Draft Watershed Plan and Environmental Assessment for the Corn Creek Watershed Plan

Corn Creek Watershed

Millard County, Utah

PREPARED BY

USDA NRCS

United States Department of Agriculture
Natural Resources Conservation Service

IN COOPERATION WITH
Sponsoring Local Organization (SLO):
Town of Kanosh, Utah

Co-Sponsoring Local Organizations:
Corn Creek Irrigation company
Kanosh Band of Paiute Indians

April 2025

Title and Document Status: Watershed Plan and Environmental Assessment (Plan-EA) for the Corn Creek Watershed Project, Millard County, Utah.

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

Cooperating Agencies: None

Sponsoring Local Organization (SLO): Town of Kanosh, Utah

Co-Sponsoring Local Organization(s): Corn Creek Irrigation Company (CCIC), Kanosh Band of Paiute Indians (Kanosh Band)

Authority: This Watershed Plan-EA has been prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954, Public Law (PL) 83-566, as amended (16 USC Section 1001 et Seq.); in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended (42 USC 4321 et seq); and in accordance with the Principles, Requirements, and Guidelines for Water and Land-Related Resources Implementation Studies and Federal Water Resource Investments (PR&G), DM 9500-013.

Abstract: Corn Creek Debris Basin was locally constructed for the purpose of flood control. The Dam is currently classified as a high hazard dam and does not meet current NRCS and Utah Dam Safety engineering standards. Failure of the Dam is imminent due to the significant seepage issues within the Dam's foundation. In addition, the natural waterways downstream of the Dam have been modified or lost over time as Kanosh Town was developed and water was diverted for irrigation, which increases the susceptibility of the Town to flooding. The primary purpose of the project is flood prevention with agricultural water management as a secondary purpose. This document contains the Environmental Assessment of the No Action (Future Without Federal Investment (FWOFI)) and the Proposed Action Alternatives. Action Alternative 1 is the Locally and Environmentally Preferred Alternative as well as the National Economic Efficiency (NEE) Plan. The probable cost (environmental, design, and construction) for the Preferred Alternative is $33,247,000. Of this, the expected Federal cost share for construction would be limited to $24,063,000.

Comments: NRCS has completed this Draft Plan-EA in accordance with NEPA and NRCS principles, rules, guidelines, and standards. Reviewers should provide their comments to NRCS during the allotted Draft Plan-EA review period. Comments need to be submitted by May 22, 2025, to become part of the Administrative Record. Please send comments to:

Derek Hamilton – NRCS Utah - Water Resources Coordinator

125 South State Street, Room 6416, Salt Lake City, UT 84138-1100

801-524-4560

Non-Discrimination Statement: 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 https://www.usda.gov/oascr/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: mailto:program.intake@usda.gov.

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Ancestral Land Acknowledgement: The project proposed and evaluated in this Watershed Plan Environmental Assessment is located on the ancestral homelands of the following tribes, who hold ancestral land and traditional use/traditional cultural property claims within and in the vicinity of the project area:

- Kanosh Band of Paiute Indians (Kanosh Band)
- Northwest Band of the Shoshone Nation
- Southern Paiute Tribe
- Cedar Band of Paiute Indians
- Navajo Utah Commission
- Shivwits Band of Paiute Indians
- Navajo Nation Office of the President
- San Juan Southern Paiute Tribe of Arizona
- Hopi Tribe of Arizona
- Southern Ute Indian Tribe
- Paiute Indian Tribe of Utah (PITU)
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Skull Valley Band of Goshute Indians

USDA-NRCS is committed to uplifting these lands as well as the community members from the Tribes.

KANOSH, UTAH
WATERSHED WORK PLAN AGREEMENT

between

Kanosh Town, Corn Creek Irrigation Company and Kanosh Band of the Paiute Tribe
(Referred to herein as sponsors)

and the

Natural Resources Conservation Service,
U.S. Department of Agriculture
(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsors for assistance in preparing a plan for works of improvement for the Corn Creek Watershed, State of Utah 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 the NRCS; and

Whereas, there has been developed through the cooperative efforts of the sponsors and NRCS a watershed project plan and environmental assessment for works of improvement for the Corn Creek Watershed, State of Utah , hereinafter referred to as the watershed project plan or plan, which plan is annexed to and made a part of this agreement;

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

1. **Term.** The term of this agreement is for the installation period and evaluated life of the project (52 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 sponsors 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 sponsors agree that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency that will continue to maintain and operate the development in accordance with the operation and maintenance agreement.

4. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The sponsors hereby agree to comply with all 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 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.** Table 1- Corn Creek Watershed Agreement Cost-Share Percentages & Amounts shows the estimated cost-share percentages and amounts for Watershed Project Plan implementation.

Table 1. Corn Creek Watershed Agreement- Cost-Share Percentage and Amounts

Watershed Works of Improvement	NRCS Cost	%	Sponsors Cost	%	Total Cost
Cost-Sharable Items					
Flood Control [1/]	$13,212,000	100%	$0	0%	$13,212,000
Agricultural Water Management - CCIC	$10,725,000	75%	$3,575,000	25%	$14,300,000
Agricultural Water Management – Kanosh Band of the Paiute Tribe	$126,000	90%	$14,000	10%	$140,000
Recreation	$0	50%	$0	50%	$0
Subtotal: Cost-Sharable Costs	**$24,063,000**		**$3,589,000**		**$27,652,000**
Non-Cost-Sharable Items [3/]					
NRCS Technical Assistance/Engineering	$5,054,000	100%	$0	0%	$5,054,000

Watershed Works of Improvement	NRCS Cost	%	Sponsors Cost	%	Total Cost
Project - Construction Administration	$281,000	100%	$0	0%	$281,000
Permits			$110,000	100%	$110,000
Land Acquisition – Kanosh/CCIC			$150,000	100%	$150,000
Subtotal: Non-Cost-Sharable Costs	**$5,335,000**		**$260,000**		**$5,595,000**
Grand Total:	**$29,398,000**		**$3,849,000**		**$33,247,000**

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 - Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost-shared in accordance with the percentages shown.

3 - If actual Non-Cost-Sharable item expenditures vary from these figures, the responsible party will bear the change.

6. **Land Treatment Agreements.** The sponsors will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their land. The sponsors will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the Watershed Project Plan. The sponsors will encourage landowners and operators to continue to operate and maintain the land treatment measures after the long-term contracts expire, for the protection and improvement of the watershed.

7. **Floodplain Management.** Before construction of any project for flood prevention, the sponsors must agree to participate in and comply with applicable Federal floodplain management and flood insurance programs. The community of Kanosh, Utah participates in the flood insurance program and is currently in good standing.

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

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

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

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

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

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

14. **Operation and Maintenance (O&M).** The sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by performing the work or arranging for such work, in accordance with an O&M Agreement. An O&M agreement will be entered into before Federal funds are obligated and will continue for the project life 50 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 sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

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

16. **Nondiscrimination Provisions.** In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, 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.

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

17. **Certification Regarding Drug-Free Workplace Requirements (7 CFR Part 3021**). By signing this Watershed Agreement, the sponsors are providing the certification set out below. If it is later determined that the sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, the 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 sub-recipients or sub-contractors in covered workplaces).

Certification:

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

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition.
(2) Establishing an ongoing drug-free awareness program to inform employees about:
    (a) The danger of drug abuse in the workplace;
    (b) The grantee's policy of maintaining a drug-free workplace;
    (c) Any available drug counseling, rehabilitation, and employee assistance programs; and
    (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 five calendar days after such conviction.
(5) Notifying the NRCS in writing, within 10 calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice must include the identification numbers of each affected grant.
(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4) (b), with respect to any employee who is so convicted.

(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
(b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

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

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

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

18. Certification Regarding Lobbying (7 CFR Part 3018) (for projects > $100,000)

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

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

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

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

B. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction

imposed by 31 U.S.C., Section 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

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

A. The sponsors certify to the best of their knowledge and belief, that they and their principals:
   (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
   (2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
   (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph A(2) of this certification; and
   (4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

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

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

A. The sponsors signatory to this agreement certify as follows:
   (1) Any facility to be utilized in the performance of this proposed agreement is ( ), is not (X) listed on the Environmental Protection Agency List of Violating Facilities.
   (2) To promptly notify the NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.
   (3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.

B. The project sponsor signatory to this agreement agrees 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 EPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the EPA 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 sub- agreement.

C. The terms used in this clause have the following meanings:
   (1) The term “Air Act” means the Clean Air Act, as amended (42 U.S.C. Section 7401 et seq.).
   (2) The term “Water Act” means Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et seq.).
   (3) The term “clean air standards” means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 of the Air Act (42 U.S.C. Section 7414) or an approved implementation procedure under section 112 of the Air Act (42 U.S.C. Section 7412).
   (4) The term “clean water standards” means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. Section 1317).
   (5) The term “facility” means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a sponsor, to be utilized in the performance of an agreement or sub- agreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location will be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

21. Assurances and Compliance. As a condition of the grant or cooperative agreement, the sponsor assures and certifies that it is in compliance with and will comply in the course of the agreement with all applicable laws, regulations,

Executive orders and other generally applicable requirements, including those set out below which are hereby incorporated in this agreement by reference, and such other statutory provisions as a specifically set forth herein.

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

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

22. **Examination of Records.** The sponsors must give the 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 retains all records related to this agreement for a period of three years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

23. **Signatures**

Sponsors: Kanosh Town	
By:	
Title:	
Date:	
Address:	Zip Code:

The signing of this plan was authorized by a resolution of the governing body of Kanosh Town

adopted at a meeting held on _____.

Address _____

Secretary [or other Title]

Date*:* _____

Co-Sponsors: Corn Creek Irrigation Company	
By:	
Title:	
Date:	
Address:	Zip Code:

The signing of this plan was authorized by a resolution of the governing body of Corn Creek Irrigation Company

adopted at a meeting held on _____.

Address _____

Secretary [or other Title]

Date*:* _____

Co-Sponsors: Kanosh Band of the Paiute Tribe	
By:	
Title:	
Date:	
Address:	Zip Code:

The signing of this plan was authorized by a resolution of the governing body of Kanosh Band of the Paiute Tribe

adopted at a meeting held on _____.

Address _____

Secretary [or other Title]

Date*:* _____

USDA United States Department of Agriculture
Natural Resources Conservation Service

Approved By:

_____

Title:	NRCS State Conservationist
Date:	

Summary: Office of Management and Budget Fact Sheet

S.1 Title of Watershed Plan and Proposed Action

Plan Name: Draft Watershed Plan and Environmental Assessment for the Corn Creek Watershed

Proposed Action Name: Action Alternative 1 – Dam Replacement Alternative

S.2 Location

S.2.1 County, State

Millard County, Utah

S.2.2 Congressional District

Third Congressional District

S.3 Organizations & Agencies

S.3.1 Sponsoring Local Organizations

- Town of Kanosh (Sponsor/SLO)
- Corn Creek Irrigation Company (Co-Sponsor)
- Kanosh Band of Paiute Indians (Co-Sponsor)

S.3.2 Cooperating Agency/Agencies

None.

S.4 Authority

This Watershed Plan-EA has been prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954, Public Law (PL) 83-566, as amended (16 USC Section 1001 et Seq.); in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended (42 USC 4321 et seq); and in accordance with the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (PR&G), DM 9500-013. The Kanosh Band is a federally recognized Tribe with tribal approval authority on their reservation. This Plan-EA will serve as the necessary environmental documentation of actions located on the Kanosh Band reservation and requiring Kanosh Band administration approval.

S.5 Purpose & Need for Action

The purpose of this project is to provide improved flood protection/flood damage reduction for the homes, community infrastructure, and agricultural land downstream of the existing Dam & Debris Basin, and to improve agricultural water management so the farmers in Kanosh can have more reliable irrigation water deliveries during the irrigation season. There is need to decrease the risk of flooding to approximately 508 people, 213 homes, 11,200 acres of agricultural land, a Town Hall, post office, fire station, church, businesses, and road network located within the dam breach inundation area. There is need to better manage water resources and improve irrigation water deliveries to approximately 3,000 acres of agricultural lands serviced by CCIC. Finally, there is need to provide better secondary water access to the Kanosh Band and to provide better irrigation and water supply conditions on Tribal land.

S.6 Description of the Preferred Alternative

The Preferred Alternative would replace the existing Dam and Debris Basin with a larger structure, replace the existing CCIC irrigation system with a gravity flow pipe system, add flood routing to divert waters away from Kanosh, mitigate seepage by piping a portion of the bypass channel, construct a diversion and measurement structure, relocate the Town's existing regulating pond, and improve the water delivery capabilities of the Kanosh Band.

S.7 Resource Information

Table S-1 identifies relevant resource information for the project area.

Table S-1: Existing Resource Information

Resource	Description
Latitude/Longitude	**Town of Kanosh:** 38°48'09" N / 112°26'18" W (Kanosh Town Park). Source: Google Earth
Elevation	5,020 Feet
Hydrologic Unit Code (HUC-8)	16030005
Climate (BestPlaces, 2023)	**Summer average high:** 90 Degrees F (July) **Winter average low:** 19 Degrees F (January)
Topography	Pahvant Valley (project locations are within the valley)
Annual Precipitation (BestPlaces, 2023)	Rain, average: 15 Inches Snow, average: 59 Inches
Watershed Area (USGS, 2020)	57,000 acres (89 square miles)
Watershed Land Use	National Forest: ~53,000 acres Agricultural: ~3,000 acres State Wildlife Conservation: < 500 acres
Watershed Land Ownership (Millard County GIS, 2024)	Federal: ~93% State: <1% Private: ~6%
Project Area Population (U.S. Census Bureau 2022a & 2022b)	**Town of Kanosh:** 508 People **Millard County:** 12,975 People
Project Area Demographics (U.S. Census Bureau 2022a & 2022b)	Town of Kanosh/Millard County White: 87.8%/82.8% Hispanic/Latino: 6.7%/12.9% Black/African American: 0.0%/0.6% American Indian/Alaska Native: 2.6%/2.1% Asian: 1.6%/1.6% Native Hawaiian/Pacific Islander: 0.0%/0.2%

Resource	Description
Farms Present in Millard County (USDA 2017a)	Number of Farms: 654 Land in Farms (acres): 481,539 Average Farm Size (acres): 736

S.8 Alternative Plans Considered

Alternatives that were analyzed in detail include the No Action Alternative (FWOFI), Action Alternative 1 – Proposed Action – Dam Replacement Alternative, and Action Alternative 2 – Nonstructural – Buyouts Alternative) . Action Alternative 1 is the Locally Preferred Alternative, Agency Preferred Alternative, Environmentally Preferred Alternative (LEDPA), and Economically Preferred Alternative (National Economically Efficient [NEE] Alternative). Mitigation measures were identified for potential impacts under the Preferred Alternative.

Under the No Action Alternative, the SLOs would have no funding to carry out the activities described under the Preferred Alternative in Section S.6. Kanosh Town would remain at a high risk of flooding during a major flood event, when the flows exceed the capacity of the open canals. The high hazard Dam and Debris Basin would continue to operate with foundation seepage issues, and the outlet works completely open to limit potential for a failure of the dam. The Dam would eventually fail when a flood event exceeded the capacity of the outlet works causing the Debris Basin to fill. As the Debris Basin fills, foundation seepage would increase, eventually resulting in the failure of the Dam. This would result in significant flooding and debris flows, cause damage to homes, and affect livelihoods, community infrastructure, and farms downstream of the Dam. CCIC would continue to use the open ditch system to deliver irrigation water to farmers, water losses due to seepage and evaporation would continue to occur, and farmers would continue to experience water shortages during the irrigation season, which limits cropping options and hinders economic development in the area. Outdoor water usage from the Kanosh Band's culinary system would continue to exceed the system's capacity resulting in service interruptions and loss of fire protection storage capacity. The Kanosh Band would not have the opportunity for future agricultural development without a reliable pipeline to deliver irrigation water.

Under the Dam Replacement Alternative, Corn Creek Dam and Debris Basin would be reconstructed to meet current NRCS and Utah Dam Safety engineering standards. Flooding concerns, agricultural water management issues, and issues pertaining to deficiencies of the Kanosh Town secondary water system and Kanosh Band's culinary system would be addressed. The Dam would be increased in height and moved downstream, increasing the flood storage capacity from approximately 250 acre-feet to 500 acre-feet. Flood routing and channel improvements would be made to divert flood water away from Kanosh Town and protect Interstate 15 from overtopping. These actions would assist in mitigating the potential effects of flooding to the downstream community. A gravity flow pipeline would minimize water losses, which would enable water savings and more reliable irrigation water deliveries to the farmers during the irrigation season. This would facilitate crop production and improve the livelihoods of the farmers in Kanosh. Splitting structures would be constructed for measurement and water management purposes. In addition, relocation of Kanosh Town's existing secondary water pond to a higher elevation would increase pressure in the Town's secondary water system and make a pressurized irrigation system feasible for the Kanosh Band, thus reducing outdoor water demand on their culinary water systems. A reliable pressurized irrigation system for Kanosh Band would also

enable future agricultural development in the Tribal community. The Kanosh Band would be able to irrigate 35 acres as a result of this project.

Under the Buyouts Alternative, the problems associated with Flood Prevention would be solved using nonstructural measures. In this case, the properties in the breach zone of Corn Creek Dam and Debris Basin and susceptible to flooding would be purchased and residents relocated to eliminate the risks and damages associated with flooding and with dam failure. All the agricultural water management measures of this alternative would be the same as the Dam Replacement Alternative and would be structural.

The Alternatives were developed from many considered management measures and were screened using a matrix consisting of the requirements of the Watershed and Flood Prevention Operations Program (PL 83-566), NEPA, and the PR&G using an Ecosystem Framework. Individual measures that addressed the problems and opportunities were screened for pairwise compatibility and combined into Alternative Plans. Alternative Plans were analyzed and evaluated using the matrix against project objectives, planning constraints, economic benefits, benefit/cost ratios, ecosystem service provision forecasts, and, finally, the PR&G screening criteria of Completeness, Effectiveness, Efficiency, and Acceptability. Proposed actions that did not meet the purpose and need, objectives, constraints, PL 83-566 program guidelines, ecosystem framework, or the PR&G screening criteria were eliminated from further study (see Section 4.3 for Alternatives eliminated and rationale for elimination and the PR&G Alternative Formulation & Screening Matrix in Appendix E).

S.9 Project Costs and Funding Source

The total estimated cost for the proposed project is summarized in Table S-2. Funding figures include all measures described in S.8. The estimated annual operation and maintenance cost for the proposed project is $28,500.

Table S-2: Estimate Project Costs

Item	NRCS PL83-566 Funds		Other Funds*		Total	
Construction	$24,063,000	72%	$3,589,000	11%	$27,652,000	83%
Engineering Technical Assistance	$5,054,000	15%	0$	0%	$5,054,000	15%
Project Admin. Costs	$281,000	1%	0$	0%	$281,000	1%
Real Property Rights	$0	0%	$150,000	0.5%	$150,000	0.5%
Permitting	$0	0%	$110,000	0.3%	$110,000	0.3%
Total	**$29,398,000**	**88%**	**$3,849,000**	**12%**	**$33,247,000**	**100%**

**Sponsor cost-share funds contributed by Kanosh Town, CCIC, and Kanosh Band.*

S.10 Net Economic Benefits

The estimated average annual economic benefits for the Preferred Alternative are summarized in Table S-3. The Preferred Alternative is also the NEE Alternative for the project, per Sections 505.2 and 505.35.B (1) (iv) of the NWPM.

Table S-3: Estimated Net Economic Benefits

Total Annual Benefits	Total Annual Costs	Benefit-Cost Ratio	Net Economic Benefits
$4,345,396	$1,232,600	3.53	$3,112,796

S.11 Period of Analysis

The period of analysis is 52 years. This includes a 2-year construction period and a 50-year evaluated life.

S.12 Project Life

The life of the project is estimated to be 50 years following 2 years of construction.

S.13 Environmental Impacts

Table S-4 identifies the resources of concern and potential environmental impacts associated with implementation of the Preferred Alternative. This table presents all resource concerns that were identified through project scoping and were included in the detailed analysis of this Plan-EA.

Table S-4: Summary of Resource Concerns Identified Through Scoping

Resource of Concern	Summary of Concern/Effect	Anticipated Environmental Effects Summary
Air Quality	Direct Temporary Effect	Construction activities are expected to produce dust and emissions, which would affect local air quality.
Climate Change & Greenhouse Gases (GHGs)	Direct Temporary Effect	Construction vehicles and equipment are expected to increase greenhouse gas emissions in the atmosphere. With the implementation of BMPs to minimize emissions from vehicles and the short duration of construction, the impact on climate change is expected to be minimal.
Cultural and Historic Resources	Direct Permanent Effect	Per 36 CFR 800.5(d)(2), the NRCS determined that the project would result in Adverse Effects to historic properties. area. Consultation was conducted in accordance with 36 CFR 800.3-800.6 to identify historic properties within the APE. The NRCS, in consultation with the SHPO, applicable tribes, etc., determined that there would be an adverse effect to historic properties. Per 36 CFR 800.6, NRCS has mitigated adverse effects through the development of an MOA. A copy of the reference draft MOA is included in Appendix A.

Resource of Concern	Summary of Concern/Effect	Anticipated Environmental Effects Summary
Ecosystem Services	Direct Permanent Benefit	Provisioning, Regulating, and Cultural Ecosystem Services would be improved under the Preferred Alternative. Further documentation of rationale and specific benefits are described throughout the Plan-EA.
Fish and Wildlife	No Effect	According to the Utah Hunt Planner interactive map (UDWR 2023), wildlife is present within the project area. The presence of fish and wildlife, however, may be limited due to residential and commercial development around the Town.
Floodplain Management	Indirect Permanent Benefit	This project aims to reduce the risk of flooding to the community in Kanosh and agricultural fields within the floodplains.
Geology & Soils	Direct Permanent Effect	Due to soil disturbance during construction, there is potential impact on the geology and soils within the project work areas.
Groundwater	Indirect Permanent Effect	Installation of a gravity pipeline to convey irrigation water in place of the open ditch system would decrease the potential for groundwater recharge. Groundwater quality could be affected by infiltration of pollutants such as spilled oils and other chemicals from construction equipment.
Invasive Species	Direct Temporary Effect	Construction activities create an opportunity for the spread of invasive plant species.
Land Use	Direct Permanent Benefit	Project measures would require easements by the sponsor or co-sponsor organization. NRCS would not be involved in agreement with the PL-566 Program regulations. Project measures would result in increased productivity on agricultural land.
Migratory Birds & Bald/Golden Eagles	Direct Temporary Effect	The official species list obtained from the USFWS IPaC system on March 21, 2022, and last updated on October 15, 2024, identified the long-eared owl as potentially present within the project area.
Prime and Unique Farmlands	Direct Permanent Benefit	According to the NRCS Web Soil Survey interactive map, prime farmland exists within the project area.
Public Health and Safety	Direct Permanent Benefit	Corn Creek Dam does not meet current NRCS and Dam Safety engineering standards for high hazard dams and poses a threat to public safety due to the significant seepage issues in the Dam's foundation.
Riparian Areas	No Effect	Riparian areas occur in association with Corn Creek.

Resource of Concern	Summary of Concern/Effect	Anticipated Environmental Effects Summary
Socioeconomics	Indirect Permanent Benefit	A positive impact on the socioeconomic status of the residents in Kanosh and the surrounding community is anticipated from implementation of the proposed project.
Significant Scientific Resources	No Effect	As defined in the National Cultural Resources Procedures Handbook, there are no resources of scientific value present in the project area. However, the NWMC requested that this resource concern be given full consideration in this Plan-EA. See letter confirming no paleontological resources in Appendix A from the Utah Geological Survey (UGS).
Scenic Beauty & Visual Resources	Direct Temporary Effect	Disturbed grounds and heavy equipment present during construction may impact the visual resources around the project area.
Threatened & Endangered Animal Species	No Effect	An official species list was acquired from the USFWS Information for Planning and Consultation (IPaC) system on March 21, 2022, and last updated on October 15, 2024.The list indicated that the monarch butterfly, currently listed as a candidate species under the Endangered Species Act (ESA), may occur within the project area.
Threatened & Endangered Plant Species	No Effect	An official species list from the USFWS IPaC system obtained on March 21, 2022, and last updated on October 15, 2024, identified the Ute ladies'-tresses (ULTs), a threatened plant species, as potentially present within the project area.
Upland Erosion, Streambank Erosion, & Sedimentation	Direct Temporary Benefit	Disturbance of soils from construction activities would increase potential for erosion and sedimentation.
Transportation Infrastructure	Direct Permanent Benefit	Transportation infrastructure exists within the dam breach inundation area and would be affected in the event of a dam breach. There is also potential to temporarily impact transportation routes during construction activities.
Surface Water	Indirect Temporary Effect	Construction activities along Corn Creek and near drainage channels may impact water quality due to erosion of soil and other pollutants from construction sites.
Wetlands	Direct Permanent Effect	Wetland resources are present within the project area.

S.14 Major Conclusions

Of the alternatives analyzed, Action Alternative 1 – Proposed Action – Dam Replacement Alternative best meets the purpose and need as required by NEPA and has the greatest benefit/cost ratio. Based on the PR&G guiding principles, this alternative is the Locally Preferred Alternative, the Environmentally Preferred Alternative, and the NEE Preferred Alternative.

S.15 Areas of Controversy

No significant issues or controversy are anticipated resulting from implementation of the Preferred Alternative. This has been confirmed through reasonable and good faith consultation efforts with SHPOs, Tribes, and Cooperating Agencies.

S.16 Issues to Be Resolved

The following issues would be resolved for the implementation of the Preferred Alternative:

- Securing easements on private property before construction
- Coordinating with utility companies
- Coordinating with agencies/cities/counties on roadway crossings

S.17 Evidence of Unusual Congressional or Local Interest

There is no evidence of unusual congressional interest. There is a local/statewide interest in that watershed planning will assist in meeting State Water Management goals as outlined in the 2023 Utah Legislative Audit for Water Management.

S.18 In Compliance

This Plan-EA is in full compliance with all public laws, statutes, and Executive Orders governing the development of water resource projects.

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1.0 Watershed Planning Background

1.1 Authority

This Watershed Plan-Environmental Assessment (Plan-EA) has been prepared under the Watershed Protection and Flood Prevention Act of 1954, Public Law (PL) 83-566, as amended (16 USC Section 1001 et. seq); in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), PL 91-190, as amended (42 USC 4321 et seq); and in accordance with the Principles, Requirements, and Guidelines for Water and Land-Related Resource Implementation Studies and Federal Water Resource Investments (PR&G).

1.2 Sponsor

The Sponsoring Local Organization (SLO) is the Town of Kanosh, located in Millard County, Utah. The project's co-sponsors are Corn Creek Irrigation Company (CCIC) and the Kanosh Band of Paiute Indians (Kanosh Band). These sponsors meet the relevant SLO responsibilities as outlined in 390 National Watershed Program Manual (NWPM) section 500.11.

1.3 Cooperating Agencies

The NRCS sent requests to the following agencies requesting to cooperate on this project. No agencies accepted the invitation to this project.

Table 1-1: Cooperating Agency Outreach

Agency	Response
Environmental Protection Agency (EPA)	Declined/Requested Opportunity to Review the Plan-EA During the Public Comment Period
U.S. Army Corps of Engineers (USACE)	No Response
U.S. Fish & Wildlife Service (USFWS)	No Response
Bureau of Land Management (BLM)	No Response

1.4 Planning Area

1.4.1 Selected Watershed

The project is being planned for the Corn Creek Watershed, located in Millard County, Utah. The planning area overview map below identifies the target watershed in its surrounding context. The watershed planning area is comprised of HUC 16030005. The watershed map below identifies the project area in context of the relevant HUC.

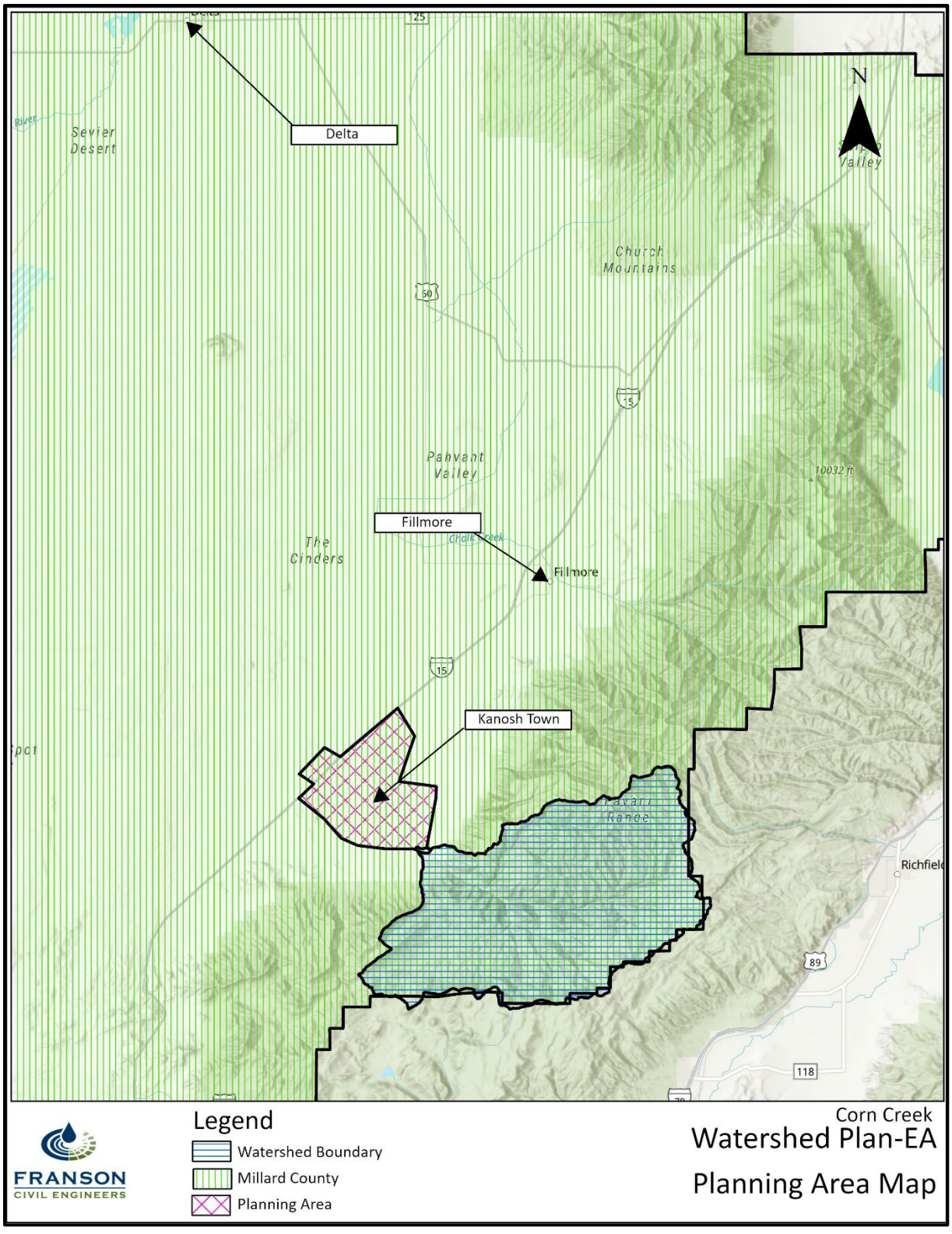

Figure 1-1: Planning Area Overview Map

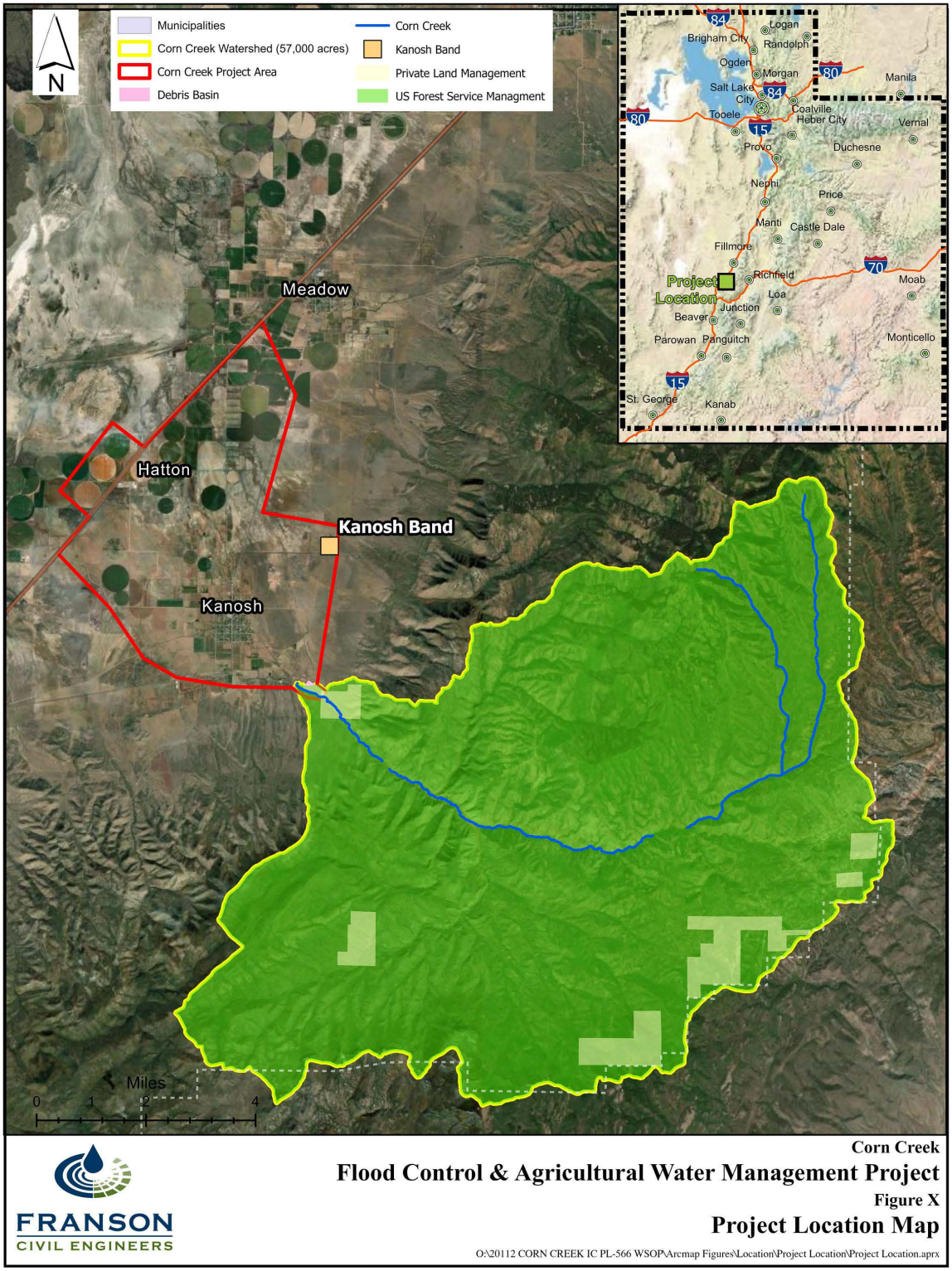

Figure 1-2: Watershed Map

1.4.2 Study Area

The project study area, or project area, is the boundary within which the proposed project would be installed. A map of the project study area is included below.

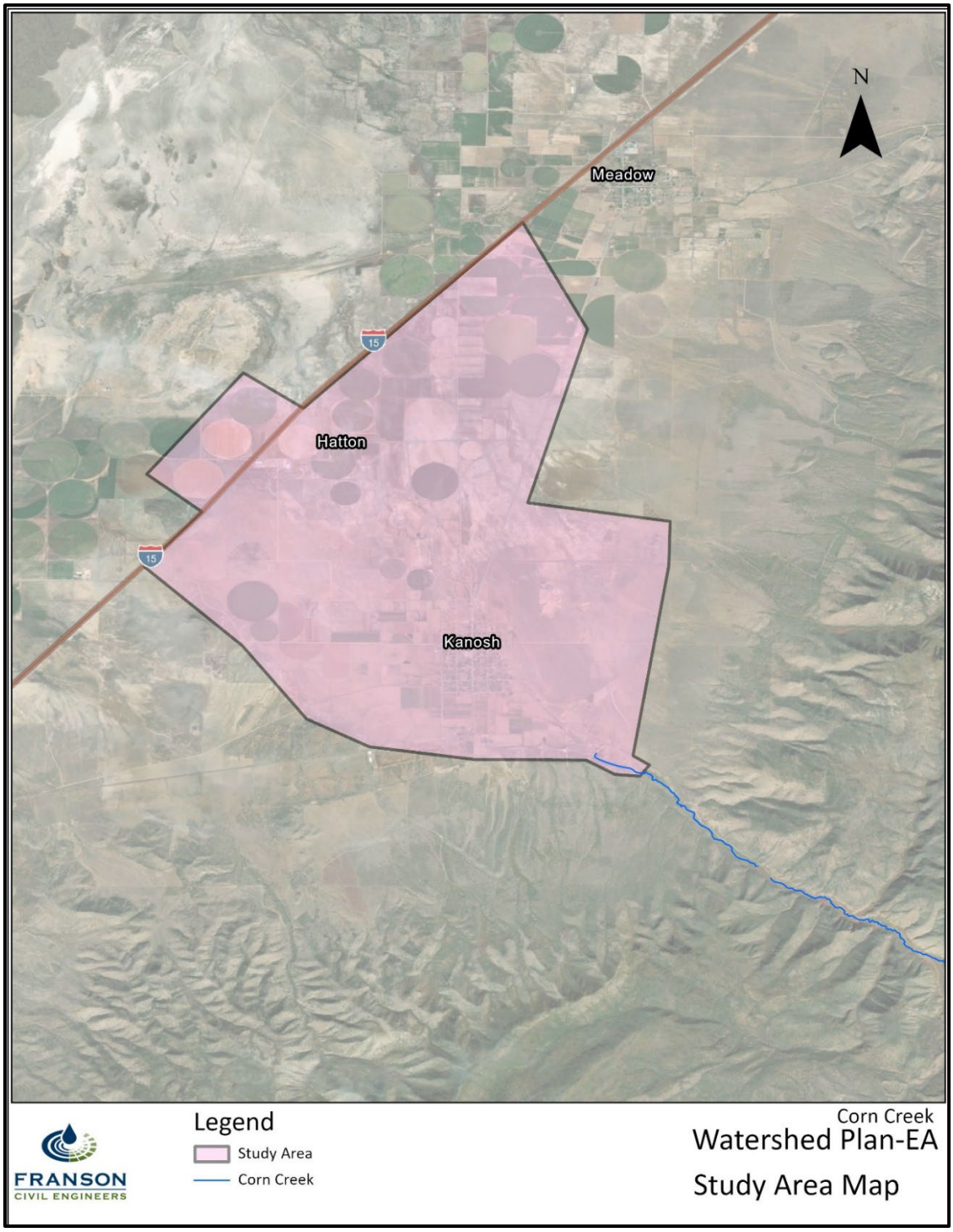

Figure 1-3: Study Area Map

1.4.3 Area(s) of Potential Effects for NHPA Compliance

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, mandates that the potential effects of a proposed Federal undertaking on historic properties be considered. In order to properly conduct section 106 analysis, the Area of Potential Effects (APE) must first be defined.

The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR, 800.16(d)).

The figure below delineates the direct APE that was used to evaluate alternatives. The indirect APE was also defined and is discussed later in this report and in Appendix D.

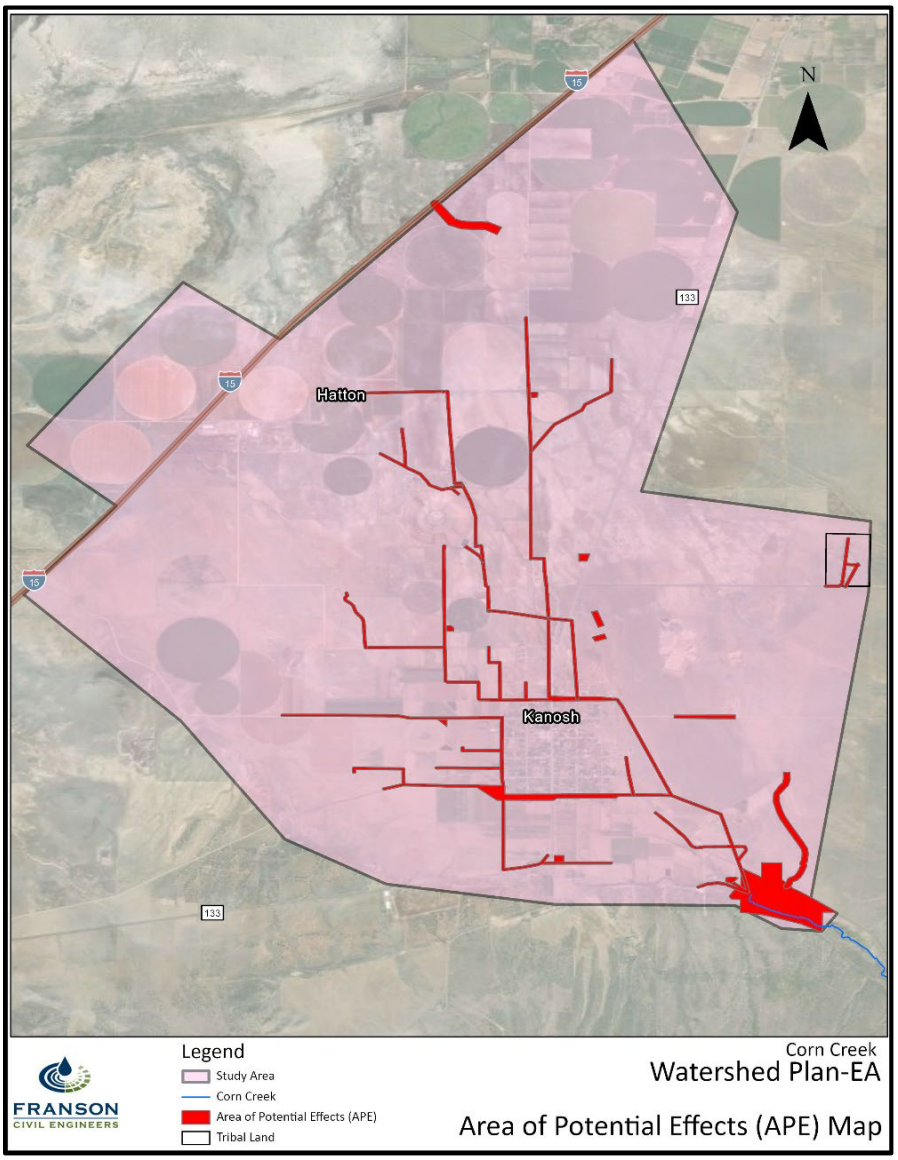

Figure 1-4: Area of Potential Effects (APE) Map

1.5 Planning Process and Study Scope

1.5.1 Stepwise Planning Process

Watershed Plans are voluntary, comprehensive plans for a watershed or other large geographic area. NRCS areawide conservation planning policy requires consideration of all natural and cultural resources within a planning area, as well as social and economic considerations. Watershed Plans are developed through a voluntary locally led effort to achieve the following:

Assess natural resource conditions and needs
Set goals
Identify programs
Alternative actions and other resources to solve those needs
Develop proposals and recommendations to solve those needs
Implement solutions
Measure success

The NRCS conservation planning process consists of nine steps which cover development, implementation, and evaluation of an Areawide Conservation Plan. The three phases and nine steps are identified below:

Phase 1 – Collection and Analysis
Step 1 – Identify Problems and Opportunities
Step 2 – Determine Objectives
Step 3 – Inventory Resources
Step 4 – Analyze Resource Data
Phase 2 – Decision Support
Step 5 – Formulate Alternatives
Step 6 – Evaluate Alternatives
Step 7 – Make Decisions
Phase 3 – Application and Evaluation
Step 8 – Implement the Plan
Step 9 – Monitor the Plan

1.5.2 Ecosystem Services Framework

This Plan-EA also complies with the PR&G (USDA DM 9500-013). The PR&G utilizes its own 8-step planning process that mirrors the processes in NEPA and the NRCS 9-step process.

An important part of the PR&G process is the use of an ecosystem framework, characterized as the goods and services provided by a healthy, functioning environment. Commonly, the ecosystem framework is organized into four service categories including:

- **Provisioning Services:** Services that provide tangible goods for direct human use or consumption.
- **Regulating Services:** Services that maintain a world in which it is possible for people to live and provide critical benefits that buffer against environmental catastrophe or disaster either locally, regionally, or on a larger scale.
- **Supporting Services:** Services that support the underlying processes for maintaining conditions for life on Earth such as nutrient cycling, soil formation, and primary production (photosynthesis).

- **Cultural Services:** Services that make the world a place in which we want to live in such as recreational, spiritual, aesthetic viewsheds, Tribal, or other cultural and community values.

1.5.3 Period of Analysis

The NWPM defines the period of analysis as "the time required for implementation (design and construction) plus the evaluated life of the project." The period of analysis for this Plan-EA is 52 years. This includes a 2-year construction period and a 50-year evaluated life.

1.5.4 Project Scope

This Plan-EA is authorized by PL 83-566. The program seeks to provide technical and financial assistance to States, local governments, and Tribes to plan and implement authorized watershed project plans for various purposes.

A Watershed Plan can provide assistance for projects planned for any combination of the various authorized purpose(s) of PL 83-566. This Plan-EA has been prepared with the authorized purposes of Flood Prevention and Agricultural Water Management.

1.5.5 External Scoping

An external scoping process was completed to gather resource information and to initiate important consultation and coordination efforts. A kickoff meeting was held on April 15, 2021. A 30-day scoping period was conducted from April 28, 2021, to May 28, 2021, to provide an opportunity for the public, agencies, Tribes, and others to express concerns related to the project. This process included agency and public scoping meetings. Six comments were received during the comment period. A scoping report was prepared summarizing the scoping process and is included in Appendix A.

Scoping letters for both NEPA and NHPA were sent to Tribes/THPOs in April 2021 to initiate the formal Tribal consultation process in order to meet the "reasonable and good faith" requirement of the NHPA. Due to updates to the Cultural Resource Package and changing interpretations of NEPA/NHPA requirements, the Section 106 consultation process was reinitiated in April 2024. The entire Section 106 process is documented in Appendix A.

The following Tribes were contacted as part of the Section 106 consultation process:

- Kanosh Band of Paiute Indians (Kanosh Band)
- Northwest Band of the Shoshone Nation
- Southern Paiute Tribe
- Cedar Band of Paiute Indians
- Navajo Utah Commission
- Shivwits Band of Paiute Indians
- Navajo Nation Office of the President
- San Juan Southern Paiute Tribe of Arizona
- Hopi Tribe of Arizona
- Southern Ute Indian Tribe
- Paiute Indian Tribe of Utah (PITU)
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Skull Valley Band of Goshute Indians

1.6 Related Projects and Studies

A list of relevant related projects/studies that have occurred within the watershed is disclosed below:

- NRCS: Millard County Emergency Watershed Protection – Site Spring & Water Crossing
- NRCS: Lower Sevier River Watershed Plan-Environmental Assessment
- USFS: Desert Experimental Range in Pine Valley/USU Soil Survey Project
- USFS: White Sage Flat Habitat Restoration Project
- IPA: Intermountain Power Project (IPP)
- FERC: Kern River Delta Lateral Project
- BLM: Renewable Energy Development/Fishlake National Forest
- BLM: Three Knolls Project Phase II
- UDWR: Pahvant Wildlife Management Area Habitat Improvement Projects
- UDWR: Fillmore WMA Habitat and Private Land Habitat Improvement Project
- UDOT: US-6 Delta to Juab County Line and SR-174 Project
- UDOT: I-70/I-15 Interchange Bridge Maintenance Project
- Kanosh Band: Geothermal Energy Development (DOI Grant) Project
- Kanosh Band: RV Park Enhancement (USDA Grant) Project
- Kanosh Band: Park and Playground Upgrades (Native American Initiative) Project

These related projects and studies and their cumulative effects on this project are discussed further in Section 5.3.27.

2.0 Purpose and Need

2.1 Purpose

The purpose of the project is to reduce the risk of flooding and flood damage to the Kanosh community downstream of the dam and improve agricultural water management for CCIC shareholders and the Kanosh Band.

2.1.1 Federal Objective

Water resources investments shall reflect national priorities, encourage economic development, and protect the environment by:

- seeking to maximize sustainable economic development,
- 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
- protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

2.1.2 Project Objectives

The project objectives are to solve the problems identified in section 2.2.1 by using the opportunities described in section 2.2.2. Objectives for this project include:

- Objective 1: Address dam safety compliance problems with Corn Creek Dam and Debris Basin through the year 2080.
- Objective 2: Address recognized breach and flood hazards for infrastructure downstream of the Corn Creek Dam through the year 2080.
- Objective 3: Develop and implement a solution to conserve secondary water in Kanosh Town and provide a secondary source to the Kanosh Band to reduce culinary water demand through the year 2080.
- Objective 4: Develop and implement a solution that will allow the residents of the watershed to be more resilient to drought conditions, which are forecasted to increase in frequency as a result of long-term climate change.

2.1.3 Constraints and Considerations

In any planning process, there are certain restrictions that limit the extent to which the implementation of a project would achieve the project objectives. The constraints and considerations for the Corn Creek Watershed project include:

1. Constraint 1: Avoid disruptions to existing residential and commercial properties during the implementation of the project in Kanosh Town and on Tribal lands.
2. Constraint 2: Avoid adverse impacts to cultural and historic resources in the watershed to the maximum extent possible during project implementation.
3. Constraint 3: Avoid impacts to existing transportation infrastructure to ensure continued access for emergency services and residents during implementation.
4. Constraint 4: Avoid disruptions to the ability of farmers to access their water supply during the irrigation season.

5. Constraint 5: Avoid adverse impacts to the socioeconomic conditions of the Kanosh Band of Paiutes.

2.2 Need

The project is needed to provide flood control to the surrounding areas and implement solutions to deficiencies at the existing Dam and Debris Basin which does not meet NRCS or Utah Dam Safety engineering standards. There is a need to increase the flood detention capacity of the Dam and Debris Basin as well in order to better control debris and sediment and facilitate routing of flood waters to minimize damage. There is a need to reduce seepage and evaporation losses in the CCIC system to extend the growing season and improve cropping options. Finally, there is a need to improve the reliability of the secondary water systems in Kanosh Town and on Kanosh Band Tribal land. This project will not seek options to perform rehabilitation of the existing dam which is (A) at risk of imminent failure and (B) is not a NRCS dam, meaning it is ineligible for rehabilitation under the NRCS's REHAB program.

2.2.1 Problems

The Corn Creek Watershed, located in Millard Couty, Utah, currently experiences problems related to Flood Prevention and Agricultural Water Management. The Town of Kanosh is at risk of significant flooding due to the noncompliance of Corn Creek Dam and Debris Basin with State and NRCS standards and the impaired flood detention capacity of the existing dam, which is rated as a high hazard dam. Additionally, the CCIC system experiences significant seepage and evaporation losses. The Kanosh Band of Paiute Indians (Kanosh Band) does not have access to secondary water and currently relies on their culinary supply to meet high outdoor demands.

2.2.1.1 Flood Prevention Problems – Corn Creek Dam and Debris Basin

Corn Creek Dam currently does not meet the minimum standards for existing dams set forth by the State Engineer under Utah Administrative Code (UAC) R655-12-5. The Dam is rated as a high hazard dam, which means that there is a high probability of loss of life, significant economic loss, or damage to critical public infrastructure in case of a dam breach.

A routine inspection by the State Engineer identified foundation seepage issues in the Dam's embankment, which compromises the integrity of the Dam and its ability to impound water. As a result, the State Engineer directed that the outlet works at the Dam (the primary spillway) remain fully open until the safety issues are resolved. The existing Debris Basin is therefore limited in its ability to capture debris and sediment which accumulate in the irrigation ditches and flood channels, limiting their capacity to capture and convey irrigation and flood water. The State Engineer is also concerned that the existing toe drain and spillway crest do not meet current NRCS and Utah Dam Safety engineering standards. Hence, the Dam and Debris Basin are currently incapable of attenuating peak flows and protecting the downstream community from flooding. With the existing foundation seepage issues, a dam breach is imminent if the debris basin was to be used as intended. A dam breach would result in debris flows and significant flooding which would be devastating for the Kanosh community. (See Appendix D for more information).

Flood detention capacity of the Dam and Debris Basin needs improvement in order to better control debris and sediment and to minimize damage. Some downstream ditches also need improvement to safely convey flood waters. The current Debris Basin capacity is approximately 480 acre-feet at the dam crest and 230 acre-feet at the crest of the main spillway. Increasing the capacity of the

Debris Basin would decrease the potential for flood damage to approximately 508 people, 213 homes, 3,776 acres of agricultural land, and critical public infrastructure, which includes a Town Hall, post office, fire station, church, and road network, all located within the 100-year flood breach inundation area.

2.2.1.2 Agricultural Water Management Problems -- Corn Creek Irrigation Company (CCIC) System

There are significant seepage and evaporation losses in the current CCIC system, warranting significant improvements to agricultural water management in the Town of Kanosh by project management measures. CCIC would like to improve its water conservation capability and increase irrigation water deliveries to lands serviced by CCIC. Additionally, CCIC seeks an extended growing season and increased cropping options and yields on the farmlands of their shareholders.

2.2.1.3 Flood Prevention & Agricultural Water Management – Kanosh Town Regulating Pond

Any work at site of the Dam and Debris Basin would likely displace the Town's existing secondary water regulating pond downstream of the Dam; there would be a need to relocate the pond. The pond would likely be relocated to a higher elevation area which would increase pressure in the secondary water systems for Kanosh Town and the Kanosh Band. This would improve the reliability of their secondary water systems and reduce outdoor water demand on their culinary water systems. The relocation of the regulating pond that would likely come as a result of project measures at the Dam and Debris Basin, would help to address the problems of flood prevention and agricultural water management in the project area.

2.2.2 Opportunities

The following opportunities presented by the project would serve as a means of resolving immediate problems (stressors) and promoting positive, long-term stability, and change in large-scale issues (drivers) affecting the project area.

- Opportunity 1: Improve the safety of the residents of Kanosh Town through the implementation of project measures.
- Opportunity 2: Enhance community resilience to flood risks through the implementation of project measures.
- Opportunity 3: Increase the level of breach and flood risk awareness in the community.
- Opportunity 4: Conserve water resources and optimize water use efficiency on agricultural lands in the watershed.
- Opportunity 5: Provide access to a reliable secondary water supply for the Kanosh Band through project measures.
- Opportunity 6: Reduce community reliance on groundwater for late season irrigation and reduce pumping demands.

3.0 Affected Environment: Current & Future Conditions

3.1 Resource Categories of Concern

During scoping, relevant resource concerns were identified to be analyzed or eliminated from detailed study. The general procedures contained in the NRCS NWPH (2014) and the NRCS NWPM (2024) were followed for the scoping process. The table below identifies the resource categories of concern and their relevance to this Plan-EA The rationales for eliminating concerns determined to be irrelevant is also included in the Table.

Table 3-1: Resource Categories of Concern and Ecosystem Services Considered During Scoping

Item/Concern	Relevant to the Proposed Action (Yes/No)	Rationale
SOIL-RELATED CONCERNS		
Geology & Soil Resources	Yes	Due to soil disturbance during construction, there is potential impact on the geology and soils within the project work areas.
Prime and Unique Farmland, and Farmland of Statewide or Local Importance	Yes	According to the NRCS Web Soil Survey interactive map, prime farmland exists within the project area.
Upland Erosion, Streambank Erosion, & Sedimentation	Yes	Disturbance of soils from construction activities would increase potential for erosion and sedimentation.
WATER-RELATED CONCERNS		
Water Resources (Water Quantity)	Yes	Project measures have the potential to impact surface and groundwater quantities in the project area.
Sole Source Aquifers (SSA)	No	The EPA's Sole Source Aquifer Map (accessed 10/15/24) identified no SSAs in or near the study area.
Water Quality	Yes	Project measures have the potential to impact water quality in the watershed.
Floodplain Management	Yes	The project aims to reduce the risk of flooding to the community of Kanosh and agricultural fields in the areas surrounding Kanosh and also prevent floodwaters from overtopping I-15 by routing floodwaters to multiple culverts.
Coastal Zone Management Areas	No	Project location is not located along the coast.
Waters of the U.S., & Special Aquatic Sites	Yes	Preliminary investigation using the National Wetlands Inventory (NWI) wetlands mapper

		identified potential wetland resources/WOTUS within the project area.
Coral Reefs	No	There is no habitat for coral reefs present in the project area.
Regional Water Resource Plans (including coastal plans)	No	There are no regional water resource plans for the project area.
Wild and Scenic Rivers	No	There are no Wild & Scenic Rivers designated in the vicinity of the project area (NPS, 2024).
AIR-RELATED CONCERNS		
Air Quality	Yes	Construction activities are expected to produce dust and emissions, which may affect local air quality.
Clean Air Act (CAA)	No	There is no CAA permitting anticipated as a part of this project.
Climate Change/Greenhouse Gases Emissions (GHG)	Yes	Construction vehicles and equipment are expected to temporarily increase greenhouse gas emissions in the atmosphere. With the implementation of BMPs to minimize emissions from vehicles and the short duration of construction, the impact on climate change is expected to be minimal.
PLANT AND ANIMAL-RELATED CONCERNS		
USFWS Threatened & Endangered Plant Species	Yes	An official species list from the USFWS IPaC system obtained on March 21, 2022, and last updated on October 15, 2024 (Appendix D), identified the Ute ladies'-tresses, a threatened plant species, as potentially present within the project area. However, an investigation was completed, and it was found that there is no suitable habitat in the project area. Thus, Ute ladies'-tresses are not a concern at this time.
USFWS Threatened & Endangered Animal Species	Yes	An official species list was acquired from the USFWS Information for Planning and Consultation (IPaC) system on March 21, 2022, and last updated on October 15, 2024 (Appendix D). The list indicated that the monarch butterfly, currently listed as a candidate species under the Endangered Species Act (ESA), may occur within the project area.
Utah Special Status Animal Species	Yes	A report from the Utah Natural Heritage Program (UNHP) identifying the Utah-sensitive species (or SGCN) within the project area was obtained on March 4, 2021 (Appendix D). The identified species included the Bald Eagle, burrowing owl, Bonneville cutthroat trout, and Sonoran Mountain kingsnake.
Migratory Birds & Bald and Golden Eagles	Yes	The official species list obtained from the USFWS IPaC system on March 21, 2022, and last updated on October 15, 2024, identified the long-eared owl

		as potentially present within the project area as well as potential presence of Bald/Golden Eagles.
Essential Fish Habitat	No	The NOAA Essential Fish Habitat Mapper (accessed 10/15/24) identified no essential fish habitat in or near the study area.
Protected Natural Areas/Conservation Areas	No	There are no protected natural areas or designated conservation areas within the study area.
Invasive Species/Noxious Weeds	Yes	Construction activities create an opportunity for the spread of invasive plant species.
Fish and Wildlife (including coordination requirements)	Yes	According to the Utah Hunt Planner interactive map (UDWR 2023), wildlife is present within the project area. The presence of fish and wildlife, however, may be limited due to residential, agricultural, and commercial development around the Town.
Riparian Areas	Yes	Riparian areas occur in association with Corn Creek and possibly irrigation ditches.
Forest Resources	No	There are no forest resources in the study area; the environment/vegetative conditions are not that of forest cover.
HUMAN USE-RELATED CONCERNS		
Cultural Resources and Tribal Consultation	Yes	Cultural resources and historic properties are present within the project area.
Environmental Justice and Civil Rights	No	Environmental Justice was not considered as a resource of concern per Executive Orders 14148 and 14173 and the Council of Environmental Quality's (CEQ's) memorandum dated February 19, 2025, as well as the USDA National Bulletin issue 190-25-8 date March 13, 2025.
Social Issues	No	There are no significant social issues in the Study Area.
Local, Regional, and National Economy (Socioeconomics)	Yes	A positive impact on the socioeconomic status of the residents in Kanosh and the surrounding community is anticipated from implementation of the proposed project. The project could generate new employment opportunities, support local businesses, and improve the productivity of local cropland.
Public Health and Safety	Yes	Corn Creek Dam does not currently meet current NRCS and Dam Safety engineering standards for high hazard dams and poses a threat to public safety due to the significant seepage issues in the Dam's foundation. Natural channels and irrigation ditches do not currently have the capacity to safely route flood waters through or around Kanosh.
Scenic Beauty	Yes	Disturbed grounds and heavy equipment present during construction may impact the visual resources around the project area. The appearance

		of the dam embankment would alter the visual resources. The proposed embankment would be taller than the existing one, but similar in appearance.
Parklands (including National Parks, Monuments, and Historical Sites)	No	There are no National Parks, Monuments, Historical Sites, or other Parklands in the study area (NPS, 2024).
Significant Scientific Resources	Yes	There are no significant geological, paleontological, or caves/karst in the study area that warrant consideration as a resource of scientific value. However, NWMC requested that this resource concern be fully considered in the Plan-EA.
Land Use	Yes	Project measures would require easements by the sponsor or co-sponsor organization. NRCS would not be involved in acquiring easements or land acquisition according to the PL-566 Program regulations. Project measures would result in increased productivity on agricultural land, but water rights limitations would prevent an increase of irrigated acreage. Additionally, a portion of the project area is owned by the Kanosh Band.
SCOPED ECOSYSTEM SERVICES OF CONCERN		
Provisioning		There are provisioning services in the project area.
Regulating		There are regulating services in the project area.
Supporting		Supporting services are categorized as an intermediate ecosystem service. As an intermediate ecosystem service, their service is already included in the final ecosystem service, which mainly consists of benefits derived from provisioning, regulating, and cultural services. Because there is no measurable benefit associated with supporting services, it is not included in the ecosystem services analysis for this Plan-EIS.
Cultural		There are cultural services in the project area.
OTHER CONCERNS IDENTIFIED BY SLO, AGENCIES, AND THE PUBLIC		
Transportation Infrastructure	Yes	Transportation infrastructure exists within the dam breach inundation area and would be affected in the event of a dam breach. There is also potential to temporarily impact transportation routes during construction activities.
Hazardous Materials & Waste	No	An evaluation for hazardous material/waste sites within the study area was conducted using the Utah Department of Environmental Quality's (DEQ) environmental response and remediation interactive tool. No permanent sites were identified. Only isolated incidents in the town of Kanosh and along I-15 were identified, no storage facilities or waste sites.

3.2 Inventory of Existing Conditions

3.2.1 Existing Conditions – Location and Setting

The project is located in Pahvant Valley in Millard County, Utah, approximately 160 miles south of Salt Lake City, with the Pahvant Mountain Range to the east and South Mountain to the south The project area starts just upstream of the Dam and Debris Basin, located at the mouth of Kanosh Canyon, and includes Kanosh Town, the Kanosh Band community, and farmland around the Town. The Debris Basin is approximately 1 mile southeast of Kanosh Town while the Kanosh Band community is located approximately 2.3 miles northeast of the Town. A map of the project location and setting may be found in Chapter 1.

Corn Creek Dam and Debris Basin receives water from Corn Creek, which originates in the Pahvant Mountain Range and drains an area of approximately 89 square miles or 57,000 acres (USGS 2020). More than 93% of the Corn Creek Watershed is Federally owned and managed by the United Stated Forest Service. Less than 6% is privately owned and less than 1% is owned by the State of Utah. Additional information for the Corn Creek Watershed, including in stream gauge records, land use information, fire history, solids information, land cover, precipitation, topography, and maps can be found in Appendix D which covers the hydrology of the upper watershed.

At the Debris Basin, Corn Creek is diverted into open irrigation ditches and natural channels managed by CCIC. The irrigation ditches supply water for agriculture and stock watering to the farmers around Kanosh, with over 60% of the farmland used to grow alfalfa and the remainder of the land used to grow corn, other hay, grass/pasture, triticale, winter wheat, spring wheat, barley, sorghum, oats, potatoes, and other tree crops (USDA 2023). However, due to seepage and evaporation from the ditches and reduced flow in Corn Creek during the irrigation season, CCIC shareholders around Kanosh experience frequent water shortages, resulting in limited crop options and yields. A portion of the water from Corn Creek is diverted into the Town pond immediately downstream of the Debris Basin.

Due to the proximity and location of the Dam and Debris Basin upstream of Kanosh Town, there is a high risk of flooding the Town. Extensive modeling has been carried out for the Kanosh area for the 2-year, 5-year, 10-year, 25-year, 50-year, 100-year, 200-year, and 500-year flood events. The model results show that flooding would start during the 5-year flood event. This is because the outlet works at the Dam must be left fully open, at all times, under a directive from the State Engineer in response to the significant foundation seepage issues identified at the Dam that are a safety concern. The flooding extent would increase in the return period, and by the 100-year flood event, most of Kanosh Town would be inundated (see Appendix D for details).

3.2.2 Existing Conditions – History of Flooding Kanosh

Historically, there has been flooding in the Kanosh area when the capacity of the open irrigation ditches and natural channels is exceeded, and the ditches/channels are unable to safely convey excess flows from Corn Creek. In 1984 and 2011, there was significant flooding that caused damage to homes and agricultural fields in the area.

In 1984, spring runoff coming from the Pahvant mountains caused Corn Creek Dam to fail. The *Millard County Progress* (1984) reported that approximately 50-75 feet of the earthen dam was washed away, resulting in mud and debris flowing towards the Town. CCIC's irrigation ditches were overwhelmed, and the flooding extended to farmland and residential areas, with about half a

dozen basements getting flooded with approximately 0.5 inches to 3 feet of water. Roads were breached and telephone poles destroyed, cutting off telephone service for a few hours. According to a 1989 report by Utah Geologic and Mineral Survey (Kaliser 1989), the damage from the floods included approximately 388,000 cubic yards of sediment that accumulated about 2-16 feet deep and over 4 acres, which cost approximately $486,000 to clean up. There was $13,000 worth of damage to a culinary water line, irrigation canal, roads, poster poles, and a parking lot, and about $50,000 in damage at the Adelaide Campground upstream of the Debris Basin (Kaliser 1989). The county Sheriff at the time, Ed Philips, estimated the damage to farm fields, the irrigation systems, and homes to cost several hundreds of thousands of dollars (*The Millard County Progress* 1984). Note that these numbers are in 1984/1989 dollars.

Damages from the 1984 flood event may be seen in the Appendix C. A copy of the newspaper article narrating this flood event is provided in Appendix D. The base flood, also known as the 100-year flood event, is the standard used by Federal agencies and the National Flood Insurance Program (NFIP) to purchase flood insurance and to regulate new development (FEMA 2020). The flood events in 1984 and 2011 are considered to be a 10-year event or smaller. The base flood is much larger than these flood events (Appendix D).

3.2.3 Existing Conditions – Agricultural Water Management

CCIC's open ditch system consists of approximately 28.5 miles of open ditches which convey irrigation water from the Debris Basin to farmland around Kanosh. The system currently supplies irrigation water to approximately 3,500 acres of farmland. Due to seepage and evaporation losses, the system is not able to deliver sufficient irrigation water to farmers during the majority of the irrigation season. This has led to increased demand for the Town's culinary water system and increased groundwater withdrawals which have caused a drop in the water table and high salt concentrations in the soils (Mower 1965). Water shortages during the irrigation season limit crop selection and production, hindering economic development in the area. The figure below shows the CCIC ditch system and service area.

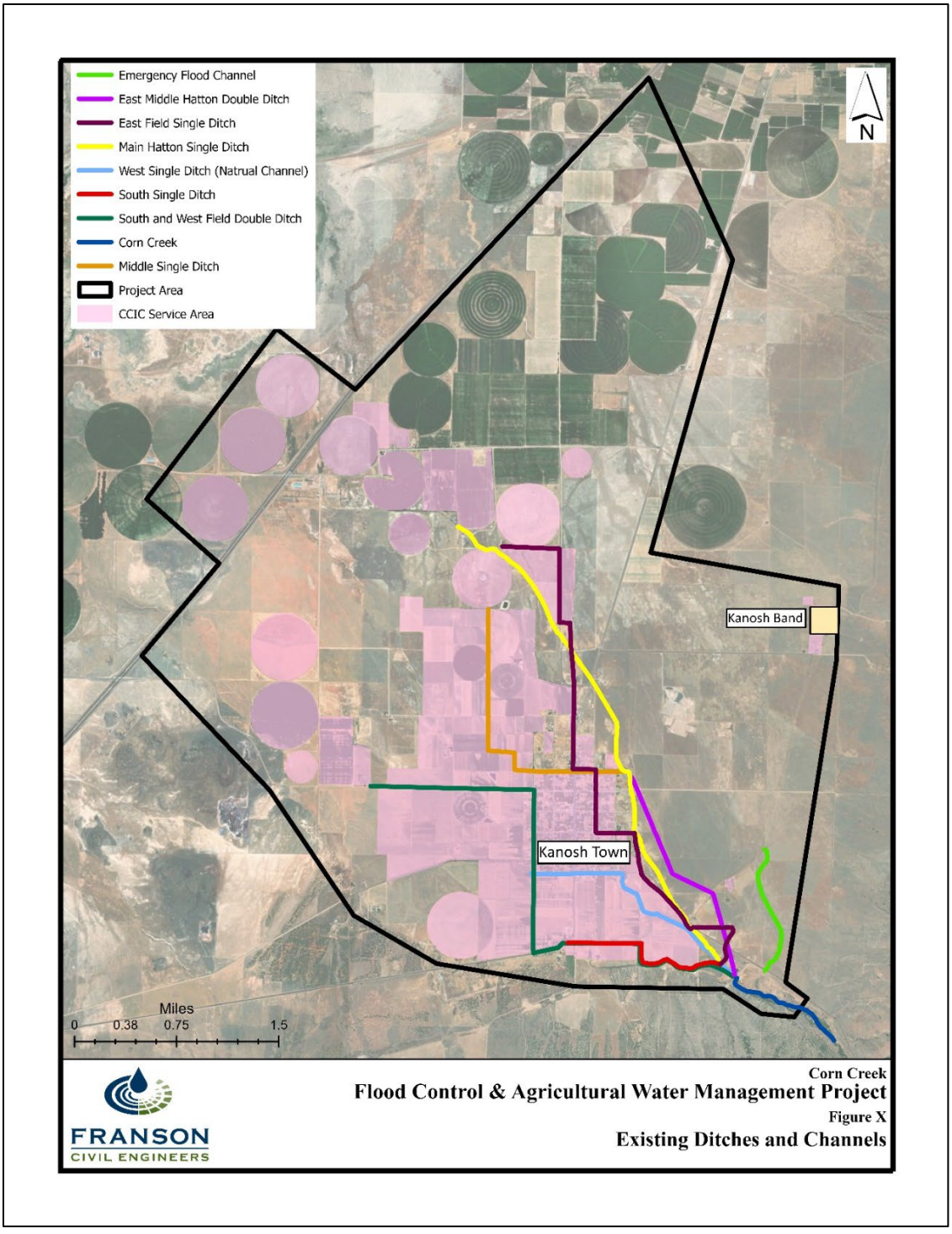

Figure 3-1: CCIC Ditch System and Service Area

3.2.4 Infrastructure and Existing Conditions

3.2.4.1 Corn Creek Dam and Debris Basin

As previously mentioned, Corn Creek Dam and Debris Basin were reconstructed in 1985 following the failure of the Dam. Reconstruction included replacing the outlet works, installing a new primary and auxiliary spillway, and installing a partial toe drain.

Table 3-2: Dam Specifications (DWRi 2023a)

Dam Characteristics	Value
Dam Site Elevation	5,198 ft
Dam Crest Length	1,900 ft
Dam Crest Width	12 ft
Storage Capacity-Crest	468 af
Storage Capacity-Spillway	200 af
Spillway Max Discharge	2,400 cfs
Dam Breach Discharge	5,000 cfs

With a use classification of flood control, the Dam is allowed to impound water only for short periods of time during high flow events. However, as mentioned earlier, the 60-inch outlet must be left open at all times to minimize the risk of dam failure. The existing toe drain on the Dam and spillway do not meet current NRCS and Dam Safety engineering standards. The toe drain, installed in 1985, does not meet filter criteria with adjacent soils which creates potential for migration of embankment materials and piping. The spillway does not have the capacity to pass the probable maximum flood. These issues render the Dam incapable of fulfilling its flood control purpose. According to the DWRi, a dam breach flow of 5,000 cfs could flood the town 3 feet deep.

In addition to the structural issues, there are several maintenance issues at the Dam and Debris Basin. The most recent Dam Inspection Report dated April 28, 2023, (Appendix D) indicates that there is woody vegetation growing on the Dam's embankment and Debris Basin, and signs of rodent activity. Deep rooted vegetation has the potential to create seepage pathways that further increase the risk of dam failure. Figures 3-2 to Figure 3-6 show the current condition of the Dam and Debris Basin.

Figure 3-2: Dam Embankment – West End View

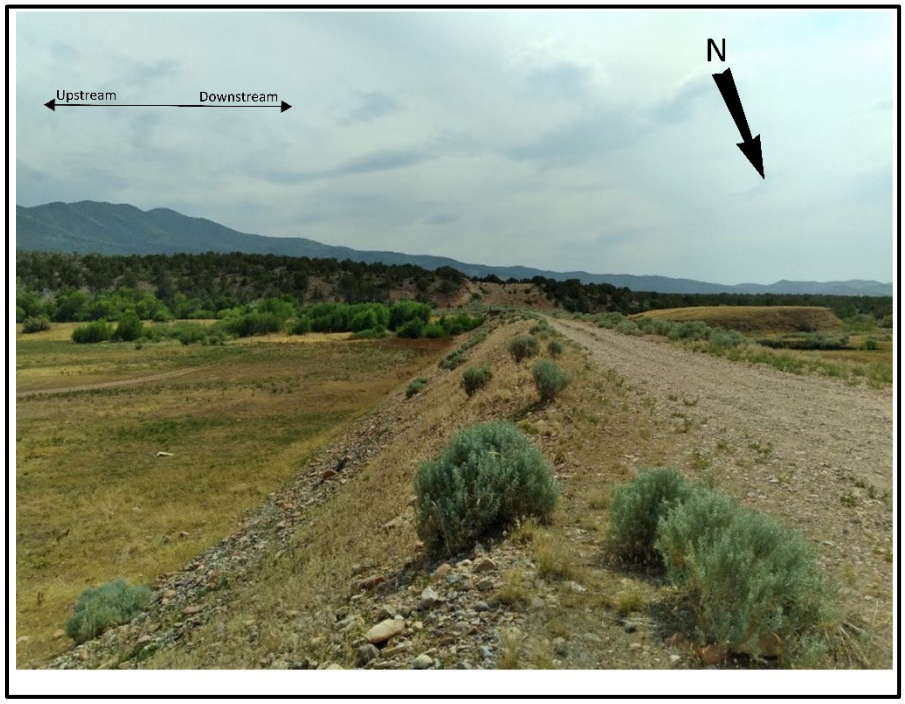

Figure 3-3: Upstream Side of Embankment Dam

Figure 3-4: Debris Basin and Corn Creek – View from above the Spillway

Figure 3-5: Stockpiles in the Debris Basin

3.2.4.2 Primary Spillway/Outlet Works and Secondary Spillway

The primary spillway/outlet works is a 60-inch corrugated metal pipe. The secondary spillway is a concrete open channel. The purpose of the secondary spillway is to safely release surplus water from the reservoir once the reservoir basin is filled. This protects the Dam from overtopping. Currently, the reservoir storage capacity at the secondary spillway crest is approximately 200 acre-feet, with a maximum spillway discharge of 2,400 cfs (DWRi 2023a). A report by Sunrise Engineering (2005) evaluated the capacity of the spillway and determined that it was insufficient to pass the probable maximum flood (PMF), which was estimated at 18,632 cfs. For this project, an extensive analysis was conducted, which also showed that the combination of all spillways is inadequate to pass the PMF. In this analysis, however, a PMF of approximately 10,655 cfs arising from the 72-hour storm event was obtained, based on current NRCS design standards (Appendix D). There are willows at the spillway intake (Figure 3-6) and woody vegetation in the spillway channel, which need to be removed. The spillway stilling basin appears to have some erosion in the concrete on each of the side walls and a buildup of algae and moss (Figure 3-7). The corrugated metal pipe of the primary spillway/outlet works also has some corrosion, which has exposed some sections of concrete, and its tar lining is delaminating (Figure 3-8).

Figure 3-6: Willows Growing in the Emergency Spillway Intake (DWRi 2023b)

Figure 3-7: Primary and Secondary Spillway Stilling Basin

Figure 3-8: 60-inch Conduit (DWRi 2019)

3.2.4.3 Emergency Spillway and Flood Channel

The emergency spillway is located on the east side of the Debris Basin. There are four 49-inch corrugated metal pipe (CMP) arch culverts installed in parallel down the spillway. The purpose of this spillway is to safely convey excess flood water from the Debris Basin to the emergency flood channel and prevent overflowing of the irrigation ditches and channels downstream of the Dam. However, under the existing conditions, the emergency spillway would not perform as intended because the 60-inch primary spillway/outlet works must be left fully open at all times due to the seepage issues in the Dam's foundation. Flood water would therefore be forced to exit via the primary spillway/outlet works pipe uncontrolled, carrying debris and sediment into the ditches and channels, and eventually resulting in flooding once the capacity of the ditches is exceeded. Only when the capacity of the primary spillway/ outlet works pipe is exceeded would the reservoir begin to fill up and send water down the secondary spillway and emergency spillways.

The maximum discharge at the emergency spillway is approximately 427 cfs. However, the spillway conduits are partially obstructed by dirt and vegetation which limits their ability to convey the maximum discharge possible during a flood event. This could result in further buildup of water in the reservoir, putting the Dam at an even greater risk of failure. In any case, the Dam could fail before the water level reaches the spillway elevation from seepage. The emergency flood channel that conveys water from the emergency spillway is about a mile long with a capacity of approximately 2,000 cfs. This channel conveys water away from the Town but still has the potential to flood agricultural fields and Highway 133. Figure 3-9 and Figure 3-10 are images taken from upstream and downstream of the emergency spillway culverts, respectively. More information can be found in Appendix D.

Figure 3-9: Emergency Spillway Culverts Upstream End

Figure 3-10: Downstream Side of Emergency Spillway Culverts

3.2.4.4 Existing Ditches/Historic Natural Channel

At the Debris Basin, Corn Creek is diverted into irrigation ditches and channels. Downstream of the Debris Basin, water is diverted at two locations: at the spillway stilling basin immediately downstream of the Dam and at the splitting structure located further downstream. Figure 3-11 shows the location of the stilling basin and the splitting structure. East of the Debris Basin is the emergency flood channel. This channel was created as an immediate response to the 1984 flood event, to divert some of the flood water away from the Town.

The existing ditches and channels are currently not adequate to pass the 100-year flood event with a dam breach (12,979 cfs). Downstream of the Debris Basin, the ditches and channels have a maximum combined capacity of approximately 950 cfs. The capacity of the existing ditches and channels was estimated based on survey and elevation data at the cross-section locations indicated in Figure 3-11. The flood routing capacity of the ditches and channels is larger at the diversion points but is significantly limited downstream by culvert size, decreasing channel size, and the amount of vegetation and debris in the channels and culverts throughout the system. Because the outlet works need to remain open, most of the flood water would be sent down to the primary spillway/outlet works, resulting in flooding due to inadequate ditch capacity. The emergency flood channel has a capacity of 2,000 cfs; however, the maximum discharge for the emergency spillway at the dam crest is only 427 cfs. Hence, excess flood water would pass over Highway 106. Figures 3-12 to3-19 show the current condition of the ditches.

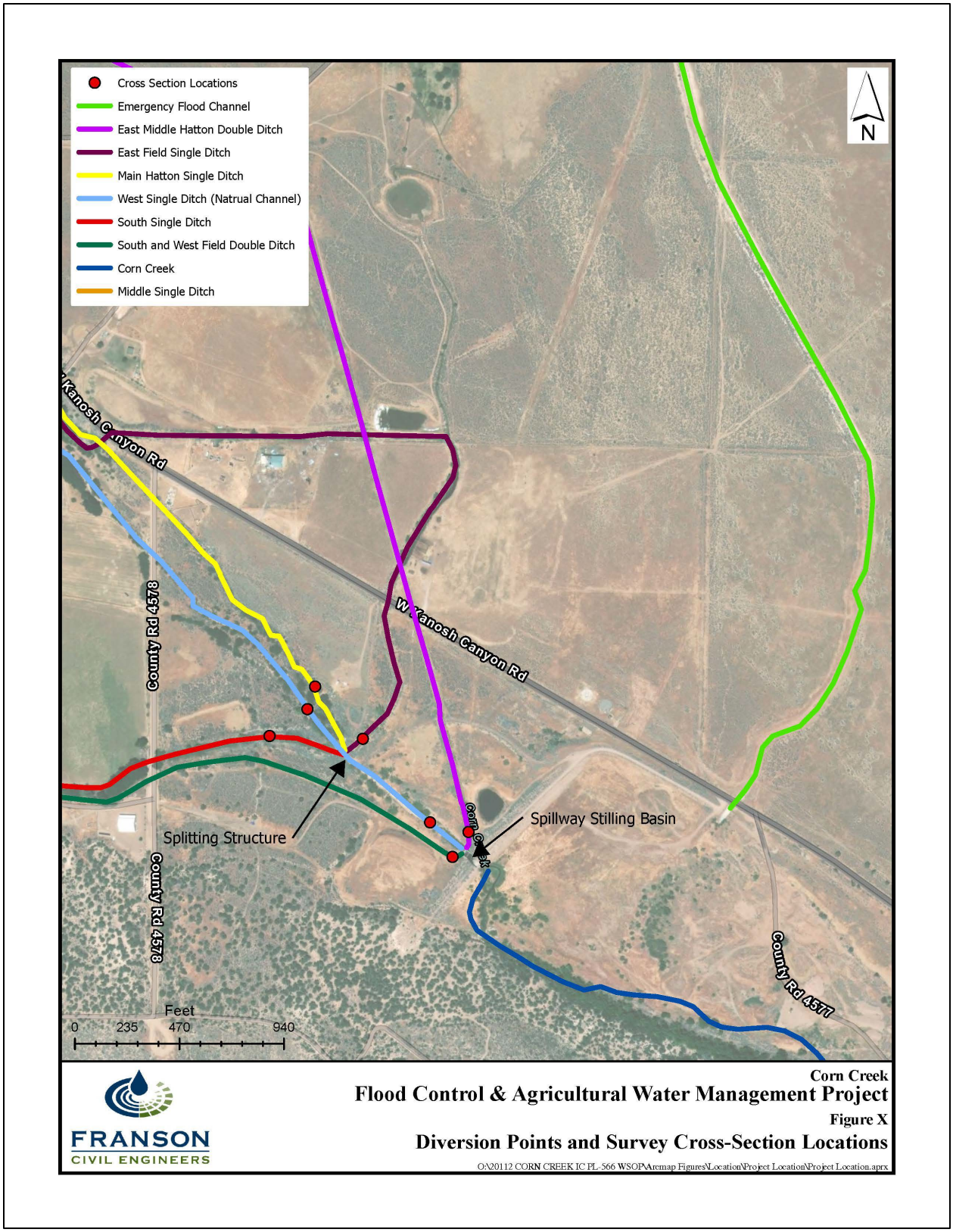

Figure 3-11: CCIC Ditches with Diversion Points and Survey Cross Section Locations

Figure 3-12: Leakage from the East Middle Hatton Ditch with Flow Approximately 3 cfs

Figure 3-13: South & West Field Double Ditch Pipe Inlet Covered in Sediment and Debris

Figure 3-14: One of the Culverts Crossing Highway 106 for the East Field Single Ditch

Figure 3-15: Box Culvert Crossing at Highway 133

Figure 3-16: Flood Control Channel on South Side of Kanosh

Figure 3-17: Double Culvert on South Single Ditch

Figure 3-18: South Single Ditch Just Downstream of the Diversion Structure

Figure 3-19: Box Culvert under Highway 106 for the East Field Single Ditch

3.2.4.5 Kanosh Town Pond

Kanosh Town owns a pond immediately downstream of the Dam and Debris Basin. This pond is used to regulate secondary water for the residents in Kanosh. This pond would need to be relocated as a result of any implemented structural measures or improvements. Figure 3-20 shows the existing Town pond.

Figure 3-20: Kanosh Town Secondary System Regulating Pond

3.3 Inventory of Existing Resources

The inventory of existing resources provides the environmental baseline for NEPA and describes the conditions of the watershed in PR&G terms. To the extent possible, future conditions were also projected for each resource concern identified in Section 3.1.

3.3.1 Geology & Soil Resources

3.3.1.1 Geology

According to the Utah Geological Survey (UGS) interactive map (2023), most of the project area is covered by late Holocene alluvium (QaI1). This alluvium is the youngest in the floodplains, low terraces, and channels, and is primarily made up of silt in the lower Pahvant Valley. In the northeast and some western parts of the project area, there are Holocene and late Pleistocene fine-grained lacustrine deposits (QIf), which are tan to gray, with calcareous silts that are deep water sediments of Lake Bonneville with younger alluvium and are 10 feet deep or less.

East of Kanosh, the geology consists of Holocene and Late Pleistocene undifferentiated lacustrine and alluvial deposits (QIa). These deposits are found on piedmont slopes and are graded from pebbly sand/silt to sandy pebble gravel. The project area also has some middle and early Holocene alluvium (QaI2) which consists of isolated remnants of Corn Creek sand and gravel.

Around the Kanosh Band site, there are Holocene and Late Pleistocene alluvial-fan deposits (Qaf1) which consist of poorly graded silt, sand, pebble, cobble, and boulder gravel and comes from debris flows, sheetwash, flash floods, or is deposited by streams. A map titled Geology Map in Appendix

C shows these geological deposits in the project area as well as some of the smaller, less significant units.

Historically, sedimentation to the debris basin has been limited to high runoff years. References to the geology specific to the Corn Creek Watershed can be referenced in Appendix D which covers the Hydrology assumptions and calculations. There were no specific findings in the geology that showed risk to major sedimentation. The United States Forest Service, which maintains more than 93% of the Corn Creek Watershed has implemented Thin & Lop and Scatter Fuels Projects in the Corn Creek Watershed. The purpose of these projects is to minimize the risk of catastrophic fires. This reduces the risk of a bare ground cover and sedimentation from the result of fires.

3.3.1.2 Soil Classification

The data presented in this section was obtained from the NRCS Soil Resource Report generated from the Web Soil Survey interface (2023). Table 3-3 summarizes data from the report, located in Appendix D. Almost half of the project area consists of loam soil (47.3%), followed by complexes (18.6%), silt loam (17.9%), gravelly loam (9.6%), sandy loam (3.5%), and the rest, as shown in Table 3-3. A map titled Soil Classification can be found in Appendix C. Table 3-3 also shows the landform, hydrologic soil group, and soil erodibility factors associated with each soil class.

74.2% of the project area falls under hydrologic soil group B, which implies that the soil has a moderate infiltration rate. 19.1% of the area has hydrologic soil group C, 4.6% has hydrologic soil group A, and 2% has hydrologic soil group D. A group A rating implies that the soil has a high infiltration rate; group C implies that the soil has a slow infiltration rate; and group D implies that the soil has a very slow infiltration rate. A map showing the hydrologic soil classifications throughout the project area titled Soil Classification may be found in Appendix C. The erodibility factor (K) can range from 0.02 to 0.69, with higher values indicating higher susceptibility to erosion. The erodibility factor of the soils in this project area ranges from 0.02 to 0.43.. In Appendix C maps titled Hydrologic Soil Group and Soil Erodibility are included. The soil report describes the soil as well-drained. The soil in the project area has a moderate infiltration rate and runoff potential when wet. More information can be found in the Web Soil Survey report in Appendix D.

Table 3-3: Soil Classification and Soil Properties

Soil Classification	Soil Unit Name	Landform	Hydrologic Soil Group	Soil Erodibility Factor, K	Acres in AOI	% of AOI
Loam	Ashdown loam	Alluvial flats, alluvial fans	B	0.28	4,116	47.3
	Bandag loam	Alluvial flats, alluvial fans	B	0.37	2,094	
	Cessna loam	Stream terraces, alluvial fans	B	0.28	28	
Silt Loam	Boxelder silt loam	Lake terraces, lake plains	B	0.43	2,213	17.9

Soil Classification	Soil Unit Name	Landform	Hydrologic Soil Group	Soil Erodibility Factor, K	Acres in AOI	% of AOI
	Deseret silt loam	Lake terraces	C	0.43	141	
Gravelly loam	Collard gravelly loam	Fan remnants, alluvial fans	C	0.15	1,262	9.6
Sandy loam	Escalante sandy loam	Lake terraces, lake plains, alluvial flats	A	0.24	462	3.5
Fine sand	Preston fine sand	Dunes	A	0.02	67	0.5
Very stony loam	Donnardo very stony loam	Fan remnants	B	0.10	49	0.4
Fine sandy loam	Hiko Peak fine sandy loam	Alluvial fans	B	0.24	169	1.3
Very fine sandy loam	Kanosh very fine sandy loam	Flood plains	B	0.37	28	0.2
Stony fine sandy loam	Hiko Peak stony fine sandy loam	Fan remnants, mountain slopes	B	0.10	87	0.7
Silty clay loam	Woodrow silty clay loam	Lake terraces	C	0.37	22	0.2
Complex	Multiple	Varies	Varies	0.27*	2,462	18.6
	13,202	**100**				

** Weighted average of the complexes*

Table 3-4: Soil Depth to Restrictive Feature and Water Table

Soil Unit Name	Depth to Restrictive Layer (in)	Depth to Water Table (in)
Ashdown loam	More than 80 inches	More than 80 inches
Bandag loam	More than 80 inches	More than 80 inches
Cessna loam	More than 80 inches	More than 80 inches
Boxelder silt loam	More than 80 inches	More than 80 inches
Deseret silt loam	More than 80 inches	About 60 to 72 inches

Soil Unit Name	Depth to Restrictive Layer (in)	Depth to Water Table (in)
Collard gravelly loam	More than 80 inches	More than 80 inches
Escalante sandy loam	More than 80 inches	More than 80 inches
Preston fine sand	More than 80 inches	More than 80 inches
Donnardo very stony loam	More than 80 inches	More than 80 inches
Hiko Peak fine sandy loam	More than 80 inches	More than 80 inches
Kanosh very fine sandy loam	More than 80 inches	About 18 to 42 inches
Hiko Peak stony fine sandy loam	More than 80 inches	More than 80 inches
Woodrow silty clay loam	More than 80 inches	More than 80 inches
Multiple	Varies (see Appendix D)	Varies (see Appendix D)

In addition to the erodibility factor, the cover management factor, C, describes the effects of vegetative cover on erosion and ranges from 0 to 1. It is the ratio of the proposed crop method to a bare soil. This ratio varies throughout the growth season. Alfalfa makes up more than 60% of the crops grown around the project area. The early season factors for cover management for some of these crops are summarized in Table 3-5.

Table 3-5: Erodibility Potential Based on Ground Cover

Cover Management Practice	"C"
Fallow, without vegetation	1.0 by definition
Alfalfa, established, with residues	0.07
Silage Corn, Residue removed, fall plowing, 0 - 10% cover	0.86
Grass Hay, established, with residues	0.03
Winter Wheat, in disked residues, 10 – 50% cover	0.30
Barley, in disked residues, 10 - 50% cover	0.30
Potatoes, rows with slope, 0 - 10% cover (ridged)	0.64

3.3.2 Prime and Unique Farmland, and Farmland of Statewide or Local Importance

Farmland classification data presented in this section was obtained from the Custom Soil Resource Report for the project area from Web Soil Survey (Appendix D). Farmland classification by the NRCS is based on national, state, and local criteria that consider the characteristics of the land to support crop production and produce crop yields when properly managed. Prime farmland produces the highest crop yields. Farmland of statewide importance is land that does not meet the criteria for prime or unique farmland but may produce high crop yields if properly managed. About 51% of the area of interest is considered to be prime farmland if irrigated, 29% is considered not to be prime farmland, and 20% is considered farmland of statewide importance.

Prime and unique farmland only occurs in the project area if irrigated; however, a map displaying the locations of the potential prime farmland in the study area is included in Appendix D. The farmland classification within the project area is summarized in Table 3-6. A map titled Farmland Classification can be found in Appendix D.

Table 3-6: Farmland Classification

Classification	Acres in Area of Interest	Percent of Area of Interest
Prime farmland if irrigated	6,700	51%
Not prime farmland	3,858	29%
Farmland of statewide importance	2,643	20%
TOTAL	**13,202**	**100%**

3.3.3 Upland Erosion, Streambank Erosion, and Sedimentation

Upland erosion occurs over land and can form channels and gullies. Streambank erosion occurs due to the wearing of the banks of streams and other waterways. Streambed erosion occurs due to the erosion of sediment by the moving water. Land without vegetative cover is prone to erosion. Overgrazing both along streambanks and overland can remove vegetative cover which would otherwise capture sediment before it enters the streams. Other causes of erosion include natural erosion of streambanks, changes in stream flows, and in-stream channel erosion. The erodibility factor of the soil in the project area is moderate, meaning the soil is moderately susceptible to sheet and rill erosion.

The existing debris basin helps to trap debris and sediment transported by water flowing from upstream of the Corn Creek channel. The basin, to some extent, protects the irrigation ditches and flood channels downstream from accumulating debris and sediment, which helps protect and preserve the functionality of these channels.

The amount of sedimentation that occurs in the debris basin was estimated by finding the difference between the original storage capacity of the debris basin after reconstruction in 1986 and the existing storage capacity. Using the design storage curve from 1986 to determine the original volume and current lidar data to determine the existing volume. The difference was estimated to be 58.6 acre-feet of net sedimentation in 36 years. This equates to 1.6 acre-feet per year. This is an average and is not representative of actual deposition events. Based on historical flood events, most years have little to no deposition and a few events represent most of the sedimentation in the debris basin. Some amount of sedimentation is not captured in this calculation because there have been operations within the debris basin that have removed sands and gravels.

3.3.4 Water Resources (Water Quantity)

Water sources for Kanosh residents include springs, wells, and Corn Creek, which is the only surface water source in the area. Spring water is used for municipal and industrial use and is managed by the Town. There are a number of wells in the area that are privately owned. Water from these wells is used for irrigation, stock watering, and domestic use. Water from Corn Creek is used for irrigation, stock watering, secondary water use, and domestic use.

The average annual rainfall in Kanosh is approximately 15 inches and the average annual snow accumulation is 59 inches (BestPlaces, 2023). The quantity varies depending on the time of year as shown in Figure 3-22. Figure 3-21 shows the average monthly precipitation values for Kanosh from 1981 to 2010 according to U.S Climate Data (2023).

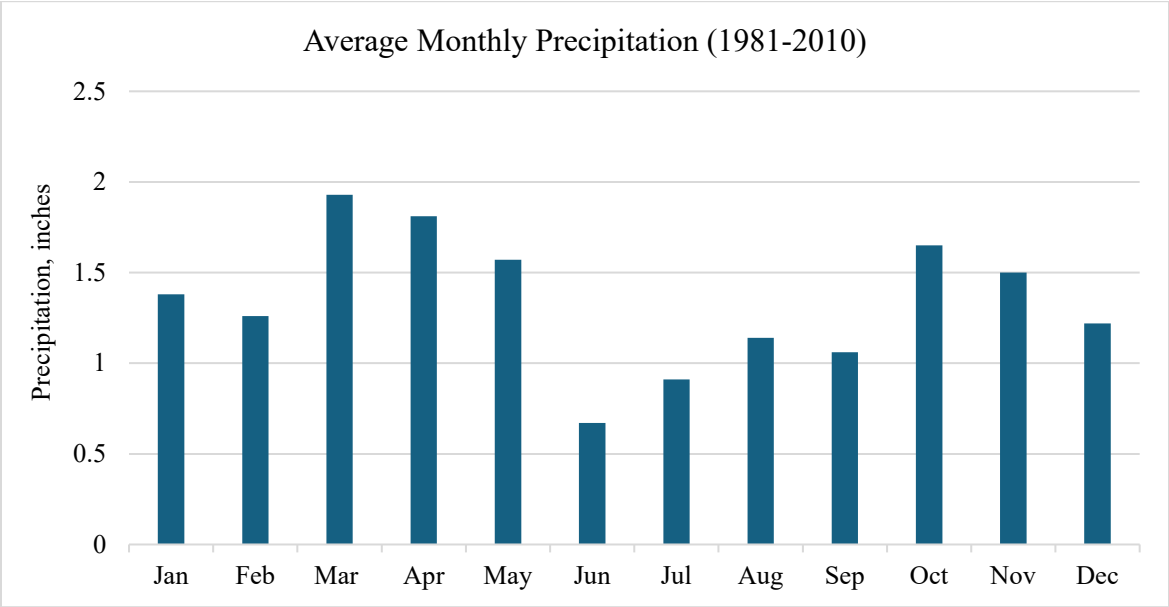

Figure 3-21: Average Monthly Precipitation (1981-2010)

3.3.4.1 Surface Water Quantity

Corn Creek has a drainage basin of approximately 89 square miles (USGS 2020). Most of the water from Corn Creek is diverted into irrigation ditches managed by CCIC once it reaches the debris basin. However, approximately 44% of the irrigation water is lost to seepage and evaporation from the open irrigation ditch system. Some of the water is diverted into the Town pond for secondary use. The Kanosh Band pipeline currently conveys water to a pond at the community site, but there are no facilities to put the water to use after it reaches the pond.

The main source of water for Corn Creek is snowmelt from the Pahvant Mountains. Some of the water in the stream is contributed by overflowing springs upstream of the debris basin. Figure 3-6 shows mean monthly discharges from Corn Creek from August 1965 to August 1975, taken from a gage station located upstream of the debris basin (USGS 2023b). The figure shows higher discharges starting in April, resulting in snowmelt and spring runoff from the mountains.

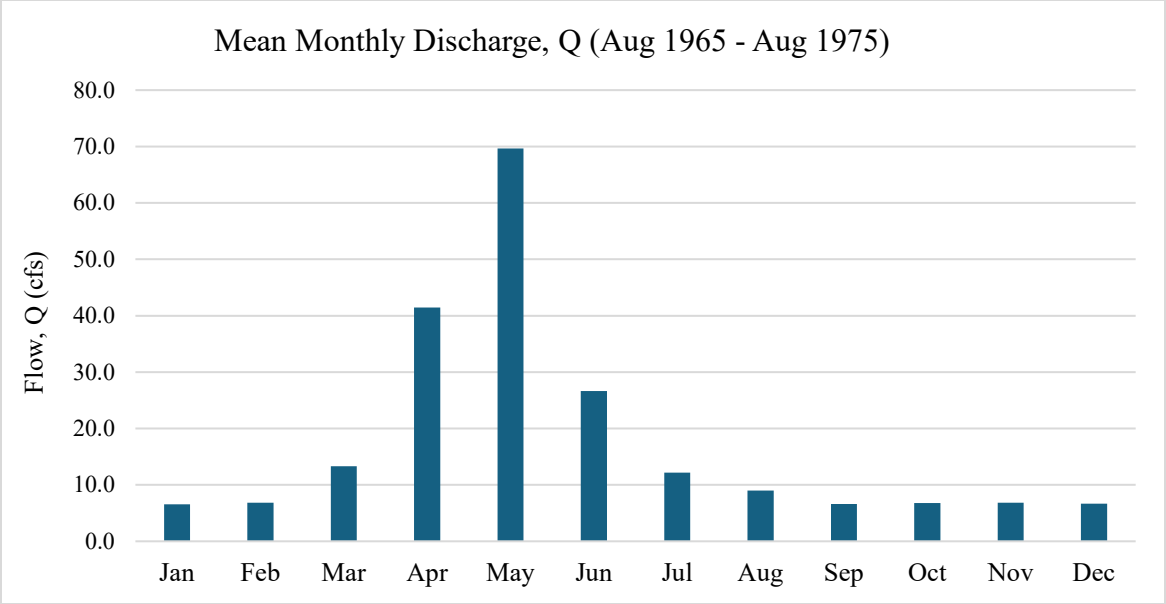

Figure 3-22: Mean Monthly Discharge from Corn Creek (Aug 1965 – Aug 1975)

The water rights associated with diversion of water from Corn Creek at the debris basin are summarized in Table 3-7 (DWRi 2022). The water rights allow CCIC and Kanosh Town to divert water from Corn Creek for irrigation, stock watering, and municipal use.

Table 3-7: CCIC Water Rights

Water Right Number	Owner	Priority Date	Diversion	Uses
67-1048	CCIC	1880	89 cfs	Irrigate 3550.9 acres
			6cfs	Stock watering during the non-irrigation season
67-1048 (2013 Correction Water Deed)	CCIC		87 cfs (CCIC)	Same uses as above
	Kanosh Town		2 cfs (Kanosh Town)	Culinary water use
67-664	CCIC	1964	15 acre-feet	Irrigate 682 acres (Apr 1-Oct 15) Stock water (Jan 1-Dec 31)
67-1182	Kanosh Town	1915	1.07 cfs or 774.6586 acre-feet	Municipal use (Jan 1-Dec 31)

3.3.4.2 Groundwater Quantity

Annual groundwater recharge in Pahvant Valley is 65,000 acre-feet, while the annual discharge is about 100,000 acre-feet, with well discharges equaling about 80,000 acre-feet (DWRi n.d.). The State Engineer believes that a groundwater management plan is necessary to reduce the

groundwater discharge so that it does not exceed the quantity recharged. The proposed groundwater management plan for the valley involves eliminating irrigated acreage without a water right, managing overflowing wells, metering well withdrawals, and, if necessary, limiting withdrawals and distributing water based on priority (DWRi n.d.).

3.3.5 Water Quality

3.3.5.1 Surface Water Quality

The Clean Water Act (CWA) establishes the basic structure for regulating quality standards for surface waters. Surface waters of the State of Utah, are classified according to their designated beneficial uses to protect against controllable pollution. The Environmental Protection Agency (EPA) is charged with regulating its implementation and has delegated a certain portion of its authority to the U.S. Army Corps of Engineers (USACE) and the Utah Department of Environmental Quality (UDEQ), which includes the Utah Division of Water Quality (UDWQ) and the Utah Division of Drinking Water (UDDW). UDWQ is responsible for classifying the beneficial uses of each water body through Utah Administrative Code (UAC) R317-2-6 and R317-2-13. The beneficial uses for Corn Creek are classified as follows (UDEQ 2022):

- Protected for infrequent primary contact recreation. Also, protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.
- Protected for cold water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.
- Protected for agricultural uses including irrigation of crops and stock watering.

These beneficial uses are protected through the water quality standards described in UAC R317-2-7. Section 303(d) of the CWA requires the State to identify water bodies that violate the standards set forth in UAC R317-2-7. These water bodies are then listed as impaired, and the State is required to conduct a total maximum daily load (TMDL) study and establish a TMDL for each of the pollutants causing the water body to be impaired. Corn Creek is not included on the EPA Office of Water 303(d) list of impaired waters, and there are no known TMDL studies for Corn Creek (Data Basin 2023; UDEQ 2022).

3.3.5.2 Groundwater Quality

There are six groundwater districts in Pahvant Valley through which the groundwater is managed (Mower 1965). The districts include Kanosh, McCornick, Greenwood, Pahvant, Flowell, and Meadows. Among the districts, only Kanosh was reported to have serious water quality problems evidenced by chemical analyses performed on the groundwater. The dissolved solids concentration and bicarbonate concentration of the groundwater in Kanosh District is several times higher than that in the other districts. Water in the district has a very high salinity hazard and medium-to-high sodium hazard. However, groundwater in the vicinity of the principal recharge area was reported to have better chemical quality than groundwater in the rest of the district. The concentration of boron was reported to be less than the toxic limit for most tolerant crops. The soil in the district has good texture and is well-drained, making irrigation of crops with the highly mineralized groundwater possible. The gypsum in some of the soils helps to alleviate the sodium hazard (Mower 1965).

The groundwater in Kanosh is believed to originate from Devil's Ridge, around Black Rock volcano, and from mountains across the south end of the valley (Mower 1965). The concentration of dissolved solids in return flows from irrigated areas is higher than that in the original water as return flows carry down mineral deposits left in the soil after evaporation occurs. During the irrigation season, as the groundwater levels decrease, water flowing beyond the pumped areas may change direction and return to the pumped areas, bringing with it dissolved minerals and increasing the chemical content of the groundwater. The chemical quality of the groundwater is expected to continue to deteriorate with time especially if the groundwater extractions exceed the recharge (Mower 1965).

The greater efficiency of sprinkler irrigation has reduced groundwater extraction and reduces or eliminates return flows that degrade the quality of the water recharging the aquifer. In recent years, sprinkler irrigation in the area has increased.

3.3.6 Floodplain Management

The Federal Emergency Management Agency (FEMA) categorizes flood hazard areas and the severity or type of flooding that could occur, which are depicted on a community's Flood Insurance Rate Map (FIRM). No FIRM maps exist for the project area. However, most of the town of Kanosh and surrounding agricultural areas are within the 100-year floodplain as shown in Appendix E.

3.3.7 Waters of the U.S. and Special Aquatic Sites (Wetlands)

Wetlands provide water storage, water filtration, nutrient and chemical absorption, and flood attenuation. The USACE administers and enforces Section 404 of the CWA, which requires wetlands to be protected from discharges of dredged or fill material, which could adversely affect the environment.

The National Wetlands Inventory (NWI) Mapper was accessed on April 6, 2022, to identify potential wetlands within the project area. Based on the range of proposed alternatives, a survey area was defined to determine the need for further assessment. Possible wetland areas classified in the project area included (NWI 2022):

- Freshwater emergent wetland
- Freshwater pond
- Riverine features

The riverine features in the NWI report were aligned with Corn Creek, the existing flood channel, and the irrigation ditches.

Based upon this information, a wetland determination was conducted by Cirrus Ecological Solutions. A formal USACE jurisdictional wetland delineation was not performed but would be performed during the design/permitting process of the Preferred Alternative. All potential wetland areas were investigated for wetland indicators. The Wetland Riparian Inventory Memo by Cirrus Ecological Solutions is included in Appendix D.

The field survey identified riparian vegetation along the Corn Creek channel, along some sections of the irrigation ditches, and at the Town pond. Most sections of ditch, however, did not have any riparian vegetation. The identified riparian vegetation includes coyote willow, box elder, elm, and narrowleaf cottonwood.

Conservative acreages of identified wetland sites, based on the presence/absence of 50% or greater hydrophytic vegetation during the field determination, are presented in the table below. Supporting information for this data is found in the field survey spreadsheet attachment to the Cirrus Memo and also in the addendum to the Cirrus Memo, both located in Appendix D. Furthermore, a more detailed summary of the wetland determination process is included in Appendix D.

Table 3-8: Approximate Acreage of Areas Supporting Hydrophytic Vegetation in the Area

Site ID (from Wetland Riparian Field Survey Inventory in Appendix D)	Site Type	Approximate Acres of Area Supporting Hydrophytic Vegetation	Possible Wetlands?[1]	WOTUS?[2]
1	Corn Creek Riparian	0.28 Acres	Yes	No
3	Corn Creek Riparian	0.01 Acres	Yes	No
5a	Pond	0.02 Acres	Yes	No
8	Riparian Vegetation along Irrigation Ditch	0.05 Acres	Yes	No
9	Riparian Vegetation along Irrigation Ditch	0.25 Acres	Yes	No
12	Riparian Vegetation along Irrigation Ditch	0.07 Acres	No	No
13	Riparian Vegetation along Irrigation Ditch	0.02 Acres	No	No
20	Riparian Vegetation along Irrigation Ditch	0.09 Acres	No	No
21	Riparian Vegetation along Irrigation Ditch	0.07 Acres	No	No
22	Riparian Vegetation along Irrigation Ditch	0.60 Acres	Yes	No
24	Riparian Vegetation along Irrigation Ditch	0.17 Acres	No	No
25	Riparian Vegetation along Irrigation Ditch	0.21 Acres	Yes	No
38	Riparian Vegetation along Irrigation Ditch	0.15 Acres	Yes	No
53	Riparian Vegetation along Irrigation Ditch	0.83 Acres	Yes	No
54	Riparian Vegetation along Irrigation Ditch	0.59 Acres	Yes	No
55	Riparian Vegetation along Irrigation Ditch	0.32 Acres	Yes	No
56	Irrigation Pond	0.50 Acres	Yes	No
57	Riparian Vegetation along Irrigation Ditch	0.32 Acres	Yes	No

Site ID (from Wetland Riparian Field Survey Inventory in Appendix D)	Site Type	Approximate Acres of Area Supporting Hydrophytic Vegetation	Possible Wetlands?[1]	WOTUS?[2]
67	Riparian Vegetation along Irrigation Ditch	0.11 Acres	Yes	No
	TOTAL	**4.64 Acres**	**N/A**	**N/A**

[1]Would the site meets the criteria to be a possible wetland, i.e., hydrophytic vegetation, hydric soils, and wetland hydrology?

[2]Would the site meets the criteria to be possibly considered a jurisdictional Waters of the U.S.?

The survey also investigated the mapped soils within the project area to determine if they are on the National Hydric Soils list. Hydric soils are soils that are seasonally or permanently saturated, causing anaerobic conditions in the upper soil layers. These soils are found in aquatic ecosystems such as wetlands and support the growth of hydrophytic vegetation. None of the soils in the project work areas were classified as hydric; however, as explained in the addendum to the Cirrus memo in Appendix D, although the soils in the identified fringe riparian zones are not classified as hydric by the NRCS Web Soil Survey, they could be classified as hydric by definition when a formal delineation is performed during the design/permitting phase of the project.

During the design/permitting phase, when a formal delineation is performed, no sites within the study area are likely to be considered jurisdictional under Section 404 of the Clean Water Act (see addendum to Cirrus Memo in Appendix D for more information).Maps and images of the surveyed areas indicating the wetland features identified within the project work areas are included in Appendix D.

3.3.8 Air Quality

The Clean Air Act (CAA) regulates air pollution nationwide. The CAA requires the EPA to institute National Ambient Air Quality Standards (NAAQS) for six primary air pollutants to safeguard public health and the environment. The NAAQS for the criteria pollutants can be found on the EPA website (EPA 2023a). Air quality conditions are designated as 'attainment', 'maintenance,' 'nonattainment,' or 'unclassifiable.' Areas that do not exceed the NAAQS are designated as attainment, while areas that exceed the standards are designated as non-attainment.

The Utah Division of Air Quality (UDAQ) monitors air quality throughout the State of Utah and is required by federal law to produce a statewide inventory of the criteria pollutants every three years. The most recent published inventory was conducted in 2017, and the data is included in UDAQ's 2020 Annual Air Quality Report. Table 3-8 shows a comparison between the 2017 data for Millard County (which includes the Corn Creek project area) and that for Salt Lake County, obtained from the report (UDAQ 2021). Even though Millard County is more than 8 times the size of Salt Lake County, the CO, NO_x, PM_{10}, and $PM_{2.5}$ values from Salt Lake County were much higher than for Millard County. This is likely due to a higher number of cars and industries, which are sources of pollution, in more urbanized communities like Salt Lake County than in rural communities like Millard County. The volatile organic compounds (VOCs) were much higher in Millard County most likely due to the presence of more farmland in Millard County (481,539 acres) compared to Salt Lake County (61,965 acres) (UDAF 2019). Farm crops and trees are some of the sources of VOCs, which are precursors to O_3.

Table 3-9: 2017 Triennial Inventory for Millard County versus Salt Lake County

Pollutant (tons/year)	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOCs
Millard County	28,407	15,313	6,706	2,019	2,537	64,440
Salt Lake County	109,696	24,583	17,074	4,358	2,487	29,580

As can be seen in the table above, Millard County has significantly better air quality than Salt Lake County, which is a far more urbanized county than Millard. Additionally, Salt Lake County is a nonattainment county under the NAAQS for both PM2.5 and SO2, further proving the better air quality of Millard County comparatively, which is in attainment for all criteria pollutants. Based on the 2021 Report (UDAQ 2021), Millard County is an attainment area for all six criteria pollutants. Also, from the Utah DEQ Environmental Interactive Map (UDEQ 2023), Millard County is not located in a $PM_{2.5}$, PM_{10}, SO_2, O_3, or CO non-attainment or maintenance area.

3.3.9 Greenhouse Gases and Climate Change

Anthropogenic activities, particularly the burning of fossil fuels, release greenhouse gases (GHGs) such as carbon dioxide, methane, ozone, and others in the atmosphere. These gases trap heat, which contributes to climate change. Construction vehicles and equipment are operated using fossil fuels and contribute to the accumulation of greenhouse gases in the atmosphere.

Of particular note in the project area are agro-based GHG emissions, coming from equipment and machinery used in the agricultural sectors in the area. The economy of the study area is primarily agriculturally-based and current GHG contribution can, in part, be attributed to farming equipment such as tractors, backhoes, vehicles/trucks, etc.

Other potential GHG sources include public use of vehicles, industry, and electric power in homes and businesses, which are all typical and expected sources of emissions in the United States.

3.3.10 USFWS Threatened & Endangered Plant Species

An official list for T&E species within the project area was obtained from the USFWS (IPaC) system on March 9, 2022. This report is included in Appendix D. According to the report, there are no critical habitats within the project area. Table 3-9 lists the T&E plant species identified in the report.

Table 3-10: Endangered and Threatened Botanical Species

Species	Status	Habitat	Present?
Ute Ladies'-Tresses *(Spiranthes diluvialis)*	Threatened	Found in moist to very wet meadows, along streams, abandoned stream meanders, near springs, lake shores, and spring seeps in sandy or loamy soils with mixed gravel. Elevation range is between 4,300 and 7,000 feet above mean sea level.	No. Suitable habitat does not occur within the project area.

Source: USFWS (2022)

The Ute Ladies'-Tresses (ULT) was listed as potentially present within the project area. A botanical survey was conducted from August 20 to August 23, 2021, by Western-Enviro

Resources, to determine if there was suitable habitat for ULTs within the project area. Approximately 4,345 acres were surveyed, including a 300-foot plant survey buffer, and used transect widths of up to 6 feet. A moderately suitable habitat for the ULTs was found closely aligned with the hydrology of Corn Creek (Figure 3-23), but no individual ULTs were located. This area, is southeast of the project area and outside of the project extents. No suitable habitat or individual ULTs were found within the project area. A copy of the Botanical Report by Western-Enviro Resources is included in Appendix D.

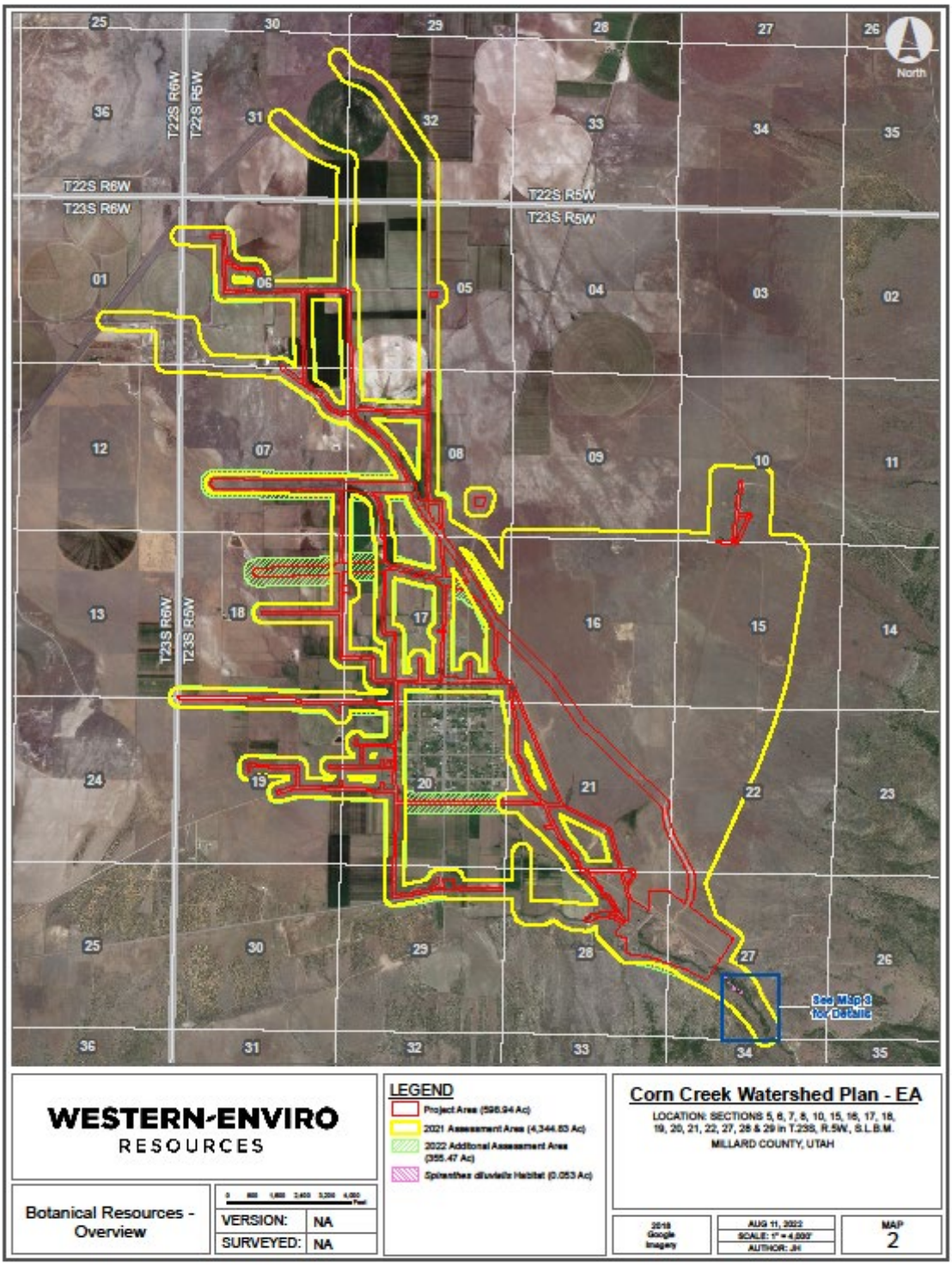

Figure 3-23: Location of Identified Moderately Suitable Habitat for the ULTs

(From Botanical Report by Western-Enviro Resources in Appendix D)

3.3.11 USFWS Threatened & Endangered Animal Species

An official list of T&E species was obtained from the USFWS IPaC system on March 21, 2022, and last updated on October 15, 2024, and is included in Appendix D. According to the IPaC report, there are no critical habitats within the project area.

The IPaC report identified the monarch butterfly, a candidate species, as potentially present within the project area (USFWS 2022). A habitat survey was conducted by Cirrus Ecological Solutions on July 16 through 19, 2022, to determine if there was suitable habitat for the monarch butterfly within the project area. No monarch butterfly individuals or milkweed were identified during the survey. The survey concluded that there is no habitat for the monarch butterfly within the project area. A copy of the T&E species memo from Cirrus Ecological Solutions is included in Appendix D.

Table 3-11: Threatened and Endangered Botanical Species in the Project Area

Species	Status	Habitat	Present?
Monarch butterfly *(Danaus plexippus)*	Candidate	Monarchs require milkweed, nectar sources, overwintering habitat, and migration habitat (USFS 2023a)	No

3.3.12 Utah Special Status Animal Species/Species of Greatest Conservation Need

A report from the Utah Natural Heritage Program (UNHP) identifying the Utah species of greatest conservation need (SGCN) within the project area was obtained on March 4, 2021, and last updated in October 2024 (UDWR 2021). The report identified species within a half-mile and two-mile radius of the project area. The species are listed in Table 3-11. A habitat survey was conducted by Cirrus Ecological Solutions on July 16 through 19, 2022, to identify suitable habitat for these species within the project area. The species identified in the UNHP report are summarized in Table 3-11, along with a description of their natural habitat. The findings of the habitat survey concluded that none of the Utah Species of Greatest Conservation Need were present in the study area. A copy of the UNHP species memo from Cirrus Ecological Solutions is included in Appendix D.

Table 3-12: Species of Greatest Conservation Need within a 2-Mile Radius of Project Area

Species	State Status	Year Last Observed	Habitat and Food
Bald Eagle *(Haliaeetus leucocephalus)*	SGCN	1988 (within a half-mile radius)	Bald Eagles live near large lakes, rivers, reservoirs, marshes, and seacoasts, but can also be found in dry areas far from water sources. Feed on fishes, injured waterfowl and seabirds, various mammals, and carrion (UDWR 2019). The habitat survey did not identify any individual bald eagles, or suitable foraging or nesting habitat for the Bald Eagle within the project area.
Burrowing Owl *(Athene cunicularia)*	SGCN	1985	Breeds in arid grassland, cold desert shrub that includes saltbrush and greasewood, and sagebrush-rabbitbrush (UDWR 2019). Feed

Species	State Status	Year Last Observed	Habitat and Food
		(within a half-mile radius) 1988 (within a two-mile radius)	primarily on large insects and rodents, and sometimes birds and amphibians. The habitat survey identified potential habitat for the burrowing owl southeast of the project area boundary. However, no individual burrowing owls were identified and there were no burrows large enough to support the species.
Bonneville Cutthroat Trout *(Oncorhynchus clarkia utah)*	SGCN	1979 (within a two-mile radius)	Occurs in large lakes, rivers, and streams (UDWR 2019). Feed on aquatic insects and terrestrial insects that fall in the water. Also feed on other fish, the bigger they grow. The habitat survey did not identify suitable habitat for this and other fish species within the project area and attributed this to the diversion of Corn Creek into irrigation ditches.
Ferruginous Hawk (*Buteo regalis*)	SGCN	2005 (within a two-mile radius)	The preferred habitat for ferruginous hawks is the arid and semiarid grassland regions of North America[12]. They inhabit open country, including short-grass prairie, sagebrush, deserts with short vegetation, and nearby agricultural areas.
Southern Leatherside Chub (*Lepidomeda aliciae*)	SGCN	1932 (within a two-mile radius)	The Southern Leatherside Chub is a small fish endemic to streams within the southern portion of the Bonneville Basin.

3.3.13 Migratory Birds/Bald and Golden Eagles

USFWS must identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA. The long-eared owl is a bird of conservation concern (BCC) that was identified on the USFWS IPaC official species list (Appendix D) as a migratory bird species potentially present within the project area. The Bald Eagle warrants attention due to the 1940 Bald and Golden Eagle Protection Act. Suitable habitat for these bird species is described in Table 3-12. A habitat survey for the long-eared owl by Cirrus Ecological Solutions found potential low-quality habitat for the long-eared owl southeast of the project area, but no nests or long-eared owls were identified during the survey. The survey report concluded that although the project could potentially affect this species, it is not likely to have adverse effects on the species.

Table 3-13: Migratory Birds/Eagles

Species	Habitat	Breeding Season
Bald Eagle *(Haliaeetus leucocephalus)*	Almost always nests in tall trees and commonly near bodies of water where fish and waterfowl prey are available.	Dec 1 – Aug 31

Long-eared Owl *(asio otus)*	Found in open woodlands, forest edges, juniper thickets, woodlots, hedgerows, riparian strips along rivers, and wooded ravines and gullies.	Mar 1– Jul 15

3.3.14 Invasive Plants and Noxious Weeds

Invasive species are species that are non-native to the ecosystem and their introduction or presence can likely cause economic or environmental harm, or harm to human health. Invasive species compete directly with native species for moisture, sunlight, nutrients, and space. Federal agencies were directed in Executive Order 13112 to expand and coordinate their efforts to combat the introduction and spread of plants not native to the United States.

There are currently 54 weeds on Utah's noxious weed list. These weeds are classified into the following categories (Dewey 2022):

- Class 1A: Not known to exist in Utah but has a significant risk of invasion. (Early Detection and Rapid Response (EDRR) Watchlist)
- Class 1B: Limited distribution in Utah (EDRR)
- Class 2: Widely distributed in Utah but considered controllable (Control)
- Class 3: Widely distributed in Utah and considered beyond control (Containment)
- Class 4: Present in Utah (Prohibited for sale or propagation)

The noxious weeds in Millard County are under Class 2 or Class 3 and are listed in Table 3-13.

Table 3-14: Noxious Weeds in the Millard County

Common Name	Taxonomy	Utah Status
Canada Thistle	*Cirsium arvense*	Class 3
Dalmatian Toadflax	*Linaria dalmatica*	Class 2
Diffuse Knapweed	*Centaurea diffusa*	Class 2
Dyers Woad	*Isatis tinctoria*	Class 2
Field Bindweed	*Convolvulus arvensis*	Class 3
Jointed Goat Grass	*Aegilops cylindrica*	Class 3
Leafy Spurge	*Euphorbia esula*	Class 2
Medusahead	*Taeniatherum caput-medusae*	Class 2
Musk Thistle	*Carduus nutans*	Class 3
Purple Loosestrife	*Lythrum salicaria*	Class 2
Quackgrass	*Elymus repens*	Class 3
Russian Knapweed	*Acroptilon repens*	Class 3
Scotch Thistle	*Onopordum acanthium*	Class 3
Spotted Knapweed	*Centaurea stoebe*	Class 2
Squarrose Knapweed	*Centaurea virgata*	Class 2

Common Name	Taxonomy	Utah Status
Tall Whitetop / Perennial Pepperweed	*Lepidium latifolium*	Class 3
White Top / Hoary Cress	*Cardari adraba*	Class 3
Yellow Starthistle	*Centaurea solstitialis*	Class 2
Yellow Toadflax	*Linaria Vulgaris*	Class 2

The Botanical Report prepared by Western-Enviro Resources in August 2022 included a list of documented botanical species within the project area that were identified during their field survey. The following species were identified as already being present in the study area:

- Canada Thistle (*Cirsium arvense*)
- Field Bindweed (*Convolvulus arvensis*)
- Russian Knapweed (*Acroptilon repens*)
- Whitetop (*Cardari adraba*)

3.3.15 Fish and Wildlife

Corn Creek is known to have historically supported cutthroat trout and other native species. However, nonnative salmonids like rainbow and brown trout were introduced into the stream by early settlers and UDWR (USFS 2023b). The stream currently has brown trout and some rainbow and tiger trout near Adelaide campground, which is about 4.5 miles from Kanosh Town, and outside of the project area (USFS 2023b). The fish do not appear to reside in the downstream area of Corn Creek. According to the UNHP species memo by Cirrus Ecological Solutions (Appendix D), given the disturbance and diversion of Corn Creek into open ditches, there is no suitable habitat for the Bonneville Cutthroat trout within the project area. This would apply to other fish species as well.

Other game birds and animals around Kanosh that are not included on the T&E species list or Utah sensitive species list were identified from the Utah Hunt Planner interactive map (UDWR 2023). These species are listed in Table 3-14.

Table 3-15: Wildlife with Mapped Habitats around the Project Area

Species	Taxonomy	Habitat
Band-tailed pigeon	*Patagioenas fasciata*	In the United States, these birds can be found on the Pacific Coast as well as the interior. The interior subspecies, among other places, breeds in east-central Utah (Seamans 2022).
Black bear	*Ursus americanas*	Black bears are found in forests and mountains of the Pacific Northwest (Fricke 2021).
Californian quail	*Callipepla californica*	This species is found in a variety of habitats, including our backyards (NDOW 2023).
American crow	*Corvus brachyrhynchos*	This species is found in open woodlands, forests, and fields (The Cornell Lab 2023).

Species	Taxonomy	Habitat
Dusky grouse	*Dendragapus obscurus*	The dusky grouse is said to be a forest species but utilizes different habitats depending on the time year (NPS 2018).
Elk	*Cervus canadensis*	Elk is found mainly in woodlands and high-country meadows during spring and summertime, but generally live in a wide variety of habitats such as in open areas, coniferous forests, and semi-deserts (LandPKS 2023).
Mule deer	*Odocoileus hemionus*	Mule deer are mostly found in the western United States, in arid, rocky areas (NPS 2020).
Ring-necked pheasant	*Phasianus colchicus*	This species can be found in semi-open habitat in farms, fields, brush, and marsh edges (Audubon 2023a).
Turkey	*Meleagris sp.*	Suitable habitat for wild turkey is areas with mixed woodland and open clearings (Audubon 2023b).

3.3.16 Riparian Areas

Riparian areas are directly influenced by water from a watercourse or water body. They typically exist along lakes, rivers, streams, and constructed water bodies such as ditches, canals, ponds, and reservoirs. Riparian areas support some plants, are a habitat for some wildlife, and can also assist in erosion control. Riparian communities along Corn Creek include native willows, sages, and grasses (USFS 2023b).

A biological survey performed by Cirrus Ecological Solutions identified the following riparian vegetation within the project area, at the locations marked in Figure 3-24 (Appendix D).

- Coyote willows (*Salix exigua*)
- Cottonwoods (*Populus sp.*)
- Russian olive (*Eleagnus angustifolia*)
- Willows (*Salix sp.*)
- Tamarisk (*Tamarix sp.*)
- Elm (*Ulmus sp.*)
- Cattails (*Typha sp.*)
- Horsetails (*Equisetum sp.*)
- Locust (*Robinia sp.*)
- Rumex (*Rumex sp.*)
- Box elder (*Acer negundo*)
- Roses (*Rosaceae sp*.)
- Mint (*Mentha sp*.)

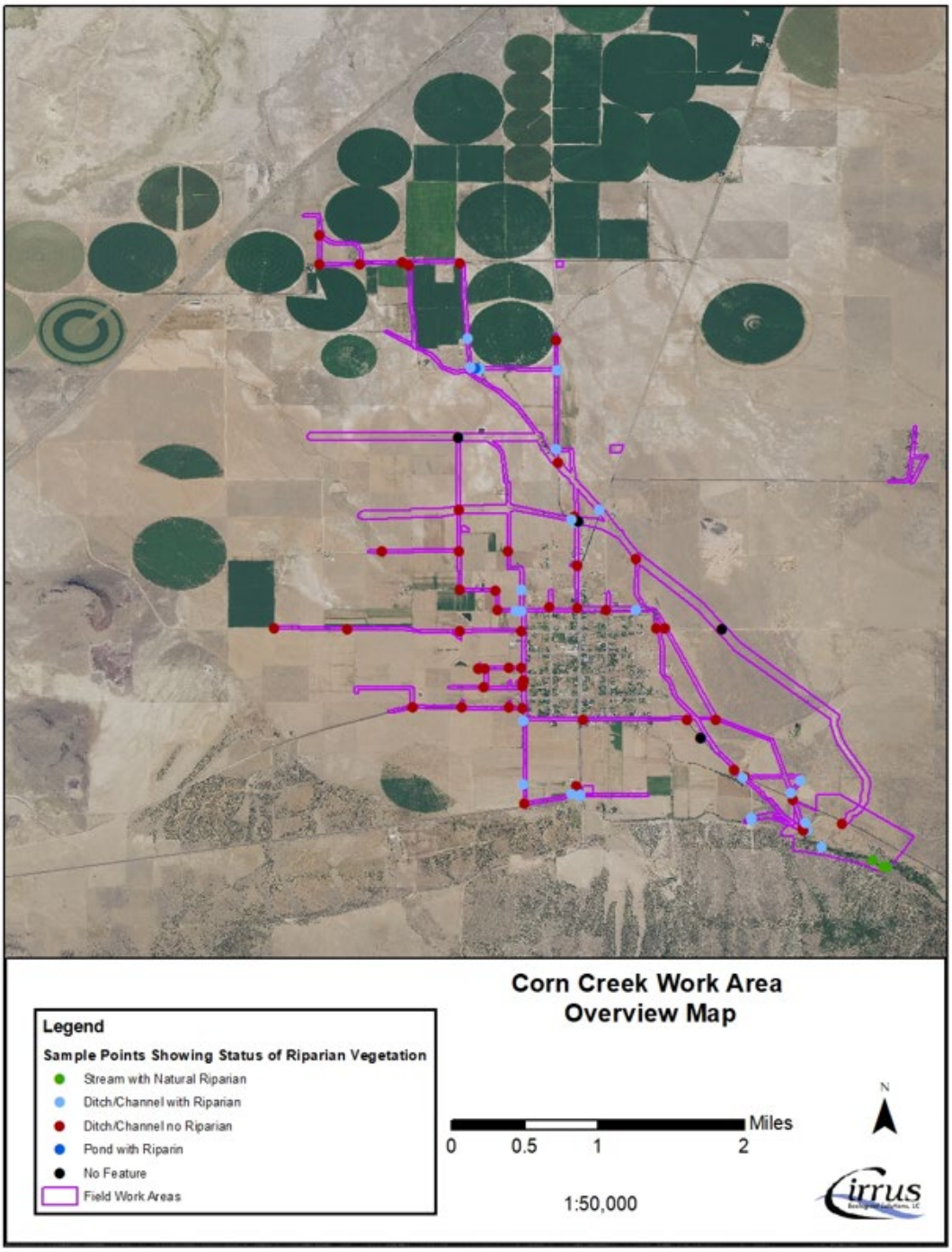

Figure 3-24: Location of Identified Riparian Vegetation

(From Wetland Riparian Inventory Memo by Cirrus Ecological Solutions in Appendix D)

3.3.17 Cultural and Historic Resources and Tribal Consultation

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, mandates that the potential effects of a proposed federal undertaking on historic properties be considered.

Historic properties are a subset of cultural resources that include prehistoric or historic districts, sites, buildings, structures, or objects that are at least 50 years of age and are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) (36 CFR 800.16).

Archaeological sites, another subset of cultural resources, are defined by National Register Bulletin No. 36, "Guidelines for Evaluating and Registering Archaeological Properties", as "a location that contains the physical evidence of past human behavior that allows for its interpretation" (NPS, 2000).

The affected environment for cultural resources is identified as the area of potential effects (APE), in compliance with the regulations found in Section 106 of the NHPA (36 CFR 800.16). The Area of Potential Effects (APE) is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR, 800.16(d)). Maps showing both the direct and indirect APE are included in Appendix B.

A historic property is a prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places that meets one or more of the following criteria, referred to as the "A-D" criteria in Section 106 of the NHPA:.

A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Are associated with the lives of significant persons in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Have yielded, or may be likely to yield, information important in prehistory or history.

To identify historic properties within the APE, per 36 CFR 800.4, and, in consultation with the Utah State Historic Preservation Office (SHPO), and applicable THPOs/Tribes, a cultural resource inventory was conducted by Certus Environmental Solutions in August and September 2023. The surveyor meets the Secretary of the Interior's (SOI) standards in archeology and architectural history. The inventory included a file search and field survey aimed at identifying cultural resources and historic properties within the APE. Permission to access Tribal lands to conduct the field survey was obtained from the Kanosh Band, and reasonable notice given to the Tribe ahead of the survey. The APE is 400 acres (375.4 intensive and 24.6 reconnaissance) of Tribal, municipal, and private land and was surveyed, which included 50- to 100-foot-wide linear corridors in the proposed work and staging areas along Corn Creek and along the existing and proposed ditches and pipelines. SHPO concurrence was obtained for the cultural resources report on June 4, 2024. In areas where the proposed pipeline would follow an existing ditch/alignment, 50-foot-wide linear corridors were used. In areas where the proposed pipeline would be installed adjacent to an existing ditch or where no ditch was present, a 100-foot-wide linear corridor was used. The survey identified 16 cultural resources sites within the APE.

Per 36 CFR 800.4(c), the NRCS evaluated the sites for their eligibility to the NRHP. Of those sites, the NRCS determined that 7 are eligible for listing on the NRHP under the A-D criteria. As part of the desktop study performed by Certus for the indirect APE (breach inundation zone), a total of 175 cultural resources, including archaeological sites and historical buildings/structures, were

identified. Of the 175 identified sites, 9 are eligible for the NRHP. Further details on the Indirect APE may be found in the redacted cultural resources report located in Appendix D. A redacted report with detailed information on methodology and the identified cultural resource is included in Appendix D, and a summary of these resources is provided in Table 3-15.

Table 3-16: Documented Sites within the Direct APE

Site Number	Resource/Property	NRHP Eligibility
42MD2017	Historical Ditch (the Indian Ditch)	Eligible
42MD4703	South and West Field Ditch system	Eligible
42MD4704	Middle Ditch system	Eligible
42MD4705	East Field Ditch system	Eligible
42MD4706	Hatton Ditch system	Eligible
42MD4707	East Middle Hatton Ditch system	Eligible
42MD4708	West Ditch system	Eligible
42MD2016	Historical concrete water pipeline	Not Eligible
42MD4696	Corn Creek Dam and Debris Basin	Not Eligible
42MD4697, 42MD4698, 42MD4699, 42MD4700	Prehistoric temporary camps (4 total)	Not Eligible
42MD4701	Historical structure/pump house	Not Eligible
42MD4702	Prehistoric rock art on a relocated boulder	Not Eligible
42MD4713	City Ditch	Not Eligible

Source: Certus Environmental Solutions (2023)

In compliance with Section 106 of the NHPA, the Utah SHPO, Tribes, and THPOs were consulted on determinations of site eligibility. There were no responses from THPOs/Tribes on site eligibility other than a coordination effort initiated by the PITU and Kanosh Band to avoid a rock art boulder near the project area that would not be impacted by any proposed measures. The Utah SHPO concurred with the site eligibility determinations per 36 CFR 800.3(c), in a letter dated June 4, 2024. These consultation letters were sent on April 9, 2024, and received by the Tribes throughout Apil and early May 2024 (return receipts in Appendix A). Documentation of this process may be found in the Tribal consultation table in Appendix A. The NHPA Section 106 consultation process is described in detail in Chapter 7 of this Plan-EA. The Tribes that were consulted are listed below:

- Kanosh Band of Paiute Indians
- Northwest Band of the Shoshone Nation
- Southern Paiute Tribe
- Cedar Band of Paiute Indians
- Navajo Utah Commission
- Shivwits Band of Paiute Indians
- Navajo Nation Office of the President
- San Juan Southern Paiute Tribe of Arizona
- Hopi Tribe of Arizona
- Southern Ute Indian Tribe

- Paiute Indian Tribe of Utah
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Skull Valley Band of Goshute Indians

3.3.18 Socioeconomics (Local, Regional, National Economy)

The socioeconomic characteristics of the people in Kanosh was compared with that of the County, State, and the entire United States. The demographic information obtained is from the 2020 Census (U.S. Census Bureau 2022a, 2022b) and is summarized in Table 3-16 to Table 3-19.

Kanosh Band enrollment as of 2021 was 151 people (Wilson 2022), with approximately 72 people living on the Reservation (Kanosh Band of Paiute Indians Economic Disadvantage Statement n.d.). According to the Kanosh Band of Paiute Indians Economic Disadvantage Statement (n.d.), there were approximately 23 households on the Kanosh Band Reservation in 2020.

3.3.18.1 Population

Table 3-16 shows the population and gender distribution for the PITU Reservation compared with that for the County, State, and Country. The Kanosh population is about 3.9% of the Millard County population, 0.02% of the Utah population, and 0.0002% of the United States population. The Paiute (UT) Reservation population is 3.4% of the Millard County population, 0.01% of the Utah population and 0.0001% of the United States population.

There is a higher percentage of people below 18 years of age in Kanosh than in the County, State or Country. However, the percentage of the Reservation population below 18 years is about the same as that for the Country, and lower than in Kanosh, Millard County, and in the State. The ratio of females to males is much lower in Kanosh, than in the County, State, and Country. However, the ratio of females to males on the PITU Reservation is much higher than in Kanosh, in Millard County, in the State, and in the Country.

Table 3-17: Population Distribution by Age and Gender

Criteria		Kanosh Town	PITU Reservation	Millard County	Utah	United States
Total Population (2020 Census)		508	439	12,975	3,271,616	331,449,281
Age	<18 years	38.4%	22.8%	31.0%	29.0%	22.3%
	18+ years	61.6%	77.2%	69.0%	71.0%	77.7%
Gender	Female	38.5%	60.4%	48.7%	49.6%	50.8%
	Male	61.5%	39.6%	51.3%	50.4%	49.2%

Source: U.S. Census Bureau (2022a, 2022b, 2023)

3.3.18.2 Race and Ethnicity

Table 3-17 shows the population distribution by race and ethnicity in Kanosh Town and on the PITU Reservation, compared to the County, State, and Country. The population in Kanosh is predominantly white, and contains a few Hispanic, Asian, and American Indian/Alaska Native populations. The percentage of white people in Kanosh, that are not Hispanic or Latino, is higher

than that in Millard County, the State, and the Country. About 89% of the population on the PITU Reservation are American Indian/Alaskan Native, with some White and Hispanic/Latino. The Hispanic/Latino population are all Mexican.

Table 3-18: Population Distribution by Race and Ethnicity

Race	Unit	Kanosh Town	PITU Reservation	Millard County	Utah	United States
White	%	90.0	4.3	93.8	90.6	76.3
White, not Hispanic or Latino	%	87.8	N/A	82.8	77.8	60.1
Black or African American	%	0.0	0	0.6	1.5	13.4
Hispanic or Latino (any race)	%	6.7	6.6	12.9	14.4	18.5
Asian	%	1.6	0	1.6	2.7	5.9
American Indian and Alaskan Native	%	2.6	88.6	2.1	1.6	1.3
Native Hawaiian/ Other Pacific Islander	%	0.0	0	0.2	1.1	0.2
Two or more races	%	3.9	6.4	1.8	2.6	2.8

Source: U.S. Census Bureau (2022a, 2022b, 2023). N/A: Not Available

3.3.18.3 Education and Employment

Table 3-18 shows that the percentage of people with a bachelor's degree or higher is low in Kanosh, and much lower on the PITU Reservation, compared to the County, State, and Country. However, the employment rate in Kanosh is higher than that for the County, State, and Country. The employment rate on the Tribal Reservation is less than 50%, which is much lower than the employment rate in Kanosh Town, and that in the County, State, and Country.

Table 3-19: Population Distribution by Income and Employment

Population Characteristic	Unit	Kanosh Town	PITU Reservation	Millard County	Utah	United States
Bachelor’s degree or higher (25+ yrs)	%	18.7	10.1	22.4	34.7	32.9
Employment Rate	%	67.9	46.1	59.1	66.1	59.6

Source: U.S. Census Bureau (2022a, 2022b, 2023)

3.3.18.4 Income and Poverty

Table 3-19 shows that the median household income for Kanosh is comparable with that for Millard County and the Country; however, it is about 15% lower than the median household income for Utah. The poverty level in Kanosh is about 14%. This is higher than the poverty level

in the County, State, and Country. The median household income on the PITU Reservation is lower than that for Kanosh Town, the County, State, and Country by 34.4%, 34.8%, 44.4%, and 36.5%. Similarly, the poverty level is much higher on the PITU Reservation than in Kanosh Town, the County, State and Country, as shown in Table 3-19.

Table 3-20: Income and Poverty Level

Measure	Description	Unit	Kanosh Town	PITU Reservation	Millard County	Utah	United States
Median Household Income		$	62,882	41,250	63,221	74,197	64,994
Poverty		%	14.3	27.5	10.7	7.3	11.4

Source: U.S. Census Bureau (2022a, 2022b, 2023)

3.3.18.5 Occupation and Economy

The main economic activity for the people in Kanosh is farming. However, on the Kanosh Band Reservation, there is currently no agricultural productivity. Table 3-20 shows information on agriculture for Millard County from the 2012, 2017, and 2022 Census of Agriculture (USDA 2014, 2017a, 2022). From 2017 to 2022, the number of farms decreased by 135, and the land in farms decreased by about 97,500 acres. The total market value of the farm products sold increased in 2022; and the average market value of products sold per farm increased. Cropland was approximately 30% and 28% of the land in farms in 2017 and 2022, respectively, with approximately 85% of the cropland being irrigated in 2017 and 65% of the cropland being irrigated in 2022. Hence, approximately 25% of the land in farms in 2017 was irrigated but only 18% of the land in farms was irrigated in 2022, showing an overall decrease in irrigated acreage since 2012 (USDA 2014, 2017a, 2022).

Table 3-21: Agricultural Value

Statistic	2012	2017	2022
Number of farms	728	654	519
Land in farms (acres)	577,405	481,539	384,052
Cropland (% of land in farms)	26%	30%	28%
Average size of farm (acres)	793	736	740
Irrigated acreage	115,207	122,680	70,528
Total market value of products sold	$180,624,000	$179,959,000	$266,724,000
Average Market value of products sold per farm	$248,110	$275,167	$513,919
Average net cash income per farm	$41,899	$55,643	$170,134

Source: USDA (2014, 2017a)

Table 3-21 is a summary of the predominant crops grown in 2022 by farmers in Kanosh within the 100-year floodplain that would be affected in the event of a dam breach by the 100-year flood,

under the existing conditions. This includes the CCIC service area and other farms not serviced by CCIC. The cropland area is approximately 11,151 acres.

Table 3-22: Predominant Crops in the 100-year Dam Breach Flood Zone (2022 Data)

Crop	Area (acres)	Percentage of Cropland Area
Alfalfa	6,818.2	61.14
Fallow/Idle Cropland	2,302.7	20.65
Other Hay/Non-Alfalfa	1,167.1	10.47
Corn	474.8	4.26
Sod/Grass Seed	172.4	1.55
Winter Wheat	109.6	0.98
Triticale	61.4	0.55
Spring Wheat	18.0	0.16
Barley	17.3	0.16
Sorghum	3.3	0.03
Sweet Corn	2.9	0.03
Potatoes	1.1	0.010
Other Tree Crops	0.9	0.008
Oats	0.4	0.004
Millet	0.4	0.004
Dbl Crop Winter Wheat/Corn	0.4	0.004
Safflower	0.2	0.002
TOTAL	**11,151**	**100**

Source: USDA (2023)

Table 3-22 is a summary of the predominant crops grown in 2022 by farmers in Kanosh within the CCIC service area that would be affected in the event of a dam breach by the 100-year flood, under the existing conditions. The main crops grown within the CCIC service area are alfalfa, other hay/non-alfalfa, and corn. The other crops grown within the CCIC service area are included in Table 3-22.

Table 3-23: Predominant Crops in the CCIC Service Area (2022 Data)

Crop	Average Area (acres)	Percentage of Cropland Area
Alfalfa	1,985.8	66.74
Other Hay/Non-Alfalfa	535.1	17.98
Corn	311.8	10.48

Crop	Average Area (acres)	Percentage of Cropland Area
Grass/Pasture	60.7	2.04
Triticale	46.5	1.56
Winter Wheat	22.2	0.75
Spring Wheat	8.9	0.30
Barley	2.0	0.07
Other Tree Crops	0.9	0.03
Sorghum	0.7	0.02
Oats	0.4	0.01
Potatoes	0.4	0.01
Dbl Crop Winter Wheat/Corn	0.2	0.01
TOTAL	**2,976**	**100**

Source: USDA (2023)

3.3.19 Public Health and Safety

Corn Creek Dam is classified as a high hazard dam (DWRi 2023a). This is due to the proximity of the Town of Kanosh to the dam and the potential for loss of life, economic loss, or damage to critical public infrastructure in the event of dam failure. The Town is approximately 1 mile downstream of the dam. The dam has seepage problems in its foundation which compromises its ability to detain and safely pass any flood event that would cause the debris basin to fill. The foundation seepage issues could cause the failure of the dam with any stored or detained water in the debris basin. The debris basin also does not have the spillway capacity or freeboard necessary to pass the probable maximum flood (PMF). This could be catastrophic for the people of Kanosh.

The PMF is the largest flood event conceivable that is expected to occur in a given area and is used in the design of the dam. It is calculated from the probable maximum precipitation (PMP), which is the maximum precipitation depth meteorologically possible that is expected to occur in a given area for a given duration. The PMP and PMF used in the current dam design for this project are 11.09 inches and 10,655 cfs, respectively (see Appendix D for more information).

An additional public safety hazard exists due to the presence of open ditches throughout the town. These open systems present a significant hazard because of the potential and likelihood of people or animals falling into them. This hazard could potentially pose a threat to life from drowning if water is in the ditches. This hazard is potentially most severe if children were to fall into one of the open ditches. Within the town boundaries, the West Ditch, East Ditch, and Middle Ditch are particularly hazardous.

3.3.19.1 Possible Modes of Failure of the Dam

With the dam's foundation compromised by seepage issues, a dam breach is imminent. This could result from internal erosion of the dam (piping) or from saturation which can weaken the dam's embankment and foundation. During average to dry years, there is a low risk of failure because

the debris basin does not detain water. The debris basin would only start to detain water when the 60-inch outlet at the dam has reached capacity. This is because the 60-inch outlet pipe must be left fully open at all times as a directive from DWRi, for safety reasons, due to the dam's foundation seepage issues. Once the debris basin begins to impound water, the risk of dam failure increases because the foundation seepage could cause complete failure of the dam.

3.3.19.2 Dam Breach Analysis

Dam breach models were performed for the 2-year, 5-year, 10-year, 25-year, 50-year, 100-year, 200-year, and 500-year storm events. During the modeling, the dam was assumed to breach at the time that the water level in the reservoir was the highest. As the water level in the reservoir rises, the pressure and rate of flow through the foundation seepage pathways increases. The probability of failure increases with increasing water level and length of time the reservoir is full. Modeling showed the impact of dam failure starting with a 5-year storm event. Flow did not exceed the capacity of the 60-inch outlet during the 2-year event and as a result no water was detained in the reservoir. The dam breach analysis was performed for the existing conditions to understand potential flood inundation. The analysis was performed by modeling a piping failure in HEC-RAS using a two-dimensional (2D) flow area. More details about the methodology, assumptions, results, and figures can be found in Appendix D.

The estimated peak inflow from Corn Creek to the debris basin for the 100-year storm event is 1,945 cfs, but a dam breach for the 100-year storm would result in a maximum outflow of 12,979 cfs from the dam. This amount represents the sum of peak outflows from the 60-inch outlet, main spillway, emergency spillway, and breach. The maximum flood depth just downstream of the embankment breach would be over 10 feet. The flooding would inundate most of Kanosh.

3.3.19.3 Consequences of Dam Failure

A dam breach would send flood water, debris, and sediment to Kanosh and the surrounding agricultural land. A dam breach would result in extensive flooding around the Town due to the relatively limited capacity of natural and irrigation channels and the topography that naturally spreads flood water over a large area. Sediment would plug irrigation and drainage channels, and destroy crops, landscaping and possibly homes resulting in costly clean-up, similar to 1984 when the dam was breached. Approximately 508 people, 213 homes, 3,776 acres of agricultural land, a road network, and Town and community infrastructure would be affected. Figure 3-25 shows the dam breach inundation area for the 100-year flood, under the existing conditions, and the maximum depths of flooding expected from this flood event. Kanosh and surrounding agricultural areas would be flooded with water depths ranging from approximately 0.1 to 10+ feet, as shown in Figure 3-25. Note that the model does not account for sediment transport. With sediment expected to plug the irrigation and drainage channels, a dam breach would have more severe consequences for the people of Kanosh. An Emergency Action Plan (EAP) for Corn Creek Dam was completed in 1995 and is available on the Utah Division of Water Rights website (DWRi 2023a). The EAP would be updated per State and NRCS policy if the dam is replaced.

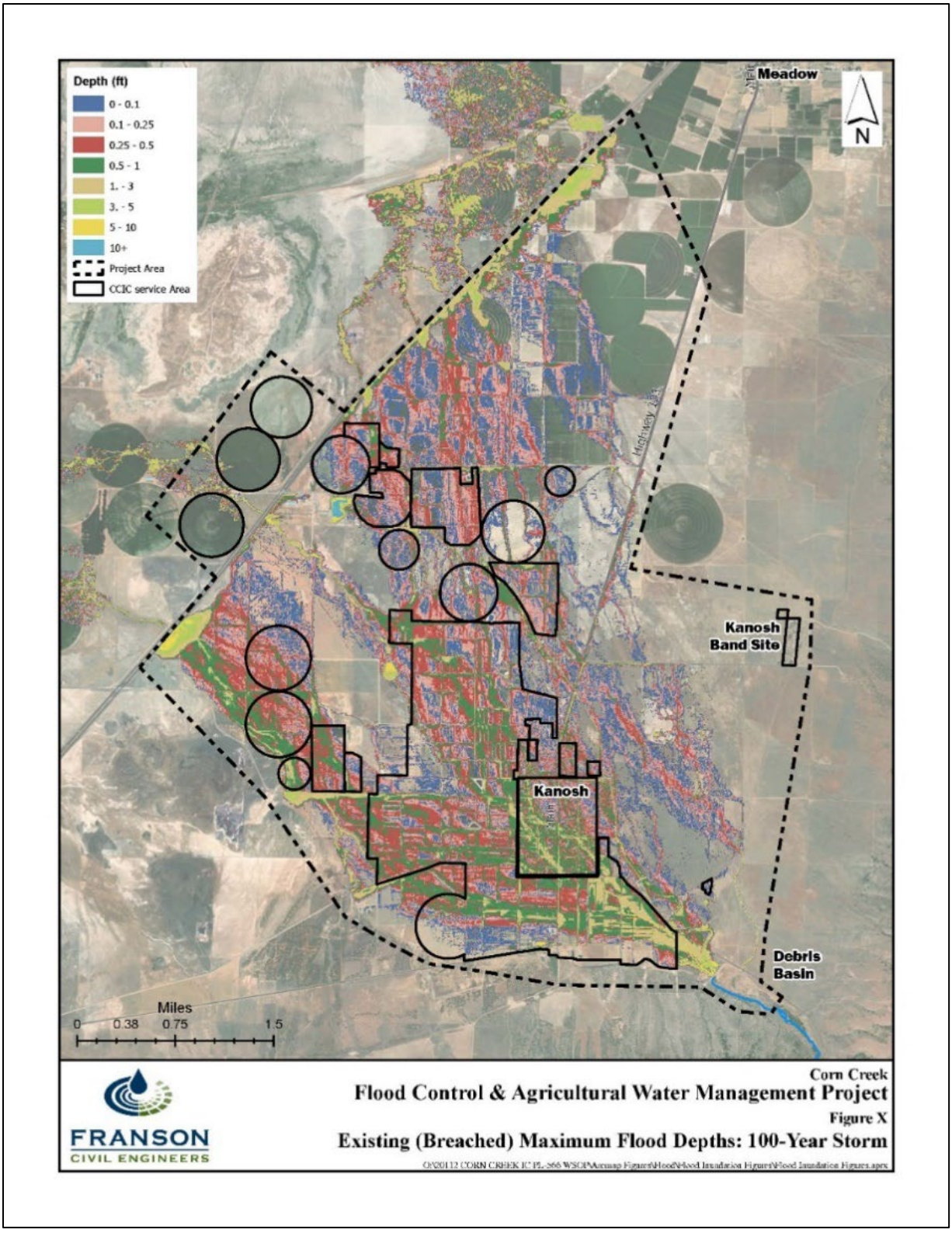

Figure 3-25: Existing (Breached) Maximum Flood Depths: 100-Year Storm

3.3.20 Scenic Beauty and Visual Resources

The mountain ranges on the outside of the project area, surround the area with beautiful scenery. While Corn Creek is not classified as wild and scenic on the National Wild and Scenic River System website, there is a 2.0-mile segment of the stream that was evaluated as scenic in a 2004 Wild and Scenic Eligibility Evaluation (USFS 2023b). This section of the stream, however, is outside of the project area.

The land within the project area is predominantly private. This land includes the Town and surrounding agricultural areas, with natural and constructed features, and vegetation along open channels contributing to the visual resources within the area. Because the land is private, it sits outside of the jurisdiction of the BLM Visual Resource Management (VRM) program and is therefore not classified under the VRM system. Viewers, including local residents and recreationists, however, have a perception of the existing physical characteristics and quality of the environment.

3.3.21 Significant Scientific Resources

Section 601.70 of the National Cultural Resources Procedures Handbook (NCRPH) defines resources of scientific value other than Cultural Resources as “those that contain no cultural material but are of value for other reasons. These resources include geological, paleontological, and other scientific resources of interest.” No regionally significant geologic features exist in the study area, nor do any known paleontological sites. An additional component the NCRPH seeks to consider caves that provide recreational opportunities for naturalists and spelunkers. However, none of these special sites exist in the study area. These conclusions are supported by the soils and the cultural resources investigation both described earlier in this chapter.

3.3.22 Land Use

Land in the project area is predominantly private, with the majority of the land being used for agricultural purposes and the land in Kanosh Town used for residential purposes as shown in Figure 3-26 (UGRC 2023). Agricultural land includes both developed and undeveloped farmlands with small farm communities. The upper watershed is managed for multiple uses including recreation, timber, mineral extraction, and rangeland/grazing in the nearby Fishlake National Forest and as outlined in the USFS Land and Resource Management Plan for Fishlake National Forest (USFS, 1986).

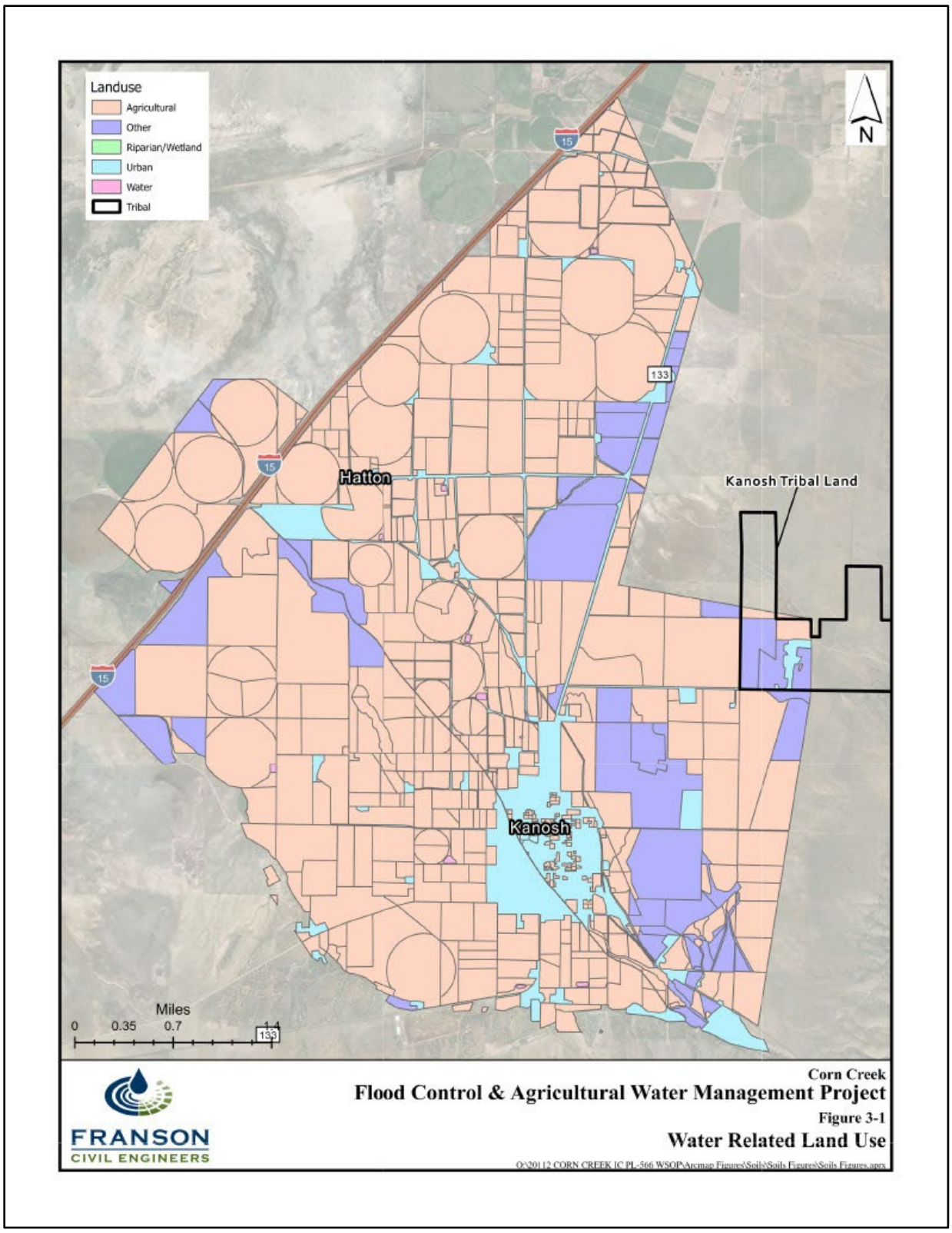

Figure 3-26: Water Related Land Use (UGRC 2023)

3.3.23 Transportation Infrastructure

The project area includes a network of roads which connect to Interstate 15 (I-15), west of the project area. This road network facilitates the transport of people, goods, and services in and out of Town. The major roads in the project area include I-15, Highway 133 north of Kanosh, Highway 91 south of Kanosh, Little Black Rock Road, Main Street, and Sandhill Road. This road infrastructure covers an area of approximately 740,774 acres.

3.3.24 Ecosystem Services

During the scoping process, ecosystem service benefits that currently exist in the watershed were identified. The scoping process identified provisioning, regulating, and cultural services in the watershed. The services also identified intermediate supporting services which is why those services were not carried forward in the ecosystem analysis. The entire ecosystem services analysis is documented in the Ecosystem Services Worksheet located in Appendix D.

Provisioning Services that currently exist in the watershed include water conservation/seepage control concerns, food production primarily related to agriculture (which can also be used as livestock feed, contributing to meat production), and drinking water supply to local residents.

Regulating Services that currently exist in the watershed include flood prevention/public safety related to flooding and the potential breach of the Corn Creek Dam. Additionally, secondary water quality is impacted by contamination in the open channel irrigation ditches. Farmers often utilize groundwater sources to supply their late season irrigation water needs, which degrades the ability of the area to build resiliency to forecasted climate trends such as increased drought.

Cultural Services that currently exist in the watershed include a focus on the agricultural economic sector and promotion of that sector's development and viability. The Kanosh Band, a Tribal community, provides a Cultural Service by providing unique perspectives on land management in the area, but are inhibited by having to utilize their culinary water supply for secondary purposes. There are also existence values associated with the aesthetics/scenic value of the watershed and of the presence of cultural/historic properties.

3.4 Forecast Future Conditions

The forecasting of future conditions in the watershed serves as a method to establish an analytic baseline against which the formulated alternatives may be compared against. This forecast considers all reasonably foreseeable large-scale processes in the natural, human, and economic environments. These forecasts are made to establish reasonably foreseeable impacts under the No Action/Future Without Federal Investment (FWOFI) alternatives.

3.4.1 Environment

The Utah State Hazard Mitigation Plan (SHMP) includes a chapter on climate change and provides documentation of the expected future conditions for the state based on ongoing climate trends. It is expected that Utah will experience temperature increases, although how much temperatures will increase is not known (SHMP, 2019). These same models predict an overall decrease in precipitation throughout the southwestern United States (SHMP, 2019). If these forecasts hold true, Utah will experience increased drought frequency as a result of the increasing temperatures. Extreme precipitation associated with monsoonal rainfall, and warming temperatures will likely increase the number of flood events in Utah (SHMP, 2019).

If existing conditions in the watershed were allowed to continue, it could be reasonably forecasted that the Corn Creek Dam and Debris Basin would fail, and the stored sediment would adversely impact the water quality of any sources downstream. Additionally, any fish in these areas could experience habitat impairment as a result of this breach, negatively impacting aquatic ecosystems and riparian areas along and near Corn Creek.

3.4.2 Society

As the risk of dam failure continues and eventually occurs, the watershed would continue to endure risks to life, injury, property, and agricultural fields. Additionally, the functionality and sustainability of the floodplain would not be improved and would likely be damaged when the dam breached.

As existing conditions continue, it can be reasonably forecasted that, at some point in the future, the flood identified in the Indirect Area of Potential Effects (APE) would occur. This would damage approximately 175 cultural/historic sites in the watershed, including 7 NRHP eligible sites.

3.4.3 Economy

Future damage would cost the local community money to mitigate. If no action is taken as a part of this project, the local economic conditions would have to continue to endure flood damage and their ensuing costs.

Crop yields would likely decrease in the watershed as secondary water access issues continued and also as seepage and evaporation losses continue. The Kanosh Band would continue to experience secondary water availability issues.

3.4.4 Ecosystem Services

The provision of the three ecosystem services considered in this Plan-EIS would continue to degrade if existing conditions were allowed to continue.

Unreliable irrigation water deliveries to Kanosh farmers would continue, preventing water savings from being increased and also preventing any increases in current crop yields. Kanosh Town's secondary system would continue to operate but would experience low pressure in high elevation areas. Even worse, the Kanosh Band would be forced to continue straining their culinary system to meet high outdoor water use demands, depleting the drinking water.

The Corn Creek Dam would remain at high risk of failure and can be reasonably expected to breach at some point, causing threats to life, structures, and agricultural fields, inhibiting regulating services. Additionally, farmers would likely increase their reliance on groundwater for late season irrigation as climate trends continue, leading to increased drought. There would be no increase in resiliency to climate change. Water quality in the irrigation ditches would continue to be subject to pollution and contamination as the system would remain open.

Agriculture would be affected adversely by the dam breach, leading to a decrease in the agricultural viability of the area, and potentially destroying cropland. The Kanosh Band would not be able to provide unique cultural services, and the aesthetic value of the watershed would be adversely impacted by the breach. Furthermore, the historic properties within the indirect/Dam Breach APE would be damaged when the dam breached, inhibiting the cultural services in the watershed.

4.0 Formation of Alternatives

4.1 Alternative Formulation Process

The alternative development process followed the procedures outlined in the NWPM (NRCS 2024), National Watershed Program Handbook (NRCS 2014), the PR&G (DM 9500-013) and other applicable NRCS watershed planning policies.

Conceptual flood prevention and agricultural water management project measures were identified, screened for pairwise compatibility, and combined into an initial array of alternatives. The initial array was then taken through two rounds of screening to arrive at the final array of alternatives.

Figure 4-1 describes the complete PR&G process and shows how the Proposed Actions are all tied to the PR&G Guiding Principles and Ecosystem Framework which then brings about a social value.

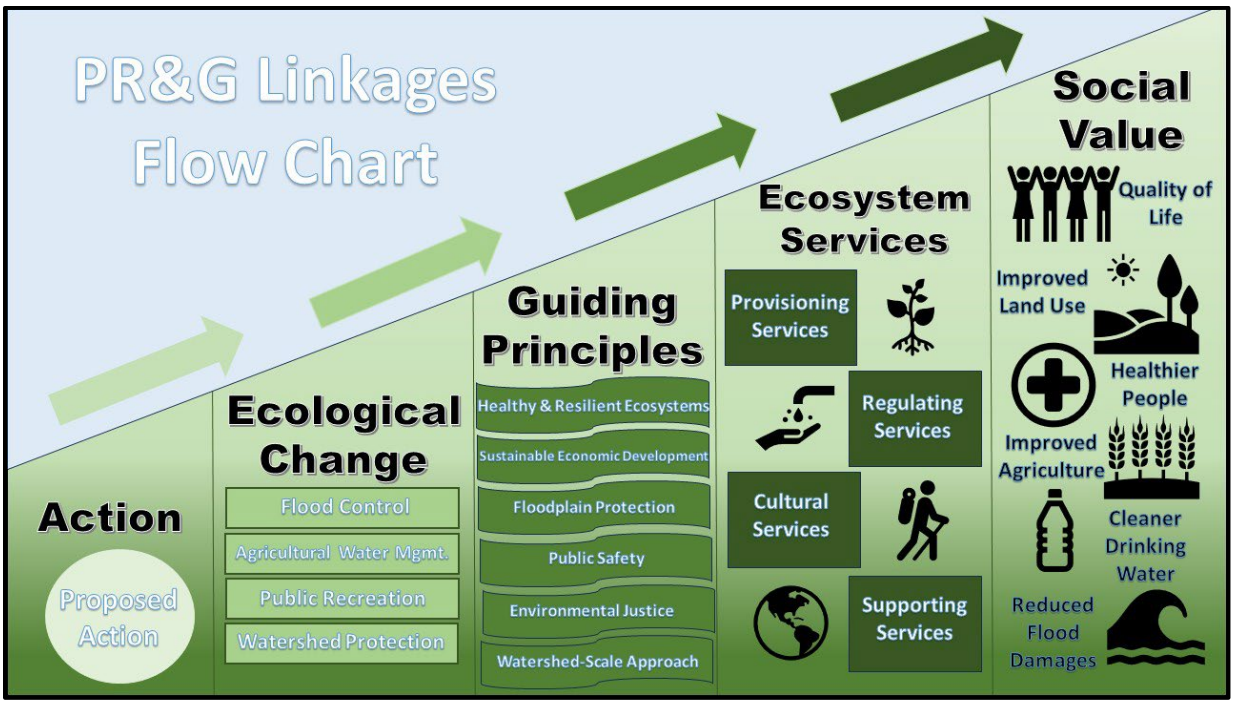

Figure 4-1: PR&G Linkages Figure

4.1.1 Guiding Principles & Alternatives Required to be Developed

Alternatives were developed in accordance with the Program guidelines to address the purpose and need and the following guiding principles of the PR&G (DM9500-013 pg. 21):

- **Healthy and Resilient Ecosystems:** protect and restore the ecosystem functions by 1) avoidance of adverse impact, 2) minimization of impacts with mitigation of any unavoidable damage, and 3) full mitigation to offset environmental damage. Mitigation must be included in the alternative development, design, and costs.
- **Sustainable Economic Development:** consider both the quantity and quality of water for both present and future generations as part of a larger economic and environmental evaluation to ensure that the future projects are both economically feasible and sustainable for both the local and national best interests. The alternative should reduce uncertainty and risks, allowing a full range of adaptable management options to maintain the project feasibility in the future.
- **Floodplains:** The alternatives must seek to avoid adverse impacts to flood prone areas and floodplains and improve flood plain sustainability and functionality.
- **Public Safety:** DM 9500-013 states, "An objective of the PR&G is to reduce the risks to people including life, injury, property, essential public services, and environmental threats concerning air and water quality".
- **Environmental Justice:** The PR&G process requires that the alternatives provide fair treatment to all people through all stages of the process. The disproportionate impact on minorities, Tribal, and low-income populations is not allowed.
- **Watershed Approach:** This approach recognizes that there may be impacts both upstream and downstream of the project area and the applicable political or administrative boundaries.

The PR&G mandates that a wide range of alternatives be developed including each of the following listed below:

- **Future without Federal Investment (FWOFI) or No Action:** This is the baseline against which all other alternatives are compared and evaluated. This is required by NEPA and should always be included as part of PR&G.
- **Nonstructural Alternatives:** These are alternatives that alter the use of existing infrastructure or human activities to avoid or minimize adverse changes to existing hydrologic, geomorphic, and ecological processes. For projects with a Flood Prevention purpose, a nonstructural or nonstructural-structural combination Plan is required to be carried into the final array of alternatives.
- **Locally Preferred Alternative:** This alternative is developed in cooperation with sponsors and local interests that have oversight or implementation authorities and responsibilities.
- **Environmentally Preferable Alternative (from NEPA) and Least Environmentally Damaging Practicable Alternative (LEDPA) (USACE):** An environmentally preferable alternative is required by the NEPA process. Additionally, if a Clean Water Act section 404 permit is required, the principles of LEDPA should be followed and complied with during alternative development. This is best accomplished via the principles of first, avoidance, then, minimization, then, and only then, mitigation.

4.1.2 Alternative Formulation Criteria

The sponsors, NRCS, and agency/public stakeholders adhered to the following alternative plan formulation process that included the following phases:

- Phase I: Identification of deficiencies resulting from the project problem(s).
- Phase II: Formulation of potentially suitable management measures to address each identified deficiency.
- Phase III: Evaluation of pairwise compatibility for each measure against one another to form a viable alternative that addresses all problems and the purpose and need.
- Phase IV: Combination of the remaining measures into an initial array of alternatives.
- Phase V: First screening of the initial array against the Federal/Project Objectives and the project Constraints.
- Phase VI: Second screening of the initial array against the ecosystem services and the Benefit-Cost Ratio (BCR)/Net Benefits.
- Phase VII: Identification of the Final Array of Alternatives

The PR&G plan criteria include completeness, effectiveness, efficiency, and acceptability. These criteria were used in the screening of the final array of alternatives as a metric to identify the Preferred Alternative.

4.1.3 Risk and Uncertainty

Risk and uncertainty are inherent in the watershed planning process. Risk refers to those outcomes that can be described using well-known probability distributions and uncertainty refers to potential outcomes that cannot be described in objectively known probability distributions.

It can be reasonably stated that climate change plays the largest role in introducing risk and uncertainty into the project. Although it can be predicted that extreme weather events including drought, wildfire, and floods will increase over time, the exact frequency and intensity of these events cannot be known. Other factors that introduce risk for this project include flood risks, water demand, and population growth in the area.

4.1.4 Formulation Process

This subsection presents the formulation of alternatives in more detail, drawing upon the results of the seven-phase formulation criteria plan presented in section 4.1.2 above. The full alternative formulation process is documented in Appendix D.

4.1.4.1 Phase I: Identification of Deficiencies

The SLOs identified locations within the watershed that experience issues associated with one or more of the project problems (i.e., flood prevention or agricultural water management). From these identified locations, a set of three deficiencies were identified for the project problems. The identified deficiencies are:

Table 4-1: Identified Deficiencies

Number	Deficiency Description
1	Corn Creek Dam and Debris Basin
2	Seepage and Evaporation Losses in the CCIC System

3	Kanosh Band Secondary Water Access

4.1.4.2 Phase II: Formulation of Potentially Suitable Management Measures

This phase identified potential management measures for each of the deficiencies identified in Phase I and qualitatively evaluated them for their suitability as a component of a fully fleshed out alternative plan. Certain measures were eliminated based on a variety of factors which are discussed in Section 4.3. A total of twelve potential management measures were carried forward for Phase III. The qualitative evaluation of all considered measures is documented in the Formulation Matrix located in Appendix D.

4.1.4.3 Phase III: Pairwise Compatibility of Each Measure

Phase III took each of the twelve measures and screened them for pairwise compatibility to be combined into a full alternative plan. This project needed to address two problems: Flood Prevention and Agricultural Water Management, which required the combination of enough measures to address each of the problems and opportunities in a single alternative plan. Most of the measures were compatible with one another as an alternative component. However, certain measures were only compatible with a particular set of measures. Other measures were mutually exclusive (i.e., nonstructural property buyouts or floodproofing are incompatible with structural measures to replace the dam). The full pairwise compatibility assessment is located in the Alternative Formulation Matrix in Appendix D.

4.1.4.4 Phase IV: Combination of Measures into Initial Array of Alternatives

This phase took each of the measures deemed to be compatible with one another as a component of a full alternative and identified a wide initial array of alternatives that each addressed the project problems and opportunities. The initial array of alternatives is listed below:

Table 4-2 Initial Array of Alternatives

Alternative Name	Where Described in Plan-EIS
No Action/FWOFI Alternative	See Section 4.2.1
Action Alternative 1 – Dam Replacement Alternative	See Section 4.2.3
Action Alternative 2 – Buyouts Alternative (Nonstructural)	See Section 4.2.4
Action Alternative 3 – Floodproofing Alternative (Nonstructural)	See Section 4.3
Action Alternative 4 – Dam Removal Alternative	See Section 4.3

4.1.4.5 Phase V: First Screening of the Initial Array

This phase includes the first screening of the initial array of alternatives against the following criteria:

A. The Federal Objective (see Section 2.1.1)
B. The Project Objectives (see Section 2.1.2)
C. The Project Constraints (see Section 2.1.3)

This screening was qualitative and assessed the ability of each of the alternatives to meet the objectives and meet the avoidance/minimization criteria of the constraints. The full screening is documented in Appendix D. The results of the first screening are described below.

Table 4-3: Results of First Screening of Initial Array of Alternatives

Alternative	Carried Forward?	Rationale
No Action/FWOFI Alternative	Yes	The No Action/FWOFI is required to be carried forward and serve as an analytic baseline of comparison of Alternative Plans. So, even though none of the objectives and only some of the constraints are met by this Plan, it was still carried forward.
Dam Replacement Alternative	Yes	This Plan meets all the project objectives and planning constraints; thus, it was carried forward to the second screening.
Buyouts Alternative	Yes	This Plan does not meet all the objectives or constraints, only some. However, at least one nonstructural option is required to be carried forward to the final array under the PR&G, thus this Plan was carried forward to the second screening.
Floodproofing Alternative	No	This Plan did not meet all the objectives and constraints, only some. This nonstructural plan met less constraints than the buyouts plan and so, was eliminated from further consideration as only one nonstructural plan is required to be carried forward.
Dam Removal Alternative	Yes	This Plan meets all the project objectives and planning constraints; thus, it was carried forward to the second screening.

4.1.4.6 Phase VI: Second Screening of the Initial Array

This phase includes the second screening of the initial array of alternatives against the following criteria:

D. The Four Ecosystem Service Categories
E. The Benefit-Cost Ratio (BCR) and Net Economic Benefits

This screening was both qualitative and quantitative and assessed the ability of each of the alternatives to improve the provision of each ecosystem service category in the watershed and meet the minimum BCR of 1.0. The full screening is described in more detail in Appendix D.

Table 4-4: Results of Second Screening of Initial Array of Alternatives

Alternative	Carried Forward?	Rationale
No Action/FWOFI Alternative	Yes	Although this Plan does not improve the provision of ecosystem services or have any positive economic benefits, it is required to

		be carried to the final array and to serve as an analytic baseline of comparison.
Dam Replacement Alternative	Yes	This Plan improved the provision of all scoped ecosystem services in the watershed and has substantial net positive economic benefits with a BCR of 3.53.
Buyouts Alternative	Yes	This Plan improved the provision of all the scoped ecosystem services in the watershed and has some net positive economic benefits with a BCR of 2.01. However, the costs to implement this Plan would be exorbitant and much higher than the Dam Replacement Plan and, in the end, would provide less benefits than that plan as well at a higher cost. This Plan was carried forward because it (A) met the criteria of the second screening and (B) because at least one nonstructural plan is required to be in the Final array under the PR&G.
Dam Removal Alternative	No	This Plan was eliminated in this round of screening because it did not benefit all the ecosystem service categories. No Cultural Services would be improved under this Plan and the services in the other categories would be improved at a much lower margin than other considered plans. Because of this, no economic screening was done on this Plan, and it was not carried forward to the final array of plans.

4.1.4.7 Phase VII: Identification of the Final Array of Alternatives

The final plan formulation phase identified the Final Array of Alternatives based on the two screening processes conducted and also identified the:

- Environmentally Preferred/LEDPA Alternative (from NEPA)
- the Locally Preferred Alternative (PR&G)

The Final Array of Alternatives is described in Section 4.4.

4.2 Alternatives Considered

The following alternatives were brought forward for detailed analysis. The individual measures included under each alternative are described in this section.

4.2.1 No Action Alternative/Future Without Federal Investment (FWOFI)

Under the No-Action Alternative, there would be no federal technical or financial assistance for implementation on any part of the project area. The debris basin's high hazard dam would continue to pose a high risk of failure during a large flood, due to the seepage problem occurring in the dam's foundation. This could result in devastating flood damage to the Town of Kanosh. Flood flows would pass through the same historic channels and waterways with the severity of the

flooding events continuing, dependent upon the nature, timing, and severity of the event. Irrigation flows would continue to be lost through seepage and evaporation from the earthen canals. The Town's secondary water system would keep receiving insufficient pressures for sprinkler irrigation and would continue encroaching on and increasing the demand on their culinary water systems. The Tribe would continue to have culinary water shortages due to outdoor water use and no effective way to utilize their CCIC shares and water from Corn Creek. No federally funded project measures would be implemented. Existing conditions and trends would continue. The No-Action Alternative would not meet the purpose and need for the project. However, the No-Action Alternative is carried forward as the basis of comparison for impact analysis.

Two scenarios of the existing conditions were considered. One where the debris basin embankment breached (Catastrophic) and one where the debris basin embankment functioned as designed. The Catastrophic or breached model was ultimately used to represent the No-Action Alternative because the current foundation seepage would eventually cause failure of the dam. Modeling results for the 100-year storm event can be seen in Appendix E, TM004 for the No Breach Scenario. The results show that even when no-breach is assumed, the current debris basin does not prevent Kanosh from being flooded.

4.2.2 Action Alternative 1 – Proposed Action – Dam Replacement Alternative

The specific management measures selected for inclusion in this alternative plan are described below.

4.2.2.1 Flood Prevention Management Measures

A summary of the proposed flood control actions is described below.

Debris Basin

The current debris basin would be reconstructed. The new debris basin would have an updated alignment farther downstream and a taller embankment. The proposed embankment crest elevation is designed to be 5,208.75 feet and the height of the embankment measured from the lowest downstream toe elevation is approximately 50 feet. Conceptual drawings of the proposed debris basin embankment can be seen in Figure 4-2 and Figure 4-3.

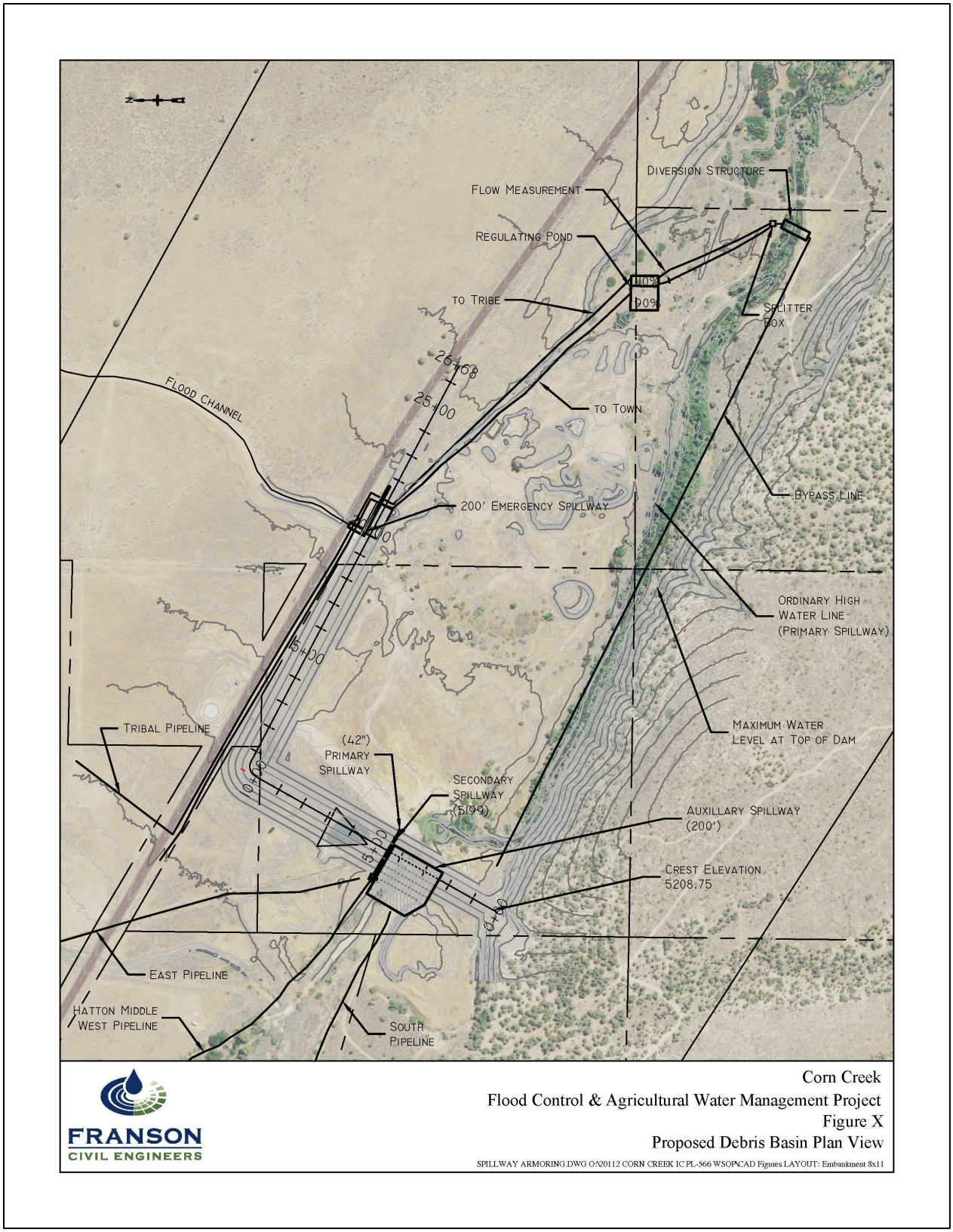

Figure 4-2: Proposed Debris Basin Plan View

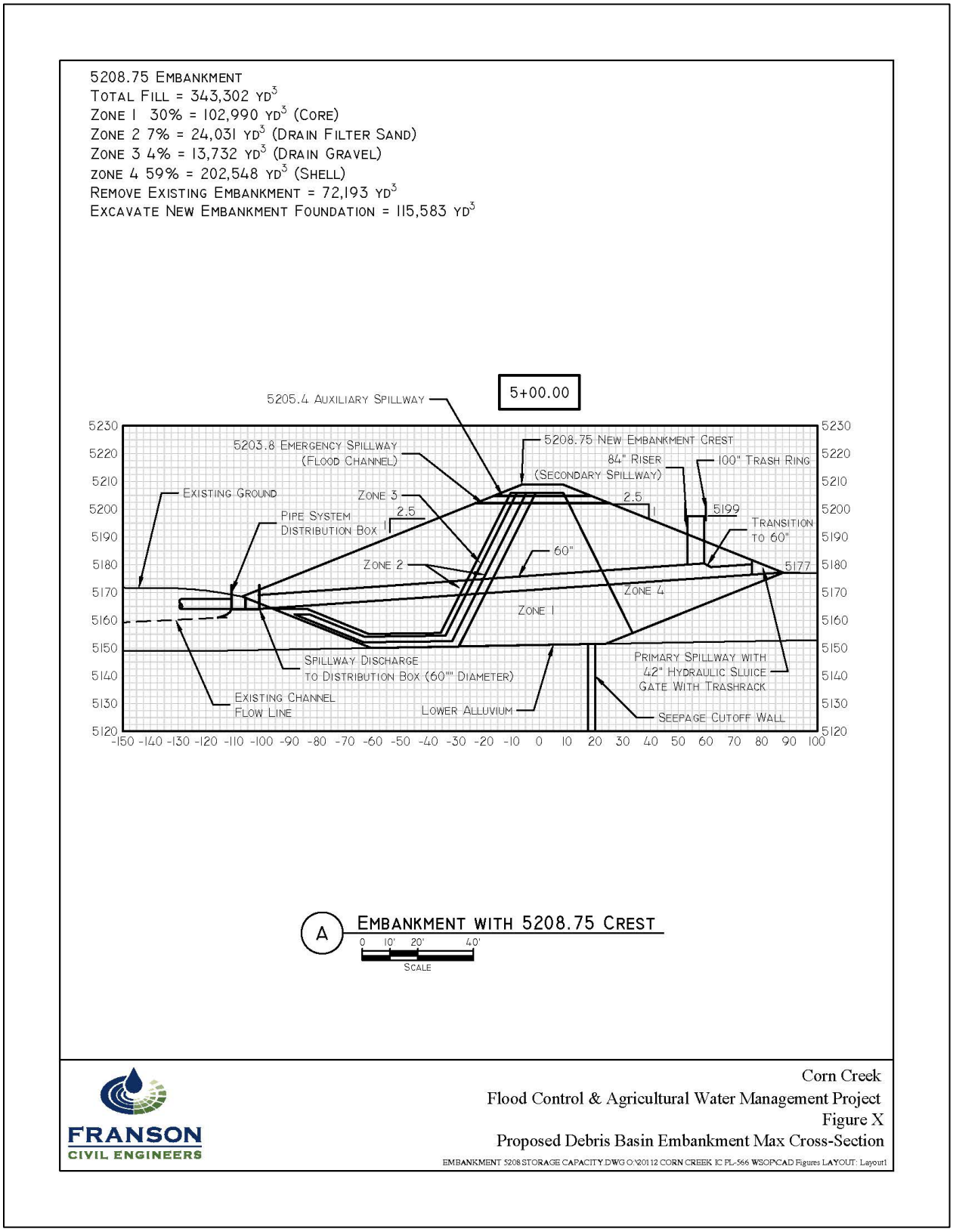

Figure 4-3: Proposed Debris Basin Embankment Max Cross-Section

Spillways: Primary, Secondary, Emergency, and Auxiliary

There are four spillways proposed to control the release of water and to reduce flooding damages. The purpose of the primary spillway/low level outlet is to provide a controlled outlet for water management during non-storm events. The purpose of secondary, morning glory spillway is to release floodwater during flood events and limit that flow to the capacity of the channels downstream of the embankment. The purpose of the emergency spillway is to divert large flood events that exceed the capacity of the channels through the town of Kanosh up to the 100-year storm event. The purpose of the auxiliary spillway is to prevent the dam embankment from overtopping during the PMF storm event. The various spillways also distribute flood waters to multiple existing culverts along I-15 to prevent the overtopping of I-15. Construction of these new spillways, along with the other new measures installed at the site of the dam/debris basin, would entirely replace the existing structures, which are in extremely poor condition as described in Chapter 3.

The proposed new primary spillway/low level outlet is a 42-inch conduit with a crest elevation of 5,177 feet. This conduit would discharge into a box that would dissipate energy, split water between two pipelines, and measure flow. This outlet pipe would have a trash rack and be controlled with a guard gate at the inlet of the pipe.

The proposed new secondary spillway is a morning glory and standpipe type design with a crest elevation of 5,199 feet and effective weir length of 22 feet. The 84-inch standpipe would have a 100-inch trash ring that would keep floating debris from blocking the flow of water into the spillway and blocking downstream culverts. The 84-inch standpipe would transition to a 60-inch conduit that would discharge into the energy dissipation box. During periods of high or flood flow, the box would discharge water to the existing channel downstream of the embankment.

The proposed new emergency spillway is a side channel spillway design with a crest elevation of 5,203.8 feet and width of 200 feet. A concrete weir wall would discharge into a concrete side channel that would route the water to the existing emergency channel. The existing emergency spillway culverts that convey water across Kanosh Canyon Road do not have the capacity needed for the additional design flows of the Preferred Alternative and have a high potential to be plugged by debris. The road would be regraded to remove the culverts and create a broad swale that would convey floodwater to the existing flood channel. The elimination of culverts would greatly reduce the potential for debris to prevent floodwater from flowing into the existing flood channel.

The proposed new auxiliary spillway would be constructed as an armored spillway over the dam with a crest elevation of 5,205.4 feet and width of 200 feet. The proposed armoring is a fabric-formed concrete mattress. An earthen auxiliary spillway was evaluated, but the velocities generated during the PMF event (5,000 cfs) greatly exceed the acceptable velocity (25 fps) for even a reinforced vegetation channel. For this reason, an armored spillway is proposed. The water would be routed into the existing channel downstream of the embankment.

Pond Relocation and Kanosh Band Secondary System

The new debris basin embankment alignment will be downstream of the existing alignment to create additional flood detention storage in the debris basin. This new alignment will eliminate the Town Pond that is used for secondary, outdoor irrigation. As part of the new debris basin construction, the Town Pond will need to be replaced.

The Tribe has an existing pond that was built for the purpose of secondary, outdoor irrigation. This pond is currently not operational and does not provide the water pressure necessary for operation. As a cost saving measure, the Town and Tribe ponds will be combined. The location for this combined pond will be approximately a half mile upstream of the new debris basin embankment. This location will be located at a higher elevation which will provide the pressure needed for the Tribe to have water available for agricultural and secondary use that they do not currently have.

The proposed scope would include the following elements:

1. A diversion structure to divert a percentage of the Corn Creek flow for the Tribe and Town's secondary water systems, as well as divert water to the naturally clay-lined bypass channel along the debris basin that minimizes seepage losses for CCIC.
2. A splitting structure to split the diverted water between the Tribe and the Town.
3. A regulating pond at a suitable elevation to temporarily hold water and provide enough pressure for the Tribe's secondary water system, as well as the Town's secondary water system.
4. Pipelines to convey this water to the two existing secondary water system pipelines below the debris basin, a short pipeline to convey water from the diversion structure to the bypass channel on the southwest side of the debris basin that would minimize seepage losses, and an overflow pipe to convey excess water from the secondary pond to the bypass line for use by CCIC.
5. A secondary water pipe network for the Tribe connecting to their existing 12-inch PVC pipeline at their existing pond to convey water directly to the residential homes for outdoor water use.

Berm and Channel Modification

The flood modeling did not assume there was any warning of flooding or changes made to the terrain like sandbagging or modifications to the ditches. The modeling showed that Kanosh begins flooding during the 2-year storm event because the East Field Single Ditch takes more water from the splitting structure than it has capacity to safely convey. The East Field Single Ditch and splitting structure can be seen in Figures in Appendix D. The splitting structure is based on shares, not on channel capacities. Installing bypasses near the existing splitting structure to prevent the Hatton and East/Middle Ditches from breaching is one of the proposed actions. The first bypass would route water that exceeds the capacity of the East/Middle Ditch to the Hatton Ditch. The second bypass would route water that exceeds the capacity of the Hatton Ditch to the West Ditch.

Minimal modifications to the last two blocks of the West Ditch allowed the upstream capacity of the West Ditch to be fully utilized. Another proposed action is to enlarge the West Ditch downstream of the Main Street culvert. The improvements include enlarging the existing channel, extending the channel, lining the ditch with concrete, and replacing the two 65 cfs capacity culverts with bridges over the concrete channel (culverts are not eligible for cost-sharing under PL-566 and would be paid for at 100% by the SLO. These costs are included as "Real Property Rights" in the economic analysis). This would allow the floodwater to be contained within the ditch until it can be safely discharged beyond the homes and structures in Kanosh.

To prevent the floodwater from overtopping I-15, it was important to route the water through a large capacity I-15 culvert. As the floodwater spread out, it was important that it didn't travel north of this culvert. Shortening the existing emergency channel releases the floodwater farther south and allows more water to reach the larger culvert. Constructing a berm north of the culvert to

prevent the floodwater from flowing north routes more water through the large culvert. Finally, raising 800 feet of an existing dirt road to prevent the water from flowing north was also one of the actions that would utilize the large capacity I-15 culvert enough to prevent the overtopping of I-15.

Some other proposed actions were much smaller berms that direct the floodwater into the Hatton Ditch and away from structures and minor grading to direct floodwater into the West Ditch. See Figure 4-4 below for the location of the proposed berm and channel modifications.

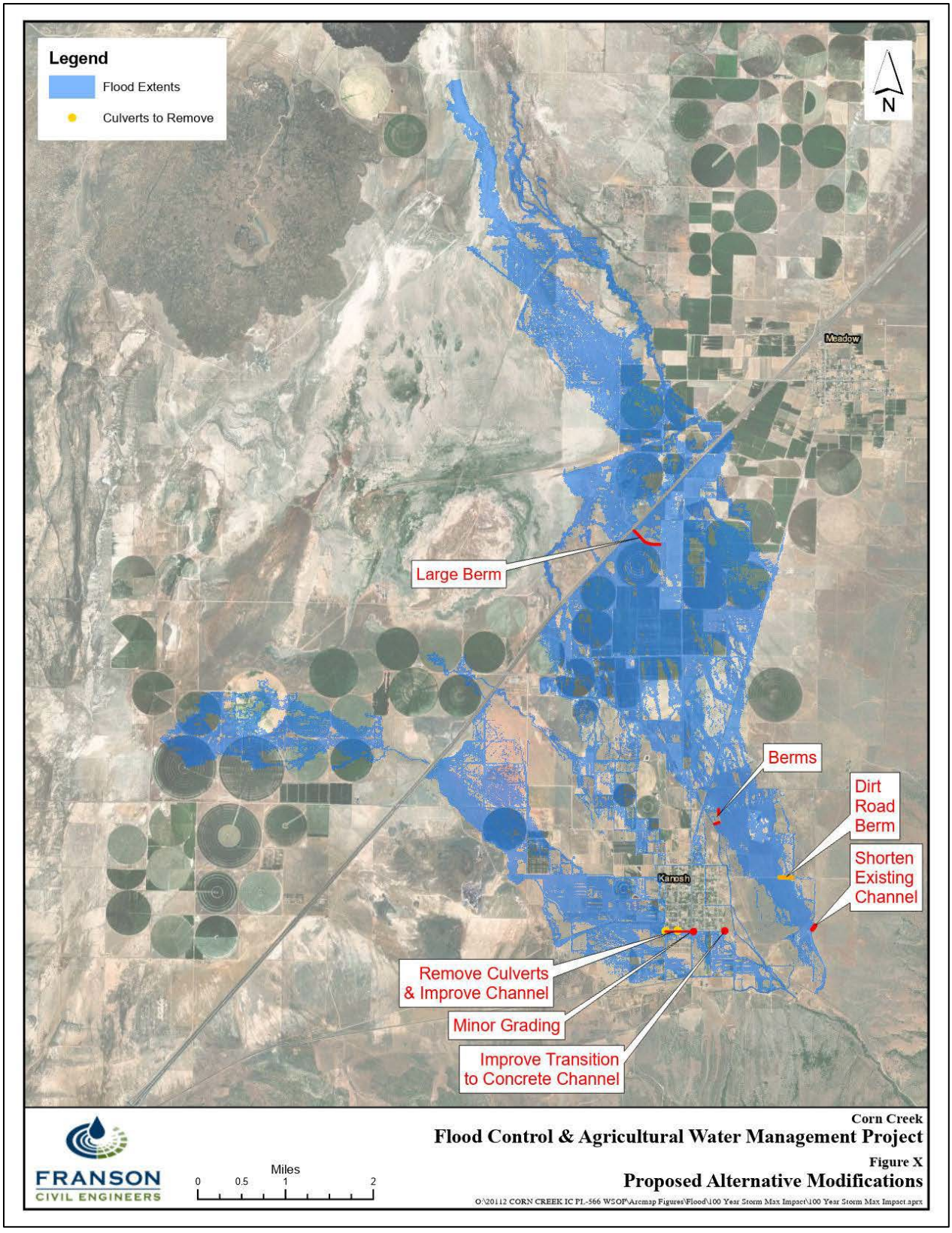

Figure 4-4: Proposed Alternative Modifications

4.2.2.2 Agricultural Water Management Measures

This section describes the agricultural water management actions that were carried forward for a detailed resource impact analysis.

Pipe Network/Secondary System

The current CCIC open ditches lose approximately 44% of the water conveyed (Appendix D). The existing ditch system can be seen in Figures 3-1 and 3-2. A gravity pipe system is proposed to greatly reduce seepage and evaporation losses and increase irrigation water deliveries to the farmers in the area. Ditches used to convey water during periods of low flow will generally be replaced with pipe. These are the ditches with the word double in their name as well as the laterals that take the water to the fields. The larger earthen ditches used to convey high water will remain to convey the water flow above the pipe system capacity. Diversion boxes would be installed at current irrigation turnouts. The proposed pipe system would replace the equivalent of approximately 4.9 miles of open ditches. Up to approximately 14.1 miles of ditches would have pipe installed adjacent to the ditch because the ditch would be needed to convey floodwater. The ends of laterals that are used infrequently or serve a single shareholder may not be piped if funding becomes short. Figure 4-5 shows the proposed agricultural pipe network. Appendix D gives the details and assumptions made for this agricultural piped system and calculations used to estimate seepage.

There are multiple splitting/measurement structures proposed for the piped system. A main splitting/measurement structure is proposed where the 60-inch debris basin outlet would discharge. This main splitting box would dissipate energy and distribute the water into two pipelines. The pipelines would have a combined capacity of about 40 cfs. Other splitting/measurement structures would also divide water downstream where previous ditches have been combined to reduce the amount of pipe needed.

A sharp crested weir would be used in the splitting structures. This would ensure uniform controlled flow into each of the splitting sections. The sharp crested weir would also be used to measure flow; therefore, there would not be a need for separate measurement structures. There would be a staff gauge in the splitting structure and possibly a water level measurement device that could be transmitted to a SCADA system. More details about the proposed pipe system can be found in Appendix D.

The Corn Creek Watershed Project aims to improve irrigation systems for the Kanosh Band of Paiute Indian Tribe by adding a secondary system to the existing pipeline between the debris basin and the community. The new regulating pond would be at a higher elevation that would allow it to service both the Town and Kanosh Band. The secondary system for the Kanosh Band would reduce the demand for existing culinary water systems. Water would be diverted from Corn Creek before it reaches the debris basin, stored in a new regulating pond with a partition to separate the Tribe's water from the Town's water. The Tribe's current pipeline, installed in 2005, has not been effectively used, leading to flooding and underutilization of water shares. The new system would allow better management of Tribal water rights, providing up to 400 gpm to supply 17 developed lots, though actual flow in Corn Creek would determine the amount of water available. The Town, with rights to 10% of CCIC’s water, would also benefit from the new system, which includes relocating their pond to a higher elevation to ensure adequate pressure. The management measures seek to optimize water distribution and minimize seepage, thereby supporting both the Tribe's and the Town's irrigation needs.

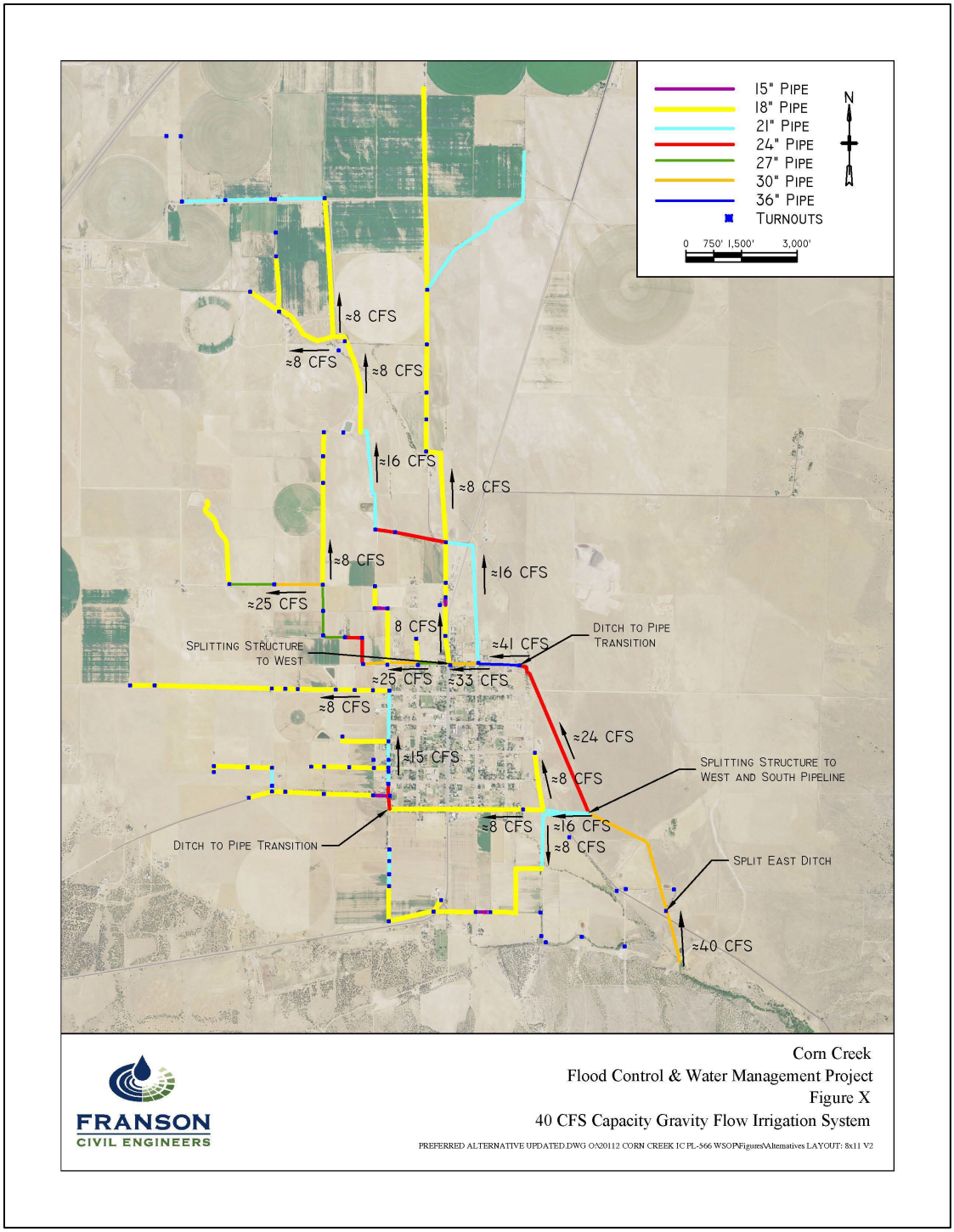

Figure 4-5: 40 cfs Capacity Gravity Flow Irrigation System

4.2.3 Summary of Alternative 1 – Proposed Action – Dam Replacement Alternative

The Proposed Action meets the purpose and need of the project. Each of the options selected to develop the Proposed Action Alternative met individual category criteria described throughout Section 4.2. Table 4-5 below describes the selected measures.

Table 4-5: Proposed Action Options

Benefit Category	Proposed Action
Flood Control	Reconstruct the debris basin and dam embankment to eliminate the existing seepage problem that has structurally compromised the dam and to construct the structure to comply with all Utah Dam Safety and NRCS standards.
	Relocate the existing Town secondary pond that is downstream of the debris basin since the proposed dam alignment eliminates the current pond location to create additional detention storage. The new pond would also have the elevation necessary to provide the Tribe's secondary system sufficient pressure for agricultural use. Both secondary systems would reduce the demand on their culinary water systems. The pond has been designed with a 2.8 acre-feet capacity with 10% of the storage being used for The Tribe and 90% of the storage being used for The Town. Design details can be found in Appendix E, Technical Memorandum 06.
	Construct the primary spillway/low level outlet, which would be a conduit that would discharge into a box that would dissipate energy, split water between two pipelines, and measure flow.
	Construct the secondary spillway using a standpipe design that would allow floodwaters to pass without the need of human adjustments while capturing floating debris and a large portion of the sediment in the debris basin.
	Construct an emergency spillway and use the existing emergency channel to convey floodwater away from Kanosh.
	Construct an auxiliary spillway that would create the spillway capacity necessary to pass the PMF without overtopping the debris basin embankment.
	Create bypass channels that prevent flow in ditches from exceeding their capacity and route flows above the existing ditches capacity to the West Ditch /natural channel where other improvements would be made to increase capacity.
	Improve the West Ditch/natural channel to prevent flooding in Kanosh. The natural channel ends when it reaches town and transitions to the West Ditch.
	Construct berms and raise a road in the project area to better utilize existing culverts under I-15 to prevent overtopping I-15 and protect structures in the project area.
Agricultural Water Management	Construct a gravity pipe system to greatly reduce seepage and evaporation losses. This would also reduce a public safety hazard of having open ditches in town with the potential for people and animals to fall into the ditches.
	Construct structures for flow measurement and better water management.

Hydrologic and hydraulic analyses (Appendices D & E) were conducted to evaluate and verify that the proposed alternative meets the purpose and need of the project. The alternative was screened using the PR&G process described in section 4.1. Close coordination with NRCS and sponsors was ongoing during the technical development of the measures that were used for this Alternative.

4.2.4 Action Alternative 2—Nonstructural Alternative – Buyouts Alternative

The specific management measures selected for inclusion in this alternative plan are detailed below.

4.2.4.1 Flood Prevention Management Measures

This Alternative Plan would address flood prevention problems in the watershed through nonstructural measures, which is a requirement for projects having that authorized purpose under PL 83-566. The nonstructural measures for flood control have been combined with "fewer or smaller" structural agricultural water management measures for this alternative, as described in the NWPM and DM 9500-013 in order to meet both purposes of the project.

The nonstructural measures would consist of conducting property buyouts of all homes in the breach zone of Corn Creek Dam and Debris Basin, effectively removing the risk to life and property for the homes downstream of the Dam and eliminating the flood prevention hazards to structures in this area. The estimated cost to conduct buyouts/relocations in the study area is $89,757,799, an exorbitant cost that would require an annual investment of $3,164,686. The dam would remain at a high hazard level and could be expected to breach eventually. The nonstructural approach would provide a solution to the problem, which is required to be fully analyzed as part of the final array of Alternative Plans under the PR&G.

4.2.4.2 Agricultural Water Management Measures

The structural agricultural water management measures would be the same as the Dam Replacement Alternative and would include a gravity pipe secondary system to greatly reduce seepage and evaporation losses and increase irrigation water deliveries to the farmers in the area. Diversion boxes would be installed at current irrigation turnouts. The proposed pipe system would replace approximately 4.9 miles of open ditches. Up to approximately 14.1 miles of ditches would have pipe installed adjacent to the ditch. Multiple splitting/measurement structures would be installed for the piped system and a sharp crested weir would be used in the splitting structures to ensure uniform controlled flow. The regulating pond would be relocated approximately a half mile upstream of the current pond location. The new pond would supply both the Town and the Kanosh Band secondary systems from a higher elevation. This would provide additional pressure in the two secondary systems. Lastly, the plan would add a secondary system to the existing pipeline between the debris basin and the Kanosh Band Tribal community.

4.2.5 Summary of Alternative 2 – Nonstructural Alternative – Buyouts Alternative

Each of the measures selected to develop Action Alternative 2 met individual category criteria described throughout Section 4.2. Table 4-6 below describes the selected options. Close coordination with NRCS and sponsors was ongoing during the technical development of the actions that were used for Action Alternative 2.

Table 4-6: Nonstructural Alternative Options

Benefit Category	Proposed Action
Flood Prevention	Conduct property buyouts and relocations in the dam breach zone to eliminate flood risk at an estimated cost of $89,757,799.
Agricultural Water Management	Construct a gravity pipe system to greatly reduce seepage and evaporation losses. This would also reduce a public safety hazard of having open ditches in town with the potential for people and animals to fall into the ditches.
	Relocate the regulating pond to a higher elevation to improve pressures.
	Construct structures for flow measurement and better water management.

4.2.6 Locally Preferred Alternative

Under the PR&G, it is required to identify an alternative plan that is locally preferred. This alternative was developed with sponsors and local interests that have oversight or implementation authorities and responsibilities. In the case of this project, the locally preferred alternative is the Dam Replacement Alternative.

4.2.7 Environmentally Preferred Alternative (from NEPA)

The NEPA process mandates that an environmentally preferred alternative be identified as a part of the planning process. Additionally, if a CWA Section 404 permit is required, the principles of the USACE Least Environmentally Damaging Practicable Alternative (LEDPA) should be complied with during the development of alternative plans. In the case of this project, the LEDPA 404 b1 analysis was conducted by recognizing that, overall, this project is associated with minor environmental impacts and that no discharge of dredged or fill material would occur at all. Action Alternative 1 – Dam Replacement Alternative is the environmentally preferable/LEDPA alternative for this Plan-EA.

4.2.8 National Economic Efficiency (NEE) Alternative

Under the PR&G, the NRCS must identify the National Economic Efficiency (NEE) plan. The alternative selected as the NEE must also comply with the PL 83-566 program and be in accordance with the PR&G. These principles incorporate selecting the alternative in the final array with the highest BCR. For this Plan-EA, the NEE Alternative is Action Alternative 1 – Dam Replacement Alternative, which has a BCR of 3.53 and net benefits of $189,077,550. More details are available in Chapter 6 of this Plan.

4.3 Alternatives Considered But Eliminated From Detailed Study

In the alternative formulation and screening process outlined in Section 4.1 of this Plan, the elimination of individual measures that either did not meet the NEPA Purpose & Need or did not address the PR&G problems and opportunities were eliminated and not carried forward for further consideration and incorporation into alternative plans.

4.3.1 Floodproofing of Structures Alternative

Floodproofing of structures include several possible options, of which the following were considered:

- Demolition or tearing down of structures in the flood prone areas and rebuilding in an area that is not prone to flooding.
- Dry Floodproofing includes sealing a structure to prevent floodwaters from entering the structure by the installation of watertight shields for windows and doors, use of sealants and membranes to reduce or eliminate seepage through walls, or reinforcement walls to withstand pressure from floodwaters.
- Wet Floodproofing makes uninhabited portions of structures resistant to flood damage by allowing water to enter during flooding and exit the home. The use of flood vents, damage resistant building materials, and protecting service equipment by locating them above the anticipated flood elevation are all methods of wet floodproofing.
- Floodwalls can be built around structures to hold back floodwater using concrete, masonry, or earth. However, this does not remove structures from a FEMA flood insurance rate map.
- Elevation or raising of the structure is permitted and required by FEMA when an existing structure in the floodplain is substantially damaged or substantially improved.

However, while floodproofing of individual structures can be very effective, the ultimate purpose and need of the project is not resolved by protecting individual structures. The simplest and least expensive floodproofing option would be to construct floodwalls around each structure. These floodwalls could be concrete walls or berms. This option would be unpopular because it would make access to a property difficult and would be visually unappealing. The greatest cost would be in obtaining the necessary easements from unsupportive property owners, and not in construction. The combination of this being unpopular and the high costs make this option infeasible.

Another floodproofing scenario considered was to construct a berm along the south and east of Kanosh. This would provide floodproofing for Kanosh with a bigger berm instead of the individual structures. This scenario was ultimately rejected because constructing berms on this alignment would:

- Complicate the routing of irrigation water and traffic
- Be locally unpopular
- Have high costs for easements needed from several landowners
- Restrict how property owners could use their land
- Be expensive without fulfilling the ultimate purpose and need of the project.

During the first round of screening of the initial array of Alternative Plans, it was noted that the Floodproofing Plan did not meet half of the planning constraints and did not meet the Dam Safety project objective. Where the Buyouts Alternative constituted a nonstructural plan that better met project screening criteria, and only a single nonstructural plan must be carried forward to the final array under the PR&G, this alternative was eliminated from further consideration.

4.3.2 Remove Dam and Channel Improvements Alternative

Given the greater flooding that would result from a failure of the debris basin dam, an alternative evaluated was the removal of the debris basin. This alternative also considered removing the dam embankment.

Based on flooding history, it was determined that the emergency channel would be used to route water that exceeded the capacity of the current ditch system. Without an embankment to increase the water elevation, the best way to route the water to the emergency channel is to divert the water upstream. This diversion structure would need to pass the first 575 cfs toward the current ditch system and the next 1,000 cfs toward the emergency channel. The rest of the water would be routed toward the existing channel to prevent damage to I-15. As this alternative was developed, it became evident that without a way to remove debris, the culverts necessary to route the floodwaters would be blocked. The diversion structure would also be nearly impossible to design so that it could handle debris and still function.

The removal of the debris basin eliminates the potential flooding from a failed dam, but it increases flooding potential in all cases other than the worst-case scenario where the debris basin dam fails. The removal of the debris basin does not meet the purpose and need to protect Kanosh from flooding. Any diversion structures and flood channels constructed to protect Kanosh would be subject to debris blockages and sediment accumulation without a debris basin to remove the debris and sediment. Regardless of what measures are taken downstream, the potential for flooding and damage would increase.

Furthermore, during the second round of screening of the initial array of Alternatives, it became clear that this alternative would not improve the provision of any Cultural Services in the watershed. Additionally, the improvements the plan would have to the delivery of Provisioning and Regulating Services would be less significant than in other evaluated Plans. For this reason, no economic screening was conducted, and it was eliminated on the basis of its inability to fully incorporate the ecosystem framework of the PR&G.

4.3.3 Flood Prevention Management Measures Eliminated

4.3.3.1 Repairing/Upgrading Existing Debris Basin

The foundation seepage issue is the greatest challenge preventing the repair and upgrade of the existing debris basin from being feasible. To repair the seepage issue, a seepage cutoff wall would need to be installed. The cost of a seepage cutoff wall increases dramatically with depth. To completely control the seepage concern in the foundation and dam, the seepage cutoff wall would need to be up to 100 feet deep. The equipment to install a seepage cutoff wall to that depth is very specialized and costly.

Utah Dam Safety has also identified that zones within the current dam do not meet filter criteria. Not meeting filter criteria indicates that water flow could move soil materials from one zone into another, allowing voids to develop. Connection of these voids could result in a piping failure. To prevent this from occurring, at least a portion of the existing dam would need to be removed and replaced with a filter and drain system.

The current dam does not have the spillway capacity or freeboard to safely pass the PMF event. A large portion of the existing dam would need to be removed to replace the existing spillway. The dam would also need to be raised to provide the necessary freeboard.

The core of the existing dam has relatively high permeability. This results in the downstream zone of the dam becoming saturated when water is detained in the dam for any length of time. When the existing dam was designed and constructed, the design standards were less stringent and assumed water would not be detained in the debris basin long enough to saturate the dam. Time has demonstrated that actual conditions often result in water being detained in the debris basin

long enough to saturate the soils in the dam, resulting in loss of strength and greater potential for failure.

To bring the existing dam into compliance with current standards, a majority of the dam would need to be removed, a filter and drain system installed to collect high seepage through the core, and additional material placed on the downstream slope to improve stability. This is in addition to the need to install a deep seepage cutoff wall from the crest and replacement of the spillway and low-level outlet. These factors combine to make rehabilitation and raising of the current dam infeasible when compared to the cost to remove and replace the existing dam. Relocating the dam slightly downstream would also allow the debris basin to have a greater detention capacity which would make the debris basin more efficient at removing sediment and debris. Figure 4-2 shows the location of the proposed and existing debris basin embankment.

4.3.3.2 Using the Agricultural Water Management System for Flood Control

During scoping it was hoped that the agricultural water management system would be able to convey a significant portion of the floodwater. However, the hydrological study found that the100-year design flood event has a peak flow of 1,945 cfs which is far greater than the needs of the agricultural water system of 40 cfs. It is impractical to construct a pipe system that could take even ten percent of the design flood.

4.3.3.3 Removal of Debris Basin with Direct Connection to Existing Channels and/or Flood Channels

As shown in Appendix D, the failure of the dam during a flood event would cause more damage than if the debris basin didn't exist. Utah Dam Safety has mandated that the outlet works be always left fully open (see UDS letter in Appendix D). The removal of the debris basin dam reduces potential flood damage when comparing the worst-case condition with and without the debris basin. As a result, the option to remove the debris basin was evaluated.

While potential flood damage under worst-case conditions is less without the debris basin, there would still be significant flood damage. Without the debris basin removing debris and sediment, culverts are likely to be blocked by debris, increasing the flooding potential even at lower flow rates. Without a debris basin, all floodwaters would flow towards Kanosh and into the existing ditch system. As long as culverts remain open and the capacity of the ditch system is not exceeded, Kanosh would be protected. When ditch capacity is exceeded and culverts plug with debris, the ditches would have taken the water towards Kanosh and flooding would become more widespread.

If a large diversion structure is constructed upstream of the flood channel, there is the potential to divert floodwater directly to the flood channel. Due to the size of the flood channel, debris is less likely to block the channel before the channel ends and floodwater sheet flows over mostly undeveloped land. However, the flood channel has a much lower slope than Corn Creek, making the flood channel subject to sediment deposition during a flood event. As determined during modeling exercises detailed in Appendix D, roughly half of the design flood can be diverted to the flood channel without overtopping I-15. As a result, a significant portion of the floodwaters would still need to be diverted into the existing channels below the debris basin. These channels have many culverts and are smaller which makes them more prone to being blocked by debris and sediment.

The removal of the debris basin eliminates the potential flooding from a failed dam, but it increases flooding potential in all cases other than the worst-case condition where the debris basin dam fails.

The removal of the debris basin does not meet the purpose and need to protect Kanosh from flooding. Any diversion structures and flood channels constructed to protect Kanosh would be subject to debris blockages and sediment accumulation without a debris basin to remove the debris and sediment. Regardless of what measures are taken downstream, debris and sediment in floodwater would increase the potential for flooding and damage, making this plan infeasible.

4.3.3.4 Diverting All Excess Flood Water to the Emergency Channel

One of the measures considered routed the 100-year flood out of the existing emergency channel utilizing a debris basin or direct diversion by a diversion structure and extension of the flood channel to move the floodwater to the flood channel. During the initial evaluations, it became evident that overtopping I-15 occurs when a peak flow of more than 1,000 cfs is routed through the emergency channel without any other improvements. The largest flood event that could be routed through the emergency channel without any other improvements or damaging I-15, was the 25-year flood event. The flood channel is incapable of meeting the purpose/need fully due to concerns with overtopping I-15.

4.3.3.5 Flood Channels

The existing ditch system for the debris basin flows toward the Town of Kanosh after discharging from the primary spillway/outlet works. The close proximity to Kanosh creates a high risk of flooding to residents if channel capacity is exceeded or blockages occur. The existing emergency flood channel takes the flow from the emergency spillway culverts and conveys it to the north approximately one mile. The emergency channel discharges that water so that it spreads out and flows overland toward the northwest, bypassing Kanosh. Flood channels were considered that would route the water at this point.

Channel 1 would utilize the existing emergency spillway channel and expand it to the northwest to connect with the Hatton Ditch north of Kanosh. Channel 1 was assumed to have a bottom width of 30 feet with side slopes of 1:1. To meet NRCS standards to prevent erosion, the channel would have to be lined. A concrete fabric material that has a Manning's coefficient of 0.011 was assumed. The slopes vary along the channel from steeper (0.0213 feet/feet) just downstream of the debris basin, to milder (0.0045 feet/feet) in flatter areas as the channel flows further northwest. The velocities in the channel range from 17 fps to 29 fps during the peak of the 100-year flood event. The channel maintained this geometry and the concrete liner up to where the Hatton Ditch crosses Highway 133, where the Hatton Ditch would take what it could, and the rest would spread out over adjacent lands. This channel routes the 100-year flood event around Kanosh. Modeling was performed and it was determined that when only Channel 1 was implemented, I-15 was overtopped, so this action was eliminated from further consideration.

Another related measure that was considered was extending Channel 1 to send a portion of the floodwater back to the west. Channels 2 and 3 are alignments that route the water to the west once the flood was downstream of Kanosh. While these channels prevented the overtopping of I-15, it created additional problems and was rejected for the following reasons:

- Channels 2 and 3 routed floodwaters to a completely different area than would be currently impacted by flooding. This results in induced flooding of areas not previously flooded. Project sponsors would need to obtain flood easements for a large area and multiple landowners, which would not meet project constraints.

- Easements would need to be obtained for all the flood channels. These easements would be difficult and costly for the sponsors.
- The construction of a 20- to 50-foot-wide concrete channel 4.5 to 5.5 miles long is very expensive and is not justified when a less expensive option is feasible.

The cost relative to the proposed alternative resulted in this alternative being infeasible.

4.3.3.6 Enlarging Existing Channels to Convey Floodwater Downstream of Kanosh

This measure is similar to the flood channel discussed above and has many of the same challenges. Although only existing channels would be enlarged, the recorded/prescriptive easements would not be sufficient when enlarging and increasing the capacity of the channels. Additional easements would need to be obtained for nearly all enlarged channels.

The natural slope in and around Kanosh results in most channels having the potential for high flow velocities. Calculations made for the flood channel demonstrated that any channel carrying significant floodwater would require armoring due to the high velocities. The miles of enlarged channels would be very expensive to construct. The proposed measure does not require extensive new easements or channel improvements. As a result, this alternative becomes financially infeasible by comparison.

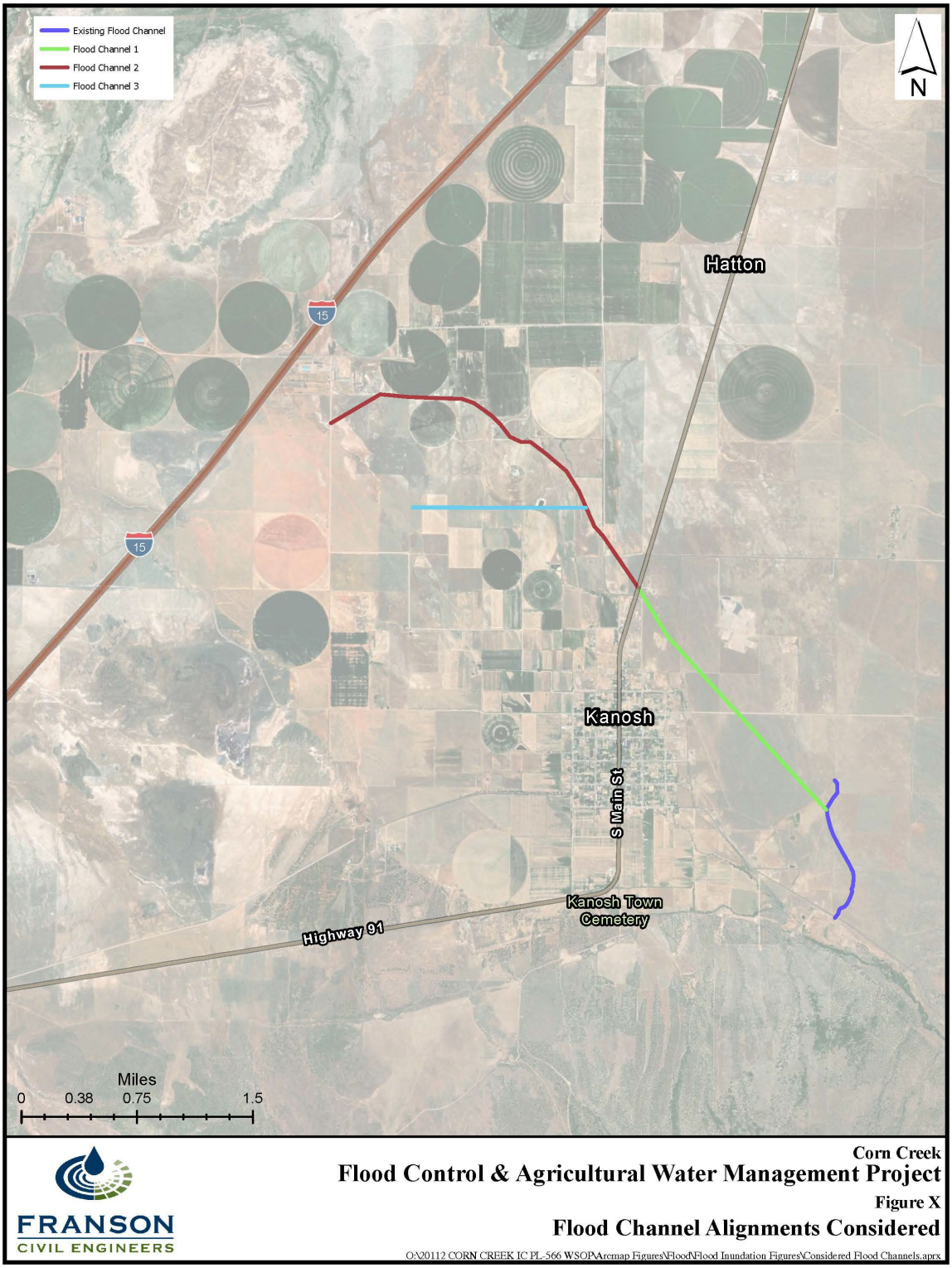

Figure 4-6: Flood Channel Alignments Considered

4.3.4 Agricultural Water Management Actions Evaluated but Eliminated

In an average year, it is estimated that 3,148 acre-feet of the total 7,164 acre-feet inflow (44%) in the CCIC system is lost to seepage. To save the water lost, canal lining and piping actions were considered.

Canal lining with membrane liners was considered as a method to reduce canal seepage; however, this action has a shorter life and lacked local support.

The existing double ditches (low water ditches) are already lined with concrete. These areas have not been satisfactory due to the accelerated deterioration caused by delivering stock water during the winter months, leading to upheaval during freeze/thaw cycles (Figure 4-7). Consequently, CCIC's preferred approach involves replacing deteriorating concrete-lined ditches with pipes rather than reinstalling concrete linings. To meet current demands, a newly installed concrete-lined canal system would exceed the size of the current concrete-lined ditches.

Figure 4-7: Existing Concrete Lined Ditch in Disrepair

Concrete-lined canals present open water channels and have raised concerns due to risks to public safety and lacking the flexibility of allowing crossings at any point along the alignment. Landowners, in turn, expressed a preference for buried pipe systems on their property rather than open canals. Furthermore, the proposed canal lining action falls short in terms of cost-effectiveness and durability when compared to piped systems. These factors contributed to the elimination of concrete-lined canals as a viable option for the project.

Appendix E goes into detail on the methods, assumptions, and calculations of how canal piping was evaluated. To save the water lost to seepage and to allow better water management, piping measures were evaluated. Both gravity flow and pressurized systems were evaluated. The method for estimating the quantities and size of pipe necessary is detailed in Appendix E.

Table 4-7 summarizes the actions evaluated to determine the preferred action. Flow Capacity describes the design flow entering the system. Delivery Capacity describes the flow exiting the system at each turnout.

Table 4-7: Summary of Agricultural Water Management Actions Evaluated

Action	Flow Capacity (cfs)	Delivery Capacity (cfs)	Pressurized/Gravity Flow	PRV (Yes/No)
1	85	10	Gravity Flow	N/A

Action	Flow Capacity (cfs)	Delivery Capacity (cfs)	Pressurized/Gravity Flow	PRV (Yes/No)
2	85	10	Pressurized	No
3	40	5	Pressurized	No
4	40	True PI System	Pressurized	No
5	20	10	Pressurized	Yes
6	20	5	Pressurized	Yes
7	40	10	Pressurized	Yes
8	40	5	Pressurized	Yes
9	40	True PI System	Pressurized	Yes
10	20	10	Gravity Flow	N/A
11	30	10	Gravity Flow	N/A
12	40	10	Gravity Flow	N/A
13	50	10	Gravity Flow	N/A

For the pressurized systems, the delivering capacities evaluated were 10 cfs, 5 cfs, and a true pressurized irrigation (PI) system. A true PI system delivers the total flow evenly across all acres served. The true PI system would allow shareholders to take water at almost any time, but the flow would be less than the 5 or 10 cfs delivery capacities that assume a form of a turn system. Laterals in a true PI system could be smaller due to the lower flow. In the pressurized actions, both pressure reducing valves (PRVs) and higher pressure rated pipe were modeled to handle the high pressures at the end of the system.

Due to cost and operational preferences, Action 12 from Table 4-7 was determined to be the preferred action. The full analysis can be found in Appendix E. The larger 85 cfs capacity actions that carried the full water right were significantly more expensive but did not have sufficient capacity to provide significant relief for the flooding conditions. Additionally, a flow of 85 cfs in Corn Creek is very rare. The extra cost of a larger capacity system that could usually only be utilized for a few weeks cannot be justified. Utilizing the crop water demands identified for Millard County and assuming 3,500 acres of alfalfa, the peak crop water demand in June equates to a flow of 36 cfs. A 40 cfs capacity pipeline system meets this demand with a little extra capacity to account for inefficiencies. Since the proposed alternative for flood control included the maintenance and continued use of the existing ditches to convey floodwater, it was felt that these ditches could also convey high water during years when high water is available. With the pipe system delivering the actual crop demand, the seepage losses in the unlined ditches is acceptable to CCIC shareholders. It is also recognized that a 40 cfs pipe system would be able to deliver the vast majority of water available throughout the irrigation season.

In addition to PI systems being more expensive than a gravity flow system, CCIC shareholders felt that a pressurized system could not be operated equitably without the expense of a full-time water

master to monitor water use. Additionally, laterals on the gravity flow system could be more easily reduced in length or eliminated to provide flexibility if cost reduction became necessary.

4.4 Final Array of Alternatives

The final array of alternative plans is listed in the table below as described by NWPM 501.42(B)(4). The table describes the ability of each alternative in the final array to meet the PR&G evaluation criteria of completeness, effectiveness, efficiency, and acceptability. Table cells that are shaded in **Green** indicate that the alternative met the specified criteria, table cells that are shaded in **Red** indicate that alternative did not meet the specified criteria.

Table 4-8: Summary of Alternatives Preliminary Screening Evaluation

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Plan Description			
Purpose & Need	This alternative would not meet the purpose and need. Flood Prevention and Agricultural Water Management problems would persist.	Flood Prevention and Ag. Water Mgmt. purposes would be met. Needs would be addressed. Is the environmentally preferred (LEDPA) and locally preferred alternative.	Flood Prevention and Ag. Water Mgmt. purposes would be met using nonstructural measures for flood control. However, would relocate many residents and be very costly.
Contribution to Planning Objectives			
Federal Objective	The FWOFI Alternative would not meet the Federal Objective as it would not meet the Guiding Principles of the PR&G, promote sustainable economic development, protect the environment, or protect the floodplain. Federal Objective not met.	Alternative 2 would meet the Federal Objective by meeting all the Guiding Principles of the PR&G, promoting sustainable economic development, being the LEDPA Plan, and protecting the floodplain downstream of the Dam. Federal Objective met.	Alternative 3 would not meet the Federal Objective, although it would meet parts of it such as some of the Guiding Principles of the PR&G. However, the Plan would not promote sustainable economic development, protect the environment, or protect the downstream floodplain. Federal Objective not met.
Objective 1 – Dam Safety Compliance	The FWOFI Alternative would not address dam safety compliance problems with Corn Creek Dam and Debris Basin as no funding would be provided to address the issue. Objective would not be met.	The Dam Replacement Alternative would replace Corn Creek Dam and Debris Basin and bring it into compliance with State and NRCS safety standards, meeting this project objective.	The Buyouts Alternative would not bring Corn Creek Dam and Debris Basin into compliance with State and NRCS dam safety standards as the nonstructural measures would remove properties rather than repairing the deficiencies at the dam itself. Objective not met.

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Objective 2 – Breach Hazards	This Plan would not increase awareness of breach/flood hazards in the watershed as no funding would be provided. Objective would not be met.	The replacement of the Dam would be visible to all residents of the watershed and public notices issued, increasing awareness of the problem(s) posed by the current dam and the risks of a breach. Objective met.	The Plan would certainly increase awareness of breach hazards as many properties and their owners would be relocated and bought out, which would inherently inform them of the rationale supporting that decision. Objective met.
Objective 3 – Secondary Water Access	Secondary water in the CCIC system would not be conserved and the Kanosh Band would continue to rely on their culinary supply for secondary uses. Objective would not be met.	This Plan would install a gravity pipe secondary system in the CCIC service area to reduce losses and conserve water and install a secondary system for the Kanosh Band to reduce their reliance on culinary water for outdoor use. Objective met.	This Plan would install a gravity pipe secondary system in the CCIC service area to reduce losses and conserve water and install a secondary system for the Kanosh Band to reduce their reliance on culinary water for outdoor use. Objective met.
Objective 4 – Drought Resilience	Residents of the watershed would not be more drought resilient as a result of this plan because no measures would be implemented to conserve water supply. Objective not met.	The Agricultural Water Management measures of this plan would conserve water and increase water use efficiency, making the communities of Kanosh and the Kanosh Band more resilient to drought conditions. Objective met.	The Agricultural Water Management measures of this plan would conserve water and increase water use efficiency, making the communities of Kanosh and the Kanosh Band more resilient to drought conditions. Objective met.
Response to Planning Constraints			
Constraint 1 – Disruptions to Property	No construction would occur under this alternative so no disruptions to property would occur. This alternative meets this constraint.	Implementation of the Plan would avoid direct disruptions to residential and commercial properties and would meet this planning constraint.	Implementation of this Plan would not meet this planning constraint as various residential and commercial properties would be disrupted in order to conduct the nonstructural flood prevention measure of property buyouts/relocations.
Constraint 2 – Cultural Site Impacts	This alternative does not meet this planning constraint. By not installing any flood control infrastructure, all historic/cultural sites in the indirect/No Action APE	Although this Plan would have adverse impacts to some historic sites, the constraint specifies avoidance to the extent practicable. The historic sites in the indirect APE	This Plan would not provide flood prevention protection to historic properties in the indirect APE which would eventually experience significant damage, or even destruction, when the dam

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
	would be damaged in this scenario.	would be protected by this Plan. This planning constraint is met by this Plan.	eventually breached. Does not meet this constraint.
Constraint 3 – Transportation Impacts	No construction would occur under this alternative so no existing transportation infrastructure would be impacted. This alternative meets this constraint.	This Plan would meet this constraint because, although traffic delays may occur during construction, the roads would still be available for use by emergency services during the implementation period.	This plan would meet this planning constraint as property buyouts and relocations would not affect transportation routes or access for emergency services.
Constraint 4 – Irrigation Water Access	No construction would occur under this alternative so no changes would be made to the ability of farmers to access their irrigation water during the irrigation season.	Agricultural Water Management measures would be implemented outside of the typical irrigation season so that access to irrigation water for farmers would not be impeded.	Agricultural Water Management measures would be implemented outside of the typical irrigation season so that access to irrigation water for farmers would not be impeded.
Constraint 5 – Kanosh Band	Problems related to secondary water access for the Kanosh Band would continue, impeding their ability to fully utilize their unique cultural role in the community.	This Plan would provide significant direct benefits to the Kanosh Band by installing a secondary system for them and relocating the Kanosh Town regulating pond, allowing the Band to better prioritize their unique cultural role in the area.	This Plan would provide significant direct benefits to the Kanosh Band by installing a secondary system for them and relocating the Kanosh Town regulating pond, allowing the Band to better prioritize their unique cultural role in the area.
Contribution to Ecosystem Services			
Provisioning Services	Unreliable irrigation water deliveries to Kanosh farmers would continue. Crop yields would not change. Kanosh Town and the Kanosh Band would not receive improved secondary systems, inhibiting drinking water supply.	Provisioning Services would be improved under this alternative. Average water conservation of ~3,148 AF would result in an expected crop yield increase of ~64% for alfalfa and ~73% for grass hay over ~3,000 acres of land. This equates to an average annual crop yield increase of ~7,400 tons of alfalfa and ~983 tons of grass hay. The installation of the proposed Agricultural Water Management measures would provide an	Provisioning Services would be improved under this alternative. Average water conservation of ~3,148 AF would result in an expected crop yield increase of ~64% for alfalfa and ~73% for grass hay over ~3,000 acres of land. This equates to an average annual crop yield increase of ~7,400 tons of alfalfa and ~983 tons of grass hay. The installation of the proposed Agricultural Water Management measures would provide an average annual

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
		average annual monetary benefit of $1,490,049 to the area, demonstrating benefits to the provisioning service of drinking water supply.	monetary benefit of $1,490,049 to the area, demonstrating benefits to the provisioning service of drinking water supply.
Regulating Services	The Corn Creek Dam and Debris Basin would remain at high risk of failure and would eventually breach. This would cause significant damage and a risk to life and property. Water quality for farmers would not change as pollution in the open irrigation ditches would continue. Climate change resiliency would not occur and reliance on groundwater in the late irrigation season would continue.	This alternative would protect the Town of Kanosh against the 100-year storm event/the Dam Breach and would provide annual monetary flood damage reduction benefits of $2,252,548. The quality of secondary water would be improved as the water would be piped and would not be subject to contamination via pollutants; this will create an observed decrease in turbidity. The watershed would become more resilient to drought/climate change under this Plan as significant water savings would occur (~3,148 AF), decreasing reliance on the groundwater system for late season irrigation needs.	This alternative would relocate the structures within the breach zone of Corn Creek Dam by conducting property buyouts, which is a very costly option. However, the avoided annual damage reduction benefit of doing this would be $3,600,905. The quality of secondary water would be improved as the water would be piped and would not be subject to contamination via pollutants; this will create an observed decrease in turbidity. The watershed would experience ~3,148 AF of water savings but would lose the storage of Corn Creek Dam when it eventually breached, leaving the community in a worse position to combat drought/climate change impacts than if the dam were rehabilitated. Although the damage reduction benefit is higher under this Plan than Action Plan 1, it comes with significantly higher costs, bringing the B/C ratio of this Plan down substantially lower than Action Plan 1.
Cultural Services	Agriculture as an economic sector would remain in its current condition until the dam breached. Once the breach occurred, there could be significant impacts to agricultural viability and destruction of cropland. The Kanosh Band would continue to be inhibited, and the breach would impact aesthetics and the existence value of historic properties	Agricultural development and viability would be supported/improved by this plan as it would protect the open space viewshed and encourage the perpetuation of the agricultural sector. Additionally, there would be benefits to the Kanosh Band Tribal community as a result of the Agricultural Water Management measures which would provide an average annual monetary	Agricultural development and viability would be supported/improved by this plan as it would protect the open space viewshed and encourage the perpetuation of the agricultural sector. However, there would be significant damage to agricultural land when the dam breach eventually occurs. There would also be benefits to the Kanosh Band Tribal community as a result

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
	within the Indirect/Dam Breach APE.	benefit of $1,490,049. Although this Plan would include some adverse impacts to cultural/historic properties, it would ultimately protect the historic properties that would otherwise be damaged during a dam breach within the indirect APE.	of the Agricultural Water Management measures, resulting in an average annual monetary benefit of $1,490,049. This plan would not protect historic properties within the indirect APE, which would ultimately be damaged by the eventual dam breach.
Supporting Services	Not Evaluated in this Plan-EA	Not Evaluated in this Plan-EA	Not Evaluated in this Plan-EA
Results to Economic Analysis			
Benefit-Cost Ratio	**0.0**	**3.53**	**2.01**
Net Project Benefits	**$0**	**$189,077,550**	**$133,299,901**
Response to Evaluation Criteria			
Completeness	This alternative would not constitute a complete alternative as no Problems or Opportunities would be addressed.	This alternative would account for all necessary investments to achieve the planned effects and is a complete solution that fully addresses the Problems and Opportunities.	This alternative would account for all necessary investments to achieve the planned effects and is a complete solution that fully addresses the Problems and Opportunities.
Effectiveness	This alternative would not constitute an effective solution as no problems would not be solved and no project objectives met, including the Federal Objective.	This alternative would address all the identified problems and meet all of the project objectives to constitute an effective solution.	This alternative would constitute only a partially effective solution as the Federal Objective and one of the project objectives would not be met by the plan.
Efficiency	This alternative would not cost anything to implement and so would constitute a cost-effective alternative that would be an efficient solution.	This alternative is the NEE alternative and has net positive economic benefits and a BCR of 3.53. This alternative constitutes a cost-efficient solution.	This alternative has net positive economic benefits with a BCR of 1.06 which is significantly lower than the other action plan due to the exorbitant cost to conduct property buyouts. Because this plan would require a much higher financial

	No Action/FWOFI (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
			investment to achieve less benefits than a cheaper plan, it is not a cost-efficient solution.
Acceptability	This alternative would not be acceptable or consistent with existing Federal laws as it would not protect the environment and would not address any of the problems in the watershed.	This alternative would comply with all Federal and State regulatory frameworks and is the environmentally preferred alternative to NEPA and the locally preferred alternative. The problems in the watershed would be addressed. This alternative constitutes an acceptable solution.	This alternative would not be acceptable as it is highly unlikely that property buyouts could be conducted on an entirely voluntary basis, requiring the use of eminent domain to accomplish it. This alternative does not constitute an acceptable solution.

5.0 Environmental Consequences: Evaluation of Alternatives

This chapter serves as an evaluation of the potential effects that each alternative may have on the various resources described in Chapter 3 of this Plan-EA. While Chapter 3 was representative of the existing conditions in the project area, this chapter serves to examine how those conditions may be altered, positively or negatively, by the Action Alternatives.

The NRCS has a responsibility under NEPA to identify and address potential effects on the environment that may result from implementation of the alternative plans.

5.1 Summary and Comparison of Alternative Plans—Planning Process

Table 5-1 below compares how well the No Action Alternative (FWOFI), Dam Replacement and Buyouts Alternatives resolve the identified problems, namely (1) Flood Prevention and (2) Agricultural Water Management. Each alternative is evaluated in comparative form in substantial and equal detail.

Table 5-1: Summary and Comparison of Alternatives – Planning Process

Item or Concern	No Action (FWOFI) (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Alternative Major Features/Works of Improvement by Authorized Purpose			
Flood Prevention			
Deficiency 1 – Corn Creek Dam and Debris Basin	No Federal investment would be made, and no construction would occur. The issues associated with this deficiency would continue.	Reconstruct the current debris basin to have an update alignment and a taller embankment. Reconstruct the primary, secondary, emergency, & auxiliary spillways of the Dam to be compliant with safety standards.	Nonstructural measure to buyout/conduct relocations of all properties in the affected by flooding/dam breach in the study area. This option would eliminate the problem of flood prevention and would not require the installation of any structural measures for this authorized purpose.
Deficiency 4 – Flooding Issues in Kanosh Town.	No Federal investment would be made, and no construction would occur. The issues associated with this deficiency would continue.	Construct a berm north of a large culvert to prevent the floodwater from flowing north. Raise 800 feet of an existing dirt road to prevent the overtopping of I-15 which is considered critical infrastructure.	Nonstructural measure to buyout/conduct relocations of all properties in the affected by flooding/dam breach in the study area. This option would eliminate the problem of flood prevention and would not require the

Item or Concern	No Action (FWOFI) (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
			installation of any structural measures for this authorized purpose.
Ag. Water Mgmt.			
Deficiency 2 – Seepage and Evaporation Losses in CCIC System	No Federal investment would be made, and no construction would occur. The issues associated with this deficiency would continue.	A gravity pipe system would be installed to reduce seepage and evaporation losses in the CCIC system and to increase irrigation water deliveries to farmers. Would include the installation of diversion boxes at existing turnouts. Would replace the equivalent of 4.9 miles of open ditches. Would also include multiple splitting/measurement structures. A sharp crested weir would be used in the structures to ensure uniform flow.	A gravity pipe system would be installed to reduce seepage and evaporation losses in the CCIC system and to increase irrigation water deliveries to farmers. Would include the installation of diversion boxes at existing turnouts. Would replace the equivalent of 4.9 miles of open ditches. Would also include multiple splitting/measurement structures. A sharp crested weir would be used in the structures to ensure uniform flow.
Deficiency 3 – Kanosh Band Secondary Water Access	No Federal investment would be made, and no construction would occur. The issues associated with this deficiency would continue.	Would construct a secondary water system for the Kanosh Band by adding the system to the existing pipeline between the debris basin and the Tribal community. Would include the relocation of the secondary regulating pond to a higher elevation to provide adequate pressure to the system. Would have an added benefit of providing additional pressure to the Kanosh Town secondary water system as well, but the relocation is essential for the Kanosh Band.	Would construct a secondary water system for the Kanosh Band by adding the system to the existing pipeline between the debris basin and the Tribal community. Would include the relocation of the secondary regulating pond to a higher elevation to provide adequate pressure to the system. Would have an added benefit of providing additional pressure to the Kanosh Town secondary water system, but the relocation is essential for the Kanosh Band.
Project Objectives			
Green indicates the objective was met; **Red** indicates it was not. More detail can be seen in Table 4-7 of this Plan-EA			
Federal Objective	NO	YES	NO
Objective 1 – Dam Safety Compliance	NO	YES	NO

Item or Concern	No Action (FWOFI) (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Objective 2 – Breach Hazards	NO	YES	YES
Objective 3 – Access to Secondary Water	NO	YES	YES
Objective 4 – Drought Resilience	NO	YES	YES
Constraints			
Green indicates the constraint was met; **Red** indicates it was not. More detail can be seen in Table 4-7 of this Plan-EA			
Constraint 1 – Disruptions to Property	YES	YES	NO
Constraint 2 – Cultural/Historic Impacts	NO	YES	NO
Constraint 3 – Transportation Impacts	YES	YES	YES
Constraint 4 – Irrigation Water Access	YES	YES	YES
Constraint 5 – Kanosh Band	NO	YES	YES
Evaluation Criteria			
Green indicates the constraint was met; **Red** indicates it was not. More detail can be seen in Table 4-7 of this Plan-EA			
Completeness	NO	YES	YES
Effectiveness	NO	YES	NO
Efficiency	YES	YES	NO
Acceptability	NO	YES	NO

5.2 Summary and Comparison of Alternatives-Ecosystem Services

Ecosystem service flow impacts for the No Action (FWOFI) were projected assuming that current conditions/trends would continue to occur for the entire period of analysis while considering all reasonably forecasted future conditions within the watershed. Table 5-2 below compares how well the No Action Alternative (FWOFI), Dam Replacement Alternative, and Buyouts Alternative impact the ecosystem service flows in the watershed as well as how they meet the six Guiding Principles of the PR&G.

Table 5-2: Summary and Comparison of Alternatives – Ecosystem Services Tradeoff

Criterion	No Action (FWOFI) (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Alternative I.D.			
Locally Preferred		X	
Nonstructural			X
Environmentally Preferred		X	
National Economic Efficiency		X	
Socially Preferred		X	
Preferred Alternative		X	
Guiding Principles			
The alternative marked with X and colored **green** is the plan that best meets the specified Guiding Principles of the PR&G			
Healthy/Resilient Ecosystems		X	
Sustainable Economic Devel.		X	
Floodplains		X	
Public Safety		X	
Environmental Justice			
Watershed Approach		X	
Ecosystem Services Effects			
The alternatives colored **green** indicates overall improvement in Service provision, red indicates overall impairment or maintenance.			
Provisioning Services			
Water Savings/Seepage (Non-Monetized)	X	X	X
Food Production/Agriculture (Non-Monetized)	X	X	X
Drinking Water Supply (Monetized)	X	X	X
Regulating Services			
Flood Control/Public Safety (Monetized)	X	X	X
Secondary Water Quality (Non-Monetized)	X	X	X
Drought/Climate Resiliency (Non-Monetized)	X	X	X

Criterion	No Action (FWOFI) (Analytic Baseline)	Dam Replacement (Structural)	Buyouts (Nonstructural)
Cultural Services			
Agricultural Development (Non-Monetized)	X	X	X
Tribal Community Benefits (Monetized)	X	X	X
Aesthetic Value of Watershed (Non-Monetized)	X	X	X
Cultural/Historic Sites (Non-Monetized)	X	X	X
Supporting Services			
Not Evaluated in this Plan-EIS	NA	NA	NA
Economic Analysis			
Costs			
Total Project Investment	$0	$33,247,000	$106,873,799
Annual Project Investment	$0	$1,204,100	$3,784,486
Annual OM&R Costs	$0	$28,500	$10,000
Total Annual Project Costs		$1,232,600	$3,794,486
Monetized Benefits for Ecosystem Services			
Provisioning	$0	$1,490,049*	$1,490,049*
Regulating	$0	$2,855,348	$2,520,432
Cultural	$0	$1,490,049*	$1,490,049*
Supporting	NA	NA	NA
Total Annual Monetized Benefits	$0	$4,345,396	$4,010,481
Total Annual Monetized Costs	$3,619,335	$1,232,600	$3,794,486
Benefit-Cost Ratio	0.0	3.53	1.06
Annual Monetized Net Benefit	$0	$3,112,796	$215,995

**= Total agricultural water management benefits. Shared value for Provisioning and Regulating Services, not double counted in B/C Analysis. The value of $1,490,049 only counted as a single combined benefit of provisioning/regulating ecosystem services.*

5.3 Effects of Individual Alternatives Relative to Resource Concerns

The following list defines the environmental resource impact terms, including classifications and descriptions, in this section.

- **Direct Effect or Impact:** Impacts caused by a proposed action and occurring at the same time and place.
- **Indirect Effect or Impact:** Impacts caused by an action that are later in time or farther removed in distance but are reasonably expected or foreseeable.
- **Cumulative Effect or Impact:** The impacts on the environment that result from the incremental impact of actions when added to other past, present, and reasonably foreseeable future actions regardless of the agency (federal or non-federal) undertaking such other action.
- **Temporary:** Impacts or effects that are not lasting and the affected resources would be expected to return to the pre-project state. Typically, this is for the duration of construction and a designated restoration period.
- **Permanent:** Impacts or effects that last for an extended duration, often for years after construction. For this evaluation, these impacts are considered to be 50 years based on the design life of the project.
- **Benefits:** Effects that mitigate or resolve previous environmental consequences or damage and/or enhance the resources.

The individual resource concerns are evaluated for impacts under each alternative in the sections below.

Tables 5-3 through 5-26 present a more detailed analysis of the environmental impacts to each of the resources caused by each of the three evaluated alternatives. Each table will describe the resource category followed by the expected environmental impacts to the resource under each of the three evaluated alternatives (No Action (FWOFI), Dam Replacement, and Buyouts Alternative). Each table is color coded to correspond with the type of resource impact. Red indicates a Negative impact, Yellow indicates No Impact/No Change, and Green indicates a Positive impact. Additionally, for each resource concern, the magnitude of impacts is evaluated.

5.3.1 Geology and Soil Resources

There are no expected impacts on the geology and soils in the project area under the No-Action Alternative or the Proposed Action Alternatives as summarized in Table 5-3.

Table 5-3: Soils Comparison

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Soil Classification	No impact, inherent characteristic of soils would remain the same.	No impact, inherent characteristic of soils would remain the same.	No impact, inherent characteristic of soils
Drainage Classification	No impact, inherent characteristic of soil layering and geologic formations would remain the same.	No impact, inherent characteristic of soil layering and geologic formations	No impact, inherent characteristic of soil layering and geologic formations

5.3.1.1 Magnitude of Impacts

All alternatives would have an equal effect on the soil properties in the project area. Existing conditions would continue unaltered under each considered alternative.

5.3.2 Prime and Unique Farmland

Table 5-4 summarizes the impacts of the No-Action Alternative and the Proposed Action Alternative on Prime and Unique Farmland in the event of a 100-year flood. None of the proposed measures under any Alternative Plan would convert any prime farmland to non-agricultural uses.

Table 5-4: Farmland Classification Impacts Comparison

Category	No-Action Alternative (FWOFI)	Proposed Action Alternative	Nonstructural
Prime and Unique Farmland	Direct permanent impact as insufficient irrigation water deliveries to farmers results in underutilization of the farmland.	Direct permanent benefit as increased and more reliable water deliveries from the proposed improvements would enable farmers to maximize their farmland potential, improving productivity/yields on the farmland. Direct permanent benefit from increased irrigation water supply, which would help maintain the agricultural viability of the farmlands.	Direct permanent benefit as increased and more reliable water deliveries from the proposed improvements would enable farmers to maximize their farmland potential, improving productivity/yields on the farmland. Direct permanent benefit from increased irrigation water supply, which would help maintain the agricultural viability of the farmlands.
Flooding and Debris Flows on Farmland	Direct permanent impact as a dam breach would remain imminent. A dam breach would result in debris flows and flooding on the agricultural fields, destroying crops on the farmlands and causing economic loss to the farmers.	Direct permanent benefit as the risk of dam failure would be greatly reduced, minimizing the risk of flooding and debris flows on the farmlands, hence reducing the risk of crop damage and economic loss to the farmers.	Direct permanent impact as a dam breach would remain imminent. A dam breach would result in debris flows and flooding on the agricultural fields, destroying crops on the farmlands and causing economic loss to the farmers.

Crop damages were considered for alfalfa, other hay, and pasture, which represent about 94% of the crops within the project area, based on a 5-year average (2018-2022) of the irrigated acreage. The crop damage from the 100-year flood event was estimated at $24,792 over 3,776 acres under the No-Action Alternative and $14,245 over 2,264 acres under the Proposed Actions. From the Economic Analysis, the expected annual benefit in crop damages from completing the project is $1,742. The Dam Replacement Alternative would reduce the acreage and velocity of flooding, resulting in reduced damage to crops and minimizing economic loss to the farmers.

5.3.2.1 Magnitude of Impacts

The Dam Replacement Alternative would have the most benefits relative to this resource concern, only having direct permanent benefits. The Buyouts Alternative would have the second most benefits relative to this resource concern but not as many as the Dam Replacement Alternative because a dam breach would remain imminent. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.3 Upland Erosion, Streambank Erosion, and Sedimentation

The impacts of erosion under the No-Action Alternative and the Proposed Action Alternatives within the project area are summarized in Table 5-5.

Table 5-5: Soil Erosion and Sedimentation Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Soil Erodibility "K"	No Impact (function of soil type)	No Impact (function of soil type)	No Impact (function of soil type)
Erosion and Sedimentation	Direct temporary impact from debris flows in the event of a dam breach, which could result in damage to crops, roads, and other infrastructure.	Direct temporary impact from construction activities along the Corn Creek channel from erosion along the stream banks. Construction activities along the open ditches would also result in erosion and sedimentation. Material storage in the storage areas could also result in the removal of vegetation and the possible mobilization of sediments into runoff. These impacts would be temporary, and the disturbed areas would be reseeded, minimizing erosion once the vegetation grows. Construction BMPs would be followed to minimize erosion during construction including revegetation, dust control plans, buffers, etc. Direct permanent benefit from the reconstructed Debris Basin, which would regain its functionality of filtering debris and sediment from the water coming from Corn Creek. This would protect the downstream water infrastructure from sedimentation and the downstream community from flooding that	Direct temporary impact from construction activities along the open ditches would result in erosion and sedimentation. Material storage in the storage areas could also result in the removal of vegetation and the possible mobilization of sediments into runoff. These impacts would be temporary, and the disturbed areas would be reseeded, minimizing erosion once the vegetation grows. Construction BMPs would be followed to minimize erosion during construction including revegetation, dust control plans, buffers, etc. Direct permanent benefit from increased water deliveries to farmers. This would enable increased crop production, resulting in increased crop cover, which would reduce erosion on the farmlands.

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		could result from inadequate capacity in the ditches to safely convey flood water. Direct permanent benefit from reconstruction of the Dam and Debris Basin to current NRCS and Utah Dam Safety engineering standards. This would reduce the risk of a dam breach and debris flows in the Town and on agricultural fields, which would destroy infrastructure and agricultural fields, resulting in economic loss, property damage, and costly clean-up. Direct permanent benefit from increased water deliveries to farmers. This would enable increased crop production, resulting in increased crop cover, which would reduce erosion on the farmlands.	

Erosion/scour and sediment damages were estimated as described in the Economic Report (Appendix D). Annual sediment deposition was estimated and used as a basis for calculating damages from sediment. This was a conservative analysis since it did not take into consideration eroded sediment from the dam embankment. In the event of a dam breach, which would result in large debris flows downstream into the Town and onto agricultural fields, the damage could be more severe.

Under the No-Action Alternative, the estimated scour damage from the 100-year flood event was $57,024 over 158.4 acres of eroded land, and the estimated sediment deposition damage was $19,685. The estimated scour damage from the 100-year flood event under the Proposed Action was $21,654 over 60.2 acres and there would be no sediment deposition damages once the Debris Basin is designed to drop sediment. The Proposed Action would reduce scour damages by approximately 62% and sediment deposition damages by 100% in the event of a 100-year flood. The expected annual benefit in erosion and sediment damages from completing the project is $5,574 and $5,079 respectively.

5.3.3.1 Magnitude of Impacts

The Dam Replacement Alternative would have the most benefits relative to this resource concern, having several permanent benefits and only one temporary effect during construction. The Buyouts Alternative would have the second most benefits relative to this resource concern but not as many as the Dam Replacement Alternative. The No Action (FWOFI) Alternative would be the least

preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.4 Surface Water Quantity

Under the existing conditions, approximately 44% of the irrigation water is lost to seepage and evaporation from the open ditch system. Table 5-6 summarizes the impacts on surface water quantity under the No-Action Alternative and the Proposed Action Alternatives.

Table 5-6: Surface Water Quantity Comparison

Category	No-Action (FWOFI)	Proposed Action	Nonstructural
Surface Water Quantity	Direct permanent impact as there would be continued seepage and evaporation losses from the irrigation ditch system, and inadequate water deliveries to the farmers.	Direct permanent impact on surface water quantity through reduction of seepage and evaporation losses in the irrigation ditch system and bypass channel west of the Debris Basin. Approximately 3,148 acre-feet of water, which is 44% of the average inflow from Corn Creek, is lost through seepage and evaporation in the open irrigation ditch system. The project would install a gravity pipeline to convey irrigation water, reducing seepage and evaporation losses, which would result in increased water deliveries to the farmers.	Direct permanent impact on surface water quantity through reduction of seepage and evaporation losses in the irrigation ditch system and bypass channel west of the Debris Basin. Approximately 3,148 acre-feet of water, which is 44% of the average inflow from Corn Creek, is lost through seepage and evaporation in the open irrigation ditch system. The project would install a gravity pipeline to convey irrigation water, reducing seepage and evaporation losses, which would result in increased water deliveries to the farmers.

5.3.4.1 Magnitude of Impacts

The two Action Alternatives would have the same level of effects as one another as all the benefits are related to the agricultural water management measures for this resource concern. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.5 Surface Water Quality

According to the Utah DEQ, the stream supports all designated categories and has no beneficial use impairment. It is not listed on the 303d list of impaired streams and therefore does not require a TMDL and is not impaired for any aquatic habitat. There is no aquatic habitat for Corn Creek within the project area as most of the stream has been diverted to irrigation water channels, hence the project would not affect any aquatic habitat. Table 5-7 identifies the effects on surface water quality under the No-Action Alternative and the Proposed Action Alternative.

Table 5-7: Surface Water Quality Comparison

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Beneficial Use Impairment	No impact as there are currently no impairments to the beneficial uses of Corn Creek.	Direct permanent benefit on water quality for agriculture and stock watering. Piping of the irrigation ditch system would reduce the amount of pollutants and sediment in the system and improve the quality of water delivered for farming and livestock. Specific water quality parameters that would be improved include turbidity, TSS, and Total Phosphorus.	Direct permanent benefit on water quality for agriculture and stock watering. Piping of the irrigation ditch system would reduce the amount of pollutants and sediment in the system and improve the quality of water delivered for farming and livestock. Specific water quality parameters that would be improved include turbidity, TSS, and Total Phosphorus.
Sediment Management	Direct permanent impact as the Debris Basin is currently not functioning as intended. This is because the outlet pipe at the Dam must always remain fully open because of the seepage issues in the foundation that pose a risk of dam failure. The existing Debris Basin is therefore not able to adequately settle sediment from the water, which affects the downstream water infrastructure and water quality. If sediment is unable to settle in the Debris Basin due to the fully open gate, it would affect water quality downstream by increasing turbidity and sedimentation levels. This could also indirectly affect other water quality parameters, such as light attenuation, as the water would remain cloudy with sediment and potentially block sunlight. Sediments traveling downstream may also be adhered to other	Direct temporary impact on water quality from sediment erosion during construction. The impact would be temporary and construction BMPs would be utilized to minimize erosion including waddles, vegetative buffers, silt fencing, and other state approved practices. Direct permanent benefit from reconstruction of the Dam and Debris Basin to current NRCS and Dam Safety standards. The risk of dam failure would be minimized, and the Debris Basin's capability of sediment capture would be restored by being able to operate and close the gate during high flows, improving water quality and protecting downstream drainage infrastructure from accumulating debris which compromises its ability to convey irrigation and floodwater.	Direct temporary impact on water quality from sediment erosion during construction. The impact would be temporary and construction BMPs would be utilized to minimize erosion including waddles, vegetative buffers, silt fencing, and other state approved practices. Direct permanent impact as the Debris Basin is currently not functioning as intended. This is because the outlet pipe at the Dam must always remain fully open because of the seepage issues in the foundation that pose a risk of dam failure. The existing Debris Basin is therefore not able to adequately settle sediment from the water, which affects the downstream water infrastructure and water quality.

Category	No Action (FWOFI)	Proposed Action	Nonstructural
	chemical constituents or pollutants, which would further degrade water quality. Sediment not being removed by the debris basin would settle out in ditches and culverts increasing maintenance efforts or depositing on fields damaging crop production.		
Surface Water Quality	Direct permanent impact on surface water quality, as described under sediment management.	Direct temporary impact on surface water quality due to erosion from construction activities. BMPs would be installed to minimize erosion (see above). Direct permanent benefit on surface water quality as a result of installation of a gravity flow pipeline to convey irrigation water. The amount of pollutants, physical, chemical, and biological, that are washed into the irrigation system from overland would be reduced. Hence, the farmers would receive cleaner and safer water.	Direct temporary impact on surface water quality due to erosion from construction activities. BMPs would be installed to minimize erosion (see above). Direct permanent benefit on surface water quality as a result of installation of a gravity flow pipeline to convey irrigation water. The amount of pollutants, physical, chemical, and biological, that are washed into the irrigation system from overland would be reduced. Hence, the farmers would receive cleaner and safer water.

5.3.5.1 Magnitude of Impacts

The Dam Replacement Alternative would have the most benefits relative to this resource concern, having several permanent benefits and only one temporary effect during construction. The Buyouts Alternative would have the second most benefits relative to this resource concern but not as many as the Dam Replacement Alternative because, although there would be some benefits, there would be serious problems that would continue as a result of the dam eventually breaching in regard to sediment management. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.6 Groundwater Quantity and Quality

Among the groundwater management districts in Pahvant Valley, Kanosh has the most serious groundwater quality problems, with high dissolved solids and bicarbonate concentrations, a high salinity hazard, and medium-to-high sodium hazard. The impacts on groundwater quality under the alternatives are discussed in Table 5-8.

Table 5-8: Groundwater Quality and Quantity Impact Comparison

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Groundwater Quantity	Direct permanent impact on groundwater quantity as farmers would continue to use groundwater to supplement the insufficient irrigation water deliveries in the existing CCIC system.	Water shortages during the irrigation season lead to increased demand for groundwater resources. Once the irrigation pipeline is installed, and irrigation water deliveries to farmers are increased, the demand on groundwater resources is expected to reduce, meaning the demand on the groundwater system would be lessened as farmers would have access to secondary water later into the growing season. This would enable conservation of the groundwater for future use. This benefit may be offset in part by reduced recharge of the primary aquifer due to Debris Basin dam improvements. Final design of the seepage cutoff wall for the Debris Basin dam would determine if recharge is enhanced or restricted. A full seepage cutoff wall to bedrock that would potentially limit recharge would only be constructed if necessary to meet design standards. A partial seepage cutoff wall may enhance primary aquifer recharge because the new Debris Basin would allow high water and floodwater to be detained, thus allowing more time for primary aquifer recharge. Seepage from most ditches does not recharge the primary aquifer and thus would not negatively impact the usable groundwater in the primary aquifer. Improving the secondary water supply for Kanosh Town and Kanosh Band would reduce outdoor water demand from their culinary water systems. This would increase the sustainability of their groundwater sources to supply culinary water for current and future generations.	Water shortages during the irrigation season lead to increased demand on groundwater resources. Once the irrigation pipeline is installed, and irrigation water deliveries to farmers are increased, the demand on groundwater resources is expected to reduce, meaning the demand on the groundwater system would be lessened as farmers would have access to secondary water later into the growing season. This would enable conservation of the groundwater for future use. Improving the secondary water supply for Kanosh Town and Kanosh Band would reduce outdoor water demand from their culinary water systems. This would increase the sustainability of their groundwater sources to supply culinary water for current and future generations. These benefits would be direct and permanent.

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		These benefits would be direct, cumulative, and permanent.	
Groundwater Quality	Direct permanent impact due to continued groundwater withdrawals to supplement the insufficient irrigation water deliveries in the existing CCIC system, which affects groundwater salt concentrations.	Direct temporary impact resulting from oil and fuel spills from construction equipment. These spills could infiltrate the ground and potentially result in groundwater contamination. BMPs such as spill cleanup would be utilized to minimize the potential for groundwater contamination. Direct permanent benefit from increased irrigation water deliveries to the farmers. Increase irrigation water deliveries would result in reduced groundwater withdrawals to supplement CCIC irrigation water. This would eventually help reduce groundwater salt concentrations. Potential changes to recharge of the primary aquifer by high quality water in the vicinity of the Debris Basin may impact groundwater quality. Increased recharge in the vicinity of the Debris Basin would possibly improve groundwater quality while reduced recharge would possibly degrade groundwater quality. As described in the groundwater quantity section above, the aquifer recharge would be determined by the final design of the seepage cutoff wall for the Debris Basin dam. The final design of the seepage cutoff wall would be very important to ensure groundwater quantity and quality improve.	

5.3.6.1 Magnitude of Impacts

The Buyouts Alternative would have the most benefits relative to this resource concern, having several permanent benefits. The Dam Replacement Alternative would have the second most benefits relative to this resource concern but not as many as the Buyouts Alternative because, although there would be some benefits, the work at the Dam and Debris Basin may offset the benefits, making it a mostly neutral action in regard to water quality. The No Action (FWOFI)

Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.7 Floodplain Management

The impacts of the No-Action Alternative and the Proposed Action Alternatives on floodplain management are summarized in Table 5-9 and Table 5-10.

Table 5-9: Floodplain Management Impact Comparison

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Floodplain Management	In absence of the proposed improvements, the Dam and Debris Basin would eventually fail. This would result in flooding and debris flows downstream, inundating homes, community infrastructure, and farmland in the project area.	The project improvements would reduce the risk of flooding and flood damages to the downstream community up to the 100-year flood.	The project improvements would reduce the risk of flooding and flood damages to the downstream community up to the 100-year flood

Table 5-10 is a summary of the number of homes/apartments, commercial properties, public and other properties, area of roads, and agricultural acreage which would be impacted by the 100-year flood under the No-Action Alternative and the Proposed Action Alternative. Out of the 213 homes/apartments which would be impacted by the 100-year flood event under the No-Action Alternative, 208 homes/apartments would be completely protected from the 100-year flood under the Proposed Action. The difference in flood depth of one home would be reduced from 2.22 feet to 0 feet. Five homes would continue to experience some flooding, but the flood depths for these 5 homes would be greatly reduced from a range of 0.11-0.89 feet to 0.04-0.17 feet. Hence, the Proposed Action would provide flood damage reduction to all 213 homes that would otherwise be flooded under the No-Action Alternative, in the event of a 100-year flood.

Table 5-10: Flooding Impact Comparison for the 100-year flood

Category	Homes/ Apartments (Number)	Commercial Properties (Number)	Public and Other Properties (Number)	Roads (Square Feet)	Agricultural Land (Acres)	Scour Damage (Acres)	Sediment Deposition (Cubic Yards)
No Action	213	7	3	615,335	3,776	158.4	2,625
Proposed Action	5*	0	0	44,885	2,264	60.2	0

**Some structures would still be impacted by the 100-year flood, but flood depths would be greatly reduced.*
**The Nonstructural Alternative was not included in this table because it would involve simply buying out the properties in the floodplain to address the issue of flood prevention and so this information is not applicable for its analysis.*

The expected annual damage to structures, contents, and vehicles was estimated at $2,520,432 under the No-Action Alternative and $57,403 under the Proposed Action. The expected annual

benefit in structures, contents, and vehicles damages from completing the project is $2,463,029. Additional information can be found in the Economic Investigation and Analysis Report in Appendix D.

5.3.7.1 Magnitude of Impacts

The Dam Replacement Alternative would have the most benefits relative to this resource concern, having permanent benefits. The Buyouts Alternative would have the second most benefits relative to this resource concern but not as many as the Dam Replacement Alternative because, although there would be benefits, the exorbitant cost to buy out properties in the floodplain makes it a much less feasible alternative to provide floodplain management benefits. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits and only offers adverse effects.

5.3.8 WOTUS and Special Aquatic Sites/Wetlands

Wetlands in the project area are discussed in Section 3.6.5, and in the Wetland Riparian Inventory Memo in Appendix D. Images and figures showing the location of riparian areas are also included in the Memo. Most wetlands identified are related to irrigation ditches. Table 5-11 summarizes the impacts of the Alternatives on the identified wetlands within the project work areas.

Table 5-11: Comparison of Wetlands Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Riverine, unknown perennial, unconsolidated bottom, permanently flooded (R5UBH)	No Impact	Direct impact because the wetland resources may be aligned with Corn Creek, the irrigation ditches, and flood channels, for which improvements are being proposed. A majority of the ditch sections where riparian vegetation has been identified would continue to convey high water and flood water. A pipeline may be installed adjacent to the ditch. These riparian areas may be temporarily disturbed during pipe installation. The effect on the wetland areas or riparian vegetation in these areas would be minimal. Affected areas would be revegetated and restored as closely as practicable to preconstruction conditions. Some sections of the open ditch system would be replaced with pipe, hence	Direct impact because the wetland resources may be aligned with Corn Creek, the irrigation ditches, and flood channels, for which improvements are being proposed. A majority of the ditch sections where riparian vegetation has been identified would continue to convey high water and flood water. A pipeline may be installed adjacent to the ditch. These riparian areas may be temporarily disturbed during pipe installation. The effect on the wetland areas or riparian vegetation in these areas would be minimal. Affected areas would be revegetated and restored as closely as practicable to preconstruction conditions. Some sections of the open ditch system would be replaced with pipe, hence the
Riverine, intermittent, streambed, seasonally flooded, excavated (R4SBCx)			
Riverine, intermittent, streambed, seasonally flooded (R4SBC)			

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		the riparian vegetation in these sections would be lost. Fortunately, there are few riparian areas identified where ditches would be eliminated. The ditches to be replaced typically are the concrete lined ditches that have lower seepage losses to provide water from riparian vegetation. The benefits of the Proposed Action Alternative, however, outweigh those of the No Action Alternative. Wetland/riparian areas impacted during construction of the Debris Basin would be temporarily removed. However, the conditions which led to the establishment of wetlands/riparian vegetation areas would be reestablished after construction. The only permanent disturbance would be for the diversion structure upstream of the Debris Basin on Corn Creek. This permanent disturbance is anticipated to be less than 1,000 square feet. Although the area of wetlands that could be impacted would be less than or equal to 3.20 acres (see Appendix D), it is anticipated that consultation and permitting with USACE would be necessary. Wetland mitigation is anticipated to be part of construction.	riparian vegetation in these sections would be lost. Fortunately, there are few riparian areas identified where ditches would be eliminated. The ditches to be replaced typically are the concrete lined ditches that have lower seepage losses to provide water from riparian vegetation. The benefits of the Proposed Action Alternative, however, outweigh those of the No Action Alternative. Although the area of wetlands that could be impacted would be less than or equal to 3.20 acres (see Appendix D) it is anticipated that consultation and permitting with USACE would be necessary. Wetland mitigation is anticipated to be part of construction.

5.3.8.1 Magnitude of Impacts

The Buyouts Alternative would have the most benefits relative to this resource concern, having permanent benefits that outweigh the temporary effects it would have. The Dam Replacement Alternative would have the second most benefits relative to this resource concern but not as many as the Buyouts Alternative because, although there would be benefits, there would be the adverse

permanent effects associated with the construction of the new Debris Basin. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits.

5.3.9 Air Quality

Under the No-Action Alternative, there would be no funding to construct any of the proposed project improvements; therefore, the existing air quality conditions would prevail. Under the Proposed Action Alternatives, criteria pollutants and other greenhouse gases (GHGs) would be generated by construction equipment. However, these emissions would be temporary, occurring within the construction period. The selected contractor would prepare a dust control plan with construction BMPs that would minimize vehicle emissions and fugitive dust from the site and from loaded vehicles. The BMPs would include but would not be limited to the following:

- The application of dust suppressants and watering to control fugitive dust
- Minimizing the extent of disturbed surfaces during times of high wind
- Removing tracked-out materials deposited onto adjacent roadways
- Establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust
- Using appropriate emission-control devices on all construction equipment
- The use of cleaner burning fuels
- Using only properly operating and well-maintained construction equipment
- Restricting earthwork activities
- Limiting the use of, and traveling speeds on unimproved road surfaces

With implementation of the above BMPs, and the construction activities being temporary, impacts on air quality are expected to be minimal. Table 5-12 shows a comparison of the impacts on air quality under the No-Action Alternative and Proposed Action Alternatives.

Table 5-12: Air Quality Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Clean Air Act (CAA) Criteria Pollutants Emissions	No Change	Direct temporary impact on air quality from vehicle emissions and fugitive dust from ground disturbance and materials handling. This could potentially affect public health and visibility. The implementation of existing federal and state requirements on emission control devices and fuel quality would help limit emissions from construction activities, minimizing the potential	Direct temporary impact on air quality from vehicle emissions and fugitive dust from ground disturbance and materials handling. This could potentially affect public health and visibility. The implementation of existing federal and state requirements on emission control devices and fuel quality would help limit $PM_{2.5}$ emissions from construction activities, minimizing the potential

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		impact these emissions would have on air quality. BMPs would be implemented to minimize fugitive dust from construction activities, minimizing the potential impact of fugitive dust on air quality.	impact these emissions would have on air quality. BMPs would be implemented to minimize fugitive dust from construction activities, minimizing the potential impact of fugitive dust on air quality.

5.3.9.1 Magnitude of Impacts

The Buyouts Alternative would have the most benefits relative to this resource concern, having only temporary impacts during construction. The Dam Replacement Alternative would have the second most benefits relative to this resource concern but not as many as the Buyouts Alternative because, although there would be benefits, there would more temporary emissions as a result of the structural work to replace Corn Creek Dam and Debris Basin. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits.

5.3.10 Climate Change and Greenhouse Gas Emissions

Construction vehicles and equipment would release greenhouse gases into the atmosphere, which are known to contribute to global warming and climate change. Table 5-13 shows a comparison of the impacts on air quality under the Alternatives.

Table 5-13: Greenhouse Gases and Climate Change Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Greenhouse Gases and Climate Change	No Impact	Direct temporary impact from diesel engine and gasoline engine emissions of CO_2, SOx, NOx, and other GHGs from construction vehicles and equipment. This could potentially contribute to global warming and climate change. However, the implementation of existing federal and state requirements on emission control devices and fuel quality would reduce GHG emissions from construction activities, minimizing the potential impact on air quality and climate change. Increased crop production has potential to reduce	Direct temporary impact from diesel engine and gasoline engine emissions of CO_2, SOx, NOx, and other GHGs from construction vehicles and equipment. This could potentially contribute to global warming and climate change. However, the implementation of existing federal and state requirements on emission control devices and fuel quality would reduce GHG emissions from construction activities, minimizing the potential impact on air quality and climate change. Increased crop production has potential to reduce

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		CO_2. This conclusion is supported because greater crops would mean more plants in the study area to sequester Carbon and reduce overall GHGs in the study area. .	CO_2. This conclusion is supported because greater crops would mean more plants in the study area to sequester Carbon and reduce overall GHGs in the study area.

5.3.10.1 Magnitude of Impacts

The Buyouts Alternative would have the most benefits relative to this resource concern, having only temporary benefits during construction. The Dam Replacement Alternative would have the second most benefits relative to this resource concern but not as many as the Buyouts Alternative because, although there would be benefits, there would more GHG emissions as a result of the structural work to replace Corn Creek Dam and Debris Basin. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not provide any temporary or permanent benefits.

5.3.11 Threatened and Endangered Plant Species

The USFWS (IPaC) system lists the ULTs as the only plant species of concern potentially present within the project area. A botanical survey was conducted by Western-Enviro Resources, Inc. in August 2021. Approximately 0.053 acres of moderately suitable habitat for the ULTs was found within the Corn Creek riparian corridor but no individual ULT plants were found. The identified area is located south of the project area and outside the limits of the proposed construction activities. Therefore, no Alternatives are expected to impact the ULT, as summarized in Table 5-14. The full Botanical Report can be found in Appendix D.

Table 5-14: Threatened and Endangered Plant Species Impacts

Species	No Action (FWOFI)	Proposed Action	Nonstructural
Ute Ladies'-Tresses (*Spiranthes diluvialis*)	No Effect	No individuals or suitable habitat was identified within the project area, hence no effect on the ULTs.	No individuals or suitable habitat was identified within the project area, hence no effect on the ULTs.

5.3.11.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no impact on this resource concern under any option. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not meet the Purpose and Need.

5.3.12 USFWS Threatened and Endangered Animal Species

The Monarch butterfly was identified as the only threatened, endangered, proposed, or candidate animal species potentially present within the project area. However, the habitat survey did not identify any critical habitat or individual species of the Monarch butterfly within the project area.

Therefore, there are no anticipated impacts on the Monarch butterfly under any Alternatives as indicated in Table 5-15. Details on the habitat surveys can be found in the T&E species memo in Appendix D.

Table 5-15: USFWS Threated and Endangered Animal Species Impacts

Species	No Action (FWOFI)	Proposed Action	Nonstructural
Monarch Butterfly (*Danaus plexippus*)	No Effect	No effect as no milkweed or Monarch butterfly individuals were identified during the habitat surveys. The survey report concluded that the project area does not provide high quality breeding habitat for the Monarch butterfly, and there is no anticipated impact on this species from the proposed project.	No effect as no milkweed or Monarch butterfly individuals were identified during the habitat surveys. The survey report concluded that the project area does not provide high quality breeding habitat for the Monarch butterfly, and there is no anticipated impact on this species from the proposed project.

5.3.12.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no impact on this resource concern under any option. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not meet the Purpose and Need.

5.3.13 Utah Special Status Animal Species

The Utah-sensitive animal species (or SGCN) within a 1-mile radius and within a 2-mile radius of the project area were identified in Chapter 3, along with a description of their essential habitat. Under the No-Action Alternative, there would be no funding to construct any of the proposed project improvements, hence, no impact would be expected on the SGCNs. Under the Proposed Action Alternatives, some of these species may be impacted. Table 5-16 summarizes the potential impacts on the identified SGCN under the Alternatives. Copies of the UNHP report identifying the SGCN, and the UNHP species memo are included in Appendix D.

Table 5-16: Utah Animal Species of Greatest Conservation Need Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Bald Eagle (*Haliaeetus leucocephalus*)	No Effect	No anticipated impact as no suitable foraging or nesting habitat for the Bald Eagle was found within the project area. The absence of eagle nesting would be verified by a qualified biologist during the construction period. If any	No anticipated impact as no suitable foraging or nesting habitat for the Bald Eagle was found within the project area. The absence of eagle nesting would be verified by a qualified biologist during the construction

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		active nests are found during construction, consultation with USFWS and NRCS would be sought to ensure that this species, if present, is not negatively affected by the project.	period. If any active nests are found during construction, consultation with USFWS and NRCS would be sought to ensure that this species, if present, is not negatively affected by the project.
Burrowing Owl (*Athene cunicularia*)	No Effect	There might be potential habitat for this species outside of the project area boundary to the southeast. However, the habitat survey did not identify any individuals or burrows large enough to support this species. Therefore, it is anticipated that there would be no impact on this species.	There might be potential habitat for this species outside of the project area boundary to the southeast. However, the habitat survey did not identify any individuals or burrows large enough to support this species. Therefore, it is anticipated that there would be no impact on this species.
Bonneville Cutthroat Trout (*Oncorhynchus clarkii utah*)	No Effect	Much of the Corn Creek channel has been disturbed or diverted into open irrigation ditches within the limits of the construction activities, which would explain why no fish habitat was identified in the project area during the habitat surveys. Thus, no impact is expected on the Bonneville Cutthroat Trout or any other fish. Fishing in Corn Creek happens further upstream from the project area, and the project is not expected to impact any upstream habitat.	Much of the Corn Creek channel has been disturbed or diverted into open irrigation ditches within the limits of the construction activities, which would explain why no fish habitat was identified in the project area during the habitat surveys. Thus, no impact is expected on the Bonneville Cutthroat Trout or any other fish. Fishing in Corn Creek happens further upstream from the project area, and the project is not expected to impact any upstream habitat.
Ferruginous Hawk (*Buteo regalis*)	No Effect	There might be potential habitat for this species outside of the project area boundary. However, the habitat survey did not identify any individuals. Therefore, it is anticipated	There might be potential habitat for this species outside of the project area boundary. However, the habitat survey did not identify any individuals. Therefore, it is anticipated

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		that there would be no impact on this species.	that there would be no impact on this species.
Southern Leatherside Chub (*Lepidomeda aliciae*)	No Effect	Much of the Corn Creek channel has been disturbed or diverted into open irrigation ditches within the limits of the construction activities, which would explain why no fish habitat was identified in the project area during the habitat surveys. Thus, no impact is expected on the Southern Leatherside Chub or any other fish. Fishing in Corn Creek happens further upstream from the project.	Much of the Corn Creek channel has been disturbed or diverted into open irrigation ditches within the limits of the construction activities, which would explain why no fish habitat was identified in the project area during the habitat surveys. Thus, no impact is expected on the Southern Leatherside Chub or any other fish. Fishing in Corn Creek happens further upstream from the project.

5.3.13.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no impact on this resource concern under any option. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not meet the Purpose and Need.

5.3.14 Migratory Birds/Bald and Golden Eagles

The long-eared owl might potentially exist within the project area due to the low-quality habitat identified during the habitat surveys. Table 5-17 summarizes the potential impacts the Alternatives would have on the long-eared owl.

Table 5-17: Migratory Birds of Concern Impacts

Species	No Action (FWOFI)	Proposed Action	Nonstructural
Long-eared Owl (*Asio otus*)	No Effect	There is low quality potential habitat southeast of the project area (UDWR 2023). However, no nests or individuals were found during the habitat surveys. Hence, the project may affect but is not likely to adversely affect this species. If present, this species may temporarily be displaced as a result of construction activities within the	There is low quality potential habitat southeast of the project area (UDWR 2023). However, no nests or individuals were found during the habitat surveys. Hence, the project may affect but is not likely to adversely affect this species. If present, this species may temporarily be displaced as a result of construction activities within the

Species	No Action (FWOFI)	Proposed Action	Nonstructural
		project area. Screening by a qualified biologist would be required to ensure that this species, if present, is not adversely affected by the project. Unlike the other Migratory Bird species identified in scoping, there was suitable habitat identified very near the action area, warranting further analysis and discussion here and a determination of May Affect, not Likely to Adversely Affect.	project area. Screening by a qualified biologist would be required to ensure that this species, if present, is not adversely affected by the project. Unlike the other Migratory Bird species identified in scoping, there was suitable habitat identified very near the action area, warranting further analysis and discussion here and a determination of May Affect, not Likely to Adversely Affect.

5.3.14.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no impact on this resource concern under any option. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not meet the Purpose and Need.

5.3.15 Invasive Species and Noxious Weeds

A list of the invasive plant species in Millard County which could possibly be found in the project area was provided in Section 3.4.2. Table 5-18 summarizes the potential impacts of invasive plant species under the Alternatives.

BMPs would be employed to minimize the spread of invasive plant species during construction. The following procedures would be included in the construction specifications:

- Equipment used for the project would be inspected for reproductive and vegetative parts, foreign soil, mud, or other debris that may cause the spread of weeds, invasive species, and other pests. Such material would be removed before moving vehicles and equipment. Earth-moving construction equipment would be cleaned prior to use on the project.
- Weed control on all disturbed areas would be required.
- The disturbed area would be reconstructed using native topsoil and native seeds collected from grubbing and replacing organic matter.
- Upon the completion of work, decontamination would be performed within the work area before the vehicle and/or equipment are removed from the project site.
- The disturbed areas would be seeded at appropriate times with weed-free, native seed mixes consisting of a variety of appropriate species to promote the revegetation of the disturbed areas.
- Weed control measures would be implemented to county standards at a minimum.

Table 5-18: Invasive Plant Species Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Existing Invasive Plant Species	The future dam breach would destroy riparian areas and other vegetated zones. Opening opportunity for existing invasive species to take root.	Existing invasive plant species could be spread within the project area due to ground disturbance and movement of vehicles and construction equipment. Also, the invasive plant species could be spread to areas outside of the construction site by the movement of construction equipment if not properly cleaned before it leaves the site. The impacts could be direct and temporary, or even long-term/permanent.	Existing invasive plant species could be spread within the project area due to ground disturbance and movement of vehicles and construction equipment. Also, the invasive plant species could be spread to areas outside of the construction site by the movement of construction equipment if not properly cleaned before it leaves the site. The impacts could be direct and temporary, or even long-term/permanent.
New Invasive Plant Species	The future dam breach would destroy riparian areas and other vegetated zones. Opening opportunity for new invasive species to take root.	Construction equipment, if not cleaned prior to coming to the site, can lead to the spread of noxious weeds and invasive plants. The impacts could be direct and temporary, or even long-term/permanent.	Construction equipment, if not cleaned prior to coming to the site, can lead to the spread of noxious weeds and invasive plants. The impacts could be direct and temporary, or even long-term/permanent.

5.3.15.1 Magnitude of Impacts

The two Action Alternative plans would have the same level of effects as one another as there would be no impact to this resource concern under any option. The No Action (FWOFI) Alternative would be the least preferable option for this resource concern because it does not meet the Purpose and Need and would have the greatest adverse impact when the Dam breached.

5.3.16 Fish and Wildlife

No fish or suitable habitat for fish was identified within the project area during the habitat surveys. However, several game birds and animals that might reside around the project area were identified from the Utah Hunt Planner (UDWR 2023). These species and their natural habitats were described in Table 5-19. Table 5-19 summarizes the potential impacts the No-Action Alternative and the Proposed Action Alternatives would have on fish and wildlife.

Table 5-19: Fish and Wildlife Impacts

Species	No Action (FWOFI)	Proposed Action	Nonstructural
Fish	Dam Breach would destroy habitat.	No impact as there is currently no quality habitat for fish within the project area.	No impact as there is currently no quality habitat for fish within the project area.
Wildlife	Dam Breach would destroy habitat.	There are no designated wilderness areas within the project area (Wilderness Connect 2023). There is potential habitat for game birds and animals near the project area (UDWR 2023), hence, there may be temporary displacement of these species due to construction activities and noise from construction. The impact would be temporary, lasting only until the project is completed.	There are no designated wilderness areas within the project area (Wilderness Connect 2023). There is potential habitat for game birds and animals near the project area (UDWR 2023), hence, there may be temporary displacement of these species due to construction activities and noise from construction. The impact would be temporary, lasting only until the project is completed.

5.3.16.1 Magnitude of Impacts

The Dam Replacement Alternative would be the most beneficial to fish and wildlife as there would be no impact on this resource concern. The No Action (FWOFI) Alternative and Nonstructural Plans would be the least preferable option for this resource concern because they and would destroy and existing habitat in the path of the dam breach.

5.3.17 Riparian Areas

The riparian vegetation associated with Corn Creek and the open irrigation ditches that receive water from Corn Creek was listed in Chapter 3. The identified riparian vegetation was obtained through a biological field survey. Table 5-20 summarizes the impacts on the existing riparian areas under the Alternatives.

Table 5-20: Riparian Areas Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Riparian Vegetation	Direct Permanent Impact as any riparian areas in the zone of the dam breach would be destroyed.	Direct impact on riparian vegetation along the open waterways would occur. The riparian vegetation along Corn Creek would temporarily be affected due to construction activities. Efforts would be made to restore the affected vegetation once construction is completed. The riparian areas along the sections of ditch to be eliminated would be lost. Most of the ditches with riparian vegetation would be kept for high water and flood control, which would minimize the area that would be impacted. In addition, the resulting benefits from the Proposed Action Alternative would outweigh those of the No-Action Alternative.	Direct impact on riparian vegetation along the open waterways would occur. The riparian vegetation along Corn Creek would temporarily be affected due to construction activities. Efforts would be made to restore the affected vegetation once construction is completed. The riparian areas along the sections of ditch to be eliminated would be lost. Most of the ditches with riparian vegetation would be kept for high water and flood control, which would minimize the area that would be impacted. In addition, the resulting benefits from the Proposed Action Alternative would outweigh those of the No-Action Alternative.

5.3.17.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no impact on this resource concern under any option. The No Action (FWOFI) Alternative would be the worst option for this resource concern because it does not meet the Purpose and Need.

5.3.18 Cultural Resources and Historic Properties/Tribal Consultation

The cultural resources and historic properties within the project area were discussed in Section 3.3.4. Pursuant to 36 CFR Part 800 of the NHPA (1966, as amended in 2000), and the regulations of the Advisory Council on Historic Preservation (ACHP) implementing Section 106 of the NHPA (54 U.S.C. 306108), federal agencies must consider the potential effect on "historic properties", which refers to cultural resources listed on, or eligible for listing, on the NRHP. Of the 16 cultural resources identified in Section 3.3.4, the NRCS, in consultation with the Utah SHPO, THPOs, and Tribes, determined that 7 of them are eligible for listing on the NRHP (per 36 CFR 800.4). Table 5-21 lists the cultural resources identified as eligible for listing on the NRHP, along with a description of the potential adverse effects of the Alternatives on these historic properties and the finding of effects. Table 512 discusses the effects to additional properties that would be affected by the No Action/Indirect APE for the project. The redacted Cultural Resources Report is available in Appendix D.

Table 5-21: Historic Properties and Effects

Site No.	Site Name/ Description	No Action	Proposed Action	Nonstructural	Effects Determination
42MD2017	Historical Ditch (the Indian Ditch)	No Impact	A buried pipeline would be installed adjacent to the existing ditch, with minor changes to the pond, to connect the new pipe to the Kanosh Band secondary water system	A buried pipeline would be installed adjacent to the existing ditch, with minor changes to the pond, to connect the new pipe to the Kanosh Band secondary water system	No adverse effect.
42MD4703	South and West Field Ditch System	No Impact	Direct permanent impact: Nearly half of it would be replaced by a buried pipeline.	Direct permanent impact: Nearly half of it would be replaced by a buried pipeline.	Adverse effect.
42MD4704	Middle Ditch System	No Impact	A buried pipeline would be installed adjacent to the existing ditch. The existing ditch would remain in place and be maintained for flood control.	A buried pipeline would be installed adjacent to the existing ditch.	No adverse effect.
42MD4705	East Field Ditch System	No Impact	A buried pipeline would be installed adjacent to the existing ditch. The existing ditch would remain in place and be maintained for flood control.	A buried pipeline would be installed adjacent to the existing ditch.	No adverse effect.
42MD4706	Hatton Ditch System	No Impact	A buried pipeline would	A buried pipeline would	No adverse effect.

Site No.	Site Name/ Description	No Action	Proposed Action	Nonstructural	Effects Determination
			be installed adjacent to the existing ditch. The existing ditch would remain in place and be maintained for flood control.	be installed adjacent to the existing ditch.	
42MD4707	East Middle Hatton Ditch System	No Impact	It would be replaced by a buried pipeline, resulting in a direct permanent impact.	It would be replaced by a buried pipeline, resulting in a direct permanent impact.	Adverse effect.
42MD4708	West Ditch System	No Impact	A 1-block long segment of the ditch would be widened and lined with concrete, and the remaining segment piped, resulting in a direct permanent impact.	A 1-block long segment of the ditch would be widened and lined with concrete, and the remaining segment piped, resulting in a direct permanent impact.	Adverse effect.

Table 5-22: Historic Properties & Impacts for the No Action/Indirect APE (Breach Inundation Zone)

Site No.	Site Name/Description	No Action/Indirect APE	Proposed Action(s)
42MD996	Multi-Component Site	This historic property is located within the No Action flood zone and would continue to be subject to flooding under this alternative. Refer to consultation letters in Appendix A for more information.	No Effects
42MD997	Prehistoric Camp	This historic property is located within the No Action flood zone and would continue to be subject to flooding under this alternative.	No Effects

		Refer to consultation letters in Appendix A for more information.	
Historic Single Family Dwellings (7)	~4675 W Hatton Ln ~4750 W Hatton Ln 4909 W Hatton Ln 10 N Main Street 60 N Main Street 35 W Center Street 60/70 W Center St.	This historic property is located within the No Action flood zone and would continue to be subject to flooding under this alternative. These sites would be impacted by flood waters. Refer to consultation letters in Appendix A for more information.	Refer to the table above to note adverse effects related to the proposed action. Additionally, a MOA for the resolution of adverse effects is included in Appendix A.

Based on the tables above, the NRCS determined that the undertaking would result in adverse effects to historic properties, per 36 CFR 800.5. Specifically, the proposed partial piping of 42MD4703, 42MD4707, and the enlargement and lining of 42MD4708, constitute adverse effects. The NRCS recommends that the proposed project proceed with an overall finding of adverse effect to historic properties per 36 CFR 800.5(d)(2). Per 36 CFR 800.5, the Utah SHPO, Tribes, and THPOs (THPOs were consulted on determinations of effects). These consultation letters were sent on April 9, 2024, and received throughout April and early May 2024 (Return receipts in Appendix A). SHPO concurred on June 4, 2024. Tribes were consulted on these items as well and did not submit any responses other than from the PITU, described below.

In response to consultation follow-up emails, the PITU requested a virtual meeting with the NRCS and Kanosh Band to discuss the history of and potential effects to Site 42MD4702, an ineligible rock art boulder that had previously been moved from its original location. A virtual meeting was held on June 28, 2024, with legal representatives from the Kanosh Band, the PITU Cultural Resources Director, and NRCS State Watershed Cultural Resources Specialist. All agreed that an on-site visit was warranted, which occurred on July 25, 2024, between NRCS and two Kanosh Band elders. Following these meetings, the Kanosh Band Council decided to leave the boulder in situ and avoidance would be ensured including the avoidance area on design drawing (email communication in Appendix A). A summary of the Tribal consultation process may be found in the Tribal consultation table in Appendix A.

Per 36 CFR 800.6, the NRCS notified the ACHP of the adverse effect determination and invited their participation in the consultation process in a letter dated June 4, 2024. The ACHP chose not to participate in consultation in their response on June 27,2024

Per 36 CFR 800.6, to resolve the adverse effects to historic properties, a draft Memorandum of Agreement (MOA) between the NRCS, SHPO, Kanosh Town, and the CCIC was prepared. All signatories have reviewed the draft MOA, which is in Appendix A. In the event that cultural resources are discovered during construction, the following BMPs would be followed:

- Site 42MD4702 (rock art on relocated boulder): General resource avoidance area of rock art boulder would be annotated on design drawings.
- If cultural resources are discovered during construction activities, all ground-disturbing activities within 50 feet of the discovery shall cease and the NRCS archaeologist would be notified, and the post-review discovery procedures followed, as outlined in the Prototype Programmatic Agreement between the NRCS and SHPO.
- If human remains or funerary objects are discovered under any circumstances, all work in the immediate vicinity (100 feet) would immediately halt, and the Millard County Sherriff, the NRCS archaeologist, and the Utah State History's Human Remains Program would be contacted. If a discovery is made, the procedures outlined above would be executed according to the procedures required under the Native American Graves Protection and Repatriation Act (NAGPRA).
- Procedures for post-review discoveries of cultural resources outlined in the Prototype Programmatic Agreement between the NRCS and SHPO shall be followed.

5.3.18.1 Magnitude of Impacts

The two Action Alternative plans would have the same level of effects as one another as there would be some adverse impacts under both options. The No Action (FWOFI) Alternative would be the most preferable option for this resource concern because it would not have any adverse impacts on any cultural resources.

5.3.19 Socioeconomics (Local, Regional, and National Economy)

The socioeconomic characteristics of the Kanosh population were described in Section 3.3.1. Impacts on the socioeconomic characteristics under the Alternatives are summarized in Table 5-24.

Table 5-23: Socioeconomic Impacts

Species	No Action (FWOFI)	Proposed Action	Nonstructural
Population	No Impact	No Anticipated Impact	Buying out properties would likely have adverse impacts here as many people would be forced to relocate, reducing the local population.
Race and Ethnicity	No Impact	The race and ethnicity surrounding the project area are not expected to change. However, this alternative promotes racial and ethnic inclusion and fairness by engaging the Kanosh Band Tribal community who, along with CCIC, are co-sponsors of the project. The project sponsor (Town of Kanosh) and co-sponsors	The race and ethnicity surrounding the project area are not expected to change. However, this alternative promotes racial and ethnic inclusion and fairness by engaging the Kanosh Band Tribal community who, along with CCIC, are co-sponsors of the project. The project sponsor (Town of Kanosh) and co-sponsors would all benefit from the project improvements.

Species	No Action (FWOFI)	Proposed Action	Nonstructural
		would all benefit from the project improvements.	
Education and Employment	No Impact	The proposed project would create some employment opportunities for the people in Kanosh during the construction period. Hence there would be a direct temporary benefit to some of the residents.	The project would not create new employment opportunities and would likely drive out some business owners as a result of the property buyouts and relocations.
Income and Poverty	The project would not create new employment opportunities and costs to repair damages of the dam breach would be great.	Employment opportunities would be created for some residents, which would be an additional stream of income for some households. Businesses like restaurants, gas stations, hotels, hardware stores, grocery stores, and others within the project area would also benefit from the project, supplying goods and providing services to the project and construction workers. These benefits would be temporary, increasing the income for some households during the period of construction. Farmers would obtain direct permanent benefits from increased irrigation water deliveries after the project improvements are made. More reliable irrigation water deliveries would enable increased productivity and yields on the farms, improving the economic status of the farmers.	The project would not create new employment opportunities or generate any changes to income and would likely drive out some business owners as a result of the property buyouts and relocations.
Occupation and Economy	Costs to repair damages from the dam breach would be large and significant, adversely	Water losses in the irrigation system would be reduced and the system would be able to supply more irrigation water to the farmers. Increased water	Water losses in the irrigation system would be reduced and the system would be able to supply more irrigation water to the farmers. Increased water deliveries to the farmers would facilitate an

Species	No Action (FWOFI)	Proposed Action	Nonstructural
	impacting the economy.	deliveries to the farmers would facilitate an extended growing season, enable farmers to maximize their farmland potential, increase cropping options and crop yields, and help maintain the agricultural viability of the area for current and future generations. This would foster economic development in the region and would be a direct long term/permanent benefit to the farmers and the community. Water deliveries to the Tribal community would create an opportunity for agricultural expansion on the Tribal lands. This would improve the economic status of the Tribal community and contribute to economic development in the region; a potential direct permanent benefit.	extended growing season, enable farmers to maximize their farmland potential, increase cropping options and crop yields, and help maintain the agricultural viability of the area for current and future generations. This would foster economic development in the region and would be a direct long term/permanent benefit to the farmers and the community. Water deliveries to the Tribal community would create an opportunity for agricultural expansion on the Tribal lands. This would improve the economic status of the Tribal community and contribute to economic development in the region; a potential direct permanent benefit.

5.3.19.1 Magnitude of Impacts

The Dam Replacement plan would be the most beneficial to this resource concern as it would provide the most benefits to the socioeconomic conditions in the project area. The Buyouts Alternative would be the second most beneficial. The No Action Alternative would be the least preferable alternative plan because it would have several negative impacts on socioeconomic conditions.

5.3.20 Public Health and Safety

The public health and safety concerns surrounding the project area were described in Chapter 3. Table 5-25 summarizes the impacts of the Alternatives on public health and safety.

Table 5-24: Public Health and Safety Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Risk of Dam Failure and flooding	Corn Creek Dam and Debris Basin would remain at high risk of failure. Dam failure	The Dam and Debris Basin would be reconstructed, minimizing the risk of dam failure and potential for	Corn Creek Dam and Debris Basin would remain at high risk of failure. Dam failure would result in significant

Category	No Action (FWOFI)	Proposed Action	Nonstructural
	would result in significant flooding and flood damage to the downstream community. Approximately 508 people, 213 homes, 3,776 acres of agricultural land, a road network, and town and community infrastructure would be affected. Cleanup would be costly.	flooding and flood damage to the downstream Kanosh community. There would be increased protection for homes, infrastructure, and farms in Kanosh from the 100-year flood event. Hence, the Proposed Action Alternative would provide a significant level of safety to the downstream community as opposed to the No-Action Alternative.	flooding and flood damage to the downstream community. However, there would be no risk to life as the residents within the breach zone would have their properties bought out and be relocated.
Accidents in the Open Irrigation Ditches	The level of risk of accidental falls and/or drowning in the open irrigation ditches would remain.	Deep and dangerous sections of the retained ditches with high flow velocities, like the West Ditch and Middle Ditch, would be piped to avoid the risk of accidental falls and/or drowning in these ditch sections.	Deep and dangerous sections of the retained ditches with high flow velocities, like the West Ditch and Middle Ditch, would be piped to avoid the risk of accidental falls and/or drowning in these ditch sections.
Transportation Infrastructure	Direct temporary impact from flooding and debris flows on roads, in the event of a dam breach. This would hinder transportation within the area. The Middle Ditch's proximity to Crooked Lane would continue to cause on-going maintenance issues for Millard County.	Direct temporary impact from the increase of construction traffic. Construction activities would require residents to slow down or change their driving patterns as roads are closed for construction. Direct permanent impact from after reconstruction of the Dam and Debris Basin to NRCS and Dam Safety standards. The risk of debris flows on the roads would be greatly reduced/eliminated as the risk of dam failure would be minimized. The risk and severity of flooding on the community roads would also be reduced. Millard County would have reduced maintenance requirements on Crooked Lane after the	Direct temporary impact from the increase of construction traffic. Construction activities would require residents to slow down or change their driving patterns as roads are closed for construction.

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		Middle Ditch is replaced with pipe.	

5.3.20.1 Magnitude of Impacts

The Dam Replacement plan would be the most beneficial to this resource concern as it would provide the most benefits to the public health and safety conditions in the project area.. The Buyouts plan would be the second most beneficial alternative plan because it would have several benefits on safety conditions but would ultimately not eliminate the flooding concerns associated with dam breach. Finally, the No Action Alternative would be the least preferable option as it would not address any current public health or safety concerns.

5.3.21 Scenic Beauty and Visual Resources

The impacts on these resources under the Alternatives are summarized in Table 5-26.

Table 5-25: Scenic Beauty and Visual Resources Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Close Range Viewers to Mid-Range Viewers	No Impact	Direct temporary impact on the scenic beauty and visual resources due to the presence of construction equipment staged or operating around the project area, disturbance of the ground cover and piling of construction materials and construction waste, and possible fugitive dust from soil disturbance and materials hauling. The construction site would be cleaned up and revegetated where necessary and restored as close as practicable to pre-construction conditions once the project is completed. BMPs to control fugitive dust would be implemented. No long-term impacts are expected.	Direct temporary impact on the scenic beauty and visual resources due to the presence of construction equipment staged or operating around the project area, disturbance of the ground cover and piling of construction materials and construction waste, and possible fugitive dust from soil disturbance and materials hauling. The construction site would be cleaned up and revegetated where necessary and restored as close as practicable to pre-construction conditions once the project is completed. BMPs to control fugitive dust would be implemented. No long-term impacts are expected.
Long-Range Viewers	No Impact	Direct and indirect temporary impacts are expected. Fugitive dust from ground disturbance and materials hauling would affect the scenic beauty and visual resources in the area. These impacts would be addressed through BMPs to control fugitive dust.	Direct and indirect temporary impacts are expected. Fugitive dust from ground disturbance and materials hauling would affect the scenic beauty and visual resources in the area. These impacts would be addressed through BMPs to control fugitive dust.

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		Direct permanent impact on visual resources associated with agricultural fields as a result of the project improvements which would provide more reliable irrigation water deliveries to foster agriculture land use in the area.	Direct permanent impact on visual resources associated with agricultural fields as a result of the project improvements which would provide more reliable irrigation water deliveries to foster agriculture land use in the area.

5.3.21.1 Magnitude of Impacts

The No Action Alternative would be the most beneficial plan to visual resources as it would not modify the existing viewshed. The Buyouts Alternative would be the second most beneficial alternative plan because it would have the least changes to the viewshed of the two action plans. Finally, the Dam Replacement Alternative would be the least preferable option as it would have the greatest adverse impact on the viewshed of the three considered plans.

5.3.22 Significant Scientific Resources

The impacts on these resources under the Alternatives are summarized in Table 5-27.

Table 5-26: Significant Scientific Resources Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Significant Scientific Resources	No Effect	No Effect. No significant scientific resources exist in the study area as defined in NCRPH 601.70.	No Effect. No significant scientific resources exist in the study area as defined in NCRPH 601.70.

5.3.22.1 Magnitude of Impacts

The three Alternative plans would have the same level of effects as one another as there would be no effects under any plans.

5.3.23 Land Use

Impacts on the land use under the Alternatives are summarized in Table 5-28.

Table 5-27: Land Use Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Land Use Designations	No Impact	Direct permanent impact as easements would be required in some locations where improvements are being proposed; in particular, areas that are outside	Direct permanent impact as easements would be required in some locations where improvements are being proposed; in particular, areas that are outside

Category	No Action (FWOFI)	Proposed Action	Nonstructural
		the alignment of the existing ditches and related infrastructure which already have easements. Efforts have been made during the planning process to minimize the location of the Proposed Action outside the existing easements and Rights of Way owned by project sponsors.	the alignment of the existing ditches and related infrastructure which already have easements. Efforts have been made during the planning process to minimize the location of the Proposed Action outside the existing easements and Rights of Way owned by project sponsors.
Agricultural Land Use	No Impact	Direct permanent benefit as the Proposed Action would improve productivity on farmlands due to increased irrigation water deliveries.	Direct permanent benefit as the Proposed Action would improve productivity on farmlands due to increased irrigation water deliveries.
Residential Land Use	No Impact	The relocated secondary pond would provide improved pressure for the Kanosh secondary system and would provide adequate pressure to install a secondary system for the Kanosh Band.	The relocated secondary pond would provide improved pressure for the Kanosh secondary system and would provide adequate pressure to install a secondary system for the Kanosh Band.
Other Land Use	No Impact	No Anticipated Impact	No Anticipated Impact

5.3.23.1 Magnitude of Impacts

The two Action Alternative plans would have the same level of effects as one another as there would be the same level of effects and benefits. The No Action Plan would be the least preferable plan for this resource concern.

5.3.24 Transportation Infrastructure

The main transportation infrastructure within the project area includes I-15 west of Kanosh, Highway 133 north of Kanosh, Highway 91 south of Kanosh, Little Black Rock Road, Main Street, and Sandhill Road, as discussed in Chapter 3. Table 5-29 summarizes the impacts that the Alternatives would have on transportation.

Table 5-28: Transportation Impacts

Category	No Action (FWOFI)	Proposed Action	Nonstructural
Traffic Flow and Safety	Direct temporary impact from flood water and/or debris flows in case of a	Direct temporary impact on traffic flow during the construction period resulting from construction vehicles and equipment that may become a	Direct temporary impact on traffic flow during the construction period resulting from construction vehicles and equipment that may

Category	No Action (FWOFI)	Proposed Action	Nonstructural
	substantial flood, such as the 100-year flood event, or dam breach, which would hinder traffic flow. This would affect transportation routes within Kanosh, and in and out of Kanosh, impacting the transport of people, goods, and services.	traffic hazard or cause traffic delays. Possible impact to traffic safety would require the implementation of traffic signage compliant with the Utah amended Manual of Uniform Traffic Devices (current edition) by the Federal Highway Administration (FHWA). The proposed improvements would minimize the possibility of dam failure, thereby protecting the roads from sediment accumulation and the extent of flooding that would occur with a dam breach.	become a traffic hazard or cause traffic delays. Possible impact to traffic safety would require the implementation of traffic signage compliant with the Utah amended Manual of Uniform Traffic Devices (current edition) by the Federal Highway Administration (FHWA). The area's roads would not be protected from the possibility of dam failure/sediment accumulation/extent of flooding during a dam breach.
Road Conditions	Direct temporary impact in the event of a large flood, such as the 100-year flood event, or dam breach, as roads could potentially be damaged by flood water and/or debris flows.	Possible roadway damage from heavy trucks hauling materials, which could become a traffic hazard. Roads would be repaired if damaged, which could also cause traffic delays. This impact could be direct or indirect but would be temporary. The proposed improvements would minimize the possibility of dam failure, thereby protecting the roads from sediment damage, which would occur with a dam breach, and minimize the impact of flooding on the roads.	Possible roadway damage from heavy trucks hauling materials, which could become a traffic hazard. Roads would be repaired if damaged, which could also cause traffic delays. This impact could be direct or indirect but would be temporary.

Road damage was estimated in areas where flood depths were 0.1 feet or greater, as described in the Economic Report in Appendix D. In the event of a 100-year flood, approximately 615,335 square feet of the major roads within the project area would be impacted under the No-Action Alternative. I-15 would not be affected by the 100-year flood but would continue to be impacted by larger flood events. The direct cost of the road damage from the 100-year flood under the No-Action Alternative would be approximately $1,802,163. Under the Proposed Action, approximately 44,885 square feet of road would be impacted with damages amounting to approximately $100,991. The Dam Replacement Alternative would reduce road damages by over 94%. According to the Economic Report, the expected annual benefit in road damages from completing the project is $379,923.

5.3.24.1 Magnitude of Impacts

The Dam Replacement Alternative would be the most beneficial plan to transportation infrastructure as, even though there would be some temporary impacts, it would provide the most benefits in the long-term. The Buyouts Alternative would be the second most beneficial alternative plan because it would also provide some benefits, although not any of the flood protection of roadways that a dam breach would cause. Finally, the No Action Alternative would be the least preferable option as it would not modify current transportation infrastructure conditions in the watershed.

5.3.25 Ecosystem Services

Effects of the alternatives on ecosystem services are covered in Section 5.2 of the Plan-EA.

5.3.26 Summary and Comparison of Environmental Consequences

Table 5-31 below provides a side-by-side summary comparison of the environmental effects of the alternatives for each resource concern evaluated in this Plan-EA.

If a table cell is marked green, it indicates that that alternative is the most beneficial for that resource concern. If a table cell is marked in yellow, it indicates that that alternative is the second most beneficial for that resource concern. If a table cell is marked in red, it indicates that that alternative is the least beneficial for that resource concern. If alternative effects are co-equal among alternatives for a particular resource concern, each alternative will be marked as green.

Table 5-29: Summary and Comparison of Alternatives – Effects on Resource Concerns

Resource Concerns	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
Soil-Related Concerns			
Geology and Soil Resources	X	X	X
Prime & Unique Farmland	X	X	X
Upland Erosion and Sedimentation	X	X	X
Water-Related Concerns			
Surface Water Quantity	X	X	X
Surface Water Quality	X	X	X
Groundwater Quantity and Quality	X	X	X
Floodplain Management	X	X	X
WOTUS and Special Aquatic Sites	X	X	X
Air-Related Concerns			
Air Quality	X	X	X
Climate Change and Greenhouse Gas Emissions	X	X	X
Plant and Animal-Related Concerns			
Special Status Plant Species (ESA)	X	X	X

Resource Concerns	No Action (FWOFI)	Flood Reduction Alternative	Property Buyouts Alternative
Special Status Animal Species (ESA)	X	X	X
Utah Special Status Species/SGCNs	X	X	X
Migratory Birds/Bald and Golden Eagles	X	X	X
Invasive Species and Noxious Weeds	X	X	X
Fish and Wildlife	X	X	X
Riparian Areas	X	X	X
Human-Related Concerns			
Cultural Resources & Tribal Consultation	X	X	X
Socioeconomics/Economy	X	X	X
Public Health and Safety	X	X	X
Scenic Beauty and Visual Resources	X	X	X
Significant Scientific Resources	X	X	X
Land Use	X	X	X
Transportation Infrastructure	X	X	X
Ecosystem Services	X	X	X
TOTAL RESOURCES MOST BENEFICIAL:	**2**	**23**	**16**

As shown in the table, the Dam Replacement Alternative would be the most beneficial alternative overall, being the most preferable option for 23/25 resource concerns. The second most preferable option would be the Buyouts Alternative (16/25) because it would still address the problems and opportunities in the watershed and meet the NEPA Purpose and Need. The least preferable option would not meet the Purpose and Need or address the problems and opportunities, the No Action Alternative (2/25).

5.3.27 Cumulative Effects Analysis

NRCS analyzed the potential for significant and adverse cumulative effects (CE) in addition to the resource-specific evaluations described in the previous sections as described in 501.43(3)(b)(1). CE include all the past, present, and reasonably foreseeable activities within the watershed that could impact resources affected by the project. The CEQ's regulations for implementing NEPA (40 CFR 1508.1(g)(3)) state that cumulative effects "are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." The defined geographic scope for this CE analysis is Millard County, Utah, with a time frame of analysis of 5 years into the future and 1 year into the past.

5.3.27.1 Methodology

NRCS searched agency websites and contacted agency/organization staff to identify past, present, and reasonably foreseeable projects with the potential to have cumulative effects in combination with the measures of the alternative plans. The following agencies and entities, which have some claim to a project or lands within the watershed, are listed below with a description of past and current projects which have the potential to contribute to cumulative effects which the actions of this project could, in combination, have significant adverse impacts to any of the resource concerns considered in the previous sections of this chapter. See Appendices D and E for more information.

5.3.27.2 Natural Resources Conservation Service (NRCS)

Millard County EWP 2023 – Spring Site and Water Crossing:

- This Emergency Watershed Protection (EWP) project includes the installation of riprap, concrete wall replacement, grading, earthen dike building, and a concrete low-water crossing. Bids for construction were opened in May 2024. There would be no beneficial or adverse CE to this project under any alternative.

Lower Sevier River Watershed Plan-EA:

- This project is being funded by NRCS through the PL 83-566 program for the Lower Sevier River Watershed near Delta in Millard County. The project seeks to make improvements to the "C" Canal Water Efficiency Project to reduce water loss from leakage and evapotranspiration and to improve public safety along the canal. The scoping phase was completed in 2022. The Plan-EA is currently still in development. If approved, the project would likely begin construction sometime in the next 5 years. Both Action Alternatives would have additive cumulative benefits to this project by supporting improved agricultural water management in the watershed.

5.3.27.3 United States Forest Service (USFS)

Desert Experimental Range in Pine Valley/USU Soil Survey Project

- The USFS established the Desert Experimental Range in Pine Valley, Millard County in 1933 as a center for cold desert rangeland research. It encompasses 87 square miles and is designated as a biosphere reserve. Recent projects in this experimental range include USU's Quantitative Soil Survey and Interpretation project, funded by the USDA REEIS program and supported by the U.S. Geological Survey as well. There would be no beneficial or adverse CE to this project as a result of the implementation of either Action Alternative.

White Sage Flat Habitat Restoration Project (Phase II)

- USFWS conducts pinyon-juniper woodland management to restore ecosystems, reduce wildfire risks, and improve wildlife habitats. This project consists of the reduction of pinyon-juniper fuel loading southeast of Kanosh, Utah. This project will consist of different methods to reduce fuel loading such as anchor chaining, reseeding, bull hog mastication of smaller trees with skid steers, and hand removal. Expected to be completed in 2025. Only the Dam Replacement Alternative would have interactive cumulative benefits to this

project by protecting the functionality of the floodplain. Both Action Plans would have the potential to have an interactive adverse effect on the project by introducing the potential of more/additional invasive species during construction. However, this adverse CE is not guaranteed and BMPs would be implemented to minimize it to the maximum extent possible.

5.3.27.4 Intermountain Power Agency (IPA)

Intermountain Power Project (IPP)

- The Intermountain Power Project (IPP) began construction in October 2022 and is anticipated to be completed in 2025. The project is transitioning the existing coal-fired power plant near Delta, Utah, in Millard County, to a combined-cycle natural gas facility capable of utilizing hydrogen. There would be no beneficial or adverse CE to this project as a result of the implementation of either Action Alternative.

5.3.27.5 Federal Energy Regulatory Commission (FERC)

Kern River Delta Lateral Project

- A Record of Decision was approved in January 2023 for the Kern River Delta Lateral Project which would install a 24-inch diameter high pressure natural gas pipeline and ancillary facilities on 6.9 miles of BLM managed public land in Millard County. The BLM will issue a 30-year right-of-way grant and a temporary use permit to construct and operate the pipeline. Construction began in 2023 and was completed in Spring 2024. There would be no beneficial or adverse CE to this project as a result of the implementation of either Action Alternative.

5.3.27.6 Bureau of Land Management (BLM)

Renewable Energy Developments in Millard County

- The BLM purchased two parcels, covering ~3,045 acres in Millard County, within the Fishlake National Forest to put toward geothermal energy development in January 2023. Leases for the project were announced in March 2023. There would be no CE to this project as a result of the implementation of either Action Alternative.

Three Knolls Project (Phase II)

- This project will expand and improve ~1,035 acres of sagebrush habitat at the south end of the Valley Mountains by removing existing juniper via mastication and seeding techniques. The project is located ~12 miles southeast of Scipio in the foothills of the Valley Mountains in Millard County, Utah. The project is expected to be implemented in 2025. There would be no CE to this project as a result of the implementation of either Action Alternative.

5.3.27.7 Utah Division of Wildlife Resources (UDWR)

Pahvant Wildlife Management Area (WMA) Habitat Improvement Project

- The DWR has been implementing habitat improvement projects on the Pahvant WMA in Millard County to improve habitat conditions for vegetation management and infrastructure improvements. These improvements are ongoing. There would be no

beneficial or adverse CE to this project as a result of the implementation of either Action Alternative.

Fillmore WMA Habitat and Private Land Habitat Improvement Project

- Phase II of this project will improve wildlife habitat in WMA in Millard County. Also, co-sponsored by the USFWS through their Partners Program to improve winter habitat for wildlife through improvements like pinyon-juniper removal and fencing. Located in the Fillmore and Holden areas of Millard County. Expected to be implemented in 2025. There would be no CE to this project as a result of the implementation of either Action Alternative.

5.3.27.8 Utah Department of Transportation (UDOT)

US-6 Delta to Juab County Line and SR-174 Project

- This project seeks to make various road improvements to US-6 between Delta and the Juab County Line/SR-174. Work began on this project in May 2024, and it is 86% complete at the time of writing this Plan-EA. There would be no CE to this project as a result of the implementation of any Alternative.

I-70/I-15 Interchange Bridge Maintenance Project

- This project consisted of routine maintenance to the I-70/I-15 Interchange Bridge in Millard County. The project was completed in September 2024. There would be no CE to this project as a result of the implementation of any Alternative.

5.3.27.9 Kanosh Band of Paiute Indians Projects (Kanosh Band)

Geothermal Energy Development Project(s)/DOI Grant

- The Kanosh Band was awarded a grant from the Department of the Interior's Energy and Mineral Development Program in September 2024 to support geophysical studies to evaluate the feasibility of geothermal energy development on Tribal lands. The benefits to the Kanosh Band that would occur as a result of this project would have interactive/additive cumulative benefits on the other projects conducted by the Kanosh Band.

RV Park Enhancement Project/USDA Grant

- The Kanosh Band was awarded a Department of Agriculture grant through the Rural Business Development Grant Program (RBDG) to provide technical assistance, training, and a computerized financial system for an RV park on their land. The benefits to the Kanosh Band that would occur as a result of this project would have interactive/additive cumulative benefits on the other projects conducted by the Kanosh Band.

Park and Playground Upgrades Project/Native American Initiative Project

- The Kanosh Band is collaborating with the Native American Initiative (NAI) program to upgrade an existing park and playground on Tribal land. The NAI also recently helped install new streetlights for the community. The benefits to the Kanosh Band that would

occur as a result of this project would have interactive/additive cumulative benefits on the other projects conducted by the Kanosh Band.

5.3.27.10 Findings of Cumulative Effects Analysis

NRCS reviewed the potential for there to be CE from the Alternatives in combination with projects that have occurred or will occur in the next 5 years in Millard County, Utah. Several effects would have interactive or additive cumulative benefits to other projects in the area. The only adverse CE that could occur under either Alternative is the potential to introduce invasive/noxious botanical species into the watershed during construction. However, BMPs will be implemented in either case to avoid or minimize the extent of these effects. For more information on the CE Analysis, see Appendices D and E.

6.0 Preferred Alternative

The NRCS's Preferred Alternative is Action Alternative 1 – Dam Replacement Alternative. The following subsections provide details on the Dam Replacement Alternative.

6.1 Rationale for the Preferred Alternative

Action Alternative 1 – Dam Replacement Alternative was selected as the Preferred Alternative due to its ability to meet the NEPA Purpose and Need, to address the problems and opportunities, meet the Federal Objective and project objectives, and to maximize net public benefits with appropriate consideration of costs above that of the No Action (FWOFI) Alternative and Action Alternative 2 – Nonstructural – Buyouts Alternative.

The Preferred Alternative was developed in collaboration and coordination with the local sponsor and co-sponsors to address the issues related to flood prevention and agricultural water management in the watershed.

The environmental consequences, both adverse and beneficial, of the Dam Replacement Alternative were analyzed under an ecosystem services framework described in Chapter 1 to better understand the alternative's contribution of net public benefits and contribution to overall social values.

The Dam Replacement Alternative supports the purpose of PL 83-566 as it reduces existing problems related to Flood Prevention and Agricultural Water Management. It avoids all the established project planning constraints.

The estimated cost of the Project is $33,247,000, of which $29,398,000 would be PL 83-566 funds, and the estimated installation period is 2 years.

6.2 Measures to be Installed

The measures to be installed under the Preferred Alternative would result in the flood protection and agricultural water management benefits described in Section 6.1. The installed measures and benefits are expected to last throughout the design life of the project, which is 50 years. The measures to be installed are discussed below:

6.2.1 Corn Creek Dam and Debris Basin

Corn Creek Dam and Debris Basin would be reconstructed to meet current NRCS and Utah Dam Safety engineering standards. This would mitigate the risk and consequences of dam failure. The dam improvements would eliminate the existing foundation and dam seepage problems which compromise the structural integrity of the dam and its ability to perform its intended purpose of flood control. The dam would be extended downstream and increased in height to increase flood storage capacity. The new dam would have a secondary spillway and an auxiliary spillway, in addition to the primary spillway and emergency spillway, which would be reconstructed. The proposed improvements would result in reduced risk of dam failure and increased flood protection for the Kanosh community, including protection of the downstream community from mud/debris flows which would result from a dam breach. Table 6-1 is a comparison between the existing dam design and the proposed modifications under the Preferred Alternative. Further details on the dam design can be found in Appendices D and E.

Table 6-1: Comparison of Existing Dam Design and Preferred Alternative Design

Component	Existing Conditions	Preferred Alternative
Structural height of dam	40 ft	50 ft
Hydraulic height of dam	27 ft	34 ft
Volume above ground surface	72,000 CY	228,000 CY
Drainage area	89 square miles	89 square miles
Maximum dam breach flow	5,000 cfs	10,840 cfs
Reservoir area at spillway crest	22 acres	47 acres
Reservoir storage at spillway crest	200 acre-ft	470 acre-ft
Reservoir storage at dam crest	468 acre-ft	907 acre-ft
Dam crest elevation (MSL)	5,198 ft	5,208.75 ft
Dam crest length	1,900 ft	2,200 ft
Dam crest width	12 ft	15 ft
Primary spillway type	Outlet pipe	Outlet pipe
Primary spillway elevation	5171.62 ft	5177 ft
Primary spillway diameter	60 in	42 in
Primary spillway maximum discharge	365 cfs	253 cfs
Secondary spillway type	Chute	Standpipe
Secondary spillway elevation	5189.62	5,199.0 ft
Secondary spillway diameter	N/A	7 ft
Secondary spillway weir length	25 ft	22 ft
Secondary spillway conveyance	Concrete chute to open channel	60-in pipe to open channel
Secondary spillway design flow (100-year)	1572 cfs	472 cfs
Emergency spillway type	Open channel, (4) 42-inch CMP arch culverts	Open channel, rectangular
Emergency spillway crest elevation (MSL)	5,189.5 ft	5,203.8 ft
Emergency spillway width	N/A	200 ft
Emergency spillway side slope (H:V)	N/A	Vertical
Emergency spillway design flow (100-year)	358 cfs	1,396 cfs
Auxiliary spillway type	N/A	Open channel, trapezoidal
Auxiliary spillway crest elevation (MSL)	N/A	5205.4 ft
Auxiliary spillway width	N/A	200 ft

Component	Existing Conditions	Preferred Alternative
Auxiliary spillway design flow (100-year)	N/A	75 cfs

Note *Hydrology data can be found in Appendix D.*

6.2.2 Flood Routing and Channel Improvements

The Preferred Alternative includes flood routing and channel improvements to protect Kanosh Town from flooding during a 100-year storm event. The homes in Kanosh Town and infrastructure within the town boundaries are completely protected under the Preferred Alternative, with no flooding taking place within these boundaries. Water is routed around the Town and conveyed across I-15, without overtopping the freeway. Other storm events were also modeled to ascertain the extent of flooding and incremental damage under the Preferred Alternative. The dam breach inundation maps for the modeled flood events can be found in Appendix C. To floodproof Kanosh Town from the 100-year flood event while preventing I-15 from overtopping, the infrastructure discussed below would need to be modified and/or installed.

6.2.2.1 Existing CCIC Ditch System with Improvements

The existing CCIC ditch system would be kept for flood control, but modifications would be made to route flood water away from the Town to open land further north and northeast of the Town to protect the Town from flooding. Some sections of the CCIC ditches that are a safety hazard would be replaced with pipes to eliminate the risk of accidental falls and drowning in these locations. Modifications would include splitting structure modifications to limit the East/Middle Ditch to 20 cfs and the Hatton Ditch to 200 cfs, channel and berm improvements to release water from the emergency channel approximately 600 feet upstream of where it currently ends to allow more water to flow to the large I-15 culvert, and various modifications to the West Ditch. The West Ditch modifications would increase its capacity from 65 cfs to 450 cfs downstream of Main Street. These would include installation of a 7-foot-wide and 4-foot-tall concrete-lined channel from Main Street to 200 West to replace the existing dirt ditch, replacing the existing 42-inch driveway culvert at 100 West with a bridge, replacing the existing 42-inch culvert at 200 West with a bridge, minor grading and modifications to divert water into the West Ditch instead of Town at approximately 200 East and Main Street, lowering the bank near the end of the West Ditch so that water can discharge into the field or is routed along Sandhill Road instead of across the field, and cleaning/increasing the capacity of the drain into the West Ditch where it first gets to Town.

6.2.2.2 Installation of Berms

The Alternative would install berms around the project area for flood control, to protect I-15 from overtopping. A large berm would be installed to reduce water flowing north along I-15 and redirect the water to cross I-15 through an existing 10-foot by 6-foot culvert. The berm would be approximately 2,200 feet long with an elevation of 4,787.75 feet. Smaller berms would be installed to divert water around private property and into the Hatton Ditch. See Appendix D for the location of the berms.

6.2.2.3 Road Improvements

Approximately 800 feet of dirt road would be raised 1 foot to prevent floodwater from flowing too far north and redirect the water through the large capacity I-15 culvert previously mentioned,

enough to prevent the overtopping of I-15. See Appendix D for the location of the proposed road modification.

6.2.3 Gravity Flow Irrigation Pipeline and Related Infrastructure

A gravity flow pipe irrigation system would be installed to convey most of the available irrigation water. The pipe system design capacity would be 40 cfs, which is sufficient to convey all of the water available in Corn Creek during the vast majority of the irrigation season and would provide enough water to meet crop water demands. When the flow in Corn Creek exceeds 40 cfs the excess water would flow into the existing open ditches, which are being kept for flood control and to convey high water to the fields. Pipe sizes would range from 15-inch to 36-inch and the pipes would convey flows ranging from 8 cfs to 40 cfs. More details on the gravity flow irrigation pipeline design can be found in Appendix D.

A diversion structure would be installed upstream of the Debris Basin to split water between CCIC, Kanosh Band, and Kanosh Town, in proportion to their shares. When the flow in Corn Creek is less than 50 cfs, CCIC's water would be conveyed through the bypass channel along the south side of the Debris Basin where the bypass channel can be constructed in a clay deposit that would minimize seepage losses. The bypass channel would take low flow water directly to the low-level outlet where it can be diverted into the pipe system. Flows in excess of 50 cfs would flow into the Debris Basin where the water can be detained to remove sediment and debris likely to be in higher flows. Details on the design of the diversion structure can be found in Appendix D. The bypass channel along the south bank of the debris basin would avoid high seepage losses that occur in the center of the debris basin. These improvements would result in water conservation to the CCIC shareholders, resulting in increased agricultural productivity on the farmlands.

Figure 6-1 shows the proposed improvements to the existing ditch system. Approximately 111,136 feet of pipe would be installed. This would include 25,622 feet of pipe that would replace the existing ditch, 11,304 feet of pipe where no ditch currently exists, and 74,209 feet of pipe would be installed alongside the existing ditch. Figure 6-1 also shows the 1,397 feet of existing pipe that would remain. Approximately 123,731 feet of the existing ditch would continue to be used for flood control and irrigation during high flows. Approximately 923 feet of the existing ditches would be abandoned.

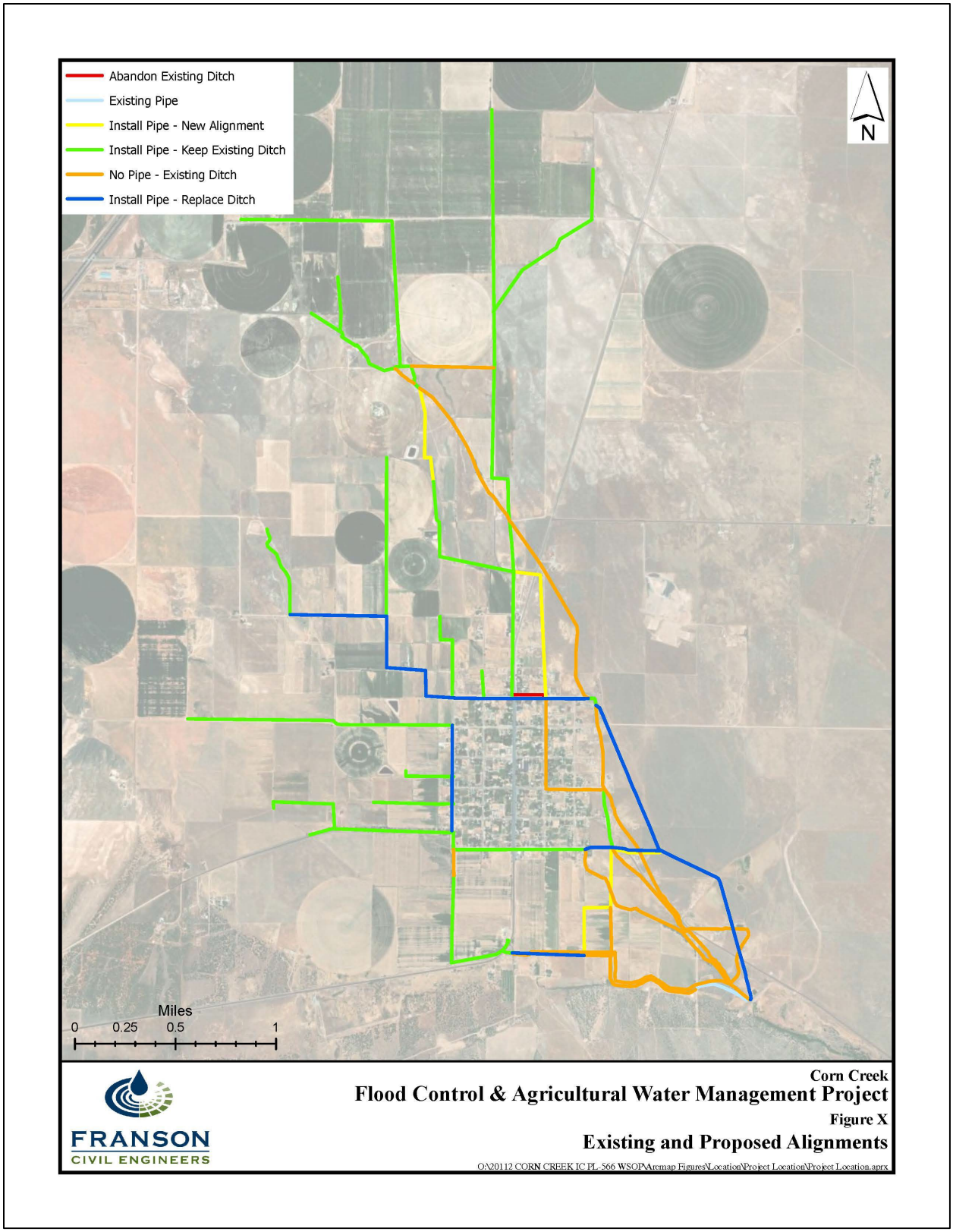

Figure 6-1: Existing and Proposed Alignments

6.2.4 Secondary Water System Regulating Pond and Related Infrastructure

Under the Preferred Alternative, the new dam would be extended downstream to increase the dam height for additional water detention capacity in the debris basin. This would eliminate the existing secondary water system regulating pond, which belongs to the Town. A new pond would be constructed upstream and east of the debris basin to temporarily store water and increase water pressure in the Town's secondary water systems. The new pond would also have sufficient elevation to provide adequate pressure for the Kanosh Band's secondary system. The current location of the Town's secondary system would not provide adequate pressure for a Kanosh Band secondary system. The volume of the pond would be approximately 2.8 acre-feet. The pond would have an overflow pipe to convey excess water to CCIC's bypass channel west of the debris basin. Related improvements would include:

- A splitting structure to split water diverted from the diversion structure between the Town and the Tribe
- Pipelines (12-, 15-, and 18-inch PIP) and related infrastructure to connect the pond to the existing Town secondary water pipelines downstream of the debris basin and the existing 12-inch pipeline to the Kanosh Band
- A pipe network with connections at each home on the Kanosh Band Reservation. The pipe network would connect to the existing 12-inch PVC pipe which currently delivers water to an existing pond at the Tribal reservation.

The Tribal pond would be eliminated, and the residential connections made directly to the existing 12-inch PVC pipe. More information on the design of the Kanosh Band's secondary water system can be found in Appendix D. Relocation of the pond creates an opportunity to select a strategic location that would increase water pressure in the Town and Tribe's secondary water systems, resulting in the reduction of outdoor water demand on their culinary water systems and sustainability of their culinary water systems for current and future generations. The Tribe's secondary water system would also include a connection for future agricultural expansion on Tribal lands within the project area.

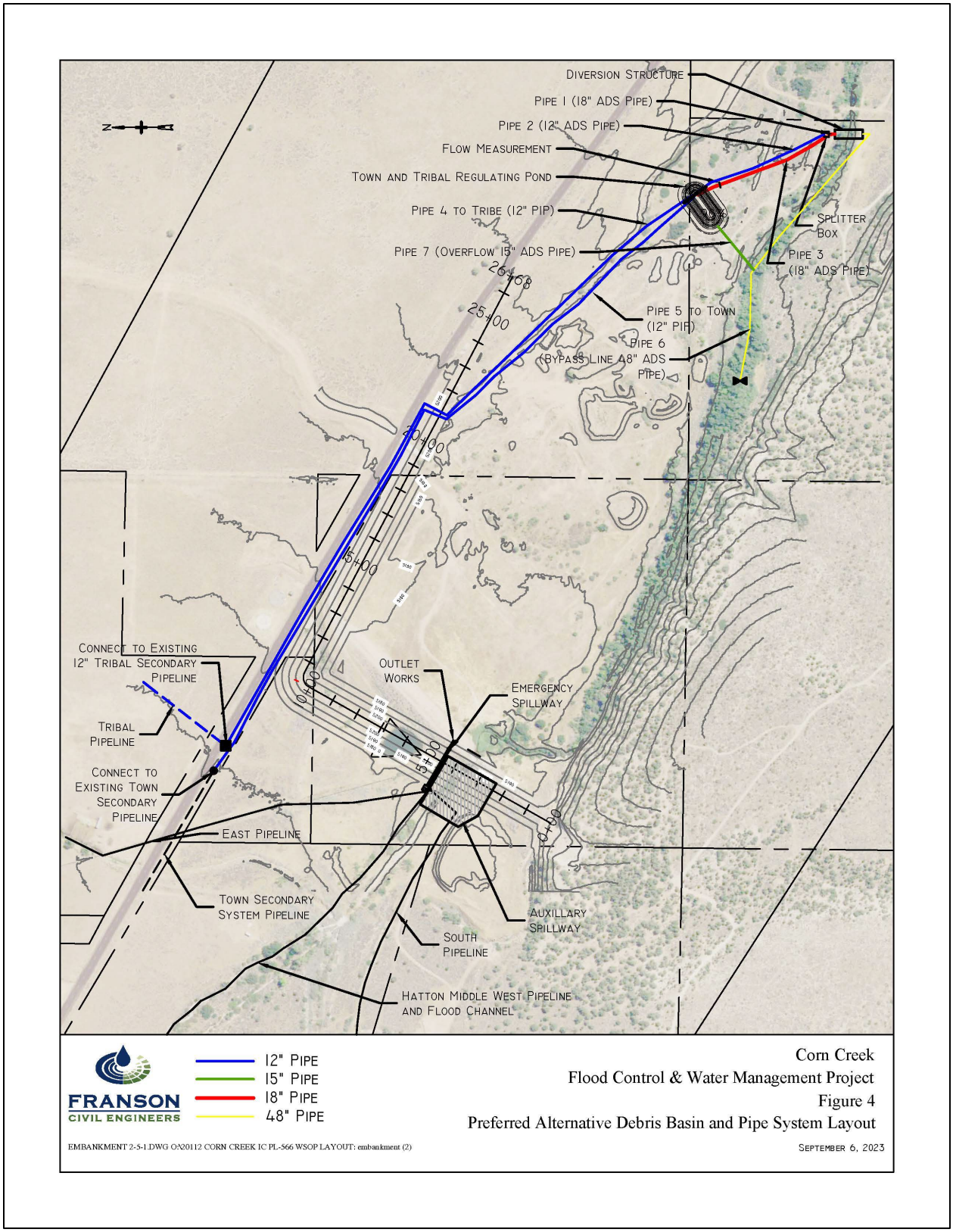

Figure 6-2: Preferred Alternative Debris Basin and Pipe System Layout

6.3 Irreversible or Irretrievable Commitment of Resources

Irreversible effects are those caused by the Preferred Alternative that cannot be reversed and are considered permanent. Irretrievable effects are gains and losses of outputs such as land use and may occur in the short-term or the long-term.

The Preferred Alternative does not have any irreversible effects.

The Preferred Alternative would have two irretrievable resources. The first would be the use of construction equipment and materials in the form of labor and fossil fuels. Additionally, the use of project financial resources is irretrievable in the short-term but should be supported in the long-term via the benefits of alternative implementation.

6.4 Areas of Controversy

No areas of controversy have been identified related to the Preferred Alternative. No comments of opposition to the project were received during the 30-day public review period of this Plan-EA.

6.5 Permits and Compliance

Prior to construction of the proposed project components, during construction, and, in some cases, following construction, the following permits or authorizations would be required:

- **Stream Alteration Permit:** Section 73-3-29 of the Utah Code requires any person, governmental agency, or other organization wishing to alter the bed or banks of a natural stream to obtain written authorization from the State Engineer prior to beginning work.
- **Floodplain Disturbance Permits:** Under FEMA rules and regulations, each local regulation agency is required to implement a floodplain disturbance permit.
- **Construction Water Discharge Permits:** When construction dewatering is required that would discharge to WOTUS, wetlands, ditches, or other possible waterways, a construction water discharge permit may be required from the Utah Division of Water Quality.
- **Utah Pollutant Discharge Elimination System (UPDES):** Construction activities that disturb more than one acre of land require a SWPPP to comply with the UPDES permit. BMPs must be in place to prevent sedimentation or other impacts to water quality in the project area. This permit process requires an NOI, NOT, and regular inspections by the contractor's storm water inspector as well as an inspector of the agency responsible for compliance.
- **USACE:** This project may require compliance with Section 404 of the CWA since most of the wetlands affected by the project are associated with the Corn Creek channel, irrigation and flood control ditches, and return flows from the irrigation system. Consultation with USACE may be required to determine if these waterways are jurisdictional and require mitigation. During design, additional adjustments within the corridors cleared by the environmental process would be used to minimize impacts on wetlands, preferring avoidance to mitigation.
- **Utah Division of Water Rights:** Change application for the point of diversion may be necessary to divert water upstream of the debris basin.
- **Permissions to Access Kanosh Band Land:** Coordination would be conducted with the Chairman of the Kanosh Band to obtain access to Tribal land during construction.
- **Easements:** Easements from private and public landowners would be obtained prior to

construction. Utility easement encroachment permits would also be acquired from local utility companies where necessary.

The project sponsor is responsible for complying with all BMPs and impact minimization efforts described in Chapter 5, and for obtaining and complying with any permits, if required.

6.6 Mitigation of Potential Effects

The following subsections will address impacts associated with the Preferred Alternative relative to specific resources and will describe the measures and management practices which would be implemented under the alternative to provide avoidance, minimization, and mitigation if necessary.

6.6.1 Soils

There are no negative impacts associated with the Preferred Alternative on the long-term conditions of the soil in the project area. Short-term impacts associated with construction would be addressed with construction BMPs as follows:

- Since the area of disturbance is greater than 1.0 acre, a SWPPP is required under the UPDES and the National Pollutant Discharge Elimination System (NPDES). The SWPPP would be prepared in compliance with Section 402 of the CWA and would describe the measures to minimize erosion and prevent soil from leaving the site it is stabilized.
- With the required SWPPP, a NOI would be required before ground disturbance could begin.
- Erosion control measures such as the use of straw waddles, dikes, silt fences, vegetative barriers, compost socks, and other approved BMPs would be implemented. Straw bales would not be allowed in efforts to prevent the spread of noxious weeds.
- Topsoil preservation and revegetation would be required as part of the SWPPP.
- Revegetation would be consistent with the surroundings with native seeds, seedlings, bare root starts, and pole plantings being used in riparian zones and agricultural compatible vegetation used in the agricultural areas.
- Tracking pads would be used at the access to all public roads from construction easements and staging areas to minimize the movement of soils.
- Regular EPA compliant inspections would be used to monitor compliance with the SWPPP and stormwater rules.

6.6.2 Water

BMPs would be implemented to mitigate and reduce impacts to surface and groundwater quality during and after construction including:

- Ensuring the SWPPP includes the appropriate BMPs to provide for sediment traps, sediment ponding, or intercepting channels, and containment facilities to capture and remove sediment before it can enter a natural water body.
- Provide sanitation facilities for construction workers to prevent contamination with nitrates, phosphates, E. Coli, etc.
- Ensure the SWPPP addresses the use of petroleum products and other potentially hazardous materials including the proper storage and disposal in accordance with NPDES requirements.

- Designated concrete wash-out facilities would be used away from water bodies for all concrete clean-up operations and at approved locations designated in the SWPPP. Concrete remnants would be legally disposed of off-site upon completion of all concrete operations.
- Consultation with USACE regarding compliance with Section 404 permits would be finalized prior to construction. Jurisdictional wetlands would be fenced off with construction fence to protect them during construction. BMPs such as filter strips, waddles, and silt fences would be placed to protect the wetlands that are to not be disturbed from impacts within the construction/staging areas. Additionally, the construction of crossings would require the restoration of any disturbed wetlands to the same conditions prior to construction of buried pipelines.
- All temporary use areas would be located outside marked wetland boundaries. Ground disturbance would be limited to parking, turning, storing materials, or storing equipment. These areas will be reclaimed when construction is final.

6.6.3 Air

BMPs would be implemented to mitigate for temporary impact on air quality due to construction activities including but not limited to the following:

- As part of the SWPPP, a dust control plan would be required. This would include, but would not be limited to, the application of dust suppressants and watering to control fugitive dust, minimizing the extent of disturbed surfaces during times of high wind, installing tracking pads at all accesses to roadways, removing tracked-out materials deposited onto adjacent roadways, establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust, the use of appropriate emission-control devices on all construction equipment, using only properly operating and well-maintained construction equipment, limiting earthwork activities, and limiting the use of, and traveling speeds on unimproved road surfaces.

6.6.4 Plants

BMPs would be implemented to minimize negative consequences on endangered and threatened species during construction, including but not limited to:

- Limit ground disturbances to only the areas necessary to safely implement the Preferred Alternative.
- Construction limits would be flagged onsite to avoid unnecessary plant loss or ground disturbance.
- Ensure that contractors and project managers can identify special status plant species that can occur in the project area. If a plant is discovered, work would stop.
- If special status plants are identified in pre-construction surveys in or adjacent to the construction corridor, protection of the plants would be prioritized.
- Weed control on all disturbed areas would be required.
- The disturbed area would be reconstructed by using native topsoil, native seeds, and replacing organic matter.
- Upon the completion of work, decontamination would be performed within the work area before the vehicle and/or equipment would be removed from the project site.
- The disturbed areas would be seeded at appropriate times with weed-free, native seed mixes (except in agricultural areas) consisting of a variety of appropriate species to

promote the revegetation of the disturbed areas.
- Weed control measures would be implemented to county standards at a minimum.
- Maintain disturbed areas on a regular basis to prevent the establishment of noxious weeds and invasive plant species.
- Clean equipment prior to delivery to the project site, and routine monitoring after construction completion.

6.6.5 Animals

BMPs would be employed to minimize the effect of project activities on special status animal species. These BMPs would include but not be limited to:

- Limiting ground disturbance to only areas necessary to safely implement the Preferred Alternative.
- Restricting construction activities to avoid sensitive breeding or nesting seasons if potential habitat for special status animal species is identified during screening prior to construction.
- Using existing roadways/maintenance routes where available to reduce habitat disruption.
- Restoring disturbed vegetation within the animal habitat as close as possible to pre-existing conditions on completion.
- Ensuring that contractors and project managers can recognize the special status animal species identified in Section 3.2 as potentially present in the project area.
- Prioritizing the protection of special status animal species if identified in pre-construction surveys in or adjacent to the construction corridor.
- Placing appropriate buffers on nests if construction activities should occur in the late spring/early summer or any time active breeding, nesting, or pre-fledging behavioral activities occur. This would be done in accordance with the USFWS Utah Raptor Guidelines until fledging activities conclude.
- Reinstating disturbed areas as close as practicable to pre-existing conditions at the end of the project to restore affected bird habitat.

6.6.6 Humans

BMPs would be employed to minimize the effect of project activities on the human environment. The BMPs would include the following:

- Resolution of adverse effects is being carried out pursuant 800.6 of the NHPA. A MOA is in Appendix A. $20,000 was estimated for cultural mitigation costs for the adverse effects to historic ditches within the project area. The MOA has been developed per 36 CFR 800.6.
- If cultural resources are discovered during construction activities, all ground-disturbing activities within 50 feet of the discovery shall cease and the NRCS archaeologist would be notified, and the Prototype Programmatic Agreement procedures would be followed. If human remains are discovered under any circumstances, all work in the immediate vicinity (100 feet) would immediately halt, and the Millard County Sherriff, the NRCS archaeologist, and the Utah State History's Human Remains Program would be contacted.
- Construction sites would be closed to public access.
- All construction would be completed in compliance with Federal safety laws/rules/regulations governed by OSHA.

- All traffic control would be in compliance with the FHWA Manual on Uniform Traffic Control Devices (MUTCD). Flaggers would be used where beneficial and required for safety.
- Noise control and dust control measures would be employed to minimize their effect on the environment.
- Implementation of construction-related and visual resource-specific BMPs coincides with the dust control plan, erosion control plan, and the vegetative restoration plans included in the SWPPP.
- Require appropriate emission-control devices on all construction equipment and using only properly operating and well-maintained construction equipment.

6.7 Costs and Cost-Sharing

The estimated project construction cost for the Preferred Alternative is $27,652,000. This excludes technical and administrative costs. The cost has been broken down into PL 83-566 program categories as shown in Table 6-2. A detailed breakdown of these costs can be found in Appendix D.

Table 6-2: Estimated Construction Cost, 2023 Dollars

Category	Subcategory	Construction Costs
Flood Control	Corn Creek Dam and Debris Basin Reconstruction	$11,147,000
	Secondary System Regulating Pond Relocation and Installation of Related Infrastructure	$1,426,000
	Flood Routing and Channel Improvements	$639,000
	Subtotal	**$13,212,000**
Agricultural Water Management	Gravity Flow Irrigation Pipe Network	$14,300,000
	Tribal Connections	$140,000
	Subtotal	**$14,440,000**
	Total	**$27,652,000**

The installation costs from Table 6-3 are anticipated to be shared by several entities and funding programs as shown in Table 6-3.

Table 6-3: Estimated Construction Cost-Share, 2023 Dollars

Category	Subcategory	NRCS Funding	Estimated Costs (Dollars)		
			Cost Share-PL 83-566	Cost Share-Other Funds	
			Federal	Federal	Non-Federal
Flood Control	Corn Creek Dam and Debris Basin Reconstruction	Up to 100%	$11,147,000	$0	$0
	Secondary System Regulating Pond Relocation and Installation of Related Infrastructure	Up to 100%	$1,426,000	$0	$0
	Flood Routing and Channel Improvements	Up to 100%	$639,000	$0	$0
			0		
	Subtotal		**$13,212,000**	**$0**	**$0**
Agricultural Water Management	Gravity Flow Irrigation Pipe Network	Up to 75%	$10,725,000	$0	$3,575,000
	Tribal Connections	Up to 90%	$126,000	$0	$14,000
	Subtotal		**$10,851,000**	**$0**	**$3,589,000**
Total			**$24,063,000**	**$0**	**$3,589,000**

6.8 Ecosystem Services Benefits

The Preferred Alternative would improve the provision of ecosystem services in the project area in the following ways:

6.8.1 Provisioning Services

Water conservation as a result of the Preferred Alternative would result in an average of 3,148 acre-feet of savings and an expected crop yield increase of 64% for alfalfa and 73% for grass hay over approximately 3,000 acres of land, providing a significant improvement to the delivery of Provisioning Services to the project area. The total annual increase in crop yields, assuming no changes in overall cropping patterns, would be expected to increase to approximately 7,400 tons/year for alfalfa and 983 tons/year for other hay. Finally, the installation of the proposed agricultural water management measures would provide an average annual monetary benefit of $1,490,049 to the area, demonstrating benefits to the provisioning service of drinking water supply.

6.8.2 Regulating Services

The Preferred Alternative would protect the Town of Kanosh against the 100-year storm event/the Dam Breach and would provide annual monetary flood damage reduction benefits of $2,252,548. The quality of secondary water would be improved as the water would be piped and would not be subject to contamination; this would create an observed decrease in turbidity. The watershed would become more resilient to drought/climate change under this Plan as significant water savings would occur (~3,148 AF), decreasing reliance on the groundwater system for late season irrigation needs.

6.8.3 Cultural Services

The construction of the project would provide adequate secondary water delivery to the Kanosh Band of Paiutes and to the Town of Kanosh. Agricultural development and viability would be supported/improved by this plan as it would protect the open space viewshed and encourage the perpetuation of the agricultural sector. Additionally, there would be benefits to the Kanosh Band Tribal community as a result of the agricultural water management measures which would provide an average annual monetary benefit of $1,490,049. Although this Plan would include some adverse impacts to cultural/historic properties, it would ultimately protect the historic properties that would otherwise be damaged during a dam breach within the indirect APE.

6.9 Installation and Financing

The following subsections present the details regarding the installation and financing of the Preferred Alternative.

6.9.1 Installation

The SLOs would obtain all approvals and permits for the project prior to the start of construction. During design, a project permit checklist would be created with a tracking process to ensure that all permits are complied with accordingly. The entire project would be completed over a 5-year period. The sponsors developed an appropriate design and construction phasing schedule that focused on sequencing of the project based on maintaining the economic viability of the SLOs during construction, protecting the environment, and minimizing risks. Phase 1 would include installation of the gravity flow irrigation pipe system to take advantage of grant money in the sum of $2,000,000, from the Utah Agricultural Water Optimization Program. Phase 2 would include construction of the Dam and Debris Basin, flood routing and channel improvements including, construction of the diversion structure, relocation of the secondary water pond, and installation of related infrastructure including the Kanosh Band secondary system.

6.9.2 Responsibilities

NRCS is responsible for leading the planning efforts, providing engineering design and construction oversight assistance, and certifying project completion. The SLOs would be responsible for engineering design, project administration, environmental permitting, contracting, and construction implementation.

6.9.3 Contracting

Implementing the Preferred Alternative would be completed using NRCS funding mechanisms. The SLOs would be primarily responsible for overseeing/administering project construction in coordination with NRCS.

6.9.4 Real Property Rights

Real property acquisition or relocation would not be required for most of the Preferred Alternative. Most construction would be completed either in existing right of way or in easements that are controlled by the project sponsors. The project sponsors have committed to obtain easements for areas where property is not already owned, or easements already exist. These areas include:

- Kanosh Town owns all of the property that will be needed to construct the proposed dam and most of the reservoir basin. However, flood easements will need to be obtained for higher elevation area of the reservoir basin. Figure 4-2 identifies the contour that represents the maximum water level. The maximum water level represents the elevation of the top of the dam which is slightly higher than the water level when routing the PMF through the reservoir.
- An easement will be needed for the diversion structure, pipelines, splitter box, and regulating pond upstream of the debris basin. These structures can be seen on Figure 4-2.
- The vast majority of the pipe system will be installed within existing easements. However, a few sections of pipe will be installed outside existing easements. These pipelines sections can be seen on Figure 6-1 (Install Pipe – New Alignment). These pipe sections are located on land owned by shareholders in CCIC. These landowners have indicated a willingness to donate an easement for the pipeline since the realigned pipeline will deliver water to their land.
- Some berms and improvements identified on Figure 4-4 will require easements. The project sponsors will obtain easements for these structures.

6.9.5 Emergency Action Plan (EAP)

The existing EAP for Corn Creek Dam was prepared in September 1995. CCIC shall prepare an updated EAP to address the dam improvements. The EAP shall be prepared as a standalone document and shall be in accordance with:

1) 210-NRCS National Engineering Manual, Part 520, Subpart B, Section 520.27
2) 180-NRCS National Operations and Maintenance Manual, Part 500, Subpart F, Section 500.52
3) Utah Dam Safety Requirements

The NRCS shall determine that an adequate EAP has been prepared prior to the execution of fund obligating documents for construction of the Dam. CCIC shall review and update the EAP annually to include all local points of contact necessary for an emergency response and shall ensure consistency with the project.

6.9.6 Financing

Based on the PL 83-566 funding program guidelines, NRCS would provide financing assistance as follows:

- Engineering Technical Assistance for Design and Construction Management
    - 100% for Flood Control/Flood Damage Reduction Projects
    - 100% for Agricultural Water Management Projects
- Installation Costs
    - 100% for Flood Control/Flood Damage Reduction Projects
    - 75% for CCIC Agricultural Water Management Projects

- 90% for Tribal Agricultural Water Management Projects

The required matching funding is expected to be provided through a mix of grants, loans, and co-sponsor participation in the installation of the irrigation pipe system. CCIC has been actively working with the State of Utah Agricultural Water Optimization Program which has committed $2,000,000 to date as matching funds for the irrigation system improvements.

O&M costs after project completion would continue to be provided through the annual assessments of the sponsor and co-sponsors. The O&M costs of the installed project components are not expected to change significantly.

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

6.10 Operation, Maintenance, and Replacement

CCIC would be responsible for the OM&R of the gravity irrigation system during the design life of the project. Additionally, the CCIC would be responsible for the O&M of the debris basin, dam, ditches, and the upper diversion structure. Prior to construction, a separate O&M agreement based on NRCS's O&M Manual would be made. The agreement would continue through the design life of the project.

The Town of Kanosh has historically worked with CCIC during periods of flooding. They have also worked together on the secondary system. This would be expected to continue.

The Kanosh Band would be responsible for the O&M of the installed pipeline for their secondary water system. Prior to construction, a separate O&M agreement based on NRCS's O&M Manual would be made. The agreement would continue through the design life of the project.

The SLOs and the NRCS would make annual inspections of project measures to assure the quality of ongoing O&M. The co-sponsors would be responsible for scheduling O&M inspections and for any necessary work. The co-sponsors' O&M would consist of a pipe inspection program, water measurement reading and maintenance, seepage evaluations, gate maintenance, annual filling and draining of the irrigation line, regular maintenance of the flood routing water ways, and the control of noxious weeds which may compromise the installed infrastructure.

OM&R costs have been estimated as shown in Table 6-4.

Table 6-4: Operation, Maintenance, and Replacement Costs Summary, 2023 Dollars

Category	Description	Estimated Preferred Alternative Annual Cost
Flood Control	Debris basin and channel maintenance	$18,500
Agricultural Water Management	Gravity pipe system maintenance	$10,000
Total		**$28,500**

6.11 Economic Tables and Structural Tables

A more detailed Benefit and Cost Analysis is provided in the Economist's Report in Appendix D. The preferred alternative was broken into two increments to complete the economic analysis. The flood control measures were described as Alternative 1A and agricultural water management measures were described as Alternative 1B.

The tables in this section summarize the results of the incremental economic analysis. It should be noted that the overall project has a benefit cost ratio with all elements exceeding 1.0. Drawings showing the conceptual engineering design for the preferred alternative can be found in Appendix C.

The Dams with Planned Storage Capacity structural table (NWPM 501.49, Structural Table 3) was not used because the new dam is not designed for storage. The new debris basin embankment details can be seen in section 6.2, Table 6-1. Table 6-8 (NWPM 501.50 Table 3a) shows the structural data for the large berm that is proposed to be constructed near I-15. See Appendix E, Technical Memorandum 004 for supporting documentation. The smaller berms to divert water into the Hatton ditch were minor and not included in Table 6-8. The Channel Work structural table (NWPM 501.51, Structural Table 3b) was not used as the channel work being performed as part of the preferred alternative was minimal.

Table 6-5: (Economic Table 1) Estimated Installation Cost, Corn Creek Watershed Plan, Utah (Dollars)[1]

Works of Improvement[2]	PL 83-566 Funds[3]	Other Funds	Total
Alternative 1A – Flood Control	$15,946,000	$185,000	$16,131,000
Alternative 1B – Agricultural Water Management	$13,452,000	$3,664,000	$17,116,000
Total Project	**$29,398,000**	**$3,849,000**	**$33,247,000**

[1] *Price base: 2023*
[2] *All works of improvement would be on non-federal land*
[3] *NRCS is the responsible Federal agency participating in the installation of the works of improvement*
Prepared August 2023
All costs include the distributed costs for technical support and other program costs not associated with construction

Table 6-6: (Economic Table 2) Estimated Cost Distribution, Corn Creek Watershed Plan, Utah (Dollars)[1]

Installation Cost Items		Alternative 1A – Flood Control	Alternative 1B – Agriculture Water Management	Total Project
Installation Costs: PL-	Construction Costs	$13,212,000*	$10,851,000	$24,063,000

Installation Cost Items		Alternative 1A – Flood Control	Alternative 1B – Agriculture Water Management	Total Project
83-566 Funds	Engineering Technical Assistance Costs	$2,598,000	$2,456,000	$5,054,000
	Project Admin Costs	$136,000	$145,000	$281,000
	Total PL-83-566 Costs	**$15,946,000**	**$13,452,000**	**$29,398,000**
Installation Costs: Other Funds	Construction Costs	$0	$3,589,000	$3,589,000
	Engineering Costs	$0	$0	$0
	Real Property Land rights	$75,000	$75,000	$150,000
	Mitigation	$0	$0	$0
	Permits	$110,000	$0	$110,000
	Project Admin. Costs	$0	$0	$0
	Total Other Funds	**$185,000**	**$3,664,000**	**$3,849,000**
Total Project Cost		**$16,131,000**	**$17,116,000**	**$33,247,000**
Amortized Costs, FY2022 Rate		$584,300	$619,800	$1,204,100
Annual O&M		$18,500	$10,000	$28,500
Total Annual Costs		**$602,800**	**$629,800**	**$1,232,600**
***This construction total includes mitigation costs of $20,000 as discussed in section 6.6.6.				

Table 6-7: (Economic Table 2a) Cost Allocation and Cost Sharing Summary, Water Resource Project Measures, Corn Creek Watershed Plan, Utah (Dollars)[1]

Item	Cost Allocation[2]			Cost Sharing					
	Purpose			PL 83-566			Other		
	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total
Corn Creek Dam and Debris Basin									
Construction	$11,147,000	$0	$11,147,000	$11,147,000	$0	$11,147,000	$0	$0	$0
Engineering/ CM	$2,230,000	$0	$2,230,000	$2,230,000	$0	$2,230,000	$0	$0	$0
Project Admin	$112,000	$0	$112,000	$112,000	$0	$112,000	$0	$0	$0
Permits/ Easements	$75,000	$0	$75,000	$0	$0	$0	$75,000	$0	$75,000
Subtotal	$13,564,000	$0	$13,564,000	$13,489,000	$0	$13,489,000	$75,000	$0	$75,000
Secondary System Regulating Pond Relocation									
Construction	$1,426,000	$0	$1,426,000	$1,426,000	$0	$1,426,000	$0	$0	$0
Engineering/ CM	$242,000	$0	$242,000	$242,000	$0	$242,000	$0	$0	$0
Project Admin	$15,000	$0	$15,000	$15,000	$0	$15,000	$0	$0	$0
Permits/ Easements	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$1,683,000	$0	$1,683,000	$1,683,000	$0	$1,683,000	$0	$0	$0
Flood Routing and Channel Improvements									
Construction	$639,000	$0	$639,000	$639,000	$0	$639,000	$0	$0	$0

Item	Cost Allocation[2]			Cost Sharing					
	Purpose			PL 83-566			Other		
	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total
Engineering/ CM	$108,000	$0	$108,000	$108,000	$0	$108,000	$0	$0	$0
Project Admin	$7,000	$0	$7,000	$7,000	$0	$7,000	$0	$0	$0
Permits/ Easements	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$754,000	$0	$754,000	$754,000	$0	$754,000	$0	$0	$0
Permitting									
Construction	$0	$0	$0	$0	$0	$0	$0	$0	$0
Engineering/ CM	$18,000	$0	$18,000	$18,000	$0	$18,000	$0	$0	$0
Project Admin	$2,000	$0	$2,000	$2,000	$0	$2,000	$0	$0	$0
Permits/ Easements	$110,000	$0	$100,000	$0	$0	$0	$110,000	$0	$110,000
Subtotal	$130,000	$0	$130,000	$20,000	$0	$20,000	$110,000	$0	$110,000
Gravity Flow Irrigation Pipeline									
Construction	$0	$14,300,000	$14,300,000	$0	$10,725,000	$10,725,000	$0	$3,575,000	$3,575,000
Engineering/ CM	$0	$2,432,000	$2,432,000	$0	$2,432,000	$2,432,000	$0	$0	$0
Project Admin	$0	$143,000	$143,000	$0	$143,000	$143,000	$0	$0	$0

Item	Cost Allocation[2]			Cost Sharing					
	Purpose			PL 83-566			Other		
	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total	Flood Control	Agricultural Water Management	Total
Permits/ Easements	$0	$75,000	$75,000	$0	$0	$0	$0	$75,000	$75,000
Subtotal	$0	$16,950,000	$16,950,000	$0	$13,300,000	$13,300,000	$0	$3,650,000	$3,650,000
Tribal Connections									
Construction	$0	$140,000	$140,000	$0	$126,000	$126,000	$0	$14,000	$14,000
Engineering/ CM	$0	$24,000	$24,000	$0	$24,000	$24,000	$0	$0	$0
Project Admin	$0	$2,000	$2,000	$0	$2,000	$2,000	$0	$0	$0
Permits/ Easements	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$0	$166,000	$166,000	$0	$152,000	$152,000	$0	$14,000	$14,000
Total	**$16,131,000**	**$17,116,000**	**$33,247,000**	**$15,946,000**	**$13,452,000**	**$29,398,000**	**$185,000**	**$3,664,000**	**$3,849,000**

Price base 2023

Table 6-8: (Structural Table 3a) Structural Data – Large Berm, Corn Creek Watershed Plan, Utah

Stationing	Top Width (ft)	Average Side Slope (H/V)	Average Height of Dike (ft)	100-Year Frequency Velocity (ft/s)	Dike Protection	Volume of Earth Fill (cubic yards)
0+00	5	3	6	n/a	n/a	0
5+00	5	3	4.6	n/a	n/a	1285
10+00	5	3	3.2	n/a	n/a	799
15+00	5	3	1.8	n/a	n/a	421
20+00	5	3	.4	n/a	n/a	151
21+50	5	3	0	n/a	n/a	7

Table 6-9: (Economic Table 4) Estimated Average Annual NEE Costs, Corn Creek Watershed Plan, Utah (Dollars)[1]

Works of Improvement	Project Outlays			Total
	Amortization of Installation Cost	Operation, Maintenance and Replacement Cost[2]	Other Direct Costs	
Alternative 1A – Flood Control	$584,300	$18,500	$0	$602,800
Alternative 1B – Agricultural Water Management	$619,800	$10,000	$0	$629,800
Total Project	**$1,204,100**	**$28,500**	**$0**	**$1,232,600**

[1] *Discount rate 2.50% with a 52-year period of analysis. Price base: 2023*

Table 6-10: (Economic Table 5) Estimated Average Annual Flood Damage Reduction Benefits, Corn Creek Watershed Plan, Utah (Dollars)[1]

	Average Annual Damages without Project		Average Annual Damages with Project		Average Annual Benefits	
Item	**Ag Related**	**Non-Ag Related**	**Ag Related**	**Non-Ag Related**	**Ag Related**	**Non-Ag Related**
Floodwater Damage						
Structures, Contents, Vehicles		$2,520,432		$57,403		$2,463,029
Roads/Crossings		$397,331		$17,408		$379,923
Crop	$5,200		$3,458		$1,742	
Subtotal	**$5,200**	**$2,917,762**	**$3,458**	**$74,810**	**$1,742**	**$2,842,952**
Sediment/Erosion Damage						
Subtotal	$13,230	$0	$2,577	$0	$10,653	$0
Indirect Damage[1]						
Non-Pressurized Pipeline					$1,490,049	
Subtotal	$0	$0	$0	$0	$1,490,049	$0
Grand Total	**$18,430**	**$2,917,762**	**$6,035**	**$74,810**	**$1,502,444**	**$2,842,952**

Note: Discount rate 2.50% with a 52-year period of analysis. Price base 2023
Irrigation pipe is an additional benefit and does not eliminate existing damages

Table 6-11: (Economic Table 6) Comparison of Annual NEE Benefits and Costs, Corn Creek Watershed Plan, UT (Dollars)[1]

Works of Improvement	Average Annual Costs[2]	Average Annual Benefits	Benefit Cost Ratio	Net Annual Economic Benefit
Alternative 1A – Flood Control	$602,800	$2,855,348	4.74	$2,252,548
Alternative 1B – Agricultural Water Management	$629,800	$1,490,049	2.37	$860,249
Total	**$1,232,600**	**$4,345,396**	**3.53**	**$3,112,796**

[1] *Price base: 2023*

7.0 Consultation, Coordination, and Public Participation

This chapter details other consultation and coordination between NRCS and other federal, state, and local Government Agencies, Native American Tribes, and the public during the preparation of this Plan-EA.

7.1 Consultation

7.1.1 Standard Requirements

Standard consultation requirements include NHPA Section 106 consultation, NEPA consultation, and Biological consultation (i.e., ESA section 7 and PL 83-566 section 12). Documentation of these standard consultation requirements is included in Appendix A and Appendix E.

7.1.1.1 NHPA Consultation

SHPO Consultation

In compliance with Section 106 of the NHPA, the Utah SHPO were involved in consultation for the project (36 CFR 800.3). The NRCS consulted with the Utah SHPO on defining the APE (36 CFR 800.16(d)), site eligibility (36 CFR 800.4)), project effects (adverse effect determination) (36 CFR 800.5), and consultation for the MOA (36 CFR 800.5(d)(2)). Consultation initiation letters requesting concurrence on APE, site eligibility, and project effects, were sent on April 9, 2024, to the NHPA consulting parties. SHPO sent concurrence back on June 4, 2024. As an additional component of Section 106 consultation, a notification letter to the ACHP notifying them of the adverse effect determination was sent on June 4, 2024. The ACHP chose not to participate in consultation in their response on June 27, 2024. Documentation may be found in Appendix A.

Tribal/THPO Consultation

In accordance with the NHPA of 1966 and EO 13007, and EO 13175, tribal consultation was conducted to maintain the NRCS' government-to-government relationship. Tribes who hold ancestral land, traditional use, and/or traditional cultural property claims in and near the Project area were identified using the NPS NAGPRA Native American Consultation Database, a database through which any federally recognized tribe could identify those counties in Utah where they had consultation interests. The Tribal Directory Assessment Tool (TDAT), the BIA website, and the Utah Division of Indian Affairs (UDIA) website were used as supplemental sources to identify tribes with consultation interests. The assembled list of tribes identified from the previously mentioned websites is listed below.

Consultation was initiated during the NEPA scoping process when the NRCS reached out to the assembled list of tribes regarding known historic properties or places of traditional religious and cultural importance near the Project area. Letters were mailed on April 26, 2021, to the following tribes for the public scoping meeting held virtually with an option for in-person attendance on May 12, 2021.

Per 36 CFR 800.3-800.5 (described in the section 6.4.1), the NRCS consulted with the following Tribes regarding determination of the project APE, cultural resource site eligibility, and project effects (adverse effect determination):

- Southern Ute Indian Tribe
- Skull Valley Band of Goshute Indians

- Indian Peaks Band of Paiutes
- Kanosh Band of Paiutes
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shivwits Band of Paiute Indians/Paiute Indian Tribe
- Paiute Indian Tribe of Utah
- Navajo Nation
- Hopi Tribe
- Cedar Band of Paiutes
- Confederated Tribes of the Goshute Reservation
- Southern Paiute Nation
- Northwest Band of the Shoshone Nation
- San Juan Southern Paiute Tribe of Arizona

A summary of the communication dates/responses from the tribes during the Section 106 process is provided in the Tribal Consultation Table, which is located in Appendix A. The follow up email dates and responses are summarized here:

- Follow-Up Email Date #1: June 18, 2024
- One response from PITU asked that a meeting between NRCS and Kanosh Band and PITU be held virtually to discuss the rock art boulder near the project area/actions. Full email correspondence is documented in Appendix A.
- No other responses were received.
- Follow Up Phone Calls Date #2: August 20, 2024

Consultation with the tribes continued during the Plan-EA review period and the results are documented in the Final Plan-EA. The MOA for the mitigation of adverse effects is in development. A copy of the MOA is included in Appendix A. Currently, the MOA is still awaiting a response from the Kanosh Band regarding whether they would be a signatory to it. A signed MOA will be included in the Final Plan-EA.

7.1.1.2 NEPA Consultation

Tribal Scoping for NEPA and Kanosh Band Participation

The Kanosh Band was invited to participate in the planning process by becoming a co-sponsor, to which they formally agreed to on October 31, 2023. A copy of the letter requesting Kanosh Band to become a co-sponsor is included in Appendix A. No other responses were received from the above Tribes during the scoping process. Subsequent coordination meetings with the Band are documented below:

Table 7-1: Coordination Meetings with Kanosh Band

Meeting Date	Co-Sponsor
9/29/2021	Kanosh Band
11/3/2021	Kanosh Band
4/12/2023	Kanosh Band

With Kanosh Band as a co-sponsor and beneficiary of the proposed project, close coordination and consultation with the Band was maintained during the Cultural Resource Survey process to ensure compliance with E.O. 13175

7.1.1.3 Biological Consultation

Section 12 of Public Law (PL) 83-566

Consultation with the USFWS pursuant to Section 12 of PL 83-566 was initiated by NRCS on May 14, 2024. No adverse effects and no mitigation were identified in USFWS's response (see the consultation letter for Section 12 located in Appendix A).

Section 7 of the Endangered Species Act (ESA)

Consultation with the USFWS regarding potential impacts to Threatened and Endangered species listed under the Endangered Species Act (ESA) of 1972 was not required for this project due to the "No Effect" Determination made for both the Monarch Butterfly and Ute Ladies'-Tresses, the listed species in the area that were identified as potentially having suitable habitat. Survey work, following USFWS standards, was completed as necessary for all species listed in the IPaC Report. NRCS, being the final decision maker in these consultations, determined there would be No Effect on any species listed in the IPaC Report. These circumstances demonstrate compliance with Section 7 of the ESA. A courtesy copy of the Biological Assessment was provided to the USFWS as an informal consultation effort. A copy of the Official Species List from the IPaC interface may be found in Appendix E.

7.2 Coordination

7.2.1 NEPA Agency Coordination

The NRCS sent letters requesting the agencies in Table 7-2 to participate as cooperating agencies on this project. The EPA officially declined but requested an opportunity to review the Draft Plan-EA during the next public comment period. The remaining agencies did not respond. An Agency Scoping Meeting was held on May 11, 2021. The meeting was attended by representatives from the NRCS, SLOs, Franson Civil Engineers (Consultants), UDOT, and USFWS. The meeting was recorded and made available at https://youtu.be/zuUkw-F526g. A copy of the agency correspondence letter is included in Appendix A.

Table 7-2: Cooperating Agencies

Agency	Accepted / Declined
Environmental Protection Agency (EPA)	Declined
U.S. Fish and Wildlife Service (USFWS)	No Response
Army Corps of Engineers (USACE)	No Response
U.S. Bureau of Reclamation (USBR)	No Response

7.3 Public Involvement

The Scoping Report prepared for the project (Appendix A) presents the scoping efforts and comments received during the 30-day comment period (April 29, 2021, to May 28, 2021). A

scoping notice announcing the public scoping meeting and period was published in *The Chronicle Progress* and *UtahLegals.com* on April 28 and May 5, 2021. Public scoping notices were also mailed to Millard County Commissioners and 329 public residents on April 23 and April 28, 2021. Details of the meeting dates along with the project and comment period information were also made available on the project website at https://www.fransoncivil.com/corn-creek-plan-ea/.

On May 12, 2021, a virtual public scoping meeting was held, with an option to attend in-person. The scoping meetings were recorded, and the recordings made available at https://fransoncivil.com/corn-creek-watershed-plan-ea-meeting/. A comment period was opened on April 29, 2021, and closed on May 28, 2021. The comments and responses are included in Appendix A.

7.4 Plan Development and Review

This Plan-EA was developed in close coordination with multiple agencies and the public underwent the following informal and formal reviews, detailed below:

- Public and Agency Scoping (Plan-EA): April and May 2021
- State-Level Preliminary Review: September 2024
- National Water Management Center (NWMC) Technical Review: October 2024
- Programmatic/National Headquarters Review: [INSERT DATE]
- Public and Agency Review: [INSERT DATE]
- Programmatic Review, Final: [INSERT DATE]

7.5 Distribution List

A notice of availability for the Plan-EA would be distributed to the following government agencies/staff and organizations.

7.5.1 Federal Agencies

- Federal Emergency Management Agency – FEMA
- U.S. Army Corps of Engineers – USACE
- U.S. Bureau of Reclamation – USBR
- U.S. Environmental Protection Agency – EPA
- U.S. Fish & Wildlife Service – USFWS
- U.S. Forest Service – USFS
- U.S. Geological Survey – USGS

7.5.2 Tribes

- Paiute Indian Tribe of Utah
- Southern Ute Indian Tribe
- Skull Valley Bank of Goshute Indians
- Indian Peaks Band of Paiutes
- Kanosh Band of Paiutes
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Shivwits Band of Paiute Indians
- Navajo Nation

- Hopi Tribe
- Cedar Bank of Paiutes
- Confederated Tribes of the Goshute Reservation
- Southern Paiute
- Northwest Band of the Shoshone Nation
- San Juan Southern Paiute Tribe of Arizona

7.5.3 State Entities

- State Representatives (Utah)
- State Senators (Utah)
- U.S. Representatives
- U.S. Senators
- State of Utah – Office of the Governor
- Utah Department of Environmental Quality – UDEQ
- Utah Department of Natural Resources – UDNR
- Utah Department of Transportation - UDOT
- Utah Department of Water Resources – UDWRe
- Utah Division of Water Rights – DWRi
- Utah Division of Wildlife Resources – UDWR
- Utah Natural Heritage Program – UNHP
- Utah State Historic Preservation Office – SHPO

7.5.4 Local Government

- Millard County
- Kanosh Town

7.5.5 Businesses and Organizations

- Corn Creek Irrigation Company

7.5.6 Private Parties

- Private parties include property owners and residents within the study area who would receive notices of the Plan-EA. Their names and addresses are not listed in this chapter for privacy reasons.

8.0 References

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9.0 List of Preparers

This Plan-EA was reviewed by NRCS-Utah specialists and the NRCS's National Water Management Center (NWMC).

Table 9-1: List of Plan-EA Preparers

Name	Affiliation	Title (Years of Experience)	Education	Other
Wayne Urie	NRCS-Utah	Watershed Coordinator (18+ yrs)	B.ASc. – Range Science and Management	
Jason Dodds	NRCS-Utah	Project Engineer (15 yrs)	B.S. Integrated Engineering	
Tara Hoffmann	NRCS-Utah	State Watershed Cultural Resource Specialist (17+ yrs)	B.S. – Interdisciplinary Studies M.A. – Anthropology	
Derek Hamilton	NRCS-Utah	Water Resources Coordinator (25+ yrs)	B.S. Environmental Sciences	
Leslie Warta	NRCS-Utah	Environmental Compliance Specialist (15+ yrs)	B.S. – Forest Management	
Josephine Gass	NRCS-Utah	State Hydraulic Engineer (5+ yrs)	B.S. – Environmental Engineering	Certified Floodplain Manager
Kyle Wheeler	NRCS-Utah	Watershed Coordinator (Richfield)	B.S. Range/Ag. Sciences	
Todd Seiber	NRCS-Utah	UT State Geologist	Geology	
Layne Jensen	Franson Civil Engineers	Project Manager (31 years)	BSc. Mining Engineering MSc. Civil and Environmental Engineering	Utah P.E. Idaho P.E.
Lance Houser	Franson Civil Engineers	Sr. Technical Manager (30 Years)	B.S. – Civil Engineering M.S. – Civil Engineering	Utah P.E. Idaho P.E.
Monique Robbins	Franson Civil Engineers	Environmental Coordinator (25+ yrs)	B.S. – Civil Engineering	California P.E.
Martilyn Neilsen	Franson Civil Engineers	Engineer In Training (2+ yrs)	B.S. – Civil Engineering	Utah E.I.T.
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Name	Affiliation	Title (Years of Experience)	Education	Other
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Nate Owen	Franson Civil Engineers	Civil/Environmental Engineer (11+ years)	B.S. – Civil Engineering M.E. – Civil Engineering	Utah P.E.
Tyler Withers	Franson Civil Engineers	Civil/Environmental Engineer (6+ years)	B.S. – Civil Engineering M.E. – Civil Engineering	Utah P.E.
Landon Richins	Franson Civil Engineers	Environmental Specialist (1+ yrs)	B.S. – Environmental Science and Management	
Matt Gurr	Franson Civil Engineers	Senior Designer, Drone Specialist (17+ yrs)	A.S. – Drafting Technology Drone Pilot Academy	
Lon Franson	Franson Civil Engineers	GIS Specialist (35+ yrs)	M.S. Geographic Information Systems	
Scott Evans	Cirrus Ecological Solutions	NEPA Specialist/Natural Resource Manager (31+ years)	B.S., Ph.D. – Range Science/Economics	
John Stewart	Cirrus Ecological Solutions	Botanist/Wetland Scientist (30+ years)	B.S. – Environmental Science	
Stephanie Trapp	Cirrus Ecological Solutions	Wildlife Biologist (7+ years)	M.S. – Wildlife Science	
Sheri Murray Ellis	Certus Environmental Solutions	Archeologist/Architectural Historian (32+ years)	B.S. – Psychology and Anthropology M.S – American Studies	
Bridget Atkins	Western-Enviro Resources	Plant Ecologist/Environmental Planner (16+ years)	M.S – Plant Science	
Richard Buhler, PE	Gerhart Cole	Geotechnical Engineer (16 yrs)	B.S. and M.S Civil Engineering, Geotechnical Emphasis	Utah, P.E.
Jed McFarlane, PE	Gerhart Cole	Geotechnical Engineer (7 yrs)	B.S. and M.S. Civil and Environmental Eng.	Utah, P.E

Name	Affiliation	Title (Years of Experience)	Education	Other
Travis Gerber, PE	Gerhart Cole	Geotechnical Engineer (28 yrs)	PhD Civil Engineering/ Geotechnical Engineering	Utah, P.E
Ryan Cole, PE	Gerhart Cole	Geotechnical Engineer (24 yrs)	PHD Civil Engineering/ Geotechnical Engineering	Utah, P.E and many other states
Matt Hess	Hess Civil Consulting	Construction Estimator (25+ yrs)		
Hal Gordon	Hal Gordon	Economist (33+ yrs)	B.S. – Range Science M.S. – Agricultural Economics	

10.0 Index and Glossary

10.1 Index

Acronym	Meaning
ACHP	Advisory Council on Historic Preservation
APE	Area of potential effects
BCC	Birds of Conservation Concern
BMP	Best Management Practice
CAA	Clean Air Act
CE	Cumulative effects
CFS	Cubic feet per second
CO_2	Carbon dioxide
CWA	Clean Water Act
CWD	Cache Water District
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GHG	Greenhouse Gas
H&H	Hydrology & Hydraulics
HDPE	High-density polyethylene pipe
HUC	Hydrologic unit codes
IPaC	Information for Planning and Consultation
NAAQS	National Ambient Air Quality Standards
NEE	National Economic Efficiency
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places

Acronym	Meaning
NWI	National Wetlands Inventory
NWMC	National Water Management Center
NWPM	National Watershed Program Manual
NWSRS	National Wild and Scenic Rivers System
Plan-EIS	Watershed Plan and Environmental Impact Statement
PL 83-566	Watershed Protection and Flood Prevention Act
PR&G	Principles, Requirements, and Guidelines
ROD	Record of Decision
SGCN	Species of Greatest Conservation Need
SLO	Sponsoring Local Organization
SWPPP	Storm Water Pollution Prevention Plan
T&E	Threatened and Endangered
TM	Technical Memorandum
UDAF	Utah Department of Agriculture and Food
UDNR	Utah Department of Natural Resources
UDWR	Utah Division of Wildlife Resources
UDWRe	Utah Division of Water Resources
UDWRi	Utah Division of Water Rights
UGS	Utah Geological Survey
UPDES	Utah Pollutant Discharge Elimination System
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USFWS	United States. Fish and Wildlife Service
WMCD	Wellsville-Mendon Conservation District

10.2 Glossary of Common Terms

Acre-foot The amount of water that will cover one acre at a depth of one foot, Equal to 43,560 cubic feet. Abbreviated as AF

Aesthetic Resources Any portions of an area that provide visitors with especially scenic views of natural or cultural resources. The scenic worth of a given area. Also called Visual Resources.

Affected Environment A description of the existing conditions of the environment where the proposed action would take place is included in a National Environmental Policy Act (NEPA) Analysis.

Air Quality The overall condition or quality of the air/atmosphere in a specified region or location.

Alkali Describes silicate minerals that contain alkali metals such as sodium and potassium.

Alluvium A collection of deposited sediments (sand, silt, clay, gravel) left by rivers, streams, and other running water sources. Typically found in drainages, channel beds, and deltas. Compare Colluvium.

Alluvial Fan When a channel flows out at a steep slope and loses its speed, it forms a triangular deposit of alluvium referred to as an alluvial fan.

Anthropogenic Coming from human activity. Non-natural processes, man-made.

Annual Runoff The maximum instantaneous peak discharge in a water year

Appropriation Doctrine Also called the Doctrine of Prior Appropriation. The water rights system used in the Western U.S. which is based on the concept of "First in time, first in right". In order to maintain water rights under the appropriation doctrine, the owner must put the water to beneficial use. See Beneficial Use. See Water Rights. See First in Time, First in Right.

Aquifer A geologic formation that contains sufficient saturated permeable material to yield water to springs and wells.

Area-depth curve A graph showing the change in average rainfall depth as the size of the area receiving the rainfall changes

Artesian Well A well that taps confined groundwater. Water in the well rises above the level of the top of the aquifer under artesian pressure.

Bank A submerged ridge of sand in a body of water. Usually exposed during low water events.

Base Flow The sustained or fair-weather discharge that persists after storm runoff and associated quick return flow are depleted. It is usually derived from groundwater discharge or gradual snow or ice melt over extended periods of time but need not be continuous flow. It can be based on annual or seasonal periods depending upon when major floods usually occur. It may also be defined as the stream discharge derived from groundwater sources. It is sometimes considered to include flow from regulated lakes or reservoirs.

Bedrock A solid layer of rock beneath the soil. Also called a Regolith.

Beneficial Use Under the Doctrine of Prior Appropriation, Water Rights are maintained through beneficial use by the holder. Beneficial use is the use of the water right that is reasonable and appropriate under reasonably efficient practices to accomplish without waste the purpose for which the appropriation is lawfully made. See Water Rights. See Appropriation Doctrine.

Best Management Practices Practices employed to reduce, eliminate, or otherwise mitigate environmental impacts as well as to ensure the safety of workers on a project. Abbreviated BMPs.

Biogeochemical Cycles A series of critical processes in which components of biology, geology, and chemistry heavily overlap. These cycles are critical for the existence of life on Earth. The most important of the cycles revolve around the cycling of the five elements required for life on Earth: Carbon, Hydrogen, Nitrogen, Oxygen, Phosphorus, and Sulfur. Also Called Nutrient Cycles.

Biological Assessment An evaluation was performed to assess all the biota located in a particular project area. A final report is produced to be included in the Appendices

of a National Environmental Policy Act (NEPA) Document. Also called a Biological Evaluation.

Biological Evaluation See Biological Assessment.

Canal An artificial waterway constructed to convey water for irrigation or to allow the passage of boats or ships inland.

Channel The bed of a stream or river. Also, a natural passageway or depression of perceptible extent containing continuously or periodically flowing water or forming a connecting link between two bodies of water.

Channel Flow Water flow in a defined channel, either natural or manmade

Channelization The straightening and deepening of a channel to permit water to move faster or to drain faster from an area,

Clean Water Act Federal legislation enacted in 1972 to restore and maintain the chemical, physical, and biological integrity of the surface waters of the United States. The act states that all waters be fishable and swimmable. Abbreviated CWA.

Climate Change A process where global temperatures rise as a result of heavy carbon emissions into the atmosphere. This causes global climates to change.

Colluvium Groupings of unconsolidated sediments and geologic materials at the base of hillslopes. The material was deposited by processes such as rain-wash or soil creep. Compare Alluvium.

Compaction A decrease in the pore space of soil. An increase in soil bulk density.

Conservation Storage Water impounded for consumptive uses, such as municipal, industrial, and irrigation water supply, and non-consumptive uses such as recreation, and fish and wildlife

Conservation Tillage A tillage practice that leaves residues on the soil surface for erosion control and water conservation. It includes specific residue management practices, such as no-till, mulch-till, or ridge-till

Consumptive Use A term used mainly by irrigation engineers to describe the amount of water used in crop growth plus evaporation from the soil.

Contact The surface between two types or ages of rocks. See Also Geologic Units.

Conveyance Loss Water lost in transit through a pipe or canal to evaporation and seepage.

Correlation A statistical index that measures linear variation between variables

Council on Environmental Quality The federal agency which is responsible for overseeing the National Environmental Policy Act (NEPA) reviews. Abbreviated CEQ.

Cover The vegetation and organic detritus, such as mulch and residue, that exist on the soil surface. In some classification schemes, fallow or bare soil is considered the minimum cover class.

Cover Crops Crops that are planted to reduce soil erosion during periods when crops for harvest are not being grown. Cover Crops are one of the most common methods used in No-Till agriculture. See Conservation Tillage.

Cross-Section The shape of a channel, stream, or valley is determined by a line approximately perpendicular to the main path of water flow, along which measurements of distance and elevations are determined. May also be used as a visual aid to examine different soil horizons. See Soil Horizons. See Soil Profile. See Water Column.

Cubic Feet per Second A volumetric unit of water flow. Sometimes called second-feet. Abbreviated “cfs”.

Culinary Water System A location’s infrastructure for providing potable water to the public.

Cultural Resources Any resource in a particular area that may be deemed significant in terms of current or historical cultures. Resources that comprise historical and archaeological sites and artifacts. See Aesthetic Resources.

Cultural Services As defined by the Principles, Requirements and Guidelines (PR&G), cultural services are ecosystem services that make the World a place in which we want to live in such as recreational, spiritual, aesthetic viewsheds, tribal or other cultural and community values.

Dam An artificial barrier, together with any associated spillways and appurtenant works, across a watercourse or natural drainage area, that does or may impound or divert water

Depth-area Curve A graph showing the change in average rainfall depth as size of area changes.

Detritus Dead and decaying organic matter. See Humus.

Direct Effect An impact that occurs as a result of the proposal or alternative in the same place and at the same time as the action.

Direct Runoff Water that enters the stream channel during a storm. It mainly consists of rainfall on the stream surface, surface runoff, and quick return flow. Abbreviated Q.

Discharge Quantity of water flow at a location in a stream or river, commonly measured and reported in units of cubic feet per second or cfs. Abbreviated q.

Dissolved Oxygen The amount oxygen dissolved in a body of water. Typically expressed as a percentage.

Diversion An alteration in the natural course of a stream or river.

Doctrine of Prior Appropriation See Appropriation Doctrine. See Water Rights.

Downstream Impacts See Indirect Impacts.

Drainage Area The area of a watershed draining into a stream at a given point. The area may be of different sizes for surface runoff, subsurface runoff or flow, and base flow. Generally, the surface runoff area is used as the drainage area.

Drainage Classification A classification method is used to identify the ability of a soil to drain water. Classification ranges from Very Well Drained to Excessively Drained.

Drawdown The drop in the water table or level of groundwater when water is being pumped from a well; the amount of water used from a tank or reservoir; the drop in the water level of a tank or reservoir.

Earthquake A rupture along a tectonic plate boundary or fault line which causes the Earth to shake. Also called Seismic Activity. See Also Fault. See Also Fault Scarp. See Also Paleoseismology.

Ecology The study of the relationships between organisms and their environment.

Ecosystem A natural environment in which all organisms are connected and fulfill various niches. Includes all biotic and abiotic components of the area.

Ecosystem Services Ecosystem Services is the framework established by the Principles, Requirements, and Guidelines (PR&G) that describes the benefits that people derive from nature and is characterized as the good and services provided by a healthy and functioning environment. Most commonly, the Ecosystem Services Framework is organized into four service categories including: Provisioning Services, Regulating Services, Supporting Services, and Cultural Services.

Endangered Species Any organism classified as an Endangered Species is listed on the federal Endangered Species List managed by the US Fish and Wildlife Service. These species illicit special protection and consideration when executing projects.

Environmental Assessment A document created in compliance with the National Environmental Policy Act in which a series of alternatives for a project area are evaluated to assess and predict the expected environmental impacts a project will have. Abbreviated EA.

Environmental Impact Statement When significant environmental impacts are identified in the Environmental Assessment, or the funding cap exceeds the established limit, an Environmental Impact Statement must be prepared under the National Environmental Policy Act. This document will assess the environmental impacts of a project in greater detail than an EA and will provide mitigations to these impacts where possible. Abbreviated EIS.

Environmental Justice A policy which does not allow a disproportionate impact on minority populations resulting from any action. It is required to be considered under the Principles, Requirements, and Guidelines (PR&G).

Erosion The natural process by which material is worn away by a natural process such as wind or water. Compare Weathering.

Eutrophication The proliferation of large algal blooms in surface waters exposed to heavy nutrient loading (most specifically phosphorus). Occasionally harmful algae will grow under these conditions. Usually caused by excess agricultural runoff.

Evaporation The process by which surface or subsurface water is converted to atmospheric vapor. Compare Sublimation.

Evapotranspiration The Water withdrawn from soil by evaporation and plant transpiration. See Consumptive Use. Abbreviated "ET". Compare Transpiration. Compare Evaporation.

Excess Rainfall The part of rainfall during a given storm that exceeds the infiltration capacity and is available for direct runoff.

Excessive Precipitation Standard term for rainfall in which the rate of fall is greater than certain accepted limits, chosen with regard to the normal precipitation of a given place or area. Not the same as excess rainfall.

Exotic Species See Invasive Species.

Fallow Cropland remained unseeded for a period of time. This may be a normal part of the cropping system for weed control, water conservation, soil conditioning, etc. Also called Idle Cropland.

Fault A geologic feature in which ruptures occur, causing seismic activity. Cracks along the Earth's surface along which mountains can be uplifted, valleys and rift zones can form, and earthquakes can occur.

Fault Scarp A small, yet clearly visible, offset on the ground surface where normal faulting has visibly occurred. See Normal Fault.

Fault Trace An intersection of a fault with the Earth's surface to create a visible disturbance. See Fault. See Fault Scarp.

Federal Objective As established by the Water Resources Development Act of 2007, the Federal Objective states that all water resource investments proposed in an EIS should "reflect national priorities, encourage economic development, and protect the environment".

First in Time, First in Right Phrase indicating that older water rights have priority over more recent rights if there is not enough water to satisfy all rights. See Also Water Rights. See Also Appropriation Doctrine. See Beneficial Use.

Flood A relatively high flow as determined by either gage height or discharge quantity/ An event during which a stream overflows its normal banks.

Flood Frequency How often, on average, a discharge of a given magnitude occurs at a particular location on a stream. Usually expressed as the probability that the discharge will exceed some size in a single year.

Floodplain The strip of relatively smooth land adjacent to a stream channel constructed by the present water course and covered by water when the stream flows over its banks

Fluvial Pertaining to a river or stream.

Flux A movement of mass or energy between compartments of a material or energy cycle.

Frequency The number of occasions that the same numerical measure of a particular quantity has occurred between definite time periods. Often stated in terms such as return interval, recurrence interval, or percent chance.

Future Without Federal Investment The Future without Federal Investment, or FWOFI, is an alternative required to be developed under the Principles, Requirements, and Guidelines for watershed planning (PR&G). It describes an alternative where no federal investment is made. Can also serve as the NEPA No-Action Alternative. See No-Action Alternative.

Geologic Units A geologic unit is an individual rock type underlying a particular area. They are usually abbreviated on geologic maps with short 2–3-character abbreviations that describe the geologic time period in which the unit was formed and what sort of material makes up the unit.

Geomorphology The study of the shape and evolution of the Earth's physical surface. The shape of the landscape. See Topography.

Gradient A degree of inclination, or a rate of ascent or descent, of an inclined part of Earth's surface with respect to the horizontal. See Also Slope.

Greenhouse Gases Greenhouse Gases are gases in the atmosphere that trap heat. The Environmental Protection Agency (EPA) publishes emissions regulations for various Greenhouse Gases including Carbon Dioxide, Methane, Nitrous Oxide, and Fluorinated Gases such as Hydrocarbons, Perfluorocarbons, and Sulfur Hexafluoride. Also called Fossil Fuels. Abbreviated GHG.

Groundwater The water in the saturated zone beneath the water table. See Also Hydrogeology.

Groundwater Law See Appropriation Doctrine. See Water Rights. See Beneficial Use. See First in Time, First in Right.

Habitat The environment in which an organism lives naturally.

Head The measure of pressure at the base or other reference point of a column of fluid. Normally measured in feet of water.

Humus Amorphous, partially decomposed organic matter. See also Detritus.

Hydrogeology The science that deals with subsurface waters and related geologic aspects of surface waters, including the movement of groundwater; the mechanical, chemical, and thermal interaction of groundwater with the porous medium; and the transport of energy and chemical constituents by the flow of groundwater.

Hydrograph A graph showing the discharge, stage, velocity, or any other property of water with respect to time for a given point on a stream or for a given point in any drainage system.

Hydrologic Soil Group A group of soils having similar physical and runoff characteristics.

Hydrologic Unit Watershed boundaries are organized in a nested hierarchy by size. Abbreviated "HU".

Hydrology Science that deals with the occurrence and distribution of naturally occurring water on, around, and under the Earth's surface.

Idle Cropland See Fallow.

Indirect Impact Reasonably foreseeable impacts that occur removed in time or space from the proposed action. Also called downstream impacts.

Infiltration The part of rainfall that enters the soil; the process by which part of the rainfall enters the soil.

Infiltration Rate The rate at which water enters the soil after prolonged wetting of the soil profile.

Infrastructure Constructed improvements to a project area that allow for a more comfortable quality of life. Could include pipes, canals, dams, roads, trails, etc.

Irrigation The use of water in controlled quantities to grow agricultural crops. Used to satisfy any water requirements of crops not provided by natural rainfall.

Irrigation Pool Reservoir storage is used to store water for release as needed in irrigation.

Invasive Species Any organism that has been introduced into an area where it does not naturally occur. Also called Exotic Species.

Kilowatt Hour A power demand of 1,000 watts for one hour. These are the units in which power company rates are typically expressed.

K Factor The Soil Erodibility Factor used in the Universal Soil Loss Equation. See Also Soil Erodibility. See Also Universal Soil Loss Equation.

Lacustrine Deposits Having to do with a lake. Often used when referring to ancient lake sediment deposits.

Lag On a hydrograph, the time from the centroid of rainfall to the peak of the hydrograph. Abbreviated "L".

Land Cover A broad land classification such as agricultural or forest, etc.

Land Use A land classification, such as row crops or pasture, that indicates a type of land use. Roads may also be classified as a separate land use.

Lead Agency The Federal agency in charge of the creation of an Environmental Assessment or Environmental Impact Statement under the National Environmental Policy Act (NEPA).

Loam A soil mixture of sand, silt, and clay.

Loss The portion of precipitation lost as runoff from the surface of the land due to evaporation and/or deep percolation.

Marsh A water-saturated, poorly drained area, intermittently or permanently water covered.

Mean The average of a series of numbers. It can be arithmetic or geometric, depending on the equation used to compute the mean.

Median The value in an array of numbers that has as many lower values as it has higher values.

National Economic Efficiency Alternative Under the Principles, Requirements, and Guidelines (PR&G) all water resource projects must develop a national economic efficiency alternative which showcases the most economically beneficial alternative to complete a project. Abbreviated NEE.

National Environmental Policy Act The federal legislation governing the mitigation of environmental impacts in federally funded projects. The legislation is executed by the US Environmental Protection Agency. It requires the development of an Environmental Assessment, Environmental Impact Statement, or Categorical Exclusion document for any federal project. Abbreviated NEPA.

No-Action Alternative Under the requirements of the National Environmental Policy Act (NEPA), an Environmental Assessment or Environmental Impact Statement must evaluate a No-Action Alternative which discusses what would happen to the project area if no action were taken. See Future Without Federal Investment.

Nonstructural Alternative The Nonstructural Alternative must be included per the Principles, Requirements, and Guidelines (PR&G). This alternative describes how existing infrastructure could be modified to potentially fulfill a project's need without constructing additional infrastructure.

Normal Fault Inclined fractures of the crust where faulting has moved one block upwards and another block downwards. Normal faults are characterized by vertical movement. See Horst. See Graben. See Fault. See Fault Scarp.

Notice of Intent The National Environmental Policy Act (NEPA) requires that a Notice of Intent to prepare an Environmental Impact Statement be written and submitted to the federal agency. The Notice of Intent describes the project's purpose and need, environmental impacts, and sets up the administrative framework out of which the document will be prepared. Abbreviated NOI.

No-Till Managing the amount, orientation, and distribution of crops and other plant residue on the soil surface year-round, while limiting the soil-disturbing activities.

Noxious Weeds Plants designated by a Federal, State, or County government as injurious to public health, agriculture, recreation, wildlife, or property.

Nutrients Naturally occurring elements and compounds which provide sustenance needed for organism growth and development.

Nutrient Cycling See Biogeochemical Cycles.

Nutrient Loading See also Eutrophication. A process by which sediments and minerals are loaded into a water body at high levels, causing water quality concerns and disruptions to aquatic ecosystems.

Organic Containing Carbon. Biotic Material. Compare Abiotic.

Operation & Maintenance The various different tasks and expenses required to upkeep and maintain function of infrastructure. Abbreviated O&M.

Paleoseismology The study of ancient/historical earthquakes along a fault line by examining displacements along fault scarps. Paleoseismic studies are used in calculating average recurrence intervals for earthquakes. See Also Colluvial Wedge Model.

Palustrine Wetlands Freshwater wetlands that include open water bodies of less than 20 acres in which water is less than 2 meters deep.

Peak Discharge The maximum discharge attained during a flood.

Percent Chance A statistical description of the probability that an event of a given size will be equaled or exceeded during any given year. This name is often given to the probability scale on log-normal paper. Percent chance is the inverse of recurrence interval.

Permeability The ability of a material to allow the passage of a liquid, such as water through rocks.

pH The concentration of Hydroxyl in a substance. The higher the Hydroxyl concentration, the lower the pH and the lower the Hydroxyl concentration, the higher the pH. pH is measured on a scale from 1 – 14 with lower values indicating more acidity and higher values indicating greater alkalinity.

Photosynthesis A common method of primary production in which plants are able to acquire energy through sunlight. See Also Autotroph.

PL 83-566 Public Law 83-566. Also known as the Watershed Protection and Flood Prevention Act of 1954.

Porosity A measure of the water-bearing capacity of subsurface rock.

Potable Water Water that is clean enough to drink safely. See Also Culinary Water.

PR&G The Principles, Requirements, and Guidelines for Water and Land Related Resource Implementation Studies and Federal Water Resource Investments. The reference document from the US Department of Agriculture most commonly used in applying PR&G to a project is the DM 9500-013.

PR&G Guiding Principles A set of six overarching principles that all water resource projects should aim to achieve and must comply with in order to properly apply the PR&G, they include Healthy and Resilient Ecosystems, Sustainable Economic Development, Floodplains, Public Safety, Environmental Justice, and Watershed-Scale Approach.

Precipitation The total measurable supply of water of all forms of falling moisture, including dew, rain, mist, snow, hail, and sleet; usually expressed as a

depth of liquid water on a horizontal surface in a day, month, or year, and designated as daily, monthly, or annual precipitation.

Pressure Force per unit area. Typically expressed in pounds per square inch (psi), bars, or atmospheres.

Prime & Unique Farmland Farmland is rated as prime, unique, statewide, and local importance based on national, state, and local criteria that consider the physical and chemical characteristics to support crop production and produce crop yields when properly managed. Prime farmland produces the highest yields based on climate conditions.

Prior Appropriation See Appropriation Doctrine. See Water Rights.

Probability The likelihood that certain event will occur

Proposed Action (Preferred Alternative) Under the National Environmental Policy Act (NEPA) process, the environmental document produced will evaluate a proposed action for a project detailing what will be done to the project area to accomplish the project successfully.

Provisioning Services As defined by the Principles, Requirements and Guidelines (PR&G), Provisioning Services are Ecosystem Services that provide tangible goods for direct human use or consumption.

Pump A device that converts mechanical energy into hydraulic energy.

Purpose and Need Under the National Environmental Policy Act (NEPA), an environmental assessment or environmental impact statement should clearly describe the project's purpose for being evaluated and list the various needs that illicit the proposed action.

Quaternary Period A geologic time period starting 2.58 million years ago to the present.

Rainfall A fall of rain; precipitation in the form of liquid water. The amount of rain, usually expressed in inches depth of water on an area, that reaches the surface of the Earth.

Rain-on-Snow Event A flooding event that occurs after rainwater falls atop snow deposits causing the additional snow to runoff and flood.

Recession Curve The part of the descending limb on a hydrograph that extends from the point of inflection to the time when direct runoff has ceased.

Recharge The process of addition of water to the saturated zone. See Also Infiltration.

Record of Decision Following the preparation of an environmental impact statement, the lead federal agency must issue a Record of Decision on whether or not the proposed project may proceed. Abbreviated ROD.

Recreation Any activity performed by a human being for the sole purpose of obtaining enjoyment, excitement, or relaxation. Common recreational activities include fishing, hunting, hiking, boating, running, walking, wildlife watching, auto touring, and swimming.

Recurrence Interval The average number of years within which a given event will be equaled or exceeded. A 50-year frequency flood has an average recurrence interval of 50 years, and so on. It is the inverse of a percent chance. Often used when referring to flooding or seismic activity. Also called the return interval.

Regolith See Bedrock.

Regulating Services As defined by the Principles, Requirements and Guidelines (PR&G), Regulating Services are Ecosystem Services that maintain a World in which it is possible for people to live and provide critical benefits that buffer against environmental catastrophe or disaster either locally, regionally, or on a larger scale.

Remediation See Mitigation.

Reservoir A pond, lake, tank, basin, or other space, either natural or man-made. A reservoir stores, regulates, and controls water.

Return Interval See Recurrence Interval.

Rill A very small brook or trickling stream of water usually without any tributaries. Also, the channel formed by such a stream.

Rill Erosion Small gullies that occur on the land slope in a random pattern.

Riparian Areas Ecological zones typically lie within or along a river or stream. These areas typically include all plants and animals along streams and riverbanks.

Saturated Hydraulic Conductivity The rate of flow of water through a unit cross section of a porous mass under a unit hydraulic gradient at a temperature of 60 F. Abbreviated Ksat.

Scope The range of actions, alternatives, and impacts to be considered in an environmental impact statement or environmental assessment under the National Environmental Policy Act (NEPA).

Scoping Process Generally conducted at the beginning of the project planning process, the scoping process seeks to identify issues, concerns, and potential impacts that require detailed analysis, and which can be eliminated from detailed study.

Secondary Water System Unfiltered and untreated water that is primarily used for agricultural irrigation.

Sediments Small grains of geologic material of varying size classes. Includes gravel, sands, silts, and clays. See Alluvium. See Colluvium. See Loess.

Sedimentation A process by which mass eroded from elsewhere settles to the bottom of rivers, lakes, or oceans.

Seepage The loss or leakage of water by infiltration into the soil from a river, canal, reservoir, or other waterway.

Seismic Activity See Earthquake. See Paleoseismology.

Sheet Erosion Erosion on a slope before a rill or small gully is formed.

Sheet Flow Flow over plane surfaces. Sheet flow usually occurs in the headwaters of a stream. NRCS limits maximum sheet flow length to 100 feet. Maximum depths are normally in the magnitude of 0.1 foot.

Slip Rate The approximate rate at which a fault moves each year. Is used to calculate average recurrence intervals for earthquakes.

Slope The angle of inclination of land, measured in degrees.

Soil The unconsolidated portion of the Earth's crust modified through physical, chemical, and biotic processes into a medium capable of supporting plant growth. See Also Soil Horizons. See Also Soil Profile. See Also Regolith. See Also Erosion. See Also Web Soil Survey. See Also Tilth. See Also Humus.

Soil Erodibility An indicator of a soil's susceptibility to raindrop impact, runoff, and other eroding processes. See Also K Factor. See Also Universal Soil Loss Equation.

Soil Horizons The various layers of soil. Typical horizon order is O, A, E, B, C, and R.

Soil Profile A cross-section of a segment of soil which allows the different soil horizons to be seen.

Special-Status Species Any organism that is listed or proposed for listing on state or federal endangered/threatened species lists. Also called Species of Greatest Conservation Need.

Species of Greatest Conservation Need See Special-Status Species. Abbreviated SGCN.

Storm A rainfall event.

Stream Water flowing in a watercourse or channel.

Structural Measure For flood prevention work, any form of earthwork dam, ditch levee, drop spillway, jetties, riprap, etc., or installation of concrete, masonry, metal, or other material.

Subsurface Underground.

Subsurface Runoff Water that infiltrates the soil and reappears as seepage or spring flow and forms part of the flood hydrograph for that storm. Difficult to determine in practice and seldom worked with separately.

Supporting Services As defined by the Principles, Requirements and Guidelines (PR&G), Supporting Services are Ecosystem Services that support the underlying processes for maintaining conditions for life on Earth such as nutrient cycling, soil formation, and primary production (photosynthesis).

Surface The uppermost level of the land.

Surface Runoff Total rainfall, minus interception, evaporation, infiltration, and surface storage, that moves across the ground surface to a stream or depression.

Threatened Species See Endangered Species.

Tillage Cultivation of the Land.

Tilth The physical structure and health of the soil.

Topography The general configuration of the land' surface. See Geomorphology.

Tributary A stream that contributes its water to another stream or water body.

Universal Soil Loss Equation An equation used to quantify the tons of soil lost each year to erosion in a particular tract of land. The equation takes numerous factors into account such as cover management, tillage practices, slope steepness and length, and constants such as the soil erodibility factor or the rainfall erosivity factor. Abbreviated USLE.

USDA CropScape An online application from the United States Department of Agriculture that allows for the download of agricultural cropping data by defining a project boundary.

Visual Resources See Aesthetic Resources.

Water Loss The part of the storm rainfall that does not appear as runoff for the duration of the flood.

Water Quality The overall condition of an area's water resources. Considers a variety of factors including dissolved oxygen, pH, turbidity, and electrical conductivity.

Water Rights The right that an individual entity holds to make use of a water source. In the Western United States, water rights are determined based on the Doctrine of Prior Appropriation. See Appropriation Doctrine.

Watershed The surface area contributing direct runoff to a stream at a given point.

Watershed Approach An approach to water resources projects that recognizes that there may be impacts both upstream and downstream of the project area and the applicable political or administrative boundaries. This approach is required under the Principles, Requirements, and Guidelines (PR&G).

Water Resources The broad category that defines any water (surface or groundwater) in a given area that may be utilized for any particular purpose.

Water Supply The amount of water in a stream or reservoir, or groundwater, available to supply necessary demands.

Water Table The upper surface of groundwater.

Water Year The year taken as beginning October 1. Often used for convenience in streamflow work, since in many areas, streamflow is at its lowest at that time.

WebSoil Survey An online application developed by the US Department of Agriculture Natural Resources Conservation Service which allows for the download of detailed soils data after defining an Area of Interest.

Well A bored, drilled, or driven shaft or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies or oil or to store or bury fluids below ground. See Also Pump. See Also Groundwater. See Also Drawdown. See Also Piezometer. See Also Saturated Zone.

Wetland Any area where water covers the surface of the soil or is near the surface of the soil for the majority of the year. Wetlands are often classified into smaller, more specific, subgroups.

Sources: National Engineering Handbook Part 630 Hydrology, United States Geological Survey Water Science Glossary, United States Forest Service NEPA Glossary, Bureau of Land Management A Citizen's Guide to NEPA, National Park Service Glossary of Terms, Bureau of Land Management Glossary of Ecological Terms, HWH Corp Glossary of Hydraulic Terms, Soil Science Society of America Glossary of Soil Science Terms, DM 9500-013 Guidance for Conducting Analyses under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments, Open Library Glossary of Environmental Science, National Park Service Glossary of Geologic Terms, The Edwards Aquifer Glossary of Water Resource Terms.

11.0 Appendices

Appendix A. Comments and Responses

Appendix B. Project Map

Appendix C. Support Maps

Appendix D. Investigation and Analysis Report

Appendix E. Other Supporting Information