survey on EC, and Bonneville’s role in past and future surveys
March 15, 2019	Rod French, ODFW	Request for input about report of fish remaining in two pools in the Main Canal following shutdown of diversion
November 7, 2019	Doug Thiesies, HRC Forestry	Request for input on proposed pipeline realignment through a portion of county land
November 26, 2019	Eric Walker, HRC Community Development	Request for preliminary input on proposed sedimentation basin and associated floodplain or land use requirements

7.2 Review of the Draft EA

[To be completed after public review of the Draft Plan-EA.]

8 Preferred Alternative

8.1 Selection and Rationale for the Preferred Alternative

NRCS has selected the Piping Alternative as the Preferred Alternative,⁴¹ based on its ability to meet the purpose and need for the project, best address the Federal Objective and Guiding Principles, and provide the most beneficial effects on environmental, social, and economic resources. The District has agreed that the Piping Alternative is their Preferred Alternative.

Although the Piping Alternative has been identified as the Preferred Alternative, there are other available steps towards conserving water and/or improving water delivery reliability within EFID. The Piping Alternative does not represent an endpoint to improving the use and conveyance of water throughout the District; rather, it details one step that would complement other methods for improving water conservation and/or delivery reliability in EFID.

Although the Piping Alternative would have minor effects on various resources (Section 6), those effects would be mitigated through BMPs and other compliance measures. As a tradeoff to those effects, the Piping Alternative would permanently protect instream flows in the East Fork Hood River and the Hood River, supporting ecological resources in and along the river system, particularly habitat and water quality resources. Additionally, as analyzed in the NEE, there would be positive economic benefits including increased instream flow, agricultural yield enhancement, reduced O&M costs, reduced carbon outputs, and reduced pumping costs. When compared to the No Action Alternative, in the face of current conditions and future environmental changes, the Piping Alternative would support the health and resiliency of the ecosystem downstream of the District's diversion as well as the agricultural resiliency of District patrons.

8.2 Measures to be Installed

The District would pipe and pressurize 56 miles of its system with HDPE gravity-fed pressurized buried pipe. Pipe would range in diameter from 4 to 66 inches. Additionally, a 30,000 square foot sedimentation basin would be installed immediately downstream of the sand trap for additional sediment settling.

In total, 61 pressure-reducing valve stations would be installed and 384 turnouts would be upgraded to pressurized delivery systems. The improvements would be split into three 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. Appendix D includes a detailed breakdown of project costs.

⁴¹ The "Preferred Alternative" is defined in the National Watershed Program Handbook as "The option and course of action that the Sponsoring Local Organization and NRCS agree best addresses the stated purpose and need."

Table 8-1. Summary of the District Canals and Laterals to be Piped under the Preferred Alternative.

Project Group	Project Components			Anticipated Year Construction Would Begin
	Length of Piping (mi)	Upgraded Turnouts	PRV Stations	
1	15.5	86	23	2020
2 ¹	26.4	158	15	2023
3	20.4	140	23	2028
Total	62.3²	384	61	-

¹ The sedimentation basin would be installed in Project Group 2.

² The total length of EFID’s system to be piped is 56 miles, but the installation of dual pipelines along the Main Canal would increase the total length of piping to 62.3 miles.

8.3 Minimization, Avoidance, and Compensatory Mitigation Measures

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

- Ground disturbances would be limited to those areas necessary to safely implement the Preferred Alternative.
- Adjacent landowners would be provided a construction schedule before construction begins. Access to residences, farms, and businesses would be maintained during construction.
- Work would be confined within the existing easements whenever possible and construction limits would be clearly flagged to preserve existing vegetation and private property.
- Disturbance of jurisdictional wetlands would be avoided during construction.
- 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 waterbodies during construction. Erosion control measures would be free of weeds and weed seeds.
- Drainage measures would be incorporated into the engineering design to minimize local flooding effects from enclosing canals.
- Construction would occur during the daytime in the winter to minimize disturbance to any recreationists, landowners, or other individuals in the construction area vicinity.

- Bald and golden eagles typically use the same nest sites year after year. No nest sites for either species are reported in or near the project area. In the unlikely event that an eagle nest is observed in or near the project area, the District would work with a USFWS biologist to determine how best to operate within the project area to minimize any potential effects. Construction would occur outside USFWS-approved buffer distances where possible. If operating within the recommended buffer distance, the District would operate outside the nesting season.
- Construction would occur outside the primary nesting period for migratory birds of concern (April 15 through July 15), although it could overlap with the early portion of the nesting period of raptors (February through July). Should an active raptor nest be found, construction would pause 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.
- Work crews would carry spill cleanup kits, and in times of burn bans or wildfire concerns, each crew would have a fire suppression kit.
- Temporary travel routes and construction staging areas would be selected and used to minimize effects on vegetation and avoid the removal of trees.
- Pruning would occur entirely within EFID's easements and would not exceed what is required for equipment clearance.
- 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.
- Prior to construction activities, the District would consult with ODFW and CTWS and a fish salvage effort would be conducted in canals to capture any fish remaining in the canals and return them to the East Fork Hood River.
- Where possible, lane closures on roadways would be avoided during peak travel periods to reduce potential traffic delays and pedestrian safety issues.
- An Inadvertent Discovery Plan would be followed if cultural materials including human remains were encountered during construction. Construction would stop accordingly, SHPO and NRCS cultural resources staff would be consulted, and appropriate tribes would be notified. Continuation of construction would occur in accordance with applicable guidance and law.
- 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 and would

follow NRCS Oregon and Washington’s Guide for Conservation Seedings and Plantings (NRCS 2000)

- The District would start a pipe inspection program that would systematically cover inspection of the entire system over a period of several years.
- The District would mechanically remove accumulated sediment from the sedimentation basin and stockpile it temporarily in an adjacent upland location or haul it off site. The sediment basin and its intake and outlet piping would be inspected for any required repairs at minimum on an annual basis.
- To the extent possible, the Preferred Alternative and construction activities would be located entirely within the District's existing easements. Prior to construction, the District would assess the existing easements for the construction segment and work with adjacent landowners.

8.4 Permits and Compliance

As discussed in Section 8.2, the Preferred Alternative would be implemented in project groups. Permitting specific to each project group would be conducted at the time that funding is available. Prior to implementing each project group, NRCS would complete an on-site EE utilizing the 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, EFID would acquire all necessary permits prior to construction. These may include the following.

8.4.1 Local and County

- **Hood River County Planning:** Under OAR Chapter 340, Division 18, a Land Use Compatibility Statement would be submitted for county approval prior to construction.
- **Hood River County Floodplain Administrator:** All work, except for construction of the sedimentation basin, would be outside of the 100-year floodplain; consultation with the county floodplain administrator would determine appropriate permitting requirements for the sedimentation basin.

8.4.2 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 one or more acres of land and have the potential to discharge into surface waters or conveyance systems leading to surface 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 transfer application must be approved by OWRD. The District would apply for an Allocation of Conserved Water under ORS 537 for 75 percent of the water saved through the Preferred Alternative. The remaining 25 percent of the saved water would be used to alleviate water supply shortages within the District. Although the application would need to be reviewed and approved by OWRD prior to issuing the instream water right, the estimated water allocated instream would be 12.45 cfs during the irrigation season (April 15 to September 30).
- **Department of State Lands:** A removal-fill permit from ODSL would not be required for work in existing canals and laterals. Prior to beginning construction of each site-specific project, consultation with ODSL would occur to verify that the District meets exemptions.
- **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 contemporary weir and fish ladder system and a functioning fish screen are in place at EFID’s irrigation diversion. Several small fish of unknown origin have been seen during the winter in the Main Canal in two areas where a spring or seep maintains a deep pool after canal shutdown (Section 4.8.1). The District would consult with ODFW and with a CTWS tribal salmon co-manager prior to construction regarding the need and extent of fish salvage efforts to remove any fish present in canals. No additional consultation or permitting related to this law is anticipated to be required.

8.4.3 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 ACHP implementing Section 106 of the NHPA (54 U.S.C. 306108), federal agencies must take into account the potential effect of an undertaking on “historic properties,” which refers to cultural resources listed, or eligible for listing, in the NRHP. Consultation with SHPO to fulfill Section 106 obligations would be completed for each project group prior to implementation.

- **Clean Water Act:**

- **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. Prior to construction activities, continued coordination and consultation with USACE would occur and measures taken as required to identify and mitigate impacts to potential jurisdictional wetlands and Waters of the United States.
- **Section 401:** Section 401 of the CWA authorizes the OEDQ to review proposed activities or facilities that require a federal permit and that may discharge into the waters of Oregon.
- **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. The project occurs primarily in EFU zones; however, all work would be done within EFID’s easements. 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 NOAA Fisheries 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 or NOAA when any action the agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species.
- **Magnuson-Stevens Act:** 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 the NOAA Fisheries 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 may affect EFH, consultation under the Magnuson-Stevens Act may be required.
- **Safe Drinking Water Act:** Since the project would have no direct or indirect 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.

8.5 Costs

Table 8-3 presents the total project cost of \$68,711,000 for the Preferred Alternative. PL 83-566 funds and Regional Conservation Partnership Program (RCPP) funds through PL 83-566 authority would support \$30,974,000 of the total project cost and the \$37,737,000 remainder of the cost 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 without having detailed design information.
- Engineering costs were estimated as a percentage of the cost of construction.
- The potential cost of mitigation for effects on cultural resources were factored into the costs shown.
- 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.

8.6 Installation and Financing

The following sub-sections present the installation and financing of the Preferred Alternative. Included in this section is a framework for implementing the Preferred Alternative, the sequence of installation, responsibilities, contracting, real property and relocations, other agencies, cultural resources, financing, and conditions for providing assistance.

8.6.1 Framework for Carrying out the Plan

The Preferred Alternative would be implemented in a planned sequence as discussed in Section 8.6.2. The responsibilities of NRCS and the sponsors for the project are outlined in Section 8.6.3. 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.

8.6.2 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 three project groups as presented in Table 8-2. The entire project would be completed over a 10-year period commencing in 2020 and ending by 2030. The District developed an appropriate project-phasing schedule that focused on sections of the system with high end spill loss, and also worked within engineering and funding constraints to meet District, patron, and community development needs.

Table 8-2. Construction Timeline and Installation Costs by Funding Source for the Piping Alternative, Hood River Watershed, Oregon, 2019¹

Construction Year	Works of Improvement	Public Law 83-566 Funds	Other, Non-Federal Funds	Total Construction Costs
0	Project Group 1: Eastside	\$10,552,000	\$3,600,000	\$14,152,000
3	Project Group 2: Main	\$19,697,000	\$12,275,000	\$31,972,000
6	Project Group 2: Dukes Valley	\$270,000	\$8,114,000	\$8,384,000
8	Project Group 3: Central	\$455,000	\$13,748,000	\$14,203,000
Total		\$30,974,000	\$37,737,000	\$68,711,000

¹ Price Base: 2019 dollars

Prepared April 2019

8.6.3 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 this Plan-EA.

8.6.4 Contracting

The piping and 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.

8.6.5 Real Property and Relocations

The majority of construction would take place in EFID’s existing easements. Prior to construction EFID would obtain a new easement agreement for the one piping segment that would be re-aligned. No property would be purchased.

8.6.6 Financing

NRCS would provide 45 percent of the total project cost for the Preferred Alternative through PL 83-566 and RCPP funding. The District is responsible for securing funding for the remaining 55 percent of the costs, including funds that are not eligible under the National Watershed Program (project administration and technical assistance). Table A in the NEE (Appendix D) presents annual installation costs of each project piping group and the proportion of funding through PL 83-566 and other funding sources.

The District has a strong history of securing public and private funding through grants, loans, and patron assessments. The majority of the required funding is expected to be provided through grants. If necessary, a portion of the project cost would be financed through loans. If financing is required, EFID expects to 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 NEE 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 EFID. 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 EFID to fulfill the provisions of their agreement.

Bonneville has been asked to cooperate on this Plan-EA due to Bonneville's proposed cost share funding of a discrete component of the project through the CTWS, specifically the Eastside Lateral Piping Project. The Eastside Lateral Piping Project would modernize approximately 6 miles of irrigation infrastructure and is expected to cost up to \$10 million to implement. Bonneville would provide CTWS with up to \$1 million to fund certain design work and materials for the Eastside Lateral Piping Project

8.6.7 Conditions for Providing Assistance

Conditions for the District to receive program funds for the proposed action include completion of a Final Watershed Plan-EA, NRCS issuing a FONSI, and authorization of funding by the Chief of NRCS.

8.7 Operation, Maintenance, and Replacement

The District would be responsible for the O&M of the project for the 100 years of its design life. Prior to construction, a separate O&M agreement, based on NRCS's National Operation and Maintenance 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 be in charge of scheduling O&M inspections and be responsible for any necessary work. The District's O&M would consist of a pipe inspection program that would systematically cover inspection of the entire system over a period of several 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

pipelined system. All procedures would be followed as specified in the O&M agreement between the project sponsor and NRCS.

8.8 Economic and Structural Tables

A summary of the economic analysis of the Preferred Alternative (NEE Alternative) and the No Action Alternative is provided in Section 5.4. The full NEE Analysis can be found in Appendix D. The Preferred Alternative would result in varying average annual benefits, costs, and benefit cost ratios depending on which project group would be implemented at the time. Average annual benefits range from \$481,000 to \$1,217,000; average annual costs would be between \$348,000 and \$1,095,000, and benefit cost ratios fall between 1.11 and 1.82. Additionally, Appendix D contains an incremental analysis of the benefits and costs of completing each additional increment of the Preferred Alternative. The costs and benefits associated with each individual project group are gone into more detail in the following tables in this section. Table 8-3 (NWPM 506.11, Economic Table 1) presents the projected installation costs and the percentages of costs to be shared by the sponsors 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 NEE costs are shown in Table 8-5.

Table 8-3. Economic Table 1—Estimated Installation Cost of the Piping Alternative, Water Resource Project Measures, Hood River Watershed, Oregon, 2019\$.

Works of Improvement	Unit	Number			Estimated Cost (dollars) ^{1,2}						
					PL 83-566 Funds			Other Funds			Total
		Federal Land	Non-Federal Land	Total	Federal Land NRCS	Non-Federal Land NRCS	Total	Federal Land	Non-Federal Land	Total	
Project Group 1 ³	feet	0	81,834	81,834	\$0	\$10,552,000	\$10,552,000	\$0	\$3,600,000	\$3,600,000	\$14,152,000
Project Group 2 ⁴	feet	1,056	138,208	139,264	\$280,000	\$19,687,000	\$19,967,000	\$174,000	\$20,215,000	\$20,389,000	\$40,356,000
Project Group 3	feet	0	107,583	107,583	\$0	\$455,000	\$455,000	\$0	\$13,748,000	\$13,748,000	\$14,203,000
Total		1,056	327,625	328,681	\$280,000	\$30,694,000	\$30,974,000	\$174,000	\$37,563,000	\$37,737,000	\$68,711,000

¹ Price base: 2019 dollars.

Prepared: November 2019

² Project cost as identified in the EFID SIP, updated to 2019 dollars and including construction, project administration, engineering, technical assistance, and permitting costs. Based on input from EFID, the total length of piping in Project Group 1 was decreased from the SIP and the costs for Project Group 1 were updated accordingly.

³ Project Group 1 construction cost includes \$1,300,000 RCPP funds, using PL 83-566 Authority.

⁴ Includes sedimentation basin cost of \$767,000.

Table 8-4. Economic Table 2 —Estimated Piping Alternative Cost Distribution, Water Resource Project Measures, Hood River Watershed, Oregon, 2019\$.

Works of Improvement	Installation Costs—PL 83-566 Funds ^{1,2}				Installation Cost—Other Funds ^{1,2}				Total ^{1,2}
	Construction	Engineering	Project Admin ³	Total PL 83-566	Construction	Engineering	Project Admin ³	Total Other	
Project Group 1	\$9,014,000 ⁴	\$297,000	\$1,241,000	\$10,552,000	\$3,005,000	\$99,000	\$496,000	\$3,600,000	\$14,152,000
Project Group 2 ⁵	\$15,986,000	\$1,176,000	\$2,805,000	\$19,967,000	\$18,553,000	\$392,000	\$1,444,000	\$20,389,000	\$40,356,000
Project Group 3	\$0	\$455,000	\$0	\$455,000	\$13,049,000	\$152,000	\$547,000	\$13,748,000	\$14,203,000
Total	\$25,000,000	\$1,928,000	\$4,046,000	\$30,974,000	\$34,607,000	\$643,000	\$2,487,000	\$37,737,000	\$68,711,000

Notes: Totals may not sum due to rounding.

Prepared: November 2019

¹ Price base: 2019 dollars

² Project cost as identified in an addendum to the EFID SIP updated to 2019 dollars and including additional costs for project administration, technical assistance, and permitting.

³ Project Admin includes project administration, technical assistance costs, and permitting costs.

⁴ Project Group 1 construction cost includes \$1,300,000 RCPP funds, using PL 83-566 Authority.

⁵ Project Group 2 includes the sedimentation basin which was originally priced in 2015\$ and adjusted to 2019\$ using the RS Means Construction Cost Index.

Table 8-5. Economic Table 4—Estimated Average Annual NEE Costs, Hood River Watershed, Oregon, 2019\$.¹

Works of Improvement²	Project Outlays (Amortization of Installation Cost)²	Project Outlays (OMR cost)³	Total
Project Group 1	\$406,000	\$1,000	\$407,000
Project Group 2	\$1,052,000	\$10,000	\$1,062,000
Project Group 3	\$332,000	\$7,000	\$339,000
Total	\$1,790,000	\$18,000	\$1,808,000

Notes: Totals may not sum due to rounding.

Prepared: November 2019

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

² Project groups would be completed over the course of multiple years such that Project Group 1 would be completed in Year 3 and Project Group 2 would be completed in Year 9.

³ OMR = operate, maintain, and replace. Operation, maintenance, and replacement costs include the expense of running EFID and maintaining District infrastructure, including replacement costs for the sedimentation basin.

The Preferred Alternative damage reduction benefits include agricultural yield enhancement, reduced O&M, power cost savings, avoided carbon emissions, and increased instream flow. Table 8-6 (NWPM 506.20, Economic Table 5a) presents the average annual watershed protection damage reduction benefits across all project groups.

Table 8-6. Economic Table 5a—Estimated Average Annual Watershed Protection Damage Reduction Benefits East Fork Irrigation District Watershed Plan, Hood River Watershed, Oregon, 2019\$.

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-Related ¹	Non-Agricultural- Related ¹
Project Group 1		
On-Site Damage Reduction Benefits		
Other - Agricultural Damage Reduction	\$91,000	
Other - Reduced O&M	\$119,000	
Other - Power Cost Savings	\$134,000	
Subtotal	\$344,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions) ²		\$3,000
Water Conservation		\$115,000
Subtotal		\$118,000
Total Quantified Benefits	\$344,000	\$118,000
Project Group 2		
On-Site Damage Reduction Benefits		
Other - Agricultural Damage Reduction	\$760,000	
Other - Reduced O&M	\$200,000	
Other - Power Cost Savings	\$91,000	
Subtotal	\$1,051,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions) ²		\$1,000
Water Conservation		\$166,000
Subtotal		\$167,000
Total Quantified Benefits	\$1,051,000	\$167,000

Item	Damage Reduction Benefit, Average Annual	
	Agricultural-Related ¹	Non-Agricultural- Related ¹
Project Group 3		
On-Site Damage Reduction Benefits		
Other - Agricultural Damage Reduction	\$522,000	
Other - Reduced O&M	\$0	
Other - Power Cost Savings	\$54,000	
Subtotal	\$576,000	
Off-Site Damage Reduction Benefits		
Other - Social Value of Carbon (Avoided Carbon Emissions) ²		\$1,000
Water Conservation		\$56,000
Subtotal		\$57,000
Total Quantified Benefits	\$576,000	\$57,000

Notes: Totals may not sum due to rounding.

Prepared: November 2019

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

² Indicates the benefit of avoided carbon emissions from eliminated on-farm pumps. These benefits would also accrue to local residents, but the majority of the value would be experienced outside the proposed project area.

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

Table 8-7. Economic Table 6— Comparison of Average Annual NEE Costs and Benefits, East Fork Irrigation District Watershed Plan, Hood River Watershed, Oregon, 2019\$.

Works of Improvement	Agriculture-Related ¹			Non-Agricultural ¹		Average Annual Benefits ¹	Average Annual Cost ^{1,2}	Benefit–Cost Ratio
	Agricultural Yield Enhancement	Reduced O&M	Patron Pumping Cost Savings	Carbon Value	Instream Flow Value			
Project Group 1	\$91,000	\$119,000	\$134,000	\$3,000	\$115,000	\$462,000	\$407,000	1.14
Project Group 2	\$760,000	\$200,000	\$91,000	\$1,000	\$166,000	\$1,218,000	\$1,062,000	1.15
Project Group 3	\$522,000	\$0	\$54,000	\$1,000	\$56,000	\$633,000	\$339,000	1.87
Total	\$1,373,000	\$319,000	\$279,000	\$5,000	\$337,000	\$2,313,000	\$1,808,000	1.28

Notes: Totals may not sum due to rounding.

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

² From Economic Table 4.

Prepared: April 2019

9 References

- Advisory Council on Historic Preservation (ACHP). (2019). *Section 106 Archaeology Guidance - Terms Defined*. Retrieved from https://www.achp.gov/Section_106_Archaeology_Guidance/Terms%20Defined.
- Archaeological Investigations Northwest, Inc. (AINW). (2019). *Archaeological Assessment for the East Fork Irrigation District Eastside Lateral Pipeline in Hood River County, Oregon*. September 2019. Portland, OR.
- Beier, P., Majka, D., Newell, S., & Garding, E. (2008). *Best Management Practices for Wildlife Corridors*. Flagstaff: Northern Arizona University.
- Blair, R.B. (1996). *Land Use and Avian Species Diversity along an Urban Gradient. Ecological Applications*, 6(2), 506-519.
- Bonneville Power Administration (Bonneville). (1996). *Hood River Fisheries Project Draft/Final Environmental Impact Statement (DOE/EIS-0241)*. July 1996. Portland, OR.
- Bottom, D. L., Jones, K. K., Simenstad, C. A. and Smith, C. L. (2009). Reconnecting social and ecological resilience in salmon ecosystems. *Ecology and Society*. 14(1):5.
- Buell and Associates, Inc. (2000). *Biological Performance Tests of East Fork Irrigation District's Sand Trap and Fish Screen Facility Phase 1-1999 conducted for East Fork Irrigation District*. January 2000. Portland, OR.
- Calejo, M.J., N. Lamaddalena, J.L. Teixeira, & L.S. Pereira. (2008). *Performance analysis of pressurized irrigation systems operating on-demand using flow-driven simulation models*. *Agricultural Water Management*, 95, 154-162.
- Christensen, N. (2013). *Hood River Water Conservation Assessment*. August 2013. Watershed Professionals Network. Hood River, OR.
- Christensen, N. and E. Salminen (2013). *Hood River Water Use Assessment*. June 2013. Watershed Professionals Network. Hood River, OR.
- Close, D.A., Fitzpatrick, M. S., Li, W.L. (2002). The Ecological and Cultural Importance of a Species at Risk of Extinction, Pacific Lamprey. *Fisheries Management*. 27(7), 19-25.
- Columbia River Inter-Tribal Fish Commission (CRITFC). (2019a). *First Salmon Feast*. Retrieved from <https://www.critfc.org/salmon-culture/tribal-salmon-culture/first-salmon-feast>
- Columbia River Inter-Tribal Fish Commission (CRITFC). (2019b). *Pacific Lamprey*. Retrieved from <https://www.critfc.org/fish-and-watersheds/columbia-river-fish-species/lamprey/>
- Confederated Tribes of Warm Springs (CTWS). (2019). *Spring Chinook- Fighting for a Future*. Retrieved from <https://fisheries.warmsprings-nsn.gov/2018/09/spring-chinook-fighting-future/>
- Ditchkoff, S.S., Saalfeld, P.S., & Gibson, C.J. (2006). *Animal Behavior in Urban Ecosystems: Modifications Due to Human-Induced Stress*. *Urban Ecosystems*, 9, 5-12.
- East Fork Irrigation District (EFID). (2011). *East Fork Irrigation District Water Management & Conservation Plan*. March 2011. Odell, OR.

- East Fork Irrigation District (EFID). (2014). *East Fork Irrigation District History*. Retrieved from <http://efidhr.org/images/pdf/History-of-EFID-2014.pdf>
- Eineichner, B. (2018). Hood River Fish Habitat Project. Annual Progress Report, October 2016 - September 2017. Confederated Tribes of the Warm Springs Reservation of Oregon, Bonneville Power Administration Project No. 1998-021-00. January 2018. Parkdale, OR.
- European Environment Agency (EEA). (2019). *CICES: Towards a common classification of ecosystem services*. Retrieved from <https://cices.eu/supporting-functions/>
- Farmers Conservation Alliance (FCA). (2018a). *East Fork Irrigation District System Improvement Plan*. May 2018. Hood River, OR.
- Farmers Conservation Alliance (FCA). (2018b). *Water Loss Assessment, East Fork Irrigation District*. August 2, 2018. Hood River, OR.
- Farmers Conservation Alliance (FCA). (2018c). *Preliminary Investigative Report for the East Fork Irrigation District – Irrigation Modernization Project*. October. Hood River, OR: Author.
- Farmers Conservation Alliance (FCA). (2019). EFID wetland types analysis. Hood River, OR: Author.
- Golden, B., and B. Aylward. (2006). Instream Flow in the Deschutes Basin: Monitoring, Status and Restoration Needs. Bend, OR: Deschutes River Conservancy.
- Grady, S. (1983). *Ground-water resources in the Hood basin Oregon*. U.S. Department of the Interior Geological Survey Water Resources Investigations report 81-1108.
- GSI Water Solutions, Inc. (GSI). (2014). Water Management and Conservation Plan. Prepared for City of The Dalles. November 2014. Corvallis, OR.
- Huggel, C., Khabarov, N., Korup, O., & Obersteiner, M. (2012). *Physical impacts of climate change on landslide occurrence and related adaptation*. In J. Clague & D. Stead (Eds.), *Landslides: Types, Mechanisms and Modeling* (pp. 121-133). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511740367.012
- Keller, J. (2011). *Groundwater Hydrology of Hood River County, draft summary*. Prepared for the Hood River County Water Planning Group. April 26, 2011. Retrieved from https://www.co.hood-river.or.us/vertical/sites/%7B4BB5BFDA-3709-449E-9B16-B62A0A0DD6E4%7D/uploads/HR_Groundwater_Resources_Summary_by_Jason.pdf
- Lillquist K., and K. Walker. (2006). *Historical glacier and climate fluctuations at Mount Hood, Oregon, Arctic, Antarctic, and Alpine Research*, 38(3), 399-412.
- Lloyd, Denby, J. Koenings, J. LaPerrire. (1987). Effects of Turbidity in Fresh Waters of Alaska. *Journal of Fisheries Management*. 7:18-13
- McCanna, J. and B. Eineichner. (2012). *Hood River Fish Habitat Project Annual Progress Report, October 2010 – September 2011*. Confederated Tribes of the Warm Springs Reservation of Oregon. Bonneville Project No. 1998-021-00.

- McCloughry, J.D., Thomas J. Wiley, R.M. Conrey, C. B. Jones, and K.E. Lite, Jr. (2012). *Digital geologic map of the Hood River Valley, Hood River and Wasco Counties, Oregon*. Open-File Report O-12-03.
- McKinney, M. L. (2002). *Urbanization, Biodiversity, and Conservation*. *Biosciences*, 52, 88-890.
- Najafi, M., A. Habibian, and F. Sever. (2015). *Durability and Reliability of Large Diameter HDPE Pipe for Water Main Applications* (Web Report 4485). Water Research Foundation, Denver, CO.
- National Marine Fisheries Service (NMFS). (2011). *Anadromous Salmonid Passage Facility Design*. NMFS Northwest Region, Portland, OR.
- National Marine Fisheries Service (NMFS). (2013). *ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead*. Northwest Region, June 2013.
- National Research Council. (2002). *Riparian Areas: Functions and Strategies for Management*. Washington, D.C.: The National Academies Press.
- National Wild and Scenic Rivers System (WSR). (2019). *Hood River (East Fork), Oregon*. Retrieved from <https://www.rivers.gov/rivers/hood-ef.php>
- Normandeau Associates, Inc. (2014). *Hood River Tributaries Instream Flow Study*. June 30, 2014. Arcata, CA.
- Olander, L., Johnston, R., Tallis, H., Kagan, J., Maguire, LA., Polasky, S., Urban, D., Boyd, J., Wainger, L., Palmer, M. (2018). *Benefit relevant indicators: Ecosystem services measures that link ecological and social outcomes*. *Ecol. Indic.* 85:1262-1272. Retrieved from <https://doi.org/10.1016/j.ecolind.2017.12.00>.
- Oregon Department of Agriculture (ODA). (2016). *Hood River Agricultural Water Quality Management Area Plan*. Developed by the Hood River Local Advisory Committee and Hood River Soil and Water Conservation District. December 2016.
- Oregon Department of Environmental Quality. (ODEQ). (2001). *Western Hood Subbasin Total Maximum Daily Load (TMDL)*. December 2001. Portland, OR.
- Oregon Department of Environmental Quality. (ODEQ). (2012). *Water Quality Assessment - Oregon's 2012 Integrated Report Assessment Database and 303(d) List*. Retrieved from <https://www.deq.state.or.us/wq/assessment/rpt2012/results.asp>
- Oregon Department of Environmental Quality. (ODEQ). (2017). *Revision to 2001 Western Hood Subbasin TMDL*. Portland, OR. April 2017. Portland, OR.
- Oregon Department of Environmental Quality. (ODEQ). (2018). *2017 Oregon Nonpoint Source Pollution Program Annual Report*. July 2018. Portland, OR.
- Oregon Department of Fish and Wildlife. (ODFW). (2010). *Lower Columbia River Conservation & Recovery Plan for Oregon Populations of Salmon & Steelhead*. Oregon Department of Fish and Wildlife. Salem, Oregon. 372 pages with appendices.
- Oregon Department of Fish and Wildlife (ODFW). (2019a). *Oregon fish habitat distribution maps*. Retrieved from https://nrimp.dfw.state.or.us/FHD_FPB_Viewer/index.html

- Oregon Department of Fish and Wildlife (ODFW). (2019b). *Threatened, Endangered, and Candidate Fish and Wildlife Species in Oregon*. Retrieved from https://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp
- Oregon Department of Fish and Wildlife (ODFW). (2019c). *Wildlife Viewing Species*. Retrieved from <https://myodfw.com/wildlife-viewing/species/mammals>. Accessed December 13, 2018
- Oregon Department of State Lands. (ODSL). (2013). *A Guide to the Removal-Fill Permit Process*. Salem, OR: Oregon Dept. of State Lands.
- Oregon Department of State Lands (ODSL). (2015). *Wetlands in Oregon*. Department of State Lands Fact Sheet.
- Oregon Encyclopedia. (2019). *Pears and the Pear Industry*. Portland State University and the Oregon Historical Society. Retrieved from https://oregonencyclopedia.org/articles/pears_the_pear_industry/#.XNye6Y5Kg2w
- Oregon Office of Economic Analysis. (OEA). (2013). *Forecasts of Oregon's County Populations and Components of Change, 2010-2050*. Department of Administrative Services: Salem, Oregon. Retrieved from <http://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx>
- Oregon State University. (2018). *Oregon Explorer Natural Resources Digital Library*. Retrieved from <https://oregonexplorer.info/topics/wildlife?ptopic=179>
- Oregon Water Resources Department. (OWRD). (2018a). *OWRD Water Availability Analysis*. Retrieved from https://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/display_wa_complete_report.aspx?ws_id=30410509&exlevel=80&scenario_id=1
- Oregon Water Resources Department. (OWRD). (2018b). *Well Log Query Report*. Retrieved from https://apps.wrd.state.or.us/apps/gw/well_log/Default.aspx
- Pace Engineers, Inc. (2016). Crystal Springs Water District Master Plan. Project 14867. November 2015 Final, revised April 2016.
- Phillippe, J. (2008). *Present-day and future contributions of glacier melt to the upper Middle Fork Hood River: implications for water management*. M.S. Thesis, Oregon State University. June 6, 2008. Corvallis, Oregon.
- Salminen, E., N. Christensen, J. Keller, and C. Thieman. (2016). *Hood River Basin Water Conservation Strategy*. March 22, 2016. Watershed Professionals Network. Hood River, OR.
- Sceva, J. E. (1966). *A reconnaissance of the ground-water resources of the Hood River Valley and the Cascade Locks area*, Hood River County Oregon. Oregon State Engineer Ground Water Report 10, 45 p.
- Shively, D. (2006). *Hood River Basin Aquatic Habitat Restoration Strategy*. November 2006. Mount Hood National Forest, Hood River Ranger District. Mount Hood-Parkdale, OR.
- Simpson, P.C. (2018). *Stream discharge data for East Fork Hood River 1996-2017*, excel spreadsheet. Oregon Department of Fish and Wildlife, unpublished data.
- Stampfli, S. (2008). *Hood River Watershed Action Plan*. Hood River Watershed Group, Hood River, Oregon. April 22, 2008.

- Stampfli, S., M. Saunders, B. Eineichner, and D. Pilz. (2012). *EFID Central Canal Pipeline Project - Stream Flow, Water Quality, and Fish Passage Final Report*. December 19, 2012. Prepared for East Fork Irrigation District of Odell, Oregon.
- Swihart, J., and J. Haynes. (2002). *Canal-Lining Demonstration Project Year 10 Final Report*. Boise, Idaho: Bureau of Reclamation.
- U.S. Army Corps of Engineers (USACE). (1986). *Final Rule for Regulatory Programs of the Corps of Engineers*. *Federal Register*, 51(219), 41206-41260. November 13, 1986.
- U.S. Bureau of Labor Statistics. (USBLS). (2017). Local Area Unemployment Statistics. Washington DC. Retrieved from: <https://www.bls.gov/lau/>.
- U.S. Bureau of Reclamation (Reclamation). (2014a) Hood River Basin Study: *Distributed Hydrology Soil and Vegetation Model Technical Memorandum*. April 2014. Pacific Northwest Regional Office. Boise, ID.
- U.S. Bureau of Reclamation (Reclamation). (2014b). Hood River Basin Study: Water Resource Management Model Technical Memorandum. Pacific Northwest Regional Office. Boise, ID.
- U.S. Bureau of Reclamation (Reclamation). (2015). *Hood River Basin Study*. Pacific Northwest Regional Office. Boise, ID.
- U.S. Bureau of Reclamation (Reclamation). (2017). *Canal Operation and Maintenance: Embankments*. Office of Policy Denver, CO.
- U.S. Census Bureau. (2010). *Selected Economic Characteristics*. Washington DC. Retrieved from <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>
- U.S. Census Bureau. (2017). *Selected Economic Characteristics*. Washington DC. Retrieved from <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>
- U.S. Department of Agriculture (USDA). (2012). *2012 Census of Agriculture*. Hood River County, Oregon – Census of Agriculture County Profile. Retrieved from https://www.nass.usda.gov/Publications/AgCensus/2012/Online_Resources/County_Profiles/Oregon/cp41027.pdf
- U.S. Department of Agriculture (USDA). (2013) *Principles and Requirements for Federal Investments in Water Resources*. March 2013.
- U.S. Department of Agriculture (USDA). (2017). *Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments*. (DoA Manual DM 9500-013). Washington, DC. Retrieved from https://www.ocio.usda.gov/sites/default/files/docs/2012/DM9500-013_final.pdf
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). (1996) Riparian Areas Environmental Uniqueness, Functions, and Values. RCA Issue Brief No. 11, August 1996. Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/?cid=nrcs143_014199
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). (2000) *Oregon & Washington Guide for Conservation Seedings and Plantings*. April 200. Portland, Oregon.

- U.S. Geological Survey (USGS). (2019). *USGS Surface-Water Annual Statistics for Oregon*. Website: USGS 14120000 Hood River at Tucker Bridge, Near Hood River, OR. Retrieved from <https://waterdata.usgs.gov/or/nwis>. Accessed February 13, 2019
- U.S. Fish and Wildlife Service. (2002). Chapter 6, Hood River Recovery Unit, Oregon. 66 p. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.
- U.S. Fish and Wildlife Service (USFWS). (2016). *National Wetlands Inventory Mapping*. Retrieved from <https://www.fws.gov/wetlands/Data/Mapper.html>. Accessed April 2018
- U.S. Fish and Wildlife Service (USFWS). (2018). *IPaC ECOS* (Environmental Conservation Online System). Retrieved from <https://ecos.fws.gov/ipac/location/index>. Accessed May 2018
- Wharry, M. (2016). *East Fork Irrigation District System Improvement Plan*. Final Report. January 2016. KPFF Project #314222.

10 List of Preparers

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

Table 10-1. List of Preparers.

Name	Title	Education	Professional Experience	Area Responsible For
FCA Watershed Plan-EA Team				
Kristin Alligood	Program Specialist	Ph.D. Biology B.A. Neuroscience	5 years	Ecosystem Services
Raija Bushnell	Program Specialist	M.P.A Natural Resource Policy M.S.E.S Natural Resource Management B.A. Political Science	6 years	General
Holly Coccoli	Program Specialist	M.S. Environmental Engineering and Science B.S. Fisheries Science	30 years	Fish and Aquatic Species, Wildlife, Water Resources, Vegetation, Wetlands, Cumulative Effects
Brett Golden	Director of Impact	M.E.M Environmental Management A.B. Environmental and Evolutionary Biology	13 years	General
Kate Hart	Program Specialist	M.S. Earth Science B.A. Earth Science	4 years	Socioeconomics, Alternatives, Preferred Alternative
David McKay	Program Specialist	M.P.A. Environmental Policy B.A. Political Science	5 years	Cultural Resources, Visual, Public Safety, Public Scoping
Amanda Schroeder	Program Specialist	B.S. Natural Resource Management	4 years	General
Alexis Vaivoda	Team Lead	M.S. Environmental Science B.S. Biology	17 years	General
NRCS - Oregon				
Gary Diridoni	Natural Resource Specialist	Fisheries Management Graduate Certificate B.S. Wildlife Management B.S. Interdisciplinary Studies, Ecosystem Conservation	16 years	General

Name	Title	Education	Professional Experience	Area Responsible For
Tom Makowski	Assistant State Conservationist-Watershed Resources and Planning	Ph.D. Rural Sociology M.S. Social Psychology B.S. Recreation Resource Management	31 years	General
Lakeitha Ruffin	Agricultural Economist	M.S. Agricultural Economics B.S. Agricultural Economics	9 years	Economic and Socioeconomic Analysis, Alternative Analysis, Overall Watershed Planning
Employees from Firms Under Contract with FCA				
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	14 years	Economic Analysis
Highland Economics	Winston Oakley	M.S. Applied Economics B.S. Environmental Sciences, Policy, and Management	5 years	Economic Analysis
ERM	Sandy Slayton	M.A. Ecology B.A. Environmental Science	16 years	General

11 Distribution List

A Notice of Availability for the Draft 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:

- Bonneville Power Administration
- Business Oregon
- City of Hood River
- Hood River County
- National Oceanic and Atmospheric Administration (NOAA) Fisheries
- Oregon Department of Agriculture (ODA)
- Oregon Department of Environmental Quality (ODEQ)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of Forestry (ODF)
- Oregon Department of State Lands (ODSL)
- Oregon Governor’s Office
- Oregon Water Resources Department (OWRD)
- Oregon Watershed Enhancement Board (OWEB)
- State Historic Preservation Office (SHPO)
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation
- U.S. Department of Agriculture, U.S. Forest Service (USFS), Mount Hood National Forest
- U.S. Fish and Wildlife Service (USFWS)

Other organizations and individuals to be notified:

- Columbia Gorge Fruit Growers
- Columbia Land Trust
- EFID patrons
- Farmers Irrigation District (FID)
- Hood River Soil and Water Conservation District
- Hood River Valley Parks and Recreation
- Hood River Watershed Group
- Interested public
- Middle Fork Irrigation District (MFID)
- Mount Hood Irrigation District (MHID)
- Thrive Hood River (formerly Hood River Residents Committee)
- Trout Unlimited
- WaterWatch of Oregon
- Wy’east Fire District

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

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

12 Acronyms, Abbreviations, and Short-forms

°F	degrees Fahrenheit
ACHP	Advisory Council on Historic Preservation
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
Bonneville	Bonneville Power Administration
CLP	Central Lateral Pipeline
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CTWS	Confederated Tribes of Warm Springs
CWA	Clean Water Act
DID	Dee Irrigation District
DVC	Dukes Valley Canal
EA	Environmental Assessment
EAP	Emergency Action Plan
EC	Eastside Canal
EE	Environmental Evaluation
EFH	Essential Fish Habitat
EFID	East Fork Irrigation District
EFU	Exclusive Farm Use
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FCA	Farmers Conservation Alliance
FID	Farmers Irrigation District
FONSI	Finding of No Significant Impact
FR	<i>Federal Register</i>
GIS	geographic information system
HDPE	high-density polyethylene
MBTA	Migratory Bird Treaty Act
MFID	Middle Fork Irrigation District
MHID	Mount Hood Irrigation District
N/A	not applicable

NEE	National Economic Efficiency
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWPM	National Watershed Program Manual
O&M	operation and maintenance
OAR	Oregon Administrative Rule
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OMB	Office of Management and Budget
OMR	operate, maintain, and replace
ORS	Oregon Revised Statute
OWRD	Oregon Water Resources Department
PCE	Primary Constituent Element
PL 83-566	Watershed Protection and Flood Prevention Act, Public Law 83-566
project	East Fork Irrigation District Infrastructure Modernization Project
PR&G	Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies
PRV	pressure reducing valve
PVC	polyvinyl chloride
RCPP	Regional Conservation Partnership Program
RM	River Mile
SHPO	State Historic Preservation Office
SIP	System Improvement Plan
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

13 Index

- best management practices, 9, 30, 31, 84, 94, 101, 109, 117, 118, 122
- bull trout, 25, 32, 59, 61, 62, 63, 64, 96, 98, 99, 103
- chinook, 25, 32, 52, 59, 60, 61, 62, 63, 64, 79, 93, 96, 98, 99, 103, 109
- Clean Water Act, 54, 65, 94, 101, 122
- coho, 25, 32, 59, 61, 62, 63, 64, 79, 96, 98, 99, 103, 109
- Conserved Water Program, 26, 27, 32, 49, 77, 89, 91
- East Fork Hood River, 13, 18, 23, 25, 26, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 59, 60, 66, 67, 77, 79, 84, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 103, 105, 108, 109, 117, 119
- Endangered Species Act, 11, 23, 123
- Hood River, 12, 53, 55, 56, 57, 59, 60, 62, 63, 77, 79, 82, 90, 92, 93, 94, 96, 97, 98, 99, 100, 102, 103, 107, 108, 117, 125, 128, 129, 130, 131, 133
- Hood River basin, 13, 14, 25, 44, 49, 50, 54, 55, 57, 58, 59, 60, 62, 70, 90, 91, 95, 98, 104, 105, 107, 109, 110, 111
- Hydrologic Unit Code, 15
- Lenz Creek, 46, 48, 55, 56, 57, 92, 94, 98
- Middle Fork Hood River, 45, 46, 51, 52, 53, 56, 63, 98
- Migratory Bird Treaty Act, 68, 69, 123
- National Environmental Policy Act, ii, 20, 21, 22, 28, 70, 111
- National Historic Preservation Act, 9, 28, 30, 31, 36, 82, 106, 107, 110, 121
- Neal Creek, 7, 15, 46, 48, 50, 55, 56, 57, 94, 95, 97, 98
- NOAA Fisheries for marine and anadromous species, 60, 62, 99, 109, 123
- noxious weeds, 10
- Oregon Department of Environmental Quality, 30, 54, 55, 56, 57, 95, 120, 126
- Oregon Department of State Lands, 65, 66, 101, 121
- Oregon Water Resources Department, 27, 49, 52, 58, 92, 104, 108, 121
- Oregon Watershed Enhancement Board, 29
- Pacific lamprey, 25, 30, 59, 60, 61, 79, 96, 100
- Socioeconomic, 31, 39, 85, 107
- State Historic Preservation Office, 9, 30, 37, 82, 83, 106, 119, 121
- steelhead, 25, 32, 45, 57, 58, 59, 60, 61, 62, 63, 64, 79, 96, 97, 98, 99, 103, 109
- streamflow, 7, 11, 13, 24, 25, 26, 27, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 58, 59, 63, 66, 73, 77, 79, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 102, 103, 105, 108, 109
- U.S. Army Corps of Engineers, 23, 65, 66, 101, 112, 122
- U.S. Fish and Wildlife Service, 60, 62, 63, 68, 69, 99, 103
- U.S. Forest Service, 62
- Whiskey Creek, 46, 48, 55, 56, 62, 93, 94, 97

14 Appendices A-E

See Appendices in separate document.

Appendix A. Comments and Responses

Appendix B. Project Maps

Appendix C. Supporting Maps

Appendix D. Investigation and Analysis Report

Appendix E. Other Supporting Information