For (Draft Submittal Version)

DRAFT SUPPLEMENTAL WATERSHED PLAN NO. 7 and ENVIRONMENTAL EVALUATION

For the
SALLISAW CREEK WATERSHED
(Hydrologic Unit Number 11110104)

A supplement to the original watershed plan for rehabilitation of Sallisaw Creek Floodwater Retarding Structures (FRS) No. 13 and 19; includes supplemental watershed agreement No. 7.

Adair County, Oklahoma
May 2024



S13



S19

PREPARED BY:

NATURAL RESOURCES CONSERVATION SERVICE
ACQUISITION & PROCUREMENT DIVISION – SECTION 3
2600 S. MAIN, SUITE D
STILLWATER, OKLAHOMA 74074

IN COOPERATION WITH:

ADAIR COUNTY CONSERVATION DISTRICT
RT. 1, BOX 333
468670 HWY 100

AND

CITY OF SALLISAW
CITY OF STILWELL
STILWELL AREA DEVELOPMENT AUTHORITY
CHEROKEE COUNTY CONSERVATION DISTRICT
SEQUOYAH COUNTY CONSERVATION DISTRICT

DRAFT SUPPLEMENTAL WATERSHED PLAN NO. 7 and ENVIRONMENTAL EVALUATION

For the
SALLISAW CREEK WATERSHED
(Preliminary Submittal Version)

SITES 13 AND 19

ADAIR COUNTY, OKLAHOMA

PREPARED BY: NATURAL RESOURCES CONSERVATION SERVICE IN COOPERATION WITH ADAIR COUNTY CONSERVATION DISTRICT AND THE SPONSORS BEING REMOVED: SEQUOYAH COUNTY CONSERVATION DISTRICT, CHEROKEE COUNTY CONSERVATION DISTRICT, CITY OF SALLISAW, CITY OF STILWELL, AND STILWELL AREA DEVELOPMENT AUTHORITY.

AUTHORITY

The original Sallisaw Creek Watershed Work Plan, February 1961, was prepared under the authority of the Flood Control Act (Public Law 78-534, approved December 22, 1944), as amended. The construction program is authorized by the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended by Section 313 of Public Law 106-472 and The Small Watershed Rehabilitation Amendments of 2000.

ABSTRACT

Adair County Conservation District requested a supplemental watershed plan and environmental document be prepared for Sites 13 and 19 to determine the preferred alternative for both dams to meet high hazard criteria while considering environmental aspects of alternatives. The dams have both exceeded their original 50-year design life and need to be rehabilitated to meet current hazard criteria. Sites 13 and 19 were originally constructed as Low Hazard Dams, but are now required to meet High Hazard Dam criteria to meet State of Oklahoma dam permitting requirements. The hazard classification was upgraded to high hazard for both dams because of downstream potential damage locations (PDLs) that were built over the years, creating a higher potential loss of life.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

This document tiers to the Environmental Impact Statement (EIS) – Rehabilitation of Aging Flood Control Dams in Oklahoma, August 2002, and reviewed April 2007, April 2012 and April 2017. A review was conducted to determine if the effects of the project are within the scope of the programmatic EIS. All effects of the project have been analyzed and accounted for and are within the scope of the cited document.

COMMENTS AND INQUIRIES:

Comments and inquiries must be received by September 20, 2024. Submit inquiries to: Jeanne Hamilton, State Conservationist USDA, Natural Resources Conservation Service, 100 USDA, Suite 206, Stillwater, Oklahoma 74074, (405) 742-1206

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.

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NON-DISCRIMINATION STATEMENT:

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: program.intake@usda.gov.

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SALLISAW CREEK WATERSHED

Supplemental Watershed Agreement No. 7

For Floodwater Retarding Structure (FRS) Nos. 13 and 19

Between the

Adair County Conservation District
(Hereinafter referred to as the Sponsors)

Sequoyah County Conservation District
Cherokee County Conservation District
City of Sallisaw
City of Stilwell
Stilwell Area Development Authority
(Sponsors being Removed)

State of Oklahoma,

And the

Natural Resources Conservation Service
(Referred to herein as NRCS)
United States Department of Agriculture

Whereas, the watershed plan for the Sallisaw Creek Watershed, executed by the sponsors named therein and the Soil Conservation Service (SCS, now NRCS), became effective on the 1st day of May, 1961; and

Whereas, a Supplemental Watershed Agreement No. 1 for said watershed, executed by the sponsors named therein and NRCS became effective on the fourth day of June, 1962; and

Whereas, a Supplemental Watershed Agreement No. 2 for said watershed, executed by the sponsors named therein and NRCS became effective on the 22nd day of March, 1963; and

Whereas, a Supplemental Watershed Agreement No. 3 for said watershed, executed by the sponsors named therein and NRCS became effective on the 3rd say of October, 1968; and

Whereas, a Supplemental Watershed Agreement No. 4 for said watershed, executed by the sponsors named therein and NRCS became effective on the 7th day of July, 2005; and

Whereas, a Supplemental Watershed Agreement No. 5 for said watershed, executed by the sponsors named therein and NRCS became effective on the 8th day of August, 2005; and

Whereas, a Supplemental Watershed Agreement No. 6 for said watershed, executed by the sponsors named therein and NRCS became effective on the 14th day of August, 2006; and

Whereas, in order to carry out the watershed plan for said watershed, it has become necessary to modify said watershed agreement, as supplemented, in order to extend the watershed plan for said FRS Nos. 13 and 19 beyond their original evaluated life and meet current safety and performance standards; and

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

Whereas, 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 rehabilitation of watershed structures 13 and 19 in the Sallisaw Creek Watershed, State of Oklahoma, under the authority of Section 14 of Public Law 83-566 (as amended), the Watershed Protection and Flood Prevention Act of 1954; and

Whereas, there has been developed through cooperative efforts of the sponsors and NRCS a supplemental plan for works of improvement for FRS Nos. 13 and 19 of the Sallisaw Creek Watershed, State of Oklahoma, which plan is annexed to and made 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 supplemental 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 supplemental watershed agreement and including the following:

1. The Sequoyah County Conservation District, the Cherokee County Conservation District, the City of Sallisaw, the City of Stilwell, and the Stilwell Area Development Authority are removed as sponsors only for the rehabilitation of FRS No. 13 and 19 and will have no responsibilities for this new project. The Adair County Conservation District will serve as sole sponsor for FRS No.13 and 19.

2. Term. The term of this agreement is for the installation period plus the evaluated life of the project (101 years) and does not commit the NRCS to assistance of any kind beyond that point unless agreed to by all parties.

3. Costs. The costs shown in this agreement 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.

4. Real Property. The sponsors will acquire all land rights, easements, or rights-of-way as will be needed in connection with the works of improvement. The amount and percentages of the real property acquisition cost to be borne by the Sponsors and NRCS are as shown in the cost-share table in item 6 hereof. The sponsor agrees that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the Operation and Maintenance Agreement.

5. Uniform Relocation Assistance and Real Property Acquisition Policies Act. The sponsor hereby agrees to comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et seq. as further implemented through regulations in 49 C.F.R. Part 24 and 7 C.F.R. 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.

6. Cost-share for Rehabilitation Plan. The percentages of total rehabilitation project costs to be paid by the sponsors and by NRCS are as follows:

Sallisaw Creek FRS No. 13

Works of Improvement	NRCS		Sponsors		Total
Cost Sharable Items	Percent	Cost	Percent	Cost	Cost
Rehabilitation of dam (Construction Cost)	65%	$884,000	35%	$461,000	$1,345,000
Relocation, Replacement in-kind	NA	$0	NA	$0	$0
Relocation, Required Decent, Safe, Sanitary	NA	$0	NA	$0	$0
Sponsors Planning Costs	0%	NA	100%	$0	$0
Sponsors Engineering Costs	0%	NA	100%	$0	$0
Sponsors Project Administration a/	0%	NA	100%	$0	$0
Land Rights Acquisition Cost b/	0%	NA	100%	$15,000	$15,000
Subtotal: Cost-Share Costs	65%	$884,000	35%	$476,000	$1,360,000
Non Cost-Sharable Items c/					
NRCS Engineering & Project Administration a/	100%	$336,200	0%	NA	$336,200
Natural Resources Rights	0%	NA	100%	$0	$0
Federal, State and Local Permits	0%	NA	100%	$10,000	$10,000
Relocation, Beyond Required decent, safe, sanitary	0%	NA	100%	$0	$0
Subtotal: Non Cost-Share Costs	---	$336,200	---	$10,000	$346,200
Total:	72%	$1,220,200	28%	$486,000	$1,706,200

[a/]The sponsors and NRCS will each bear the costs of project administration that each incurs.

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

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

Sallisaw Creek FRS No. 19

Works of Improvement	NRCS		Sponsors		Total
Cost Sharable Items	Percent	Cost	Percent	Cost	Cost
Rehabilitation of dam (Construction Cost)	65%	$3,142,600	35%	$1,677,200	$4,819,800
Relocation, Replacement in-kind	NA	$0	NA	$0	$0
Relocation, Required Decent, Safe, Sanitary	NA	$0	NA	$0	$0
Sponsors Planning Costs	0%	NA	100%	$0	$0
Sponsors Engineering Costs	0%	NA	100%	$0	$0
Sponsors Project Administration a/	0%	NA	100%	$0	$0
Land Rights Acquisition Cost b/	0%	NA	100%	$15,000	$15,000
Subtotal: Cost-Share Costs	65%	$3,142,600	35%	$1,692,200	$4,834,800
Non Cost-Sharable Items c/					
NRCS Engineering & Project Administration a/	100%	$1,205,000	0%	NA	$1,205,000
Natural Resources Rights	0%	NA	100%	$0	$0
Federal, State and Local Permits	0%	NA	100%	$10,000	$10,000
Relocation, Beyond Required decent, safe, sanitary	0%	NA	100%	$0	$0
Subtotal: Non Cost-Share Costs	---	$1,205,000	---	$10,000	$1,215,900
Total:	72%	$4,347,600	28%	$1,702,200	$6,049,800

[a/]The sponsors and NRCS will each bear the costs of project administration that each incurs.

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

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

7. 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.

8. 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 sponsor is required to have development controls in place below low and significant hazard dams prior to NRCS or the sponsor entering into a construction contract.

9. 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. Any costs incurred must be borne by the sponsors and these costs are not eligible as part of the sponsors cost-share.

10. 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. These costs are not eligible as part of the sponsors cost-share.

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

12. 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.

13. Amendments. This Rehabilitation Plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may de-authorize 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 de-authorization 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 de-authorized. 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.

14. 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.

15. Operation and Maintenance (O&M). The sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with the Operation and Maintenance Agreement. An O&M agreement will be entered into before Federal funds are obligated and will continue for the project life (100 years). Although the sponsor's responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement, the sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life. A specific Operation and Maintenance Plan will be prepared for FRS Nos. 13 and 19 before issuing invitations to bid for construction, utilizing the NRCS National Operation and Maintenance Manual.

16. 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 the 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.

17. 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 Department of Agriculture 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.

18. Certification Regarding Drug-Free Workplace Requirements. (7CFR 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 subcontractors in covered workplaces).

Certification:

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

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

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

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

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

(c) Any available drug counseling, rehabilitation, and employee assistance programs; 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 will:

(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 ten 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 shall include the identification number(s) 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 site(s) for the performance or work done in connection with a specific project or other agreement.

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

19. Certification Regarding Lobbying (7 CFR Part 3018).
(applicable if this agreement exceeds $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 shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The sponsors shall 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 shall 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 Section 1352, Title 31, U.S. Code. 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.

20. 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 three-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 three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause of default.

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

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

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

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

(3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.

B. The project sponsoring organization(s) 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 subagreement.

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

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

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

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

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

(5) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a sponsor, to be utilized in the performance of an agreement or sub-agreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location shall 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.

22. Assurances and Compliance

As a condition of the grant of 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 C.F.R. Parts 3015, 3016, 3017, 3018, 3021, 3052.

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

23. 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 retain 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.

24. Signatures

Sponsors being Removed:

Sequoyah County Conservation District BY _____
PO Box 1522
Sallisaw, OK 74955 Title _____
Address

Date _____

The signing of being removed from this supplemental watershed agreement was authorized by a resolution of the governing body of the Sequoyah County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

Cherokee County Conservation District BY _____
1009 S. Muskogee Avenue
Tahlequah, OK 74464 Title _____
Address

Date _____

The signing of being removed from this supplemental watershed agreement was authorized by a resolution of the governing body of the Sequoyah County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

City of Sallisaw BY _____
P.O. Box 525
Sallisaw, OK 74955 Title _____
Address

Date _____

The signing of being removed from this supplemental watershed agreement was authorized by a resolution of the governing body of the Sequoyah County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

City of Stilwell BY _____
503 W. Division
Stilwell, OK 74960 Title _____
Address

Date _____

The signing of being removed from this supplemental watershed agreement was authorized by a resolution of the governing body of the Sequoyah County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

Stilwell Area Development Authority BY _____
503 W. Division
Stilwell, OK 74960 Title _____
Address

Date _____

The signing of being removed from this supplemental watershed agreement was authorized by a resolution of the governing body of the Sequoyah County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

Sponsor:

Adair County Conservation District BY _____
Rt. 1, Box 333
468670 Hwy 100
Stilwell, OK 74960-9710 Title _____
Address

Date _____

The signing of this supplemental watershed agreement was authorized by a resolution of the governing body of the Adair County Conservation District adopted at a meeting held on _____(Date).

_____

Secretary Address

Natural Resources Conservation Service BY _____
United States Department of Agriculture Jeanne Hamilton
100 USDA, Suite 206
Stillwater, OK 74074 Title: State Conservationist
Address

Date _____

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LIST OF ACRONYMS

Acronym	Definition
ACHP	Advisory Council on Historic Preservation
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
AQCR	Air Quality Control Region
BCA	Benefit-Cost Analysis
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CAA	Clean Air Act
CDL	Cropland Data Layer
CRC	Cultural Resources Coordinator
CWA	Clean Water Act
DEM	Digital Elevation Model
EA	Environmental Assessment
EO	Executive Order
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
ESA	Endangered Species Act
EQ	Environmental Quality
FEMA	Federal Emergency Management Agency
FIA	Flood Insurance Agency
FPPA	Farmland Protection Policy Act
FWCA	Fish and Wildlife Coordination Act
FRS	Floodwater Retarding Structure
FWOFI	Future Without Federal Investment
GIS	Geographic Information System
HEC-RAS	Hydrologic Engineering Center, River Analysis System Computer Model
HPO	Historic Preservation Office
HRE	Healthy and Resilient Ecosystems
IPaC	Information, Planning, and Conservation
LCGP	Large Construction General Permit
LCNOI	Large Construction Notice of Intent
MBTA	Migratory Bird Treaty Act
NAAQS	National Ambient Air Quality Standards
NEE	National Economic Efficiency
NECH	National Environmental Compliance Handbook
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

Acronym	Definition
NWI	National Wetland Inventory
OAS	Oklahoma Archaeological Survey
OCC	Oklahoma Conservation Commission
ODEQ	Oklahoma Department of Environmental Quality
ODWC	Oklahoma Department of Wildlife Conservation
OSE	Other Social Effects
OWRB	Oklahoma Water Resource Board
Plan-EE	Supplemental Watershed Plan and Environmental Evaluation
PR&G	Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies
PCN	Pre-Construction Notification
PSS	Palustrine shrub-scrub
PUB	Palustrine unconsolidated bottom
RED	Regional Economic Development
RFT	Request for Termination
SHPO	Oklahoma State Historic Preservation Office
SED	Sustainable Economic Development
SITES	Water Resource Site Analysis Computer Program
SLO	Sponsoring Local Organization
SWPPP	Storm Water Pollution Prevention Plan
TIN	Triangulated Interlocking Network
TMDL	Total Maximum Daily Loads
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service

Summary (OMB Fact Sheet)
of
Sallisaw Creek Watershed
Supplemental Watershed Plan and Environmental Evaluation
for
Sites 13 and 19
Adair County, Oklahoma
Congressional District - OK: 2nd

Authorization

The original Sallisaw Creek Watershed Work Plan, February 1961, was prepared under the authority of the Flood Control Act (Public Law 78-534, approved December 22, 1944), as amended. The construction program is authorized by the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended by Section 313 of Public Law 106-472 and The Small Watershed Rehabilitation Amendments of 2000.

Sponsoring Local Organization (SLO)

Adair County Conservation District, Adair County, Oklahoma

Original Additional Sponsors (Not part of this Supplement)

Sequoyah County Conservation District
Cherokee County Conservation District
City of Sallisaw
City of Stilwell
Stilwell Area Development Authority

Proposed Action

The proposed action (Project) consists of the rehabilitation of Floodwater Retarding Structures (FRS) 13 and 19 within the Sallisaw Creek Watershed in Adair County, OK.

Purpose and Need for Action

The Purpose of the proposed action is Flood Prevention and Watershed Protection. The Sponsor's purpose is to reduce risk of loss of life and flood damage reduction in the project area.

The Project is needed to sustainably improve dam safety, continue flood damage reduction, and protect community resources. Because of the possibility for economic development downstream of Sallisaw Creek S-13 and S-19, the Sponsor and NRCS have determined rehabilitation of the dams to the current criteria for a high hazard dam is justified and will provide economic benefit to the area.

Preferred Alternative

The preferred alternative is to rehabilitate both dams to meet current NRCS High Hazard Class dam design criteria and comply with Oklahoma Water Resources Board (OWRB) – Dam Safety Division regulations as well as extend the service life to 100 years plus implementation time, which will provide flood protection benefits for agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.

Resource Information

Resource information is summarized in **Table S-1** and described below.

Table S-1. Resource Information

	Site S-13	Site S-19
Latitude and Longitude	35.6867, -94.7834	35.7678, -94.6667
Hydrologic Unit Code (HUC)	111101040102	
Watershed of Dam	1,254 acres	7,968 acres
Land Ownership	100% private	100% private

Climate and Topography

Adair County experiences humid subtropical climate with 47.73 inches of precipitation per year and average maximum and minimum temperatures of 69.6°F 49.3°F, respectively, and average relative humidity of 71 percent. The average growing season is 204 days a year.

Site 13, constructed in a tributary of Sallisaw Creek, is located within Hamlin Hollow, which is located between moderately to steeply sloped terrain ranging from 900 feet to 1400 feet msl and representative of the lower watershed. Site 19, constructed in Sallisaw Creek is located in a broader floodplain with elevations ranging from 900 feet to 1,100 feet msl and is representative of the upper watershed.

Land Use

Land use within the 104,065.59- acre Sallisaw Creek Watershed is largely undeveloped and dominated by deciduous forest (66 percent) and pasture (23 percent). Only four percent of the Sallisaw Creek Watershed is developed. Land use within the 1,252.89- acre S-13 subwatershed is undeveloped and dominated by grassland (90 percent). The S-13 subwatershed does not contain developed lands. Land use within the 7,970.52- acre S-19 subwatershed is largely undeveloped and dominated by pasture (55 percent) and deciduous forest (33 percent). Only seven percent of the S-19 subwatershed is developed.

Population and Demographics

According to the 2020 U.S. Census Bureau, Adair County has a population of 19,495. The largest ethnic group is comprised of one race and includes American Indian and Alaska Native at

44 percent. The median household income is $37,940; the employment rate is 47.6 percent; and 20.8 percent of the Adair County population lives in poverty (USCB 2020). According to CEQ's *Environmental Justice Guidance Under the National Environmental Policy Act* (CEQ 1997), these statistics indicated that Adair County is an environmental justice (EJ) community. Local EJ communities were engaged during project scoping efforts as discussed in Section 8.0.

Resource Concerns

Relevant resource concerns identified during the scoping process include:

- Air Quality
- Cultural Resources
- Endangered and Threatened Species
- Environmental Justice
- Erosion and Sedimentation
- Fish and Wildlife
- Floodplain Management
- Flood Damage
- Forest Resources
- Invasive Species
- Land Use/Land Cover
- Migratory Birds/Bald and Golden Eagle Protection Act
- Prime and Unique Farmlands
- Public Health and Safety
- Regional Water Resource Plans
- Riparian Areas
- Scenic Beauty
- Water Resources
- Water Quality
- Water of the U.S.
- Wetland

Mitigation

Section 404 compensatory mitigation is not anticipated with the rehabilitation of either dam as each action entails replacing the principal spillway and adjusting the auxiliary spillway without altering existing pool levels. Temporary and short-term impact of shoreline wetlands may occur during construction activities, but disturbed areas will be restored to pre-construction conditions per U.S. Army Corps of Engineers (USACE) requirements.

Mitigation actions are necessary to avoid or minimize impacts to endangered species and migratory birds. These mitigation measures include felling potential roost trees during the inactive period of Northern long-eared bats and Indiana bats (November 15 – March 31) and initiating construction activities or site preparations prior to the primary nesting season (April 1 – July 1).

ALTERNATIVES CONSIDERED

Several alternatives and variations of alternatives were considered as part of this study. The National Economic Efficiency (NEE) Alternative is the alternative that reasonably maximizes net economic benefits consistent with protecting the Nation's environment.
Alternatives included structural and non-structural measures.

The preferred alternative for both dams is the National Economic Efficiency (NEE) Alternative, which is to rehabilitate Flood Water Retarding Structures Sites S-13 and S-19. This will:

- Rehabilitate the dams to the current NRCS High Hazard Class dam design criteria.
- Comply with the Oklahoma Water Resources Board (OWRB) - Dam Safety Division regulations.
- Provide flood protection benefits for events up to the 1% annual chance recurrence interval for agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.
- Extend the service life to 100 years plus implementation time.

Site 13 Preferred Alternative

On Site 13 the structural rehabilitation improvements to meet high hazard dam criteria include widening the auxiliary spillway from 40 feet to 120 feet and lowering the auxiliary spillway crest by 4.2 feet; removing the existing, orifice controlled, riser inlet and 24 inch diameter principal spillway conduit and replacing it with a standard D x 3D covered top riser and 30 inch diameter, 285 feet long barrel; constructing a new concrete impact basin; raising the left (north) abutment driveway access to existing top of dam elevation; and adding 530 lin. ft. riprap wave protection with bedding along the dam face.

Site 13 has a net fill of approximately 10,500 cubic yards. The auxiliary spillway excavation is 160 lin. ft. along the dam. The left abutment (north) abutment will require to be filled to the top of dam elevation for a linear length of 375 ft perpendicular to the dam. The borrow will be from within the existing permanent pool and surrounding area of flooding impoundment. The impact basin will be surfaced with reinforced concrete.

The conversion from an orifice-controlled riser inlet to a standard D x 3D covered top riser inlet significantly reduced the initial reservoir elevation required for SDH and FBH routings, which was the most significant factor that allowed the auxiliary spillway to be lowered and the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

Site 19 Preferred Alternative

On Site 19 the structural rehabilitation improvements include filling the existing 200 feet wide auxiliary spillway to existing top of dam elevation; constructing a new 400 feet wide auxiliary spillway with roller compacted concrete at left (south abutment) with crest that is 5.9 feet lower than the existing auxiliary spillway crest elevation; removing/abandon/grout fill the existing 30 inch diameter principal spillway conduit and riser and replacing it with a 48 inch diameter barrel 340 feet long and riser; constructing a new concrete impact basin; constructing a left abutment drain; and adding 950 lin. ft of riprap wave protection with bedding along the dam face. A drain pipe from the railroad right-of-way at the right (north) abutment needs the west end exposed and the east end repaired by the flap gate to be effective.

Site 19 has a net cut of approximately 42,200 cubic yards that needs to be properly addressed. The excavation results from lowering the auxiliary spillway 5.9 ft from the existing top of dam

elevation, impact basin, and for the roller compacted concrete. The excavation for the auxiliary spillway results in 500 lin ft of excavation along the dam. The auxiliary spillways will be surfaced with roller compacted concrete 260 lin ft in the direction of the water flow, each spillway 200 ft wide. The two (2) impact basins will be approximately 18 ft below the existing ground at the dam toe. Each impact basin will be 200 ft x 20ft in the direction of the water flow. The impact basins will surfaced with reinforced concrete and rip rap. The right abutment of the dam will require 280 lin. ft. of fill in the existing auxiliary spillway location. This will require 8,600 cu. yds. for a 16 ft. top width. The final waste area will be determined with the final design, the plan assumed all excess cut would be spread on the downstream face of the dam at an approximate 10" average depth., and cost and NEPA implications were included and considered for this location. The final design will need to confirm structural stability implications of the fill on the downstream face.

Enlarging the principal spillway (250% increase in flow area) impacted the detention volume and allowed for a lower auxiliary spillway crest elevation and lower initial reservoir elevation for routing the SDH and FBH. By lowering the auxiliary spillway crest and widening it to 400 feet allowed the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

The period of analysis for all alternatives was determined to be 101 years to include installation and evaluated life. All alternatives used the same period of analysis so that they could be consistently compared. Table S-2 summarizes the primary alternatives considered for Floodwater Retarding Structures Sites S-13 and S-19.

Table S-2. Primary Alternative Plans Considered

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost (S-13/ S-19)	Project Purpose Met	Project Need Met	
No Action/Future Without Federal Investment (FWOFI)	The FWOFI alternative describes the most likely future condition that could be expected if NRCS takes no action. It describes what is most likely to happen in the absence of any developed Federal alternative or changes in law or public policy. In this case, the FWOFI considered was that each dam is breached	$1,098,600/ $1,310,500			Yes

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost (S-13/ S-19)	Project Purpose Met	Project Need Met	
	by the Sponsor as the most likely scenario. Without the federal investment, the Sponsor would not try to rehabilitate the dams to meet Oklahoma state dam safety requirements and would remove the dams from operation. This doesn't meet the purpose and need of the project.				
Structural Rehabilitation to High Hazard Dam Criteria (also NEE Alternative)	Rehabilitate both dams to NRCS and State of OK High Hazard Class design criteria. Replacing the principal spillways of both dams. Lowering and widening the auxiliary spillways of both dams. Filling low area to top of dam elevation at S-13 and filling existing auxiliary spillway at S-19.	$1,706,200/ $6,049,800	✓	✓	Yes

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost (S-13/ S-19)	Project Purpose Met	Project Need Met	
Nonstructural Alternative	The Non-structural Alternative includes moving, floodproofing, or purchase of impacted structures and acquisition of easements for property that is located within the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential. For each dam, this alternative was eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements downstream of dams as well as purchase of homes impacted by potential breach.	$8,195,500/ $21,598,200	✓	✓	No
Decommissioning Alternative	The Decommissioning Alternative includes complete removal of the dam and purchase of impacted homes that are located within the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential. For each dam, this alternative was eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements		✓	✓	No

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost (S-13/ S-19)	Project Purpose Met	Project Need Met	
	downstream of dams. Detailed costs can be found in Appendix D.				

PROJECT COSTS AND BENEFITS

Tables S-3 – S-8 describe the Project costs and benefits data.

Table S-3 Total Estimated Project Installation Cost

Preferred Alternative	Source		Total Estimated Installation Costs
	PL 83-566 Funds	Other Funds	
Sallisaw Dam #13 - High Hazard Class Dam	$1,220,200	$486,000	$1,706,200
Sallisaw Dam #19 - High Hazard Class Dam	$4,347,600	$1,702,200	$6,049,800

[1] Price base 2024 January-2024

Table S-4 Estimated Cost Distributions

Works of Improvement	Installation Cost - Public Law 83-566 [1]				Installation Cost - Other Funds [1]							Total Installation Costs
	Construction	Engineering	Project Administration	P.L. 83-566 Funds	Construction	Engineering	Mitigation	Real Property	Permits	Administration	Total Other	
Sallisaw Dam #13 - High Hazard Class Dam	$884,000	$269,000	$67,200	$1,220,200	$461,000			$15,000	$10,000		$486,000	$1,706,200
Sallisaw Dam #19 - High Hazard Class Dam	$3,142,600	$964,000	$241,000	$4,347,600	$1,677,200	-	-	$15,000	$10,000	-	$1,702,200	$6,049,800

[1] Price base 2024 January-2024

Table S-5 Average Annual Flood Damage Benefits

Condition	Sallisaw Dam #13			Sallisaw Dam #19		
	Average Annual Agriculture-Related Flood Damage[1, 2]			Average Annual Agriculture-Related Flood Damage[1, 2]		
	Without Project	With Project	Damage Reduction	Without Project	With Project	Damage Reduction
Floodwater	$ 1,472,000	$ 1,459,000	$ 13,000	$ 1,816,000	$ 1,471,000	$ 345,000
Sediment						
Indirect	$ -	$ -	$ -	$ -	$ -	$ -
Restoration to Former Use			$ -			$ -
Total			$ 13,000			$ 345,000

[1] Price base 2024 January-2024

[2] Agriculture-related damage includes damage to rural communities.

Table S-6 Comparison of NEE Benefits and Costs

Works of Improvement	Average Annual Benefits						Average Annual Costs [1,3]	Estimated Benefit/Cost Ratio
	Damage Reduction			Restoration to Former Use [1,2]	Other Benefits	Total		
	Floodwater [1,2]	Sediment [1,2]	Indirect [1,2]					
Sallisaw Dam #13 - High Hazard Class Dam	$ 13,000	$ -	$ -	$ -	$ -	$ 13,000	$ 52,100	0.25
Sallisaw Dam #19 - High Hazard Class Dam	$ 345,000	$ -	$ -	$ -	$ -	$ 345,000	$ 180,000	1.99

[1] Price base 2024 January-2024

[2] From Table 5

[3] From Table 4.

Damages were annualized as shown in Economic Table 5. The annual damages, construction cost estimates, project administration costs, and operation and maintenance costs were then used to conduct a benefit-cost analysis (BCA) for the proposed project life of 100 years for each dam. This analysis compares the benefits of building each dam to the cost of implementation and maintenance. A project is considered cost-effective when the B/C Ratio is 1.0 or greater. The results of this BCA indicated that the B/C ratio is 0.25 for Sallisaw Dam #13 and 1.99 for Sallisaw Dam #19 which means, in this case, the benefits of rehabilitating these dams outweigh the costs. Although the B/C ratio is low for Sallisaw Dam #13, the costs of rehabilitation is much lower than the other alternatives, thus making the rehabilitation option more favourable.

Table S-7 - Benefit Cost Ratio (Sallisaw Dam #13 – 100-Year Project Life)

	Est. Annual Damage	Est. Annual Damage Benefit	PV Benefit	PV Total Cost (100 Year)	B/C Ratio (100 Year)
Without Dam	$1,472,000.00				
Dam 13 Rehabilitation to High Hazard Criteria	$1,459,000.00	$13,000.00	$441,363.55	$1,748,260.99	0.25245862
Analysis Period:	100	years			
Discount Rate:	0.0275	OMB A-94 nominal discount rate (Dec 2023)			

Table S-8 - Benefit Cost Ratio (Sallisaw Dam #19 – 100-Year Project Life)

Scenario	Est. Annual Damage	Est. Annual Damage Benefit	PV Benefit	PV Total Cost (100 Year)	B/C Ratio (100 Year)
Without Dam	$1,816,000.00				
Dam 19 Rehabilitation to High Hazard Criteria	$1,471,000.00	$345,000.00	$11,713,109.60	$5,883,578.68	1.9908138
Analysis Period:	100	years			
Discount Rate:	0.0275	OMB A-94 nominal discount rate (Dec 2023)			

Properties within the Breach Inundation Area

The breach results show potential loss of life as a consequence of dam failure. Please see the Breach Inundation Study Sallisaw Creek watershed Dam 13 | Dam 19 for more detailed information in Appendix E.

Breach Results Summary – Existing Condition Breaches

Because the top of dam elevation at each dam location remains the same between the existing condition and the rehabilitated option, the existing condition's hydrologic breach results are identical to the rehabilitated option's hydrologic breach results for each respective dam. Please see the following sections for hydrologic breach results.

By the same logic, the existing condition's seismic breach results are identical to the rehabilitated option's seismic breach results since the permanent pool elevation was kept constant between the existing condition and the rehabilitated option at both dam locations. Please read the following sections for seismic breach results.

The static breach was not analyzed in the existing condition for this report.

Breach Results Summary - Dam 13

Hydrologic Breach: Approximately 1 roadway crossing (Bunch Rd), 1 railroad crossing (RR KCS Heavener), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of Dam 13. The maximum depth of the flooding at these structures ranges from approximately 1.5 feet to 5.8 feet.

Static Breach: Approximately 1 roadway crossing (Bunch Rd), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 4.2 feet.

Seismic Breach: No potential damage locations (PDLs) are predicted to be inundated by the seismic breach at Dam 13. Therefore, Dam 13 can likely be evaluated for low consequence seismic criteria during design.

Breach Results Summary – Dam 19

Hydrologic Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 7 homes, 1 church, and 1 electrical substation are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.6 feet to 13.5 feet.

Static Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 3 homes, 1 church, and 1 electrical substation are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.4 feet to 10.3 feet.

Seismic Breach: Approximately two roadway crossings (S4680 Rd and E908 Rd) are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures is approximately 2.9 feet at S4680 Rd and 0.5 feet at E908 Rd. Due to the overtopping at these locations during the seismic breach, Dam 19 may need to be evaluated with the significant consequence seismic criteria during design.

Other Beneficial Effects

The Preferred Alternative includes these additional benefits:

- Minimized risk of loss of human life
- Minimized risk of damages
- Maintained land values
- Maintained fish and wildlife habitat

FUNDING SCHEDULE

The most likely scenario is for the dams to be implemented over three years including the design and construction.

Funding Schedule for Dam 13

Federal funds (PL-566):

Year 1 - $269,000 for engineering/technical assistance (rehab); $22,400 for project administration
Year 2 - $694,900 for construction (rehab); $22,400 for project administration
Year 3 - $694,900 for construction (rehab); $22,400 for project administration
Year 4 –$0
Year 5 - $0

Non-Federal Funds:

Year 1 - $4,000 for project administration (permits)
Year 2 - $230,500 for construction, $15,000 for property acquisition; $3,000 for project administration (permits)
Year 3 - $230,500 for construction, $3,000 for project administration (permits)
Year 4 – $0
Year 5 - $0

Period of Analysis: 103 years (includes 1 year for design and 2 years for construction)
Project Life: 100 years

Funding Schedule for Dam 19

Federal funds (PL-566):

Year 1 - $964,000 for engineering/technical assistance (rehab); $80,300 for project administration
Year 2 - $1,571,300 for construction (rehab); $80,300 for project administration
Year 3 - $1,571,300 for construction (rehab); $80,300 for project administration
Year 4 –$0
Year 5 - $0

Non-Federal Funds:

Year 1 - $4,000 for project administration (permits)
Year 2 - $838,600 for construction, $15,000 for property acquisition; $3,000 for project administration (permits)
Year 3 - $838,600 for construction, $3,000 for project administration (permits)
Year 4 – $0
Year 5 - $0

Period of Analysis: 103 years (includes 1 year for design and 2 years for construction)
Project Life: 100 years

ENVIRONMENTAL EFFECTS

Table S-9 describes the resource concerns identified during project scoping and summarizes the potential impacts related to the proposed Action.

Table S-9 Summary of Relevant Resource Concerns and Effects of Preferred Alternative (Rehabilitation for both FRS Sites S-13 and S-19)

Resource Concern/NRCS Planning Requirements	Rehabilitation to High Hazard Class Dams
Air Quality/ Clean Air Act/Climate Change	Short-term, minor impacts on air quality during rehabilitation.
Cultural Resources	Section 106 consultation for the rehabilitation of FRS Nos. 13 and 19 undertakings was conducted with the Oklahoma State Historic Preservation Office (SHPO), Oklahoma Archaeological Survey (OAS), Caddo Nation, Cherokee Nation, Osage Nation, Quapaw Nation, and United Keetoowah Band of Cherokee Indians in Oklahoma (Appendix A). The negotiated Area of Potential Effect (APE) was defined. Prior to the field investigation, a search of historic property records, maps, National Register of Historic Places (NRHP) listings, Oklahoma Landmarks Inventory listings, historic maps, land patent data, Indian allotment records, and general library search was undertaken. Traditional Cultural Properties, Properties of Religious and Cultural Significance, Indian Sacred Sites and cultural landscapes were considered during consultation. The Cherokee Nation "found instances where this project (FRS No. 19) is within close proximity to culturally sensitive resources". NRCS conducted a Section 106 field investigation to identify historic properties (Appendix E). NRCS determined FRS Nos. 13 and 19 and accoutrements, warrant historic resource documentation, having been constructed in 1966 and 1968, respectively—the current year being 2024. As stipulated by the SHPO, a Historic Property Resource Identification form was completed for both FRS. The preferred alternative involves a structural upgrade (rehabilitation). FRS Nos. 13 and 19 and its fixtures were evaluated using NRHP criteria. NRCS determined that FRS Nos. 13 and 19 did not meet criteria A-D to warrant listing on the NRHP. However, the SHPO's opinion was Sallisaw Creek Watershed (as a whole) qualified as a Historic District and FRS No. 19 was a contributing resource; a historic structure (house) within FRS No. 19 APE was not considered a contributing resource to the historic district.

Resource Concern/NRCS Planning Requirements	Rehabilitation to High Hazard Class Dams
	Conversely, FRS No. 13 was not considered a contributing resource to the historic district. As a result of continued consultation, taking into account the SHPO's opinions, NRCS determined that rehabilitation would have "no adverse effect" on the identified historic properties, historic district, or culturally sensitive resources—will not diminish integrity. As to indirect effects (visual elements) with rehabilitation, a "no adverse effect" determination was made since the existing agricultural landscapes will remain the same—will not diminish integrity. Through the consultation process, the Cherokee Nation noted that "these significant (culturally sensitive) resources are outside the APE" of FRS No. 19. Regarding the rehabilitation of FRS No. 13, the Cherokee Nation "does not foresee the project imparting impacts to Cherokee cultural resources". At this stage of the consultation process (2024), the SHPO, Survey, Cherokee Nation, and Osage Nation concurred with the finding of no effect by the undertakings, despite there being a historic district, contributing resource to that district, and the nearby presence of a Cherokee Nation culturally sensitive resource. The Quapaw Nation noted that the undertakings were outside their area of interest, while the United Keetoowah Band of Cherokee Indians in Oklahoma abstained after two attempts to engage in consultation.
Endangered and Threatened Species	Adverse impacts to threatened and endangered species are not anticipated (see Appendix A for ODWC and USFWS concurrence).

Resource Concern/NRCS Planning Requirements	Rehabilitation to High Hazard Class Dams
Environmental Justice	No disproportionate effect on minority or low-income populations. During scoping correspondence [Site 13, letter dated October 8, 2021, and Site 19, letter dated September 21, 2022], the Cherokee Nation (Nation) noted "continued interest in acting as a consulting party to this proposed project." Through a Nation database and record review, it was found that Site 13 does not intersect or adjoin cultural, historic, and/or pre-historic resources; however, Site 19 was found to be "within close proximity to such resources, including culturally sensitive resources and land held by the Nation." The Cherokee Nation Tribal Historic Preservation Office requested construction details. These details were provided on February 15, 2024. On March 14, 2024 the Cherokee Nation determined that the significant resources are outside the Area of Potential Effect. A preliminary plat map for Site 19 in Appendix C shows that the Cherokee Nation has 1 parcel of land upstream of Site 19 that receives inundation during flooding events, and the preferred alternative plans are not increasing the elevation of the dam or depth of inundation for this parcel, and no work is planned near or on this parcel..
Erosion and Sedimentation	Beneficial impact by maintaining reduced downstream erosion and sedimentation.
Fish and Wildlife	No change from baseline condition. No impact is anticipated.
Floodplain Management	The existing dams are currently accounted for in Zone A floodplain mapping. The rehabilitation of each dam to meet NRCS high hazard criteria will have minor impact on the regulated Zone A floodplains. Because the principal spillway size is being increased higher frequency events such as the 50%, and 10% chance events have minor increased flow downstream, but this has little impact on the regulated 100-year floodplain.
Flood Damage	Beneficial impact by continued flood damage reduction downstream, meeting Purpose and Need.
Forest Resources	Permanent impact to scrub/shrub habitat may occur from removal for auxiliary spillway widening.
Land Use	No change from baseline condition and no impact to land use.
Migratory Birds/Bald and Golden Eagle Protection Act	Vegetation used for nesting by migratory birds may be removed; however, if construction activities are conducted during non-nesting season no impact is anticipated.
Prime and Unique Farmlands	No change from baseline condition and no impact.

Resource Concern/NRCS Planning Requirements	Rehabilitation to High Hazard Class Dams
Public Health & Safety	Beneficial impact by reducing flooding potential to roads and bridges downstream, resulting in less chance of loss of life and reduced damages.
Regional Water Resources Plans	These structures fit within the Watershed Plan in reducing flooding for the entire watershed and rehabilitating them to higher hazard criteria increases overall protection and public safety. No other regional water resource plans were found for this branch of the watershed in the project area. No impact.
Riparian Areas	The flow behavior upstream and downstream of the dams would change with the modification of the spillways and alter the flood cycle in areas downstream of the dams. Upstream of the dams, existing riparian areas should remain the same as the permanent pools for both dams will remain at the same elevations, but they could be affected by having larger principal spillways that reduce temporary impoundment at a faster rate. Minor, temporary impact.
Scenic Beauty	No areas of exceptional scenic beauty or specifically designated unique of valuable scenic landscapes would be affected.
Social Issues	Beneficial impact by reducing flooding which provides safer routes to school and hospitals with more reliable roads.
Water Quality	Sallisaw Creek is impaired within the project area. Project will provide beneficial impact by trapping sediments and by maintaining reduced downstream erosion and sedimentation.
Water Resources/Waters of the US/Clean Water Act	No change from baseline condition, permanent pool and top of dam elevations to remain the same. Replacement of principal spillways may affect WOTUS and a 404 permit may be required. These two sites fall under the scope of Nationwide Permit 3 – Maintenance. S-19 is in "high quality waters" and requires an Individual Water Quality Certification from the Oklahoma Department of Environmental Quality (ODEQ). A pre-filing meeting for S-19 will need to be requested 30 days prior to submitting the certification request. With coordination with USACE and ODEQ the proper 404 and water quality permits were received for both sites (Sallisaw 13, permit # SWT-2021-00520, Sallisaw 19 permit # SWT-2022-00481). These permits can be found in Appendix A.
Wetlands	No change from baseline condition. There are no wetlands in the area of the principal spillway or auxiliary spillway work on either site. No wetlands will be impacted by construction activities. Because the permanent pool would not increase, wetlands would not be affected.

MAJOR CONCLUSIONS

The Preferred Alternative is to structurally rehabilitate Sites S-13 and S-19 to NRCS High Hazard Class design criteria and to extend the design lives for an additional 100 years. This is the National Economic Efficiency (NEE) Alternative.

AREAS OF CONTROVERSY

No areas of controversy were identified. One property owner (Rainwater) at Sallisaw Site 19 was adamant that they will not give any additional permanent easements. The dam rehabilitation was planned to keep permanent pool and top of dam elevations the same as existing for this reason. Any temporary construction easements needed for auxiliary spillway RCC construction work will need to come from other property owners. Those to the west of the base of dam would be the best location.

ISSUES TO BE RESOLVED

No issues to be resolved were identified.

EVIDENCE OF UNUSUAL CONGRESSIONAL OR LOCAL INTEREST

No evidence of unusual congressional or local interests was identified.

COMPLIANCE CERTIFICATION

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes_X_ No___.

1.0 Changes Requiring A Supplement

1.1 Introduction

This project was initiated by the Adair County Conservation District (Sponsor) to continue to help alleviate flooding in the Sallisaw Creek Watershed. Dam 13 was completed September 20, 1966 as a small sized dam to low hazard criteria and has exceeded its original 50-year evaluation life. Dam 19 was completed June 20, 1968 as an intermediate sized dam to low hazard criteria and has exceeded its original 50-year evaluation life. Sallisaw Creek Sites 13 and 19 are located in Adair County, U.S. Congressional District 2, Oklahoma. Site 13 latitude 35.6857, longitude -94.7834. Site 19 latitude 35.7678, longitude -94.6667. The Sponsor requested a supplemental watershed plan and environmental document be prepared to determine the dams' viability and potential use of PL-566 funding to structurally rehabilitate the dams to meet current high hazard dam criteria. State of Oklahoma Natural Resources Conservation Service (NRCS) requested that the supplemental watershed plan be analyzed to meet high hazard class dam criteria. A non-structural alternative of modifying the hazards downstream of the dams, Future Without Federal Investment (FWOFI) (in this case, a sponsor dam breach), and decommissioning the dams were also considered alternatives.

This document tiers to the Environmental Impact Statement (EIS) – Rehabilitation of Aging Flood Control Dams in Oklahoma, August 2002, and reviewed April 2007, April 2012, April 2017, and August 2022. A review was conducted to determine if the effects of the project are within the scope of the programmatic EIS. All effects of this project have been analyzed and accounted for and are within the scope of the cited document. Due to the minimal effects of the proposed action, the project can be processed as a categorical exclusion.

1.2 Changes Requiring Preparation of Supplemental Watershed Plan

The hazard classification was upgraded to high hazard for both dams because of downstream potential damage locations (PDLs) that were built over the years, creating a higher potential loss of life. Both dams also have exceeded the original design life. A Supplemental Watershed Plan is required to update the original plan and environmental evaluation for these dams in order to meet current criteria to be authorized for federal funding. The current policy is to consider each structure on its own merits and not as part of a group of structures as was originally considered in the 1961 Work Plan.

2.0 Purpose and Need for Action

2.1 Project Purpose and Need

The Purpose of the proposed action is Flood Prevention and Watershed Protection and to reduce the risk of loss of life and flood damage reduction by bringing the Sallisaw Creek S13 and S19 dams into compliance with the current NRCS and Oklahoma safety performance standards or decommissioning the dams.

Sallisaw Creek S-13 was constructed in 1966 and S-19 in 1968 under the authority of *Public Law 83-566* as *low* hazard potential dams. Low hazard dams are classified as those where failure may cause damage to farm buildings, agricultural land, or township and country roads. The original design life of both dams was 50 years, which has been exceeded, and a purpose is to continue flood damage reduction. The dams do not currently safely convey 100 percent of the Probable Maximum Precipitation (PMP) through the auxiliary spillway without overtopping the dam or have the capacity to safely contain the 100-year, 10-day storm without flowing over the crest of the auxiliary spillway.

The Need for the proposed action is that the Sallisaw Creek Sites S-13 and S-19 are both currently classified as *high* hazard potential dams and NRCS has determined them to be out of compliance with NRCS TR 60 design criteria and performance standards regarding principal spillway capacity and freeboard capacity. The Oklahoma Water Resources Board determined the dams were out of compliance with the Oklahoma State Dam Safety Criteria. Both sites were built with single purpose flood control benefits. High hazard dams are those where failure may cause loss of life and serious damage to homes, industrial or commercial buildings, important public utilities, main highways, or railroads. Site 13 at a high hazard level protects 5 homes, 1 commercial building, 1 church, and 1 road and additionally at a significant hazard level protects 1 home, 2 roads, and 5 railroads out of 29 potential damage locations (PDLs) that were analyzed. Site 19 at a high hazard level protects 7 homes, 1 church, 1 electrical substation, 5 roads, and 1 railroad and additionally at a significant hazard level protects 2 homes out of the 29 PDLs analyzed. This protection is currently at risk with the dams not meeting NRCS TR 60 design criteria.

The Principles, Requirements and Guidelines for Federal Investments in Water Resources states that the Federal Objective of all water resources projects should strive to maximize public benefits, with appropriate cost considerations. Public benefits encompass environmental, economic, and social goals and include monetary and nonmonetary effects and quantified and unquantified measures. No hierarchy exists among these three goals and, as a result, trade-offs among alternatives are assessed

The Federal Objective, as set forth in the Water Resources Development Act of 2007, specifies that Federal investments in water resources shall reflect national priorities, encourage economic development, and protect the environment by: (1) seeking to maximize sustainable economic development; (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

2.2 Opportunities

The following opportunities will be recognized by implementing the Preferred Alternative. Quantification of these opportunities will be provided in other sections of this report as necessary.

- Comply with dam design and safety criteria established by NRCS and the Oklahoma Water Resources Board (OWRB).
- Minimize the potential for loss of life associated with a failure of the dams.
- Extend or improve the existing level of flood protection for downstream agricultural land, houses, businesses, and infrastructure. Results of the hydraulics and hydrology study for the 10, 25-, 50-, 100-, and 500-yr return intervals are summarized in the Investigation and Analyses Report in Appendix D from the Breach Inundation Study, Flood Frequency Analysis, Watershed Dam Routing Memorandum, SITES Analysis, and Hazard Analysis reports included in Appendix E.
- Extend opportunity for higher-value land use in the benefit area, defined as the area protected from flooding by the dam, shown on Appendix B project map.
- Protect real estate values.

3.0 Scope of the Plan - Environmental Evaluation

3.1 Scoping Process

The scoping process identified issues of economic, environmental, cultural, and social concerns related to the project. Concerns of the Sponsor and local citizens were expressed at planning and public meetings. Factors affecting natural resources and ecosystems; historic and cultural resources; community and public safety; floodplains; agricultural and land uses; and sustainable economic development were identified by engineers, biologists, economists, resource conservationists, water quality specialists, archaeologists, local farmers and residents, and other stakeholders.. The scoping process of the Environmental Evaluation for the dams involved site investigations, public meetings, and consultations with jurisdictional agencies.

The scoping process identified (1) the objectives, needs, and primary concerns for the Sponsor, (2) the relevant issues, and (3) the environmental, social, and economic concerns associated with the project.

3.2 Identified Concerns

Table 3-1 identifies potential resource concerns. Relevancy to the proposed action was determined and rationale was provided. Irrelevant concerns were eliminated from further consideration. Relevant resource concerns were reviewed in detail for the comparison of alternatives. Table 3-1 includes resource concerns that require evaluation per the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) and NRCS guidance.

Table 3-1 Summary of Scoping

Potential Resource Concern	Relevant to Proposed Action?	Rationale
National Economic Efficiency (NEE)	Yes	The National Economic Efficiency (NEE) Alternative is not an independent option. The NEE alternative is the alternative that reasonably maximizes net economic benefits consistent with protecting the nation's environment. It is the alternative, or combination of alternatives, that reduces the off-site or public problem and maximizes net national economic development benefits. In the context of PR&G and tradeoff analysis, it may also be possible to select an alternative (Preferred Alternative) that may not be the most economically efficient from an array of alternatives due to its other economic, social, and environmental tradeoff effects.
Air Quality/Clean Air Act/Climate Change	Yes	Air quality, clean air, and climate change are relevant concerns because of the potential impact from the project and were considered.
Coastal Zone Management	No	No coastal areas are associated with this project. The project is located in Oklahoma.
Coral Reefs	No	No coral reefs are associated with this project. The project is located in Oklahoma.

Cultural Resources/ Historic Properties	Yes	In accordance with 36 CFR800.4 and 36 CFR 800.5 identification and assessment of effects, including consultation with consulting parties, was performed for cultural resources (historic properties) within the delineated Area of Potential Effect (APE). Per 36 CFR 800.16 (l), resources that may be considered archaeological sites, built environmental resources (including those over 45 years of age) culturally significant resources, and historic districts, were considered. Section 106 consultation for the rehabilitation of FRS Nos. 13 and 19 undertakings was conducted with the Oklahoma State Historic Preservation Office (SHPO), Oklahoma Archaeological Survey (OAS), Caddo Nation, Cherokee Nation, Osage Nation, Quapaw Nation, and United Keetoowah Band of Cherokee Indians in Oklahoma (Appendix A). The negotiated APE was defined. Prior to the field investigation, a search of historic property records, maps, National Register of Historic Places (NRHP) listings, Oklahoma Landmarks Inventory listings, historic maps, land patent data, Indian allotment records, and general library search was undertaken. Traditional Cultural Properties, Properties of Religious and Cultural Significance, Indian Sacred Sites and cultural landscapes were considered during consultation. The Cherokee Nation "found instances where this project (FRS No. 19) is within close proximity to culturally sensitive resources". NRCS conducted a Section 106 field investigation to identify historic properties (Appendix E). NRCS determined FRS Nos. 13 and 19 and accoutrements, warrant historic resource documentation, having been constructed in 1966 and 1968, respectively—the current year being 2024. As stipulated by the SHPO, a Historic Property Resource Identification form was completed for both FRS. The preferred alternative involves a structural upgrade (rehabilitation). FRS Nos. 13 and 19 and its fixtures were evaluated using NRHP criteria. NRCS determined that FRS Nos. 13 and 19 did not meet criteria A-D to warrant listing on the NRHP. However, the SHPO's opinion was Sallisaw Creek Watershed (as a whole) qualified as a Historic District and FRS No. 19 was a contributing resource; a historic structure (house) within FRS No. 19 APE was not considered a contributing resource to the historic district. Conversely, FRS No. 13 was not considered a

Potential Resource Concern	Relevant to Proposed Action?	Rationale
		contributing resource to the historic district. As a result of continued consultation, taking into consideration the SHPO's opinions NRCS determined that rehabilitation would have "no adverse effect" on the identified historic properties, historic district, or culturally sensitive resources—will not diminish integrity. As to indirect effects (visual elements) with rehabilitation, a "no adverse effect" determination was made since the existing agricultural landscapes will remain the same—will not diminish integrity. Through the consultation process, the Cherokee Nation noted that "these significant (culturally sensitive) resources are outside the APE" of FRS No. 19. Regarding the rehabilitation of FRS No. 13, the Cherokee Nation "does not foresee the project imparting impacts to Cherokee cultural resources". At this stage of the consultation process (2024), the SHPO, Survey, Cherokee Nation, and Osage Nation concurred with the finding of no effect by the undertakings, despite there being a historic district, contributing resource to that district, and the nearby presence of a Cherokee Nation culturally sensitive resource. The Quapaw Nation noted that the undertakings were outside their area of interest, while the United Keetoowah Band of Cherokee Indians in Oklahoma abstained after two attempts to engage in consultation.
Ecological Critical Areas	No	Ecologically critical areas are not present in the project area.
Endangered and Threatened Species	Yes	The potential for threatened and endangered species being impacted within the area of influence by the project exists and was considered both by desktop and field investigation techniques.

Potential Resource Concern	Relevant to Proposed Action?	Rationale
Environmental Justice	Yes	The potential impact on minority or low-income populations was a relevant project impact concern that was considered to ensure fair and equitable treatment of all populations. During scoping correspondence [Site 13, letter dated October 8, 2021, and Site 19, letter dated September 21, 2022], the Cherokee Nation (Nation) noted "continued interest in acting as a consulting party to this proposed project." Through a Nation database and record review, it was found that Site 13 does not intersect or adjoin cultural, historic, and/or pre-historic resources; however, Site 19 was found to be "within close proximity to such resources, including culturally sensitive resources and land held by the Nation." The Cherokee Nation Tribal Historic Preservation Office has requested construction details once prepared.
Erosion and Sedimentation	Yes	The nature of the project purpose and need includes the potential impact of reducing downstream erosion potential and settling out of existing suspended solids, and this was considered. There is also a potential erosion and sedimentation impact from construction activities that was considered.
Essential Fish Habitat (EFH)	No	No essential fish habitat was identified in the project area or area of influence.
Fish and Wildlife	Yes	The project could affect fish and wildlife habitat by changing the land use both in the project location and downstream and these effects were considered.
Floodplain Management	Yes	The dams are proposed to be rehabilitated in a FEMA unmapped Zone A floodplain. By design, the dams intersect with the 100-year floodplain at these locations. The dams create flooding upstream of the dam area and reduce it downstream.
Flood Damage	Yes	By design the dams will impact downstream flood damages, so this was an essential part of the considerations of the Plan and Environmental Evaluation.

Potential Resource Concern	Relevant to Proposed Action?	Rationale
Forest Resources	Yes	A part of the auxiliary spillway widening at the dam sites could remove existing forest and the downstream flooding impacts existing forest, so this was a relevant concern that was considered.
Invasive Species	Yes	Invasive species are a relevant concern in this type of project and were considered.
Land Use	Yes	The project will affect the land use within the permanent pools, dam sites, and downstream and these are relevant concerns that were considered.
Migratory Birds/Bald and Golden Eagle Protection Act	Yes	This was a relevant concern because migratory birds likely utilize the project area and bald eagle and golden eagle preferred habitat could potentially be located within the project based on the location and was thus considered.
National Parks, Monuments, and Historical Sites	No	National Parks, Monuments, or Historical Sites are not located in the project area.
Natural Areas	No	No formally designated Natural Areas were identified in the project area.
Parklands	No	No formally designated Parklands were identified in the project area.
Prime and Unique Farmlands	Yes	Less than 1 acre of either project site meets the requirements for prime farmland (NRCS, 2007) The potential area affected was considered.
Public Health and Safety	Yes	Proposed changes to the dams would provide flood damage reduction within the benefit area, defined as the area of land that is provided flood attenuation These benefits include reduction of flooding of roads, residential structures, and agricultural lands. The project Purpose and Need includes designed beneficial impacts to public health and safety and were thus considered.

Potential Resource Concern	Relevant to Proposed Action?	Rationale
Regional Water Resource Plans	Yes	The proposed project will not change the volume of water detained in the reservoirs, but they will continue to provide small amounts of surface water storage and sediment storage from their respective watersheds which are located in the Lower Arkansas Watershed Planning Region (2012 Oklahoma Comprehensive Water Plan). Removal of the dams would counter to the objective of the plan to maintain and/or increase surface water storage volumes.
Riparian Areas	Yes	The project areas include and are adjacent to riparian habitat; therefore, this resource was considered.
Scenic Beauty	No	No areas of exceptional scenic beauty or specifically designated unique or valuable scenic landscapes were identified in the project area. No concerns were identified.
Significant Scientific Resources	No	Due to the lack of significant scientific resources in the area, no concerns were identified.
Sole Source Aquifers	No	Due to the lack of aquifer resources identified, no concerns were identified.
Social Issues	No	No Action represents a foregone benefit. Proposed changes to the dams would provide flood damage reduction within the benefit area.
Water-based Recreation	No	The planned structures are private and no public needs for water recreation were identified.
Water Quality	Yes	Sallisaw Creek is impaired within the project area; therefore, water quality impacts were considered. Project will provide beneficial impact by trapping sediments and by maintaining reduced downstream suspended solids.

Potential Resource Concern	Relevant to Proposed Action?	Rationale
Water Resources	Yes	The proposed dam modifications affect the flow rate of a stream at two separate locations, S19 at the Sallisaw Creek headwaters and S13 from a sub-watershed unnamed tributary, and is relevant for consideration. By design it will also impact the use and operation of water resources within the area. Flow rate and quantity of water upstream of dams and below should be maintained to the point where impact is negligible to ensure retaining designation.
Waters of the United States/Clean Water Act (CWA)	Yes	The proposed dam rehabilitation modifications affect the flow rate of a stream at two separate locations, S19 at the Sallisaw Creek headwaters and S13 from a sub-watershed unnamed tributary, that likely falls under the jurisdiction of the USACE and this is part of the proposed action of the project and relevant for consideration. A Section 404 permit may be required for this project. These two sites fall under the scope of Nationwide Permit 3 – Maintenance. S-19 is in "high quality waters" and requires an Individual Water Quality Certification from the Oklahoma Department of Environmental Quality (ODEQ). A pre-filing meeting for S-19 will need to be requested 30 days prior to submitting the certification request. An NPDES permit is expected for this project. Waters of the US are already impacted by the existing dams and the rehabilitation modifications will change the flow rates. Prior to conducting site activities, an NPDES Construction permit may be required. For seeding needs, S-13 expects 1.6 acres and S-19 expects 0.5 acres of ground disturbance.
Wetlands	Yes	Site and aerial reconnaissance indicate the potential for wetlands within the project at both dam sites, including downstream of site S-19 and this relevant consideration was carried forward.

Potential Resource Concern	Relevant to Proposed Action?	Rationale
Wild and Scenic Rivers	No	No Federal or State designated Wild, Scenic, or Recreational River segment or a river listed in the Nationwide Rivers Inventory (NRI) occurs in the project area.
Ecosystem Services		
Provisioning Services	Yes	Tangible goods provided by local agriculture as well as other services supported by soils, water, animals, and riparian habitat could be impacted by the proposed action.
Regulating Services	Yes	Regulating services associated with clean water; floodplains; regional water resource plans; sedimentation and erosion; climate stabilization; and land use could be impacted by the proposed action.
Cultural Services	Yes	Flooding issues in the watershed negatively affect cultural services and the proposed action would positively influence this ecosystem service.

4.0 Affected Environment

The affected environment includes ecological, cultural, social, aesthetic, and economic resources that could be affected by the proposed alternatives. The purpose of describing the affected environment is to define the context in which the impacts could occur. This section describes general setting and characteristics of proposed rehabilitation modifications to S-13 and S-19.

4.1 Project Setting

Oklahoma lies in the South-Central portion of the United States bordered by Texas, Arkansas, Kansas, Colorado, New Mexico, and a small section of Missouri. The eastern portion of the state experiences a humid subtropical climate compared to the western portion of the state which experiences more of a semi-arid type of climate, according to the Köppen climate classification.

According to the Oklahoma Climatological Survey (OCS, 2021), Adair County in Oklahoma receives 47.73 inches of precipitation per year. The wettest year on record was in 1927 when the county saw 80.36 inches of rain while the driest year resulted in 22.33 inches of rain in the year 1936. The average annual snowfall for the county is 8.0 inches with an average of 9 days a year with snow on the ground. However, snowfall is more common in the Northwestern portion of the state even though southeastern Oklahoma has a higher average level of precipitation.

Data shows that August is the warmest month in the county while January is the coldest. Average nighttime temperatures in Adair County are 28.4 degrees Fahrenheit in the month of January. The average maximum temperature in Adair County is 69.6 degrees Fahrenheit compared to the average minimum which is 49.3 degrees. However, the record high and low temperatures of the region were recorded at 114 degrees and -27 degrees Fahrenheit. In an average winter season, the county sees 8.0 inches of snowfall with the first freeze beginning in late October and the last freeze in early April. This leaves the growing season predicted to last about 204 days a year (OCS, 2021).

The state of Oklahoma is known to have strong storms and winds that can produce severe weather. Thunderstorms are noted to occur an average of 50 days per year across the county. In Adair County alone, 25 tornados were recorded from the year 1950 to 2016. The Oklahoma Climatological Survey states that the average wind speed for the county is 7 miles per hour (OCS, 2021).

The Oklahoma Climatological Survey also notes that the county sees sunshine around 50-75 percent of the time. The average relative humidity is 71 percent from (OCS, 2021).

Adair County is connected to other areas of the State by two U.S. Highways and three State Highways. The county is served by the Blackwell Northern Gateway Railroad. Several paved farm-to-market roads extend into almost every part of the county. The county road system consists of graded or unimproved roads. Many of the roads on the fine-textured prairie soils are graveled and are passable during wet weather, but some are impassable during protracted rainy

spells. Adair County connects Arkansas, the neighboring state, and other areas of Oklahoma by US Route 100, US Route 62, US Route 59, and several other minor highways. There is one main railway, the Kansas City Southern Railway, which travels from Springfield, Illinois into Kansas City, and down through Adair County all the way to Mexico (ODOT, 2021).

4.2 Background and Current Status of Dams

4.2.1. Dam Inspections

Both dam Sites 13 and 19 were inspected on July 29th, 2021, including dam field inspection checklists. They were both found to generally be in good visual condition.

Site 13 has an access drive that crosses the left (north) abutment and has worn down the top of dam at this location. It needs to be built back up to the top of dam elevation during rehabilitation. The bottom of this elevation was higher than the existing auxiliary spillway crest.

Site 19 has a corrugated metal pipe (CMP) drain line from the railroad right-of-way into the upstream area that is inoperable. Site 19 also has a 12 inch CMP that had continuous flow into the plunge pool that is not on the record drawings and the site visit surmised that it may be connected into the toe drain system. Site 19 had a seep near the left (south) abutment, downstream face. It appeared to be from the side hill, but this was not verified. It is recommended that this seep be physically investigated during final rehabilitation design of the dam.

The inspections were discussed with the sponsor with recommendations for addressing items that were O&M concerns. Several O&M items were being addressed while on site for the inspections.

4.2.2. Status of Operation and Maintenance

Both dams were being maintained and appeared to be operating as designed. Both dams showed debris evidence of temporary impoundment on the dam face. Neither dam had visual evidence of having had the auxiliary spillway activated.

They both had need for additional removal of woody vegetation growth. Site 19 had large debris on the principal spillway riser that needs to be removed. The woody vegetation and large debris will be removed using Sponsor funds other than what is authorized for this proposed project.

4.2.3. Potential Modes of Failure

Each Site was reviewed for potential modes of dam failure. The dams were analyzed in for static (material deterioration – spillway or conduit, erosion or foundation), hydrologic (overtopping), and seismic breach scenarios. These potential modes of failure are with the water surface elevation with the breach occurring at sunny day conditions for static and seismic modes and at the peak reservoir state resulting from the probably maximum flood (PMF) for hydrologic mode.

4.2.4. Breach Analysis and Hazard Classifications

The breach analysis of the dams was modeled using HEC RAS 6.0 and 6.1 independently for each dam without concurrent dam failure because they are independent facilities. The analysis included breach analysis, breach inundation mapping, and downstream hazard field reconnaissance. The dam at Site 13 has about 1083 acre-feet of storage capacity and the dam at Site 19 has about 5840 acre-feet of storage capacity at top of dam elevations. The breach analysis modeled the peak discharge associated with each of the potential modes of failure discussed above. For both Site 13 and Site 19 the hydrologic breach at the peak reservoir state resulting from the PMF resulted in the largest flowrate and downstream consequences. A narrative of the breach analysis results is listed in Section 4.2.7 Consequences of Dam Failure. The existing and rehabilitated hydrologic scenarios were the same because top of dam is to remain at the same elevation in the preferred alternative. Please see the Breach Inundation Study Sallisaw Creek Watershed Dam 13 | Dam 19 for more detailed information in Appendix E.

Site 13 and 19 dams were evaluated as high hazard dams. Analysis of the Sallisaw Creek watershed indicates 29 potential damage locations (PDLs) could be affected by a breach of either dam. Both dam Sites 13 and 19 rated as high hazard class in both the static and hydrologic breach scenarios. The hazard analysis recommends that Site 13 be evaluated for low consequence seismic criteria and Site 19 be evaluated for significant consequence seismic criteria in a rehabilitation design. This recommendation is based on the seismic hazard classification of each PDL for each dam, please see Hazard Analysis Summary in Appendix E.

The Population at Risk (PAR) was computed using the PDLs identified in this analysis. These PARs represent a minimum value, since the PDL locations identified this study do not represent an exhaustive list of all possible inundated locations. The PAR computation form for each site is attached in Appendix E.

Population at Risk:
Site 13 (Seismic) - 0
Site 13 (Static) - 14
Site 13 (Hydrologic) - 14

Site 19 (Seismic) - 5
Site 19 (Static) - 13
Site 19 (Hydrologic) - 31

4.2.5. Sediment Accumulation

The dams both had bathymetric sedimentation surveys completed from July 27, 2021 thru August 1, 2021; included as part of the SITES Analysis Summary Reports in Appendix E. These surveys were compared to stage-storage provided in original as-built plans to develop an annual sedimentation rate for each dam.

Site 13 had 56.77 acre-feet of total sedimentation, 48.25 acre-feet submerged (0.86 acre-feet/year) and 8.52 acre-feet aerated sedimentation (0.15 acre-feet/year). This dam had an increased sedimentation rate over the 56 years of service than the rate in the original design. The total sediment rate increased from 0.53 acre-ft/year to 1.01 acre-feet/year.

Site 19 had 292.81 acre-feet of total sedimentation, 248.89 acre-feet submerged (4.53 acre-feet/year) and 43.92 acre-feet aerated sedimentation (0.80 acre-feet/year). This dam had an increased sedimentation rate over the 56 years of service than the rate in the original design. The total sediment rate increased from 3.74 acre-ft/year to 5.33 acre-feet/year.

4.2.6. Embankment and Geotechnical Evaluation

There was no new geotechnical evaluation with this Supplemental Watershed Plan and Environmental Evaluation. From the record drawings, both Sites 13 and 19 are built with a zoned earthfill embankment, originally designed to a low hazard classification for a 50-year design life. The structural rehabilitation alternative for both dams was modeled in SITES for a 100-year design life. The hazard analysis recommends that Site 13 be evaluated for low consequence seismic criteria and Site 19 be evaluated for significant consequence seismic criteria in a rehabilitation design. This recommendation is based on the hazard classification of each potential damage location (PDL) for each dam, please see Hazard Analysis Summary in Appendix E.

4.2.7. Consequences of Dam Failure

The breach results show potential loss of life as a consequence of dam failure. Please see the Breach Inundation Study Sallisaw Creek watershed Dam 13 | Dam 19 for more detailed information in Appendix E.

Breach Results Summary – Existing Condition Breaches

Because the top of dam elevation at each dam location remains the same between the existing condition and the rehabilitated option, the existing condition's hydrologic breach results are identical to the rehabilitated option's hydrologic breach results for each respective dam. Please see the following sections for hydrologic breach results.

By the same logic, the existing condition's seismic breach results are identical to the rehabilitated option's seismic breach results since the permanent pool elevation was kept constant between the existing condition and the rehabilitated option at both dam locations. Please read the following sections for seismic breach results.

The static breach was not analyzed in the existing condition for this report.

Breach Results Summary - Dam 13

Hydrologic Breach: Approximately 1 roadway crossing (Bunch Rd), 1 railroad crossing (RR KCS Heavener), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of

Dam 13. The maximum depth of the flooding at these structures ranges from approximately 1.5 feet to 5.8 feet.

Static Breach: Approximately 1 roadway crossing (Bunch Rd), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 4.2 feet.

Seismic Breach: No PDLs are predicted to be inundated by the seismic breach at Dam 13. Therefore, Dam 13 can likely be evaluated for low consequence seismic criteria during design.

Breach Results Summary – Dam 19

Hydrologic Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 7 homes, 1 church, and 1 electrical substation are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.6 feet to 13.5 feet.

Static Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 3 homes, 1 church, and 1 electrical substation are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.4 feet to 10.3 feet.

Seismic Breach: Approximately two roadway crossings (S4680 Rd and E908 Rd) are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures is approximately 2.9 feet at S4680 Rd and 0.5 feet at E908 Rd. Due to the overtopping at these locations during the seismic breach, Dam 19 may need to be evaluated with the significant consequence seismic criteria during design.

4.3 Relevant Resource Concerns

4.3.1. Air Quality

Adair County is in the Metropolitan Intrastate Air Quality Control Region (AQCR). The Clean Air Act (CAA) (42 USC §§ 7401–7671, as amended) provided the authority for the U.S. Environmental Protection Agency (USEPA) to establish nationwide air quality standards to protect public health and welfare. Federal standards, known as the National Ambient Air Quality Standards (NAAQS), were developed for six criteria pollutants: ozone (O3), nitrogen dioxide (NO2), carbon monoxide (CO), sulfur dioxide (SO2), particulate matter (PM10 and PM2.5), and lead (Pb). Criteria pollutants are considered those with excessive concentrations in the atmosphere that adversely impact human health. Adair County is in attainment for all criteria pollutants (USEPA, 2021).

4.3.2. Cultural Resources

Consultation with historic preservation partners included the Oklahoma State Historic Preservation Officer, the State Archaeologist (with OAS), and tribes with ancestral lands in Oklahoma. Based on verbal conversations (GM 420 Part 601.23(B)(2)(ii), Title 190 Part

315.5(E)(2)), and past consultation on other watershed rehabilitation projects, the APE is defined by the top-of-dam elevation upstream of Floodwater Retarding Structures (FRS) Nos 13 and 19 as well as below FRS Nos. 13 and 19 to the extent of the state/federal easement. The APE also included the auxiliary spillway, the ingress/egress routes, and the likely location of a staging area. Obviously, indirect effects of the undertaking extend beyond the so called "footprint" of the undertaking (36 CFR 800.16(d)). Given the local discretionary protocol for defining the APE, as allowed by the NHPA, official consultation was initiated on April 19, 2021 with the OAS and Oklahoma SHPO with a request for comment letter which included the proposed APE (Appendix C). In all, five Indian tribes (GM 420 Part 401.2(16), 36 CFR 800.16(m)) with ancestral lands (GM 420 Part 401.2(3)) or tribal lands (36 CFR 800.16(x)) in Oklahoma were consulted (Title 190 Part 315.3(2), Title 190 Part 315.5, National Instruction 410-301). These tribes are: Caddo Nation, Cherokee Nation, Osage Nation, Quapaw Nation, and United Keetoowah Band of Cherokee in Oklahoma. Consultation with these tribes was initiated on September 9, 2021 with a request for comment letter (Appendix A). A continuation of consultation with the Cherokee Nation and SHPO are addressed for FRS No. 19 in a paragraph to follow.

Prior to the cultural resources (GM 420 Part 401.2(7)) field investigation (36 CFR 800.4; GM 420 Part 401.2(13)) to identify historic properties (36 CFR 800.16(l)1, GM 420 Part 401.2(14)), a search of the records and maps housed at the OAS were investigated; OAS site forms/files for Adair County were also reviewed. Likewise, the NRHP listings for Oklahoma and the Oklahoma Landmarks Inventory, both maintained by the Oklahoma SHPO, were consulted prior to the field investigation. Historic maps and land patent data from the late 1800s, archived by the Bureau of Land Management, and American Indian allotment records maintained by the Bureau of Indian Affairs, were also studied. Further research included examining the construction records and inspectors' field notes archived at the NRCS State Office, Stillwater. Additionally, a general library search was undertaken to identify miscellaneous articles of interest relating to construction of the dams, and conservation/flood control/agricultural trends in the watershed and vicinity. Personal knowledge from prehistoric and historic events in Oklahoma, as well as prehistoric and historic trends associated with particular landforms, were also taken into account. The results of the consultation and background research identified two matters of note. First, Sallisaw Creek watershed as a whole is an historic district (with contributing and non-contributing resources), and the Cherokee Nation noted a culturally significant resource near FRS No. 19. These two resources and the effect of the undertakings (rehabilitation) on them are discussed later in this narrative.

NRCS conducted a cultural resources (GM 420 Part 401.2(7)) archaeological field investigation (36 CFR 800.4; GM 420 Part 401.2(13)) to identify historic properties (36 CFR 800.16(l)1, GM 420 Part 401.2(14)) on April 5, 2022 for FRS No. 13 and July 19, 2022 for FRS No. 19. A Historic Resources Survey Report for both FRS (No. 13 and No. 19), to document the built environment, was completed on January 7, 2022. With the two separate archaeological field reports—including subsurface probes—for the APE, no cultural resources (historic properties, archaeological sites) were identified (see Appendix E). On the other hand, the Historic Resources Survey Report documented historic resources at both FRS No 13 and FRS No. 19 (see Appendix

E). For FRS No. 13, the earthen dam, riser (principal spillway pipe), outlet pipe, plaque (Soil Conservation Service monument), stacked stone structure—possibly for water extraction, livestock watering trough, wood domestic structure, and associated concrete outbuilding were documented. The FRS-related items within the APE (dam, riser, outlet pipe, and plaque) were recorded as one unit using the Oklahoma SHPO Historic Property Resource Identification form. The stone structure and livestock watering trough in the APE did not rise to the level of further documentation. The wooden domestic dwelling and associated outbuilding are approximately 325 feet east (downstream) of the earthen dam. The abandoned, dilapidated structure is on the edge of the dam-breach portion of the APE. Breach inundation maps reveal the structure will be minimally affected, if at all, in the event of a catastrophic breach or with any form of structural rehabilitation of the dam, No Action, or decommissioning. For FRS No. 19, the earthen dam, riser (principal spillway pipe), spillway (auxiliary), plaque (Soil Conservation Service monument), trail (across top of dam), two docks, fence (exclusion), wood domestic structure and associated concrete outbuilding were documented. The FRS-related items within the APE (dam, riser, outlet pipe, and plaque) were recorded as one unit using the Oklahoma SHPO Historic Property Resource Identification form. The docks, trail, and fence did not rise to the level of documentation. The wooden domestic dwelling and associated outbuilding are approximately 415 feet north of the earthen dam. The abandoned, dilapidated structure is in the maximum extent of the pool (top of dam) portion of the APE. The structure and associated outbuilding were recorded using the Oklahoma SHPO Historic Property Resource Identification form.

From NRCS' determinations, resulting from the two archaeological reports and the architectural survey report (36 CFR 800.4(c)), FRS Nos. 13 and 19 and accoutrements are considered historic resources by NRCS, having been constructed in 1966 and 1968—the current year being 2024. National Register of Historic Places criteria (36 CFR 63.2(a), 36 CFR 60.4, GM 420 Part 601.23(B)(1), National Register Bulletin 15) were applied to FRS Nos 13 and 19 and its fixtures. Applying National Register criteria to FRS Nos. 13 and 19, association with significant events is nominal—1 FRS out of 2,104 in Oklahoma (Criterion A), FRS Nos. 13 and 19 were not designed by a significant person—cadre of engineers (Criterion B), FRS Nos. 13 and 19 do not represent distinctive characteristics—standard design drawings (Criterion C), and FRS Nos. 13 and 19 are unlikely to yield information important to history—based on that described above (Criterion D). On the other hand, FRS Nos. 13 and 19 must be considered within the broader context of the Sallisaw Creek Watershed historic district as defined by Oklahoma NRCS and Oklahoma SHPO. FRS No. 13 is considered a non-contributing resource by NRCS while FRS No. 19 is a contributing resource to the historic district. Concurrence with these determinations was received from the SHPO on April 26, 2022 and August 3, 2022. The historic structures and outbuildings associated with FRS Nos. 13 and 19 are considered not eligible for listing on the National Register. The structures do not represent a significant historical theme or event—Criterion A, have no association with persons of transcendent importance—Criterion B, do not exhibit characteristics of rare or unique architectural design—Criterion C, and are unlikely to provide information important to history in the future—Criterion D. Concurrence with these determinations was received from the SHPO on April 26, 2022 and August 3, 2022. Moreover, the FRS No. 19 historic structure is considered a non-contributing resource to the historic district

(although the dam is) by NRCS. Concurrence from the SHPO on that determination was received on August 3, 2022. The Cherokee Nation noted a culturally significant resource near (downstream) FRS No. 19. Through continued consultation, including the preparation of breach maps, the Cherokee Nation determined that the culturally significant resource was outside NRCS' APE, in a letter dated March 14, 2024.

Since August 3, 2022, the preferred alternative for FRS Nos. 13 and 19 is to fill the current auxiliary spillway with dirt and install a roller-compacted concrete spillway over the dam. The necessary modifications contrast with the original statement of work presented to the SHPO which was to simply replace the internal principal spillway pipe with like in-kind materials and armor the auxiliary spillway while maintaining both spillways' original size. Previously, NRCS received concurrence from the SHPO that the original statement of work would have no adverse effect on the historic property. Even with the previously mentioned modifications, NRCS still believes the proposed changes will not adversely impact the properties to the extent that FRS No. 19 is no longer a contributing feature to the historic district and therefore, once again proposed a finding of no adverse effect pursuant to 36CFR800.5. Concurrence from the SHPO with this determination was received on March 22, 2024. As to indirect effects (including the "viewshed" as articulated by the historic preservation community), rehabilitation of FRS Nos. 13 and 19 will not change the existing agricultural (cultural) landscape as it currently exists (36 CFR 800.16(d), National Register Bulletin 18). Concerning the two historic residential structures, one each at FRS Nos. 13 and 19, the original setting, feeling, and association have been lost since construction of the dams. The same holds true for the culturally sensitive resource of the Cherokee Nation near FRS No.19.

4.3.3. Endangered Species

There are ten federally listed threatened and endangered species located within Adair County, Oklahoma according to the US Fish and Wildlife Service (USFWS) Information, Planning, and Conservation (IPaC) Consultations, 2023. Four of those species listed are Federally endangered mammals. The Gray Bat (*Myotis grisescens*) is a federally endangered species whose primary habitat includes caves along rivers and in limestone karst areas, which they use for hibernation and roosting purposes. The Indiana Bat (*Myotis sodalis*) habitat requirements consists of cool, humid caves. However, roosting habitat consists of woody areas with dead or dying trees and loose bark. The Ozark Big-eared Bat (*Corynorhinus townsendii ingens*) prefers caves found within karst areas surrounded by mature, hardwood forests and forage (Oklahoma Department of Wildlife Conservation (ODWC, 2021)). The Northern long-eared bat (*Myotis septentrionalis*) which uses forested hillsides and ridges for night feeding and may roost underneath the bark of trees or in tree cavities during their active period. The Tri-colored bat (*Perimyotis subflavus*) is proposed to be listed as endangered. During the active period, these bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees but have been found within artificial roosts such as barns, porch roofs, and bridges.

Additionally, there are three Federally threatened species within the county, Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), and the American Burying Beetle

(*Nicrophorus americanus*) and one species that is proposed to be listed as threatened, Alligator Snapping Turtle (*Macrochelys temminckii*). Piping Plover, a threatened bird species, use wide, flat, open beaches with little to no vegetation. In terms of nesting habitats, this species prefers small creeks or wetland regions. Red Knot is another threatened bird species that inhabit dry hillside areas with little vegetation during the summer months and sandy, coastal areas close to streams and ponds for the winter months. The American Burying Beetle, a species of insect, prefers grasslands and open understory oak hickory forests (ODWC, 2021). The Alligator Snapping Turtle can be found in deep river systems as well as lakes and large ponds. They prefer waters with canopy cover, debris, submerged trees and logs, and cutbanks.

There is one species noted under the Federally Listed Threatened and Endangered Species of this county with the federal status of a "candidate". The Monarch Butterfly is a migratory insect that travels through this region of Oklahoma. It's breeding habitat includes a variety of milkweed species (ODWC, 2021). Please see Limited Threatened and Endangered Species Habitat Assessment for both dams 13 and 19 in Appendix E. Section 7 consultation with USFWS can be found in Appendix A.

4.3.4. Environmental Justice

According to the 2020 U.S. Census Bureau, Adair County has a population of 19,495. The largest ethnic groups are comprised of one race and include American Indian and Alaska Native at 44 percent and white (non-Hispanic) at 39 percent. The third largest ethnicity population is comprised of these two races at 11 percent. The median household income is $37,940; the employment rate is 47.6 percent; and 20.8 percent of the Adair County population lives in poverty (USCB 2020). According to CEQ's Environmental Justice Guidance Under the National Environmental Policy Act (CEQ 1997), these statistics indicated that Adair County is an environmental justice (EJ) community.

4.3.5. Erosion and Sedimentation

The bathymetric surveys of the two dams showed that there has been less sedimentation than was expected with the original design. This reduced level of sedimentation assists with extending the life expectancy of the dams without raising the permanent pool elevations. The structures are still providing benefit by reducing the peak flow flooding rates below the historic peaks. The structures trap sediment and create better downstream water quality for plant and animal life by reducing the total suspended solids carried in the stream.

4.3.6. Fish & Wildlife/Habitat

There are two state-listed fish species known to occur in Adair County, Oklahoma. The Longnose darter (*Percina nasut*) is a state-listed endangered species while the Backside darter (*Percina maculata)* is a state-listed threatened species. No essential fish habitat was identified in the project area or area of influence. If any intermittent tributaries are to be disturbed during construction activities, it is recommended that further consultation with ODWC be conducted by a qualified biologist prior to construction. Please see Limited Threatened and Endangered Species Habitat Assessments for Sallisaw 13 and 19 dams in Appendix E.

4.3.7. Floodplain Management

The dams proposed to be rehabilitated are in a FEMA Zone A floodplain. Dam 13 is located on FEMA Flood Insurance Rate Map (FIRM) No. 40001C0350D, effective date 11/26/21010 and Dam 19 is located on FIRM No. 40001C0270D, effective date 11/26/2010. As such, no base (100-yr) flood elevations have been determined by detailed analysis for the Zone A, and the flood boundaries were determined by approximate methods for the FEMA map.
This current planning effort assesses the extent of the flooding resulting from a range of flooding events. Analyses were performed downstream of Dam 13 and Dam 19 for the 100-year and 500-year events for five scenarios. The five scenarios considered include the existing condition, the proposed rehabilitation of each dam individually, and the scenario without a dam for each site (one dam removed).

Due to the flood control intent of these dams, they are included in the 100-year floodplain determination. The dams create flooding upstream in the immediate area around the permanent pools and reduce the flooding downstream of the site to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life. The current planning effort includes the floodplain mapping analysis of the 100-year and 500-year recurrence intervals to meet NRCS responsibilities to provide land users with technical flood hazard data.

4.3.8. Flood Damages

The project team reviewed land use composition within flood impact zones using aerial imagery and the 2016 MRLC National Land Cover Database (NLCD). Two types of damages were identified for each dam: structures/infrastructure damages and agricultural damages.

Structure/Infrastructure Damages - A 100-year 24-hour storm analysis was simulated using HEC-RAS 2D which identified flood damage locations. Two conditions were modeled for the 100-year storm: 1) with all of the existing structures in place and 2) without the existing structures in place.

The existing condition results indicate approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, and 1 electrical substation are predicted to be inundated by the 100-year event in the existing condition. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet.

For structure/infrastructure monetized losses, the Federal Emergency Management Agency (FEMA) Hazus software tool was utilized to provide a conservative estimate of risk. For this analysis, a Level 1 Hazus analysis was conducted to establish Existing Conditions. Results in the form of annualized damages are provided in Table 4-1. Results indicate that damages occurring within this watershed are primarily structure losses which concurs with modeling results. Additional details on the Hazus analysis are provided in Appendix D.

Table 4-1 Total Annualized Direct Economic Losses for Buildings

SCENARIO	SCENARIO	TOTAL DIRECT ECONOMIC LOSSES FOR BUILDINGS
EXISTING CONDITIONS	Existing Conditions (With Current Dams)	$ 1,464,000

Agricultural Damages - For the agriculture evaluation, the USDA National Agricultural Statistics Service (NASS) 2020 Cropland Data Layer (CDL)1) was downloaded with a Crop Mask Layer which includes the past 5 years of CDL data combined. This data was used to develop agricultural grids to calculate damage. The agricultural area was quantified within 100-year inundation area downstream of the dams for existing conditions. A total of 18.6 acres of the 9,372-acre with-dam inundation area were considered agriculture. Agricultural acres by crop are provided In Table 4-2.

Table 4-2 Agricultural Acreage

	WITH DAM (ACRES)
100-YR INUNDATION AREA	**9,372**
Corn	0.7
Soybeans	2.3
Winter Wheat	0.3
Double Crop Winter Wheat	1.4
Other Hay	13.9
TOTAL	**18.6**

4.3.9. Forest Resources

No special status plant species were identified within the project area. Oklahoma Ecological Mapping Systems (EMS) maps use a combination of satellite land cover, soils types, thematic data, and other factors to produce land classifications for Oklahoma. These classifications help identify vegetation communities within the Site. The sites fall within ten mapped vegetation types of Adair County, Oklahoma. The vegetative types defined by the EMS are Disturbed Soil Pasture, Eastern Great Plains-Herbaceous Wetland, Open Water, Ozark-Ouachita-Dry Oak Woodland, Ozark-Ouachita-Dry-Mesic Oak Forest, Ozark-Ouachita-Pasture/Prairie, Ozark-Ouachita-Riparian Hardwood Woodland, Ruderal Deciduous Woodland, South Central Interior-Bottomland Hardwood Forest, and South Central Interior-Bottomland Herbaceous Wetland. For

[1]USDA National Agricultural Statistics Service Cropland Data Layer. {2020}. Published crop-specific data layer. Available at https://nassgeodata.gmu.edu/CropScape/ (accessed Nov. 2021). USDA-NASS, Washington, DC.

detailed descriptions, please see Limited Threatened and Endangered Species Habitat Assessments for Sallisaw 13 and 19 dams in Appendix E

4.3.10. Invasive Species

Introduced invasive species of concern in Oklahoma are the gypsy moth (*Lymantria dispar dispar*), Emerald Ash Borer (*Agrilus planipennis*), Introduced Wood Wasp (*Sirex noctilio Fabricius*), Bradford pear (*Pyrus calleryana*), Japanese honeysuckle (*Lonicera japonica*), privet (*Ligustrum sp*), and Tree of Heaven (*Ailanthus altissima*). During field activities associated with the Waters of the US delineation, none of these species were observed.

4.3.11. Land Use/Land Cover

Land cover within the 104,065.59- acre Sallisaw Creek Watershed is largely undeveloped and dominated by deciduous forest (66 percent) and pasture (23 percent). Only four percent of the Sallisaw Creek Watershed is developed. Land cover within the 1,252.89- acre S-13 subwatershed is undeveloped and dominated by grassland (90 percent). The S-13 subwatershed does not contain developed lands. Land cover within the 7,970.52- acre S-19 subwatershed is largely undeveloped and dominated by pasture (55 percent) and deciduous forest (33 percent). Only seven percent of the S-19 subwatershed is developed. A summary of land cover types is presented in the table below.

Table 4-3 Land Cover Summary

Land Cover Type	Sallisaw Creek Watershed (acres)	S-13 Subwatershed (acres)	S-19 Subwatershed (acres)
Open Water	732.81	1.63	47.33
Developed, Open Space	3,141.47	0.22	438.76
Developed, Low Intensity	594.75	0	73.58
Developed, Medium Intensity	160.43	0	26.80
Developed, High Intensity	33.65	0	10.71
Barren Land	166.88	0	0
Deciduous Forest	68,605.72	9.46	2,665.18
Evergreen Forest	411.10	0	54.18
Mixed Forest	3,347.69	33.64	79.93
Shrub	1,344.16	76.49	73.84
Grassland	1,612.01	1,122.21	141.26
Pasture	23,718.52	8.39	4,357.98
Woody Wetlands	191.17	0.84	0.74
Emergent Herbaceous Wetlands	5.22	0	0.22
Total	**104,065.59**	**1,252.89**	**7,970.52**

Source: USGS National Land Cover Database, 2019

4.3.12. Migratory Birds and Bald and Golden Eagle Protection Act

Endangered Species Act (ESA) and State-listed avian species, as well as other migratory birds, are protected under the Migratory Bird Treaty Act (MBTA). The 1918 MBTA establishes a Federal prohibition "to pursue, hunt, capture, kill, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg, without a permit" issued in accordance with the policies and regulations of the MBTA. Take is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect migratory birds" (USFWS, 2017). The MBTA does not prohibit the destruction of the bird nest alone (without birds or eggs) provided that no possession of the nest occurs during destruction (USFWS, 2017). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured. The USFWS is the lead agency determining permitting requirements for nest removal or destruction.

There are two Federally threatened birds, Piping Plover (*Charadrius melodus*) and Red Knot (*Calidris canutus rufa*),of concern that may occur near dam Site 19 according to the IPaC consultation letter attached to the Limited Threatened and Endangered Species Habitat Assessment for Site 19 in Appendix E. During a site visit to Sallisaw 13 on April 4, 2022, an adult Bald eagle was seen perched on a snag near the west end of the conservation pool. No nests were observed.

4.3.13. Prime and Unique Farmland

Farmland categorized as prime, unique, or of statewide/ local importance is considered important farmland. Land is prime farmland given that the land displays the best combination of physical and chemical characteristics to produce food, feed, forage, fiber, and oilseed crops and is able to be utilized in this manner. Prime farmland is important for "meeting the Nation's short-and long-range needs for food and fiber" (NRCS, 2007). Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment. Prime farmland soils may presently be used as cropland, pasture, rangeland, or woodland or for other purposes. They are either used for food and fiber or are available for these uses (NRCS, 2007).

Unique farmland is identified as land other than prime farmland that is used to produce specific high-value food and fiber crops. This includes crops such as "citrus, tree nuts, olives, cranberries, and other fruits and vegetables" (NRCS, 2007).

The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland. Less than 1 acre of both sites meets the requirements of prime farmland (NRCS, 2007).

The S-13 subwatershed supports 31 acres of prime farmland and the S-19 subwatershed supports 3,038 acres of prime farmland. No acres of prime/unique farmland will be irreversibly converted by the proposed site alternatives.

4.3.14. Public Health and Safety

The dams provide flood damage reduction within the benefit area, defined as the area of land that is provided flood attenuation by the study dams "benefit area". These benefits include reduction of flooding of roads, residential structures, and agricultural lands as evidenced by reduction in water surface elevation (WSE) when comparing existing condition to future without federal investment.

The Sallisaw S-13 and S-19 dams are currently classified as high hazard potential dams. High hazard dams are those where failure may result in loss of life, damage to homes, damage to main highways or railroads, or interruption of use or service of important public utilities.

The Adair County Health Department provides public health services for the county, with a clinic location in Stilwell. The Department provides services in Adult Health, Child Health, Consumer Health, Family Planning, Health Education, HIV/Sexual Health and Harm Reduction, Immunization, Sooner Start/Early Intervention, Tobacco Prevention, Tuberculosis, and WIC (OSDH, 2021). There are two police departments in Adair County, serving a population of 22,194 people in an area of 577 square miles (USCB, 2019). These are the Stilwell Police Department and the Westville Police Department. Adair County is also served by the Adair County Sheriff's Department, based in Stilwell (USACOPS, 2021). Access to these public health and safety departments as well as access to residents in the project area by these departments is impeded during times of road flooding.

4.3.15. Regional Water Resources Plans

The project area is situated in the Lower Arkansas Watershed Planning Region (Region) Basin 46, where water needs for all sectors are approximately ten percent of the total demand in the Region and are projected to increase by 61 percent by 2060. Within Basin 46, surface water is used to meet 65 percent of the total demand and surface water use is projected to increase by 82 percent by 2060 (2012 Oklahoma Comprehensive Water Plan). However, due to the relatively small volume of water in the Site 13 and Site 19 pools, these surface water sources negligibly effect water storage in Basin 46 and generally provide surface water benefits to local landowners for agricultural and recreational uses.

4.3.16. Riparian Areas

Riparian areas are the transitional areas between water and land. Riparian areas house a wide variety of plant species each contributing to the ecological makeup of that region's environment. Both sites are bordered by riparian vegetation and agricultural land. The existing sites permanent pools allow this riparian vegetation to thrive and any permanent changes to these permanent pool elevations would damage or destroy the riparian areas.

4.3.17. Water Resources

No Federal or State designated Wild, Scenic, or Recreational River segment or a river listed in the Nationwide Rivers Inventory (NRI) occurs in the project area. The permanent pools created

by the dams are not used as a public water supply, but may be utilized by wildlife in the area. They are also utilized by livestock.

4.3.18. Water Quality

The reach of Sallisaw Creek upstream of its confluence with Greasy Creek (near E 938 Road) [Water Body ID (WBID) OK220200030010_30] is not listed on the 2022 303(d) list of impaired waters and is in good waterbody condition. However, the reach of Sallisaw Creek downstream of the Greasy Creek confluence (WBID OK220200030010_20) and within the project area is listed on the 303(d) list of impaired waters. Enterococcus is the listed pollutant which is impairing primary body contact recreation (EPA 2022) (OK-DEQ 2022).

The existing dam structures help to increase downstream water quality by collecting sediment within the normal pools. There is also a limit to how much sediment can be collected over the site design life.

4.3.19. Waters of the U.S./Clean Water Act

A Preliminary Waters of the U.S. Assessment was conducted for the Sallisaw Creek watershed S-13 and S-19 sites. The project sites, located within the East and Central Farming and Forest land resource region, were found to have potential WOTUS in the vicinity. Refer to the WOTUS Field Verification Report for each site in Appendix E. The Oklahoma programmatic EIS specified looking at each site individually. These two sites fall under the scope of Nationwide Permit 3 – Maintenance. S-19 is in "high quality waters" and requires an Individual Water Quality Certification from the Oklahoma Department of Environmental Quality (ODEQ). A pre-filing meeting for S-19 will need to be requested 30 days prior to submitting the certification request. With coordination with USACE and ODEQ the proper 404 and water quality permits were received for both sites (Sallisaw 13, permit # SWT-2021-00520, Sallisaw 19 permit # SWT-2022-00481). These permits can be found in Appendix A.

4.3.20. Wetlands

The National Wetland Inventory (NWI) was established by the US Fish and Wildlife Service with the goal of creating a nationwide inventory of wetlands for conservation efforts. Impacts to these wetland and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act.

The NWI map, published by the USFWS, does indicate the presence of two wetland features at S-13: Palustrine, unconsolidated bottom, flooded, diked/impounded (PUBHh) and Palustrine, emergent, persistent, seasonally flooded (PEM1C). PUBHh is associated with a freshwater pond on the west side of site S-13. PEM1C is west of PUBHh and associated with a freshwater emergent wetland upstream of the dam. Approximately 0.5 acre of wetland fringe associated with the eight acre lake were observed; the wetland would be considered a WOTUS utilizing guidance under the *Navigable Waters Protection Rule* to define "Waters if the United States", effective on June 22, 2020. At site S-19, fringe wetlands were noted during the field verification.

The fringe wetlands are approximately three acres and are located along the eastern boundary of the pond, created by the dam, as well as two areas north of the pond These wetlands are not identified on the NWI. Refer to the WOTUS Field Verification Report for each site in Appendix E.

Additionally, a wetland hydrologic condition assessment was completed for the project area in September of 2021. Using climate condition data from the NRCS Agriculture Applied Climate Information System (AgACIS) and the Direct Antecedent Rainfall Evaluation Method (DAREM) to analyze the data, both sites experienced wetter than normal hydrologic conditions during the time of investigation in summer of 2021.

4.3.21. Ecosystem Services Framework

A PR&G analysis is required during the planning process for watershed activities authorized by the Watershed and Flood Prevention Act (PL 566) and includes the use of an ecosystem services framework. The concept of ecosystem services is a way of framing and describing the numerous benefits that nature provides to people. Both tangible and intangible ecosystem services link ecological function and social well-being, promoting balance in the conservation and sustainable use of shared land, water, and living resources in an equitable way. For the purposes of the PR&G, the ecosystem services framework will provide an integrated approach that articulates the relevant costs and benefits inherent in a decision-making process, to complement any economic and ecological assessment of magnitude. Such values must be elicited through stakeholder engagement, and tradeoffs must be weighed in a transparent, systematic and inclusive process.

Millennium Ecosystem Assessment (MEA, 2003) organized benefits into four service categories:

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

The number and variety of ecosystem services to be considered as well as the population groups potentially affected by the proposed action were determined during project scoping and are identified in Table 3-1 Summary of Scoping.

5.0 Alternatives

5.1 Formulation Process

The NRCS National Watershed Manual (501.12) requires that all reasonable alternatives that address the purpose and need for action must be presented in the watershed project plan, including those not within the program authorities of the NRCS and those not preferred by sponsors. For watershed project plans involving flood protection, consideration must be given to alternative measures to prevent or reduce flood damage, including but not limited to the following: floodproofing of structures; floodplain regulation; acquisition of floodplain lands for recreational, fish and wildlife, and other public purposes; moving buildings and facilities; and conversion of land use to forest.

Alternative plans were formulated with consideration to completeness, effectiveness, efficiency, and acceptability (as required by the DM9500-013 Manual) These criteria are described below.

- *Completeness.* Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to the realization of the contributions to the objective.

- *Effectiveness.* Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

- *Efficiency.* Efficiency is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at least cost.

- *Acceptability.* Acceptability is the viability and appropriateness of an alternative from the perspective of the general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

As stated in the DM9500-013 Manual, when preparing a PR&G analysis, the PR&G Guiding Principles for Water and Related Land Resources should also be incorporated into the analysis. The PR&G revise and replace the 1983 Principles and Guidelines (P&G). The PR&G constitute the comprehensive policy and guidance for Federal investments in water resources. The Guiding Principles are explained below.

A. Healthy and Resilient Ecosystems (HRE). Federal investments in water resources should protect and restore the functions of ecosystems and mitigate any unavoidable damage to these natural systems.

B. *Sustainable Economic Development* (*SED*). Federal investments in water resources should encourage sustainable economic development. Alternative solutions for resolving water resources problems should improve the economic well-being of the Nation for present and future generations through the sustainable use and management of water resources ensuring both water supply and water quality. Sustainable in this context means the

creation and maintenance of conditions under which humans and nature can coexist in the present and into future. Federal investments in sustainable economic development activities contribute to the Nation's resiliency.

C. *Floodplains (FP)*. Floodplains are critical components of watersheds. They connect land and water ecosystems and support high levels of biodiversity and productivity. Floodplains that have not been adversely affected can sustain their natural functions and increase the resilience of communities. For this reason, Federal investments in water resources should avoid the unwise use of floodplains and flood-prone areas and minimize adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used.

D. *Public Safety (PS)*. Threats to people, including both loss of life and injury, from natural events should be assessed in the determination of existing and future conditions, and ultimately, in the decision-making process. Alternative solutions, which include structural and nonstructural elements, must avoid, reduce, and mitigate risks to the extent practicable and include measures to manage and communicate residual risks. The impact and reliability of alternatives on these threats must be evaluated and shared with the public and decision makers.

E. *Environmental Justice (EJ)*. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Agencies should ensure that Federal actions identify any disproportionately high and adverse public safety, human health, or environmental burdens of projects on minority, Tribal, and low-income populations.

F. *Watershed Approach (WA)*. A watershed is land area that drains to a common waterbody. A watershed approach to analysis and decision making facilitates evaluation of a more complete range of potential solutions and is more likely to identify the best means to achieve multiple goals over the entire watershed. A watershed approach facilitates the proper framing of a problem by evaluating it on a system level to identify root cause(s) and its interconnectedness to problem symptoms. The approach enables the design of solutions that considers the benefits of water resources for a wide range of stakeholders within and around the watershed.

5.2 Alternatives Considered

- ***No Action/Future Without Federal Investment (FWOFI)***

The FWOFI alternative describes the most likely future condition that could be expected if NRCS takes no action. It describes what is most likely to happen in the absence of any developed Federal alternative or changes in law or public policy. In this case, the FWOFI considered was that each dam is independently breached by the Sponsor as the most likely scenario. Without the federal investment, the Sponsor would not try to rehabilitate the dams to meet Oklahoma state dam safety requirements and would remove the dams from operation.

The FWOFI is used to compare other alternatives to determine the magnitude of benefits and adverse effects. Clearly describing the FWOFI condition provides the reference necessary to evaluate changes caused by the alternatives. The FWOFI alternative may contain flaws, violate a law, or fail to meet the project Purpose and Need; but it must still be developed as a comparison.

- **Structural Rehabilitation to High Hazard Dam Criteria**

The High Hazard Alternative includes federally assisted construction rehabilitation of each dam independently to applicable standards. The least costly and least impactful option was arrived at by holding the permanent pool and top of dam elevations constant and then iterating with different principal spillway diameters, auxiliary spillway widths and auxiliary spillway crest elevation changes to find the least costly rehabilitation option independently for each dam that met the high hazard criteria. Proposed independent changes to dam geometry and spillway configurations will result in little impact to flooding downstream of the dam during flood frequency events compared to the current condition while reducing the potential for a breach. This will maintain the current ecosystem services considerations and will not change the cultural resources, or the ecology of land use, wetland, and species habitat around the existing sites by maintaining existing principal spillway, and top of dam elevations. It will maximize public safety by meeting more stringent hydrological criteria and with relatively little change in floodplain management along the length of the channel. It will also continue to reduce the flooding that would occur if the sites were to be independently decommissioned or breached at a lower cost than pursuing downstream easements and zoning / structure purchases.

- **Non-structural Alternative**

The Non-structural Alternative would allow each structure to maintain a low hazard classification by independently moving, flood proofing or purchasing of impacted structures. This alternative includes independent acquisition of easements for property that is located within the breach area and the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential. By independently removing the breach hazards and not allowing future structures to be built in this area, the embankments would be kept low hazard in the future.

For each dam, this alternative was independently eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements downstream of dams as well as purchase/moving/flood proofing of homes impacted by potential breach. Detailed costs can be found in Appendix D, pages D-10 and D-13.

- **Decommissioning Alternative**

The Decommissioning Alternative includes independent complete removal of the dam and purchase of impacted homes that are located within the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential.

For each dam, this alternative was independently eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements downstream of dams. Detailed costs can be found in Appendix D.

- **National Economic Efficiency (NEE) Alternative**

The National Economic Efficiency (NEE) Alternative is not an independent option, but is considered independently for each structure. The NEE alternative is the alternative that reasonably maximizes net economic benefits consistent with protecting the nation's environment. It is the alternative, or combination of alternatives, that reduces the off-site or public problem and maximizes net national economic development benefits.

- **Other reasonable alternatives**

Other alternatives that meet the purpose and need include variations to the Structural Alternatives; however, these alternatives were independently considered for each structure but eliminated from detailed study due to cost, lack of benefit, or infeasibility.

Table 5-1 summarizes the alternatives considered and the results of the screening process.

Table 5-1 Range of Alternatives and Determination for Detailed Study

Alternative	Screening Criteria [1]				Carried Forward for Detailed Study
	Completeness	Effectiveness	Efficiency[3]	Acceptability	
No Action/Future Without Federal Investment (FWOFI)	• Does Not meet project Purpose and Need	• Does not provide for flood damage reduction.	• Benefit/Costs of the FWOFI were evaluated only for comparison of Federal alternatives. • Annual damages without dams were estimated to be: o $1,472,000 Sallisaw Dam #13 o $1,816,000 Sallisaw Dam #19	• Consistent with state and local laws, regulations, and policies. • Requires breaching of dams.	Yes
Structural Rehabilitation to High Hazard Class Dam Criteria	• Meets project Purpose and Need. • Provides for necessary investments to achieve purpose of the project. • Dams provides for flood damage reduction benefits.	• Provides for flood damage reduction by rehabilitation of dams. • Addresses current risk of loss of human life resulting from dam failure.	• Estimated annual damage benefit: o $13,000 Sallisaw Dam #13 o $345,000 Sallisaw Dam #19 • The B/C ratio is 0.30 for Sallisaw Dam #13 which, while low, is above zero and which means, in this case, the benefits of rehabilitating this dam are better than the non-structural and FWOFI alternatives. • The B/C ratio is 2.29 for Sallisaw Dam #19 which means, in this case, the benefits of rehabilitating this dam outweigh the costs.	• Consistent with state and local laws, regulations, and policies.	Yes
Nonstructural Measures (Easements, Acquisition or Relocation of At-Risk Structures and Floodproofing)	• Meets project Purpose • Technically reliable and provides for all accounts.	• Minimizes risk of loss of human life resulting from dam failure.	• The estimated cost of the nonstructural alternative was $8,195,500 for Sallisaw Dam #13 and $21,598,200 for Sallisaw #19 which would be sourced primarily from local funding. Detailed planning was not conducted due to the exorbitant local cost, difficulty in getting downstream easements purchased, and social disruption of the alternative.	• Consistent with local laws, regulations, and policies. • Requires acquisition of easements for downstream floodzone.	No

[1] Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Section V. — Alternative Plans - 1.6.1 (c)
[2] See Section 5.5 Comparison of alternatives for PR&G.
[3]Detailed costs are presented in Appendix D

5.3 Sponsor's Rationale for Conditions of Future Without Federal Investment

In the absence of NRCS technical and financial assistance, the likely SLO action that was discussed with the Sponsor would be to independently decommission the dams and electing not to provide any non-structural flood control measures due to costs.

5.4 Description of Alternative Plans

No Action/FWOFI. This alternative requires independent breaching of dams and does NOT maintain existing conditions. Flood damages would increase with this alternative. This would remove the risk of catastrophic dam failure. This alternative would involve removing 33,000 cubic yards of embankment for S13 and 54,500 cubic yards of embankment for S19 using 3:1 cut side slopes with a 70 feet wide bottom flow channel for each Site. Approximately 5,000 cubic yards of the removed embankment material will be placed along the side slopes of the now proposed channel through the pool storage area and the shaping of the proposed channel to prevent erosion on each Site. Excess removal of 28,000 cubic yards for S13 and 49,500 cubic yards for S19 will be hauled offsite. The channel length rehabilitation, revegetation, and monitoring for each removed dam will be 1,000 linear feet for S13 and 1,000 linear feet for S19. The existing intake structures and principal spillway pipes will also be removed. See Appendix D for costs associated with this alternative.

Non-Structural Alternative. This alternative involves meeting future flood protection needs by independently incorporating applicable areas into FEMA NFIP, obtaining easements and upgrading any bridges and/or roads to account for inundation potential. This alternative was not carried forward beyond costs due to high local cost for obtaining downstream easements, property owners sent specific letters that they wouldn't grant any new easements, Adair County won't pursue zoning regulation changes, and the Sponsors were clear in the public meetings that they wouldn't proceed with the project without federal cost share.

Structural Rehabilitation to High Hazard Class Dam. The Structural Rehabilitation to High Hazard Dam Alternative includes independent federally assisted rehabilitation construction of the dams to current applicable standards. Both dams would have the principal spillways replaced with larger diameter pipes, new risers, and outlet impact basins. Both dams would have the auxiliary spillways widened and the crest elevations lowered. Sallisaw #19 would have the auxiliary spillway moved to the south (left) end of the dam to remove potential impact of the existing railroad immediately downstream and for maintenance access because the velocities will require armouring of the auxiliary spillway.

Site 13 Structural Alternative

On Site 13 the structural rehabilitation improvements to meet high hazard dam criteria include widening the auxiliary spillway from 40 feet to 120 feet and lowering the auxiliary spillway crest by 4.2 feet; removing the existing, orifice controlled, riser inlet and 24 inch diameter principal spillway conduit and replacing it with a standard D x 3D covered top riser and 30 inch diameter, 285 feet long barrel; constructing a new concrete impact basin; raising the left (north) abutment

driveway access to existing top of dam elevation; and adding 530 lin. ft. riprap wave protection with bedding along the dam face.

Site 13 has a net fill of approximately 10,500 cubic yards. The auxiliary spillway excavation is 160 lin. ft. along the dam. The left abutment (north) abutment will require to be filled to the top of dam elevation for a linear length of 375 ft perpendicular to the dam. The borrow will be from within the existing permanent pool and surrounding area of flooding impoundment. The impact basin will be surfaced with reinforced concrete.

The conversion from an orifice controlled riser inlet to a standard D x 3D covered top riser inlet significantly reduced the initial reservoir elevation required for SDH and FBH routings, which was the most significant factor that allowed the auxiliary spillway to be lowered and the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

Site 19 Structural Alternative

On Site 19 the structural rehabilitation improvements include filling the existing 200 feet wide auxiliary spillway to existing top of dam elevation; constructing a new 400 feet wide auxiliary spillway with roller compacted concrete at left (south abutment) including two stilling basins with crest that is 5.9 feet lower than the existing auxiliary spillway crest elevation; removing/abandon/grout fill the existing 30 inch diameter principal spillway conduit and riser and replacing it with a 48 inch diameter barrel 340 feet long and riser; constructing a new concrete impact basin; constructing a left abutment drain; and adding 950 lin. ft of riprap wave protection with bedding along the dam face. A drain pipe from the railroad right-of-way at the right (north) abutment needs the west end exposed and the east end repaired by the flap gate to be effective.

Site 19 has a net cut of approximately 39,650 cubic yards that will be hauled offsite. The final off-site waste area will be determined with the final design, the plan assumed a round trip haul distance of 10 miles. The excavation results from lowering the auxiliary spillway 5.9 ft from the existing top of dam elevation, stilling basins, and for the roller compacted concrete. The excavation for the auxiliary spillway results in 500 lin. ft of excavation along the dam. The right abutment of the dam will require 280 lin. ft. of fill in the existing auxiliary spillway location. This will require 8,600 cu. yds. for a 16 ft. top width. A total of 2750 cubic yards of excess cut will be spread on the downstream face of the dam at an approximate 10” average depth. The final design will need to confirm structural stability implications of the fill on the downstream face.

The auxiliary spillways will be surfaced with roller compacted concrete 260 lin. ft in the direction of the water flow, each spillway 200 ft wide. The two (2) stilling basins will be approximately 18 ft below the existing ground at the dam toe. Each stilling basin will be 200 ft x 20ft in the direction of the water flow. The stilling basins will surfaced with reinforced concrete and rip rap.

Enlarging the principal spillway (250% increase in flow area) impacted the detention volume and allowed for a lower auxiliary spillway crest elevation and lower initial reservoir elevation for routing the SDH and FBH. By lowering the auxiliary spillway crest and widening it to 400 feet allowed the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

Project components of the **Sallisaw Dam #13 Structural Rehabilitation to High Hazard Class Dam** include the following (refer to Table 5-2):

- Rehabilitation of dam with existing crest elevation at 892.4 ft. NAVD88.
- Removal and construction of principal spillway concrete riser at existing normal pool elevation of 860.2 ft. NAVD88 with new 30-inch conduit 285-ft in length.
- Rehabilitation of rock 120-ft wide auxiliary spillway (AS) to elevation 884.7 ft. NAVD88.
- Raising of north dam access road to top of dam elevation 892.4 ft. NAVD88.
- Construction of new principal spillway outlet concrete impact basin.
- Construction of new shoreline protection riprap with bedding.
- Acquisition of construction easement (5 acres)

The estimated cost of implementation of this alternative is $1,693,500. A cost estimate is provided in the first following table.

Project components of the **Sallisaw Dam #19 Structural Rehabilitation to High Hazard Class Dam** include the following (refer to Table 5-2):

- Rehabilitation of dam with existing crest elevation at 984.5 ft. NAVD88.
- Removal and construction of principal spillway concrete riser at existing normal pool elevation of 948.7 ft. NAVD88 with new 48-inch conduit 340-ft in length.
- Construction of roller compacted concrete 400-ft wide auxiliary spillway (AS) with (2) 200-ft by 20-ft stilling basins to crest elevation 974.8 ft. NAVD88.
- Earth fill of existing auxiliary spillway to top of dam elevation 984.5 ft. NAVD88.
- Construction of new principal spillway outlet concrete impact basin.
- Construction of new shoreline protection riprap with geotextile fabric and bedding.
- Construction of left (south) abutment drain.
- Acquisition of construction easement (5 acres)

The estimated cost of implementation of this alternative is $6,004,400. A cost estimate is provided in the second following table.

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S13

Date : 28-Feb-22
Prepared By : RST
Checked By : DBW

S13 - Rehabilitation Alternative 3

Elevations (MSL)	EXISTING		PROPOSED	
Top of Dam	892.4	feet	892.4	feet
Principal Spillway Crest	860.2	feet	860.2	feet
Outlet Pipe Downstream Invert	845.4	feet	845.4	feet
Auxiliary Spillway Crest	888.9	feet	884.7	feet
Spillway Dimensions	**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width	40	feet	120	Feet
Principal Spillway Diameter	24	inches	30	inches

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	1296	Cubic Yards	$ 4.40	$ 5,702	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Earthfill, Embankment	14710 *	Cubic Yards	$ 15.40	$ 226,534	RS Means 31 23 2315 6075: Borrow, clay, till, or blasted rock, 5 C.Y. bucket, loading and/or spreading, front end loader, track mounted
3	Earthfill, Embankment, Compaction	14710 *	Cubic Yards	$ 0.80	$ 11,768	RS Means 31 23 23.23 5040 - Riding vibratory roller, 6" lifts, 4 passes
4	Primary Riser Structure Removal	1	Lump Sum	$ 10,000.00	$ 10,000	Estimate for demolition
5	New Principal Spillway Riser	1	Lump Sum	$ 87,000.00	$ 87,000	Based on median bid price for similar structure dam rehabilitation project
6	Excavation	4000	Cubic Yards	$ 5.35	$ 21,400	RS Means 31 23 1646 5565: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 460 H.P. dozer, 300' haul
7	30" Principal Spillway Barrel	285	Linear Feet	$ 2,500.00	$ 712,500	Estimate for Jack and Bore technology (no open cut)
8	Concrete Impact Basin - Concrete Volume	1	Each	$ 100,000.00	$ 100,000	Rough estimate
9	Seeding	7778	SY	$ 2.00	$ 15,556	Similar bid projects
10	Rip Rap (US face -900 and Impact Basin-180)	1080	Tons	$ 36.00	$ 38,880	Based on median bid price for similar structure dam rehabilitation project
11	Geotextile Fabric	800	SY	$ 4.27	$ 3,416	Avg bid prices
12	Bedding - Wave Protection	583	Tons	$ 35.00	$ 20,405	#57 stone average bid prices
13	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
14	Easement Acquisition (Construction Easements)	5	Acres	$ 3,000.00	$ 15,000	Estimated Costs
				Subtotal 1 :	**$ 1,253,161**	
				Mobilization : 5%	$ 62,658	
				Erosion and Sediment Control : 5%	$ 62,658	
				Dewatering : 5%	$ 62,658	
				Construction Contingency : 20%	$ 250,632	
				Subtotal 2 :	**$ 1,691,768**	
				2021 RS Means Location Factor** 0.789	**$ 1,334,805**	
				Construction Subtotal :	**$ 1,334,805**	
				Permitting :	$ 10,000	
				Stream Mitigation :	$ -	
				Easement Acquisition (Construction Easements) :	$ 15,000	
				Dam Construction Subtotal :	**$ 1,359,805**	
				Project Design, Construction Engineering, Contracting, Inspection : 20%	$ 266,961	
				Project Administration : 5%	$ 66,740	
				Dam Rehabilitation Total :	**$ 1,693,506**	

* 15% swell index factor of the excavated volume was added.

** OK local factor applied to Subtotal

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S19

Date : 28-Feb-22
Prepared By : RST
Checked By : DBW

S19 - Rehabililtation Alternative 3

Elevations (MSL)	EXISTING		PROPOSED	
Top of Dam	984.5	feet	984.5	feet
Principal Spillway Crest	948.7	feet	948.7	feet
Outlet Pipe Downstream Invert	930.5	feet	930.5	feet
Auxiliary Spillway Crest	980.7	feet	974.8	feet
Spillway Dimensions	**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width	200	feet	400	Feet
Principal Spillway Diameter	30	inches	48	inches

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	3122	Cubic Yards	$ 4.40	$ 13,737	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Earthfill, Embankment	8600 *	Cubic Yards	$ 15.40	$ 132,440	RS Means 31 23 2315 6075: Borrow, clay, till, or blasted rock, 5 C.Y. bucket, loading and/or spreading, front end loader, track mounted
3	Earthfill, Embankment, Compaction	8600 *	Cubic Yards	$ 0.80	$ 6,880	RS Means 31 23 23.23 5040 - Riding vibratory roller, 6" lifts, 4 passes
4	Existing Primary Structure Removal	1	Lump Sum	$ 10,000.00	$ 10,000	Estimate for demolition
5	New Principal Spillway Riser	1	Lump Sum	$ 87,000.00	$ 87,000	Based on median bid price for similar structure dam rehabilitation project
6	Excavation	51000	Cubic Yards	$ 5.35	$ 272,850	RS Means 31 23 1646 5565: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 460 H.P. dozer, 300' haul
7	Hauling Excess Excavated Material Offsite	46000	Cubic Yards	$ 9.60	$ 441,600	RSMeans No 31 23 23.20 1038 - 12CY truck, 10 mile cycle, 20mph average, 15 min wait/load/unload
8	In-Place Roller Compacted Concrete (RCC)	18000	Cubic Yards	$130.00	$2,340,000	NRCS Suggested Cost based on past NRCS projects in PA and WV
9	48" Principal Spillway Barrel	340	Linear Feet	$ 2,500.00	$ 850,000	Estimate for Jack and Bore technology (no open cut)
10	Abutment Drain	220	Linear Feet	$ 300.00	$ 66,000	6" diameter HDPE in gravel bed with fabric filter wrap
11	Concrete Impact Basin	1	Each	$ 100,000.00	$ 100,000	Rough estimate
12	Seeding	23000	SY	$ 2.00	$ 46,000	Similar bid projects
13	Rip Rap (US face -2100 and Impact Basin-180)	2280	Tons	$ 36.00	$ 82,080	Based on median bid price for similar structure dam rehabilitation project
14	Geotextile Fabric	1300	SY	$ 4.27	$ 5,551	Avg bid prices
15	Bedding - Wave Protection	1050	Tons	$ 35.00	$ 36,750	#57 stone average bid prices
16	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
17	Easement Acquisition (Construction Easements)	5	Acres	$ 3,000.00	$ 15,000	Estimated Acres and Costs
				Subtotal 1 :	**$ 4,490,888**	
				Mobilization : 5%	$ 224,544	
				Erosion and Sediment Control : 5%	$ 224,544	
				Dewatering : 5%	$ 224,544	
				Construction Contingency : 20%	$ 898,178	
				Subtotal 2 :	**$ 6,062,699**	
				2021 RS Means Location Factor** 0.789	**$ 4,783,469**	
				Subtotal 3 :	**$ 4,783,469**	
				Permitting :	$ 10,000	
				Easement Acquisition (Construction Easements) :	$ 15,000	
				Subtotal 4 :	**$ 4,808,469**	
				Project Design, Construction Engineering, Contracting, Inspection : 20%	$ 956,694	
				Project Administration : 5%	$ 239,173	
				Rehabilitation Subtotal :	**$ 6,004,336**	

* 15% swell index factor of the excavated volume was added.

** OK local factor applied to Subtotal

Table 5-2
High Hazard Design Features

Feature	Sallisaw Dam 13	Sallisaw Dam 19
Top of Dam Elevation (match existing) (ft NAVD88)	892.4	984.5
Auxiliary Spillway Crest Width (ft)	120	400
Auxiliary Spillway Type	Natural Rock / Vegetated	RCC
Auxiliary Spillway Crest Elevation (ft NAVD88)	884.7	974.8
Principal Spillway Crest Elevation (match existing) (ft NAVD88)	860.2	948.7
Principal Spillway Conduit Diameter (inches)	30	48
Principal Spillway Conduit Length (ft)	285	340
Principal Spillway Riser Type	Standard Baffle	Standard Baffle
Principal Spillway Conduit Type (C301 RCP)	RCP	RCP

5.5 Comparison of Alternative Plans

Alternatives were compared by independently evaluating each with respect to relevant resource concerns and NRCS planning requirements, the PR&G guiding principles, the Federal Objective, costs and benefits including environmental impacts and ecosystem services, and the criteria of completeness, effectiveness, efficiency, and acceptability. A comparison of Alternatives is presented in Table 5-3 which compares the project alternatives with respect to the relevant resource concerns. Table 5-3 compares the project alternatives with respect to ecosystem services and PR&G guiding principles.

The relevant guiding principles were also documented in Table 5-1. The Project Team also completed a comparative cost analysis for the alternative plans carried forward for detailed study. The Project Benefit Analysis and the Project Economic Analysis are further detailed in Appendix D, Section D.4.

The following tables illustrate how the two alternatives carried forward for consideration compare in terms of environmental, economic, and social goal trade-offs. Table 5-3 summarizes PR&G analysis results as well as Guiding Principles. Table 5-4 illustrates how the relevant ecosystem services identified during scoping (Table 3-1) are impacted or benefited from the proposed action.

Table 5-3 Summary Comparison of Alternative Plans

		Alternative	
Item or Resource Concern		**No Action/FWOFI**	**Structural Rehabilitation to High Hazard Class Dams**
Locally Preferred			√
National Economic Efficiency			√
Environmentally Preferred			√
Total Project Investment – S13		$1,098,600	$1,706,200
Total Project Investment – S19		$1,310,500	$ 6,049,800
PR&G Guiding Principles	Healthy and Resilient Ecosystems		√
	Sustainable Economic Development		√
	Floodplains		√
	Public Safety		√
	Environmental Justice		√
	Watershed Approach	√	√

√ **-** Consistent with PR&G Guiding Principles

Table 5-4 Ecosystem Trade-Offs of Alternative Plans

	Alternative			
	No Action/FWOFI		Structural Rehabilitation to High Hazard Class Dams	
	Description	Rating[1]	Description	Rating[1]
Provisioning Services				
Erosion and Sedimentation	Benefits foregone. Sediment load and potential erosion downstream would increase with breaching of dams.	2-	Maintain reduced downstream erosion and reduced sedimentation carried downstream.	2+
Forest Resources	Breaching would allow trees to colonize riparian habitat along the stream channel and sediment pool.	2+	Scrub/shrub habitat may be removed for auxiliary spillway widening.	1-
Invasive Species	No change	0	No change	0
Prime and Unique Farmlands	Breaching may create additional farmland upstream in the current permanent pool area.	2+	No change from baseline condition.	0
Riparian Areas	Current riparian areas would likely change species composition with breaching.	1-	Minor changes to adjacent riparian areas may occur with hydrology alterations	1-
Regulating Services				
Air Quality/Clean Air Act/Climate Change	Short-term, minor impacts on air quality during dam breaching.	1-	Short-term, minor impacts on air quality during rehabilitation.	1-
Endangered and Threatened Species	Removal of the dams and reversion of the sediment pool could result in establishment of potential habitat for some species, over time. It would eliminate potential foraging habitat for gray bats. No resource habitat noted during surveys.	0	Adverse impacts to threatened and endangered species are not anticipated.	0
Fish and Wildlife	Dam breaching would remove aquatic habitat but would re-connect streams up-and downstream of the	2+	Protection of existing aquatic habitat. Temporary, short-term impacts during construction activities.	2+

	Alternative			
	No Action/FWOFI		Structural Rehabilitation to High Hazard Class Dams	
	Description	Rating[1]	Description	Rating[1]
	current ponds. Temporary, short-term impacts during breach activities.			
Floodplain Management	Flooding would increase downstream with dam breaching and necessitate re-evaluation of floodplains. Resiliency of the floodplain would be reduced.	2-	No increase in the extent of the 100-year floodplain as currently mapped by FEMA. Rehabilitation of the dams will continue to protect downstream flooding and add resiliency to the floodplain.	2+
Flood Damage	Flood damage would increase downstream with dam breaching.	2-	Flooding continues to be reduced downstream, meeting Purpose and Need.	2+
Land Use	At dam locations, land use changes from open water to pasture with breaching.	1-	No change from baseline condition.	0
Migratory Birds/Bald and Golden Eagle Protection Act	Breaching of the dams would remove available open water resting and forage areas for migratory birds, including waterfowl, shorebirds, and wading birds. Breach would create potential habitat for other birds associated with shrub/scrub, riparian woodland and grasslands.	1-	Vegetation used for nesting by migratory birds may be removed; however, if construction activities are conducted outside of nesting season, no impact is anticipated.	0
Water Quality	Increased sediment load of suspended solids downstream with breaching of dam.	2-	Sallisaw Creek is impaired within the project area. Project will provide beneficial impact by trapping sediments and by maintaining reduced downstream erosion and sedimentation.	2+
Water Resources /Waters of the United States/Clean Water Act	Breaching may affect WOTUS by removing the permanent pool areas and permitting and mitigation may be necessary.	1-	No change from baseline condition, permanent pool and top of dam elevations to remain the same. Replacement of principal spillways may affect WOTUS and a 404 permit may be required.	1-

	Alternative			
	No Action/FWOFI		Structural Rehabilitation to High Hazard Class Dams	
	Description	Rating[1]	Description	Rating[1]
Wetlands	There could be a change from the baseline condition. Wetlands along shoreline may change once pools are gone. Breach may return hydrology, in part, to wetlands occurring within the Sallisaw Creek floodplain below site S-19.	1-	No change from baseline condition. Because the permanent pool would not increase, wetlands would not be affected.	0
Cultural Services				
Cultural Resources/ Historic Properties	FRS No. 13—no impact since the dam is not eligible for the National Register; no impact since it is a non-contributing resource to the historic district; no impact to the historic structure, will be minimally impacted. FRS No. 19—no impact since the dam is not eligible for the National Register; minor impact since it is a contributing resource to the historic district; no impact to the historic structure since it is a non-contributing resource to the historic district.	1-	FRS No. 13—no impact since the dam is not eligible for the National Register; no impact since it is a non-contributing resource to the historic district; no impact since the historic structure will be minimally impacted (if at all); no impact since the dam is not eligible for the National Register; no FRS No. 19—will not diminish the integrity of the resource to the greater district based on consultation; no impact since historic structure is a non-contributing resource to the historic district.	0
Tribal Concern	No concerns with FRS No. 13 since no cultural properties are identified. No concerns with FRS No. 19 based on consultation and breach inundation map, despite there being a Cherokee Nation culturally significant property nearby. Breach map shows cultural property to be unaffected..	0	No concerns with FRS No. 13 since no cultural properties are identified. No concerns with FRS No. 19 based on consultation, despite there being a Cherokee Nation culturally significant property nearby. Dam modification (and outlet flow) shows cultural property to be unaffected—not in the APE.	0

	Alternative			
	No Action/FWOFI		Structural Rehabilitation to High Hazard Class Dams	
	Description	**Rating[1]**	**Description**	**Rating[1]**
Environmental Justice	No disproportionate effect on minority, Tribal, or low-income populations. Potential increase in downstream flooding.	1-	No disproportionate effect on minority, Tribal, or low-income populations. Dam continues to provide flood protection.	1+
Public Health and Safety	Flood reduction benefits foregone and increased downstream flooding with permanent breaching may affect emergency and school route access. Dam removal does remove risk of an unanticipated breach event.	1-	Reduced flooding potential to roads and bridges downstream results in less chance of loss of life and provides safer routes to school and hospitals roads. Rehabilitating the dams to higher hazard criteria increases overall protection and public safety.	1+
Regional Water Resource Plans	Benefits foregone. Purpose and need not addressed.	2-	Dam rehabilitations align with goals and objectives of the regional watershed plan and the Lower Arkansas Watershed Planning Region (2012 Oklahoma Comprehensive Water Plan) by providing small amounts of surface water and sediment storage from their respective watersheds. The proposed action will not change the volume of water detained in the reservoirs.	1+
Total Alternative Rating:		13-		9+

[1]Ecosystem Service Trade-Off Rating Symbology for Impact: 0 = Little to no impact; 1+ = minor benefit, long- or short-term; 1- = minor impact, long- or short-term, not requiring mitigation; 2+ = moderate benefit, temporary or permanent duration, benefit not resulting in major benefit; 2- = moderate impact, long- or short-term duration, replaceable or restorable action with mitigation measure; 3+ = major benefit, long-term or permanent duration, improve service enough to change status [e.g. removing waterbody from the 303(d) list of impaired waters]; 3- = major impact with long-term or permanent effect, significantly controversial action, result in loss of life or unmitigable impact, does not meet Federal Objective.

Benefit/Cost Comparison. The project team completed a comparative cost analysis for the alternative plans carried forward for detailed study, which is shown in Table 5-5. Cost items include:

- The intent of the Sponsor is to acquire the necessary easements for properties in the construction work area and flood pool if applicable.
- Construction-related activities such as mobilization, clearing and grubbing, erosion and sediment control, demolition and removal of existing structures, site work, earthwork, fencing, seeding, sediment removal, drainfill, and conduits.
- Engineering activities such as completing design, surveys, geotechnical investigations, construction observations, and project administration.

Table 5-5 - Sallisaw Creek Watershed Dams 13 & 19
Comparative Cost Analysis of Alternative Plans

ITEM	Project Alternative [1]					
	Sallisaw Dam #13			Sallisaw Dam #19		
	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)
Total Investment	$ 1,098,600	$ 8,195,500	$ 1,706,200	$ 1,310,500	$ 21,598,200	$ 6,049,800
P.L. 83-566 Funds	$ -	$ -	$ 1,220,200	$ -	$ -	$ 4,347,600
Other Funds	$ 1,098,600	$ -	$ 486,000	$ 1,310,500	$ 21,598,200	$ 1,702,200
Average Annual Benefits [2]			$ 13,000			$ 345,000
Average Annual Costs [2]			$ 52,100			$ 180,000
Net Beneficial			$ (39,100)			$ 165,000
Average Annual O&M Costs			$ 1,800			$ 1,800
[1] Price Base 2024						Jan-24

[2] Amortized over 100 years at a discount rate of 2.75 percent. Based on total economic benefit and costs of alternatives as compared to existing conditions

The project Benefit Analysis and the project Economic Analysis is detailed in Section 9.0.

5.6 National Economic Efficiency (NEE) Alternative

The National Economic Efficiency (NEE) alternative may be one of the other alternatives or a combination of alternatives. To avoid seeking individual exceptions in those cases where human life is at risk in the event of catastrophic failure of an existing dam, the NEE plan is the federally assisted alternative with the greatest net economic benefits. This removes the FWOFI (Future Without Federal Investment) or no-action alternative as a NEE plan option where human life is at risk in the event of catastrophic failure of an existing dam. The NEE alternative identified in this plan is to rehabilitate Dam #13 and Dam #19 to High Hazard Criteria. The Rehabilitate to NRCS High Hazard Class Dam is the NEE Alternative for both Dams 13 and 19.

6.0 Environmental Consequences

6.1 Section Overview

This section describes the economic, environmental, and social effects of each alternative identified in **Section 5**. Resource areas identified in Table 5-3 as being relevant to the Proposed Action are included in this section.

Impacts to resource areas are evaluated in accordance with applicable Federal regulations and NRCS guidance documents. Direct, indirect, and cumulative impacts as well as an assessment of the significance of impacts (beneficial and adverse), are discussed in this section. The sponsor has indicated that should federal funding not be available, the dams will be breached.

6.2 Air Quality/Clean Air Act/Climate Change

No Action/FWOFI – Fugitive dust emissions and emissions from construction vehicles associated with dam breaching may temporarily increase levels of air pollutants during excavation and construction. Impacts to air quality are expected to be short-term and minor. Air pollutants would be minimized by dust suppression (watering) and vehicle maintenance.

By reducing floodplain resiliency, the no action alternative will reduce protections from climate change.

Structural Rehabilitation to High Hazard Class Dams –. Fugitive dust emissions and emissions from construction vehicles during dam rehabilitation activities may temporarily increase levels of air pollutants during excavation and construction. Air pollutants would be minimized by dust suppression (watering) and vehicle maintenance. Impacts to air quality are expected to be short-term and minor. Therefore, the Proposed Action Alternative would have little to no impact on air quality.

The proposed action will continue to provide flood protection during extreme weather events caused by climate change, providing a beneficial impact.

6.3 Cultural Resources/Historic Properties

No Action/FWOFI – There is no concern with this alternative since no historic properties, eligible for listing on the National Register (including archaeological resources), were recorded during the field surveys of FRS Nos. 13 and 19 APEs (see Appendixes A and E). FRS No. 13, and associated features identified in the Historic Resources Survey Report, are not eligible for the National Register of Historic Places (having applied National Register criteria) and concurrence with this NRCS determination was received from the SHPO (see Appendix A). This includes indirect effects (visual elements) since the existing agricultural landscape will remain the same—will not diminish integrity—even in the event of catastrophic failure. Moreover, FRS No. 13 is a non-contributing resource to the Sallisaw Creek Watershed historic district, as determined by NRCS and concurred with by the SHPO (see Appendix A). One non-eligible historic structure, and associated outbuilding, were identified downstream of FRS No. 13 in the breach APE. This abandoned, dilapidated, and modified structure is on the cusp of the breach

inundation zone (APE) and thus will be minimally impacted (if at all) if this alternative is selected. Nevertheless, consultation with the SHPO will need to be revisited for an opinion with this alternative. There were no culturally sensitive resources noted, through consultation with Caddo Nation, Cherokee Nation Osage Nation, Quapaw Nation, or United Keetoowah Band of Cherokee Indians in Oklahoma. FRS No. 19, and associated features identified in the Historic Resources Survey report, are not eligible for the National Register of Historic Places (having applied National Register criteria) and concurrence with this NRCS determination was received from the SHPO (see Appendix A). This includes indirect effects (visual elements) since the existing agricultural landscape will remain the same—will not diminish integrity—even in the event of catastrophic failure. However, FRS No. 19 is a contributing resource to the Sallisaw Creek Watershed historic district, although it is not considered eligible for the National Register (having applied criteria A-D) as a standalone historic resource. One non-eligible historic structure, and associated outbuilding, were identified within the FRS No. 19 top of dam pool APE. This abandoned, dilapidated, and modified structure is considered a non-contributing resource to the historic district. Both NRCS determinations were concurred with by the SHPO (see Appendix A). There is one culturally sensitive resource noted, through consultation with Caddo Nation, Cherokee Nation Osage Nation, Quapaw Nation, or United Keetoowah Band of Cherokee Indians in Oklahoma. The Cherokee Nation noted a cultural significant resource near FRS No. 19, but determined it was outside the NRCS APE (see Appendix A). Consultation with the Cherokee Nation will need to be revisited for an opinion if this alternative is chosen. Consequently, the breach APE would remain the same in the event of a catastrophic dam failure and thus the cultural significant resource would still be outside the APE.

Structural Rehabilitation to High Hazard Class Dams – There is no concern with this alternative since no historic properties, eligible for listing on the National Register (including archaeological resources), were recorded during the field surveys of FRS Nos. 13 and 19 APEs (see Appendixes A and E). FRS No. 13, and associated features identified in the Historic Resources Survey report, are not eligible for the National Register of Historic Places (having applied National Register criteria) and concurrence with this NRCS determination was received from the SHPO (see Appendix A). This includes indirect effects (visual elements) since the existing agricultural landscape will remain the same—will not diminish integrity—even with structural rehabilitation. Moreover, FRS No. 13 is a non-contributing resource to the Sallisaw Creek Watershed historic district, as determined by NRCS and concurred with by the SHPO (see Appendix A). One non-eligible historic structure, and associated outbuilding, were identified downstream of FRS No. 13 in the breach APE. This abandoned, dilapidated, and modified structure is on the cusp of the breach inundation zone (APE) and thus will not be impacted since the outflow with rehabilitation of FRS No. 13 will remain as it currently is. There were no culturally sensitive resources noted, through consultation with Caddo Nation, Cherokee Nation Osage Nation, Quapaw Nation, or United Keetoowah Band of Cherokee Indians in Oklahoma. Consultation with the SHPO will not need to be revisited since the original consultation accounted for the possibility of structural rehabilitation. FRS No. 19, and associated features identified in the Historic Resources Survey report, are not eligible for the National Register of Historic Places (having applied National Register criteria) and concurrence with this NRCS determination was received from the SHPO (see Appendix A). This includes indirect effects (visual elements) since the existing agricultural landscape will remain the same—will not diminish integrity—even with structural rehabilitation. FRS No. 19 is a contributing resource to the Sallisaw Creek Watershed historic district, although it is not considered eligible for the National Register (having applied criteria A-D) as a standalone historic resource. The structural rehabilitation of the dam using roller-compacted

concrete was revisited with the SHPO in 2024, NRCS determining that this form of structural rehabilitation would not diminish the integrity of the dam or historic district. On March 22, 2024, the SHPO concurred with NRCS' determination, finding that structural rehabilitation maintains the functionality of the dam and thus meets the Secretary of Interior's Standards for Rehabilitation (Appendix A). One non-eligible historic structure, and associated outbuilding, were identified within the FRS No. 19 top of dam pool APE. This abandoned, dilapidated, and modified structure is also considered a non-contributing resource to the historic district. There is one culturally sensitive resource noted, through consultation with Caddo Nation, Cherokee Nation Osage Nation, Quapaw Nation, or United Keetoowah Band of Cherokee Indians in Oklahoma. The Cherokee Nation noted a cultural significant resource near FRS No. 19, but determined it was outside the NRCS APE through continued consultation. The Cherokee Nation response, dated March 14, 2024, was based on the proposition that the dam would be structurally rehabilitated.

6.4 Endangered and Threatened Species

No Action/FWOFI – Removal of the dams and reversion of the sediment pool could result in establishment of potential habitat for some species, over time. It would eliminate potential foraging habitat for gray bats. No resource habitat noted during surveys and no impact is anticipated.

Structural Rehabilitation to High Hazard Class Dams – Three species (Piping Plover (*Charadrius melodus*), Monarch Butterfly (*Danaus plexippus*) and Red Knot (*Calidris canatus rufa*)) may only be in the vicinity of the study area during migration. Due to the lack of resources identified during surveys, no impact is anticipated to these species.

Potential favorable habitat of American Burying Beetle (*Nicrophorus americanus*) (federal listed) exists within portions of site S-13 and further consultation with USFWS should be conducted by a qualified biologist prior to construction. Based on the submission of the IPaC report, associated with the Limited Threatened & Endangered Species Habitat Assessments for the dams, it was determined the action may affect the American Burying Beetle; however an incidental *take* that may occur as a result of the action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.47(d).Please see Limited Threatened & Endangered Species Habitat Assessments in Appendix E.

The USFWS in the Oklahoma Ecological Services Field Office in Tulsa, OK sent an email that the sites are both within 5 miles but less than 0.25 miles of roosting locations for Ozark Big-eared Bat (*Corynorhinus* (+*Plecotus*) *townsendii ingens*) and are within the range of the Gray Bat (*Myotis grisescens*), Indiana Bat (*Myotis sodalist*), Tri-colored Bat (*Perimyotis subflavus*) and Northern Long-eared Bat (*Myotis spetentrionalis*). If tree removal is required, any tree over three inches in diameter with nesting cavity should be considered habitat. Tree clearing can be conducted prior to the bats returning to the area, during their inactive period from November 15 to March 31. The project is anticipated to be compliant under the ESA under the 4-d rule adopted for the species under 50 CFR 17.40(0). Removal of known habitat will reduce the potential impact to the Ozark Big-eared Bat, Gray Bat, Tri-colored bat, Indiana Bat, and Northern Long-eared Bat. The USFWS must be informed about any activities involving tree removal or potential disturbance to cave/karst features. Consultation with USFWS was updated in October 2023 and can be found in Appendix A.

These sites are lacking significant canopy cover, submerged trees and logs, or debris. These downstream dams may limit migration of juvenile Alligator Snapping Turtles. Activities proposed with dam rehabilitation will likely have no effect on the Alligator Snapping Turtle.

6.5 Environmental Justice

No Action/FWOFI – Little to no impact on minority, Tribal, or low-income populations is anticipated..

Structural Rehabilitation to High Hazard Class Dams – Little to no impact on minority, Tribal, or low-income populations is anticipated. However, the dams would continue to provide flood damage reduction benefits to local communities. Site 19 is within close proximity to cultural, historic, and pre-historic resources, including culturally sensitive resources and land held by the Cherokee Nation. As such, the Cherokee Nation Tribal Historic Preservation Office will need consulted with during final design plans to review and verify no potential impact to these resources.

6.6 Erosion and Sedimentation

No Action/FWOFI – Sediment load and potential erosion downstream would increase with breaching of dams, causing moderate impact. The increased sediment load would result from both the excavation of the breach cut and resulting higher flows in the waterway once the dams are removed. A moderate impact from increased sedimentation would occur downstream.

Structural Rehabilitation to High Hazard Class Dams – Maintain reduced erosion and reduced sedimentation carried downstream. The dams would collect sediment from stream flows for the 100-year design life and thereby reduce the sediment load going downstream. This reduction is 0.86 acre-feet/year of submerged sediment and 0.15 acre-feet/year of aerated sediment for Site 13 and 4.53 acre-feet/year submerged and 0.80 acre-feet/year aerated for Site 19. Moderate impact to watershed from sediment storage.

6.7 Fish and Wildlife

No Action/FWOFI – Dam breaching would remove lake fish habitat, but would reconnect up-and downstream of the current ponds, allowing continual fish access through the stream. Temporary, short-term impacts would occur during dam breach activities.

Structural Rehabilitation to High Hazard Class Dams – Protection of existing aquatic habitat would occur. Riparian and wooded areas may be modified with auxiliary spillway modifications, modifying existing habitat for terrestrial wildlife; however, similar habitat is adjacent to the impacted area to which wildlife could migrate. Short-term impacts are anticipated during construction; however long-term or permanent adverse impact is not anticipated.

6.8 Floodplain Management

No Action/FWOFI – No impact to the existing FEMA floodplain is anticipated.

Structural Rehabilitation to High Hazard Class Dams – The existing dams are currently accounted for in the effective Zone A floodplain mapping. The rehabilitation of each dam to meet NRCS high hazard criteria will have little to no impact on the regulated Zone A floodplains. To bring the dam into compliance with NRCS high hazard to reduce the risk of a dam breach, it was necessary to alter the dam geometry. Because the principal spillway size is being increased, higher frequency events such as the 50% chance and 10% chance events may have increased flow downstream, but this has little to no impact on the regulated 100-year floodplain. Although specific locations will experience a deeper inundation depth with the proposed improvements during the 100-year flood frequency event (<0.2' modeled increase, which is within the model accuracy level), the impacts of the improvements are concentrated near the dam outfall and diminish farther downstream. The floodplain downstream of the improvements will be minimally impacted. The proposed rehabilitation will maintain the current ecosystem services considerations and not change the cultural resources, or the ecology of land use, wetlands, and species habitat around the existing sites by maintaining existing principal spillway, and top of dam elevations. It will improve public safety, have little impact on regulatory floodplain management and will continue to provide flood reduction benefits compared to decommissioning or removing the dams.

6.9 Flood Damages

No Action/FWOFI – Damages would occur and are provided in Table 6-1 as without dam conditions for each site, resulting in significant impact.

Structural Rehabilitation to High Hazard Class Dams –

Structure/Infrastructure Damages – As discussed in Section 4.3.8, a 100-year 24-hour storm analysis was simulated using HEC-RAS 2D which identified flood damage locations. This alternative would provide significant impact in terms of flood damage reduction.

For Site 13, approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 3.7 feet.

For Site 19, approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet.

The FEMA Hazus (Level 1) tool was run for 5 scenarios (Existing Conditions, Without Dam #13, Without Dam #19, With Dam #13 and With Dam #19) to estimate monetized losses. Results in the form of annualized damages for each scenario are provided in Table 6-1.

Table 6-1 Total Annualized Direct Economic Losses for Buildings

SCENARIO	SCENARIO	TOTAL DIRECT ECONOMIC LOSSES FOR BUILDINGS
EXISTING CONDITIONS	Existing Conditions (With Current Dam)	$ 1,464,000
SALLISAW DAM #13	Without Dam	$ 1,472,000
	With Dam (Preferred Alternative)	$ 1,459,000

SALLISAW DAM #19	Without Dam	$	1,816,000
	With Dam (Preferred Alternative)	$	1,471,000

Agricultural Damages – Damages under this alternative remain similar to existing conditions, resulting in little to no impact with this alternative. When the agricultural area was quantified within 100-year inundation area downstream of the dams for the with and without dams scenarios, only 18.6 acres of the 9372-acre with-dam inundation area were considered agriculture. With the dams removed, the agriculture acreage was predicted to increase 0.6 acres to 19.2 acres. This correlates to less than of 1 acre of protected agricultural area by the dams. Thus, agriculture losses were considered negligible. Agricultural losses by crop are provided in Table 6-2.

Table 6-2 Agricultural Loss Acreage

	WITHOUT DAM (ACRES)	WITH DAM (ACRES)
100-YR INUNDATION AREA	**10,906**	**9372**
Corn	0.4	0.7
Soybeans	2.3	2.3
Winter Wheat	0.2	0.3
Double Crop Winter Wheat	1.5	1.4
Other Hay	14.7	13.9
TOTAL	**19.2**	**18.6**

6.10 Forest Resources

No Action/FWOFI – Breaching would allow trees to colonize riparian habitat along the stream channels and sediment pool; however, minimal impact is anticipated due to the relatively small amount of potentially affected forest resources.

Structural Rehabilitation to High Hazard Class Dams – At the dam locations scrub/shrub habitat may be removed for the auxiliary spillway widening. There are no high value old wood timber or rare trees that will be impacted.

6.11 Invasive Species

No Action/FWOFI – No impact.

Structural Rehabilitation to High Hazard Class Dams –During field activities associated with the Waters of the US delineation, invasive species of concern were not observed, so no impact is anticipated. The proposed dam modifications would not be anticipated to affect invasive species.

6.12 Land Use

No Action/FWOFI – At dam locations, land use changes from open water to pasture with breaching, resulting in minor, localized impacts.

Structural Rehabilitation to High Hazard Class Dams – No impact.

6.13 Migratory Birds

No Action/FWOFI – Breaching of the dams would remove available open water resting and forage areas for migratory birds, including waterfowl, shorebirds, and wading birds. Breach would create potential habitat for other birds associated with shrub/scrub, riparian woodland and grasslands. Little to no impact is anticipated.

Structural Rehabilitation to High Hazard Class Dams – Vegetation used for nesting by migratory birds may be removed/disturbed during rehabilitation; however, if construction activities are conducted outside of nesting season, no impact is anticipated.

6.14 Prime and Unique Farmlands

No Action/FWOFI – Breaching may create additional farmland upstream in the current permanent pool area; however, impacts are anticipated to be minor..

Structural Rehabilitation to High Hazard Class Dams – No impact.

6.15 Public Health and Safety

No Action/FWOFI – Purpose and Need not addressed. Breaching of dams would increase public risk at road and railroad crossings and result in significant impact.

Structural Rehabilitation to High Hazard Class Dams – With implementation of the Proposed Action, the dams will continue to provide flood protection that minimizes the risk of loss of human life from a catastrophic flood event and would allow emergency vehicles to travel area roads with limited interruption, providing a significant positive impact and benefit to the area.

6.16 Regional Water Resources Plans

No Action/FWOFI – No significant impact to regional water resource plans.

Structural Rehabilitation to High Hazard Class Dams – No significant impact to regional water resource plans.

6.17 Riparian Areas

No Action/FWOFI –Current riparian areas would likely change species composition with breaching.; however, impact is anticipated to be minor due to the relatively small area of potentially effected riparian area.

Structural Rehabilitation to High Hazard Class Dams – Minor changes to adjacent riparian areas may occur with hydrology alterations. Permanent pool lowering during construction should not affect the long-term health of the riparian areas and result in little to no impact.

6.18 Water Resources

No Action/FWOFI – Breaching of dams would reconnect the streams and remove permanent pools. These modifications fall under the jurisdiction of the USACE and ODEQ and would need permitting for this alternative. Should the dams be breached, initially, impacts would be moderate to significant; however, may provide positive impact once ecosystems are restored.

Structural Rehabilitation to High Hazard Class Dams – The proposed dam rehabilitation modifications would occur in a stream with the principal spillway replacements, which falls under the jurisdiction of the USACE and ODEQ and permitting for both sites has been received. No Federal or State designated Wild, Scenic, or Recreational River segment or a river listed in the Nationwide Rivers Inventory (NRI) occurs in the project area. Temporary impact during construction would be short-term and minor.

6.19 Water Quality

No Action/FWOFI –Sallisaw Creek is impaired downstream of the dams for Enterococcus pollution. Breaching of the dams would moderately impact waters already impaired by increasing the sediment load of suspended solids downstream.

Structural Rehabilitation to High Hazard Class Dams – Sallisaw Creek is impaired within the project area. Project will provide beneficial impact by trapping sediments and by maintaining reduced downstream erosion and sedimentation, helping to maintain current clean water conditions in the reach of Sallisaw Creek upstream of its confluence with Greasy Creek. Temporary soil disturbance during construction will be mitigated by erosion control best management practices to protect the creek water quality.

6.20 Waters of the U.S./Clean Water Act

No Action/FWOFI – Breaching may affect WOTUS by removing the permanent pool areas. However, dam removal is beneficial to aquatic habitats; therefore, while Section 404 permitting may be needed for the dam breach, mitigation is not anticipated due to the aquatic habitat benefit increase. Should the dams be breached, initially, impacts would be moderate to significant; however, may provide positive impact once ecosystems are restored.

Structural Rehabilitation to High Hazard Class Dams – Little to no impact with temporary short-term construction impact by replacing the principal spillways.

6.21 Wetlands

No Action/FWOFI – No impact is anticipated. If the volume or flow regime within the ponds were to be modified, the wetlands directly adjacent to the ponds, downstream of the ponds, as

well as at the ponds themselves would be impacted. Wetland vegetation composition along shoreline may change with a different water flow regime. Refer to the WOTUS Field Verification Report for each site in Appendix E. Breach could restore hydrology in part to riverine wetlands occurring within the floodplain of Sallisaw Creek below site S-19, and provide minor beneficial impact.

Structural Rehabilitation to High Hazard Class Dams – No impact. The wetlands should be undisturbed by the dams' rehabilitation. Section 404 compensatory mitigation is not anticipated with the rehabilitation of either dam as each action entails replacing the principal spillway and adjusting the auxiliary spillway without altering existing permanent pool levels. Temporary and short-term impact of shoreline wetlands may occur during construction activities, but disturbed areas will be restored to pre-construction conditions per U.S. Army Corps of Engineers (USACE) requirements. By only modifying the auxiliary spillway crest elevations the permanent pool would not increase, no mitigation should be necessary, and wetlands would not be affected. Refer to the WOTUS Field Verification Report for each site in Appendix E.

6.22 Cumulative Effects

Cumulative effects result from the incremental effects of the proposed action when compounded with other past, present, and reasonably foreseeable actions and can result from individually minor but collectively significant actions taking place over a period of time [40 CFR 1508.1(g)(3)]. Challenges to analyzing the cumulative effects of an action include defining the spatial and temporal bounds to include significant and relevant issues without extending analyses too broadly (CEQ 1997). For this evaluation, the cumulative effects analysis for each proposed action focused on each subwatershed proposed for dam rehabilitation; however, a broader assessment of the Sallisaw Creek Watershed was also considered. Because most floodwater retarding dams are relatively small in scale, they directly affect only a small-localized area. However, indirect and cumulative effects may extend to downstream areas as well. As the potential rehabilitation of S13 and S19 are considered individual projects, the potential cumulative effects of both projects are discussed herein.

Beneficial impacts of the dams are plentiful and include alleviation of downstream flooding, decreased erosion, provision of livestock water, reduction of erosion and soil loss, and resiliency to climate change. Although there are many benefits and potential impacts of the proposed action and alternatives, not all resources are retained in the cumulative effects analysis. Resources retained for this cumulative effects analysis include 1) those resources for which the Project or alternatives would have moderate or major impacts, and/or 2) resources in poor or declining health or at risk even if the Project impacts were relatively small. Based on potential moderate impacts discussed in Chapter 6, specific resources retained for this cumulative effects analysis include: fish and wildlife resources, floodplains, and water quality.

Fish and Wildlife Resources

Rehabilitation and/or elimination of multiple dams within the watershed could have a cumulative effect on fish and wildlife resources as available habitats could be modified. When constructed, the dams impacted the aquatic stream and riparian habitat by flooding areas upstream of the dam; this reduced stream habitat but increased lake habitat. These impacts and benefits continue in the present. With the No Action/FWOFI, breaching of the dams would affect resources and ecosystem services within the subwatershed as well as the overall watershed. Breaching of the dams would modify the existing aquatic habitat within the pools; however, in the long-term, impounded streams would be reconnected to the native flow regime and aquatic species would be able to freely migrate through reaches of stream not previously traversable. Under the No Acton alternative, fish and wildlife resources that depend on stream habitat could realize a positive cumulative effect and fish and wildlife resources that depend on lake habitat could realize a negative cumulative effect in combination with potentially eliminating other floodwater retarding dams within the watershed.

The historic impacts and benefits created by dam construction would continue in the present and the foreseeable future if both dams are rehabilitated to current regulatory criteria. The proposed action would affect resources and ecosystem services within the subwatersheds as well as the overall watershed. Dam rehabilitation would protect the existing aquatic habitat within the pools; however, impounded streams will remain disconnected to the native flow regime and aquatic species will not be able to freely migrate through impounded reaches. The rehabilitation of each dam in combination with other rehabilitation projects within the watershed would provide a cumulative beneficial contribution to fish and wildlife resources that utilize lake habitats.

Floodplains

Implementation of the No Action would cause a loss of flood protection downstream of each dam. This could cause a cumulative increase in flooding within the watershed should other dams within the watershed be eliminated.

Implementation of the proposed action would allow for flood protection to continue in downstream areas. This flood protection in combination with flood protection of other floodwater retarding dams in the watershed would cause a cumulative benefit. Reduction of damages from flooding and disruption of civil services would also be realized. The floodplain could become more resilient to climate change.

Water Quality

Under the No Action, erosional issues up- and downstream of the dams could worsen and nutrient-laden sediment could freely flow through the streams. The impact of breaching FWS 13 and 19 could have a cumulative negative effect on water quality within the watershed, due to the potential for impact to already impaired downstream waters.

Under the proposed action, erosional protections up- and downstream of the dams will remain, as well as the dams' protective quality of retaining nutrient-laden sediment. The rehabilitation of S13 and S19 would have a cumulative beneficial effect on water quality.

6.23 Controversy

No issues of controversy were identified. One property owner (Rainwater) at Sallisaw Site 19 was adamant that they will not give any additional permanent easements. The dam rehabilitation was planned to keep permanent pool and top of dam elevations the same as existing for this reason. Any temporary construction easements needed for auxiliary spillway RCC construction work will need to come from other property owners. Those to the west of the base of dam would be the best location.

7.0 Risk and Uncertainty

7.1 Risk and Uncertainty

Climate change risk affects the best modeling on future peak storm events. Climate change increases the uncertainty of the rainfall depths that are currently published as PMP values or those published for statistical storms such as the 100-year event. The most up to date published data was used for all storm events. Risk and uncertainty may involve increased costs or reduced benefits through adjustments in design related to this modeling. This affects all alternatives equally and thus doesn't affect the overall decision in this Plan, except that it may result in not meeting the benefit to cost ratios arrived at.

Future land use can be a risk, but based on historical use of the watershed and lack of proposed development, this is a very low risk. No geotechnical investigation was completed with this planning phase and there is risk this could affect the rehabilitation. This risk is mitigated by keeping the top of dam elevation the same as existing.

For the flood frequency analysis, there were 23 existing dams identified upstream of the impacted benefit area that could impact flooding. Of the 23 dams, 11 dams had orifice controlled principal spillway inlets that were modeled based on barrel diameter and did not account for orifice control. Due to the small orifice openings that can easily be plugged, the orifice inlets of the non-project dams were ignored. Because the flood frequency for both the existing and proposed conditions for all dams were modeled the same way, the overall results for the project dams were not affected. See Watershed Dam Routings Memorandum in Appendix E for more detailed information. The rehabilitation conceptual designs were completed using SITES and thus the proposed structural alternatives are not impacted by the minor uncertainty in the flood frequency results.

8.0 Consultation, Coordination, and Public Participation

8.1 Public Participation

The project team developed a Public Participation Plan, including a comprehensive mailing list of agencies, groups and individual stakeholders, in consultation with the Sponsor and NRCS. The Public Participation Plan complied with NRCS General Title 400, Part 400 – Public Participation Policy.

The comprehensive mailing list included federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Indian tribes; other interested parties; and newspapers. This list also included affected landowners who are potential right-of-way grantors, whose property may be used temporarily for project purposes, or who own homes within certain distances of the project, and anyone who submits comments on the project. The mailing list was updated as the analysis proceeded, and the information related to this environmental review was sent to individuals, organizations, and government entities interested in and/or potentially affected by the planned project.

Public meetings were held on September 9, 2021 and November 30, 2021. The initial meeting was held at Adair County Conservation District Office, 468670 Hwy 100, Stilwell, OK 74960 and the final meeting was held at the Indian Capital Technology Center, 470826 E 810 Rd, Stilwell, OK 74960 in conjunction with a Live Virtual Stream on MS Teams to accommodate participants unable/unwilling to attend because of Covid19 restrictions. The meetings provided instruction and guidance on the project scope and the extent of activities required for developing the Supplemental Watershed Plan and Environmental Evaluation. The first public meeting (September 9, 2021) was primarily a scoping meeting to introduce the project and identify project needs and concerns. One concern identified was to not increase the permanent pool elevations with the dam rehabilitations. The second meeting (November 30, 2021) allowed the project team to present project alternatives, including the National Economic Efficiency (NEE) alternative, and estimated project costs.

The objectives of the public meetings included:

- Ensure that the general public; private groups; and local, county, and state government agencies are thoroughly familiar with the proposed Sallisaw Creek Sites 13 and 19 dam rehabilitation project.
- Promote an atmosphere of extra-agency cooperation.
- Provide a forum for the reception and consideration of public input regarding the project.
- Clarify the effects of the diverse alternatives under consideration.
- Collect existing resource data regarding the Sallisaw Creek watershed from agencies and citizens.
- Incorporate written and verbal comments into the decision-making process.

All Public Meetings were open forums conducted in compliance with State of Oklahoma Open Meeting Act which requires public agencies to hold certain meetings and hearings open to the public.

Meeting minutes showing comments and responses from agencies, stakeholders, and the general public are included in Appendix A.

8.2 Agency Consultation

Input from numerous federal, state, local, and tribal agencies was solicited during the scoping process. Scoping letters were mailed to the following agencies:

- Natural Resources Conservation Service
- U.S. Army Corps of Engineers (USACE) – Tulsa District
- U.S. Fish and Wildlife Service
- Federal Emergency Management Agency (FEMA)
- Oklahoma Department of Wildlife Conservation (ODWC)
- Oklahoma Department of Emergency Management (Oklahoma DEM)
- Oklahoma Department of Environmental Quality (ODEQ)
- Oklahoma Archaeological Survey
- Oklahoma Historical Society State Historic Preservation Office (Oklahoma SHPO)
- Oklahoma Department of Transportation
- Oklahoma Conservation Commission
- Oklahoma Water Resources Board
- City of Sallisaw
- City of Stilwell
- Stilwell Area Development Authority
- Adair County – Floodplain Administrator
- Sequoyah County
- Cherokee County
- Adair County Conservation District
- Cherokee County Conservation District
- Sequoyah County Conservation District

Consultation was completed with USACE, ODEQ, USFWS, ODWC, OAS, SHPO, and OCC, see Appendix A. According to these agencies, the proposed action will not significantly impact natural, cultural, or historic resources. However, Adair County Conservation District will need to consult with ODEQ for a Section 401 Water Quality Certification.

The NRCS also solicited input from the following tribes during the development of the Plan-ED. The invitation to participate as a consulting party was requested pursuant to requirements of Section 106 of the National Historic Preservation Act of 1966, as amended, (16 USC §470 et. seq.) and the Protection of Historic Properties (36 CFR Part 800). The proposed action will have no adverse effect on historic properties which include Traditional Cultural Properties, Places of Religious and Cultural Significance, Indian Sacred Sites, or culturally sensitive resources based on the alternatives presented in this document and consultation with relevant tribal entities about these alternatives (see Appendix A).

- Osage Nation
- Caddo Nation
- Cherokee Nation
- Quapaw Nation
- United Keetoowah Band of Cherokees

Environmental/Wildlife Consultation *

United States Fish and Wildlife Service	☒Yes	☐No	Date: 10-11-23

Section 7 T&E Species Consultation (2022-0032463) – Sallisaw Creek 13 Date: 10-11-23
Section 7 T&E Species Consultation (2022-0032520) – Sallisaw Creek 19 Date: 10-11-23

The following species are listed as having a range of occurrence that overlaps the project location: * Not Likely to Adversely Affect (NLAA)

Sallisaw 13: Gray Bat (Endangered)=NLAA, Indiana Bat (Endangered)=NLAA, Northern Long eared Bat (Threatened) =NLAA, Ozark Big-eared Bat (Endangered)=NLAA, Tri-colored Bat (Proposed Endangered)= NLAA, Piping Plover (Threatened)=habitat not present, Red Knot (Threatened)=habitat not present, American Burying Beetle (threatened)=4(d) exempt, Monarch Butterfly (Candidate)=NLAA, Alligator Snapping Turtle (Proposed Threatened)= NLAA

Sallisaw 19: Gray Bat (Endangered)=NLAA, Indiana Bat (Endangered) =NLAA with tree removal during hibernation, Northern Long eared Bat (Threatened) =NLAA with tree removal during hibernation, Ozark Big-eared Bat (Endangered), Tri-colored Bat (Proposed Endangered)= NLAA, Piping Plover (Threatened)=habitat not present, Red Knot (Threatened)=habitat not present, Monarch Butterfly (Candidate)=NLAA, Alligator Snapping Turtle (Proposed Threatened)= NLAA

Oklahoma Department of Wildlife Conservation	☒Yes	☐No	Date: 05-06-22
United States Army Corps of Engineers	☒Yes	☐No	Date: On-going
Oklahoma Conservation Commission	☒Yes	☐No	Date: 06-01-22

* Consultation correspondence resides in supporting document files.

Cultural Resources Consultation *

Pedestrian Survey conducted by NRCS Archaeologist	☒Yes	☐No	Date: 04-05-22, 07-19-22
Historic Resources Survey	☒Yes	☐No	Date 01-07-22
Cultural Resources identified	☒Yes	☐No	Date: 01-07-22
Consultation with Oklahoma Archaeological Survey	☒Yes	☐No	Date: 05-11-22, 08-17-22
Consultation with State Historic Preservation Office	☒Yes	☐No	Date: 04-26-22, 12-01-22
Consultation with Tribes	☒Yes	☐No	Date: 09-09-21

Tribes Contacted: Osage Nation, Quapaw Nation, Cherokee Nation, Caddo Nation, United Keetoowah Band of Cherokees.

* Consultation correspondence resides in supporting document files in Appendix A.

Regarding consultation, NRCS, the State Historic Preservation Officer, the State Archaeologist (OAS), and tribes with ancestral lands in Oklahoma, have a standard operating procedure when it comes to NRCS' rehabilitation program. Based on verbal conversations, and past consultation on other watershed rehabilitation projects, the area of potential effect has been standardized as are consultation communications/procedures. Given the local protocol, official consultation with the SHPO and OAS was initiated with the submittal of the reports of findings on April 19, 2022 for FRS No. 13 and May 20, 2022 for FRS No. 19. SHPO Historic Resource Identification forms were FRS Nos. 13 and 19 were submitted concurrently. Consultation with tribes, to address the presence of possible cultural properties (identified during background research) was initiated prior to submittal of the report—September 9, 2021 for both FRS Nos. 13 and 19.

Concurrence with the NRCS determination of "No Effect on Historic Properties" for FRS No. 13 was received from the OAS on May 11, 2022 and FRS No. 19 from OAS on August 17, 2022. Concurrence with the NRCS determination of "No Effect on Historic Properties" for FRS No. 13 was received from the SHPO on April 26, 2022 and for FRS No. 19 from SHPO on December, 2022. Consequently, Sallisaw Creek Watershed was designated a historic district, FRS No. 13 being a non-contributing resource, but FRS No. 19 was a contributing resource to the historic district. One NRCS alternative for rehabilitating FRS No. 19 was to fill the auxiliary spillway with dirt and place a roller-compacted concrete auxiliary spillway over the top of the dam. Given this alternative, and recognizing that FRS No. 19 was a contributing resource to a historic district, consultation with the SHPO was revisited. NRCS determined that this form of structural rehabilitation was not an adverse effect to FRS No. 19. Concurrence with this determination was received from the SHPO on March 22, 2024. Regarding continued consultation with tribal entities, the Cherokee Nation noted the presence of a culturally sensitive resource in the vicinity of FRS No. 19. Consultation with the Cherokee Nation was revisited. NRCS provided breach maps showing the current discharge of runoff and future discharge estimates based on the structural rehabilitation alternative as well as the No Action/FWOFI alternative and decommissioning alternative. After receiving these data, the Cherokee Nation determined that the culturally sensitive resource was outside the APE with a letter dated March 14, 2024.

The following entities responded to the scoping request:

- Beverly Sturgis, Land Owner – Stated by phone call on September 13th, 2021 with Adair County Conservation District that the Rainwater Family will not sign any new permanent easements for the project on the land they own around Site 19.

- U.S. Fish and Wildlife Service – The USFWS requested by email on September 15th, 2021 to be kept in the loop on the process as it moves forward and that there is concern that tree removal or potential disturbance to cave/karst features used by bats could affect the Ozark Big-eared bat, Gray bat, or Northern Long-eared bat.

- USACE – The USACE indicated by September 21th, 2021 letter that the USACE reviewed the potential rehabilitation of the dams in accordance with Section 404 of the Clean Water Act. Nationwide Permit (NWP) 3 for Maintenance authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act Section 404(f) exemption for maintenance. A Section 401 Clean Water Act certification will need to be requested for any license or permit that authorizes an activity that may result in a discharge. A USACE September 26, 2022 letter for S-13 reviewed for Section 404 and verified it falls within NWP 3. This letter incorporates an Activity Specific Condition by requiring the preparation and submittal of an Aquatic Resource Protection Plan prior to construction starting. Site S-13 was assigned Identification Number SWT-2021-00520.

- Oklahoma Department of Environmental Quality (ODEQ) – The ODEQ provided a Clean Water Act 401 Water Quality Certification for Section 404 permit SWT-2002-00481 on June 15, 2023 including conditions.

- Quapaw Nation – The Quapaw Nation stated in a September 23, 2021 letter that the project is outside the current area of interest for the Quapaw Nation and does not desire to comment on this project at this time.

- Adair County Conservation District – Stated by email on December 9, 2021 that the board of directors selected and approved SITES structural rehabilitation alternative 3 for both dams as the Sponsor Preferred Alternative.

Consultation responses are provided in Appendix A.

A draft of the Supplemental Watershed Plan and Environmental Evaluation will be made available for review and public comment when it reached Draft Plan – ED status.

9.0 Preferred Alternative

9.1 Rationale for Preferred Alternative

Four main alternatives were considered for each site: Future without Project / Future Without Federal Investment (FWOFI), Decommissioning, Structural Rehabilitation to High Hazard, and Non-Structural Alternative. See Section 5 for alternatives considerations.

For the Structural Rehabilitation to High Hazard alternatives, on the two Sallisaw dams the modeling began with the two suggested alternatives from the 2010 Rehabilitation Assessment Reports (basis of Alt 1 and Alt 2 from the SITES Narratives, see appendices). The suggested alternatives from the 2010 assessments were showing lower top of dam elevations being required. These results were due to lower sedimentation shown from bathymetric surveys than was assumed in the assessment reports and the increased size of the principal spillway significantly reducing drawdown times and lowering the initial routing elevations required. On dam site 13, the existing outlet was through a restricted orifice on the riser and replacing this also allows lower the auxiliary spillway crest. On dam site 19, the modeling started keeping the principal spillway (PSW) crest at existing elevation to accommodate existing property owner requests to not require additional permanent easements, and the results were still showing the top of dam to be lowered. This would have resulted in additional construction cost that was not necessary. The modeling then started looking at smaller replacement diameters on the PSW conduit and not lowering the ASW crest as much to iteratively find the minimal amount of cut necessary on the ASW to pass the design storms and meet the Oklahoma Water Resources Board (OWRB) design criteria check with freeboard.

This resulted in the lowest potential construction cost to meet the purpose and need with a structural rehabilitation alternative because it is the least amount of dirt work and does not add any mitigation or environmental concerns upstream by keeping the current top of dam and PSW permanent pool crest elevation the same as existing on both dams. Site 13 was similar in approach, except the ASW width was also varied in addition to the crest elevation to achieve a reasonable velocity for a rock bottom ASW because it was observed on site that the existing ASW is cut into a rock hillside. So, the less rock cut excavation that occurs, the lower the cost. Both dam sites have minimal environmental and mitigation costs by keeping the top of dam and PSW crest elevations the same as currently exists. This also results in the least increase in downstream design flow impacts to downstream road crossings and PDL's as possible.

The only alternative shown to have a lower cost than the Structural Rehabilitation to High Hazard Dam for each dam is the Future Without Federal Investment (FWOFI), which is a Sponsor paid for (no Federal involvement) breach of the dams to remove their breach wave potential. The FWOFI doesn't meet the purpose and need to prevent/reduce downstream flooding, so there would be additional/increased flood damages downstream and additional risk that are not a part of the cost estimate.

For these reasons the Sponsor Preferred Alternative for both dams is the Structural Rehabilitation to High Hazard Dam. This is also the National Economic Efficiency (NEE) alternative for both dams by maximizing net economic benefits while meeting the purpose and need, see Section 9 for more details.

9.2 Floodwater Retarding Structure Measures to be Installed

On Site 13 the structural rehabilitation improvements to meet high hazard dam criteria include widening the auxiliary spillway from 40 feet to 120 feet and lowering the auxiliary spillway crest by 4.2 feet; removing the existing, orifice controlled, riser inlet and 24 inch diameter principal spillway conduit and replacing it with a standard D x 3D covered top riser and 30 inch diameter, 285 feet long barrel; constructing a new concrete impact basin; raising the left (north) abutment driveway access to existing top of dam elevation; and adding riprap wave protection with bedding along the dam face. Site 13 has a net fill of approximately 10,500 cubic yards. The borrow will be from within the existing permanent pool and surrounding area of flooding impoundment. The conversion from an orifice controlled riser inlet to a standard D x 3D covered top riser inlet significantly reduced the initial reservoir elevation required for SDH and FBH routings, which was the most significant factor that allowed the auxiliary spillway to be lowered and the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

On Site 19 the structural rehabilitation improvements include filling the existing 200 feet wide auxiliary spillway to existing top of dam elevation; constructing a new 400 feet wide auxiliary spillway with roller compacted concrete at left (south abutment) with crest that is 5.9 feet lower than the existing auxiliary spillway crest elevation; removing/abandon/grout fill the existing 30 inch diameter principal spillway conduit and riser and replacing it with a 48 inch diameter barrel 340 feet long and riser; constructing a new concrete impact basin; constructing a left abutment drain; and adding riprap wave protection with bedding along the dam face. A drain pipe from the railroad right-of-way at the right (north) abutment needs the west end exposed and the east end repaired by the flap gate to be effective. Site 19 has a net cut of approximately 42,200 cubic yards that will need to be properly disposed of. Enlarging the principal spillway (250% increase in flow area) impacted the detention volume and allowed for a lower auxiliary spillway crest elevation and lower initial reservoir elevation for routing the SDH and FBH. By lowering the auxiliary spillway crest and widening it to 400 feet allowed the top of dam to remain unchanged while meeting TR-60 high hazard, hydrologic criteria.

9.3 Mitigation

No compensatory mitigation is anticipated with the rehabilitation of either dam. Both dams are replacing the principal spillways and widening/lowering the auxiliary spillways, but keeping permanent pool and top elevations the same as existing. Site 19 dam is moving the auxiliary spillway to the south end of the dam. All of the proposed rehabilitation features are well away from the field observations of lake shoreline wetlands, see the Preliminary WOTUS Field Verification Reports and the conceptual plans in

the appendices. As long as the permanent pool elevations remain the same, compensatory mitigation should not be required.

Mitigation actions are necessary to avoid or minimize impacts to endangered species and migratory birds. These mitigation measures include felling potential roost trees during the inactive period of Northern long-eared bats and Indiana bats (November 15 – March 31) and initiating construction activities or site preparations prior to the primary nesting season (April 1 – July 1).

Oklahoma NRCS' Post-Review Discovery and Monitoring Plan: Outlined here is the process that NRCS and its representatives will implement to address potential adverse effects if cultural resources are encountered during construction (even though adequate identification efforts were made before construction began). The post-review discoveries clause contained in the Section 106 report (Appendix E) will be relayed to the contractor when the contract is awarded. NRCS Contracting Officer's Representative and NRCS Construction Inspectors have been trained in Oklahoma cultural resources procedures, which includes provisions for the discovery of cultural materials and human remains. This statement is prepared in accordance with 36 CFR 800.13. In brief, the NRCS Cultural Resources Coordinator (CRC) will be contacted, and all construction will cease in a 50' radius of the discovery. The CRC will examine the discovery location to determine if the discovery requires further assessment. Simultaneously, the Advisory Council on Historic Preservation (ACHP), Oklahoma SHPO, Oklahoma State Archaeologist, and appropriate tribal entities will be contacted within 48 hours of the discovery. With these partners, NRCS will determine the actions to resolve the adverse effects. If the finding of the effect for the project is likely to be "no adverse effect", a finding of "no adverse effect" document will be prepared and shared with the consultation partners. If the effects are unknown, NRCS will enter into an agreement document with the consultation partners for identification, evaluation, and assessment of the effects. The agency official will provide the ACHP/SHPO/State Archaeologist/tribes a report of the remedial actions when they are completed.

9.4 Compliance with Federal, State, and Local Laws

The structural rehabilitation to high hazard dam criteria preferred alternative conceptually meets federal, state, and local laws. For final design and construction, Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NDPES) construction permit will be needed if more than 1 acre of ground is to be disturbed during rehabilitation, which is likely. The United States Fish and Wildlife Service (USFWS) has requested review involvement for any tree removal or potential disturbance to cave/karst features that could affect bats. United States Army Corp of Engineers (USACE) section 404 clean water certification exemption for maintenance or Nationwide Permit 3 for Maintenance has been obtained for rehabilitation of the existing structures, and will need an Aquatic Resource Protection Plan and Permittee Construction Schedule submitted to USACE prior to commencement of work on the site. The Oklahoma Department of Environmental Quality has provided Water Quality Certification (401 certification) that is required for S-19 with conditions that need to be followed in construction. An OWRB review and permit will be required with the final design for structural rehabilitation of the dams. There will also be Oklahoma forms that need to be submitted and filled out for forms OK ENG 49 and OK ENG 59.

9.5 Costs and Cost Sharing

The Project Team completed a comparative cost analysis for the alternative plans carried forward for detailed study. Cost items included:

- The intent of the Sponsor to acquire the necessary temporary easements as necessary for construction access and ongoing maintenance.
- Construction-related activities such as mobilization, clearing and grubbing, erosion and sediment control, removal of debris, site work, earthwork, fencing, and seeding.
- Engineering activities such as completing design, surveys, construction observations, and Project administration.

The cost accounting guidance is the PR&G. The basis for cost sharing between NRCS and the Sponsor is based on the provisions of the amendments of the Watershed Protection and Flood Prevention program. Cost sharing for authorized projects is based on 390-USDA-NRCS, National Watershed Program Manual, Part 506, Subpart B, April 2014:

Total eligible Project costs for the purpose of cost sharing include: all costs associated with construction, acquisition of property rights, easements or rights-of-way, non-federal Project administration and contracting, and non-federal technical and engineering assistance for Project planning, design, and installation. Technical engineering and Project administration assistance provided by NRCS shall not be considered as part of the total cost. Sponsor shall be responsible for the cost of all water, mineral and other resource rights and all required permits. These costs shall not be considered part of the total cost. Federal funds will be 65% of the above-defined costs, not to exceed 100% of the construction costs. The Sponsor shall be responsible for 35% of the calculated total cost of the Project based on the above definitions using non-federal funds. In-kind contributions and the value of property rights acquired may be counted as agreed to under a separate Memorandum of Understanding (MOU) between the Sponsor and NRCS.

The Project Benefit Analysis and the Project Economic Analysis is detailed in Appendix D, Section D.4.

9.6 Project Costs

Tables 9.1 through 9.6 (Economic Tables 1 through 6) document and describe the Project costs, channel data and Project benefits for the Preferred Alternative. Estimated installation costs and cost distribution between NRCS and the Sponsor for the Preferred Alternative are shown in Table 9.1 and 9.2 (Economic Tables 1 and 2). Structure data is provided in Table 9.3 (Structural Table 3). Total annualized costs for the preferred alternative are shown in Table 9.4 (Economic Table 4). Average Annual Flood Damage Reduction Benefits are provided in Table 9.5 (Economic Table 5). Estimated detailed construction costs for each alternative are provided in Appendix D. The calculation of damages for each alternative, the annual damages, construction cost estimates, project administration

costs, and operation and maintenance costs were used to conduct a benefit-cost analysis (BCA) for the proposed project life of 100 years. Details on this BCA are provided Table 9.6 and in Appendix D. The costs shown in these tables and throughout the document are based on standard cost accounting practices required of federal watershed planning agencies, such as NRCS.

Table 9-1.
Economic Table 1 - Estimated Project Installation Cost (Sallisaw Creek Watershed) (OK)
(Dollars[1])

Preferred Alternative	Source		Total Estimated Installation Costs
	PL 83-566 Funds	Other Funds	
Sallisaw Dam #13 - High Hazard Class Dam	$1,220,200	$486,000	$1,706,200
Sallisaw Dam #19 - High Hazard Class Dam	$4,347,600	$1,702,200	$6,049,800

[1] Price base 2024 January-2024

Table 9-2.
Economic Table 2 - Estimated Cost Distribution – Water Resource Project Measures (Sallisaw Creek Watershed) (OK) (Dollars[1])

Works of Improvement	Installation Cost - Public Law 83-566 [1]				Installation Cost - Other Funds [1]							Total Installation Costs
	Construction	Engineering	Project Administration	P.L. 83-566 Funds	Construction	Engineering	Mitigation	Real Property	Permits	Administration	Total Other	
Sallisaw Dam #13 - High Hazard Class Dam	$884,000	$269,000	$67,200	$1,220,200	$461,000			$15,000	$10,000		$486,000	$1,706,200
Sallisaw Dam #19 - High Hazard Class Dam	$3,142,600	$964,000	$241,000	$4,347,600	$1,677,200	-	-	$15,000	$10,000	-	$1,702,200	$6,049,800

[1] Price base 2024

January-2024

Table 9-3. (Economic Table 3 – Structure Data) – Dams 13 and 19 (Sallisaw Creek Watershed)(OK)

Item	Unit	Dam 13	Dam 19
NRCS Hazard Class		High	High
Seismic zone		Zone I	Zone I
Uncontrolled drainage area	sq-mi	1.96	12.45
Controlled drainage area	sq-mi	0	0
Total drainage area	sq-mi	1.96	12.45
Runoff curve number (1-day) (AMC II)		71	71
Time of concentration (Tc)	hrs	0.85	3.63
Elevation top of dam [2]	ft	892.4	984.5[3]
Elevation crest auxiliary spillway [2]	ft	884.7	974.8
Elevation crest high stage inlet (principal spillway)[2]	ft	860.2	948.7
Elevation crest low stage inlet	ft	NA	NA
Auxiliary spillway type	Type	Natural Rock / Vegetated	RCC
Auxiliary spillway bottom width	ft	120	400
Auxiliary spillway exit slope	Percent	3.0	6.0
Maximum height of dam [2]	ft	48.0	61.0
Volume of fill	yd^3	10,500	42,200
Total capacity	ac-ft	678	3249
Sediment Capacity Available (Submerged)	ac-ft	86	452
Sediment aerated	ac-ft	15	80
Beneficial use (identify use)	ac-ft	N/A	N/A
Floodwater retarding – Auxiliary Spillway Crest	ac-ft	577	2717
Between high and low stage	ac-ft	N/A	N/A
Surface Area			
Sediment Pool (Pond Area)	ac	10.2	40.1
Beneficial use pool (identify use)	ac	N/A	N/A
Floodwater Retarding Pool	ac	44.2	229.2
Principal spillway design (Weir)			
Rainfall volume (1-day)	in	8.56	8.42
Rainfall volume (10-day)	in	13.8	13.8
Runoff volume (1-day)	in	4.63	4.51
Runoff volume (10-day)	in	9.11	9.11
Capacity of low stage (max) - principal spillway (Weir Only – 100-Yr Design Storm)	cfs	N/A	N/A
Capacity of high stage (max) - principal spillway (Weir Only – 100-Yr Design Storm)	cfs	104	401
Dimensions of conduit (Width at base of Weir)	ft	2.5	4.0
Type of conduit	Type	RCP	RCP
Auxiliary spillway hydrograph			
Percent Chance of Use	percent	1	1

Rainfall volume	in	11.22	10.52
Runoff volume	in	6.86	6.27
Storm duration	hrs	6	6
Velocity of flow (Ve)	fps	6.04	10.5
Maximum reservoir water surface elevation [2]	ft	886.6	977.6
Freeboard hydrograph			
Rainfall volume	in	25.91	23.44
Runoff volume	in	20.03	17.78
Storm duration	hrs	6	6
Maximum reservoir water surface elevation [2]	ft	892.3	983.1
Capacity equivalents			
Sediment volume	in	0.82	0.68
Floodwater retarding volume	in	9.92	8.19
Beneficial volume (identify use)	in	N/A	N/A

[1] Information in this table is based on the results of the planning study and may vary from the General Work Plan and As-Built Drawings for structures. Prepared: 04/23

[2] Vertical Datum, ft NAVD88.

[3] S-19 top of dam set by the OWRB freeboard criteria.

Table 9-4.
Economic Table 4 - Average Annual Costs (Sallisaw Creek Watershed) (OK) (Dollars[1])

Item	Sallisaw Dam #13	Sallisaw Dam #19
Annual Costs[2]		
Amortized Installation Costs	$ 50,300	$ 178,200
O&M and Replacement Costs	$ 1,800	$ 1,800
Total Average Annual Costs	$ 52,100	$ 180,000

[1] Price base 2024 January-2024

[2] Amortized over 100 years at 2.75% interest rate.

Table 9-5 - Economic Table 5
Average Annual Flood Damage Reduction Benefits (Sallisaw Creek Watershed) (OK) (Dollars[1])

Condition	Sallisaw Dam #13			Sallisaw Dam #19		
	Average Annual Agriculture-Related Flood Damage[1, 2]			Average Annual Agriculture-Related Flood Damage[1, 2]		
	Without Project	With Project	Damage Reduction	Without Project	With Project	Damage Reduction
Floodwater	$ 1,472,000	$ 1,459,000	$ 13,000	$ 1,816,000	$ 1,471,000	$ 345,000
Sediment						
Indirect	$ -	$ -	$ -	$ -	$ -	$ -
Restoration to Former Use			$ -			$ -
Total			$ 13,000			$ 345,000

[1] Price base 2024 January-2024

[2] Agriculture-related damage includes damage to rural communities.

Table 9-6.
Economic Table 6 - Comparison of Benefits and Costs (Sallisaw Creek Watershed)(OK)(Dollars[1])

Works of Improvement	Average Annual Benefits						Average Annual Costs [1,3]	Estimated Benefit/Cost Ratio
	Damage Reduction			Restoration to Former Use[1,2]	Other Benefits	Total		
	Floodwater[1,2]	Sediment[1,2]	Indirect[1,2]					
Sallisaw Dam #13 - High Hazard Class Dam	$ 13,000	$ -	$ -	$ -	$ -	$ 13,000	$ 52,100	0.25
Sallisaw Dam #19 - High Hazard Class Dam	$ 345,000	$ -	$ -	$ -	$ -	$ 345,000	$ 180,000	1.99

[1] Price base 2024 January-2024
[2] From Table 5
[3] From Table 4.

9.7 Real Property

No new permanent easements are anticipated with the preferred alternative. Temporary construction easements downstream of the dams will probably be needed for the structural rehabilitation. This will need to be detailed with final design. Please see Preliminary Plat Maps in Appendix C.

9.8 Operation, Maintenance, and Replacement

The dams will continue to be operated and maintained by the Adair County Conservation District (Sponsor). The costs associated with this are detailed in Appendix D. An updated Operation and Maintenance (O&M) Plan will need to be created for the dams with final design.

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11.0 List of Preparers

Table 11.1 List of Preparers

NAME	ROLE	ORGANIZATION	YEARS EXPERIENCE	EDUCATION
		NRCS		
April Burns	Water Resources Planning Coordinator	NRCS - Oklahoma	19	B.S. Ag Economics
Michael Sams	State Biologist	NRCS - Oklahoma	26	B.S. Wildlife Ecology M.S. Wildlife Ecology
Melissa Jones	Biologist	NRCS - Oklahoma	11	B.S. Zoology M.S. Wildlife Ecology PhD Aquatic Resources
Richard L. Lane	Planning Engineer	NRCS - Oklahoma	41	B.S. Agricultural Engineering
K.C. Kraft	Archaeologist	NRCS - Oklahoma	35	B.A. Anthropology M.A. Anthropology PhD Anthropology
Ted Kersten	Civil Engineer – H&H	NRCS - Oklahoma	19	B.S. Ag Engineering M.S. Ag Engineering
		Planning Consultant		
Scott Hobart	Project Task Manager	Conservation Works, JV - Maurer-Stutz	21	Bachelor of Science – Civil Engineering
Larry Sample, P.E.	Assistant Project Task Manager	Wood	25	Master of Science – Agricultural Engineering
Randy Norris	Environmental (NEPA) Lead	Conservation Works, JV - Prairie Engineers	30	Master of Urban and Regional Planning, Environmental Planning. Bachelor of Plant and Soil Science
Scott Taylor, P.E.	Watershed Planning Lead	Wood	29	Master of Science – Civil Engineering;

				Bachelor of Science – Civil Engineering; Bachelor of Science – Physical Science
Darren Forgy, P.E., PLS	Surveying Lead	Conservation Works, JV - Prairie Engineers	24	Bachelor of Science
Bryan Brennan, S.I.	CADD Lead	Conservation Works, JV Prairie Engineers	29	Bachelor of Science
Jennifer Peters	Environmental (NEPA)	Terracon	21	Bachelor of Science – Geography – Environmental Science
Ann Scott, PhD, RPA	Cultural Resources	Terracon	26	PhD Latin America Studies; Master of Archeology – Anthropology; Bachelor of Science - Anthropology

Appendix A

Consultations, Comments, and Responses

Oklahoma Historical Society *Founded May 27, 1893*
State Historic Preservation Office
Oklahoma History Center • 800 Nazih Znhdi Drive • Oklahoma City, OK 73105-7917
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April 26, 2022

Received
APR 28 2022
NRCS-STC

Ms. Stacy Riley
USDA Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074-2655

RE: File #1322-22; NRCS Proposed Sallisaw Creek Watershed Site #13 Rehabilitation

Dear Ms. Riley

We have received and reviewed the documentation submitted on the referenced project in Adair County. Additionally, we have examined the information contained in the Oklahoma Landmarks Inventory (OLI) files and other materials on historic resources available in our office. We find that there are no known historic properties affected within the referenced project's area of potential effect.

In addition to our review, you must contact the Oklahoma Archeological Survey (OAS), 111 E. Chesapeake, #102, Norman OK 73019-5111 (#405/325-7211, FAX #405/325-7604), to obtain a determination about the presence of prehistoric resources that may be eligible for the National Register of Historic Places. Should the OAS conclude that there are no prehistoric archaeological sites or other types of "historic properties," as defined in 36 CFR Part 800.16(l), which are eligible for inclusion in the National Register of Historic Places within the project area and that such sites are unlikely to occur, we concur with that opinion.

The OAS may conclude that an additional on-site investigation of all or part of the project impact area is necessary to determine the presence of archaeological resources. In the event that such an investigation reveals the presence of prehistoric archaeological sites, we will defer to the judgment of the OAS concerning whether or not any of the resources should be considered "historic properties" under the Section 106 review process. If sites dating from the historic period are identified during the survey or are encountered during implementation of the project, additional assessments by the SHPO will be necessary.

Please note that this project is located within the reservation boundaries of the Cherokee Nation and is therefore on tribal lands as defined in the National Historic Preservation Act (NHPA) and the Section 106 regulations (36 CFR Part 800).

Should further correspondence pertaining to this project be necessary, please reference the above file #. If you have any questions, please contact Kristina Wyckoff, Hist. Archaeologist, at 405/521-6381. Thank you.

Sincerely,

Lynda Ozan
Deputy State Historic
Preservation Officer

LO:jr

cc: Ms. Elizabeth Toombs, Cherokee Nation

Oklahoma Archeological Survey

THE UNIVERSITY OF OKLAHOMA

Received
MAY 16 2022
NRCS-STC

May 11, 2022

Natural Resources Conservation Service
Attn: Stacy Riley
Assistant State Conservationist (Programs)
100 USDA, Suite 206
Stillwater, OK 74074-2655

Re: OAS FY22-1249 *NRCS NHPA Section 106 Sallisaw Creek Watershed Site #13 Rehabilitation Cultural Resources Investigation Report.* Report by Mark W. Kelly (NRCS).
Legal Description: Section 17-18, T4N, R24E, Adair County, Oklahoma.

Dear Ms. Riley,

This agency received the above-referenced cultural resources report in association with the proposed Sallisaw Creek Watershed Site #13 project in Adair County for review and comment. From the information provided, we understand that NRCS staff surveyed the 72-acre project Area of Potential Effects (APE) on March 16, 2022. No archaeological sites or other historic resources were located within the APE. NRCS recommends a finding of *No Effect on Historic Properties* for the undertaking.

I concur with the findings and recommendations as they pertain to precontact archaeological resources and defer opinion on the overall project effects to the Oklahoma State Historic Preservation Office.

This review has been conducted in cooperation with the State Historic Preservation Office, Oklahoma Historical Society. You must also have a letter from that office to document your consultation pursuant to Section 106 of the National Historic Preservation Act.

Sincerely,

Kary L. Stackelbeck, Ph.D.
State Archaeologist

: ksw
cc: SHPO

Oklahoma Historical Society *Founded May 27, 1893*
State Historic Preservation Office
Oklahoma History Center • 800 Nazih Zuhdi Drive • Oklahoma City, OK 73105-7917
(405) 521-6249 • Fax (405) 522-0816 • www.okhistory.org/shpo/shpom.htm

OAS/SHPO Concurrence

December 1, 2022

Dr. Kenneth C. Kraft, Ph.D.
USDA NRCS
100 USDA, Suite 206
Stillwater, OK 74074

RE: File #0390-23 [Previously File #2163-22]; NRCS Proposed Sallisaw Creek Watershed Site #19 Rehabilitation Project, Stilwell Vicinity, Adair County

Dear Dr. Kraft:

We have received and reviewed the additional documentation submitted with your letter dated November 15, 2022, on the referenced project in Adair County. Thank you for your concurrence to the National Register of Historic Places eligibility of the Sallisaw Creek Watershed Historic District with the Sallisaw Creek Watershed Site/Dam #19 being a contributing resource to the historic district. We find that the proposed project, as proposed, will have **no adverse effect** on the historic property.

Our opinion is based on the fact that project, as proposed, is limited to the replacement of the existing concrete spillway and conduit with like in-kind materials and design. Though articulating concrete blocks (ACB) will be installed at the auxiliary spillway, the size of the auxiliary spillway will be maintained and the addition of the ACB's will provide erosion control and stability. All of this is to ensure the longevity and functionality of the historic property. Thus, the project, as proposed, meets the *Secretary of the Interior's Standards for Rehabilitation.*

Please note that this project is located within the reservation boundaries of the Cherokee Nation and is therefore on tribal lands as defined in the National Historic Preservation Act (NHPA) and the Section 106 regulations (36 CFR Part 800).

Unless you receive an objection from any other consulting party during the comment period pursuant to 36 CFR Part 800.5(c)(1), this correspondence documents that your agency has completed the Section 106 process in accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800).

Thank you for the opportunity to review this project. Should further correspondence pertaining to this project be necessary, please reference the above underlined file number. If you have any questions, please do not hesitate to call Matthew Pearce, Ph.D., National Register Program Coordinator, at 405-522-4479, or Sara Werneke, Historic Preservation Architect, at 405-522-4478.

Sincerely,

Lynda Ozan
Deputy State Historic
Preservation Officer

LO:pm

cc: Ms. Elizabeth Toombs, Cherokee Nation

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oklahoma State Office
100 USDA
Suite 206
Stillwater, OK 74074

February 27, 2024

Sara Werneke
Historic Preservation Architect
State Historic Preservation Office
800 Nazih Zuhdi Drive
Oklahoma City, OK 73105

Re: File #0390-23 [formerly File #2163-22]; NRCS Proposed Sallisaw Creek Watershed Site #19 Rehabilitation Project, Adair County—Adverse Effect

Dear Ms. Werneke:

This letter is a continuation of Section 106 consultation per 36CFR800.2 as codified in of the National Historic Preservation Act of 1966 (NHPA), as amended, for a proposed US Department of Agriculture, Natural Resources Conservation Service (NRCS) undertaking located in Adair County, Oklahoma. The undertaking entails the possible rehabilitation of an existing NRCS floodwater control dam, Sallisaw Creek Watershed Site #19 (Sallisaw #19). The proposed undertaking (36CFR800.3(a)) is in the "Planning phase" with subsequent phases being "Design" and "Construction".

As noted in your December 1, 2022 letter (enclosed), NRCS concurred that Sallisaw Creek Watershed Historic District is eligible for the National Register of Historic Places under Criterion A. Additionally, Sallisaw #19 is a contributing resource to that historic district. Since then, a list of alternatives to address the rehabilitation strategy—to meet current dam safety criteria—have been evaluated by NRCS contractors and in-house engineers. The only approach available to meet the safety criteria is to adversely affect Sallisaw #19 by changing its design and materials. To meet the safety requirements, the current auxiliary spillway will need to be filled with dirt and a roller-compacted concrete spillway needs to be installed on the left flank of the dam (enclosed).

The necessary modification contrasts with the original statement of work presented to the SHPO which was to simply replace the internal principal spillway pipe with like in-kind materials and armor the auxiliary spillway while maintaining both spillways' original size. Previously, NRCS received concurrence from your office that the original statement of work would have no adverse effect on the historic property.

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

Regarding characteristics of the historic property that qualify it for inclusion in the National Register, NRCS does not believe the new statement of work (proposed modifications) will diminish Sallisaw #19's setting, workmanship, feeling, or association. Obviously, the setting will not be affected since the property is an immovable earthen structure and Site #19 will continue to be a structure to the observer; the workmanship, being an earthen embankment used to facilitate the slow release of floodwater, will not be affected; the feeling will not be affected since the property will still represent an earthen embankment in series; and, the association with the built environment, primarily an agricultural setting, will not be affected.

On the other hand, the characteristics of the historic property that qualify it for inclusion, such as design and materials, will be changed as previously noted; this action could be interpreted as an adverse effect. The design of the earthen dam (physical features) will be altered by filling the auxiliary spillway with dirt as well as placing roller-compacted concrete over a portion of the dam itself. Placing concrete on the earthen structure also could be interpreted as a change in the dam's physical features by introducing new materials. However, these modifications could still fit into the category of rehabilitation as specified in 36CFR86.2(b) since filling the auxiliary spillway and creating a new concrete spillway over the top of the dam constitutes a repair, alteration, and/or addition, while still preserving those portions or features of the dam that convey its historical, cultural, or architectural values.

NRCS awaits your decision and interpretation of the (possible) adverse effect to the historic property and its significance to the Sallisaw Creek Watershed Historic District as a contributing resource. As a side note, NRCS has already rehabilitated 13 dams which are now considered non-contributing resources to the historic district while the remaining 21 dams in the watershed have not been modified (i.e., contributing resource).

Please send your comments, requests for information, or proposed mitigation measures to the above address marked to the attention of NRCS Cultural Resources Coordinator K.C. Kraft. You may also submit your comments by e-mail to kc.kraft@usda.gov. I look forward to your next communication about the future of Sallisaw Creek Watershed Site #19.

Respectfully,

K.C. KRAFT

Kenneth C. Kraft, PhD, RPA

Encls. (3)

cc:
Alexis Clark, Advisory Council on Historic Preservation, NRCS Liaison
Erika Seibert, NRCS, Federal Preservation Officer
Roderick, Dukes, NRCS, Assistant State Conservationist (Water Resources)

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Enclosure 1
(SHPO Consultation Letter)

Oklahoma Historical Society *Founded May 27, 1893*
State Historic Preservation Office
Oklahoma History Center • 800 Nazih Zuhdi Drive • Oklahoma City, OK 73105-7917
(405) 521-6249 • Fax (405) 522-0816 • www.okhistory.org/shpo/shpom.htm

OAS/SHPO Concurrence

December 1, 2022

Dr. Kenneth C. Kraft, Ph.D.
USDA NRCS
100 USDA, Suite 206
Stillwater, OK 74074

RE: File #0390-23 [Previously File #2163-22]; NRCS Proposed Sallisaw Creek Watershed Site #19 Rehabilitation Project, Stilwell Vicinity, Adair County

Dear Dr. Kraft:

We have received and reviewed the additional documentation submitted with your letter dated November 15, 2022, on the referenced project in Adair County. Thank you for your concurrence to the National Register of Historic Places eligibility of the Sallisaw Creek Watershed Historic District with the Sallisaw Creek Watershed Site/Dam #19 being a contributing resource to the historic district. We find that the proposed project, as proposed, will have **no adverse effect** on the historic property.

Our opinion is based on the fact that project, as proposed, is limited to the replacement of the existing concrete spillway and conduit with like in-kind materials and design. Though articulating concrete blocks (ACB) will be installed at the auxiliary spillway, the size of the auxiliary spillway will be maintained and the addition of the ACB's will provide erosion control and stability. All of this is to ensure the longevity and functionality of the historic property. Thus, the project, as proposed, meets the *Secretary of the Interior's Standards for Rehabilitation.*

Please note that this project is located within the reservation boundaries of the Cherokee Nation and is therefore on tribal lands as defined in the National Historic Preservation Act (NHPA) and the Section 106 regulations (36 CFR Part 800).

Unless you receive an objection from any other consulting party during the comment period pursuant to 36 CFR Part 800.5(c)(1), this correspondence documents that your agency has completed the Section 106 process in accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800).

Thank you for the opportunity to review this project. Should further correspondence pertaining to this project be necessary, please reference the above underlined file number. If you have any questions, please do not hesitate to call Matthew Pearce, Ph.D., National Register Program Coordinator, at 405-522-4479, or Sara Werneke, Historic Preservation Architect, at 405-522-4478.

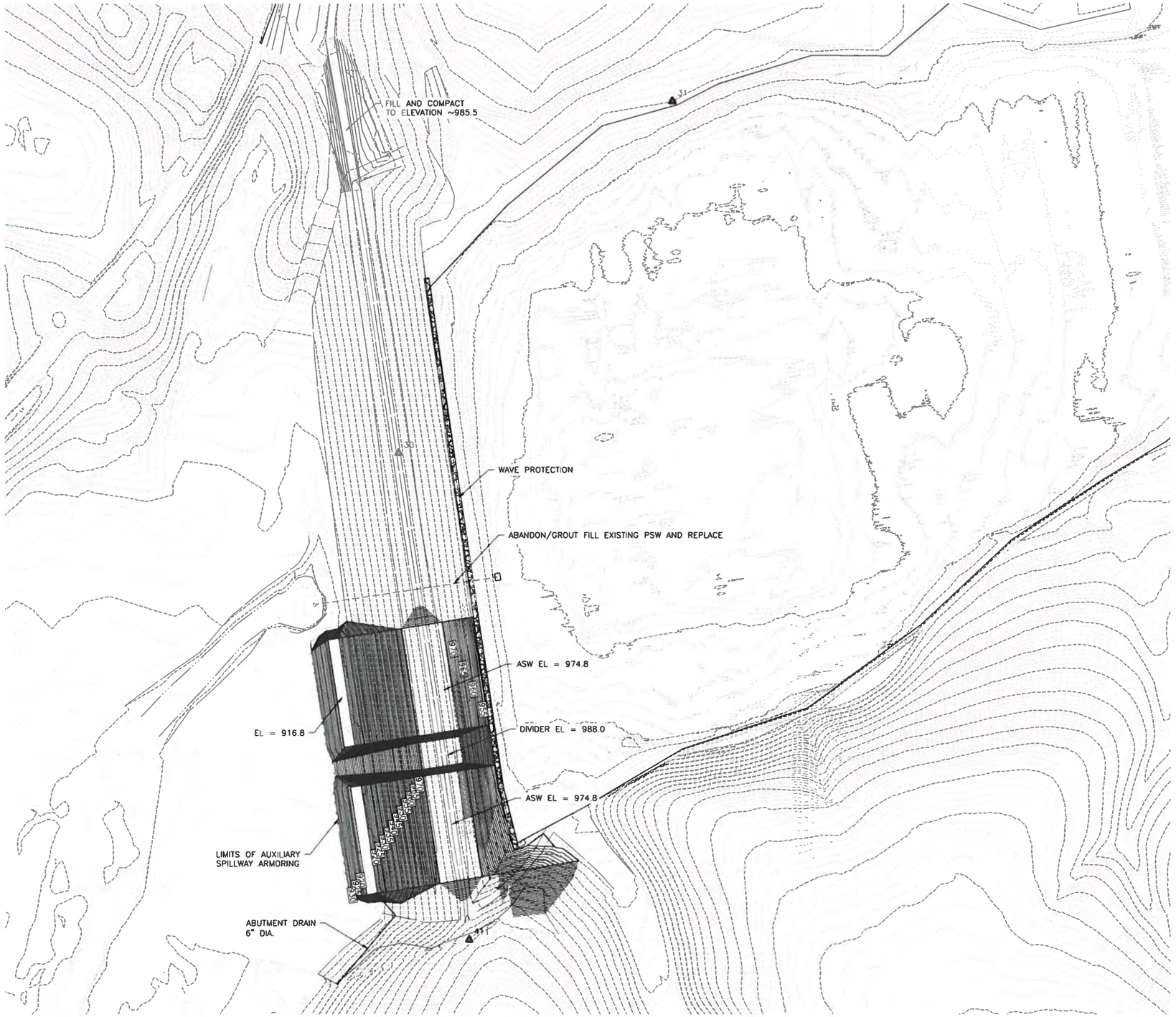
Sincerely,

Lynda Ozan
Deputy State Historic
Preservation Officer

LO:pm

cc: Ms. Elizabeth Toombs, Cherokee Nation

Enclosure 2
Plan Map (Line Drawing)



S19 DAM

TOD = 984.5 FT
SIDE SLOPES = 3:1

SEDIMENT = 950.0 FT

PRINCIPAL SPILLWAY
PSW = 948.7 FT
WEIR LENGTH = 18.9 FT
48"ø BARREL CONDUIT
BARREL LENGTH = 340 FT
OUTLET EL = 928.0

AUXILIARY SPILLWAY
ASW = 974.8 FT
ASW WIDTH = 400 FT
ASW VEL = 10.8 FPS
ASW INLET SLOPE = 3.0%
ASW OUTLET SLOPE = 6.0%

MATERIAL QUANTITIES

51,000 CY TOTAL CUT (INCLUDING 18,000 FOR RCC)
8,600 CY TOTAL FILL (5% SETTLEMENT INCLUDED)

SEEDING AREA (EX ASW) = 23,000 SF

ROLLER COMPACTED CONCRETE = 18,000 CY

WAVE PROTECTION
RIP RAP: 1300 CY = 2100 TONS
BEDDING QUANTITY: 650 CY = 1050 TONS
GEOTEXTILE FABRIC: 11650 SF = 1300 SY

IMPACT BASIN
CONCRETE VOLUME: 80 CY
REBAR QUANTITY: 14,100 LBS
RIP RAP: 75 CY = 180 TONS
BEDDING QUANTITY: 18 CY = 40 TONS

ABUTMENT DRAIN, 6"ø: 220 LF

DECOMMISSIONING MATERIAL QUANTITIES

343,000 CY TOTAL CUT

SEEDING AREA = 555,000 SF

SPONSORSHIP BREACH MATERIAL QUANTITIES

54,500 CY TOTAL CUT

SEEDING AREA = 85,300 SF

POINT TABLE				
POINT ID	DESCRIPTION	ELEVATION	NORTHING	EASTING
30	103 / PRAIRIE 20	987.05	296682.8720	2957150.4140
31	103 / PRAIRIE BP 19	950.07	297330.2080	2957655.6050
411	103 / 1/2" ROD	1000.09	295787.5090	2957280.8670

N

0 100' 200'

BAR SCALE IN FEET

PRELIMINARY
20 January 2022

SCALE VALID ONLY ON
22"x34" SIZE PLANS

DESIGNED BY: DNF — DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB — OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE — NOVEMBER 2021
APPROVED BY: SRH — NOVEMBER 2021

SHEET TITLE: **S19 GRADING PLAN**

PROJECT: **S13 & S19 WATERSHED**

CLIENT: **SALLISAW 13 AND 19**

NRCS United States Department of Agriculture — Natural Resources Conservation Service

PROJECT NO.: 23121008.00

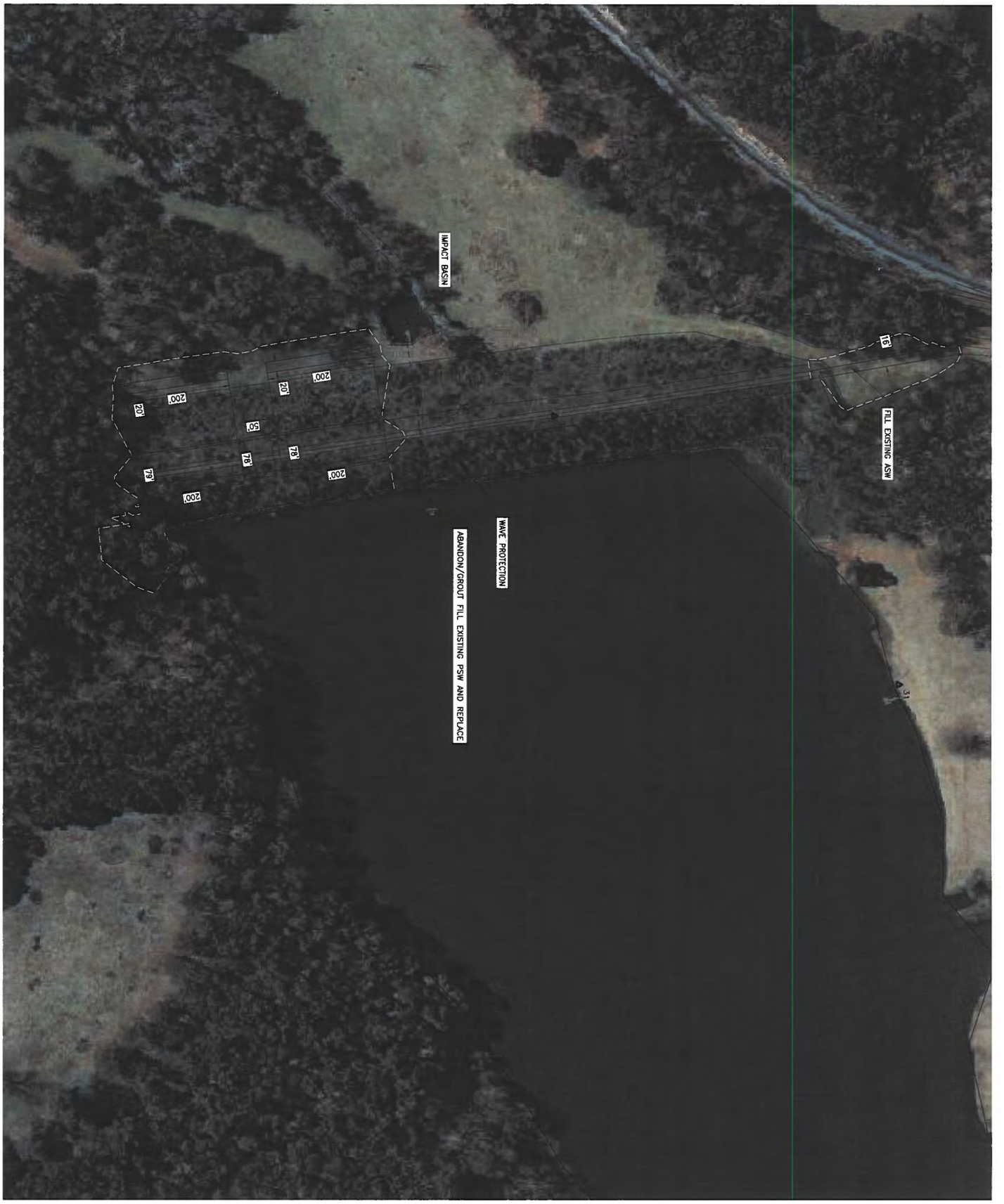
SHEET: C102

SHEET OF

S:\23\1\2021\23121008.00 (Sallisaw 13 & 19 NRCS OK)\Cad\23121008.00_base.dwg 1/20/2022 8:13 AM

Enclosure 3
Plan Map (Aerial Photograph)

S:\231\2021\23121008.00 (Sallisaw 13 & 19 NRCS OK)\Cadd\23121008.00_base.dwg 1/20/2022 8:13 AM



PRELIMINARY
20 January 2022

0 BAR SCALE IN FEET 100' 200'

N

SCALE VALID ONLY ON 22"x34" SIZE PLANS

SHEET: C101	SHEET OF	PROJECT NO.: 23121008.00	NRCS United States Department of Agriculture Natural Resources Conservation Service	CLIENT: SALLISAW 13 AND 19	SHEET TITLE: S19 - SITE PLAN PROJECT: S13 & S19 WATERSHED

DESIGNED BY: DNF	DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB	OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE	NOVEMBER 2021
APPROVED BY: SRH	NOVEMBER 2021

Oklahoma Historical Society
State Historic Preservation Office

March 22, 2024

Dr. Kenneth C. Kraft, Ph.D.
USDA NRCS
100 USDA, Suite 206
Stillwater, OK 74074

RE: File #1204-24 [Previous Files #0390-23 & #2163-22]; NRCS Proposed Sallisaw Creek Watershed Site #19 Rehabilitation Project, Stilwell Vicinity, Adair County

Dear Dr. Kraft:

We have received your request for review of additional documentation with your letter dated March 6, 2024, for the referenced project in Adair County. The property to be impacted, Sallisaw Creek Watershed Dam #19 (Consensus DOE; A; 11/15/2022) has been previously determined eligible for listing in the National Register of Historic Places (NRHP) as a contributing resource to the previously determined eligible Sallisaw Creek Watershed Historic District. We concur with your finding that the project, as now proposed, will still have **no adverse effect** on the historic property.

Our opinion is based on the fact that though the project will be introducing a new exterior material (concrete) to the structure, the alteration maintains the functionality of the dam, for which it has been determined eligible. Thus, the project meets the *Secretary of the Interior's Standards for Rehabilitation*. Please note however, additional alterations to the dam structure may warrant a cumulative adverse effect to the historic property.

Unless you receive an objection from any other consulting party during the comment period pursuant to 36 CFR Part 800.5(c)(1), this correspondence documents that your agency has completed the Section 106 process in accordance with the Advisory Council on Historic Preservation's regulations (36 CFR Part 800).

Please note that the project is located within the reservation boundaries of the Cherokee Nation and is therefore on tribal lands as defined in the National Historic Preservation Act (NHPA) and the Section 106 regulations (36 CFR Part 800).

We appreciate the opportunity to comment on this project and look forward to working with you in the future.

Should further correspondence pertaining to this project be necessary, please reference the above underlined file number. If you have any questions, please contact Sara Werneke, Historic Preservation Architect, at 405-522-4478.

RE: File #1204-24 [Previous Files #0390-23 & #2163-22]; NRCS Proposed Sallisaw Creek Watershed Site #19 Rehabilitation Project, Stilwell Vicinity, Adair County

Sincerely,

Lynda Ozan
Deputy State Historic
Preservation Officer

LO:pm

cc: Ms. Elizabeth Toombs, Cherokee Nation

Oklahoma Archeological Survey

THE UNIVERSITY OF OKLAHOMA

Received
AUG 25 2022
NRCS-STC

August 17, 2022

Natural Resources Conservation Service
Attn: Stacy Riley
Assistant State Conservationist (Programs)
100 USDA, Suite 206
Stillwater, OK 74074-2655

Re: OAS FY22-2181 *NRCS NHPA Section 106 Sallisaw Creek Watershed Site #19, Cultural Resources Investigation Report.* Report by Mark W. Kelly (NRCS).
Legal Description: Sections 15-17, 20-21, T15N, R25E, Adair County, Oklahoma.

Dear Ms. Riley,

This agency received the above-referenced cultural resources report in association with the proposed Sallisaw Creek Watershed Site #19 project in Adair County for review and comment. From the information provided, we understand that NRCS staff surveyed the 155.72-acre project Area of Potential Effects (APE) between March 24-April 20, 2022. No archaeological sites or other historic resources were located within the APE. NRCS recommends a finding of *No Historic Properties Affected* for the undertaking.

I concur with the findings and recommendations as they pertain to precontact archaeological resources and defer opinion on the overall project effects to the Oklahoma State Historic Preservation Office.

This review has been conducted in cooperation with the State Historic Preservation Office, Oklahoma Historical Society. You must also have a letter from that office to document your consultation pursuant to Section 106 of the National Historic Preservation Act.

Sincerely,

Kary L. Stackelbeck, Ph.D.
State Archaeologist

: ksw
cc: SHPO

QUAPAW NATION

P.O. Box 765
Quapaw, OK 74363-0765

(918) 542-1853
FAX (918) 542-4694

Received
SEP 29 2021
NRCS-STC

September 23, 2021

ATTN: April Burns & Gary L. O'Neill
Natural Resources Conservation Service
100 USDA
Suite 206
Stillwater, OK 74074

Re: Rehabilitation of the Sallisaw Creek Sites 13 and 19 high hazard dams in Adair County, OK.

To Whom It May Concern,

This project is outside of the current area of interest for the Quapaw Nation; therefore, the Quapaw Nation does not desire to comment on this project at this time. Thank you for your efforts to consult with us on this matter.

Sincerely,

Everett Bandy

Everett Bandy, THPO
Quapaw Nation
P.O. Box 765
Quapaw, OK 74363
(p) 918-238-3100

Osage Nation Historic Preservation Office

Date: **September 28, 2022**

RE: **USDA, NRCS, Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, Adair County, Oklahoma**

Natural Resources Conservation Service
KC Kraft
100 USDA, Suite 206
Stillwater, OK 74074-2655

Dear Mr. Kraft,

The Osage Nation Historic Preservation Office has evaluated your submission regarding the proposed USDA, NRCS, Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, Adair County, Oklahoma and determined that the proposed project **most likely will not adversely affect any sacred properties and/or properties of cultural significance to the Osage Nation**. For direct effect, the finding of this NHPA Section 106 review is a determination of **"No Properties"** eligible or potentially eligible for the National Register of Historic Places.

In accordance with the National Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966, undertakings subject to the review process are referred to in 54 U.S.C. § 302706 (a), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969). **The Osage Nation concurs that the Natural Resources Conservation Service fulfilled NHPA compliance by consulting with the Osage Nation Historic Preservation Office in regard to the proposed project referenced as USDA, NRCS, Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, Adair County, Oklahoma.**

The Osage Nation has vital interests in protecting its historic and ancestral cultural resources. We do not anticipate that this project will adversely impact any cultural resources or human remains protected under the NHPA, NEPA, the Native American Graves Protection and Repatriation Act, or Osage law. **If, however, artifacts or human remains are discovered during project construction, we ask that work cease immediately and the Osage Nation Historic Preservation Office be contacted.**

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.

Andrea A. Hunter, Ph.D.
Director, Tribal Historic Preservation Officer

Robbie Murie, MA, RPA
Archaeologist

627 Grandview Ave. * Pawhuska, OK 74056 Telephone 918-287-5328 * Fax 918-287-5376
www.osagenation-nsn.gov/who-we-are/historic-preservation * HistoricPreservation@osagenation-nsn.gov

Osage Nation Historic Preservation Office

WA[A[E KOSY KY]EA

Date: **September 9, 2022**

RE: **USDA, NRCS, Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, Adair County, Oklahoma**

Natural Resources Conservation Service
K.C. Kraft
100 USDA, Suite 206
Stillwater, OK 74074-2655

Dear Kraft,

The Osage Nation Historic Preservation Office has evaluated your submission regarding the proposed USDA, NRCS, Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, Adair County, Oklahoma and determined that the proposed project **most likely will not adversely affect any sacred properties and/or properties of cultural significance to the Osage Nation**. For direct effect, the finding of this NHPA Section 106 review is a determination of **"No Properties"** eligible or potentially eligible for the National Register of Historic Places.

In accordance with the National Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966, undertakings subject to the review process are referred to in 54 U.S.C. § 302706 (a), which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires Federal agencies to consider the effects of their actions on historic properties (36 CFR Part 800) as does the National Environmental Policy Act (43 U.S.C. 4321 and 4331-35 and 40 CFR 1501.7(a) of 1969). **The Osage Nation concurs that the Natural Resources Conservation Service fulfilled NHPA compliance by consulting with the Osage Nation Historic Preservation Office in regard to the proposed project referenced as USDA, NRCS, Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, Adair County, Oklahoma.**

The Osage Nation has vital interests in protecting its historic and ancestral cultural resources. We do not anticipate that this project will adversely impact any cultural resources or human remains protected under the NHPA, NEPA, the Native American Graves Protection and Repatriation Act, or Osage law. **If, however, artifacts or human remains are discovered during project construction, we ask that work cease immediately and the Osage Nation Historic Preservation Office be contacted.**

Should you have any questions or need any additional information please feel free to contact me at the number listed below. Thank you for consulting with the Osage Nation on this matter.

Andrea A. Hunter, Ph.D.
Director, Tribal Historic Preservation Officer

Robbie Murie, MA, RPA
Archaeologist

627 Grandview Ave. * Pawhuska, OK 74056 Telephone 918-287-5328 * Fax 918-287-5376
www.osagenation-nsn.gov/who-we-are/historic-preservation * HistoricPreservation@osagenation-nsn.gov

GWYᏰ DᏰᏢ
CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
GᏢ ᎮᏫᏢ ᏕᏁᏚ
O-EOGᏗ

Bryan Warner
Deputy Principal Chief
ᏚZᏗᏢVᏗ
WᏢᏁ DᏓᎴᏁ O-EOGᏗ

October 8, 2021

K.C. Kraft
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074-2655

Re: Rehabilitation of Sallisaw Creek Watershed Site #13, Adair County

Dr. K.C. Kraft:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Rehabilitation of Sallisaw Creek Watershed Site #13**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project's legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time.

However, the Nation requests that the Natural Resources Conservation Service (NRCS) halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project.

Additionally, the Nation requests that NRCS conduct appropriate inquiries with other pertinent Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

GWYᏰ DᏰᏢ
CHEROKEE NATION®
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918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
GᏢ ᎮᎸᏢ ᏚᏁᏚ
ᎤᎾᎤᎶᏗ

Bryan Warner
Deputy Principal Chief
ᏚZᏗᏢVᏗ
ᎳᏢᏁ ᎠᏓᎴᏁ ᎤᎾᎤᎶᏗ

September 21, 2022

K.C. Kraft
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074-2655

Re: Rehabilitation of Sallisaw Creek Watershed Site #19

Dr. K.C. Kraft:

The Cherokee Nation (Nation) is in receipt of your correspondence about and related report for the proposed **Rehabilitation of Sallisaw Creek Watershed Site #19**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's continued interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project's legal description against our information, and found instances where this project is within close proximity to such resources, including culturally sensitive resources and land held by the Nation. This Office requests additional information to determine potential impacts, including the project's timeline, equipment staging areas, and egress/ingress to the project area.

The Nation also requests that the National Resources Conservation Service conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Office regarding historic and prehistoric resources not included in the Nation's databases or records. Further, the Nation requests our Office is re-contacted if an agreement document is developed for this project.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oklahoma State Office
100 USDA
Suite 206
Stillwater, OK 74074

February 15, 2024

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
Post Office Box 948
Tahlequah, OK 74465-0948

Re: FOLLOW-UP—Rehabilitation of Sallisaw Creek Watershed Site #19 Adair County, Oklahoma

Dear Ms. Toombs:

This letter is a continuation of Section 106 consultation per 36CFR800.2 as codified in of the National Historic Preservation Act of 1966 (NHPA), as amended, for a proposed US Department of Agriculture, Natural Resources Conservation Service (NRCS) undertaking located in Adair County, Oklahoma. The undertaking entails the possible rehabilitation of an existing NRCS floodwater control dam, Sallisaw Creek Watershed Site #19 (Sallisaw #19). The proposed undertaking (36CFR800.3(a)) is authorized and funded by PL 106-472, commonly referred to as the Small Watershed Rehabilitation Amendment of 2000. PL 106-472 is an amendment to PL 83-566, the Watershed Protection and Flood Prevention Act of 1954.

Sallisaw #19 is located in sections 17 and 20, Township 15 North, Range 25 East (35°46'5.64"N, 94°40'0.54"W) on the Stilwell West 7.5-minute topographic map. Construction of Sallisaw #19 was completed in 1966 by the Soil Conservation Service, predecessor to NRCS. The dam is located along Sallisaw Creek and west of Stilwell, Oklahoma.

In your letter dated September 21, 2022, your office requested additional information about the project to determine potential impacts. Your office requested a timeline, location of equipment staging areas, and ingress/egress routes. As I mentioned in my October 16, 2023 e-mail, NRCS has hired a contractor to assist with the "Planning" phase of the possible rehabilitation of Sallisaw #19. As of 2024, we are near the end of the "Planning" phase with the subsequent phases being "Design" and "Construction". Each phase has separate funding appropriations. In other words, actual ground-disturbance or earthmoving is one-to-three years in the future. Regarding the equipment staging areas and ingress/egress routes, I included a

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map depicting these locations. I have included another map which shows the location of known tribal land (from the Cherokee Nation GIS tribal lands database) with the Flint Courthouse and Flint Courthouse Cemetery plotted. The third map I included depicts the flood inundation zone if the dam fails—in the event that rehabilitation funds are not secured—depicting the Flint Courthouse and Flint Courthouse Cemetery.

I trust this information meets your request for additional information about the undertaking. As a side note, NRCS has also consulted with other tribal and historic preservation offices with ancestral lands in Adair County. These include the Caddo Nation, the Osage Nation, the Quapaw Nation, and the United Keetoowah Band of Cherokee. NRCS has also consulted with the Oklahoma Archeological Survey and Oklahoma State Historic Preservation Office. If an agreement document is developed with these two state entities, NRCS will notify the Cherokee Nation.

Please accept these data, per your request, for the NRCS undertaking—Rehabilitation of Sallisaw Creek Watershed Site #19 in Adair County, Oklahoma. Please send your comments, additional requests for information, or concurrence to the above address marked to the attention of NRCS Cultural Resources Coordinator K.C. Kraft. You may also submit your comments by electronic mail to kc.kraft@usda.gov. I look forward to your next communication about the future of Sallisaw Creek Watershed Site #19.

Respectfully,

K.C. KRAFT

Kenneth C. Kraft, PhD, RPA

Encls. (4)

cc: Roderick, Dukes, NRCS, ASTC (Water Resources)

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CHEROKEE NATION®
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Chuck Hoskin Jr.
Principal Chief
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Bryan Warner
Deputy Principal Chief
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March 14, 2024

K.C. Kraft
United States Department of Agriculture
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074

Re: Sallisaw Creek Watershed Site 19 Rehabilitation, Adair County

Dr. K.C. Kraft:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Sallisaw Creek Watershed Site 19 Rehabilitation**, and appreciates the opportunity to provide comment upon this project. This communication is intended for government-to-government consultation with a sovereign federally recognized Tribal Nation. Information received in consultation will be deemed confidential unless explicit consent is provided by the Nation.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project's legal description against our information, and found instances where this project is within close proximity to culturally sensitive resources. These significant resources are outside the Area of Potential Effect (APE). Thus, this Office does not object to the project proceeding as long as the following stipulations are observed:

1) The Nation requests that the United States Department of Agriculture (USDA) re-contact this Office if there are any changes to the activities within or the scope of the APE;

2) The Nation requests that the USDA halt all project activities immediately and re-contact our Office for further consultation if items of cultural significance are discovered during the course of this project; and

3) The Nation requests that the USDA conduct appropriate inquiries with other pertinent Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,



Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Oklahoma State Office
100 USDA
Suite 206
Stillwater, OK 74074

March 25, 2024

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
Tribal Historic Preservation Office
Post Office Box 948
Tahlequah, OK 74465-0948

Re: RECEIVED CONCURRENCE—Rehabilitation of Sallisaw Creek Watershed Site #19 Adair County, Oklahoma

Dear Ms. Toombs:

This letter is a continuation of Section 106 consultation per 36CFR800.2 as codified in of the National Historic Preservation Act of 1966 (NHPA), as amended, for a proposed US Department of Agriculture, Natural Resources Conservation Service (NRCS) undertaking located in Adair County, Oklahoma. The undertaking entails the possible rehabilitation of an existing NRCS floodwater control dam, Sallisaw Creek Watershed Site #19.

We are in receipt of your concurrence letter dated March 14, 2024 regarding the Sallisaw Creek Watershed Site #19 undertaking. Thank you for your continued interest in being a consultation partner on this NRCS undertaking. We will continue to advise you on the progress of the rehabilitation project.

Respectfully,

K.C. KRAFT

Kenneth C. Kraft, PhD, RPA

cc: Roderick, Dukes, NRCS, ASTC (Water Resources)

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, TULSA DISTRICT
2488 EAST 81ST STREET
TULSA, OKLAHOMA 74137-4290

September 21, 2021

Regulatory Office

Ms. April Burns
Water Resources Coordinator
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074-2655

Dear Ms. Burns:

The U.S. Army Corps of Engineers received your letter, dated August 24, 2021, regarding the potential rehabilitation of high hazard dams, referenced as Sallisaw Creek Sites 13 and 19, located in Adair County, Oklahoma. The Corps has reviewed the information provided in accordance with Section 404 of the Clean Water Act.

Please note that, subject to applicable terms and conditions, Nationwide Permit 3 (NWP-3) for Maintenance authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act Section 404(f) exemption for maintenance. In many instances, the terms and conditions of the permit require permittees to submit a pre-construction notification to the district engineer prior to commencing the activity.

Our observation is that Site 13 is located on an unnamed tributary of Sallisaw Creek; while, in contrast, Site 19 is located on Sallisaw Creek. The Oklahoma Department of Environmental Quality (ODEQ) has denied Water Quality Certification for NWP-3 in Critical Resource Waters, including Sallisaw Creek.

Regarding proposed work at Site 19, on Sallisaw Creek, it is our understanding that the Adair County Conservation District has not yet requested a Section 401 Clean Water Act certification, as required by recent changes in Federal regulations. In accordance with 40 CFR Part 121, applicants are required to request certification for any license or permit that authorizes an activity that may result in a discharge. At least 30 days prior to submitting a certification request, applicants must request a pre-filing meeting with the ODEQ. Applicants may contact ODEQ at 405-702-8200 to arrange the pre-filing meeting. The subsequent certification request should be submitted to ODEQ and to the Corps concurrently.

We have also enclosed for your convenience, 40 CFR Part 121.4 and 40 CFR Part 121.5 to aid in the certification request.

Your project has been assigned Identification Number SWT-2021-00520. If you have any questions, please contact Mr. David Carraway at (918) 669-7618.

Sincerely,

Ed Parisotto

For Andrew R. Commer
Chief, Regulatory Office

Enclosure

cc:
Dr. Elena Jigoulina, Water Quality Division, ODEQ

40 CFR Part 121.4 Pre-filing meeting request.

(a) At least 30 days prior to submitting a certification request, the project proponent shall request a pre-filing meeting with the certifying authority.

(b) The certifying authority is not obligated to grant or respond to the prefiling meeting request.

(c) If the certifying authority grants the pre-filing meeting request, the project proponent and the certifying authority are encouraged to discuss the nature of the proposed project and potential water quality effects. The project proponent is encouraged to provide a list of other required state, interstate, tribal, territorial, and federal authorizations and to describe the anticipated timeline for construction and operation.

(d) After receiving the pre-filing meeting request, the certifying authority is encouraged to contact the Federal agency and to identify points of contact to facilitate information sharing between the certifying authority and Federal agency throughout the certification process.

40 CFR Part 121.5 Certification request.

(a) A certification request shall be submitted to the certifying authority and to the Federal agency concurrently.

(b) A certification request for an individual license or permit shall:

(1) Identify the project proponent(s) and a point of contact;

(2) Identify the proposed project;

(3) Identify the applicable federal license or permit;

(4) Identify the location and nature of any potential discharge that may result from the proposed project and the location of receiving waters;

(5) Include a description of any methods and means proposed to monitor the discharge and the equipment or measures planned to treat, control, or manage the discharge;

(6) Include a list of all other federal, interstate, tribal, state, territorial, or local agency authorizations required for the proposed project, including all approvals or denials already received;

(7) Include documentation that a prefiling meeting request was submitted to the certifying authority at least 30 days prior to submitting the certification request;

(8) Contain the following statement: ‘The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief’; and

(9) Contain the following statement: ‘The project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.’

(c) A certification request for issuance of a general license or permit shall:

(1) Identify the project proponent(s) and a point of contact;

(2) Identify the proposed categories of activities to be authorized by the general license or permit for which certification is requested;

(3) Include the draft or proposed general license or permit;

(4) Estimate the number of discharges expected to be authorized by the proposed general license or permit each year;

(5) Include documentation that a prefiling meeting request was submitted to the certifying authority at least 30 days prior to submitting the certification request;

(6) Contain the following statement: ‘The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief ’; and

(7) Contain the following statement: ‘The project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.’

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT
2488 EAST 81ST STREET
TULSA, OKLAHOMA 74137-4290

September 26, 2022

Regulatory Office

Mr. Marty Hern
Adair County Conservation District
468670 Hwy 100
Stilwell, OK 74960

Dear Mr. Hern:

Please reference correspondence from Natural Resources Conservation Service (NRCS) regarding proposed rehabilitation to the Sallisaw Creek Site 13 Floodwater Retaining Structure located in Section 17, Township 14 North, Range 24 East, Adair County, Oklahoma. We have reviewed the submitted data relative to Section 404 of the Clean Water Act (CWA).

The proposed construction of a temporary coffer dam (0.5 acre) and redistribution of dredge and/or fill material from non-wetland open water areas (6 acres) of the impoundment for the rehabilitation of the existing dam (with no change in pool elevation), associated with the proposed project, falls within the scope of Nationwide Permit (NWP) 3 for Maintenance, provided the conditions therein are met. You must access the following link to view and print NWP 3 and State Regional Conditions http://www.swt.usace.army.mil/Missions/Regulatory/Nationwide-Permit-Program/. If you accept the obligations and requirements of the NWP and Activity Specific Conditions listed below, sign and return the enclosed PERMITTEE CONSTRUCTION SCHEDULE (PCS). The NWP will be valid when the signed PCS is returned to this office.

The following Activity Specific Condition has been incorporated into this permit to ensure the activity does not have more than minimal individual or cumulative adverse effects on the environment:

- Aquatic Resource Protection Plan: Prior to the commencement of any work on the project site, the permittee must prepare and submit to the Corps a written Aquatic Resource Protection Plan. This plan will detail how aquatic areas in the project site and proximity that are not included in the permitted impacts will be protected from unintended disturbance and impacts by the permittee and contractors working on the project. This plan must be approved by the Corps prior to commencement of any work on site. All aquatic area boundaries where the permittee or their agent made commitments during the permit evaluation process to avoid impact (no disturbance) shall be temporarily marked during construction with 1) a conspicuous barrier or 2) durable posts (t-post or other like post), flagging and signs indicating the area is “Off Limits” to all construction activities. GPS controls on construction equipment may be included in the plan but are not a substitute for conspicuous onsite boundary markers. These disturbance boundaries will be identified and explained to all contractors, equipment operators and laborers employed on the project site. The temporary boundary shall include a vegetative buffer to help protect against unintended impacts of fill to the aquatic area(s). Once construction activities are completed, the

temporary boundary markers may be removed, unless required to remain by other mitigation provisions of the permit special conditions. Once construction has commenced, you are required to submit photos of the in-place construction boundary protection markers to the Corps to verify proper implementation.

Following completion of your activity, you must return the enclosed "PERMITTEE COMPLIANCE CERTIFICATION" form. This is the certification referred to in General Condition 30 of the NWP. (Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with these requirements you are subject to permit suspension, modification, or revocation.)

The NWP verification for this project is based on the proposed impacts to aquatic resources. No approved jurisdictional determination (AJD) is necessary unless jurisdictional questions arise. Should jurisdictional questions arise, you may request an AJD. Only an AJD, which may be appealed, may make a definitive, official determination that there are, or that there are not, jurisdictional aquatic resources on a parcel. Unless an AJD has been issued which identified applicable aquatic resources to be non-jurisdictional, undertaking any activity in reliance on any form of Corps permit authorization constitutes agreement that all aquatic resources in the review area, affected in any way by that activity, will be treated as jurisdictional.

This NWP is scheduled to expire on March 14, 2026. It is incumbent on you to remain informed of changes to the NWPs. The Corps will issue a public notice announcing the changes as they occur. Furthermore, if you commence, or are under contract to commence, the activity before the date the NWP is modified or revoked, you will have 12 months from the date of the modification or revocation to complete the activity under the present terms and conditions of this NWP.

Your project has been assigned Identification Number SWT-2021-00520. If you have any questions, please contact Mr. David Carraway at (918) 669-7618.

Sincerely,

Ed Parisotto

For Andrew R. Commer
Chief, Regulatory Office

Enclosures

cc: Dr. Melissa C. Jones, USDA-NRCS

Scott A. Thompson
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

June 15, 2023

Ms. Tammy Sawatsky
Adair County Conservation District
Rt. 1 Box 333
Stillwell, OK 74960

RE: Clean Water Act 401 Water Quality Certification Application for Section 404 permit No. SWT-2022-00481 (Application)

Dear Ms. Sawatsky:

The Department of Environmental Quality (DEQ) has received your request for a Water Quality Certification under Section 401 of the Federal Clean Water Act (33 U.S.C. §1341), for activities in the Sallisaw Creek to be permitted under Section 404 of the Act. DEQ rules governing 401 Water Quality Certification are contained in Oklahoma Administrative Code (O.A.C.) § 252:611-3 (2022) pursuant to 27A O.S. § 2-6-103(C)(2) (OSCN 2023). DEQ rules and regulations related to the 401 procedures are available at 611.pdf (ok.gov) or through contacting the DEQ Office of Business and Regulatory Affairs (800) 869-1400.

We have reviewed and examined the proposed project as described in your Application. Sallisaw Creek, OK220200030010_30, is assigned the following beneficial uses through the Oklahoma Water Quality Standards (WQS): Public and Private Water Supply, Cool Water Aquatic Community, Agriculture: Livestock and Irrigation, Primary Body Contact Recreation, Aesthetics, and High Quality Waters (OAC 252:730 Appendix A.2). The current Oklahoma WQS are available from the Department of Environmental Quality at: https://www.deq.ok.gov/wp-content/uploads/deqmainresources/730.pdf.

The application is for rehabilitation of Flood Water Retention Structure (FWRS) Sallisaw No. 19 in Adair County. The purpose of this project is to bring the FWRS into compliance with the current NRCS and Oklahoma safety performance standards for a high hazard potential dam and by doing so, reduce the risk of catastrophic dam failure and loss of life. The FWRS rehabilitation may result in the following discharges into Sallisaw Creek: soil to fill the existing 200 linear feet (lf) wide auxiliary spillway (soil will come from the excavation of the new auxiliary spillway) to existing top of dam elevation; roller compacted concrete (RCC) to construct a new 400 lf wide auxiliary spillway and a new impact basin; riprap (rock) below the RCC to help prevent erosion. There will be management practices in place to prevent soil from discharging into the creek during construction. The rehabilitation work is covered under the U.S. Army Corps of Engineers' Nationwide Permit 3 (NWP3), Maintenance.

The project is located in Section 20, Township 15 North, Range 25 East, I.M, in Adair County, Oklahoma.

The conditions attached to this conditional Certification will be terms of the Section 404 permit. The state may require compliance with these conditions under state and/or federal law. Failure to comply with the conditions or any other applicable state requirements may result in proceedings brought by the state for the suspension, termination, modification or revocation of this Certification and/or for injunctive relief, damages and/or penalties as allowed by law. This Certification may be revoked or modified upon subsequent amendments or revisions to Oklahoma's Water Quality Standards requirements or upon expiration of the federal permit for the described activity.

This conditioned Water Quality Certification does not supersede the requirements of a Section 404 permit from the U.S. Army Corps of Engineers, a permit required by the local floodplain board, or any other permit required for this project.

The certification is granted subject to the following conditions:

1) Appropriate procedures shall be utilized during the construction of this project to prevent the release of construction debris, fuels and lubricants, or other deleterious materials into the aquatic resources to prevent degradation of water quality in the waters [OAC 252: 730-3-2(b); CWA 301(a)].
2) Work in the stream shall be limited to periods of low flow, when practicable, and with the minimum amount of equipment to prevent the release (discharge) of pollutants into the stream [OAC 252: 730-3-2(d), CWA 301(a)].
3) All fueling and servicing of vehicles and equipment shall be done above the Ordinary High Water Mark (OHWM) to prevent the discharge of oil and grease into waters (CWA 301(a), OAC 252: 730-5-12(f)(4) and (6), and OAC 252: 730-5-19.)
4) Environmental control practices, including but not limited to, effective erosion control measures and sediment control measures, shall be utilized during construction to comply with OAC 252: 730-5-12(f) (7) and (8).
5) All construction shall be done in a manner that will minimize increased turbidity and prevent downstream deposition of bank material during or after construction to comply with OAC 252:730-5-9, OAC 252:730-5-12(f) (7) and (8), and OAC 252: 730-5-19.
6) If the instream activities involve the pouring of concrete, then care must be taken to ensure this process does not 1) release high pH water, and/or 2) change the pH of the receiving water body [OAC 252: 730-5-9 (b); OAC 252:730-5-12(f)(3)].
7) All excess fill material, waste materials, construction debris, etc., must be removed from the site upon completion of the project to avoid the introduction of pollutants into the stream (OAC 252: 730-5-9 (b) and OAC 252: 730-5-19).
8) Fill material for the dike must be from an uncontaminated source and be devoid, insofar as practicable, of any erodible or turbidity-causing materials to comply with OAC 252: 730-3-2(a), OAC 252: 730-3-2 (d), OAC 252:730-5-9, OAC 252:730-5-12 (f)(6), OAC 252:730-5-12(f)(7), OAC 252:730-5-12(f)(8), and OAC 252: 730-5-19.
9) Post-project condition should not result in surface water quality degradation which will interfere with the attainment or maintenance of an existing or designated beneficial use [OAC 252: 730-3-2(b) and (d)].

If you have any questions concerning this matter, please contact Elena Jigoulina at 405-702-8200.

Sincerely,



Joe A. Long, Environmental Programs Manager
Watershed Planning Section
Water Quality Division

cc: David Carraway, Regulatory Branch, U.S. Army Corps of Engineers, Tulsa
Kenneth Cunningham, Oklahoma Department of Wildlife Conservation
Brooks Tramell, Monitoring, Assessment and Wetlands Programs, Oklahoma Conservation Commission
Daniel Landeros, EPA Region 6 (6WQ-EM)
Jennifer Lewis, Assistant Attorney General, Conservation Unit, OK, Office of the Attorney General

Scott R. Hobart

From: Burns, April - NRCS, Stillwater, OK <april.burns@usda.gov>
Sent: Wednesday, September 15, 2021 12:45 PM
To: Sams, Michael - NRCS, Stillwater, OK; Scott R. Hobart
Subject: FW: Sallisaw 13 & 19 and Request for Stakeholder Input

See below

Thanks,

April

From: Fullerton, Matthew R <matthew_fullerton@fws.gov>
Sent: Wednesday, September 15, 2021 12:43 PM
To: Burns, April - NRCS, Stillwater, OK <april.burns@usda.gov>
Subject: Sallisaw 13 & 19 and Request for Stakeholder Input

Hi April,
My name is Matt Fullerton and I'm a biologist with the U.S. Fish and Wildlife Service in the Oklahoma Ecological Services Field Office in Tulsa, OK. Our office had received a letter from NRCS requesting stakeholder participation regarding an Environmental Assessment for two dams on Sallisaw Creek in Adair Co. I will be our office's contact for these projects, so I am requesting to be kept in the loop on this process as it moves forward.

Both sites are within 5 miles of roosting locations for the federally endangered Ozark big-eared bat. Further, the general project location is within the range of the endangered gray bat and threatened northern long-eared bat. Therefore, any activities that may involve tree removal or potential disturbance to cave/karst features used by bats will be of interest to our agency.

Thank you for reaching out to our office for input and please let us know if you have questions.

Respectfully,

Matt Fullerton
Fish and Wildlife Biologist,
Threatened and Endangered Species

U.S. Fish and Wildlife Service
Interior Region 6 (Legacy Region 2)
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, Oklahoma 74129
Email: matthew_fullerton@fws.gov
Cell: (405) 434-2780

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From:	Mark Howery
To:	Jones, Melissa - FPAC-NRCS, Stillwater, OK
Cc:	Sams, Michael - NRCS, Stillwater, OK
Subject:	Re: IRT Site Visit Summary Sallisaw 13 and 19
Date:	Friday, May 6, 2022 9:42:18 AM
Attachments:	image001.png Outlook-v0yebgqt.png

Thank you Melissa!
If an email will work for your needs, then I'll take that approach because it's much quicker. I've reviewed both of the maps and your detailed notes from the site visit. I also spoke with Matt Fullerton on Tuesday to get his assessment of the sites and anticipated construction. I think that the impact of both the Sallisaw 13 and the Sallisaw 19 watershed structure rehabilitation projects will be very minor. I don't believe that there is a need for wetland mitigation at either site and I think that the measures that you've proposed to avoid impacts to nesting migratory birds and to federally listed bats are sufficient. I don't anticipate any adverse effects on state-listed species - specifically the state-endangered Longnose Darter. I concur with the conclusion that there will be no significant impacts to sensitive fish and wildlife resources at either project location.

Thank you for setting up the on-site meeting, giving the agencies and opportunity to participate in the process, and sending out the maps and field notes.
Mark

Mark Howery
Senior Wildlife Diversity Biologist
Oklahoma Department of Wildlife Conservation

mailing address:
1801 N. Lincoln Blvd
Oklahoma City, OK 73105
C: (405) 990-7259
wildlifedepartment.com

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

From: Jones, Melissa - FPAC-NRCS, Stillwater, OK <Melissa.Jones@usda.gov>
Sent: Friday, May 6, 2022 9:21 AM
To: Mark Howery <mark.howery@odwc.ok.gov>

Cc: Sams, Michael - NRCS, Stillwater, OK <michael.sams@usda.gov>
Subject: [EXTERNAL] RE: IRT Site Visit Summary Sallisaw 13 and 19

Howdy Mark,

Thank you for reviewing our IRT site visit notes for Sallisaw 13 and 19. We have submitted the Species Conclusion Table and associated attachments to OKProjectReview per Section 7 consultation with FWS. So moving forward, we are requesting a statement of concurrence that no significant impact on wildlife or wildlife resources is anticipated for these two projects. This can either be in letter format, or just a simple response to this email (which ever you feel comfortable with). We are just needing to record/note we sought input from ODWC on these two projects.

Thanks Mark! Let me know if you have any questions.

Melissa C. Jones, PhD
Biologist
USDA-NRCS
Stillwater, OK
405-742-1232
Melissa.Jones@usda.gov

From: Mark Howery <mark.howery@odwc.ok.gov>
Sent: Tuesday, May 3, 2022 9:21 PM
To: Jones, Melissa - FPAC-NRCS, Stillwater, OK <Melissa.Jones@usda.gov>
Subject: Re: IRT Site Visit Summary Sallisaw 13 and 19

Hi Melissa,
I hope your month is off to a great start and thank you for sending me the notes and the updated project maps! It sounds like you had some productive on-site meetings and thank you for accommodating my last-minute cancellation (it shouldn't happen again - this time it was just an artifact of our budget schedule, which hadn't been shared properly with my section of the agency).

I think that both projects are well thought-out and should have minor impacts to local wildlife populations that will be temporary. I appreciate the plans to conduct vegetation (at least tree) removal outside of the bird nesting season and summer roosting season for bats. I don't think that there will be any appreciable loss of wetlands and only minor loss of riparian habitat, so I don't believe that wetland/riparian mitigation will be needed. There aren't any state-listed threatened or endangered species within the Sallisaw Creek watershed, and our

special concern species such as the Alligator Snapping Turtle and the Oklahoma Salamander are unlikely to be affected by either of these projects because their combined foot print within the watershed is so small and located in the headwater tributaries.

I'm comfortable with these projects as they've been presented and as they've been slightly modified to address federal T&E concerns. What are the next steps that you need from me? Do you need me to prepare a concurrence letter or sign a consultation sheet (the latter is what I've done in the past)? Just let me know and I'll be happy to do that.
Thanks again,
Mark

Mark Howery
Senior Wildlife Diversity Biologist
Oklahoma Department of Wildlife Conservation

mailing address:
1801 N. Lincoln Blvd
Oklahoma City, OK 73105
C: (405) 990-7259
wildlifedepartment.com

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

From: Jones, Melissa - FPAC-NRCS, Stillwater, OK <Melissa.Jones@usda.gov>
Sent: Thursday, April 14, 2022 10:57 AM
To: Mark Howery <mark.howery@odwc.ok.gov>
Subject: [EXTERNAL] IRT Site Visit Summary Sallisaw 13 and 19

Howdy Mark,

I have attached a summary from the IRT site visit on April 4th 2022. It summarizes the construction actions of the preferred alternative and short discussions we had about T and E listed species. Please let me know if you have any additional comments on impact concerns to T and E species, especially state listed species. I have also attached updated maps of each site.

Thanks Mark!

Melissa C. Jones, PhD
Biologist
USDA-NRCS
Stillwater, OK
405-742-1232

Melissa.Jones@usda.gov

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From: Brooks Tramell
To: Jones, Melissa - FPAC-NRCS, Stillwater, OK
Cc: Sams, Michael - NRCS, Stillwater, OK
Subject: Re: [EXTERNAL] Follow up on Sallisaw 13 and 19
Date: Wednesday, June 1, 2022 9:12:29 AM

Hi Melissa,

Thanks for including OCC in this review. I'm sorry if I've missed an email and if I'm delinquent in response. I have no concerns regarding wildlife or wildlife resources for either of these projects as presented during our field visits.

Thanks again,

Brooks

Brooks Tramell
Director of Monitoring, Assessment, and Wetlands Programs
Oklahoma Conservation Commission

> On Jun 1, 2022, at 8:39 AM, Jones, Melissa - FPAC-NRCS, Stillwater, OK <Melissa.Jones@usda.gov> wrote:
>
> Howdy Brooks!
>
> Hope you had a great 3 day weekend! I wanted to touch base with you on Sallisaw 13 and 19. Thank you for meeting with us on site back in April. Moving forward, we would like to request a statement of concurrence that no significant impact on wildlife or wildlife resources is anticipated for these two projects. This can either be in letter format, or just a simple response to this email (which ever you are more comfortable with). We are just needing to record/note we sought input from OCC on these two projects.
>
> Thanks Brook! Let me know if you have any questions.
>
> *Melissa C. Jones, PhD*
> Biologist
> USDA-NRCS
> Stillwater, OK
> 405-742-1232
> Melissa.Jones@usda.gov

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August 2015

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

April 25th, 2022

Online Project Review Concurrence Letter

To: Gary O'Neill, Oklahoma State Conservationist
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74874

Project Name: NRCS Sallisaw Creek 13 Floodwater Retaining Structure (FWRS) Rehabilitation

Consultation Code: 2022-0032463

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Oklahoma Ecological Services Field Office (ESFO) online project review process. By providing this letter in conjunction with your complete project review package, you are certifying that you have accurately completed the online project review process for the referenced project in accordance with all instructions provided, using the best available information to reach your conclusions. Concurrence with "not likely to adversely affect" determinations does not provide any exemption for violations of section 9 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA) or "take" of federally-listed species. The Federal action agency is ultimately responsible for ensuring compliance with the ESA and any take that occurs due to your proposed action would be considered a violation under section 9 of the ESA.

This letter and the enclosed project review package complete the review of your project in accordance with the ESA. This letter also provides information for your project review under the National Environmental Policy Act (National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C.4321-4347, 83 Stat. 852), as amended.

A copy of this letter and the project review package must be emailed to **okprojectreview@fws.gov** for this certification to be valid. This letter and the project review package will be maintained in Service records. **Please allow the Oklahoma ESFO 45 days to review your information. If the Oklahoma ESFO determines that the package is not complete, or that additional coordination is necessary, we will contact your office. If, after 45 days from the date of your email submittal of your project review package, the Oklahoma ESFO has not contacted your office, consider your section 7 consultation complete.**

The proposed action consists of:

This project is a dam rehabilitation of FWRS Sallisaw Creek 13 located in Adair, Co, Oklahoma. Sallisaw 13 was constructed in 1966 and was given the high hazard classification in 2005. Dam height is 48 ft with a length of 830 ft. Surface area of conservation pool is 8 acres. This dam has exceeded its original service life of 50 years and now poses a risk of loss of life if a catastrophic dam breach were to occur. The project is currently in the planning phase. The purpose of this project is to reduce the risk of loss of life due to catastrophic dam failure and flooding by bringing the FWRS into compliance with the currently NRCS and Oklahoma safety performance standards for a high hazard dam. The proposed project would

Project start and completion dates:

2025-2026

Federal agency or federal program providing a permit, funding, grant, authorization, loan, etc. associated with the proposed project and how that agency is associated with your project:

NRCA is the lead agency for the proposed project authorized by Public Law 83-566 as amended by Section 313 of Public Law 106-472.

Federal Agency/Program Point of contact (Name, phone, and email address):

Melissa Jones, 405-742-1232, melissa.jones@usda.gov

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in "not likely to adversely affect/modify" determinations for listed species and critical habitat in relation to potential effects of your proposed project. We certify that the use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with determinations of "not likely to adversely affect" for listed species and critical habitat reached by proper use of this process. For projects where this particular determination is reached, additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages efforts to avoid or minimize adverse impacts to them from project effects. Some federal agencies have standing policies that grant limited protections to candidate species. Conservation of candidate species now may preclude future needs to federally list them as endangered or threatened, at which point their legal protection would become required. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. You should re-visit the Service's Information, Planning, and Conservation (IPaC) website at http://ecos/fws.gov/ipac/ within 90 days of project initiation to ensure species information is correct. If new species or critical habitat is identified, this letter is no longer valid and a new project package should be submitted to the Oklahoma ESFO.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Oklahoma is available at our website: <http://www.fws.gov/southwest/es/oklahoma/ >. If you have any questions, please call 918-581-7458 or send an email message to OKProjectReview@fws.gov.

Sincerely,
/s/ Jonna Polk
Field Supervisor
Oklahoma Ecological Services Field Office

Enclosures:

1) ENTIRE PROJECT REVIEW
   - ☑ PACKAGE: Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This letter (Online Concurrence Letter)
   - ☑ (Optional) Additional maps
2) Other relevant project data/documents

MA Verification Letter American Burying Beetle Consultation
MA Verification Northern Long-eared Bat Consultation

Sallisaw Creek Site 13 Action Area Map, Adair Co. OK



N
W
E
S

NRCS
Natural Resources Conservation Service

0 0.075 0.15 0.3 Miles

Map ID: Sallisaw Creek Site 13 2022
Map Date: March 2022 NRCS MJones

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: April 15, 2022
Project Code: 2022-0032463
Project Name: FWRS Sallisaw Creek 13 Dam Rehabilitation

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

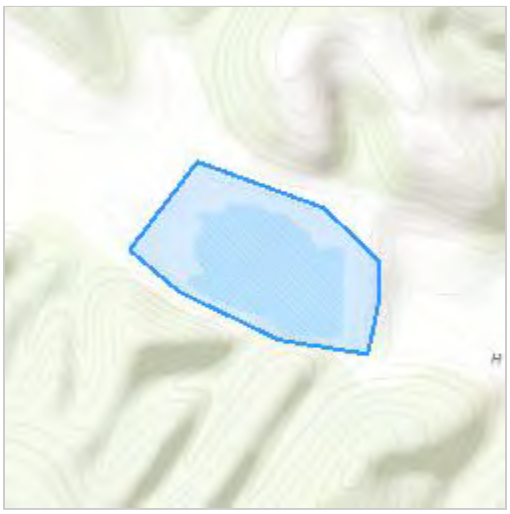
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

Project Summary

Project Code: 2022-0032463
Event Code: None
Project Name: FWRS Sallisaw Creek 13 Dam Rehabilitation
Project Type: Dam - Maintenance/Modification
Project Description: This project is a dam rehabilitation of FWRS Sallisaw Creek 13 located in Adair, Co, Oklahoma. Sallisaw 13 was constructed in 1966 and was given the high hazard classification in 2005. Dam height is 48 ft with a length of 830 ft. Surface area of conservation pool is 8 acres. This dam has exceeded its original service life of 50 years and now poses a risk of loss of life if a catastrophic dam breach were to occur. The project is currently in the planning phase. The purpose of this project is to reduce the risk of loss of life due to catastrophic dam failure and flooding by bringing the FWRS into compliance with the currently NRCS and Oklahoma safety performance standards for a high hazard dam. The proposed project would add an additional 100 years of flood damage reduction. In order to meet current safety performance standards the project proposes to widen the auxiliary spillway from 40' to 120' and lower the auxiliary spillway 4.2 ft. The project would replace the 24" principal spillway conduit with a 30" and a new impact basin. The access drive on the north abutment would be raised to meet the top of dam elevation. Upstream face riprap will be added for wave protection. This project will leave the principal spillway and top of dam at current elevation.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.6859175,-94.78535927526866,14z



Counties: Adair County, Oklahoma

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened
Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7245	Endangered

Birds

NAME | STATUS

Piping Plover *Charadrius melodus* — Threatened

Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/6039

Red Knot *Calidris canutus rufa* — Threatened

There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/1864

Insects

NAME | STATUS

American Burying Beetle *Nicrophorus americanus* — Threatened

Population: Wherever found, except where listed as an experimental population
No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/66

Monarch Butterfly *Danaus plexippus* — Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

THERE ARE NO FWS MIGRATORY BIRDS OF CONCERN WITHIN THE VICINITY OF YOUR PROJECT AREA.

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical

Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: Natural Resources Conservation Svc
Name: Melissa Jones
Address: 100 USDA Suite 206
City: Stillwater
State: OK
Zip: 74075
Email mj46953@gmail.com
Phone: 5128088640

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: April 18, 2022
Project code: 2022-0032463
Project Name: FWRS Sallisaw Creek 13 Dam Rehabilitation

Subject: Verification letter for 'FWRS Sallisaw Creek 13 Dam Rehabilitation' project under the October 15, 2020, Programmatic Biological Opinion on Final 4(d) Rule for the American burying beetle and Activities Excepted from Take Prohibitions (50 CFR § 17.47(d), Federal Register Citation 85 FR 65241).

Dear Melissa Jones:

The U.S. Fish and Wildlife Service (Service) received on **April 18, 2022** your effect determination(s) for the 'FWRS Sallisaw Creek 13 Dam Rehabilitation' (the Action) using the American burying beetle (*Nicrophorus americanus*) determination key within the Information for Planning and Consultation (IPaC) system.

This determination key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's October 15, 2020, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from incidental "take"[1] prohibitions applicable to the American burying beetle under the Endangered Species Act of 1973 (Act) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the American burying beetle; however, any incidental take that may occur as a result of the Action is not prohibited under the Act Section 4(d) rule adopted for this species at 50 CFR §17.47(d). **Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under Act Section 7(a)(2) with respect to the American burying beetle.**

Please report any changes to the information about the Action that you submitted in IPaC, the results of any American burying beetle surveys conducted in the Action area, and any dead, injured, or sick American burying beetles that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with Act Section 7(a)(2) only for the American burying beetle.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (Act, Section 3(19)).

This letter covers only the American burying beetle. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Northern Long-eared Bat *Myotis septentrionalis* Threatened
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If your project may affect additional listed species, you must evaluate additional DKeys for other species, or submit a request for consultation for the additional species to your local Ecological Services Field Office.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

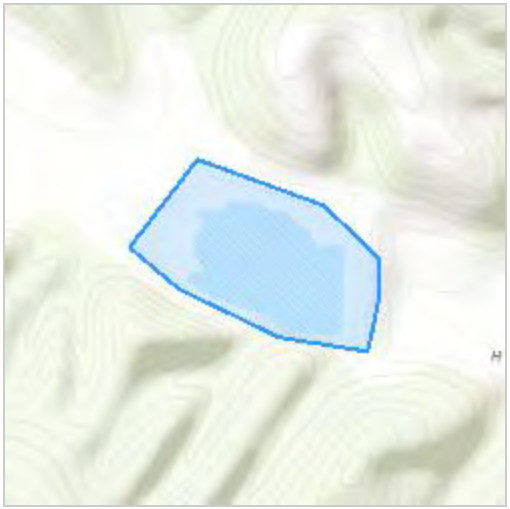
FWRS Sallisaw Creek 13 Dam Rehabilitation

2. Description

The following description was provided for the project 'FWRS Sallisaw Creek 13 Dam Rehabilitation':

> This project is a dam rehabilitation of FWRS Sallisaw Creek 13 located in Adair, Co, Oklahoma. Sallisaw 13 was constructed in 1966 and was given the high hazard classification in 2005. Dam height is 48 ft with a length of 830 ft. Surface area of conservation pool is 8 acres. This dam has exceeded its original service life of 50 years and now poses a risk of loss of life if a catastrophic dam breach were to occur. The project is currently in the planning phase. The purpose of this project is to reduce the risk of loss of life due to catastrophic dam failure and flooding by bringing the FWRS into compliance with the currently NRCS and Oklahoma safety performance standards for a high hazard dam. The proposed project would add an additional 100 years of flood damage reduction. In order to meet current safety performance standards the project proposes to widen the auxiliary spillway from 40' to 120' and lower the auxiliary spillway 4.2 ft. The project would replace the 24" principal spillway conduit with a 30" and a new impact basin. The access drive on the north abutment would be raised to meet the top of dam elevation. Upstream face riprap will be added for wave protection. This project will leave the principal spillway and top of dam at current elevation.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.6859175,-94.78535927526866,14z



Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have “no effect” on the American burying beetle? (If you are unsure select "No")

   No

3. Will your activity **purposefully take** American burying beetles?

   No

4. Is your project wholly inside the 4d rule Analysis Area? For areas of your project occurring inside the Analysis Area (New England, Northern Plains, Southern Plains), your project may qualify for exemptions. For areas of your project occurring outside the Analysis Area, all incidental take is exempted according to the ABB 4d Rule.

   Automatically answered
   Yes

5. Is American burying beetle suitable habitat present within the action area?

   Yes

6. Will suitable habitat be affected by the proposed action? Suitable habitat may be impacted if the action involves soil disturbance, use of vehicles or heavy equipment, artificial lighting, vegetation removal, use of herbicides, pesticides, other hazardous chemicals.

   Yes

Project Questionnaire

Please select the activity that best matches your proposed action.

13. Other activities with soil disturbance - briefly describe below

If you chose 13 above, please describe below. If you did not choose 13 above, please type "0".

Soil disturbance related to dam rehabilitation construction and maintenance

Estimate the total acres of suitable American burying beetle habitat that may be affected.

3

Please estimate the total number of acres of **temporary impacts** to American burying beetle habitat. See definitions

3

Please estimate the total number of acres of **permanent impacts** to American burying beetle habitat. See definitions

0

IPaC User Contact Information

Agency: Natural Resources Conservation Svc
Name: Melissa Jones
Address: 100 USDA Suite 206
City: Stillwater
State: OK
Zip: 74075
Email mj46953@gmail.com
Phone: 5128088640

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: April 15, 2022
Project code: 2022-0032463
Project Name: FWRS Sallisaw Creek 13 Dam Rehabilitation

Subject: Verification letter for the 'FWRS Sallisaw Creek 13 Dam Rehabilitation' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Melissa Jones:

The U.S. Fish and Wildlife Service (Service) received on April 15, 2022 your effects determination for the 'FWRS Sallisaw Creek 13 Dam Rehabilitation' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- American Burying Beetle *Nicrophorus americanus* Threatened
- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

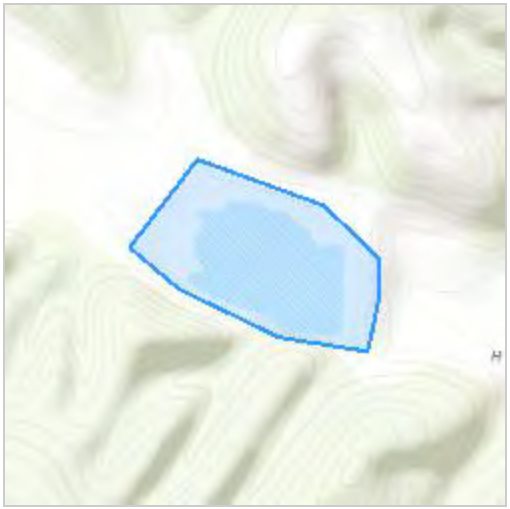
FWRS Sallisaw Creek 13 Dam Rehabilitation

2. Description

The following description was provided for the project 'FWRS Sallisaw Creek 13 Dam Rehabilitation':

> This project is a dam rehabilitation of FWRS Sallisaw Creek 13 located in Adair, Co, Oklahoma. Sallisaw 13 was constructed in 1966 and was given the high hazard classification in 2005. Dam height is 48 ft with a length of 830 ft. Surface area of conservation pool is 8 acres. This dam has exceeded its original service life of 50 years and now poses a risk of loss of life if a catastrophic dam breach were to occur. The project is currently in the planning phase. The purpose of this project is to reduce the risk of loss of life due to catastrophic dam failure and flooding by bringing the FWRS into compliance with the currently NRCS and Oklahoma safety performance standards for a high hazard dam. The proposed project would add an additional 100 years of flood damage reduction. In order to meet current safety performance standards the project proposes to widen the auxiliary spillway from 40' to 120' and lower the auxiliary spillway 4.2 ft. The project would replace the 24" principal spillway conduit with a 30" and a new impact basin. The access drive on the north abutment would be raised to meet the top of dam elevation. Upstream face riprap will be added for wave protection. This project will leave the principal spillway and top of dam at current elevation.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.6859175,-94.78535927526866,14z



Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Natural Resources Conservation Svc
Name: Melissa Jones
Address: 100 USDA Suite 206
City: Stillwater
State: OK
Zip: 74075
Email mj46953@gmail.com
Phone: 5128088640

Species Conclusion Table – NRCS Sallisaw Site 13 Dam Rehabilitation

Table 1: Listed Species on Official Species List

Species/ Critical Habitat	Habitat Determination	Notes/Documentation	ESA Determination
Piping Plover	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Red Knot	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Monarch Butterfly	Potential habitat present	Moist soil conditions from temporary dewatering may increase preferred nectar sources. Initiating construction prior to peak spring migration (Apr 1 – Jul 1) will minimize potential monarch population impacts.	Not likely to adversely affect
American Burying Beetle	Potential habitat present	Construction will include soil disturbing activities within a small footprint (<2) acres. Other areas will return to conditions that existed pre-construction with no long-term impacts associated with activities.	May affect (iPAC determination key, Letter of Concurrence attached) Project Code #2022-0032463
Gray Bat	Potential habitat present	Potential foraging habitat for aquatic insects. Short-term adverse effects to aquatic invertebrate populations due to a draw-down of the conservation pool prior and during construction will affect prey availability in the immediate area. Sallisaw Creek and Floodwater Retention Structures 11, 14 and 23 are within 3-mile of the site providing alternative foraging sites. After completion, foraging habitat will return with no long-term impacts.	Not likely to adversely affect
Indiana Bat	Potential habitat present	Foraging habitat present along forest edges, over pool and along streams. No tree that could be potential maternity roost occur in the area of impact. No long-term impacts associated with activities.	Not likely to adversely affect

Northern long-eared Bat	Potential habitat present	As a forest dependent species, habitat suitable for traveling and foraging is limited to trees along the dam which are considered too small (<5-in dbh) to provide maternity roost. No long-term impacts associated with activities.	Not likely to adversely affect (iPAC determination key Letter of Concurrence attached). Project Code #2022-0032463
Ozark big-eared Bat	Potential habitat present	No potential habitat is directly located on the dam and is limited to ingress/egress routes Activities through potential habitat will be limited primarily during daylight hours and are not expected to alter foraging behavior.	Not likely to adversely affect

August 2015

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

October 11, 2023

Online Project Review Concurrence Letter

To: Jeanne Hamilton, Oklahoma State Conservationist
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74874

Project Name: NRCS Sallisaw Creek 13 Floodwater Retaining Structure (FWRS) Rehabilitation

Consultation Code: 2022-0032463

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Oklahoma Ecological Services Field Office (ESFO) online project review process. By providing this letter in conjunction with your complete project review package, you are certifying that you have accurately completed the online project review process for the referenced project in accordance with all instructions provided, using the best available information to reach your conclusions. Concurrence with "not likely to adversely affect" determinations does not provide any exemption for violations of section 9 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA) or "take" of federally-listed species. The Federal action agency is ultimately responsible for ensuring compliance with the ESA and any take that occurs due to your proposed action would be considered a violation under section 9 of the ESA.

This letter and the enclosed project review package complete the review of your project in accordance with the ESA. This letter also provides information for your project review under the National Environmental Policy Act (National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C.4321-4347, 83 Stat. 852), as amended.

A copy of this letter and the project review package must be emailed to **okprojectreview@fws.gov** for this certification to be valid. This letter and the project review package will be maintained in Service records. **Please allow the Oklahoma ESFO 45 days to review your information. If the Oklahoma ESFO determines that the package is not complete, or that additional coordination is necessary, we will contact your office. If, after 45 days from the date of your email submittal of your project review package, the Oklahoma ESFO has not contacted your office, consider your section 7 consultation complete.**

The proposed action consists of:

This project is a dam rehabilitation of FWRS Sallisaw Creek 13 located in Adair, Co, Oklahoma. Sallisaw 13 was constructed in 1966 and was given the high hazard classification in 2005. Dam height is 48 ft with a length of 830 ft. Surface area of conservation pool is 8 acres. This dam has exceeded its original service life of 50 years and now poses a risk of loss of life if a catastrophic dam breach were to occur. The project is currently in the planning phase. The purpose of this project is to reduce the risk of loss of life due to catastrophic dam failure and flooding by bringing the FWRS into compliance with the currently NRCS and Oklahoma safety performance standards for a high hazard dam. The proposed project would

Project start and completion dates:

2025-2026

Federal agency or federal program providing a permit, funding, grant, authorization, loan, etc. associated with the proposed project and how that agency is associated with your project:

NRCA is the lead agency for the proposed project authorized by Public Law 83-566 as amended by Section 313 of Public Law 106-472.

Federal Agency/Program Point of contact (Name, phone, and email address):

Melissa Jones, 405-742-1232, melissa.jones@usda.gov

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in "not likely to adversely affect/modify" determinations for listed species and critical habitat in relation to potential effects of your proposed project. We certify that the use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with determinations of "not likely to adversely affect" for listed species and critical habitat reached by proper use of this process. For projects where this particular determination is reached, additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages efforts to avoid or minimize adverse impacts to them from project effects. Some federal agencies have standing policies that grant limited protections to candidate species. Conservation of candidate species now may preclude future needs to federally list them as endangered or threatened, at which point their legal protection would become required. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. You should re-visit the Service's Information, Planning, and Conservation (IPaC) website at http://ecos/fws.gov/ipac/ within 90 days of project initiation to ensure species information is correct. If new species or critical habitat is identified, this letter is no longer valid and a new project package should be submitted to the Oklahoma ESFO.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Oklahoma is available at our website: <http://www.fws.gov/southwest/es/oklahoma/ >. If you have any questions, please call 918-581-7458 or send an email message to OKProjectReview@fws.gov.

Sincerely,
/s/ Jonna Polk
Field Supervisor
Oklahoma Ecological Services Field Office

Enclosures:

1) ENTIRE PROJECT REVIEW
   - ☑ PACKAGE: Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This letter (Online Concurrence Letter)
   - ☑ (Optional) Additional maps
2) Other relevant project data/documents

   MA Consistency Northern Long-eared Bat Consultation
   MA Verification Letter American Burying Beetle

Species Conclusion Table – NRCS FWRS Sallisaw 13

Table 1: Listed Species on Official Species List

Species/ Critical Habitat	Habitat Determination	Notes/Documentation	ESA Determination
Piping Plover	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Red Knot	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Monarch Butterfly	Potential habitat present	Milkweed and nectar sources are presumed present but scarce in the area of impact. Construction activities will be initiated outside of the prime reproductive period (Apr 1 – July 1) to minimize potential impacts to eggs and caterpillar. Approximately 3.6 acres of potential habitat will be paved over to armor auxiliary spillway. Other areas will return to conditions that existed pre-construction with no long-term impacts.	May affect, not likely to adversely affect
American Burying Beetle	Potential habitat present	Construction will include soil disturbing activities within a small footprint (< 2 acres). Other areas will return to conditions that existed pre-construction with no long-term impacts associated with activities.	May affect, not likely to adversely affect (IPaC determination key Verification Letter #2022-0032463)
Gray Bat	Potential habitat present	Potential foraging habitat of aquatic insects. Short-term adverse effects on aquatic insects from sedimentation will be minimized by erosion control measures (e.g. silt fences) and best management practices. Rehabilitation will not completely drain the conservation pool so limiting indirect impacts to gray bats. No long-term impacts to habitat.	May affect, not likely to adversely affect
Indiana Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. Foraging habitat present along forest edges, over pool and along streams. Potential roost trees	May affect, not likely to adversely affect

		will be felled during the bats inactive period (Nov 15 – Mar 31). No long-term impacts to habitat.	
Northern long-eared Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. As a forest dependent species, habitat suitable for traveling and foraging is limited to the stream just below the dam. Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 – Mar 31).	May affect, not likely to adversely affect (iPAC determination key MA Consistancy attached). Project Code #2022-0032463)
Tri-colored Bat	Potential habitat present	A few potential maternity or roost trees occur in the area of impact (large pine trees on the south side of the dam near the plunge pool). Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 – Mar 31).	May affect, not likely to adversely affect
Ozark big-eared Bat	No habitat present	Mature upland forest and karst areas are not located in the area of impact.	No effect
Alligator Snapping Turtle	Potential habitat present	Downstream dam may limit migration of juvenile species. Lack of overstory /canopy cover along conservation pool perimeter. No evidence of structure (logs, undercut of bank) within conservation pool.	May affect, not likely to adversely affect

August 2015

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

April 25th, 2022

Online Project Review Concurrence Letter

To: Gary O'Neill, Oklahoma State Conservationist
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74874

Project Name: NRCS Sallisaw Creek 19 Floodwater Retaining Structure (FWRS) Rehabilitation

Consultation Code: 2022-0032520

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Oklahoma Ecological Services Field Office (ESFO) online project review process. By providing this letter in conjunction with your complete project review package, you are certifying that you have accurately completed the online project review process for the referenced project in accordance with all instructions provided, using the best available information to reach your conclusions. Concurrence with "not likely to adversely affect" determinations does not provide any exemption for violations of section 9 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA) or "take" of federally-listed species. The Federal action agency is ultimately responsible for ensuring compliance with the ESA and any take that occurs due to your proposed action would be considered a violation under section 9 of the ESA.

This letter and the enclosed project review package complete the review of your project in accordance with the ESA. This letter also provides information for your project review under the National Environmental Policy Act (National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C.4321-4347, 83 Stat. 852), as amended.

A copy of this letter and the project review package must be emailed to **okprojectreview@fws.gov** for this certification to be valid. This letter and the project review package will be maintained in Service records. **Please allow the Oklahoma ESFO 45 days to review your information. If the Oklahoma ESFO determines that the package is not complete, or that additional coordination is necessary, we will contact your office. If, after 45 days from the date of your email submittal of your project review package, the Oklahoma ESFO has not contacted your office, consider your section 7 consultation complete.**

The proposed action consists of:

The proposed project is to rehabilitate Flood water structure Sallisaw 19 to meet NRCS and Oklahoma safety performance standards for a high hazard dam classification. Sallisaw 19 is located in Adair Co., Oklahoma just south of the town of Stilwell OK. This structure was built in 1968 with the purpose of flood control benefits and conservation pool surface area is 46 acres. Dam height is 61 ft and length is 2,470 ft. The structure received a high hazard classification in 2006 and is no longer in compliance with NRCS design criteria and performance standards. The purpose of this project is to reduce the risk of loss of life due to a catastrophic dam failure and flooding. A dam failure would potentially impact 11 houses, 3

Project start and completion dates:

2025-2026

Federal agency or federal program providing a permit, funding, grant, authorization, loan, etc. associated with the proposed project and how that agency is associated with your project:

NRCA is the lead agency for the proposed project authorized by Public Law 83-566 as amended by Section 313 of Public Law 106-472.

Federal Agency/Program Point of contact (Name, phone, and email address):

Melissa Jones, 405-742-1232, melissa.jones@usda.gov

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in "not likely to adversely affect/modify" determinations for listed species and critical habitat in relation to potential effects of your proposed project. We certify that the use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with determinations of "not likely to adversely affect" for listed species and critical habitat reached by proper use of this process. For projects where this particular determination is reached, additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages efforts to avoid or minimize adverse impacts to them from project effects. Some federal agencies have standing policies that grant limited protections to candidate species. Conservation of candidate species now may preclude future needs to federally list them as endangered or threatened, at which point their legal protection would become required. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. You should re-visit the Service's Information, Planning, and Conservation (IPaC) website at http://ecos/fws.gov/ipac/ within 90 days of project initiation to ensure species information is correct. If new species or critical habitat is identified, this letter is no longer valid and a new project package should be submitted to the Oklahoma ESFO.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Oklahoma is available at our website: <http://www.fws.gov/southwest/es/oklahoma/ >. If you have any questions, please call 918-581-7458 or send an email message to OKProjectReview@fws.gov.

Sincerely,
/s/ Jonna Polk
Field Supervisor
Oklahoma Ecological Services Field Office

Enclosures:

1) ENTIRE PROJECT REVIEW
   - ☑ PACKAGE: Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This letter (Online Concurrence Letter)
   - ☑ (Optional) Additional maps
2) Other relevant project data/documents

MA Verification Northern Long-eared Bat Consultation

Sallisaw Creek Site 19 Action Area Map, Adair Co. OK



N
W
E
S

NRCS
Natural Resources Conservation Service

0 0.125 0.25 0.5 Miles

Map ID: Sallisaw Creek Site 19 2022
Map Date: March 2022 NRCS MJones

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: April 15, 2022
Project Code: 2022-0032520
Project Name: FWRS Sallisaw Creek 19 Dam Rehabilitation

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

Project Summary

Project Code: 2022-0032520
Event Code: None
Project Name: FWRS Sallisaw Creek 19 Dam Rehabilitation
Project Type: Dam - Maintenance/Modification
Project Description: The proposed project is to rehabilitate Flood water structure Sallisaw 19 to meet NRCS and Oklahoma safety performance standards for a high hazard dam classification. Sallisaw 19 is located in Adair Co., Oklahoma just south of the town of Stilwell OK. This structure was built in 1968 with the purpose of flood control benefits and conservation pool surface area is 46 acres. Dam height is 61 ft and length is 2,470 ft. The structure received a high hazard classification in 2006 and is no longer in compliance with NRCS design criteria and performance standards. The purpose of this project is to reduce the risk of loss of life due to a catastrophic dam failure and flooding. A dam failure would potentially impact 11 houses, 3 mobile homes, two double-wide mobile homes, one church, one auto body shop and one cabin. In order to meet safety criteria the auxiliary spillway would be widened from 200' to 400' and the crest lowered by 5.9'. The auxiliary spillway would be moved to the south end of the dam for dam access and outflow direction to lead away from railroad and give better line up with creek. The old auxiliary will remain at current height and act as a second auxiliary spillway. Reticulated concrete will be used on the auxiliary spillway for velocities. The 30" principal spillway conduit will be replaced with a 48" pipe and a new impact basin. An abutment drain will be added to the south side of the dam. Upstream faced riprap will be added for wave protection. Drainage relief pipe that runs from railroad ROW near north abutment to the east will be repaired with a flap gate. Principal spillway and top of dam elevation will remain the same. The project is currently in the planning phase.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.76865265,-94.66402750952096,14z



Counties: Adair County, Oklahoma

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened
Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7245	Endangered

Birds

NAME	STATUS
Piping Plover *Charadrius melodus*	Threatened
Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	
Red Knot *Calidris canutus rufa*	Threatened
There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1864	

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

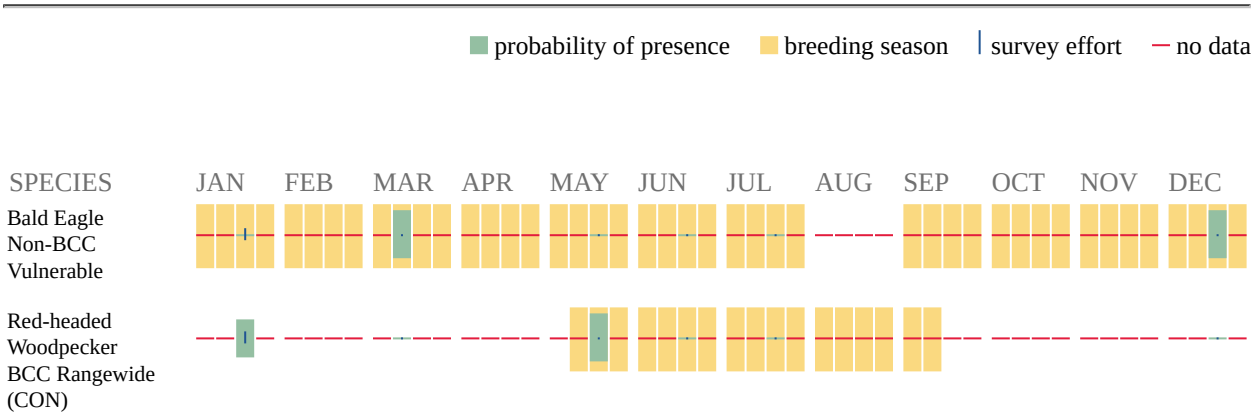
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as

warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: Natural Resources Conservation Svc
Name: Melissa Jones
Address: 100 USDA Suite 206
City: Stillwater
State: OK
Zip: 74075
Email mj46953@gmail.com
Phone: 5128088640

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: April 15, 2022
Project code: 2022-0032520
Project Name: FWRS Sallisaw Creek 19 Dam Rehabilitation

Subject: Verification letter for the 'FWRS Sallisaw Creek 19 Dam Rehabilitation' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Melissa Jones:

The U.S. Fish and Wildlife Service (Service) received on April 15, 2022 your effects determination for the 'FWRS Sallisaw Creek 19 Dam Rehabilitation' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

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[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

FWRS Sallisaw Creek 19 Dam Rehabilitation

2. Description

The following description was provided for the project 'FWRS Sallisaw Creek 19 Dam Rehabilitation':

> The proposed project is to rehabilitate Flood water structure Sallisaw 19 to meet NRCS and Oklahoma safety performance standards for a high hazard dam classification. Sallisaw 19 is located in Adair Co., Oklahoma just south of the town of Stilwell OK. This structure was built in 1968 with the purpose of flood control benefits and conservation pool surface area is 46 acres. Dam height is 61 ft and length is 2,470 ft. The structure received a high hazard classification in 2006 and is no longer in compliance with NRCS design criteria and performance standards. The purpose of this project is to reduce the risk of loss of life due to a catastrophic dam failure and flooding. A dam failure would potentially impact 11 houses, 3 mobile homes, two double-wide mobile homes, one church, one auto body shop and one cabin. In order to meet safety criteria the auxiliary spillway would be widened from 200' to 400' and the crest lowered by 5.9'. The auxiliary spillway would be moved to the south end of the dam for dam access and outflow direction to lead away from railroad and give better line up with creek. The old auxiliary will remain at current height and act as a second auxiliary spillway. Reticulated concrete will be used on the auxiliary spillway for velocities. The 30" principal spillway conduit will be replaced with a 48" pipe and a new impact basin. An abutment drain will be added to the south side of the dam. Upstream faced riprap will be added for wave protection. Drainage relief pipe that runs from railroad ROW near north abutment to the east will be repaired with a flap gate. Principal spillway and top of dam elevation will remain the same. The project is currently in the planning phase.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.76865265,-94.66402750952096,14z



Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

   No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

   No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

    No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Natural Resources Conservation Svc
Name: Melissa Jones
Address: 100 USDA Suite 206
City: Stillwater
State: OK
Zip: 74075
Email mj46953@gmail.com
Phone: 5128088640

Species Conclusion Table – NRCS Sallisaw Site 19 Dam Rehabilitation

Table 1: Listed Species on Official Species List

Species/ Critical Habitat	Habitat Determination	Notes/Documentation	ESA Determination
Piping Plover	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Red Knot	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Monarch Butterfly	Potential habitat present	Milkweed and nectar sources are presumed present but scarce in the area of impact. Construction activities will be initiated outside of the prime reproductive period (Apr 1 – Jul 1) to minimize potential impacts to eggs and caterpillar. Approximately 3.6 acres of potential habitat will be paved over to armor auxiliary spillway. Other areas will return to conditions that existed pre-construction with no long-term impacts associated with activities.	Not likely to adversely affect
Gray Bat	Potential habitat present	Potential foraging habitat of aquatic insects. Short-term adverse effects on aquatic insect from sedimentation will be minimized by erosion control measure (e.g. silt fences) and best management practices. Rehabilitation will not completely drain the conservation pool so limiting indirect impact to gray bats. No long-term impacts associated with activities.	Not likely to adversely affect
Indiana Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. Foraging habitat present along forest edges, over pool and along streams. Potential roost trees will be felled during the bats inactive period (Nov 15 – Mar 31). No long-term impacts associated with activities.	Not likely to adversely affect
Northern long-eared Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. As a forest dependent	Not likely to adversely affect

		species, habitat suitable for traveling and foraging is limited to the stream just below the dam. Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 – Mar 31).	(iPAC determination key Letter of Concurrence attached) Project Code #2022-0032520
Ozark big-eared Bat	No habitat present	Mature upland forest and karst areas are not located in the area of impact.	No effect

August 2015

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

October 11, 2023

Online Project Review Concurrence Letter

To: Jeanne Hamilton, Oklahoma State Conservationist
Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74874

Project Name: NRCS Sallisaw Creek 19 Floodwater Retaining Structure (FWRS) Rehabilitation

Consultation Code: 2022-0032520

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Oklahoma Ecological Services Field Office (ESFO) online project review process. By providing this letter in conjunction with your complete project review package, you are certifying that you have accurately completed the online project review process for the referenced project in accordance with all instructions provided, using the best available information to reach your conclusions. Concurrence with "not likely to adversely affect" determinations does not provide any exemption for violations of section 9 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA) or "take" of federally-listed species. The Federal action agency is ultimately responsible for ensuring compliance with the ESA and any take that occurs due to your proposed action would be considered a violation under section 9 of the ESA.

This letter and the enclosed project review package complete the review of your project in accordance with the ESA. This letter also provides information for your project review under the National Environmental Policy Act (National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C.4321-4347, 83 Stat. 852), as amended.

A copy of this letter and the project review package must be emailed to **okprojectreview@fws.gov** for this certification to be valid. This letter and the project review package will be maintained in Service records. **Please allow the Oklahoma ESFO 45 days to review your information. If the Oklahoma ESFO determines that the package is not complete, or that additional coordination is necessary, we will contact your office. If, after 45 days from the date of your email submittal of your project review package, the Oklahoma ESFO has not contacted your office, consider your section 7 consultation complete.**

The proposed action consists of:

The proposed project is to rehabilitate Flood water structure Sallisaw 19 to meet NRCS and Oklahoma safety performance standards for a high hazard dam classification. Sallisaw 19 is located in Adair Co., Oklahoma just south of the town of Stilwell OK. This structure was built in 1968 with the purpose of flood control benefits and conservation pool surface area is 46 acres. Dam height is 61 ft and length is 2,470 ft. The structure received a high hazard classification in 2006 and is no longer in compliance with NRCS design criteria and performance standards. The purpose of this project is to reduce the risk of loss of life due to a catastrophic dam failure and flooding. A dam failure would potentially impact 11 houses, 3

Project start and completion dates:

2025-2026

Federal agency or federal program providing a permit, funding, grant, authorization, loan, etc. associated with the proposed project and how that agency is associated with your project:

NRCA is the lead agency for the proposed project authorized by Public Law 83-566 as amended by Section 313 of Public Law 106-472.

Federal Agency/Program Point of contact (Name, phone, and email address):

Melissa Jones, 405-742-1232, melissa.jones@usda.gov

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in "not likely to adversely affect/modify" determinations for listed species and critical habitat in relation to potential effects of your proposed project. We certify that the use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with determinations of "not likely to adversely affect" for listed species and critical habitat reached by proper use of this process. For projects where this particular determination is reached, additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages efforts to avoid or minimize adverse impacts to them from project effects. Some federal agencies have standing policies that grant limited protections to candidate species. Conservation of candidate species now may preclude future needs to federally list them as endangered or threatened, at which point their legal protection would become required. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. You should re-visit the Service's Information, Planning, and Conservation (IPaC) website at http://ecos/fws.gov/ipac/ within 90 days of project initiation to ensure species information is correct. If new species or critical habitat is identified, this letter is no longer valid and a new project package should be submitted to the Oklahoma ESFO.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Oklahoma is available at our website: <http://www.fws.gov/southwest/es/oklahoma/ >. If you have any questions, please call 918-581-7458 or send an email message to OKProjectReview@fws.gov.

Sincerely,
/s/ Jonna Polk
Field Supervisor
Oklahoma Ecological Services Field Office

Enclosures:

1) ENTIRE PROJECT REVIEW
   - ☑ PACKAGE: Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This letter (Online Concurrence Letter)
   - ☑ (Optional) Additional maps
2) Other relevant project data/documents

MA Consistency Northern Long-eared Bat Consultation

Species Conclusion Table – NRCS FWRS Sallisaw 19

Table 1: Listed Species on Official Species List

Species/ Critical Habitat	Habitat Determination	Notes/Documentation	ESA Determination
Piping Plover	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Red Knot	No habitat present	No bare shoreline/mudflat as potential habitat.	No effect
Monarch Butterfly	Potential habitat present	Milkweed and nectar sources are presumed present but scarce in the area of impact. Construction activities will be initiated outside of the prime reproductive period (Apr 1 – July 1) to minimize potential impacts to eggs and caterpillar. Approximately 3.6 acres of potential habitat will be paved over to armor auxiliary spillway. Other areas will return to conditions that existed pre-construction with no long-term impacts.	May affect, not likely to adversely affect
Gray Bat	Potential habitat present	Potential foraging habitat of aquatic insects. Short-term adverse effects on aquatic insects from sedimentation will be minimized by erosion control measures (e.g. silt fences) and best management practices. Rehabilitation will not completely drain the conservation pool so limiting indirect impacts to gray bats. No long-term impacts to habitat.	May affect, not likely to adversely affect
Indiana Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. Foraging habitat present along forest edges, over pool and along streams. Potential roost trees will be felled during the bats inactive period (Nov 15 – Mar 31). No long-term impacts to habitat.	May affect, not likely to adversely affect
Northern long-eared Bat	Potential habitat present	Only a few potential maternity or roost trees occur in the area of impact. As a forest dependent species, habitat suitable for	May affect, not likely to adversely affect (iPAC determination key

		traveling and foraging is limited to the stream just below the dam. Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 – Mar 31).	MA Consistency attached). Project Code #2022-0032520)
Tri-colored Bat	Potential habitat present	A few potential maternity or roost trees occur in the area of impact (large pine trees on the south side of the dam near the plunge pool). Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 – Mar 31).	May affect, not likely to adversely affect
Ozark big-eared Bat	No habitat present	Mature upland forest and karst areas are not located in the area of impact.	No effect
Alligator Snapping Turtle	Potential habitat present	Downstream dam may limit migration of juvenile species. Lack of overstory /canopy cover along conservation pool perimeter. No evidence of structure (logs, undercut of bank) within conservation pool.	May affect, not likely to adversely affect

MEETING MINUTES

Project: **Sallisaw Tributaries Watershed FRD No. S-13 and S-19**
Stakeholder Meeting No.1
Date: September 9th, 2021 – 3:00 PM (Central Daylight Time)
Location: Virtual Live Stream on Microsoft Teams

Presenting:

Larry Sample	– Public Participation Lead, PE	Wood, Subconsultant to Conservation Works
Sarah Wenzel	– Civil Engineer, EIT	Conservation Works / Prairie Engineers

Attendees:

Andrew Ewing - NRCS, Watershed staff
April Burns - NRCS Stillwater, Watershed planning staff
Daniel Landeros – EPA Region 6 CWA 404/401 Program
Deb Green – Assistant State Archaeologist
Elizabeth Toombs – Cherokee Nation, Tribal Historic Preservation Office
Jack Hudgins - Cherokee Nation, Soil technician & soil conservationist, partner of NRCS Tahlequah
James Munkres - Osage Nation Historic Preservation Office, Archaeologist
Janet Stewart – Oklahoma Conservation Commission
Kary Stackelbeck - Oklahoma Archaeological Survey, State Archaeologist
KC Kraft – NRCS Stillwater, Archaeologist
Keith Miller – City of Sallisaw, Floodplain administrator
Kenneth Cunningham – Oklahoma Department of Wildlife, Assistant Chief of Fisheries
Kristina Wyckoff – Section 10-6 Coordination/Archaeologist, Oklahoma State Archaeologist Office
Lynda Ozan – Deputy State Preservation Office
Michael Sams, NRCS Stillwater
Mike Sams – NRCS State Biologist
Randy Norris – Conservation Works JV., Environmental engineer
Richard Lane - NRCS Stillwater, Civil engineer
Ted Kerten - NRCS Stillwater, Watershed planning staff
Terry Feldman – Civil Engineer, Conservation Works JV
Zachary Hollandsworth – Oklahoma Water Resources Board, Dam Safety Program

Prepared by: Sarah Wenzel – Conservation Works JV / Prairie Engineers
Attachments: *2010 Alternative #1 pdf maps shown at meeting, PowerPoint*

Due to Covid-19, the stakeholder meeting was conducted virtually via Microsoft Teams on September 9th, 2021, at 3:00pm Central Daylight Time. The meeting was led by Larry Sample, PE, of Wood, the public participation lead of the Sallisaw Creek Watershed Dams S-13 and S-19 Rehabilitation planning project, and Sarah Wenzel, Civil Engineer EIT, of Conservation Works JV/ Prairie Engineers. The meeting was conducted as a presentation followed by a question-and-answer session for involved agencies and stakeholders.

MEETING MINUTES

The purpose of this meeting was to ensure stakeholders are familiar with the project. This meeting also provides an opportunity to answer questions and collect feedback that will guide the consideration of design alternatives. The attendees were asked that if issues arise outside of this meeting to please make the issue known to NRCS who will pass information along to the design team.

The intent of the proposed rehabilitation of the dams at the Sallisaw Watershed sites S-13 and S-19 is to develop alternatives that will bring the dams into compliance with NRCS high hazard criteria, since the dams were reclassified from low-hazard to high-hazard in 2010 due to downstream development.

The following minutes express our understanding of the items discussed. Please respond in writing within five days of receipt if any changes are required.

Discussion:

USDA's Flood Prevention Operations Program is carried out under the authority of the Watershed Protection and Flood Prevention Act of 1954; Public Law 83-566 and the Control Act of 1944; Public Law 78-534. The scope of the Sallisaw S-13 and S-19 rehabilitation project was discussed briefly, including showing the location of each dam within the estimated affected watershed area to be analyzed, which extends from the dam sites to just south of Marble City. The project location was discussed with pictures.

Project information

The project is based on a 2010 reclassification of S-13 and S-19 from Low Hazard to High Hazard classification based on new development downstream of the dam. The hazard classifications do not reflect the structural integrity of the dams, but rather they are based on the potential loss of life and/or property in the unlikely event of a structural failure. The basis for the project is to analyze the existing conditions at S-13 and S-19 and develop alternatives that would bring the dams into compliance with the stricter high hazard criteria. A high hazard dam needs to store more water than a low hazard dam. Typically, it would need to store a 100-year flood event. The high hazard dam must also pass a Probable Maximum Precipitation event (PMP), which represents largest precipitation event the dam locations would ever receive. The PMP has an extremely low chance of happening within a lifetime. To put the PMP in perspective for non-hydrologists, A PMP at the Sallisaw dams would be like getting 36" of precipitation in a single storm.

This project aims to create a plan so these dams will meet high hazard classification at the best cost, while also factoring in environmental and cultural resources, and public input.

MEETING MINUTES

Project History

Preliminary design assessment for the rehabilitation was completed in 2010. The project will use the 2010 assessment and the existing NRCS Sallisaw Creek watershed work plans as a starting point for developing alternatives. As part of the planning process each watershed will be modelled hydraulically using new modelling methods unavailable in 2010 to develop and refine alternatives. Results will be compared to the existing condition and post-project condition with modified dam geometry.

According to Richard Lane (NRCS Stillwater), rehabilitation has already been completed on Sallisaw dam numbers 15, 16, 18, and 20, and 26.

The history of Oklahoma Watershed projects and benefits of watershed dams was discussed.

The anticipated benefit area was displayed over a map of Oklahoma. An image showing the location of S-13 and S-19 watersheds in relation to the benefit area was shown. A zoomed in aerial map with the dam watershed was shown for each of S-13 and S-19.

Planning Schedule

Data collection and analysis was started in July 2021 and is anticipated to be complete in October 2021. The survey has been completed and is getting finalized and put into maps for alternatives analysis. Habitat assessment for this rehabilitation project will not be as intensive as for new construction. Hydraulic analysis will be used to assess what flood control benefits each dam provides.

The formulation and evaluation of alternatives is scheduled from October 2021 through November 2021. The preliminary alternatives from the 2010 assessment will be revisited and refined.

The Plan Environmental Document, which is required by NRCS, will be completed in July 2022.

MEETING MINUTES

NEPA (National Environmental Policy Act) Planning

The NEPA planning process is underway. The project team is working with US Fish & Wildlife (USFW). Potentially significant species at the site include:

Mammals: Ozark big-eared bat, Gray bat, Indiana bat, Northern Long-eared bat
Birds: Piping Plover, Red Knot
Clams: Neosho Mucket, Rabbitsfoot
Insects: American Burying Beetle

Note this list of species is taken from US Fish & Wildlife. The Oklahoma Department of Wildlife Conservation does not have all these species listed for Adair County.

Alternatives to be evaluated:

- Future Without Project: Would require coordination with the State of Oklahoma to potentially bring the dam into compliance with state standards.
- Rehabilitate to high hazard dam criteria: This would provide equal or better benefits downstream. The dam must be built to stricter criteria to protect downstream development in the event of failure.
- Non-Strucutral option: Instead of rehabilitating the dam, the sponsor would buy out houses or acquire easements so no one can build downstream in the future. This is usually an expensive option, probably more expensive than rehabilitation.
- Remove the dam: With the loss of flood control benefits, true decommissioning is quite expensive to return the area to a more natural pre-dam state.

The first step of rehabilitation is to look at the assessment done in 2010. The 2010 Alternatives are simply suggestions to be used as the starting point for the project. These are not the final design alternatives.

The 2010 recommended alternative (2010 Alternative #1) for each dam was displayed on a map along with property information to show landowners what a similar alternative might look like. It was stressed that the alternatives shown would likely change.

	Existing Dam S-13	2010 Alternative #1 for S-13
Top of Dam Elevation	892.0	893.4
Auxiliary Spillway Elevation	888.5	883.9
Auxiliary Spillway Width	40’	120’
Principal Spillway Elevation	859.8	863.1
Principal Spillway Pipe	24”	Bore and jack a new 30” spillway conduit through the embankment and abandon the existing conduit in place

*All units in US feet.

	Existing Dam S-19	2010 Alternative #1 for S-19
Top of Dam Elevation	984.6	990.1
Auxiliary Spillway Elevation	980.2	979.2
Auxiliary Spillway Width	200’	400’
Principal Spillway Elevation	948.2	953.1
Principal Spillway Pipe	30”	Bore and jack a new 54” spillway conduit through the embankment and abandon the existing conduit in place

*All units in US feet.

These alternatives may change, especially because there was no bathymetric survey available in 2010, which we have now. Bathymetry is survey (mapping) of the bottom of the dam basin, which is underwater, and tells us precisely how much space is left in the dam to hold water and sediment.

MEETING MINUTES

STAKEHOLDER COMMENTS/QUESTIONS

Kristina Wyckoff (Section 10-6 Coordination/Archaeologist): Can you please clarify what it means to abandon conduit in place?
Larry Sample: We would place a new spillway over to the left or right of the existing spillway. Then we would remove the old intake tower completely. Then we would excavate to remove a little bit of the principal spillway on the upstream and downstream side of the embankment. Then the old principal spillway conduit will be filled with a non-shrink grout or flowable concrete to seal it off completely. Sealing it would also include putting a filter around the pipe if there wasn't one there before to capture any leakage.

Kary Stacklebeck (Oklahoma Archaeological Survey, State Archaeologist): Do you have a sense of when the environmental studies, especially cultural resources, will be completed?
Larry Sample: Environmental and cultural resources are part of the data collection phase of the project. Randy Norris may have some insight (Randy had left the call before this question came up). Terracon is doing the work for cultural resources. We anticipate cultural resources should be completed by October.

Kary Stacklebeck: When will Section 106 consultation be initiated?
Larry Sample: Have you received the letters?
Kary Stacklebeck: The letters we received specifically referenced NEPA. Are you planning to streamline NEPA and NHPA; will they be handled together or separately?
Larry Sample: I can't answer that myself right now. Another team member will probably know the answer better. Randy are you still on?
Terry Feldman: Randy is not on the call anymore.
Larry Sample: I apologize. Let us take that down and we will get back to you as soon as we touch base with the environmental and cultural folks.
Kary Stacklebeck: Archaeological resources were previously documented in the area. So, with heightening the dams, that may potentially warrant some survey work. This is early in the process so we would be looking into many other things too, but we would look specifically at that.
Larry Sample: We will make sure we get your question to those folks, and it is on our radar. KC is on this call, so coordination between these dam projects is helpful.
KC Kraft (NRCS Stillwater, Archaeologist): The contract archaeologist is doing a survey on it to the proposed height of the dam. Let's remember that this may never be built at all. The archaeological survey area includes the survey pool, the dam itself, the potential breach area to where the breach ends, the proposed future area, both streams looking into them [the dams]. The dams themselves are being looked at as historic landscape features. The formal Section 106 letters are going through the chain of command with my three supervisors, so the formal letters should be going out soon.

Deed searches for both structures through the 1950s are also being performed. Note the Flint District Courthouse is one mile downstream. We've done quite a bit of work that has been represented in this presentation; it is on our radar.
Kary Stacklebeck: Thanks KC.

James Munkres (Osage Nation Historic Preservation Office, Archaeologist): KC. Thank you for listing the area being surveyed. I didn't hear you say, "proposed borrow area". Where would be the source of soil for increasing the proposed top of dam?
Larry Sample: We probably are not going to designate something specifically because the geotechnical work for analyzing the borrow area is not part of the scope of this project. However, typically the borrow area would come from the area beneath the permanent pool (not the sediment, because that's usually too weak to be used in the structure). Or the borrow could also be taken from somewhere upstream of the dam along the edge as close as possible to the existing permanent pool. The thing about borrow for rehab is a typical 1' - 4' of raise is significantly less material than what is needed for the original dam construction. One of the alternatives for Site 19 from 2010 has a 7-ft raise proposed, which is an exception to the typical 1'-4' raise. If we expand the auxiliary spillway, borrow would typically be taken from there. However, at Site 13, the auxiliary spillway material is rock, so that is not an option for Site 13.

Larry Sample: The short answer is we are not sure at this point. These are just typical situations from past rehabilitation projects I've done.

James Munkres: Is it your intent to identify these areas before construction and apply Section 106 on them?
Larry Sample: I don't know that we will specifically identify locations of borrowed materials.
James Munkres: why is that?
Larry Sample: Doing the geological borings was not part of the scope that we were contracted for.
Janet Stewart (Oklahoma Conservation Commission): That work typically comes in the design stage. So that is further down the line, not to be done in the planning stage.

James Munkres: So, the areas that will be used for borrow will be identified for stakeholders and Section 106 will be conducted?
KC Kraft: Yes, I will inform the stakeholders. Even if we need to do a post-contractor report, we will do that. I will take care of that to be sure the survey and 106 will be conducted in the borrow areas at the appropriate stage in this project.
Larry Sample: We can always put that into the Plan ED document [as part of the recommended design]. If we don't know where the borrow areas are (assuming the preferring alternative includes

construction), then we won't know where they are. But we can state in our instructions that Section 106 should be applied on the borrow area.

James Munkres: Has Terracon started field work?
Larry Sample: They have either started this week or are starting next week.
Terry Feldmann: They were planning for next week, but I haven't seen dates for coordination yet.
Larry Sample: The intent is to have the cultural and environmental work completed by the 1st of October. It's either this week or we are mobilizing and starting next week

James Munkres: It's all private land, correct?
Sarah Wenzel: There is land owned by the Cherokee Nation on Site 19. There was also some State of Oklahoma property on Site 13. There were two very small parcels of land that did not have an owner listed in the Oklahoma database. I believe all the other land is privately owned.

James Munkres : Will these maps (We won't need the landowner ID's) be supplied in the 106 documentation?
Sarah Wenzel: I believe these will be included in the Plan-ED document.

James Munkres: And you will send out the slides and the maps?
Larry Sample: This is all very preliminary. This example in no way means that the final will look like this.
James Munkres: As Section 106 we are supposed to know the APE (Area of Potential Effect). Those should be identified to us?
Larry Sample: Our final document will almost certainly be very different than what we are showing here. As we evaluate alternatives, that will be refined. I guess we can share these if they go through NRCS first.

Sarah Wenzel & Larry Sample asked stakeholders about farmland with 1ft-3ft mounds.
Suggestions:
-That's where round bales for cattle are being dropped.
-It looks like groundhog mounds.
-There is a particular bush that will leave circular impressions from the aerial that look like something on the aerial, but I think that bush is found more on the west side of the state.

No more comments or questions. Meeting concluded at 4:26pm.

MEETING MINUTES

Project: **Sallisaw Watershed FRS No. S-13 and S-19**
Public Meeting #1
Date: September 9th, 2021 – 6:30 PM
Location: Adair County Conservation District Office
468670 Hwy 100
Stilwell, OK 74960-9710

Also offered as a Virtual Live Stream on Microsoft Teams

Presenting:

Larry Sample	– Public Participation Lead, PE	Wood, Subconsultant to Conservation Works
Sarah Wenzel	– Civil Engineer, EIT	Conservation Works JV / Prairie Engineers

In-person attendees:

Name	Affiliation and/or title	Address	Email	Phone
Nikki Starr	Harold & Lillian Knight	85201 S. 4735 Rd. Stilwell, OK 74960	stilwelllivestockauction@gmail.com	(918)-575-0501
Alan Starr	Harold & Lillian Knight	85201 S. 4735 Rd. Stilwell, OK 74960	stilwelllivestockauction@gmail.com	(918)-696-1869
Lillian Knight	Harold & Lillian Knight	85201 S. 4735 Rd. Stilwell, OK 74960	stilwelllivestockauction@gmail.com	(918)-696-0739
Eugene Kester	ACCD	Rt 1 Box 333 Stilwell, OK	N/A	(918)-696-3563
Jim Carson	Rocking JF	PO Box 312 Stilwell, OK	-	(918)-696-7191
Roy Ogden	Rent	Rt 6. 1847 Stilwell, OK	-	(918)-696-2085
Beverly Rainwater Sturgis	Property owner	PO Box 361 Carthage, MO 64836	bevsturgis@protonmail.com	(505)-553-5913
Margaret Rainwater	Property owner	20453 E. Whipperwill Tahlequah, OK 74464	Rainwaterm9184@gmail.com	(918)-456-1571
Jim & David Dotsa	Jim Dotsa	P.O. Box 1205 Stilwell 74960	-	(918)-575-1349
Ashley Mann	Adair County District Staff	468670 Hwy 100 Stilwell, OK 74960	-	-
Eugene Kester	Adair County District Staff	468670 Hwy 100 Stilwell, OK 74960	-	-

Virtual Attendees:
Ted Kerten - NRCS Stillwater, Watershed planning staff
April Burns - NRCS Stillwater, Watershed planning staff
Richard Lane - NRCS Stillwater, Civil engineer

MEETING MINUTES

Prepared by: Sarah Wenzel – Conservation Works JV / Prairie Engineers
Attachments: *2010 Alternative #1 pdf maps shown at meeting, PowerPoint*

Due to Covid-19, the public meeting was held outdoors on the front porch of the Adair County Conservation District office in Stilwell, Oklahoma on September 9th, 2021, at 6:30pm. A large flat screen TV was set up on the porch to display the PowerPoint presentation. The meeting was led by Larry Sample, PE, of Wood, the public participation lead of the Sallisaw Creek Watershed Dams S-13 and S-19 Rehabilitation planning project, and Sarah Wenzel, Civil Engineer EIT, of Conservation Works JV/ Prairie Engineers. The meeting was conducted as a presentation followed by a question-and-answer session for involved landowners and stakeholders. Some attendees participated virtually via Microsoft Teams.

The purpose of this meeting was to ensure the public, especially affected landowners, is familiar with the project. This meeting also provided an opportunity to answer questions, collect feedback from the public and affected property owners, and collect local knowledge that will guide the consideration of design alternatives.

The intent of the proposed rehabilitation of the dams at the Sallisaw Watershed sites S-13 and S-19 is to develop alternatives that will bring the dams into compliance with NRCS high hazard criteria, since the dams were reclassified from low-hazard to high-hazard in 2010 due to downstream development.

The following minutes express our understanding of the items discussed. Please respond in writing within five days of receipt if any changes are required.

Discussion:

USDA's Flood Prevention Operations Program is carried out under the authority of the Watershed Protection and Flood Prevention Act of 1954; Public Law 83-566 and the Control Act of 1944; Public Law 78-534. The scope of the Sallisaw S-13 and S-19 rehabilitation project was discussed briefly, including showing the location of each dam within the estimated affected watershed area to be analyzed, which extends from the dam sites to just south of Marble City. The project location was discussed with pictures.

Project information

The project is based on a 2010 reclassification of S-13 and S-19 from Low Hazard to High Hazard classification based on new development downstream of the dam. The hazard classifications do not reflect the structural integrity of the dams, but rather they are based on the potential loss of life and/or property in the unlikely event of a structural failure. The basis

for the project is to analyze the existing conditions at S-13 and S-19 and develop alternatives that would bring the dams into compliance with the stricter high hazard criteria. A high hazard dam needs to store more water than a low hazard dam. Typically, it would need to store a 100-year flood event. The high hazard dam must also pass a Probable Maximum Precipitation event (PMP), which represents largest precipitation event the dam locations would ever receive. The PMP has an extremely low chance of happening within a lifetime. To put the PMP in perspective for non-hydrologists, a PMP at the Sallisaw dams would be like getting 36 inches of precipitation in a single storm.

This project aims to create a cost effective plan so these dams will meet high hazard classification while factoring in environmental and cultural resources, and public input.

Project History

Preliminary design assessment for the rehabilitation was completed in 2010. The project will use the 2010 assessment and the existing NRCS Sallisaw Creek watershed work plans as a starting point for developing alternatives. As part of the planning process each watershed will be modelled hydraulically using new modelling methods unavailable in 2010 to develop and refine alternatives. Results will be compared to the existing condition and post-project condition with modified dam geometry.

The history of Oklahoma Watershed projects and benefits of watershed dams was discussed.

The anticipated benefit area was displayed over a map of Oklahoma. An image showing the location of S-13 and S-19 watersheds in relation to the benefit area was shown. A zoomed in aerial map with the dam watershed was shown for each of S-13 and S-19.

Planning Schedule

Data collection and analysis was started in July 2021 and is anticipated to be complete in October 2021. The formulation and evaluation of alternatives is scheduled from October 2021 through November 2021. The Plan Environmental Document, which is required by NRCS, will be completed in July 2022.

NRCS has easements for Site 13 ready for the design team (this was announced by NRCS during the meeting)

MEETING MINUTES

NEPA (National Environmental Policy Act) Planning

The project team is working with US Fish & Wildlife (USFW). Potentially significant species at the site include:

Mammals: Ozark big-eared bat, Gray bat, Indiana bat, Northern Long-eared bat
Birds: Piping Plover, Red Knot
Clams: Neosho Mucket, Rabbitsfoot
Insects: American Burying Beetle

Alternatives

The first step of our rehabilitation is looking at the assessment done in 2010. The 2010 Alternatives are simply suggestions to be used as the starting point for the project. These are not the final design alternatives.

The 2010 recommended alternative (2010 Alternative #1) for each dam was displayed on a map along with property information to show landowners what a similar alternative might look like. It was stressed that the alternatives shown would likely change.

	Existing Dam S-13	**2010 Alternative #1 for S-13**
Top of Dam Elevation	892.0	893.4
Auxiliary Spillway Elevation	888.5	883.9
Auxiliary Spillway Width	40’	120’
Principal Spillway Elevation	859.8	863.1
Principal Spillway Pipe	24”	Bore and jack a new 30” spillway conduit through the embankment and abandon the existing conduit in place

*All units in US feet.

	Existing Dam S-19	**2010 Alternative #1 for S-19**
Top of Dam Elevation	984.6	990.1
Auxiliary Spillway Elevation	980.2	979.2
Auxiliary Spillway Width	200’	400’
Principal Spillway Elevation	948.2	953.1
Principal Spillway Pipe	30”	Bore and jack a new 54” spillway conduit through the

		embankment and abandon the existing conduit in place

*All units in US feet.

Other possible alternatives to be evaluated:

- Future without federal project. This alternative looks at what to do with the area if federal funds are not available. This could mean either upgrading the dam to state criteria or removing the dam because it does not meet state standards.
- Non-structural Alternative – This option looks at protecting houses downstream or buying out downstream affected property. Typically, it requires purchasing easements downstream to restrict future development downstream.
- Decommission – Remove the sediment and enough of the embankment to restore the channel to pre-dam conditions. This is usually an expensive option.

PUBLIC COMMENTS/QUESTIONS

Question from Eugene Kester (NRCS): The dams were originally designed for fifty years. If we go ahead and do this project, will that double the design life to 100 years?
Larry Sample: We were contracted to design for another 50 years. If you set sediment capacity at another fifty years, then we are only giving that reservoir design life another 50 years. Since parts of these structures are made of concrete, earth, and rock building materials, we could claim a 100-yr design life provided there was enough sediment storage. Basically, we can extend the design life by avoiding using lesser materials such as corrugated metal pipe.

Comment from Eugene Kester (NRCS):
There are lot of low water crossings downstream of Sallisaw 13 and 19. Some of the 2010 assessment mentioned raising the PSW from 36" pipe to 60" pipe. I can say from experience that this causes the water to hit/overtop the downstream small crossings very hard, which damages them.
Larry: These 2010 are just suggestions of designs. We will consider safety at downstream crossings when we revise the design alternatives. Typically, we would look at using an impact basin to help with the velocity and the danger of bridges being overtopped.
Sarah: I would like to add that the modelling techniques today offer a more complete view of the water behavior than the best-practice techniques that were available in 2010. We will look into the effect on the low road crossing when developing the final alternatives.

Question from Eugene Kester (NRCS):

This project will put potentially 3-5 million dollars on the landowners' properties. Will this increase the property tax value and increase property taxes?
Larry: I'm not sure. You would need to consult someone more familiar with tax law.

Question from Eugene Kester (NRCS):
This is a federal easement, correct?
Larry: It's a local conservation district – not the federal government.

Question from Eugene Kester (NRCS):
The cost split is 75% federal money to 25% state money?
Larry: Nowadays its 65% federal to 35% state money. One thing you may want to look out for is that any purchasing of easements is 100% on the sponsor. Typically, any of the land acquisition cost counts toward the 35% match. The cost of getting the easements depends on the local feeling toward the dam. Sometimes the landowner may want the dam on their property for recreation. In this case, purchasing easements is usually not very expensive. I've seen some people transfer an easement for some low cost, like $1, if the landowner was in favor of having the dam constructed.

Question from Beverly Rainwater Sturgis (property owner)
Can we get copies of your PowerPoint slides?
Larry Sample: Yes, but we need to get permission through NRCS first.

Question from Eugene Kester (NRCS):
Who do we contact with questions?
Larry Sample: You can contact me and I would be happy to try to answer whatever questions you have, but it would probably be better to contact, Scott Hobart, the project manager.
Eugene Kester (NRCS): I know Scott and we will get in contact with him for you if you go through our NRCS office.

Comment by Larry Sample (Presenter):
We will be offering another meeting in October to share progress on the project and get your public feedback. I was a bit concerned with how the October meeting will turn out if we need to be outside again due to Covid-19. We may look into doing the October meeting virtually because of this. In a virtual meeting, you would see the same presentation format. We will send out a letter, a newspaper notice, and we will try to send out email invitations with information about the meeting. We have the emails of everyone who attended this meeting on our sign-up sheet.

Larry: Any other questions?

MEETING MINUTES

Beverly Rainwater Sturgis (property owner):
If these dams had not been moved to a high hazard classification, then what would you do then?
Larry Sample: At any point after a dam's design life it could be withdrawn from the federal program. The conservation district would need to talk with the federal program to either re-enroll it, or it would be removed from the federal program. But even if the dam is removed from the federal program, it would still be subject to state standards. Which would mean that you would be looking at a lot of the same types of alternatives except you would need to design to state standards rather than federal standards. Options would be to have the dam modified to meet state standards, do a non-structural option (which is purchasing downstream property), or decommissioning the dam.

[pause]

Larry Sample (cont.): Typically, most dams (85%-90%) have not silted anywhere close to full by the end of their design life, so re-enrollment happens frequently.

[General talk among the attendees about how the Sallisaw dams silt unevenly.]

Eugene Kester (NRCS): On the upstream of the dam there is a pool that is 17 ft deep *(editor note: which site Eugene was talking about is unknown at the time of writing).*

Beverly Rainwater Sturgis (property owner):
When you decommission a dam, do you take the whole thing out?
Larry Sample: We would not necessarily take the whole thing out but would remove enough of it to restore the channel to pre-dam conditions.
Beverly Rainwater Sturgis: Then how would you take care of the downstream flooding if the dam was removed?
Larry Sample: You don't. The cost of the flooding would be factored into the cost-benefit decision of whether to remove the dam or not. If you decommission the dam, you might need to compensate property owners downstream by floodproofing their homes, buying an easement, or something similar.

No more comments or questions. Meeting ended.

MEETING MINUTES

Project: **Sallisaw Creek Dam 13 and Dam 19**
Date: 11/30/2021 – 6:30 PM
Location: Sallisaw Conservation District
Indian Capital Technology Center, 470826 E 810 Rd, Stilwell, OK 74960
+ Live Virtual Stream on MS Teams

Presenting:

Larry Sample, PE	Wood, Subconsultant to Conservation Works
John Wrona, PE	Wood, Subconsultant to Conservation Works

Attendees:

*Sarah Wenzel	CWJV
*B. Sturgis	Property Owner
*Tammy Sawatzky	OK Conservation District
*Richard Lane	NRCS
*Tashina Kirk	NRCS
*April Burns	NRCS
*Rick Lane	NRCS
*Ted Kersten	NRCS
*Danica Deen	NRCS
**Paul Rainwater	Property Owner
Eugene Kester	Adair County Conservation District
Dustin Alexander	Adair County Conservation District
Ashley Mann	Adair County Conservation District
Andy Inman	Adair County Conservation District
Butch & Suzie Ogden	Property Owner
David & Karen Dotson	Property Owner
Nikki & Stetson Starr	Property Owner
Lillian Knight	Property Owner

*Denotes Virtual Participant
**Denotes participant that left approximately halfway through.

Prepared by: John Wrona – Conservation Works / Wood
Attachments: *Sign-In Sheet, Powerpoint presentation*

The public meeting was held in the Indian Capital Technology Center conference room in Stilwell, Oklahoma, on November 30th, 2021, at 6:30pm. The meeting was led by Larry Sample of Wood, the public participation lead of the Sallisaw Creek Watershed Site 13 and Site 19 proposed planning project. The meeting was conducted using PowerPoint slides by Larry Sample (Wood) followed by a question-and-answer session for involved landowners and stakeholders of the proposed project.

MEETING MINUTES

The purpose of this meeting was to present design alternatives and receive public and stakeholder input on those alternatives with a goal of reaching a preferred alternative. The design options included: 1. Future without Project; 2. Decommissioning; 3. Non-structural; and 4. Rehabilitation to high hazard criteria. The identification of a preferred alternatives is a needed to proceed with preparation of the draft environmental document.

The following minutes express our understanding of the items discussed. Please respond in writing within five days of receipt if any changes are required.

Discussion:

Mr. Sample discussed with group that another virtual meeting may be held due to letters not being sent out for this meeting. He reviewed project objectives, project authorization, and the alternatives considered.

Discussed having communication with all agencies including the Corp and OWRB.

Mr. Sample cited several examples of what could occur if reservoir water surface elevation gets too high including local wells upstream of Site 19 being inundated and potential loss of life if the dam breaches.

Discussed Site 19 and the land ownership differences between it and Site 13.

Concerns of Local Native American tribe on the land of the tribe that may be impacted if the permanent pool is raised.
Previous concerns brought up by stakeholders were the water potentially covering a well and the potential for erosion if a large pipe is used in the final design. These concerns are being considered in the design recommendations.

Both dams fall under the Corp of Engineers Categorical Exclusions because they are being proposed as rehabilitation projects rather than new construction or expansion.

Both dams were classified as high hazard in the mid 2000's. The high hazard classification implies that if the dams breach there is a potential threat of loss of human life downstream. He noted that the high hazard classification is not a reflection of the condition of the dam but only a reflection of the consequences if the dam were to breach.

Discussed the that the evaluation of flood control benefits provided by each dam are in process. The benefit area studied is from each Site downstream to an area just south of Marble City.

Showed drainage area, time of concentration and land use conditions associated with each of the dams.

Discussed sediment volume associated with the dams of which a 100-yr design sediment volume was calculated.

MEETING MINUTES

- Discussed 4 alternatives:
  - Future without project
    - No federal funds would be used for this
    - The dam would be breached for not meeting High hazard criteria
    - Flood control benefits would be lost
  - Decommissioning
    - Dam would be removed, and floodplain would be restored to its original state
    - Flood control benefits would be lost.
  - Rehab Design
    - Tried to keep the permanent pool and top of dam at current elevations.
    - Evaluated three options for each dam
  - Non-Structural Alternative
    - This alternative is associated with the hazards downstream in either raising the road, increasing home elevations, or building features to protect areas.
    - Could involve a lot of easements needing to be attained.

Based on public input from a prior meeting, there is likely going to be limited easement availability. Public input was a critical factor in trying to keep the top of the dams at the same elevations they are currently at.

For the future without project alternative, Mr. Sample described it as a baseline alternative.

Discussed high hazard design criteria associated with utilizing a PMP storm event which was on the order of +30" of rainfall.

Discussed 3 alternatives for rehab of Site 13 which included replacing the principal spillway pipe, lowering and widening the auxiliary spillway, and boring and jacking a new principal spillway pipe.

Discussed 3 alternatives for rehab of Site 19 which included replacing the principal spillway pipe, lowering and widening the auxiliary spillway, and excavating and replacing the new principal spillway pipe due to the pipe size being larger than 54". A bore and jack option was considered for Alternative 3 with a 48" principal spillway conduit which differs from the prior two alternatives of Site 19. Alternative 3 also includes the use of an RCC spillway.

Question: If they dig out the dam to replace the spillway pipe, does a cofferdam get installed? Response: Yes, a cofferdam will be used, water surface elevation will likely decrease in order to control the potential flooding. Boring and jacking on a dam with seepage issues is not typically a safe option. During a bore and jack option, they do typically drain the reservoir and use a cofferdam to help control the water. The safest way to perform rehabilitation is to partially or fully drain the reservoir. How and when the dam would be drained for construction is determined by the contractor after a thorough site visit.

MEETING MINUTES

Discussed what RCC is (roller compacted concrete), high strength concrete placed in layers. Several configurations of this RCC spillway were considered. It is better for maintenance to design the auxiliary spillway as far south as possible for easier access to Site 19.

Discussed relation to water well upstream of Site 19 that could be inundated when the reservoir water level approaches the current auxiliary spillway crest elevation. By increasing the PSW and ASW size and lowering the auxiliary spillway crest the water well is much less likely to ever be inundated.

Also discussed rehabilitation alternatives that were considered but ultimately eliminated from consideration due to cost and/or the practicality in meeting the purpose and need of the project.

Questions: What does it mean when land acquisition is 100% on sponsor.
Response (April): That cost can be applied to the 35% of cost that is provided by the sponsor.

Discussed how future without project for both options does not consider the loss of flood control benefit.

For Site 13 the most economical alternative that meets the purpose and need of the project is the high hazard rehabilitation alternative. CWJV is recommending this alternative as the preferred alternative. For construction, engineering, admin, and land acquisition the estimated cost for the high hazard rehabilitation alternative is $1.6 million.

For Site 19 the most economical alternative that meets the purpose and need of the project is also the high hazard rehabilitation alternative. CWJV is recommending this alternative as the preferred alternative. For construction, engineering, admin, and land acquisition the estimated cost for the high hazard rehabilitation alternative is $5.4 million.

Discussed that the schedule for this project is slightly behind with the initial plan EE (Environment Evaluation to be sent at end of December or first part of January. The current engineer recommendation is to move forward with the high-hazard preferred alternative for both Site 13 and Site 19. The benefit-cost alternatives are not available yet, but it is coming soon. The action to be taken moving forward will be decided by the sponsors once all benefit-cost information is available.

Question: How many projects has Wood had on Sallisaw Creek?
Response: Mr. Sample has completed several projects associated with assessments and one design. 5 total sites have been rehabilitated in Sallisaw Creek Watershed. These are CWJV's first two planning projects for Sallisaw Creek Watershed.
Follow up: How many more projects are left?
Response: Mr. Sample discussed the series of projects that typically take place during these types of projects for clarity. It is anticipated that approx. 3 years of time until construction could start for Site 13 & Site 19.

Question: On these dams, do you typically have to get additional ROW?

MEETING MINUTES

Response: Sometimes, but it is typically based on whether the top of dam or permanent pool is raised which would require additional ROW due to new dam footprint or permanent pool backing up.

Question: Clarification, for Site 19, the top of dam and permanent pool will not be raised?
Response: Yes, neither will be raised.

Question/comment: Live near Site 19, there has been a large amount of sediment added to the dam over the years. Can dredging be done or considered an alternative?
Response: Typically, this is considered during the design phase but tends to be expensive due to sediment having to be dredged and disposed of (sometimes as a hazardous material). Discussed the design life of the dam due to sediment of the dam, and the estimate of the sediment life of the dam is estimated to be 100-years based on bathymetric survey.

Question/comment: Biggest concern for landowners is that on Site 19 whether landowners have responsibility of cost for existing and proposed easements.
Response: April & Team will review existing easements to see if additional easement is needed. Because this was brought up as a concern in the first public meeting, CWJV only considered rehabilitation alternatives that did not raise the top of dam elevations in an attempt to eliminate the need for the Sponsor to obtain additional easements. This was taken into account for all alternatives developed. The current easements are needed for typical O&M of the dam as well.

Discussed with NRCS about providing an additional meeting based on current attendance of meeting.

Meeting was concluded at ~07:40 PM

Attachments:
1. Attendee Sign-in Sheet
2. PowerPoint slides

MEETING SIGN-IN SHEET

Project:	Sallisaw Creek Watershed Flood Control Site #13 & Site #19	**Meeting Date:**	November 30, 2021
Facilitator:	Adair County Conservation District / NRCS / Conservation Works	**Place/Room:**	ICTC Seminar Center, Stilwell, OK 74960

Name	Address & Phone Number	E-Mail
Eugene Kester	ACCD 468670 Hwy 100 west 918-696-3563	Adair ccd@conservation.gov
Dustin Alexander	ACCD 468670 Hwy 100 west 918-696-3563	Adair ccd@conservation.gov
Ashley Mann	ACCD 468670 HWY 100 918 6963563	ashley.mann@conservation.ok.gov
Andy Inman	ACCD Board director	
Butch + Suzie Ogden	469324 E 850 Rd 918-696-2085	
David + Karen Dotson	86502 S. 4694 Rd 918 [redacted] 575-1349	dKdotson05@gmail.com
Nikki + Stetson Starr	P.O. Box 1417 Stilwell, OK 74960	(918) 575-0501
Lillian Knight	85201 S. 4735 Rd. Stilwell, OK 74960	(918) 696-0739

Scott R. Hobart

From: Mann, Ashley - NRCS, Stilwell, OK <Ashley.Mann@usda.gov>
Sent: Thursday, December 9, 2021 2:17 PM
To: Scott R. Hobart; Burns, April - NRCS, Stillwater, OK
Cc: Lane, Richard - NRCS, Stillwater, OK; scott.taylor@woodplc.com; Sample, Larry
Subject: RE: [External Email]Sallisaw - S13 & S19 - Sponsor Preferred Alternative consideration

Scott,

Today the board of directors selected and approved Alternative 3 as the Sponsor Preferred Alternative.

Let us know if you need anything else from us.

Thanks,
Ashley Mann

From: Scott R. Hobart <srhobart@mstutz.com>
Sent: Thursday, December 2, 2021 12:48 PM
To: Mann, Ashley - NRCS, Stilwell, OK <Ashley.Mann@usda.gov>; Burns, April - NRCS, Stillwater, OK <april.burns@usda.gov>
Cc: Lane, Richard - NRCS, Stillwater, OK <richard.lane@usda.gov>; scott.taylor@woodplc.com; Sample, Larry <larry.sample@woodplc.com>
Subject: [External Email]Sallisaw - S13 & S19 - Sponsor Preferred Alternative consideration
Importance: High

[External Email]
If this message comes from an **unexpected sender** or references a **vague/unexpected topic;**
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Ashley,

We need the Sponsor to confirm that the Rehabilitation, Alternative 3 on both Sallisaw S13 and S19 we are working with is the Sponsor Preferred Alternative. We are asking for a quick consideration. If we can get a yes from the Board early next week, that should allow finishing the benefits analysis before Christmas to allow finishing Phase III before Christmas.

Attached are Cost Estimates for the various alternatives, SITES Narratives of modeling analysis, and conceptual plan layout sheets showing the Alternative 3 from the SITES modeling. These documents show what was included in the final public meeting earlier this week, but have updated quantities and costs for the RCC armoring of S19.

On the two Sallisaw dams we started out by modeling the 2 suggested alternatives from the 2010 Rehabilitation Assessment Reports (basis of Alt 1 and Alt 2 from the SITES Narratives). The suggested alternatives were showing to lower the top of dams because of lower sedimentation shown from our bathymetric surveys than what was assumed in the reports. On S19, when we started keeping the PSW crest at existing elevation to accommodate existing property owner requests to not require additional easements the dam was still showing to be lowered. This would have resulted in additional construction cost that was not necessary. This was with the maximum ASW 400' width that OK NRCS has said is acceptable on other dam projects. Then we started looking at smaller replacement diameters on the PSW conduit and not lowering the ASW crest as much to iteratively find the minimal amount of cut necessary on the ASW to pass the design storms and meet the OWR check with freeboard.

In our opinion this is the lowest potential construction cost to meet the purpose and need because it is the least amount of dirt work and does not add any mitigation or environmental concerns upstream because it keeps the current top of dam and PSW permanent pool crest elevation the same on both dams. S13 is similar in approach, except we also varied the ASW width in addition to the crest elevation to achieve a reasonable velocity for a rock bottom ASW because it was observed on site that the existing ASW is cut into a rock hillside. So, the less rock cut excavation that occurs, the lower the cost. Both dam sites have minimal environmental and mitigation costs by keeping the top of dam and PSW crest elevations the same as currently exists. This also results in the least increase in downstream design flow impacts to downstream road crossings and PDL's as possible.

The only alternative shown to have a lower cost than the Rehabilitation, Alternative 3 for each dam is the Future Without Project (FWOP), which is essentially a Sponsor paid for (no Federal involvement) breach of the dams to remove their breach wave potential. The FWOP doesn't meet the purpose and need to prevent/reduce downstream flooding, so there would be additional/increased flood damages downstream and additional risk that are not a part of the cost estimate.

Please let me know if there are any questions that need to be answered to make this decision. We would be happy to have a Teams meeting to discuss if needed, or board members could be added to the monthly NRCS meeting on next Wednesday, Dec. 8th.

Thank you,

Scott R. Hobart, P.E.
CONSERVATIONWORKS Joint Venture **| Project Manager**
3116 N. Dries Lane Suite 100 **|** Peoria, IL 61604
Ph: (309) 693-7615 **|** Fax: (309) 693-7616
Email: srhobart@mstutz.com **|** Website: www.mstutz.com
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Scott R. Hobart

From: Burns, April - NRCS, Stillwater, OK <april.burns@usda.gov>
Sent: Monday, September 13, 2021 9:35 AM
To: Mann, Ashley - NRCS, Stilwell, OK; Scott R. Hobart
Cc: Sample, Larry
Subject: RE: Easements-Watershed Site 19

Thank you Ashley. We are not sure yet if the original easements will be enough to cover but we will continue to move forward with the planning and take this into consideration.

Thank you!
April

From: Mann, Ashley - NRCS, Stilwell, OK <Ashley.Mann@usda.gov>
Sent: Monday, September 13, 2021 9:31 AM
To: Burns, April - NRCS, Stillwater, OK <april.burns@usda.gov>; Scott R. Hobart <srhobart@mstutz.com>
Cc: Sample, Larry <larry.sample@woodplc.com>
Subject: Easements-Watershed Site 19

Mornin',

I just got off a phone call with Beverly Sturgis. She asked about the easements that were talked about at last Thursday's public meeting.
Her question was will the old easements be used only for maintenance or are they going to be included in this new project. She said property ownership was handed down to the children of Margaret Rainwater. There new deeds on file for that as well.

Long story short; the landowners (Rainwater Family) will not sign any new easements for this project. She was very kind and understanding that everyone is just doing their jobs, but she said out of respect for their parents, the children will not sign.

Let me know if there is anything I need to do. I told her I would forward her questions and wishes to you all.

Thanks,

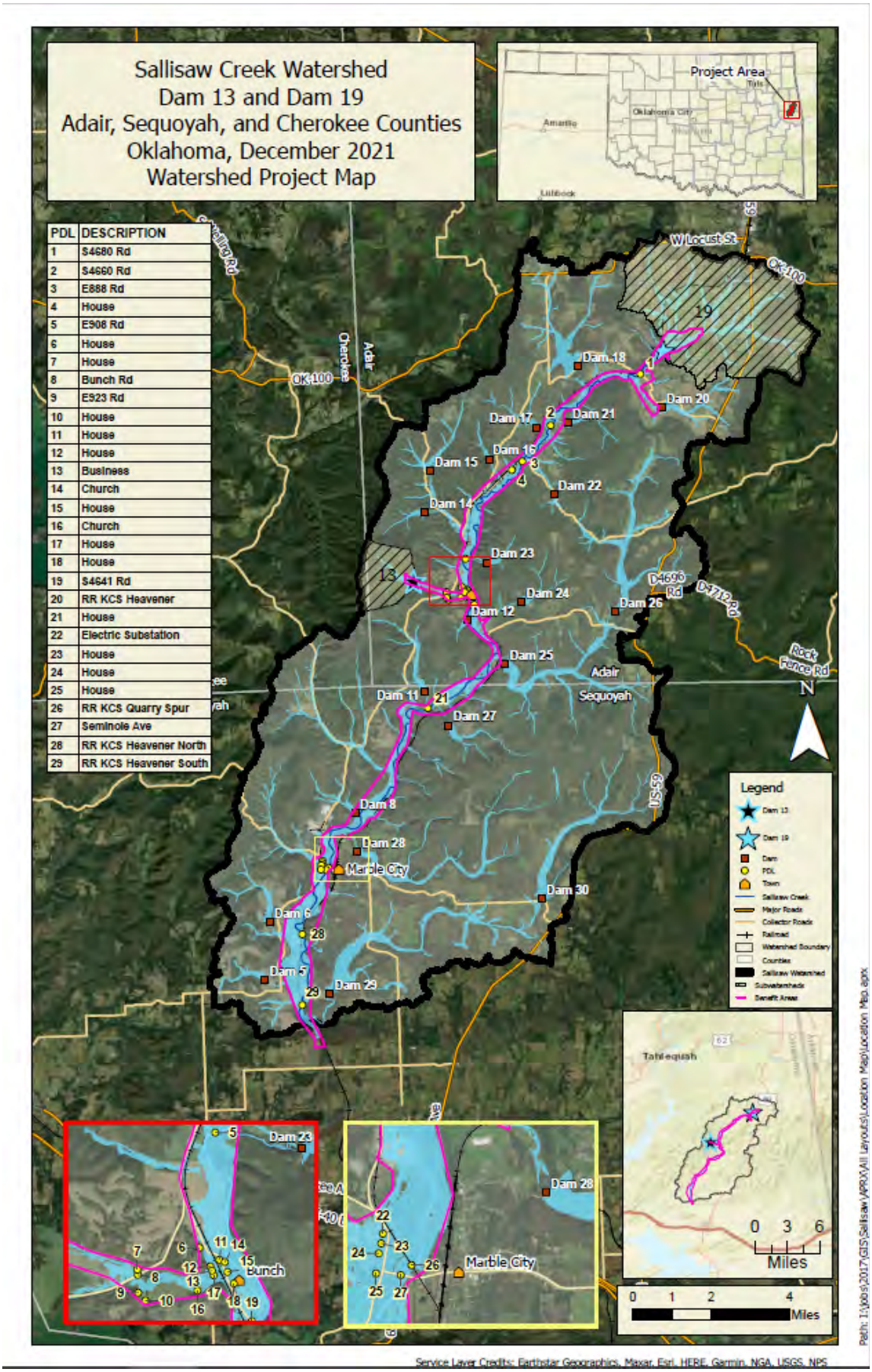
Ashley Mann

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Appendix B

Watershed Project Map

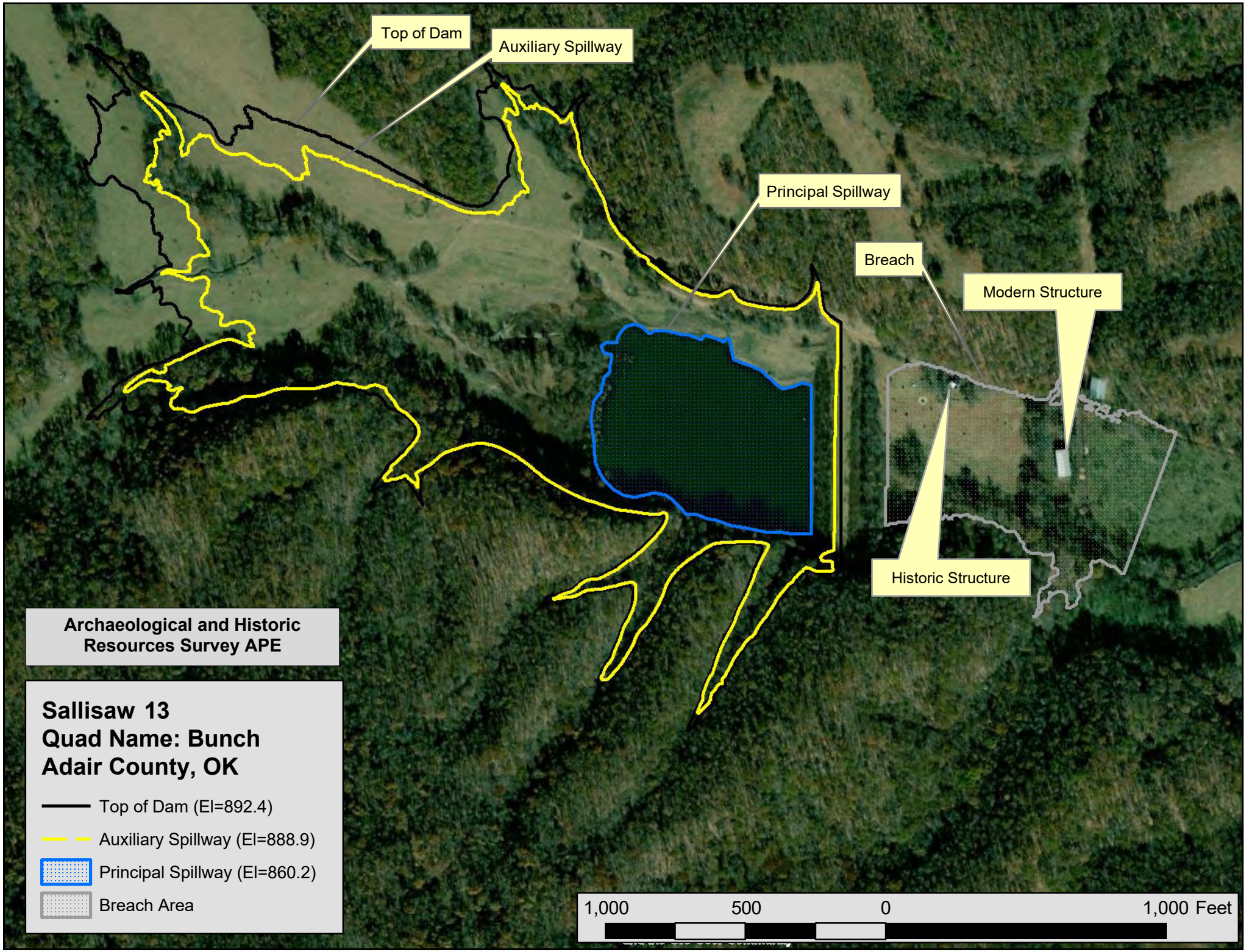

Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Watershed Project Map
Project Area
Tulsa
Oklahoma City
Amarillo
Lubbock
PDL DESCRIPTION
1 S4680 Rd
2 S4660 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
W Locust St
OK-100
Cherokee
Adair
Dam 18
Dam 20
Dam 17
Dam 21
Dam 16
Dam 15
Dam 22
Dam 14
Dam 23
Dam 24
Dam 12
Dam 26
D4696 Rd
D4712 Rd
Rock Fence Rd
Dam 25
Adair
Sequoyah
Dam 11
Dam 27
US-59
Dam 8
Dam 28
Marble City
Dam 30
Dam 6
Dam 7
Dam 29
Legend
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Collector Roads
Railroad
Watershed Boundary
Counties
Sallisaw Watershed
Subwatersheds
Benefit Areas
Tahlequah
0 3 6
Miles
0 1 2 4
Miles
Bunch
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
Path: I:\jobs\2017\GIS\Sallisaw\APRX\All Layouts\Location Map\Location Map.aprx

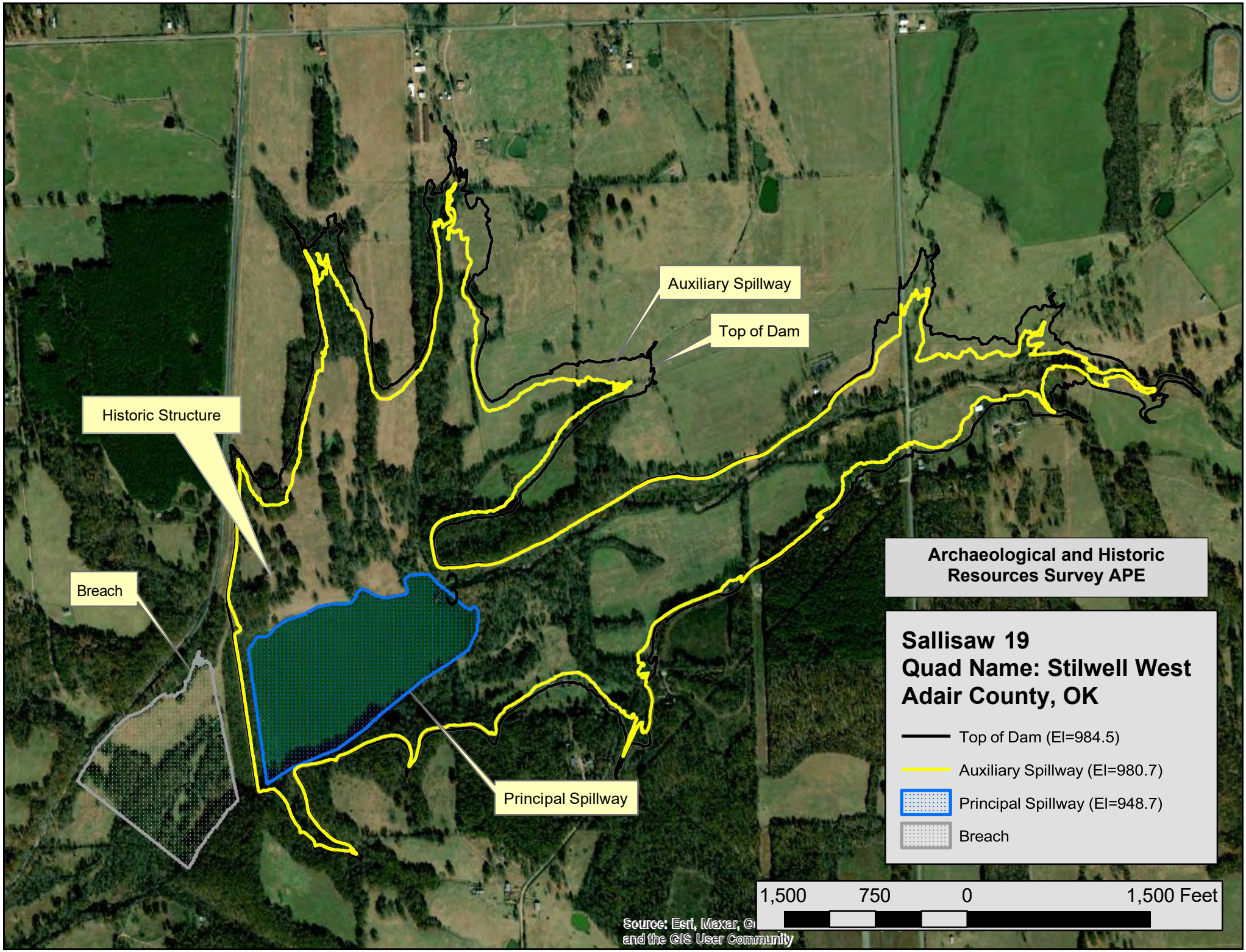
Appendix C

Support Maps

Archaeological and Historic Resources Survey APE 1-2
Preliminary Plat Maps 1-2
Preliminary Concept Plans- S13 & S19 1-4
Breach Inundation Maps
- S13 Hydrologic Breach Maps 1-12
- S13 Static Breach maps 1-12
- S13 Seismic Breach maps 1-12
- S19 Hydrologic Breach Maps 1-12
- S19 Static Breach maps 1-12
- S19 Seismic Breach maps 1-12

Flood Inundation Maps, 100-yr and 500-yr
- S13 Inundation Area (100-Yr Recurrence Interval) 1-12
- S13 Inundation Area (500-Yr Recurrence Interval) 1-12
- S19 Inundation Area (100-Yr Recurrence Interval) 1-12
- S19 Inundation Area (500-Yr Recurrence Interval) 1-12


Top of Dam
Auxiliary Spillway
Principal Spillway
Breach
Modern Structure
Historic Structure
Archaeological and Historic Resources Survey APE
Sallisaw 13
Quad Name: Bunch
Adair County, OK
Top of Dam (El=892.4)
Auxiliary Spillway (El=888.9)
Principal Spillway (El=860.2)
Breach Area
1,000
500
0
1,000 Feet


Auxiliary Spillway
Top of Dam
Historic Structure
Breach
Principal Spillway
Archaeological and Historic Resources Survey APE
Sallisaw 19
Quad Name: Stilwell West
Adair County, OK
Top of Dam (El=984.5)
Auxiliary Spillway (El=980.7)
Principal Spillway (El=948.7)
Breach
1,500 750 0 1,500 Feet
Source: Esri, Maxar, G
and the GIS User Community

Sallisaw Creek Watershed
S-13
Adair County
Preferred Alternative
March 2022

Legend

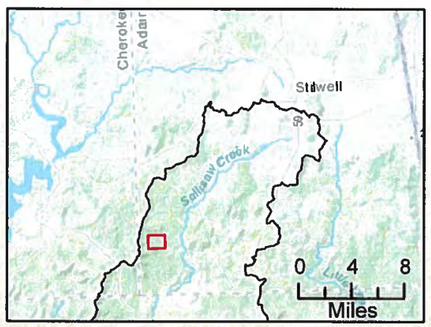
- Proposed Principal Spillway
- Proposed Wave Protection
- Proposed Auxiliary Spillway
- Parcels
- Elev. of EX Auxilary Spillway (888.5)
- Township Lines
- 20 ft. Ground Contours
- Elev. of PR Auxiliary Spillway (884.7)
- Elev. of Principal Spillway (860.2)
- Elev. of Top of Dam (892.4)

N

0 500 1,000

Feet

Disclaimer: Property lines are approximated & intended for visual reference only. Contour elevations are based on preliminary design for high hazard criteria. Subject to change.



CONSERVATIONWORKS JOINT VENTURE

State of Oklahoma

Knight, Harold

Knight, Harold

State of Oklahoma

State of Oklahoma

Tibbits, Lee A. & Louise N.

Service Layer Credits: Texas Parks & Wildlife, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Watershed Delineation Project\Archive\WSDelin_01kec.aprx

Sallisaw Creek Watershed
S-19
Adair County
Preferred Alternative
March 2022

Legend

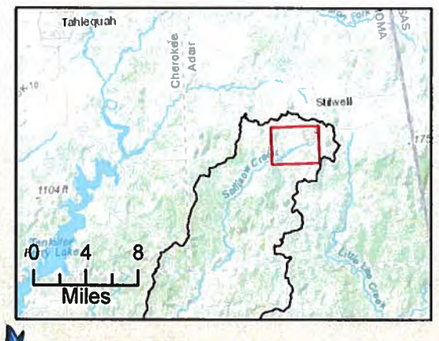
- Proposed Principal Spillway
- Proposed Wave Protection
- Proposed Auxiliary Spillway
- Parcels
- EX Aux. Spillway To Be Decommissioned
- Elev. of EX Auxiliary Spillway (980.2)
- Township Lines
- 20 ft. Ground Contours
- Elev. of PR Auxiliary Spillway (974.8)
- Elev. of Principal Spillway (948.7)
- Elev. of Top of Dam (984.5)

N

0 1,000 2,000 3,000

Feet

Disclaimer: Property lines are approximated & intended for visual reference only. Contour elevations are based on preliminary design for high hazard criteria. Subject to change.



CONSERVATIONWORKS JOINT VENTURE

Rainwater. Paul W. C/O Beverly Sturgis
Ogden, Roy Jr & Sue Ogden (Trustees) Revoc Trust 12/17/2008
Rainwater. Paul W. C/O Beverly Sturgis
Minton, Trenna P
Sixkiller, Marvin J
Boecher, Donna Ruth (Trustee) Donna Ruth Boecher Trust 10/11/2011
Liberty Baptist Church
Dotson, David
Starr, Rex Earl & George David
Sturgis, Beverly Rainwater, Trustee for Revocable Trust
Rainwater, Brian H. C/O Beverly Sturgis
Starr, James Colbert
Starr, Rex
Harris, Madelyn J (Trustee) Trus Floyd Harris Revoc Trust
Sturgis, Beverly Rainwater Trustee of Revocable Trust
Rainwater, Paul W. C/O Beverly Sturgis
Starr, Joyce & David 1/2 Int
Rocking, JF, LLC.
Starr, Jon Douglas
Caviness, Jerry W
Rocking, JF, LLC
Rainwater, Paul W. C/O Beverly Sturgis
Rathjen, Henry D Jr
Mays, D J & Nelma - Trustees
Cherokee Nation
Campbell, R.C., Rhonda James &
Burton, Dean & Yalonda Burton
Campbell, David Lee
Brackeen, Jared
Campbell, David Lee
Connaly, Mike & Kim
Fletcher, Orpha C/O Neil & Ron Fletcher
Dewey, Margaret Eileen Dotson
Sturgis, Beverly Rainwater Trustee of Revocable Trust
Campbell-Kirsch, Rhonda
Rocking, JF, LLC

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Watershed Delineation Project\Archive\WSDelin_01kec.aprx

Service Layer Credits: Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, Maxar

N

0 100' 200'

BAR SCALE IN FEET

PRELIMINARY
20 January 2022

SCALE VALID ONLY ON
22"x34" SIZE PLANS

DESIGNED BY: DNF	DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB	OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE	NOVEMBER 2021
APPROVED BY: SRH	NOVEMBER 2021

SHEET TITLE: **S13 - SITE PLAN**

PROJECT: **S13 & S19 WATERSHED**

CLIENT: **SALLISAW 13 AND 19**

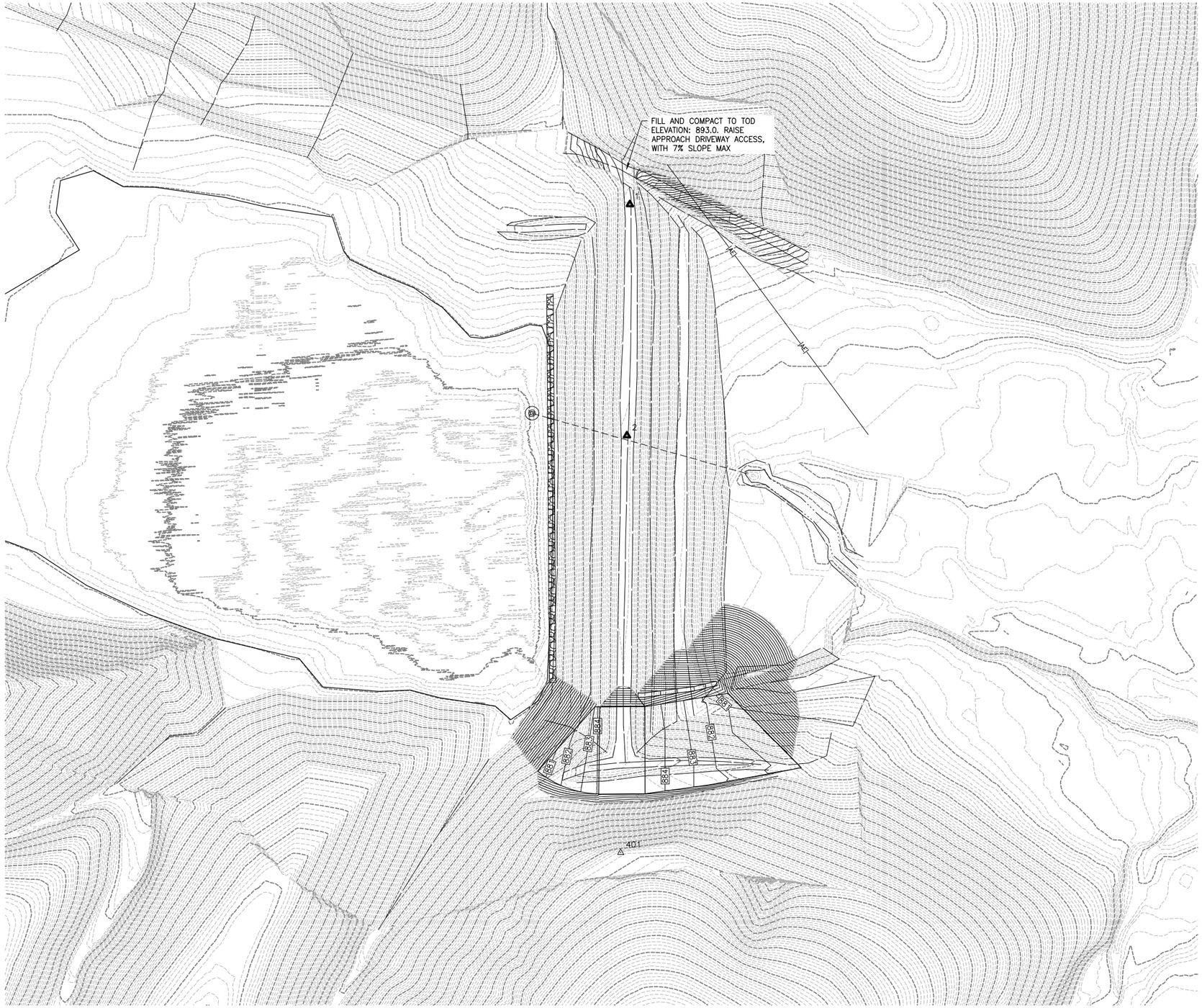
NRCS
United States Department of Agriculture Natural Resources Conservation Service

PROJECT NO.: 23121008.00

SHEET: C101

SHEET OF

S:\23\2021\23121008.00 (Sallisaw 13 & 19 NRCS OK)\Cadd\23121008.00_base.dwg 1/20/2022 8:13 AM



S13 DAM

TOD = 892.3 FT
SIDE SLOPES = 3:1

SEDIMENT = 863.5 FT

PRINCIPAL SPILLWAY
PSW = 860.2 FT
WEIR LENGTH = 11.78 FT
30"ø BARREL CONDUIT
BARREL LENGTH = 285 FT
OUTLET EL = 844.0

AUXILIARY SPILLWAY
ASW = 884.7 FT
ASW WIDTH = 120 FT
ASW VEL = 8.9 FPS
ASW INLET SLOPE = 3.0%
ASW OUTLET SLOPE = 3.0%

DOWNSTREAM BENCH = 869.4
BENCH WIDTH = 15 FT

MATERIAL QUANTITIES

4000 CY TOTAL CUT
14,500 CY TOTAL FILL (5% SETTLEMENT INCLUDED)

SEEDING AREA (ASW) = 70,000 SF

WAVE PROTECTION
RIP RAP: 550 CY = 900 TONS
BEDDING QUANTITY: 275 CY = 440 TONS
GEOTEXTILE FABRIC: 7200 SF = 800 SY

IMPACT BASIN
CONCRETE VOLUME: 45 CY
REBAR QUANTITY: 6700 LBS
RIP RAP: 75 CY = 180 TONS
BEDDING QUANTITY: 18 CY = 40 TONS

RAISE NORTH ABUTMENT
210 CY TOTAL FILL
200 CY GRAVEL (6" THICK)

DECOMMISSIONING MATERIAL QUANTITIES

130,400 CY TOTAL CUT

SEEDING AREA = 391,000 SF

SPONSOR BREACH MATERIAL QUANTITIES

33,000 CY TOTAL CUT

SEEDING AREA = 56,100 SF

POINT TABLE				
POINT ID	DESCRIPTION	ELEVATION	NORTHING	EASTING
1	103 / 3/8" ROD	893.53	265730.7590	2923579.2220
2	103 / 3/8" ROD	894.20	265413.2630	2923575.1080
401	104 / CONC MARKER	933.69	264839.8930	2923566.6140

N

0 75' 150'

BAR SCALE IN FEET

PRELIMINARY
20 January 2022

SCALE VALID ONLY ON 22"x34" SIZE PLANS

DESIGNED BY: DNF	DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB	OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE	NOVEMBER 2021
APPROVED BY: SRH	NOVEMBER 2021

SHEET TITLE: **S13 GRADING PLAN**

PROJECT: **S13 & S19 WATERSHED**

CLIENT: **SALLISAW 13 AND 19**

NRCS
United States Department of Agriculture Natural Resources Conservation Service

PROJECT NO.: 23121008.00

SHEET: C102

SHEET OF

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N

0 100' 200'

BAR SCALE IN FEET

PRELIMINARY
20 January 2022

SCALE VALID ONLY ON
22"x34" SIZE PLANS

DESIGNED BY: DNF	DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB	OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE	NOVEMBER 2021
APPROVED BY: SRH	NOVEMBER 2021

SHEET TITLE:
S19 - SITE PLAN

PROJECT:
S13 & S19 WATERSHED

CLIENT:
SALLISAW 13 AND 19

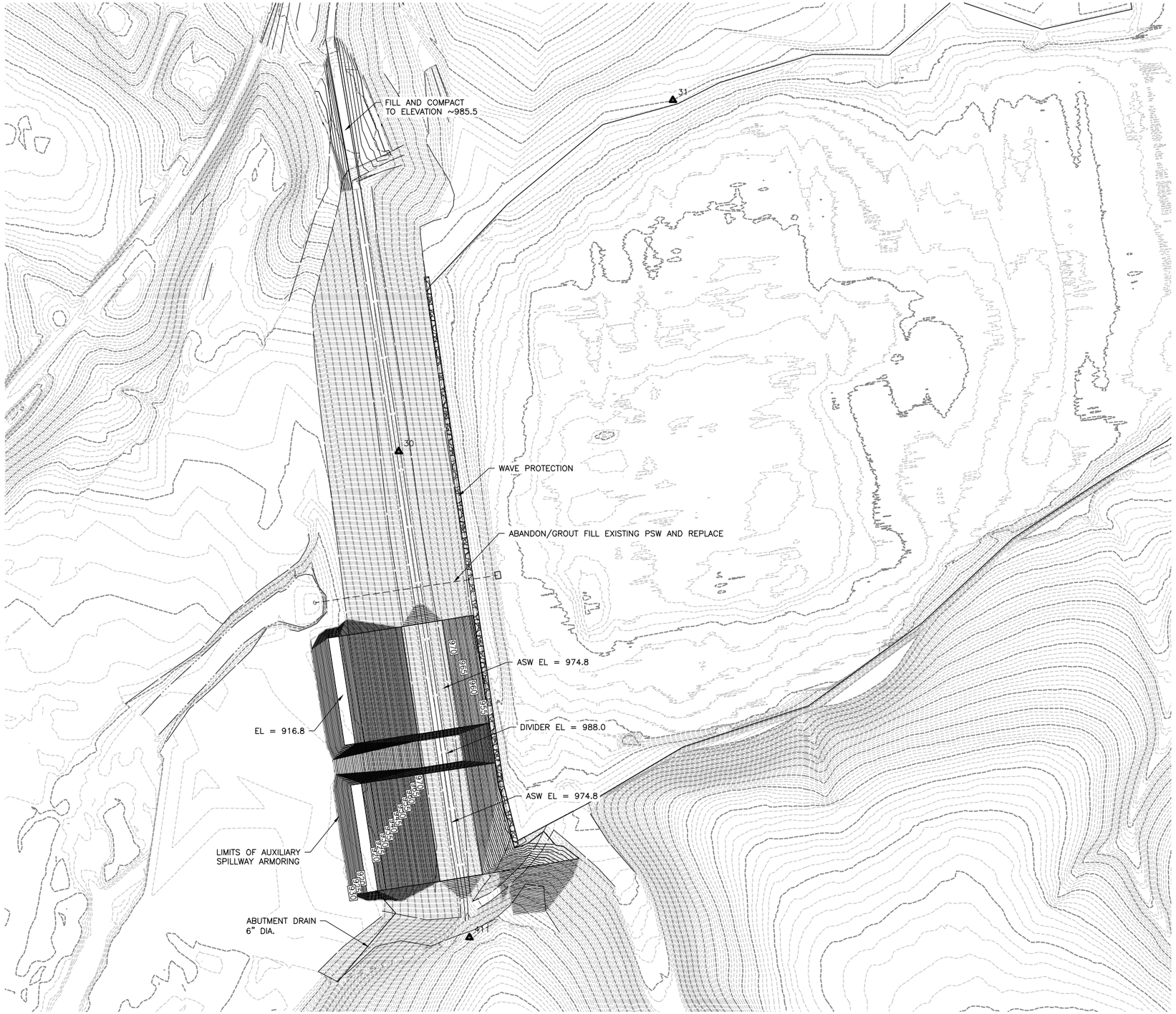
NRCS
United States Department of Agriculture Natural Resources Conservation Service

PROJECT NO.:
23121008.00

SHEET:
C101

SHEET OF

S:\23\2021\23121008.00 (Sallisaw 13 & 19 NRCS OK)\Cadd\23121008.00_base.dwg 1/20/2022 8:13 AM



S19 DAM

TOD = 984.5 FT
SIDE SLOPES = 3:1

SEDIMENT = 950.0 FT

PRINCIPAL SPILLWAY
PSW = 948.7 FT
WEIR LENGTH = 18.9 FT
48"ø BARREL CONDUIT
BARREL LENGTH = 340 FT
OUTLET EL = 928.0

AUXILIARY SPILLWAY
ASW = 974.8 FT
ASW WIDTH = 400 FT
ASW VEL = 10.8 FPS
ASW INLET SLOPE = 3.0%
ASW OUTLET SLOPE = 6.0%

MATERIAL QUANTITIES

51,000 CY TOTAL CUT (INCLUDING 18,000 FOR RCC)
8,600 CY TOTAL FILL (5% SETTLEMENT INCLUDED)

SEEDING AREA (EX ASW) = 23,000 SF

ROLLER COMPACTED CONCRETE = 18,000 CY

WAVE PROTECTION
RIP RAP: 1300 CY = 2100 TONS
BEDDING QUANTITY: 650 CY = 1050 TONS
GEOTEXTILE FABRIC: 11650 SF = 1300 SY

IMPACT BASIN
CONCRETE VOLUME: 80 CY
REBAR QUANTITY: 14,100 LBS
RIP RAP: 75 CY = 180 TONS
BEDDING QUANTITY: 18 CY = 40 TONS

ABUTMENT DRAIN, 6"ø: 220 LF

DECOMMISSIONING MATERIAL QUANTITIES

343,000 CY TOTAL CUT

SEEDING AREA = 555,000 SF

SPONSORSHIP BREACH MATERIAL QUANTITIES

54,500 CY TOTAL CUT

SEEDING AREA = 85,300 SF

POINT TABLE				
POINT ID	DESCRIPTION	ELEVATION	NORTHING	EASTING
30	103 / PRAIRIE 20	987.05	296682.8720	2957150.4140
31	103 / PRAIRIE BP 19	950.07	297330.2080	2957655.6050
411	103 / 1/2" ROD	1000.09	295787.5090	2957280.8670

N

0 100' 200'

BAR SCALE IN FEET

PRELIMINARY
20 January 2022

SCALE VALID ONLY ON
22"x34" SIZE PLANS

DESIGNED BY: DNF
DATE: OCTOBER 2021
QUALITY ASSURANCE BY: GCB
OCTOBER 2021
QUALITY CONTROL BY: L. SAMPLE
NOVEMBER 2021
APPROVED BY: SRH
NOVEMBER 2021

SHEET TITLE: **S19 GRADING PLAN**

PROJECT: **S13 & S19 WATERSHED**

CLIENT: **SALLISAW 13 AND 19**

NRCS
United States Department of Agriculture Natural Resources Conservation Service

PROJECT NO.: 23121008.00

SHEET: C102

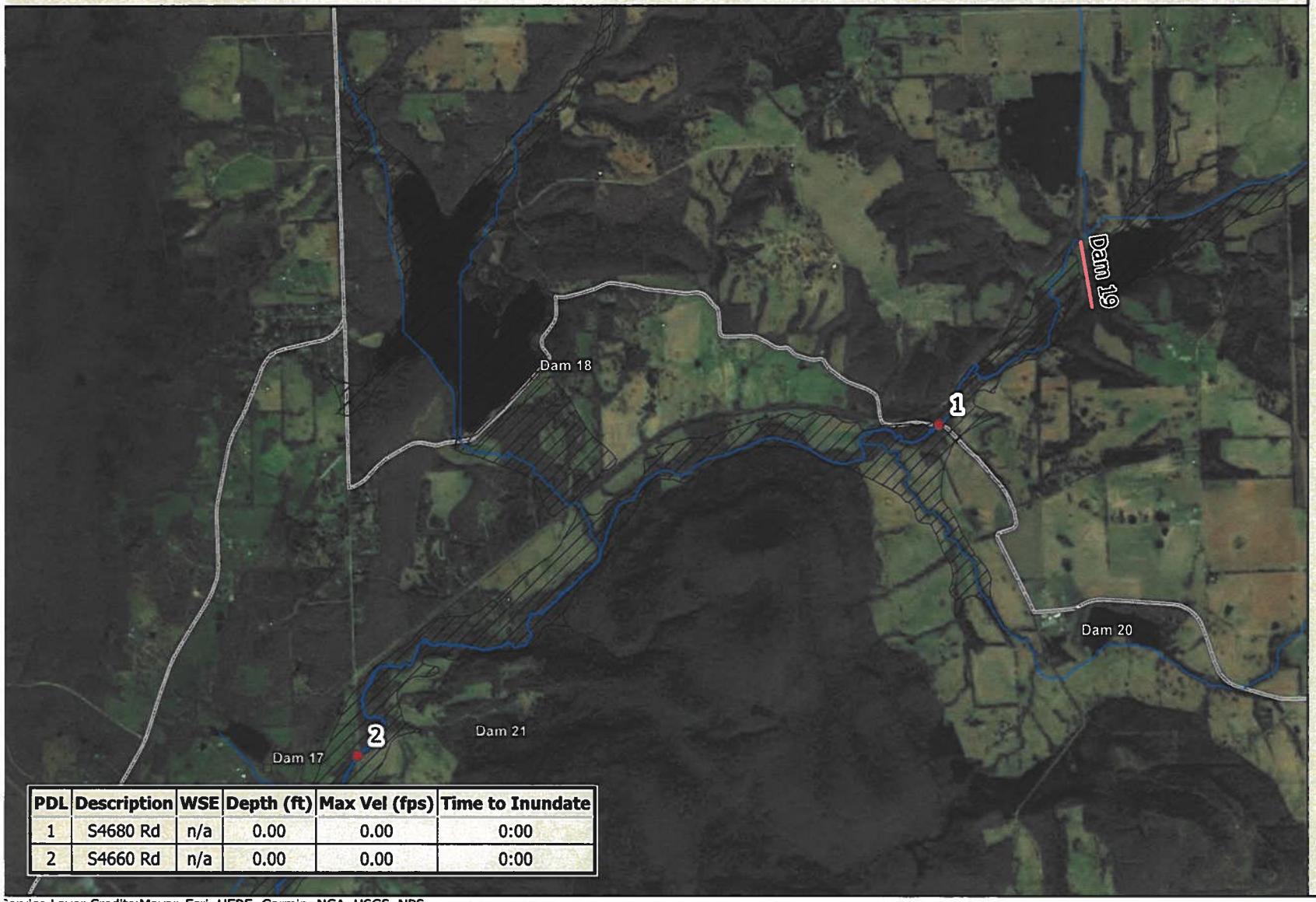
SHEET OF

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S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 1 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	n/a	0.00	0.00	0:00
2	S4660 Rd	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

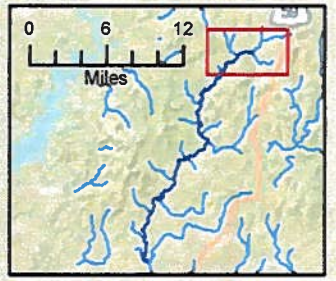
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



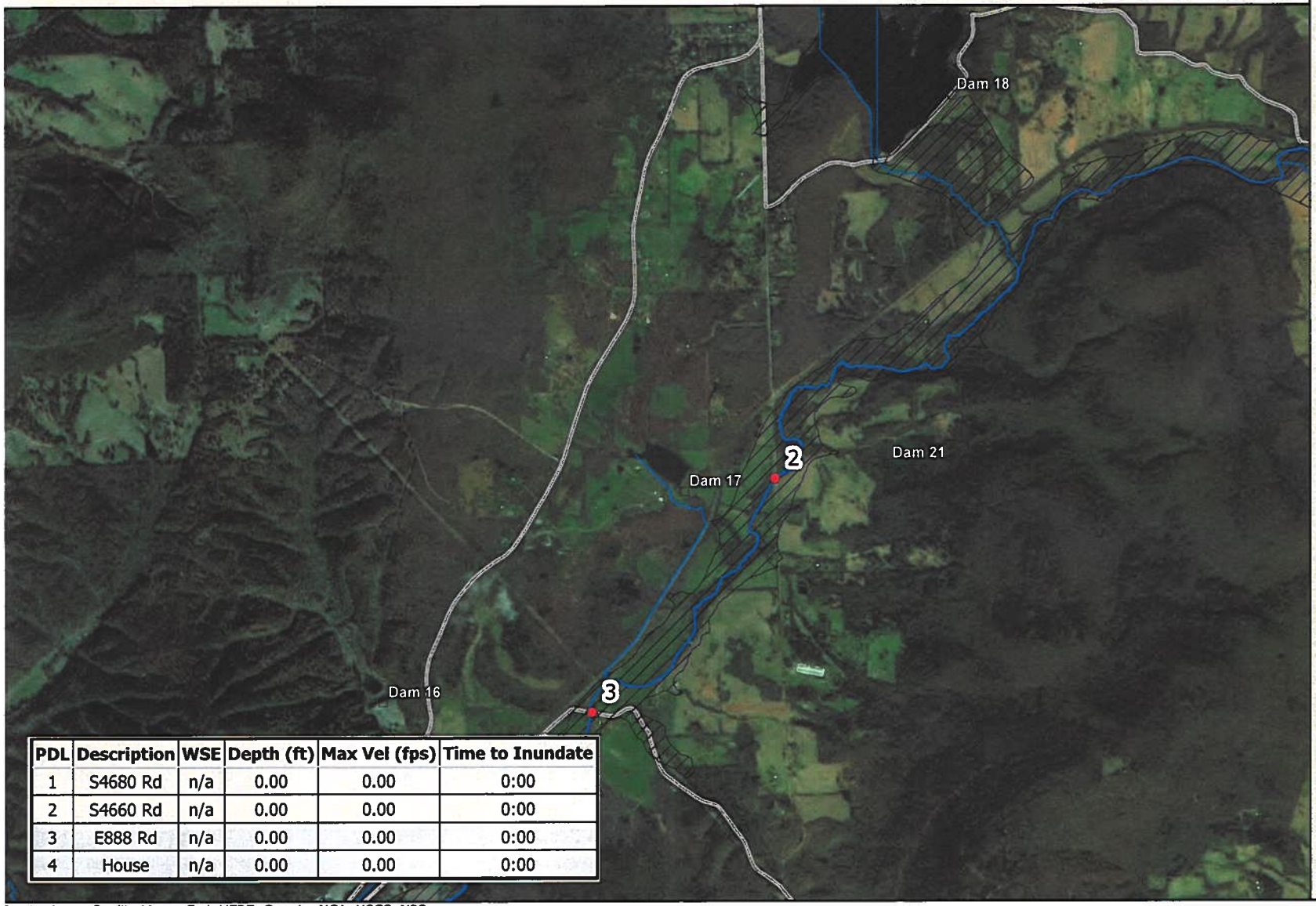
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 2 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	n/a	0.00	0.00	0:00
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

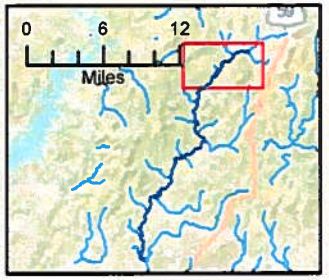
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



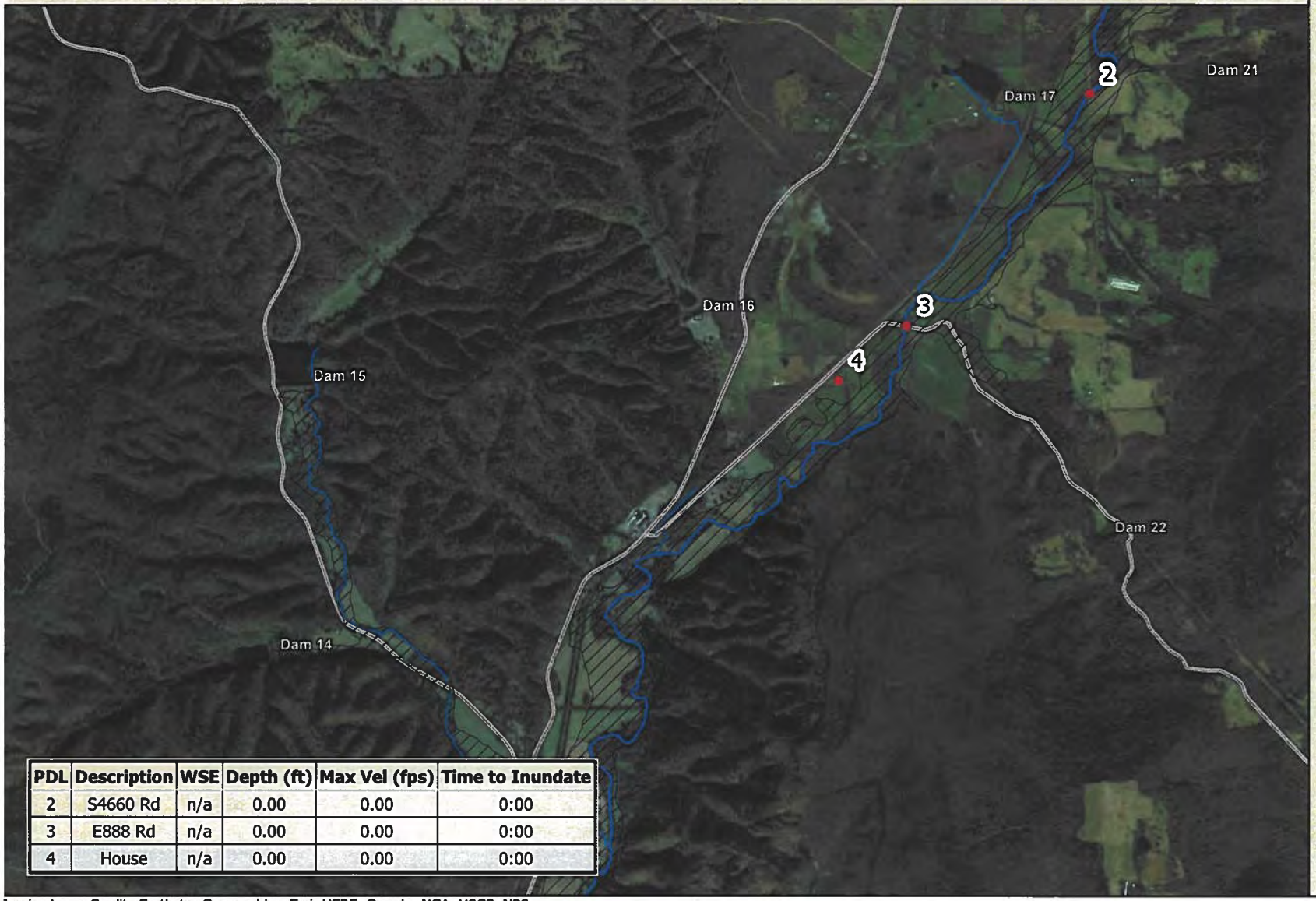
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 3 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

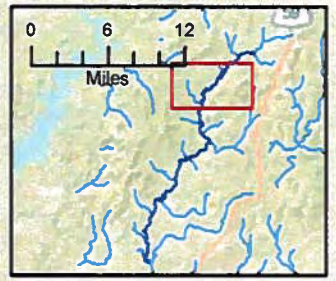
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



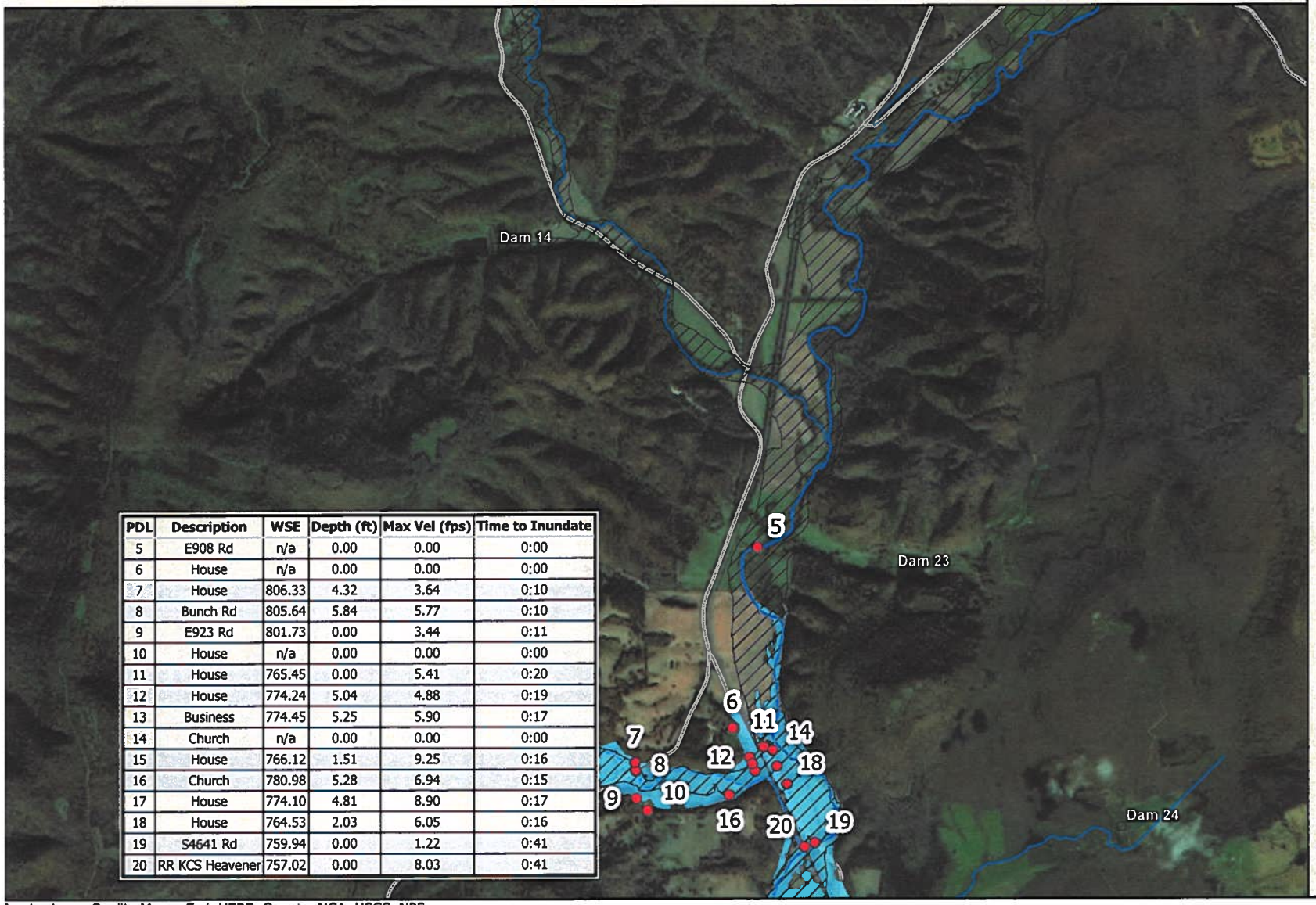
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 4 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	806.33	4.32	3.64	0:10
8	Bunch Rd	805.64	5.84	5.77	0:10
9	E923 Rd	801.73	0.00	3.44	0:11
10	House	n/a	0.00	0.00	0:00
11	House	765.45	0.00	5.41	0:20
12	House	774.24	5.04	4.88	0:19
13	Business	774.45	5.25	5.90	0:17
14	Church	n/a	0.00	0.00	0:00
15	House	766.12	1.51	9.25	0:16
16	Church	780.98	5.28	6.94	0:15
17	House	774.10	4.81	8.90	0:17
18	House	764.53	2.03	6.05	0:16
19	S4641 Rd	759.94	0.00	1.22	0:41
20	RR KCS Heavener	757.02	0.00	8.03	0:41

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

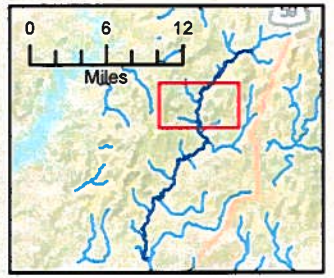
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



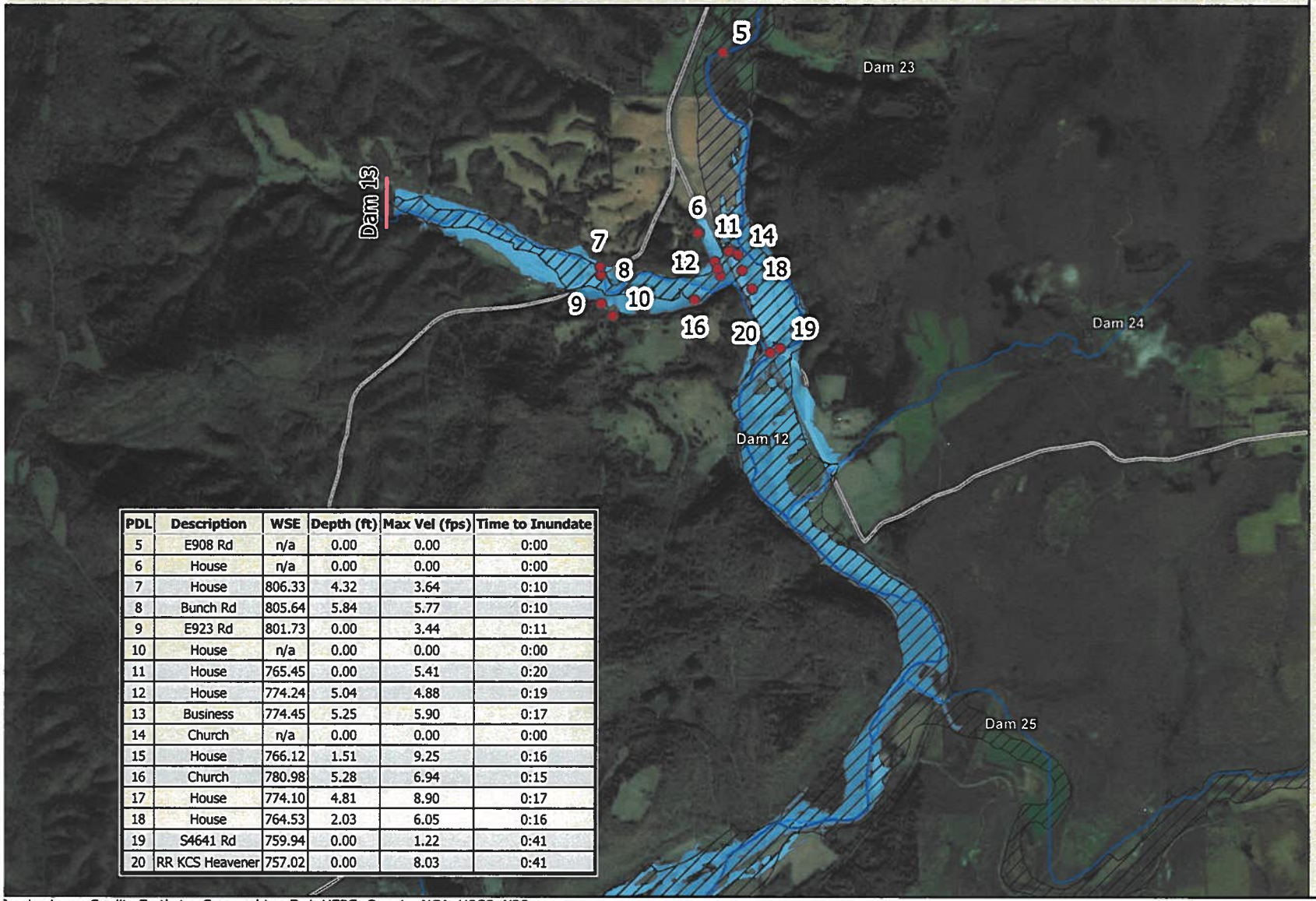
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 5 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	806.33	4.32	3.64	0:10
8	Bunch Rd	805.64	5.84	5.77	0:10
9	E923 Rd	801.73	0.00	3.44	0:11
10	House	n/a	0.00	0.00	0:00
11	House	765.45	0.00	5.41	0:20
12	House	774.24	5.04	4.88	0:19
13	Business	774.45	5.25	5.90	0:17
14	Church	n/a	0.00	0.00	0:00
15	House	766.12	1.51	9.25	0:16
16	Church	780.98	5.28	6.94	0:15
17	House	774.10	4.81	8.90	0:17
18	House	764.53	2.03	6.05	0:16
19	S4641 Rd	759.94	0.00	1.22	0:41
20	RR KCS Heavener	757.02	0.00	8.03	0:41

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

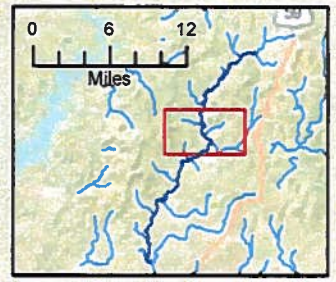
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



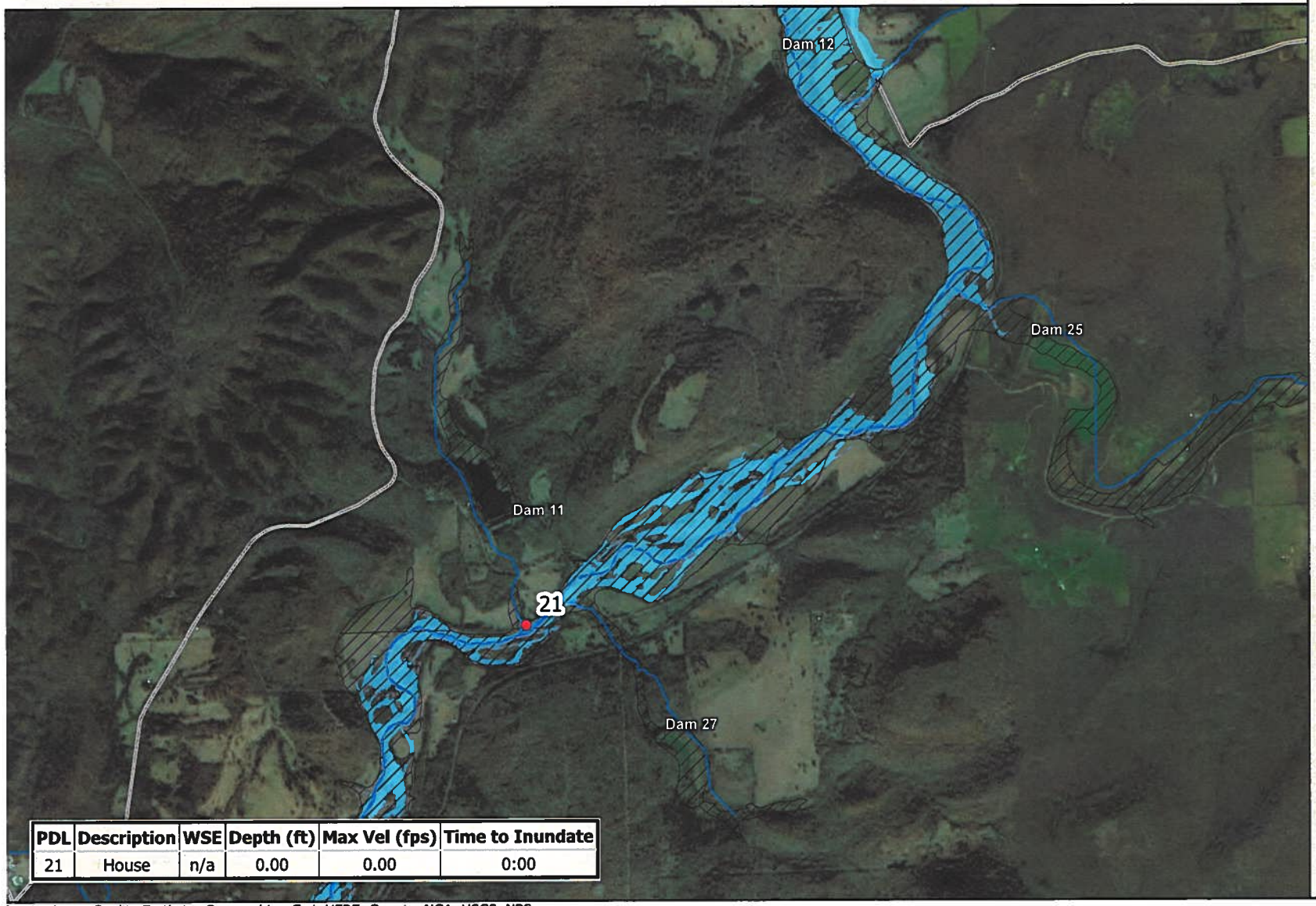
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 6 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

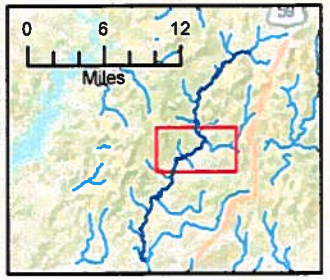
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



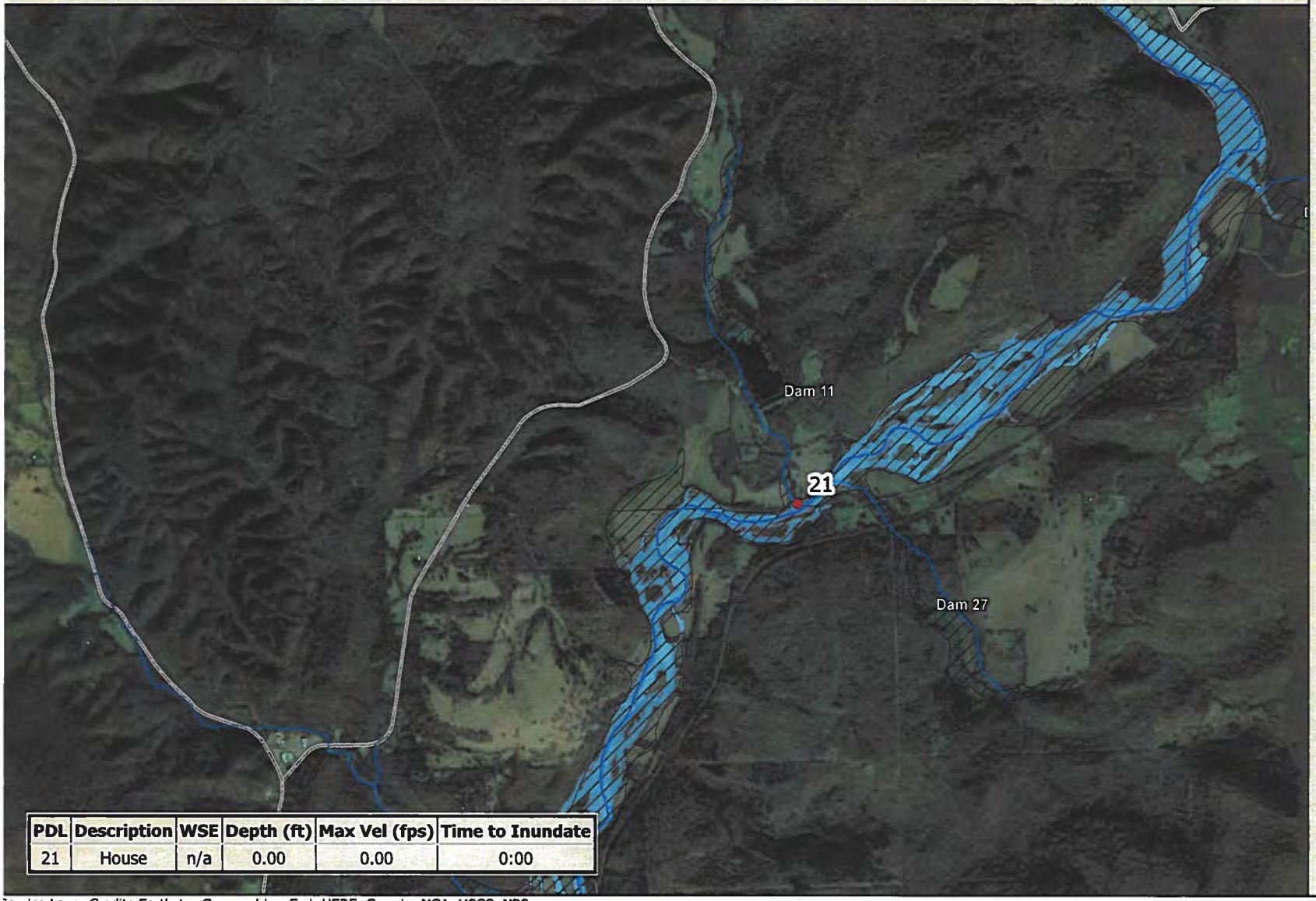
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 7 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

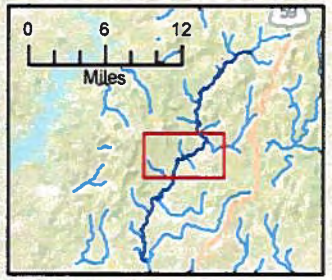
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



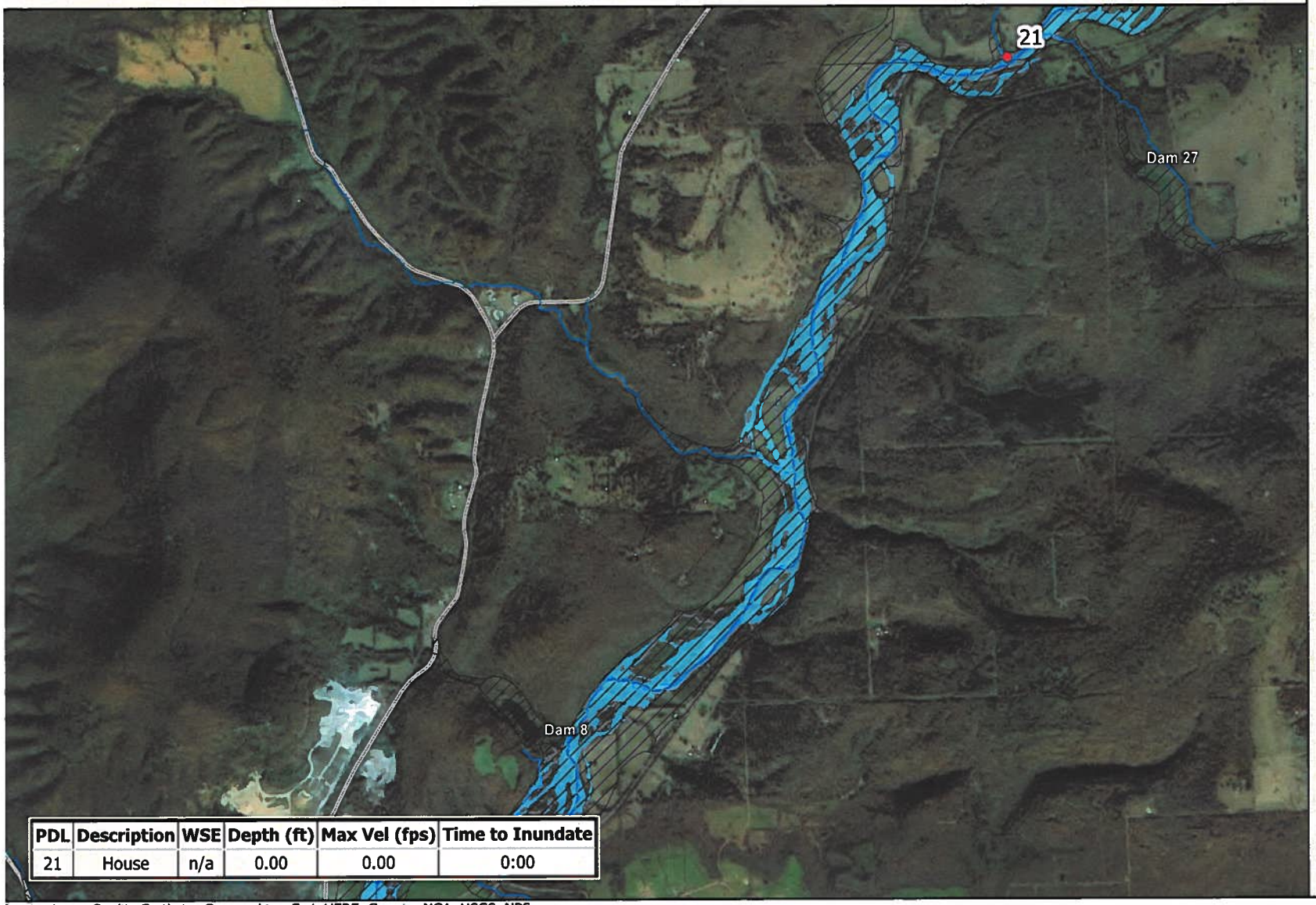
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 8 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

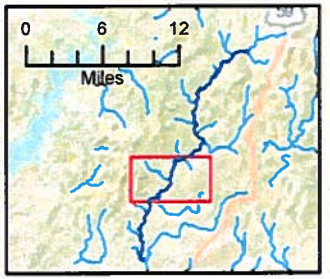
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



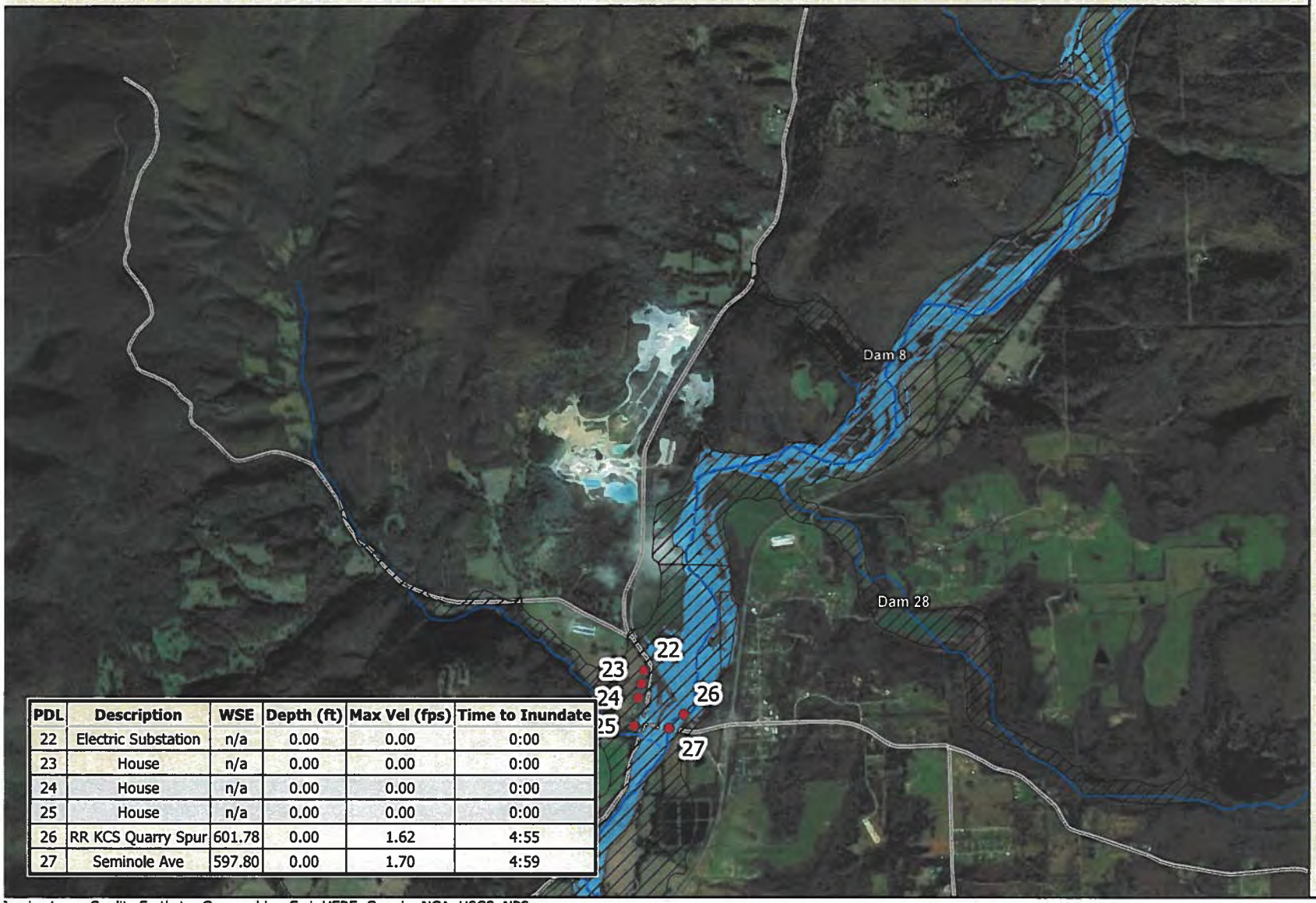
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 9 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	601.78	0.00	1.62	4:55
27	Seminole Ave	597.80	0.00	1.70	4:59

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

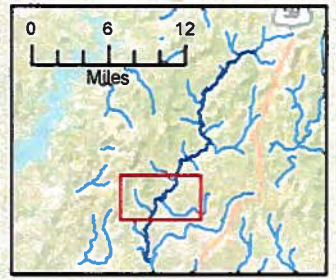
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



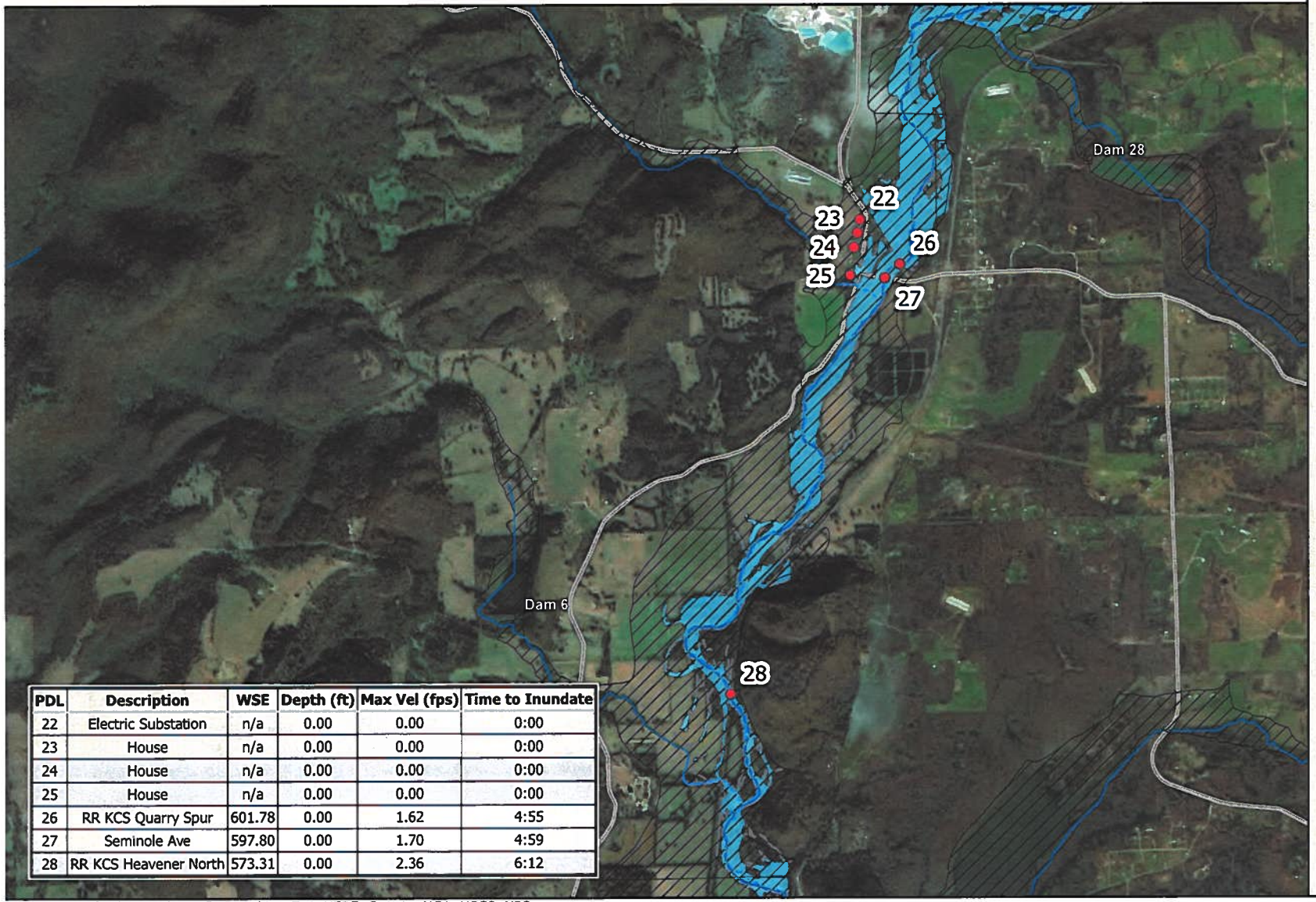
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 10 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	601.78	0.00	1.62	4:55
27	Seminole Ave	597.80	0.00	1.70	4:59
28	RR KCS Heavener North	573.31	0.00	2.36	6:12

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

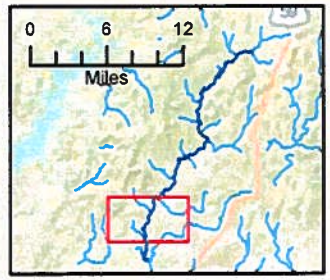
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



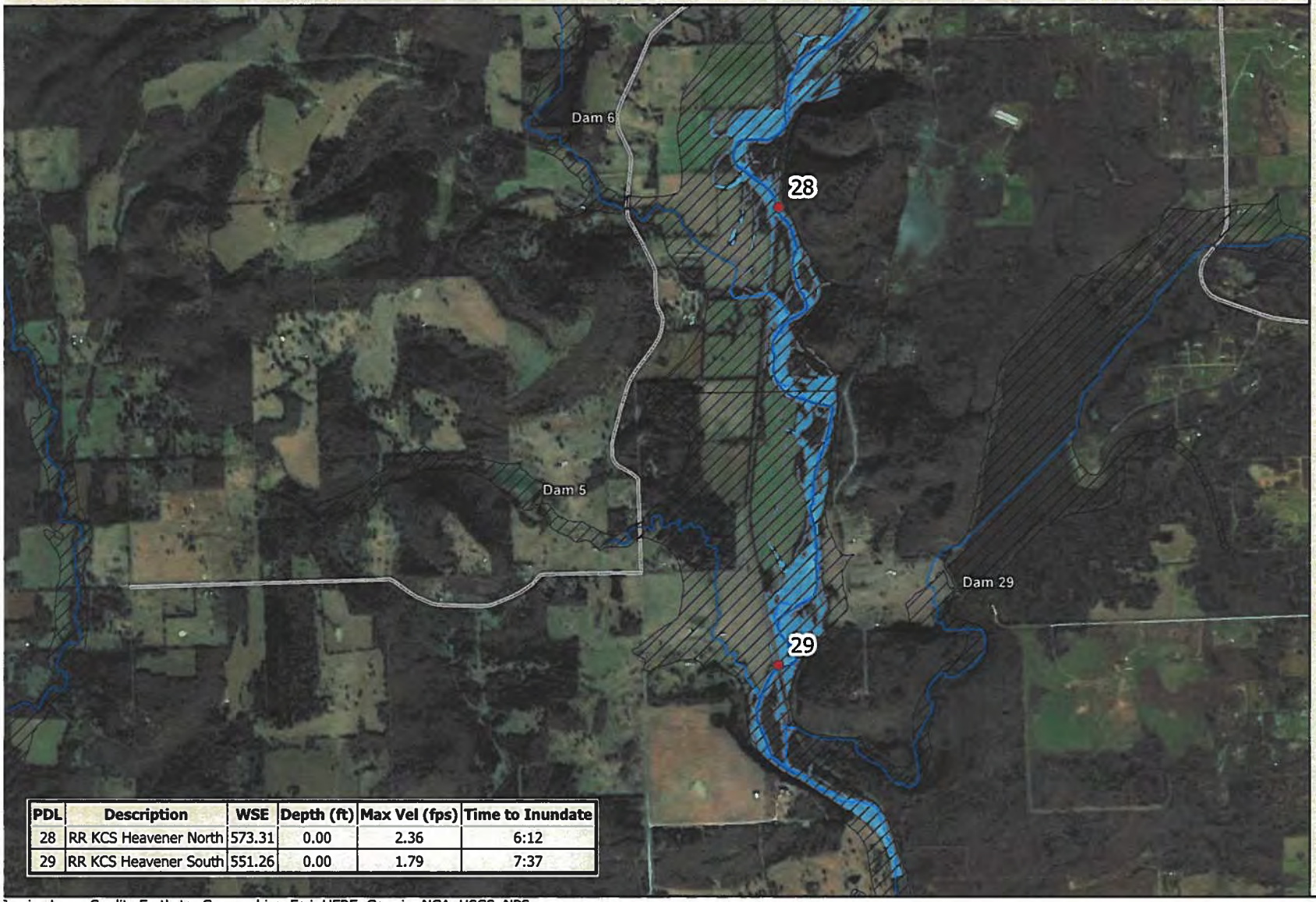
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 11 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
28	RR KCS Heavener North	573.31	0.00	2.36	6:12
29	RR KCS Heavener South	551.26	0.00	1.79	7:37

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

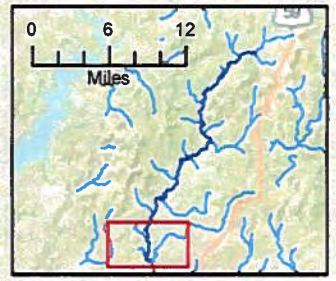
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.

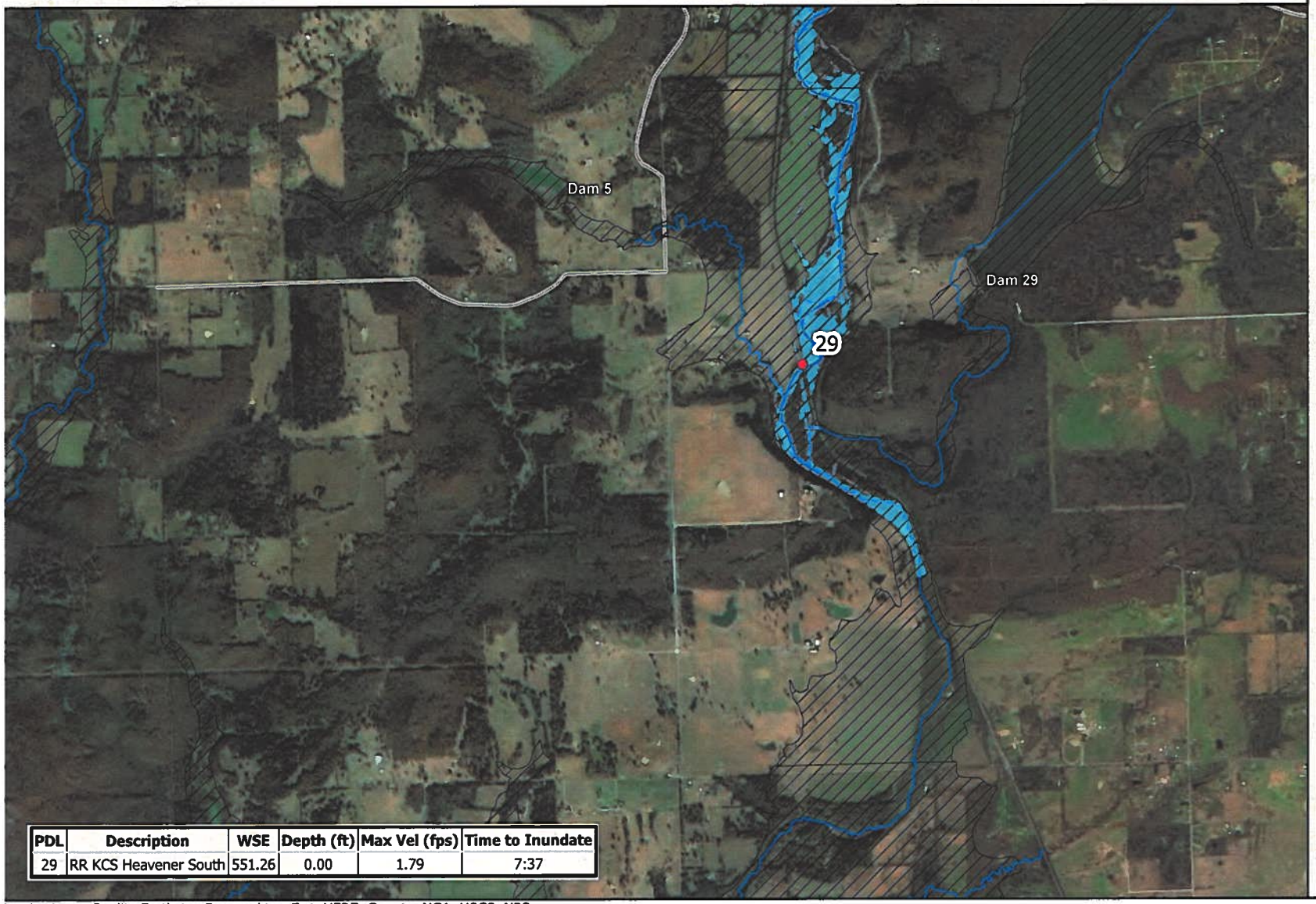


CONSERVATIONWORKS JOINT VENTURE

S-13
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 12 of 12
Model Date: November 2023



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
29	RR KCS Heavener South	551.26	0.00	1.79	7:37

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

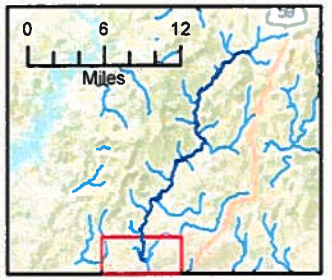
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



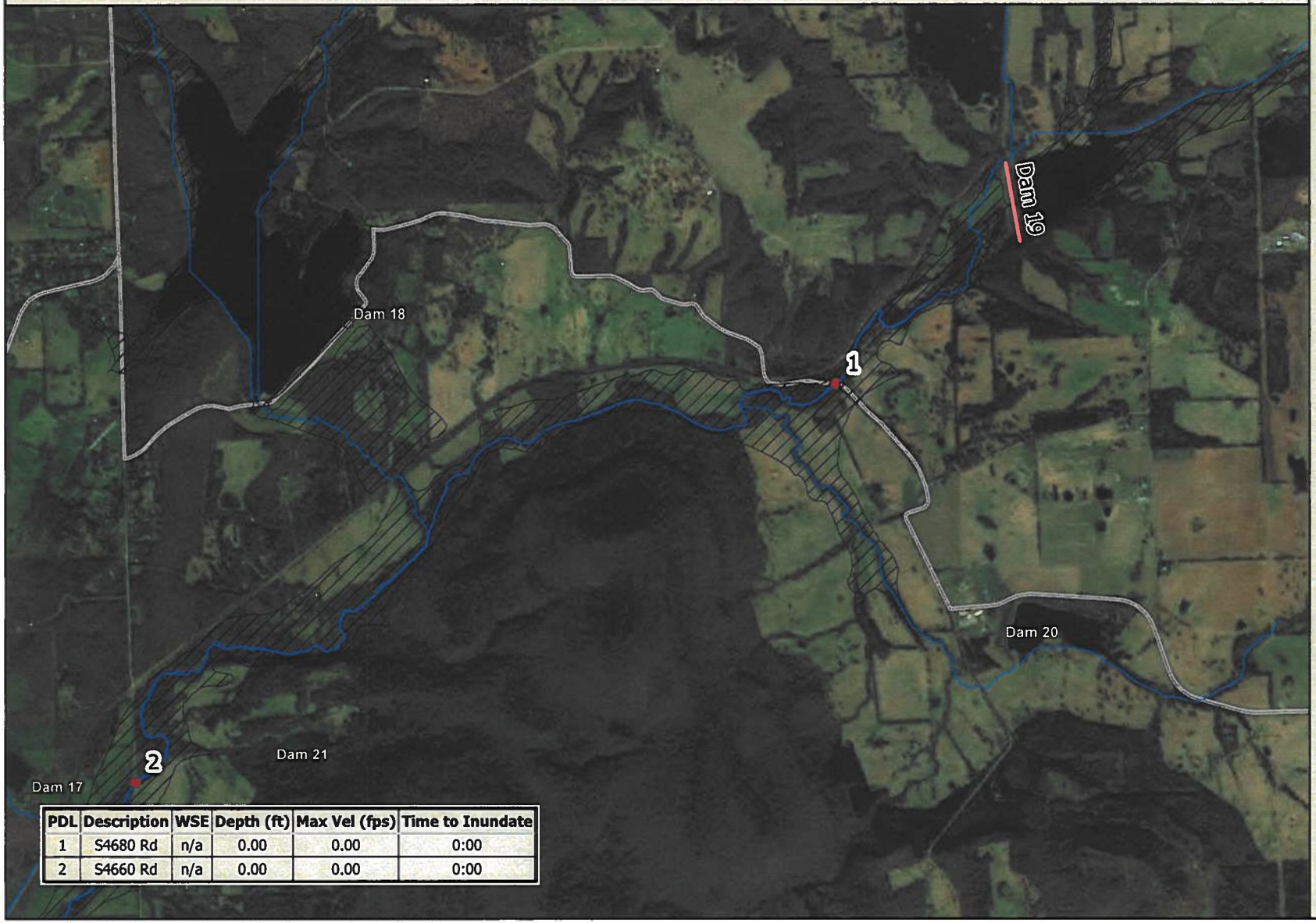
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 1 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	n/a	0.00	0.00	0:00
2	S4660 Rd	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

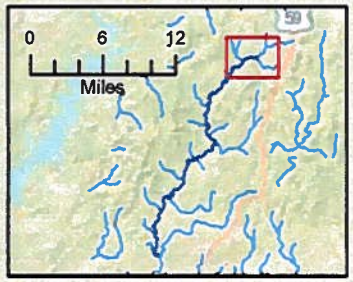
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



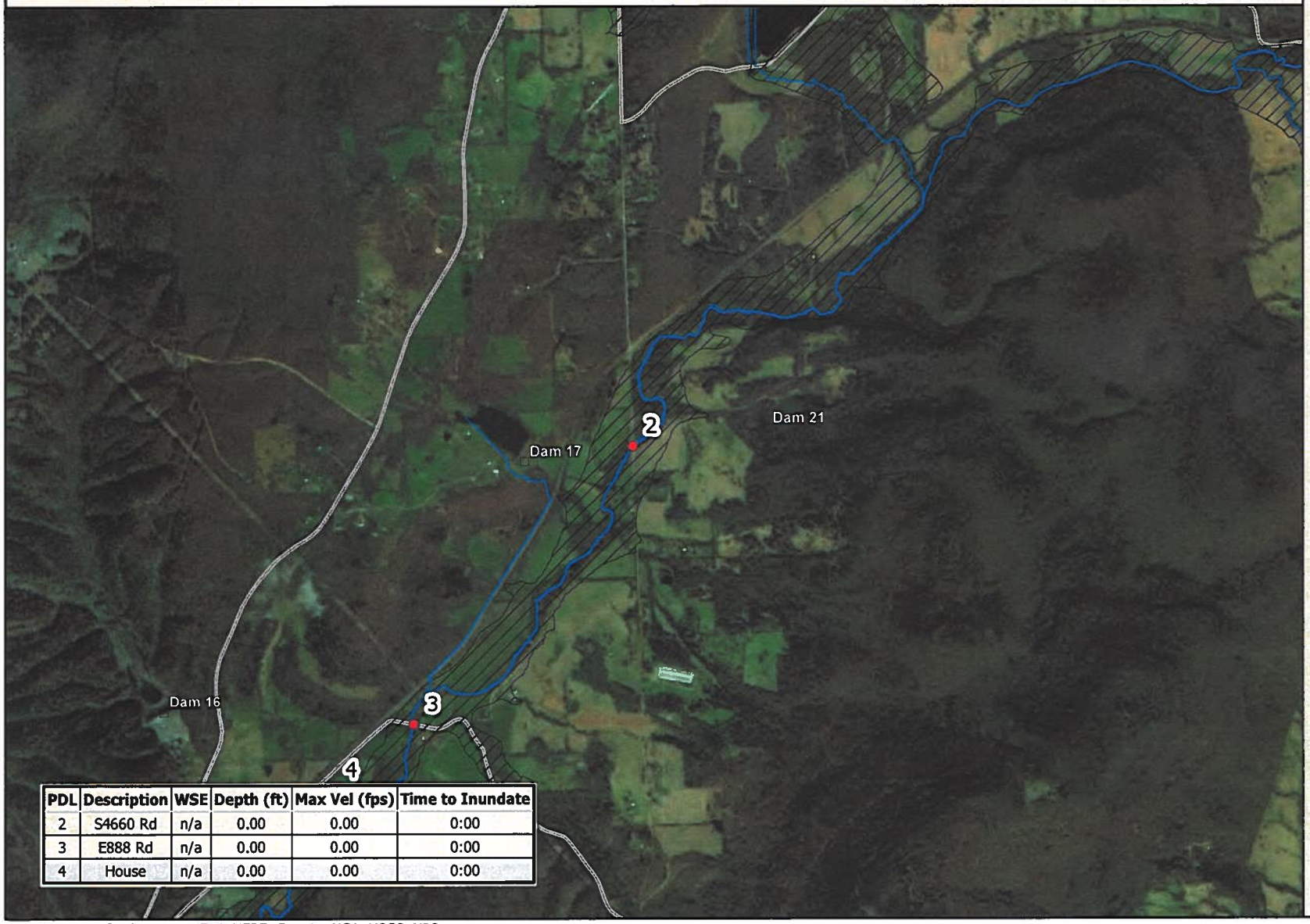
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 2 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

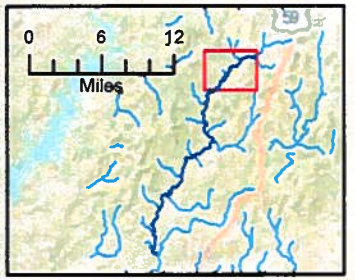
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



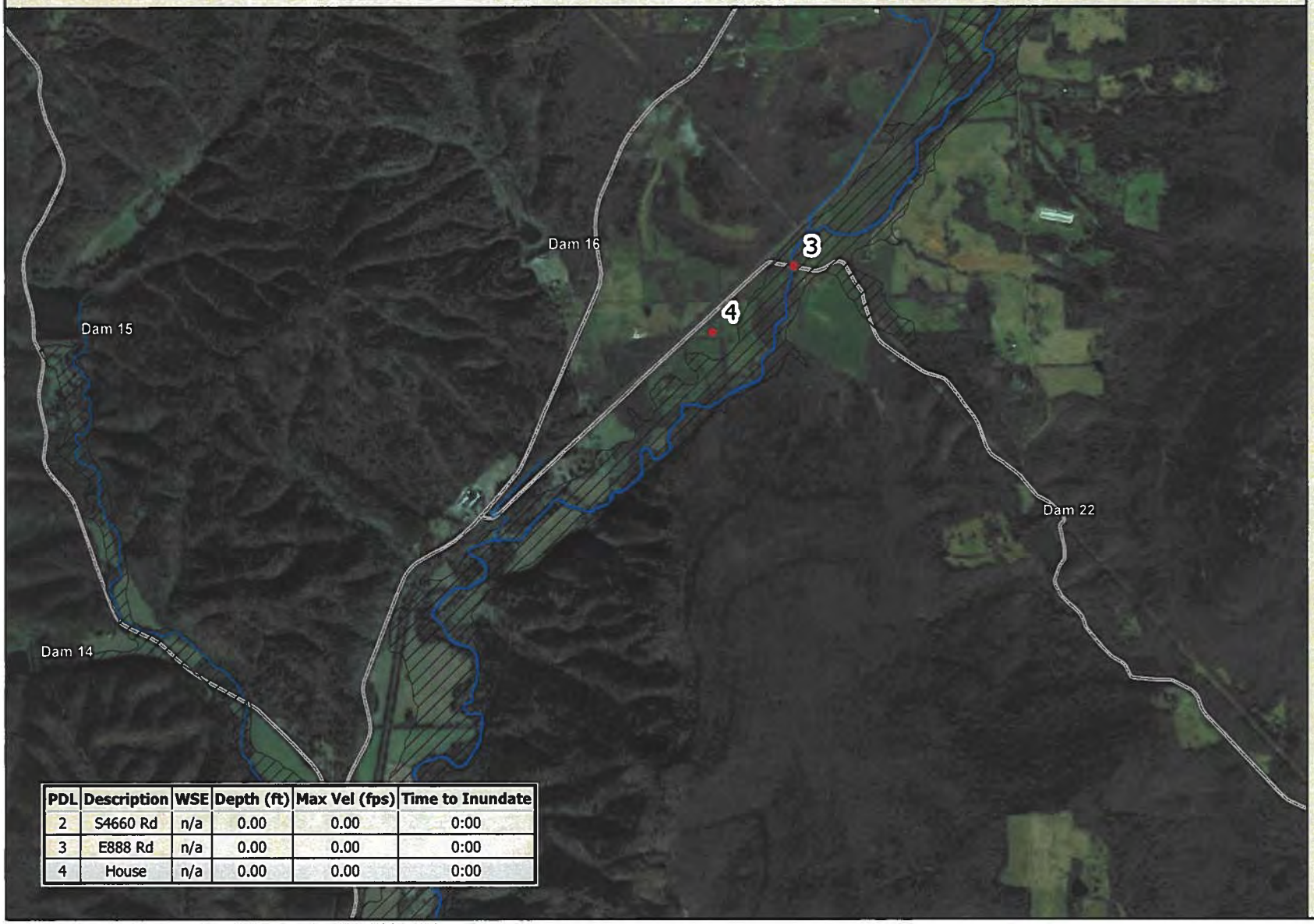
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 3 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

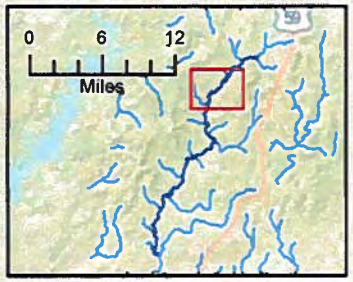
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



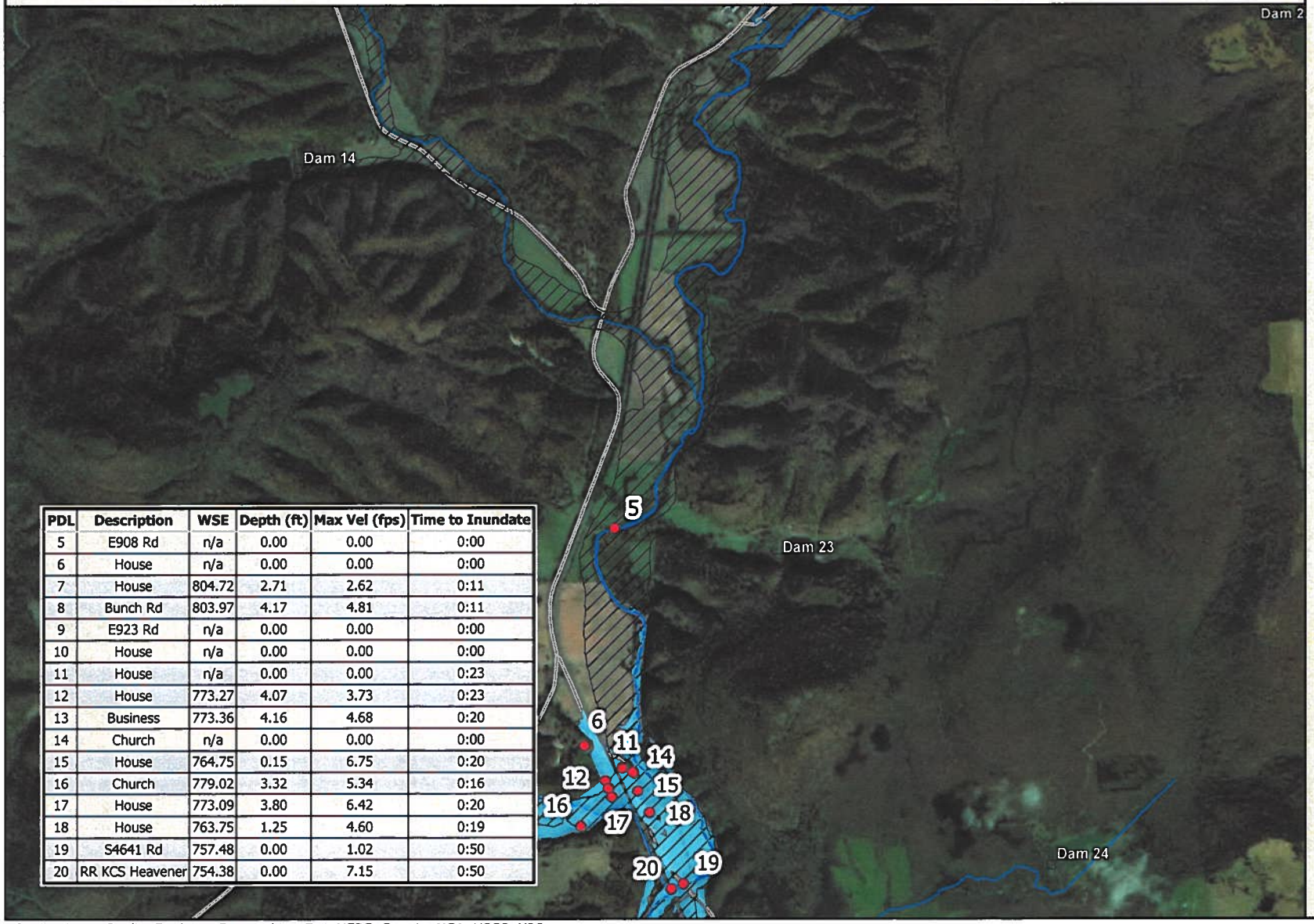
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 4 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	804.72	2.71	2.62	0:11
8	Bunch Rd	803.97	4.17	4.81	0:11
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	n/a	0.00	0.00	0:23
12	House	773.27	4.07	3.73	0:23
13	Business	773.36	4.16	4.68	0:20
14	Church	n/a	0.00	0.00	0:00
15	House	764.75	0.15	6.75	0:20
16	Church	779.02	3.32	5.34	0:16
17	House	773.09	3.80	6.42	0:20
18	House	763.75	1.25	4.60	0:19
19	S4641 Rd	757.48	0.00	1.02	0:50
20	RR KCS Heavener	754.38	0.00	7.15	0:50

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

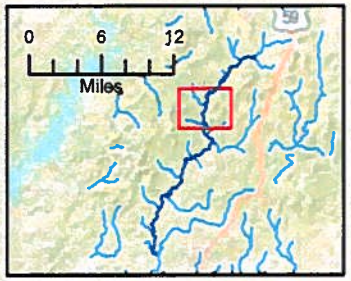
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



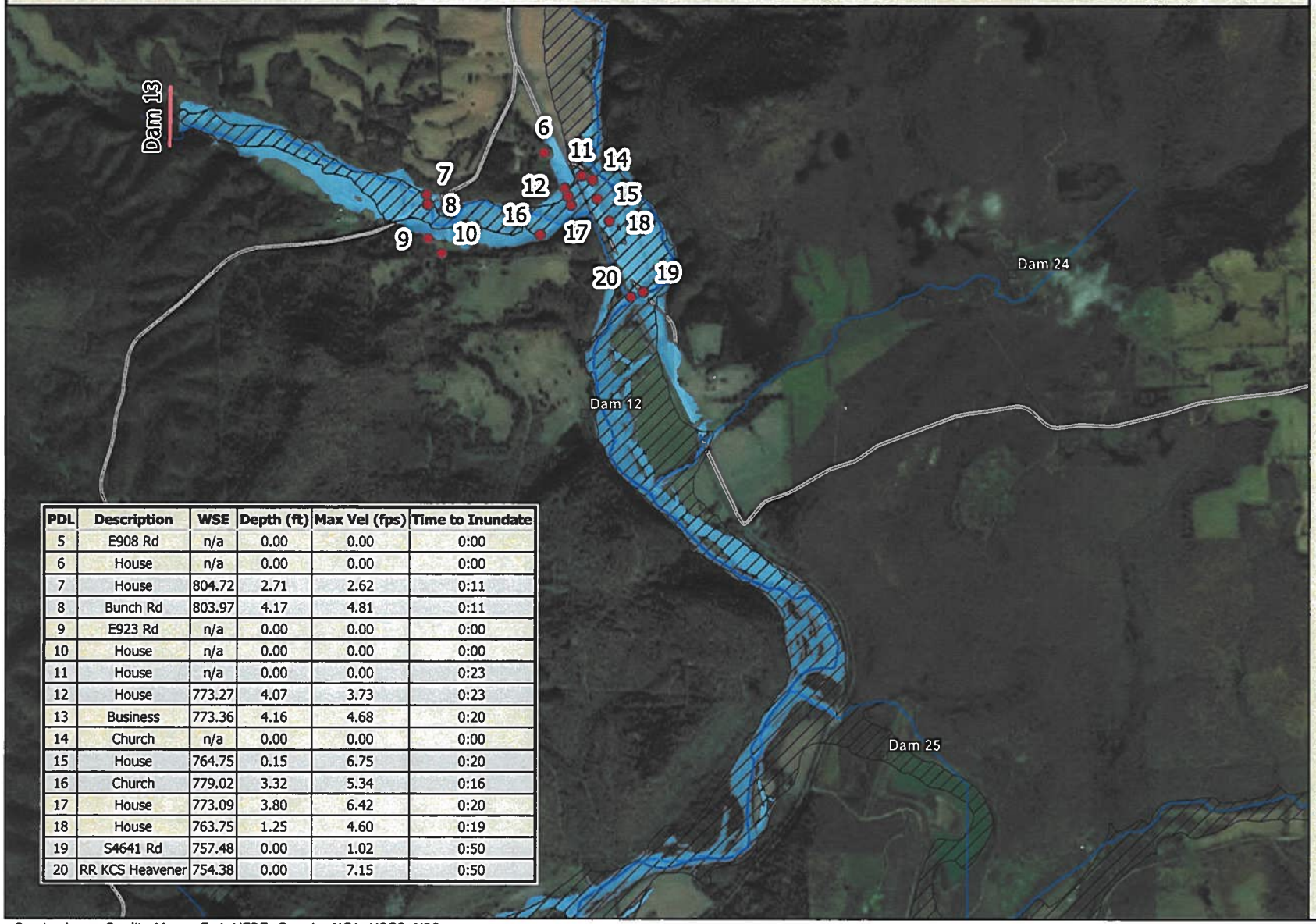
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 5 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	804.72	2.71	2.62	0:11
8	Bunch Rd	803.97	4.17	4.81	0:11
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	n/a	0.00	0.00	0:23
12	House	773.27	4.07	3.73	0:23
13	Business	773.36	4.16	4.68	0:20
14	Church	n/a	0.00	0.00	0:00
15	House	764.75	0.15	6.75	0:20
16	Church	779.02	3.32	5.34	0:16
17	House	773.09	3.80	6.42	0:20
18	House	763.75	1.25	4.60	0:19
19	S4641 Rd	757.48	0.00	1.02	0:50
20	RR KCS Heavener	754.38	0.00	7.15	0:50

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

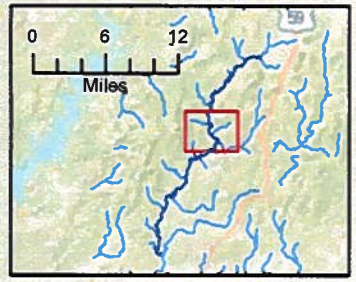
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



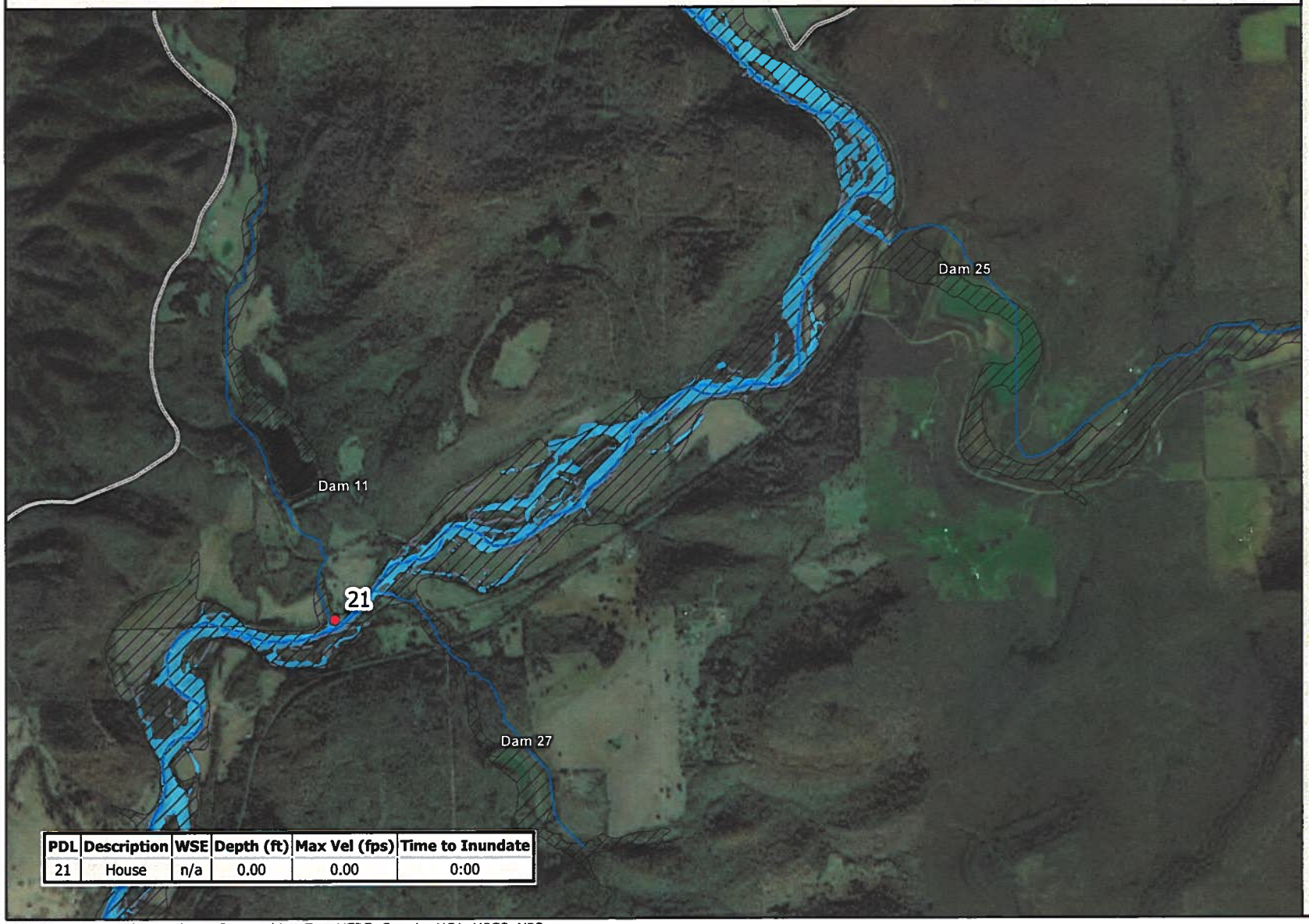
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 6 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

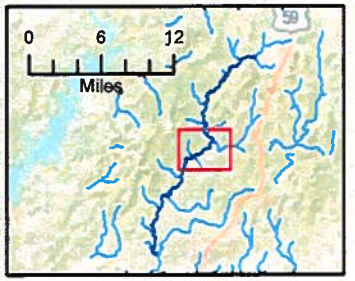
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



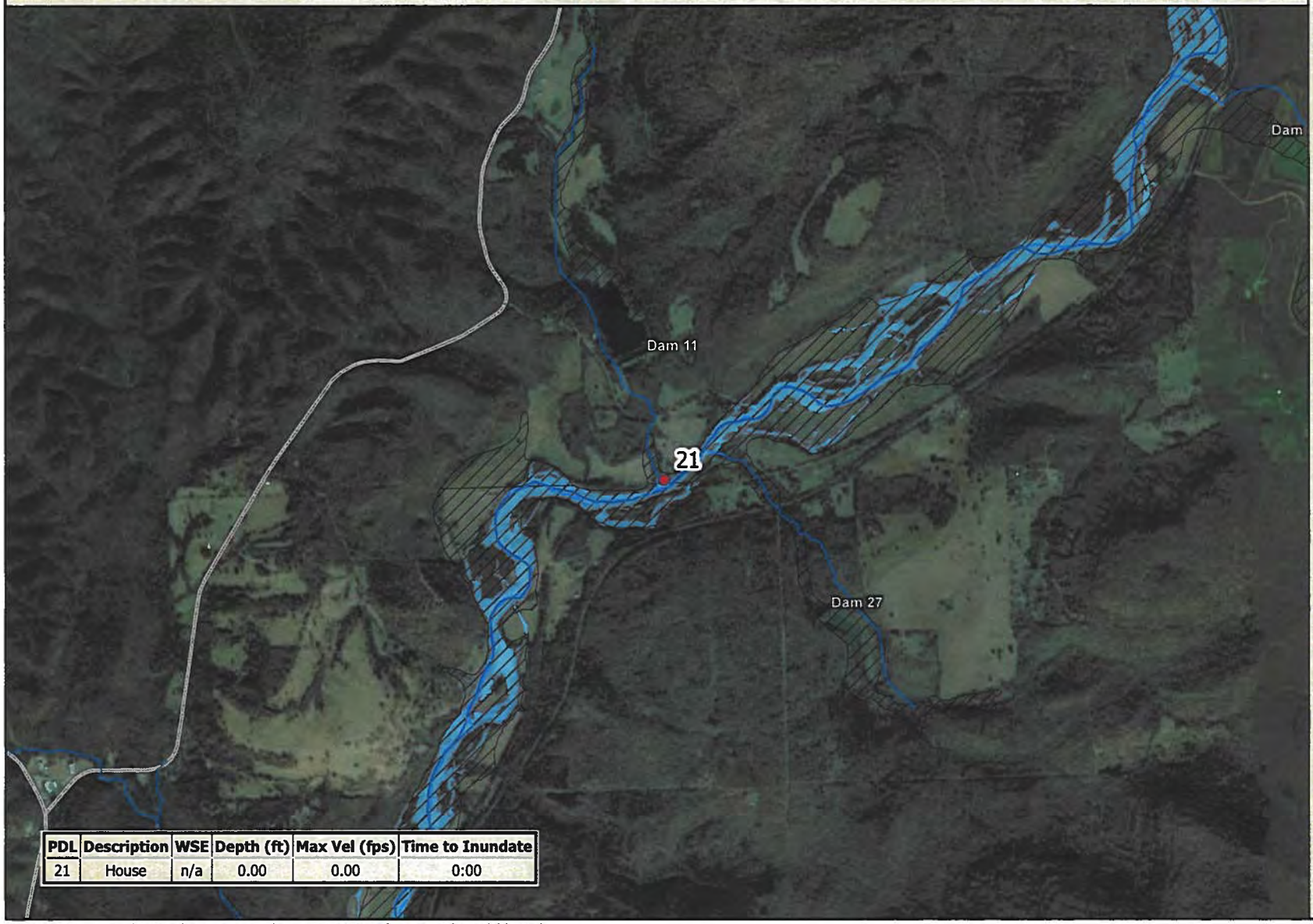
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 7 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

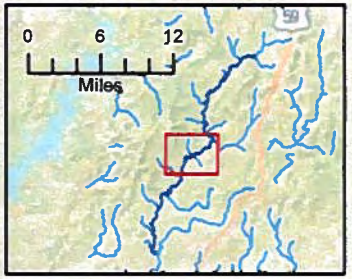
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



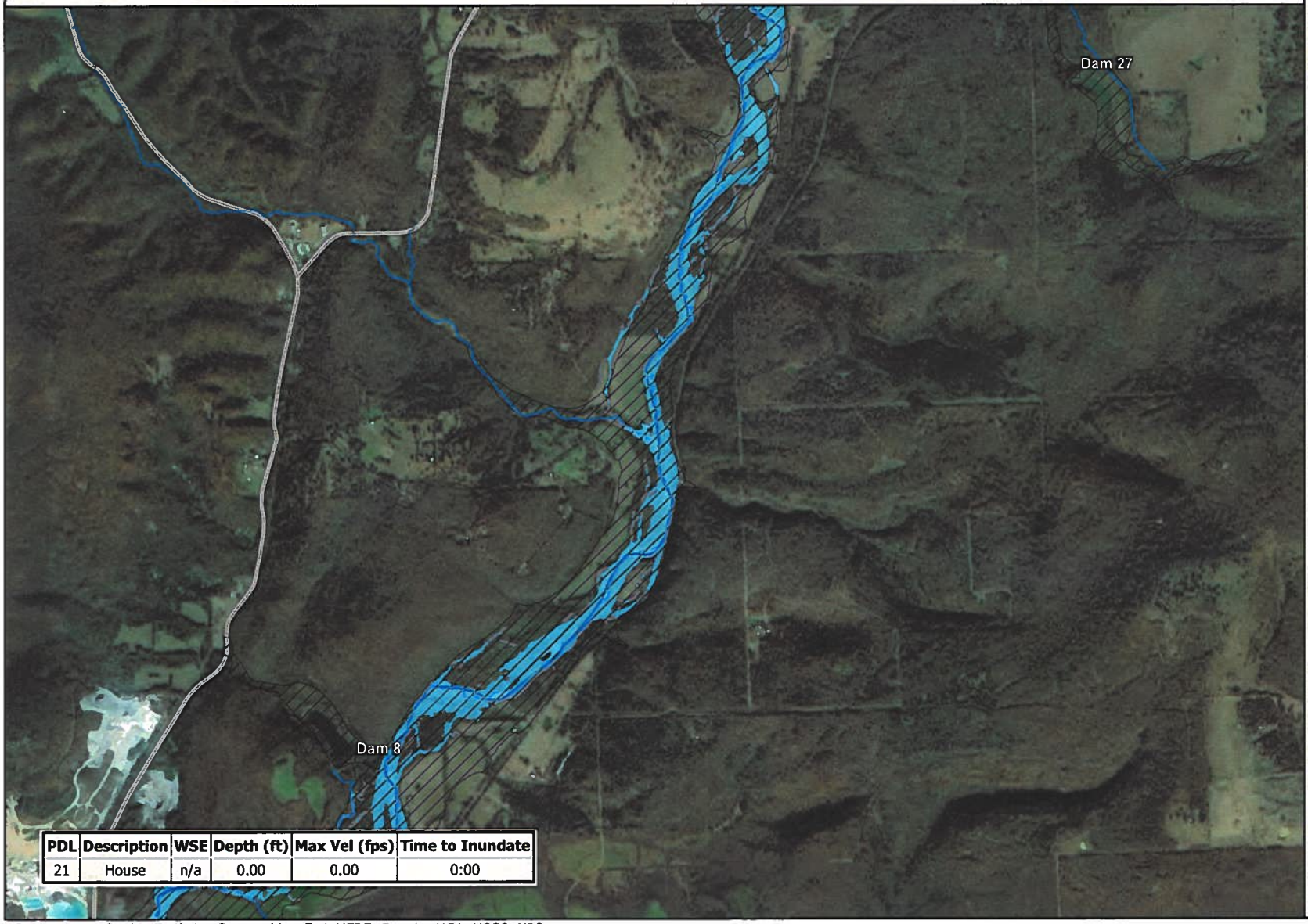
CONSERVATIONWORKS JOINT-VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 8 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

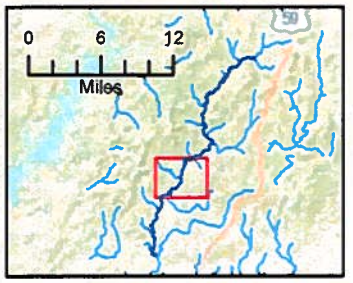
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



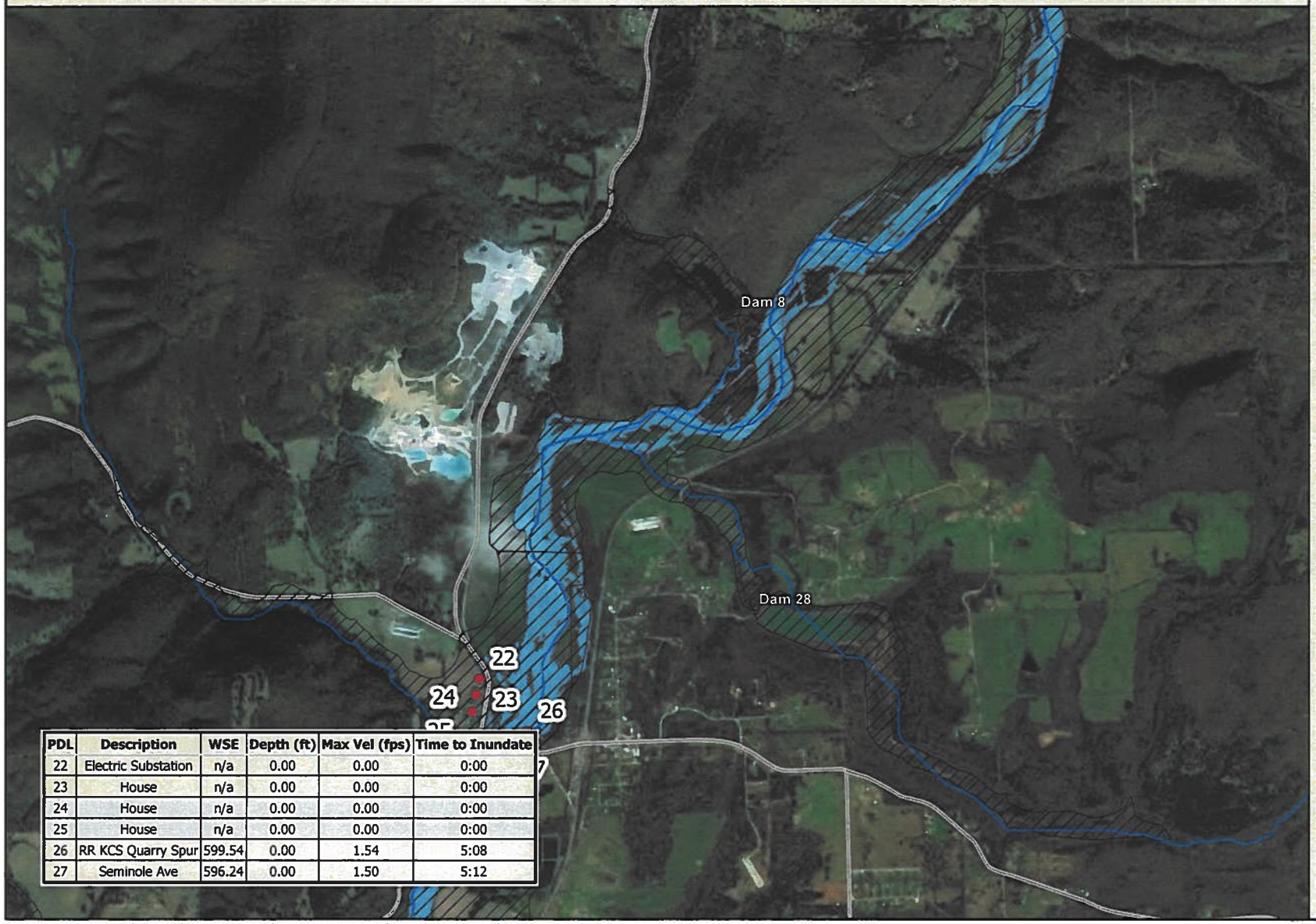
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 9 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	599.54	0.00	1.54	5:08
27	Seminole Ave	596.24	0.00	1.50	5:12

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

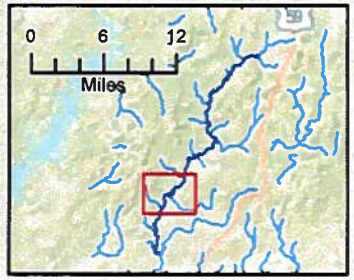
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



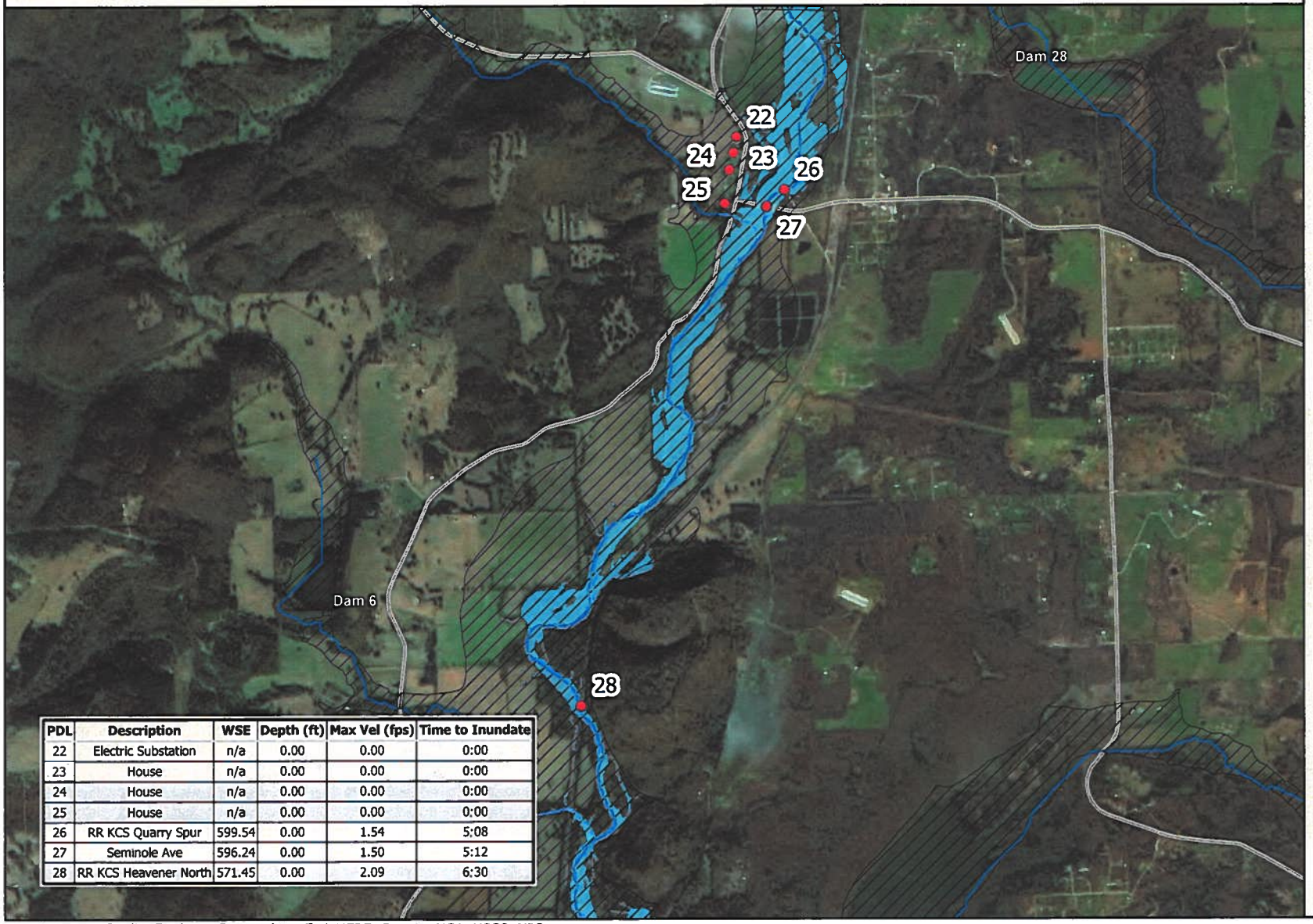
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 10 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	599.54	0.00	1.54	5:08
27	Seminole Ave	596.24	0.00	1.50	5:12
28	RR KCS Heavener North	571.45	0.00	2.09	6:30

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

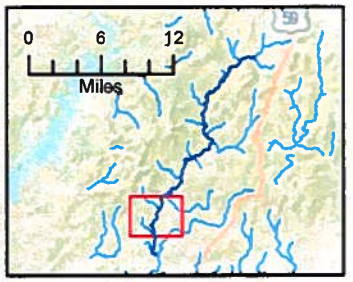
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



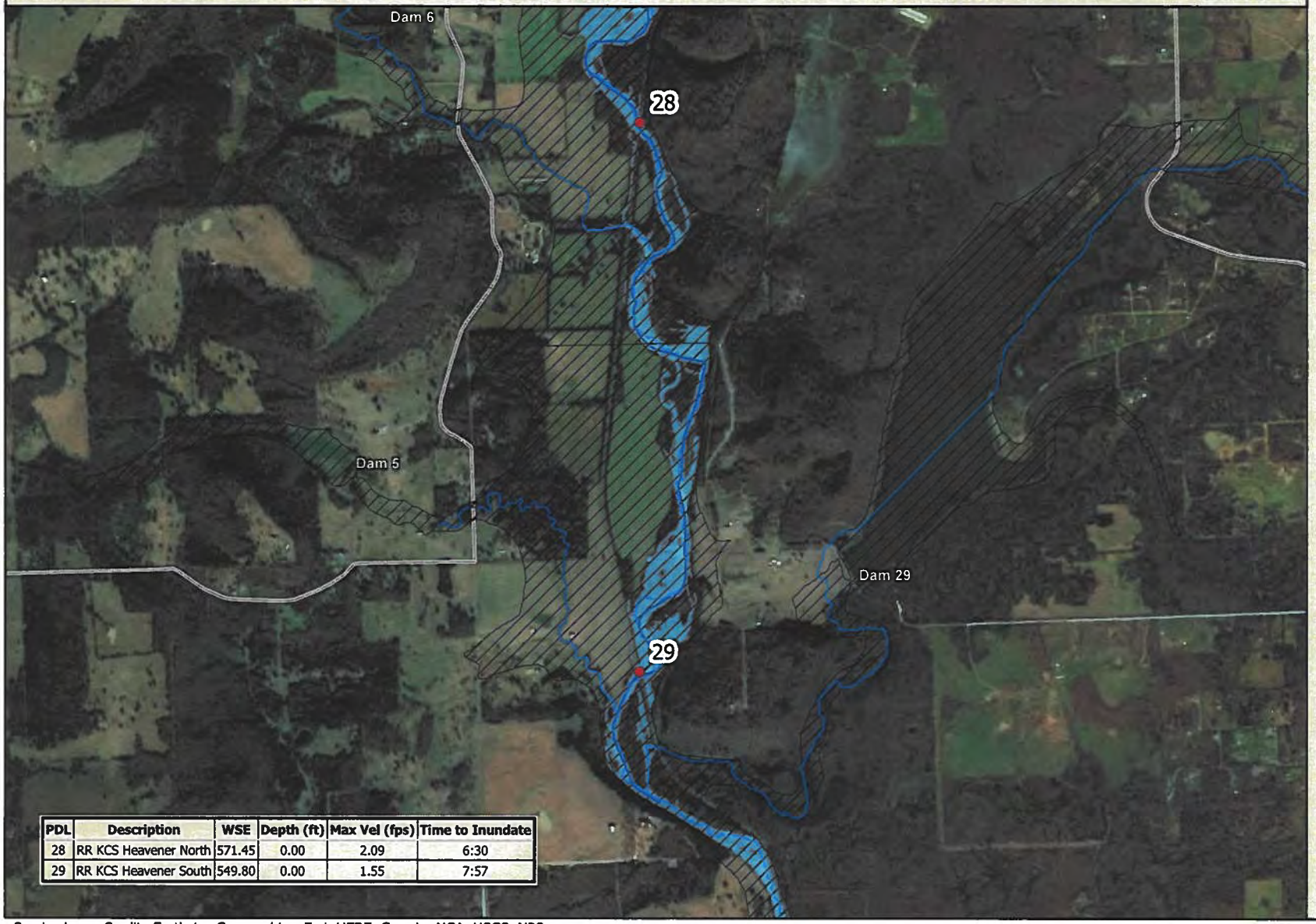
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 11 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
28	RR KCS Heavener North	571.45	0.00	2.09	6:30
29	RR KCS Heavener South	549.80	0.00	1.55	7:57

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

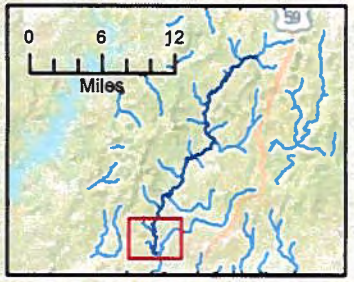
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



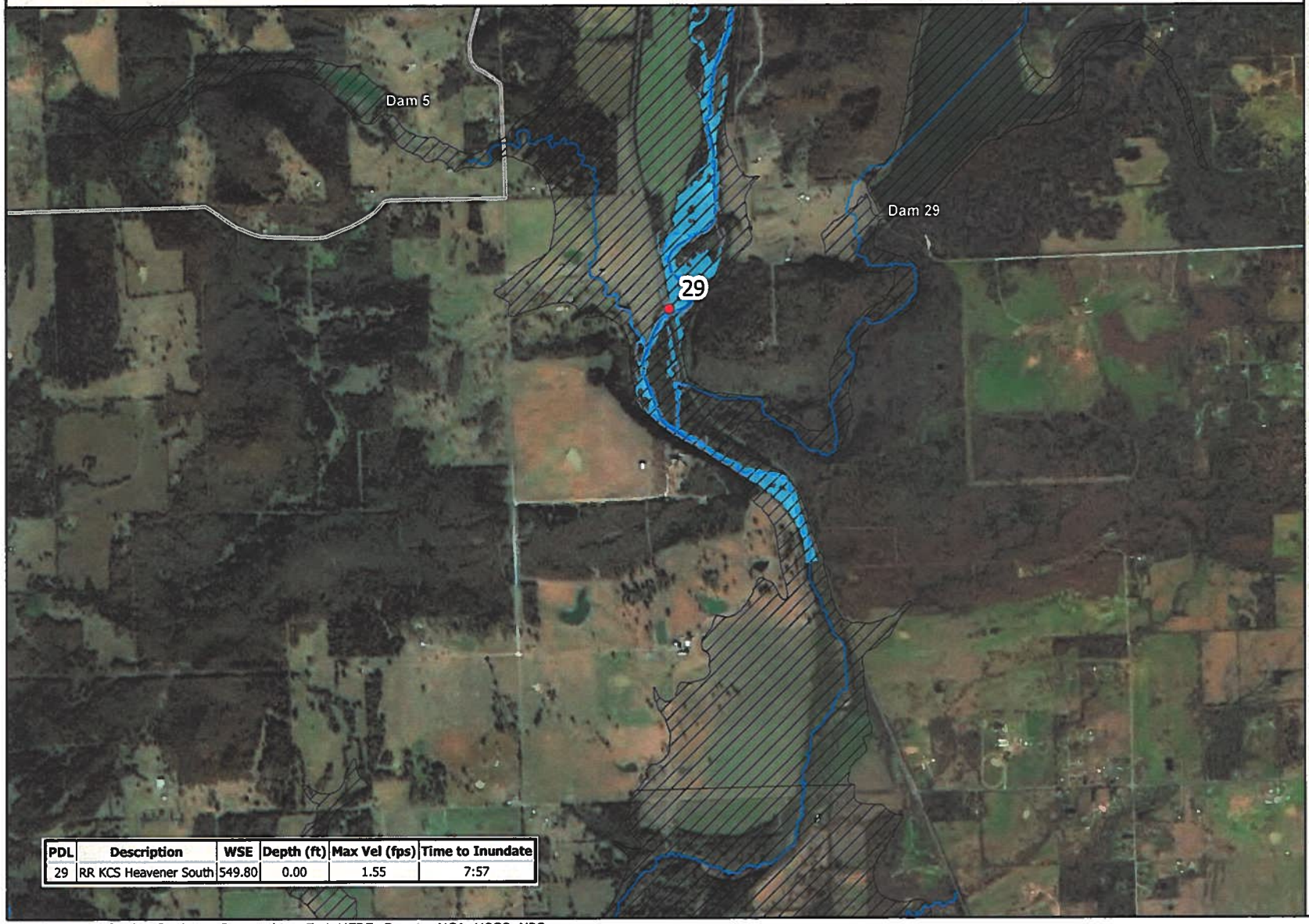
CONSERVATIONWORKS JOINT-VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 12 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
29	RR KCS Heavener South	549.80	0.00	1.55	7:57

Legend

- PDLs
- Static Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

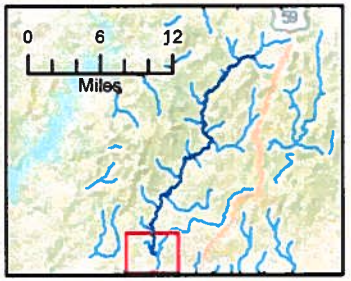
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



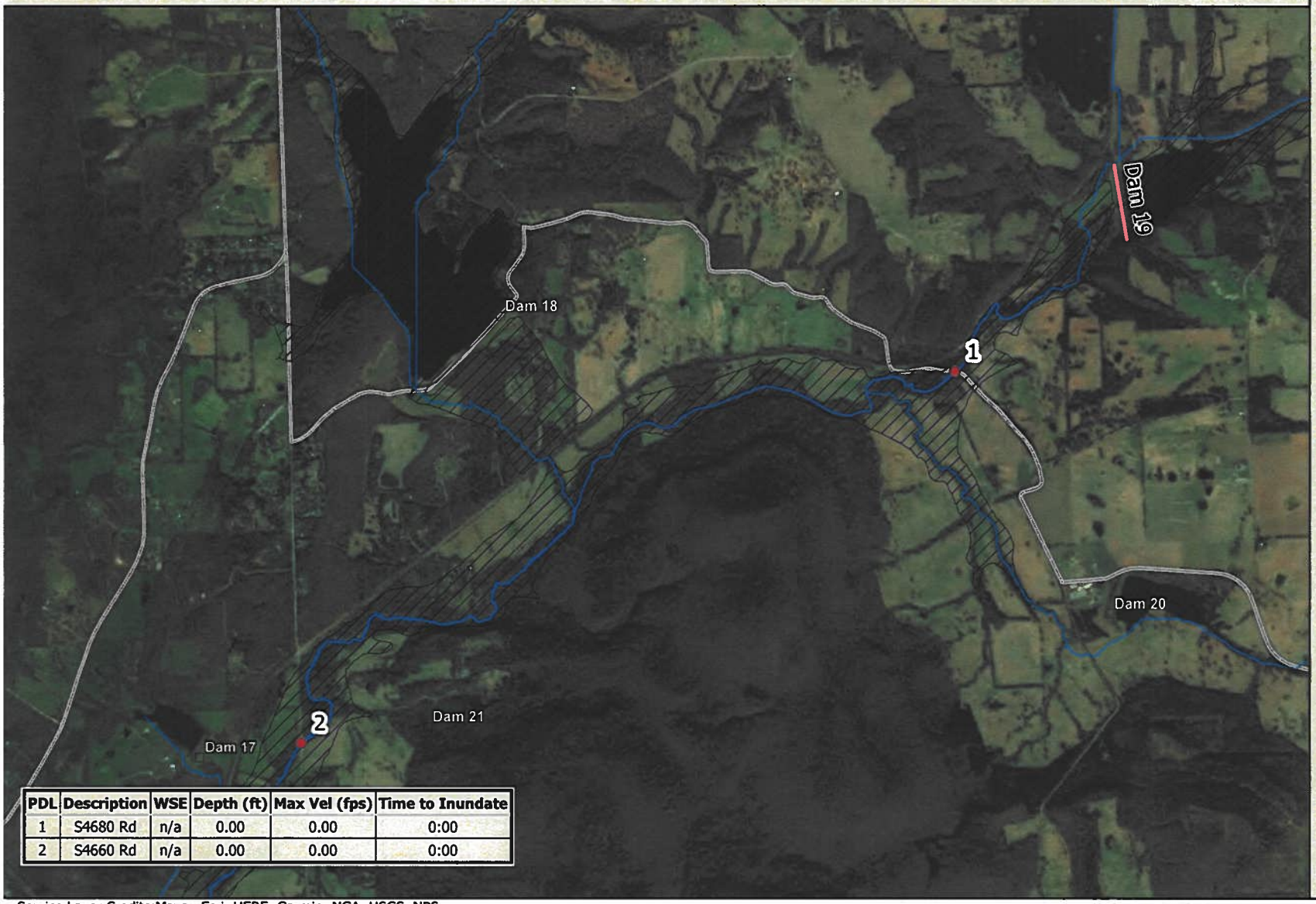
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 1 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	n/a	0.00	0.00	0:00
2	S4660 Rd	n/a	0.00	0.00	0:00

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

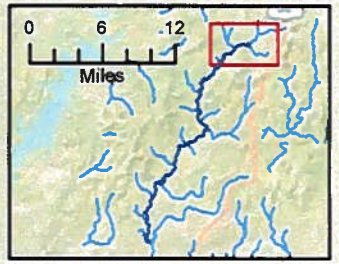
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



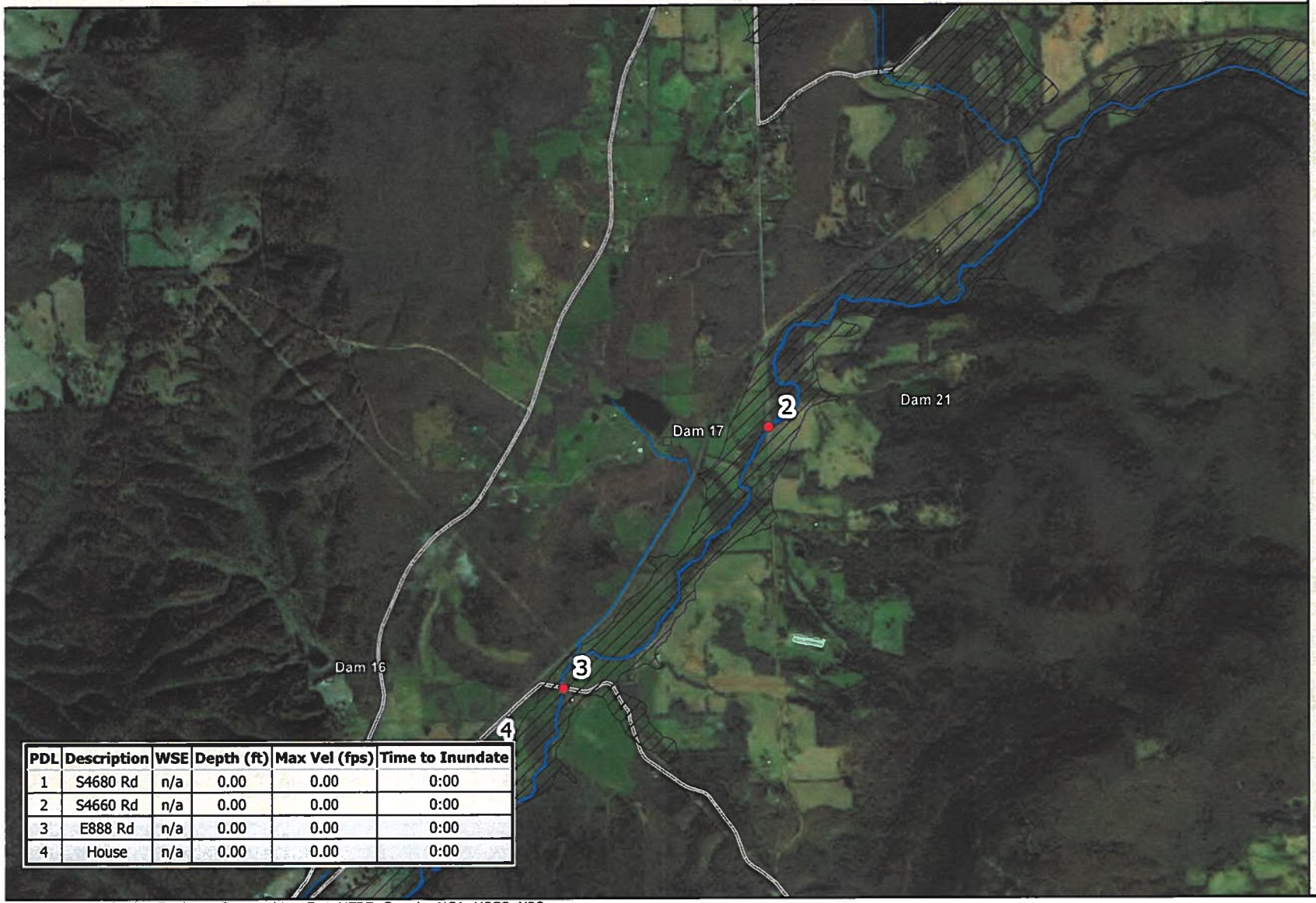
CONSERVATIONWORKS

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 2 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	n/a	0.00	0.00	0:00
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

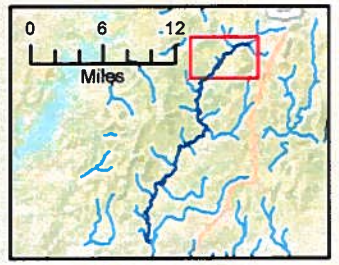
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



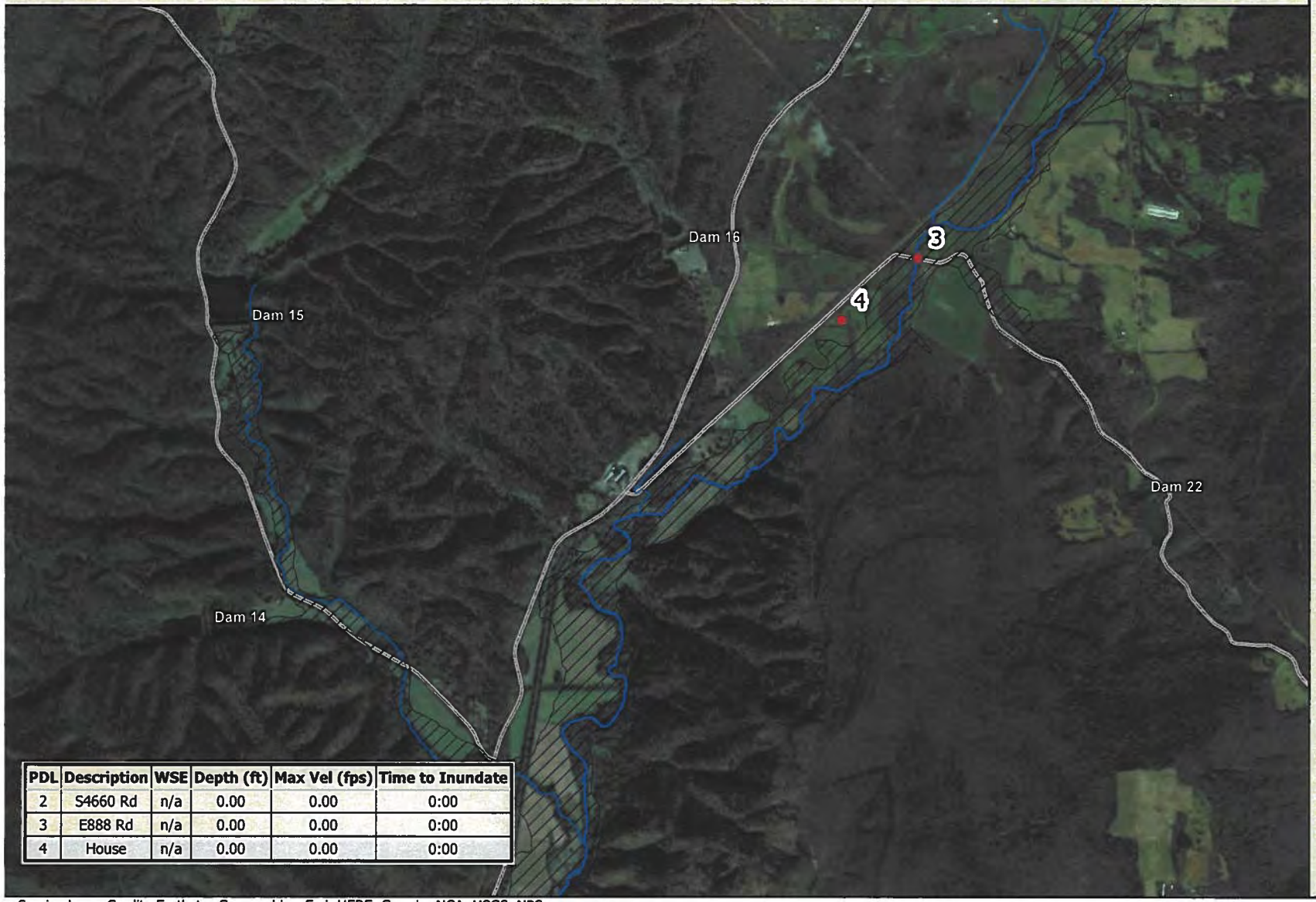
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 3 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	n/a	0.00	0.00	0:00
3	E888 Rd	n/a	0.00	0.00	0:00
4	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

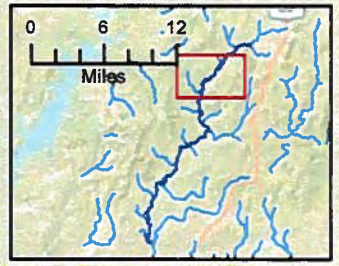
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



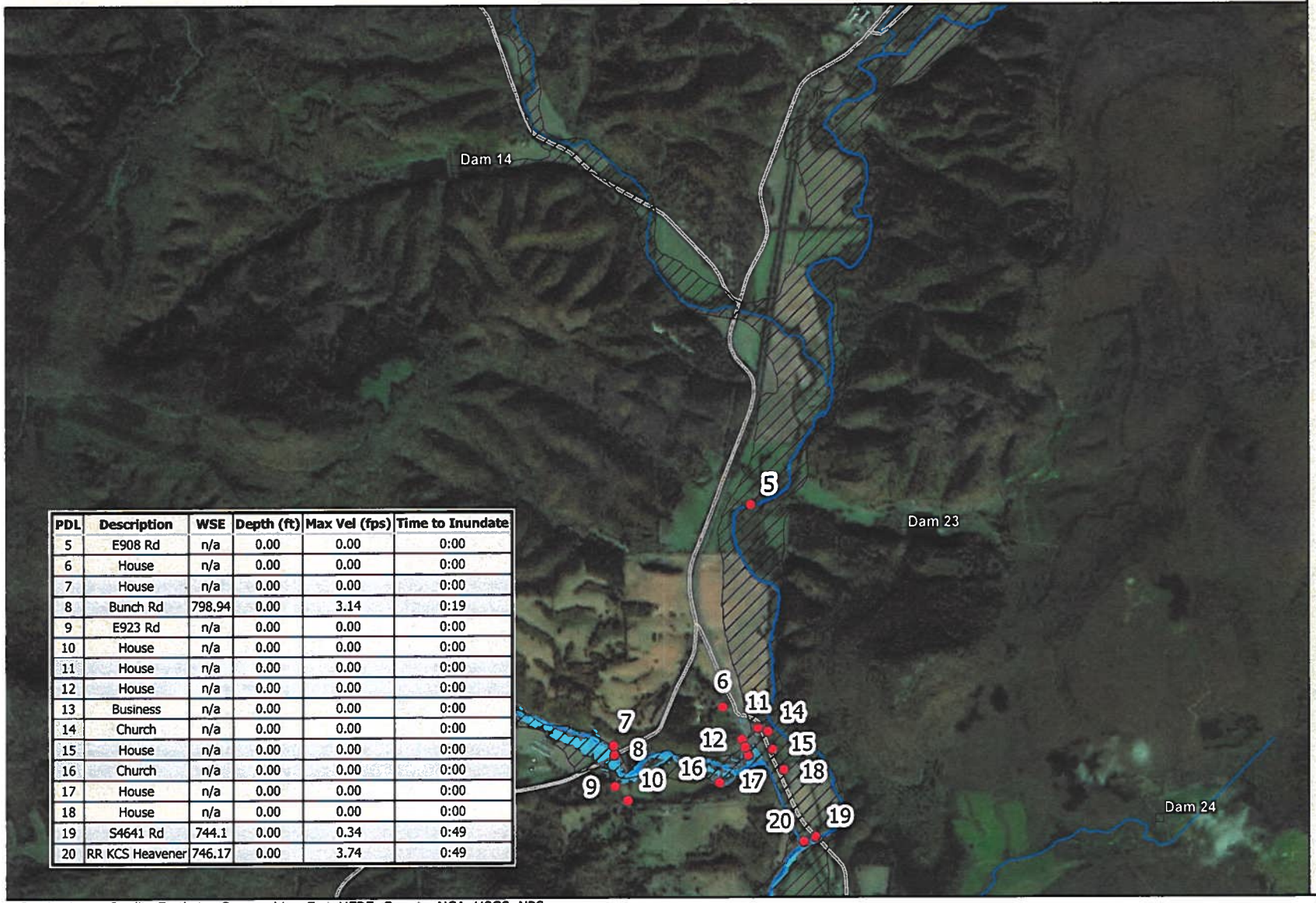
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 4 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	n/a	0.00	0.00	0:00
8	Bunch Rd	798.94	0.00	3.14	0:19
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	n/a	0.00	0.00	0:00
12	House	n/a	0.00	0.00	0:00
13	Business	n/a	0.00	0.00	0:00
14	Church	n/a	0.00	0.00	0:00
15	House	n/a	0.00	0.00	0:00
16	Church	n/a	0.00	0.00	0:00
17	House	n/a	0.00	0.00	0:00
18	House	n/a	0.00	0.00	0:00
19	S4641 Rd	744.1	0.00	0.34	0:49
20	RR KCS Heavener	746.17	0.00	3.74	0:49

Legend
- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

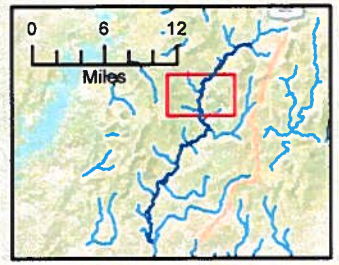
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



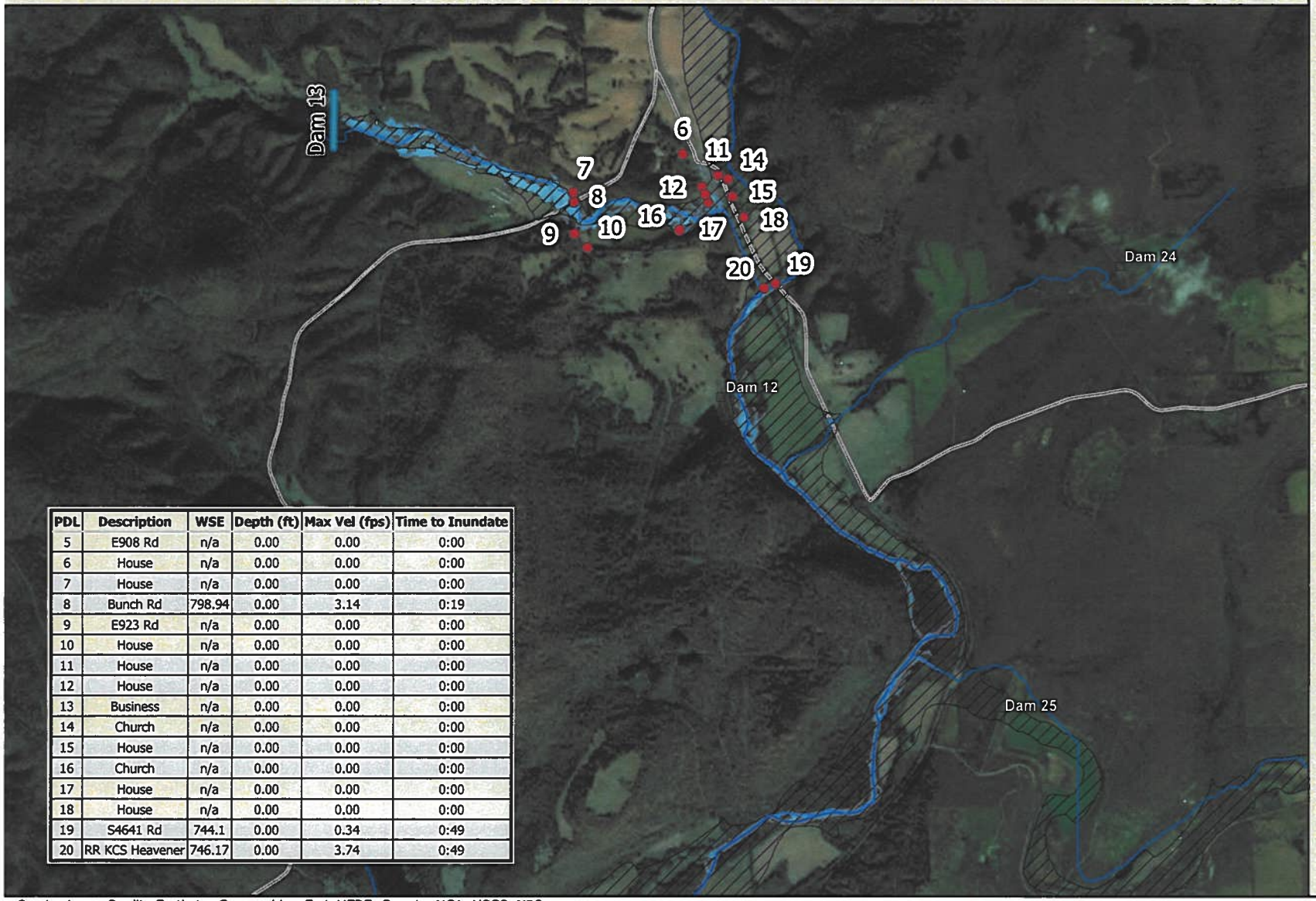
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 5 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	n/a	0.00	0.00	0:00
6	House	n/a	0.00	0.00	0:00
7	House	n/a	0.00	0.00	0:00
8	Bunch Rd	798.94	0.00	3.14	0:19
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	n/a	0.00	0.00	0:00
12	House	n/a	0.00	0.00	0:00
13	Business	n/a	0.00	0.00	0:00
14	Church	n/a	0.00	0.00	0:00
15	House	n/a	0.00	0.00	0:00
16	Church	n/a	0.00	0.00	0:00
17	House	n/a	0.00	0.00	0:00
18	House	n/a	0.00	0.00	0:00
19	S4641 Rd	744.1	0.00	0.34	0:49
20	RR KCS Heavener	746.17	0.00	3.74	0:49

Legend
- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

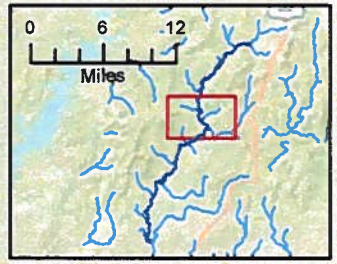
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

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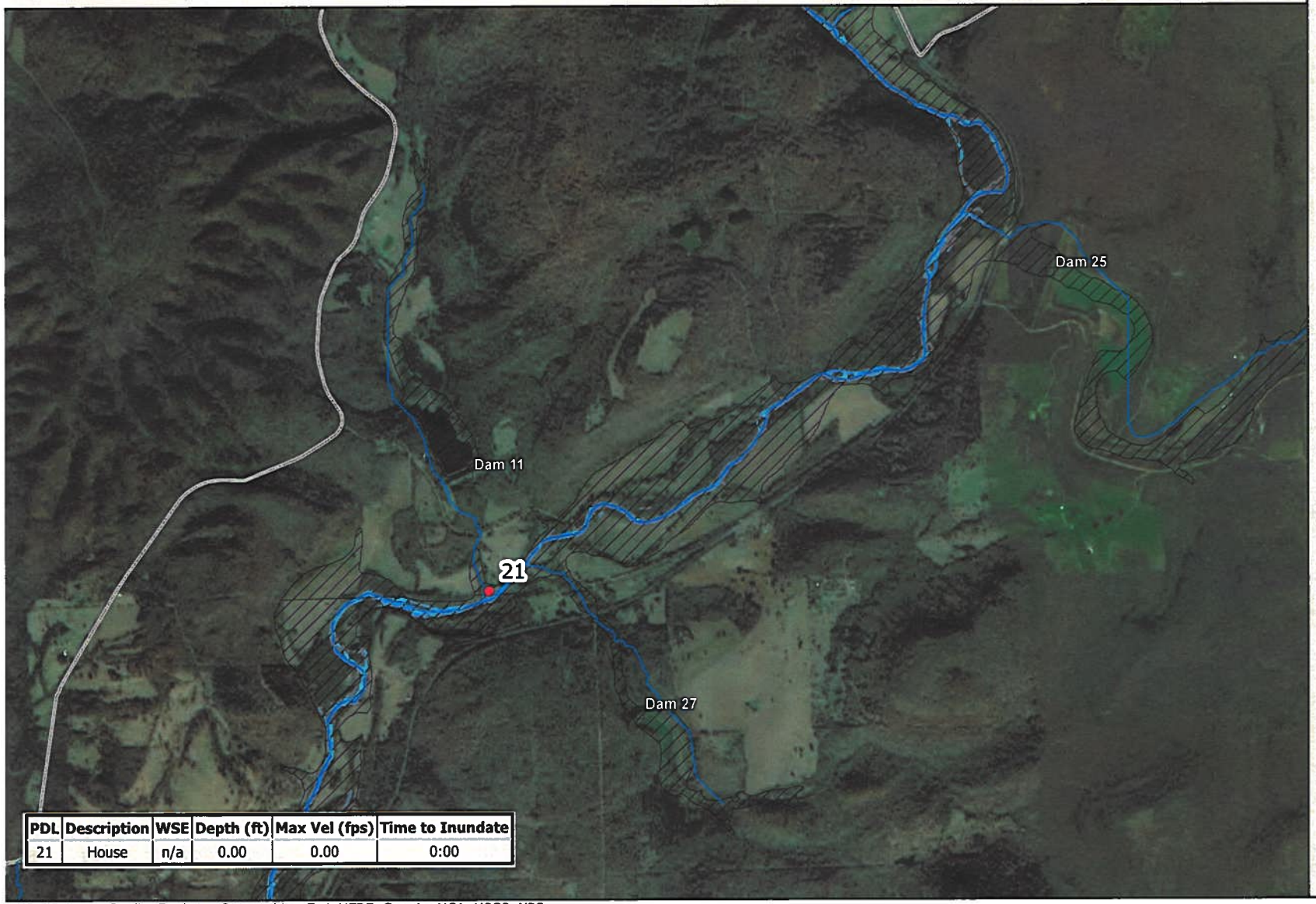
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 6 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

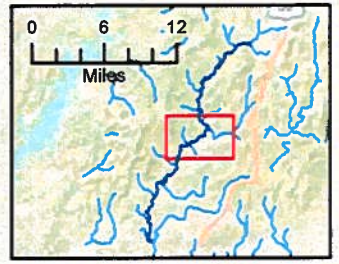
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 7 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

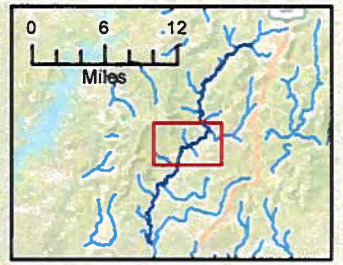
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

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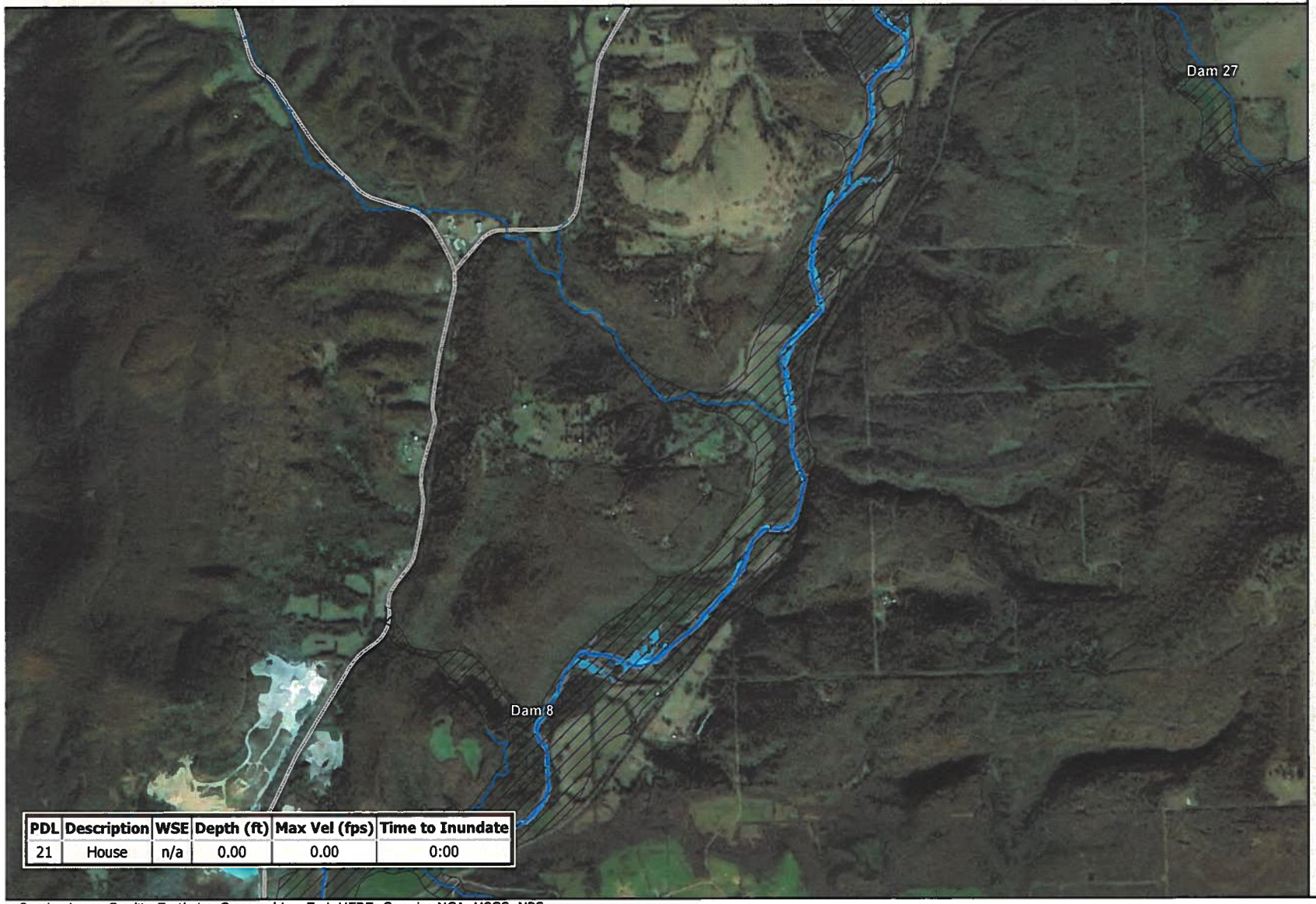
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 8 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend
- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

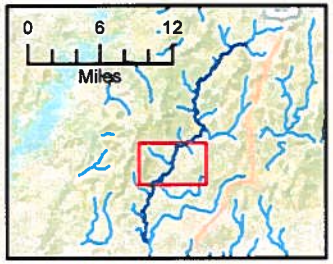
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



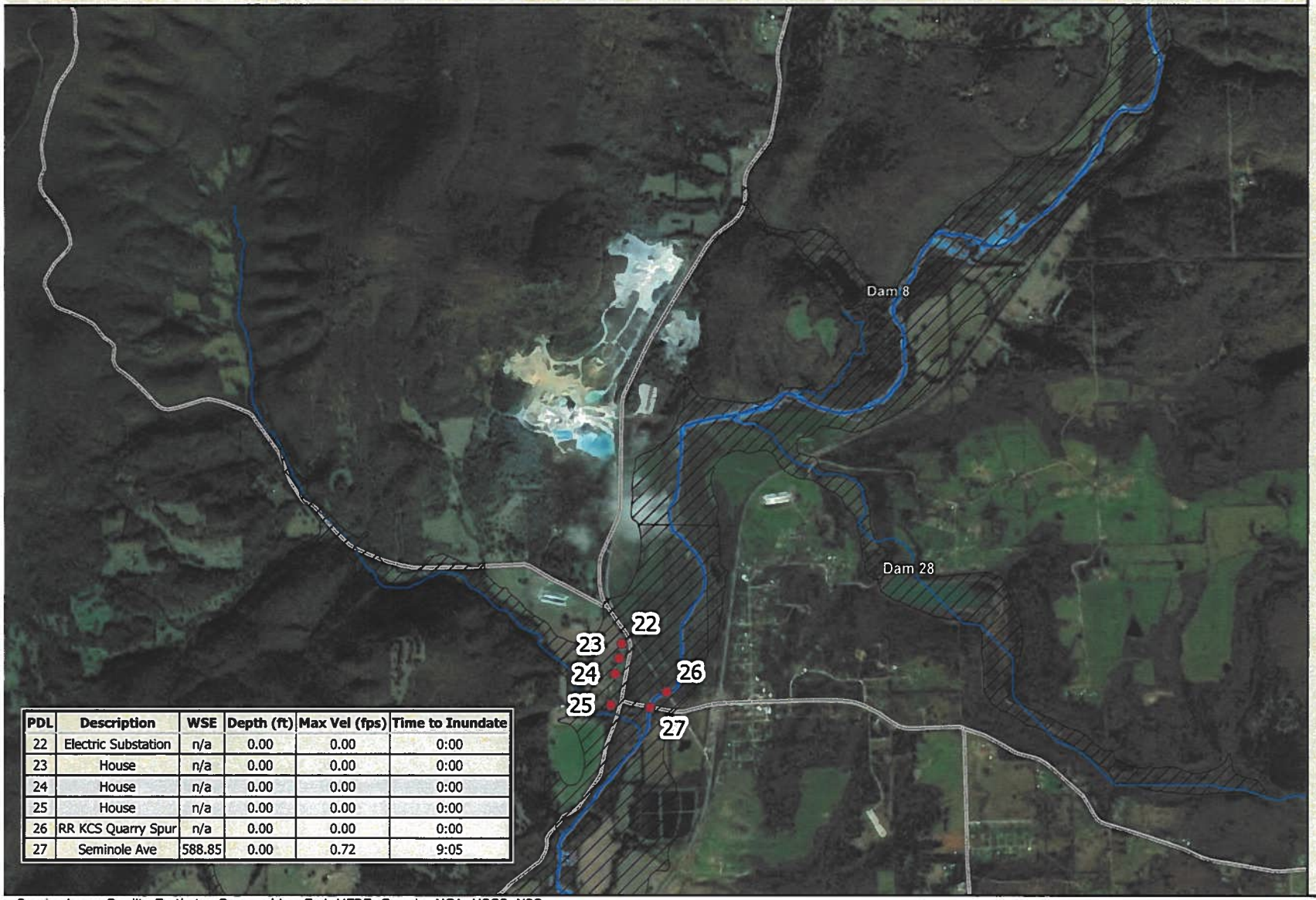
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 9 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	n/a	0.00	0.00	0:00
27	Seminole Ave	588.85	0.00	0.72	9:05

Legend
- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

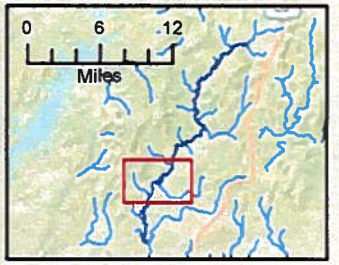
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



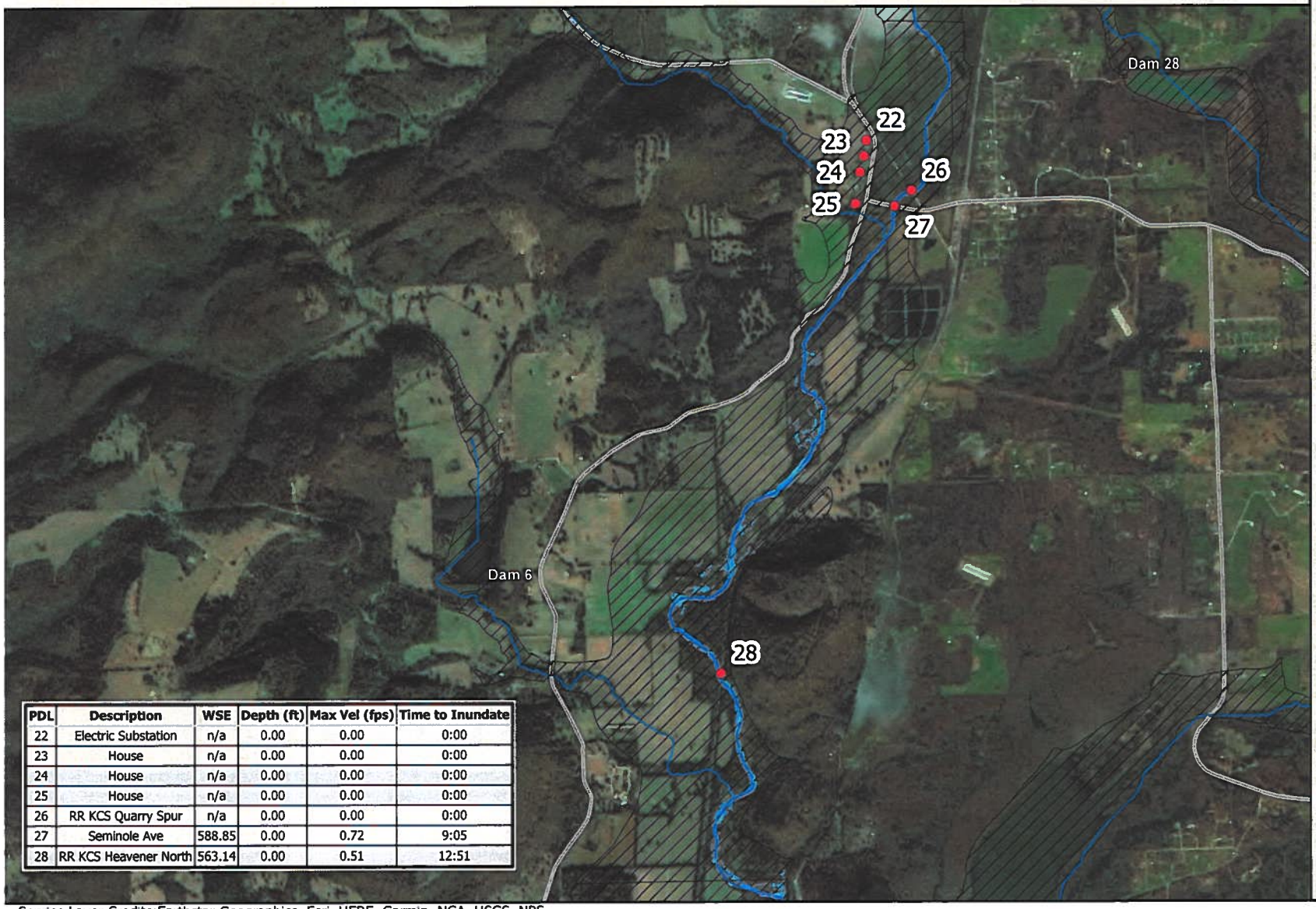
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 10 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00
25	House	n/a	0.00	0.00	0:00
26	RR KCS Quarry Spur	n/a	0.00	0.00	0:00
27	Seminole Ave	588.85	0.00	0.72	9:05
28	RR KCS Heavener North	563.14	0.00	0.51	12:51

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

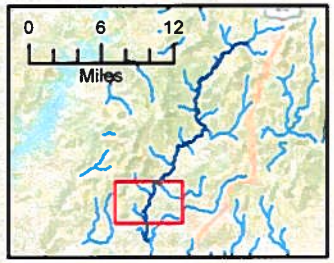
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



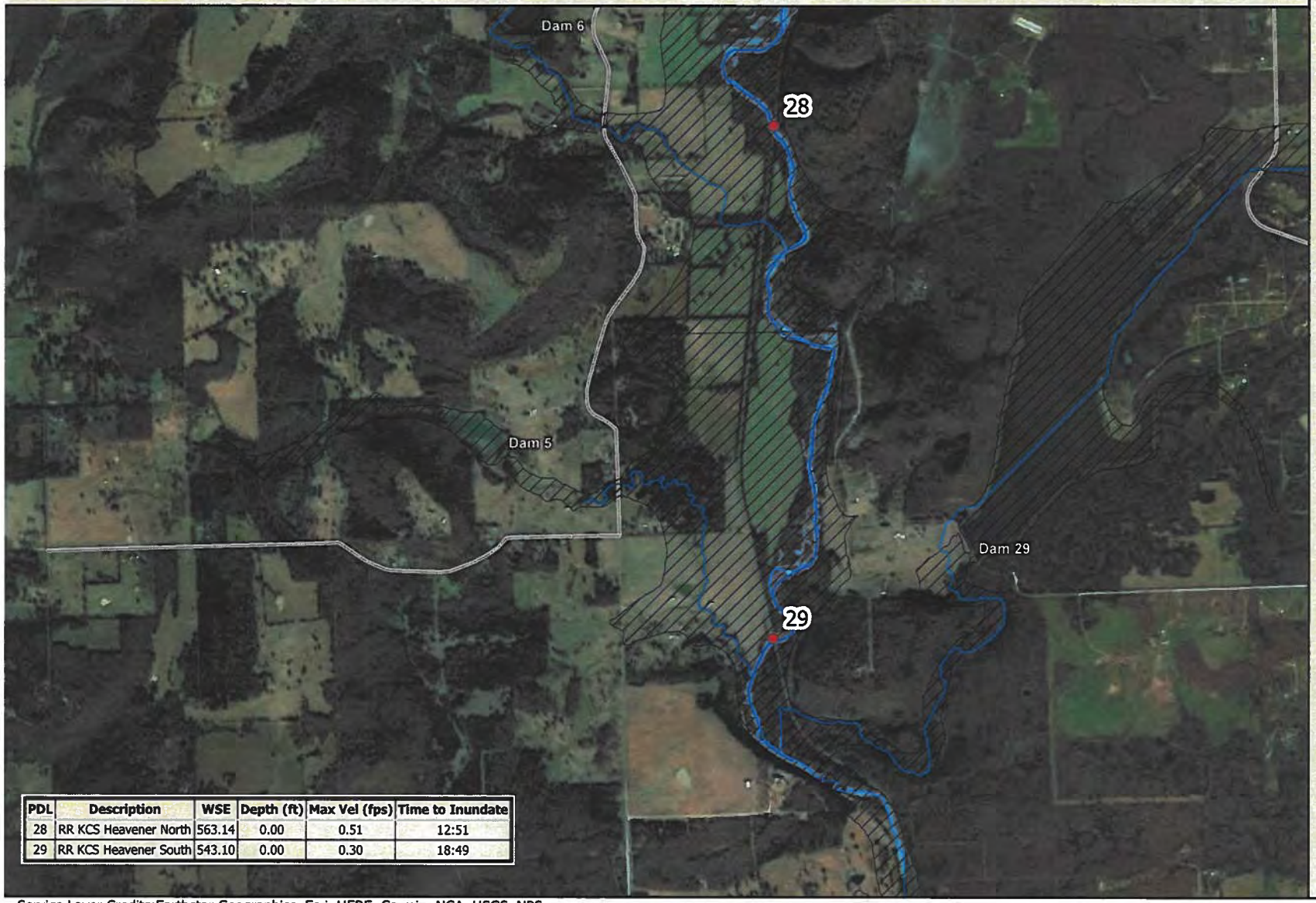
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 11 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
28	RR KCS Heavener North	563.14	0.00	0.51	12:51
29	RR KCS Heavener South	543.10	0.00	0.30	18:49

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

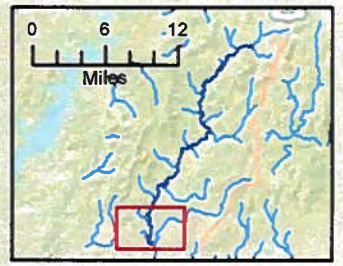
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



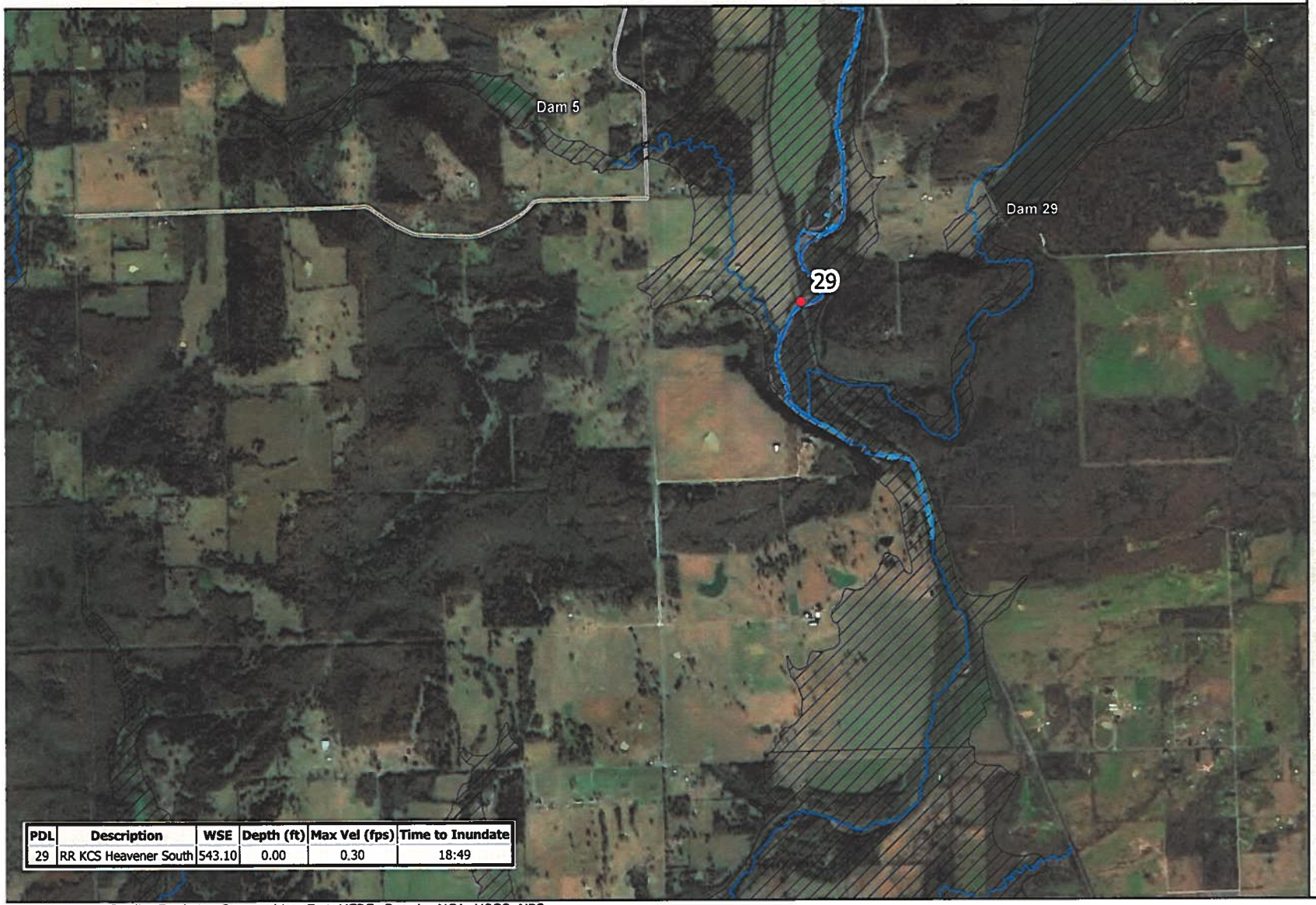
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-13
Seismic Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 12 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
29	RR KCS Heavener South	543.10	0.00	0.30	18:49

Legend

- PDLs
- Seismic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Dam Lines
- Dam

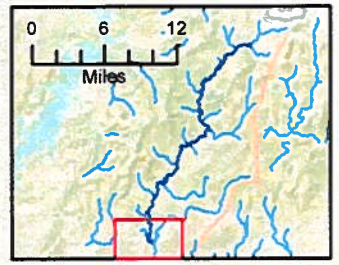
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



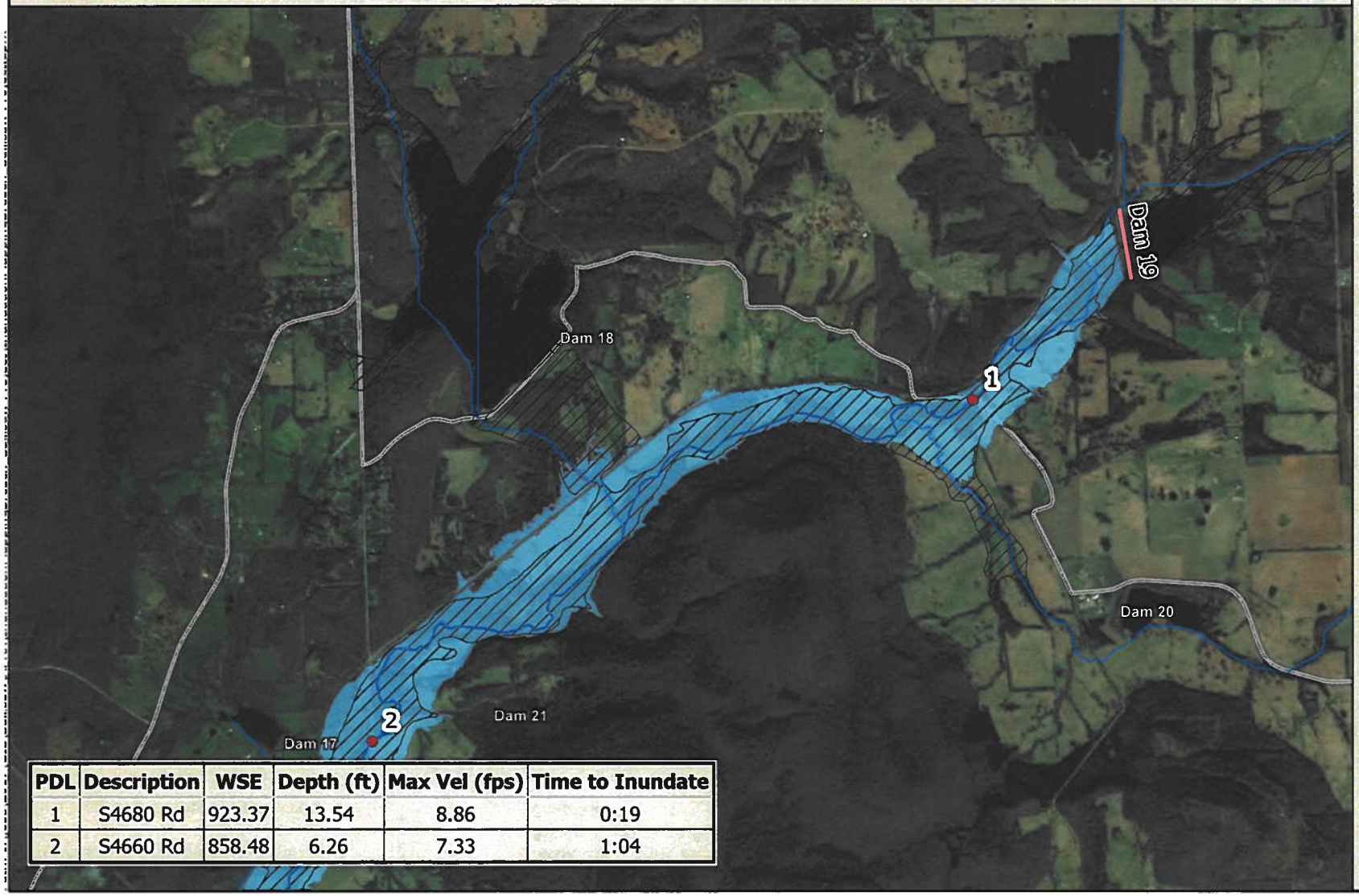
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 1 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	923.37	13.54	8.86	0:19
2	S4660 Rd	858.48	6.26	7.33	1:04

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

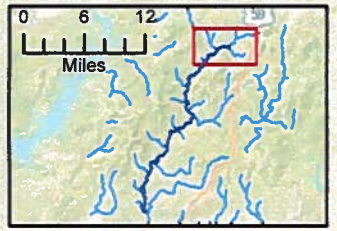
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



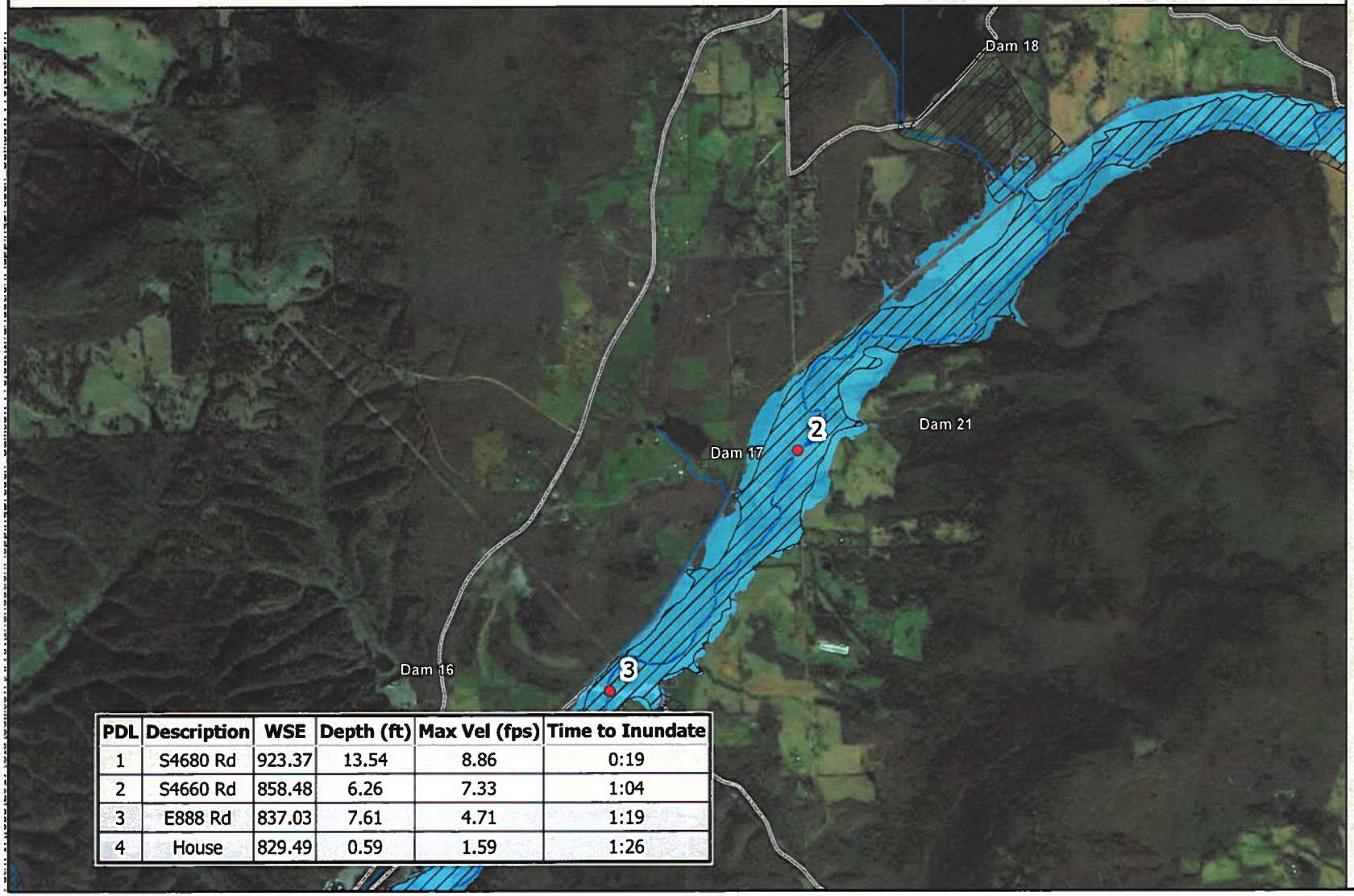
CONSERVATIONWORKS

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 2 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	923.37	13.54	8.86	0:19
2	S4660 Rd	858.48	6.26	7.33	1:04
3	E888 Rd	837.03	7.61	4.71	1:19
4	House	829.49	0.59	1.59	1:26

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

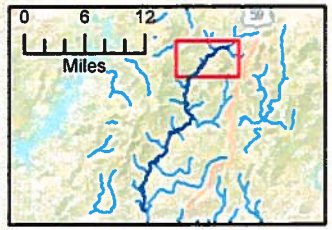
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



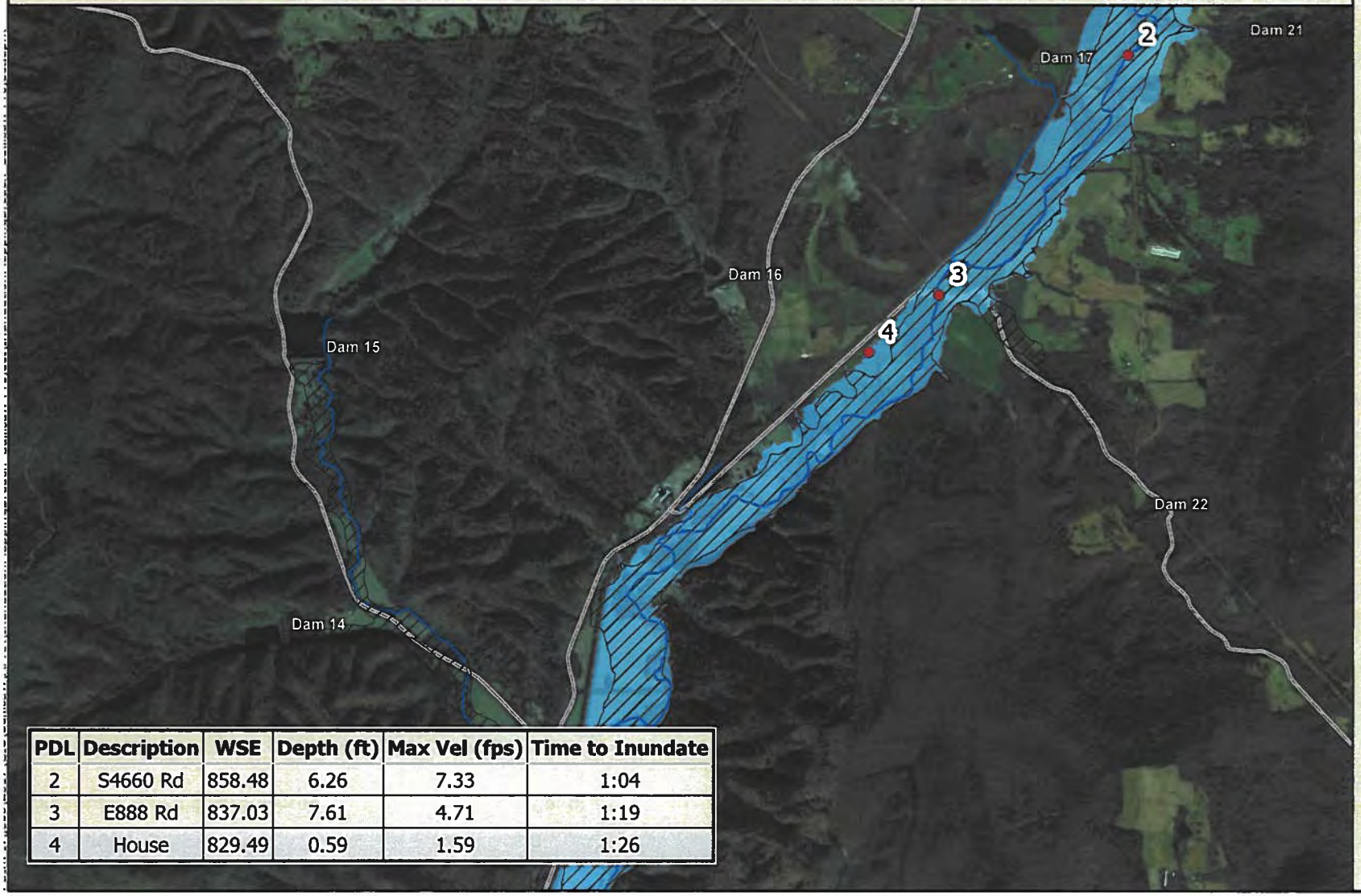
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 3 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	858.48	6.26	7.33	1:04
3	E888 Rd	837.03	7.61	4.71	1:19
4	House	829.49	0.59	1.59	1:26

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

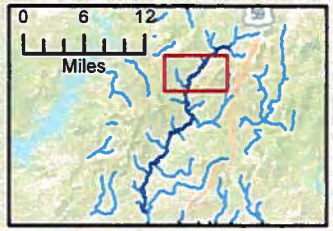
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



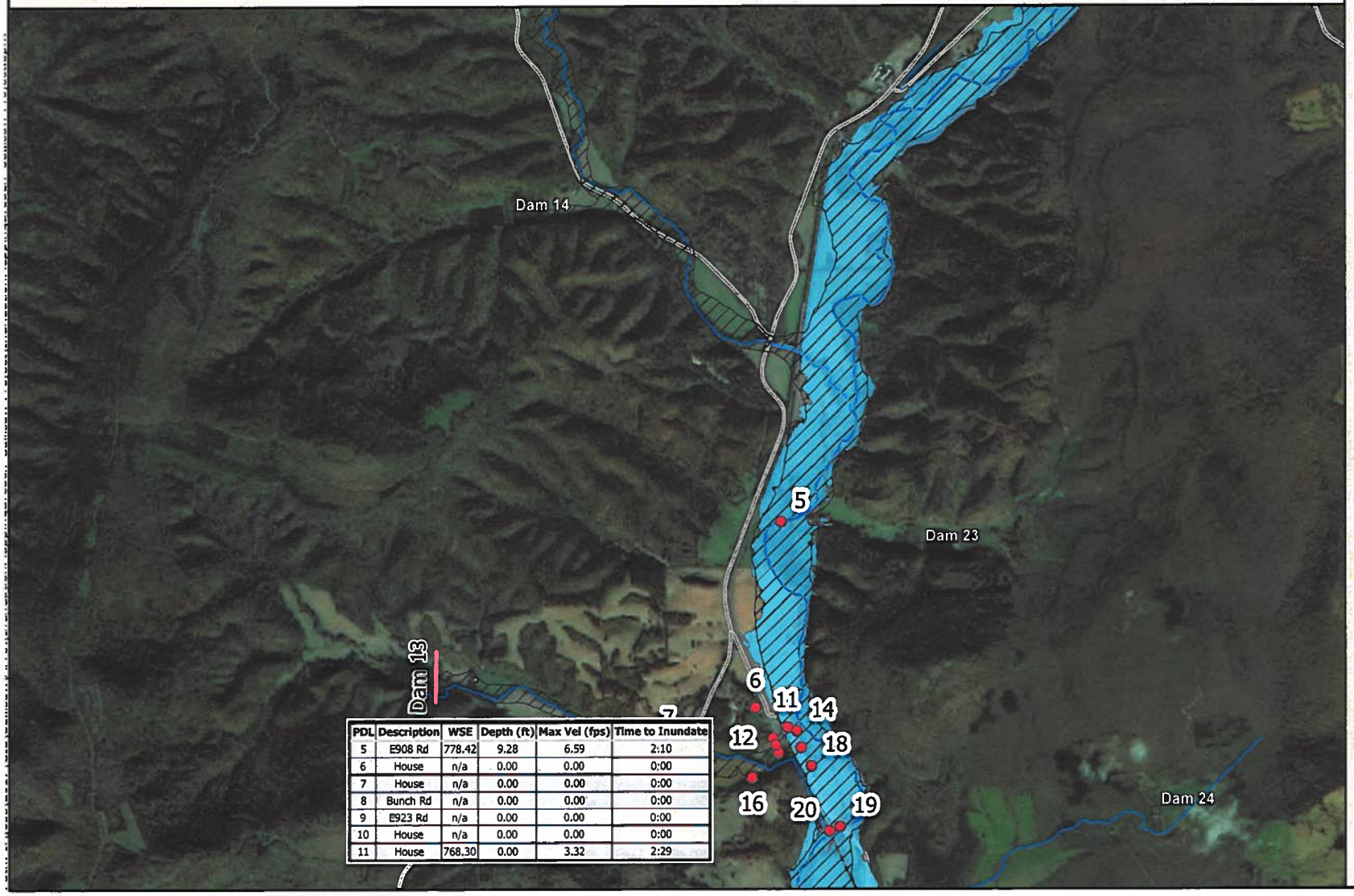
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 4 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	778.42	9.28	6.59	2:10
6	House	n/a	0.00	0.00	0:00
7	House	n/a	0.00	0.00	0:00
8	Bunch Rd	n/a	0.00	0.00	0:00
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	768.30	0.00	3.32	2:29

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

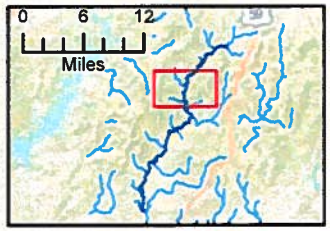
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



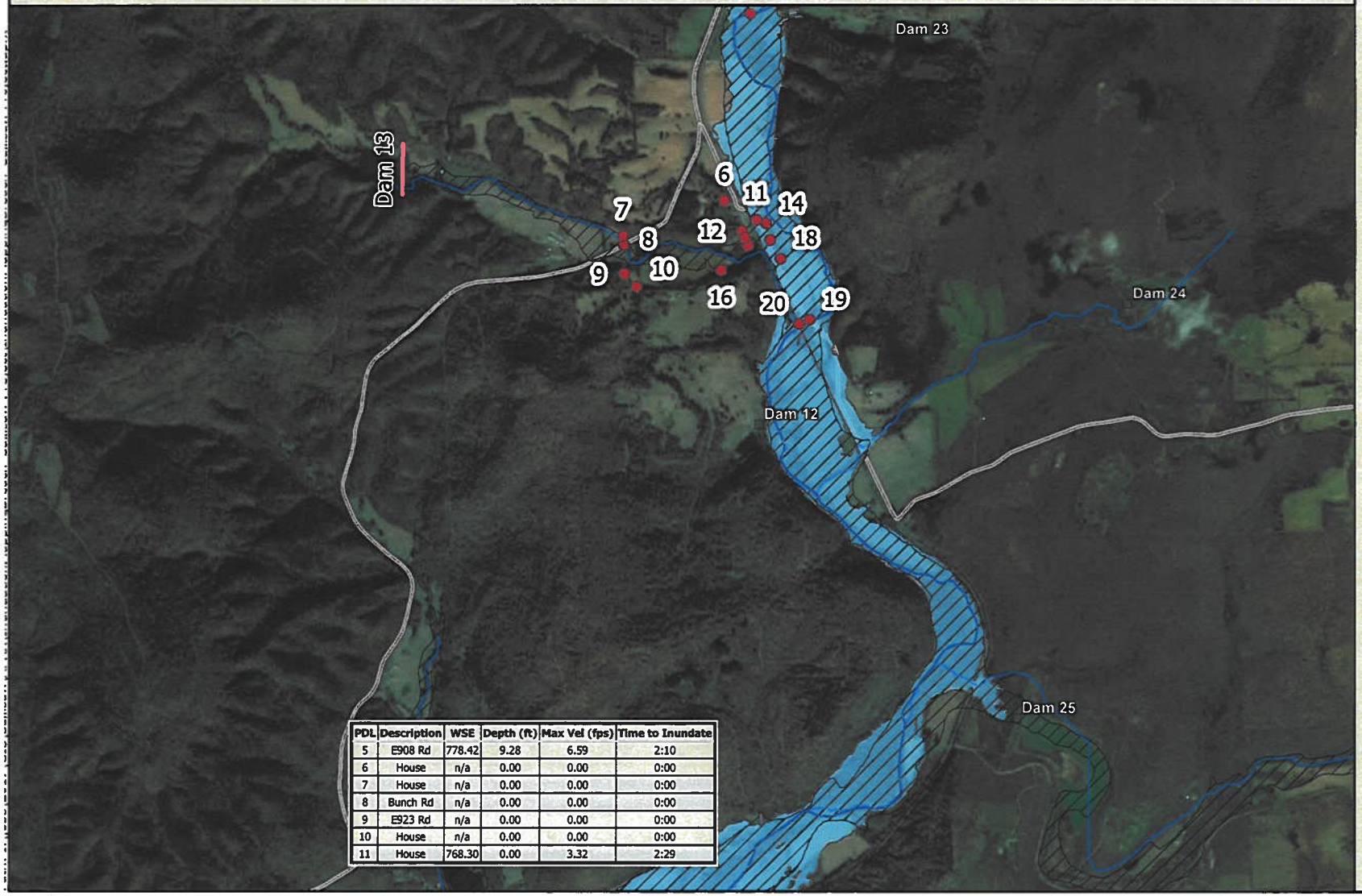
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 5 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	778.42	9.28	6.59	2:10
6	House	n/a	0.00	0.00	0:00
7	House	n/a	0.00	0.00	0:00
8	Bunch Rd	n/a	0.00	0.00	0:00
9	E923 Rd	n/a	0.00	0.00	0:00
10	House	n/a	0.00	0.00	0:00
11	House	768.30	0.00	3.32	2:29

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

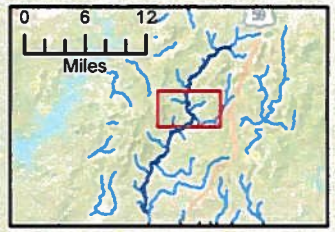
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



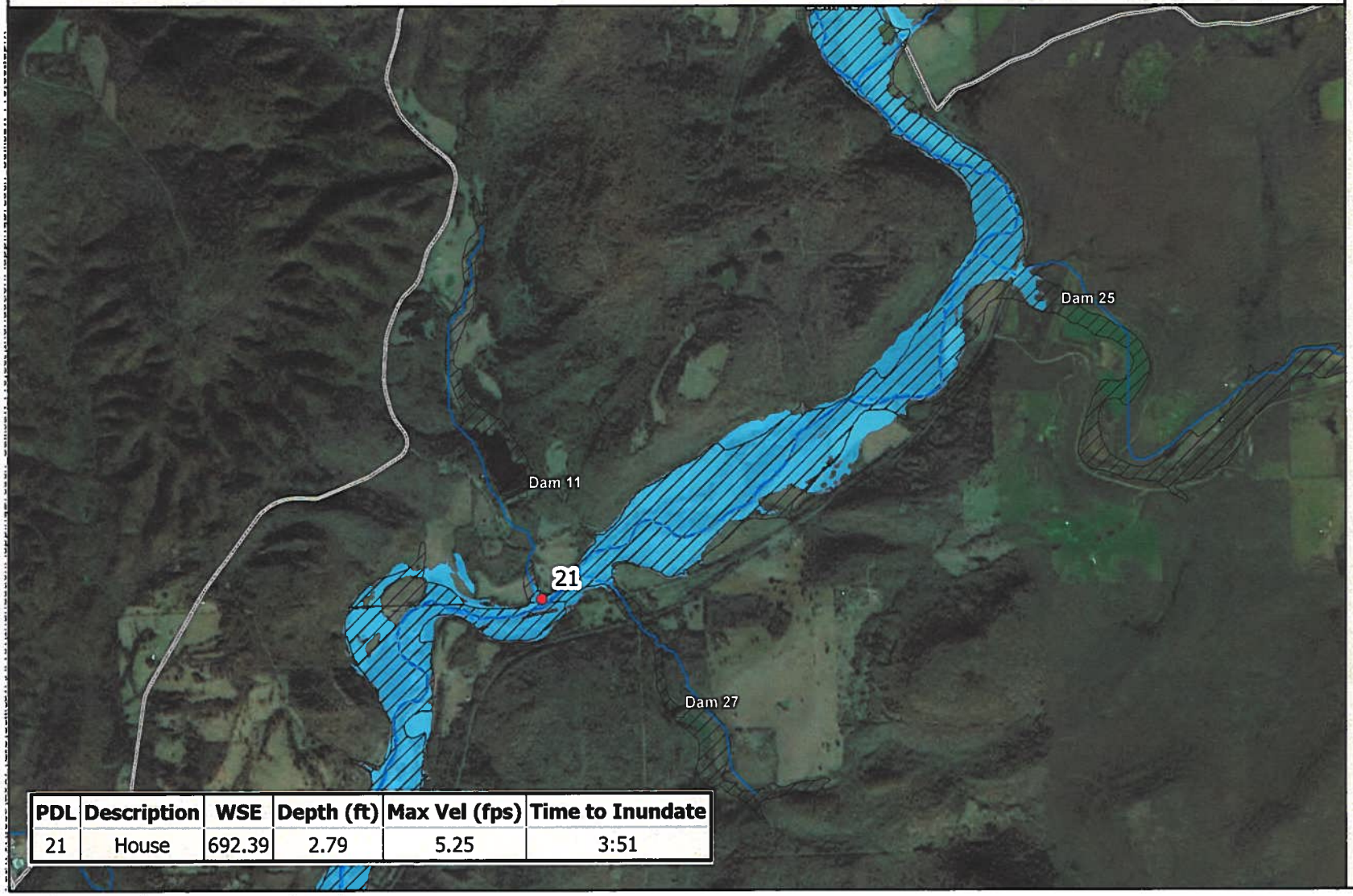
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 6 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	692.39	2.79	5.25	3:51

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

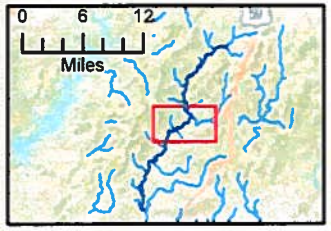
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



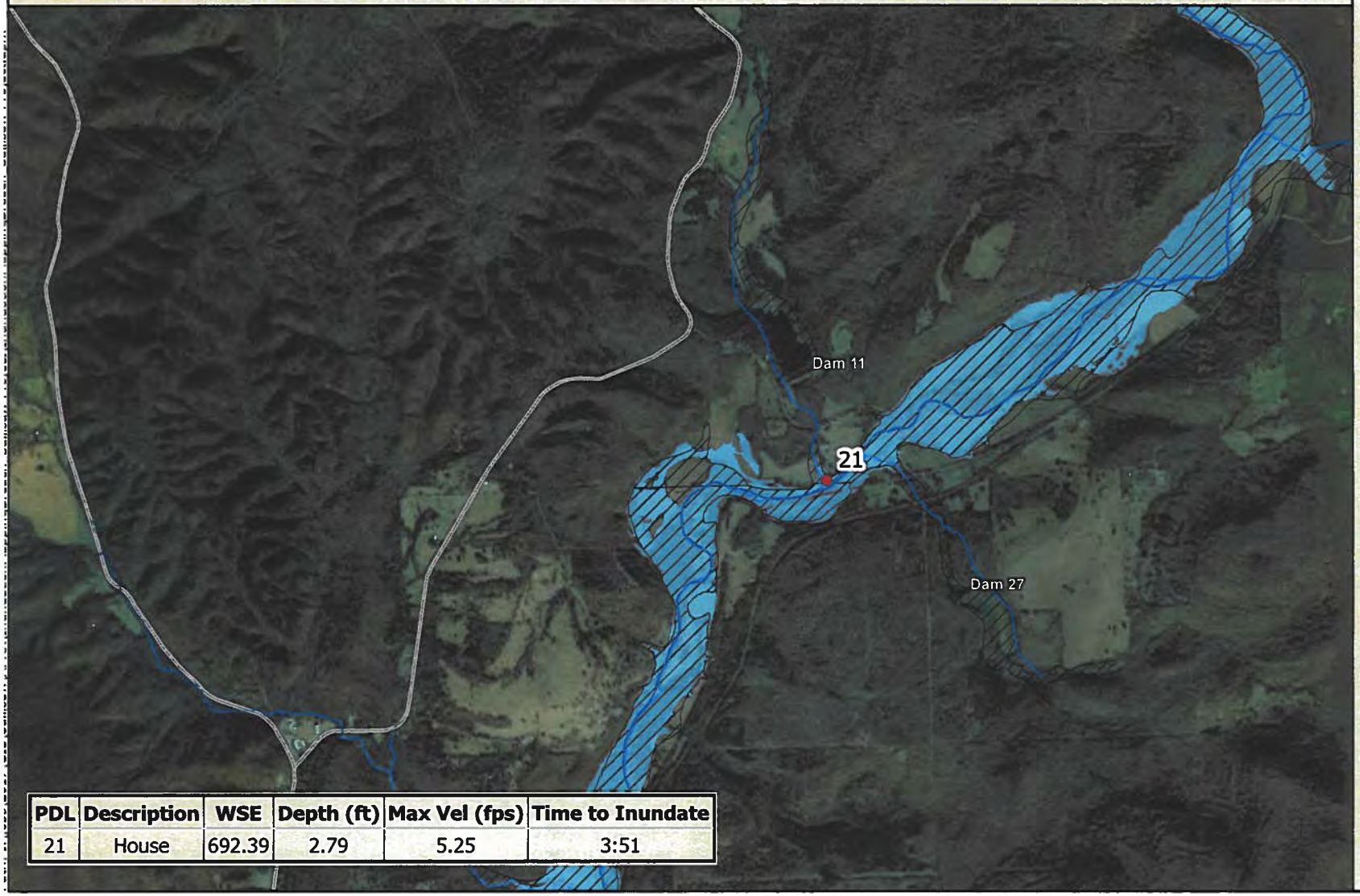
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 7 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	692.39	2.79	5.25	3:51

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

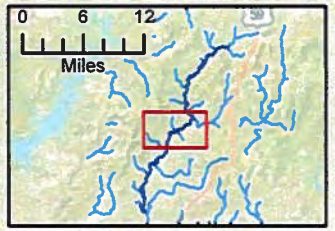
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



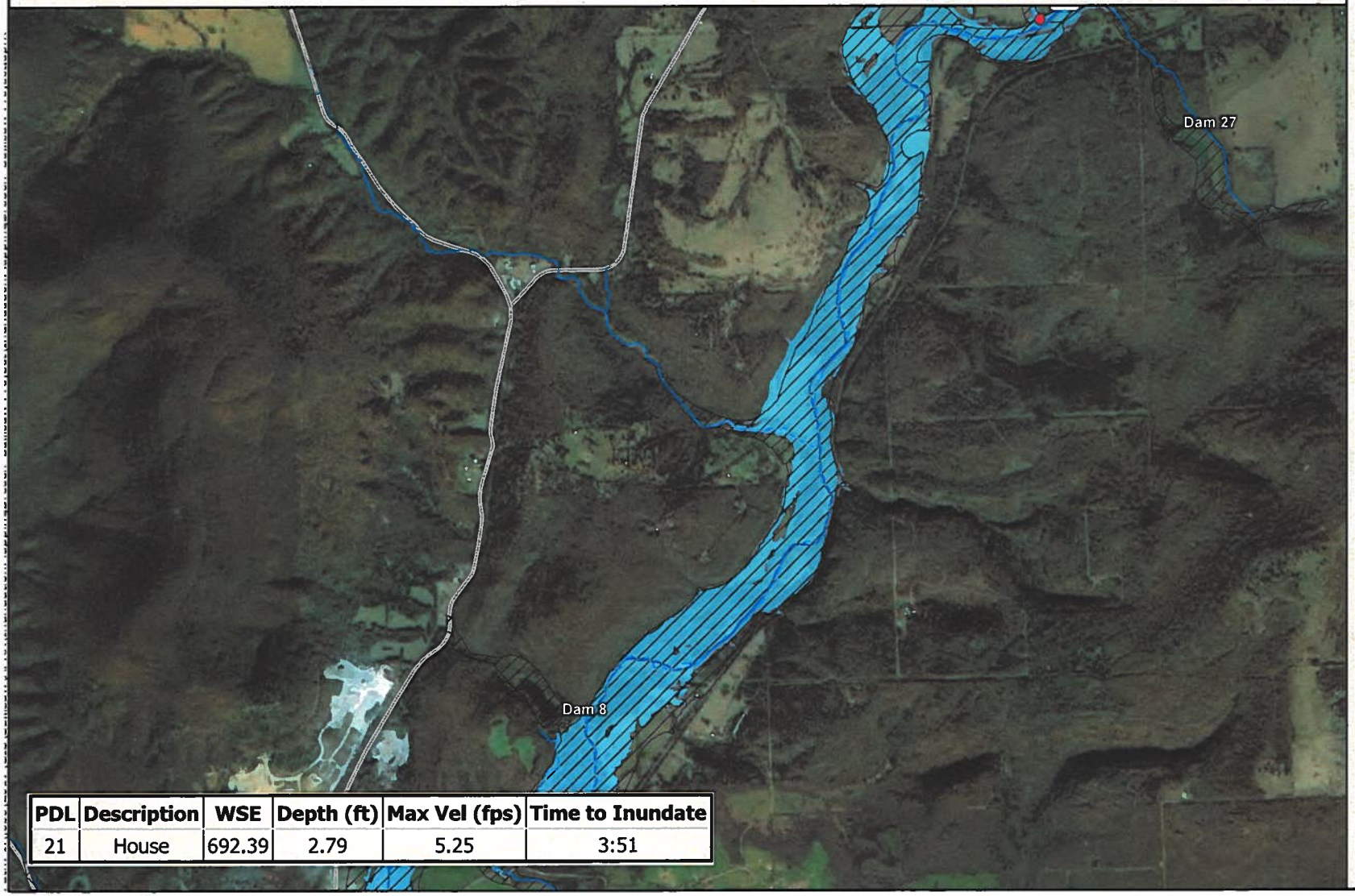
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 8 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	692.39	2.79	5.25	3:51

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

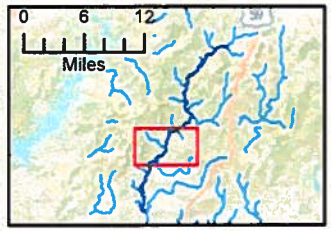
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



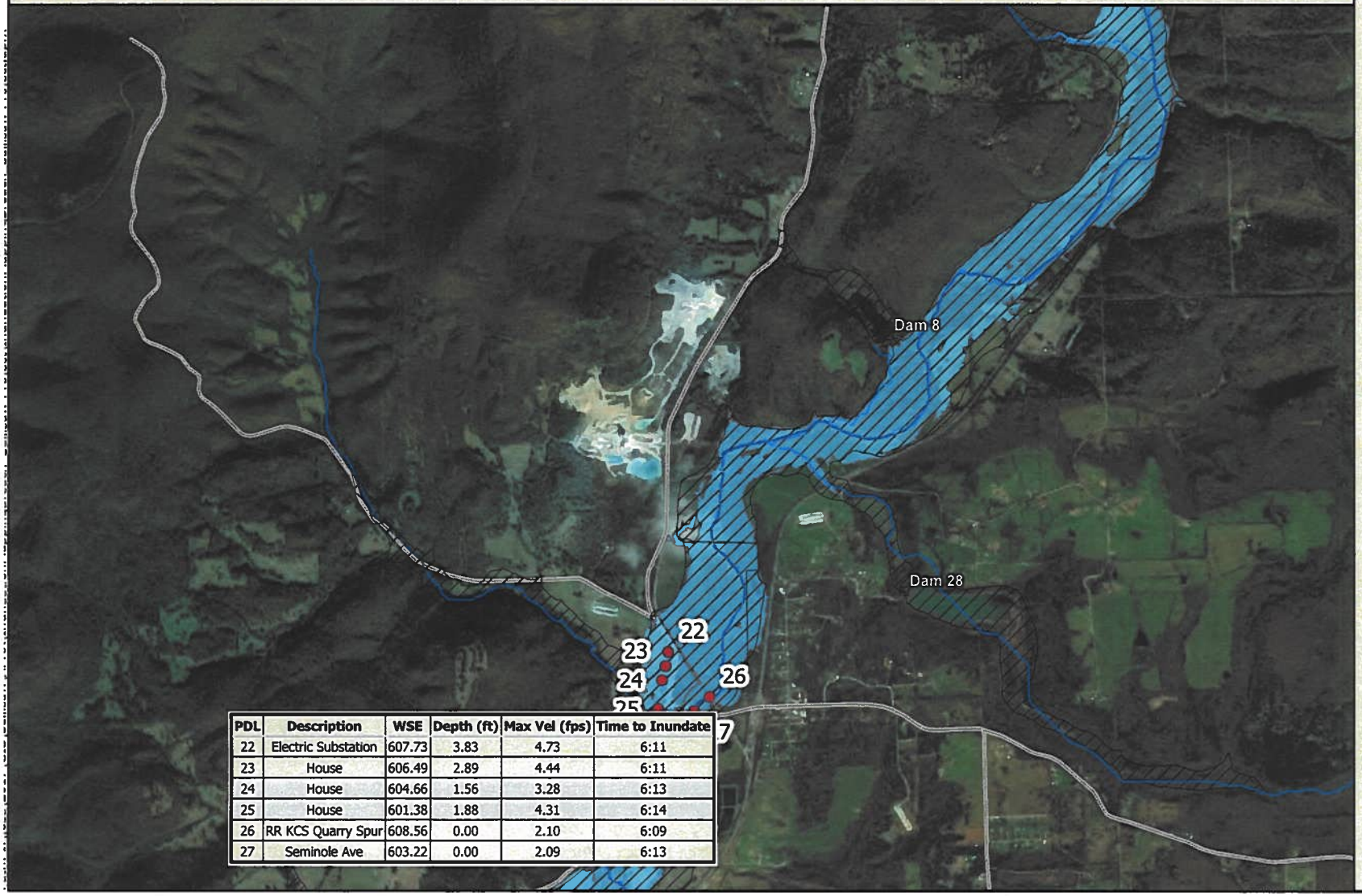
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 9 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	607.73	3.83	4.73	6:11
23	House	606.49	2.89	4.44	6:11
24	House	604.66	1.56	3.28	6:13
25	House	601.38	1.88	4.31	6:14
26	RR KCS Quarry Spur	608.56	0.00	2.10	6:09
27	Seminole Ave	603.22	0.00	2.09	6:13

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

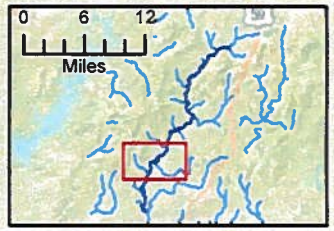
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



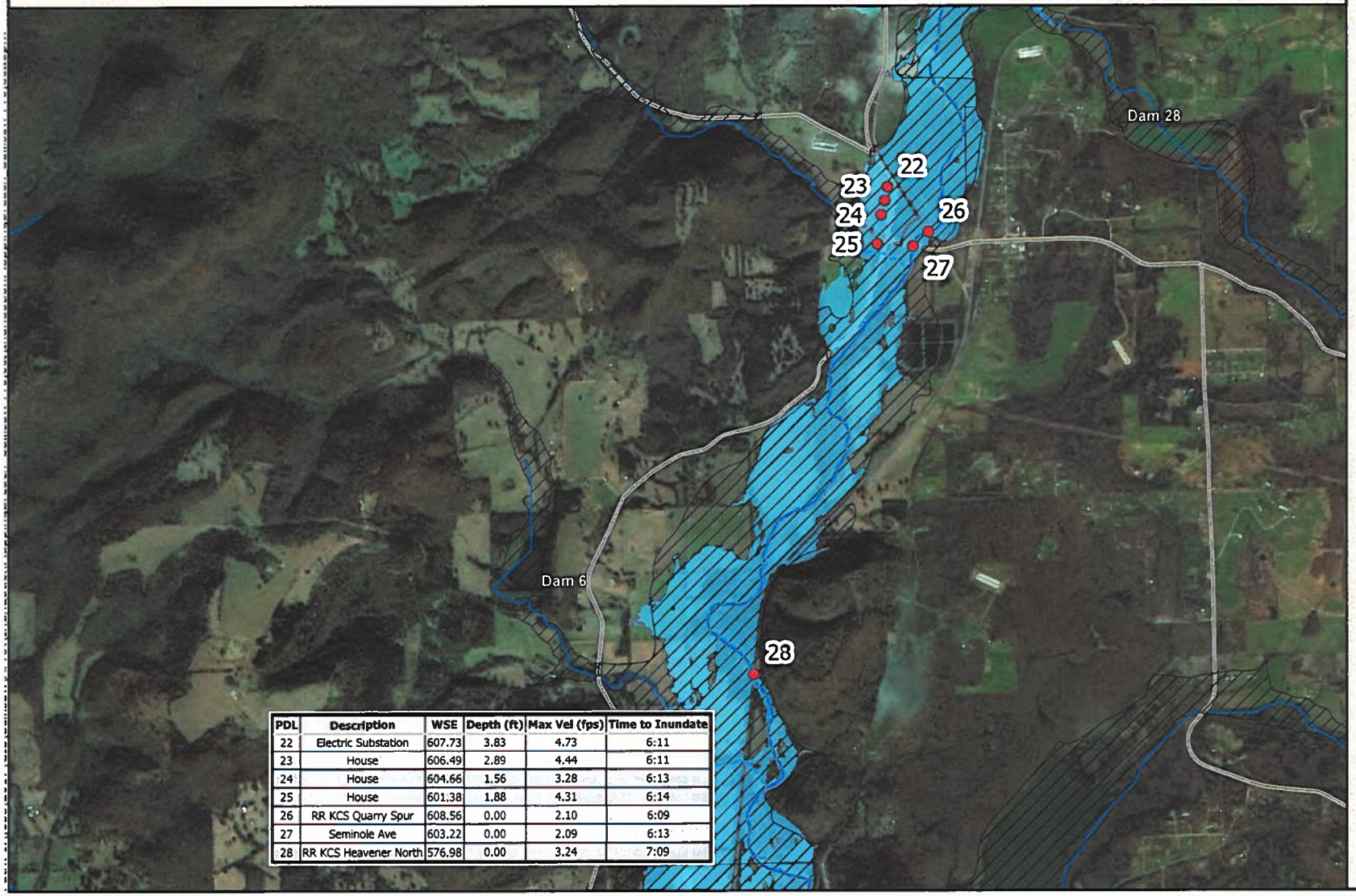
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 10 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	607.73	3.83	4.73	6:11
23	House	606.49	2.89	4.44	6:11
24	House	604.66	1.56	3.28	6:13
25	House	601.38	1.88	4.31	6:14
26	RR KCS Quarry Spur	608.56	0.00	2.10	6:09
27	Seminole Ave	603.22	0.00	2.09	6:13
28	RR KCS Heavener North	576.98	0.00	3.24	7:09

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

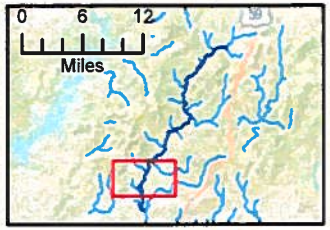
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



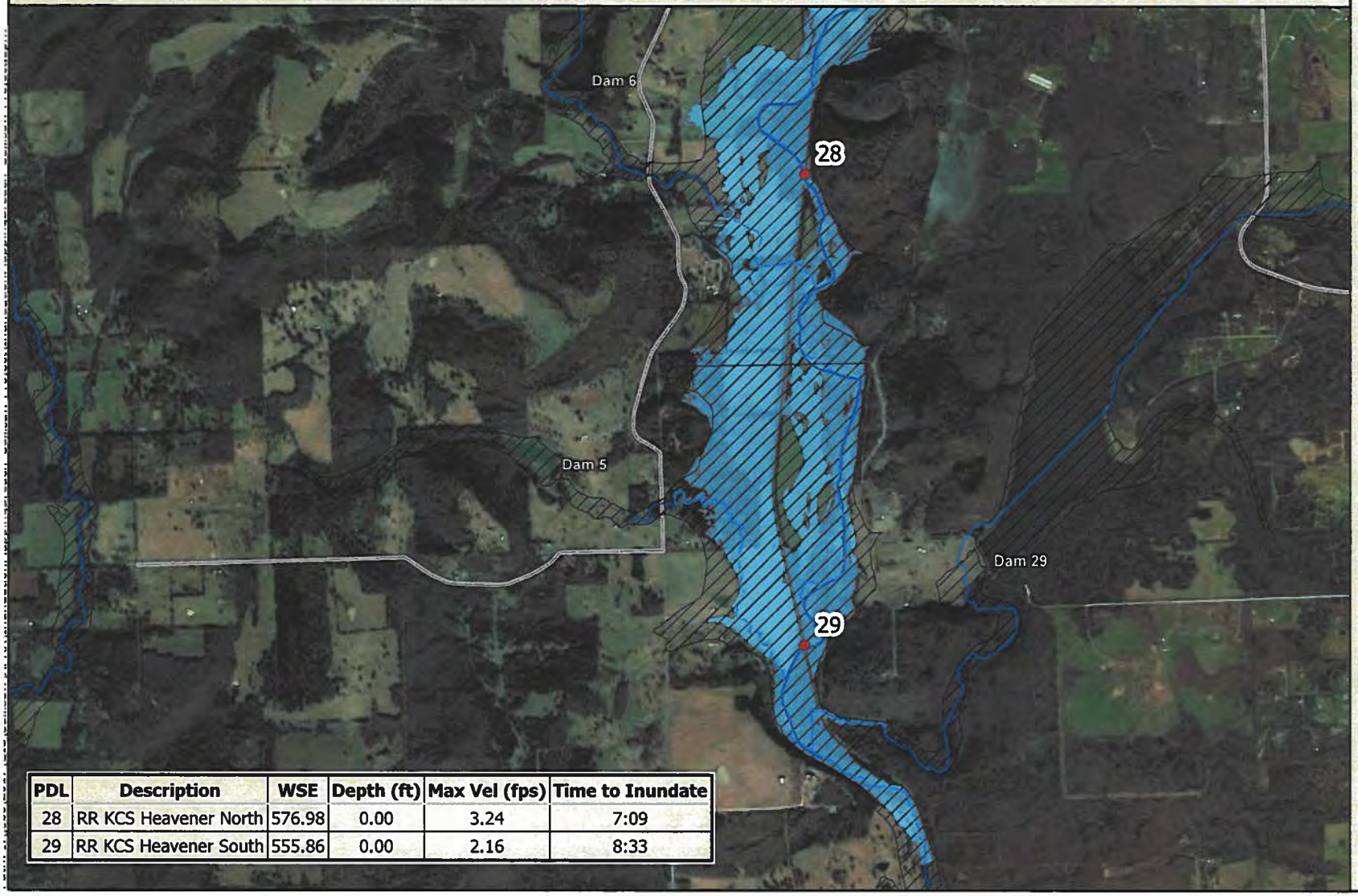
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 11 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
28	RR KCS Heavener North	576.98	0.00	3.24	7:09
29	RR KCS Heavener South	555.86	0.00	2.16	8:33

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

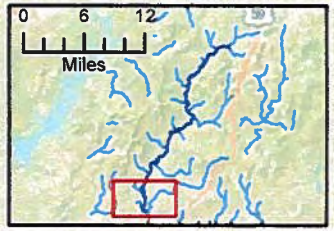
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



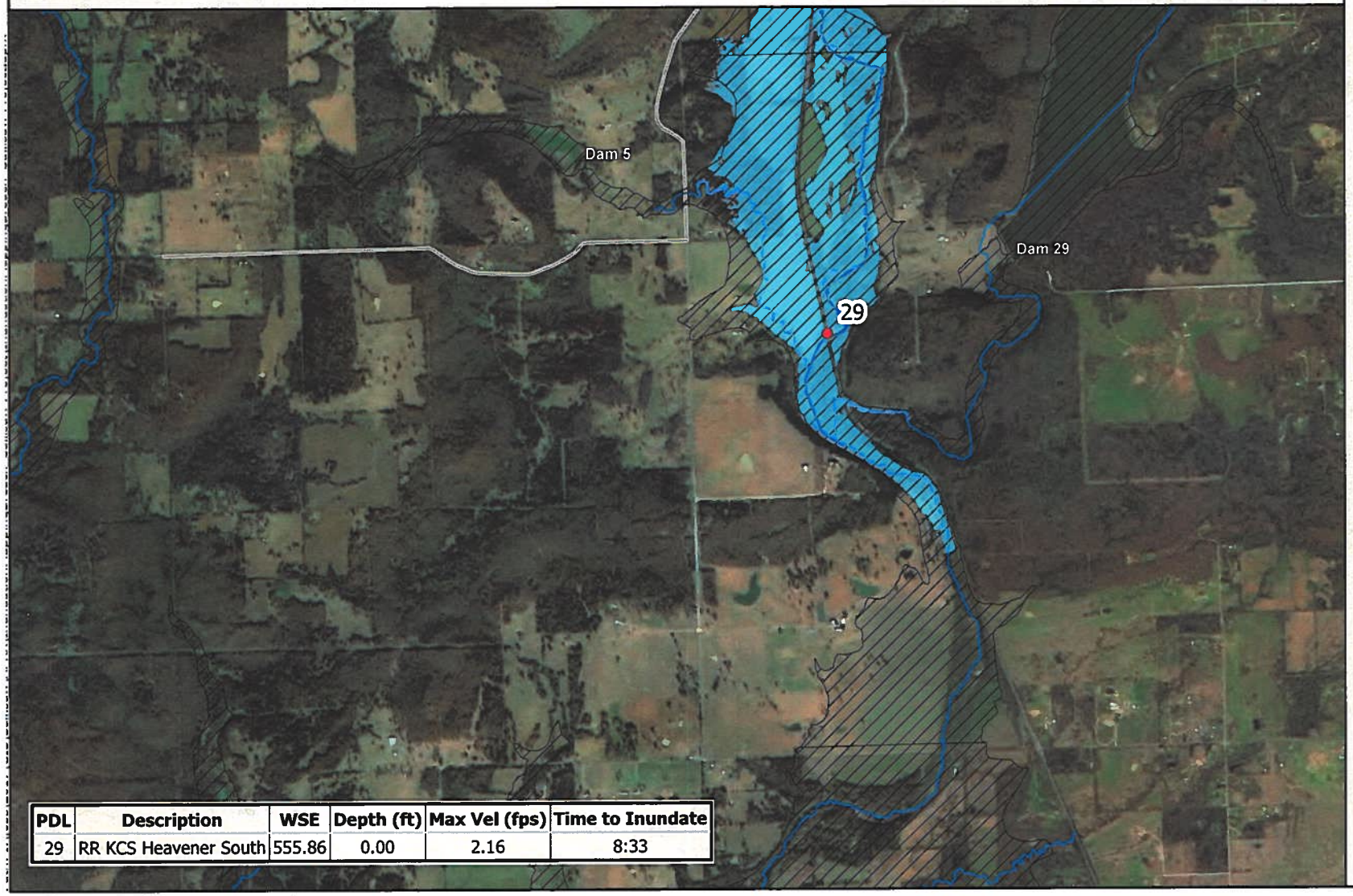
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Hydrologic Breach Inundation Map
Existing Condition & Preferred

Alt.*
Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 12 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
29	RR KCS Heavener South	555.86	0.00	2.16	8:33

Legend
- PDLs
- Hydrologic Breach
- FEMA 100 Yr Floodplain
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

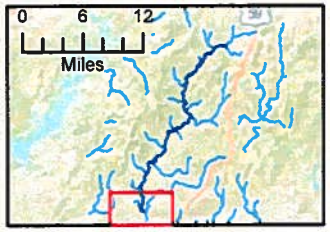
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

*NOTE: The analysis for the hydrologic breach yields the same inundation results in both the existing condition and preferred alternative because the top of dam elevation is the same for both scenarios.



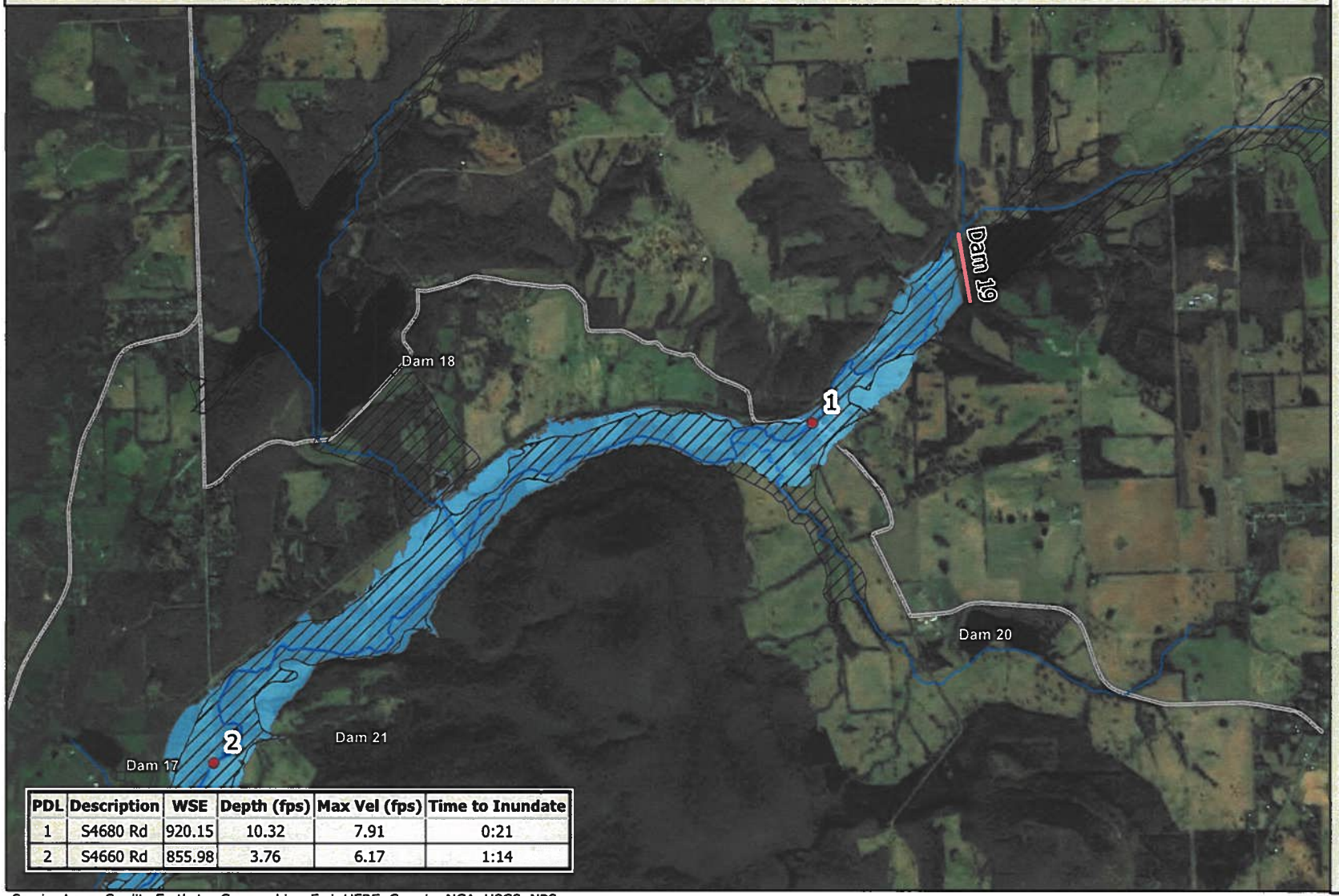
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 1 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	920.15	10.32	7.91	0:21
2	S4660 Rd	855.98	3.76	6.17	1:14

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

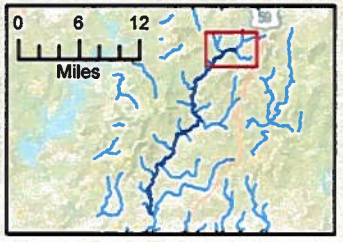
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

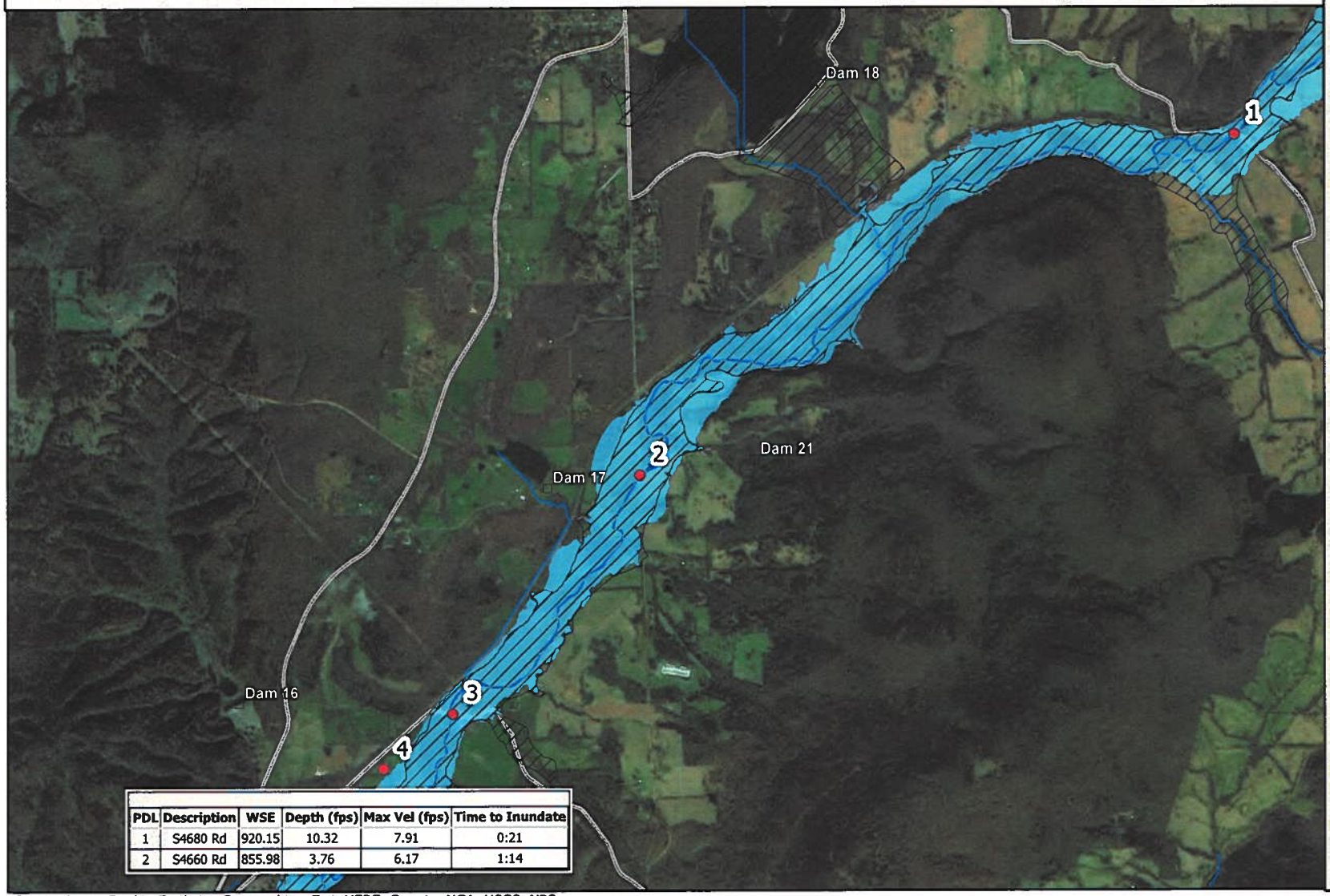


CONSERVATIONWORKS JOINT VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 2 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	920.15	10.32	7.91	0:21
2	S4660 Rd	855.98	3.76	6.17	1:14

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

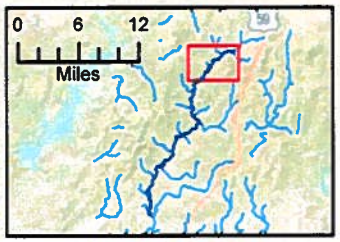
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



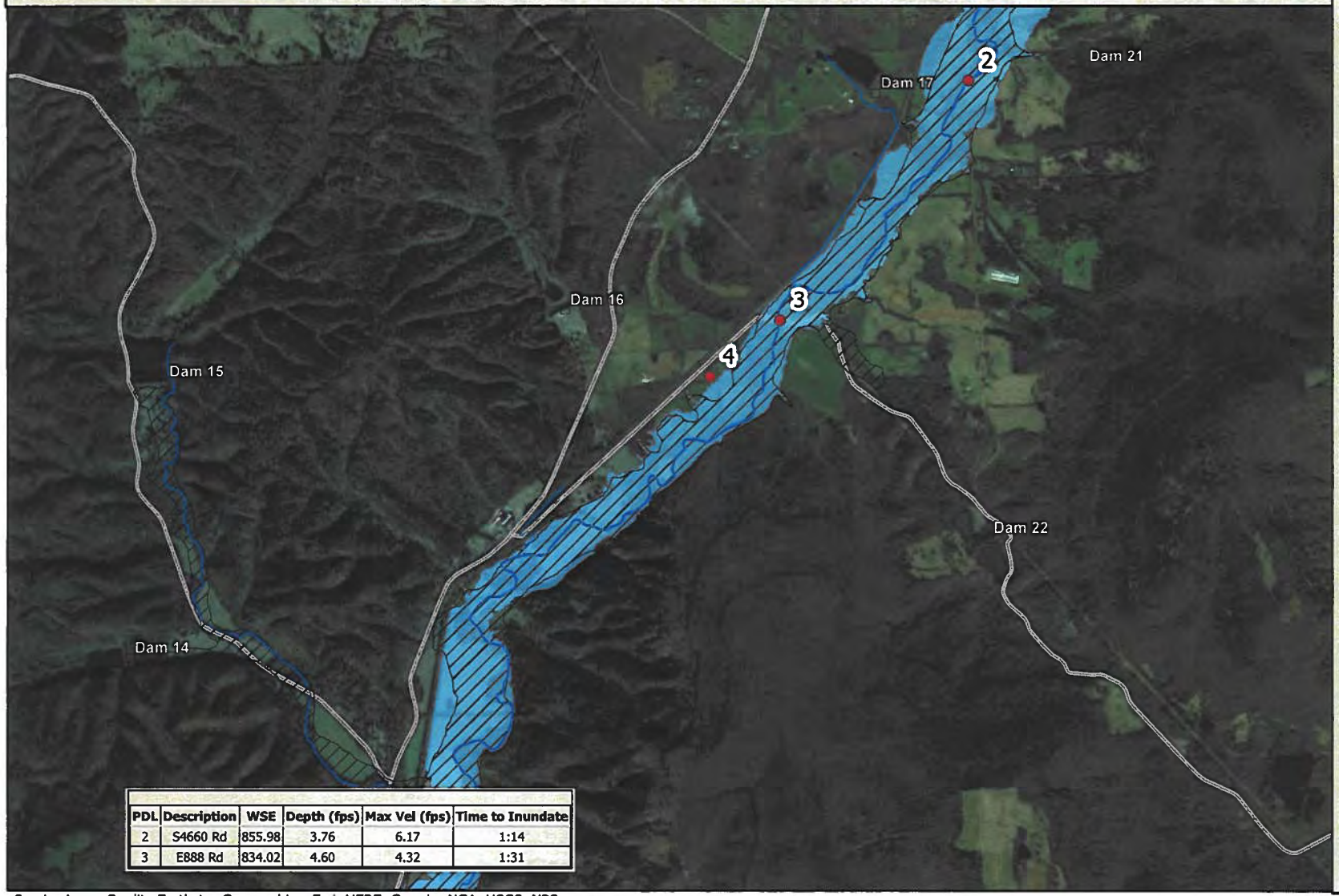
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 3 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	855.98	3.76	6.17	1:14
3	E888 Rd	834.02	4.60	4.32	1:31

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

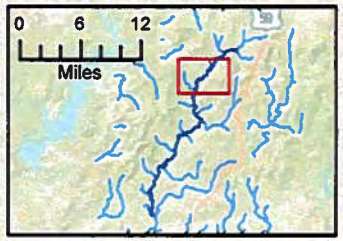
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



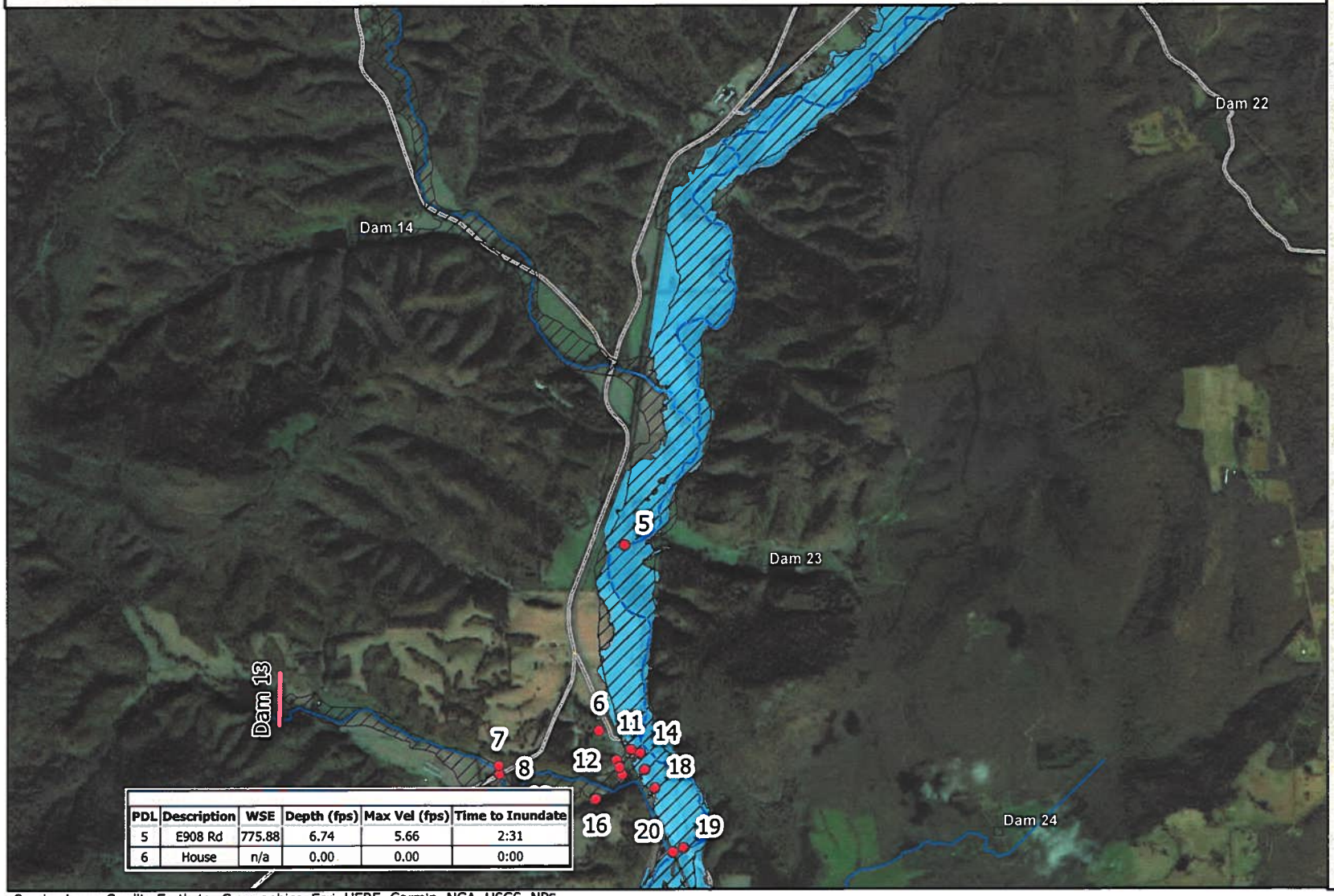
CONSERVATIONWORKS
JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 4 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
5	E908 Rd	775.88	6.74	5.66	2:31
6	House	n/a	0.00	0.00	0:00

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

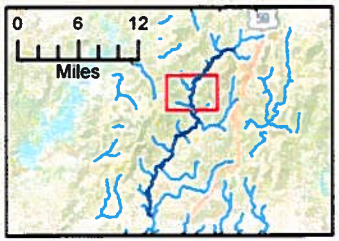
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



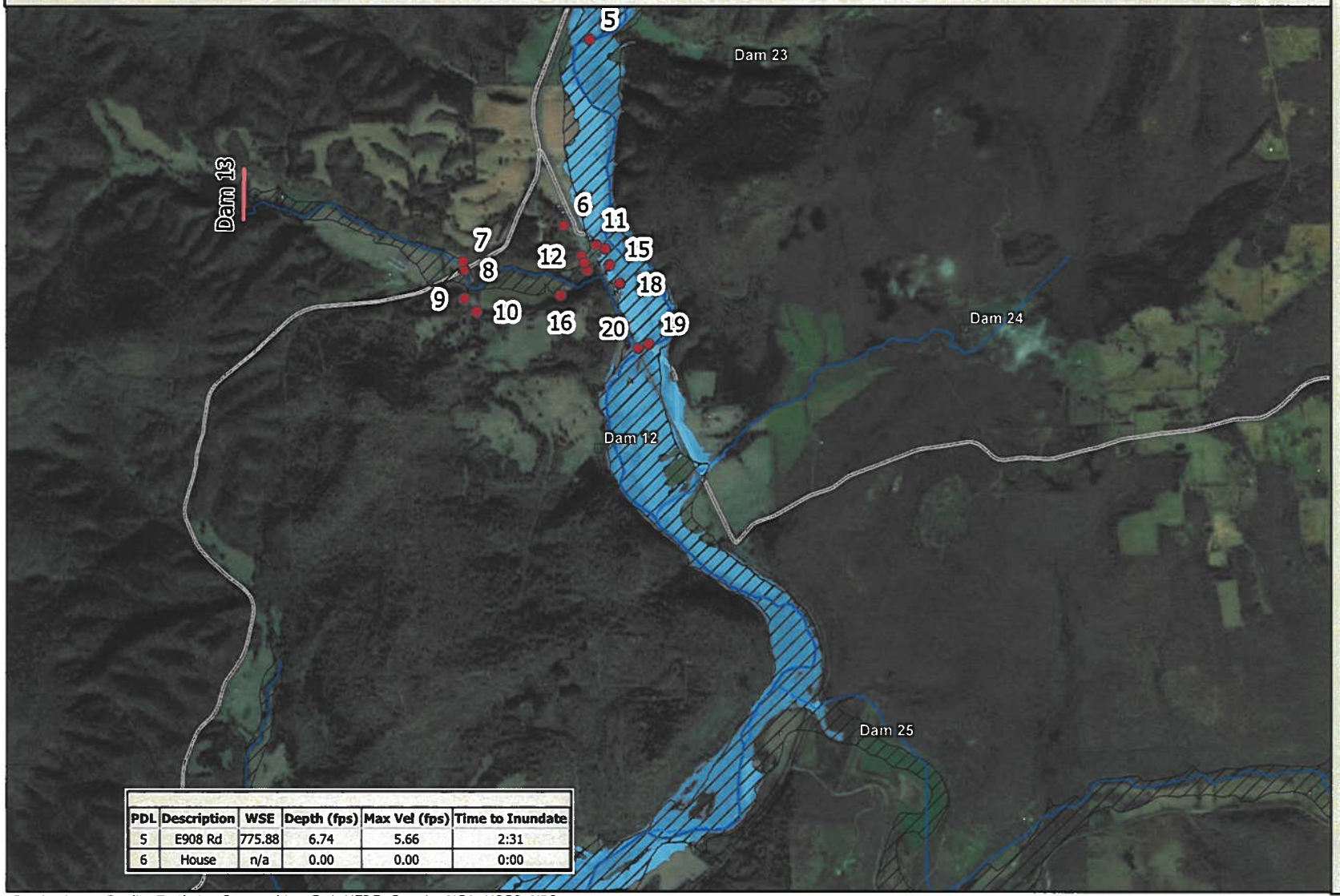
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 5 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
5	E908 Rd	775.88	6.74	5.66	2:31
6	House	n/a	0.00	0.00	0:00

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

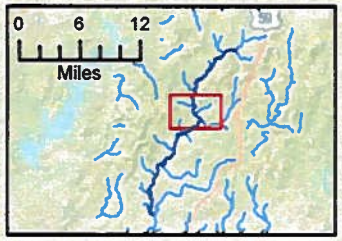
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 6 of 12
Model Date: November 2021



cription	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

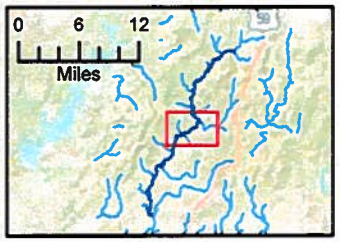
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

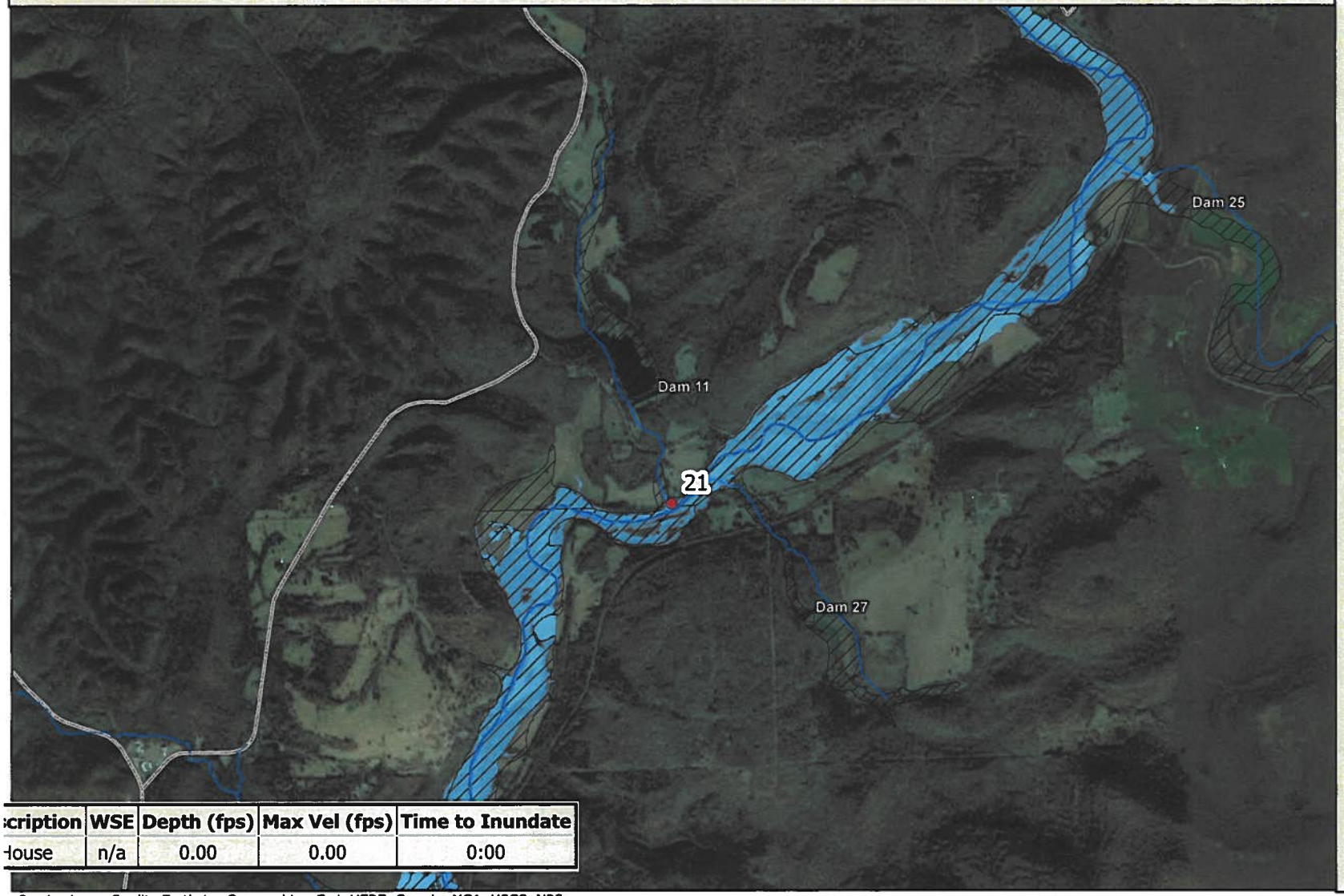


CONSERVATIONWORKS JOINT VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 7 of 12
Model Date: November 2021



cription	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

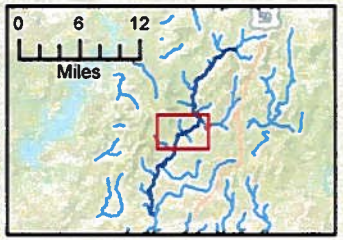
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

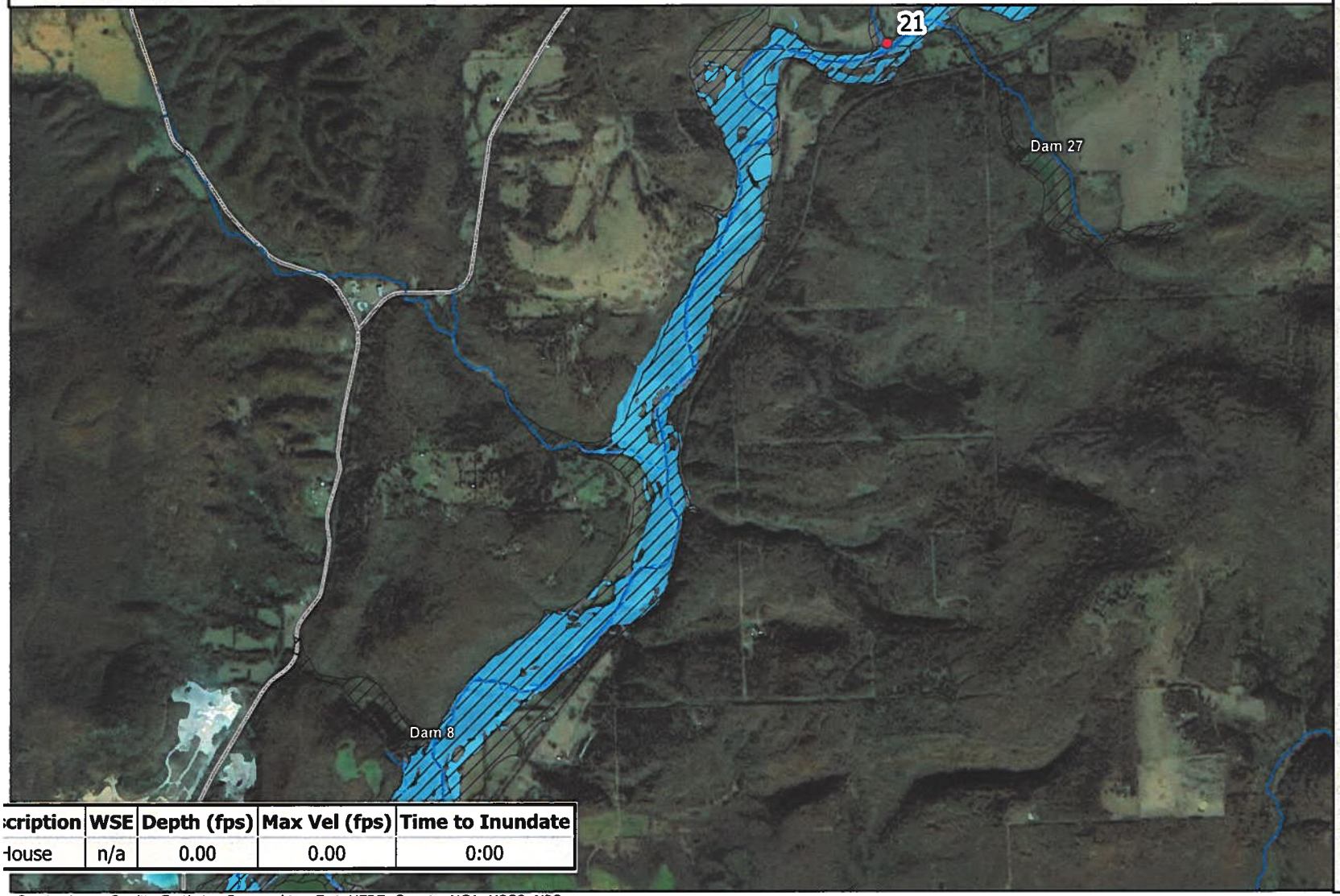


CONSERVATIONWORKS JOINT VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 8 of 12
Model Date: November 2021



cription	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

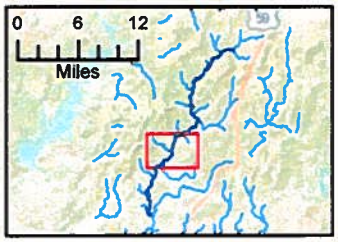
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

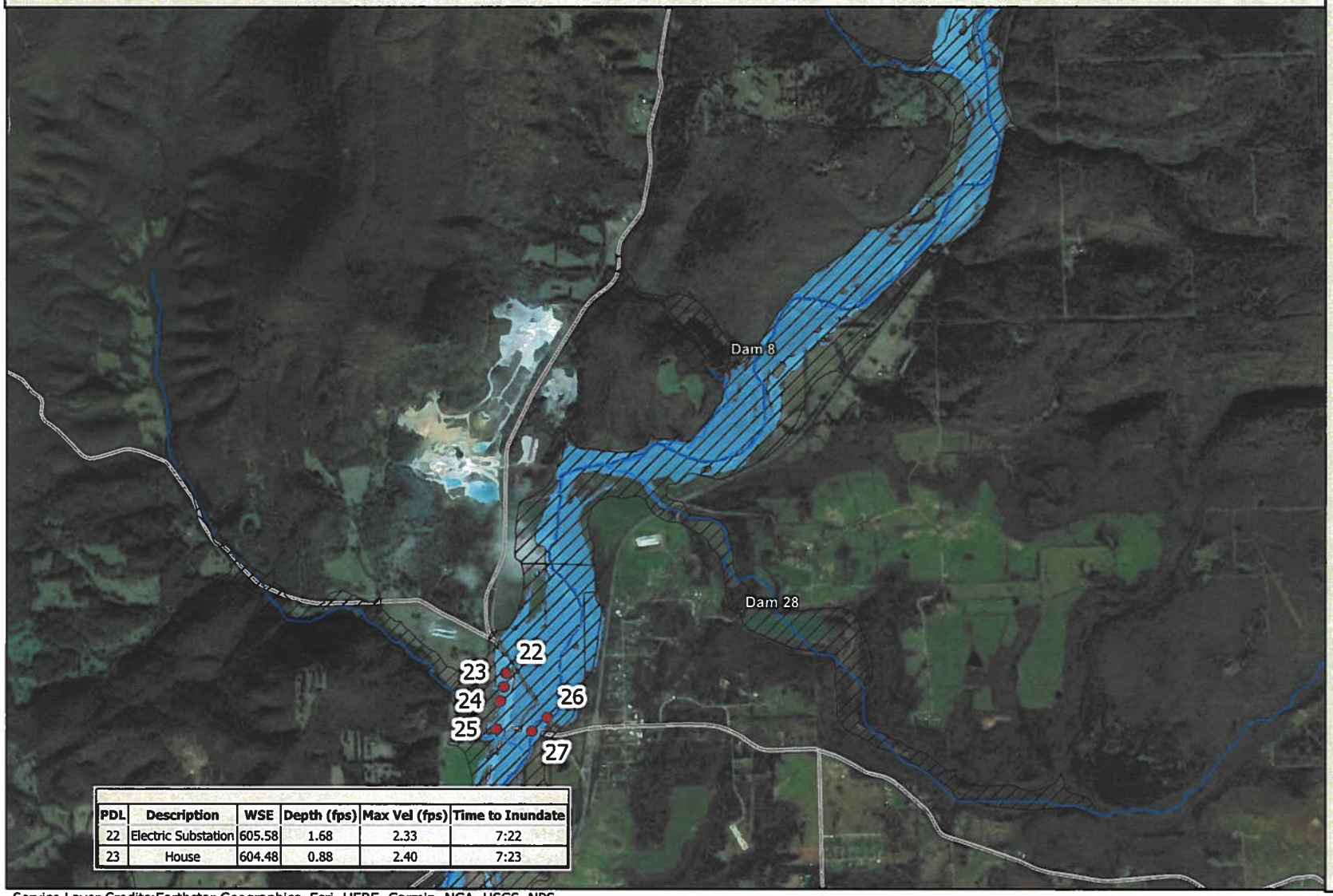


CONSERVATIONWORKS JOINT VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 9 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
22	Electric Substation	605.58	1.68	2.33	7:22
23	House	604.48	0.88	2.40	7:23

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

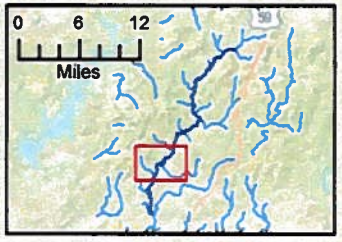
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

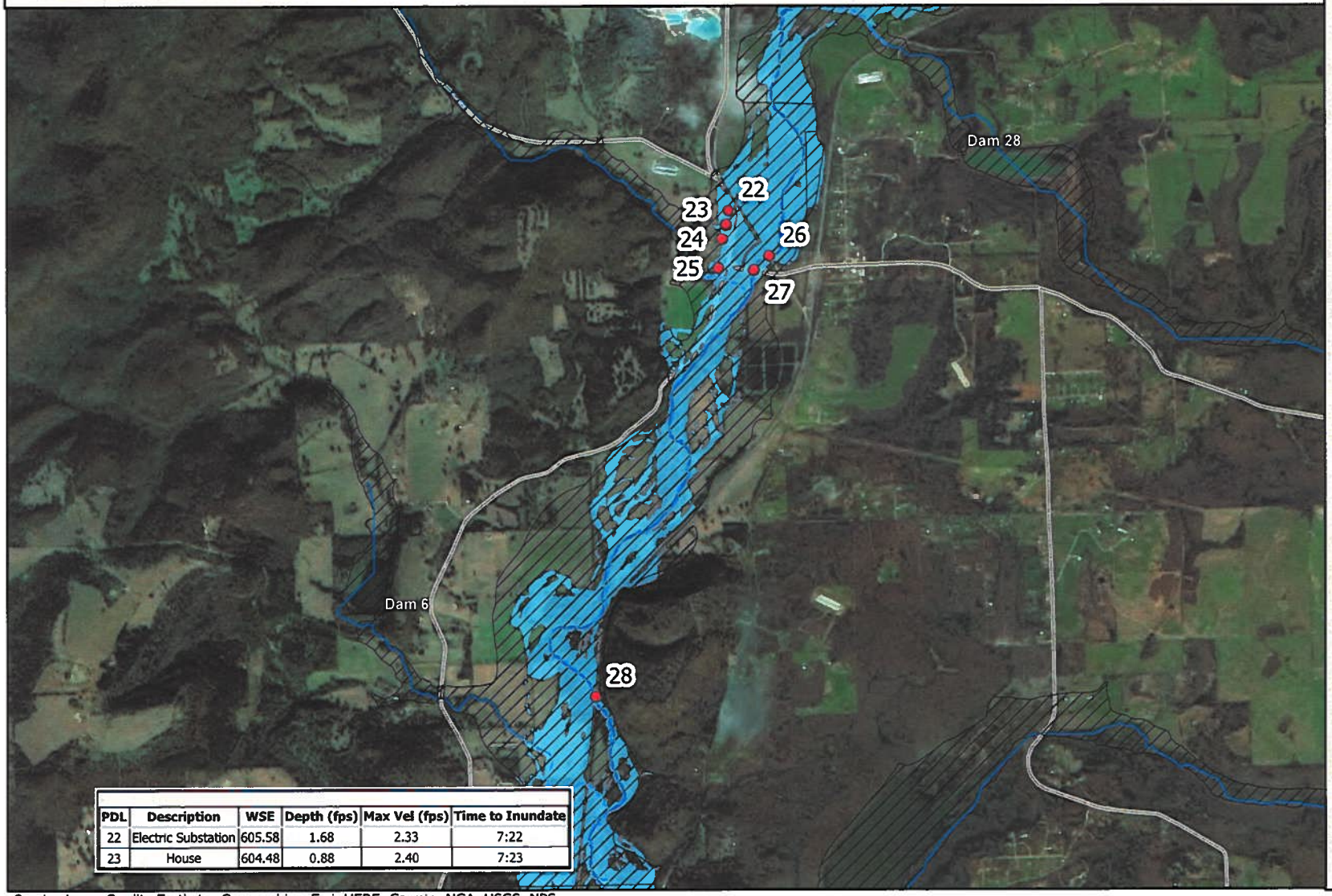


CONSERVATIONWORKS VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 10 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
22	Electric Substation	605.58	1.68	2.33	7:22
23	House	604.48	0.88	2.40	7:23

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

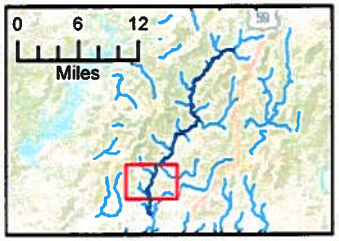
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



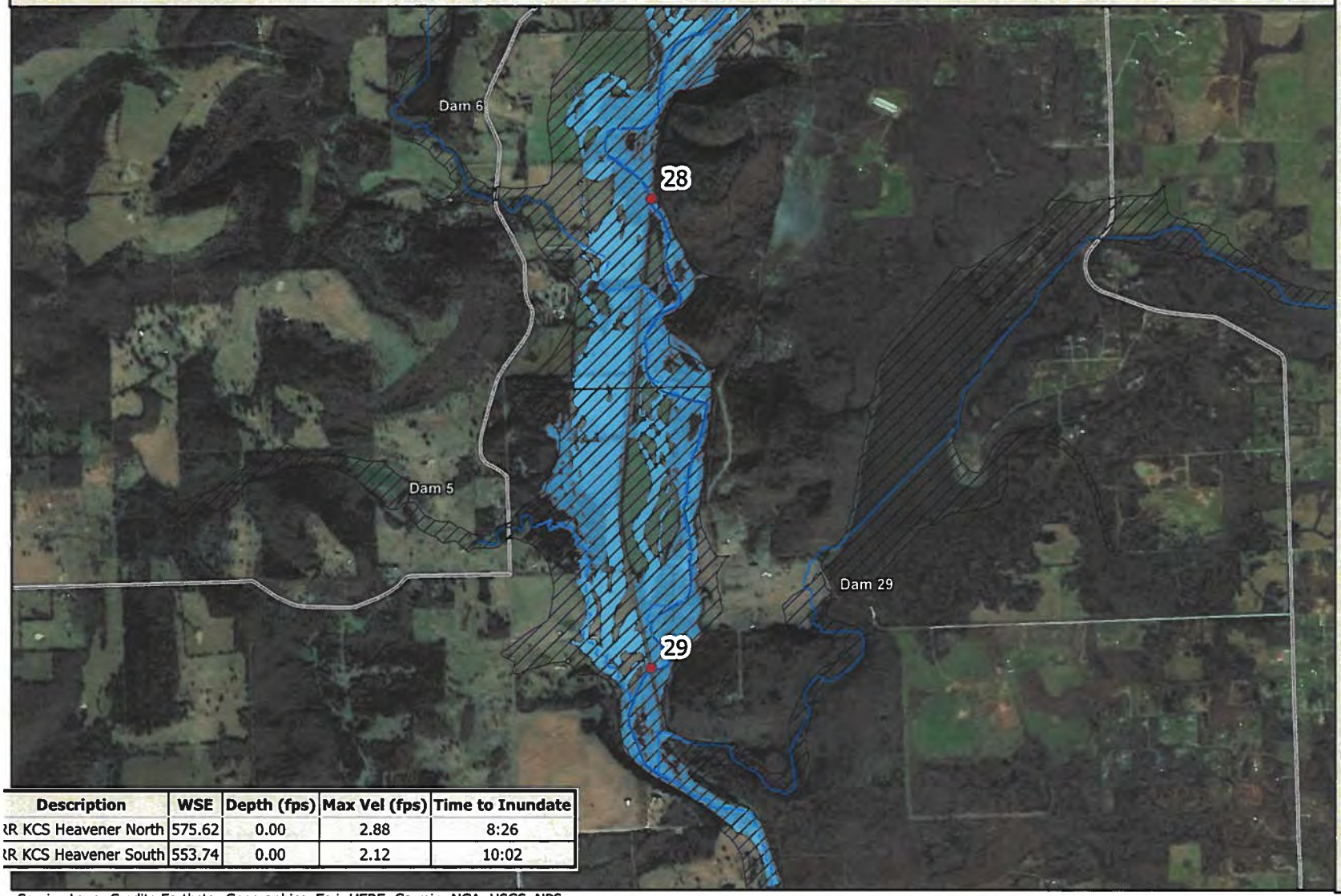
CONSERVATIONWORKS JOINT-VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 11 of 12
Model Date: November 2021



Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
RR KCS Heavener North	575.62	0.00	2.88	8:26
RR KCS Heavener South	553.74	0.00	2.12	10:02

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

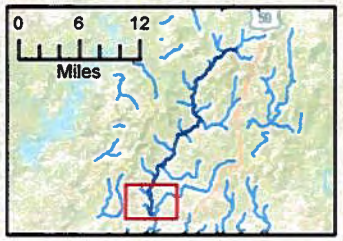
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

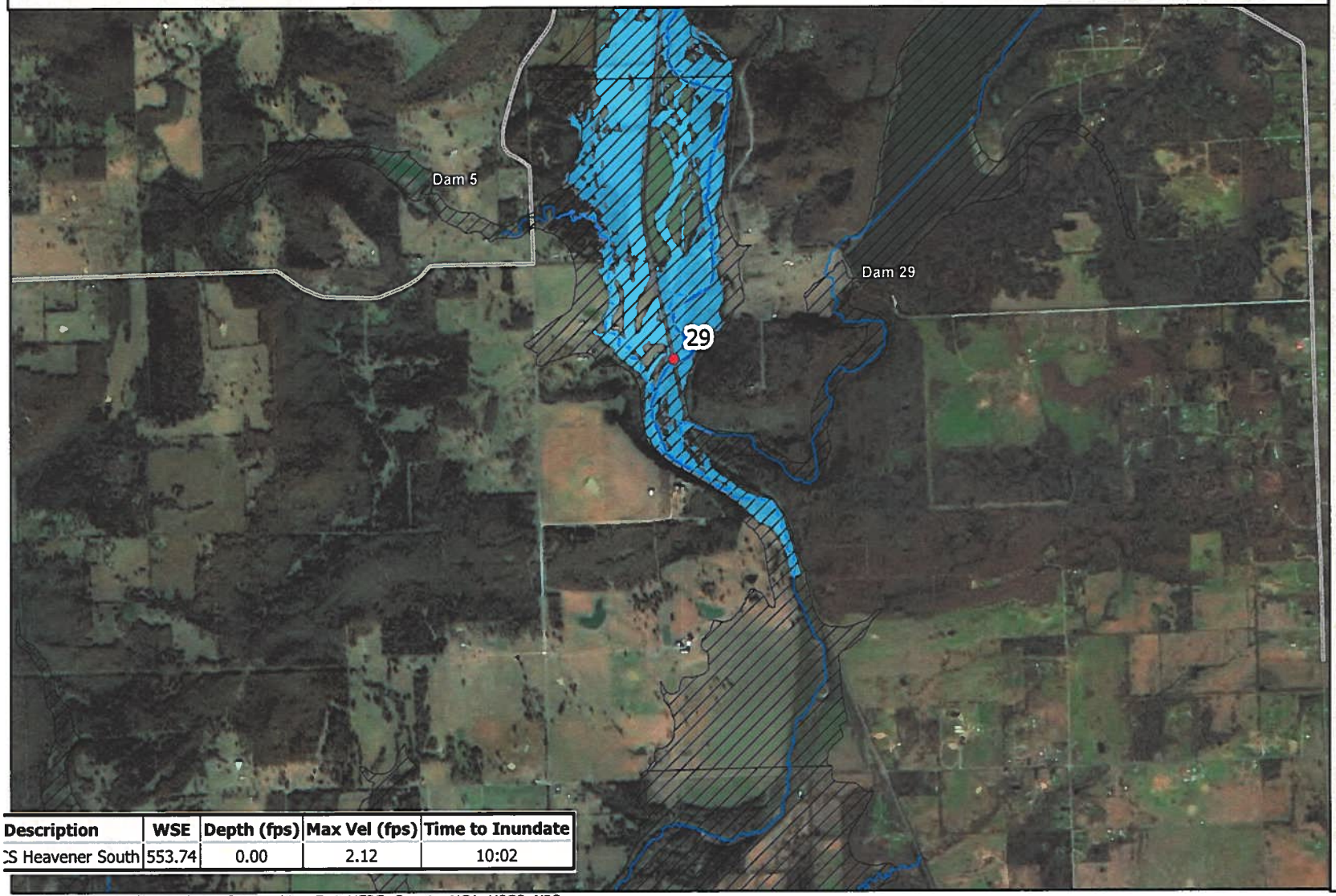


CONSERVATIONWORKS JOINT VENTURE

S-19
Static Breach Inundation Map
Preferred Alternative

Sallisaw Creek Watershed
Adair, Cherokee & Sequoyah Counties

Panel 12 of 12
Model Date: November 2021



Description	WSE	Depth (fps)	Max Vel (fps)	Time to Inundate
CS Heavener South	553.74	0.00	2.12	10:02

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- Project Dams
- PDLs
- Dams
- Main Channel
- Tributaries
- FEMA 100 Yr Floodplain
- Static Breach
- Roads

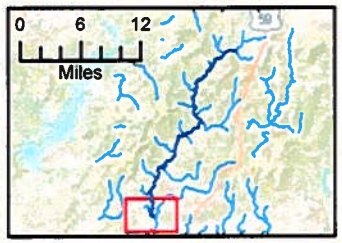
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

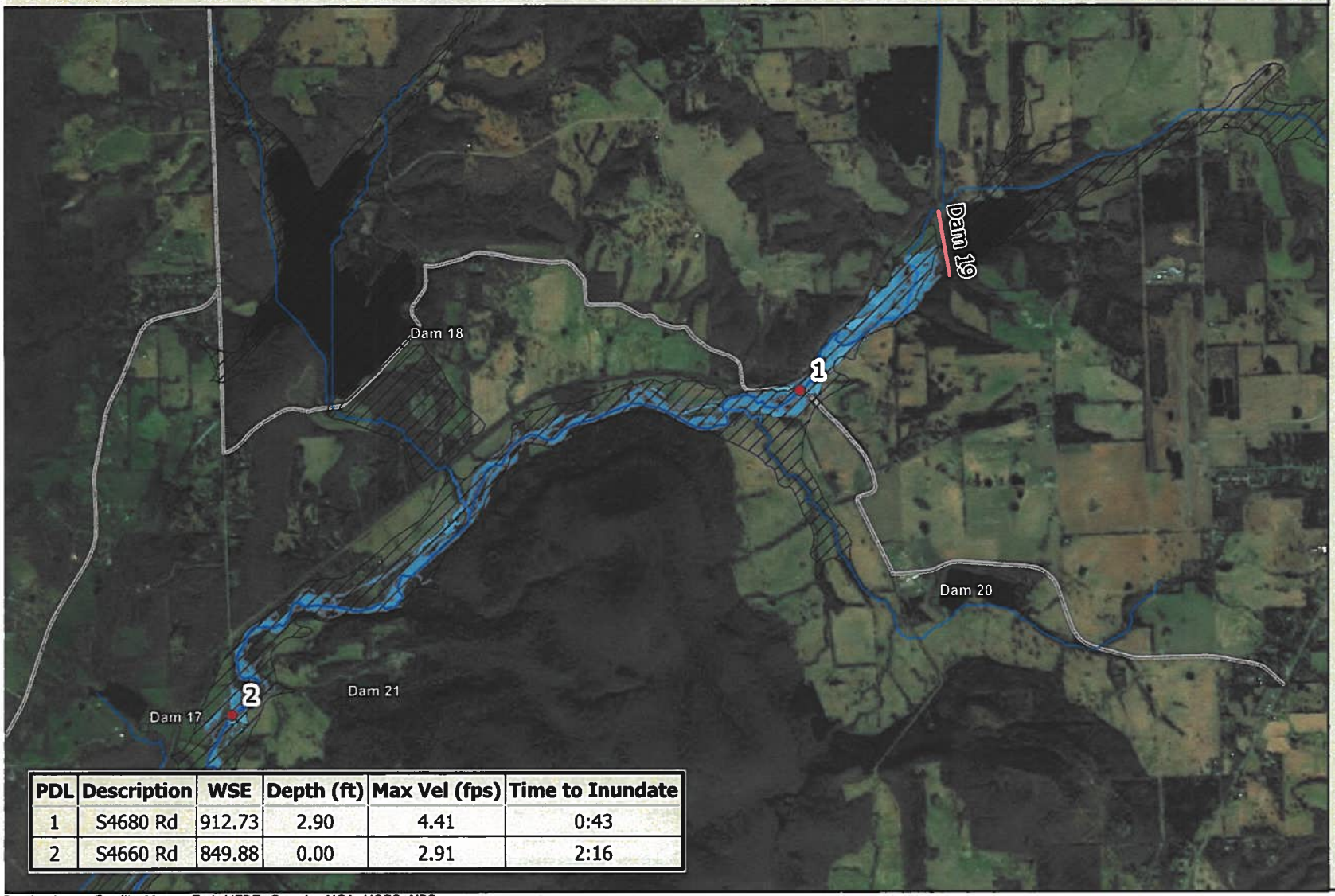


CONSERVATIONWORKS JOINT VENTURE

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 1 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	912.73	2.90	4.41	0:43
2	S4660 Rd	849.88	0.00	2.91	2:16

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

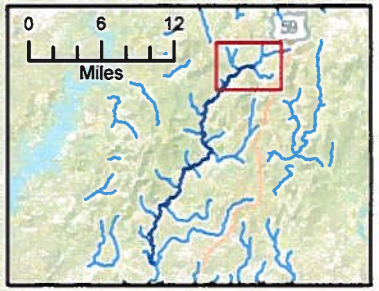
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



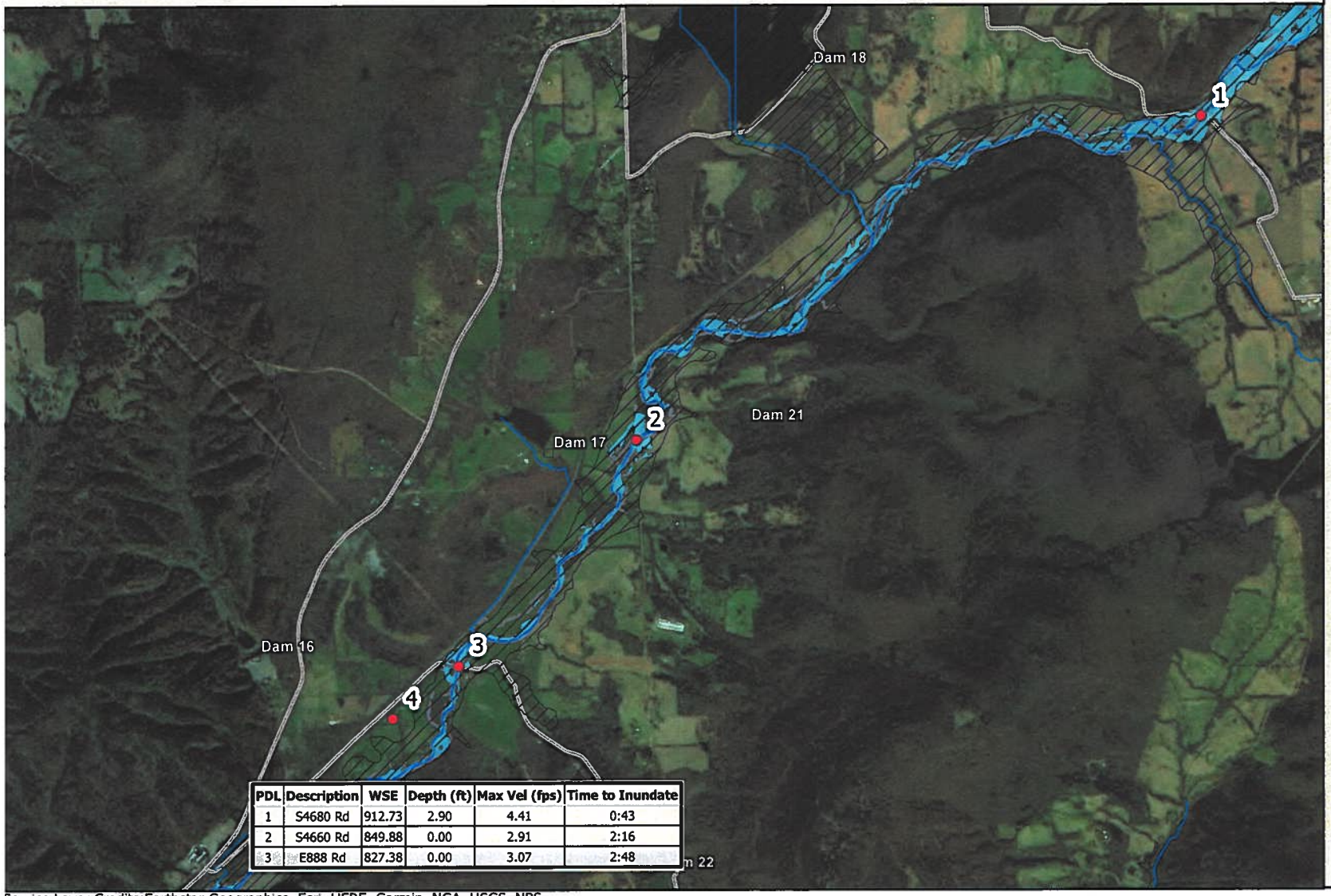
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 2 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
1	S4680 Rd	912.73	2.90	4.41	0:43
2	S4660 Rd	849.88	0.00	2.91	2:16
3	E888 Rd	827.38	0.00	3.07	2:48

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

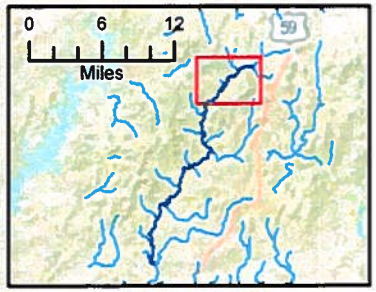
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

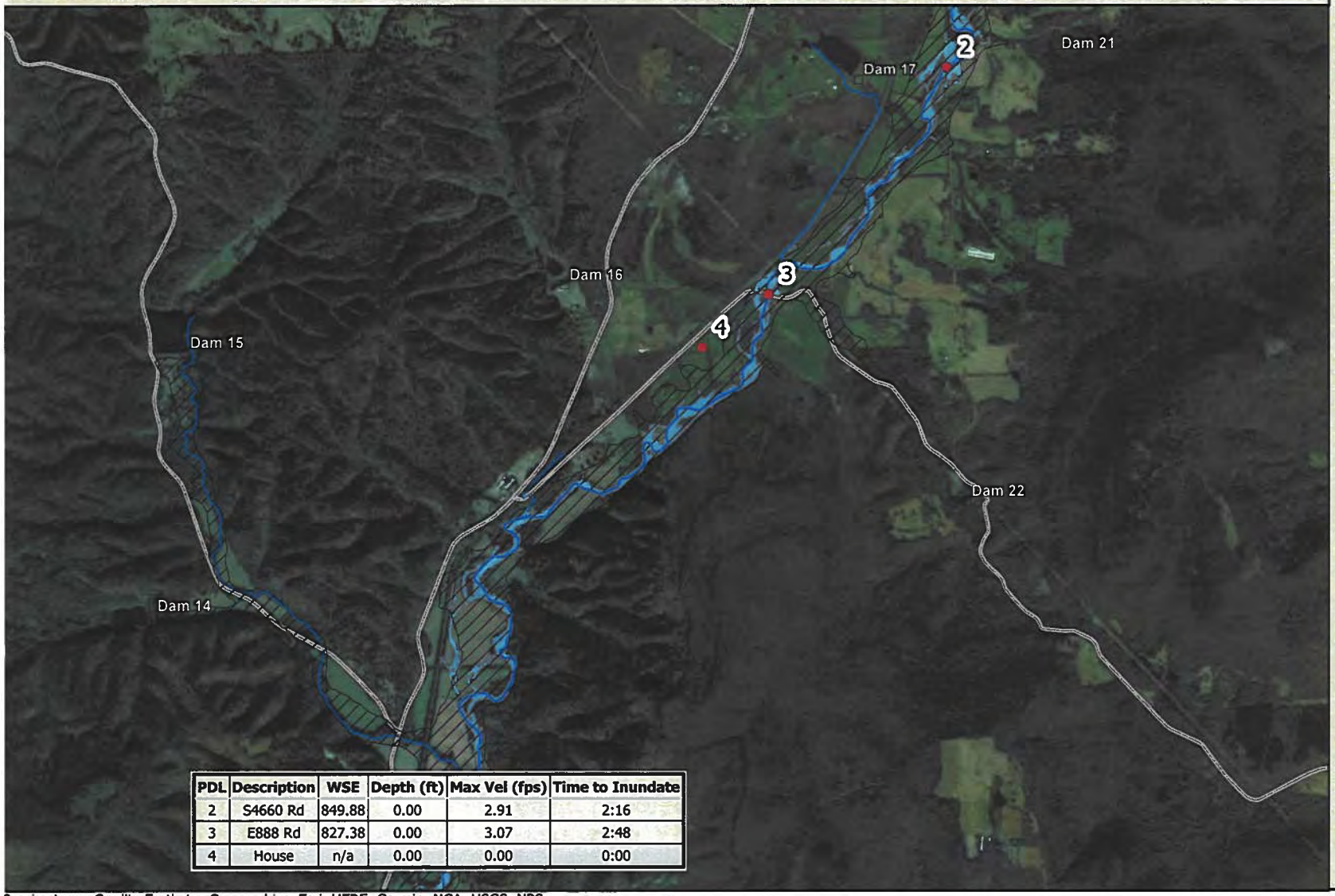


CONSERVATIONWORKS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 3 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
2	S4660 Rd	849.88	0.00	2.91	2:16
3	E888 Rd	827.38	0.00	3.07	2:48
4	House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

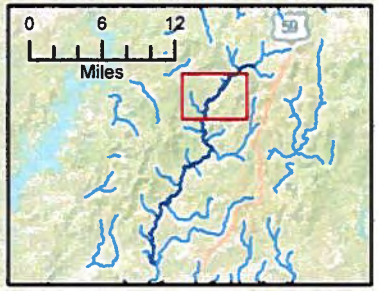
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

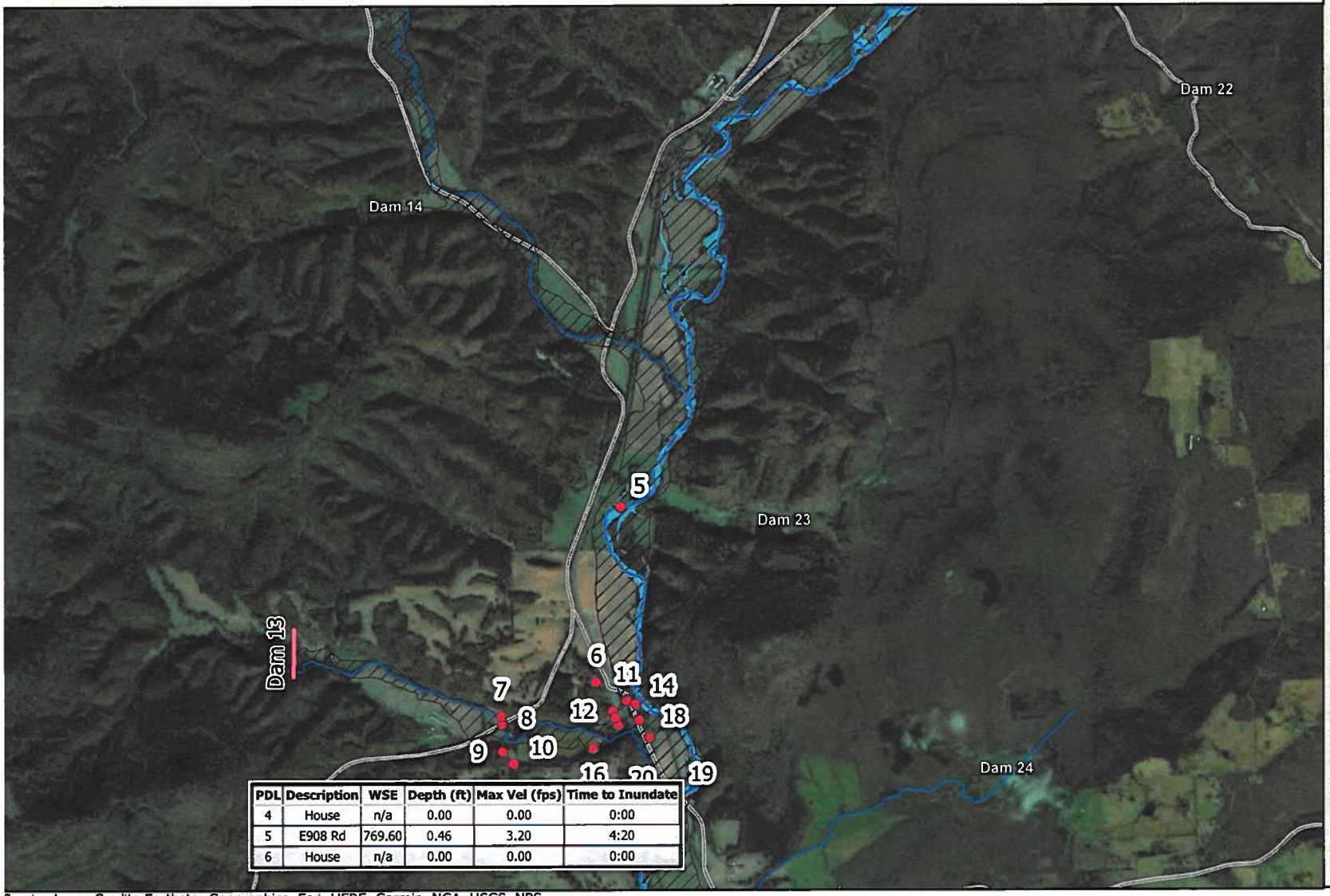


CONSERVATIONWORKS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 4 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
4	House	n/a	0.00	0.00	0:00
5	E908 Rd	769.60	0.46	3.20	4:20
6	House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

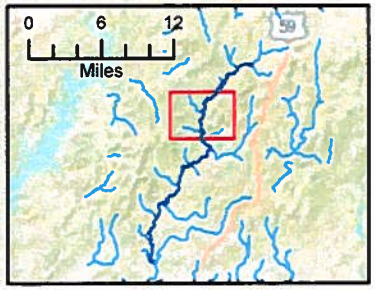
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

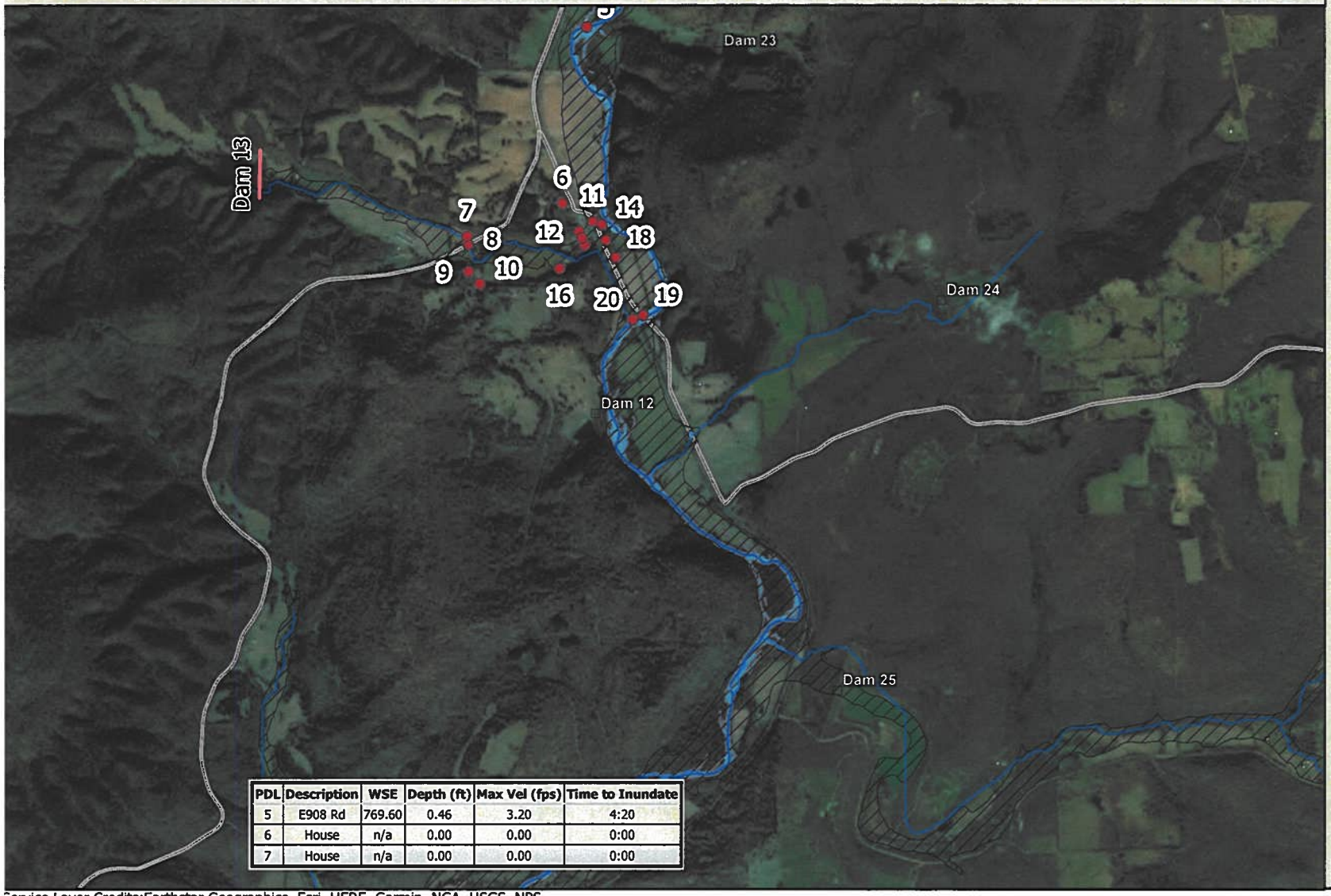


CONSERVATIONWORKS JOINT VENTURE

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 5 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
5	E908 Rd	769.60	0.46	3.20	4:20
6	House	n/a	0.00	0.00	0:00
7	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

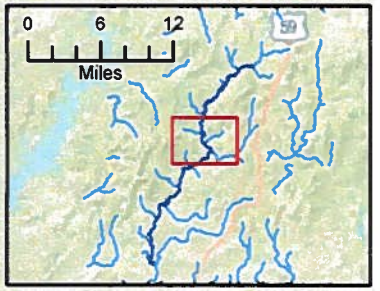
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



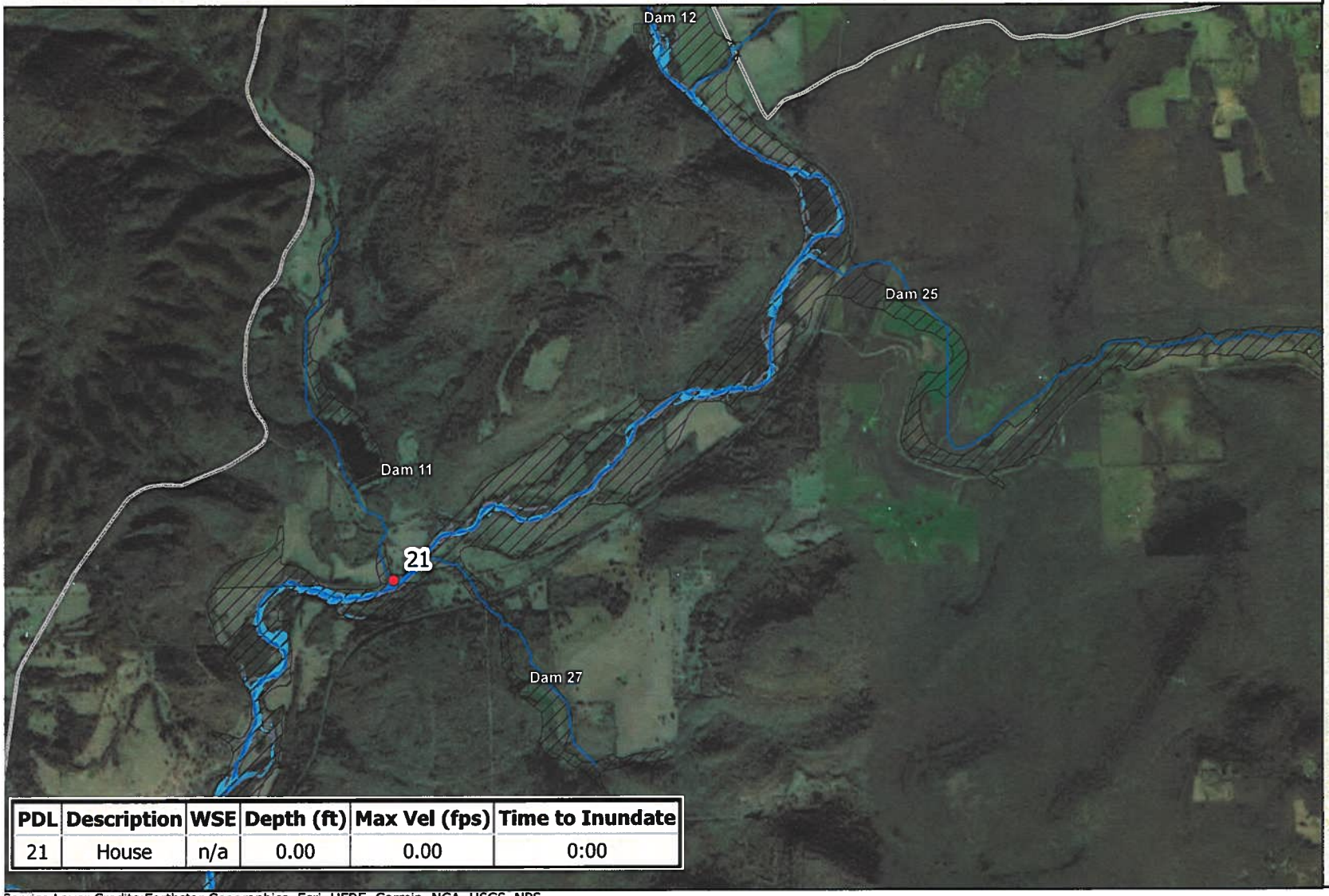
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 6 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

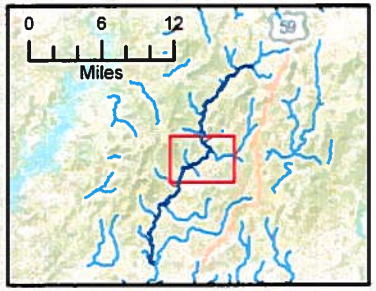
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

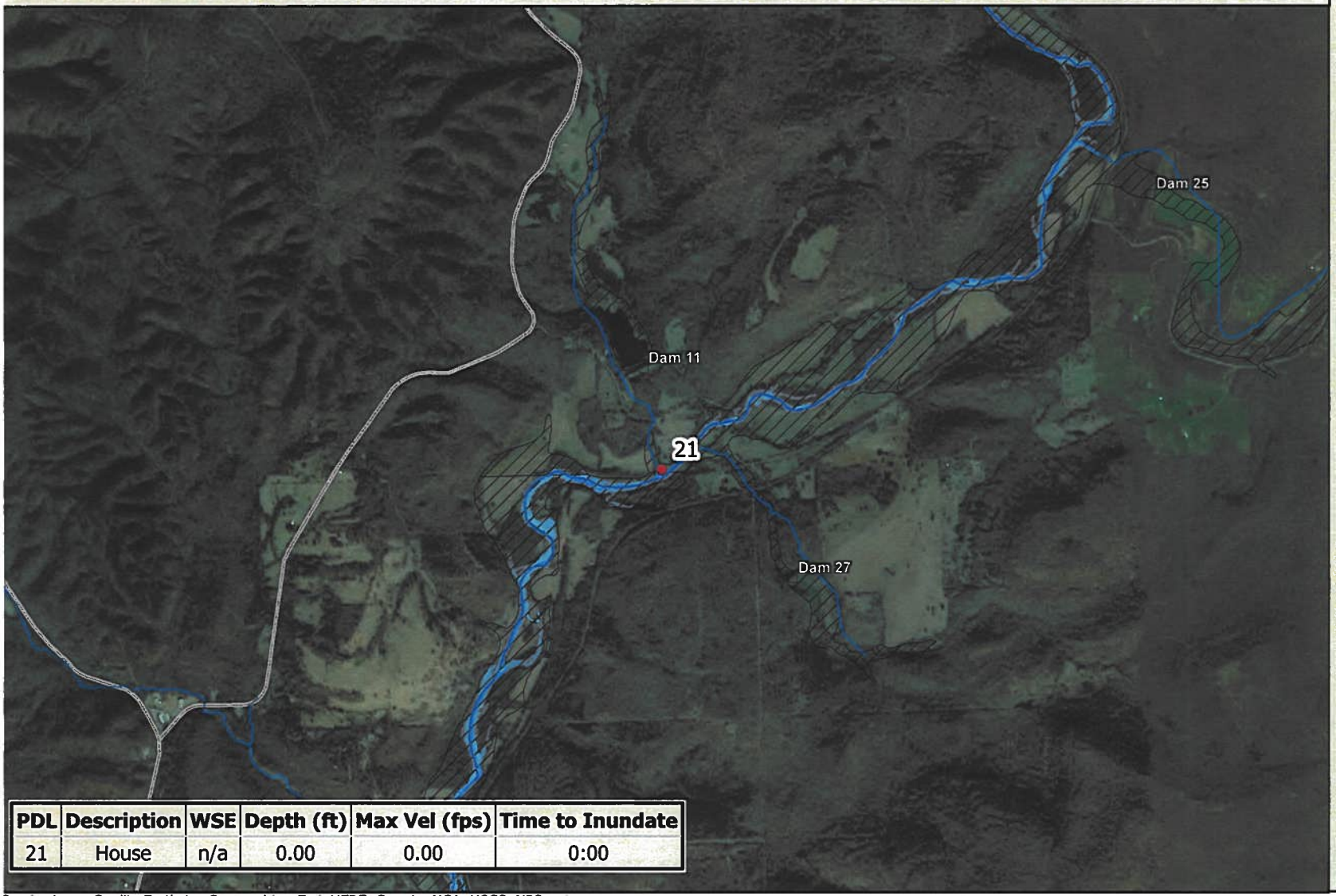


CONSERVATIONWORKS
JOINT VENTURE

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 7 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

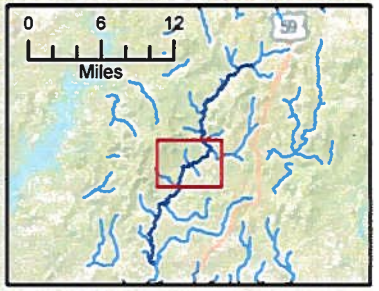
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



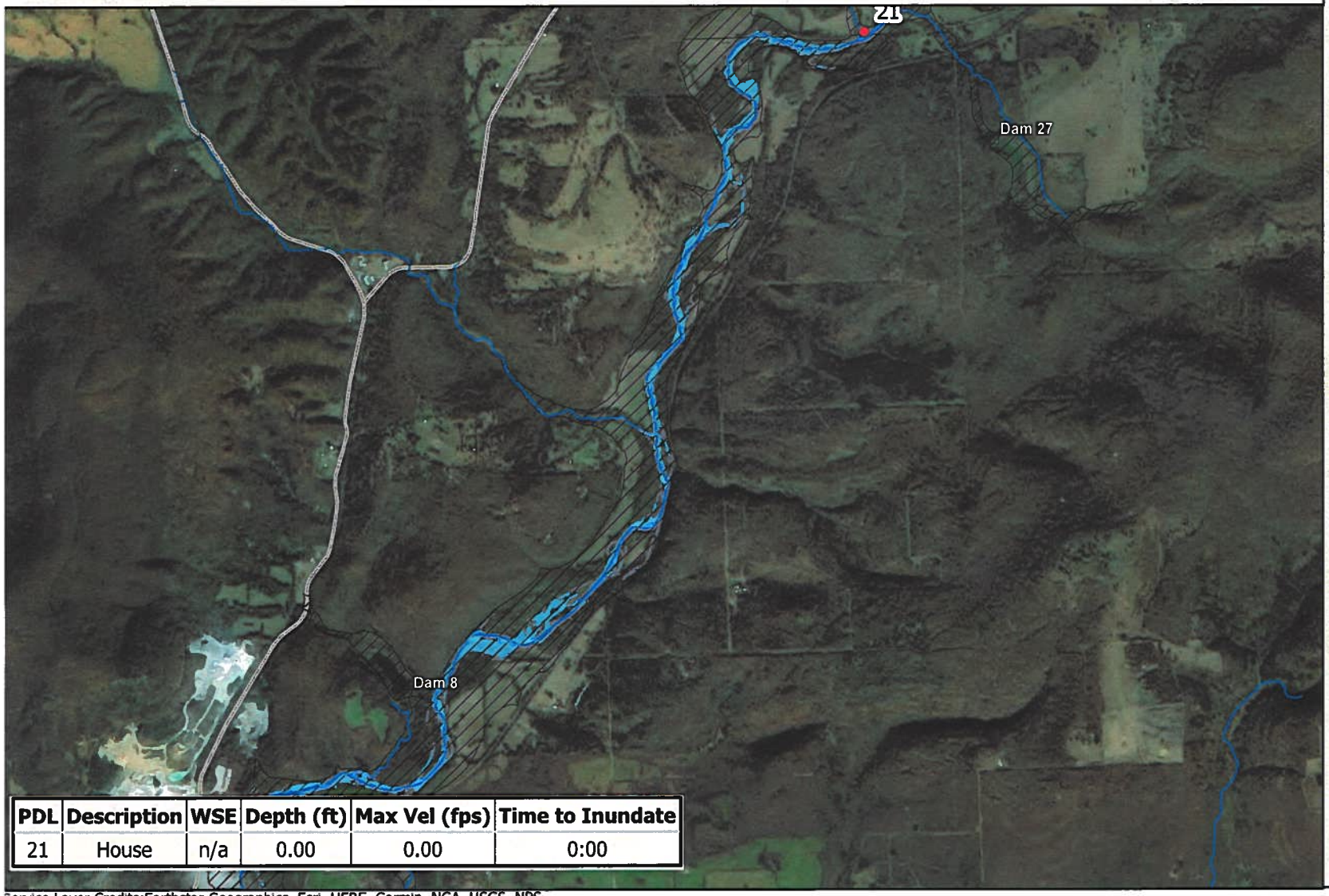
CONSERVATIONWORKS

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 8 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
21	House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

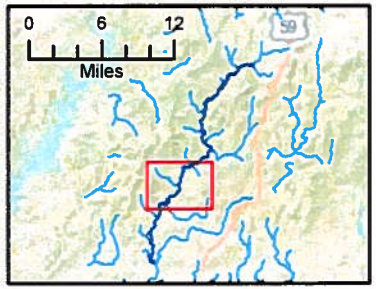
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

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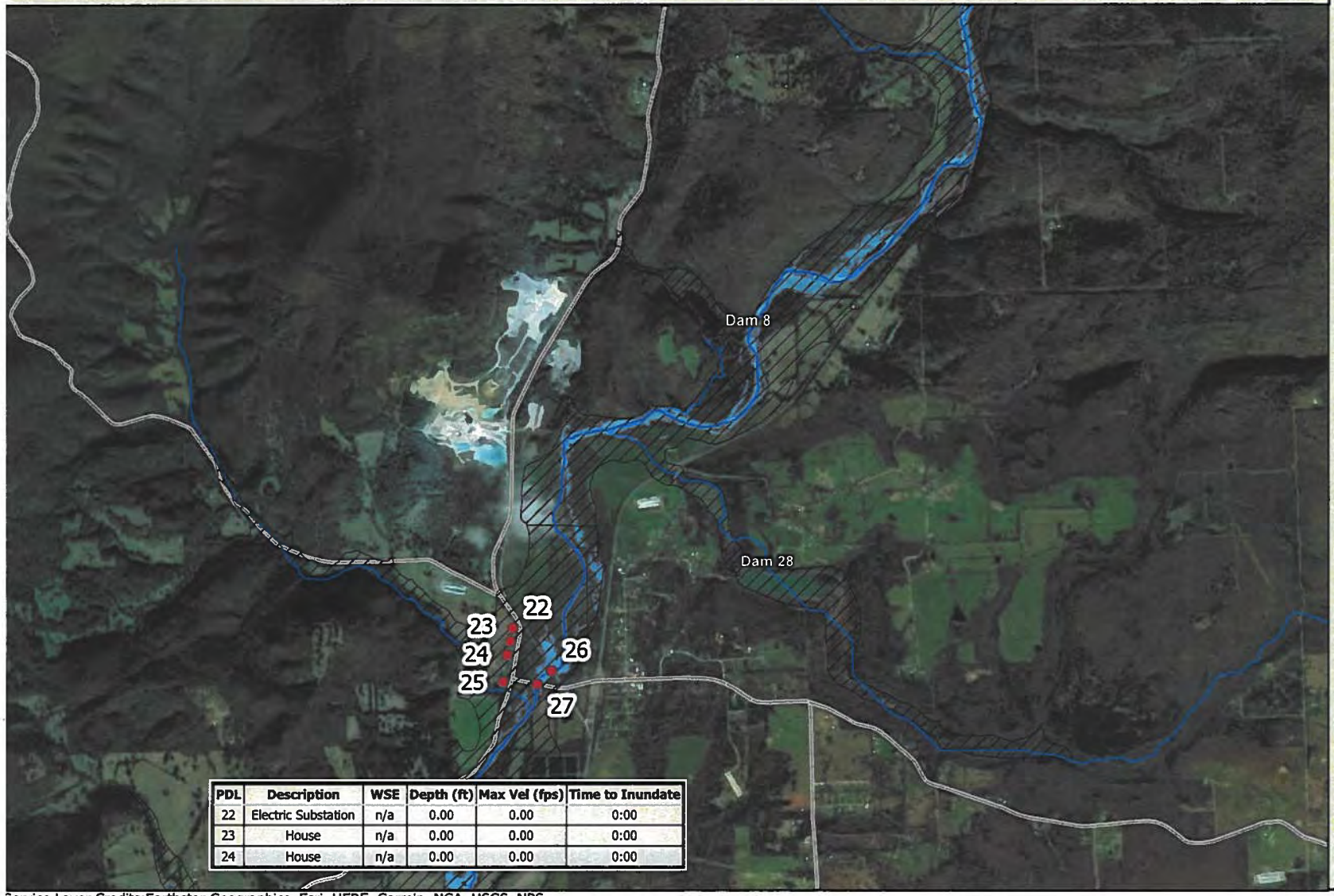


CONSERVATIONWORKS
JOINT VENTURE

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 9 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

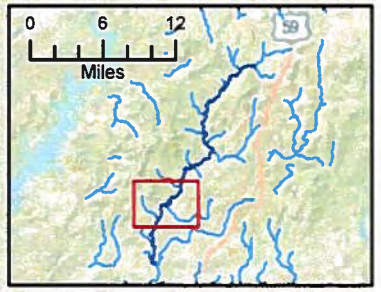
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

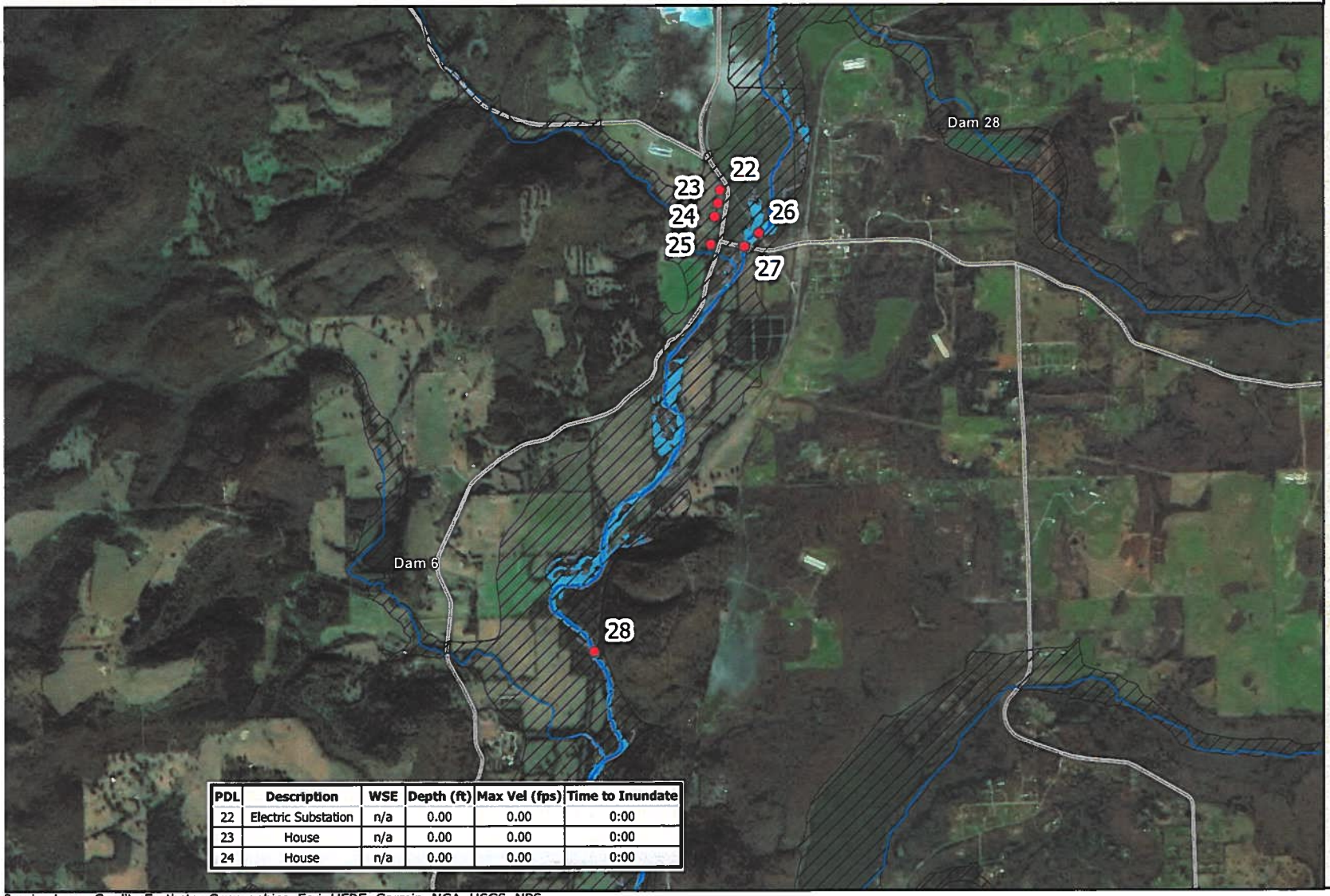


CONSERVATIONWORKS
JOINT VENTURE

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 10 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
22	Electric Substation	n/a	0.00	0.00	0:00
23	House	n/a	0.00	0.00	0:00
24	House	n/a	0.00	0.00	0:00

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

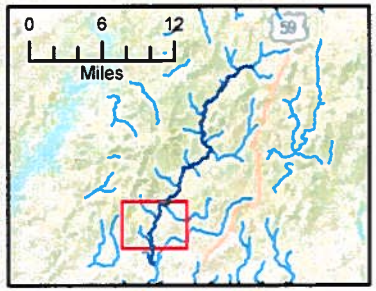
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

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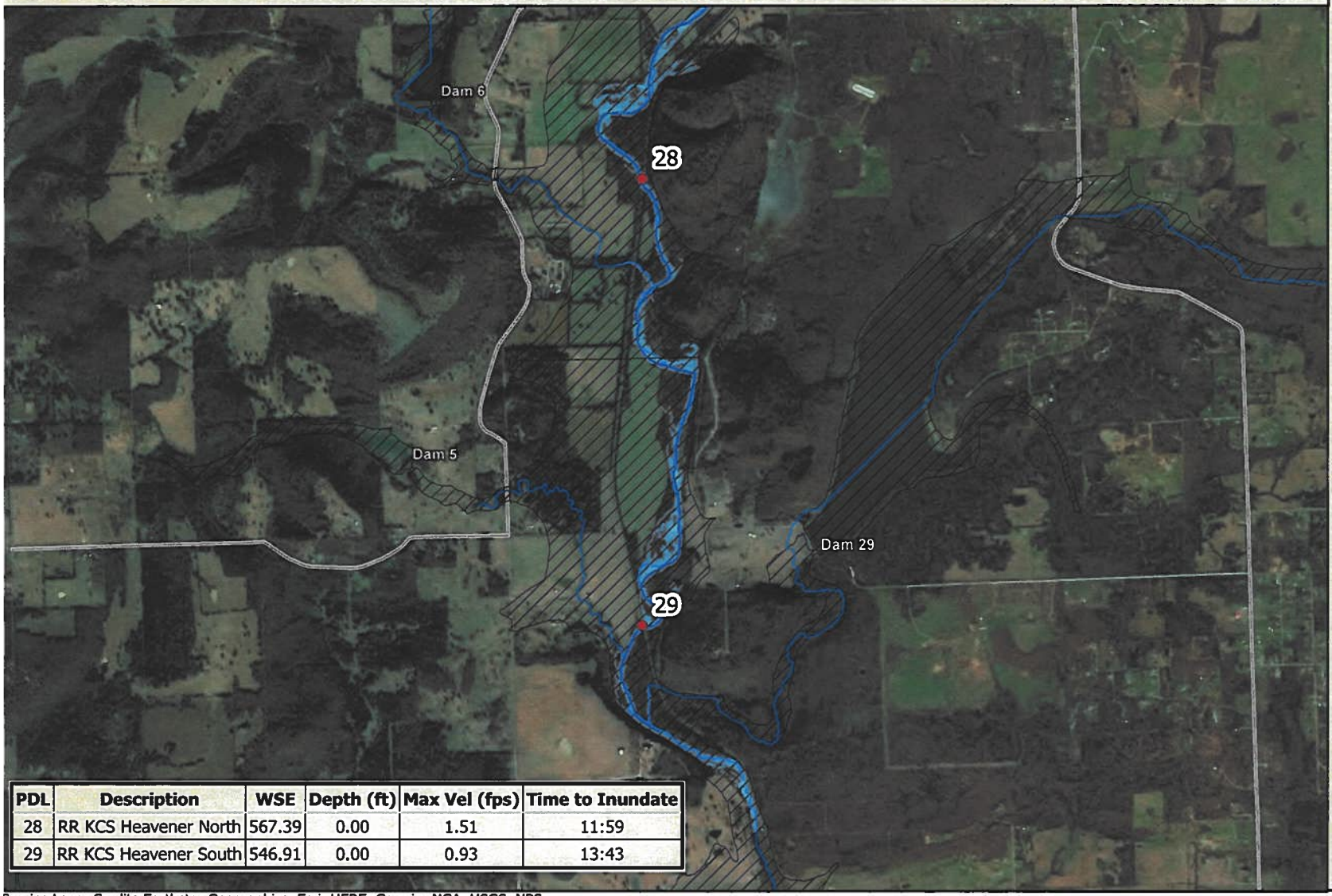
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 11 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
28	RR KCS Heavener North	567.39	0.00	1.51	11:59
29	RR KCS Heavener South	546.91	0.00	0.93	13:43

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

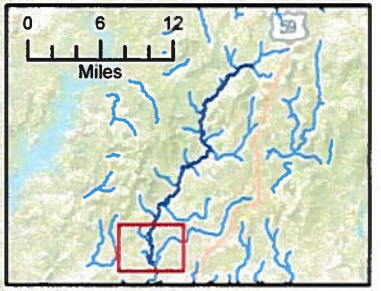
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.

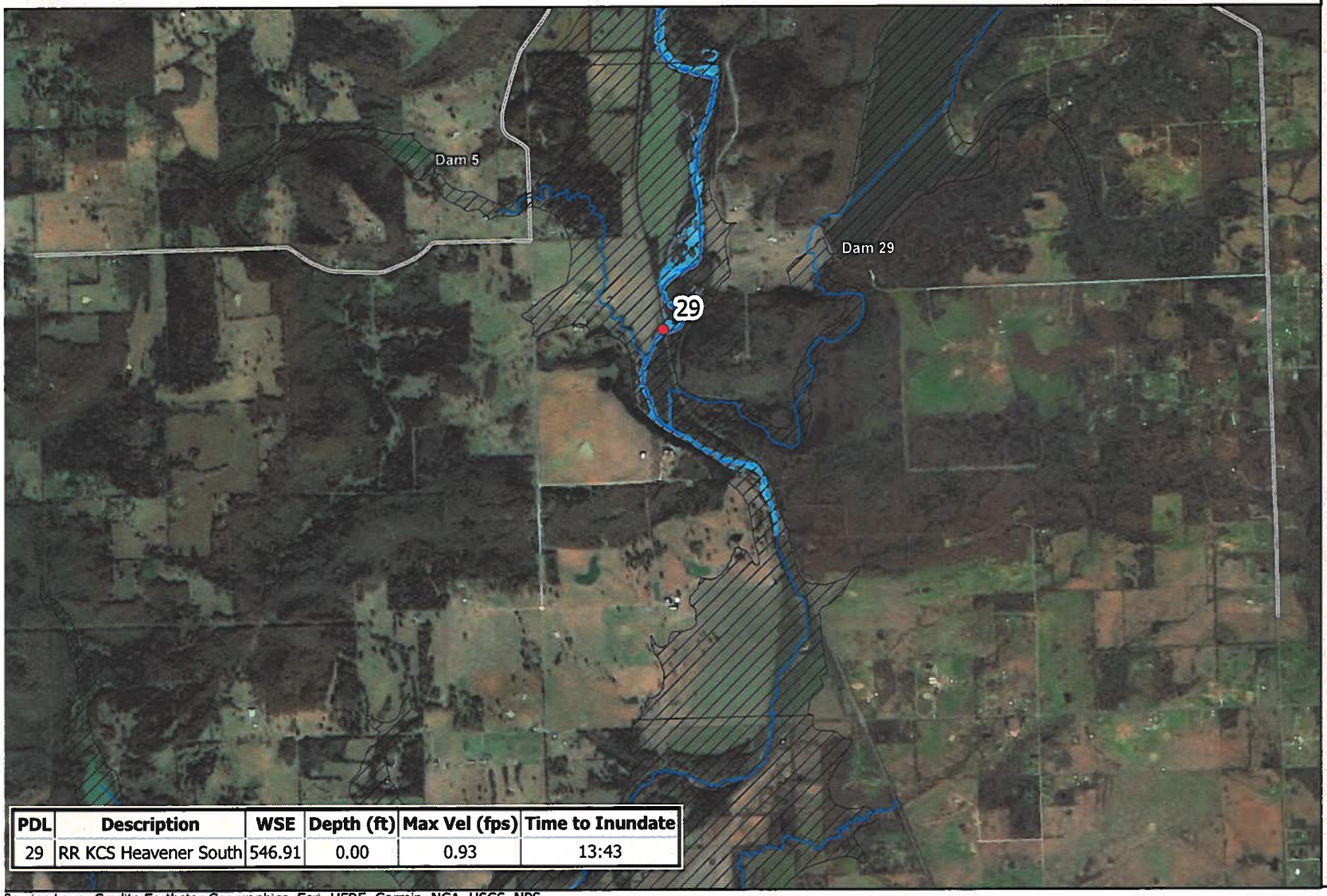


CONSERVATIONWORKS

S-19
Seismic Breach
Inundation Map
Preferred Alternative

Sallisaw Creek
Watershed
Adair, Cherokee &
Sequoyah Counties

Panel 12 of 12
Model Date: November 2021



PDL	Description	WSE	Depth (ft)	Max Vel (fps)	Time to Inundate
29	RR KCS Heavener South	546.91	0.00	0.93	13:43

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Legend

- PDLs
- FEMA 100 Yr Floodplain
- Seismic Breach
- Main Channel
- Tributaries
- Roads
- Project Dams
- Dams

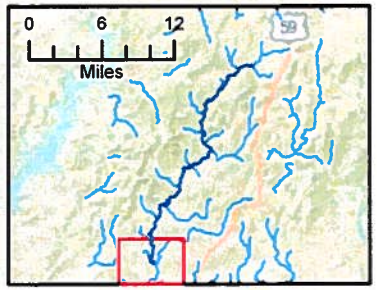
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
WSE = Water Surface Elevation

Elevation reported in feet.

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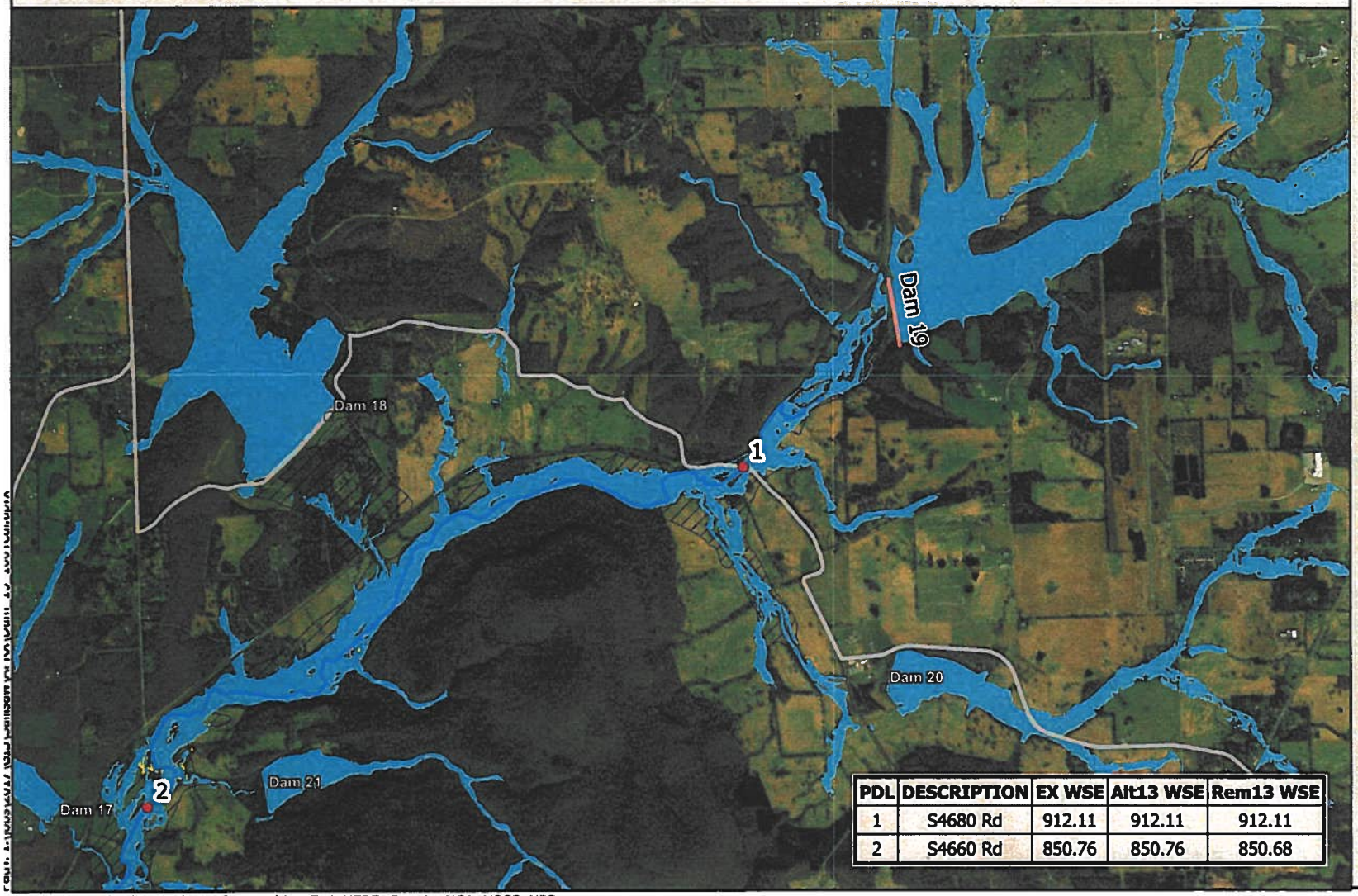


CONSERVATIONWORKS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 1 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
1	S4680 Rd	912.11	912.11	912.11
2	S4660 Rd	850.76	850.76	850.68

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

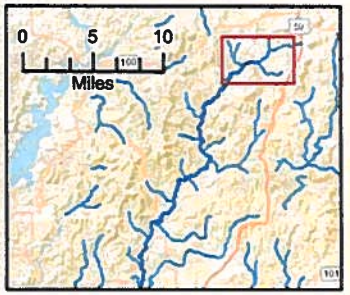
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



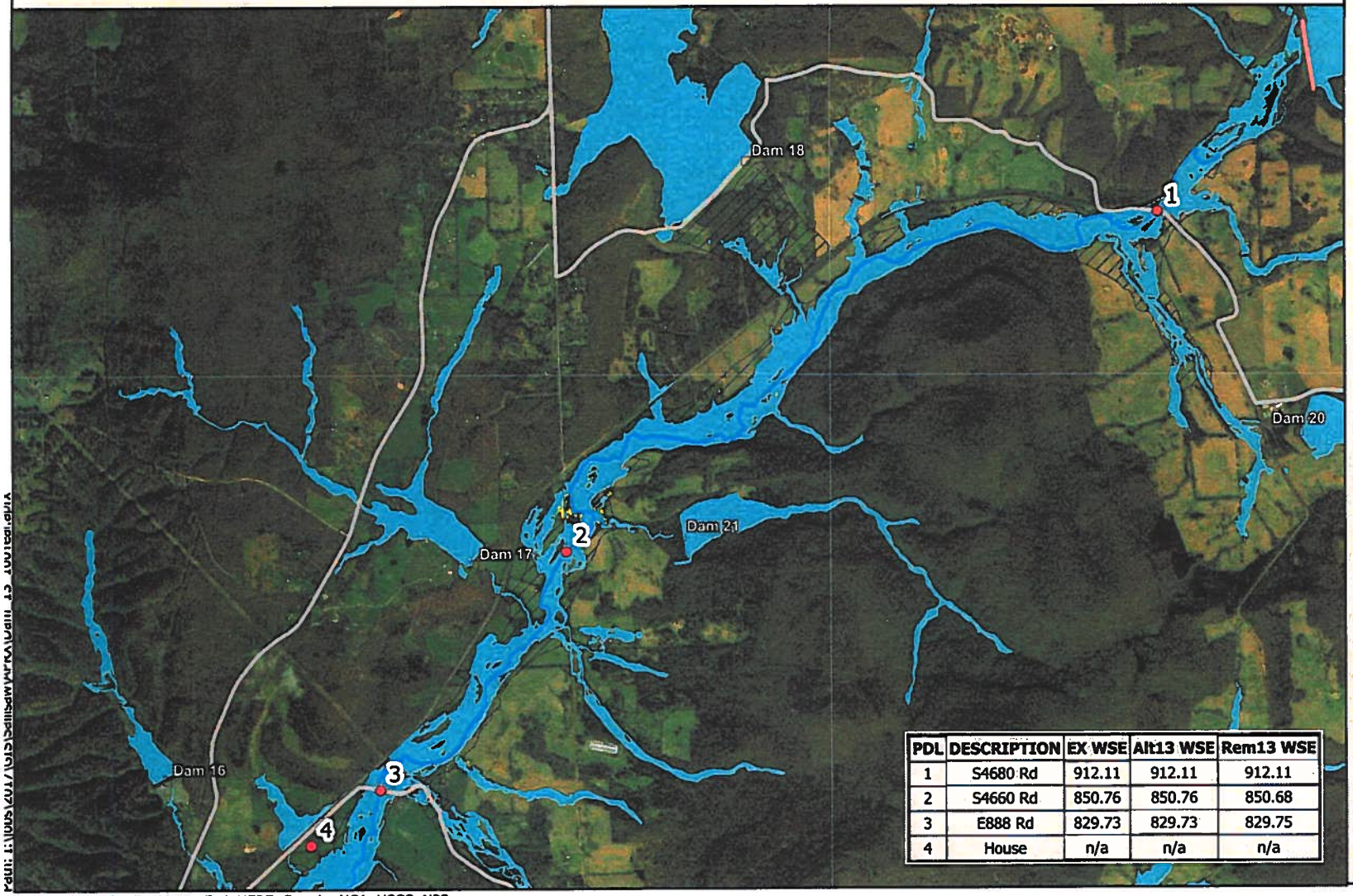
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 2 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
1	S4680 Rd	912.11	912.11	912.11
2	S4660 Rd	850.76	850.76	850.68
3	E888 Rd	829.73	829.73	829.75
4	House	n/a	n/a	n/a

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

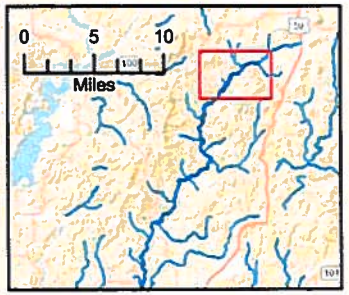
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



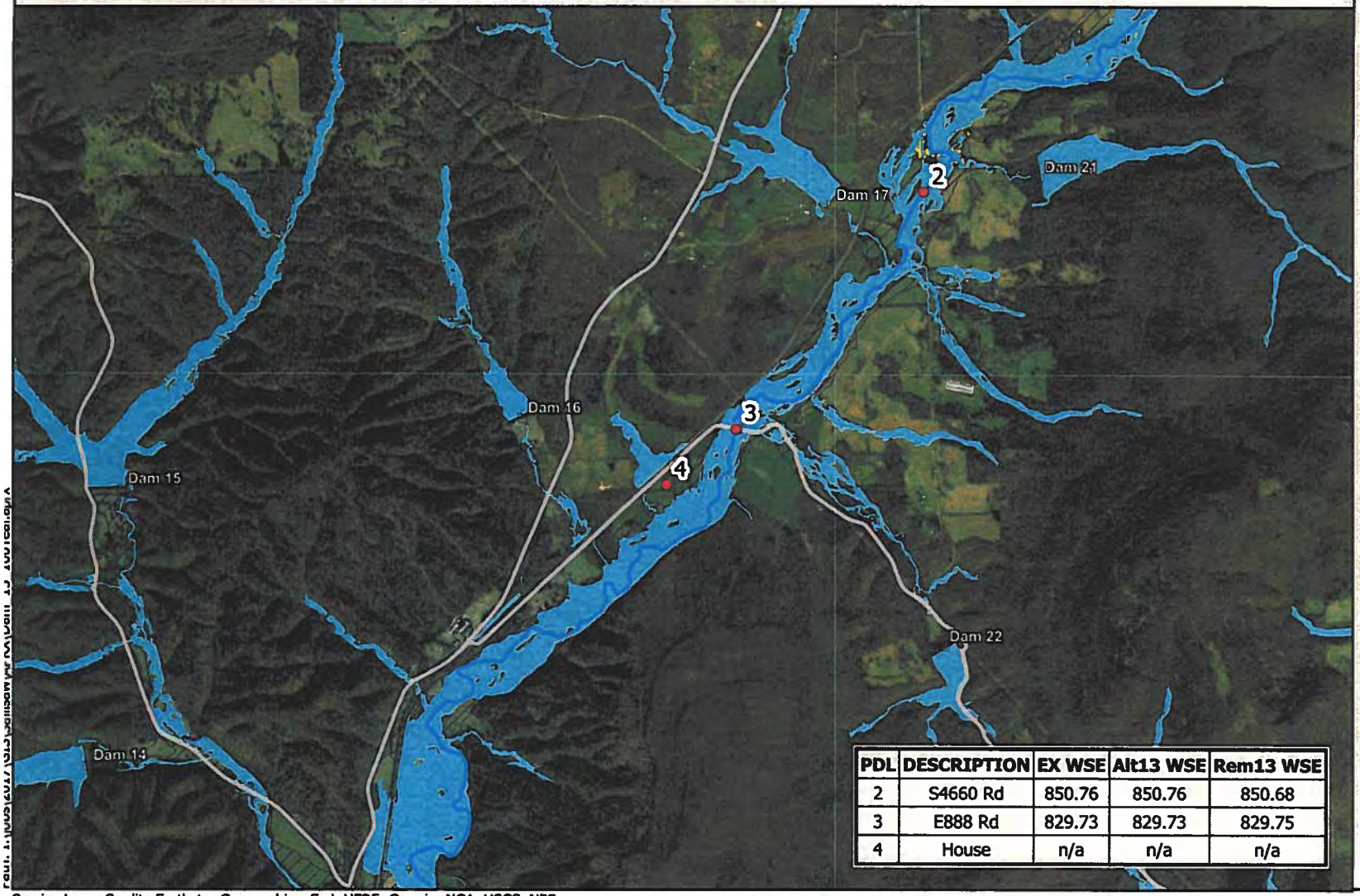
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 3 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
2	S4660 Rd	850.76	850.76	850.68
3	E888 Rd	829.73	829.73	829.75
4	House	n/a	n/a	n/a

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

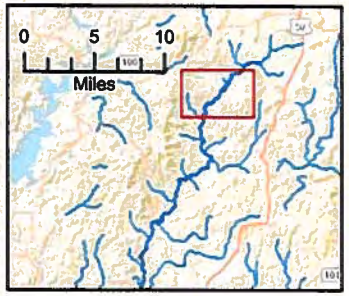
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



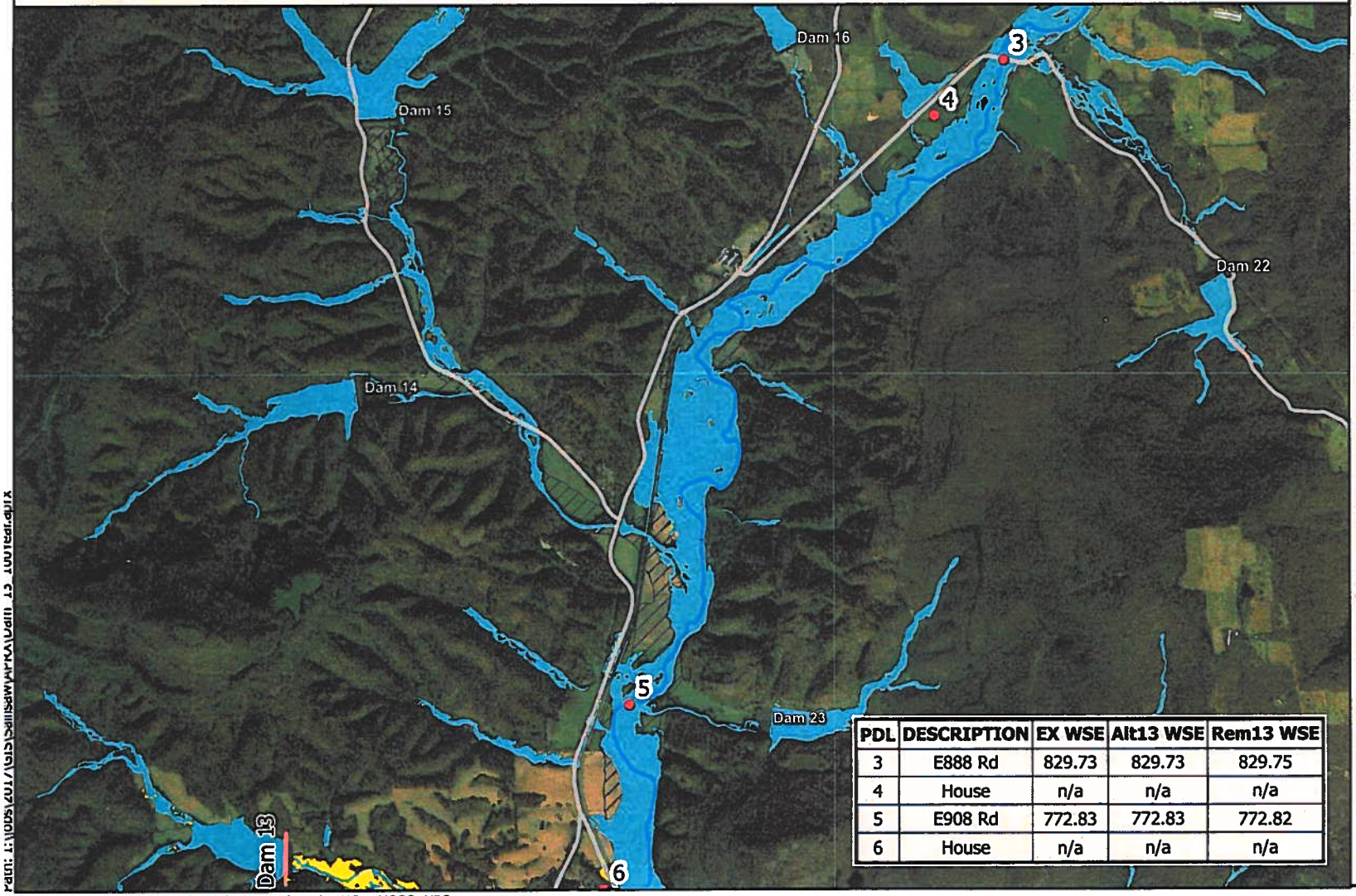
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 4 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
3	E888 Rd	829.73	829.73	829.75
4	House	n/a	n/a	n/a
5	E908 Rd	772.83	772.83	772.82
6	House	n/a	n/a	n/a

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

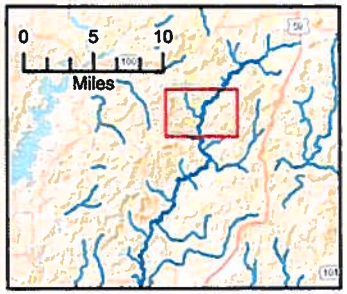
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



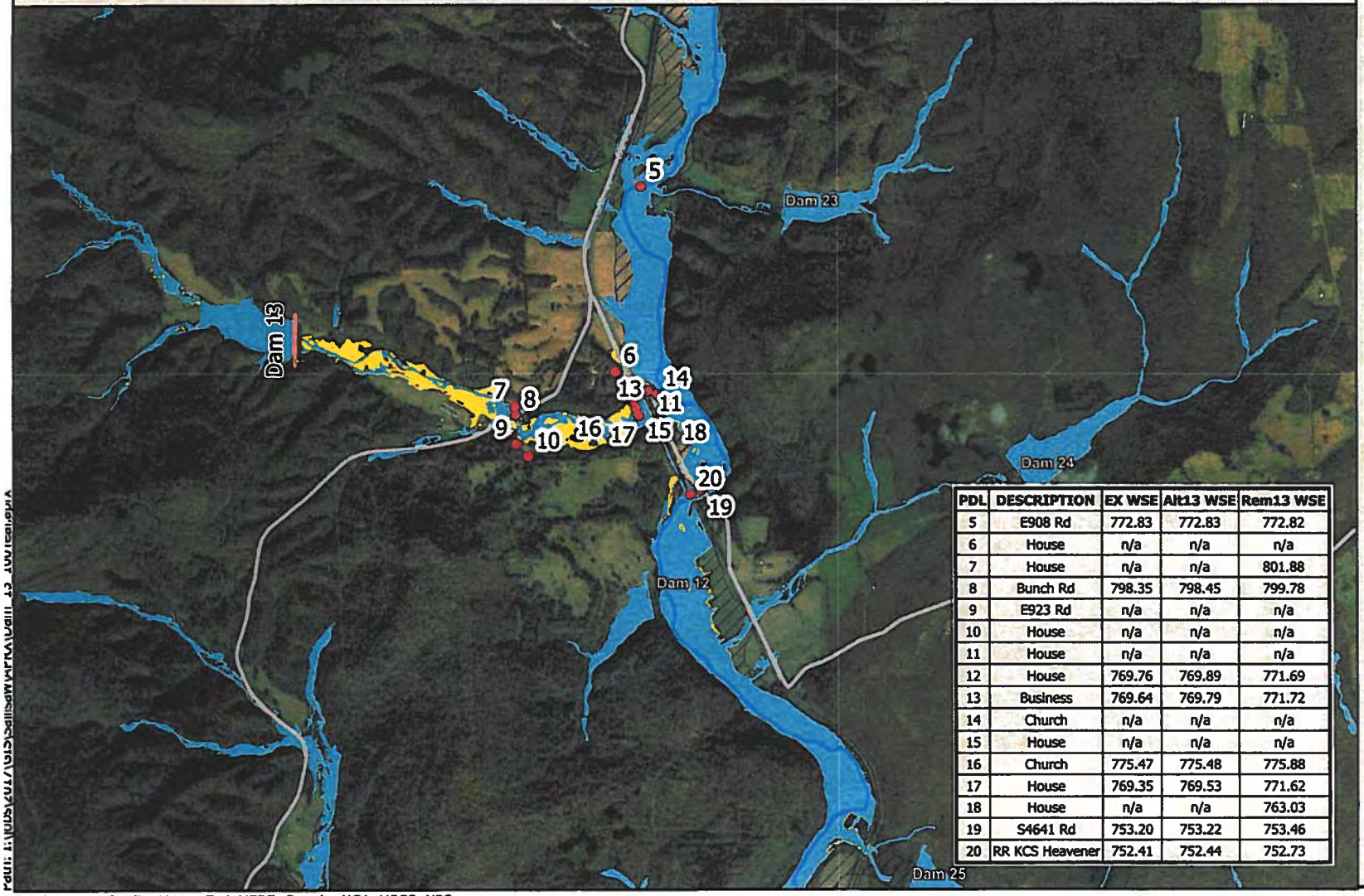
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 5 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
5	E908 Rd	772.83	772.83	772.82
6	House	n/a	n/a	n/a
7	House	n/a	n/a	801.88
8	Bunch Rd	798.35	798.45	799.78
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
11	House	n/a	n/a	n/a
12	House	769.76	769.89	771.69
13	Business	769.64	769.79	771.72
14	Church	n/a	n/a	n/a
15	House	n/a	n/a	n/a
16	Church	775.47	775.48	775.88
17	House	769.35	769.53	771.62
18	House	n/a	n/a	763.03
19	S4641 Rd	753.20	753.22	753.46
20	RR KCS Heavener	752.41	752.44	752.73

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

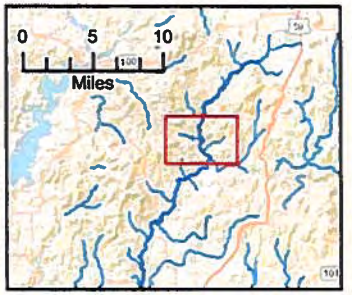
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

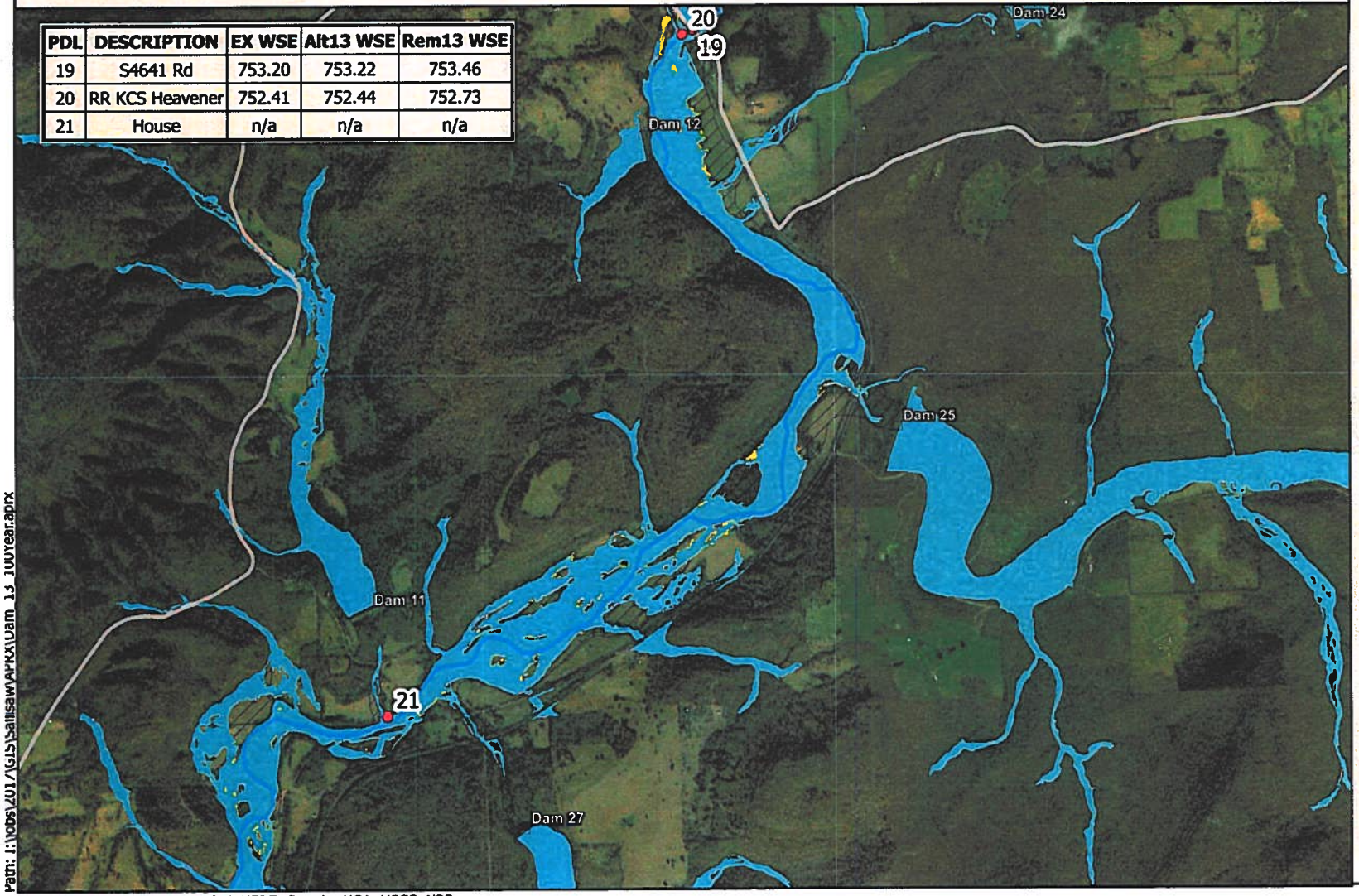
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 6 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
19	S4641 Rd	753.20	753.22	753.46
20	RR KCS Heavener	752.41	752.44	752.73
21	House	n/a	n/a	n/a



Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

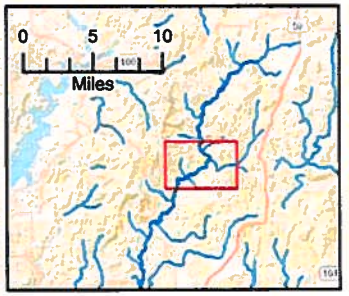
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Path: I:\Jobs\2017\GIS\SallisawAPRX\Dam_13_100year.aprx

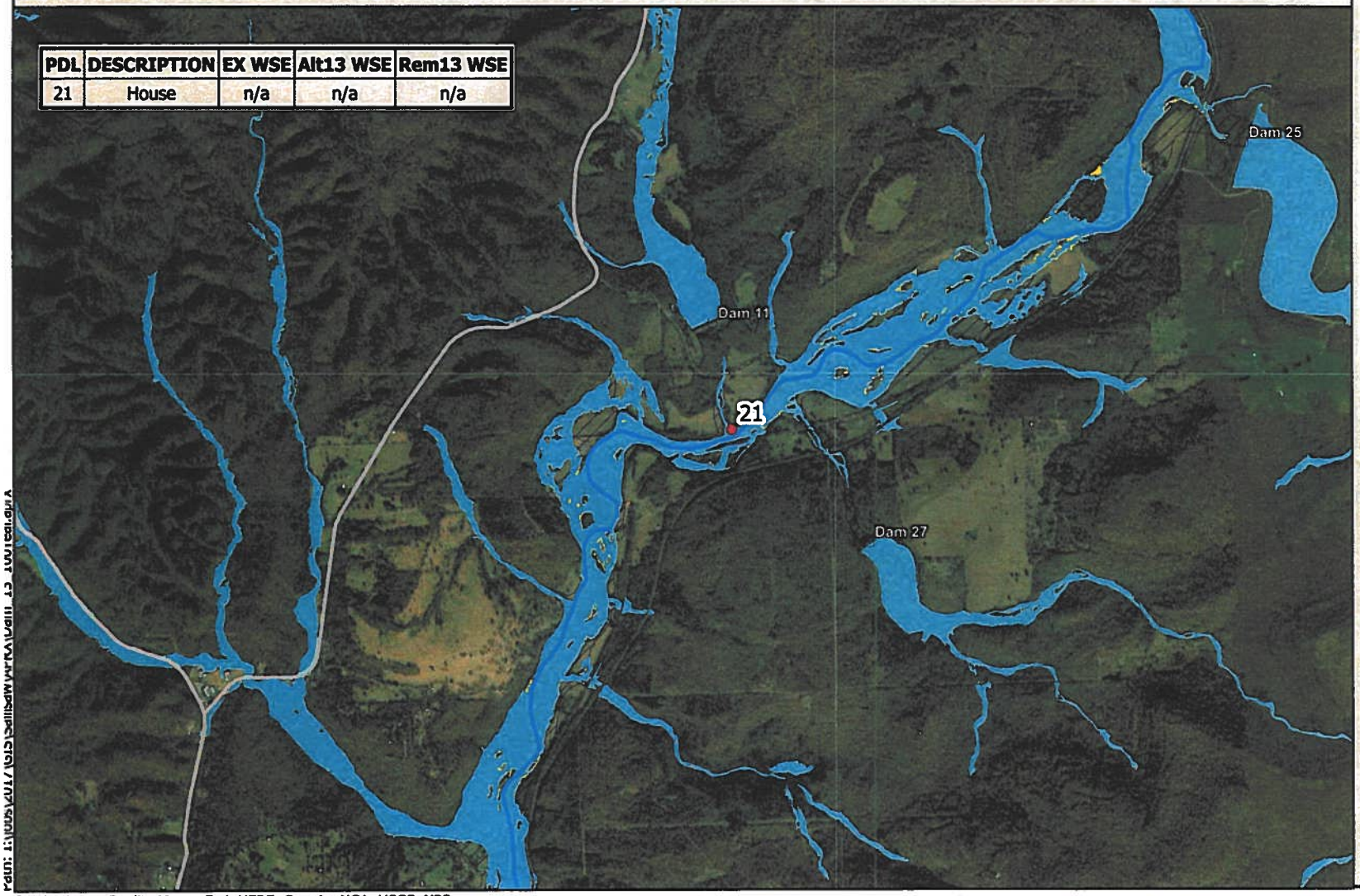
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 7 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
21	House	n/a	n/a	n/a



Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

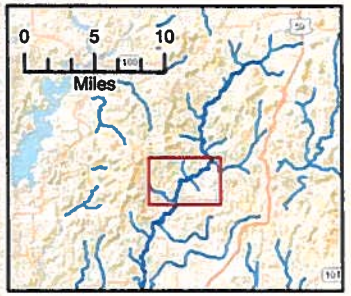
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

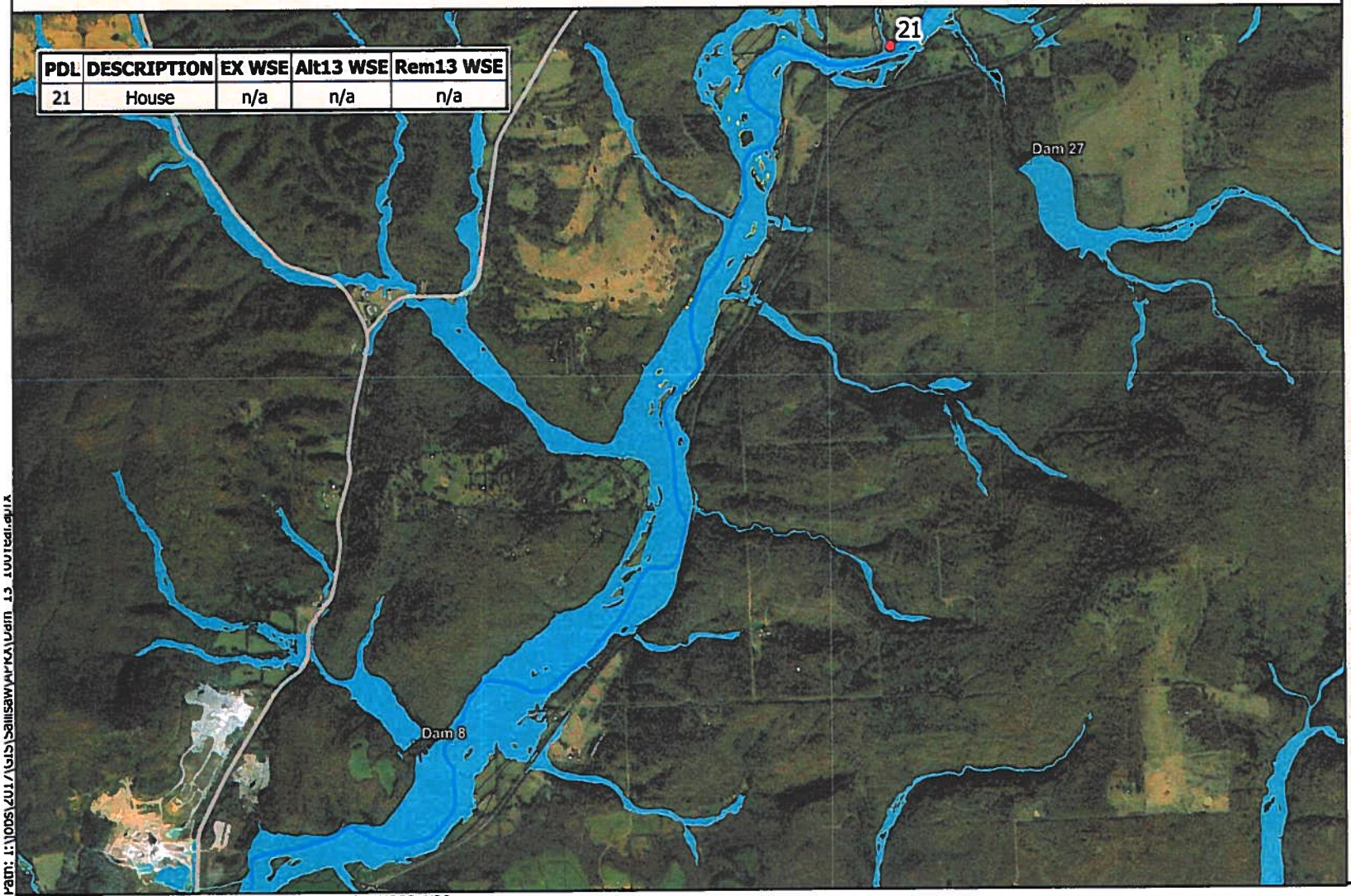
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 8 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
21	House	n/a	n/a	n/a



Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

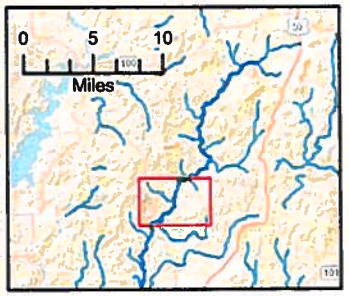
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

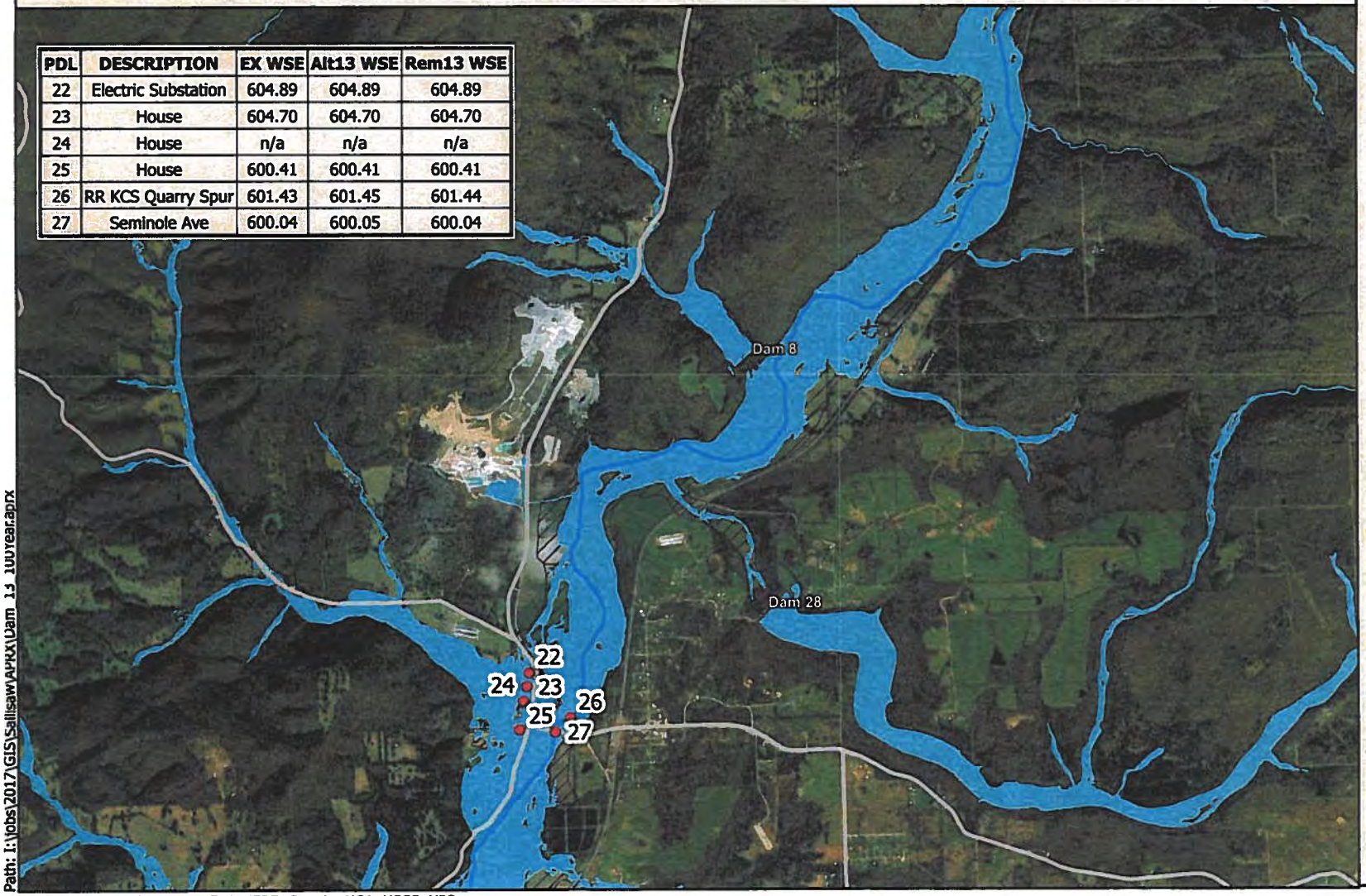
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Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 9 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
22	Electric Substation	604.89	604.89	604.89
23	House	604.70	604.70	604.70
24	House	n/a	n/a	n/a
25	House	600.41	600.41	600.41
26	RR KCS Quarry Spur	601.43	601.45	601.44
27	Seminole Ave	600.04	600.05	600.04



Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

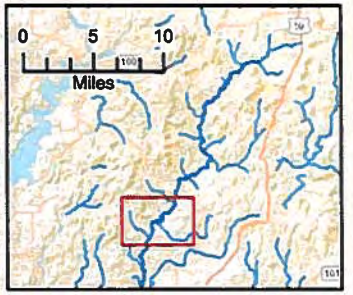
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

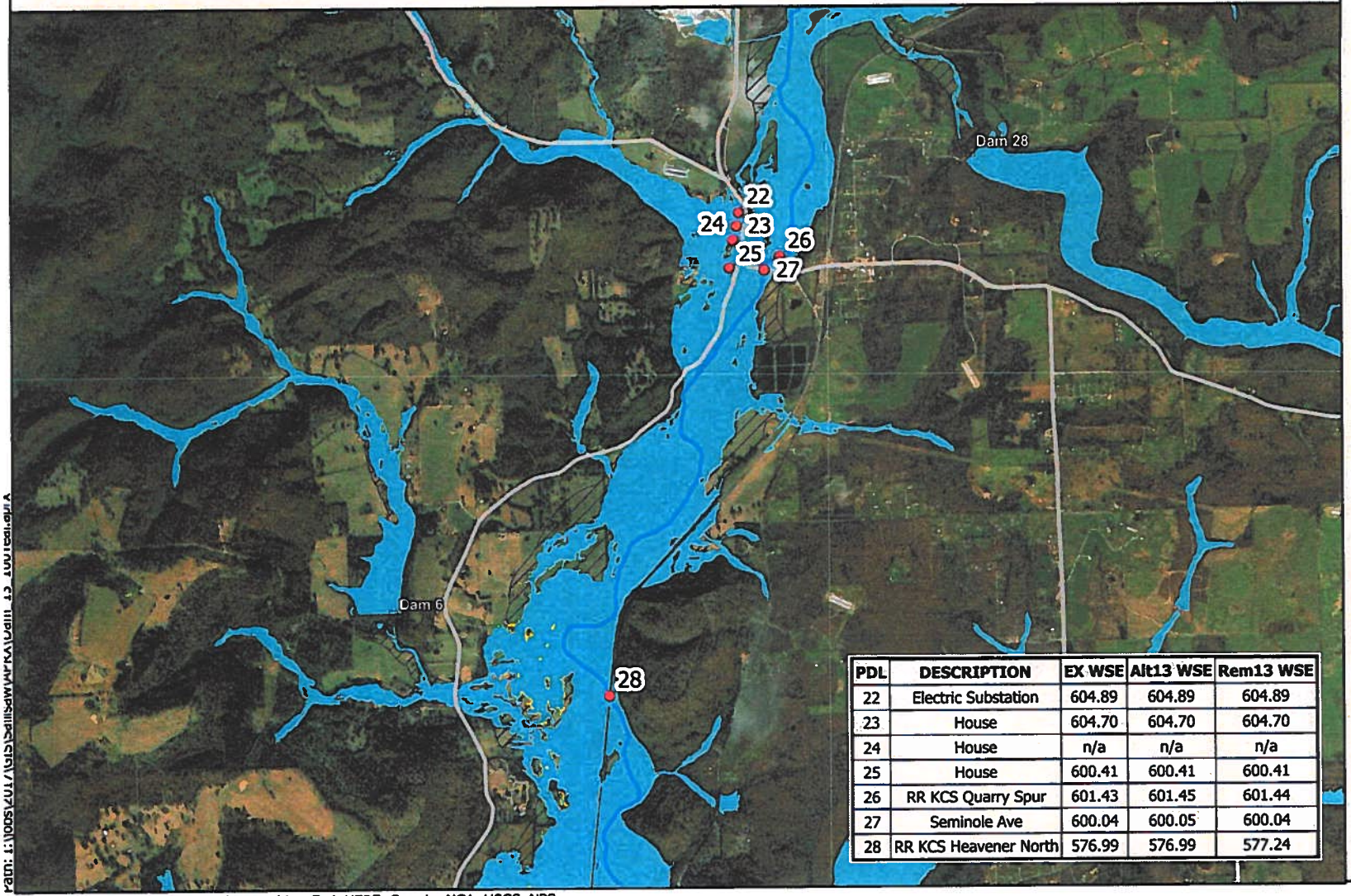
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 10 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
22	Electric Substation	604.89	604.89	604.89
23	House	604.70	604.70	604.70
24	House	n/a	n/a	n/a
25	House	600.41	600.41	600.41
26	RR KCS Quarry Spur	601.43	601.45	601.44
27	Seminole Ave	600.04	600.05	600.04
28	RR KCS Heavener North	576.99	576.99	577.24

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

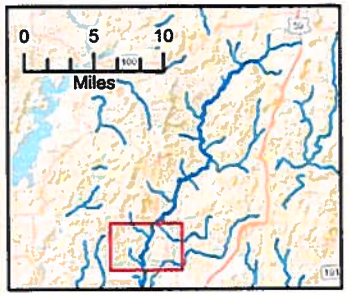
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



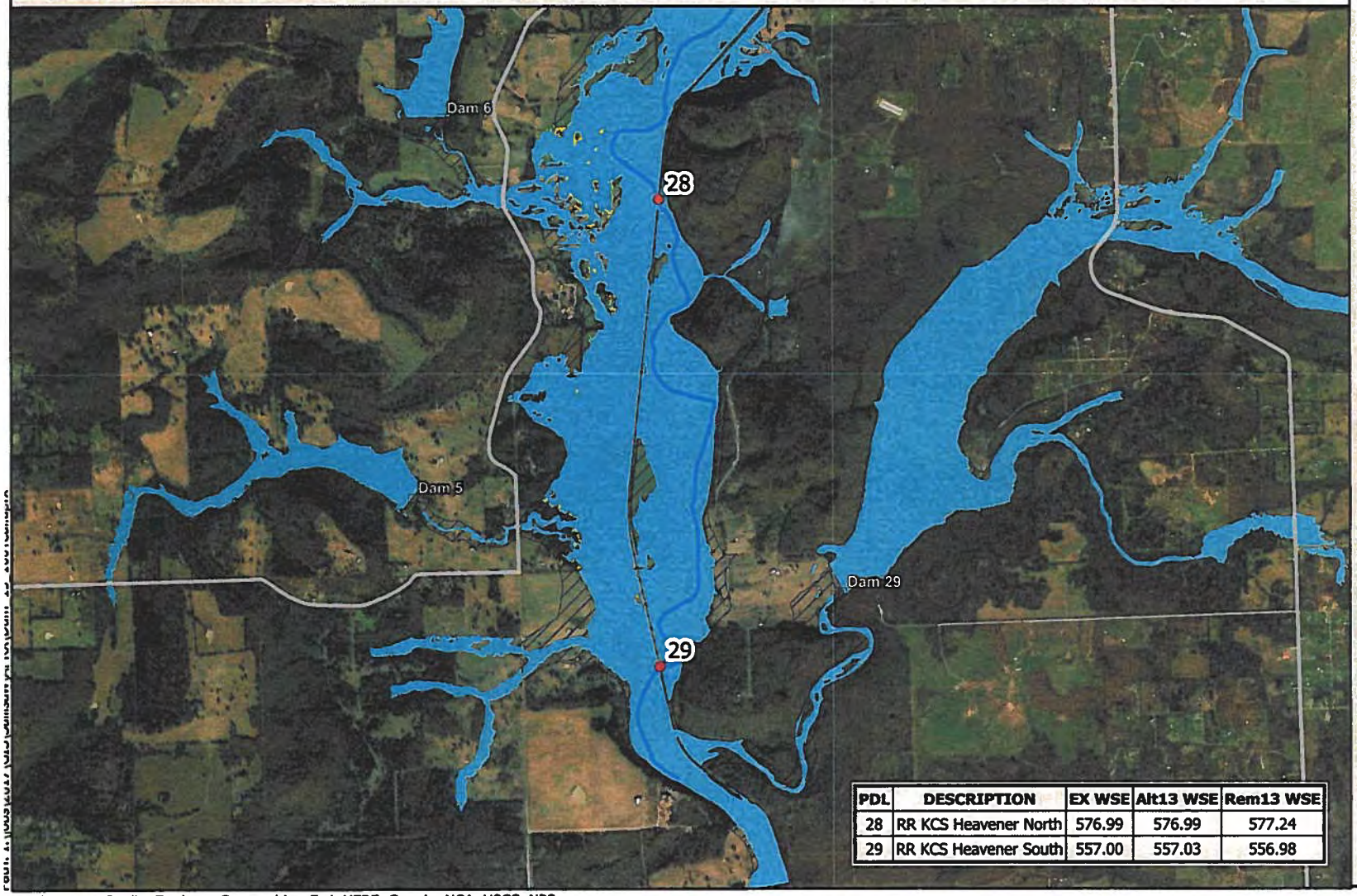
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 11 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
28	RR KCS Heavener North	576.99	576.99	577.24
29	RR KCS Heavener South	557.00	557.03	556.98

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

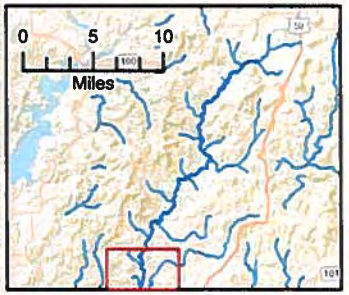
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



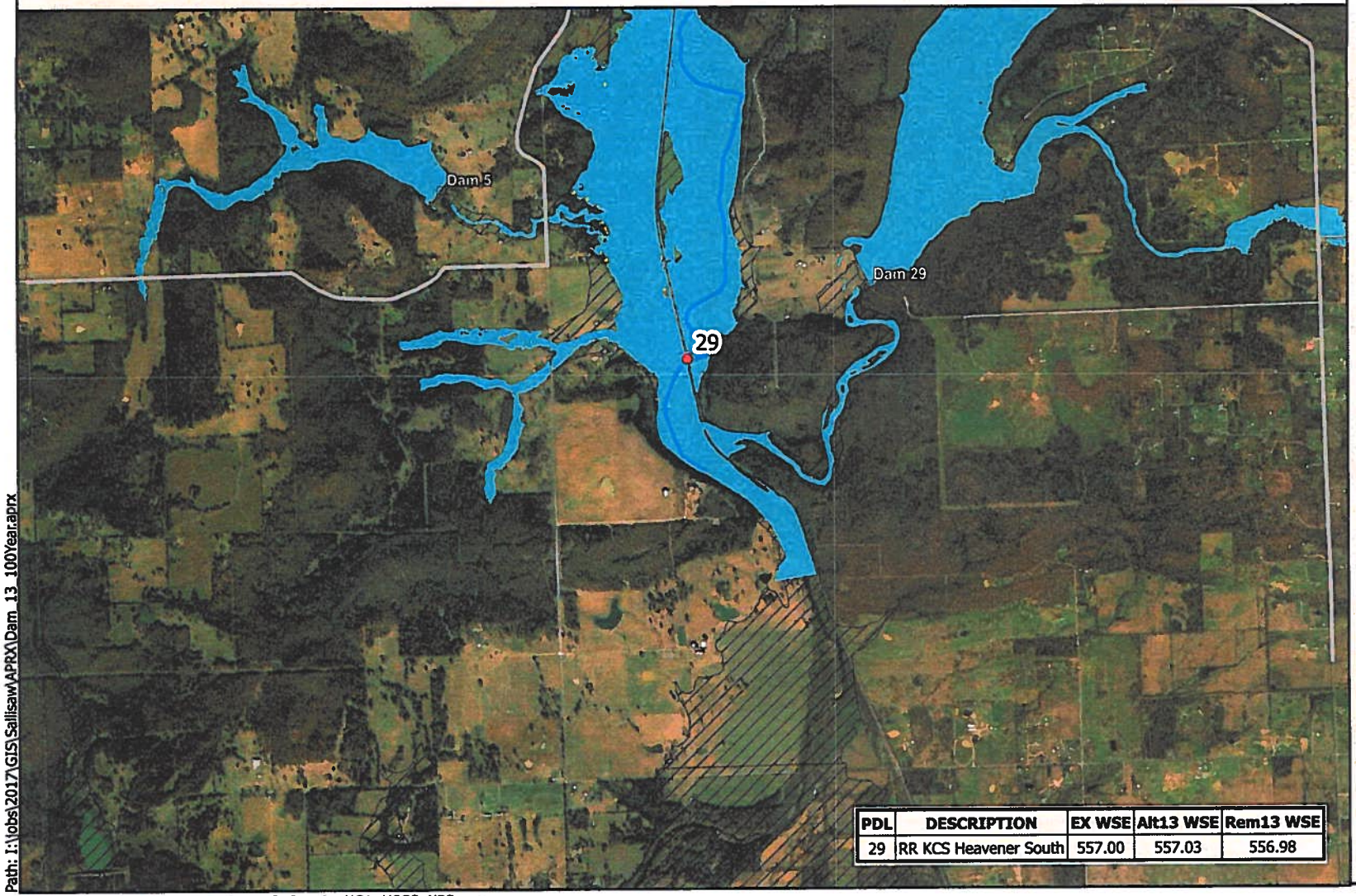
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Earthstar Geographics, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 12 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
29	RR KCS Heavener South	557.00	557.03	556.98

Legend
- 100 Year Alt
- 100 Year Rem
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

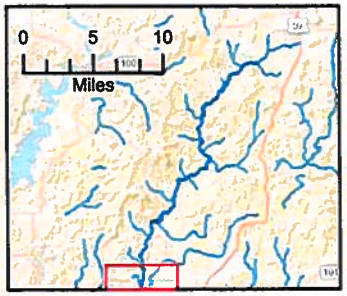
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

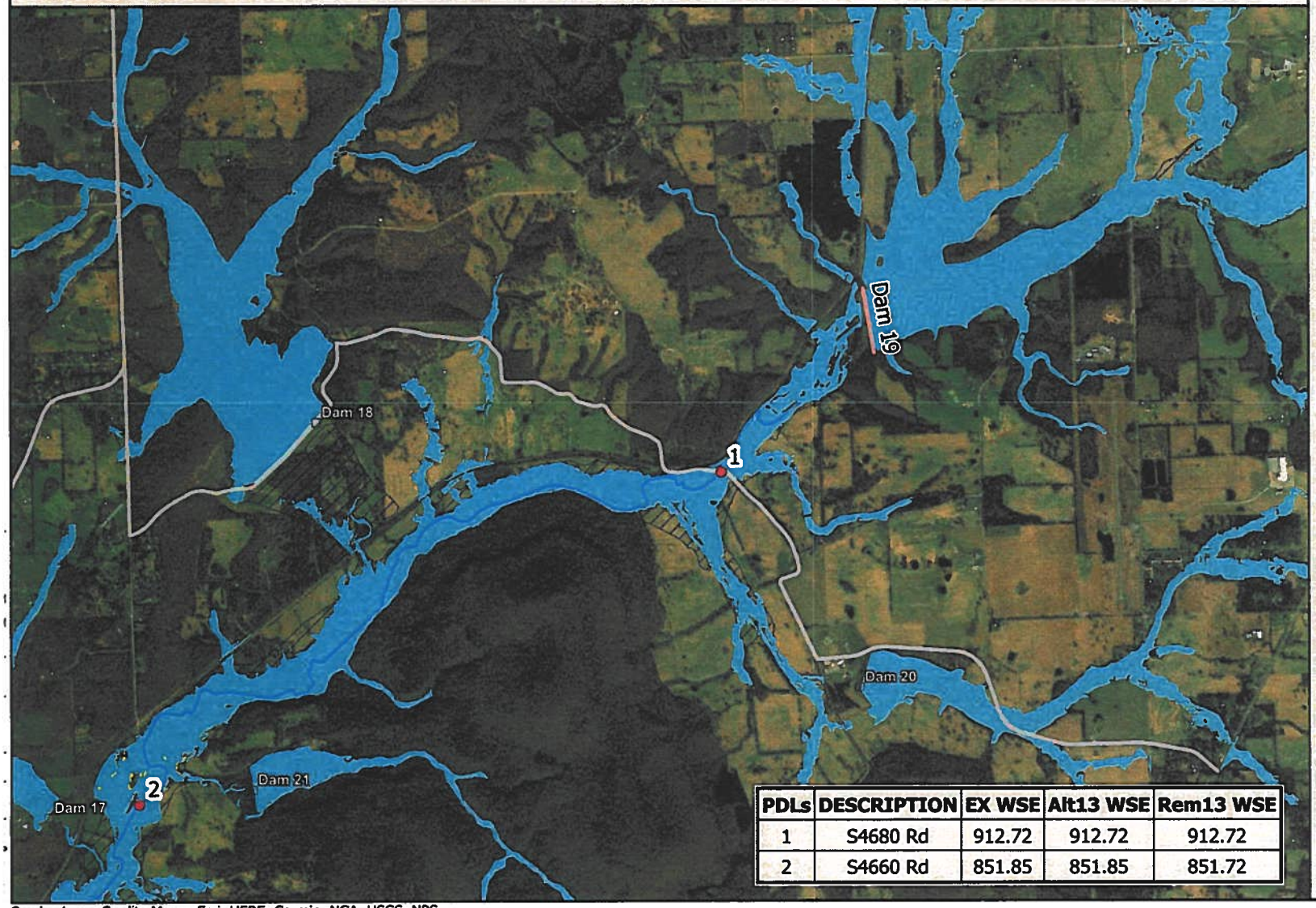
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah
Counties

Panel 1 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
1	S4680 Rd	912.72	912.72	912.72
2	S4660 Rd	851.85	851.85	851.72

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

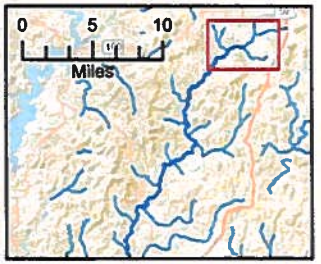
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



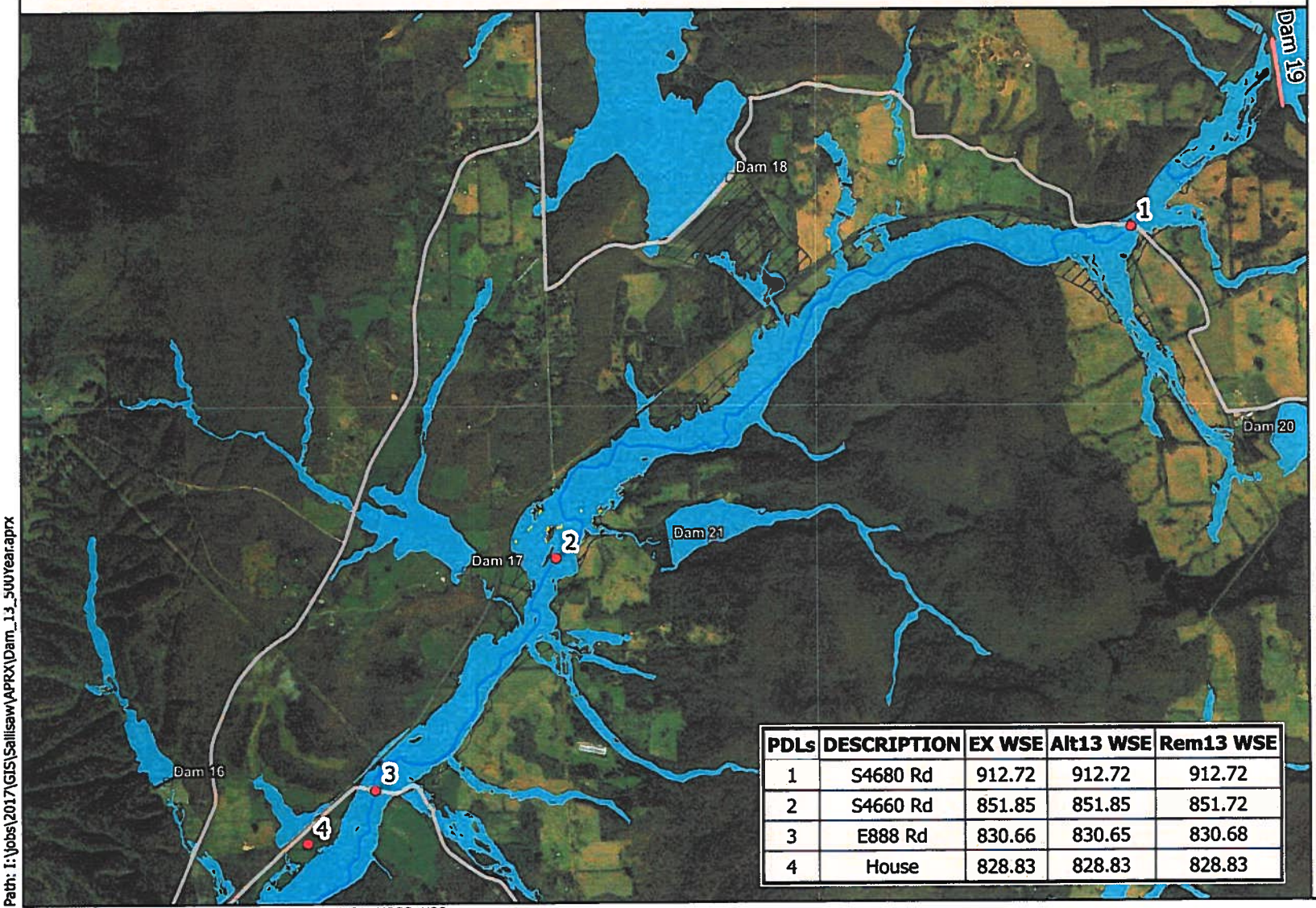
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 2 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
1	S4680 Rd	912.72	912.72	912.72
2	S4660 Rd	851.85	851.85	851.72
3	E888 Rd	830.66	830.65	830.68
4	House	828.83	828.83	828.83

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

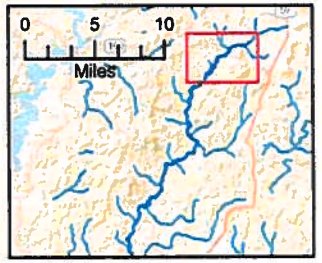
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

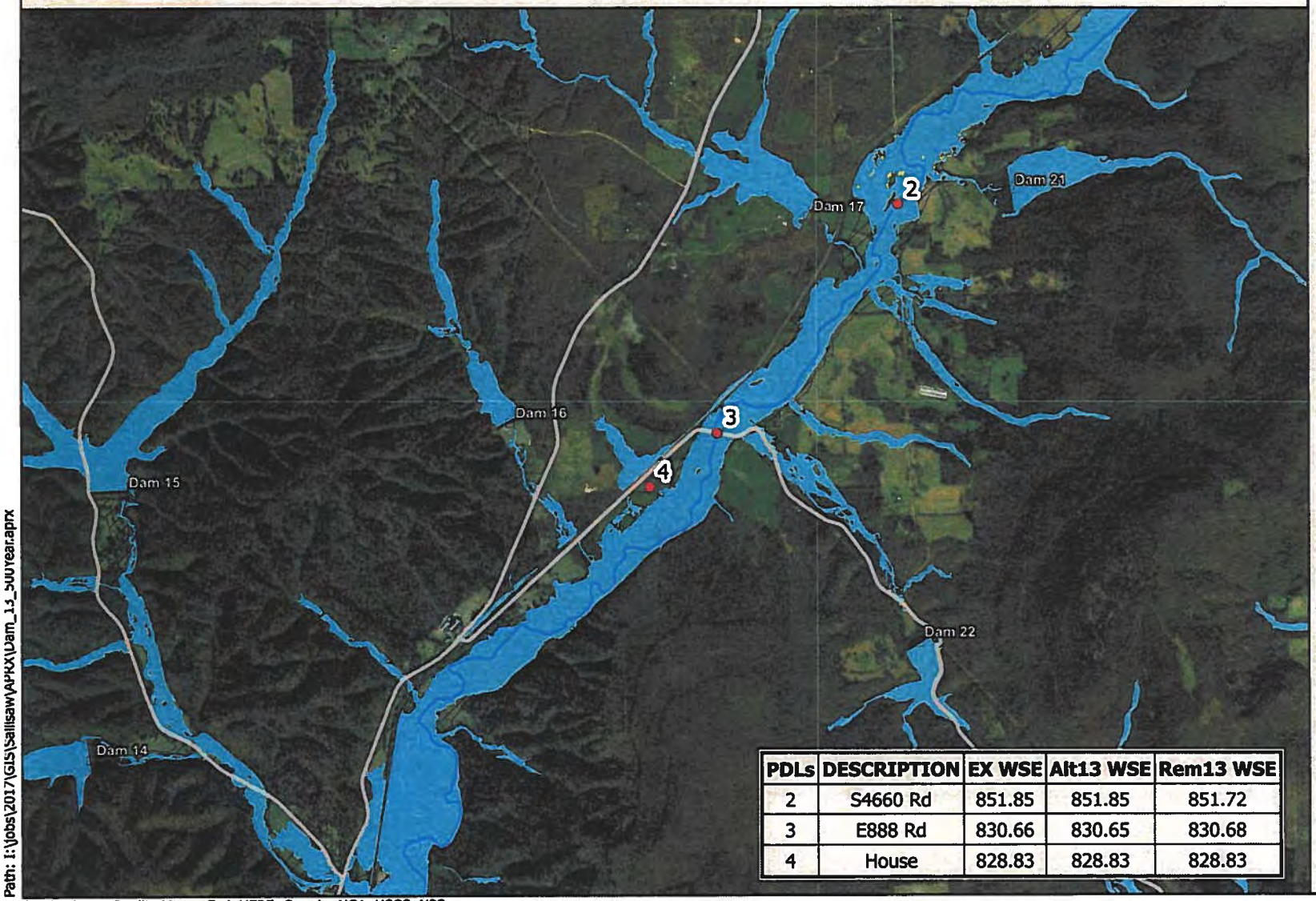
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 3 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
2	S4660 Rd	851.85	851.85	851.72
3	E888 Rd	830.66	830.65	830.68
4	House	828.83	828.83	828.83

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

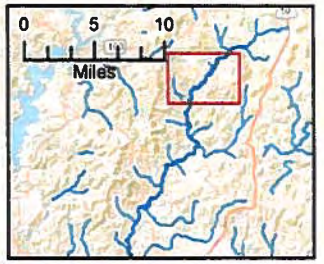
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

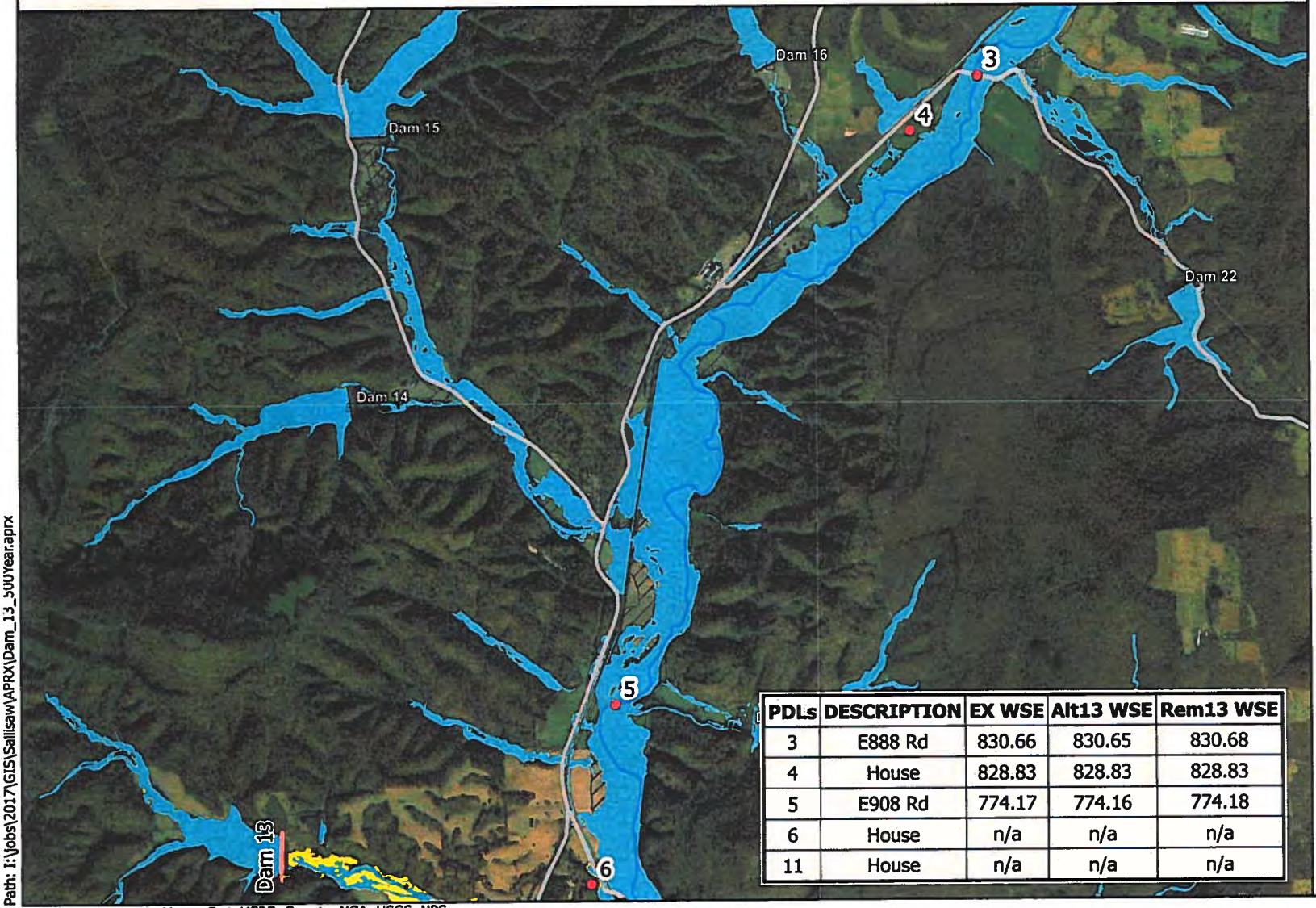
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 4 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
3	E888 Rd	830.66	830.65	830.68
4	House	828.83	828.83	828.83
5	E908 Rd	774.17	774.16	774.18
6	House	n/a	n/a	n/a
11	House	n/a	n/a	n/a

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

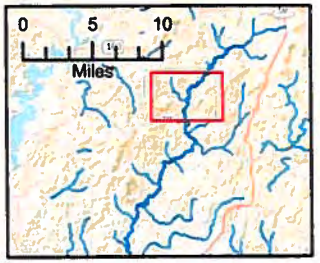
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

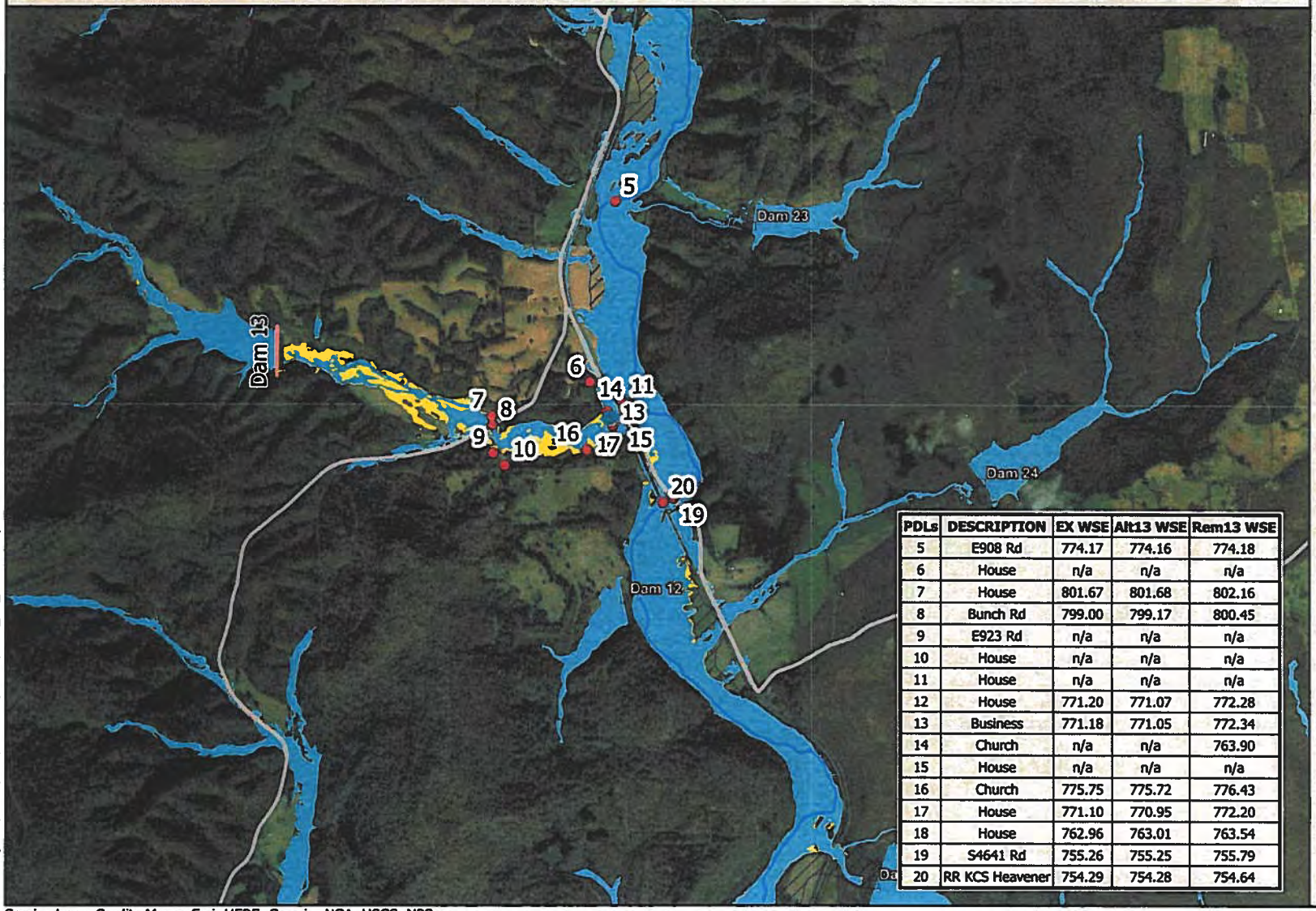
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 5 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
5	E908 Rd	774.17	774.16	774.18
6	House	n/a	n/a	n/a
7	House	801.67	801.68	802.16
8	Bunch Rd	799.00	799.17	800.45
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
11	House	n/a	n/a	n/a
12	House	771.20	771.07	772.28
13	Business	771.18	771.05	772.34
14	Church	n/a	n/a	763.90
15	House	n/a	n/a	n/a
16	Church	775.75	775.72	776.43
17	House	771.10	770.95	772.20
18	House	762.96	763.01	763.54
19	S4641 Rd	755.26	755.25	755.79
20	RR KCS Heavener	754.29	754.28	754.64

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

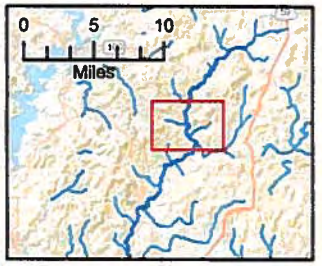
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

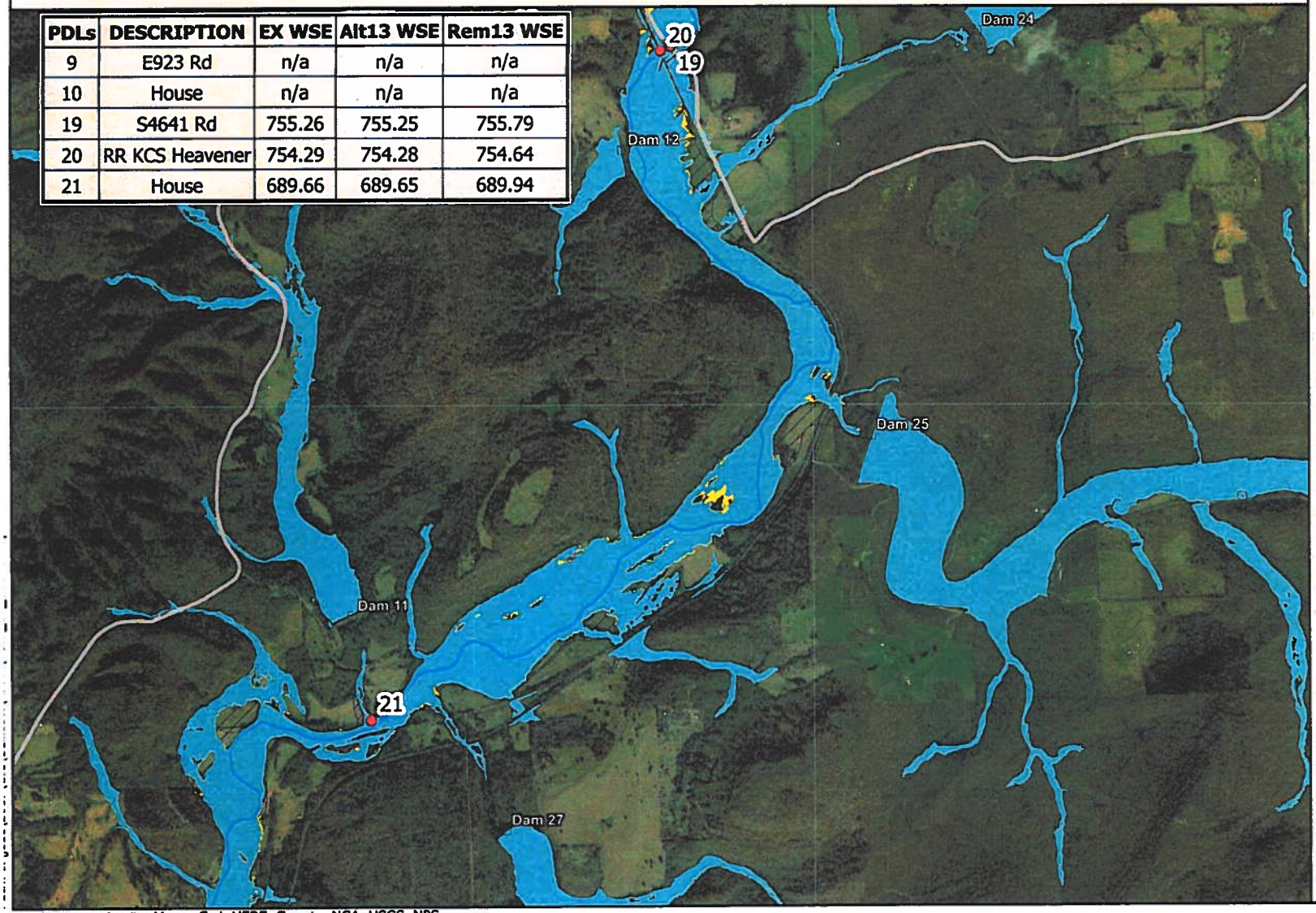
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Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 6 of 12
Print Revisions April 2023
Model Date: December 2021

PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
19	S4641 Rd	755.26	755.25	755.79
20	RR KCS Heavener	754.29	754.28	754.64
21	House	689.66	689.65	689.94



Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

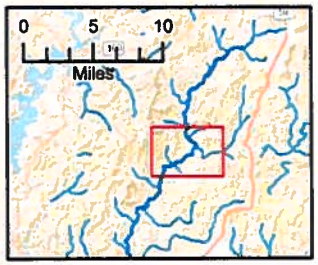
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

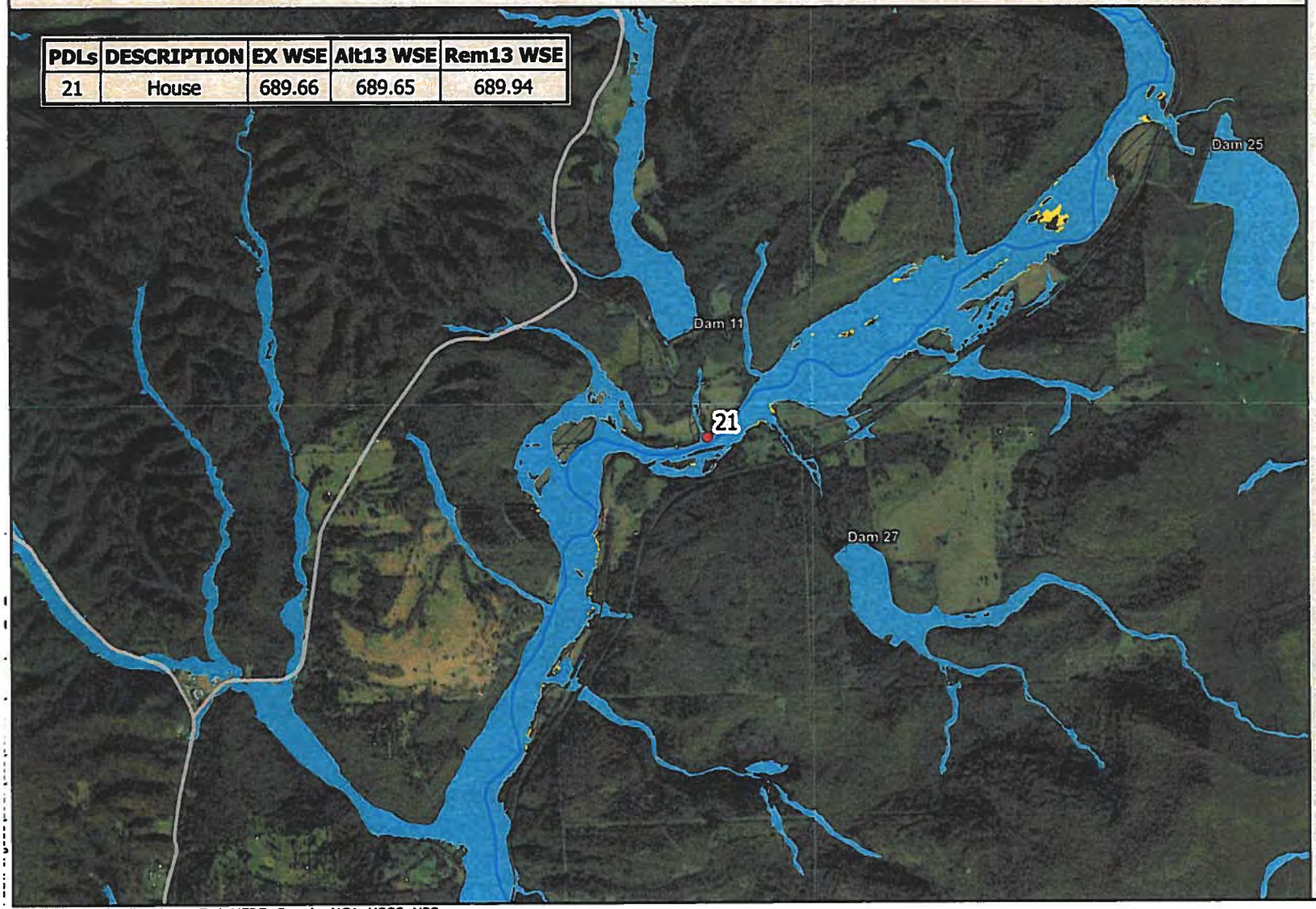
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Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 7 of 12
Print Revisions April 2023
Model Date: December 2021

PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
21	House	689.66	689.65	689.94



Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

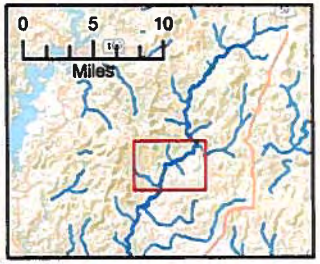
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

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CONSERVATIONWORKS JOINT VENTURE

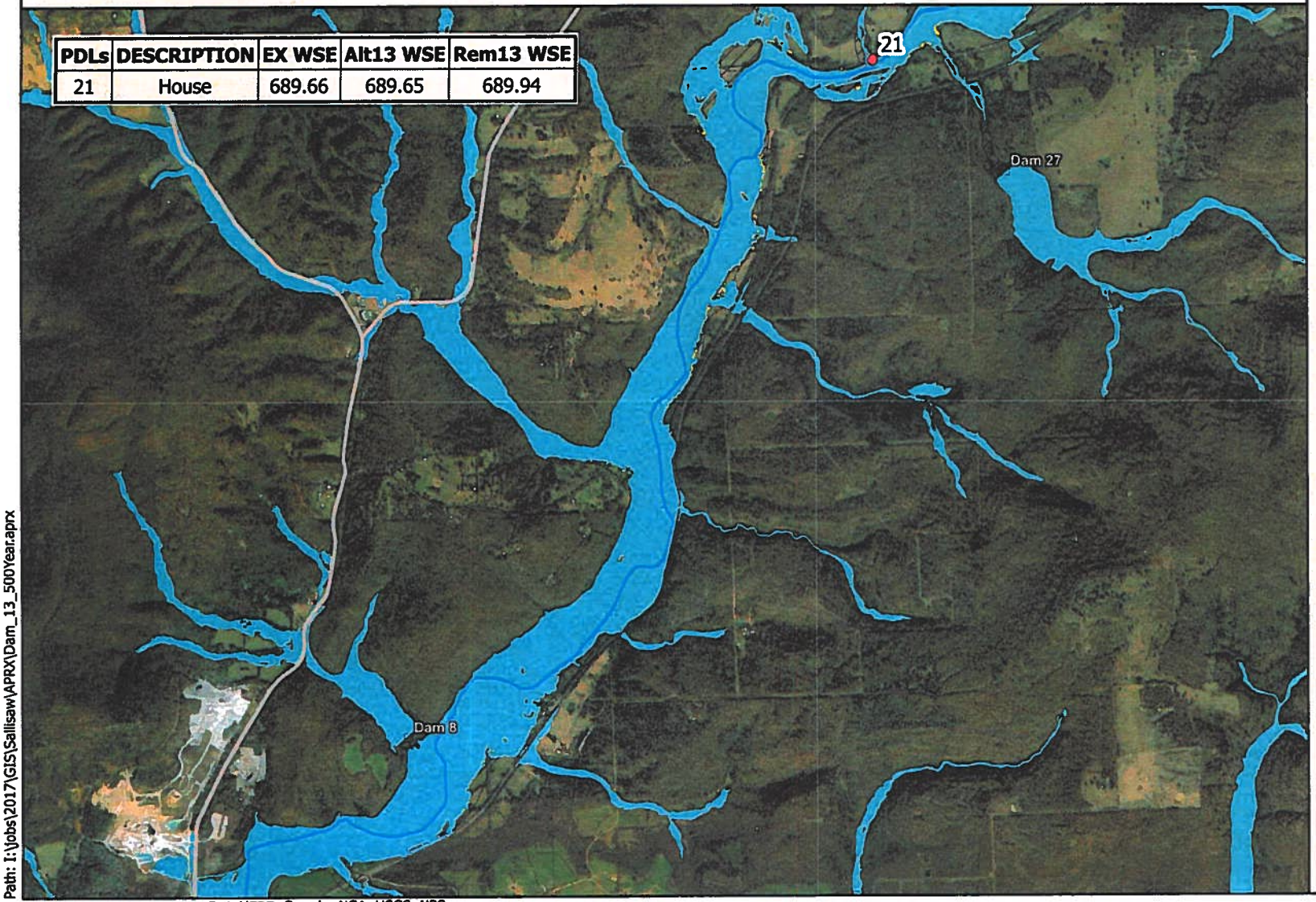
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Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 8 of 12
Print Revisions April 2023
Model Date: December 2021

PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
21	House	689.66	689.65	689.94



Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

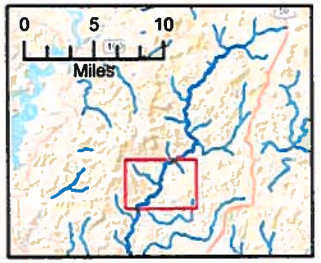
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

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CONSERVATIONWORKS JOINT VENTURE

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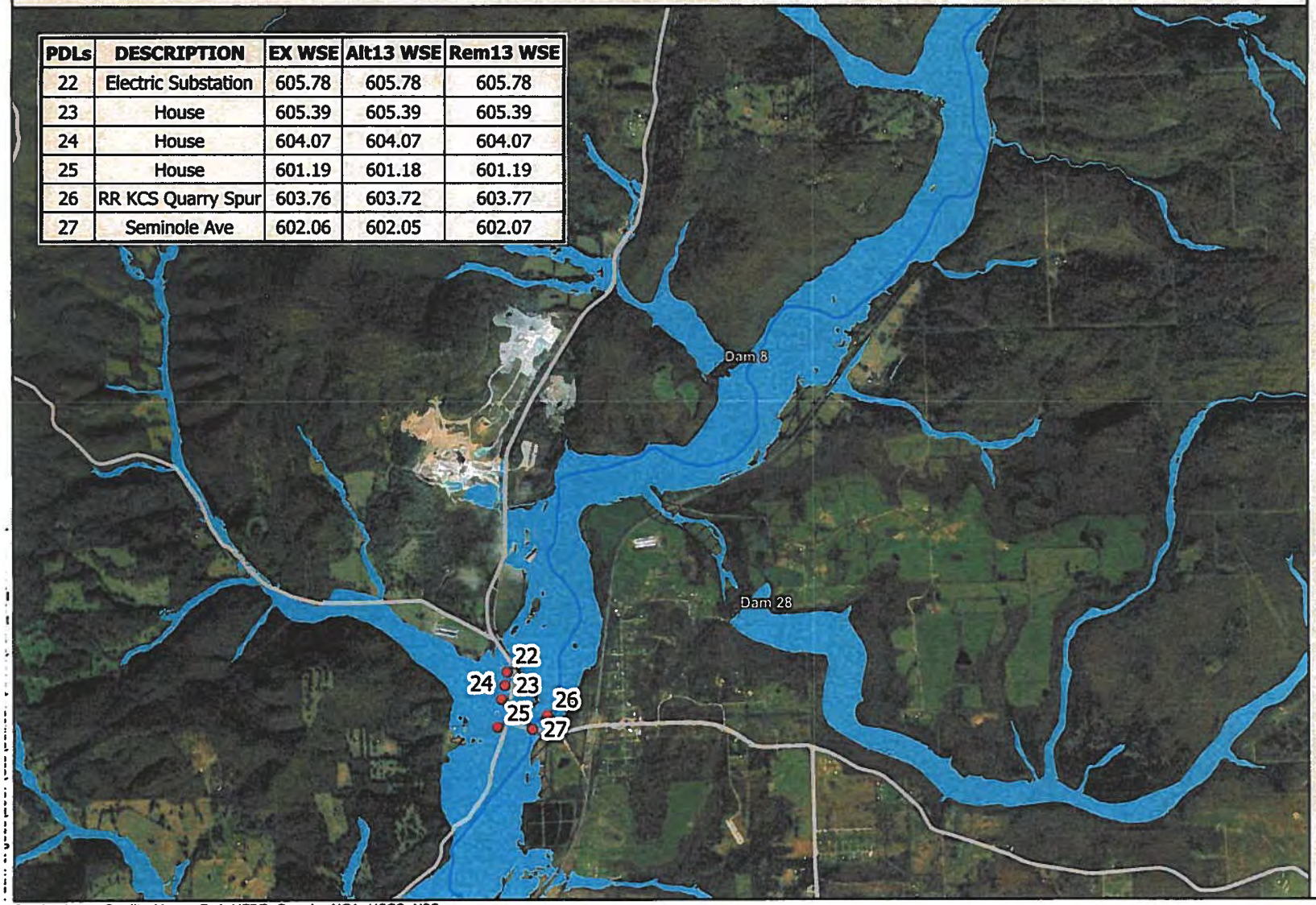
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Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 9 of 12
Print Revisions April 2023
Model Date: December 2021

PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
22	Electric Substation	605.78	605.78	605.78
23	House	605.39	605.39	605.39
24	House	604.07	604.07	604.07
25	House	601.19	601.18	601.19
26	RR KCS Quarry Spur	603.76	603.72	603.77
27	Seminole Ave	602.06	602.05	602.07



Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

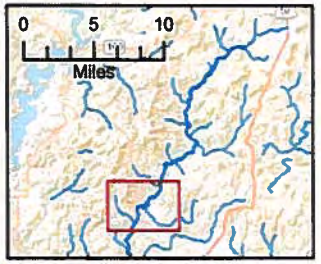
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



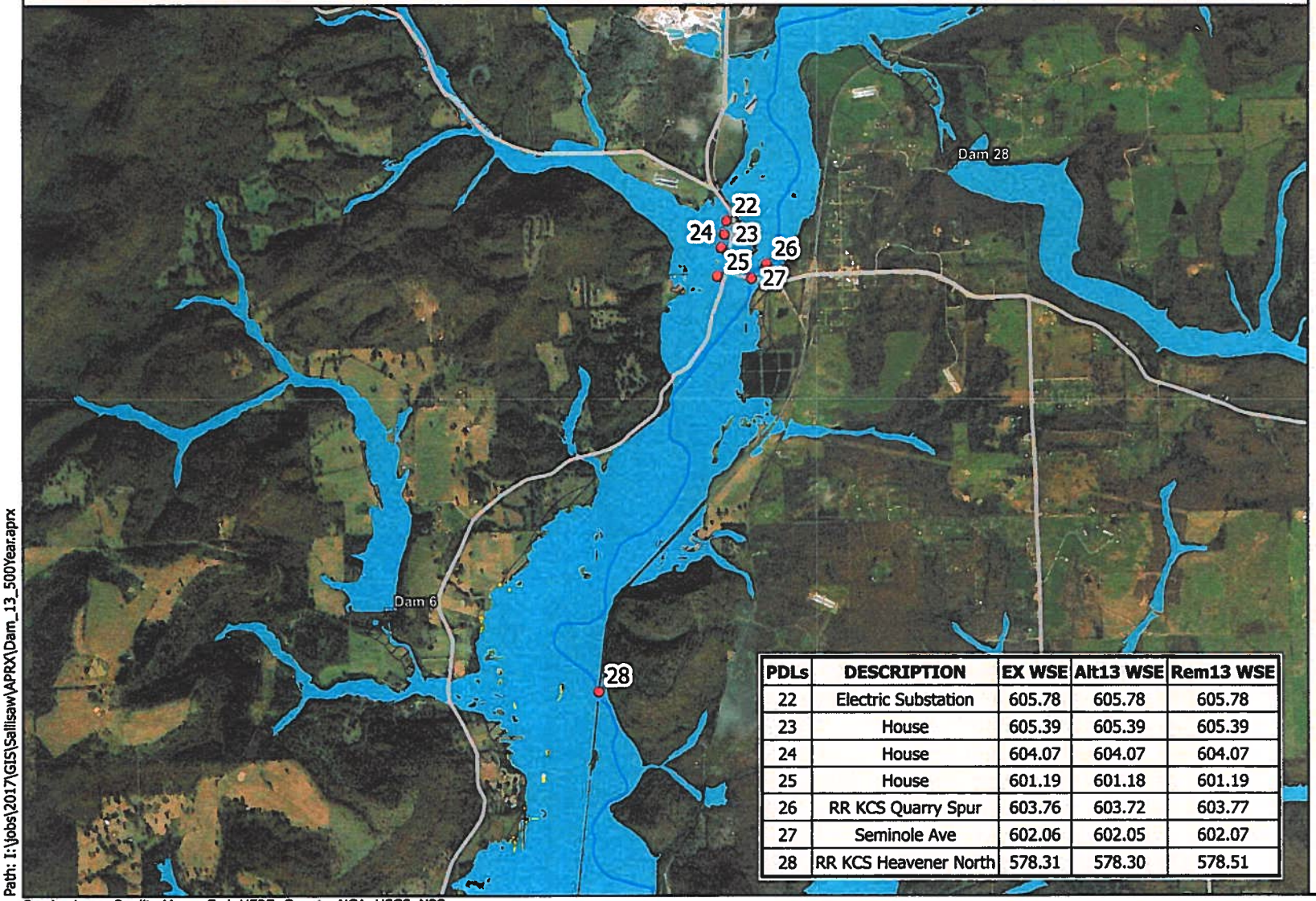
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 10 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
22	Electric Substation	605.78	605.78	605.78
23	House	605.39	605.39	605.39
24	House	604.07	604.07	604.07
25	House	601.19	601.18	601.19
26	RR KCS Quarry Spur	603.76	603.72	603.77
27	Seminole Ave	602.06	602.05	602.07
28	RR KCS Heavener North	578.31	578.30	578.51

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

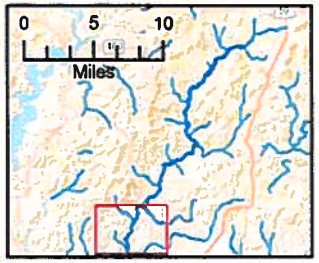
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

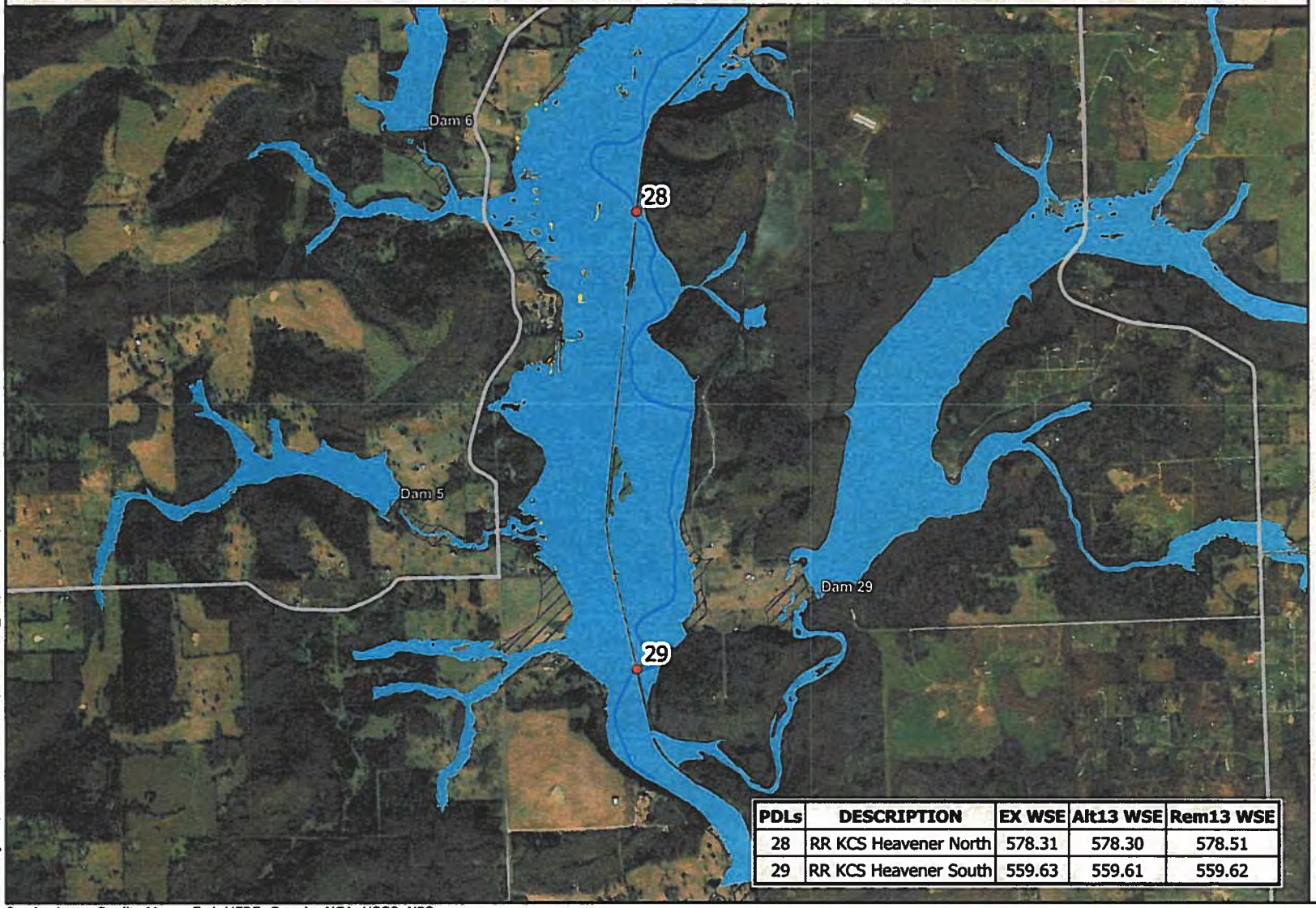
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 11 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
28	RR KCS Heavener North	578.31	578.30	578.51
29	RR KCS Heavener South	559.63	559.61	559.62

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

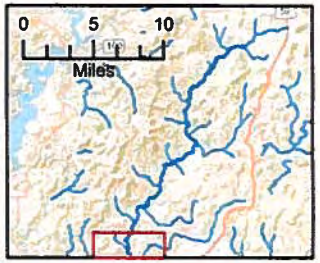
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

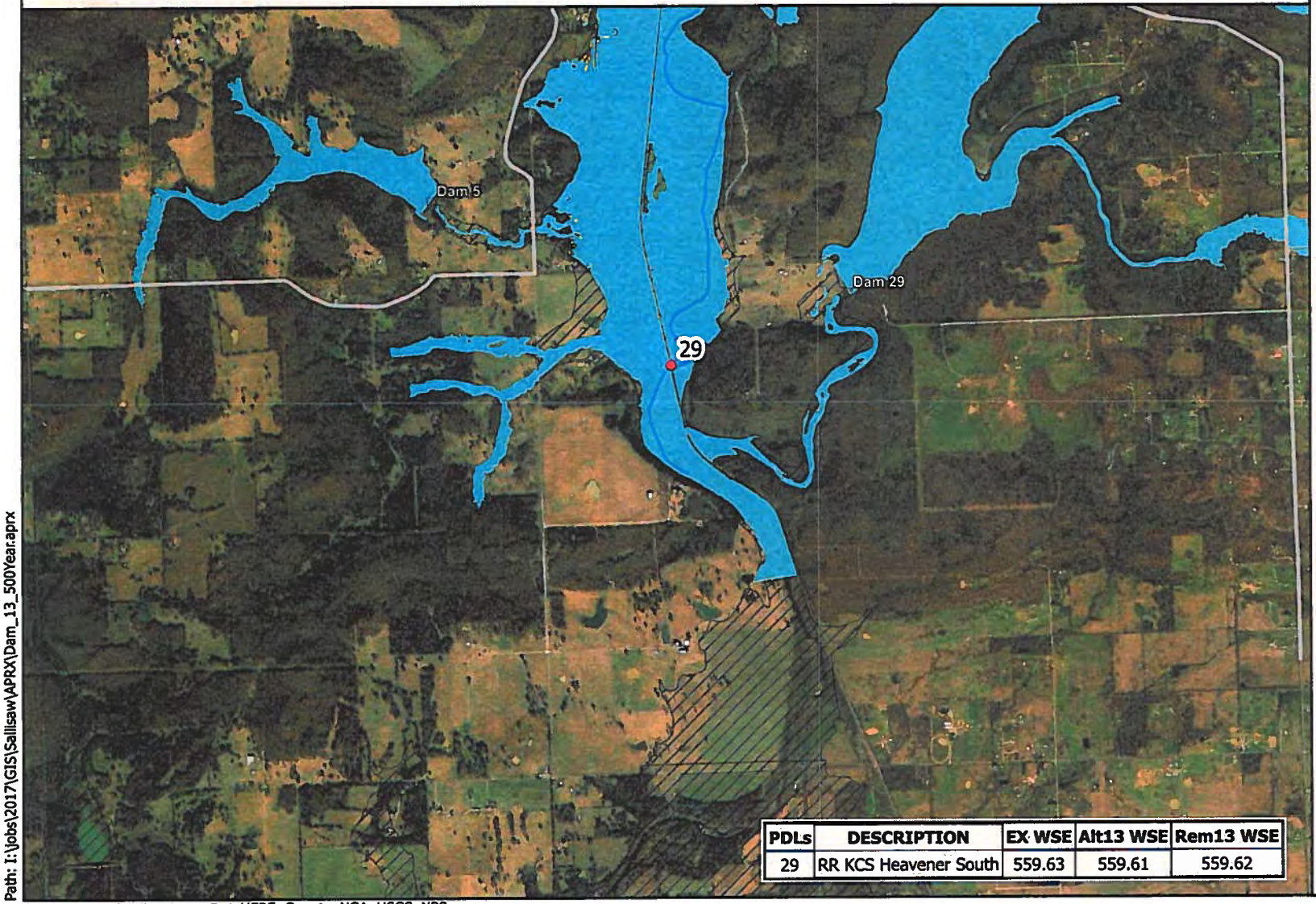
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 13

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah
Counties

Panel 12 of 12
Print Revisions April 2023
Model Date: December 2021



PDLs	DESCRIPTION	EX WSE	Alt13 WSE	Rem13 WSE
29	RR KCS Heavener South	559.63	559.61	559.62

Legend
- 500 Year Rem
- 500 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

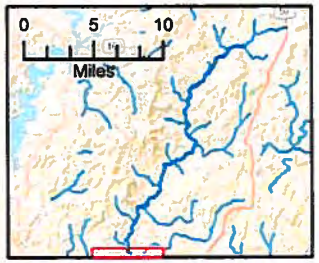
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt13 = Rehabilitation Option
Rem13 = Decommissioned Option

Elevation reported in feet.

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CONSERVATIONWORKS JOINT VENTURE

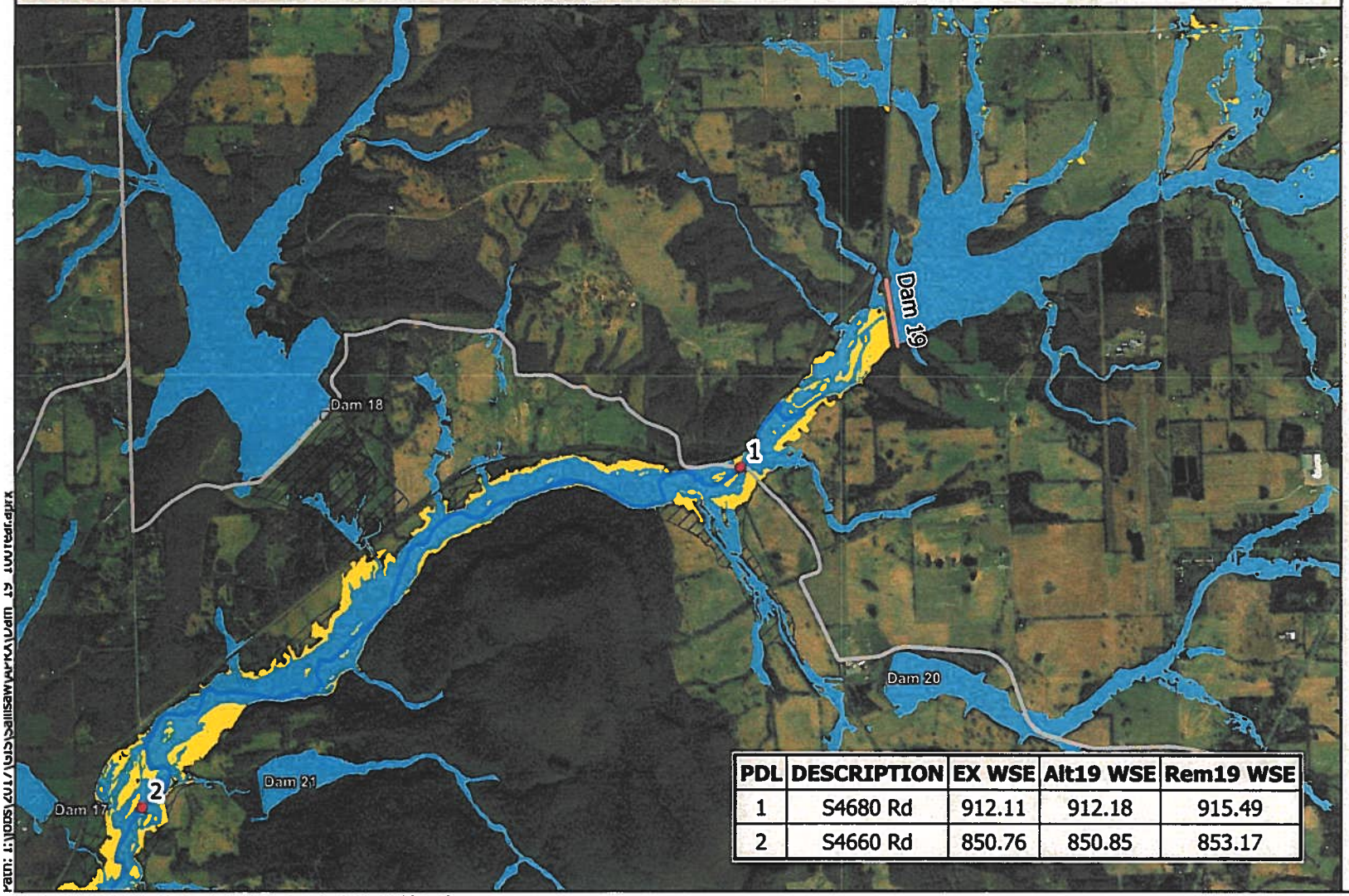
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 1 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
1	S4680 Rd	912.11	912.18	915.49
2	S4660 Rd	850.76	850.85	853.17

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

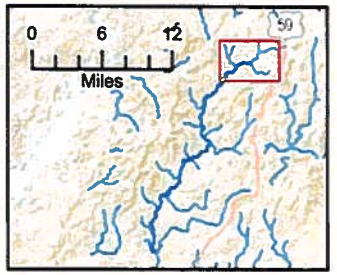
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

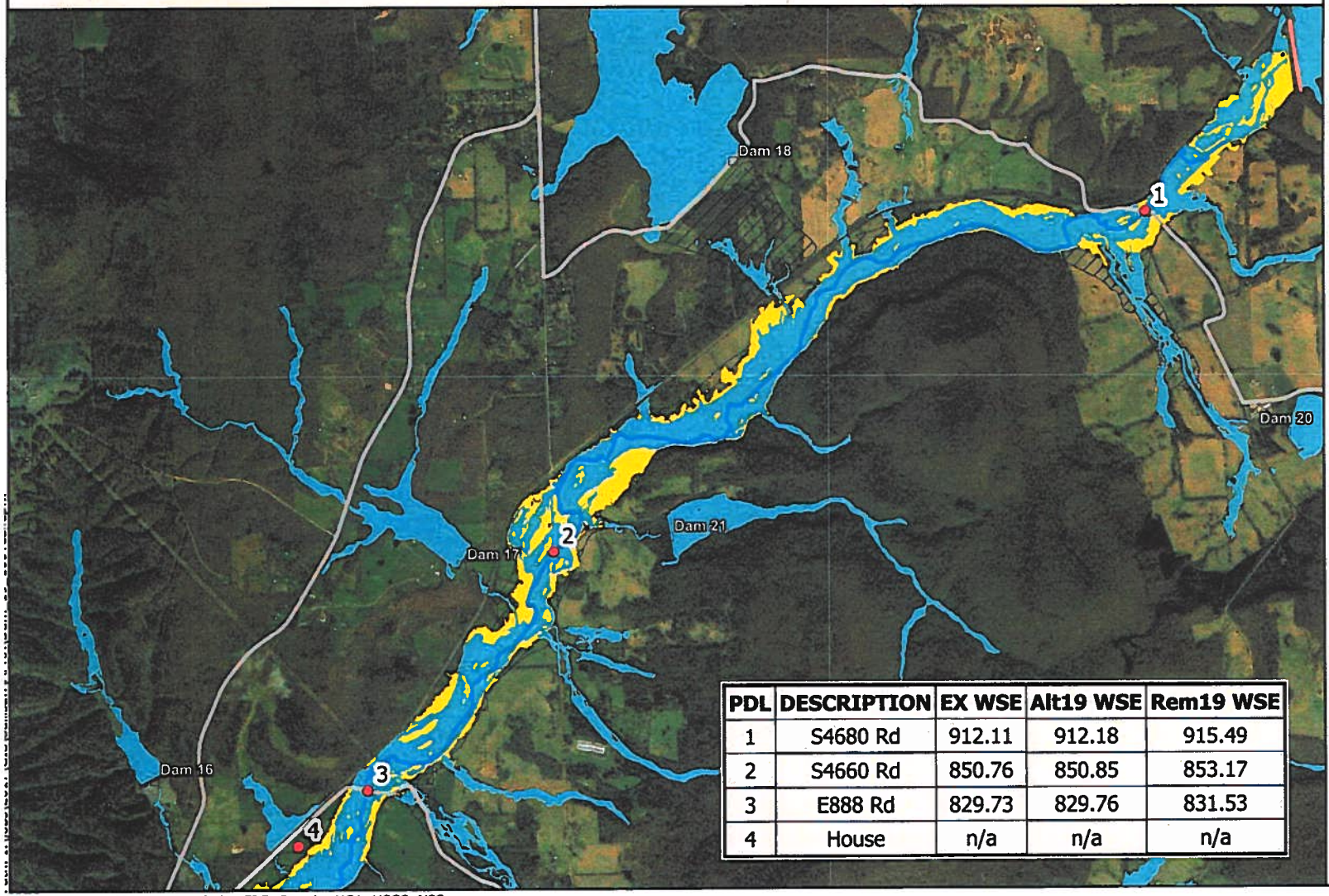
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Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 2 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
1	S4680 Rd	912.11	912.18	915.49
2	S4660 Rd	850.76	850.85	853.17
3	E888 Rd	829.73	829.76	831.53
4	House	n/a	n/a	n/a

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

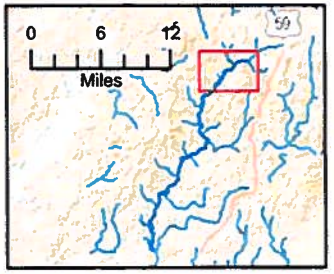
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



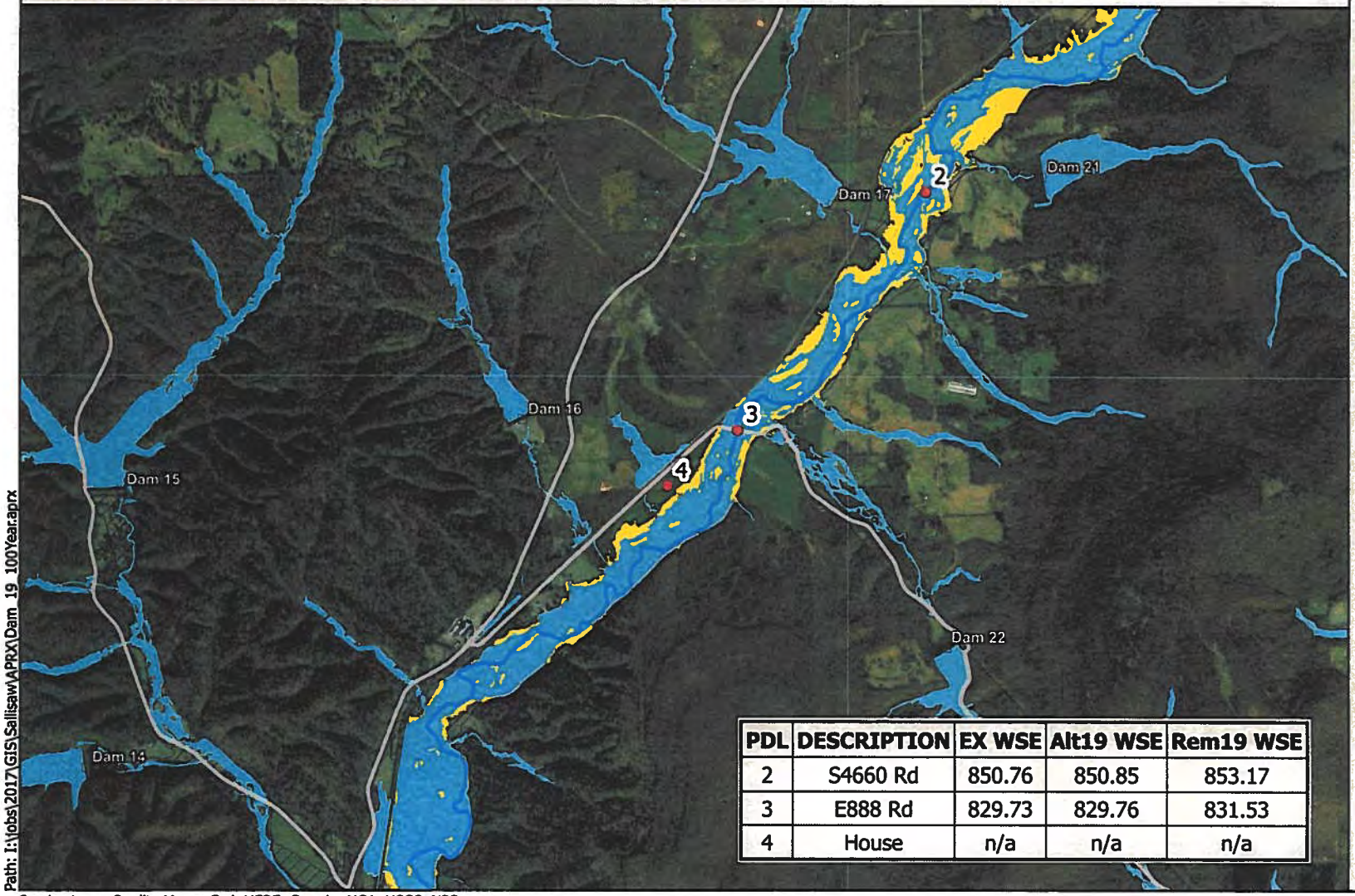
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 3 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
2	S4660 Rd	850.76	850.85	853.17
3	E888 Rd	829.73	829.76	831.53
4	House	n/a	n/a	n/a

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

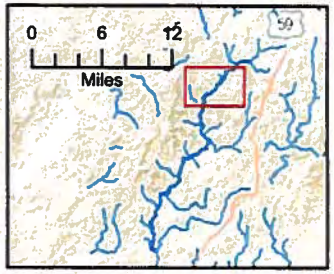
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

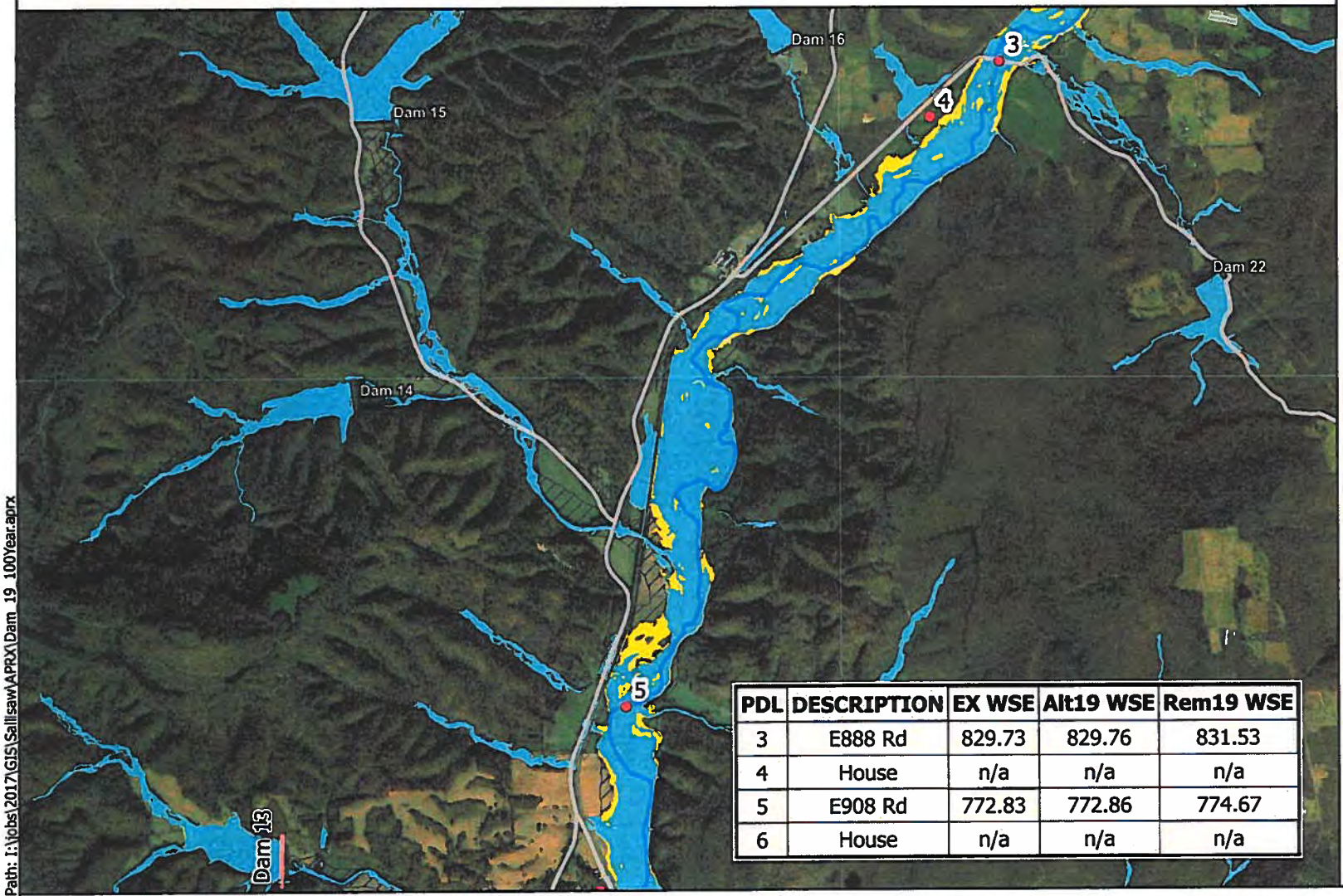
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 4 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
3	E888 Rd	829.73	829.76	831.53
4	House	n/a	n/a	n/a
5	E908 Rd	772.83	772.86	774.67
6	House	n/a	n/a	n/a

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

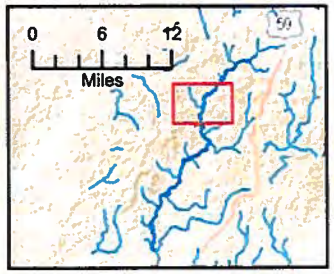
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

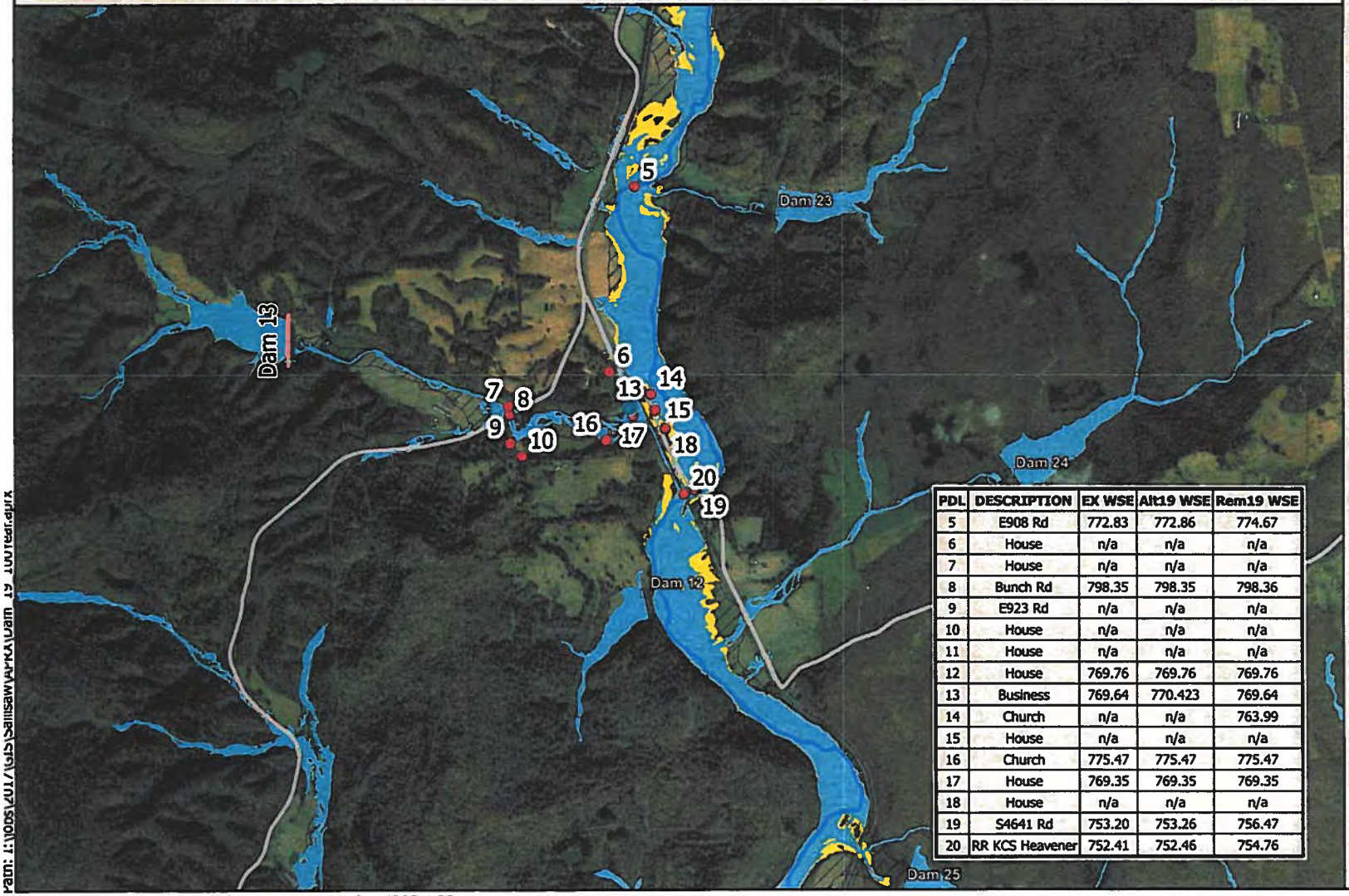
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 5 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
5	E908 Rd	772.83	772.86	774.67
6	House	n/a	n/a	n/a
7	House	n/a	n/a	n/a
8	Bunch Rd	798.35	798.35	798.36
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
11	House	n/a	n/a	n/a
12	House	769.76	769.76	769.76
13	Business	769.64	770.423	769.64
14	Church	n/a	n/a	763.99
15	House	n/a	n/a	n/a
16	Church	775.47	775.47	775.47
17	House	769.35	769.35	769.35
18	House	n/a	n/a	n/a
19	S4641 Rd	753.20	753.26	756.47
20	RR KCS Heavener	752.41	752.46	754.76

Legend

- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

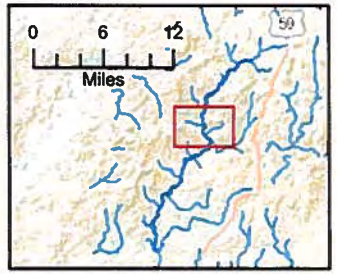
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

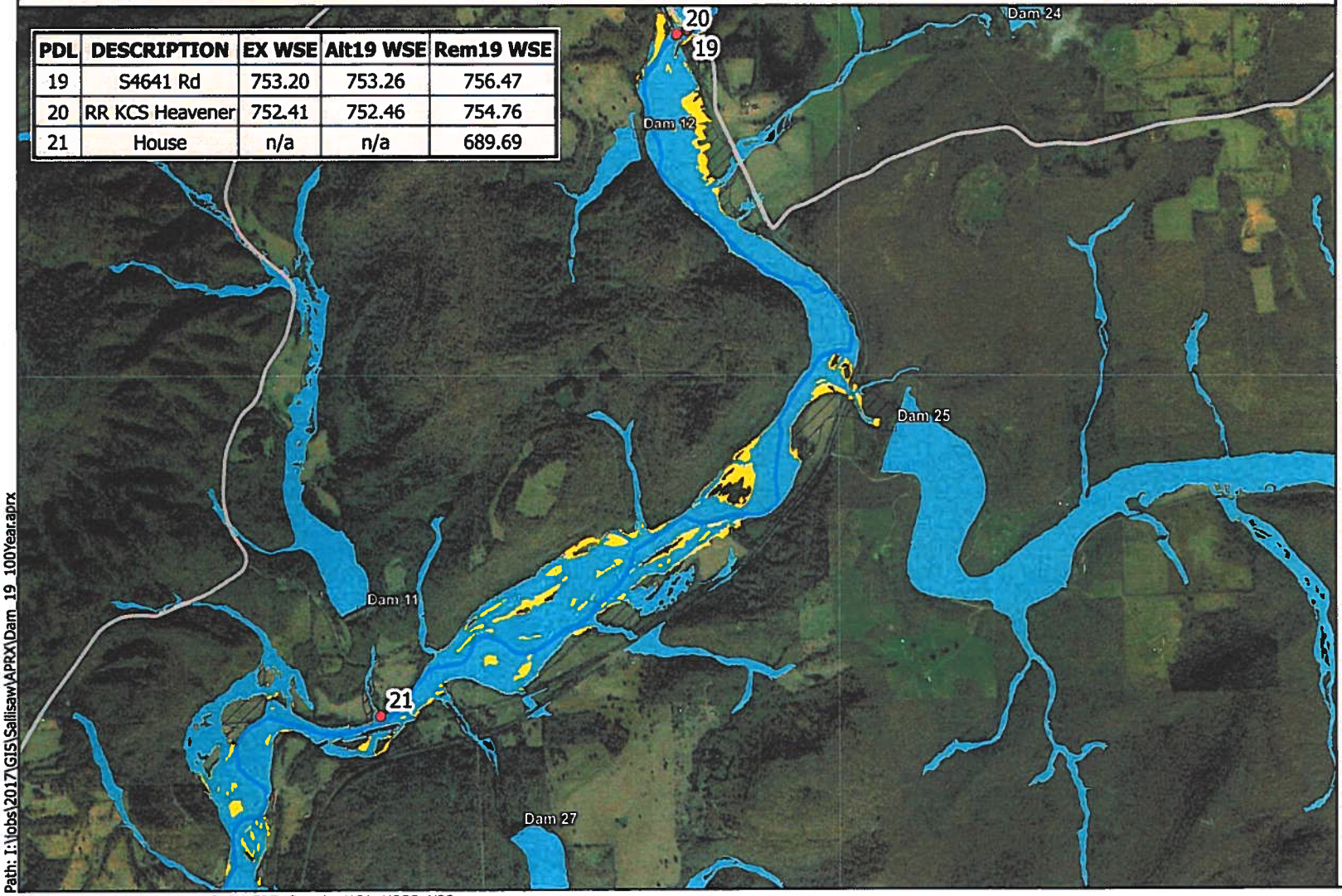
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Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 6 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
19	S4641 Rd	753.20	753.26	756.47
20	RR KCS Heavener	752.41	752.46	754.76
21	House	n/a	n/a	689.69



Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

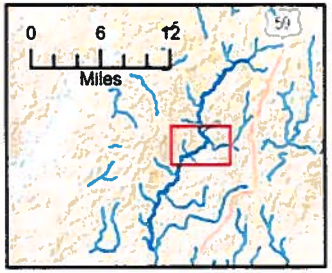
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

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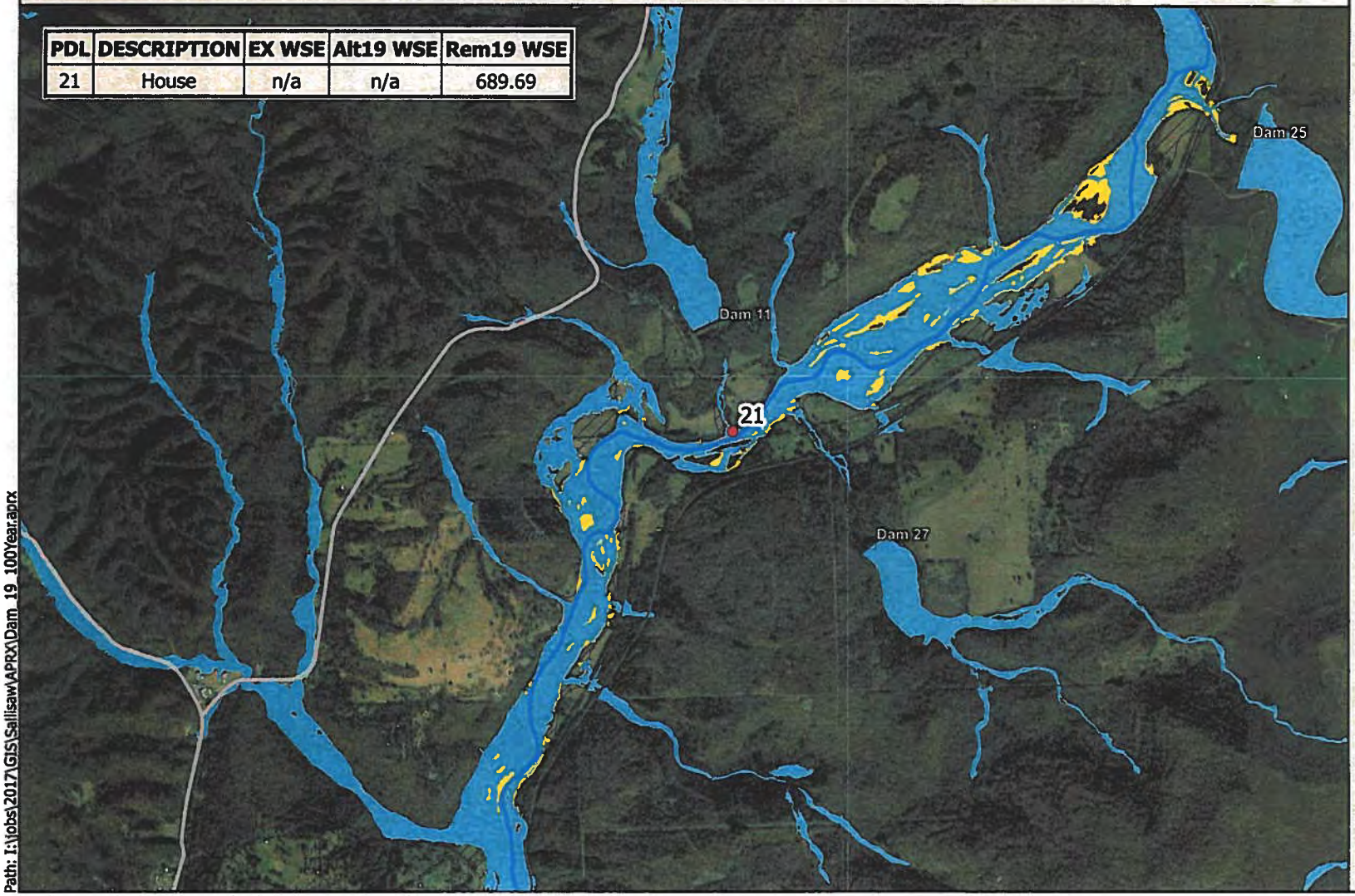
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 7 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
21	House	n/a	n/a	689.69



Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

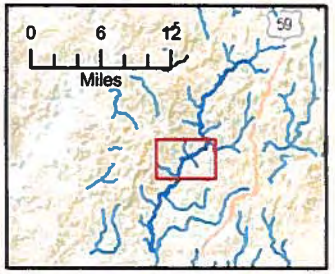
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

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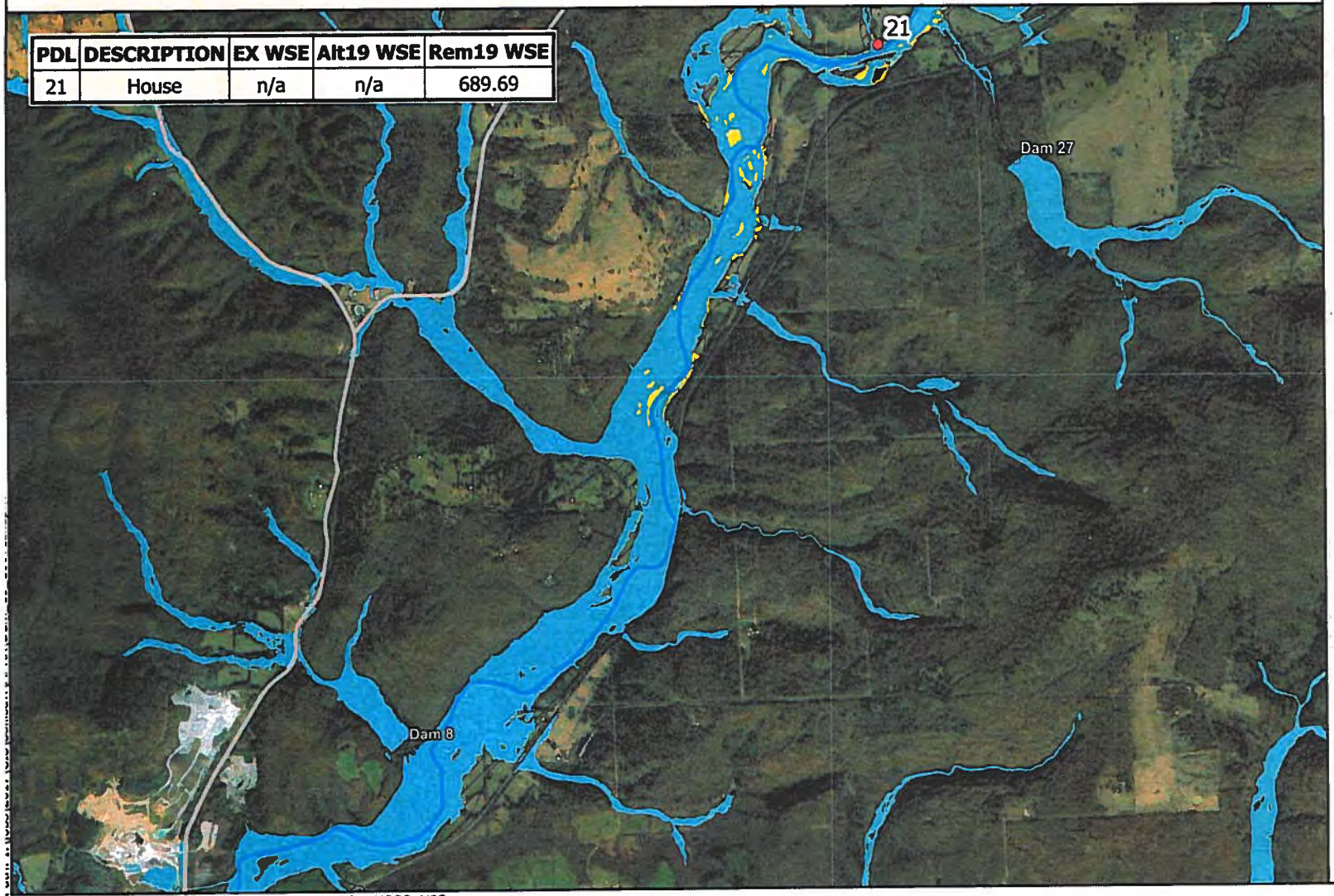
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 8 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
21	House	n/a	n/a	689.69



Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

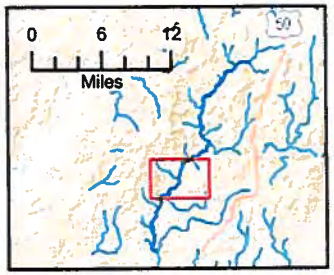
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

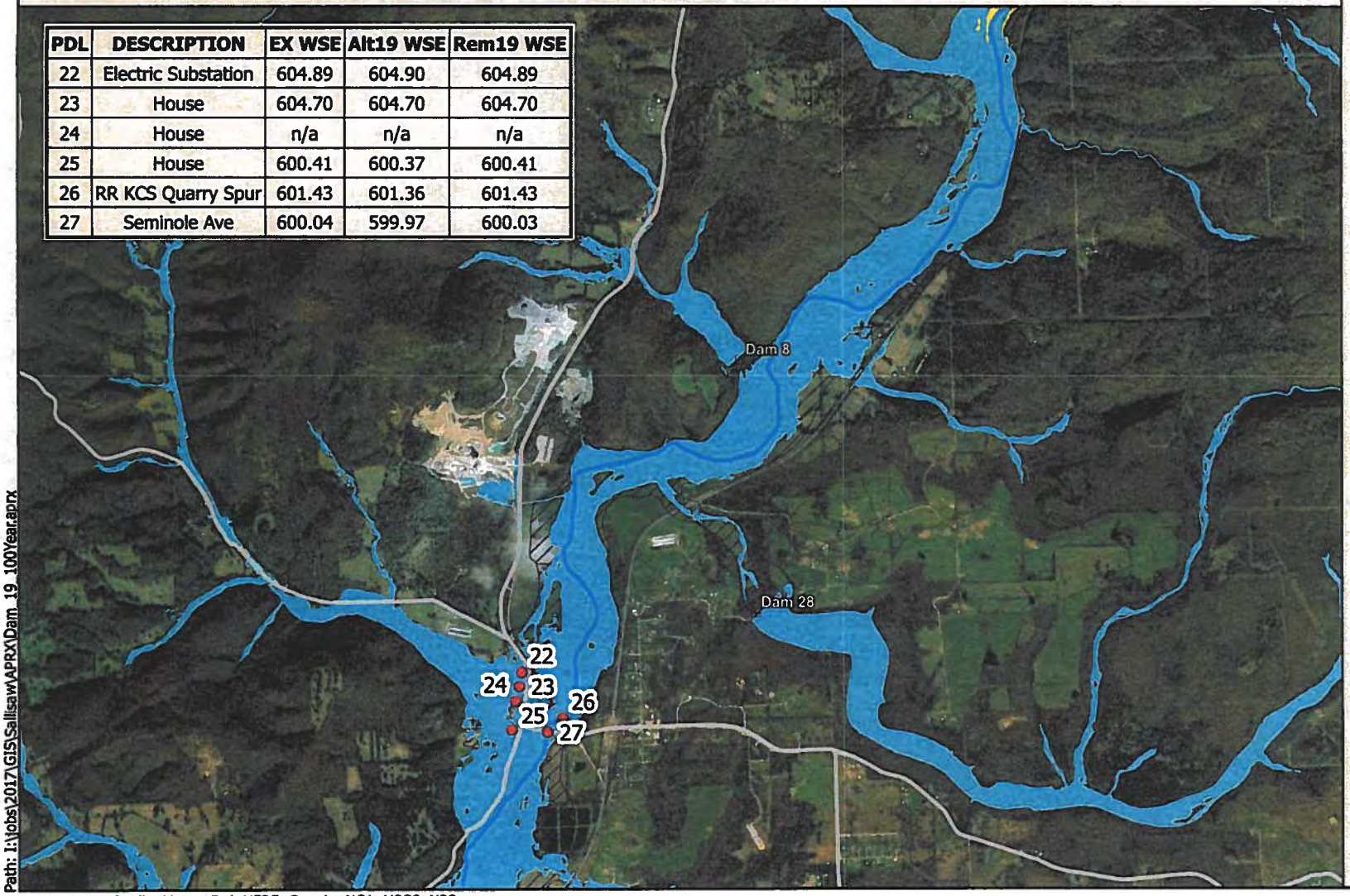
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Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 9 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
22	Electric Substation	604.89	604.90	604.89
23	House	604.70	604.70	604.70
24	House	n/a	n/a	n/a
25	House	600.41	600.37	600.41
26	RR KCS Quarry Spur	601.43	601.36	601.43
27	Seminole Ave	600.04	599.97	600.03



Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

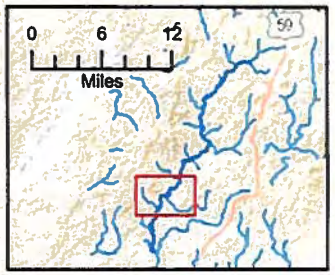
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

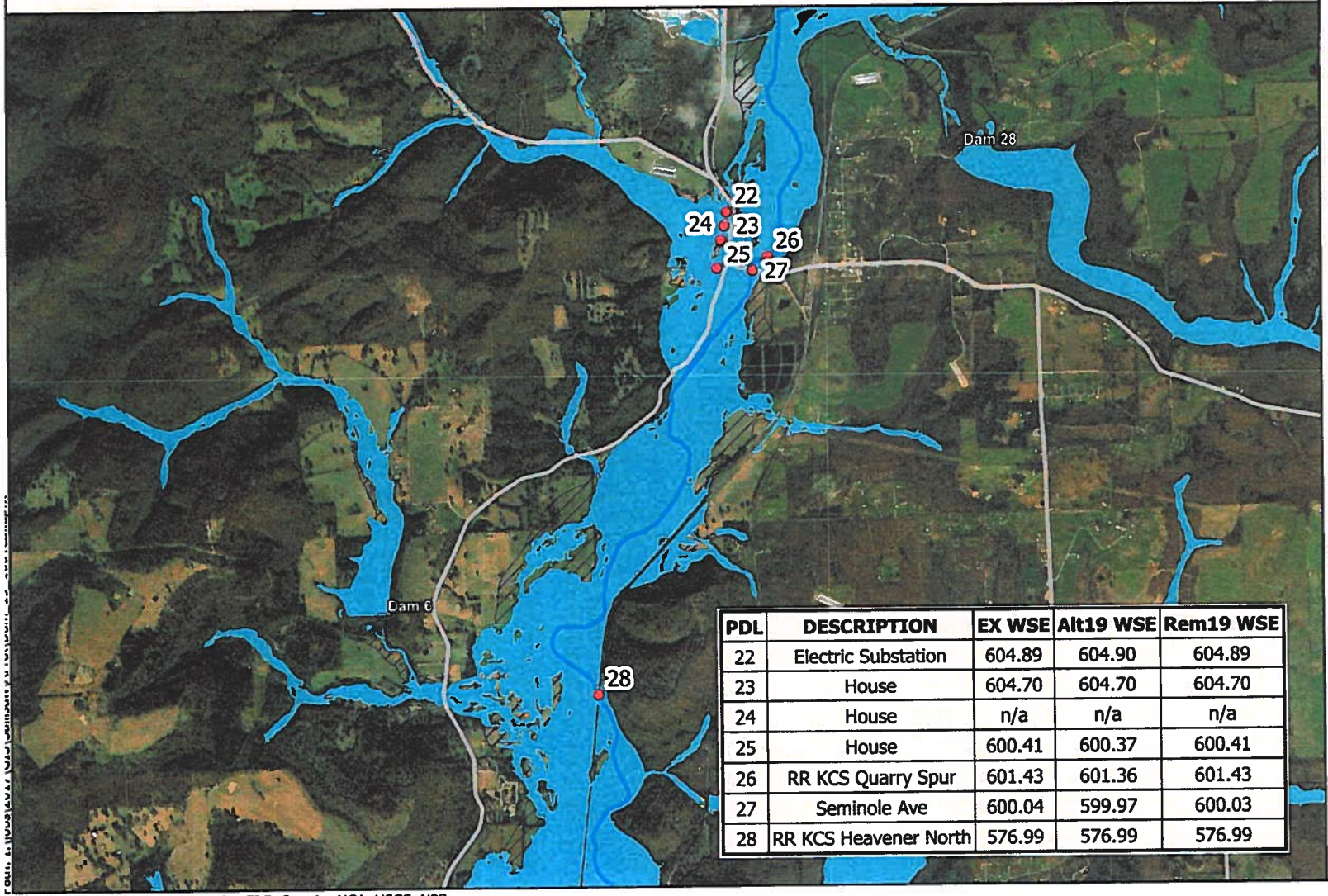
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 10 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
22	Electric Substation	604.89	604.90	604.89
23	House	604.70	604.70	604.70
24	House	n/a	n/a	n/a
25	House	600.41	600.37	600.41
26	RR KCS Quarry Spur	601.43	601.36	601.43
27	Seminole Ave	600.04	599.97	600.03
28	RR KCS Heavener North	576.99	576.99	576.99

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

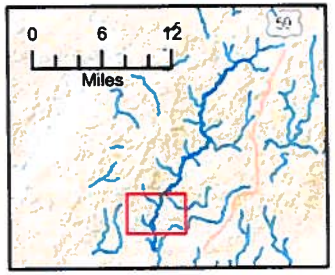
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



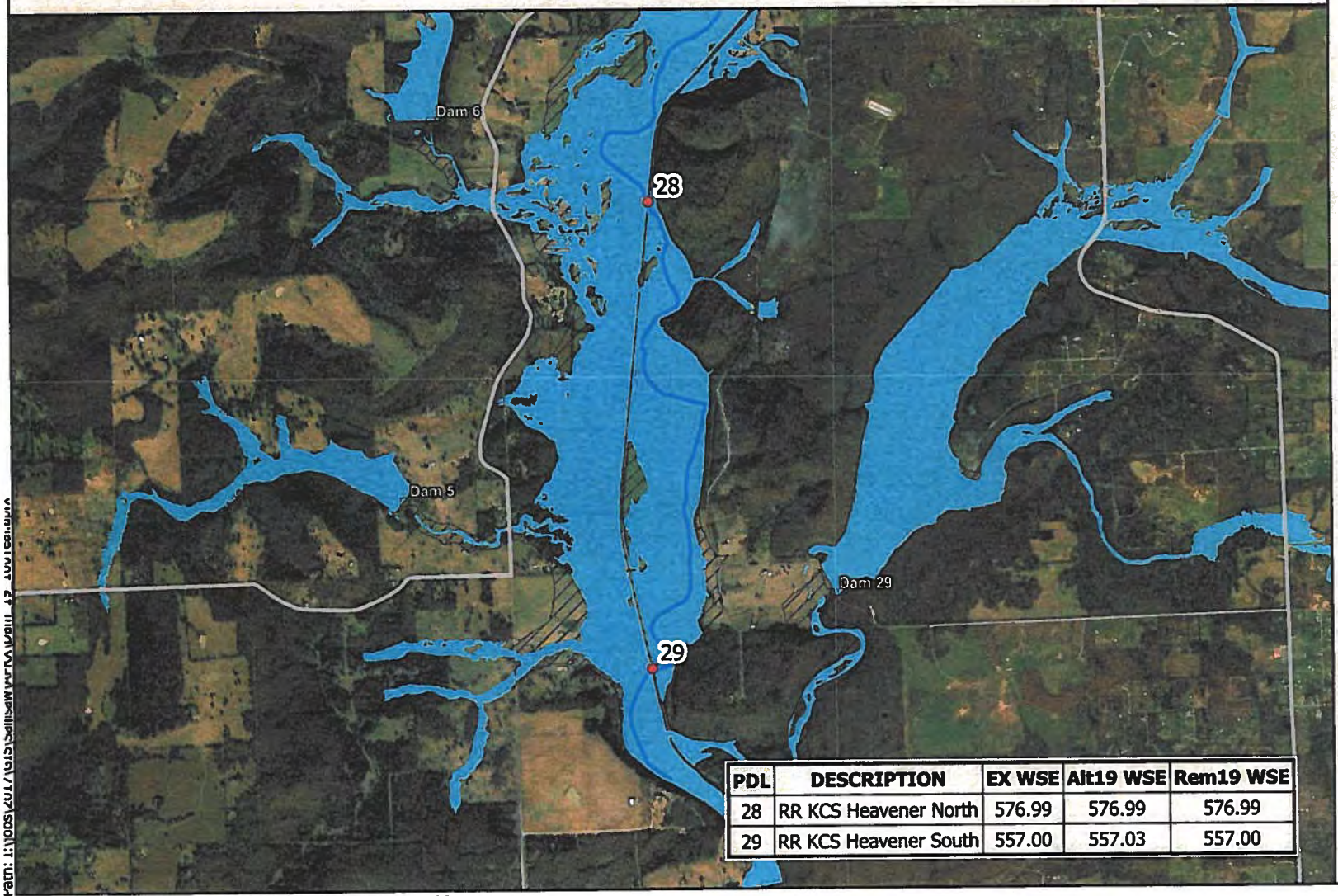
CONSERVATIONWORKS JOINT VENTURE

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 11 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
28	RR KCS Heavener North	576.99	576.99	576.99
29	RR KCS Heavener South	557.00	557.03	557.00

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

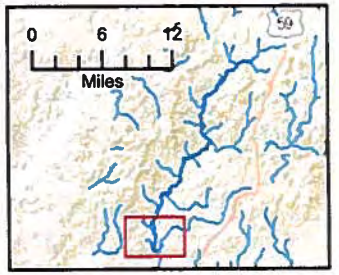
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

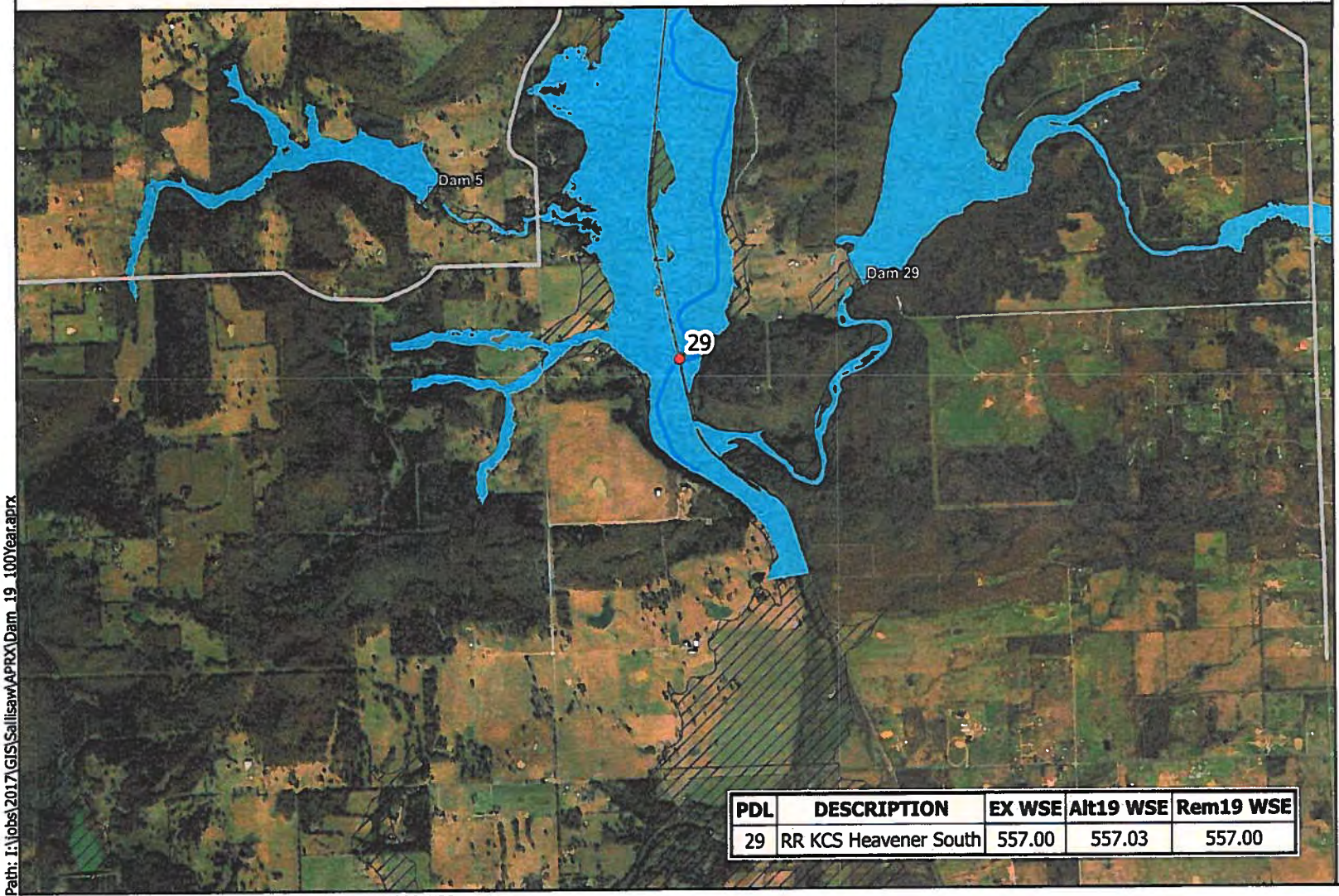
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
100-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 12 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
29	RR KCS Heavener South	557.00	557.03	557.00

Legend
- 100 Year Rem
- 100 Year Alt
- FEMA 100 Yr Floodplain
- Main Channel
- Roads
- Project Dams
- Dams
- PDLs

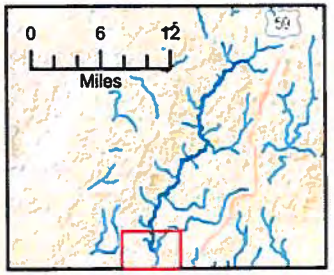
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

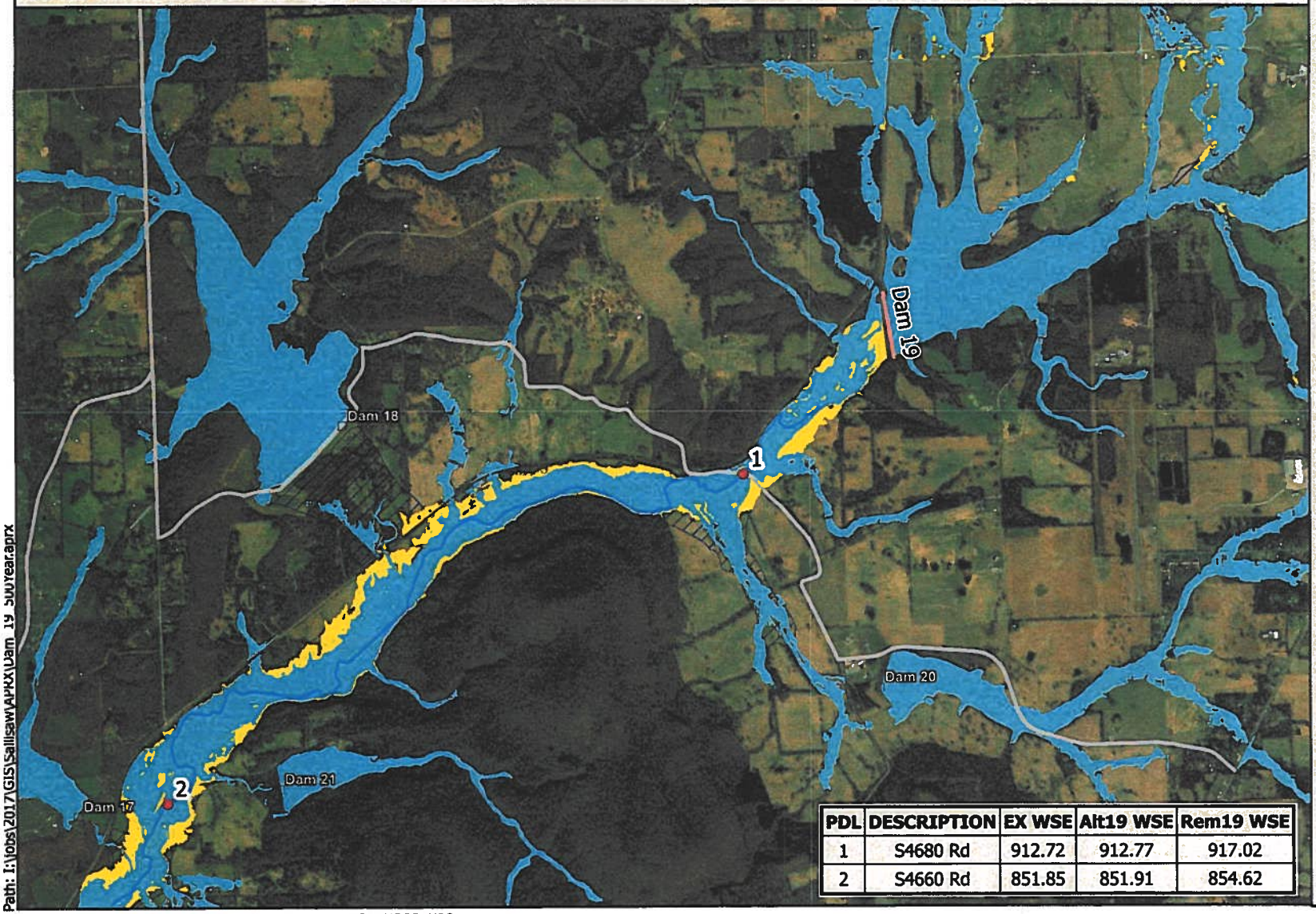
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 1 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
1	S4680 Rd	912.72	912.77	917.02
2	S4660 Rd	851.85	851.91	854.62

Legend

- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

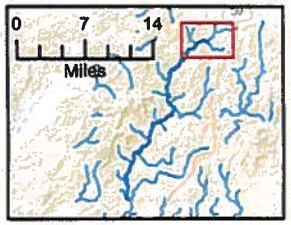
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

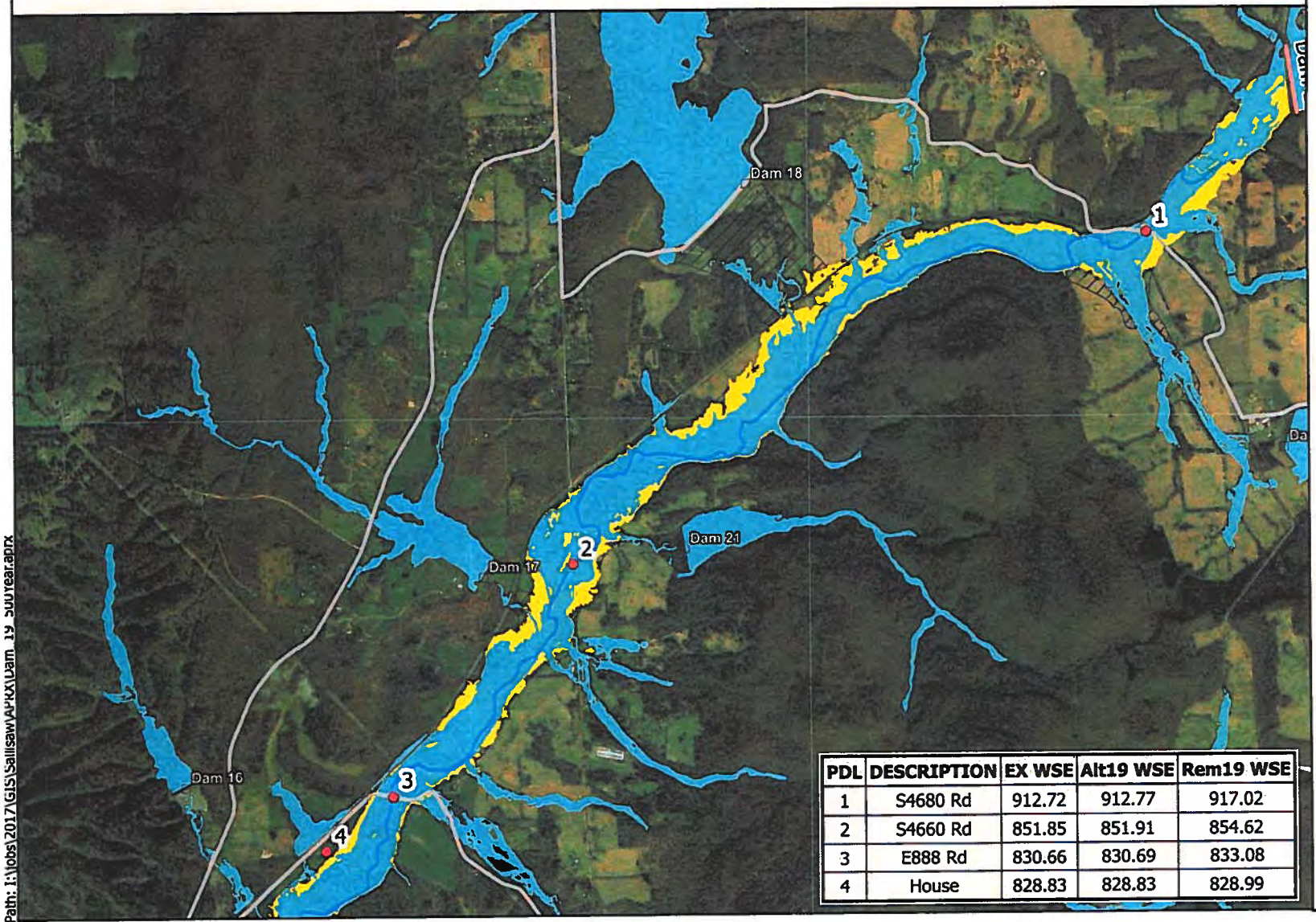
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 2 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
1	S4680 Rd	912.72	912.77	917.02
2	S4660 Rd	851.85	851.91	854.62
3	E888 Rd	830.66	830.69	833.08
4	House	828.83	828.83	828.99

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

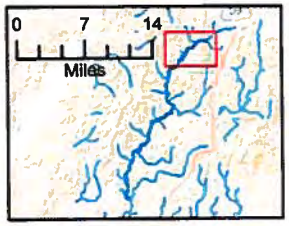
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

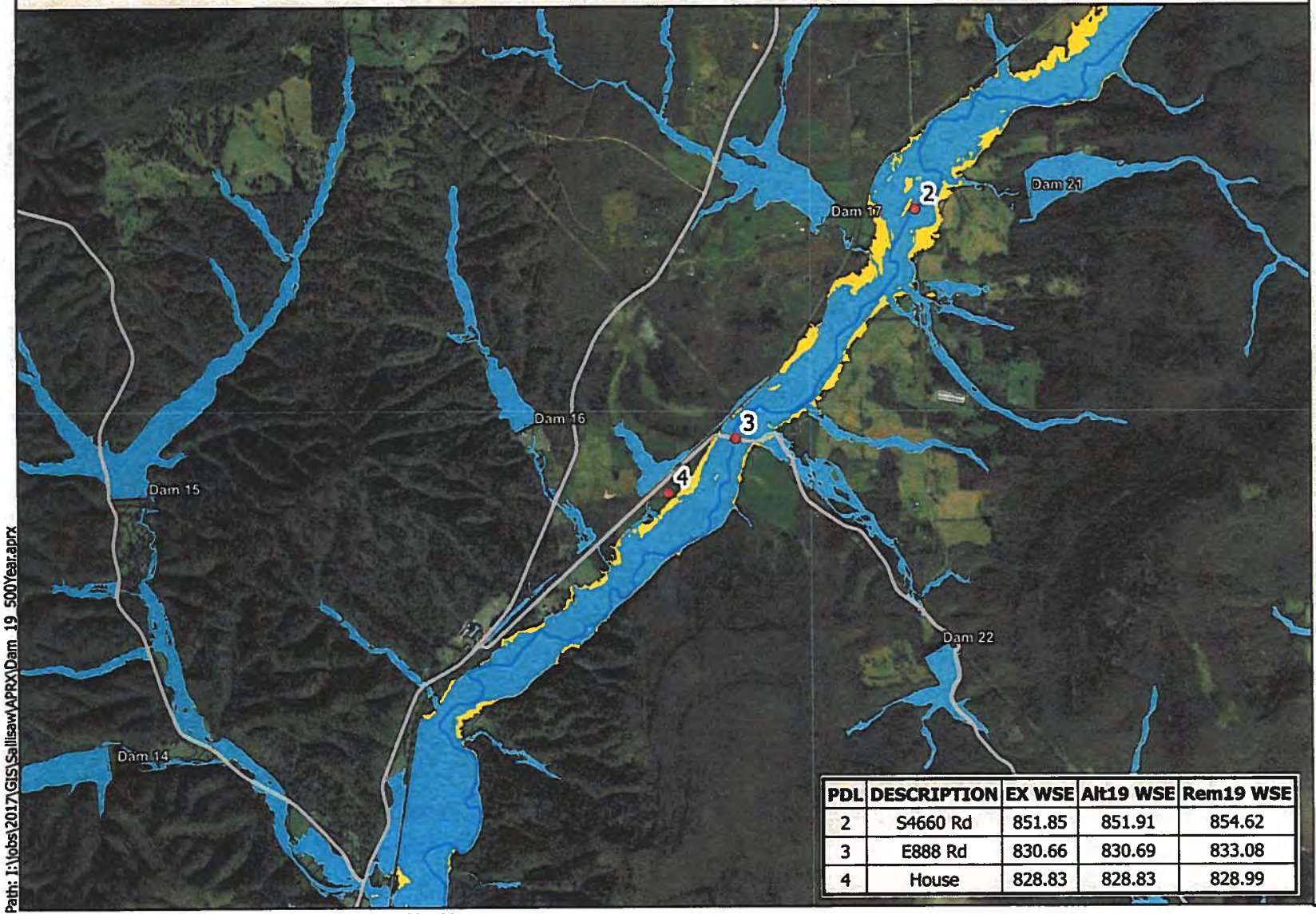
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah
Counties

Panel 3 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
2	S4660 Rd	851.85	851.91	854.62
3	E888 Rd	830.66	830.69	833.08
4	House	828.83	828.83	828.99

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

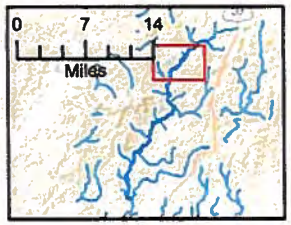
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

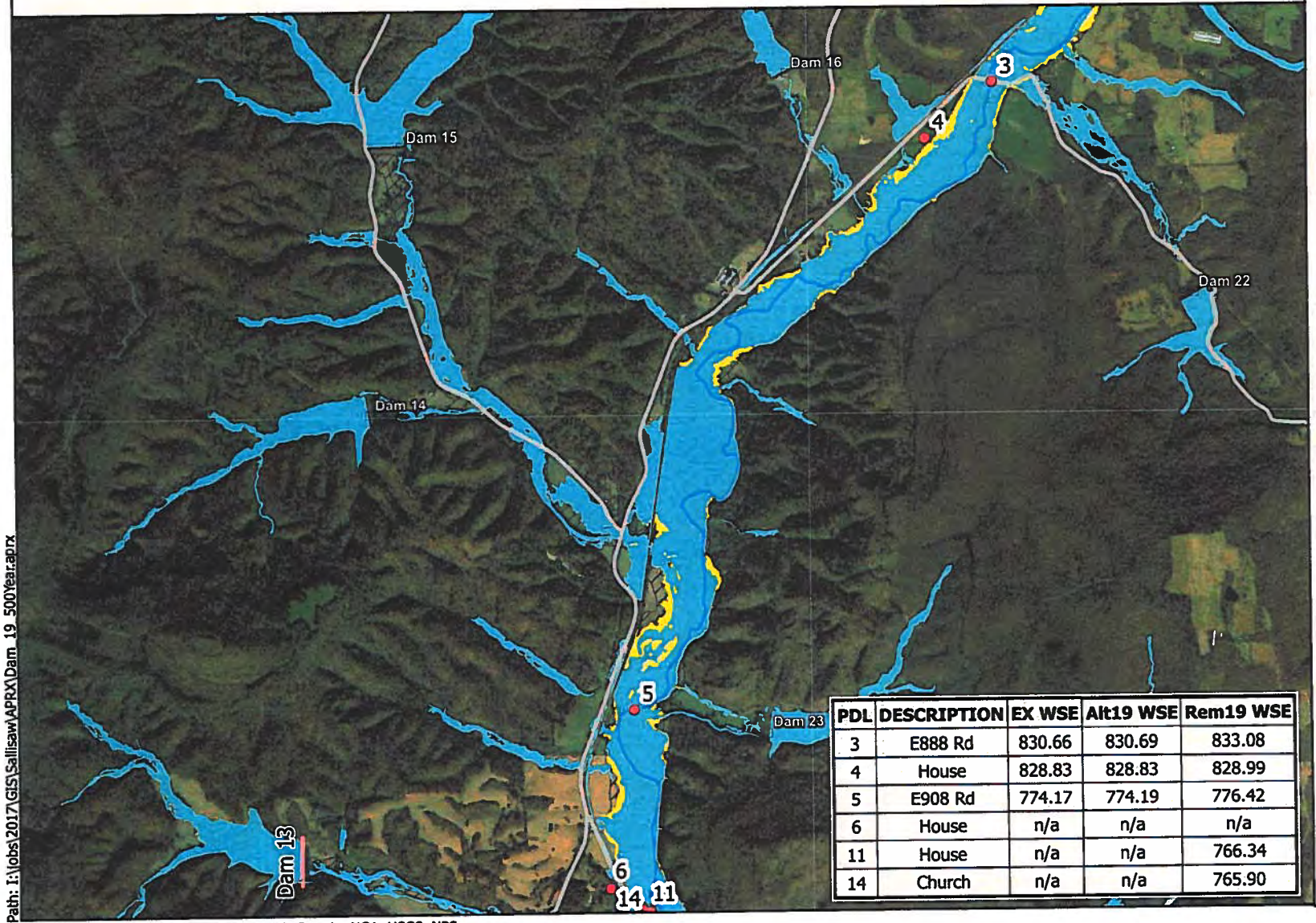
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 4 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
3	E888 Rd	830.66	830.69	833.08
4	House	828.83	828.83	828.99
5	E908 Rd	774.17	774.19	776.42
6	House	n/a	n/a	n/a
11	House	n/a	n/a	766.34
14	Church	n/a	n/a	765.90

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

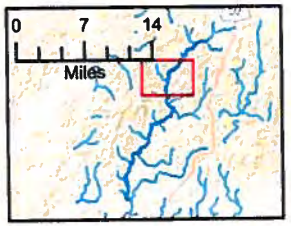
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

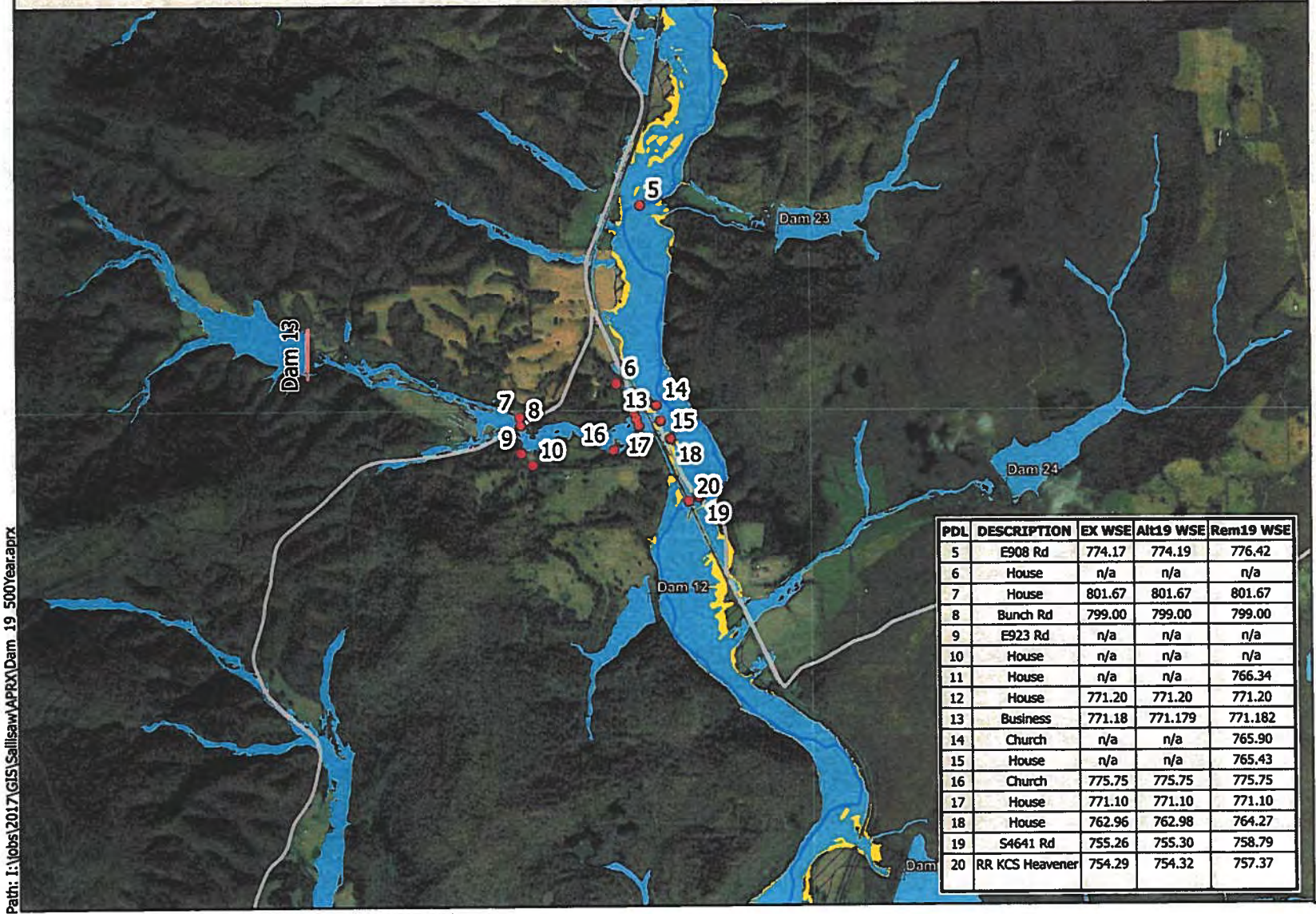
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 5 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
5	E908 Rd	774.17	774.19	776.42
6	House	n/a	n/a	n/a
7	House	801.67	801.67	801.67
8	Bunch Rd	799.00	799.00	799.00
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
11	House	n/a	n/a	766.34
12	House	771.20	771.20	771.20
13	Business	771.18	771.179	771.182
14	Church	n/a	n/a	765.90
15	House	n/a	n/a	765.43
16	Church	775.75	775.75	775.75
17	House	771.10	771.10	771.10
18	House	762.96	762.98	764.27
19	S4641 Rd	755.26	755.30	758.79
20	RR KCS Heavener	754.29	754.32	757.37

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

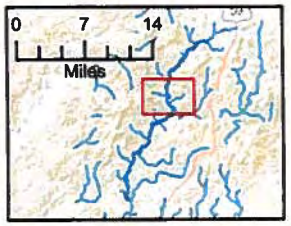
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam 19 500Year.aprx

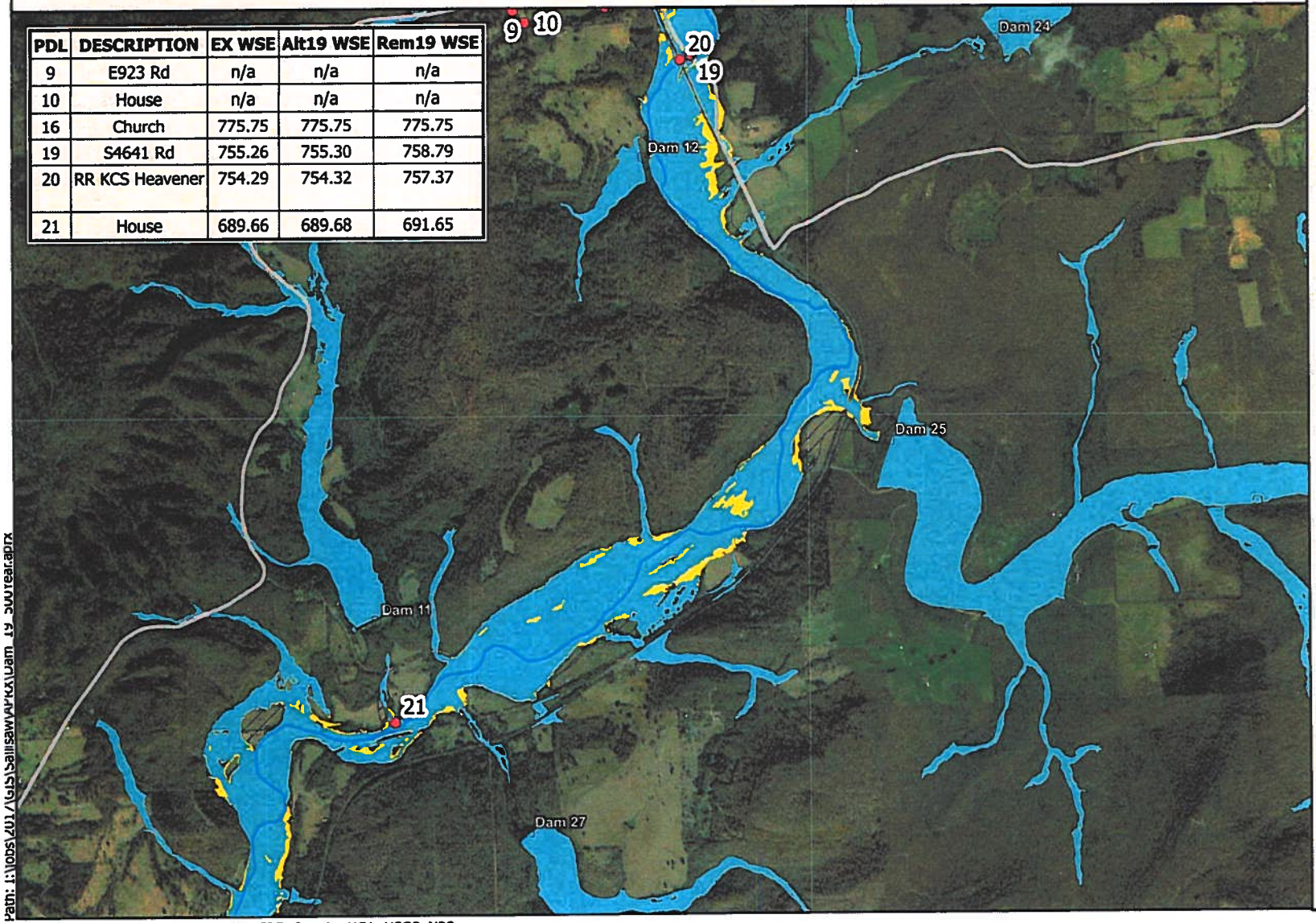
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 6 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
9	E923 Rd	n/a	n/a	n/a
10	House	n/a	n/a	n/a
16	Church	775.75	775.75	775.75
19	S4641 Rd	755.26	755.30	758.79
20	RR KCS Heavener	754.29	754.32	757.37
21	House	689.66	689.68	691.65



Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

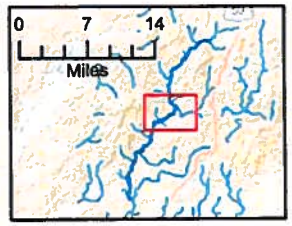
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

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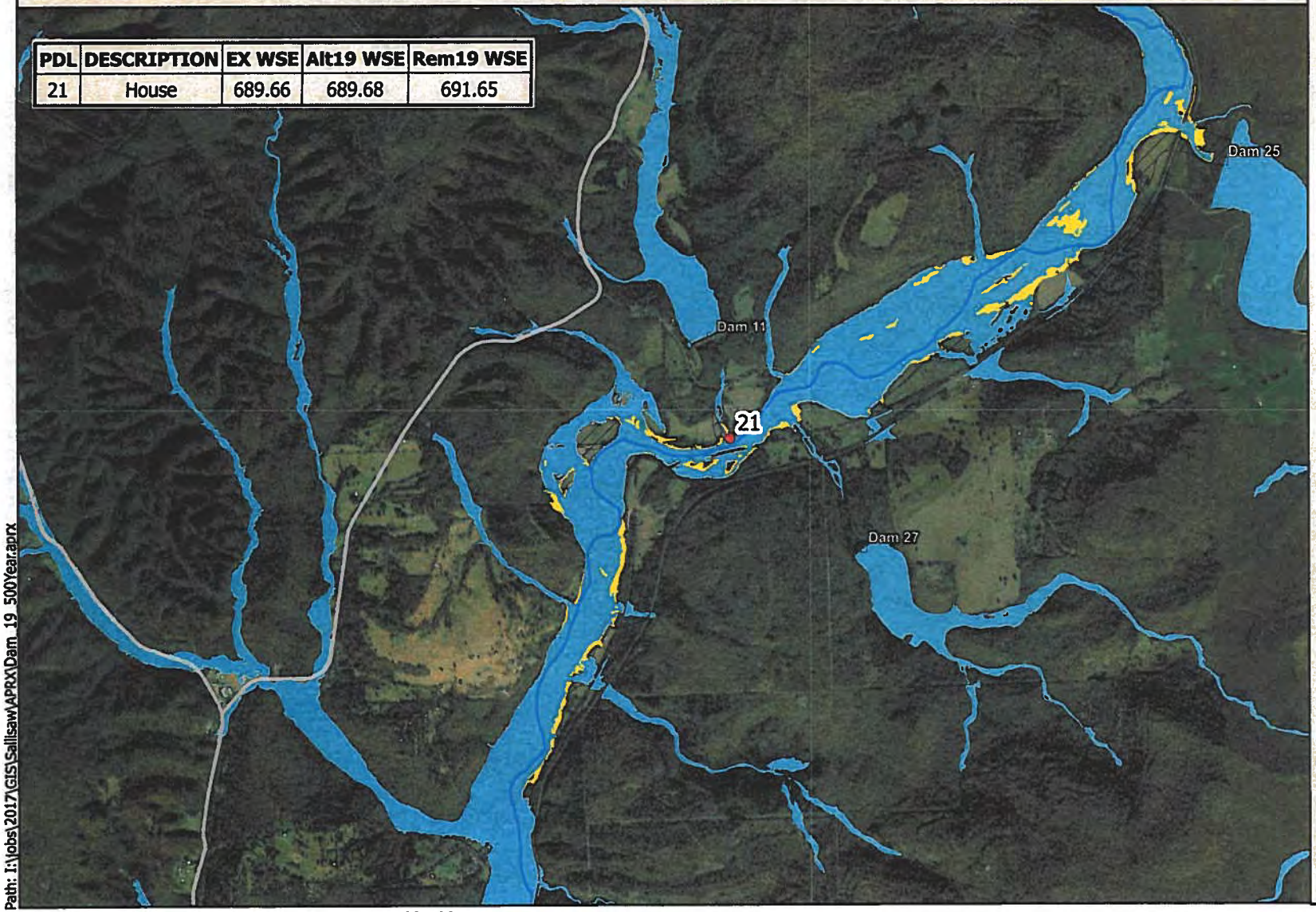
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 7 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
21	House	689.66	689.68	691.65



Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

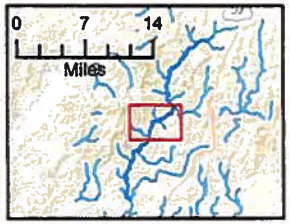
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam_19_500Year.aprx

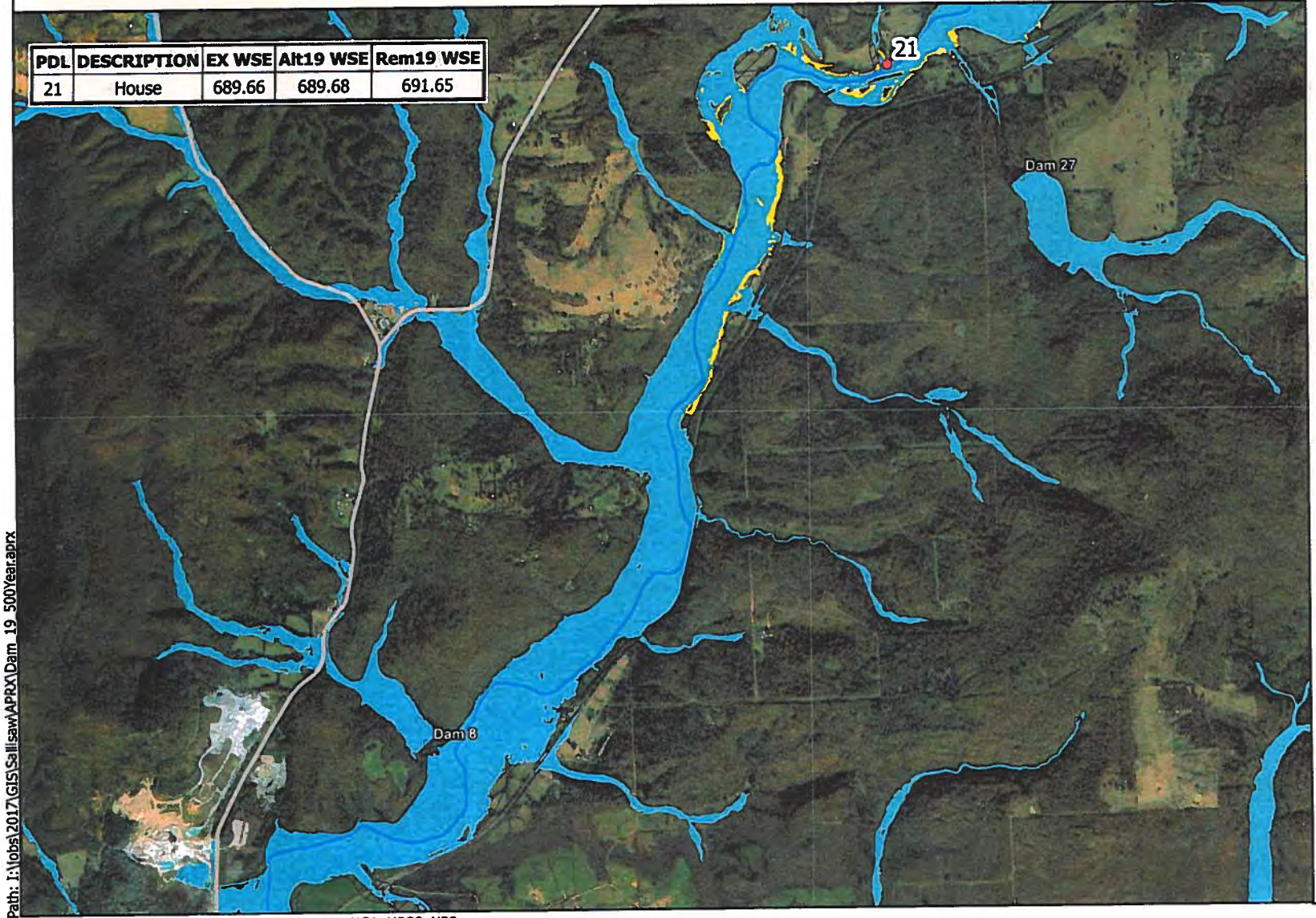
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 8 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
21	House	689.66	689.68	691.65



Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

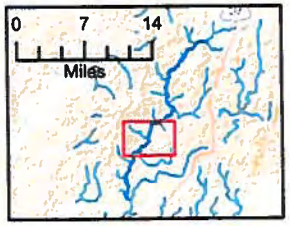
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam_19_500Year.aprx

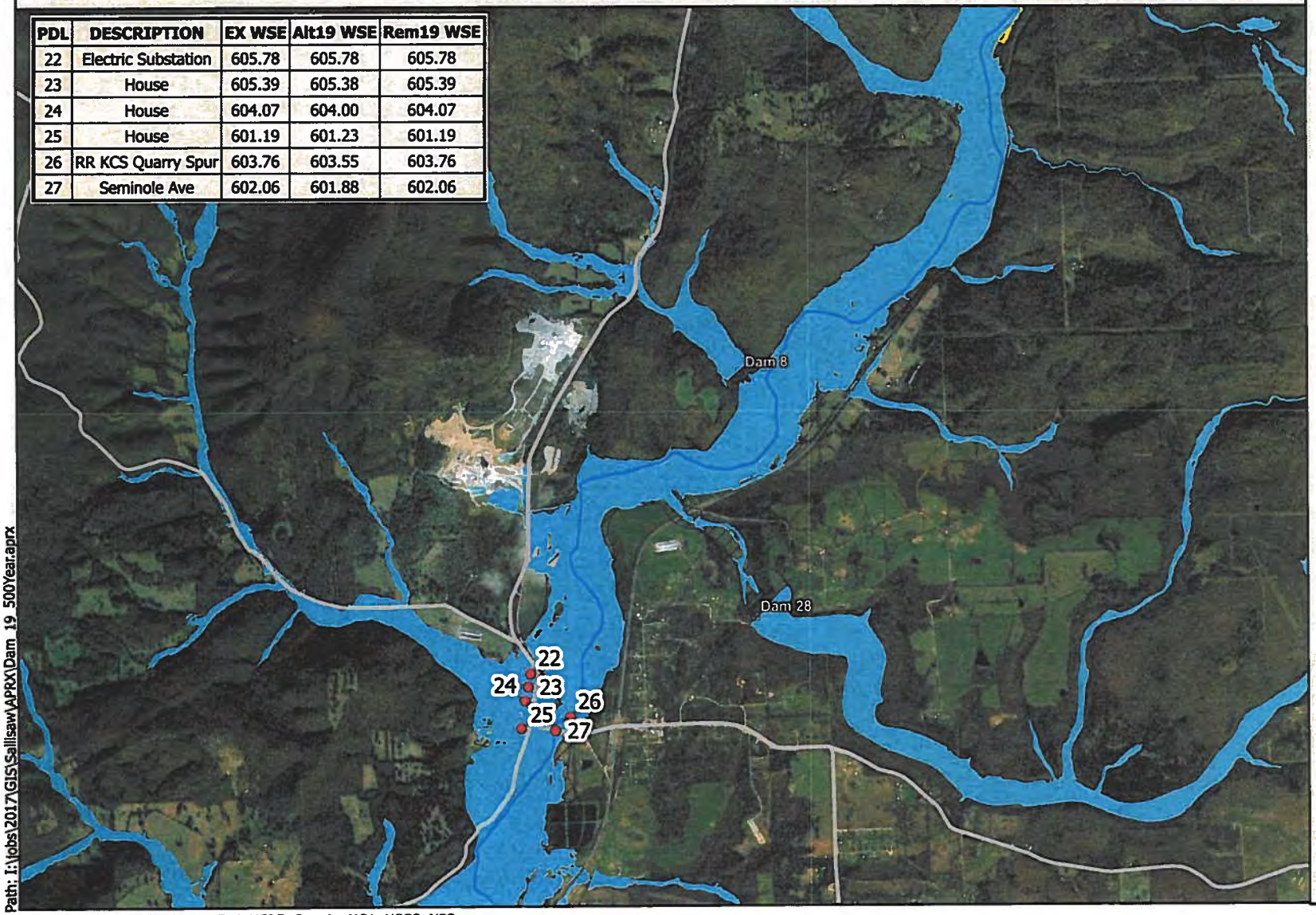
Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 9 of 12
Print Revision April 2023
Model Date: December 2021

PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
22	Electric Substation	605.78	605.78	605.78
23	House	605.39	605.38	605.39
24	House	604.07	604.00	604.07
25	House	601.19	601.23	601.19
26	RR KCS Quarry Spur	603.76	603.55	603.76
27	Seminole Ave	602.06	601.88	602.06



Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

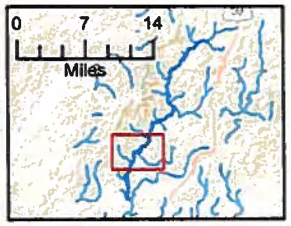
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

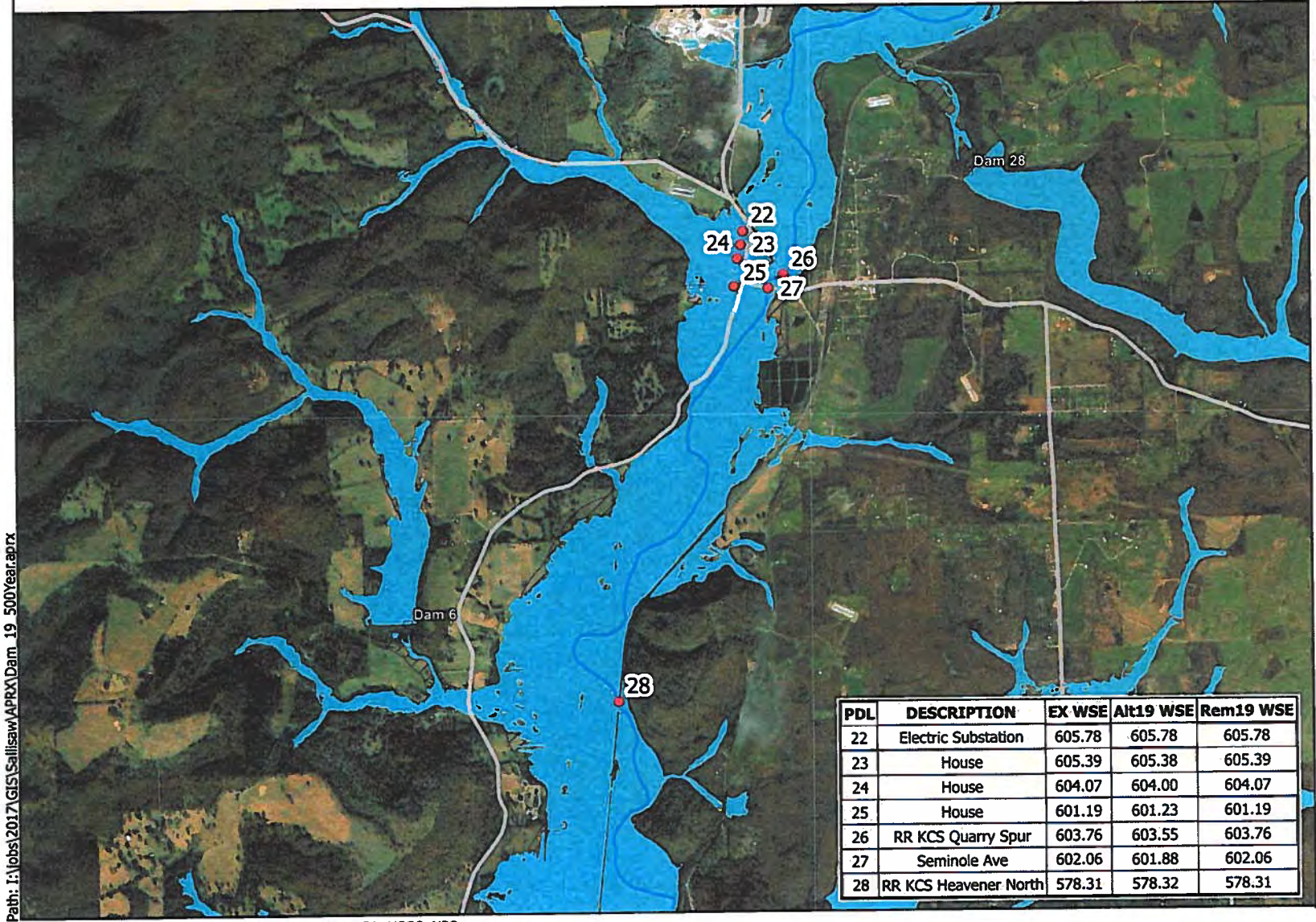
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Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 10 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
22	Electric Substation	605.78	605.78	605.78
23	House	605.39	605.38	605.39
24	House	604.07	604.00	604.07
25	House	601.19	601.23	601.19
26	RR KCS Quarry Spur	603.76	603.55	603.76
27	Seminole Ave	602.06	601.88	602.06
28	RR KCS Heavener North	578.31	578.32	578.31

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

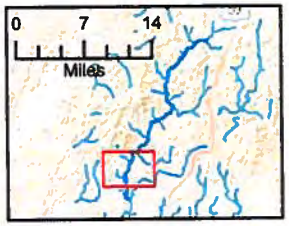
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

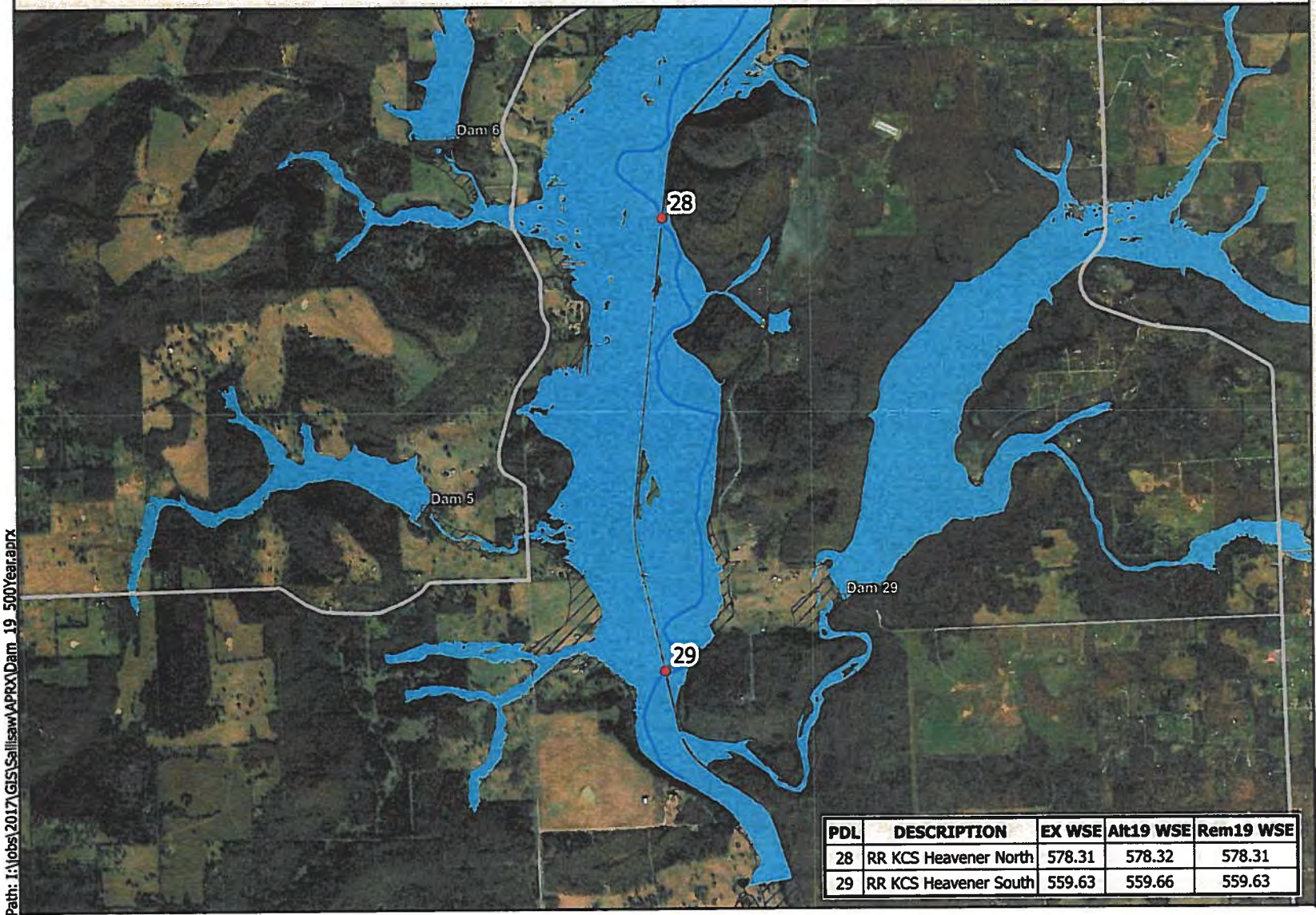
Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam_19_500Year.aprx

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 11 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
28	RR KCS Heavener North	578.31	578.32	578.31
29	RR KCS Heavener South	559.63	559.66	559.63

Legend

- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

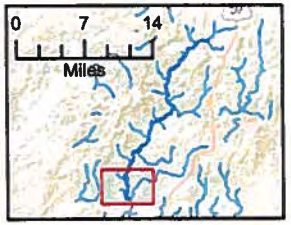
N

0 1,000 2,000
Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

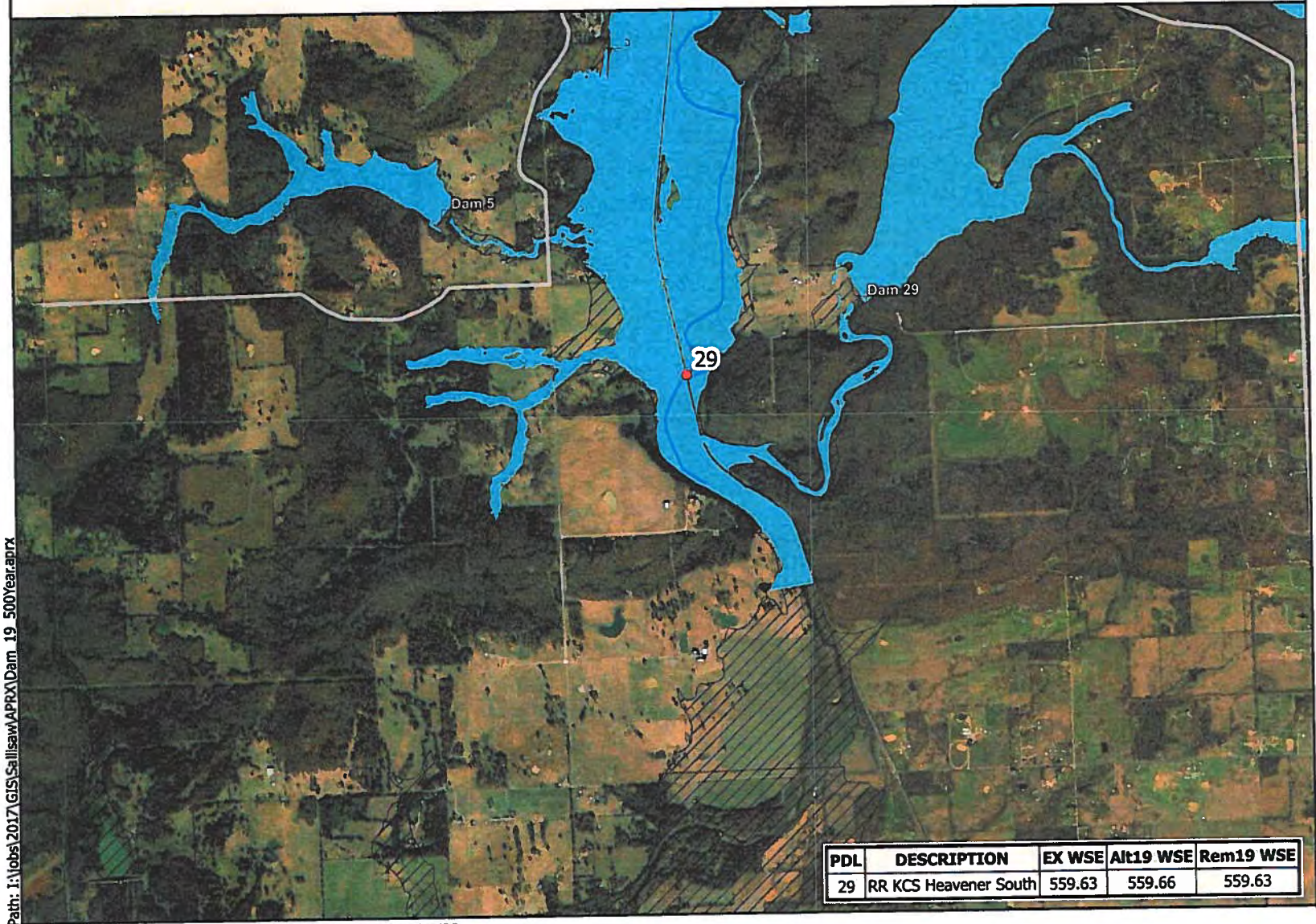
Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam_19_500Year.aprx

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Flood Inundation Map
500-yr Recurrence Interval
Dam 19

Sallisaw Creek Watershed
Adair, Cherokee, & Sequoyah Counties

Panel 12 of 12
Print Revision April 2023
Model Date: December 2021



PDL	DESCRIPTION	EX WSE	Alt19 WSE	Rem19 WSE
29	RR KCS Heavener South	559.63	559.66	559.63

Legend
- Dam Lines
- Main Channel
- Roads
- FEMA 100 Yr Floodplain
- 500 Year Rem
- 500 Year Alt
- Dam
- PDLs

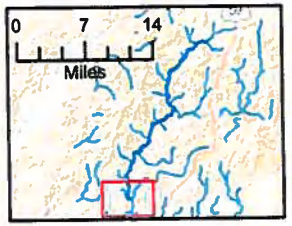
N

0 1,000 2,000 Feet

PDL = Potential Damage Location
EX = Existing Conditions
Alt19 = Rehabilitation Option
Rem19 = Decommissioned Option

Elevation reported in feet.

DISCLAIMER: These inundation maps are an estimation of the flood extents and actual flood conditions may differ from those shown here.



CONSERVATIONWORKS JOINT VENTURE

Path: I:\Jobs\2017\GIS\Sallisaw\APRX\Dam_19_500Year.aprx

Service Layer Credits:Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

Appendix D

INVESTIGATION AND ANALYSIS REPORT

Investigation and Analysis Report

Project Formulation

Alternatives for rehabilitation considered were a) the no action – future without federal investment alternative, b) rehabilitation to high hazard criteria, c) non-structural alternative, and d) decommissioning.

Structural measures were developed and evaluated using SITES software. Costs were estimated using average bid prices from recent jobs of similar scope and are provided in this section. Land values for easements were based on the GARC (geographic area rate caps) for NRCS easement programs.

As in all watershed plans, the NRCS freeboard criteria is compared to state criteria and the more restrictive of the two is used for design. NRCS criteria were checked for both the 6-hour and 24-hour storm durations.

For FRS No. 13, the 6-hour criterion set the maximum flow elevation in the auxiliary spillway at 888.9, The 24 hour criteria set the maximum flow elevation at 890.5, and the OWRB routing set the maximum flow elevation at 888.3 ft. Adding 1.0 feet of freeboard to meet criteria for an small sized high hazard dam, the OWRB criteria put the top of dam at 892.4 ft. The OWRB routing was the most restrictive but was below the existing top of dam.

For FRS No. 19, the 6-hour criterion set the maximum flow elevation in the auxiliary spillway at 983.0, The 24 hour criteria set the maximum flow elevation at 982.8, and the OWRB routing set the maximum flow elevation at 981.5 ft. Adding 3.0 feet of freeboard to meet criteria for an intermediate sized high hazard dam, the OWRB criteria put the top of dam at 984.5 ft. The OWRB routing was the most restrictive and was at the existing top of dam elevation.

Economic Analysis

Sallisaw Creek Watershed Structures 13 and 19 are single-purpose structures providing flood damage reduction benefits. This project benefit-cost analysis (BCA) was completed according to Evaluation of Alternatives and Determination of Preferred Alternative within the project Statement of Work.

Benefits gained by implementing the preferred alternative for each dam were calculated and used to determine the relative benefit/cost ratio for the preferred project alternative for each dam. This was accomplished by comparing the average annual benefit with the amortized rehabilitation costs.

The BCA indicated that the B/C ratio for this proposed project is estimated to be 0.25 for Sallisaw Dam #13 and 1.99 for Sallisaw Dam #19 for the proposed project life of 100 years. The project is expected to reasonably maximize net national economic benefits consistent with protecting the Nation's environment. This report provides an explanation of the BCA process and results.

The project team observed the dam site and the flood impact zone below the dam. The predominant land uses in the benefit area were qualitatively inventoried. The results of this project benefit analysis will be used to determine the relative benefit/cost ratio for each project alternative by comparing the average annual benefit with the amortized rehabilitation costs.

The following is brief outline of the Project Benefit Analysis:

1. Inventory the flood impact zone below the dams and determine benefits and damages attributable to the dams.
2. Evaluate substantial changes in number of houses and businesses with reduced flood damages.
3. Estimate costs for rehabilitation of dams (construction, engineering, operation and maintenance, etc)
4. Update the flood damage reduction benefits allocated to the dams.

This Project Benefit Analysis report references the following documents:

- USDA-NRCS, National Watershed Program Manual April 2014
- USDA-NRCS, National Planning Procedures Handbook
- USDA-NRCS, National Resource Economics Handbook, July 1998
- USDA-NRCS, National Watershed Program Handbook, April 2014
- Principles and Guidelines for Water and Land Related Resources Implementation Studies (PR&G), U.S. Water Resources Development Act of 2007.
- Principles and Requirements for Federal Investments in Water Resources, Council on Environmental Quality, March 2013.
- USDA-National Agricultural Statistic Service, Quick Stats Ad-hoc Query Tool.
- Engineering News Record, Construction Cost Index History.
- Consumer Price Index-All Urban Consumers.

Determining Project Damages

Updated flood damage reduction benefits were calculated consistent with Principles and Requirements for Federal Investments in Water Resources (PR&G) and National Resources Economics Handbook (NREH) part 611. Benefits represent costs or damages that would occur in the absence of the project and are calculated for each dam separately.

To determine project benefits, damages occurring under both with and without dam scenarios were calculated and compared. The project team reviewed land use composition within the flood impact zones using aerial imagery and the 2016 MRLC National Land Cover Database (NLCD).

Primarily, two types of damages were evaluated for the multiple scenarios for each dam: structures/infrastructure damages and agricultural damages. For the agriculture evaluation, the

USDA National Agricultural Statistics Service (NASS) 2020 Cropland Data Layer (CDL)[1]) was downloaded with a Crop Mask Layer which includes the past 5 years of CDL data combined. This data was used to develop agricultural grids to calculate damage. When the agricultural area was quantified within 100-year inundation area downstream of the dams for the with and without dams scenarios, only 18.6 acres of the 9372-acre with-dam inundation area were considered agriculture. With the dams removed, the agriculture acreage was predicted to increase 0.6 acres to 19.2 acres. This correlates to less than of 1 acre of protected agricultural area by the dams. Thus, agriculture losses were considered negligible. Agricultural losses by crop are provided in Table D-1.

Table D-1 - Agricultural Loss Acreage

	WITHOUT DAM (ACRES)	WITH DAM (ACRES)
100-YR INUNDATION AREA	**10,906**	**9372**
Corn	0.4	0.7
Soybeans	2.3	2.3
Winter Wheat	0.2	0.3
Double Crop Winter Wheat	1.5	1.4
Other Hay	14.7	13.9
TOTAL	**19.2**	**18.6**

For structure/infrastructure losses, the Federal Emergency Management Agency (FEMA) Hazus software tool was utilized to provide a conservative estimate of risk. The Hazus tool predicts damages based on depth/damage curves derived by depth grids from the HEC-RAS modelling discussed in the H&H details in the Flood Frequency Analysis for Rehabilitation of Dams – Sallisaw Creek Watershed, Dam 13 & Dam 19. The Hazus tool relies on a generalized national dataset of estimated building characteristics including location, lowest adjacent grade, and associated finished floor elevations. This dataset is summarized/distributed at the census block level to facilitate a baseline risk assessment. It should be noted that this analysis does not directly incorporate the structures identified by HEC-RAS modeling to incur flooding.

For this analysis, The FEMA Hazus tool Level 1 analysis with standard data and the HEC-RAS modeled depth grids/floodplain was run for 5 scenarios (Existing Conditions, Without Dam #13, Without Dam #19, With Dam #13 and With Dam #19). Results in the form of annualized damages for each scenario are provided in Table D-2. Results for damages occurring for each scenario are provided in Table D-3. Results indicate that damages occurring within this watershed are primarily structure losses. As discussed above, other damages such as crop losses. sediment

[1]USDA National Agricultural Statistics Service Cropland Data Layer. {2020}. Published crop-specific data layer. Available at https://nassgeodata.gmu.edu/CropScape/ (accessed Nov. 2021). USDA-NASS, Washington, DC.

deposition or recreation loss might occur but were minimal and not calculated for purposes of this planning document.

Table D-2 - Total Annualized Direct Economic Losses for Buildings

SCENARIO	SCENARIO	TOTAL DIRECT ECONOMIC LOSSES FOR BUILDINGS
EXISTING CONDITIONS	Existing Conditions (With Current Dams)	$ 1,464,000
SALLISAW DAM #13	Without Dam	$ 1,472,000
	With Dam (Preferred Alternative)	$ 1,459,000
SALLISAW DAM #19	Without Dam	$ 1,816,000
	With Dam (Preferred Alternative)	$ 1,471,000

Table D-3 - Direct Economic Losses for Buildings for All Modeled Events

2-YR EVENT		Total Direct Economic Losses for Buildings	5-YR EVENT		Total Direct Economic Losses for Buildings
Scenario	Rem19	$7,135,000	Scenario	Rem19	$10,649,000
	Rem13	$5,633,000		Rem13	$8,072,000
	Existing	$5,640,000		Existing	$8,077,000
	Alt13	$5,636,000		Alt13	$8,072,000
	Alt19	$5,721,000		Alt19	$8,173,000
10-YR EVENT		**Total Direct Economic Losses for Buildings**	**25-YR EVENT**		**Total Direct Economic Losses for Buildings**
Scenario	Rem19	$14,013,000	Scenario	Rem19	$18,118,000
	Rem13	$10,478,000		Rem13	$14,726,000
	Existing	$10,465,000		Existing	$14,644,000
	Alt13	$10,409,000		Alt13	$14,593,000
	Alt19	$10,575,000		Alt19	$14,696,000
50-YR EVENT		**Total Direct Economic Losses for Buildings**	**100-YR EVENT**		**Total Direct Economic Losses for Buildings**
Scenario	Rem19	$21,397,000	Scenario	Rem19	$24,580,000
	Rem13	$17,887,000		Rem13	$20,845,000
	Existing	$17,792,000		Existing	$20,753,000
	Alt13	$17,741,000		Alt13	$20,752,000
	Alt19	$17,838,000		Alt19	$20,786,000
200-YR EVENT		**Total Direct Economic Losses for Buildings**	**500-YR EVENT**		**Total Direct Economic Losses for Buildings**
Scenario	Rem19	$28,080,000	Scenario	Rem19	$32,159,000
	Rem13	$24,055,000		Rem13	$27,606,000
	Existing	$23,969,000		Existing	$27,496,000
	Alt13	$23,931,000		Alt13	$27,458,000
	Alt19	$23,991,000		Alt19	$27,465,000

Alternative Cost Estimates

The Conservation Works Joint Venture (CWJV) team prepared predictions of probable costs for all alternatives. The predictions of probable costs are intended for comparing the alternatives. Unless otherwise noted predictions of probable costs were prepared using the RS Means method for engineering cost estimation. Table D-4 summarizes the raw Project Alternative Cost Estimates. All costs will be rounded to the nearest $100 for subsequent analyses in this study. Engineering cost estimates for each alternative are provided in this section.

Table D-4 - Sallisaw Creek Watershed Dams 13 & 19
Project Alternative Cost Estimates

ITEM	Project Alternatives					
	Sallisaw Dam #13			Sallisaw Dam #19		
	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)
NRCS - Construction Cost	-	$ 256,400	$ 884,000	-	$ 1,538,600	$ 3,142,600
Sponsor - Construction Cost	$ 877,500		$ 461,000	$ 1,040,400		$ 1,677,200
Acquisition/Relocation	-	$ 1,400,000	-	-	$ 1,800,000	-
Easements	-	$ 6,465,000	$ 15,000	-	$ 17,865,000	$ 15,000
NRCS - Project Design, Construction Engineering	-	$ 51,300	$ 269,000	-	$ 307,700	$ 964,000
Sponsor - Project Design, Construction Engineering	$ 168,900	-	$ -	$ 208,100	-	-
NRCS - Project Administration		$ 12,800	$ 67,200		$ 76,900	$ 241,000
Sponsor - Project Administration	$ 42,200	-	-	$ 52,000	-	-
Mitigation	-	-	-	-	-	-
Federal, State and Local Permits	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Total Installation Cost	$ 1,098,600	$ 8,195,500	$ 1,706,200	$ 1,310,500	$ 21,598,200	$ 6,049,800
Price Base 2024						January 2024

Comparative Cost Analysis

A comparative cost analysis was completed for Sallisaw Dams 13 and 19 for alternative plans carried forward for detailed study, which is shown in Table D-5. Cost items include:

- The intent of the Sponsor to acquire the necessary easements for properties in the construction work area and flood pool if applicable.
- Construction-related activities such as mobilization, clearing and grubbing, erosion and sediment control, demolition and removal of existing structures, site work, earthwork, fencing, seeding, sediment removal, drainfill, and conduits.
- Engineering activities such as completing design, surveys, geotechnical investigations, construction observations, and project administration.

Table D-5 - Sallisaw Creek Watershed Dams 13 & 19
Comparative Cost Analysis of Alternative Plans

ITEM	Project Alternative [1]					
	Sallisaw Dam #13			Sallisaw Dam #19		
	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)	No Action/Future Without Federal Investment	Nonstructural	Preferred Alternative (Structural Rehabilitation to High Hazard Dam Criteria)
Total Investment	$ 1,098,600	$ 8,195,500	$ 1,706,200	$ 1,310,500	$ 21,598,200	$ 6,049,800
P.L. 83-566 Funds	$ -	$ -	$ 1,220,200	$ -	$ -	$ 4,347,600
Other Funds	$ 1,098,600	$ -	$ 486,000	$ 1,310,500	$ 21,598,200	$ 1,702,200
Average Annual Benefits [2]			$ 13,000			$ 345,000
Average Annual Costs [2]			$ 52,100			$ 180,000
Net Beneficial			$ (39,100)			$ 165,000
Average Annual O&M Costs			$ 1,800			$ 1,800

[1] Price Base 2024 Jan-24

[2] Amortized over 100 years at a discount rate of 2.75 percent. Based on total economic benefit and costs of alternatives as compared to existing conditions

National Economic Efficiency Alternatives

The National Economic Efficiency (NEE) alternative may be one of the other alternatives or a combination of alternatives. To avoid seeking individual exceptions in those cases where human life is at risk in the event of catastrophic failure of an existing dam, the NEE plan is the federally assisted alternative with the greatest net economic benefits. This removes the FWOFI (Future Without Federal Investment) or no-action alternative as a NEE plan option where human life is at risk in the event of catastrophic failure of an existing dam. The NEE alternative identified in this plan is to rehabilitate Dam #13 and Dam #19 to High Hazard Criteria. The Rehabilitate to NRCS High Hazard Class Dam is the NEE Alternative for both Dams 13 and 19.

Benefit-Cost Analysis

Damages were annualized as shown in Economic Table 5 (Table 9-5). The annual damages, construction cost estimates, project administration costs, and operation and maintenance costs were then used to conduct a benefit-cost analysis (BCA) for the proposed project life of 100 years for each dam. This analysis compares the benefits of building each dam to the cost of implementation and maintenance. A project is considered cost-effective when the B/C Ratio is 1.0 or greater. The results of this BCA indicated that the B/C ratio is 0.25 for Sallisaw Dam #13 and 1.99 for Sallisaw Dam #19 which means, in this case, the benefits of rehabilitating these dams outweigh the costs. Although the B/C ratio is low for Sallisaw Dam #13, the costs of rehabilitation is much lower than the other alternatives, thus making the rehabilitation option more favourable.

Table D-6 - Benefit Cost Ratio (Sallisaw Dam #13 – 100-Year Project Life)

	Est. Annual Damage	Est. Annual Damage Benefit	PV Benefit	PV Total Cost (100 Year)	B/C Ratio (100 Year)
Without Dam	$1,472,000.00				
Dam 13 Rehabilitation to High Hazard Criteria	$1,459,000.00	$13,000.00	$441,363.55	$1,748,260.99	0.25245862
Analysis Period:	100	years			
Discount Rate:	0.0275	OMB A-94 nominal discount rate (Dec 2023)			

Table D-7 - Benefit Cost Ratio (Sallisaw Dam #19 – 100-Year Project Life)

Scenario	Est. Annual Damage	Est. Annual Damage Benefit	PV Benefit	PV Total Cost (100 Year)	B/C Ratio (100 Year)
Without Dam	$1,816,000.00				
Dam 19 Rehabilitation to High Hazard Criteria	$1,471,000.00	$345,000.00	$11,713,109.60	$5,883,578.68	1.9908138
Analysis Period:	100	years			
Discount Rate:	0.0275	OMB A-94 nominal discount rate (Dec 2023)			

Engineering Cost Estimates – Following 6 Pages

Engineering Cost Estimate – Sallisaw Dam #13 - Rehabilitation to High Hazard Dam Criteria

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S13

Date : 5-Jan-24
Prepared By : RST
Checked By : DBW

S13 - Rehabilitation Alternative 3

Elevations (MSL)	EXISTING		PROPOSED	
Top of Dam	892.4	feet	892.4	feet
Principal Spillway Crest	860.2	feet	860.2	feet
Outlet Pipe Downstream Invert	845.4	feet	845.4	feet
Auxiliary Spillway Crest	888.9	feet	884.7	feet
Spillway Dimensions	**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width	40	feet	120	Feet
Principal Spillway Diameter	24	inches	30	inches

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	1296	Cubic Yards	$ 4.40	$ 5,702	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Earthfill, Embankment	14710 *	Cubic Yards	$ 15.40	$ 226,534	RS Means 31 23 2315 6075: Borrow, clay, till, or blasted rock, 5 C.Y. bucket, loading and/or spreading, front end loader, track mounted
3	Earthfill, Embankment, Compaction	14710 *	Cubic Yards	$ 0.80	$ 11,768	RS Means 31 23 23.23 5040 - Riding vibratory roller, 6" lifts, 4 passes
4	Primary Riser Structure Removal	1	Lump Sum	$ 10,000.00	$ 10,000	Estimate for demolition
5	New Principal Spillway Riser	1	Lump Sum	$ 87,000.00	$ 87,000	Based on median bid price for similar structure dam rehabilitation project
6	Excavation	4000	Cubic Yards	$ 5.35	$ 21,400	RS Means 31 23 1646 5565: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 460 H.P. dozer, 300' haul
7	30" Principal Spillway Barrel	285	Linear Feet	$ 2,500.00	$ 712,500	Estimate for Jack and Bore technology (no open cut)
8	Concrete Impact Basin - Concrete Volume	1	Each	$ 100,000.00	$ 100,000	Rough estimate
9	Seeding	7778	SY	$ 2.00	$ 15,556	Similar bid projects
10	Rip Rap (US face -900 and Impact Basin-180)	1080	Tons	$ 36.00	$ 38,880	Based on median bid price for similar structure dam rehabilitation project
11	Geotextile Fabric	800	SY	$ 4.27	$ 3,416	Avg bid prices
12	Bedding - Wave Protection	583	Tons	$ 35.00	$ 20,405	#57 stone average bid prices
13	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
14	Easement Acquisition (Construction Easements)	5	Acres	$ 3,000.00	$ 15,000	Estimated Costs
				Subtotal 1 :	**$ 1,253,161**	
				Mobilization : 5%	$ 62,658	
				Erosion and Sediment Control : 5%	$ 62,658	
				Dewatering : 5%	$ 62,658	
				Construction Contingency : 20%	$ 250,632	
				Subtotal 2 :	**$ 1,691,768**	
				2022 RS Means Location Factor** 0.795	**$ 1,344,955**	
				Construction Subtotal :	**$ 1,344,955**	
				Permitting :	$ 10,000	
				Stream Mitigation :	$ -	
				Easement Acquisition (Construction Easements) :	$ 15,000	
				Dam Construction Subtotal :	**$ 1,369,955**	
				Project Design, Construction Engineering, Contracting, Inspection : 20%	$ 268,991	
				Project Administration : 5%	$ 67,248	
				Dam Rehabilitation Total :	**$ 1,706,194**	

* 15% swell index factor of the excavated volume was added.

** OK local factor applied to Subtotal. Last update to these values provided in 2022.

Engineering Cost Estimate – Sallisaw Dam #13 - Future Without Federal Investment

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S13

Date : *9-Jan-24*

Prepared By : *DBW*

Checked By : *RST*

Future Without Project

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	4033	Cubic Yards	$ 4.40	$ 17,745	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Excavation (Remove Dam Embankment)	33,000 *	Cubic Yards	$ 6.40	$ 211,200	RS Means 31 23 1646 5410: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 300 H.P. dozer, 300' haul
3	Onsite Disposal of Removed Embankment Material and Topsoil	5,000	Cubic Yards	$ 0.77	$ 3,850	RS Means 31 23 2313 2350: Backfill, in 8" layers, spreading, small dozer, includes compaction with vibrating roller
4	Hauling Excess Excavated Material Offsite	28,000 **	Cubic Yards	$ 9.60	$ 268,800	RSMeans No 31 23 23.20 1038 - 12CY truck, 10 mile cycle, 20mph average, 15 min wait/load/unload
5	Minor Stream Channel Definition, Revegetation and Monitoring [1]	1,000	Linear Feet	$ 50.00	$ 50,000	Excludes design costs. Source: The Virginia Stream Restoration & Stabilization Best Management Practices Guide
6	Structure Removal (Riser)	1	Lump Sum	$55,000.00	$ 55,000	Based on median bid price for similar structure dam rehabilitation project
7	RC Pipe of 24" Inside Diameter Removal	304	Linear Feet	$ 21.50	$ 6,536	RS Means 02 41 1323 2930: Utility removal, pipe, sewer/water, 24"" diameter, remove, excludes excavation, hauling Add > RS Means 31 23 1614 5300: Excavating, chain trencher, utility trench, common earth, 24" pipe, hand excavate and trim for pipe bells after trench excavation, includes excavation and backfill
8	Seeding	6233	SY	$ 2.00	$ 12,466	RS Means 32 92 19.14 4500
9	Permitting	1	Lump Sum	$ 10,000.00	$ 10,000	OK DEQ
				Subtotal 1 :	**$ 625,597**	
			Mobilization :	5%	$ 31,280	
			Erosion and Sediment Control :	5%	$ 31,280	
			Dewatering :	5%	$ 31,280	
			Construction Contingency :	20%	$ 125,119	
				Subtotal 2 :	**$ 844,556**	
			2022 RS Means Location Factor* **	0.795	**$ 882,561**	
				Subtotal 3 :	**$ 882,561**	
			Permitting :		$ 10,000	
			Project Design, Construction Engineering, Contracting, Inspection :	20%	$ 168,911	
			Project Administration :	5%	$ 42,228	
				FWOP Total :	**$ 1,103,700**	

* 15% swell index factor of the excavated volume was added.

** Includes topsoil displaced by rip rap or other ground surface covering.

*** OK local factor applied to Subtotal

[1] Based on NHD stream length within reservoir coverage area

Engineering Cost Estimate – Sallisaw Dam #13 - Nonstructural alternative

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S13

Date : *9-Jan-24*
Prepared By : *DBW*
Checked By : *RST*

Non-Structural Alternative

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Acquisition of structures that are within the Breach Inundation Zone	7	Structures	$ 200,000.00	$ 1,400,000	5 homes, 1 business, church
2	Acquisition of easement area to be regulated within the Breach Inundation Zone	1,293	Acres	$ 5,000.00	$ 6,465,000	Cost estimated at $5000/acre
3	Bridges/Roads to Upgrade to account for breach inundation potential	1.00	Culvert/Road	$ 250,000.00	$ 250,000	Structural cost of modification of downstream road - Bunch Road
4	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
			Subtotal 1 (Construction) :		**$ 250,000**	
			Mobilization :	5%	$ 12,500	
			Erosion and Sediment Control :	5%	$ 12,500	
			Construction Contingency :	20%	$ 50,000	
			Subtotal 2 (Construction) :		**$ 325,000**	
			2022 RS Means Location Factor*	0.795	**$ 258,375**	
			Subtotal 3 (Construction) :		**$ 258,375**	
			Acquisition of downstream flow easements :		$ 7,865,000	
			Subtotal 4 :		**$ 8,123,375**	
			Permitting :		$ 10,000	
			Project Design, Construction Engineering, Contracting, Inspection :	20%	$ 51,675	
			Project Administration :	5%	$ 12,919	
			Non-Structural Total Cost:		**$ 8,197,969**	

* OK local factor applied to Subtotal

Engineering Cost Estimate – Sallisaw Dam #19 - Rehabilitation to High Hazard Dam Criteria

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S19

Date : *9-Jan-24*
Prepared By : *RST*
Checked By : *DBW*

S19 - RehabiliItation Alternative 3

Elevations (MSL)	EXISTING		PROPOSED	
Top of Dam	984.5	feet	984.5	feet
Principal Spillway Crest	948.7	feet	948.7	feet
Outlet Pipe Downstream Invert	930.5	feet	930.5	feet
Auxiliary Spillway Crest	980.7	feet	974.8	feet
Spillway Dimensions	**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width	200	feet	400	Feet
Principal Spillway Diameter	30	inches	48	inches

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	3122	Cubic Yards	$ 4.40	$ 13,737	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Earthfill, Embankment	8600 *	Cubic Yards	$ 15.40	$ 132,440	RS Means 31 23 2315 6075: Borrow, clay, till, or blasted rock, 5 C.Y. bucket, loading and/or spreading, front end loader, track mounted
3	Earthfill, Embankment, Compaction	8600 *	Cubic Yards	$ 0.80	$ 6,880	RS Means 31 23 23.23 5040 - Riding vibratory roller, 6" lifts, 4 passes
4	Existing Primary Structure Removal	1	Lump Sum	$ 10,000.00	$ 10,000	Estimate for demolition
5	New Principal Spillway Riser	1	Lump Sum	$ 87,000.00	$ 87,000	Based on median bid price for similar structure dam rehabilitation project
6	Excavation	51000	Cubic Yards	$ 5.35	$ 272,850	RS Means 31 23 1646 5565: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 460 H.P. dozer, 300' haul
7	Hauling Excess Excavated Material Offsite	46000	Cubic Yards	$ 9.60	$ 441,600	RSMeans No 31 23 23.20 1038 - 12CY truck, 10 mile cycle, 20mph average, 15 min wait/load/unload
8	In-Place Roller Compacted Concrete (RCC)	18000	Cubic Yards	$130.00	$2,340,000	NRCS Suggested Cost based on past NRCS projects in PA and WV
9	48" Principal Spillway Barrel	340	Linear Feet	$ 2,500.00	$ 850,000	Estimate for Jack and Bore technology (no open cut)
10	Abutment Drain	220	Linear Feet	$ 300.00	$ 66,000	6" diameter HDPE in gravel bed with fabric filter wrap
11	Concrete Impact Basin	1	Each	$ 100,000.00	$ 100,000	Rough estimate
12	Seeding	23000	SY	$ 2.00	$ 46,000	Similar bid projects
13	Rip Rap (US face -2100 and Impact Basin-180)	2280	Tons	$ 36.00	$ 82,080	Based on median bid price for similar structure dam rehabilitation project
14	Geotextile Fabric	1300	SY	$ 4.27	$ 5,551	Avg bid prices
15	Bedding - Wave Protection	1050	Tons	$ 35.00	$ 36,750	#57 stone average bid prices
16	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
17	Easement Acquisition (Construction Easements)	5	Acres	$ 3,000.00	$ 15,000	Estimated Acres and Costs
				Subtotal 1 :	**$ 4,490,888**	
			Mobilization :	5%	$ 224,544	
			Erosion and Sediment Control :	5%	$ 224,544	
			Dewatering :	5%	$ 224,544	
			Construction Contingency :	20%	$ 898,178	
				Subtotal 2 :	**$ 6,062,699**	
			2022 RS Means Location Factor**	0.795	**$ 4,819,845**	
				Subtotal 3 :	**$ 4,819,845**	
			Permitting :		$ 10,000	
			Easement Acquisition (Construction Easements) :		$ 15,000	
				Subtotal 4 :	**$ 4,844,845**	
			Project Design, Construction Engineering, Contracting, Inspection :	20%	$ 963,969	
			Project Administration :	5%	$ 240,992	
				Rehabilitation Subtotal :	**$ 6,049,807**	

* 15% swell index factor of the excavated volume was added.

** OK local factor applied to Subtotal. Last update to these values provided in 2022.

Engineering Cost Estimate – Sallisaw Dam #19 - Future Without Federal Investment

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S19

Date : *9-Jan-24*

Prepared By : *DBW*

Checked By : *RST*

Future Without Project - Sponsor Breach

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Clearing and Grubbing	4033	Cubic Yards	$ 4.40	$ 17,745	RS Means 31 14 1323 1430: Topsoil stripping and stockpiling, loam or topsoil, remove and stockpile on site, 200 HP dozer, 6" deep, 300' haul
2	Excavation (Remove Dam Embankment)	54,500 *	Cubic Yards	$ 6.40	$ 348,800	RS Means 31 23 1646 5410: Excavating, bulk, dozer, open site, bank measure, sandy clay & loam, 300 H.P. dozer, 300' haul
3	Onsite Disposal of Removed Embankment Material and Topsoil	5,000	Cubic Yards	$ 0.77	$ 3,850	RS Means 31 23 2313 2350: Backfill, in 8" layers, spreading, small dozer, includes compaction with vibrating roller
4	Hauling Excess Excavated Material Offsite	49,500 **	Cubic Yards	$ 9.60	$ 475,200	RSMeans No 31 23 23.20 1038 - 12CY truck, 10 mile cycle, 20mph average, 15 min wait/load/unload
5	Minor Stream Channel Definition, Revegetation and Monitoring [1]	1,000	Linear Feet	$ 50.00	$ 50,000	Excludes design costs. Source: The Virginia Stream Restoration & Stabilization Best Management Practices Guide
6	Structure Removal (Riser)	1	Lump Sum	$55,000.00	$ 55,000	Based on median bid price for similar structure dam rehabilitation project
7	RC Pipe of 30" Inside Diameter Removal	336	Linear Feet	$ 21.50	$ 7,224	RS Means 02 41 1323 2930: Utility removal, pipe, sewer/water, 15" to 18" diameter, remove, excludes excavation, hauling Add > RS Means 31 23 1614 5300: Excavating, chain trencher, utility trench, common earth, 18" pipe, hand excavate and trim for pipe bells after trench excavation, includes excavation and backfill
8	Seeding	9478	SY	$ 2.00	$ 18,956	RS Means 32 92 19.14 4500
9	Permitting	1	Lump Sum	$ 10,000.00	$ 10,000	OK DEQ
				Subtotal 1 :	**$ 976,775**	
			Mobilization :	5%	$ 48,839	
			Erosion and Sediment Control :	5%	$ 48,839	
			Dewatering :	5%	$ 48,839	
			Construction Contingency :	20%	$ 195,355	
				Subtotal 2 :	**$ 1,318,647**	
			2022 RS Means Location Factor* **	0.795	**$ 1,048,324**	
				Subtotal 3 :	**$ 1,048,324**	
			Permitting :		$ 10,000	
				Subtotal 4 :	**$ 1,058,324**	
			Project Design, Construction Engineering, Contracting, Inspection :	20%	$ 209,665	
			Project Administration :	5%	$ 52,416	
				FWOP Total :	**$ 1,320,405**	

* 15% swell index factor of the excavated volume was added.

** Includes topsoil displaced by rip rap or other ground surface covering.

*** OK local factor applied to Subtotal

[1] Based on NHD stream length within reservoir coverage area

Engineering Cost Estimate – Sallisaw Dam #19 - Nonstructural alternative

Engineer's Construction Cost Estimate Breakdown

Project Name: Sallisaw Creek Watershed Structure S19

Date : *9-Jan-24*
Prepared By : *DBW*
Checked By : *RST*

Non-Structural Alternative

Line	Item	Quantity	Unit	Unit Price	Cost	Unit Cost Reference
1	Acquisition of easement for property that lies in Flood Plain that would be protected by dam	3,573	Acres	$ 5,000.00	$ 17,865,000	Cost estimated at $5,000/acre
2	Buy Structures Impacted by Breach of Dam	9	Each	$200,000.00	$1,800,000	8 houses, 1 substation
3	Bridges/Roads to Upgrade to account for inundation potential	6	Culvert/Road	$ 250,000.00	$ 1,500,000	Structural cost of modification of downstream roads/infrastructure (5 roads, 1 RR)
4	Permitting	1	Each	$ 10,000.00	$ 10,000	OK DEQ
				Subtotal 1 (Construction) :	**$ 1,500,000**	
				Mobilization : 5%	$ 75,000	
				Erosion and Sediment Control : 5%	$ 75,000	
				Construction Contingency : 20%	$ 300,000	
				Subtotal 2 (Construction) :	**$ 1,950,000**	
				2022 RS Means Location Factor* 0.795	**$ 1,550,250**	
				Subtotal 3 (Construction) :	**$ 1,550,250**	
				Acquisition of downstream flow easements and houses:	$ 19,665,000	
				Subtotal 4 :	**$ 21,215,250**	
				Permitting :	$ 10,000	
				Project Design, Construction Engineering, Contracting, Inspection : 20%	$ 310,050	
				Project Administration : 5%	$ 77,513	
				Non-Structural Total Cost:	**$ 21,612,813**	

* OK local factor applied to Subtotal

Engineering Analysis

Engineering Surveys

The storage curves for Sallisaw Creek FRS No. 13 and 19 were developed using a combination of bathymetric survey, topographic survey of the local sites, and 2-Meter LiDAR data. The bathymetric and topographic surveys were completed in July 27, 2021 – August 01, 2021 and contours processed using CADD software. The contours from the LiDAR data were processed using ArcGIS. Bathymetric contour areas were used to elevation 860.2 and the LiDAR contour areas were used from elevation 860.2 to elevation 900.0 to build the final storage curve for FRS No. 13. For FRS No. 19, the bathymetric survey data was used up to elevation 948.7, and the LiDAR contour areas were used from elevation 948.7 to elevation 985.0. The final vertical adjustment used to correct the as-built elevations from the assumed elevations to NAVD-88 datum was 0.427 feet for FRS No. 13, and 0.479 ft for FRS No. 19. Storage tables were developed and compared to as-built data.

Hydrologic and As-Built

The drainage area was checked using USGS 7.5 minute quadrangle maps and ArcGIS software. FRS No. 13 was shown to have a drainage area of 1,254 acres. As-built data shows the drainage area to be 1,235 acres but existing shapefiles showed the area to be 1,254 acres. The updated drainage area of 1,254 acres was used for planning. FRS No.19 was shown to have a drainage area of 7,968 acres. The original table 3 data shows the drainage area to be 8,160 acres. The updated drainage area of 7,968 acres was used for planning. The condition II curve number (RCN) was checked using updated land use data, and determined to be 71 for FRS No. 13, and 71 for FRS No. 19. Both of these curve numbers were based on existing soil and land use data and were considered more accurate and lower than the curve numbers used in the original 1960's design oof 84 for Site 13 and 82 for Site 19. Rainfall data was developed from HMR-51, NOAA Atlas 14, Volume 8, Version 2, and the OK-AR-LA-MS Regional Probable Maximum Precipitation Study by Applied Weather Associates. It was applied to the 2D computational modeling using rain-on-grid method, which calculates the runoff and infiltration based on each grid cell within HEC-RAS.

Geologic Investigations

Geologic investigation information and soil mechanics reports from the original site design folder were used for planning purposes. Evaluation of the auxiliary spillways alternatives used the As-Built & Original data. Velocity output from SITES and existing soils information was used to determine that both dams needed armoring. S13 was determined to need rock armoring and S19 was determined to need RCC armoring based on the velocity results from SITES. Further investigations will be needed for detailed designs.

Sediment Storage

Sediment and storage surveys obtained in 2021 were compared to the original planning data, as-built plans, and USGS quadrangle map data. The bathometric survey shows that the actual submerged sediment was much less than the as-build and original planning data estimateed would occur. For S13, it was assumed that 50% of the dam fill volume was

captured from the pool area, which provided additional sediment storage. S19 assumed that all the excavation for the dam fill was included in the volume. This was based on the bathometric survey from 2021 and the amount of sedimentation that has taken place since the construction of the dams. This was added to the surveyed sediment which provided the submerged sediment volume. The submerged sediment pool will be set at the planned principal spillway elevation and was assumed to be 85% of the total sediment volume, and aerated sediment storage will be allocated in the detention pool. See further narrative in the SITES Analysis Summary Reports in Appendix E.

Breach Analysis - General

The Breach routing was performed using procedures as outlined in TR-60 and TR-66. TR-60 requires the Hw, the depth of water at the dam at the time of failure, to be calculated based on the "…dam crest or the peak reservoir stage resulting from the PMF." For this breach analysis, the effective TOD (or dam crest) elevation is used to calculate Hw and volume at the time of breach. Total non-detention storage is included in the calculation of breach discharge volume. Hw was used according to TR-60 guidelines to calculate the minimum peak discharge of the breach hydrograph using the TR-60 series of empirical equations. For this study, the hydrologic, static, and seismic breach events were analyzed at each location.

A 2-D model was created using two-meter LiDAR data and HEC-RAS 6.0 and 6.1. The Breach hydrograph was routed downstream using un-steady flow routing procedures. Hydrograph routing was performed using the HEC-RAS 6.1 SWE-ELM equation set, which stands for "Shallow Water Equations, Eulerian-Lagrangian Method". The Diffusion Wave equation was used for flood frequency routing. Details about the mathematical formulation and the solution algorithm used by HEC-RAS 6.1 can be found in the technical manual. Water depths, velocities, and inundation boundary were exported as shape files into ArcGIS Pro 2.5 for data refinement and creation of inundation maps.

An instantaneous, curvilinear breach hydrograph was developed. Site 13 had a peak discharge of 46,929 cfs. Site 19 had a peak discharge of 94,932 cfs. The downstream normal flow boundary condition is approximately 18 miles downstream of Dam 13, and 27.5 miles downstream of Dam 19. This location was chosen because it was sufficiently far downstream that the effect of the boundary condition on the simulation results was negligible.

Potential Damage Locations

In 2010, a breach analysis was performed as part of the 2010 Rehabilitation Assessment Reports for the existing Site 13 and Site19. The 2010 breach analysis for Sallisaw 13 indicated 22 Potential damage locations (PDLs) including structures, a US highway, and a railroad track. The 2010 breach analysis for Sallisaw 19 indicates 16 PDLs including structures and multiple county roads.

The 2021 hydrologic and hydraulic analysis identified 29 possible damage locations (eleven modeled bridge crossings, 13 homes, 1 business, 2 churches, 1 electric substation, and one additional bridge crossing represented as a terrain feature) for the Sallisaw Creek Watershed based on their elevation relative to the valley elevation. Although the electrical

substation is not included in the calculation for potential loss of life, it could indirectly contribute to potential in loss of life if it fails during an inundation event. For this reason, the electrical substation is noted as a PDL location throughout this report.

Please note, these locations do not correspond perfectly with the 22 PDLs identified in the 2010 rehabilitation assessment. More PDLs were identified in the 2021 study than in the 2010 rehabilitation study, which indicates an additional need for rehabilitation to high hazard criteria. The additional PDL locations also add cost to the non-structural option.

The PDLs analyzed in this study were prioritized based on their elevation relative to the channel elevation - or in other words, their likelihood to be inundated during a breach and/or flood event. Since the purpose of this study is to determine hazard classification, the question of "how many PDLs are affected?" is not as relevant as "are PDLs affected?". Therefore, this study focused on whether breach scenarios impacted those locations identified as at risk. It is possible additional damage locations may exist beyond those analyzed in this report.

Breach inundation information (i.e., water surface elevation, maximum velocity, and arrival time of peak inundation) were extracted directly from the HEC RAS 2D model results at each PDL location for each scenario. Inundation floodplain elevation was extracted just upstream of the eleven bridges on the main channel to capture the maximum rise in water surface elevation before the bridge. For all other PDLs, the inundation flood elevation was extracted at the PDL location. Velocity was extracted at the PDL location for all PDLs.

Estimated maximum breach inundation depth at each PDL was reported by subtracting the low elevation of the PDL from the flood inundation elevation. The low elevation reported at bridge crossings was the lower value of either the lowest deck elevation or the lowest surveyed roadway elevation approaching the deck. This reporting method was used to estimate the depth of water over the road. Low elevations reported at buildings are lowest adjacent grade. Inundation depths were based on LiDAR ground elevations at the potential damage locations (PDL) and are detailed in the Breach Narrative in Appendix E.

Population at Risk (PAR)
The PAR was computed with the PDLs identified in this study. The results are as follows:

Site 13 (Seismic Breach) - 0
Site 13 (Static Breach) - 14
Site 13 (Hydrologic Breach) - 14

Site 19 (Seismic Breach) - 5
Site 19 (Static Breach) - 13
Site 19 (Hydrologic Breach) - 31

Flood Frequency Analysis

The purpose of the flood frequency analysis was to provide data for use in the economic evaluation of plan alternatives and to be used for FEMA mapping if the recommended structural alternatives are constructed. The purpose of the hydrologic and hydraulic analysis is also to assess flood prevention and flood damage reduction downstream of Site 13 and Site 19 for a range of flood frequency events. Analyses were performed downstream of Site 13 and Site 19 for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-yr events for five scenarios, detailed below in the Flood Frequency report in Appendix E. This resulted in a total of 40 flood frequency scenarios that were modeled. The 100-yr and 500-yr flood frequency inundation maps are in Appendix C.

The modeled proposed conditions results were compared to results produced from a similar process for the existing and "dam removed" scenarios as a basis of analysis. Each dam site was analyzed independently.

The hydrological and hydraulic modeling was carried out in HEC-RAS 6.0 and HEC-RAS 6.1. The simulations were run using HEC-RAS 6.1. Overland flow and open channel flow were simulated with the "2D-Diffusion Wave" equation. Hydrograph routing at each dam in HEC-RAS required elevation-discharge curves. These were computed with HydroCAD v10.00-15 hydraulic routing software for all dams using dimensions from the as-built plans. The effects of other FRS downstream were also taken into account. The downstream normal flow boundary condition is approximately 18 miles downstream of Dam 13, and 27.5 miles downstream of Dam 19. This location was chosen because it was sufficiently far downstream that the effect of the boundary condition on the simulation results was negligible: this distance encompassed all the same PDLs considered in the breach analysis. Two conditions were modeled for the each storm: 1) with each existing structure in place and 2) without each existing structure in place. Structure outflows were developed using SITES.

Point precipitation frequency estimates from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Volume 8, Version 2 were used to define rainfall depth for 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year 24-hour duration storms. This information was retrieved using NOAA's web-based point precipitation tool using the subwatershed centroid at latitude 35.6617, longitude -94.7476 as input. No areal reduction was used, and rainfall was assumed uniform on the subwatershed.

The rainfall temporal distribution was defined using the SCS Type III Storm based on the geographical location of the watershed. These storms were used to model the flood frequency scenarios. Hyetographs were created using HEC-HMS and stored as .dss files so they could be used as an input for the HEC-RAS 2D model. HEC-HMS was used solely for creating the hyetograph in .dss format for the flood frequency scenarios. This was modelled for a sensitivity analysis in which the downstream hydrologic impacts were compared between the existing site and the as-planned site. This was done for both Sallisaw Creek Site 13 and Site 19 with the structure outflows calculated using SITES. For the SITES analysis the 24-hr rainfall used the 5-pt distribution, the 6-hr rainfall used the standard distribution. TR-60 analysis used ACM II and ACM III was used for OWRB analysis. Once the HEC-RAS model and frequency rainfall depths were developed, the

model could be used to produce maximum water surface elevation maps, velocity maps, and depth maps over the watershed. The results from HEC-RAS were exported to ARC-GIS where the data could be more easily examined downstream for each PDL. Water Surface Elevations (WSE) results were extracted at each PDL and flood frequency and breach inundation results for each PDL can be found in Appendix E.

The proposed structural alternative would bring the existing structures into compliance with NRCS high hazard criteria. To achieve this, the principal spillway was increased, and the auxiliary spillway was lowered for each dam site. These improvements will cause inundation depth to increase in high frequency events (such as the 2-yr, 10-yr, and 50-yr events) at some locations near the dam outfall. Flood benefits from the dam are maintained and the presence of the dams with proposed improvement will continue to provide protection compared to a scenario with the dams removed. Per the results of hydrologic/hydraulic modeling, the proposed improvements will cause specific locations to experience deeper inundation compared to existing conditions, but it will also bring the dams into compliance with high hazard criteria, which will decrease the chances of a breach. This design will allow the dams to continue providing significant protection compared to scenarios where the dams are decommissioned or removed.

Although the proposed improvements cause an increase in inundation depth at some locations, the impact to the majority of the floodplain is negligible. The maximum modeled increase in flood depth from the existing condition was 0.42’ across all modeled PDLs, scenarios, and frequency events. Some PDL locations see a modest increase in the 100-year water surface of <0.20’ due to the proposed improvements.

The proposed improvements at Site 13 will minimally expand the 100-yr flood footprint in the tributary between Site 13 outfall and the main channel of Sallisaw Creek. This is because the existing Site 13 currently provides excess flood storage because of the orifice control to account for the 10 day storm not being fully drawn down before another 100-year storm and the proposed Site 13 improvements do not have this excess storage. The increase in the 100-year storm outflow is attributable to the proposed principal spillway outflow only being restricted by the pipe diameter. The proposed structural improvements at Site 13 would result in an inundation increase of 0.19’ in 100-year water surface elevation, occurring at PDL 13 (a business located near the confluence of Dam 13 discharge and the main channel of Sallisaw Creek). This is within the model accuracy level and not considered a significant increase as compared to the Zone A FEMA mapping. This increase would not require any additional ACOE permitting.

The proposed improvements at Site 19 will have negligible or no effect on the existing flood footprint. The enlargement of the principal spillway at Site 19 will result in increased water surface elevations during high frequency events (such as the 2-yr and 10-yr events), with the largest increase in water surface elevation occurring near the outfall of Site 19 with the impact on water surface elevation diminishing farther downstream. The largest modeled increase in water surface elevation expected from the enlargement of the principal spillway is 0.42’, occurring in the 2-yr event at PDL 1 (S4680 Road). The proposed structural improvements at Site 19 are expected to result in an inundation increase of 0.07’ in the 100-year water surface elevation, occurring at PDL 1 (S4680 Road). This is within

the model accuracy level and not considered a significant increase as compared to the Zone A FEMA mapping. This increase would not require any additional ACOE permitting.

The proposed rehabilitation will maintain the current ecosystem services considerations and not change the cultural resources, or the ecology of land use, wetland, and species habitat around the existing sites by maintaining existing principal spillway, and top of dam elevations. It will improve public safety, have little impact on regulatory floodplain management and will continue to proved flood reduction benefits compared to decommissioning or removing the dams.

Existing Condition Results Summary

100-yr
Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event in the existing condition. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet.

500-yr
Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event in the existing condition. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.0 feet.

Site 13 Rehabilitation Option Results Summary

100-yr
Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option at Site 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 3.7 feet. There are no new locations impacted from rehabilitation as compared to existing flooding condition, see flood frequency report in Appendix E and flood frequency mapping in Appendix C for specific locations including Latitude/Longitude.

500-yr
Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the rehabilitated option at Site13. The maximum depth of the flooding at these structures ranges from approximately 0.0 feet to 5.0 feet. There are no new locations impacted from rehabilitation as compared to existing flooding condition, see flood frequency report in Appendix E and flood frequency mapping in Appendix C for specific locations including Latitude/Longitude.

Site 13 Without Dam Option Results Summary

100-yr
Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 5 homes, 1 business, 1 church, and 1 electrical substation are predicted to be inundated by the 100-year event for the without dam option at Site 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 3.7 feet. This is an increase in the number of homes inundated if the dam was removed without any downstream structure changes.

500-yr
Approximately 4 roads (S4680 Rd, E888 Rd, E908 Rd, Bunch Rd), 8 homes, 1 business, 2 churches, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the decommissioned option at Site 13. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.0 feet. This is an increase in the number of homes and churches inundated if the dam was removed without any downstream structure changes.

Site 19 Rehabilitation Option Results Summary

100-yr
Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option at Site 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet. There are no new locations impacted from rehabilitation as compared to existing flooding condition, see flood frequency report in Appendix E and flood frequency mapping in Appendix C for specific locations including Latitude/Longitude.

500-yr
Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the rehabilitated option at Site 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.1 feet. There are no new locations impacted from rehabilitation as compared to existing flooding condition, see flood frequency report in Appendix E and flood frequency mapping in Appendix C for specific locations including Latitude/Longitude.

Site 19 Decommissioned Option Results Summary

100-yr
Approximately 4 roads (S4680 Rd, S4660 Rd, E888 Rd, and E908 Rd), 5 homes, 1 church, and 1 electrical substation are predicted to be inundated by the 100-year event for the decommissioned option at Site 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.7 feet. This is an increase in the number of homes inundated if the dam was removed without any downstream structure changes.

500-yr

Approximately 4 roads (S4680 Rd, S4660 Rd, E888 Rd, and E908 Rd), 9 homes, 1 business, 2 churches, 2 railroads (RR KCS Heavener and RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the decommissioned option at Site 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 7.3 feet. This is an increase in the number of homes, churches, and railroads inundated if the dam was removed without any downstream structure changes.

Resource Analysis

CPA-52

The CPA-52 was completed by CWJV and reviewed by Mike Sams, Oklahoma State Biologist

Biology

Information on fish and wildlife resources of the project area and on project impacts was determined by a review of available literature, aerial photographs, and on-site field investigations. Consultation with the following agencies was conducted during the Environmental Evaluation of the project.

1. U.S. Fish and Wildlife Service (USFWS)
2. U.S. Army Corps of Engineers (USACE)
3. Oklahoma Department of Wildlife Conservation (ODWC)
4. Oklahoma Conservation Commission (OCC)

In addition, informal consultation with the USFWS, in accordance with Section 7 of the Endangered Species Act of 1973 (Public Law 93-205, as amended), has been initiated. Cumulative effects of rehabilitation of floodwater retarding structures in Oklahoma are addressed in the Environmental Impact Statement (EIS) – Rehabilitation of Aging Flood Control Dams in Oklahoma, August 2002, and reviewed April 2007 and April 2012. All effects of the project have been analyzed and accounted for and are within the scope of the cited document.

Land Use (Prime Farmland and Soils Information)

Prime farmland and soils information was collected from both the NRCS Soils Data Mart and the Web Soil Survey. County-wide percentages of soils acreages and proportionate extent were applied proportionally to obtain project area numbers. Floodplain soils and land use acreages were also obtained from Soils Data Mart and Web Soil Survey.

Water Quality

The reach of Sallisaw Creek upstream of its confluence with Greasy Creek (near E 938 Road) [Water Body ID (WBID) OK220200030010_30]is not listed on the 2022 303(d) list of impaired waters and is in good waterbody condition. However, the reach of Sallisaw Creek downstream of the Greasy Creek confluence (WBID OK220200030010_20) is listed on the 303(d) list of impaired waters. Enterococcus is the listed pollutant which is impairing primary body contact recreation (USEPA 2022) (OK-DEQ 2022).

Cultural Resources

This overview and analysis of the historic properties identified during the Historic Resources Survey fieldwork, outlined in the Historic Resources Survey Report in Appendix E. Four major structures and their (minor) associated features are documented. Two major properties are primarily constructed of earthen material while the two other properties are primarily constructed of cut-lumber.

Sallisaw Creek Watershed FRS No. 13 and associated elements are documented as Resource ID No. 1. The FRS No. 13 APE included the top-of-dam elevation upstream of FRS No 13, as well as below FRS No. 13 to the extent of the state/federal easement, the auxiliary spillway, the ingress/egress routes, and the likely location of a staging area and borrow area (former pool). This resource was constructed in 1966 under the Watershed Protection and Flood Prevention Act by Adair County Soil and Water Conservation District and Sallisaw Creek Conservancy District with the assistance of the Soil Conservation Service of the U.S. Department of Agriculture. The earthen walled dam was built at a height of 48 feet and is currently approximately 825 feet long. Located at the eastern base of the earthen dam (within the APE) is a small earthen basin spillway with concrete discharge conduit associated with the dam. The dam's water retention area is located to the west of the dam in the APE. Located directly at the western base of the dam in the northeast corner (within the APE) is a concrete principal spillway with riser and trash rack. Located outside of the entrance of the dam (within the APE) is a concrete marker with bronze memorial. FRS No. 13 was constructed in the 1960s to help control devastating flood events, when partnered with land conservation practices. The resource, as an individual structure does not meet the requisite threshold of significance required to be consider eligible under NRHP Criterion A for Conservation. Limited archival research did not reveal associations with persons of transcendent importance, to be considered eligible under NRHP Criterion B. Moreover, FRS No. 13 does not exhibit characteristics of high engineering merit to be considered eligible under NRHP Criterion C. Based on the above, FRS No. 13 is not likely to provide information important to history in the future, under NRHP Criterion D. In conclusion, NRCS determined that FRS No. 13 is not NRHP eligible.

Within the Sallisaw Creek Watershed FRS No. 13 APE is Resource ID No. 2, an abandoned and dilapidated T-plan single-family dwelling. The house's primary entrance is located on the eastern elevation. This eastern elevation features a centralized doorway flanked by two window openings. The eastern elevation shows signs that it once featured a full-length porch with overhanging shed roof. The southern elevation of the house features a doorway and six window openings. On this southern elevation the house features an addition with shed roof on the house's southern T-side. The addition-portion features windows with three vertical fixed panes and asbestos tile siding. The western elevation of the house is too dilapidated to distinguish any character-defining features. The northern elevation's most prominent features are a brick chimney flanked by double-hung windows. North of the house, set into the hillside, is a site-cast concrete structure with a board-form foundation and exterior walls, and a concrete roof. The structure

features a singular doorway opening located at the southeast corner of the structure. No door is present, and the structure is currently filled with debris. Southwest of the historic-age house structure is a cattle water trough—most likely a modern addition to the landscape. The structure is composed of a round circular cast concrete pad that slopes up towards the center. In the center of the poured concrete pad is a large tractor tire with four metal T-posts on each side. The metal T-posts were typically installed to prevent cattle from stepping into the trough. Inside the trough is a water valve protected by a wire cage. The trough does not appear to be in use. The setting of the house and associated outbuilding and cattle water trough now includes Sallisaw Creek Site 13, constructed in 1966, although originally the setting would have been largely agricultural (to the east and west) and wooded along Hamlin Hollow, a Sallisaw Creek tributary (to the south). Therefore, the original setting, feeling, and association are largely lost. The house does not represent a significant historical theme or event to be considered eligible under NRHP Criterion A. Limited archival research did not reveal associations with persons of transcendent importance to be considered eligible under NRHP Criterion B. Likewise, Resource ID No. 2 does not it exhibit characteristics of a rare, unique, or outstanding architectural design to be considered eligible under NRHP Criterion C. Based on the above, Resource ID No. 2 is not likely to provide information important to history in the future under NRHP Criterion D. In conclusion, NRCS determined Resource ID No. 2 is not NRHP eligible.

Sallisaw Creek Watershed FRS No. 19 and associated elements are documented as Resource ID No. 3. The FRS No. 19 APE included the top-of-dam elevation upstream of FRS No 19, as well as below FRS No. 13 to the extent of the state/federal easement, the auxiliary spillway, the ingress/egress routes, and the likely location of a staging area and borrow area (former pool). The resource was constructed in 1968, under the Watershed Protection and Flood Prevention Act by Adair County Soil and Water Conservation District and Sallisaw Creek Conservancy District with the assistance of the Soil Conservation Service of the U.S. Department of Agriculture. The earthen walled dam was built at a height of 61 feet and is currently approximately 1,420 feet long. Located at the western base of the earthen dam (within the APE) is a small earthen basin spillway with concrete discharge conduit associated with the dam. The dam's water retention area is located to the east of the dam (within the APE). Located directly at the eastern base of the dam (within the APE) is a concrete principal spillway with riser and trash rack. Additionally, running perpendicular with the dam (within the APE) is wire fencing seen along the northern and southern shoreline. Along the northern shore is a floating dock with various docking structures for boats. At the southeast corner of the dam is another pier/dock structure—both are most likely a modern addition to the landscape. The Sallisaw Creek enters the reservoir from the east/northeast. Located outside of the entrance of the dam (within the APE) is a concrete marker with bronze memorial. FRS No. 19 was constructed in the 1960s to help control devastating flood events, when partnered with land conservation practices. The resource, as an individual structure does not meet the requisite threshold of significance required to be consider eligible, under NRHP Criterion A for conservation. Limited archival research did not reveal associations with persons of transcendent importance to be considered eligible under NRHP Criterion B. Moreover, FRS No. 19 does not exhibit characteristics of high engineering merit to be considered eligible under NRHP Criterion C. Based on the above, FRS No. 19 is not

likely to provide information important to history in the future under NRHP Criterion D. In conclusion, NRCS determined that FRS No. 19 is not NRHP eligible.

Within the Sallisaw Creek Watershed FRS No. 19 APE is Resource ID No. 4, an abandoned and dilapidated T-shaped house structure. The house's primary entrance is located on the northern elevation. This northern elevation features two doorways under a non-extant wraparound porch and two window openings. The northern elevation, again, shows signs that it once featured a wraparound porch with overhanging shed roof that covered the north and west sides of the house and porch. The eastern elevation of the house features a rear doorway and one window opening under another shed roof porch area of the house. This rear porch features character-defining turned post supports and decorative details around the doorway and window trims. The western elevation features four window openings, with two window pairings. This elevation also shows a later shed roofed addition to the house. The northern elevation of the house is very dilapidated from the collapsed shed roof but looks to have featured two window openings and large front gable. The house appears to represent a common example of the National Folk style, with some subtle detailing. North of the house is a one-story outbuilding constructed of concrete block. This structure has a shed roof and single wooden door opening, secured by a padlock. The setting of the house and associated outbuilding now includes FRS No. 19, constructed in 1968, although originally the setting would have been largely agricultural (to the north) and wooded along Sallisaw Creek tributary (to the south). Therefore, the original setting, feeling, and association are largely lost. The house does not represent a significant historical theme or event to be considered eligible under NRHP Criterion A. Limited archival research did not reveal associations with persons of transcendent importance to be considered eligible under NRHP Criterion B. Likewise, Resource ID No. 4 does not it exhibit characteristics of a rare, unique, or outstanding architectural design to be considered eligible under NRHP Criterion C. Based on the above, Resource ID No. 4 is not likely to provide information important to history in the future under NRHP Criterion D. In conclusion, NRCS determined Resource ID No. 4 is not NRHP eligible.

Appendix E
Other Supporting Information

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Site 19 CPA-52 1-6

Population at Risk (PAR) S13 1-3

Population at Risk (PAR) S19 1-3

Watershed Dam Routings Memorandum 1-5

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S19 SITES Analysis Summary 1-3

Hazard Analysis Summary 1-3

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Flood Frequency Analysis for Rehabilitation of Dams – Sallisaw Creek Watershed – Dam 13 | dam 19 1-29

Historic Resources Survey Report 1-56

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Limited Threatened and Endangered Species Habitat Assessment – Sallisaw Creek Watershed Dam No. 13 1-45

Limited Threatened and Endangered Species Habitat Assessment – Sallisaw Creek Watershed Dam No. 19 1-42

WOTUS Field Verification Report – Sallisaw Creek Watershed Dam No. 13 & attachments 1-25

Preliminary WOTUS Field Verification Report – Sallisaw Creek Watershed Dam No. 19 & attachments 1-25

U.S. Department of Agriculture | NRCS-CPA-52
Natural Resources Conservation Service | 11/2019

ENVIRONMENTAL EVALUATION WORKSHEET

A. Client Name: Adair County Conservation District

B. Conservation Plan ID # (as applicable)**:**
Program Authority (optional)**:** PL 83-566

C. Identification # (farm, tract, field #, etc. as required)**:**
Sallisaw Creek Floodwater Retarding Structure No. 13

D. Client's Objective(s) (purpose):
To bring the dam associated with FWRS 13 into compliance with current safety standards reducing the risk of loss of life due to catastrophic dam failure.

E. Need for Action:
The Need for the proposed action is to continue to provide flood protection to properties downstream. Modifications to the dam would provide capacity to safely contain the 100-year, 10-day storm. The proposed action should reduce the future magnitude, extent, frequency, and duration of flooding problems in the Sallisaw Creek Watershed area protected by the S-13. Sallisaw Creek S-13 would continue to protect homes, businesses, crops, roads, bridges, and land and water resources.

H. Alternatives

No Action √ if RMS ☐	***Alternative 1*** √ if RMS ☐	***Alternative 2*** √ if RMS ☐
The Future Without Federal Investment would involve a sponsor breach of the dam to remove its ability to impound water. A breach would include clearing and grubbing, excavation/removal of the dam embankment, onsite and offsite disposal of excavated material, minor stream channel modification, revegetation, and structure removal.	Rehabilitation to NRCS performance standards for a high hazard dam while maintaining pool area. Replace 24" PSW with 30" pipe and new impact basin. Increase ASW width from 40' to 120' and lower crest by 4.2'. Raise dam access drive by left (north) abutment to existing top of dam elevation. Add upstream face riprap wave protection. Acquire approximately 5 acres of construction easement.	Rehabilitation of FWRS 13 to current low hazard criteria includes acquisition of easements for property that is located within the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential. Will also include the relocation and/or floodproofing of structures below the dam. This alternative was eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements downstream of dam.

Resource Concerns

In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process.
(See FOTG Section III - Resource Planning Criteria for guidance).

I. Effects of Alternatives

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	***No Action*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC	***Alternative 1*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC	***Alternative 2*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC
SOIL						
No resource concern identified Short-term compaction due to construction equipment	Temporary short-term impact from breach activities with no long-term effects.	☐ NOT meet PC	Temporary short-term impact from construction activities with no long-term effects.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
WATER						
No resource concern identified Sediment is retained in the conservation pool.	Sediment would no longer be retained because there would no longer be an impoundment. Potential short-term negative impact from construction activities and long-term negative impact from increased sediment transport.	☐ NOT meet PC	Temporary short-term impact from construction activities with long term sediment retention (aerated and submerged) would increase from 53 acft in the existing condition to 101 acft in the proposed condition. A storm water pollution plan would be developed to mitigate for erosion during construction.	☐ NOT meet PC	Not Considered	☐ NOT meet PC

I. (continued)

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	***No Action*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC	***Alternative 1*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC	***Alternative 2*** Amount, Status, Description ***(Document both short and long term impacts)***	√ if does NOT meet PC
AIR						
No resource concern identified Adair County is in the Metro-politan Intrastate Air Quality Control Region. Adair County is in attainment for all criteria pollutants (USEPA, 2021).	No change from baseline conditions are anticipated. Any effects from dam breach activities would be negligible and short-term.	☐ NOT meet PC	The proposed action is not anticipated to result in non-attainment for any criteria pollutant. Any effects from dam rehabilitation activities would be negligible and short-term.	☐ NOT meet PC	Not Considered	☐ NOT meet PC

PLANTS							
No resource concern identified No federal or state listed plant species were identified. Wetland vegetation occurs along shoreline, scrub/shrub habitat at plunge pool with herbaceous ground cover and sapling trees on dam.	Temporary short-term impact from construction with long-term loss of lacustrine vegetation being replaced with riverine and riparian vegetation.	☐ NOT meet PC	No effects to federal or state listed plant species. Vegetation species composition is not expected to change. Minimal temporary disruption to vegetation is expected with construction.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
ANIMALS							
No resource concern identified Project site contains lotic fish habitat and foraging areas for wading and shore birds and foraging and loafing habitat for waterfowl. Dam presents a barrier for movement for some aquatic species.	Loss of aquatic habitat resulting in mortality of some aquatic species and displacement of mobile species. Temporary increase in food items for scavengers. Change in aquatic and wetland species composition in response to change in habitat, including a restored corridor of movement for some aquatic species. Upland species would not be significantly impacted.	☐ NOT meet PC	Potential temporary reduction of aquatic habitat resulting in displacement of some species. Shoreline plants should increase in the short-term and provide a boost in food items when pool returns to normal. Upland species will not be significantly impacted.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
ENERGY							
No resource concern identified	N/A	☐ NOT meet PC	N/A	☐ NOT meet PC	Not Considered	☐ NOT meet PC
Human Economic and Social Considerations							
Public Health and Safety S-13 doesn't meet current safety criteria and a catastrophic breach could result in the loss of life and property.	Risks of loss of life from catastrophic breach would be removed. Flood prevention downstream would be vacated.		Risk of loss of life would be reduced, as would flooding risk to that deemed acceptable under the dam safety criteria. Decrease in risk of flooding and catastrophic loss from dam breach. Would bring S-13 dam into compliance with the current NRCS and Oklahoma safety performance standards.		Potential losses to homes and businesses downstream would be avoided by relocating and/or floodproofing structures. Potential negative impact for families and livelihoods due to relocation of structures.	
Capital Adair Conservation District is the project sponsor and relies on state appropriations for funding.	Funding would be the responsibility of the sponsor.		Federal funding is available to offset capital costs expended by the Adair County Conservation District under PL 83-566		Relocation and/or floodproofing homes and businesses would be cost prohibitive and therefore Alternative 2 is no longer being considered.	

Special Environmental Concerns: Environmental Laws, Executive Orders, policies, etc.

In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "●" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.

G. Special Environmental Concerns (Document existing/ benchmark conditions)	**J. Impacts to Special Environmental Concerns**					
	No Action		***Alternative 1***		***Alternative 2***	
	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action
●Clean Air Act ***Guide Sheet*** Adair County is in the Metropolitan Intrastate Air Quality Control Region. Adair County is in attainment for all criteria pollutants.	May Effect The FWOFI scenario is not anticipated to result in non-attainment for any criteria pollutant. Impacts from breach would be minor and temporary. Short-term impacts of particulate matter (PM) from equipment emissions and dust.	☐	May Effect The proposed action is not anticipated to result in non-attainment for any criteria pollutant. Impacts from construction would be minor and temporary. Short-term impacts of PM from equipment emissions and dust.	☐	Not Considered	☐

●Clean Water Act / Waters of the U.S. ***Guide Sheet*** FWRS 13 is constructed on and impounds an unnamed tributary to Sallisaw Creek. Sallisaw Creek is listed as a Category 2 stream and is designated as "High Quality Waters" and FWRS 13 is within a HQW area. Alternatives will require USACE 404 permit as well as State Water Quality Certification through ODEQ.	May Effect Potential short-term impact due to loss of sediment retained in conservation pool downstream during dam breach activities. Increased sediment deposition into downstream channel to interfere with flow and change channel alignment via bank erosion and scour. Consultation with regulatory agencies necessary.	☑	May Affect Temporary impacts due to construction activities should be short-term and mitigated for with BMP. A larger principle spillway pipe may increase flow, but this is not expected to provide significant changes is stream morphology or species habitat downstream. If is anticipated that activities would qualify for the Nationwide Permit 03.	☑	Not Considered	☐
●Coastal Zone Management ***Guide Sheet*** NA	No Effect The project site is in Oklahoma.	☐	No Effect The project site is in Oklahoma.	☐	NA	☐
Coral Reefs ***Guide Sheet*** NA	No Effect The project site is in Oklahoma.	☐	No Effect The project site is in Oklahoma.	☐	NA	☐
●Cultural Resources / Historic Properties ***Guide Sheet*** No previously designated historic-age resources within the APE.	No Effect Recommend a finding of No Historic Properties Present.	☑	No Effect No previously designated historic-age resources within the APE. Finding of No Historic Properties Present submitted to SHPO and OAS for concurrence.	☑	Not Considered	☐
●Endangered and Threatened Species ***Guide Sheet*** Listed species occur in Adair County, but not at the project site. Species identified by the IPAC include: gray bat, Indiana bat, Northern long-eared bat, Ozark big-eared bat, piping plover, red knot, American burying beetle, and monarch butterfly. Potential habitat present for gray bat, Indiana bat, NLEB, ABB, American burying beetle and monarch.	May Affect NLEB and Indiana Bat - A few potential maternity or roost trees occur in the area of impact. Grey bat would be potentially impacted by a reduction in foraging habitat. Activities could result in direct adverse impacts on ABB and monarch. ABB and monarch habitat would be expected to increase as moist soil type plants recolonize the sediment pool providing nectar and potential host plants.	☑	May Affect NLEB and Indiana Bat - A few potential maternity or roost trees occur in the area of impact. Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 - Mar 31). Grey Bat - Short-term indirect impacts to foraging habitat from water drawdown with no long-term impacts as habitat returns. Construction activities will be initiated prior to early migration (Apr - Jun 15) to avoid direct mortality. ABB take is not prohibited via 4(d) rule. USFWS consultation rendered a May Affect - Not Likely to Adversely Affect determination (4/25/22; IPaC Project Consultation Code: 2022-0032520)	☐	Not Considered	☐
Environmental Justice ***Guide Sheet*** 2010 Census data does not show census tracts in the proposed project area in which the percentage of minorities is greater than the county or state average. The data does not show census tracts in the proposed project area in which the percentage of low-income population is greater than the county or state average.	No Effect A change in flooding frequency and risk would be shared equally, regardless of poverty level and/or race.	☐	No Effect Project would have a benefit to local population, regardless of poverty level or race.	☐	Not Considered	☐
●Essential Fish Habitat ***Guide Sheet*** The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	No Effect The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	☐	No Effect The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	☐	Not Considered	☐

Floodplain Management ***Guide Sheet*** Areas downstream of the existing dam are in Zone A. Floodplain function altered by past dam construction.	May Affect Areas downstream of the existing dam are in Zone A. Breach of the dam would change the boundaries of Zone A. The occurrence of flooding would increase but the function of the floodplain would be partially restored.	☐	No Effect Floodplain will continue to function as it currently does with a reduced risk from flooding due to a catastrophic dam failure.	☐	Not Considered	☐
Invasive Species ***Guide Sheet*** No species of concern were observed. Invasive species were not noted on the dams or within the project area.	May Affect Exposure of soil will increase the risk of introducing invasive species.	☐	May Affect Exposure of soil will increase the risk of introducing invasive species. Contractors are required to clean equipment prior to brining on site to avoid introducing invasive species.	☐	Not Considered	☐
●Migratory Birds/Bald and Golden Eagle Protection Act ***Guide Sheet*** An eagle was observed in a tree in the upper end of the pool, but no nest was observed. There is migratory bird habitat for water and shorebirds, as well as some shrub habitat on dam and along riparian area.	May Effect Birds may be indirectly impacted by construction actives and directly by potential impacts to nest. Activities would net rise to the level to affect population status of any avian species.	☐	May Effect Short-term adverse effect (avoidance) during equipment operation. Construction and/or vegetation clearing prior to construction will occur outside the primary nesting season to minimize impacts to nest. Activities would net rise to the level to affect population status of any avian species.	☐	Not Considered	☐
Natural Areas ***Guide Sheet*** No designated Natural Areas occur in or in proximity to project area.	No Effect Not present within project boundary.	☐	No Effect Not present within project boundary.	☐	Not Considered	☐
Prime and Unique Farmlands ***Guide Sheet*** Negligible, less than 1 acre, Prime Farmland exists at project site.	No Effect There would be no conversion of Prime Farmland at the project site.	☐	No Effect Negligible Prime Farmland at project site.	☐	Not Considered	☐
Riparian Area ***Guide Sheet*** Riparian areas are present both up and downstream of FWRS 13.	May Affect Vegetation composition along shoreline may change with a different water regime. The breach needed to pass the 100-year event would restore the stream riparian corridor. A long-term impact of loss of habitat along conservation pool but gain in stream riparian habitat.	☐	May Affect A negative short-term impact from water withdrawal. This short-term impact to the existing riparian areas is not anticipated to have a negative impact since the flora and faunal communities are accustomed and prefer areas that are inundated. No long-term effects anticipated.	☐	Not Considered	☐
Scenic Beauty ***Guide Sheet*** There are no specifically designated unique or valuable scenic landscapes in the project area.	No Effect There are no specifically designated unique or valuable scenic landscapes in the project area. The visual landscape will be altered with dam breach.	☐	No Effect There are no specifically designated unique or valuable scenic landscapes in the project area. The visual landscape will be largely unchanged.	☐	Not Considered	☐
●Wetlands ***Guide Sheet*** Fringe wetland vegetation along the edge of the conservation pool are potentially under the jurisdiction of the United States Army Corpus of Engineers.	May Affect Breaching the dam would drain the conservation pool and would adversely impact the lacustrine fringe wetland habitat.	☐	May Affect There would be no change in the amount of wetlands. Short-term dewatering during construction would benefit some shoreline plants increasing biomass and food resources in the short-term after the pool returns to normal elevation.	☐	Not Considered	☐
●Wild and Scenic Rivers ***Guide Sheet*** No Wild or Scenic Rivers occur in the project area.	No Effect No Wild or Scenic Rivers occur in the project area.	☐	No Effect No Wild or Scenic Rivers occur in the project area.	☐	Not Considered	☐

K. Other Agencies and Broad Public Concerns	No Action	Alternative 1	Alternative 2
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.	Sponsor would complete necessary consultations.	Easements, permissions, public review, and permits required would be pursued when final project details are complete. A USACE 404 permit will be required as well as consultations and/or clearances from the USFWS, OSA & the SHPO.	Not Considered
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)	Changes in ecological function. Long-term loss of lotic habitat with substantial gains in lentic habitat as well as riparian buffers. Long-term negative impacts to sites developed within the floodplain from the elimination of flood prevention.	With dam in place development downstream will likely continue. Adverse effects are short-term with no long-term effects except for a reduced risk of catastrophic dam failure and an increased life.	Not Considered
L. Mitigation (Record actions to avoid, minimize, and compensate)		No compensatory mitigation required however mitigation efforts need to avoid or minimize impacts include; - Eliminating potential roost/nesting trees prior to IB & NLEB active season ((Nov 15 – Mar 31). - Initiate construction activities or remove nesting and monarch brood habitat prior to the primary nesting season (Apr 1 – Jul 1). - Clean equipment prior to bringing on site. - Use and install BMP to control erosion	
M. Preferred Alternative √ preferred alternative	☐	☑	☐
Supporting reason		Sponsor preference that continues to meet the project purpose.	

N. Context (Record context of alternatives analysis) | local | regional |

The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.

O. To the best of my knowledge, the data shown on this form is accurate and complete:

In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.

Signature (TSP if applicable)	Title	Date
Signature (NRCS)	Title	Date

If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client then indicate to whom this is being provided.

The following sections are to be completed by the Responsible Federal Official (RFO)

NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.

P. Determination of Significance or Extraordinary Circumstances

To answer the questions below, consider the severity (intensity) of impacts in the contexts identified above. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.

Yes	No	
☐	☐	• Is the preferred alternative expected to cause significant effects on public health or safety?
☐	☐	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?
☐	☐	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?
☐	☐	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?

☐	☐	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?
☐	☐	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?
☐	☐	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.
☐	☐	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?

Q. NEPA Compliance Finding (check one)

The preferred alternative:		**Action required**
☐	1) is **not a federal action** where the agency has control or responsibility.	Document in "R.1" below. No additional analysis is required
☐	2) is a federal action **ALL** of which is **categorically excluded** from further environmental analysis **AND** there are **no extraordinary circumstances as identified in Section "P".**	Document in "R.2" below. No additional analysis is required
☑	3) is a federal action that has been **sufficiently analyzed** in an existing Agency state, regional, or national NEPA document **and** there are no predicted significant adverse environmental effects or extraordinary circumstances.	Document in "R.1" below. No additional analysis is required.
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects **and has been formally adopted by NRCS**. NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (**Note: This box is not applicable to FSA)**	Contact the State Environmental Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required
☐	5) is a federal action that has **NOT** been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Liaison. Further NEPA analysis required.

R. Rationale Supporting the Finding

R.1 Findings Documentation	No Additional analysis is required; activities tiered to the Environmental Impact Statement (ESI) - Rehabilitation of Aging Flood Control Dams in Oklahoma, August 2002, Reviewed in April 2007, April 2012 and April 2017.
R.2 Applicable Categorical Exclusion(s) **(more than one may apply)** 7 CFR Part 650 ***Compliance With NEPA***, subpart 650.6 ***Categorical Exclusions*** states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	

I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.

S. Signature of Responsible Federal Official:

Signature	**Title**	**Date**

Additional notes

U.S. Department of Agriculture — NRCS-CPA-52
Natural Resources Conservation Service — 11/2019

ENVIRONMENTAL EVALUATION WORKSHEET

A. Client Name: Adair County Conservation District

B. Conservation Plan ID # (as applicable)**:**
Program Authority (optional)**:** PL 83-566

C. Identification # (farm, tract, field #, etc. as required)**:**
Sallisaw Creek Floodwater Retarding Structure No. 19

D. Client's Objective(s) (purpose):
To bring the dam associated with FWRS 19 into compliance with current safety standards reducing the risk of loss of life due to catastrophic dam failure.

E. Need for Action:
The Need for the proposed action is to continue to provide flood protection to properties downstream. Modifications to the dam would provide capacity to safely contain the 100-year, 10-day storm. The proposed action should reduce the future magnitude, extent, frequency, and duration of flooding problems in the Sallisaw Creek Watershed area protected by the S-19. Sallisaw Creek S-19 would continue to protect homes, businesses, crops, roads, bridges, and land and water resources.

H. Alternatives

No Action √ if RMS ☐	*Alternative 1* √ if RMS ☐	*Alternative 2* √ if RMS ☐
The Future Without Federal Investment would involve a sponsor breach of the dam to remove its ability to impound water. A breach would include clearing and grubbing, excavation/removal of the dam embankment, onsite and offsite disposal of excavated material, minor stream channel modification, revegetation, and structure removal.	Rehabilitation to NRCS performance standards for a high hazard dam while maintaining pool area. Replace 30" PSW with 48" pipe and new impact basin. Construct ASW over the top of south end of dam using roller compacted concrete, widen to 400', and lower crest by 5.9'. ASW moved to south end of dam to improve access and direct outflow away from railroad and better lineup with creek. Fill old 200' ASW to top of dam elevation. Add left (south) abutment drain. Add upstream face riprap wave protection. Repair pipe with flapgate that goes form railroad ROW near north abutment to east for drainage relief.	Rehabilitation of FWRS 19 to current low hazard criteria includes acquisition of easements for property that is located within the 100-year recurrence interval floodplain that would otherwise be protected by a dam as well as upgrading roads and bridges to account for inundation potential. Will also include the relocation and/or floodproofing of structures below the dam. This alternative was eliminated from detailed study due to exorbitant cost. High cost is derived primarily from acquisition of easements downstream of dam.

Resource Concerns

In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process. (See FOTG Section III - Resource Planning Criteria for guidance).

I. Effects of Alternatives

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	*No Action* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*No Action* — √ if does NOT meet PC	*Alternative 1* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*Alternative 1* — √ if does NOT meet PC	*Alternative 2* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*Alternative 2* — √ if does NOT meet PC
SOIL						
No resource concern identified Short-term compaction due to construction equipment	Temporary short-term impact from breach activities with no long-term effects.	☐ NOT meet PC	Temporary short-term impact from construction activities with no long-term effects.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
WATER						
No resource concern identified Sediment is retained in the conservation pool.	Sediment would no longer be retained because there would no longer be an impoundment. Potential short-term negative impact from construction activities and long-term negative impact from increased sediment transport.	☐ NOT meet PC	Temporary short-term impact from construction activities with long term sediment retention (aerated and submerged) would increase from 374 acft in the existing condition to 532 acft in the proposed condition. A storm water pollution plan would be developed to mitigate for erosion during construction.	☐ NOT meet PC	Not Considered	☐ NOT meet PC

I. (continued)

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	*No Action* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*No Action* — √ if does NOT meet PC	*Alternative 1* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*Alternative 1* — √ if does NOT meet PC	*Alternative 2* — **Amount, Status, Description** ***(Document both short and long term impacts)***	*Alternative 2* — √ if does NOT meet PC
AIR						
No resource concern identified Adair County is in the Metro-politan Intrastate Air Quality Control Region. Adair County is in attainment for all criteria pollutants (USEPA, 2021).	No change from baseline conditions are anticipated. Any effects from dam breach activities would be negligible and short-term.	☐ NOT meet PC	The proposed action is not anticipated to result in non-attainment for any criteria pollutant. Any effects from dam rehabilitation activities would be negligible and short-term.	☐ NOT meet PC	Not Considered	☐ NOT meet PC

PLANTS							
No resource concern identified No federal or state listed plant species were identified. Wetland vegetation occurs along shoreline, scrub/shrub habitat at plunge pool with herbaceous ground cover and sapling trees on dam.	Temporary short-term impact from construction with long-term loss of lacustrine vegetation being replaced with riverine and riparian vegetation.	☐ NOT meet PC	No effects to federal or state listed plant species. Vegetation species composition is not expected to change. Minimal temporary disruption to vegetation is expected with construction.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
ANIMALS							
No resource concern identified Project site contains lotic fish habitat and foraging areas for wading and shore birds and foraging and loafing habitat for waterfowl. Dam presents a barrier for movement for some aquatic species.	Loss of aquatic habitat resulting in mortality of some aquatic species and displacement of mobile species. Temporary increase in food items for scavengers. Change in aquatic and wetland species composition in response to change in habitat, including a restored corridor of movement for some aquatic species. Upland species would not be significantly impacted.	☐ NOT meet PC	Potential temporary reduction of aquatic habitat resulting in displacement of some species. Shoreline plants should increase in the short-term and provide a boost in food items when pool returns to normal.	☐ NOT meet PC	Not Considered	☐ NOT meet PC
ENERGY							
No resource concern identified	N/A	☐ NOT meet PC	N/A	☐ NOT meet PC	Not Considered	☐ NOT meet PC
Human Economic and Social Considerations							
Public Health and Safety S-19 doesn't meet current safety criteria and a catastrophic breach could result in the loss of life and property.	Risks of loss of life from catastrophic breach would be removed. Flood prevention downstream would be vacated.		Would bring S-19 dam into compliance with the current NRCS and Oklahoma safety performance standards.Reduced risk of catestrophic breach, loss of life, and flooding to that deemed acceptable under the dam safety criteria. Redirecting ASW flow away from the railroad will reduce associated risk.		Potential losses to homes and businesses downstream would be avoided by relocating and/or floodproofing structures. Potential negative impact for families and livelihoods due to relocation of structures.	
Capital Adair Conservation District is the project sponsor and relies on state appropriations for funding.	Funding would be the responsibility of the sponsor.		Federal funding is available to offset capital costs expended by the Adair County Conservation District under PL 83-566		Relocation and/or floodproofing homes and businesses would be cost prohibitive and therefore Alternative 2 is no longer being considered.	

Special Environmental Concerns: Environmental Laws, Executive Orders, policies, etc.

In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "●" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.

G. Special Environmental Concerns (Document existing/ benchmark conditions)	**J. Impacts to Special Environmental Concerns**					
	No Action		***Alternative 1***		***Alternative 2***	
	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action
●Clean Air Act ***Guide Sheet*** Adair County is in the Metropolitan Intrastate Air Quality Control Region. Adair County is in attainment for all criteria pollutants.	May Effect The FWOFI scenario is not anticipated to result in non-attainment for any criteria pollutant. Impacts from breach would be minor and temporary. Short-term impacts of particulate matter (PM) from equipment emissions and dust.	☐	May Effect The proposed action is not anticipated to result in non-attainment for any criteria pollutant. Impacts from construction would be minor and temporary. Short-term impacts of PM from equipment emissions and dust.	☐	Not Considered	☐

●Clean Water Act / Waters of the U.S. ***Guide Sheet*** FWRS 19 is constructed on and impounds approximately 2,300 feet of Sallisaw Creek. Sallisaw Creek is listed as a Category 2 stream and is designated as "High Quality Waters". Alternatives will require USACE 404 permit as well as State Water Quality Certification through ODEQ.	May Effect Potential short-term impact due to loss of sediment being retained in conservation pool from dam breach activities. Increased sediment deposition into downstream channel to interfere with flow and change channel alignment via bank erosion and scour. Consultation with regulatory agencies necessary.	☑	May Affect Temporary impacts due to construction activities should be short-term and mitigated for with BMP. A larger principle spillway pipe may increase flow, but this is not expected to provide significant changes is stream morphology or species habitat downstream. If is anticipated that activities would qualify for the Nationwide Permit 03.	☑	Not Considered	☐
●Coastal Zone Management ***Guide Sheet*** NA	No Effect The project site is in Oklahoma.	☐	No Effect The project site is in Oklahoma.	☐	NA	☐
Coral Reefs ***Guide Sheet*** NA	No Effect The project site is in Oklahoma.	☐	No Effect The project site is in Oklahoma.	☐	NA	☐
●Cultural Resources / Historic Properties ***Guide Sheet*** No previously designated historic-age resources within the APE.	No Effect Recommend a finding of No Historic Properties Present.	☑	No Effect No previously designated historic-age resources within the APE. Recommend a finding of No Historic Properties Present. SHPO and OAS concurrence needed.	☑	Not Considered	☐
●Endangered and Threatened Species ***Guide Sheet*** Listed species occur in Adair County, but not at the project site. Species identified by the IPAC include: gray bat, Indiana bat, Northern long-eared bat, Ozark big-eared bat, piping plover, red knot, and Monarch butterfly. Potential habitat present for gray bat, Indiana bat, NLEB and monarch.	May Affect NLEB and Indiana Bat - A few potential maternity or roost trees occur in the area of impact. Grey bat would be potentially impacted by a reduction in foraging habitat. Monarch habitat would be expected to increase as moist soil type plants recolonize the sediment pool providing nectar and potential host plants.	☐	May Affect NLEB and Indiana Bat - A few potential maternity or roost trees occur in the area of impact. Potential maternity/roost trees will be felled during the bats inactive period (Nov 15 - Mar 31). Grey Bat - Short-term indirect impacts to foraging habitat from water drawdown with no long-term impacts as habitat returns. Construction activities will be initiated prior to early migration (Apr - Jun 15) to avoid direct mortality. USFWS consultation rendered a May Affect - Not Likely to Adversely Affect determination (4/25/22; IPaC Project Consultation Code: 2022-0032520)	☐	Not Considered	☐
Environmental Justice ***Guide Sheet*** 2010 Census data does not show census tracts in the proposed project area in which the percentage of minorities is greater than the county or state average. The data does not show census tracts in the proposed project area in which the percentage of low-income population is greater than the county or state average.	No Effect A change in flooding frequency and risk would be shared equally, regardless of poverty level and/or race.	☐	No Effect Project would have a benefit to local population, regardless of poverty level or race.	☐	Not Considered	☐
●Essential Fish Habitat ***Guide Sheet*** The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	No Effect The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	☐	No Effect The project area, both dam and pond, are not designated as Essential Fish Habitat as noted on the National Oceanic and Atmospheric Administration Essential Fish Habitat Mapper.	☐	Not Considered	☐
Floodplain Management ***Guide Sheet*** Areas downstream and upstream of the existing dam are in Zone A. Floodplain function altered by past dam construction.	May Affect Areas downstream and upstream of the existing dam are in Zone A. Breach of the dam would change the boundaries of Zone A. The occurrence of flooding would increase but the function of the floodplain would be partially restored.	☐	No Effect Floodplain will continue to function as it currently does with a reduced risk from flooding due to a catastrophic dam failure. Lowering the ASW will reduce flooding impacts above the site.	☐	Not Considered	☐

Invasive Species ***Guide Sheet*** No species of concern were observed. Invasive species were not noted on the dams or within the project area.	May Affect Exposure of soil will increase the risk of introducing invasive species.	☐	May Affect Exposure of soil will increase the risk of introducing invasive species. Contractors are required to clean equipment prior to brining on site to avoid introducing invasive species.	☐	Not Considered	☐
●Migratory Birds/Bald and Golden Eagle Protection Act ***Guide Sheet*** No eagles or their nests were observed. There is migratory bird habitat for water and shorebirds, as well as some shrub habitat on dam and along riparian area.	May Effect Birds may be indirectly impacted by construction actives and directly by potential impacts to nest. Activities would net rise to the level to affect population status of any avian species.	☐	May Effect Short-term adverse effect (avoidance) during equipment operation. Construction and/or vegetation clearing prior to construction will occur outside the primary nesting season to minimize impacts to nest. Activities would net rise to the level to affect population status of any avian species.	☐	Not Considered	☐
Natural Areas ***Guide Sheet*** No designated Natural Areas occur in or in proximity to project area.	No Effect Not present within project boundary.	☐	No Effect Not present within project boundary.	☐	Not Considered	☐
Prime and Unique Farmlands ***Guide Sheet*** Negligible, less than 1 acre, Prime Farmland exists at project site.	No Effect There would be no conversion of Prime Farmland at the project site.	☐	No Effect Negligible Prime Farmland at project site.	☐	Not Considered	☐
Riparian Area ***Guide Sheet*** Riparian areas are present both up and downstream of FWRS 19.	May Affect Vegetation composition along shoreline may change with a different water regime. The breach needed to pass the 100-year event would restore the stream riparian corridor. A long-term impact of loss of habitat along conservation pool but gain in stream riparian habitat.	☐	May Affect A negative short-term impact from water withdrawal. This short-term impact to the existing riparian areas is not anticipated to have a negative impact since the flora and faunal communities are accustomed and prefer areas that are inundated. No long-term effects anticipated.	☐	Not Considered	☐
Scenic Beauty ***Guide Sheet*** There are no specifically designated unique or valuable scenic landscapes in the project area.	No Effect There are no specifically designated unique or valuable scenic landscapes in the project area. The visual landscape will be altered with dam breach.	☐	No Effect There are no specifically designated unique or valuable scenic landscapes in the project area. The visual landscape will be largely unchanged.	☐	Not Considered	☐
●Wetlands ***Guide Sheet*** Fringe wetland along the edge of the conservation pool are potentially under the jurisdiction of the United States Army Corpus of Engineers. Some wetlands are indicated on the National Wetland Inventory downstream of the dam.	May Affect Breaching the dam would drain the conservation pool and would adversely impact the lacustrine fringe wetland habitat. Breaching would restore in part the normal hydrology to the forested/shrub wetland immediately downstream of the dam.	☐	May Affect There would be no change in the amount of wetlands. Short-term dewatering during construction would benefit some shoreline plants increasing biomass and food resources in the short-term after the pool returns to normal elevation. Hydrology to wetlands below the dam would remain at their current level.	☐	Not Considered	☐
●Wild and Scenic Rivers ***Guide Sheet*** No Wild or Scenic Rivers occur in the project area.	No Effect No Wild or Scenic Rivers occur in the project area.	☐	No Effect No Wild or Scenic Rivers occur in the project area.	☐	Not Considered	☐
K. Other Agencies and Broad Public Concerns	***No Action***		***Alternative 1***		***Alternative 2***	
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.	Sponsor would complete necessary consultations.		Easements, permissions, public review, and permits required would be pursued when final project details are complete. A USACE 404 permit will be required as well as consultations and/or clearances from the USFWS, OSA & the SHPO.		Not Considered	
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)	Changes in ecological function. Long-term loss of lotic habitat with substantial gains in lentic habitat as well as riparian buffers. Long-term negative impacts to sites developed within the floodplain from the elimination of flood prevention.		With dam in place development downstream will likely continue. Adverse effects are short-term with no long-term effects except for a reduced risk of catastrophic dam failure and an increased life.		Not Considered	

L. Mitigation (Record actions to avoid, minimize, and compensate)			No compensatory mitigation required however mitigation efforts need to avoid or minimize impacts include; - Eliminating potential roost/nesting trees prior to IB & NLEB active season ((Nov 15 – Mar 31). - Initiate construction activities or remove nesting and monarch brood habitat prior to the primary nesting season (Apr 1 – Jul 1). - Clean equipment prior to bringing on site. - Use and install BMP to control erosion	
M. Preferred Alternative	√ preferred alternative	☐	☑	☐
	Supporting reason		Sponsor preference that continues to meet the project purpose.	

N. Context (Record context of alternatives analysis) | local | regional |

The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.

O. To the best of my knowledge, the data shown on this form is accurate and complete:

In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.

Signature (TSP if applicable)	**Title**	**Date**
Signature (NRCS)	**Title**	**Date**

If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client then indicate to whom this is being provided.

The following sections are to be completed by the Responsible Federal Official (RFO)

NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.

P. Determination of Significance or Extraordinary Circumstances

To answer the questions below, consider the severity (intensity) of impacts in the contexts identified above. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.

Yes	No	
☐	☐	• Is the preferred alternative expected to cause significant effects on public health or safety?
☐	☐	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?
☐	☐	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?
☐	☐	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?
☐	☐	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?
☐	☐	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?
☐	☐	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.
☐	☐	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?

Q. NEPA Compliance Finding (check one) The preferred alternative:		Action required
☐	1) is **not a federal action** where the agency has control or responsibility.	Document in "R.1" below. No additional analysis is required
☐	2) is a federal action **ALL** of which is **categorically excluded** from further environmental analysis **AND** there are **no extraordinary circumstances as identified in Section "P".**	Document in "R.2" below. No additional analysis is required
☑	3) is a federal action that has been **sufficiently analyzed** in an existing Agency state, regional, or national NEPA document **and** there are no predicted significant adverse environmental effects or extraordinary circumstances.	Document in "R.1" below. No additional analysis is required.
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects **and has been formally adopted by NRCS**. NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (**Note: This box is not applicable to FSA)**	Contact the State Environmental Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required
☐	5) is a federal action that has **NOT** been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Liaison. Further NEPA analysis required.

R. Rationale Supporting the Finding	
R.1 Findings Documentation	No Additional analysis is required; activities tiered to the Environmental Impact Statement (ESI) - Rehabilitation of Aging Flood Control Dams in Oklahoma, August 2002, Reviewed in April 2007, April 2012 and April 2017.
R.2 Applicable Categorical Exclusion(s) **(more than one may apply)** 7 CFR Part 650 ***Compliance With NEPA*** , subpart 650.6 ***Categorical Exclusions*** states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	

I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.

S. Signature of Responsible Federal Official:

Signature	Title	Date

Additional notes

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		BY	Sarah Wenzel	DATE	4/21/23
DAM	Sallisaw Site 13		CHECKED BY		DATE	
YEAR BUILT	1966	DESIGN HAZARD CLASS	L	DRAINAGE AREA	1.93	mi^2
WORK PLAN DATE		CURRENT HAZARD CLASS	H	DAM HEIGHT	48	ft
sht 1 of 3	STATIC FAILURE SCENARIO (ver. 2013-01)				NID ID	OK00076

Structures (Elevated) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=2.0 Ft.	PAR
	Inundation Depth Above Natural Ground		Total		
	<2.0 Ft	>=2.0 Ft.			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Inundation Depth Above Natural Ground		Total		
	<1.0 Ft	>=1.0 Ft.			
Homes	1	4	5	3	12
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	1	1		0
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Church	0	1	1		0

Highways and Railroads	Number of Roads, Highways and Railways			PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Road Overflow Depth		Total		
	<1.0 Ft	>=1.0 Ft.			
Main Local Roads and Minor State Highways					
Bunch Rd.	0	1	1	2	2
Name(s) (if applicable)	0	0		2	
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	0		3	
Passenger Traffic	0	0		20	

TOTAL NUMBER OF PEOPLE AT RISK (PAR)	14

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		BY	Sarah Wenzel	DATE	4/21/23
DAM	Sallisaw Site 13		CHECKED BY		DATE	
YEAR BUILT	1966	DESIGN HAZARD CLASS	L	DRAINAGE AREA	1.93	mi^2
WORK PLAN DATE		CURRENT HAZARD CLASS	H	DAM HEIGHT	48	ft
sht 2 of 3	HYDROLOGIC FAILURE SCENARIO (ver. 2013-01)				NID ID	OK00076

Structures (Elevated) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=2.0 Ft.	PAR
	Inundation Depth Above Natural Ground		Total		
	<2.0 Ft	>=2.0 Ft.			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	Number of Structures			PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Inundation Depth Above Natural Ground		Total		
	<1.0 Ft	>=1.0 Ft.			
Homes	1	4	5	3	12
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	1	1		0
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Church	0	1	1		0

Highways and Railroads	Number of Roads, Highways and Railways			PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Road Overflow Depth		Total		
	<1.0 Ft	>=1.0 Ft.			
Main Local Roads and Minor State Highways					
Bunch Rd.	0	1	1	2	2
Name(s) (if applicable)	0	0		2	
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	0		3	
Passenger Traffic	0	0		20	

TOTAL NUMBER OF PEOPLE AT RISK (PAR)	14

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		BY	Sarah Wenzel	DATE	4/21/23
DAM	Sallisaw Site 13		CHECKED BY		DATE	
YEAR BUILT	1966	DESIGN HAZARD CLASS	L	DRAINAGE AREA	1.93	mi^2
WORK PLAN DATE		CURRENT HAZARD CLASS	H	DAM HEIGHT	48	ft
sht 3 of 3	SEISMIC FAILURE SCENARIO (ver. 2013-01)				NID ID	OK00076

Structures (Elevated) Impacted by Potential Breach	Number of Structures		Total	PAR per Exposure with Inundation Depths >=2.0 Ft.	PAR
	Inundation Depth Above Natural Ground				
	<2.0 Ft	>=2.0 Ft.			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	Number of Structures		Total	PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Inundation Depth Above Natural Ground				
	<1.0 Ft	>=1.0 Ft.			
Homes	0	0		3	
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	0			
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Church	0	0			

Highways and Railroads	Number of Roads, Highways and Railways		Total	PAR per Exposure with Inundation Depths >=1.0 Ft.	PAR
	Road Overflow Depth				
	<1.0 Ft	>=1.0 Ft.			
Main Local Roads and Minor State Highways					
Name(s) (if applicable)	0	0		2	
Name(s) (if applicable)	0	0		2	
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	0		3	
Passenger Traffic	0	0		20	

TOTAL NUMBER OF PEOPLE AT RISK (PAR)	0

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		**BY**	Sarah Wenzel	**DATE**	4/21/23
DAM	Sallisaw Site 19		**CHECKED BY**		**DATE**	
YEAR BUILT	1968	**DESIGN HAZARD CLASS**	L	**DRAINAGE AREA**	12.75	mi^2
WORK PLAN DATE		**CURRENT HAZARD CLASS**	H	**DAM HEIGHT**	61	ft
sht 1 of 3	**STATIC FAILURE SCENARIO (ver. 2013-01)**				**NID ID**	OK00082

Structures (Elevated) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=2.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<2.0 Ft	**>=2.0 Ft.**			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Homes	3	0	3	3	0
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	0			
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Churches	1	0	1		0
Electrical Substation	0	1	1		0

Highways and Railroads	**Number of Roads, Highways and Railways**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Road Overflow Depth		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Main Local Roads and Minor State Highways					
S4680 Rd S4660 Rd E888 Rd E 908 Rd S4641 Rd	0	5	5	2	10
Name(s) (if applicable)	0	0		2	
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	1	1	3	3
Passenger Traffic	0	0		20	
TOTAL NUMBER OF PEOPLE AT RISK (PAR)					**13**

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		**BY**	Sarah Wenzel	**DATE**	4/21/23
DAM	Sallisaw Site 19		**CHECKED BY**		**DATE**	
YEAR BUILT	1968	**DESIGN HAZARD CLASS**	L	**DRAINAGE AREA**	12.75	mi^2
WORK PLAN DATE		**CURRENT HAZARD CLASS**	H	**DAM HEIGHT**	61	ft
sht 2 of 3	**HYDROLOGIC FAILURE SCENARIO (ver. 2013-01)**				**NID ID**	OK00082

Structures (Elevated) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=2.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<2.0 Ft	**>=2.0 Ft.**			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Homes	1	6	7	3	18
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	0			
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Churches	0	1	1		0
Electrical Substation	0	1	1		0

Highways and Railroads	**Number of Roads, Highways and Railways**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Road Overflow Depth		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Main Local Roads and Minor State Highways					
S4680 Rd S4660 Rd E888 Rd E 908 Rd S4641 Rd	0	5	5	2	10
Name(s) (if applicable)	0	0		2	
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	1	1	3	3
Passenger Traffic	0	0		20	
TOTAL NUMBER OF PEOPLE AT RISK (PAR)					**31**

COMPUTATION OF POPULATION AT RISK (PAR) DURING DAM FAILURE

STATE	Oklahoma		**BY**	Sarah Wenzel	**DATE**	4/21/23
DAM	Sallisaw Site 19		**CHECKED BY**		**DATE**	
YEAR BUILT	1968	**DESIGN HAZARD CLASS**	L	**DRAINAGE AREA**	12.75	mi^2
WORK PLAN DATE		**CURRENT HAZARD CLASS**	H	**DAM HEIGHT**	61	ft
sht 3 of 3	**SEISMIC FAILURE SCENARIO (ver. 2013-01)**				**NID ID**	OK00082

Structures (Elevated) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=2.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<2.0 Ft	**>=2.0 Ft.**			
Mobile Homes	0	0		3	
Seasonal Use RV's	0	0		2	
Other	0	0			

Structures (With Foundations) Impacted by Potential Breach	**Number of Structures**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Inundation Depth Above Natural Ground		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Homes	0	0		3	
Seasonal Use Homes and Cabins	0	0		1.5	
Duplexes	0	0		5	
Apartments	0	0			
Commercial Buildings	0	0			
Schools (In Use)	0	0			
Schools (Not in Use)	0	0			
Hospitals	0	0			
Churches	1	0	1		0
Electrical Substation	0	1	1		0

Highways and Railroads	**Number of Roads, Highways and Railways**			**PAR per Exposure with Inundation Depths >=1.0 Ft.**	**PAR**
	Road Overflow Depth		**Total**		
	<1.0 Ft	**>=1.0 Ft.**			
Main Local Roads and Minor State Highways					
E908 Rd.	1	0	1	2	0
S4680 Rd.	0	1	1	2	2
Major State and Minor Federal Highways					
Highway Name(s) or Number(s)	0	0		4	
Highway Name(s) or Number(s)	0	0		4	
Major Federal and Interstate Highways					
Highway Name(s) or Number(s)	0	0		8	
Highway Name(s) or Number(s)	0	0		8	
Railroads					
UPSF Freight Traffic Only	0	1	1	3	3
Passenger Traffic	0	0		20	
TOTAL NUMBER OF PEOPLE AT RISK (PAR)					**5**

Memorandum

To:	NRCS
From:	Larry Sample, P.E. Wood Environment & Infrastructure Solutions, Inc on behalf of the Conservation Works Joint Venture Team
Project:	Sallisaw Creek Watershed Site 13 and Site 19 Rehabilitation Planning
Task Order No:	12SFPC321F0137
Date:	04/18/2022
Subject:	Watershed Dam Routings Memorandum

Introduction

The Conservation Works Joint Venture (CWJV) team was tasked with completing flood frequency analyses for Sallisaw Creek Site 13 and Site 19. For the hydrology and hydraulics analyses we used "rain-on-grid" in HEC-RAS 6.0 to simulate runoff and flooding events in the watershed. The results were used to make comparisons with and without each dam to determine the flood reduction benefits associated with each dam. Using the rain-on-grid method allows for variable runoff to be calculated for each cell and thus hydrologic flows routing downstream. The flow is routed on the topographic grid that is developed based on LiDAR and survey elevations. For the hydrology and hydraulics to be accurate the topographic data had to be hydro-enforced allowing flow through various types of barriers such as culverts in road embankments.

Purpose of this Memorandum

In the H&H report it was noted that most of the auxiliary spillways of existing flood control dams were not activated by the 100-year, 24-hour frequency event It also notes that some auxiliary spillways were not activated by the 500-year, 24-hour frequency event. Since many the flood control dams in the watershed were designed as low hazard dams with 4% (25-year, 24-hour event) chance of auxiliary spillway activation it did not seem logical that so many of the auxiliary spillways were not being activated by the 100-year and 500-year events. Therefore, CWJV reviewed the HEC-RAS modelling, SITES modelling, and as-builts of Sites 13 and 19 to determine what / if there is a specific reason why the auxiliary spillways of the existing dams (both designed and built as low hazard dams) were not being activated by the 100-year and 500-year rainfall events.

Potential Reasons for Auxiliary Spillways Not Being Activated

There are several potential explanations for the low hazard dams not flowing their auxiliary spillways during a 100-year or even a 500-year event. These explanations can be split into three categories; 1. Routing differences associated "rain-on-grid" HEC-RAS modelling; 2. Changes in the accuracy of topographic data and hydrologic parameters of the watershed; and 3. Flood control dams designed with only orifice riser inlets that restricted principal spillway outflow and caused the dam to be designed with significantly more detention volume.

Rain-on-Grid Routing Method

With the rain-on-grid method, runoff and infiltration is calculated based on the runoff curve number and flow downstream is based on 2D computations routing from one grid cell to the adjacent grid cells representing the topography. With this method runoff is routed downstream but every embankment and/or detention area that is in the topographic data is accounted for and contributes to the attenuation of the peak flow being routed through the model mesh. CWJV did add hydro-connectors and breaklines to represent roads, bridges and culverts in the model. However, any form of topographic barrier or ponding area within the drainage area of a dam would provide some level of attenuation to the inflow hydrograph which, in turn, will result in a lower peak reservoir level for each rainfall event compared to the traditional methods of hydraulic routings.

Changes in Available Data

For this project there are two modelling parameters that can significantly impact the results of the flood routings. The first is the runoff curve number (CN) and the second is more accurate topographic data.

CWJV found that the CN used back in the 1960's is much higher than what we have concluded the CN should be based on the existing soil and land use data. Site 13 was designed based on the CN = 84, but our analysis determined that the CN for the Site 13 drainage area should be 71. Site 19 was designed based on the CN = 82, but our analysis determined that the CN for the Site 19 drainage area should be 71. This reduction on the CN value does have a significant impact on the runoff that is routed through the model. To examine this, we used SITES models to compare the difference in peak inflow and the peak reservoir water surface elevation for a 100-year, 24-hour storm event.

Dam	CN	100-yr Peak Inflow (cfs)	100-yr Peak Reservoir Elev. (feet)
Site 13	71	3,954	880.40
Site 13	84	5,091	884.04
Site 19	71	8,214	976.00
Site 19	82	10,413	979.72

Based on the results of this analysis it was confirmed that the lower CN resulted in approximately a 20% reduction in peak flow and roughly a 3.5 feet lower peak reservoir level. The existing auxiliary spillway elevations for Site 13 and Site 19 are 888.90 feet and 980.70 respectively. This is important to note because according the watershed work plan both dams were designed as low hazard dams with auxiliary spillways (ASW) designed to be activated with a 4% chance (25-year) event. Note that even with the higher original design CN that the 100-year event does not activate either ASW. Based on this analysis, it is clear that the lower runoff curve number, alone, significantly impacts the peak reservoir level of routed frequency events.

The topographic data available today is significantly more accurate than the data available in the 1960's. We compared the stage storage table developed from the 2021 survey and available LiDAR data to the stage storage curves shown in the as-builts for Site 13 and Site 19.

Dam	Current Storage at ASW Elev. (ac-ft)	Current Storage at TOD Elev. (ac-ft)	Storage at ASW Elev. From As-Built (ac-ft)	Storage at TOD Elev. From As-Built (ac-ft)
Site 13	881	1,065	800	1,000
Site 19	4,612	5,252	5,000	6,000

This analysis did not show a significant impact from improved topography.

Designed Detention Storage for Orifice Only Principal Spillways

Site 13 was originally designed with a covered riser that only had a 10" x 13" orifice opening in the riser. This significantly restricts the outflow from the principal spillway. Thus, to account for the restricted flow and slow drawdown time the detention storage for the dam was significantly increased. For example, for Site 13, high hazard criteria requires the "initial Reservoir Elevation" to start the SDH and FBH routings under the current PSW configuration is 880.23 feet which is nearly 20 feet above the permanent pool elevation of 860.2 feet. For the frequency analysis the starting elevations for the frequency events are at the normal pool elevation or essentially the PSW elevation. This

is a distinct difference between dam design routing criteria and flood frequency routing criteria. The existing ASW crest elevation for Site 13 is 888.90 feet which is a resultant of the PSW restricted orifice flow and additional storage required for the dam's design. Routing 100-year, 24-hour and 500-year, 24-hour events through Site 13 with the reservoir level starting at the PSW elevation yields maximum water surface elevations of 881.65 and 887.39 feet, respectively. That means that even the 500-year rainfall event is 1.5 feet below the ASW crest.

Therefore, any of the flood control dams, modelled in the HEC-RAS flood frequency analyses, that were designed with a similar type of riser and additional storage to account for a slow drawdown likely have enough additional storage to contain the 100-year and 500-year frequency events. For the flood frequency analysis there were 11 dams out 23 dams that have this type of riser configuration.

Comparison of SITES and HEC-RAS

The water surface elevations for the 100-year, 24-hour rainfall event were compared between SITES results and HEC-RAS. Since there are no attenuation barriers within the Site 13 drainage area this analysis was used to determine if the HEC-RAS model and SITES were in general agreement on the reservoir level produced from a 100-year, 24-hour rainfall event. In general, the peak water surface elevations were found to be in agreement (less than 0.7-feet of difference).

The comparison for Site 19 (which does have several roads and small farm ponds within the drainage area) showed a slightly lower water surface elevations for the HEC-RAS model which was expected due to an attenuated inflow hydrograph caused by the roads and small farm pond detention storage.

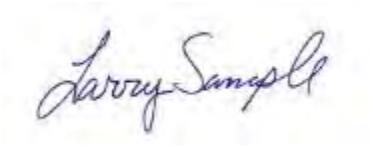
Dam	CN	SITES 100-yr Peak Reservoir Elev. (feet)	HEC-RAS 100-yr Peak Reservoir Elev. (feet)
Site 13	71	881.65	880.79
Site 13	84	885.55	884.72
Site 19	71	976.00	974.85

In addition to the above analysis, the HEC-RAS 100-year, 24-hour flow just upstream of the railroad bridge near Bunch, OK was compared to the Oklahoma StreamStats flow estimates. The flow at this location from the HEC-RAS model is 9,886 cfs and the flow from StreamStats (Region 2 NRCS Regulated) is 10,400 cfs. This indicates to us that the rain-on-grid HEC-RAS model we developed has produced reasonable flood frequency results.

Summary of Analyses

Based on results of the analyses, CWJV has determined that the use of a lower CN has the largest impact on the flood control dams not showing auxiliary spillway activation during a 100-year and even a 500-year event. In addition, road embankments and shallow ponding areas with the drainage area of each modelled dam can impact the attenuation of the peak flow and ultimately reduce the peak water surface elevation in each dam.

In conclusion, it is the opinion of the CWJV team that using the less conservative rain-on-grid modelling method and the lower runoff curve numbers, that more accurately represent the land use in the watershed, produce the most accurate flood frequency results that can be obtained with the existing available data.



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S13 SITES ANALYSIS SUMMARY

Hydrologic Parameters
A review of the original and existing hydrologic parameters and hazard classification information is accumulated in this document as a summary.

Table 1 – Hydrologic Parameters

Parameter	Assessment Value
Watershed Area (mi^2)	1.96
Time of Concentration (hr)	0.853
Curve Number	71

The data shown in Table 1 is the current information for the uncontrolled drainage area of S13. It was developed using Geographic Information System (GIS) processes and measurements.

Rainfall-Runoff and Basin Parameters
Rainfall depths for the 100-year and PMP storm events used for all NRCS alternatives and analyses were taken from Atlas 14 (National Oceanic and Atmospheric Administration, 2013). Rainfall depths for the PMP storm events used for all NRCS alternatives and analyses were developed using HMR51 (National Oceanic and Atmospheric Administration, 1978) and HMR52 (National Oceanic and Atmospheric Administration, 1982). See Table 2 for a summary of rainfall for storm events used in the hydraulic analysis of Sallisaw S19.

The Water Resources Site Analysis Program (SITES) was used to check if the existing site configuration meets current NRCS high hazard criteria and Oklahoma WRB small, high hazard criteria based on the hazard classification analysis. The current principal spillway configuration of Sallisaw 19 is a riser with orifice and 24-inch diameter RC barrel.

Table 2 – Rainfall and Storm Summary

Rainfall	
50% PMF, 24-hour (OWRB)	16.31
100-Year, 6-hour Rainfall, (inches)	8.56
100-Year, 24-hour Rainfall, (inches)	13.8
SDH 6-Hour (inches)	11.22
SDH 24-Hour (inches)	15.30
PMP FBH 6-Hour (inches)	25.91
PMP FBH 24-Hour (inches) (Tropical)	34.49

Stage-Storage

A stage-storage table was developed using the results of the survey and LiDAR information. This table was utilized in SITES.

Table34 – SITES Stage-Storage Table

Elevation (Feet)	Storage Vol. (Acre Feet)	Elevation (Feet)	Storage Vol. (Acre Feet)
850.0	0.0	876.0	358.6
854.0	4.2	878.0	421.1
856.0	12.6	880.0	489.5
860.0	43.9	882.0	564.5
860.2	46.1	884.0	646.7
862.0	66.3	884.7	678.0
864.5	103.2	886.0	736.2
866.0	125.3	888.0	833.4
868.0	161.9	890.0	939.3
870.0	203.2	892.4	1089.9
872.0	249.9	896.0	1315.8
874.0	301.7	900.0	1616.2

Sediment Analysis

The surface as surveyed in 2021 surveyed stage storage was compared to the As-Built surface. The two storages are presented in Table 5 with the difference between the two being presented in the table below. It was also assumed that additional excavation was created during construction of the dam from excavation of the earth fill material. Dam fill was calculated at 1334,000 Cu. Yds and 50% of this volume was excavated from the pool area. The submerged sediment is identified below the principal spillway elevation of 860.2. The total submerged sediment 48.25 acre-feet. This is the difference between the storages at the PSW elevation from the As-Built and current survey. The aerated sediment volume is 15% of the total sediment volume, or 8.52 acre-feet.

Table 4 – Summary Table of Storage

Elevation (Feet)	***As Built Storage (ac-ft)***	***Assessment Storage (ac-ft)***	***Submerged Sediment (ac-ft)***	***Data Source***
850	*5*	*0*	*0*	*2021 Survey*
855	*22.4*	*7.4*	*15*	*2021 Survey*
860	*91.5*	*43.2*	*48.3*	*2021 Survey*

Sediment Analysis - S13

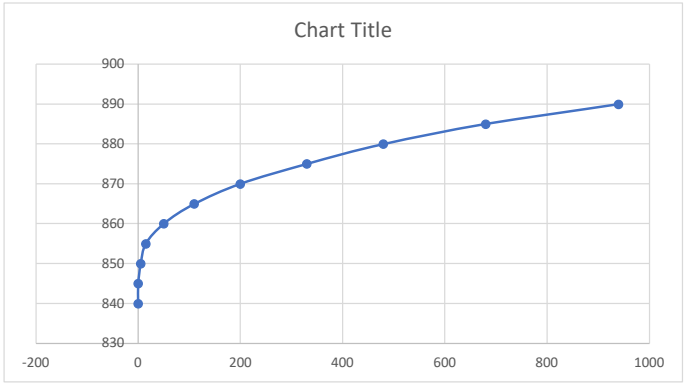
Elevation	As Built Storage (acre feet)
840	0
845	0
850	5
855	15
860	50
865	110
870	200
875	330
880	480
885	680
890	940
895	1250

Sediment pool El.
860.2

Auxiliary Spillway El.
888.5

Top of Dam El.
892

Dam fill * 133850 CY
82.96 AC-FT
*assume 1/2 excavated from permanent pool area



Current

Elevation	Storage (yd^3)	Storage (acre feet)	Submerged Sediment
840	0	0.00	0.00
845	0	0.00	0.00
850	0	0.00	0.00
855	11924.52	7.39	7.61
860	69745.39	43.23	6.77

Submerged Sedimentation Volume (acre-feet) **48.25** = Storage Current El. 860 - Storage As Built El. 860
Aerated Sedimentation Volume (acre-feet) **8.52** As the aerated sedimentation volume as computed between the as-built plans and the current survey was negative, we made the assumption that 85% of s

Top layer of soil is primarily CL-ML, therefore CL-ML sediment is assumed

Submerged Sedimentation		
Volume	acre-foot	48.25
Volume	ft^3	2101840.73
CL-ML Volume-weight	lb/ft^3	50.00
Weight	lb	105092036.40
Weight	tons	525460.18

Aerated Sedimentation		
Volume	acre-foot	8.52
Volume	ft^3	370913.07
CL-ML Volume-weight	lb/ft^3	80.00
Weight	lb	29673045.57
Weight	tons	148365.23

Submerged Sedimentation Weight (tons) **525460.18**
Aerated Sedimentation Weight (tons) **148365.23**
Dam design life: **100**

Years 56 - As built 1965

Submerged Rate of Sedimentation Volume	**acre-feet/year**	**0.86**	86.2	
Submerged Rate of Sedimentation Weight	**tons/year**	**9383.22**		
Aerated Rate of Sedimentation Volume	**acre-feet/year**	**0.15**	15.2	101.4
Aerated Rate of Sedimentation Weight	**tons/year**	**2649.38**		

The following table outlines the planned sediment accumulation rate and the actual sedimentation rate for the 56 service years the dam has been operational. A higher sediment volume and rate should be used for the proposed rehabilitation design.

Table 5 – Summary Table of Storage

Elevation (Feet)	***Design (ac-ft/year)***	***Actual (ac-ft)***
Submerged Sedimentation Rate	*0.45*	*0.86*
Aerated Sedimentation Rate	*0.08*	*0.15*

SITES Analysis

All SITES models are provided in a digital deliverable. See a summary of these deliverables in the design report.

Table 6 – Results of Reservoir Routing for Proposed Conditions

Event	**Rainfall Depth (inches)**	**Peak Inflow (cfs)**	**Peak Discharge (cfs)**	**Peak Stage NAVD 88 (feet)**	**Exit Channel Velocity (fps)**
NRCS TR-60 HIGH HAZARD DESIGN STORM EVENTS					
PSH	8.56	-	-	860.2	N/A
SDH 6-hr	11.22	5,261	1,420	882.8	8.2
FBH 6-hr	25.91	15,483	10,714	888.9	-
SDH 24-hr	15.30	2,222	1,629	887.5	8.8
FBH 24-hr	34.49	5,343	5,323	890.5	-
OWRB DESIGN STORM CHECK					
0.5 PMP, 24-hr	16.31[1]	2,434	2,250	888.3	10.6

1. OWRB requires using AMC III which resulted in a CN of 86.
2. OWRB requires 1 foot minimum freeboard above the 50% PMF WS.

Table 7 – Results of Alternatives Analysis

S13	Existing	Required	**Alt 1** 30" Cond 120' ASW ASW -8.5' Lower Dam	**Alt 2** 36" Cond 100' ASW ASW -9.2' Lower Dam	**Alt 3** 30" Cond 120' ASW ASW -4.2'	**OWRB Check**
			6 HR / 24 HR	**6 HR / 24 HR**	**6 HR / 24 HR**	
Sediment	860.2	864.5	864.5	864.5	864.5	863.5
PSW	860.2		860.2	860.2	860.2	860.2
Conduit Diam	24 inch		30 inch	36 inch	30 inch	30 inch
Drawdown Days	> 30 days	< 10days	2.59	2.45	2.59	
Max WS SDH	892.4	892.3	882.8 / 883.5	882.3 / 883.1	882.8 / 887.6	
Max WS FBH	892.4	897.2	888.9 / 886.0	888.9 / 885.9	888.9 / 890.5	888.2
ASW	888.9	891.6	880.4	879.7	884.7	884.7
ASW Width	40'		120'	100'	120'	120'
Exit Channel Vel	11.37		8.2 / 9.5	8.8 / 10.0	8.2 / 8.8	10.6
T/Dam	892.4		888.9	888.9	890.5	892.1
Dam Height	48		44.8	44.8	47.9	47.9

Table 8 – Summary of the Existing and Proposed Design

General Data			**EXISTING**		**PROPOSED**	
Name of Dam	Sallisaw Creek Watershed Dam No. 13					
Latitude	35.68568	degrees	Longitude	-94.78343	degrees	
Construction Completed			September 20, 1966			
Embankment Type			Zoned Earthfill			
Purpose(s)			Flood Control			
Hazard Classification			Low		High	
Design Life			50	years	100	years
Drainage Area			1.93	sq. mi.	1.96	sq. mi.
Runoff Curve Number			84		71	
Maximum Dam Height			48	feet	48	feet
Elevations			**EXISTING**		**PROPOSED**	
Top of Dam			892.4	feet	892.4	feet
Principal Spillway Crest			860.2	feet	860.2	feet
Outlet Pipe Downstream Invert			845.4	feet	845.4	feet
Auxiliary Spillway Crest			888.9	feet	884.7	feet
Spillway Dimensions			**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width			40	feet	120	Feet
Principal Spillway Diameter			24	inches	30	inches
Storage			**EXISTING**		**PROPOSED**	
Submerged Sediment Storage			45	acre-feet	86	acre-feet
Aerated Sediment Storage			8	acre-feet	15	acre-feet
Permanent Pool			53	acre-feet	46	acre-feet
ASW Pool			855	acre-feet	678	Acre-feet
Maximum Pool			1,094	acre-feet	1,083	Acre-feet

Figure 1. SITES Alternatives Analysis as of 04-19-2022

	S13 EX PSW Check	S13 EX FBH Check	S13_6 hr Alt1	S13_24 hr Alt1	S13_6 hr_alt 2	S13_24 hr_alt 2	S13_6 hr_alt 3	S13_24 hr_alt 3	S13_OWR_alt 3	S13 100yr FF Check	S13 100yr FF Check2	S13 500yr FF Check
Site Identification	S13	S13	S13	S13	S13	S13	S13	S13	S13	S13	S13	S13
Watershed Runoff Curve Number	71.	71.	71.	71.	71.	71.	71.	71.	98.	71.	84.	71.
Total Watershed Drainage Area (Sq.Miles)	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Watershed Time of Concentration (Hours)	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SDH Rainfall Total (Inches)	N/A	11.22	11.22	15.30	11.22	15.30	11.22	15.30	16.31	N/A	N/A	N/A
SDH Rainfall Duration (Hours)	N/A	6.0	6.0	24.0	6.0	24.0	6.0	24.0	24.0	N/A	N/A	N/A
FBH or Storm Rainfall Total (Inches)	N/A	25.91	25.91	34.49	25.91	34.49	25.91	34.49	16.31	8.56	8.56	11.10
FBH or Storm Rainfall Duration (Hours)	N/A	6.0	6.0	24.0	6.0	24.0	6.0	24.0	24.0	24.0	24.0	24.0
SDH Inflow Peak (CFS)	N/A	5261.0	5261.0	2067.6	5261.0	2067.6	5261.0	2222.7	2433.4	N/A	N/A	N/A
FBH or Storm Inflow Peak (CFS)	N/A	15483.1	15483.1	5017.8	15483.1	5017.8	15483.1	5343.7	2433.4	3954.3	5090.6	5740.3
Initial Reservoir Elevation (Feet)	880.23	880.23	864.50	864.50	864.50	864.50	864.50	864.50	860.20	860.20	860.20	860.20
Maximum WS SDH (Feet)	N/A	892.30	882.74	883.47	882.25	883.02	882.74	887.54	888.24	N/A	N/A	N/A
Maximum WS FBH or Storm (Feet)	N/A	897.20	888.90	886.01	888.88	885.89	888.90	890.44	888.24	881.65	885.55	887.39
Storage at Max. WS FBH or Storm (Acre-Ft)	N/A	1594.7	884.1	737.6	882.4	731.8	884.1	971.3	847.2	588.2	725.3	804.5
Top Dam (Feet)	N/A	897.20	888.90	886.01	888.88	885.89	888.90	890.44	888.24	N/A	N/A	N/A
Storage, Top Dam (Acre-Ft)	N/A	1427.0	881.0	737.0	880.0	731.0	881.0	967.0	846.0	N/A	N/A	N/A
Emb. Yardage (CY)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PSH Drawdown (Days)	N/A	N/A	2.59	N/A	2.45	N/A	2.59	N/A	N/A	N/A	N/A	N/A
378 Drawdown (Days)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Crest (Feet)	860.20	860.20	860.20	860.20	860.20	860.20	860.20	860.20	860.20	860.20	860.20	860.20
PS Number of Conduits	1	1	1	1	1	1	1	1	1	1	1	1
PS Conduit Diameter (Inches)	24.0	24.0	30.0	30.0	36.0	36.0	30.0	30.0	30.0	24.0	24.0	24.0
PS Conduit Height (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Conduit Width (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Conduit Area (Sq. Feet)	3.14	3.14	4.91	4.91	7.07	7.07	4.91	4.91	4.91	3.14	3.14	3.14
Storage, PS Crest (Acre-Ft)	47.	47.	46.	46.	46.	46.	46.	46.	46.	47.	47.	47.
PS Discharge at AS Crest (CFS)	73.0	24.9	109.4	109.8	167.5	168.2	109.4	116.3	117.6	23.0	23.0	23.0
PS Discharge for SDH (CFS)	N/A	25.3	113.4	114.5	174.3	176.1	113.4	120.4	122.8	N/A	N/A	N/A
PS Discharge FBH or Storm (CFS)	N/A	27.8	122.4	118.2	189.3	182.7	122.4	124.5	122.8	19.2	21.5	22.4
AS Crest (Feet)	891.60	891.60	880.18	880.40	879.42	879.70	880.18	884.70	884.70	888.90	888.90	888.90
Storage, AS Crest (Acre-Ft)	1047.4	1047.4	496.4	504.5	469.7	479.2	496.4	678.0	678.0	855.0	855.0	855.0
AS Width (Feet)	N/A	40.	120.	120.	100.	100.	120.	120.	120.	N/A	N/A	N/A
AS Exit Slope (%)	N/A	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	N/A	N/A	N/A
AS Ret. Curve Index	N/A	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	N/A	N/A	N/A
AS Veg. Cover Factor	N/A	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	N/A	N/A	N/A
AS Maintenance Code	N/A	1	1	1	1	1	1	1	1	N/A	N/A	N/A
AS Max. Head SDH (Feet)	N/A	0.70	2.56	3.07	2.82	3.32	2.56	2.84	3.54	N/A	N/A	N/A
AS Peak Discharge SDH/Storm (CFS)	N/A	1071.1	1306.5	1795.2	1279.7	1700.9	1306.5	1508.1	2249.9	N/A	N/A	N/A
AS Exit Velocity SDH or Storm (Ft/S)	N/A	11.37	8.15	9.51	8.77	10.02	8.15	8.75	10.55	N/A	N/A	N/A
AS Stress SDH or Storm (Lb./Sq.Ft.)	N/A	0.421	0.219	0.285	0.250	0.314	0.219	0.248	0.340	N/A	N/A	N/A
Hp FBH or Storm (Feet)	N/A	5.60	8.72	5.61	9.46	6.19	8.72	5.74	3.54	N/A	N/A	N/A
AS Peak Discharge FBH/Storm (CFS)	N/A	8572.	10592.	4881.	10285.	4819.	10592.	5198.	2250.	N/A	N/A	N/A
AS Integ. Dist. FBH or Storm (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oe/B FBH or Storm (Acre-Ft/Ft)	N/A	42.3	14.8	21.2	17.6	24.8	14.8	19.4	7.4	N/A	N/A	N/A
Uncontrolled Drainage Area (Sq.Miles)	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Number of Errors	0	0	0	0	0	0	0	0	0	0	0	0
Number of Warnings	0	1	0	0	0	0	0	0	0	1	1	1

S19 SITES ANALYSIS SUMMARY

Hydrologic Parameters
A review of the original and existing hydrologic parameters and hazard classification information is accumulated in this document as a summary.

Table 1 – Hydrologic Parameters

Parameter	Assessment Value
Watershed Area (mi^2)	12.45
Time of Concentration (hr)	3.63
Curve Number	71

The data shown in Table 1 is the current information for the uncontrolled drainage area of S19. It was developed using Geographic Information System (GIS) processes and measurements.

Rainfall-Runoff and Basin Parameters
Rainfall depths for the 100-year and PMP storm events used for all NRCS alternatives and analyses were taken from Atlas 14 (National Oceanic and Atmospheric Administration, 2013). Rainfall depths for the PMP storm events used for all NRCS alternatives and analyses were developed using HMR51 (National Oceanic and Atmospheric Administration, 1978) and HMR52 (National Oceanic and Atmospheric Administration, 1982). See Table 2 for a summary of rainfall for storm events used in the hydraulic analysis of Sallisaw S19.

The Water Resources Site Analysis Program (SITES) was used to check if the existing site configuration meets current NRCS high hazard criteria and Oklahoma WRB medium, high hazard criteria based on the hazard classification analysis. The current principal spillway configuration of Sallisaw 19 is a riser with orifice and 30-inch diameter RC barrel.

Table 2 – Rainfall and Storm Summary

Rainfall	
50% PMF, 24-hour (OWRB)	23.64
100-Year, 6-hour Rainfall, (inches)	6.1
100-Year, 24-hour Rainfall, (inches)	8.42
100-Year, 10-day Rainfall, (inches)	13.8
SDH 6-Hour (inches)	10.52
SDH 24-Hour (inches)	14.69
PMP FBH 6-Hour (inches)	23.44
PMP FBH 24-Hour (inches) (Tropical)	32.88

Stage-Storage

A stage-storage table was developed using the results of the survey and LiDAR information. This table was utilized in SITES.

Table 3 – SITES Stage-Storage Table

Elevation (Feet)	Storage Vol. (Acre Feet)	Elevation (Feet)	Storage Vol. (Acre Feet)
928.0	0.0	966.0	1781.9
932.0	2.8	968.0	2061.7
937.0	51.4	970.0	2371.9
940.0	113.3	972.0	2712.2
945.0	259.1	974.0	3085.2
948.7	401.3	974.8	3248.8
950.0	451.2	976.0	3494.3
951.7	542.7	978.0	3941.5
955.0	720.4	980.0	4427.2
960.0	1108.5	982.0	4956.4
962.0	1307.7	984.5	5398.8
964.0	1531.3	985.0	5841.2

Sediment Analysis

The surface as surveyed in 2021 surveyed stage storage was compared to the As-Built surface. The two storages are presented in Table 4 with the difference between the two being presented in the table below. It was also assumed that additional excavation was created during construction of the dam from excavation of the earth fill material. Dam fill was calculated at 367,270 Cu. Yds and all of this volume was assumed to be excavated from the pool area. The submerged sediment is identified below the principal spillway elevation of 948.2. The total submerged sediment 248.9 acre-feet. This is the difference between the storages at the PSW elevation from the As-Built and current survey. The aerated sediment volume is 15% of the total sediment volume, so 43.9 acre-feet.

Table 4 – Summary Table of Storage

Elevation (Feet)	***As Built Storage (ac-ft)***	***Assessment Storage (ac-ft)***	***Submerged Sediment (ac-ft)***	***Data Source***
930	*0*	*0*	*0*	*2021 Survey*
935	*48.3*	*32.0*	*16.3*	*2021 Survey*
940	*233.0*	*113.3*	*119.7*	*2021 Survey*
945	*508.0*	*259.1*	*248.9*	*2021 Survey*

Sedimentation Analysis - S19

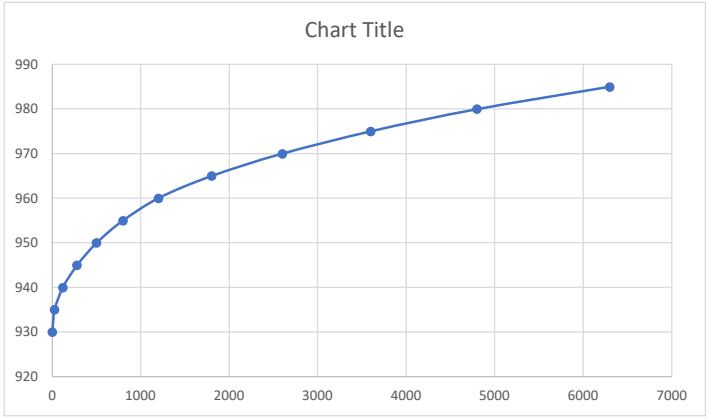
Elevation	As Built Storage (acre feet)
930	0
935	25
940	120
945	280
950	500
955	800
960	1200
965	1800
970	2600
975	3600
980	4800
985	6300

Sediment pool El.
948.2

Auxiliary Spillway El.
980.2

Top of Dam El.
984.6

Dam fill * 367270 CY
227.65 AC-FT
*assume excavated from permanent pool area



Elevation	Current Storage (yd^3)	Storage (acre feet)	Submerged Sediment
930	0	0.00	0.00
935	37569.82	23.29	1.71
940	182289.43	112.99	7.01
945	417467.18	258.76	21.24

Submerged Sedimentation Volume (acre-feet) **248.89** = Storage Current El. 945 - Storage As Built El. 945
Aerated Sedimentation Volume (acre-feet) **43.92** = (Storage Current El. 985 - Storage As Built El. 985) - Submerged Sediment Volume

Top layer of soil is primarily CL-ML, therefore CL-ML sediment is assumed

Submerged Sedimentation		
Volume	acre-foot	248.89
Volume	ft^3	10841427.81
CL-ML Volume-weight	lb/ft^3	50.00
Weight	lb	542071390.32
Weight	tons	2710356.95

Aerated Sedimentation		
Volume	acre-foot	43.92
Volume	ft^3	1913193.14
CL-ML Volume-weight	lb/ft^3	80.00
Weight	lb	153055451.39
Weight	tons	765277.26

Submerged Sedimentation Weight (tons) **2710356.95**
Aerated Sedimentation Weight (tons) **765277.26**
Dam design life: **100**

Years 55 - As built 1966

Submerged Rate of Sedimentation Volume	**acre-feet/year**	**4.53**	452.52	
Submerged Rate of Sedimentation Weight	**tons/year**	**49279.22**		
Aerated Rate of Sedimentation Volume	**acre-feet/year**	**0.80**	79.86	532.38
Aerated Rate of Sedimentation Weight	**tons/year**	**13914.13**		

The following table outlines the planned sediment accumulation rate and the actual sedimentation rate for the 56 service years the dam has been operational. A higher sediment volume and rate should be used for the proposed rehabilitation design.

Table 5 – Summary Table of Storage

Elevation (Feet)	***Design (ac-ft/year)***	***Actual (ac-ft)***
Submerged Sedimentation Rate	*3.13*	*4.53*
Aerated Sedimentation Rate	*0.61*	*0.80*

SITES Analysis

All SITES models are provided in a digital deliverable. See a summary of these deliverables in the design report.

Table 6 – Results of Reservoir Routing for Proposed Conditions

Event	Rainfall Depth (inches)	Peak Inflow (cfs)	Peak Discharge (cfs)	Peak Stage NAVD 88 (feet)	Exit Channel Velocity (fps)
NRCS TR-60 HIGH HAZARD DESIGN STORM EVENTS					
PSH	8.42	-	372	784.8	N/A
SDH 6-hr	10.52	12,551	4,639	977.5	10.54
FBH 6-hr	23.44	36,422	28,797	983.0	-
SDH 24-hr	14.69	11,159	7,242	978.3	13.1
FBH 24-hr	32.88	28,417	27,105	982.8	-
OWRB DESIGN STORM CHECK					
0.75 PMP, 24-hr	23.64[1]	21,764	20,781	981.5	20.26

1. OWRB requires using AMC III which resulted in a CN of 86.
2. OWRB requires 3 foot minimum freeboard above the 75% PMF WS.

Table 7 – Alternatives Analysis

S19	**Existing**	**Alt 1** 54” Cond 400’ ASW Lower Dam	**Alt 2** 60” Cond 400’ ASW Lower Dam	**Alt 3** 48” Cond 400’ ASW ASW -5.9’	**OWR Check Alt 3**
		6 HR / 24 HR	**6 HR / 24 HR**	**6 HR / 24 HR**	
Sediment		950.0	950.0	950.0	950.0
PSW	948.7	948.7	948.7	948.7	948.7
Conduit Diam	30 inch	54 inch	60 inch	48 inch	48 inch
Max WS SDH		977.6 / 977.6	976.0 / 976.5	977.6 / 678.4	981.5
Max WS FBH		982.5 / 981.9	981.3 / 980.7	983.1 / 982.8	981.5
ASW	980.7	973.9	972.8	974.8	974.8
ASW Width	200’	400’	400’	400’	400’
Exit Channel Vel		11.3 / 13.5	11.8 / 13.6	10.8 / 13.2	20.3
T/Dam	984.5	982.4	981.3	984.5	984.5
Dam Height	61	58.9	57.8	61	61

Table 8 – Summary of the Existing and Proposed Design

General Data			**EXISTING**		**PROPOSED**	
Name of Dam	Sallisaw Creek Watershed Dam No. 19					
Latitude	35.76778	degrees	Longitude	-94.66672	degrees	
Construction Completed			June 20, 1698			
Embankment Type			Zoned Earthfill			
Purpose(s)			Flood Control			
Hazard Classification			Low		High	
Design Life			50	years	100	years
Drainage Area			12.75	Sq. mi.	12.45	sq. mi.
Runoff Curve Number			82		71	
Maximum Dam Height			61	feet	61	feet
Elevations (MSL)			**EXISTING**		**PROPOSED**	
Top of Dam			984.5	feet	984.5	feet
Principal Spillway Crest			948.7	feet	948.7	feet
Outlet Pipe Downstream Invert			930.5	feet	930.5	feet
Auxiliary Spillway Crest			980.7	feet	974.8	feet
Spillway Dimensions			**EXISTING**		**PROPOSED**	
Auxiliary Spillway Width			200	feet	400	Feet
Principal Spillway Diameter			30	inches	48	inches
Storage			**EXISTING**		**PROPOSED**	
Submerged Sediment Storage			313	acre-feet	452	acre-feet
Aerated Sediment Storage			61	acre-feet	80	acre-feet
Permanent Pool			374	acre-feet	401	acre-feet
ASW Pool			4,796	acre-feet	3,249	Acre-feet
Maximum Pool			6,367	acre-feet	5,840	Acre-feet

Figure 1. SITES Alternatives Dam Analysis as of 10/07/21

	S19_6 hr	S19_24 hr	S19_6 hr_alt 2	S19_24 hr_alt 2	S19_6 hr_alt 3	S19_24 hr_alt 3	S19_OWR_alt 3
Site Identification	S19	S19	S19	S19	S19	S19	S19
Watershed Runoff Curve Number	71.	71.	71.	71.	71.	71.	100.
Total Watershed Drainage Area (Sq.Miles)	12.45	12.45	12.45	12.45	12.45	12.45	12.45
Watershed Time of Concentration (Hours)	3.63	3.63	3.63	3.63	3.63	3.63	3.63
SDH Rainfall Total (Inches)	10.68	14.69	10.52	14.69	10.52	14.69	23.64
SDH Rainfall Duration (Hours)	6.0	24.0	6.0	24.0	6.0	24.0	24.0
FBH or Storm Rainfall Total (Inches)	23.80	32.88	23.44	32.88	23.44	32.88	23.64
FBH or Storm Rainfall Duration (Hours)	6.0	24.0	6.0	24.0	6.0	24.0	24.0
SDH Inflow Peak (CFS)	12824.6	11159.0	12550.7	11159.0	12550.7	11159.0	21763.9
FBH or Storm Inflow Peak (CFS)	36421.8	28416.9	35760.3	28416.9	35760.3	28416.9	21763.9
Initial Reservoir Elevation (Feet)	950.00	950.00	950.00	950.00	950.00	950.00	950.00
Maximum WS SDH (Feet)	976.86	977.52	975.89	976.54	977.53	978.31	981.51
Maximum WS FBH or Storm (Feet)	982.36	981.87	981.27	980.71	983.04	982.75	981.51
Storage at Max. WS FBH or Storm (Acre-Ft)	5062.6	4929.5	4768.6	4624.8	5263.1	5177.6	4836.2
Top Dam (Feet)	982.36	981.87	981.27	980.71	983.04	982.75	981.51
Storage, Top Dam (Acre-Ft)	5063.0	4921.0	4762.0	4616.0	5264.0	5177.0	4827.0
Emb. Yardage (CY)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PSH Drawdown (Days)	4.72	N/A	4.76	N/A	N/A	N/A	N/A
378 Drawdown (Days)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Crest (Feet)	948.70	948.70	948.70	948.70	948.70	948.70	948.70
PS Number of Conduits	1	1	1	1	1	1	1
PS Conduit Diameter (Inches)	54.0	54.0	60.0	60.0	48.0	48.0	48.0
PS Conduit Height (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Conduit Width (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PS Conduit Area (Sq. Feet)	15.90	15.90	19.63	19.63	12.57	12.57	12.57
Storage, PS Crest (Acre-Ft)	401.	401.	401.	401.	401.	401.	401.
PS Discharge at AS Crest (CFS)	484.0	484.1	609.2	609.1	371.9	371.9	371.9
PS Discharge for SDH (CFS)	500.4	503.9	631.0	635.5	383.2	386.4	399.1
PS Discharge FBH or Storm (CFS)	529.2	526.7	667.3	663.6	405.1	403.9	399.1
AS Crest (Feet)	973.86	973.90	972.82	972.80	974.80	974.80	974.80
Storage, AS Crest (Acre-Ft)	3059.9	3066.6	2864.3	2861.4	3248.8	3248.8	3248.8
AS Width (Feet)	400.	400.	400.	400.	400.	400.	400.
AS Exit Slope (%)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
AS Ret. Curve Index	5.90	5.90	5.90	5.90	5.90	5.90	5.90
AS Veg. Cover Factor	0.50	0.50	0.50	0.50	0.50	0.50	0.50
AS Maintenance Code	1	1	1	1	1	1	1
AS Max. Head SDH (Feet)	2.99	3.62	3.08	3.74	2.73	3.51	6.71
AS Peak Discharge SDH/Storm (CFS)	5418.9	7523.2	5657.4	7871.7	4638.9	7242.4	20780.6
AS Exit Velocity SDH or Storm (Ft/S)	11.38	13.30	11.62	13.57	10.54	13.07	20.26
AS Stress SDH or Storm (Lb./Sq.Ft.)	0.427	0.552	0.442	0.570	0.375	0.536	1.065
Hp FBH or Storm (Feet)	8.50	7.97	8.45	7.91	8.24	7.95	6.71
AS Peak Discharge FBH/Storm (CFS)	29987.	27059.	29961.	27081.	28797.	27105.	20781.
AS Integ. Dist. FBH or Storm (Feet)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
De/B FBH or Storm (Acre-Ft/Ft)	24.3	38.0	23.9	37.9	23.5	38.0	29.8
Uncontrolled Drainage Area (Sq.Miles)	12.45	12.45	12.45	12.45	12.45	12.45	12.45
Number of Errors	0	0	0	0	0	0	0
Number of Warnings	0	0	0	0	0	0	0

The Scope of Work has requested that the Site 13 and Site 19 dams be each evaluated as a high hazard dam. Analysis of the Sallisaw Creek watershed indicates 29 potential damage locations (PDLs) that could be affected by a breach of either dam.

Oklahoma WRB Risk Assessment Factors	
Hazard-Potential Classification	**Risk Involved with Dam Failure**
High	Probable loss of human life
Significant	No probable loss of human life but can cause economic loss or disruption of lifeline facilities
Low	No probable loss of human life and low economic loss

Site 13 has 8 PDLs that classify as high hazard and Site 19 has 13 PDLs that classify as high hazard from the breach analysis. Site 13 can likely be evaluated for low consequence seismic criteria in the design. Site 19 should likely be evaluated for significant consequence seismic criteria in the design.

Dam: S13

Hazard Classification

Below is a table of the hazard class for each PDL for the three different S13 dam failures: static, seismic and hydrologic.

Description	Static	Hydrologic	Seismic
PDL1 – S4680 Rd	Low	Low	Low
PDL2 – S4660 Rd	Low	Low	Low
PDL3 – E888 Rd	Low	Low	Low
PDL4 – E908 Rd	Low	Low	Low
PDL5 – House	Low	Low	Low
PDL6 – House	Significant	High	Low
PDL7 – Bunch Rd	Significant	High	Low
PDL8 – House	Low	Significant	Low
PDL9 – E923 Rd	Low	Significant	Low
PDL10 – House	Low	Low	Low
PDL11 – Church	High	High	Low
PDL12 – House	High	High	Low
PDL13 – RR KCS Heavener	Significant	Significant	Low
PDL14 – S4641 Rd	Significant	Significant	Low
PDL15 – Seminole Ave	Significant	Significant	Low
PDL16 – RR KCS Quarry Spur	Significant	Significant	Low
PDL17 – RR KCS Heavener North	Significant	Significant	Low
PDL18 – RR KCS Heavener South	Significant	Significant	Low
PDL19 – House	Low	Low	Low
PDL20 – House	Low	Low	Low
PDL21 – House	High	High	Low
PDL22 – House	High	High	Low
PDL23 – House	High	High	Low
PDL24 – Business	High	High	Low
PDL25 – House	Low	Low	Low
PDL26 – Electric Sub Station	Low	Low	Low
PDL27 – House	Low	Low	Low
PDL28 – House	Low	Low	Low
PDL29 - House	Low	Low	Low

Summary of analysis:

1. The proposed top of dam and the existing top of dam are the same. The hydrologic breach and the seismic breach are the same for both the existing dam and the proposed alternative.
2. The analysis shows that no PDLs are affected by the seismic breach and the dam for Site 13 can likely be evaluated for low consequence seismic criteria in the design.
3. Note in the hydrologic breach that several PDLs were found to be affected by the breach that were not in the original assessment report. This adds costs to the non-structural alternative or rehabilitation to high hazard dam for the structural alternative.

Dam: S19

Hazard Classification

Below is a table of the hazard class for each PDL or structure for the three different S19 dam failures: static, seismic and hydrologic.

Description	Static	Hydrologic	Seismic
PDL1 – S4680 Rd	High	High	Significant
PDL2 – S4660 Rd	High	High	Low
PDL3 – E888 Rd	High	High	Low
PDL4 – E908 Rd	High	High	Significant
PDL5 – House	Low	Low	Low
PDL6 – House	Low	Low	Low
PDL7 – Bunch Rd	Low	Low	Low
PDL8 – House	Significant	Significant	Low
PDL9 – E923 Rd	Low	Low	Low
PDL10 – House	Low	Low	Low
PDL11 – Church	Low	Low	Low
PDL12 – House	Low	Low	Low
PDL13 – RR KCS Heavener	Significant	High	Low
PDL14 – S4641 Rd	Significant	High	Low
PDL15 – Seminole Ave	Low	Low	Low
PDL16 – RR KCS Quarry Spur	Low	Low	Low
PDL17 – RR KCS Heavener North	Low	Low	Low
PDL18 – RR KCS Heavener South	Low	Low	Low
PDL19 – House	Low	Significant	Low
PDL20 – House	Significant	High	Low
PDL21 – House	Low	High	Low
PDL22 – House	Significant	High	Low
PDL23 – House	Low	Low	Low
PDL24 – Business	Low	Low	Low
PDL25 – House	Low	High	Low
PDL26 – Electric Sub Station	Low	Significant	Low
PDL27 – House	Significant	High	Low
PDL28 – House	Low	High	Low
PDL29 - House	Significant	High	Low

Summary of analysis:

1. The proposed top of dam and the existing top of dam are the same. The hydrologic breach and the seismic breach will be the same for both the existing dam and the proposed alternative.
2. The analysis shows that there is some minor overtopping of two roads are affected by the seismic breach and the dam for Site 19 should likely be evaluated for significant consequence seismic criteria in the design.
3. Note in the hydrologic breach that several PDLs were found to be affected by the breach that were not in the original assessment report. This adds costs to the non-structural alternative or rehabilitation to high hazard dam for the structural alternative.

Breach Inundation Study

Sallisaw Creek Watershed

Dam 13 | Dam 19

NID OK00076 | NID OK00082
Adair County, Oklahoma
Modeled November 2021

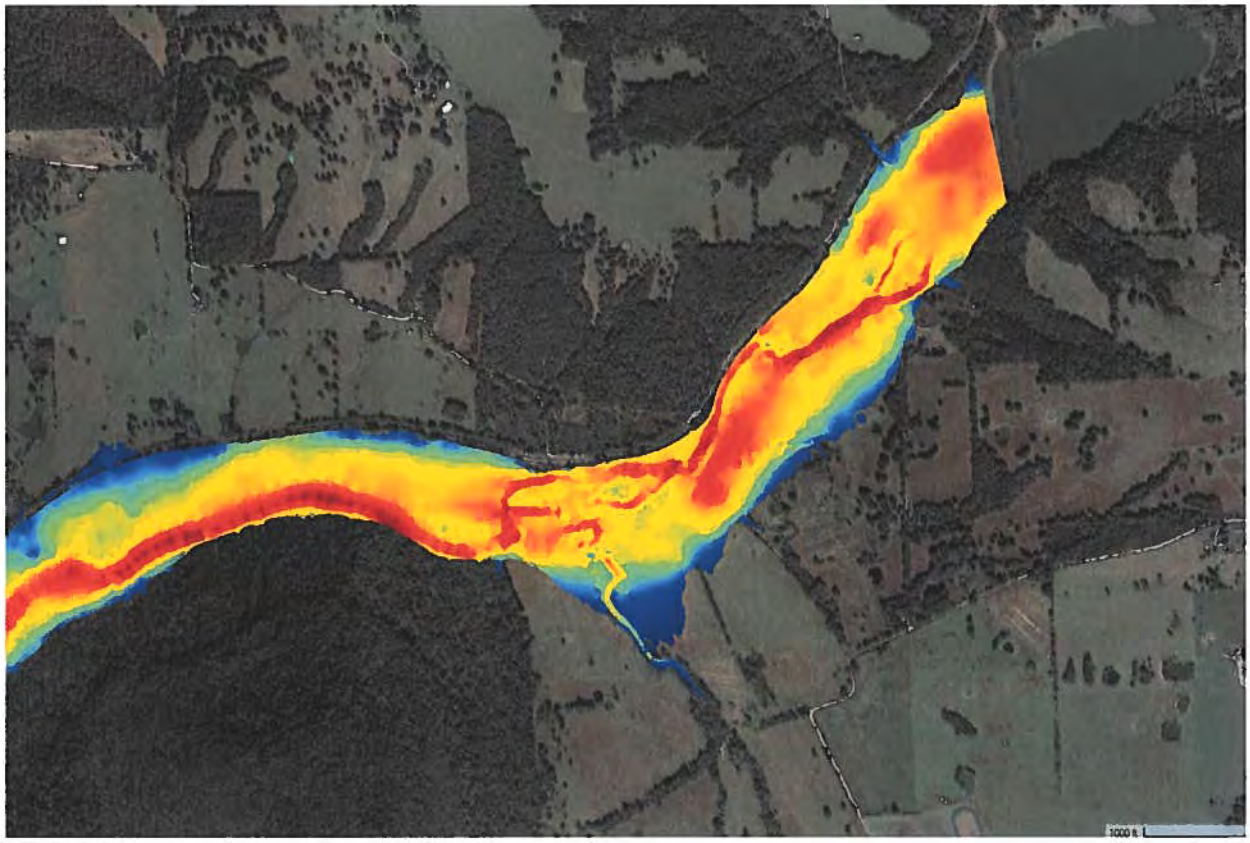


Image: Dam 19 Existing Condition Hydrologic Breach.
Google Earth Satellite Imagery (2017, 2019)

Prepared for: Oklahoma Natural Resources Conservation Service
Prepared by: Conservation Works Joint Venture

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Attached: Breach Inundation Maps

Project Introduction

The purpose of this study is to assess the extent of the flooding resulting from a possible breach of Floodwater Retarding Structure 13, referred in this document as Dam 13, and Floodwater Retarding Structure 19, referred in this document as Dam 19. These analyses do not consider concurrent dam failure because they are independent facilities. This breach study includes hydrologic and hydraulic analysis of the existing condition, and the proposed rehabilitation of each dam (sometimes referred to as the "preferred alternative"). The study includes dam breach analyses and inundation mapping.

Dam 13 has a total storage capacity at top of dam approximately equal to 1080 acre-feet for both the existing and rehabilitated dam geometries. Dam 19 has a total storage capacity at the top of the dam approximately equal to 5687 acre-feet for both the existing and preferred alternative dam geometries.

Original Construction

Sallisaw Creek Watershed Dam 13 is located in southwest Adair County, Oklahoma, approximately 7.3 miles north and 2.2 miles east of Marble City at latitude 35.6857, longitude -94.7834. This location is approximately 1.5 miles west of the unincorporated community of Bunch (Section 17 T14N R24E). The dam was built in 1966 in Hamlin Hollow, which is a tributary of Sallisaw Creek. The dam is 48 feet in height, and controls 1,235 acres of drainage. It has a 40-ft wide earthen auxiliary spillway and a 24-inch diameter concrete pipe for a principal spillway conduit.

Sallisaw Creek Watershed Dam 19 is located in a rural agricultural area in central Adair County, Oklahoma approximately 13.1 miles north and 7.5 miles east of Marble City at latitude 35.7678, longitude -94.6667. This location is a rural agricultural area approximately 5.5 miles south and 2.5 miles west of Stilwell, Oklahoma. The dam was built in 1968 and is 61 feet in height and controls 8,160 acres of drainage. It has a 200-ft wide earthen auxiliary spillway and a 30-inch diameter concrete reinforced pipe principal spillway conduit.

Dam 13 and Dam 19 were constructed under Public Law 83-566 as low hazard potential dams. The design service life of Dam 13 and Dam 19 are 50 years each. Both dams were built for single purpose flood control benefits. A location map is included in Appendix A.

2010 Rehabilitation Assessment Reports

In 2010, a breach analysis was performed for the existing Dam 13 and Dam 19. The 2010 breach analysis for Sallisaw 13 indicated 22 Potential damage locations (PDLs) including structures, a US highway, and a railroad track. The 2010 breach analysis for Sallisaw 19 indicates 16 PDLs including structures and multiple county roads. In 2010, preliminary alternatives were developed to bring the dams into compliance with the stricter high hazard criteria.

Although both dams were originally classified as low hazard dams, they were reclassified as high hazard prior to the 2010 report. The 2010 report continued to recommend changing the hazard classification to high hazard due to potential loss of life in event of a breach. This change in hazard class means both dams are now out of compliance with NRCS TR-60 design criteria and performance. Furthermore, the Oklahoma Water Resources Board (OWRB) determined the dams were out of compliance with the Oklahoma State Dam Safety Criteria.

2021 Analyses

The 2021 analysis used the 2010 recommendations as a starting point to develop dam rehabilitation alternatives compliant with the high hazard dam criteria. The 2021 effort included additional hydrologic and hydraulic evaluation of the dams in the existing and rehabilitated conditions using modern modeling methods. This

document summarizes the results of the 2021 Dam Breach analyses. In addition to the breach analyses described in this document, the 2021 effort also included analysis of inundation resulting from the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year flood recurrence intervals for the existing, decommissioned, and rehabilitated conditions at both dams. The 2021 flood frequency is discussed separately in the Flood Frequency Analysis for Rehabilitation of Dams document (Conservation Works, J.V., 2021). Any reference to "analysis" in this document refers to the 2021 analysis unless otherwise noted.

Dam Breach Analysis

This dam breach analysis was performed to predict the extent of flooding from a catastrophic breach of Dam 13 and Dam 19. The results developed in this 2021 analysis are considered sufficient for developing an inundation map and making a hazard class determination. However, the limit of the breach inundation areas shown are approximate. Actual areas inundated in the event of a failure would depend on actual failure and flooding conditions and may differ from the areas shown on the map. It is prudent to assume that areas outside, but adjacent to, the inundation limits shown could also be flooded.

Dam 13 Downstream Description:

Hamlin Hollow, downstream of Dam 13, runs through a moderately wide valley for approximately 9,990 feet, then travels through the broad Sallisaw Creek floodplain until it reaches the downstream boundary condition.

Dam 19 Downstream Description:

Dam 19 is located about three miles below the headwaters of Sallisaw Creek. Sallisaw Creek downstream of the dam runs through a moderately wide valley for approximately 10,000 feet before the Sallisaw Creek floodplain becomes significantly wider.

The following sections present the methodologies used to analyze the catastrophic breach of the dam.

Breach Scenarios

Breach scenarios were analyzed in isolation. All breach scenarios assumed sunny day conditions. In this analysis, four scenarios for each dam were considered, totaling eight scenarios: the existing condition hydrologic breach, rehabilitated alternative hydrologic breach, rehabilitated alternative static breach, and rehabilitated alternative seismic breach. Because the existing dam and rehabilitated dam have the same top of dam elevation as the existing condition at each location, hydrologic breach hydrographs for the existing condition and proposed rehabilitated alternative for each dam site were identical. Therefore, only one hydrologic dam breach simulation was needed per dam site. With this in mind, a total of six breach scenarios were modeled as shown in the table below.

Table 1: Modeled Breach Scenarios

Scenario Name	Scenario Geometry	Dam 13	Dam 19
BR13_EXAlt_Hydr	Existing Condition / Rehabilitated (yield the same breach hydrograph)	Hydrologic Breach	-
BR13_Alt_Stat	Rehabilitated	Static Breach	-
BR13_Alt_Seis	Rehabilitated	Seismic Breach	-
BR19_EXAlt_Hydr	Existing Condition / Rehabilitated (yield the same breach hydrograph)	-	Hydrologic Breach
BR19_Alt_Stat	Rehabilitated	-	Static Breach
BR19_Alt_Seis	Rehabilitated	-	Seismic Breach

Breach Modeling Overview

The hydrologic and hydraulic modeling was carried out in HEC-RAS 6.0 and HEC RAS 6.1. Hydrograph routing was simulated with the 2D SWE-ELM equation set, which stands for "Shallow Water Equations, Eulerian-Lagrangian Method". Breach hydrographs corresponding to each mode of failure were inputted at boundary conditions located immediately downstream of Dam 13 and Dam 19. Additional information pertaining to the analysis and model parameters are discussed in the HEC-RAS 2D Breach Model Parameters section and the Breach Modeling Assumptions section of this report.

Input Data

- Terrain NRCS 2-meter DEM Bare Earth FIPS 40001, 40021 and 40135
- Field survey at bridge/culvert upstream openings
- Breach hydrograph for each scenario, calculated with as-built and proposed dam rehabilitation geometries using NRCS TR-60 and TR-66

Model Development

1. Begin with a copy of the existing condition flood frequency model.
2. Remove the SA/2D connections from all 23 dams (including Dam 13 and Dam 19).
3. Reduce the model domain to include Dam 13, Dam 19, and the downstream waterway to the downstream boundary condition only.
4. Remove rain-on-grid precipitation.
5. Increase the in-simulation end time to capture the full effects of the breach at each crossing.
6. Create boundary conditions for Dam 13 and Dam 19. For each breach scenario, load the appropriate breach hydrograph into the appropriate boundary condition, and define the slope downstream of the breach based on terrain (Dam 13 slope = 0.013; Dam 19 slope = 0.008). Whichever dam site is inactive in a scenario is given a flat hydrograph of Q=0 flow for the duration of the simulation.
7. Adjust the SA/2D Htab parameters at the crossings based on anticipated maximum water surface elevations during breach events.

8. Decrease the simulation time step to capture the sudden change in water surface elevation due to the breach.

Breach Model Parameters

This section describes the parameters used in the 2021 breach analyses.

Rainfall

Breach analyses were performed using a sunny-day analysis. Therefore, the breach model did not use a rainfall parameter.

Curve Number

The curve numbers calculated for this model were lower than the curve numbers used in the 2010 analysis. The curve number assumptions used for this analysis are consistent with documented values in Table 2-2a and 2-2c in the "SCS Technical Release 55 – Urban Hydrology for Small Watersheds" and observations made during field visits and in arial imagery. Much of the difference appears to be due to the assumption of a "good" pasture land cover condition. Changing the pasture land cover condition assumption to "fair" increases the curve number by 5 in some portions of the model. The "good" pasture condition is consistent with observations made during field visits and in arial imagery. Curve number assumptions were consistent between the flood frequency analyses and breach analyses. See the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) for more detail.

Soils Data

Soil Data was consistent between the flood frequency models and breach models. See the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) for more detail.

Land cover/Manning's n

Land cover and Manning's n values are not expected to change in the future and were consistent between the existing and proposed conditions. Land cover and Manning's n assumptions were consistent between the flood frequency analyses and breach analyses. See the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) for more detail.

Breach Modeling Assumptions

The U.S. Army Corps of Engineers Hydrologic Engineering Center's River Analysis System (HEC-RAS) Version 6.0 and Version 6.1 were used to develop the breach model. HEC-RAS 6.0 was the most current version at the start of the project and was used for the bulk of the modeling effort. HEC-RAS version 6.1 was officially released during the modeling phase and resolved some of the bugs present in HEC-RAS 6.0 that were detrimental to the modeling process. Therefore, HEC-RAS 6.1 was used for model development towards the end of the modeling process and was used to run the final simulations. The HEC-RAS 2D models developed for breach studies are child models of the HEC-RAS 2D flood frequency model for the existing condition (created in HEC-RAS 6.0). The same hydrologic and hydraulic assumptions were used for breach models and flood frequency models unless explicitly noted below. Mapping was performed in ArcGIS Pro 2.8. The following paragraphs explain the assumptions used to develop this model.

See the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) report for more information about the flood frequency existing condition parent model.

Information sources

Information sources were identical between flood frequency and breach analyses. A 2-meter digital elevation model (DEM) derived from bare earth LiDAR downloaded from Oklahoma GIS Data Clearinghouse (OKmaps.org) was created to define the terrain in the HEC-RAS model. Data from field survey, as-built plans, and ground-level photographs were used at eleven crossings modeled in HEC-RAS 2D within the area of study.

Numerical model

Hydrograph routing was performed using the HEC-RAS 6.1 SWE-ELM equation set, which stands for "Shallow Water Equations, Eulerian-Lagrangian Method". The Diffusion Wave equation was used for flood frequency routing. Details about the mathematical formulation and the solution algorithm used by HEC-RAS 6.1 can be found in the technical manual.

Domain Extents

The domain extends from immediately downstream of Dam 13 and Dam 19 to an arbitrary downstream boundary located six miles downstream of Marble City, Oklahoma, at the junction of Sallisaw Creek and Brushy Creek. This downstream boundary location is the same one used in the flood frequency analyses. The Dam 13 and 19 breach simulations were performed in isolation since failure was assumed as non-concurrent, and overland flow was not modeled because dam failure was simulated assuming sunny day conditions. Therefore, the upstream watersheds of Dam 13 and Dam 19, as well as the contributing area upstream of the other 21 dams within the area of study were excluded from the domain. All breach scenarios used the same domain.

The breach model domain included the main channel of Sallisaw Creek, the tributary from Dam 13 to Sallisaw Creek, and enough area on each side of the channel to capture the extent of flooding for the largest inundation event.

Downstream Boundary Condition

The downstream normal flow boundary condition is approximately 18 miles downstream of Dam 13, and 27.5 miles downstream of Dam 19. This location was chosen because it was sufficiently far downstream that the effect of the boundary condition on the simulation results was negligible.

LiDAR Source ad DEM Creation

The LiDAR information used for the breach model is identical to the LiDAR used for the flood frequency model DEM. The NRCS 2-meter DEM Bare Earth FIPS 40001, 40021 and 40135 raster LiDAR downloaded from OKmaps.org was used to create a terrain DEM as input for the HEC-RAS 2D model. Because of the size of the model domain, the raw LiDAR download was parsed in multiple rasters which needed to be combined into a single raster for modeling purposes. This action was initially attempted in ArcMap 10.8, the most recent version available at the time. The merged raster was then compared with the original LiDAR data, which revealed vertical distortion in the merged raster between 0.1 feet and 0.5 feet. A bug report was filed with ESRI. To work around the bug causing the distortion, the terrain raster for this project was created using ArcGIS Pro 2.5 (rather than ArcMap), which was the most recent version of ArcGIS Pro that did not produce distortion.

Terrain modifications

The terrain modifications in the breach analyses were identical to the modifications made in the existing condition flood frequency model. A list of these modifications can be found in the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) document, under the heading for "Flood Frequency Modeling Assumptions", under the section "Terrain modifications".

Computational mesh modifications

Mesh modifications were identical to the existing condition flood frequency model, except for the computational cells immediately downstream of Dam 13 and 19. These cells were reconfigured to have 4 sides and a size of 200 feet to bolster numerical stability. See the Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) for more detail.

Vertical Datum

The breach analysis was conducted using the North American Vertical Datum of 1988 (NAVD 88). Dam 13 and Dam 19 as-built information was provided in the National Geodetic Vertical Datum of 1929 (NGVD 29). The existing condition dam dimensions were converted from NGVD 29 to NAVD 88. The dimensions for the proposed dam geometry were designed in NAVD 88, so they did not require conversion. See Flood Frequency Analysis for Rehabilitation of Dams (Conservation Works, J.V., 2021) under heading "Flood Frequency Modeling Assumptions", section "Vertical datum" for details about the vertical datum conversion method.

Dam and Bridge Structures

The elevation-discharge relationships used at Dam 13 and Dam 19 in the flood frequency model were removed for breach analysis. The elevation-discharge relationships for other dams within the breach model domain were disconnected from the model. The SA/2D connections present for other dams in the flood frequency existing condition parent model were removed in the breach model.

The crossings were modeled by incorporating data obtained from field survey conducted by Conservation Works, J.V. in August 2021. Survey was not collected at the southernmost railroad crossing, RR KCS Heavener South. The geometry of the RR KCS Heavener South crossing was estimated using the geometry from RR KCS Heavener North, which was assumed to have a similar structure. This was deemed an acceptable assumption because RR KCS Heavener South is the structure located the farthest downstream within the area of study, so it is not expected to have a large effect on the flood effects from Dam 13 and Dam 19. Structures and obstructions in the watershed that were not specifically surveyed were assumed to be represented by the LiDAR data. The eleven modeled crossings were identical between the breach models and the flood frequency models except for the Htab maximum headwater parameter, which is parameter related to model stability and computational efficiency. One additional crossing, E923 Rd, was modeled as a terrain feature due to its small size. Survey was not collected at this crossing, so its elevation was estimated using the best available LiDAR data. This parameter was modified for each structure in the breach scenarios based on the hydrologic breach maximum water surface elevation at each crossing plus an arbitrary value so the maximum water surface was not overly constrained.

Breach Hydrograph Development

The peak discharge of the breach hydrograph was computed using a series of empirical equations from the NRCS Technical Release 60 (TR-60). These equations are based on actual dam breaches and use parameters such as depth of water, volume of water, cross sectional area of the embankment normal to the centerline of the dam, and width of the valley at the elevation corresponding to the depth of water. For this study, the hydrologic, static, and seismic breach events were analyzed at each location.

The definition of each breach event is as follows:

The hydrologic breach assumes the worst-case reservoir water surface elevation at the crest of dam embankment or at the maximum water surface elevation obtained by routing a 6- or 24-hour inflow hydrograph developed using the probable maximum precipitation through the dam.

The static breach assumes the reservoir water surface elevation is at the crest of the auxiliary spillway elevation or at the maximum reservoir water surface elevation obtained by routing a 100-yr-generated inflow hydrograph through the dam, whichever is higher.

The seismic breach assumes an initial water surface elevation equal to the crest of the principal spillway (permanent pool) elevation.

Based on this procedure, the peak discharge for each breach event are as follows:

Table 2: Peak Breach Discharges

Dam	Scenario Geometry	Type of Breach	Peak Discharge (cfs)
13	Existing & Rehabilitated	Hydrologic	46,929
13	Rehabilitated	Static	29,814
13	Rehabilitated	Seismic	2,431
19	Existing & Rehabilitated	Hydrologic	94,932
19	Rehabilitated	Static	52,515
19	Rehabilitated	Seismic	2,765

Based on the NRCS TR-66 procedures it is assumed that the flow immediately downstream of the dam is subcritical and tailwater will submerge the breach at some outflow, thus reducing the total flow from the breach which results in a curvilinear hydrograph shape. To reflect the phenomenon, NRCS developed the following exponential equation to generate the breach hydrograph:

$$Q_t = Q_p \times e^{(-t \times Q_p / V_{max})}$$

Where:

Qt = Outflow (cfs) from breach at time t
Qp = Peak breach discharge (cfs)
t = Time (seconds)
Vmax = Maximum volume water (cubic feet)

The resulting breach hydrograph was used as an upstream boundary condition in the HEC-RAS 2D unsteady flow model. The hydrograph produced by TR-60 does not include a rising limb. It begins with the maximum flow produced by the breach and tapers to a lower flow based on reservoir volume.

Boundary Conditions at Dam 13 and Dam 19

Unique to the breach analyses, boundary conditions were added at Dam 13 and Dam 19. The boundary conditions were defined using the dam breach hydrograph for the dam of interest. For each Dam 13 breach analysis, the boundary condition at Dam 13 was assigned an appropriate breach hydrograph depending on the simulation (hydrologic, static, or seismic), and the boundary condition at Dam 19 was assigned a null hydrograph (flow = 0 for all timesteps), and vice versa. Normal depth based on the channel slope was used as the downstream boundary condition.

Computational Timestep

The computational timesteps for each of the six breach analyses were adjusted on a trial-and-error basis. The largest possible timestep that could be used without sacrificing accuracy or introducing severe oscillations was preferred.

Potential damage locations (PDLs)

The 2021 hydrologic and hydraulic analysis identified 29 possible damage locations (eleven modeled bridge crossings, 13 homes, 1 business, 2 churches, 1 electric substation, and one additional bridge crossing represented as a terrain feature) for the Sallisaw Creek Watershed based on their elevation relative to the valley elevation. Although the electrical substation is not included in the calculation for potential loss of life, it could indirectly contribute to potential in loss of life if it fails during an inundation event. For this reason, the electrical substation is noted as a PDL location throughout this report.

Please note, these locations do not correspond perfectly with the 22 PDLs identified in the 2010 rehabilitation assessment. More PDLs were identified in the 2021 study than in the 2010 rehabilitation study, which indicates an additional need for rehabilitation to high hazard criteria. The additional PDL locations also add cost to the non-structural option.

The PDLs analyzed in this study were prioritized based on their elevation relative to the channel elevation - or in other words, their likelihood to be inundated during a breach and/or flood event. Since the purpose of this study is to determine hazard classification, the question of "how many PDLs are affected?" is not as relevant as "are PDLs affected?". Therefore, this study focused on whether breach scenarios impacted those locations identified as at risk. It is possible additional damage locations may exist beyond those analyzed in this report.

A summary of the PDLs surveyed for the 2021 study is shown in Table 4. Asterisks indicate the PDL is one of the crossings modeled as an object in HEC-RAS 2D. A diamond symbol indicates that no survey information was available. It is possible other PDLs exist beyond the locations captured in the survey efforts.

Table 4: Potential Damage Locations

Name	Description	PDL Type	Lat/Long
PDL 1*	S4680 Rd	Roadway Slab Bridge	35.7595676° -94.6774930°
PDL 2*	S4660 Rd	Roadway Multi-Box Culvert	35.7416826° -94.7189904°
PDL 3*	E888 Rd	Roadway Box Culvert	35.7287168° -94.7323520°

Name	Description	PDL Type	Lat/Long
PDL 4♦	House	House	35.725714° -94.737225°
PDL 5*	E908 Rd	Roadway Bridge	35.6931332° -94.7605278°
PDL 6	House	House	35.6831143° -94.7617555°
PDL 7	House	House	35.6813408° -94.7686743°
PDL 8*	Bunch Rd	Roadway Box Culvert	35.6808705° -94.7686317°
PDL 9*♦	E923 Rd	Low Roadway Crossing	35.679264° -94.768657°
PDL 10	House	House	35.6785394° -94.7678886°
PDL 11	House	House	35.6819818° -94.7596120°
PDL 12♦	House	House	35.681412° -94.760622°
PDL 13♦	Business	Business	35.681025° -94.760443°
PDL 14♦	Church	Church	35.681767° -94.758998°
PDL 15♦	House	House	35.680859° -94.758749°
PDL 16	Church	Church	35.6792700° -94.7621254°
PDL 17	House	House	35.6806092° -94.7602758°
PDL 18♦	House	House	35.679808° -94.758093°
PDL 19*	S4641 Rd	Roadway Bridge	35.6763692° -94.756252°
PDL 20*	RR KCS Heavener	Railroad Bridge	35.6761410° -94.756978°
PDL 21*♦	House	House	35.638672° -94.778844°
PDL 22♦	Electric Substation	Electric Substation	35.583522° -94.828864°
PDL 23♦	House	House	35.582752° -94.829063°

Name	Description	PDL Type	Lat/Long
PDL 24♦	House	House	35.58196° -94.829336°
PDL 25♦	House	House	35.580371° -94.829669°
PDL 26*	RR KCS Quarry Spur	Railroad Bridge	35.5809385° -94.8261738°
PDL 27*	Seminole Ave	Roadway Bridge	35.5801737° -94.8272511°
PDL 28*	RR KCS Heavener North	Railroad Bridge	35.5566796° -94.8390175°
PDL 29♦	RR KCS Heavener South	Railroad Bridge	35.530481° -94.840064°

*Asterisk indicates a modeled SA/2D connection

♦Diamond indicates no survey information available

Existing and Preferred Alternative Geometry

Dimensions for the existing and proposed rehabilitated dams are summarized in Table 5.

Table 5: Dam Geometry

	Dam 13		Dam 19	
	Existing	Rehabilitated	Existing	Rehabilitated
Top of Dam Elevation	892.4	892.4	984.5	984.5
Auxiliary Spillway Elevation	888.9	884.7	980.7	974.8
Auxiliary Spillway Width	40'	120'	200'	400'
Principal Spillway Elevation	860.2	860.2	948.7	948.7
Principal Spillway Conduit Dia.	24"	30"	30"	48"

*All elevations expressed in NAVD 88 datum

Results

Once the HEC-RAS model and breach hydrograph was developed, the model could be used to produce maximum water surface elevation maps, velocity maps, and depth maps over the watershed. Results at potential damage locations (PDLs were extracted from the model results and printed in the appendices).

Twenty-nine PDLs were analyzed in this study including 11 modeled bridges, 13 homes, 1 business, 2 churches, 1 electrical substation, and an additional bridge (E 923 Rd), which was modeled simply as a terrain feature rather than a SA/2D connection because it does not cross the main channel. The number of PDLs identified at this location has increased since the 2010 assessment. These new PDL locations add additional need for rehabilitation to high hazard criteria and would add costs to the non-structural option. Please see Table 4 and the location map in Appendix A to view all PDL locations.

Breach inundation information (i.e., water surface elevation, maximum velocity, and arrival time of peak inundation) were extracted directly from the HEC RAS 2D model results at each PDL location for each scenario. Inundation floodplain elevation was extracted just upstream of the eleven bridges on the main channel to capture the maximum rise in water surface elevation before the bridge. For all other PDLs, the inundation flood elevation was extracted at the PDL location. Velocity was extracted at the PDL location for all PDLs.

Estimated maximum breach inundation depth at each PDL was reported by subtracting the low elevation of the PDL from the flood inundation elevation. The low elevation reported at bridge crossings was the lower value of either the lowest deck elevation or the lowest surveyed roadway elevation approaching the deck. This reporting method was used to estimate the depth of water over the road. Low elevations reported at buildings are lowest adjacent grade.

The results of the 2D HEC-RAS model produced shapefiles with the extent of the maximum breach water surface elevation, which are shown in the breach inundation maps deliverable, a companion to this report.

Breach Results Summary – Existing Condition Breaches

Because the top of dam elevation at each dam location remains the same between the existing condition and the rehabilitated option, the existing condition's hydrologic breach results are identical to the rehabilitated option's hydrologic breach results for each respective dam. Please see the following sections for hydrologic breach results.

By the same logic, the existing condition's seismic breach results are identical to the rehabilitated option's seismic breach results since the permanent pool elevation was kept constant between the existing condition and the rehabilitated option at both dam locations. Please read the following sections for seismic breach results.

The static breach was not analyzed in the existing condition for this report.

Breach Results Summary - Dam 13 Rehabilitated Alternative

Hydrologic Breach: Approximately 1 roadway crossing (Bunch Rd), 1 railroad crossing (RR KCS Heavener), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.0 feet to 5.8 feet.

Static Breach: Approximately 1 roadway crossing (Bunch Rd), 5 homes, 1 business, and 1 church are predicted to be inundated by a breach of Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 4.2 feet.

Seismic Breach: No PDLs are predicted to be inundated by the seismic breach at Dam 13. Therefore, Dam 13 can likely be evaluated for low consequence seismic criteria during design.

Breach Results Summary – Dam 19 Rehabilitated Alternative

Hydrologic Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 7 homes, 1 church, and 1 electrical substation are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.6 feet to 13.5 feet.

Static Breach: Approximately 5 roadway crossings (S4680 Rd, S4660 Rd, E888 Rd, E908 Rd, and S4641 Rd), 1 railroad crossing (RR KCS Heavener), 3 homes, 1 church, and 1 electrical are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.4 feet to 10.3 feet.

Seismic Breach: Approximately two roadway crossings (S4680 Rd and E908 Rd) are predicted to be inundated by a breach of Dam 19. The maximum depth of the flooding at these structures is approximately 2.9 feet at S4680 Rd and 0.5 feet at E908 Rd. Due to the overtopping at these locations during the seismic breach, Dam 19 may need to be evaluated with the significant consequence seismic criteria during design.

Inundation Results Table

Breach inundation results for each PDL can be found in the appendices.

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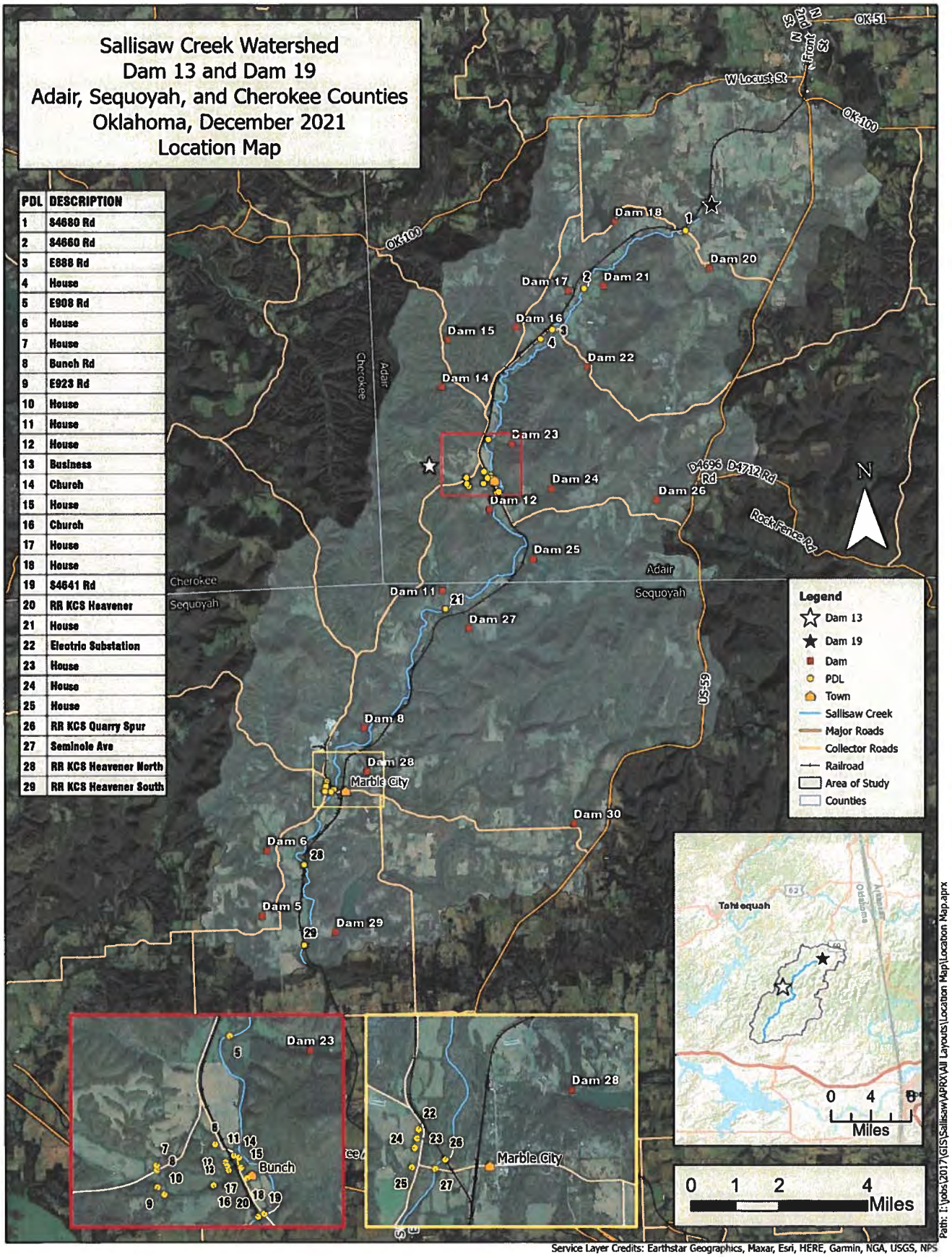
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Appendix A – Location Map


Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Location Map
PDL DESCRIPTION
1 S4680 Rd
2 S4660 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
Dam 18
Dam 20
Dam 17
Dam 21
Dam 16
Dam 15
Dam 22
Dam 14
Dam 23
Dam 24
Dam 12
Dam 26
Dam 25
Dam 11
Dam 27
Dam 8
Dam 28
Marble City
Dam 30
Dam 6
Dam 5
Dam 29
OK-51
W Locust St
OK-100
Front St
Cherokee
Adair
Sequoyah
D4696 Rd
D4712 Rd
Rock Fence Rd
US-59
N
Legend
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Collector Roads
Railroad
Area of Study
Counties
Tahlequah
Oklahoma
Arkansas
0 4 8
Miles
Bunch
0 1 2 4
Miles
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
Path: I:\jobs\2017\GIS\Sallisaw\APRX\All Layouts\Location Map\Location Map.aprx

Appendix B – Breach Results

BREACH INUNDATION RESULTS - DAM 13 - EXISTING / REHAB - HYDROLOGIC BREACH								
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**	**Approx. Max Velocity (ft/sec)**	**Time until first inundation (Hrs:min)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	n/a	0.00	0.00	0:00
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	n/a	0.00	0.00	0:00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	n/a	0.00	0.00	0:00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	0.00	0.00	0:00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	n/a	0.00	0.00	0:00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	806.33	4.32	3.64	0:10
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	805.64	5.84	5.77	0:10
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	801.73	0.00	3.44	0:11
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	765.45	0.00	5.41	0:20
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	774.24	5.04	4.88	0:19
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	774.45	5.25	5.90	0:17
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	0.00	0.00	0:00

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	766.12	1.51	9.25	0:16
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	780.98	5.28	6.94	0:15
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	774.10	4.81	8.90	0:17
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	764.53	2.03	6.05	0:16
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	759.94	0.00	1.22	0:41
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	0.00	8.03	0:41
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	0.00	0.00	0:00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	0.00	0.00	0:00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	0.00	0.00	0:00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	0.00	0.00	0:00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	0.00	0.00	0:00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	601.78	0.00	1.62	4:55
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	597.80	0.00	1.70	4:59
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	573.31	0.00	2.36	6:12
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	551.26	0.00	1.79	7:37

BREACH INUNDATION RESULTS - DAM 13 REHABILITATED - SEISMIC BREACH								
Location ID	Description	Location Latitude, Longitude	PDL Low Elevation (ft, NAVD 88)	Low Elevation Type	Inundation Floodplain Elevation (ft, NAVD 88)	Estimated Max Inundation Depth at PDL (ft)	Approx. Max Velocity (ft/sec)	Time until first inundation (Hrs:min)
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	n/a	0.00	0.00	0:00
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	n/a	0.00	0.00	0:00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	n/a	0.00	0.00	0:00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	0.00	0.00	0:00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	n/a	0.00	0.00	0:00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	0.00	0.00	0:00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.94	0.00	3.14	0:19
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	n/a	0.00	0.00	0:00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	0.00	0.00	0:00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	0.00	0.00	0:00

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	0.00	0.00	0:00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	0.00	0.00	0:00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	0.00	0.00	0:00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	0.00	0.00	0:00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	744.10	0.00	0.34	0:49
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	746.17	0.00	3.74	0:49
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	0.00	0.00	0:00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	0.00	0.00	0:00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	0.00	0.00	0:00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	0.00	0.00	0:00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	0.00	0.00	0:00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	n/a	0.00	0.00	0:00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	588.85	0.00	0.72	9:05
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	563.14	0.00	0.51	12:51
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	543.10	0.00	0.30	18:49

BREACH INUNDATION RESULTS - DAM 13 REHABILITATED - STATIC BREACH								
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**	**Approx. Max Velocity (ft/sec)**	**Time until first inundation (Hrs:min)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	n/a	0.00	0.00	0:00
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	n/a	0.00	0.00	0:00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	n/a	0.00	0.00	0:00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	0.00	0.00	0:00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	n/a	0.00	0.00	0:00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	804.72	2.71	2.62	0:11
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	803.97	4.17	4.81	0:11
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	n/a	0.00	0.00	0:00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	0.00	0.00	0:23
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	773.27	4.07	3.73	0:23
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	773.36	4.16	4.68	0:20
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	0.00	0.00	0:00

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	764.75	0.15	6.75	0:20
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	779.02	3.32	5.34	0:16
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	773.09	3.80	6.42	0:20
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	763.75	1.25	4.60	0:19
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	757.48	0.00	1.02	0:50
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	754.38	0.00	7.15	0:50
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	0.00	0.00	0:00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	0.00	0.00	0:00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	0.00	0.00	0:00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	0.00	0.00	0:00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	0.00	0.00	0:00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	599.54	0.00	1.54	5:08
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	596.24	0.00	1.50	5:12
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	571.45	0.00	2.09	6:30
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	549.80	0.00	1.55	7:57

BREACH INUNDATION RESULTS - DAM 19 - EXISTING / REHAB - HYDROLOGIC BREACH								
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**	**Approx. Max Velocity (ft/sec)**	**Time until first inundation (Hrs:min)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	923.37	**13.54**	8.86	0:19
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	858.48	6.26	7.33	1:04
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	837.03	7.61	4.71	1:19
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	829.49	0.59	1.59	1:26
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	778.42	9.28	6.59	2:10
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	0.00	0.00	0:00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	n/a	0.00	0.00	0:00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	n/a	0.00	0.00	0:00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	768.30	0.00	3.32	2:29
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	767.58	4.08	4.91	2:30

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	767.05	2.45	3.15	2:31
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	0.00	0.00	0:00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	0.00	0.00	0:00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	766.20	3.70	4.10	2:32
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	764.63	4.49	2.73	2:35
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	760.96	3.94	5.92	2:35
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	692.39	2.79	5.25	3:51
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	607.73	3.83	4.73	6:11
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	606.49	2.89	4.44	6:11
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	604.66	1.56	3.28	6:13
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	601.38	1.88	4.31	6:14
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	608.56	0.00	2.10	6:09
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	603.22	0.00	2.09	6:13
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	576.98	0.00	3.24	7:09
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	555.86	0.00	2.16	8:33

BREACH INUNDATION RESULTS - DAM 19 REHABILITATED - SEISMIC BREACH								
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**	**Approx. Max Velocity (ft/sec)**	**Time until first inundation (Hrs:min)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	912.73	2.90	4.41	0:43
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	849.88	0.00	2.91	2:16
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	827.38	0.00	3.07	2:48
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	0.00	0.00	0:00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	769.60	0.46	3.20	4:20
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	0.00	0.00	0:00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	n/a	0.00	0.00	0:00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	n/a	0.00	0.00	0:00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	0.00	0.00	0:00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	0.00	0.00	0:00

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	0.00	0.00	0:00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	0.00	0.00	0:00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	0.00	0.00	0:00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	0.00	0.00	0:00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	752.40	0.00	1.34	5:16
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	748.91	0.00	1.59	5:16
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	0.00	0.00	0:00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	0.00	0.00	0:00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	0.00	0.00	0:00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	0.00	0.00	0:00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	0.00	0.00	0:00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	595.22	0.00	1.43	10:16
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	592.53	0.00	1.80	10:20
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	567.39	0.00	1.51	11:59
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	546.91	0.00	0.93	13:43

BREACH INUNDATION RESULTS - DAM 19 REHABILITATED - STATIC BREACH								
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**	**Approx. Max Velocity (ft/sec)**	**Time until first inundation (Hrs:min)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	920.15	10.32	7.91	0:21
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	855.98	3.76	6.17	1:14
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	834.02	4.60	4.32	1:31
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	0.00	0.00	0:00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	775.88	6.74	5.66	2:31
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	0.00	0.00	0:00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	0.00	0.00	0:00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	n/a	0.00	0.00	0:00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	n/a	0.00	0.00	0:00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	0.00	0.00	0:00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	765.19	0.00	1.27	2:55
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	0.00	0.00	0:00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	764.31	0.81	2.47	2:58

Breach Results

PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	0.00	0.00	0:00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	0.00	0.00	0:00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	0.00	0.00	0:00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	763.19	0.69	1.83	3:01
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	761.70	1.56	2.36	3:04
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	758.35	1.33	4.72	3:04
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	0.00	0.00	0:00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	605.58	1.68	2.33	7:22
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	604.48	0.88	2.40	7:23
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	0.00	0.00	0:00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	599.86	0.36	2.16	7:24
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	605.66	0.00	1.89	7:20
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	600.66	0.00	1.91	7:24
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	575.62	0.00	2.88	8:26
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	553.74	0.00	2.12	10:02

Flood Frequency Analysis for Rehabilitation of Dams

Sallisaw Creek Watershed

Dam 13 | Dam 19

NID OK00076 | NID OK00082
Adair County, Oklahoma
November 2021
Modeled October 2021

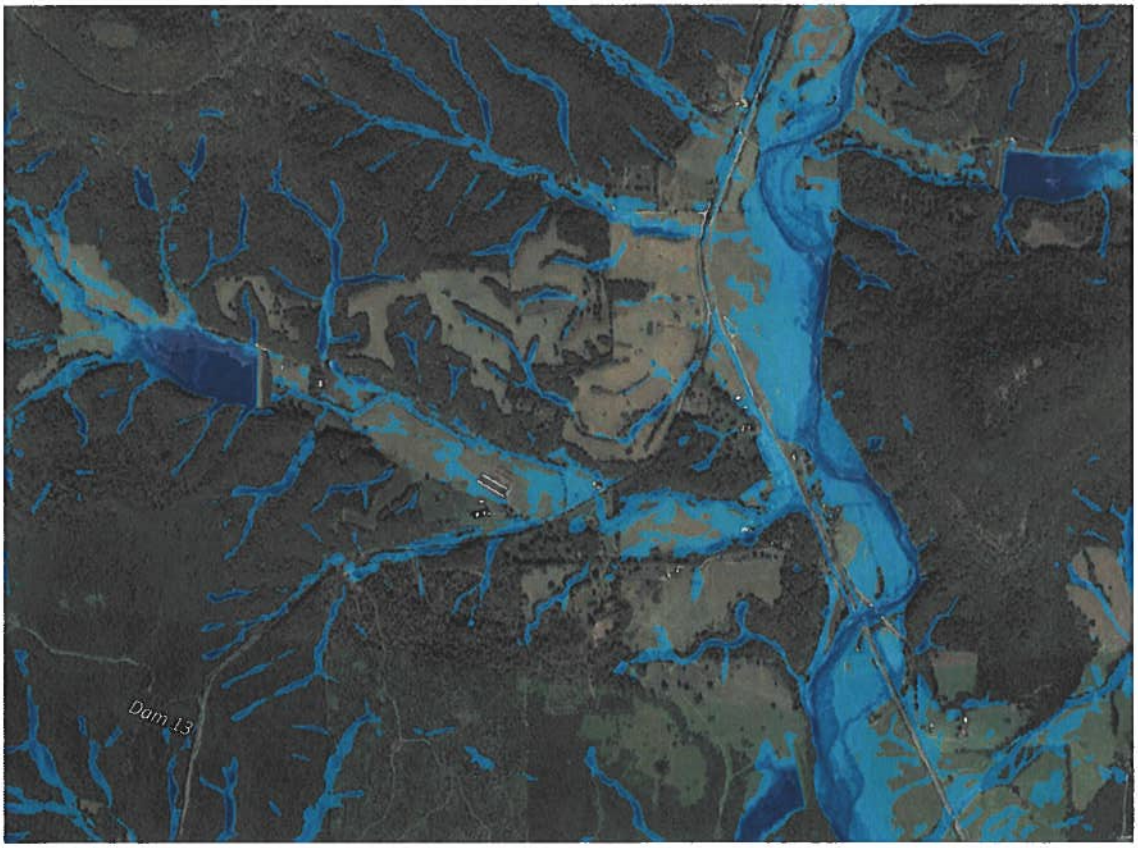


Image: Existing Condition 100-yr
Google Earth Satellite Imagery (2017, 2019)

Prepared for: Oklahoma Natural Resources Conservation Service
Prepared by: Conservation Works Joint Venture

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Project Introduction

The purpose of this study is to assess the extent of the flooding resulting from a range of flooding events. The structures of interest are Sallisaw Creek Floodwater Retarding Structure 13, referred to in this document as Dam 13, and Floodwater Retarding Structure 19, referred to in this document as Dam 19. This flood frequency study includes hydrologic and hydraulic analysis of the existing condition, the proposed rehabilitation of each dam (sometimes called the "preferred alternative"), and the without dam scenario for each site (one dam removed).
This study includes flood frequency analyses and inundation mapping.

Original Construction

Sallisaw Creek Watershed Dam 13 is located in southwest Adair County, Oklahoma, approximately 7.3 miles north and 2.2 miles east of Marble City at latitude 35.6857, longitude -94.7834. This location is approximately 1.5 miles west of the unincorporated community of Bunch (Section 17 T14N R24E). The dam was built in 1966 in Hamlin Hollow, which is a tributary of Sallisaw Creek. The dam is 48 feet in height, and controls 1,235 acres of drainage. It has a 40-ft wide earthen auxiliary spillway and a 24-inch diameter concrete pipe for a principal spillway conduit.

Sallisaw Creek Watershed Dam 19 is located in a rural agricultural area in central Adair County, Oklahoma approximately 13.1 miles north and 7.5 miles east of Marble City at latitude 35.7678, longitude -94.6667. This location is a rural agricultural area approximately 5.5 miles south and 2.5 miles west of Stilwell, Oklahoma. The dam was built in 1968 and is 61 feet in height and controls 8,160 acres of drainage. It has a 200-ft wide earthen auxiliary spillway and a 30-inch diameter concrete reinforced pipe principal spillway conduit.

Dam 13 and Dam 19 were constructed under Public Law 83-566 as low hazard potential dams. The design service life of Dam 13 and Dam 19 are both 50 years. Both dams were built for single purpose flood control benefits. A location map is included in Appendix B.

2010 Rehabilitation Assessment Reports

In 2010, a breach analysis was performed for the existing Dam 13 and Dam 19. The 2010 breach analysis for Sallisaw 13 indicated 22 Possible Damage Locations (PDLs) including structures, a US highway, and a railroad track. The 2010 breach analysis for Sallisaw 19 indicates 16 PDLs including structures and multiple county roads. In 2010, preliminary alternatives were developed to bring the dams into compliance with the stricter high hazard criteria.

Although both dams were originally classified as low hazard dams, they were reclassified as high hazard prior to the 2010 report. The 2010 report continued to recommend changing the hazard class to high hazard due to potential loss of life in event of a breach. This change in hazard class means both dams are now out of compliance with NRCS TR-60 design criteria and performance. Furthermore, the Oklahoma Water Resources Board (OWRB) determined the dams were out of compliance with the Oklahoma State Dam Safety Criteria.

2021 Analyses

The 2021 analyses used the 2010 recommendations as a starting point to produce dam rehabilitation alternatives that comply with the dam high hazard criteria. The 2021 effort includes additional hydrologic and hydraulic evaluation of the dams using modern modeling methods. This document summarizes the 2021 Flood Frequency inundation analyses. Any reference to "analysis" in this document refers to the 2021 analysis unless otherwise noted.

Flood Frequency Analysis

The purpose of the hydrologic and hydraulic analysis is to assess flood prevention and flood damage reduction downstream of Dam 13 and Dam 19 for a range of flood frequency events. Analyses were performed downstream of Dam 13 and Dam 19 for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-yr events for five scenarios, detailed below in Table 1. This resulted in a total of 40 flood frequency scenarios. In addition, eight breach scenarios were considered (although only six simulations were required due to the similarities between the dimensions of the existing condition dams and the preferred rehabilitation alternatives). Breach scenarios are listed in Table 2 for convenience, although they are not discussed in this document. Details about the 2021 breach analysis can be found in the Breach Inundation Study (Conservation Works J.V., 2021).

Table 1: Flood Frequency Modeling Scenarios

Scenario Name	Dam 13	Dam 19
EX	Existing Condition	Existing Condition
Rem13	Removed	Existing Condition
Rem19	Existing Condition	Removed
Alt13	Rehabilitated Alternative	Existing Condition
Alt19	Existing Condition	Rehabilitated Alternative

Table 2: Breach Modeling Scenarios

Scenario Name	Scenario Geometry	Dam 13	Dam 19
BR13_EXAlt_Hydr	Existing Condition / Rehabilitated (yield the same breach hydrograph)	Hydrologic Breach	-
BR13_Alt_Stat	Rehabilitated	Static Breach	-
BR13_Alt_Seis	Rehabilitated	Seismic Breach	-
BR19_EXAlt_Hydr	Existing Condition / Rehabilitated (yield the same breach hydrograph)	-	Hydrologic Breach
BR13_Alt_Stat	Rehabilitated	-	Static Breach
BR13_Alt_Seis	Rehabilitated	-	Seismic Breach

Flood Frequency Modeling Overview

The hydrological and hydraulic modeling was carried out in HEC-RAS 6.0 and HEC-RAS 6.1. The simulations were run using HEC-RAS 6.1. Overland flow and open channel flow were simulated with the "2D-Diffusion Wave" equation. Hydrograph routing at each dam in HEC-RAS required elevation-discharge curves. These were computed with HydroCAD v10.00-15 hydraulic routing software for all dams using dimensions from the as-built plans.

Additional information pertaining to the analysis as well as model parameters are discussed in the Model Parameters section.

Input Data

- Terrain NRCS 2-meter DEM Bare Earth FIPS 40001, 40021 and 40135
- Bathymetric data at the Dam 13 reservoir (for the Dam 13 removed condition)
- Bathymetric data at the Dam 19 reservoir (for the Dam 19 removed condition)
- Land cover data (NLCD) and associated Manning's n roughness coefficient values (HEC-RAS manual)
- Point Precipitation Frequency Estimates (NOAA Atlas 14, Volume 8, Version 2)
- HydroCAD-calculated elevation-discharge curves based on the as-built information (existing condition) and dimensions for the proposed rehabilitation alternatives at Dam 19 and Dam 13
- Field survey at bridge/culvert upstream openings

Model Differences Between Flood Frequency Scenarios

The existing condition model (EX) was used as a baseline model for existing conditions. For flood reduction benefits analysis, the flooding depths were compared between the without dam models (Rem13 and Rem19) and preferred rehabilitation alternatives (Alt13 and Alt19) models. The difference i flood depth between "without dam" and "rehabilitated dam" wasthen used in the economic analyses to quantify the flood reduction benefits each dam.

Removed Dam 13 (Rem 13)

Terrain modifications: Raster LiDAR elevation values inside the permanent pool area were replaced with bathymetric survey of the Dam 13 reservoir. Additionally, a 50-ft wide channel was enforced into the LiDAR raster to estimate the location of the natural channel beneath the permanent pool elevation. The 50-ft cell size was chosen to match the width of the existing channel downstream of Dam 13. The channel cut through the dam and connected the lowest point of dam's reservoir bathymetry and the principal spillway outlet plunge basin.

Mesh modifications: Mesh refinement regions were created to connect the plunge basin to streams upstream of the reservoir. Computational cells were modified so they aligned with the flow direction of the enforced channel. Cells that prevented leaking through the dam were removed where the channel refinement region was created.

Manning's land cover layer: Land cover polygons covering the new mesh refinement regions were created. A value of roughness coefficient n = 0.04 was assigned to the main channel to match the existing channel manning's n downstream of Dam 13.

Geometry modifications: Dam 13 SA/2D connection was removed.

Removed Dam 19 (Rem19)

Terrain modifications: Raster LiDAR elevation values inside the permanent pool area were replaced with bathymetric survey of the Dam 19 reservoir. Additionally, a 50-ft wide channel was enforced into the LiDAR

raster to estimate the location of the natural channel beneath the permanent pool elevation. The 50-ft cell size was chosen to match the width of the existing channel downstream of Dam 19. The channel cut through the dam and connected the lowest point of dam's reservoir bathymetry and the principal spillway outlet plunge basin.

Mesh modifications: Mesh refinement regions were created to connect the plunge basin to streams upstream of the reservoir. Computational cells were modified so they aligned with the flow direction of the enforced channel. Cells that prevented leaking through the dam were removed where the channel refinement region was created.

Manning's land cover layer: Land cover polygons covering the new mesh refinement regions were created. A value of roughness coefficient n = 0.04 was assigned to the main channel to match the existing channel manning's n downstream of Dam 19.

Geometry modifications: Dam 19 SA/2D connection was removed.

Dam 13 Preferred Alternative (Alt13)

Terrain modifications: The raster LiDAR was modified to replace the existing auxiliary spillway with a spillway with a crest elevation of 884.7 ft and width of 120 ft (see Table 8). The enforced auxiliary spillway was assigned an arbitrarily small positive slope up to a 150 ft station. The spillway was extended beyond the 150-ft station with a slightly higher slope to simulate the hydraulic behavior of the structure. This increase of slope is based on the auxiliary spillway geometry of other existing within the area of study.

Mesh modifications: The mesh was modified to simulate flow at the new wider auxiliary spillway by creating cells aligned with the direction of flow.

Geometry modifications: An auxiliary spillway with a crest elevation of 884.7 ft and width of 120 ft was enforced at the Dam 13 SA/2D connection weir cross section. To simulate flow through the proposed auxiliary spillway and the pipe outlet, a new discharge elevation curve was calculated using Hydrocad 10.00-15. This curve was used as an input for the Dam 13 SA/2D connection. The outlet width was changed to 2.5 feet to match the diameter of the proposed outlet pipe.

Dam 19 Preferred Alternative (Alt19)

Terrain modifications: The raster LiDAR was modified to replace the existing auxiliary spillway with a spillway with a crest elevation of 974.8 ft and width of 400 ft. The enforced auxiliary spillway was assigned an arbitrarily small positive slope.

Mesh modifications: The mesh was modified to simulate flow at the new wider auxiliary spillway by creating cells aligned with the direction of flow.

Geometry modifications: An auxiliary spillway with a crest elevation of 974.8 ft and width of 400 ft was enforced on the Dam 19 SA/2D connection weir cross section. To simulate flow through the proposed auxiliary spillway and the pipe outlet, a new discharge elevation curve was calculated using Hydrocad 10.00-15. This curve was

used as an input for the Dam 19 SA/2D connection. The outlet width was changed to 4.0 feet to match the diameter of the proposed outlet pipe.

Flood Frequency Model Parameters

This section details modeling parameter used in the hydrologic and hydraulic modeling as well a description of the sources of information used to define these values.

Rainfall

Point precipitation frequency estimates from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Volume 8, Version 2 were used to define rainfall depth for 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year 24-hour duration storms. This information was retrieved using NOAA's web-based point precipitation tool using the subwatershed centroid at latitude 35.6617, longitude -94.7476 as input. No areal reduction was used, and rainfall was assumed uniform on the subwatershed.

The rainfall temporal distribution was defined using the SCS Type III Storm based on the geographical location of the watershed. These storms were used to model the flood frequency scenarios. Hyetographs were created using HEC-HMS and stored as *.dss* files so they could be used as an input for the HEC-RAS 2D model. HEC-HMS was used solely for creating the hyetograph in *.dss* format for the flood frequency scenarios.

Table 3. NOAA Atlas 14, Volume 8, Version 2 Point Precipitation Frequency Estimate

Flood Frequency Events	Rainfall Depth (in)
2-yr	4.06
5-yr	4.86
10-yr	5.59
25-yr	6.67
50-yr	7.58
100-yr	8.54
200-yr	9.57
500-yr	11.00

Curve Number

The loss method used was the U.S. Department of Agriculture Soil Conservation Services (SCS) Curve Number method. The method assigns a curve number (CN) to areas in the watershed based on the hydrologic soil group and land cover. Hydrologic soil group georeferenced polygons were obtained from the Soil Survey Geographic database (SSURGO) database (retrieved August 2021). Land cover was obtained from the National Land Cover Database (NLCD) (retrieved August 2021). Based on the intersection of the hydrologic group soil and land cover polygons curve numbers were determined.

Curve number values were assigned using guidance from Table 2-2a and 2-2c in the "SCS Technical Release 55 – Urban Hydrology for Small Watersheds".

The calculated curve numbers used in this model were lower than the curve numbers used in the 2010 breach study. For a typical dam, the auxiliary spillway is activated before the 200-yr event, but many of the dams in this model did not activate the auxiliary spillway even by the 500-year event. This anomaly is most likely explained by the lower curve numbers chosen for the 2021 analysis compared to the analysis used for the original dam design and construction. Lowering the curve number values attenuates the watershed hydrograph, which could result in a lower maximum water surface elevation in each reservoir, which would affect if and when the auxiliary spillway is activated.

Soils Data

Typical soils in the study area consist of hydrologic soil groups A, B, C, and D. Group D is the predominant group in the subwatershed east of the Sallisaw mainstem. Conversely, group B dominates on the west side of the subwatershed as well as in the headwater and upstream portion of the Sallisaw mainstem. The predominant groups are C and C/D near the channel in the downstream reaches of Sallisaw Creek.

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15- 0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

For soils with a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. The soil data was obtained as a GIS shape file and corresponding hydrologic soil feature table from the NRCS website.

Soil type was used to calculate a weighted curve number for the area of study and the catchment areas for Dam 13 and Dam 19. See Appendix B to view soils data.

Land Cover and Manning's n

Land cover data was downloaded from the National Land Cover Database (NLCD) and was verified using Google Earth aerial imagery (2017, 2019). See Appendix B to view the land cover in the area of study. Each land use was assigned a Manning's n based on recommendations from the HEC-RAS manual. The land cover-associated Manning's n values were applied universally to the HEC-RAS model. User-defined polygons were used to override the default land cover Manning's n values in key areas such as in the channels and at crossings. The land cover at channels was defined using a combination of photographs obtained from field survey and Google Earth aerial imagery (2017, 2019). Land cover values in mesh cells containing bridge geometry were overridden with an internal Manning's n value which was calculated separately for each modeled crossing based on ground photos at the crossing locations. The Einstein-Horton method was used to calculate a composite Manning's n based on the opening's wetted perimeter.

Table 4. NLCD Manning's n Associations

National Land Cover Database 2016 Land Cover	n
Pasture/Hay	0.060
Deciduous Forest	0.100
Grassland/Herbaceous	0.040
Mixed Forest	0.100
Open Water	0.035
Developed, Open Space	0.030
Shrub/Scrub	0.060
Developed, Low Intensity	0.060
Developed, Medium Intensity	0.100
Developed, High Intensity	0.150
Woody Wetlands	0.120
Evergreen Forest	0.100
Barren Land Rock/Sand/Clay	0.020
Emergent Herbaceous Wetlands	0.100
No Data	0.060

Table 5. User-Defined Manning's n Data

Description	n
Channels	
Main channel (Sallisaw Creek)	0.035
Other channels < 25ft wide	0.050
Other channels < 50ft	0.040
Other channels < 70ft	0.035
Crossings	
Bunch Rd	0.027
E888 Rd	0.030
E908 Rd	0.041
RR KCS Heavener	0.032
RR KCS Heavener N	0.038
RR KCS Heavener S	0.038
RR KCS Quarry Spur	0.043
S4641 Rd	0.041
S4660 Rd	0.029
S4680 Rd	0.032
Seminole Ave	0.047

Horton – Einstein formula used to compute the composite n value in the bridges

$$\bar{n} = \frac{\left(p_1 n_1^{1.5} + p_2 n_2^{1.5} + \cdots + p_N n_N^{1.5}\right)^{\frac{2}{3}}}{P^{2/3}}$$

Where

$\bar{n}$ =composite Manning's roughness coefficient for the cross section

p_N = wetted perimeter in subdivided area n

n_N = Manning's roughness coefficient in subdivided area n

N = last subdivided area in the cross section

P = total wetted perimeter

Flood Frequency Modeling Assumptions

The U.S. Army Corps of Engineers Hydrologic Engineering Center's River Analysis System (HEC-RAS) Version 6.0 and Version 6.1 were used to develop the flood frequency model. HEC-RAS 6.0 was the most current version at the start of the project and was used for the bulk of the modeling effort. HEC-RAS version 6.1 was officially released during the modeling phase and resolved some of the bugs present in HEC-RAS 6.0 that were detrimental to the modeling process. Therefore, HEC-RAS 6.1 was used for model development towards the end of the modeling process and was used to run the final flood frequency simulations. Mapping was performed in ArcGIS Pro 2.8. The following paragraphs explain the assumptions used to develop this model.

Information sources

A 2-meter digital elevation model (DEM) derived from bare earth LiDAR downloaded from Oklahoma GIS Data Clearinghouse (OKmaps.org) was used to define the terrain in the HEC-RAS model. Data from field survey, as-built plans, and ground-level photographs were used to supplement the development of the model at the downstream crossings and dams within the area of study.

Numerical model

The HEC-RAS 6.1 implicit numerical solution of the "2D Diffusion Wave" equation was used to simulate all the frequency analysis events in this study. Details about the mathematical formulation and the solution algorithm used by HEC-RAS 6.1 can be found in the technical manual.

Rain-on-Grid

The model utilized a "rain-on-grid" technique which applies rainfall directly to the model terrain. An assumption was made that all dams should have an initial water surface elevation equal to their permanent pool elevations.

Domain extents

The area of study was delineated with ArcMap v 10.6 using the Arc Hydro 10.6.0.83 tool suite.

The model domain boundary is the Sallisaw Creek watershed upstream of the junction of Sallisaw Creek and Brushy Creek, which is about 6 miles downstream from Marble City. The model domain ends downstream of Marble City, sufficiently far from Dam 13, Dam 19, and the PDLs such that the effect of the downstream boundary condition at those locations is negligible.

Downstream boundary condition

A downstream normal flow boundary condition was imposed on the main stem of Sallisaw Creek 0.7 miles downstream of the junction of Sallisaw Creek and Brushy Creek. This location is just outside the area of study. The downstream boundary condition of the domain is approximately 18 miles downstream of Dam 13, and 27.5 miles downstream of Dam 19. This location was chosen because it was sufficiently far downstream that the effect of the boundary condition on the simulation results was negligible.

LiDAR Source and DEM Creation

The NRCS 2-meter DEM Bare Earth FIPS 40001, 40021 and 40135 raster LiDAR downloaded from OKmaps.org was used to create a terrain DEM as input for the HEC-RAS 2D model. Because of the size of the model domain, the raw LiDAR download was parsed in multiple rasters which needed to be combined into a single raster for modeling purposes. This action was initially attempted in ArcMap 10.8, the most recent version available at the time. The merged raster was then compared with the original LiDAR data, which revealed vertical distortion in the merged raster between 0.1 feet and 0.5 feet. A bug report was filed with ESRI. To work around the bug causing the

distortion, the terrain raster for this project was created using ArcGIS Pro 2.5 (rather than ArcMap), the most recent version of ArcGIS Pro that did not produce distortion.

Terrain modifications

Terrain cuts were imposed (hydro-enforced) at culvert locations in the bare earth DEM to prevent ponding on the model simulated flows.

The raster LiDAR in the channel upstream and downstream of each crossing was lowered gradually with channel burning tools to create a channel bathymetry that matched the surveyed bottom of waterway elevation at the upstream face of the crossing. For most of the model extents, the LiDAR in the channel was left unchanged under the assumption that the raster LiDAR elevations in the channel represented typical baseflow.

LiDAR inside the reservoirs below the principal spillway crest elevation was raised or lowered to the principal spillway crest elevation. This was done to support the modeling assumption that all reservoirs in study begin the simulation with a water surface elevation equal to the principal spillway crest elevation.

Modifications for Rehabilitated and Decommissioned Scenarios

The rehabilitated scenarios (Alt13 and Alt19) and the decommissioned scenarios (Rem13 and Rem19) included additional modifications to the terrain to represent the different dam geometry. See the Model Differences Between Flood Frequency Scenarios section for more detail.

Computational mesh modifications

The 2D HEC-RAS mesh was created with a cell size of 200 feet in the floodplain and the watershed. Different cell sizes were used to refine the mesh. Cell sizes in refinement regions ranged from 25 feet in small tributaries to 150 feet near structures and in the main stem of Sallisaw Creek. Break lines were used to prevent flow leakage on mesh cells at crossings, dams, railroads and roadway embankments.

Flood routing through dams

To model the flow through the principal spillway in HEC-RAS, an elevation-discharge curve was required for each dam. Elevation-discharge curves were defined in HydroCAD version 10.00-15 using dimensions from as-built plans provided by NRCS. Twenty-three curves for the existing condition scenarios, plus two additional curves for the proposed rehabilitated dimensions of Dam 13 and Dam 19 were calculated in this manner, for a total of 25 discharge-elevation curves. HydroCAD 10.00-15 is available in a free version with a 10-node limitation. Use of HydroCAD during this project is compatible with the free version of the software.

Once produced, the elevation-discharge curves were modified in the following ways:

1) The curves derived from as-built plans reported elevations in National Geodetic Vertical Datum of 1929 (NGVD 29). The elevation values from the elevation-discharge curves were transformed from NGVD 29 to the North American Vertical Datum of 1988 (NAVD 88). (See Vertical Datums section below for detail).

2) The discharge values for every elevation at and above the auxiliary spillway crest were replaced with the value of the principal spillway discharge at the auxiliary spillway crest elevation. This was done because the auxiliary spillway is a part of the LiDAR raster terrain, so the auxiliary spillway flow is already considered based on the terrain geometry. Including auxiliary spillway flow in the SA/2D rating curve would have caused the program to double account the auxiliary spillway flow. Assuming a constant discharge from the principal spillway for every elevation above the auxiliary spillway was deemed acceptable because the contribution of flow from the principal spillway is negligible compared to flow through the auxiliary spillway.

Vertical datum

The as-builts for the existing Sallisaw Creek watershed dams expressed elevation in the National Geodetic Vertical Datum of 1929 (NGVD 29). HEC-RAS DEM elevations and model results for the 2021 effort are reported in North American Vertical Datum of 1988 (NAVD 88).

In this watershed the conversion equation is *Elevation (ft) in NGVD 29 + X = Elevation (ft) in NAVD 88*, with *X* approximately equal to 0.4 feet, though the exact conversion varies with location.

Elevation data in the NGVD-29 datum was converted into the model datum NAVD 88 using the conversion factors shown in the next table.

Table 6. Vertical Datum Shift

Dam Site	Latitude	Longitude	NAVD88-NAVD29 (ft)
5	35.5398	-94.8559	0.351
6	35.5602	-94.8536	0.358
8	35.6003	-94.8123	0.374
11	35.6438	-94.7794	0.381
12	35.6701	-94.7589	0.390
13	35.6857	-94.7834	0.427
14	35.7113	-94.7748	0.423
15	35.7240	-94.7755	0.440
16	35.7292	-94.7465	0.423
17	35.7409	-94.7246	0.430
18	35.7627	-94.7049	0.446
19	35.7678	-94.6667	0.479
20	35.7474	-94.6688	0.466
21	35.7424	-94.7117	0.433
22	35.7156	-94.7193	0.433
23	35.6928	-94.7510	0.404
24	35.6763	-94.7374	0.404
25	35.6541	-94.7442	0.397
26	35.6717	-94.6936	0.440
27	35.6326	-94.7704	0.390
28	35.5870	-94.8134	0.371
29	35.5339	-94.8283	0.351
30	35.5667	-94.7308	0.413

Bridge SA/2D connections

The analysis included modeling eleven crossings as hydraulic objects, each designated with an asterisk in Table 7. These structures were modeled by incorporating data obtained from field survey conducted by Conservation Works, J.V. in August 2021. The crossing at E923 Rd was modeled as a terrain feature due to its small size. Survey was not collected at this crossing, so its elevation was estimated using the best available LiDAR data. Survey was

also not collected at the southernmost railroad crossing, RR KCS Heavener South. The RR KCS Heavener South crossing was defined in the model using the geometry from RR KCS Heavener North which is assumed to have a similar structure. The assumption was deemed acceptable due to its distance from Dam 13 and Dam 19. Structures and obstructions in the watershed that were not specifically surveyed were assumed to be represented by the LiDAR data.

Internal Manning's n

Internal Manning's n values were specified for each structure based on the roughness of the channel and the wetted perimeter of the upstream opening. Reference the "Land Cover and Manning's n" section in this report for additional detail.

User-Specified Maximum Headwater

To simulate flow through bridges, HEC-RAS creates a family of rating curves based on the key cross sections at the bridge structure. HEC-RAS requires the user to specify the maximum headwater at each structure to compute these curves. The user-specified maximum headwater for flood frequency events is based on the maximum headwater computed for the existing 500-yr storm plus an arbitrary value. The arbitrary value was determined through trial and error. Refining the specified maximum headwater value was important for reducing computational effort.

Computational Timestep

The time step was selected based on the general guidance of keeping the Courant Number under 1 using the following equation:

$$C = \frac{V\Delta T}{\Delta X}$$

Where:

$$C = Courant\ Number$$

$$V = Flood\ Wave\ Velocity\ (wave\ celerity)(^{ft}/_{s})$$

$$\Delta T = Computational\ time\ step\ (s)$$

$$\Delta X = Average\ cell\ size\ (ft)$$

A base time step of 15 seconds was chosen with the variable time step option allowing the time step to drop as low as 0.23 seconds or go as high as 60 seconds to keep the courant number near 1. The computational timestep was chosen through sensitivity analyses maintain accuracy and stability in the model.

Potential Damage Locations (PDLs)

The 2021 hydrologic and hydraulic analysis identified 29 possible damage locations (eleven modeled bridge crossings, 13 homes, 1 business, 2 churches, 1 electric substation, and one additional bridge crossing represented as a terrain feature) for the Sallisaw Creek Watershed based on their elevation relative to the valley elevation. Although the electrical substation is not included in the calculation for potential loss of life, it could indirectly contribute to potential in loss of life if it fails during an inundation event. For this reason, the electrical substation is noted as a PDL location throughout this report.

Please note, these locations do not correspond perfectly with the 22 PDLs identified in the 2010 rehabilitation assessment. More PDLs were identified in the 2021 study than in the 2010 rehabilitation study, which indicates

an additional need for rehabilitation to high hazard. The additional PDL locations also add cost to the non-structural option.

The PDLs analyzed in this study were prioritized based on their elevation relative to the channel elevation - or in other words, their likelihood to be inundated during a flood event. Since the purpose of this study is to determine flood reduction benefits and not hazard classification, the question of "how many PDLs are affected?" is not as relevant as "are PDLs affected?". Therefore, this study focused on the impact of flooding at those locations most likely to be inundated by flooding event. It is possible additional damage locations may exist beyond those analyzed in this report.

A summary of the PDLs surveyed for the 2021 study is shown in Table 7. Asterisks indicate the PDL is one of the crossings modeled as an object in HEC-RAS 2D. A diamond symbol indicates that no survey information was available. It is possible other PDLs exist beyond the locations captured in the survey efforts.

Table 7: Potential Damage Locations

Name	Description	PDL Type	Lat/Long
PDL 1*	S4680 Rd	Roadway Slab Bridge	35.7595676° -94.6774930°
PDL 2*	S4660 Rd	Roadway Multi-Box Culvert	35.7416826° -94.7189904°
PDL 3*	E888 Rd	Roadway Box Culvert	35.7287168° -94.7323520°
PDL 4♦	House	House	35.725714° -94.737225°
PDL 5*	E908 Rd	Roadway Bridge	35.6931332° -94.7605278°
PDL 6	House	House	35.6831143° -94.7617555°
PDL 7	House	House	35.6813408° -94.7686743°
PDL 8*	Bunch Rd	Roadway Box Culvert	35.6808705° -94.7686317°
PDL 9*♦	E923 Rd	Low Roadway Crossing	35.679264° -94.768657°
PDL 10	House	House	35.6785394° -94.7678886°
PDL 11	House	House	35.6819818° -94.7596120°
PDL 12♦	House	House	35.681412° -94.760622°
PDL 13♦	Business	Business	35.681025° -94.760443°
PDL 14♦	Church	Church	35.681767° -94.758998°
PDL 15♦	House	House	35.680859° -94.758749°
PDL 16	Church	Church	35.6792700° -94.7621254°
PDL 17	House	House	35.6806092° -94.7602758°
PDL 18♦	House	House	35.679808° -94.758093°
PDL 19*	S4641 Rd	Roadway Bridge	35.6763692° -94.756252°

Name	Description	PDL Type	Lat/Long
PDL 20*	RR KCS Heavener	Railroad Bridge	35.6761410° -94.756978°
PDL 21*♦	House	House	35.638672° -94.778844°
PDL 22♦	Electric Substation	Electric Substation	35.583522° -94.828864°
PDL 23♦	House	House	35.582752° -94.829063°
PDL 24♦	House	House	35.58196° -94.829336°
PDL 25♦	House	House	35.580371° -94.829669°
PDL 26*	RR KCS Quarry Spur	Railroad Bridge	35.5809385° -94.8261738°
PDL 27*	Seminole Ave	Roadway Bridge	35.5801737° -94.8272511°
PDL 28*	RR KCS Heavener North	Railroad Bridge	35.5566796° -94.8390175°
PDL 29♦	RR KCS Heavener South	Railroad Bridge	35.530481° -94.840064°

*Asterisk indicates a modeled SA/2D connection

♦Diamond indicates LiDAR information used

Existing and Preferred Alternative Geometry

The existing and proposed dam geometries are summarized in Table 8.

Table 8. Dam Geometry

	Dam 13		Dam 19	
	Existing	Rehabilitated	Existing	Rehabilitated
Top of Dam Elevation	892.4	892.4	984.5	984.5
Auxiliary Spillway Elevation	888.9	884.7	980.7	974.8
Auxiliary Spillway Width	40'	120'	200'	400'
Principal Spillway Elevation	860.2	860.2	948.7	948.7
Principal Spillway Conduit Dia.	24"	30"	30"	48"

*All elevations expressed in NAVD 88 datum

Results

Once the HEC-RAS model and frequency rainfall depths were developed, the model could be used to produce maximum water surface elevation maps, velocity maps, and depth maps over the watershed. Results at possible damage locations (PDLs) were extracted from the model results and can be seen in the appendices.

Twenty-nine PDLs were analyzed in this study including 11 modeled bridges, 13 homes, 1 business, 2 churches, 1 electrical substation, and an additional bridge (E 923 Rd), which was modeled simply as a terrain feature rather than a SA/2D connection because it does not cross the main channel. The number of PDLs identified at this location has increased since the 2010 assessment. These new PDL locations add additional need for rehabilitation to high hazard criteria and would add costs to the non-structural option. Please see Table 7 and the location map in Appendix B to view all PDL locations.

Inundation floodplain elevation (i.e., water surface elevation) and maximum velocity were extracted from the HEC-RAS 2D model results for each PDL for each scenario. Inundation floodplain elevations were extracted just upstream of the eleven bridges modeled in HEC-RAS 2D to capture the maximum rise in water surface elevation before the bridge. For all other PDLs, the inundation floodplain elevation was extracted exactly at the PDL location. Velocity was extracted at the PDL location for all PDLs.

Estimated maximum inundation depth at PDL was reported by subtracting the low elevation of the PDL from the flood inundation elevation. The low elevation reported at bridge crossings was the lower value of either the lowest deck elevation or the lowest surveyed roadway elevation approaching the deck. This reporting method was used to estimate the depth of water over the road. Low elevations reported at buildings are lowest adjacent grade.

Surveyed elevations were used in reporting where available. See Table 7 to view the source of elevation data used at each location for results reporting.

Interpreting mapped floodplain results

Due to the use of rain-on-grid 2D modeling, the floodplains that are generated within HEC-RAS far exceed typical riverine flooding extents. Due to precipitation being applied to every cell in the 2D area, it is not feasible to use these floodplains for determining the extent of flooding. Very minimal flooding depths of 2 inches, for example, are included in the computed HEC-RAS grids, which is not appropriate for plotting the differences in flooding caused by changes or removal of a dam.

For conventional 1D modeling, flood elevations are computed along a stream/creek/river/lake and the floodplains are linearly interpolated from cross-section to cross-section. The flood elevations for the small ditches, creeks and ponding areas beyond the typical riverine extents are not computed nor plotted. With this 2D approach, flood elevations are computed for the first cell and water gets deeper as you move downstream, and the resultant floodplain covers a significantly larger amount of the studied area than conventional methods.

GIS processes were used to assist in generating regulatory floodplains from 2D HEC-RAS model runs that reflect flooding from the riverine sources. A shapefile was used to determine the flooding origins using a source polygon generated to the riverine extents, and then 'floods out' iteratively from these origins cell by cell. The water surface elevations under the origin shapefile are taken directly from the model results, but the values around the boundary of this shapefile were used to start the iterative flooding. New water surface elevations are calculated based on an average of the surrounding existing water surface elevations and shall never exceed the original water surface elevations from the HEC-RAS models. The net result is that the water surface is 'run into the ground' or 'shore-lined' from the origins to generate the floodplains. The resulting floodplain polygons developed in this process better show the changes in the floodplains under the various scenarios modeled for this analysis by removing the areas flooded by local rainfall.

Existing Condition Results Summary

<u>100-yr</u>

Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event in the existing condition. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet.

500-yr

Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event in the existing condition. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.0 feet.

Dam 13 Rehabilitation Option Results Summary

100-yr

Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option at Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 3.7 feet.

500-yr

Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the rehabilitated option at Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.0 feet to 5.0 feet.

Dam 13 Without Dam Option Results Summary

100-yr

Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 5 homes, 1 business, 1 church, and 1 electrical substation are predicted to be inundated by the 100-year event for the without dam option at Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.2 feet to 3.7 feet.

500-yr

Approximately 4 roads (S4680 Rd, E888 Rd, E908 Rd, Bunch Rd), 8 homes, 1 business, 2 churches, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the decommissioned option at Dam 13. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.0 feet.

Dam 19 Rehabilitation Option Results Summary

100-yr

Approximately 3 roads (S4680 Rd, E888 Rd, and E908 Rd), 4 homes, 1 business, and 1 electrical substation are predicted to be inundated by the 100-year event for the rehabilitated option at Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 3.7 feet.

500-yr

Approximately 3 roads (S4680 Rd, E888 Rd, E908 Rd), 7 homes, 1 business, 1 church, 1 railroad (RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the rehabilitated option at Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.1 feet.

Dam 19 Decommissioned Option Results Summary

100-yr

Approximately 4 roads (S4680 Rd, S4660 Rd, E888 Rd, and E908 Rd), 5 homes, 1 business, 1 church, and 1 electrical substation are predicted to be inundated by the 100-year event for the decommissioned option at Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 5.7 feet.

500-yr

Approximately 4 roads (S4680 Rd, S4660 Rd, E888 Rd, and E908 Rd), 9 homes, 1 business, 2 churches, 2 railroads (RR KCS Heavener and RR KCS Heavener North), and 1 electrical substation are predicted to be inundated by the 500-year event for the decommissioned option at Dam 19. The maximum depth of the flooding at these structures ranges from approximately 0.1 feet to 7.3 feet.

Inundation Results

Flood frequency and breach inundation results for each PDL can be found in the appendices.

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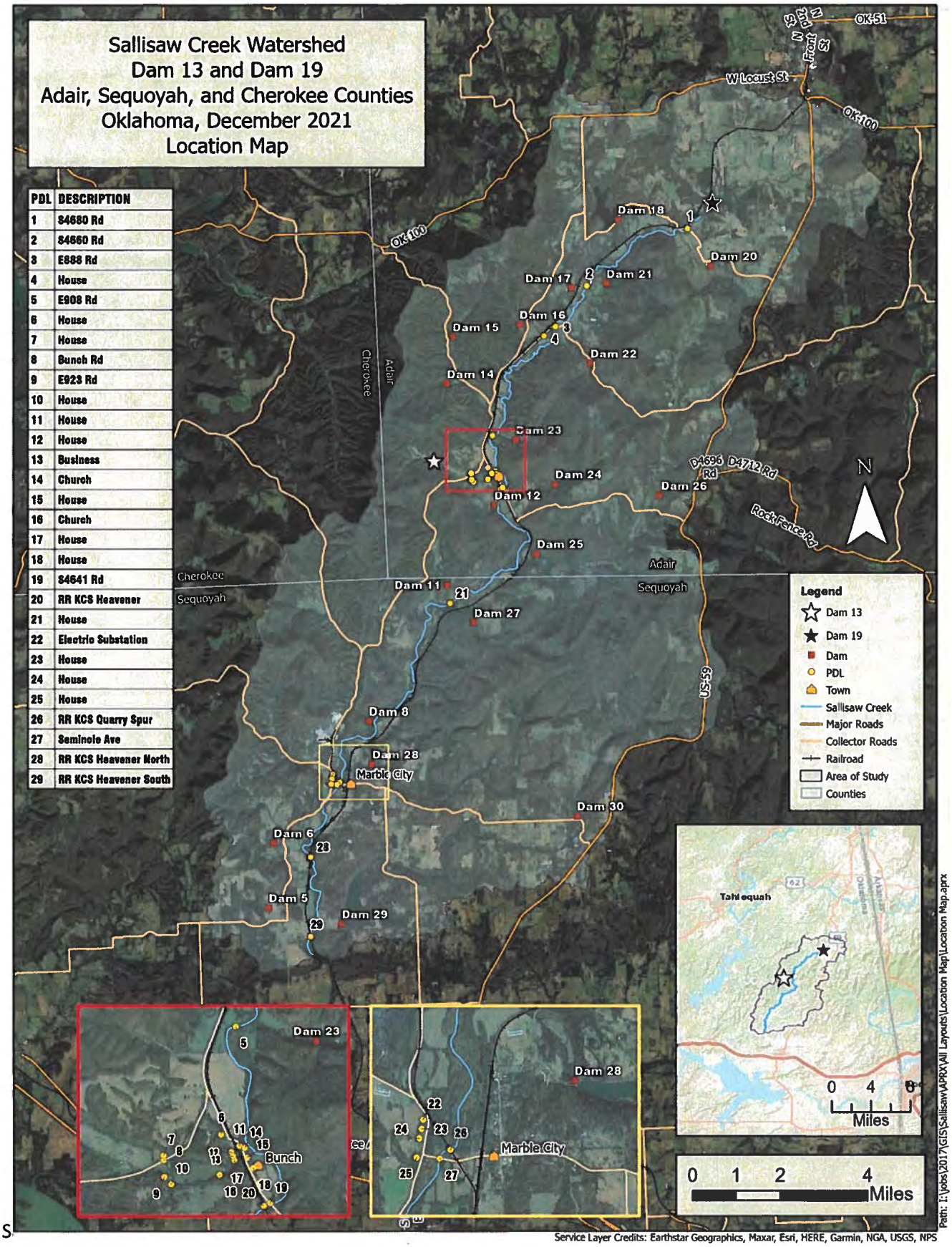
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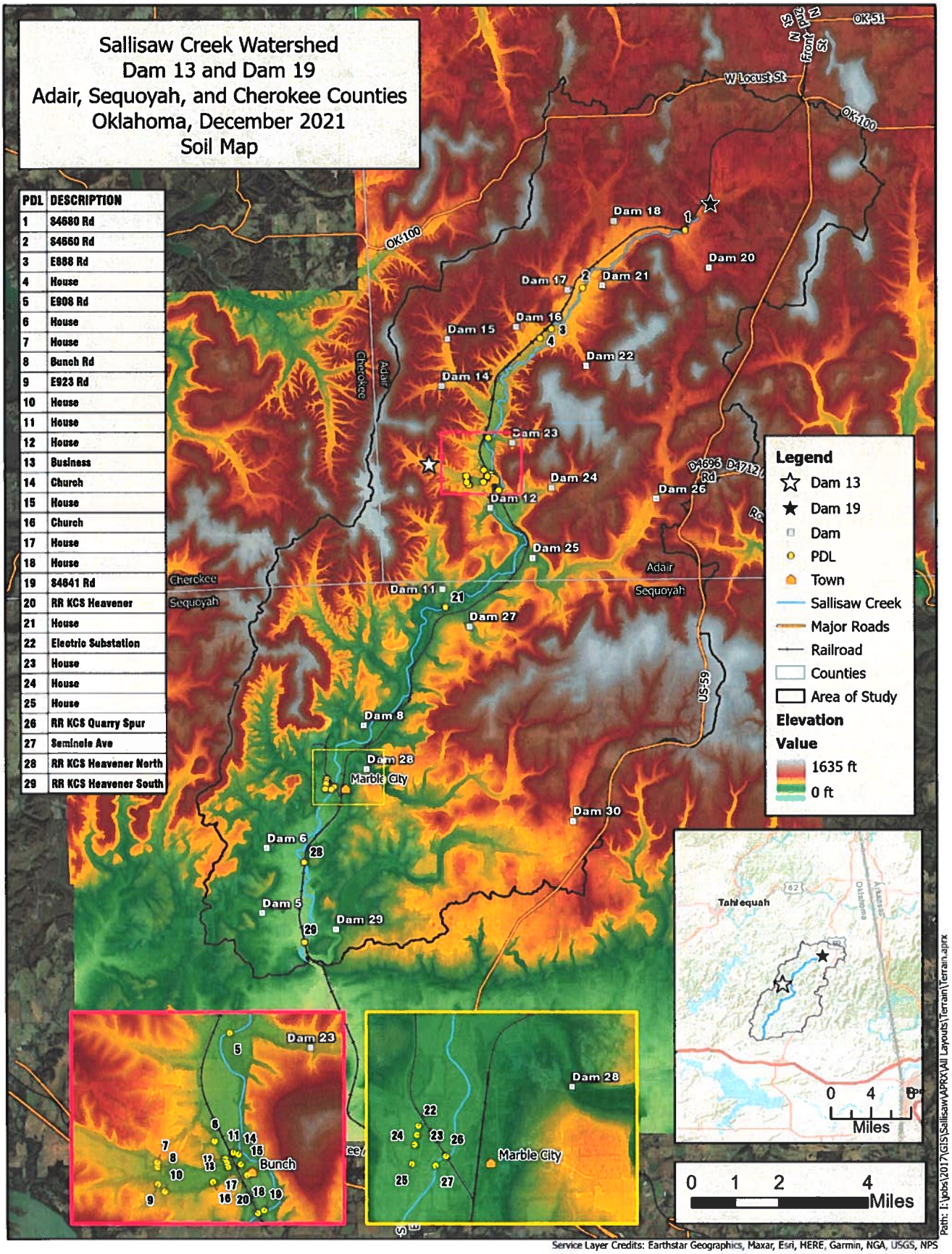
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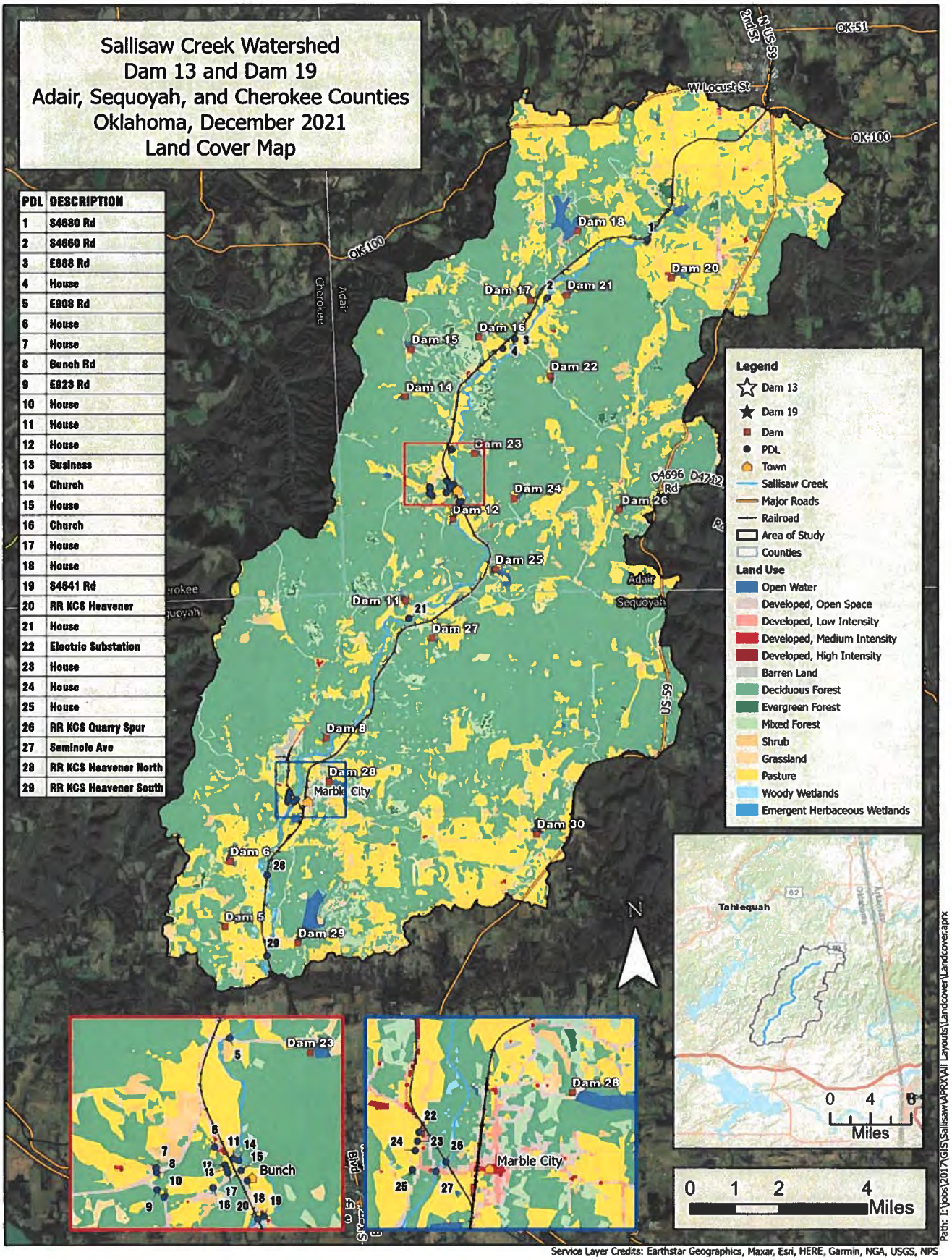
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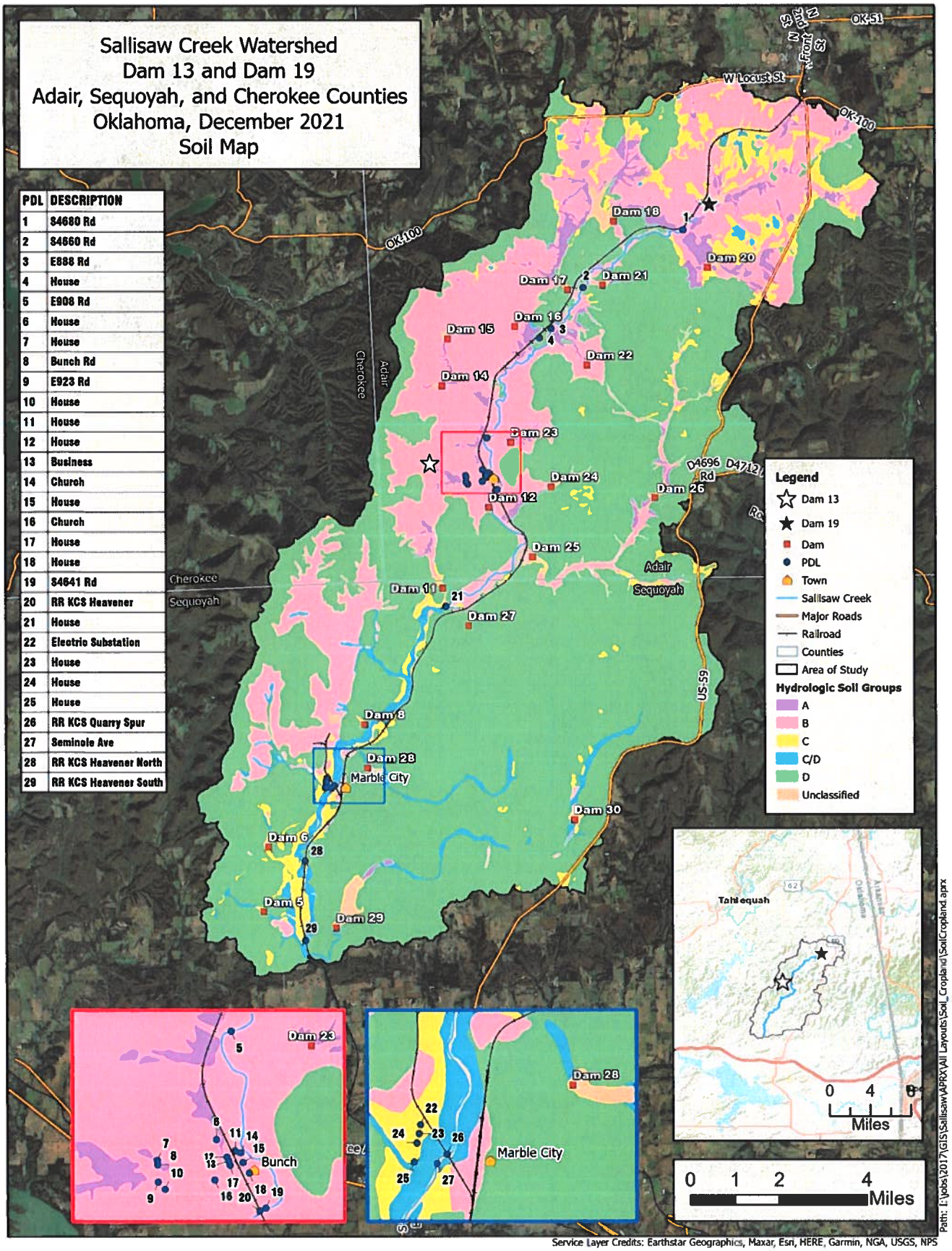
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Appendix A - Additional Figures


Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Location Map
PDL DESCRIPTION
1 S4680 Rd
2 S4660 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Collector Roads
Railroad
Area of Study
Counties
Cherokee
Adair
Sequoyah
OK-51
W Locust St
OK-100
US-59
Rock Fence Rd
D4695 Rd
D4712 Rd
Marble City
Bunch
Tahlequah
0 4 8
Miles
0 1 2 4
Miles
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
Path: I:\Jobs\2017\GIS\Sallisaw\APRX\All Layouts\Location Map\Location Map.aprx


Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Soil Map
PDL DESCRIPTION
1 S4680 Rd
2 S4650 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Railroad
Counties
Area of Study
Elevation
Value
1635 ft
0 ft
Dam 18
Dam 20
Dam 17
Dam 21
Dam 16
Dam 15
Dam 22
Dam 14
Dam 23
Dam 24
Dam 12
Dam 26
Dam 25
Dam 11
Dam 27
Dam 8
Dam 28
Marble City
Dam 30
Dam 6
Dam 5
Dam 29
Bunch
Tahlequah
Cherokee
Adair
Sequoyah
OK-51
OK-100
W Locust St
US-59
0 1 2 4 Miles
0 4 8 Miles
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
Path: I:\jobs\2017\GIS\Sallisaw\APRX\All Layouts\Terrain\Terrain.aprx


Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Land Cover Map
PDL DESCRIPTION
1 S4680 Rd
2 S4660 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
Legend
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Railroad
Area of Study
Counties
Land Use
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub
Grassland
Pasture
Woody Wetlands
Emergent Herbaceous Wetlands
Dam 18
Dam 20
Dam 17
Dam 21
Dam 16
Dam 15
Dam 22
Dam 14
Dam 23
Dam 24
Dam 12
Dam 26
Dam 25
Dam 11
Dam 27
Dam 8
Dam 28
Marble City
Dam 30
Dam 6
Dam 5
Dam 29
Bunch
Tahlequah
N
0 4 8
Miles
0 1 2 4
Miles
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
Path: I:\jobs\2017\GIS\Sallisaw\APRX\All Layouts\Landcover\Landcover.aprx


Sallisaw Creek Watershed
Dam 13 and Dam 19
Adair, Sequoyah, and Cherokee Counties
Oklahoma, December 2021
Soil Map
PDL DESCRIPTION
1 S4680 Rd
2 S4660 Rd
3 E888 Rd
4 House
5 E908 Rd
6 House
7 House
8 Bunch Rd
9 E923 Rd
10 House
11 House
12 House
13 Business
14 Church
15 House
16 Church
17 House
18 House
19 S4641 Rd
20 RR KCS Heavener
21 House
22 Electric Substation
23 House
24 House
25 House
26 RR KCS Quarry Spur
27 Seminole Ave
28 RR KCS Heavener North
29 RR KCS Heavener South
Legend
Dam 13
Dam 19
Dam
PDL
Town
Sallisaw Creek
Major Roads
Railroad
Counties
Area of Study
Hydrologic Soil Groups
A
B
C
C/D
D
Unclassified
Dam 18
Dam 20
Dam 17
Dam 21
Dam 16
Dam 15
Dam 22
Dam 14
Dam 23
Dam 24
Dam 12
Dam 26
Dam 25
Dam 11
Dam 27
Dam 8
Dam 28
Marble City
Dam 30
Dam 6
Dam 5
Dam 29
Bunch
Tahlequah
Cherokee
Adair
Sequoyah
OK-51
OK-100
W Locust St
US-59
0 1 2 4 Miles
0 4 8 Miles
Service Layer Credits: Earthstar Geographics, Maxar, Esri, HERE, Garmin, NGA, USGS, NPS
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Appendix B - Technical Notes

Technical Notes

Dam 21 and Dam 22 Oscillations

After reviewing the analysis results, it became clear there were artificial oscillations being produced at Dam 21 and Dam 22, likely due to some program bug associated with the dam object occurring at the Dam 21 and Dam 22 SA/2D connections. It was determined that this discrepancy would not affect the model unless the auxiliary spillway was activated, because the contributions from the principal spillway discharge are too small to affect the water surface in the main channel.

Dam 22 and Dam 21 Investigation

A simulation was performed to determine which, if any design, storms would active the auxiliary spillways of Dam 21 and Dam 22. The simulation results show the maximum water surface elevation of the reservoir assuming no flow exits via the principal spillway for the duration of the 500 yr storm. This allowed the user to determine the 500-yr runoff volume for the subwatershed upstream of each structure.

The maximum water surface elevation calculated for both dam reservoirs on this simulation are lower than their respective the auxiliary spillway crest elevation, which implies neither Dam 21 or Dam 22's auxiliary spillways would be activated for any event.

Worst possible operational conditions of Dam 22 in a 500 yr maximum water surface elevation at reservoir: 955.33 ft

Dam 22 ASW crest elevation: 958.63

Worst possible operational conditions of Dam 21 in a 500 yr maximum water surface elevation at reservoir: 910.44 ft

Dam 21 ASW crest elevation: 911.44

Model description

The test model is a child model of the existing condition model. The Dam 21 and Dam 22 SA/2D connections were removed and a break line was placed at the crest of the dam to prevent leakage from the reservoir upstream of the dam. The storm event used was the 500-yr existing storm.

Observations

Special care was taken when placing the cells to prevent leakage, nonetheless a small volume of water was measured downstream of the dam. The necessary additional volume of runoff necessary to activate the ASW can be estimated from the following storage curves. The additional volume of runoff measure downstream of each dam is also reported

Dam 22 storage curve based on DEM

NAVD 88 Elevation ft	Volume Ac-ft
953.4	383.8
954.3	404.3
WSE Max: 955.3	*429.7*
956.0	447.2
956.8	470.1
957.7	492.8
ASW crest: 958.63	*516.2*
959.0	530.6

Additional volume needed to activate ASW: 86.5 Ac-ft

Additional runoff volume measure downstream of dam: 6.7 Ac-ft

Dam 21 storage curve based on DEM

NAVD 88 Elevation ft	Volume Ac-ft
908.6	504.5
909.9	552.4
WSE Max: 910.4	*572.9*
911.1	598.4
ASW crest: 911.4	*612.3*

Additional volume needed to activate ASW: 39.4

Additional runoff volume measured downstream of dam: 11.7 ac-ft

Conclusion

Based on the results of the investigation, the artificial oscillation occurring at Dam 21 and Dam 22 will not significantly impact the results of the model. Therefore, the simulations affected by this error were not rerun.

Attachment to Flood Frequency Analysis for Rehabilitation of Dams
Sallisaw Creek Watershed
Dam 13 | Dam 19

Flood Frequency Tabular Results

2-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.12	0.29
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	846.42	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	824.98	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	768.97	0.00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.37	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	748.34	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	747.91	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	595.81	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	594.68	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	572.36	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	550.90	0.00

5-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.63	0.80
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.12	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	826.59	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	769.98	0.84
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	749.36	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.88	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	596.97	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	595.78	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	573.66	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	552.15	0.00

10-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.99	1.16
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.79	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.10	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.66	1.52
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.12	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.22	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	750.15	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	749.61	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.96	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	596.74	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.57	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	553.18	0.00

25-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.49	1.65
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	849.23	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.91	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	771.50	2.36
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.87	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.30	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	751.41	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	750.80	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	603.99	0.09
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	603.75	0.15
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	599.72	0.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	599.36	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	598.10	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	575.63	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	554.66	0.00

50-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.87	2.04
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.17	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.31	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.18	3.04
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.82	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.38	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	768.44	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	752.32	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.64	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.40	0.50
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.29	0.69
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.11	0.61
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	600.41	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.11	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.35	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	555.84	0.00

100-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.11	2.28
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.76	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.73	0.31
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.83	3.69
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.35	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	769.76	0.56
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	769.64	0.44
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.47	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	769.35	0.06
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	753.20	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	752.41	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.89	0.99
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.70	1.10
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.41	0.91
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	601.43	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.04	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.99	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	557.00	0.00

200-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.31	2.48
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.23	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.14	0.72
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.42	4.28
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	770.48	1.28
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	770.42	1.21
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.63	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.29	1.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	754.09	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	753.18	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.35	1.45
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.02	1.41
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	603.48	0.38
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.72	1.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	602.43	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.92	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.60	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	558.15	0.00

500-YR FLOOD FREQUENCY - EXISTING CONDITION - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.72	2.89
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.85	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.66	1.24
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	828.83	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	774.17	5.03
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.67	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.00	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.20	2.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.18	1.98
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.75	0.05
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.10	1.81
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	762.96	0.46

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	755.26	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	754.29	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	689.66	0.06
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.78	1.88
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.39	1.79
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	604.07	0.97
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	601.19	1.69
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	603.76	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	602.06	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	578.31	0.53
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	559.63	0.00

2-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.12	0.29
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	846.42	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	824.98	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	768.97	0.00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.55	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	748.38	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	747.97	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	595.83	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	594.69	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	572.38	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	550.91	0.00

5-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.63	0.80
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.12	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	826.59	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	769.98	0.84
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.88	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	749.38	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.91	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	596.98	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	595.79	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	573.68	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	552.16	0.00

10-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.987	1.16
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.779	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.036	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.633	1.49
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.41	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.215	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	750.196	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	749.701	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.923	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	596.707	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.53	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	553.12	0.00

25-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.49	1.65
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	849.20	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.89	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	771.47	2.33
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.83	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.29	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	751.36	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	750.83	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	603.99	0.09
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	603.75	0.15
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	599.72	0.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	599.33	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	598.07	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	575.60	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	554.62	0.00

50-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.87	2.04
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.16	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.30	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.15	3.01
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	797.50	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.37	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	768.43	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	752.30	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.63	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.40	0.50
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.29	0.69
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.10	0.60
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	600.39	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.09	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.33	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	555.81	0.00

100-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.11	2.28
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.76	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.73	0.31
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.83	3.69
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.45	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	769.89	0.69
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	769.79	0.59
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.48	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	769.53	0.24
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	753.22	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	752.44	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.89	0.99
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.70	1.10
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.41	0.91
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	601.45	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.05	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.99	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	557.03	0.00

200-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.31	2.48
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.23	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.13	0.71
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.40	4.26
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.88	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	770.30	1.10
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	770.23	1.03
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.61	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.06	0.77
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	754.00	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	753.19	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.35	1.45
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.02	1.41
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	603.48	0.38
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.72	1.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	602.40	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.90	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.58	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	558.13	0.00

500-YR FLOOD FREQUENCY - DAM 13 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.72	2.89
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.85	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.65	1.23
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	828.83	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	774.16	5.02
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.68	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.17	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.07	1.87
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.05	1.85
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.72	0.02
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.95	1.66
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	763.01	0.51
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	755.25	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	754.28	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	689.65	0.05
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.78	1.88
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.39	1.79
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	604.07	0.97
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	601.18	1.68
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	603.72	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	602.05	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	578.30	0.52
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	559.61	0.00

2-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.12	0.29
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	846.72	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	825.07	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	768.96	0.00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.37	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	748.42	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.04	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	595.80	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	594.68	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	572.85	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	550.88	0.00

5-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.63	0.80
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.07	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	826.58	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	769.97	0.83
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.46	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	774.98	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	749.39	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.93	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	596.94	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	595.78	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.09	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	552.12	0.00

10-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.99	1.16
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.67	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.09	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.65	1.51
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.53	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	769.39	0.19
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	769.27	0.06
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.37	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	768.93	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	750.28	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	749.80	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.95	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	596.74	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.96	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	553.13	0.00

25-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.49	1.65
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	849.06	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.94	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	771.48	2.34
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.08	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	770.78	1.58
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	770.77	1.57
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.60	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.68	1.39
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	751.58	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.02	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	603.99	0.09
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	603.75	0.15
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	599.72	0.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	599.36	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	598.10	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	575.94	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	554.64	0.00

50-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.87	2.04
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.03	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.35	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.17	3.03
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.74	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.46	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.36	2.16
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.37	2.17
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.72	0.01
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.29	2.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	762.87	0.37

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	752.52	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.89	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.40	0.50
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.29	0.69
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.11	0.61
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	600.42	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.12	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.58	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	555.83	0.00

100-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.11	2.28
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.68	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.75	0.33
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.82	3.68
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.88	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.78	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.69	2.49
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.72	2.52
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.88	0.18
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.62	2.33
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	763.03	0.53

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	753.46	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	752.73	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.89	0.99
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.70	1.10
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.41	0.91
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	601.44	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.04	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.24	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	556.98	0.00

200-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.31	2.48
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.14	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.15	0.73
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.42	4.28
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	802.00	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	800.07	0.27
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.96	2.76
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	772.01	2.81
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	776.08	0.38
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.89	2.60
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	763.16	0.66

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	754.37	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	753.53	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.35	1.45
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.02	1.41
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	603.48	0.38
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.72	1.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	602.43	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.93	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.81	0.03
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	558.13	0.00

500-YR FLOOD FREQUENCY - DAM 13 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.72	2.89
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.72	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.68	1.26
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	828.83	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	774.18	5.03
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	802.16	0.15
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	800.45	0.65
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	772.28	3.08
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	772.34	3.14
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	763.90	0.40
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	776.43	0.73
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	772.20	2.91
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	763.54	1.04

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	755.79	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	754.64	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	689.94	0.34
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.78	1.88
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.39	1.79
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	604.07	0.97
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	601.19	1.69
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	603.77	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	602.07	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	578.51	0.73
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	559.62	0.00

2-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.54	0.71
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	846.62	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	825.17	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	769.09	0.00
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.37	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	748.44	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.01	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	595.85	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	594.71	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	572.39	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	550.93	0.00

5-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	910.87	1.04
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.25	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	826.75	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.05	0.91
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	749.43	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.94	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	596.99	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	595.81	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	573.69	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	552.17	0.00

10-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.23	1.40
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	847.90	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.28	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.71	1.57
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.12	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.22	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	750.23	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	749.68	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.98	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	596.76	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.59	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	553.20	0.00

25-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.61	1.78
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	849.35	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.93	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	771.54	2.40
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.87	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.30	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	751.48	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	750.86	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	603.99	0.09
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	603.75	0.15
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	599.72	0.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	599.35	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	598.09	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	575.63	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	554.69	0.00

50-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	911.97	2.13
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.25	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.34	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.22	3.08
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.82	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.38	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	768.44	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	752.39	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.69	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.40	0.50
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.30	0.70
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.09	0.59
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	600.36	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.08	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.35	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	555.87	0.00

100-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.18	2.34
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.85	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.76	0.34
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.86	3.72
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.35	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	769.76	0.55
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	769.64	0.44
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.47	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	769.35	0.06
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	753.26	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	752.46	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.90	1.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.70	1.10
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.37	0.87
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	601.36	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.97	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.99	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	557.03	0.00

200-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.34	2.51
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.32	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.16	0.74
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.45	4.31
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	770.48	1.27
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	770.42	1.22
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.63	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.29	1.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	754.13	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	753.22	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.35	1.45
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.01	1.41
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	603.43	0.33
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.64	1.14
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	602.30	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.81	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.60	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	558.18	0.00

500-YR FLOOD FREQUENCY - DAM 19 - REHABILITATED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.77	2.94
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.91	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.69	1.27
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	828.83	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	774.19	5.05
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.67	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.00	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.20	2.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.18	1.98
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.75	0.05
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.10	1.81
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	762.98	0.48

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	755.30	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	754.32	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	689.68	0.08
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.78	1.88
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.38	1.78
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	604.00	0.90
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	601.23	1.73
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	603.55	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	601.88	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	578.32	0.54
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	559.66	0.00

2-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.07	2.24
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	848.02	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	827.85	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	770.16	1.02
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.38	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00

PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	749.43	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	748.90	0.00
PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	596.04	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	594.83	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	572.36	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	550.89	0.00

5-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	912.63	2.80
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	849.87	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	828.95	0.00
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	771.12	1.98
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	794.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	n/a	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	750.76	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	750.16	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.01	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	595.78	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	573.66	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	552.15	0.00

10-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	913.32	3.49
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	850.76	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	829.52	0.10
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	772.02	2.88
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.13	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.22	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	751.96	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	751.28	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	n/a	0.00
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	n/a	0.00
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	n/a	0.00
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	597.96	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	596.74	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	574.57	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	553.17	0.00

25-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	914.17	4.33
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	851.67	0.00
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.29	0.87
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.16	4.02
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	795.88	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.30	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	n/a	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	753.56	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	752.68	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	603.99	0.09
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	603.75	0.15
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	599.72	0.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	599.36	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	598.10	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	575.62	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	554.66	0.00

50-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	914.82	4.99
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	852.41	0.19
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	830.91	1.49
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	773.94	4.80
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	796.82	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	n/a	0.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	n/a	0.00
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	n/a	0.00
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.38	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	768.45	0.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	754.71	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	753.71	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	n/a	0.00
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.40	0.50
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.29	0.69
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.11	0.61
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	600.41	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	599.11	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.35	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	555.84	0.00

100-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	915.49	5.66
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	853.17	0.95
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	831.53	2.11
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	774.67	5.53
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.36	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	n/a	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	769.76	0.56
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	769.64	0.44
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	763.99	0.49
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	n/a	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.47	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	769.35	0.06
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	n/a	0.00
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	756.47	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	754.76	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	689.69	0.09
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	604.89	0.99
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	604.70	1.10
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	n/a	0.00
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.41	0.91
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	601.43	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.03	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	576.99	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	557.00	0.00

200-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	916.09	6.26
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	853.84	1.62
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	832.16	2.74
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	n/a	0.00
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	775.43	6.29
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	n/a	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	798.73	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	765.26	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	770.48	1.28
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	770.43	1.23
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	764.85	1.35
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	764.47	0.00
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.63	0.00
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	770.29	1.00
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	763.38	0.88
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	757.55	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	755.91	0.00

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	690.39	0.79
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.35	1.45
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.02	1.41
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	603.48	0.38
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	600.72	1.22
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	602.43	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	600.92	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	577.60	0.00
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	558.15	0.00

500-YR FLOOD FREQUENCY - DAM 19 - REMOVED - INUNDATION RESULTS							
Location ID	**Description**	**Location Latitude, Longitude**	**PDL Low Elevation (ft, NAVD 88)**	**Low Elevation Type**	**Low Beam/ Culvert Crown Elevation, for crossings only (ft, NAVD88)**	**Inundation Floodplain Elevation (ft, NAVD 88)**	**Estimated Max Inundation Depth at PDL (ft)**
PDL 1	S4680 Rd	35.7595676° -94.6774930°	909.83	Low Roadway	908.92	917.02	7.19
PDL 2	S4660 Rd	35.7416826° -94.7189904°	852.22	Low Roadway	851.07	854.62	2.40
PDL 3	E888 Rd	35.7287168° -94.7323520°	829.42	Low Roadway	828.65	833.08	3.66
PDL 4	House	35.725714° -94.737225°	828.90	LiDAR	n/a	828.99	0.09
PDL 5	E908 Rd	35.6931332° -94.7605278°	769.14	Low Roadway	768.20	776.42	7.28
PDL 6	House	35.6831143° -94.7617555°	781.09	L.A.G.	n/a	n/a	0.00
PDL 7	House	35.6813408° -94.7686743°	802.01	L.A.G.	n/a	801.67	0.00
PDL 8	Bunch Rd	35.6808705° -94.7686317°	799.80	Low Roadway	798.30	799.00	0.00
PDL 9	E923 Rd	35.679264° -94.768657°	803.13	Low Roadway	unknown	n/a	0.00
PDL 10	House	35.6785394° -94.7678886°	806.82	L.A.G.	n/a	n/a	0.00
PDL 11	House	35.6819818° -94.7596120°	768.38	L.A.G.	n/a	766.34	0.00
PDL 12	House	35.681412° -94.760622°	769.20	LiDAR	n/a	771.20	2.00
PDL 13	Business	35.681025° -94.760443°	769.20	LiDAR	n/a	771.18	1.98
PDL 14	Church	35.681767° -94.758998°	763.50	LiDAR	n/a	765.90	2.40
PDL 15	House	35.680859° -94.758749°	764.60	LiDAR	n/a	765.43	0.82
PDL 16	Church	35.6792700° -94.7621254°	775.70	L.A.G.	n/a	775.75	0.05
PDL 17	House	35.6806092° -94.7602758°	769.29	L.A.G.	n/a	771.10	1.81
PDL 18	House	35.679808° -94.758093°	762.50	LiDAR	n/a	764.27	1.77
PDL 19	S4641 Rd	35.6763692° -94.756252°	760.14	Low Roadway	755.66	758.79	0.00
PDL 20	RR KCS Heavener	35.6761410° -94.756978°	757.02	Low Steel	757.02	757.37	0.35

PDL 21	House	35.638672° -94.778844°	689.60	LiDAR	n/a	691.65	2.05
PDL 22	Electric Substation	35.583522° -94.828864°	603.90	LiDAR	n/a	605.78	1.88
PDL 23	House	35.582752° -94.829063°	603.60	LiDAR	n/a	605.39	1.79
PDL 24	House	35.58196° -94.829336°	603.10	LiDAR	n/a	604.07	0.97
PDL 25	House	35.580371° -94.829669°	599.50	LiDAR	n/a	601.19	1.69
PDL 26	RR KCS Quarry Spur	35.5809385° -94.8261738°	611.38	Low Steel	611.38	603.76	0.00
PDL 27	Seminole Ave	35.5801737° -94.8272511°	603.59	L.A.G.	604.71	602.06	0.00
PDL 28	RR KCS Heavener North	35.5566796° -94.8390175°	577.78	Low Steel	578.01	578.31	0.53
PDL 29	RR KCS Heavener South	35.530481° -94.840064°	564.50	LiDAR	unknown	559.63	0.00

HISTORIC RESOURCES SURVEY REPORT

Sallisaw Creek Sites 13 and 19

Adair County, Oklahoma

January 7, 2022

Terracon Project No. 96217693

S. Elizabeth Valenzuela, Principal Investigator



Prepared for:

Conservation Works Joint Venture

Prepared by:

Terracon Consultants, Inc.
Austin, Texas

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

DRAFT REPORT

HISTORIC RESOURCES SURVEY REPORT

Sallisaw Creek Sites 13 and 19

Adair County, Oklahoma

Prepared for:
Conservation Works Joint Venture
Peoria, Illinois

Prepared by:
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Report Contributor

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January 7, 2022

S. Elizabeth Valenzuela
Senior Architectural Historian

John D. Hall
Authorized Project Reviewer

ABSTRACT

Project Location	Adair County, Oklahoma
Lead Agency	U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
Other Involved Agencies	Oklahoma State Historic Preservation Office (SHPO)
Applicable Regulations	Section 106 of the National Historic Preservation Act (NHPA), as amended as part of an Environmental Evaluation prepared in accordance with the National Environmental Policy Act (NEPA)
Description of Project/ Undertaking	Rehabilitation of two aging flood control dams to meet current NRCS and Oklahoma Dam Safety criteria and performance standards. Site 13 was constructed in 1966 and Site 19 was constructed in 1968, under the authority of *Public Law 83-566* as low hazard potential dams. The evaluated life of Sites 13 and 19 was 50 years.
Location	Site 13 – Latitude 35.6857, Longitude -94.7834 Site 19 – Latitude 35.7678, Longitude -94.6667
Project Area/ Area of Potential Effects (APE)	The APE is an existing Natural Resources Conservation Service (NRCS) reservoir and includes an earthen dam structure, reservoir, spillway and appurtenances associated with the dam for Sallisaw Creek Dam Sites 13 and 19.
Land Jurisdiction	NRCS
Terracon Project Number	96217693
Date of Fieldwork	September 29, 2021
Previously Determined NRHP Eligible or Listed Historic Properties in APE	0

Comments: Review of the Oklahoma State Historic Preservation Office NRHP Public View GIS map indicates there are no previously designated historic-age resources within the APE for Sallisaw Creek Sites 13 and 19. Terracon conducted a reconnaissance-level historic resources survey of the project area for Sallisaw Creek Sites 13 and 19 and recommends a finding of ***No Historic Properties Present*** within the project area.

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1.0 INTRODUCTION

This report presents the results of a reconnaissance-level historic resources survey of the Sallisaw Creek Sites 13 and 19 within Adair County, Oklahoma. The survey was conducted in support of a Supplemental Watershed Plan and Environmental Evaluation to comply with Title 390, National Watershed Program Manual (NWPM), the National Environmental Policy Act (NEPA), the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended by the Small Watershed Rehabilitation Amendments of 2000 (Section 313 of Public Law 106-472), policy outlined in DR 9500-013 "Conducting Analysis Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments," related environmental and economic documentation requirements. The studies will inform the rehabilitation of two aging floodwater retarding structures to meet current safety criteria and performance standards.

Professional staff meeting the *Secretary of the Interior's (SOI's) Professional Qualifications in History and Architectural History* conducted a reconnaissance-level historic resources survey of historic-age buildings, structures, and site features at the Sallisaw Creek Sites 13 and 19. This Historic Resources Survey Report was completed in fulfilment of the request by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to provide a National Register of Historic Places evaluation for the two reservoirs.

2.0 PROJECT DESCRIPTION

NRCS is conducting studies as part of a Conservation Plan and Environmental Evaluation related to Sallisaw Creek Sites 13 and 19. The project area for Sallisaw Creek 13 is an existing NRCS reservoir located approximately 1.2 miles west of Bunch, Adair County, Oklahoma. Sallisaw Creek 13 is located within the northeast quarter of the southwest quarter of Township 14 North, Range 24 East, and Section 17. The project area for Sallisaw Creek 19 is an existing NRCS reservoir located approximately 3.5 miles south of Stilwell, Adair County, Oklahoma. Sallisaw Creek 19 is located within the northeast quarter of the northeast quarter of Township 15 North, Range 25 East, and Section 20 (Appendix A – Exhibit A-1).

The reservoirs are located within the Ozark Plateau region of eastern Oklahoma, in a rural area dominated by agricultural and undeveloped and wooded land. The surrounding terrain is characterized by gently rolling hillsides, open fields, and low-density residential development.

3.0 METHODOLOGY

Professional staff meeting *Secretary of the Interior's Professional Qualifications* in Architectural History conducted a reconnaissance-level survey of historic-age resources within the project area to determine if historic properties are present. Historic properties, as defined in 36 CFR §

800.16(l)(1), are "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places." The National Register of Historic Places (NRHP) Criteria for Evaluation were used to assess the significance of the surveyed historic-age resources. The Secretary of the Interior-determined Seven Aspects of Integrity were used to evaluate the physical characteristics and associative qualities of the resources and determine their ability to convey their historical and/or architectural significance. Data analysis and development of conclusions and recommendations were completed by Ms. Beth Valenzuela, MA, an architectural historian meeting the Secretary of the Interior's (SOI) Professional Qualifications Standards in the area of architectural history and historic architecture.

3.1 Archival Research

Historical and archival research was conducted to support NRHP eligibility recommendations. Research for the project occurred during January 2022, and included review of historical collections and secondary source materials available online through the Library of Congress, the Oklahoma Historical Society's Gateway to Oklahoma History (the Gateway), the Oklahoma Conservation Commission, and newspapers.com, and genealogical and census databases accessed through ancestry.com.

3.2 Fieldwork

Fieldwork complied with field procedures that are accepted as industry standard and followed the SOI's *Standards for Identification, Archaeological Documentation, and Professional Standards.* A reconnaissance-level survey was then undertaken for historic-age resources within the project APE. Reconnaissance-level survey consisted of confirming the location of a resource in the field, digital photography, and documenting physical characteristics and integrity.

To comply with the NHPA, as amended (54 U.S.C. § 300101 et seq.), field investigations adhered to guidelines set forth in National Register Bulletin 15 – *How to Apply the National Register Criteria for Evaluation*. The existing condition of the historic-age resources was evaluated and documented using standard survey forms and digital photography. Professional staff maintained clear field notes, sketches, and field maps, for use in the analysis of the fieldwork for the subject site(s), noting locations, distinctive landscape features, and other relevant non-archaeological resources.

The following steps were undertaken to record the current condition of the extant historic-age resources:

1. Documented the condition of physical character-defining features and other associative qualities according to the *Seven Aspects of Integrity* defined in National Register Bulletins 15, 18, 30, and 38, as applicable to each resource. Assessed physical changes that have occurred since the original construction of the resource.
2. Performed photographic documentation to record historic-age resources within the project APE. This work included digital photography according to National Park Service (NPS)

standards as defined in National Register Bulletin 23 and subsequent Photograph Policy Expansion in 2005 and Photograph Policy Update in 2008 and 2013. Digital photograph files were saved in JPEG format and meet minimum NPS resolution standards. A photo log was maintained for each recorded resource noting direction camera is facing for each photograph.

a. A minimum of two photographs of the historic-age resources, incorporating the primary façade and side elevations, were taken.

b. For locations with more than one related resource on the site, multiple photographs illustrate historic-age resources and their overall relationship to each other.

4.0 SURVEY RESULTS

The reservoir associated with Sallisaw Creek Site 13 was constructed in 1966; the reservoir located at Sallisaw Creek Site 19 was constructed in 1968. In addition, two historic-age residences and associated outbuildings were observed within the vicinity of the two reservoirs. The reservoirs are managed by the Adair County Soil and Water Conservation District and the Sallisaw Creek Conservancy District with the assistance of Oklahoma Conservation Commission and the USDA NRCS. Review of historic aerials and topographic maps indicate the reservoirs and their associated features have undergone minimal alterations since their original construction. The following narrative provides additional information related to the historic-age resources identified within the project area.

4.1 Identification of Historic Properties within the Area of Potential Effects

Terracon's architectural historian performed a limited literature and agency file review to identify the occurrence of previously identified historic properties within the project area. The search included a review of historic-age resources previously listed as National Historic Landmarks (NHLs), NRHP individual properties and/or historic districts, and the Oklahoma State Historic Preservation Office's NRHP Public View GIS map. No previously designated historic properties are located within the project area.

4.2 Reconnaissance Survey

Terracon conducted a reconnaissance-level survey on September 29, 2021. Field investigations adhered to guidelines set forth in National Register Bulletin 15 – *How to Apply the National Register Criteria for Evaluation* and National Register Bulletin 22 – *Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Past Fifty Years* (Andrus, 1997; Sherfy and Luce 1996).

Terracon evaluated the existing condition of the historic-age resources within the project area and documented the site and its associated resources using standard survey forms and digital photography. Photographs taken of the buildings and site features are provided in Appendix B. Terracon maintained clear field notes, sketches and field maps for use in the analysis of the

fieldwork for the subject site(s), noting building/structure locations, distinctive landscape features, and other relevant non-archaeological resources.

Table 1 provides an inventory and thumbnail image of the historic-age resources documented at a reconnaissance survey level. The location of each keyed resource is illustrated in Appendix A – Exhibit A-2a and A-2b.

Table 1.
Historic-age resources documented during field investigations

Thumbnail	Resource ID	Resource Name	Historic/ Current Function Architectural Style	Date Built
	1a	SALLISAW CREEK SITE 13 – dam and reservoir	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks Earthen dam and reservoir	1966
	1b	SALLISAW CREEK SITE 13 – riser	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1966
	1c	SALLISAW CREEK SITE 13 – plaque	RECREATION AND CULTURE: monument/marker Commemorative marker	1966
	1d	SALLISAW CREEK SITE 13 – brick/stone structure	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1966

Thumbnail	Resource ID	Resource Name	Historic/ Current Function Architectural Style	Date Built
	1e	SALLISAW CREEK SITE 13 – spillway	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1966
	2a	House	DOMESTIC: single dwelling / VACANT National Folk / vernacular	c. 1920
	2b	Outbuilding	DOMESTIC: secondary structure / VACANT Vernacular	c. 1950
	2c	Cattle water trough	AGRICULTURE/ SUBSISTENCE: animal facility / NOT IN USE No Style	c. 1975
	3a	SALLISAW CREEK SITE 19 – reservoir	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks Earthen dam and reservoir	1968

Thumbnail	Resource ID	Resource Name	Historic/ Current Function Architectural Style	Date Built
	3b	SALLISAW CREEK SITE 19 – plaque	RECREATION AND CULTURE: monument/marker Commemorative marker	1968
	3c	SALLISAW CREEK SITE 19 – riser	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1968
	3d	SALLISAW CREEK SITE 19 – spillway	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1968
	3e	SALLISAW CREEK SITE 19 – trail	RECREATION AND CULTURE: outdoor recreation No Style	1968
	3f	SALLISAW CREEK SITE 19 – dock	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1968
	3g	SALLISAW CREEK SITE 19 – fence	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1968

Thumbnail	Resource ID	Resource Name	Historic/ Current Function Architectural Style	Date Built
	3h	SALLISAW CREEK SITE 19 – dock	INDUSTRY/ PROCESSING/ EXTRACTION: waterworks No Style	1968
	4a	House	DOMESTIC: single dwelling / VACANT National Folk / vernacular	c. 1915
	4b	Outbuilding	DOMESTIC: secondary structure / VACANT No Style	c. 1950

5.0 HISTORIC-AGE RESOURCE EVALUATION

Field survey and research indicates four historic-age resources and associated site features are located on the project areas. As outlined in *Section 2.0—Methodology*, professional staff conducted archival research to document the historical significance of the Sallisaw Creek Sites 13 and 19, and two other historic-age homes adjacent to the project area. Fieldwork was completed to identify the noteworthy architectural and landscape elements of the project areas. The evaluation of the historic-age resources included an assessment of the physical integrity and associative qualities of the resource, in accordance with National Register Bulletin 15, *How to Apply the National Register Criteria for Evaluation.* The following historic property evaluations rely on observations taken in the field and information collected as part of archival research efforts.

5.1 Historical Background

The Sallisaw Creek Watershed Sites 13 and 19 are located within the Adair County Conservation District (Area 3) of the Oklahoma Conservation Commission. The Conservation District Enabling Act, passed by the Oklahoma State Legislature in 1937, created the commission – composed of landowners and operators – and placed decision-making for best practices for the conservation of soil and water resources at a local level.

In the 1940s, the Oklahoma Conservation Commission began a series of watershed protection and flood prevention projects in the Washita River Watershed. The program, authorized initially through Public Law 76-534 in 1944, enabled the construction of small watershed dams partnered with land conservation practices to help control devastating flood events. The program was extended by Public Law 83-566, the Watershed Protection and Flood Prevention Act of 1954.[1]

Bids for Sallisaw Creek Watershed Site 13 (and 22) was advertised in September 1965, but limited archival research did not yield additional information related to the construction of the flood control structure.[2] A 1936 cadastral map of the site indicates approximately 150-acres within the southwestern quarter of Township 14 North, Range 24 East, and Section 17 land was owned by George W. Hamlin.[3] Construction was completed in 1966, by the Adair County Soil and Water Conservation District and the Sallisaw Creek Conservancy District with the assistance of Oklahoma Conservation Commission and the Soil Conservation Service of the USDA (now the USDA NRCS).

Work on Sallisaw Creek Watershed Site 19 began in July 1967, on land owned by Harold Rainwater, E.J. Campbell, and Elmer Dotson. The Fulmer Construction Company of Claremore, Oklahoma served as the contractor for the project that created a 40-acre reservoir. At the time of its construction, it was the largest reservoir maintained by the Adair County Soil and Water Conservation District and the Sallisaw Creek Conservancy District. The reservoir served a drainage area of 8,000 acres. Although it was constructed as a flood control measure, it was envisioned to be used for irrigation and recreational purposes as well.[4] The flood control reservoir was completed in June 1968 and at the time of its construction, Site 19 was the only reservoir actually constructed on Sallisaw Creek; others were constructed on tributaries of the waterway. The reservoir was designed to control a 6½-inch rainwater runoff in a six-hour period for land within the 8,160-acre watershed.[5]

5.2 Historic-Age Resources within the Subject Parcels

The reconnaissance-level historic resources survey included Sallisaw Creek Sites 13 and 19, their associated features and appurtenances. Additional historic-age resources located directly adjacent to the reservoir were also subject to survey. The historic-age resources, as noted in Table 1, were documented for their historical significance and architectural merit. Sallisaw Creek Sites 13 and 19 retain their physical integrity and were subject to additional research to place the

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[1] "Oklahoma's Upstream Flood Control Program: Background," *Oklahoma's Conservation Commission* (website, https://conservation.ok.gov/flood-control-program/).

[2] "Notice to Prospective Bidders – Construction," *Stilwell Democrat-Journal* (Stilwell, Oklahoma) 2 September 1965, p. 8.

[3] "Adair County, Oklahoma, Township 14 North, Range 24 East map, sheet 1," United States: Works Progress Administration, 1936 (online resource, https://dc.library.okstate.edu/digital/collection/p17279coll8/id/2292/rec/1).

[4] "Work Starts on New County Dam," *Stilwell Democrat-Journal* (Stilwell, Oklahoma) 13 July 1967, p. 1.

[5] "Flood Control Reservoir," *Stilwell Democrat-Journal* (Stilwell, Oklahoma) 20 June 1968, p. 1.

resources within their appropriate historic context. The following evaluation provides an overview of the architectural significance and its association to the historical background (Section 5.1), as part of the documentation of the historic-age resources. Refer to Appendix B for project photographs of the documented resources.

5.2.1 Resource ID No. 1 – Sallisaw Creek Site 13

The Sallisaw Creek Site 13 (Resource 1a) was constructed in 1966 under the Watershed Protection and Flood Prevention Act by Adair County Soil and Water Conservation District and Sallisaw Creek Conservancy District with the assistance of the Soil Conservation Service of the U.S. Department of Agriculture. When completed in 1966, the dam had a drainage area of 1,235 acres with a total storage of 855 acres feet. The earthen walled dam was built at a height of 48 feet and is currently approximately 825 feet long. Currently the eastern side of the dam is overgrown with shrubbery and trees while the west side of the dam is cleared of shrubbery and trees. Located at the eastern base of the earthen dam is a small earthen basin spillway (Resource 1e) with concrete discharge conduit associated with the dam. The dam's water retention area is located to the west of the dam. Located directly at western base of the dam in the northeast corner is a concrete principal spillway with riser and trash rack (Resource 1b). There are no piers or dock structures associated with Sallisaw Creek Site 13. The Sallisaw Creek enters into the reservoir from the west. Located outside of the entrance of the dam is a concrete marker with bronze memorial (Resource 1c).

5.2.2 Resource ID No. 2a – House

Located approximately 325 feet east of the earthen dam adjacent to the two-track access road is an abandoned and dilapidated T-plan single-family dwelling. The house's primary entrance is located on the eastern elevation. This eastern elevation features a centralized doorway flanked by two window openings. The eastern elevation shows signs that it once featured a full-length porch with overhanging shed roof. The southern elevation of the house features a doorway and six window openings. On this southern elevation the house features an addition with shed roof on the house's southern T-side. The addition portion features windows with three vertical fixed panes and asbestos tile siding. The western elevation of the house is too dilapidated to distinguish any character-defining features. The northern elevation's most prominent features is a brick chimney flanked by double-hung windows.

5.2.3 Resource ID No. 2b – Outbuilding

North of the house, set into the hillside, is a site-cast concrete structure with a board-form foundation and exterior walls, and a concrete roof. The structure features a singular doorway opening located at the southeast corner of the structure. No door is present and the structure is currently filled with debris.

5.2.4 Resource ID No. 2c – Cattle Water Trough

Southwest of the historic-age house structure is a cattle water trough. The structure is composed of a round circular cast concrete pad that slopes up towards the center. In the center of the poured concrete pad is a large tractor tire with four metal T-posts on each side. The metal T-posts were typically installed to prevent cattle from stepping into the trough. Inside the trough is a water valve protected by a wire cage. The trough does not appear to be in use.

5.2.5 Resource ID No. 3 – Sallisaw Creek Site 19 reservoir and dam

The Sallisaw Creek Site 19 (Resource 3a) was constructed in 1968, under the Watershed Protection and Flood Prevention Act by Adair County Soil and Water Conservation District and Sallisaw Creek Conservancy District with the assistance of the Soil Conservation Service of the U.S. Department of Agriculture. When completed in 1968, the dam had a drainage area of 8,160 acres with a total storage of 4,796 acres feet. The earthen walled dam was built at a height of 61 feet and is currently approximately 1,420 feet long. Currently the eastern side of the dam is overgrown with shrubbery and trees while the west side of the dam is cleared of shrubbery and trees. Located at the western base of the earthen dam is a small earthen basin spillway (Resource 3d) with concrete discharge conduit associated with the dam. The dam's water retention area is located to the east of the dam. Located directly at the eastern base of the dam is a concrete principal spillway with riser and trash rack (Resource 3c). Additionally, running perpendicular with the dam is wire fencing (Resource 3g) seen along the northern and southern shoreline. Along the northern shore is a floating dock (Resource 3f) with various docking structures for boats. At the southeast corner of the dam is another pier/dock structure (Resource 3h). The Sallisaw Creek enters into the reservoir from the east/northeast. Located outside of the entrance of the dam is a concrete marker with bronze memorial (Resource 3b).

5.2.6 Resource ID No. 4a – House

Located approximately 415 feet northwest of the reservoir is an abandoned and dilapidated T-shaped house structure. The house's primary entrance is located on the northern elevation. This northern elevation features two doorways under a non-extant wraparound porch and two window openings. The northern elevation, again, shows signs that it once featured a wraparound porch with overhanging shed roof that covered the north and west sides of the house and porch. The eastern elevation of the house features a rear doorway and one window opening under another shed roof porch area of the house. This rear porch features character-defining turned post supports and decorative details around the doorway and window trims. The western elevation features four window openings, with two window pairings. This elevation also shows a later shed roofed addition to the house. The northern elevation of the house is very dilapidated from the collapsed shed roof but looks to have featured two window openings and large front gable. Also noted and seen on this façade was a piece of corrugated metal with "G.W. Brooks, Stilwell, OK" written on it.

5.2.7 Resource ID No. 4b – Outbuilding

North of the house is a one-story outbuilding constructed of concrete block. This structure has a shed roof and single wooden door opening, secured by a padlock.

6.0 SUMMARY AND RECOMMENDATIONS

Sallisaw Creek Sites 13 (Resource ID No. 1) and 19 (Resource ID No. 3) are two flood control features of the Sallisaw Creek Watershed, constructed in the 1960s to help control devastating flood events, when partnered with land conservation practices. The construction of the small watershed dams was enabled by Public Law 83-566, the Watershed Protection and Flood Prevention Act of 1954. Although associated with a first-of-its-kind federal-level initiative to manage flooding within the state of Oklahoma, the resources represent standard earthen dam and reservoir designs that contribute to a larger system of flood control. The program for the Sallisaw Creek Watershed began in 1961, after Congressional approval was secured for the construction of 40 floodwater retardation structures and two multipurpose flood prevention and municipal water supply structures, at a cost of almost $7 million.[6] Sites 13 and 19 were constructed midway through the program and do not appear to address unique or challenging site conditions. The resources, as individual structures that are part of a larger system, do not meet the requisite threshold of significance required to be consider eligible under NRHP Criterion A for Conservation, nor do they exhibit characteristics of high engineering merit to be considered eligible under NRHP Criterion C. Limited archival research did not reveal associations with persons of transcendent importance to be considered eligible under NRHP Criterion B. Terracon recommends a finding of ***Not NRHP Eligible*** for Sallisaw Creek Sites 13 and 19, and their associated site features and appurtenances.

Resource ID No. 2 is an early twentieth century single-family dwelling that has experienced significant deterioration since its original construction. The house is currently vacant and is structurally compromised. Due to a number of additions and alterations, in addition to the dilapidated state of the building, it is difficult to discern the original architectural style, but the house appears to represent a common vernacular example of the National Folk style. The house remains at its original location and retains some character-defining features that help illustrate original materials and workmanship. Alterations and additions obscure the original design and configuration of the house. The setting of the house now includes Sallisaw Creek Site 13, constructed in 1966, although originally the setting would have been largely agricultural (to the east and west) and wooded along Hamlin Hollow, a Sallisaw Creek tributary (to the south). Therefore, the original setting, feeling, and association are largely lost. The house does not represent a significant historical theme or event to be considered eligible under NRHP Criterion A, nor does it exhibit characteristics of a rare, unique, or outstanding architectural design to be considered eligible under NRHP Criterion C. Limited archival research did not reveal associations

[6] "Sallisaw Creek: Final OK Given," *Stilwell Democrat-Journal* (Stilwell, Oklahoma) 31 August 1961, p. 1.

with persons of transcendent importance to be considered eligible under NRHP Criterion B. Terracon recommends a finding of ***Not NRHP Eligible*** for Resource ID No. 2 and its associated outbuildings and structures.

Resource ID No. 4 is an early twentieth century single-family dwelling that has experienced significant deterioration since its original construction. The house appears to represent a common example of the National Folk style, with some subtle detailing that sets this house apart from Resource ID No. 2. The house remains at its original location and retains some character-defining features that help illustrate its original design, materials and workmanship – most notably the turned porch posts and gable end wall and fascia detailing. The setting of the house now includes Sallisaw Creek Site 19, constructed in 1968. Like Resource ID No. 2, the original setting would have been largely agricultural (to the north) and wooded along Sallisaw Creek (to the south). Therefore, the original setting, feeling, and association are largely lost. The house does not represent a significant historical theme or event to be considered eligible under NRHP Criterion A, nor does it exhibit characteristics of a rare, unique, or outstanding architectural design to be considered eligible under NRHP Criterion C. Limited archival research did not reveal associations with persons of transcendent importance to be considered eligible under NRHP Criterion B. Terracon recommends a finding of ***Not NRHP Eligible*** for Resource ID No. 4 and its associated outbuildings and structures.

7.0 REFERENCES CITED

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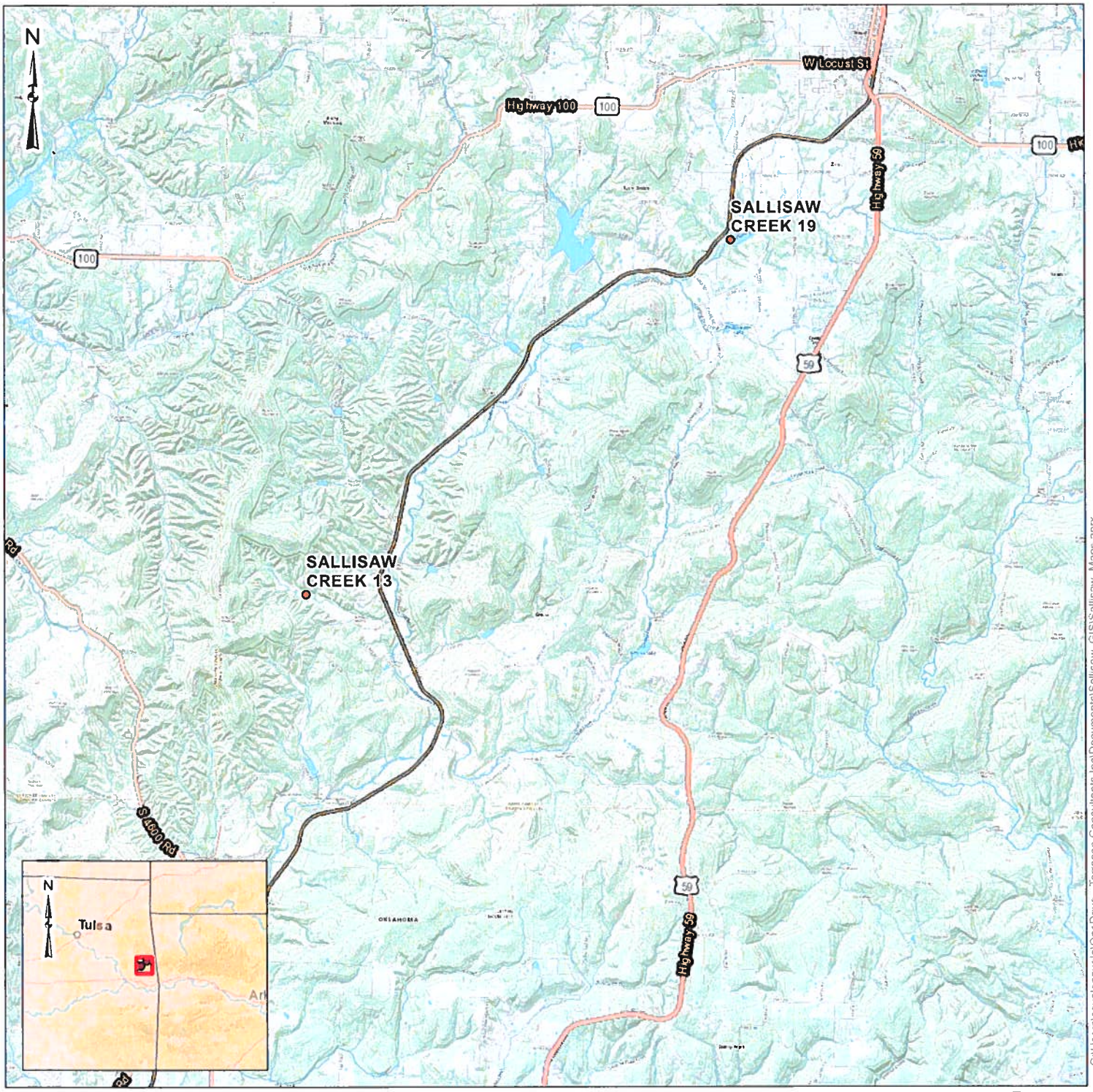
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APPENDIX A – MAP EXHIBITS



C:\Users\sevalenzuela\OneDrive - Terracon Consultants Inc\Documents\Sallisaw_GIS\Sallisaw_Maps.aprx

Legend

- Dams

Feet

0 5,000 10,000 20,000

DATA SOURCES:
USGS - Topographic Map
ESRI WMS - OpenStreetMap

Project No.:	96217693
Date:	Jan 2022
Drawn By:	SEV
Reviewed By:	JDH

Terracon
5307 Industrial Oaks Blvd, Ste. 160 Austin, TX 78735
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Topographic Overview

Section 106 Coordination
Sallisaw Creek Sites 13 and 19
Adair County, Oklahoma

Exhibit

A-1



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Legend

- Modern Resources
- Historic-Age Resources
- Sallisaw Creek Dam Site

Feet

0 195 390 780

DATA SOURCES:
ESRI WMS - World Aerial Imagery, OpenStreetMap

Project No.:	96217693
Date:	Jan 2022
Drawn By:	SEV
Reviewed By:	JDH

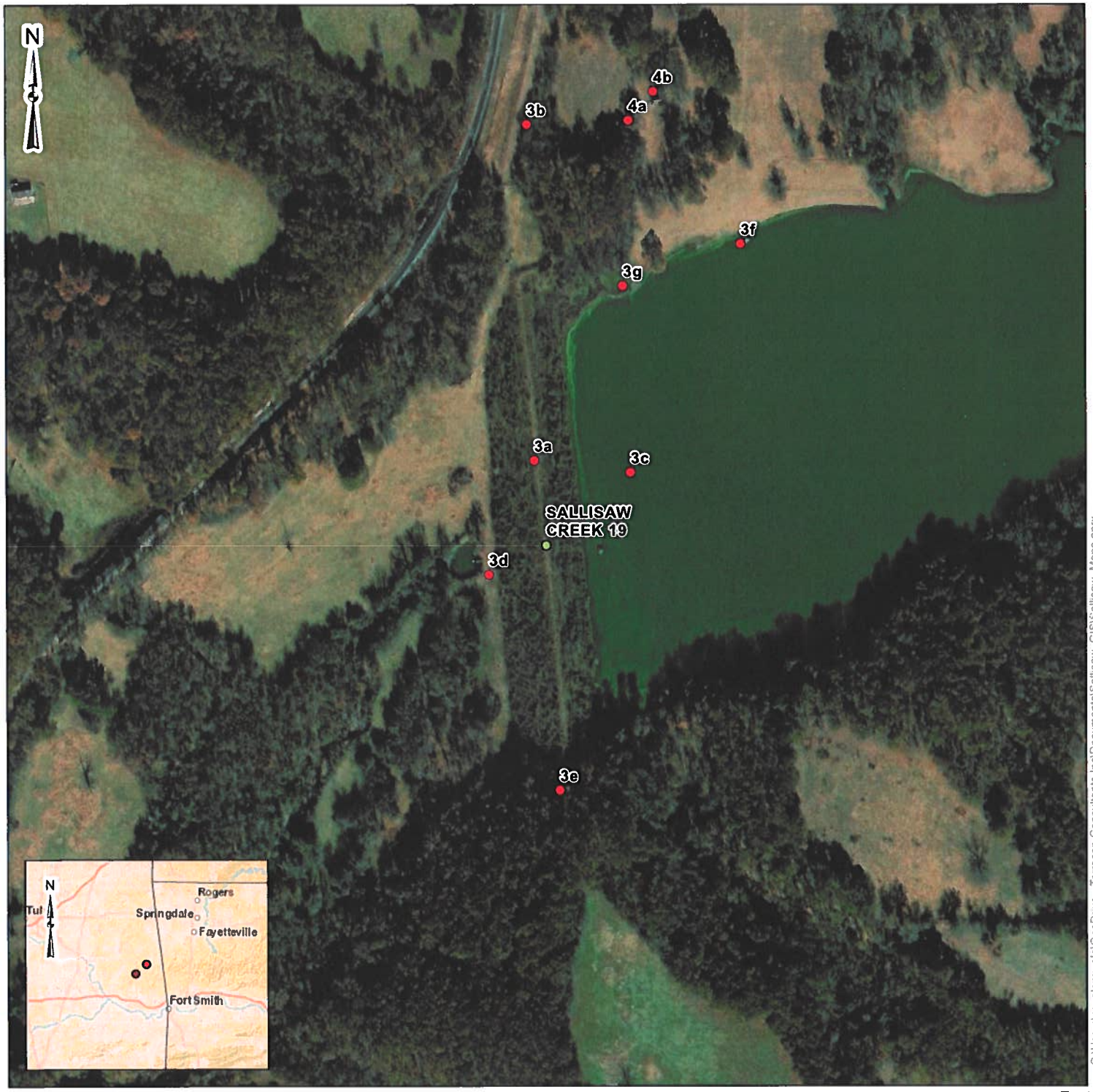
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Aerial Overview Map

Section 106 Coordination
Sallisaw Creek Site 13
Adair County, Oklahoma

Exhibit

A-2a



C:\Users\sevalenzuela\OneDrive - Terracon Consultants Inc\Documents\Sallisaw_GIS\Sallisaw_Maps.aprx

Legend

- Modern Resources
- Historic-Age Resources
- Sallisaw Creek Dam Site

Feet

0 195 390 780

DATA SOURCES:
ESRI WMS - World Aerial Imagery, OpenStreetMap

Project No.:	96217693
Date:	Jan 2022
Drawn By:	SEV
Reviewed By:	JDH

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Aerial Overview Map

Section 106 Coordination
Sallisaw Creek Site 19
Adair County, Oklahoma

Exhibit

A-2b

APPENDIX B – PROJECT PHOTOGRAPHS

SALLISAW DAM SITE 13



Figure 1. *View of dam plaque (Resource 1c) looking west at front entrance to Sallisaw Creek Floodwater Retarding Dam No. 13 (Terracon 2021).*



Figure 2. *View of dam plaque looking northwest at entrance to Sallisaw Creek Floodwater Retarding Dam No. 13 (Terracon 2021).*



Figure 3. *View looking northwest at two-track entrance to Sallisaw Creek Site 13 (Terracon 2021).*



Figure 4. *Southeast view of an older entrance to the dam that is no longer used (Terracon 2021).*



Figure 5. *View of Sallisaw Creek Site 13 (Resource 1a) looking south from top of main entrance (Terracon 2021).*



Figure 6. *View of Sallisaw Creek Site 13 from top of dam towards water retention area and view of dam's riser looking southwest (Terracon 2021).*

Figure 7. *View from top of earthen dam looking north (Terracon 2021).*



Figure 8. *View of dam's riser with trash rack (Resource 1b) looking southwest (Terracon 2021).*





Figure 9. *View of dam's riser with trash rack looking northwest (Terracon 2021).*



Figure 10. *View of brick and stone structure (Resource 1d) on east side of the dam looking north (Terracon 2021).*



Figure 11. *View of access gate to dam's outlet area looking southwest (Terracon 2021).*



Figure 12. *View of dam's outlet and spillway looking southwest (Terracon 2021).*



Figure 13. *View of house (south elevation) located on east side of Sallisaw Creek Site 13 looking north (Terracon 2021).*



Figure 14. *View looking northeast at south and west elevations (Terracon 2021).*



Figure 15. *View looking southeast at north and west elevations (Terracon 2021).*



Figure 16. *View looking southwest at north and east elevations (Terracon 2021).*



Figure 17. *View looking west at east elevations (Terracon 2021).*



Figure 18. *View door detail looking west at east elevation (Terracon 2021).*



Figure 19. *View of door detail looking north of the south elevation (Terracon 2021).*



Figure 20. *View or door detail looking north at south elevations (Terracon 2021).*



Figure 21. *View of interior fireplace looking north (Terracon 2021).*



Figure 22. *View of concrete storage cellar, Resource 2b (Terracon 2021).*



Figure 23. *View of cattle watering trough (Resource 2c) looking northeast (Terracon 2021).*



Figure 24. *View of modern outbuilding adjacent to dam access road looking northwest (Terracon 2021).*

SALLISAW DAM SITE 19



Figure 25. *View of Dam No. 19 plaque (Resource 3b) looking south near entrance to reservoir (Terracon 2021).*



Figure 26. *View looking south at entrance of dam and plaque (Terracon 2021).*



Figure 27. *View of entrance to Sallisaw Creek Site 19, looking south (Terracon 2021).*



Figure 28. *View looking southwest at Sallisaw Creek Site 19 entry gate (Terracon 2021).*



Figure 29. *View looking south at top of Sallisaw Creek Site 19 (Resource 3a) from northern end (Terracon 2021).*



Figure 30. *View looking east to water retention area of Sallisaw Creek Site 19 from top of earthen dam (Terracon 2021).*



Figure 31. *View looking southwest from top of earthen dam to spillway water area (Terracon 2021).*



Figure 32. *View looking south at midway point on top of earthen dam (Terracon 2021).*



Figure 33. *View looking north from top of earthen dam (Terracon 2021).*



Figure 34. *View of trail (Resource 3e) adjacent to top of earthen dam wall heading southwest looking southwest (Terracon 2021).*



Figure 35. *View of principal spillway riser (Resource 3c) looking southeast (Terracon 2021).*



Figure 36. *View of principal spillway riser looking north (Terracon 2021).*



Figure 37. *View of spillway outlet pipe looking northeast on western side of dam (Terracon 2021).*



Figure 38. *View of concrete spillway (Resource 3d) leading into pond spillway looking south (Terracon 2021).*



Figure 39. *View of meadow west of dam looking southwest (Terracon 2021).*



Figure 40. *View of fencing in water retention area looking southeast (Terracon 2021).*



Figure 41. *View of dock structure (Resource 3f) looking southwest (Terracon 2021).*



Figure 42. *View concrete structure near dock looking (Terracon 2021).*



Figure 43. *View of docking implement looking south (Terracon 2021).*



Figure 44. *View of dam fencing (Resource 3g) looking west north shore of reservoir (Terracon 2021).*



Figure 45. *View of wooden dock structure (Resource 3h) on southeast shore of reservoir looking southeast (Terracon 2021).*



Figure 46. *View of house adjacent to Sallisaw Creek Site 19 looking southeast (Terracon 2021).*



Figure 47. *View of house adjacent to Sallisaw Creek Site 19 looking north (Terracon 2021).*



Figure 48. *View of north elevation looking south (Terracon 2021).*



Figure 49. *View of north and east elevations looking southwest (Terracon 2021).*



Figure 50. *View of east elevation looking west (Terracon 2021).*



Figure 51. *View of east and south elevations looking northwest (Terracon 2021).*



Figure 52. *View of west elevation east (Terracon 2021).*



Figure 53. *View of south and west elevations looking northeast (Terracon 2021).*



Figure 54. *View of west elevation looking east (Terracon 2021).*



Figure 55. *View of north and west elevations looking southeast (Terracon 2021).*



Figure 56. *View of porch detail looking south on northeast corner of house (Terracon 2021).*



Figure 57. *View of gable detail (Terracon 2021).*



Figure 58. *View of non-extant porch column base (Terracon 2021).*



Figure 59. *View name "G.W. Brooks, Stilwell, OK" on corrugated metal of house (Terracon 2021).*



Figure 60. *View of rear porch with doorway and turned posts details looking west (Terracon 2021).*



Figure 61. *View of front porch entrances and door details looking southeast (Terracon 2021).*



Figure 62. *View of utility structure adjacent to house on southside looking northwest (Terracon 2021).*



Figure 63. *View of utility structure on northside of house looking northwest (Terracon 2021).*



Figure 64. *View structure adjacent to house looking south (Terracon 2021).*



Figure 65. *View of cleared fencing and other non extant structures associated with the house looking south (Terracon 2021).*

USDA

United States Department of Agriculture

NATURAL RESOURCES CONSERVATION SERVICE
NATIONAL HISTORIC PRESERVATION ACT (NHPA) SECTION 106
SALLISAW CREEK WATERSHED SITE #13 REHABILITATION
CULTURAL RESOURCES INVESTIGATIONS

PREPARED BY:
Mark W. Kelly – Principal Investigator
USDA Natural Resources Conservation Service
State Office – Water Resources
100 USDA, Suite 206
Stillwater, OK 74074
405-742-1246

UNDERTAKING:
Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking
Cultural Resources Investigation
Adair County, Oklahoma

REPORT DATE:
5 April 2022

SUBMITTED BY:
Mark W. Kelly – Principal Investigator
USDA Natural Resources Conservation Service
State Office – Water Resources
100 USDA, Suite 206
Stillwater, OK 74074
405-742-1246

USGS INFORMATION:
Bunch, OK 7.5-Minute Quadrangle
Sec. 17-18, T14N, R24E

TOTAL ACREAGE:
±72 Acres

Contains Privileged and Confidential Information: DO NOT RELEASE.
Not Covered under the Freedom of Information Act (1966)

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Contains Privileged and Confidential Information: DO NOT RELEASE.

ABSTRACT

A National Historic Preservation Act (NHPA) Section 106 Investigation was conducted on 16 March 2022 by NRCS Archaeologist Mark W. Kelly, Principal Investigator, assisted by NRCS county staff members, on the proposed Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking located in Adair County, Oklahoma.

The rehabilitation undertaking is authorized and funded by PL 106-472, referred to as the *Small Watershed Rehabilitation Amendment of* 2000. PL 106-472 is an amendment to PL 83-566, the *Watershed Protection and Flood Prevention Act of* 1954. The present undertaking is designed to extend the service life of the Sallisaw Creek Watershed Site #13 to one hundred years and meet applicable safety and performance standards for a high hazard dam. As to NRCS participation, the principal spillway will be replaced with a new 36"-diameter RCP (reinforced concrete pipe) conduit, with a standard NRCS design riser. A concrete impact basin will be installed to dissipate energy at the outlet of the conduit. The auxiliary spillway elevation will be maintained at the existing elevation of 888.5' amsl and the (sediment) pool will have a surface area of ±8 acres. The auxiliary spillway will be maintained at a width of 40.0' and will be lined with articulating concrete blocks (ACB) to provide erosion control and stability. The top of the dam will remain at an elevation of 892.0' amsl and the dam height will continue to be 48.0' above the average valley floor height.

The investigations conducted on the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking consisted of both a reconnaissance survey and an intensive survey via screened shovel tests. A total of ±61 acres was investigated from the dam location upstream (which total includes the total acreage located at/below the top of dam elevation of 892.4' amsl) and a total of ±11 acres investigated downstream of the dam, encompassing that area to be potentially impacted should a catastrophic breach of the dam occur. As to direct effects, there are no recorded sites located on/within or adjacent to the APE for direct effects as to the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking. As to indirect effects, the records review disclosed no evidence of previously reported historic resources within a 0.5-mile radius surrounding the undertaking likely to be adversely or otherwise affected by the proposed construction activities. Regarding the earthen structure being an historic property, the dam does not meet criteria A-D.

No cultural materials were discovered during the investigation of the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking indicative of an early-day, post-contact historic or prehistoric occupation. The investigators therefore conclude, based on the finding of no ceramics, lithics or materials possessing cultural manifestations on/within the APE for either direct or indirect effects, that the undertaking will not impact any historic properties of Oklahoma.

Based on the results of this Section 106 investigation – a finding of no materials possessing manifestations indicative of either a prehistoric or post-contact historic occupation - the proposed activities on the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking will have no effect (either directly or indirectly) on the historic resources of Oklahoma – no properties

identified. It is the professional opinion of the investigating NRCS archaeologist that no further investigation is considered necessary.

INTRODUCTION

As noted, the present undertaking is designed to extend the service life of the Sallisaw Creek #13 Watershed Site to one hundred years and meet applicable safety and performance standards for a high hazard dam. A total of ±61 acres was investigated from the dam location upstream and a total of ±11 acres was investigated downstream of the dam, bisected by an unnamed right-bank tributary to Sallisaw Creek (Hamlin Hollow), for a total acreage surveyed of ±72 acres.

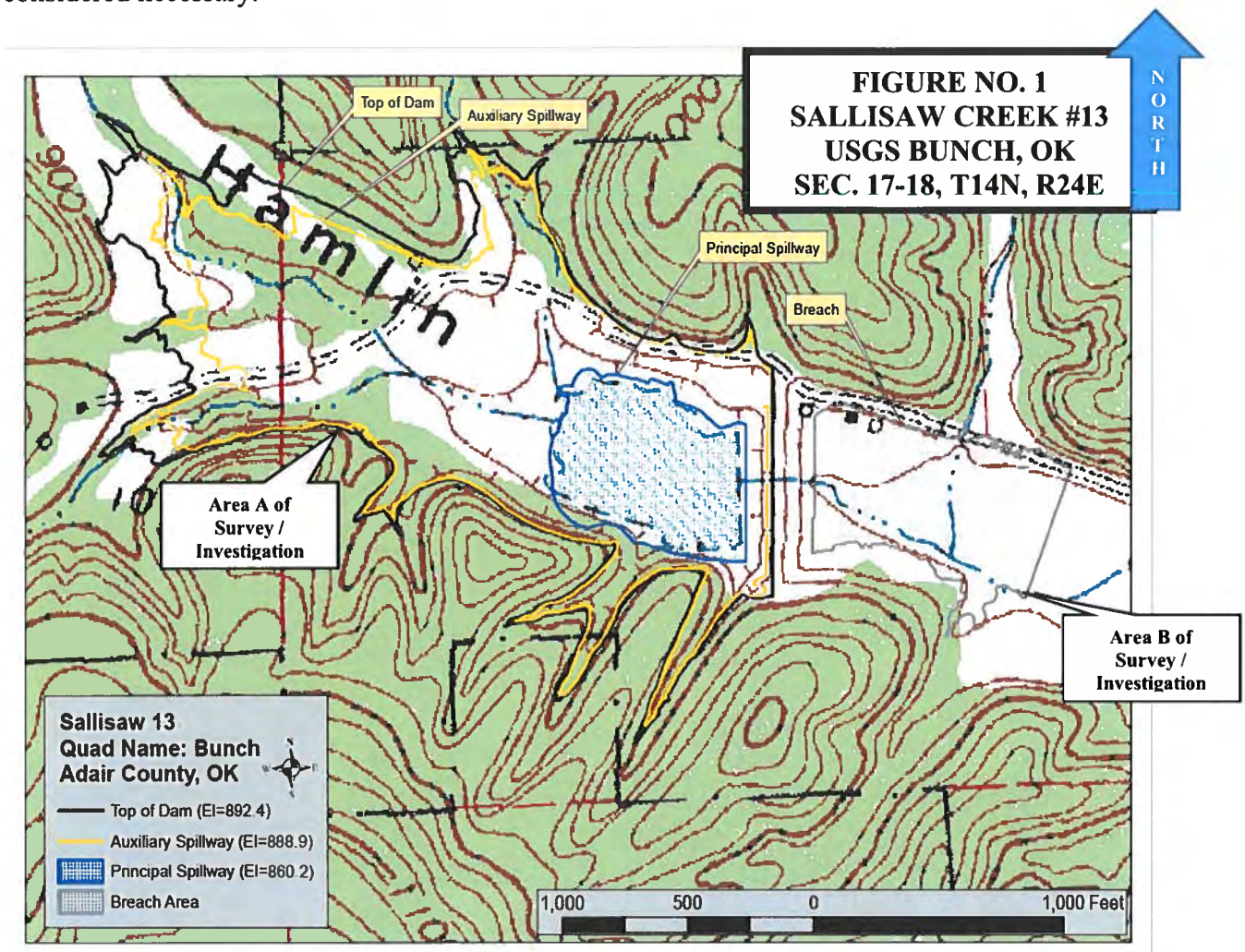
As to NRCS participation, the principal spillway will be replaced with a new 36"-diameter reinforced concrete pipe conduit, with a standard NRCS design riser. A concrete impact basin will be installed to dissipate energy at the outlet of the conduit. The auxiliary spillway elevation will be maintained at the existing elevation of 888.5' amsl and the (sediment) pool will have a surface area of ±8 acres. The auxiliary spillway will be maintained at a width of 40.0' and will be lined with articulating concrete blocks (ACB) to provide erosion control and stability. The top of the dam will remain at an elevation of 892.0' amsl and the dam height will continue to be 48.0' above the average valley floor height.

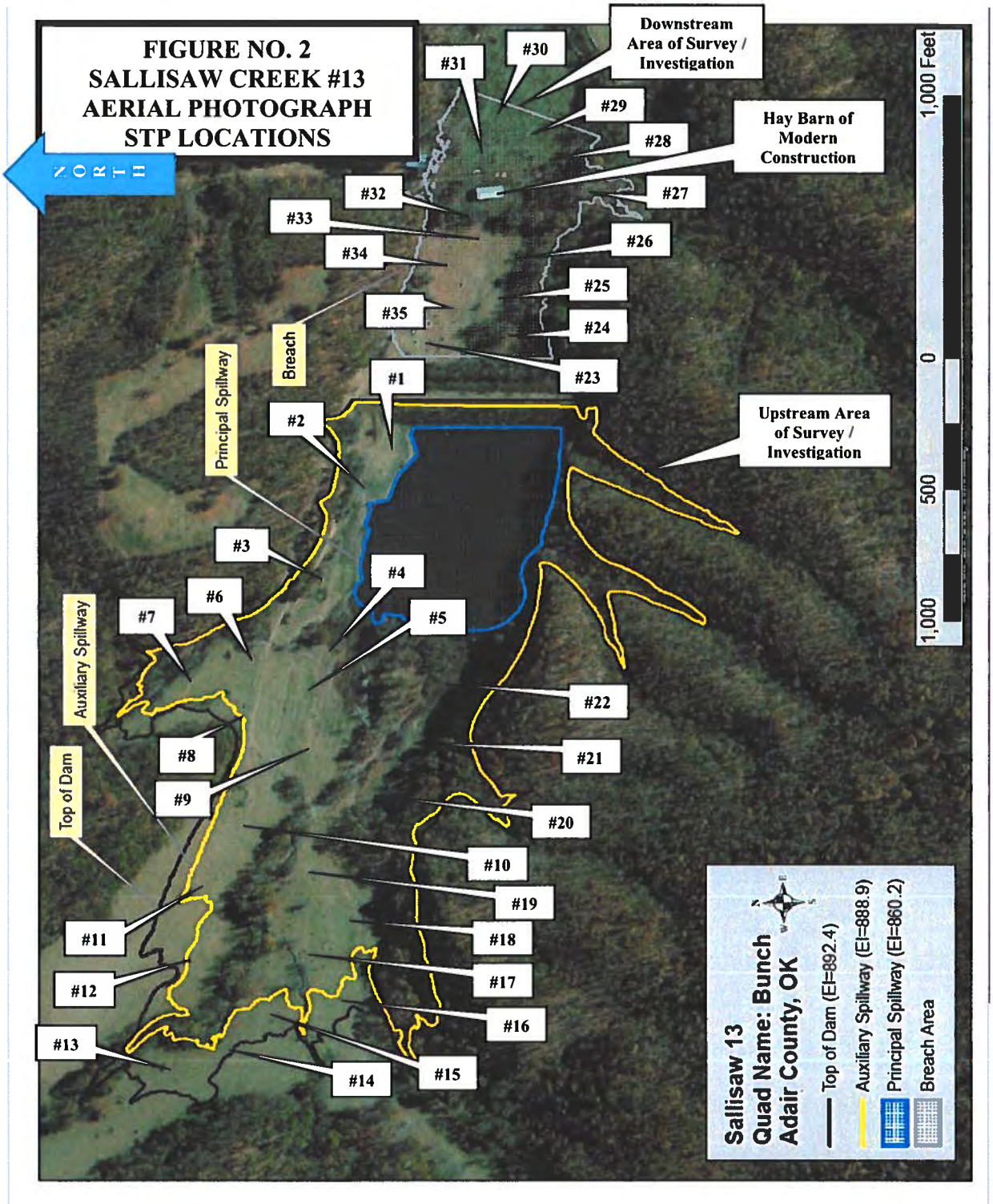
The sponsor of the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking is the USDA NRCS State Office – Water Resources Section, located at 100 USDA, Suite 206, Stillwater, Oklahoma 74074 and the Adair County Conservation District; 920 South 2nd Street, Stilwell, OK 74960. No difficulties were encountered during the course of the undertaking investigation that adversely affected the survey results.

The records review/background research was facilitated by K.C. Kraft, NRCS Cultural Resources Coordinator in February 2021, via the Oklahoma Archaeological Survey Library. Additional research was conducted by Mark W. Kelly, NRCS Archaeologist. The physical site investigation, consisting of both a reconnaissance and intensive survey, was completed by Mark W. Kelly, with assistance from NRCS Adair County employees, on 16 March 2022.

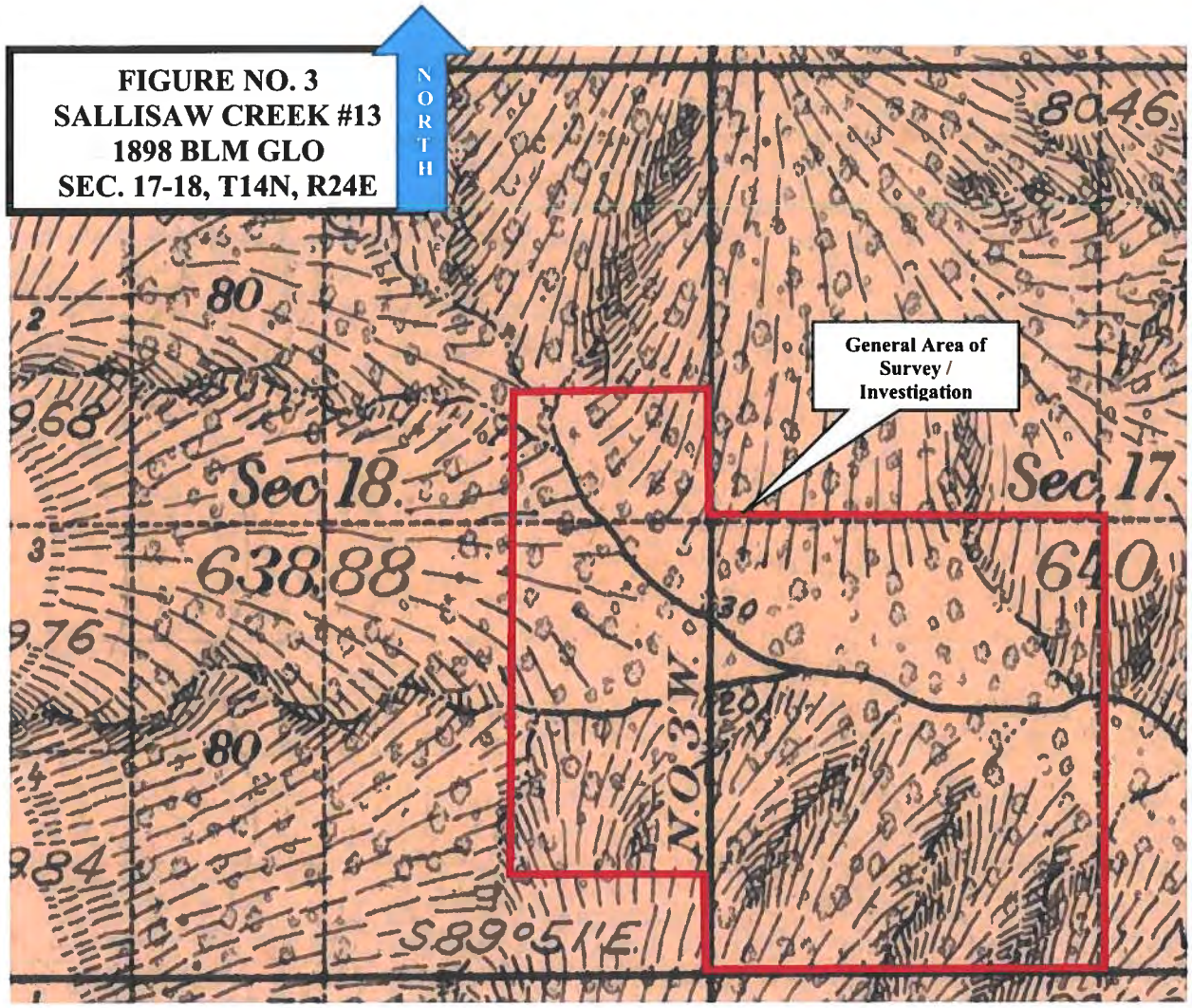
Figure Nos. 1-3 depict the specific areas subjected to investigation. Ingress/egress to each is via existing private road and/or over previously disturbed property. The investigations conducted on the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking consisted of both reconnaissance survey by transects and intensive survey via screened shovel tests. *Please note: NO STPs were excavated on strict/straight line alignments – owing to the extensive areas possessing exposed rock, as depicted in the attached Photograph Log.* As to direct effects, there are no recorded sites identified on/adjoining the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking. Regarding the dam's age of 56 years, the SHPO has determined that no historic properties will be affected by the referenced project (File #0430-21). This determination was based on the dam's universal construction methodology and generalized design plans associated with the earthen feature. As to indirect effects, there are no recorded sites identified within a 0.5-mile radius surrounding the undertaking; thus, the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking will not affect any properties of record. Based on the results of this cultural resources investigation, the proposed activities of the Sallisaw Creek

Watershed Site #13 Rehabilitation Undertaking will not result in either a direct or indirect effect on the historic properties of Oklahoma – no properties identified. No further investigation is considered necessary.





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FIGURE NO. 3
SALLISAW CREEK #13
1898 BLM GLO
SEC. 17-18, T14N, R24E
NORTH
General Area of Survey / Investigation
Sec 18.
Sec 17.
638.88
640
80
80
8046
968
976
984
30
20
N.0.W.
S89°51'E.

RESEARCH DESIGN

There are multiple venues worthy of exploration within the region wherein the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking is located. As to Region #3, as so designated by Wyckoff and Brooks (1983), the eleven-county "Tall Grass Prairies and Oak-Hickory Forests" region represents "one of the most studied areas within Oklahoma," beginning in 1926 with the efforts of J.B. Thoburn in Delaware County. As to notable work in Sequoyah County, excavations of the Horton site in the Arkansas River valley, a 20-acre site, were initiated in the 1950s. The farming village "under the domain of the Spiro Mounds leaders," was occupied from A.D. 1300-1450. The excavations revealed both a rectangular and a circular structure, both serving unique purposes, in addition to the finding of "farming plots" in association with an abundance of siltstone tools. As to prehistoric sites, per the Oklahoma Archaeological Survey 2005 tabulation, only two Paleoindian sites have been discovered in Adair County, thirty Archaic Period sites, nine Woodland Period sites, and nine Plains Village sites have been recorded, as well.

Region #3 has produced very few Paleoindian sites to date; indeed, no kill sites or camp sites have been identified therein – isolated finds of artifacts only. Evidence of Archaic Period occupations, assemblages, and sequence for Region #3 comes primarily via work conducted in Delaware, Nowata, and Mayes Counties. As to the Woodland Period, abundant sites representative of that period are located throughout Region #3, including Adair County. Regardless, much confusion regarding the origin of these people yet exists, but a relationship with Woodland people to the north in Missouri and Illinois appears to be indicated via studies finding a similarity in the craftsmanship of pottery and tool assemblages found in Oklahoma.

As Wyckoff and Brooks (1983) attest, "The rise of prehistoric Caddoan villagers in the Arkansas River Valley is clearly linked to people moving north from the Fourche Maline Valley around A.D. 700, as represented by the significant Spiro village site located in northern LeFlore County. Between A.D. 1200 and 1350, however, it appears the primary Spiro village site had been abandoned, replaced by many smaller outlying communities with associated small mounds. By A.D. 1400 it appears the Caddoan villagers were no longer building mounds; indeed, indications exist that the inhabitants of the smaller villages, although continuing to pursue their agricultural practices, were engaged in bison hunting, as well. Wyckoff and Brooks (1983) do provide, however, that the southern part of Region #3 "figured prominently for some 900 years in the culture history of the Caddoan speaking Wichita."

In sum, regardless of the fact that no sites have been recorded in proximity to the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, the survey area is located within a relatively rural setting bisected by the unnamed right-bank tributary to Sallisaw Creek, in turn, a left-bank tributary to the Arkansas River; thus, the possibility of finding evidence of both prehistoric and historic cultural deposits on/within/adjoining the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking via field survey certainly does exist, particularly referencing occupation of the region during the Archaic and Woodland Periods and post-contact tribes removed to the region via the 1830 Indian Removal Act, including the Cherokee, Miami, Quapaw, Peoria, Ottawa, Eastern Shawnee, Shawnee, Modoc, Wyandotte, and Seneca-Cayuga tribes.

ENVIRONMENTAL CONTEXT

The subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, located in Adair County, Oklahoma, is situated at/near the junction of the Prairie Plains and Ozark Plateau geographic regions of Oklahoma, the historic vegetation of which region consisted primarily of tall grasses and post oak/blackjack oak trees. Indeed, per Wyckoff and Brooks (1983), the area has been described as the "Tall Grass Prairies and Oak-Hickory Forests" region. The eastern reach of the county abuts the Ozark Uplift, a "deeply dissected, southwest sloping, limestone plateau…." (Wyckoff and Brooks). The western reach of the county consists of rolling uplands "formed on shales … broken by east-facing, sandstone escarpments." More particularly, the subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking is bisected by an unnamed right-bank tributary to Sallisaw Creek, in turn, a left-bank tributary to the Arkansas River. Prior disturbance on the undertaking includes dam construction, grading, and streambank stabilization in ca. 1965.

HISTORIC CONTEXT

As referenced above, the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking is situated within Region #3 (Wyckoff and Brooks 1983), wherein abundant pre-contact and post-contact sites have been recorded. As discussed in that work, the region possesses abundant evidence of Archaic occupations dating from 4,000 to 2,000 years ago, as well as semi-sedentary Woodland Period sites and Caddoan Villager sites, dating collectively from A.D. 1 to 1500. As to the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, it appears abundant disturbance/alteration has been accomplished thereon, as of 1966, including the construction of a dam with associated spillway grading and streambank stabilization activities.

PRE-FIELD RESEARCH

The site-specific pre-field research conducted preparatory to visiting the undertaking in the field is considered vital to the conduct of an appropriate investigation and the preparation of an adequate summary report document. To that end, please note an approximate 0.5-mile radius surrounding the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking sufficed as to the search radius – for the purpose of identification of specific undertaking area history.

The records review/background research was facilitated by K.C. Kraft, NRCS Cultural Resources Coordinator in February 2021, via the Oklahoma Archaeological Survey Library. Additional research was conducted by Mark W. Kelly, NRCS Archaeologist, as well, including:

1) SHPO-NRHP/DOE Lists;
2) Aerial Photographs @ www.historicaerials.com: 1971, 1981, 1995, 2003, 2008, 2010, 2013, 2015, 2017, an 2019 per www.google.com/maps;
3) USGS 7.5-minute series quadrangle maps @ www.historicaerials.com: 1974, 2012, 2016, and 2019; and
4) BLM-GLO 1898 Survey Maps (Sec. 17-18, T14N, R24E)

PRE-FIELD RESEARCH RESULTS

OAS Library: No recorded archaeological sites appear to be located on/within/adjoining the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking although one site may potentially be so located, identified as AD50 with a denotation written on the file as being located "somewhere in Section [17]." As to archaeological and/or architectural surveys being conducted within a one-mile radius surrounding the undertaking, there are multiple, as noted below:

1) HUD project: Dusti Asbill residence, surveyed by D. Henry on 11/22/2004;
2) 2) ODWC project: Cookson Wildlife Management, surveyed by J. Clanahan on 02/28/2007;
3) ODOT project: BRO-101C(066)CO, surveyed by O'Shea on 06/16/2008;
4) HUD project: Roger Vann single family residence, surveyed by J. Bielah on 02/14/2020; and
5) HUD project: Carol Drumm residence sanitation, Cherokee Nation, surveyed by J. Bielah on 03/22/2015.

SHPO-NRHP/DOE Lists: No properties identified on/within/adjoining the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking. No properties identified within a 0.5-mile radius surrounding the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking. Moreover, the dam is not eligible for the National Register but is considered a part of the built landscape per the SHPO (File #0430-21).

Aerial Photography:

1) 1971: (b/w) lake dam and access road shown; outbuilding shown below/east of dam;
2) 1980: (color) no apparent change noted;
3) 1995: (b/w) outbuilding removed below dam;
4) 2003: (color) no apparent change from 1995;
5) 2008: (color) new hay barn constructed downstream of dam in breach area;
6) 2010: (color) no apparent change from 2008;
7) 2013: (color) no apparent change from 2010;
7) 2015: (color) no apparent change from 2013;
9) 2017: (color) no apparent change from 2015; and
10) 2019: (color) no apparent change from 2017.

Topographic Maps:

1) 1974: lake dam and access road shown, one residential structure and two outbuildings shown downstream of dam, one outbuilding shown above dam;
2) 2012: no structures depicted;
3) 2016: no change noted; and
4) 2019: no apparent change.

BLM-GLO 1898 Map: no cultural features noted on/within/adjoining Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking.

FIELD WORK

Initial Reconnaissance Survey: Cultural evidence of pre-contact and/or post-contact occupation/use of the subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking was sought via transects over the entirety of the ±72-acre tract (excluding the ±8-acre sediment pool). As to natural occurrences of disturbance, the feeder streams and their attendant erosional drainages, the tailings of burrowing animals, overturned trees, and heavily disturbed tributary channel walls provided excellent visual opportunities to review the undertaking for evidence of prehistoric usage – particularly as to the high likelihood of finding displaced artifacts as a result of the modification of drainage patterns following construction of the dam. As to historic activities, owing to the fact the dam and pool were not subjected to a NHPA Section 106 survey, the property adjoining the pool, the dam itself, and the downstream channel were all investigated for the purpose of potentially finding displaced artifacts. Further, it should be noted that no natural surficial features, including distinct mounds and/or pits, etc., were noted on/within the undertaking. In sum, no evidence of pre-contact and/or post-contact occupation on/within the subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking was observed/collected via reconnaissance survey. The totality of the dam rehabilitation undertaking surveyed via reconnaissance: 76-100%.

Intensive Survey/Subsurface Testing: Cultural evidence of pre-contact and/or post-contact occupation/use of the subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking was sought via the conduct of screened shovel tests (hand/trowel screened) within those areas possessing surficial soils of sufficient depth (*Please note: NO STPs could be excavated on strict/straight line alignments – owing to the extensive areas possessing exposed rock, as depicted in the attached Photograph Log*).

The following chart portrays the representative soils and the number of shovel tests conducted on/within each defined soil unit on/within those specific areas of the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking destined to be disturbed by the NRCS dam rehabilitation activities.

Please note that not every STP attempted could be accomplished to a width/depth of 45cm/50cm utilizing a round-tip shovel – owing to the abundant presence of rock! The Observed Profile DOES NOT reflect every STP!

Specific Tract Tested	Soil Identification	Published Pedon / Profile	Location of Tests	Observed Profile	Results of STPs
Tract A – Upstream of Dam	Hu – Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #1-2, 5, 9, 13-16	(adjoining dam) 0-13cm – brown silt loam / rock cobbles / gravel (adjoining stream above dam) 0-24cm – brown silt loam; 24-52cm – reddish brown gravelly loam	Negative – no lithics / items exhibiting cultural manifestations
Tract A – Upstream of Dam	BsF – Clarksville very gravelly silt loam, 20 to 50 percent slopes, stony	A: 1-5" – dark grayish brown gravelly silt loam; E: 5-12" – yellowish brown and brown gravelly silt loam;	STP #3	0-12cm – dark grayish brown gravelly silt loam; 12-21cm – brown gravelly silt loam / rock cobbles	Negative – no lithics / items exhibiting

		Bt1: 12-18" – light yellowish brown gravelly silt loam; Bt2: 18-29" – yellowish brown gravelly silt loam			cultural manifestations
Tract A – Upstream of Dam	Ga – Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #4, 6-7, 12, 17-22	0-26cm – brown silt loam; 26-49cm – brown gravelly loam / rock cobbles (WET!)	Negative – no lithics / items exhibiting cultural manifestations
Tract A – Upstream of Dam	BdD – Clarksville very gravelly silt loam, 1 to 8 percent slopes	A: 1-5" – dark grayish brown gravelly silt loam; E: 5-12" – yellowish brown and brown gravelly silt loam; Bt1: 12-18" – light yellowish brown gravelly silt loam; Bt2: 18-29" – yellowish brown gravelly silt loam	STP #8, 10-11	0-13cm – dark grayish brown gravelly silt loam; 13-30cm – reddish brown gravelly silt loam; 26-48cm – dark yellowish brown silt loam	Negative – no lithics / items exhibiting cultural manifestations
Tract B – Downstream of Dam	Hu – Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #23, 27-35	0-24cm – gravelly brown silt loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Tract B – Downstream of Dam	Ga – Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #24-26	0-26cm – brown gravelly silt loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations

SUMMARY OF FINDINGS

The investigations conducted on the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking consisted of both reconnaissance survey and intensive survey via screened shovel tests. As to direct effects, there are no recorded sites identified on/adjoining the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking and no recorded sites are identified in the undertaking vicinity. As to indirect effects, no recorded sites will be affected by the proposed dam rehabilitation activities. Based on the results of this cultural resources investigation, the proposed activities of the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking will not result in either a direct or indirect effect on the historic properties of Oklahoma. No further investigation is considered necessary.

ARCHAEOLOGICAL RESOURCES

No evidence of a pre-contact occupation was revealed on/within the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking. It further appears there is no evidence of an early-day, post-contact occupation on/within the undertaking. Thus, it is concluded the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking will not affect – either directly or indirectly – the historic properties of Oklahoma.

CONCLUSION

No cultural materials were discovered during the investigation of the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking indicative of an early-day, post-contact historic or prehistoric occupation. The investigators therefore conclude, based on the finding of no materials possessing cultural manifestations on/within the APE for either direct or indirect effects, that the undertaking will not impact any historic properties.

RECOMMENDATION

The activities proposed for the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking will not affect the historic properties of Oklahoma – no historic properties were identified via either the reconnaissance or intensive surveys conducted on/within the undertaking. No further investigation of the subject Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking, located/identified as referenced herein, is recommended. That being said, should any construction activities associated with the Sallisaw Creek Watershed Site #13 Rehabilitation Undertaking inadvertently reveal the presence of cultural materials/remains – including human bone and/or funerary objects – all such activities shall immediately cease at/within a 50'-diameter radius surrounding the site of the discovered materials/remains until the Oklahoma Archeological Survey/State Historic Preservation Office shall be contacted and the cultural materials/remains examined by a professional archaeologist.

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1) Kawecki, Patricia L. and Don Wyckoff
   1984 *Contributions to Cross Timbers Prehistory*. Oklahoma Archeological Survey, Norman.
2) Morris, John W., Charles R. Goins, and Edwin C. McReynolds
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   2012 *Spiro and Fort Coffee Phases: Changing Cultural Complexes of the Caddoan Area*. Oklahoma Archeological Survey Memoir No. 16, Norman.
6) Warth, Peter and Dock J. Polone
   1965 Soil Survey of Adair County, Oklahoma. United States Department of Agriculture, Soil Conservation Service.
7) Wyckoff, Don G., and Robert L. Brooks
   1983 *Oklahoma Archeology: A 1981 Perspective of the State's Archeological Resources, Their Significance, Their Problems and Some Proposed Solutions*. Oklahoma Archeological Survey Report No. 16, Norman.
8) http://www.ou.edu/cas/archsur/counties/Adair.htm

PHOTOGRAPHS

Photo #1
View ESE



Photo #2
View South



Photo #3
View SSW

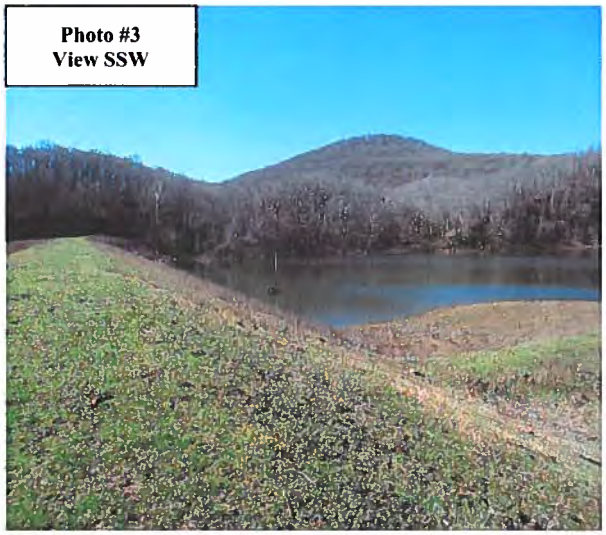


Photo #4
View SW

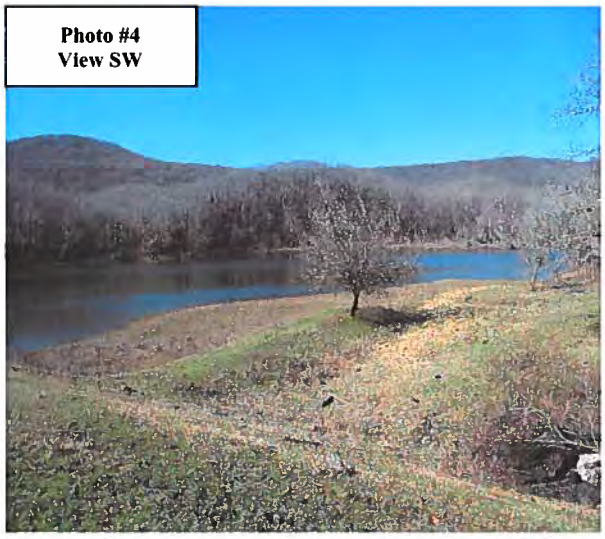


Photo #5
View West



Photo #6
View NW



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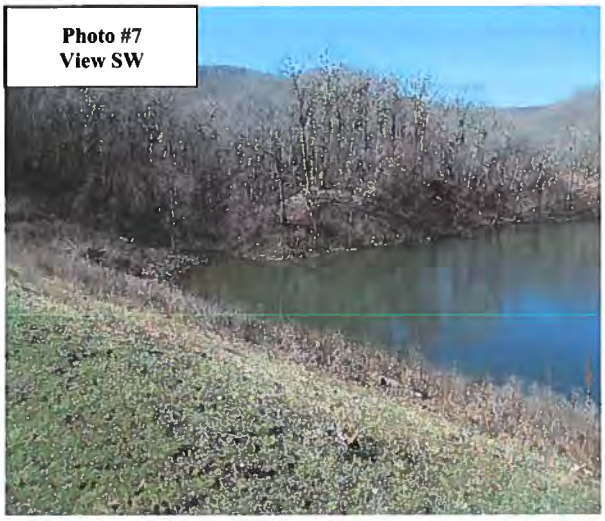

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View SW


Photo #8
View South

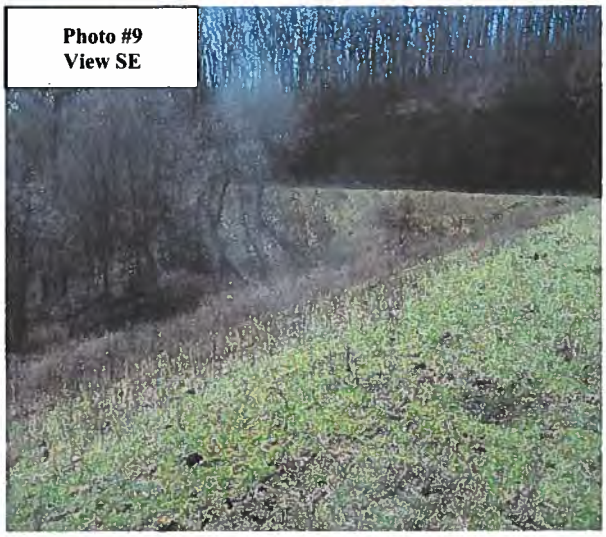

Photo #9
View SE


Photo #10
View ESE


Photo #11
View North


Photo #12
View North

Photo #13
View NNW



Photo #14
View NW



Photo #15
View WNW



Photo #16
View East



Photo #17
View ENE

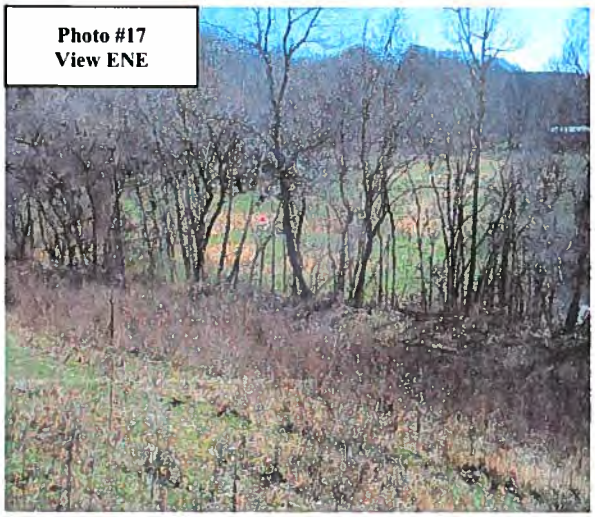


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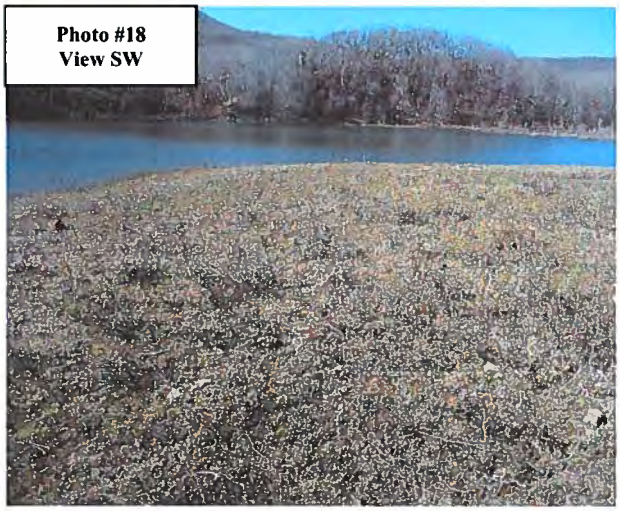



Photo #19
View West


Photo #20
View NW


Photo #21
View SE


Photo #22
View ESE


Photo #23
View WSW


Photo #24
View West

Photo #25
View WSW



Photo #26
View ESE



Photo #27
View WNW



Photo #28
View NW



Photo #29
View North



Photo #30
View NW



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Photo #31
View NW


Photo #32
View WNW


Photo #33
View SW


Photo #34
View WNW

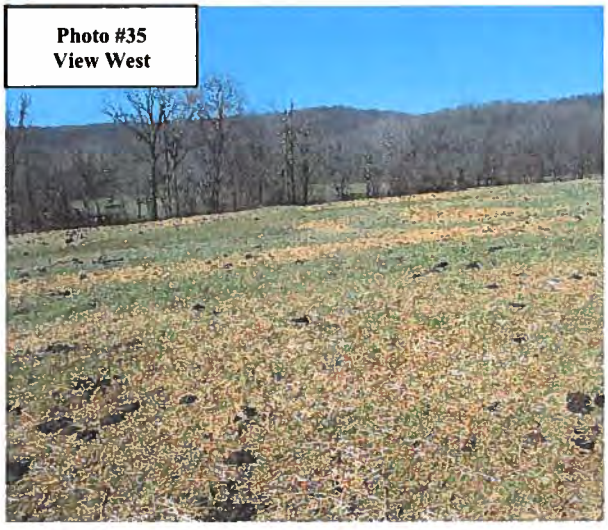

Photo #35
View West


Photo #13
View WNW

Photo #37
View NE



Photo #38
View SW



Photo #39
View ENE



Photo #40
View ESE



Photo #41
View NNW



Photo #42
View East



Photo #43
View SE



Photo #44
View ESE



Photo #45
View East



Photo #46
View --



Photo #47
View WNW



Photo #48
View SW



Photo #49
View ESE



Photo #50
View SW



Photo #51
View NW



Photo #52
View SW



Photo #53
View SE

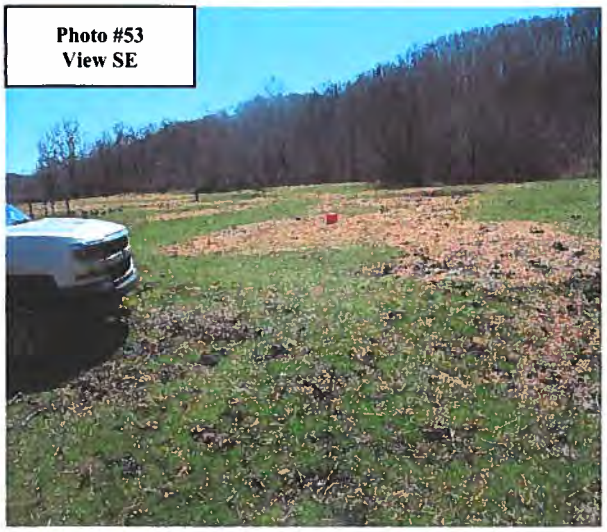


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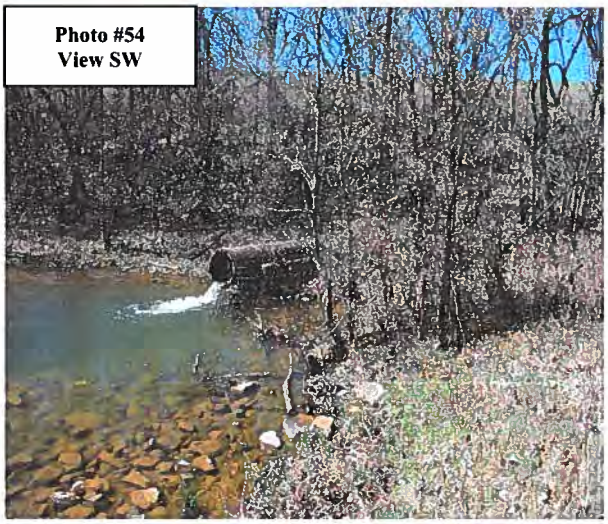


Photo #55
View NNW



Photo #56
View ESE



Photo #57
View North



Photo #58
View NE



Photo #59
View SW



Photo #60 – Upstream of Dam
Hu: Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded



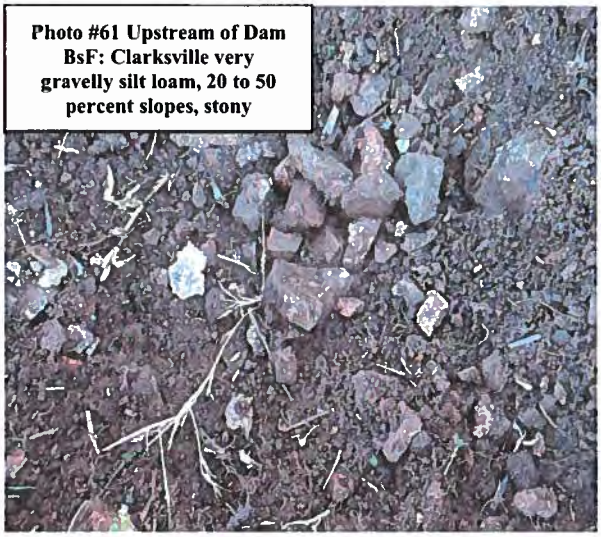


Photo #61 Upstream of Dam BsF: Clarksville very gravelly silt loam, 20 to 50 percent slopes, stony

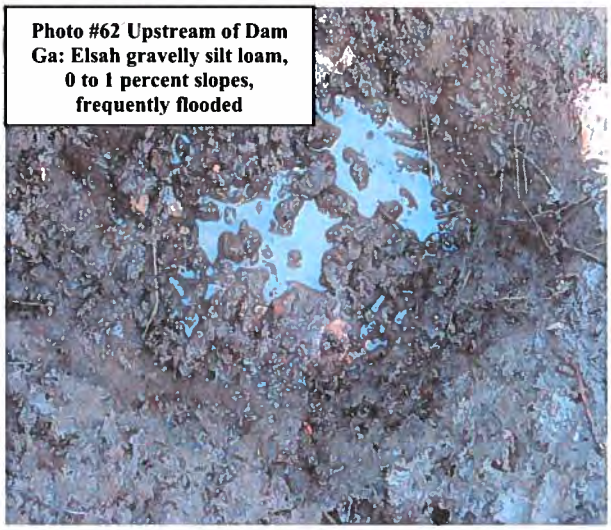


Photo #62 Upstream of Dam Ga: Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded



Photo #63 Upstream of Dam BdD: Clarksville very gravelly silt loam, 1 to 8 percent slopes



Photo #64 Upstream of Dam Hu: Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded

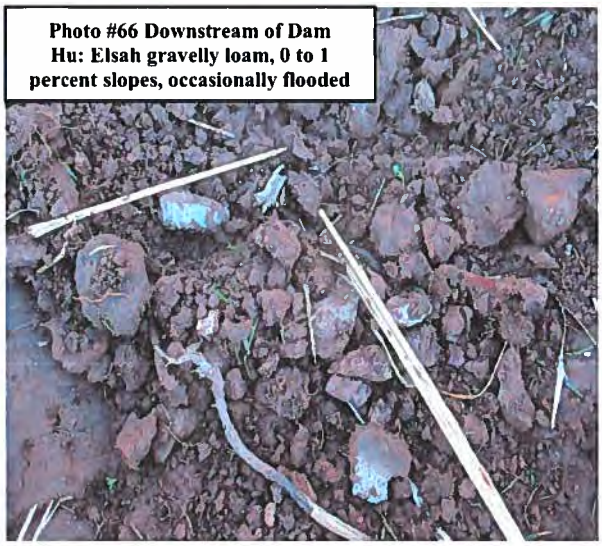


Photo #66 Downstream of Dam Hu: Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded

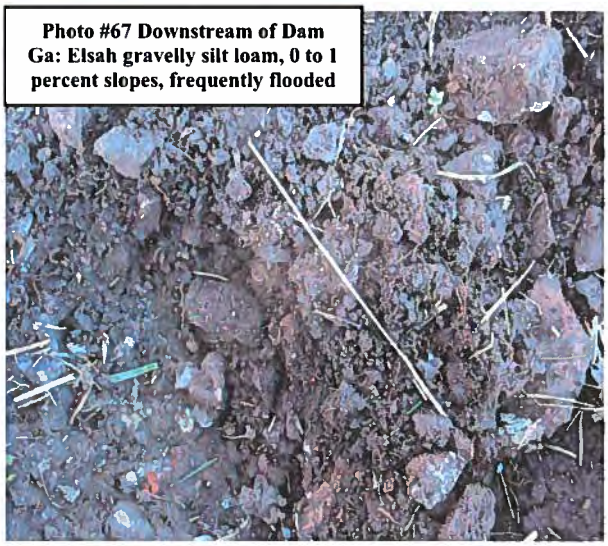


Photo #67 Downstream of Dam Ga: Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded

USDA

United States Department of Agriculture

NATURAL RESOURCES CONSERVATION SERVICE
NATIONAL HISTORIC PRESERVATION ACT (NHPA) SECTION 106
SALLISAW CREEK WATERSHED SITE #19 REHABILITATION
CULTURAL RESOURCES INVESTIGATIONS

PREPARED BY:
Mark W. Kelly – Principal Investigator
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UNDERTAKING:
Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking
Cultural Resources Investigation
Adair County, Oklahoma

REPORT DATE:
19 July 2022

SUBMITTED BY:
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USGS INFORMATION:
Stilwell West, OK 7.5-Minute Quadrangle
Sec. 15-17, 20-21 T15N, R25E

TOTAL ACREAGE:
±155.72 Acres

Contains Privileged and Confidential Information: DO NOT RELEASE.
Not Covered under the Freedom of Information Act (1966)

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ABSTRACT

A National Historic Preservation Act (NHPA) Section 106 Investigation was conducted on 24 March, 6 April, and 20 2022 by NRCS Archaeologist Mark W. Kelly, Principal Investigator on the proposed Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking located in Adair County, Oklahoma. The rehabilitation undertaking is authorized and funded by PL 106-472, referred to as the *Small Watershed Rehabilitation Amendment of* 2000. PL 106-472 is an amendment to PL 83-566, the *Watershed Protection and Flood Prevention Act of* 1954. The present undertaking is designed to extend the service life of the Sallisaw Creek Watershed Site #19 to one hundred years and meet applicable safety and performance standards for a high hazard dam. As to NRCS participation, the principal spillway will be replaced with a new 36"-diameter RCP (reinforced concrete pipe) conduit, with a standard NRCS design riser. A concrete impact basin will be installed to dissipate energy at the outlet of the conduit. The existing auxiliary spillway elevation will be reduced to 979.2' amsl from the existing elevation of 980.7' amsl. The top of dam elevation will remain at 984.5' amsl. The principal spillway elevation will remain at 948.7' amsl and the (sediment) pool will continue to have a surface area of ±46 acres. The auxiliary spillway will be maintained at a width of 200.0' and will be lined with articulating concrete blocks (ACB) to provide erosion control and stability. In any event, other than the disturbance during construction, there will be no impact on any historic properties resulting from the rehabilitation of the dam. Regarding the existing earthen dam, an historic property constructed in 1968, it does not meet criteria A-D of the National Historic Preservation Act (NRHP); thus, the dam is not eligible for listing in the NRHP.

The investigations conducted on the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking consisted of both a reconnaissance survey and an intensive survey via screened shovel tests. A total of 155.72 acres was investigated from the dam location upstream, which total includes the total acreage located at/below the top of dam elevation of 984.5' amsl – which includes ±27.6 acres investigated downstream of the dam, encompassing that area to be potentially impacted should a catastrophic breach of the dam occur. As to direct effects, there are no recorded historic properties or archaeological sites located on/within or adjacent to the APE for direct effects as to the specific activities to be conducted relative to the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking. No cultural materials were discovered during the investigation of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking indicative of an early-day, post-contact historic or prehistoric occupation - no ceramics, lithics or materials possessing cultural manifestations on/within the APE for either direct or indirect effects. However, one unoccupied structure was identified near the top of dam pool APE (984.5' amsl). Sallisaw Watershed Site #19 "as built" drawings from 1968 list the then occupied house as being 985' amsl. As to indirect effects, the records review disclosed no evidence of previously reported historic resources within a 0.5-mile radius surrounding the undertaking likely to be adversely or otherwise affected by the proposed dam rehabilitation construction activities.

Based on the results of this Section 106 investigation the proposed activities deemed necessary to extend the service life of the Sallisaw Creek Watershed Site #19 dam to one hundred years and meet applicable safety and performance standards for a high hazard dam will not result in an effect (either directly or indirectly) on the historic properties of Oklahoma. It is the professional

opinion of the investigating NRCS archaeologist that no further investigation is considered necessary.

INTRODUCTION

The present undertaking is designed to extend the service life of the Sallisaw Creek #19 Watershed Site to one hundred years and meet applicable safety and performance standards for a high hazard dam. A total of ±128.12 acres was investigated from the dam location upstream and a total of ±27.6 acres investigated downstream of the dam—termination of easement. The total acreage subjected to investigation is ±155.72 acres.

As to NRCS participation, the principal spillway will be replaced with a new 36"-diameter RCP (reinforced concrete pipe) conduit, with a standard NRCS design riser. A concrete impact basin will be installed to dissipate energy at the outlet of the conduit. The existing auxiliary spillway elevation of will be reduced to 979.2' amsl from the existing elevation of 980.7' amsl. The top of dam elevation will remain the same height of 984.5' amsl. The principal spillway elevation will will stay the same at 948.7' amsl and the (sediment) pool will continue to have a surface area of ±46 acres. The auxiliary spillway will be maintained at a width of 200.0' and will be lined with articulating concrete blocks (ACB) to provide erosion control and stability.

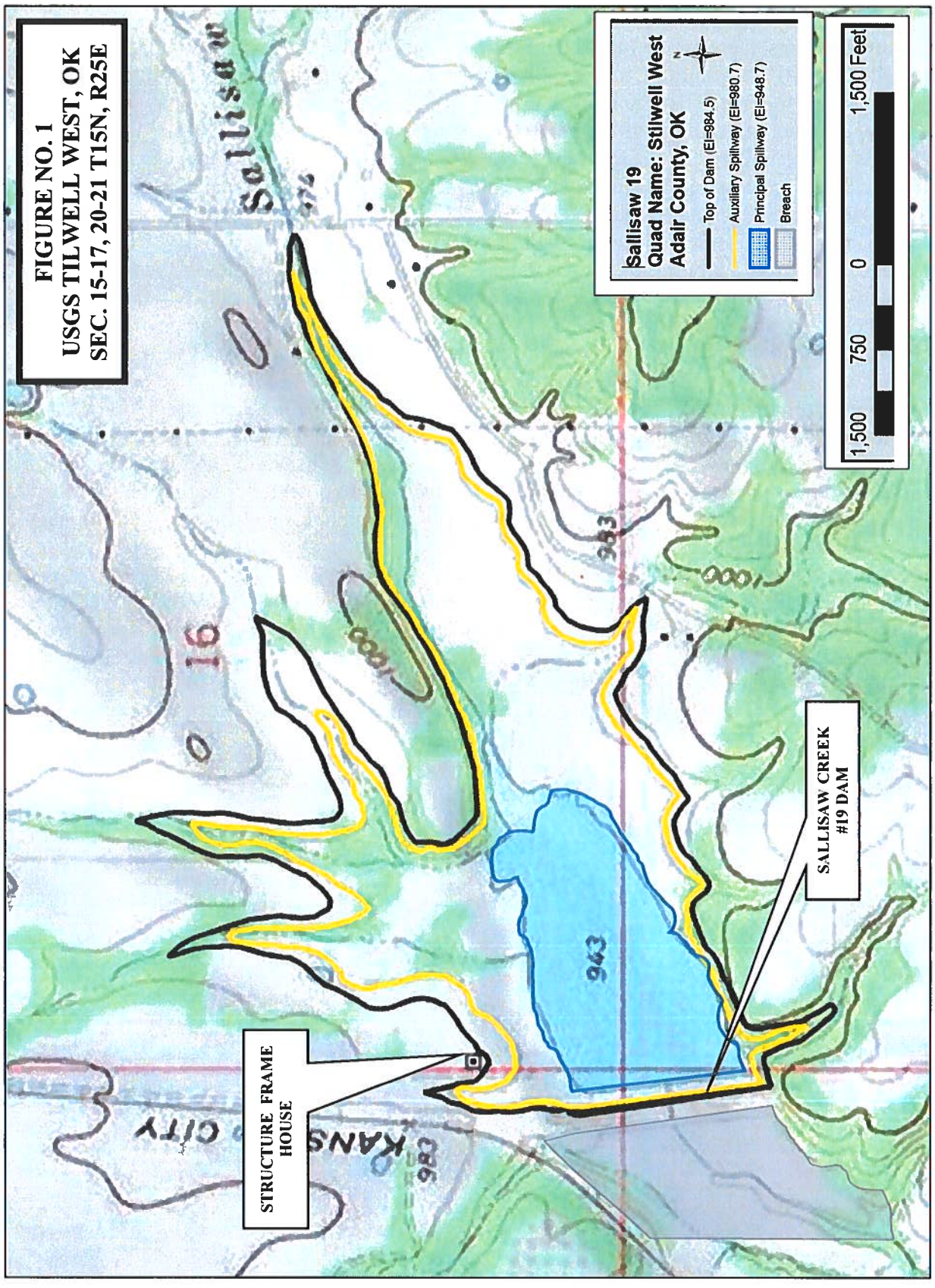
The sponsor of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking is the USDA NRCS State Office – Water Resources Section, located at 100 USDA, Suite 206, Stillwater, Oklahoma 74074 and the Adair County Conservation District: 920 South 2nd Street, Stilwell, OK 74960. No difficulties were encountered during the course of the undertaking investigation that adversely affected the survey results.

The records review/background research was facilitated by K.C. Kraft, NRCS Cultural Resources Coordinator in February 2021 and February 2022, via the Oklahoma Archaeological Survey Library. Additional research was conducted by Mark W. Kelly, NRCS Archaeologist. The physical site investigation, consisting of both a reconnaissance and intensive survey, was completed by Mark W. Kelly on 24 March, 6 April, and 20 April 2022.

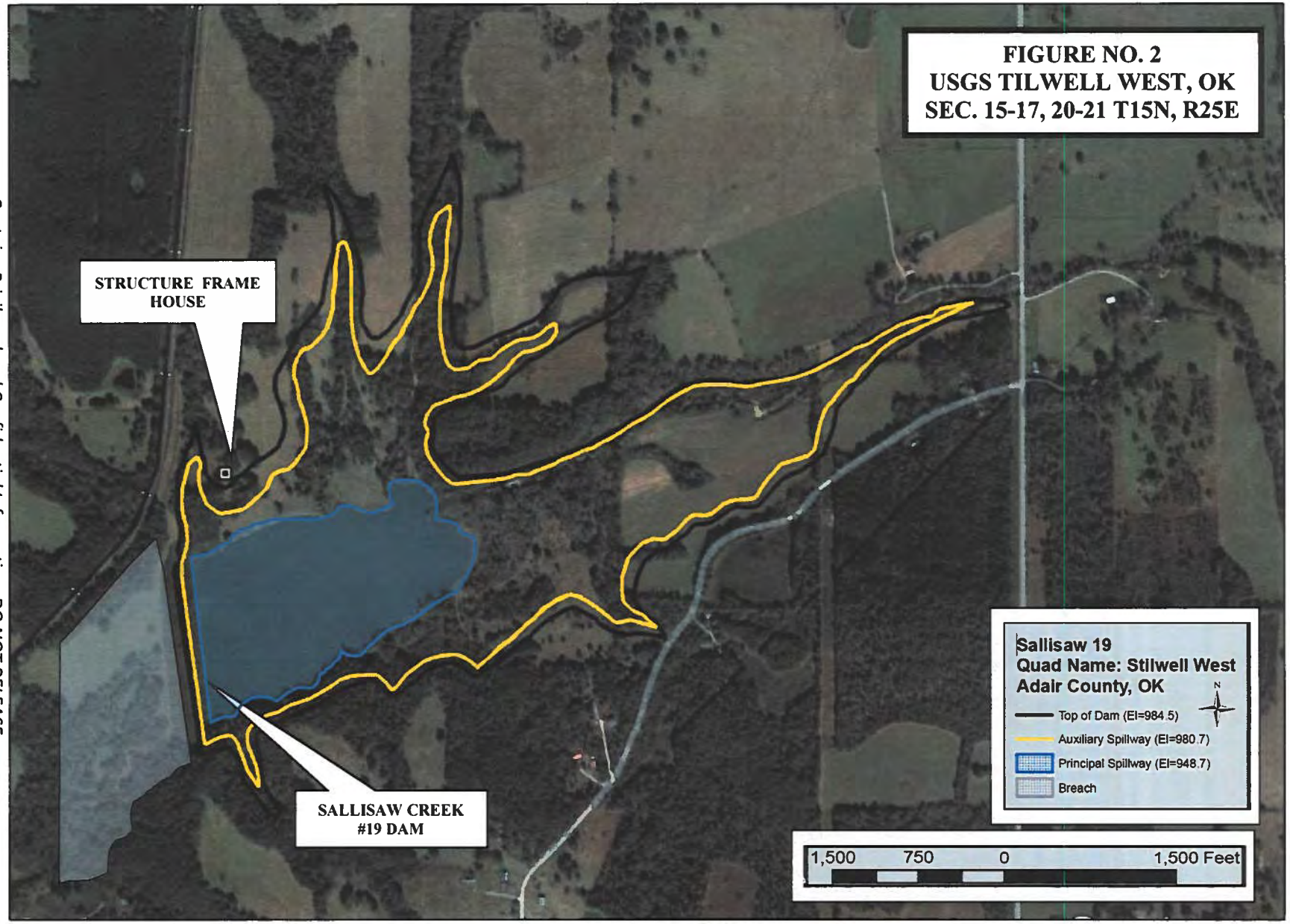
Figure Nos. 1-3 depict the specific areas subjected to investigation. Ingress/egress to each is via existing private road and/or over previously disturbed property. The investigations conducted on the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking consisted of both reconnaissance survey using 30-40 meter transects and 25-to-30-meter screened shovel test (STP) placement. Transect spacing was based on level of subsurface impact of undertaking (e.g.: heavy equipment excavation, permanent inundation, temporary [2-day] inundation). Transect and STP spacing was also adjusted by based on field observations of topography and previous level of ground-disturbance (e.g.: farming-ranching operations). Not all STPs could be excavated on strict/straight line alignments owing to the extensive areas possessing exposed rock, as depicted in the attached Photograph Log. Likewise, no STPs could be performed along the southernmost edge of the pool since it was composed of rock (e.g.: hillside-bluff). Also, only one NRCS-described soil – Hn: Razort silt loam, 0-1% slopes, occasionally flooded – did not always possess the heavy presence of gravel and rock as described in the NRCS Soil Survey likely a result of water transported sediments.

As to direct effects, there are no historic properties identified on/adjoining the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking – apart from the dam itself. Regarding the dam's age of 54 years, the State Historic Preservation Office (SHPO) has determined that earthen dams of this type are not affected by NRCS rehabilitation measures (File #0430-21); no historic properties will be affected by the Sallisaw Creek Watershed #19 Rehabilitation. This determination was based on the dam's universal construction methodology and generalized design plans associated with the earthen feature. As to indirect effects, there are no recorded sites identified within a 0.5-mile radius surrounding the undertaking; thus, the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking will not affect any properties of record. However, one historic structure was identified approximately 206 meters north of the most northern extent of the dam and 136 meters from the permanent pool. The footings of the structure would not be affected (985 amsl) if the water level reached the top of dam (984.5 amsl)—during a 500-year storm—before receding to the normal pool level. Based on the significant deterioration of the structure, loss of original setting, feeling, and association because of the original construction of the dam; absence of representing a historical theme (common National Folk Style); lack of characteristic of a rare, unique, or outstanding architectural design; no association with persons of transcendent importance; and no potential for providing future archaeological research opportunities, the dwelling is not eligible for inclusion to the National Register of Historic Places.

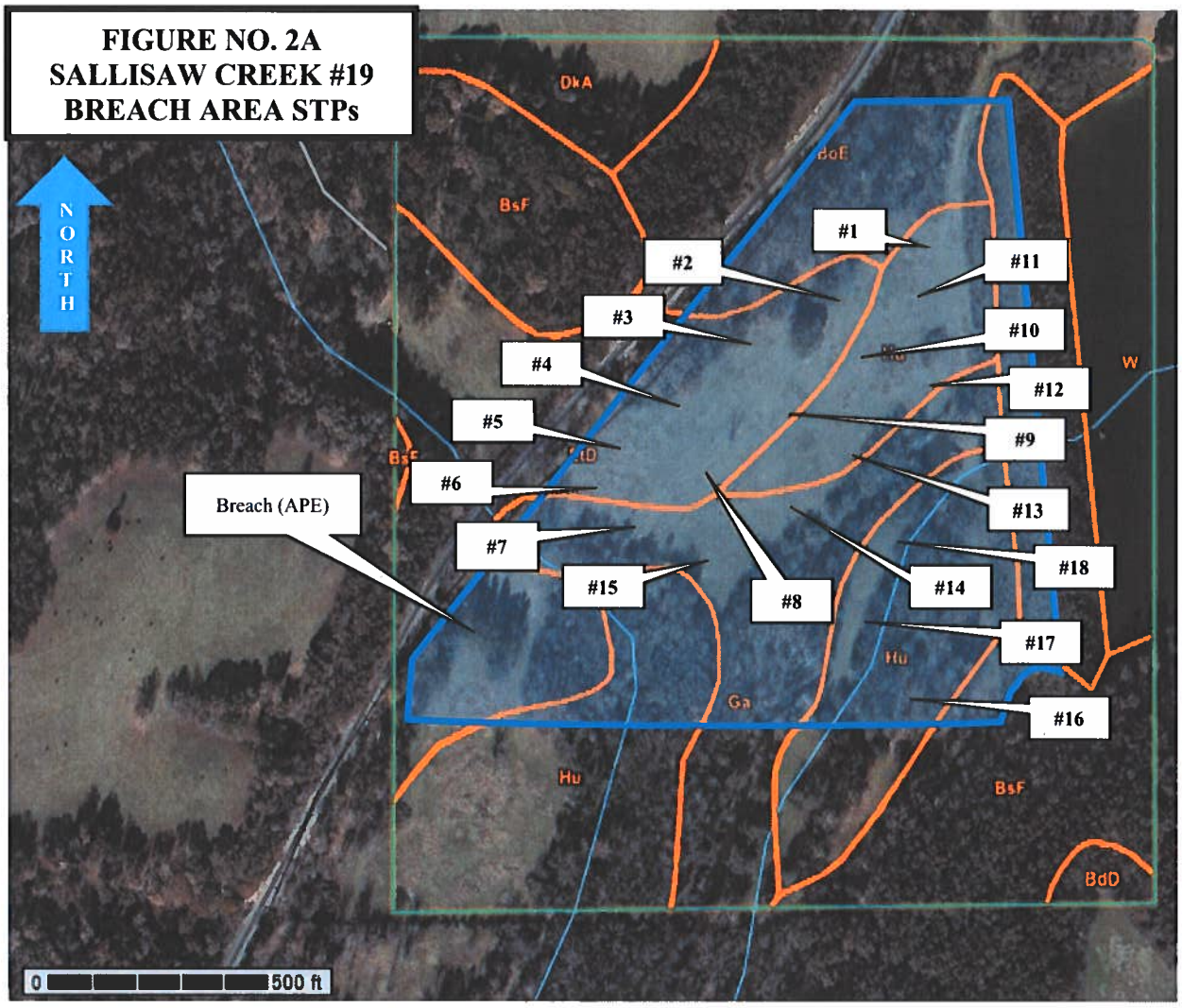
Based on the results of this cultural resources investigation, the proposed activities of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking will not result in either a direct or indirect effect on the National Register-eligible historic properties of Oklahoma. No further investigation is considered necessary.

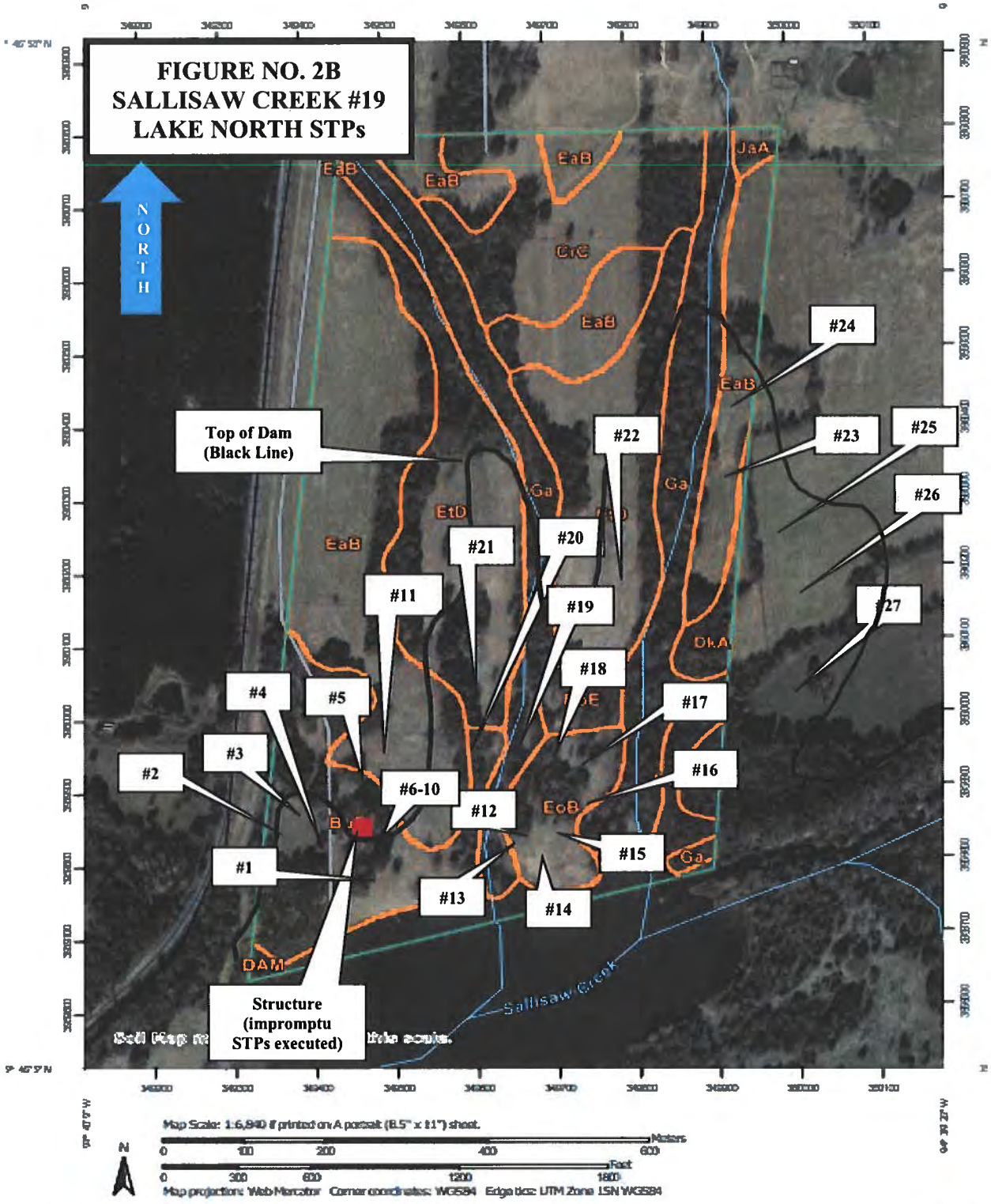


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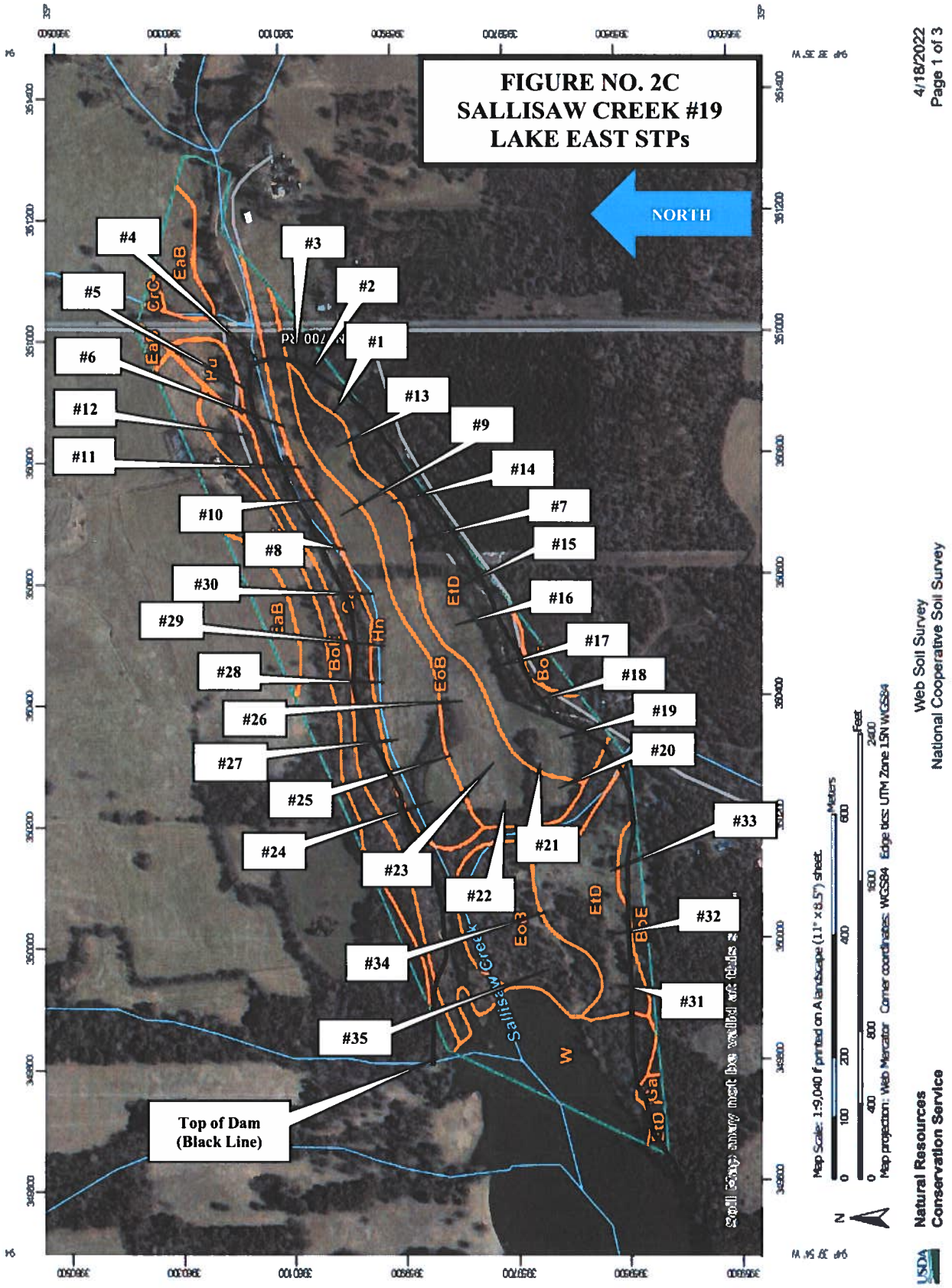


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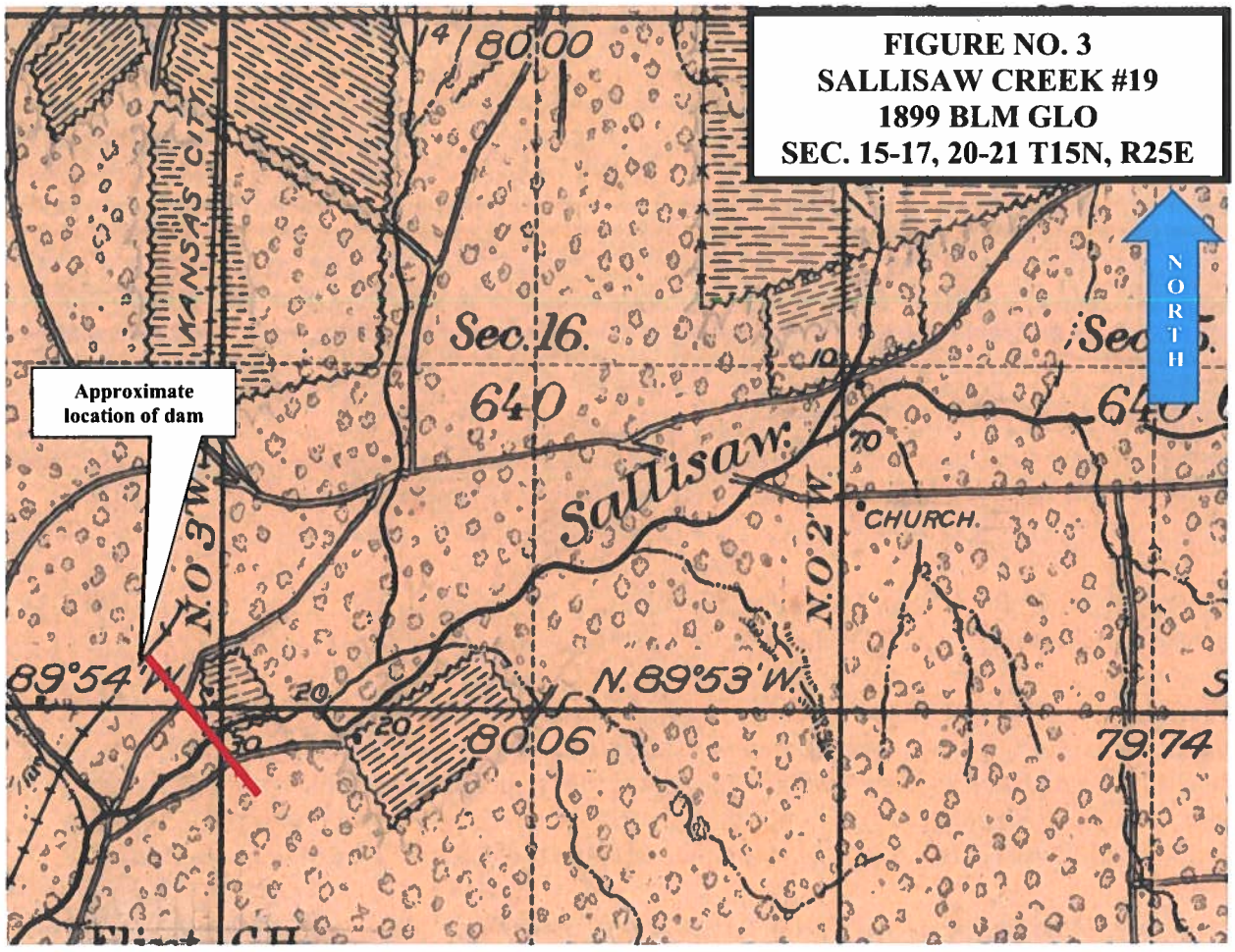

FIGURE NO. 2A
SALLISAW CREEK #19
BREACH AREA STPs
NORTH
DkA
BsF
BdE
#1
#2
#3
#4
#5
#6
#7
#8
#9
#10
#11
#12
#13
#14
#15
#16
#17
#18
Breach (APE)
Hu
Ga
BdD
0
500 ft



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FIGURE NO. 3
SALLISAW CREEK #19
1899 BLM GLO
SEC. 15-17, 20-21 T15N, R25E
NORTH
Approximate location of dam
Sec. 16.
640
Sallisaw.
CHURCH.
N. 89°53' W.
89°54' W.
80.00
80.06
79.74
N. 0 3 W.
N. 0 2 W.

RESEARCH DESIGN

There are multiple venues worthy of exploration within the region wherein the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking is located. As to Region #3, as so designated by Wyckoff and Brooks (1983), the eleven-county "Tall Grass Prairies and Oak-Hickory Forests" region represents "one of the most studied areas within Oklahoma," beginning in 1926 with the efforts of J.B. Thoburn in Delaware County. As to notable work in Sequoyah County, excavations of the Horton site in the Arkansas River valley, a 20-acre site, were initiated in the 1950s. The farming village "under the domain of the Spiro Mounds leaders," was occupied from A.D. 1300-1450. The excavations revealed both a rectangular and a circular structure, both serving unique purposes, in addition to the finding of "farming plots" in association with an abundance of siltstone tools. As to prehistoric sites, per the Oklahoma Archaeological Survey 2005 tabulation, only two Paleoindian sites have been discovered in Adair County, thirty Archaic Period sites, nine Woodland Period sites, and nine Plains Village sites have been recorded, as well.

Region #3 has produced very few Paleoindian sites to date; indeed, no kill sites or camp sites have been identified therein – isolated finds of artifacts only. Evidence of Archaic Period occupations, assemblages, and sequence for Region #3 comes primarily via work conducted in Delaware, Nowata, and Mayes Counties. As to the Woodland Period, abundant sites representative of that period are located throughout Region #3, including Adair County. Regardless, much confusion regarding the origin of these people yet exists, but a relationship with Woodland people to the north in Missouri and Illinois appears to be indicated via studies finding a similarity in the craftsmanship of pottery and tool assemblages found in Oklahoma.

As Wyckoff and Brooks (1983) attest, "The rise of prehistoric Caddoan villagers in the Arkansas River Valley is clearly linked to people moving north from the Fourche Maline Valley around A.D. 700, as represented by the significant Spiro village site located in northern LeFlore County. Between A.D. 1200 and 1350, however, it appears the primary Spiro village site had been abandoned, replaced by many smaller outlying communities with associated small mounds. By A.D. 1400 it appears the Caddoan villagers were no longer building mounds; indeed, indications exist that the inhabitants of the smaller villages, although continuing to pursue their agricultural practices, were engaged in bison hunting, as well. Wyckoff and Brooks (1983) do provide, however, that the southern part of Region #3 "figured prominently for some 900 years in the culture history of the Caddoan speaking Wichita."

In sum, regardless of the fact that no sites have been recorded in proximity to the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, the survey area is located within a relatively rural setting bisected by the unnamed right-bank tributary to Sallisaw Creek, in turn, a left-bank tributary to the Arkansas River; thus, the possibility of finding evidence of both prehistoric and historic cultural deposits on/within/adjoining the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking via field survey certainly does exist, particularly referencing occupation of the region during the Archaic and Woodland Periods and post-contact tribes removed to the region via the 1830 Indian Removal Act, including the Cherokee, Miami, Quapaw, Peoria, Ottawa, Eastern Shawnee, Shawnee, Modoc, Wyandotte, and Seneca-Cayuga tribes.

ENVIRONMENTAL CONTEXT

The subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, located in Adair County, Oklahoma, is situated at/near the junction of the Prairie Plains and Ozark Plateau geographic regions of Oklahoma, the historic vegetation of which region consisted primarily of tall grasses and post oak/blackjack oak trees. Indeed, per Wyckoff and Brooks (1983), the area has been described as the "Tall Grass Prairies and Oak-Hickory Forests" region. The eastern reach of the county abuts the Ozark Uplift, a "deeply dissected, southwest sloping, limestone plateau...." (Wyckoff and Brooks). The western reach of the county consists of rolling uplands "formed on shales ... broken by east-facing, sandstone escarpments." More particularly, the subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking is bisected by Sallisaw Creek, in turn, a left-bank tributary to the Arkansas River. Prior disturbance on the undertaking includes dam construction, grading, and streambank stabilization in ca. 1968.

HISTORIC CONTEXT

As referenced above, the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking is situated within Region #3 (Wyckoff and Brooks 1983), wherein abundant pre-contact and post-contact sites have been recorded. As discussed in that work, the region possesses abundant evidence of Archaic occupations dating from 4,000 to 2,000 years ago, as well as semi-sedentary Woodland Period sites and Caddoan Villager sites, dating collectively from A.D. 1 to 1500. As to the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, it appears abundant disturbance/alteration has been accomplished thereon, as of 1968, including the construction of a dam with associated spillway grading and streambank stabilization activities.

PRE-FIELD RESEARCH

The site-specific pre-field research conducted preparatory to visiting the undertaking in the field is considered vital to the conduct of an appropriate investigation and the preparation of an adequate summary report document. To that end, please note an approximate 0.5-mile radius surrounding the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking sufficed as to the search radius – for the purpose of identification of specific undertaking area history.

The records review/background research was facilitated by K.C. Kraft, NRCS Cultural Resources Coordinator in February 2021 and February 2022, via the Oklahoma Archaeological Survey Library. Additional research was conducted by Mark W. Kelly, NRCS Archaeologist, as well, including:

1) SHPO-NRHP/DOE Lists;
2) Aerial Photographs @ www.historicaerials.com: 1971, 1980, 1995, 2003, 2008, 2010, 2013, 2015, 2017, and 2019 per www.google.com/maps;
3) USGS 7.5-minute series quadrangle maps @ www.historicaerials.com: 1974, 2012, 2016, and 2019; and
4) BLM-GLO 1899 Survey Maps (Sec. 15-17, 20-21; T15N, R25E).

PRE-FIELD RESEARCH RESULTS

OAS Library: No recorded archaeological sites appear to be located on/within/adjoining the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking. As to archaeological and/or architectural surveys being conducted within a one-mile radius surrounding the undertaking, only one is noted:

1) Community Assistance: Ozarks Electric Cooperative; surveyed by F. Gettys on behalf of REA, on 02/15/1991.

SHPO-NRHP/DOE Lists: No properties identified on/within/adjoining the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking; and no properties identified within a 0.5-mile radius surrounding the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking. The dam is not eligible for the National Register but is considered a part of the built landscape per the SHPO (File #0430-21). One "occupied" structure is plotted near the dam as shown on the 1972 USGS 7.5-minute series topographic map. This house is referenced as an historic structure in this report.

Aerial Photography:

1) 1971: (b/w) lake dam and access road shown; multiple structures depicted upstream of dam to north and east;
2) 1980: (color) no apparent change noted;
3) 1995: (b/w) no apparent change from 1980;
4) 2003: (color) no apparent change from 1995;
5) 2008: (color) no apparent change from 2003;
6) 2010: (color) no apparent change from 2008;
7) 2013: (color) no apparent change from 2010;
7) 2015: (color) no apparent change from 2013;
9) 2017: (color) no apparent change from 2015; and
10) 2019: (color) no apparent change from 2017.

Topographic Maps:

1) 1972: lake dam and access road shown, one residential structure shown above dam;
2) 2012: no structures depicted;
3) 2016: no change noted; and
4) 2019: no apparent change.

BLM-GLO 1899 Map: multiple roads and cultivated fields are depicted on/within the direct effects APE. Multiple structures are shown beyond the limits of the direct effects APE.

FIELD WORK

A total of ±128.12 acres were investigated from the dam location upstream, which total includes the total acreage located at/below the top of dam elevation of 984.5' amsl, and a total of ±27.6 acres investigated downstream of the dam, encompassing that area to be potentially impacted

should a catastrophic breach of the dam occur. In all, 155.72 acres was surveyed and subjected to shovel testing.

Initial Reconnaissance Survey: Cultural evidence of pre-contact and/or post-contact occupation/use of the subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking was sought via transects – spaced at/near 30 meters – on/within those areas devoid of dense vegetative growth, including deadfall and briars/brush. Also, only one identified USDA NRCS soil description did not possess dense gravel/rock at all depths (Hn – Razort silt loam, 0-1% slopes, occasionally flooded). Indeed, as may be observed via the Photograph Log, the deforested areas possess extraordinarily dense rock cobbles/gravel – as well as an abundance of rock piles indicating heavy equipment usage to relocate said rocks. As to natural occurrences of disturbance, the feeder streams and their attendant erosional drainages, the tailings of burrowing animals, overturned trees, and heavily disturbed tributary channel walls provided excellent visual opportunities to review the undertaking setting for evidence of prehistoric usage – particularly as to the high likelihood of finding displaced artifacts as a result of the modification of drainage patterns following construction of the dam. As to historic activities, owing to the fact the dam and pool were not subjected to a NHPA Section 106 survey, the property adjoining the pool, the dam itself, and the downstream channel were all investigated for the purpose of potentially finding displaced artifacts. Further, it should be noted that no natural surficial features, including distinct mounds and/or pits, etc., were noted on/within the undertaking. In sum, no evidence of pre-contact and/or post-contact occupation on/within the subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking was observed/collected via reconnaissance survey. The totality of the dam rehabilitation undertaking surveyed via reconnaissance: 76-100%.

Intensive Survey/Subsurface Testing: Cultural evidence of pre-contact and/or post-contact occupation/use of the subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking was sought via the conduct of screened shovel tests (hand/trowel screened) on/within those areas possessing surficial soils of sufficient depth. As noted above, transects – spaced at/near 30 meters – were walked on/within those areas devoid of dense vegetative growth, including deadfall and briars/brush. On occasion strict/straight line transects could not be accomplished given the tree cover in areas considered as the top of dam elevation. Likewise, no STPs could be performed along the southernmost edge of the pool since it was composed of rock (e.g.: hillside-bluff). Indeed, as may be observed via the Photograph Log, the deforested areas possess extraordinarily dense rock cobbles/gravel – as well as an abundance of rock. Regardless, a shovel test was attempted/conducted on each transect spaced at/near 30-meter intervals (as paced).

The following chart portrays the representative soils and the number of shovel tests conducted on/within each defined soil unit on/within those specific areas of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking destined to be disturbed by the NRCS dam rehabilitation activities – as permitted by the density of vegetation/presence of rock. Please note that not every STP attempted could be accomplished to a width/depth of 45cm/50cm utilizing a round-tip shovel – owing to the abundant presence of rock. The observed profile does not always reflect every STP.

Specific Tract Tested	Soil Identification	Published Pedon / Profile	Location of Tests	Observed Profile	Results of STPs
Breach Area Downstream of Dam See Fig. 2A	EtD – Waben gravelly silty loam, 3-8% slopes	A: 0-5" – dark grayish brown very gravelly silt loam; E: 5-15" – pale brown very gravelly silt loam; Bt: 15-40" – brown very gravelly silt loam	STP #2-6, 8-9	1-7cm: dark grayish brown very gravelly silt loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Breach Area Downstream of Dam See Fig. 2A	Hu – Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #1, 10-13, 16-18	0-24cm – brown silt loam / rock cobbles' 24-51cm – brown gravelly loam	Negative – no lithics / items exhibiting cultural manifestations
Breach Area Downstream of Dam See Fig. 2A	Ga – Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #7, 14-15	0-25cm – brown silt loam; 25-52cm – brown gravelly loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	BoE – Clarksville stony silt loam, 5-15% slopes	A: 1-5" – dark grayish brown gravelly silt loam; E: 5-12" – light yellowish brown and brown gravelly silt loam; Bt1: 12-18" – light yellowish brown gravelly silt loam; Bt2: 18-29" – yellowish brown very gravelly loam	STP #1-2, 16	0-8cm – dark grayish brown gravelly silt loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	EaB – Britwater silt loam, 1-3% slopes	Ap: 0-6" - brown gravelly silt loam; Bt1: 6-22" – yellowish red gravelly silt loam	STP #3-5, 20	0-15cm – reddish brown gravelly silt loam; 15-49cm – dark reddish brown gravelly silt loam	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	EtD – Waben gravelly silty loam, 3-8% slopes	A: 0-5" – dark grayish brown very gravelly silt loam; E: 5-15" – pale brown very gravelly silt loam; Bt: 15-40" – brown very gravelly silt loam	STP #6-12, 17-19	0-12cm – dark grayish brown very gravelly silt loam; 12-38cm – brown very gravelly silt loam; 38-47cm – dark brown very gravelly silt loam	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	Ga – Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #26	0-22cm – brown silt loam; 22-51cm – brown gravelly loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	EoB – Waben gravelly silty loam, 1-3% slopes	A: 0-5" – dark grayish brown very gravelly silt loam; E: 5-15" – pale brown very gravelly silt loam; Bt: 15-40" – brown very gravelly silt loam	STP #13-15	0-13cm – dark grayish brown very gravelly silt loam – rock cobblers!	Negative – no lithics / items exhibiting cultural manifestations
Lake North Upstream of Dam See Fig. 2B	DkA – Tonti gravelly silt loam, 0-3% slopes	Ap: 0-8" – brown gravelly silt loam; Bt1: 8-14" – yellowish brown gravelly silt loam; Bt2: 14-20" – yellowish brown gravelly silty clay loam	STP #24	0-13cm – reddish brown very gravelly silt loam / rock	Negative – no lithics / items exhibiting cultural manifestations

Lake North Upstream of Dam See Fig. 2B	CrC: Craig gravelly silt loam, 1-5% slopes	A1: 0-7" – very dark brown silt loam; A2: 7-12" – very dark grayish brown silt loam; E: 12-16" – dark grayish brown silt loam; BE: 16-21" – brown silt loam	STP #27	0-18cm – very dark brown silt loam; 18-31cm – dark grayish brown silt loam; 31-53cm – dark brown silt loam	Negative – no lithics / items exhibiting cultural manifestations
Lake East Upstream of Dam See Fig. 2C	Ga – Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	A: 0-10" - brown silt loam; C1: 10-22" - brown gravelly loam	STP #1-4, 6, 12	0-26cm – brown silt loam; 26-49cm – brown gravelly loam	Negative – no lithics / items exhibiting cultural manifestations
Lake East Upstream of Dam See Fig. 2C	EaB – Britwater silt loam, 1-3% slopes	Ap: 0-6" - brown gravelly silt loam; Bt1: 6-22" – yellowish red gravelly silt loam	STP #5	0-15cm – brown gravelly silt loam; 15-50cm – yellowish red gravelly silt loam	Negative – no lithics / items exhibiting cultural manifestations
Lake East Upstream of Dam See Fig. 2C	EtD – Waben gravelly silty loam, 3-8% slopes	A: 0-5" – dark grayish brown very gravelly silt loam; E: 5-15" – pale brown very gravelly silt loam; Bt: 15-40" – brown very gravelly silt loam	STP #15-19, 21, 31-34	0-12cm – dark grayish brown gravelly silt loam; 12-21cm – brown gravelly silt loam / rock cobbles	Negative – no lithics / items exhibiting cultural manifestations
Lake East Upstream of Dam See Fig. 2C	EoB – Waben gravelly silty loam, 1-3% slopes	A: 0-5" – dark grayish brown very gravelly silt loam; E: 5-15" – pale brown very gravelly silt loam; Bt: 15-40" – brown very gravelly silt loam	STP #7, 13-14, 20, 22-23, 25-26, 35	0-14cm – dark grayish brown very gravelly silt loam; 14-48cm – light brown very gravelly silt loam	Negative – no lithics / items exhibiting cultural manifestations
Lake East Upstream of Dam See Fig. 2C	Hn – Razort silt loam, 0-1% slopes, occasionally flooded	Ap: 0-8" – dark yellowish brown silt loam; AB: 8-19" – dark brown silt loam; B21t: 19-24" – brown silt loam	STP #8-11, 24, 27-30	0-20cm – dark yellowish brown silt loam; 20-48cm – dark brown silt loam	Negative – no lithics / items exhibiting cultural manifestations

SUMMARY OF FINDINGS

The investigations conducted on the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking consisted of both reconnaissance survey at 30-meter intervals (based on topography and level of the undertakings subsurface disturbance) and intensive survey via screened shovel tests placed approximately every 30 meters (based on topography and undertakings subsurface impact). As to direct effects, there are no recorded sites identified on/adjoining the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking and no recorded sites were identified in the undertaking vicinity.

Based on the results of this cultural resources investigation, one structure (985 amsl) was identified on/within the top of dam pool (984.5 amsl). This stormwater would then recede after two to three days—based on engineering models. The historic property is a frame house atop stone pilons and stem wall located in the SW ¼ of the SW ¼ of Section 16, T15N, R25E (35.77107 N; -94.66580 W) as seen on Figure Nos. 1-2. The structure, located approximately 206 meters north of the most northern extent of the dam and 136 meters from the permanent pool (northwest), is an abandoned and dilapidated T-shaped structure. The house's primary entrance is

located on the northern elevation. This northern elevation features two doorways under a non-extant wraparound porch and two window openings. The northern elevation, again, shows signs that it once featured a wraparound porch with overhanging shed roof that covered the north and west sides of the house and porch. The eastern elevation of the house features a rear doorway and one window opening under another shed roof porch area of the house. The western elevation features four window openings, with two window pairings. This elevation also shows a later shed roofed addition to the house. The northern elevation of the house is very dilapidated from the collapsed shed roof but looks to have featured two window openings and large front gable. Impromptu shovel testing was conducted around the structure to determine if the location had any archaeological potential. All shovel probes were negative. If ever present, it appears that associated material were salvaged or removed from the locality.

In conclusion, the footings of the elevated structure would not be inundated if the water level reached the top of dam—during a 500-year storm—before receding to the normal pool level. Based on the significant deterioration of the structure, loss of original setting, feeling, and association resulting from construction of the dam, as well as absence of being a representation of a historical theme (common National Folk Style), also the lack of characteristic of a rare, unique, or outstanding architectural design, further no association with persons of transcendent importance, and finally no potential for providing future archaeological research opportunities (criteria A-D), the structure is not eligible for inclusion to the National Register of Historic Places. Thus, a determination of no effect to the historic property is concluded by NRCS.

Two Historic Property Resource Identification forms were prepared for the identified residential structure and the dam. Regardless, the proposed activities of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, as described above, will not result in either a direct or indirect effect on the historic properties of Oklahoma. No further investigation is considered necessary.

ARCHAEOLOGICAL RESOURCES

No evidence of a pre-contact occupation was revealed on/within the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking. One historic structure (abandoned frame house atop stone pilons and stem wall) located in the SW ¼ of the SW ¼ of Section 16, T15N, R25E (35.77107 N; -94.66580 W) was identified and determined ineligible for inclusion to the National Register of Historic Places.

CONCLUSION

No cultural materials (artifact or features) were discovered during the investigation of the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking indicative of an early-day, post-contact historic or prehistoric occupation within the direct effects APE of the proposed undertaking. As to the extant structure identified via reconnaissance survey, the investigators conclude that none of the activities pertaining to the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, as described above, will affect – directly or indirectly – the identified structures.

RECOMMENDATION

The activities proposed for the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking will not affect the historic properties of Oklahoma. As noted above, one abandoned historic structure was identified via reconnaissance survey. Regardless, no further investigation of the subject Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking, as identified/referenced herein, is recommended. That being said, should any construction activities associated with the Sallisaw Creek Watershed Site #19 Rehabilitation Undertaking inadvertently reveal the presence of cultural materials/remains – including human bone and/or funerary objects – all such activities shall immediately cease at/within a 50'-diameter radius surrounding the site of the discovered materials/remains until the Oklahoma Archeological Survey/State Historic Preservation Office shall be contacted and the cultural materials/remains examined by a professional archaeologist.

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9) http://www.ou.edu/cas/archsur/counties/Adair.htm

PHOTOGRAPHS



Photo #1
Sallisaw #19
Monument



Photo #2
View SSW
North End Emergency Spillway

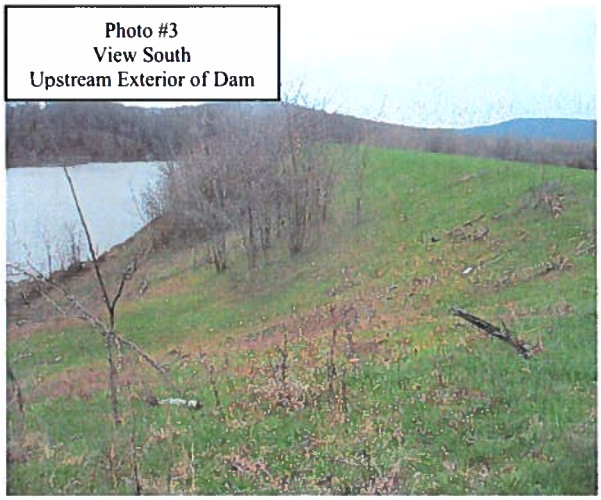


Photo #3
View South
Upstream Exterior of Dam



Photo #4
View South
Downstream Exterior of Dam

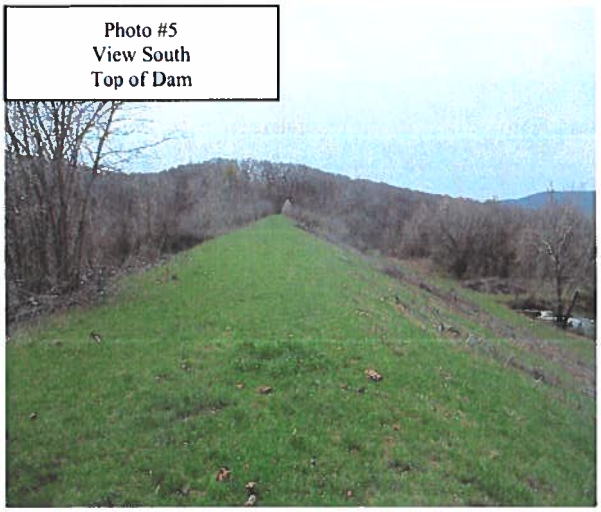


Photo #5
View South
Top of Dam



Photo #6
View West
Downstream Outfall

Photo #7
View SE
Permanent Pool / South Perimeter

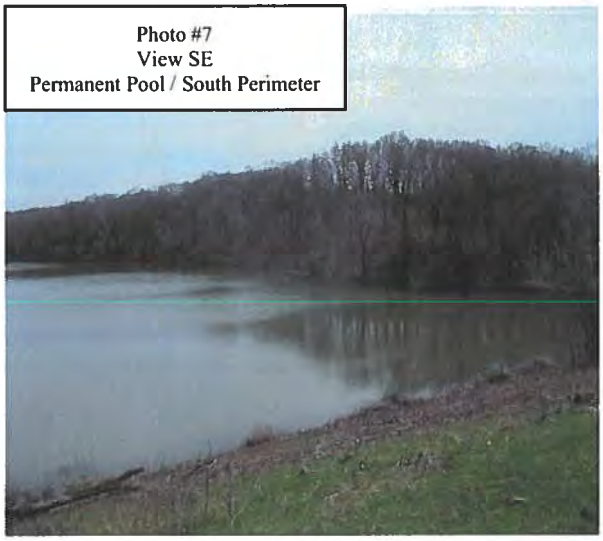


Photo #8
View SW
Permanent Pool / North Perimeter

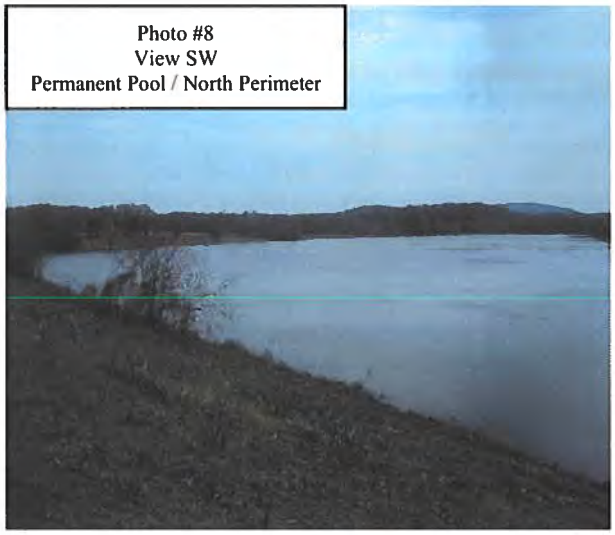


Photo #9
View ESE
Permanent Pool / North Perimeter

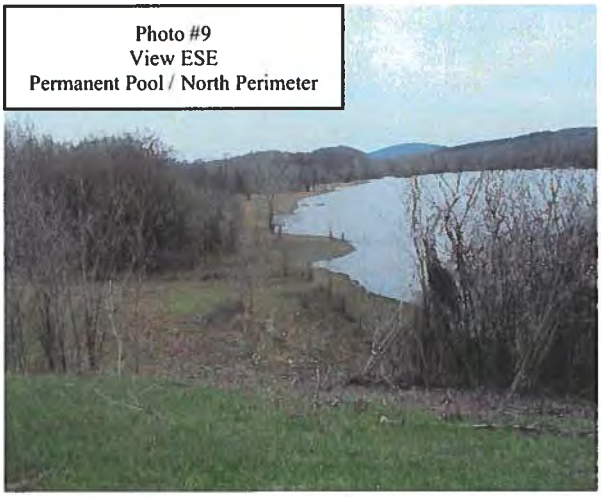


Photo #10
View SE
Permanent Pool / Inflow Structure

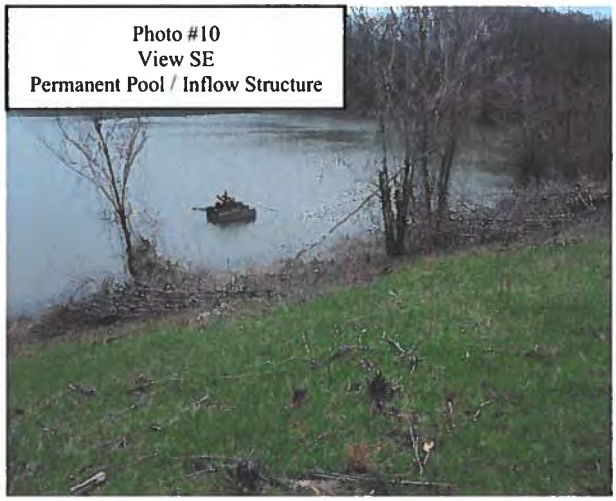


Photo #11
View SW
Breach Area – Left Bank Sallisaw Creek



Photo #12
View SW
Breach Area – Sallisaw Creek

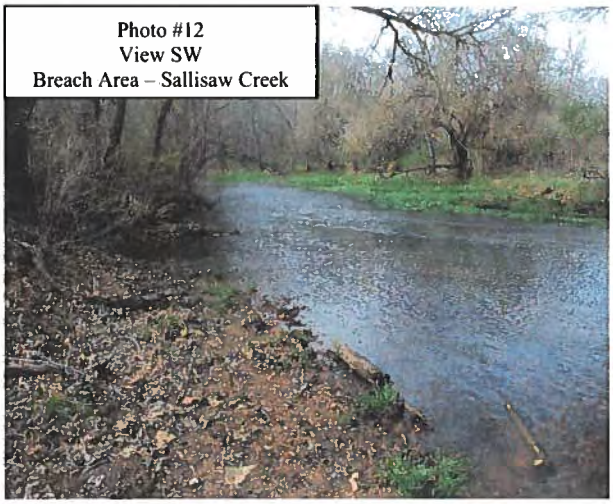




Photo #13
View NE
Outfall Structure



Photo #14
View SSW
Outfall Structure

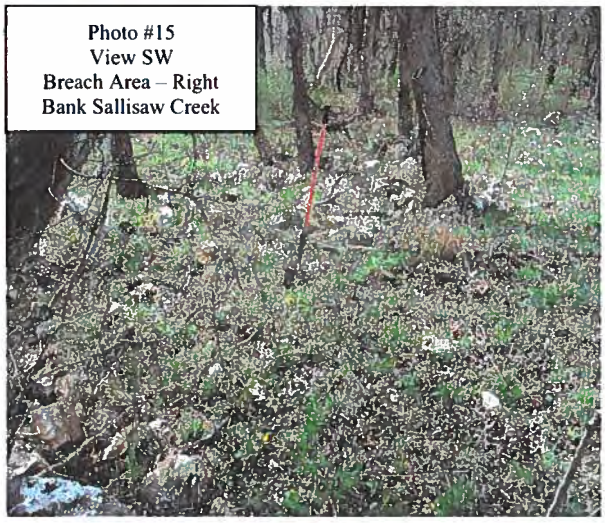


Photo #15
View SW
Breach Area – Right
Bank Sallisaw Creek

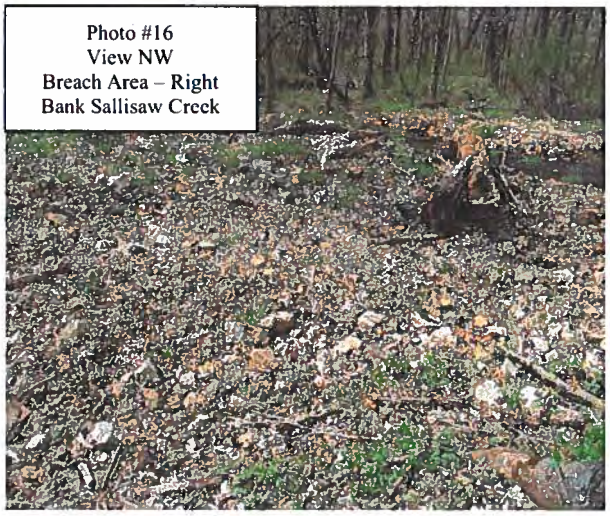


Photo #16
View NW
Breach Area – Right
Bank Sallisaw Creek



Photo #17
View ENE
Breach Area – Right
Bank Sallisaw Creek



Photo #18
View SE
Breach Area – Right
Bank Sallisaw Creek

Photo #19
View North
Upstream Area Within
Top of Dam Elevation

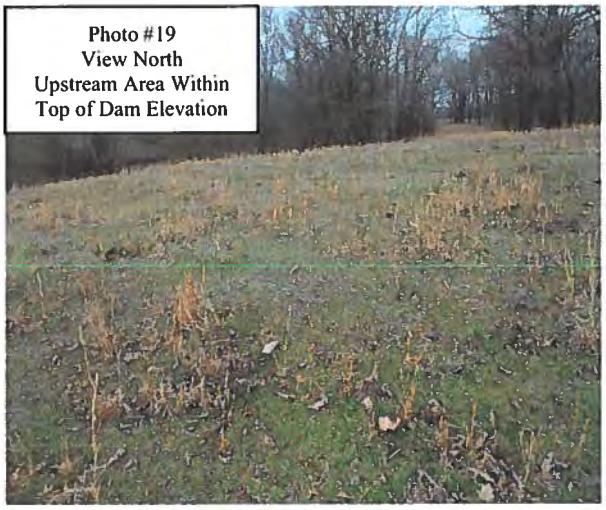


Photo #20
View South
Upstream Area Within
Top of Dam Elevation



Photo #21
View East
Upstream Area Within
Top of Dam Elevation

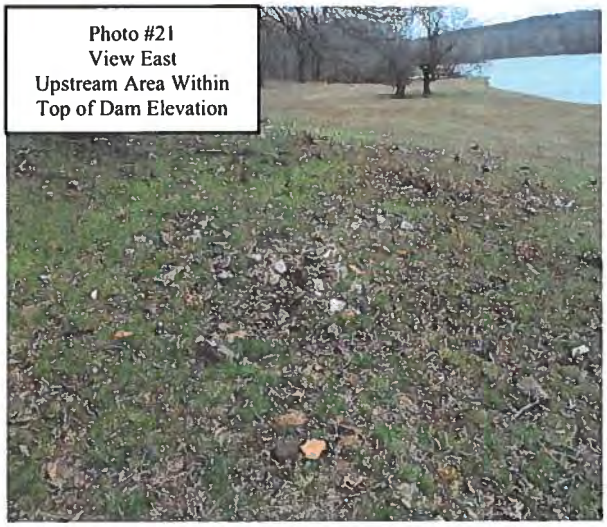


Photo #22
View North
Upstream Area Within
Top of Dam Elevation



Photo #23
View North
Upstream Area Within
Top of Dam Elevation



Photo #24
View North
Upstream Area Within
Top of Dam Elevation



Photo #25
View East
Upstream Area Within
Top of Dam Elevation



Photo #26
View East
Upstream Area Within
Top of Dam Elevation



Photo #27
View South
Upstream Area Within
Top of Dam Elevation

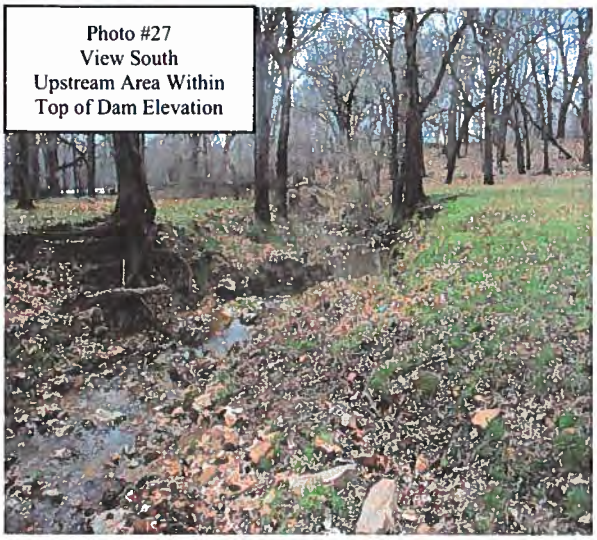


Photo #28
View North
Upstream Area Within
Top of Dam Elevation

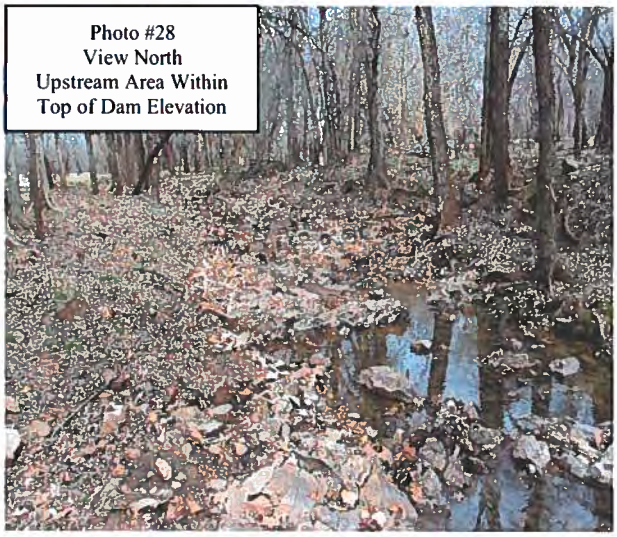


Photo #29
View North
Upstream Area Within
Top of Dam Elevation

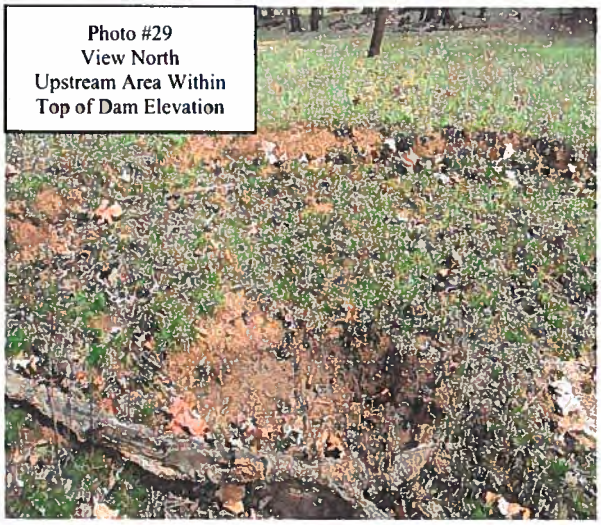


Photo #30
View NNW
Upstream Area Within
Top of Dam Elevation

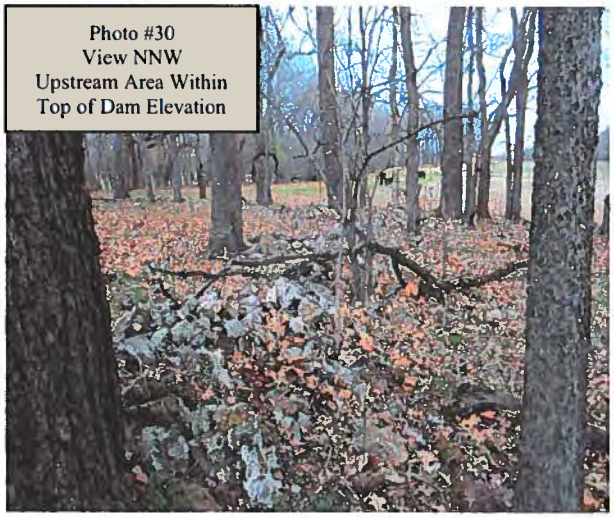




Photo #31
View NNW
Upstream Area Within
Top of Dam Elevation



Photo #32
View Ne
Upstream Area Within
Top of Dam Elevation

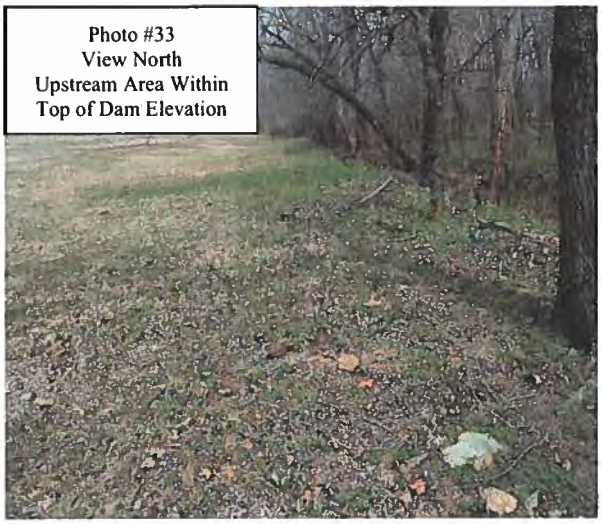


Photo #33
View North
Upstream Area Within
Top of Dam Elevation



Photo #34
View North
Upstream Area Within
Top of Dam Elevation



Photo #35
View ENE
Upstream Area Within
Top of Dam Elevation



Photo #36
View South
Upstream Area Within
Top of Dam Elevation

Photo #37
View NE
Upstream Area Within
Top of Dam Elevation

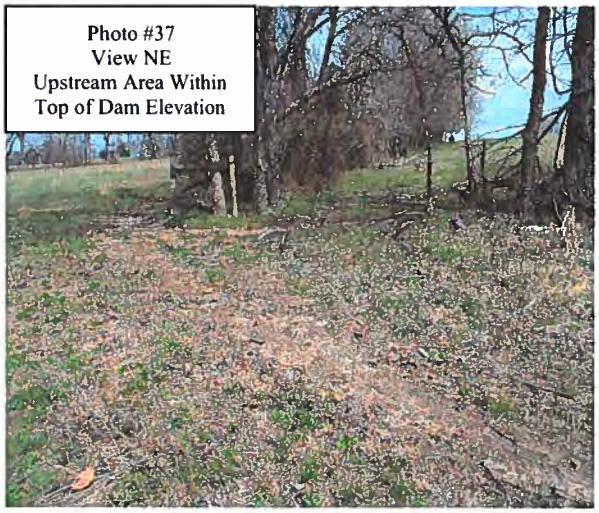


Photo #38
View North
Upstream Area Within
Top of Dam Elevation

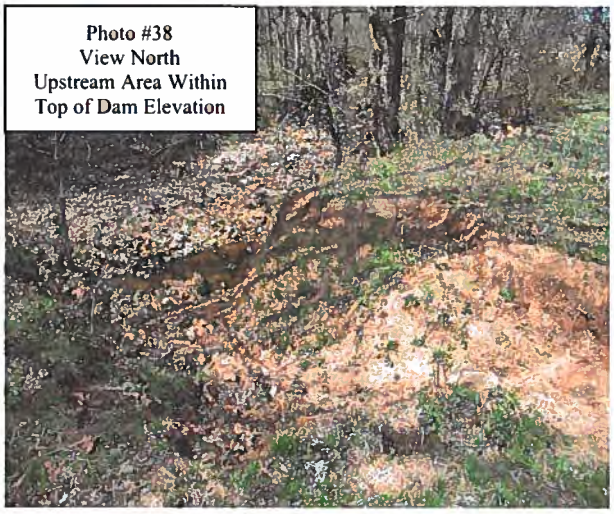


Photo #39
View North
Upstream Area Within
Top of Dam Elevation

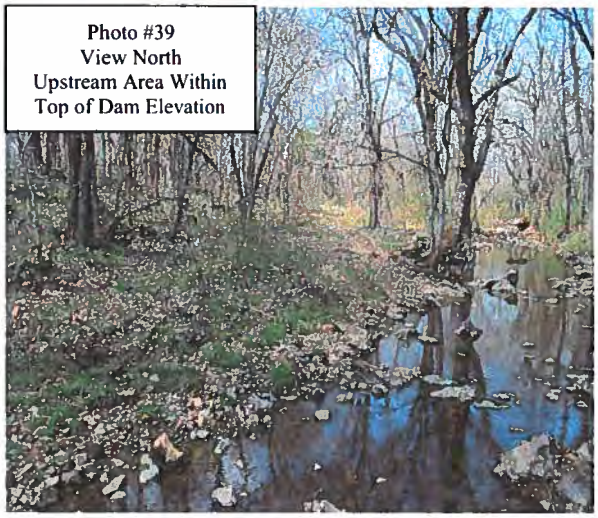


Photo #40
View NE
Upstream Area Within
Top of Dam Elevation



Photo #41
View NNW
Upstream Area Within
Top of Dam Elevation

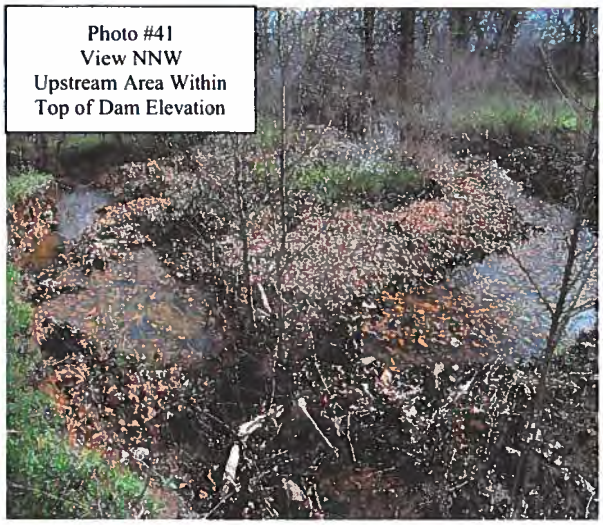


Photo #42
View NNE
Upstream Area Within
Top of Dam Elevation



Photo #43
View ENE
Upstream Area Within
Top of Dam Elevation

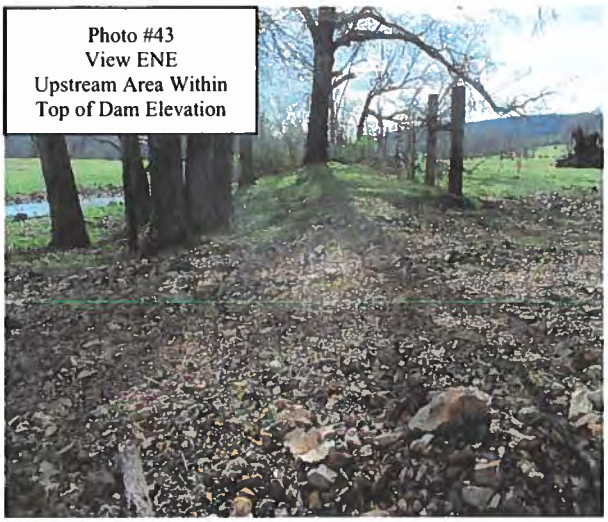


Photo #44
View NE
Upstream Area Within
Top of Dam Elevation

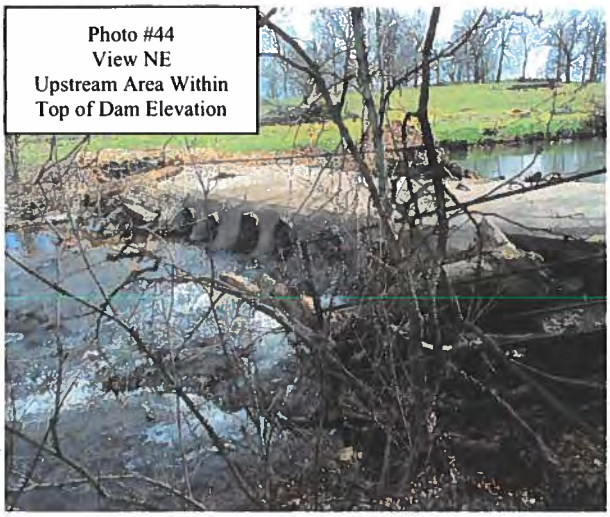


Photo #45
View SW
Upstream Area Within
Top of Dam Elevation



Photo #46
View NE
Upstream Area Within
Top of Dam Elevation



Photo #47
View NE
Upstream Area Within
Top of Dam Elevation

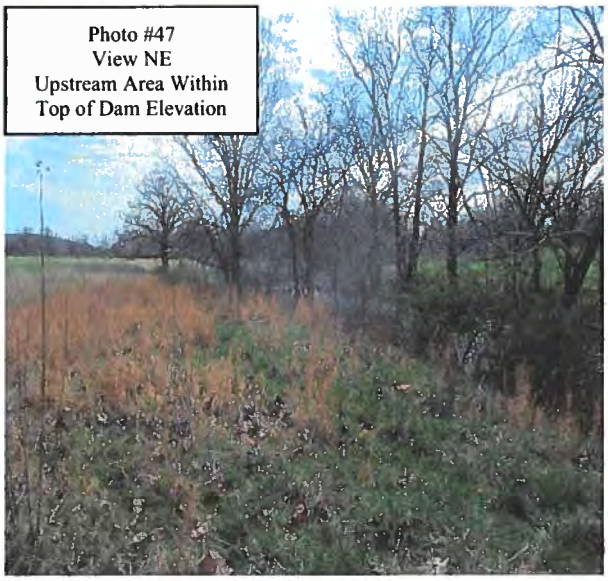


Photo #48
View ENE
Upstream Area Within
Top of Dam Elevation



Photo #49
View NE
Upstream Area Within
Top of Dam Elevation

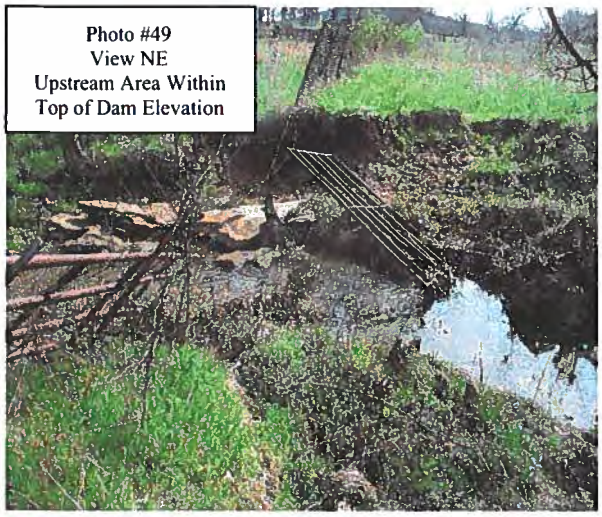


Photo #50
View SW
Upstream Area Within
Top of Dam Elevation

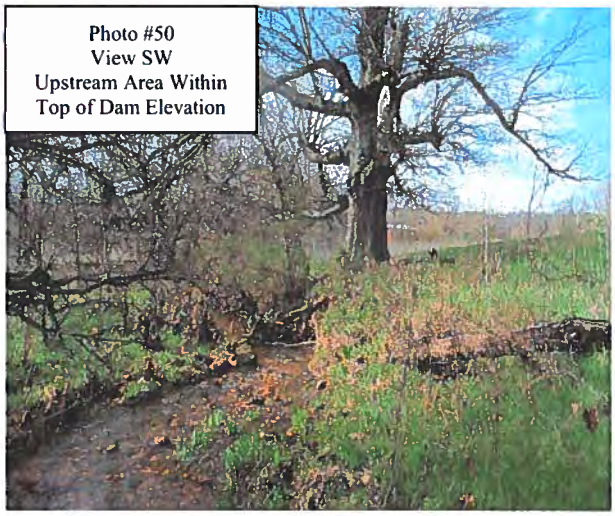


Photo #51
View East
Upstream Area Within
Top of Dam Elevation

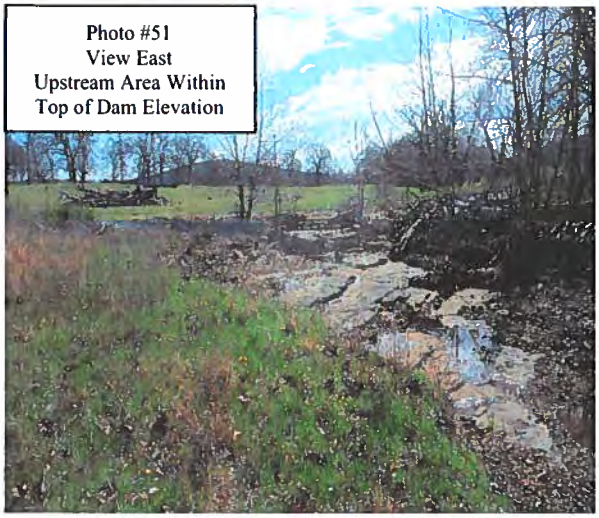


Photo #52
View NNE
Upstream Area Within
Top of Dam Elevation

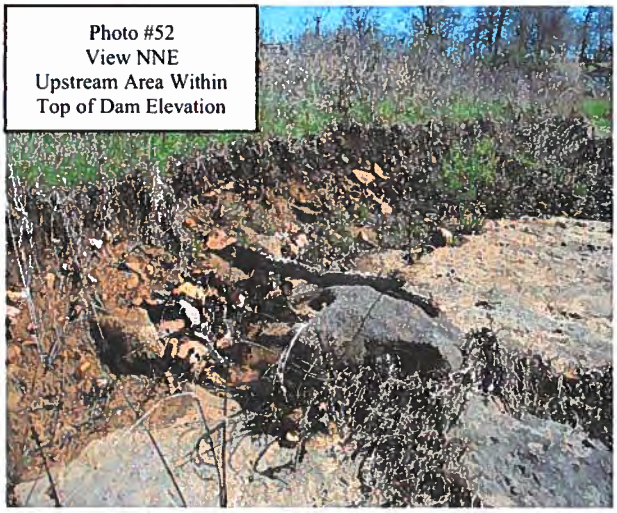


Photo #53
View South
Upstream Area Within
Top of Dam Elevation



Photo #54
View North
Upstream Area Within
Top of Dam Elevation



Photo #55
View ESE
Upstream Area Within
Top of Dam Elevation



Photo #56
View NE
Upstream Area Within
Top of Dam Elevation

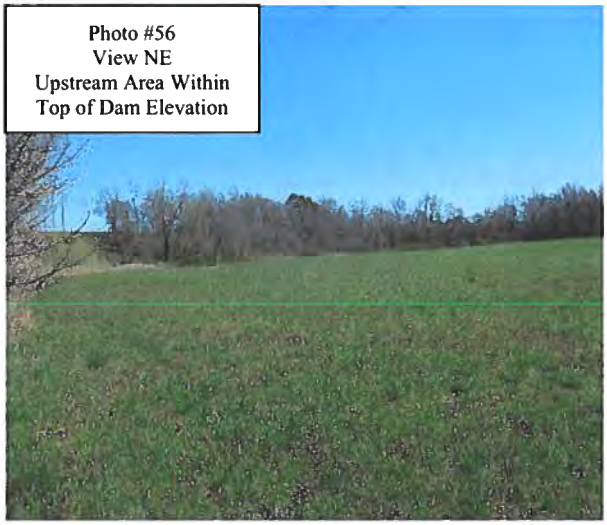


Photo #57
View NE
Upstream Area Within
Top of Dam Elevation



Photo #58
View WNW
Upstream Area Within
Top of Dam Elevation



Photo #59
View NE
Upstream Area Within
Top of Dam Elevation

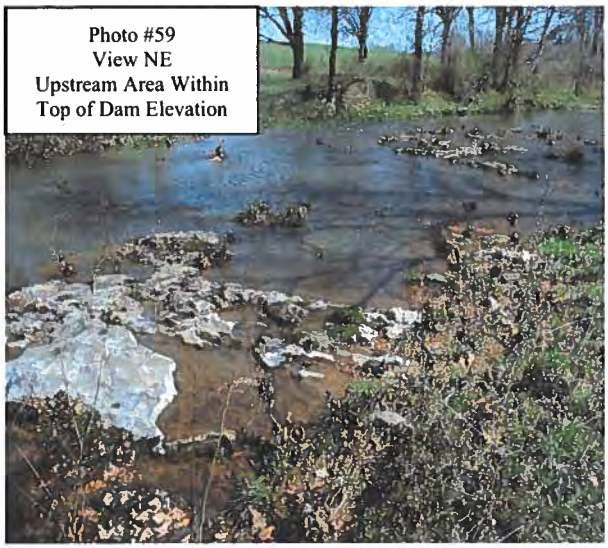


Photo #60
View ESE
Upstream Area Within
Top of Dam Elevation

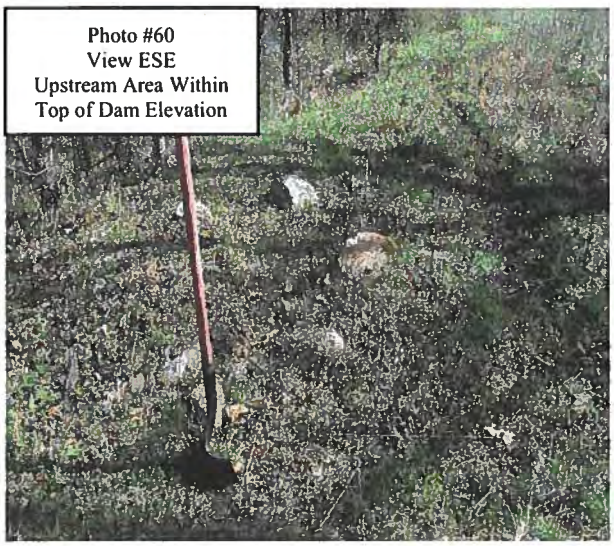


Photo #61
View North
Upstream Area Within
Top of Dam Elevation

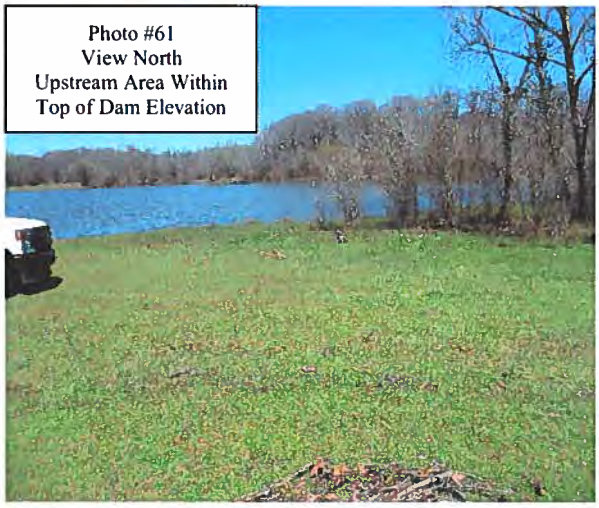


Photo #62
View SSE
Upstream Area Within
Top of Dam Elevation

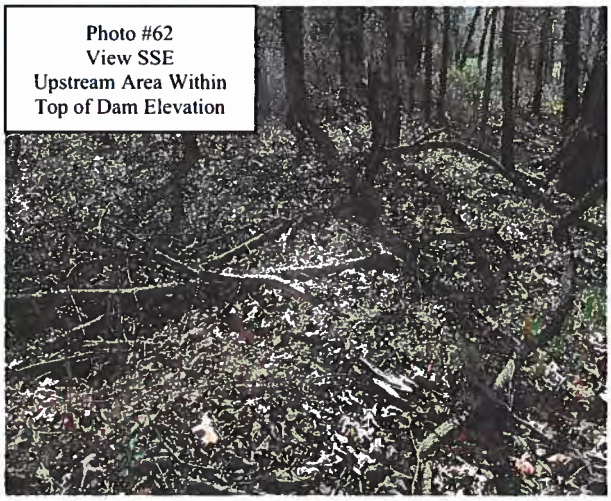


Photo #63
View North
Upstream Area Within
Top of Dam Elevation

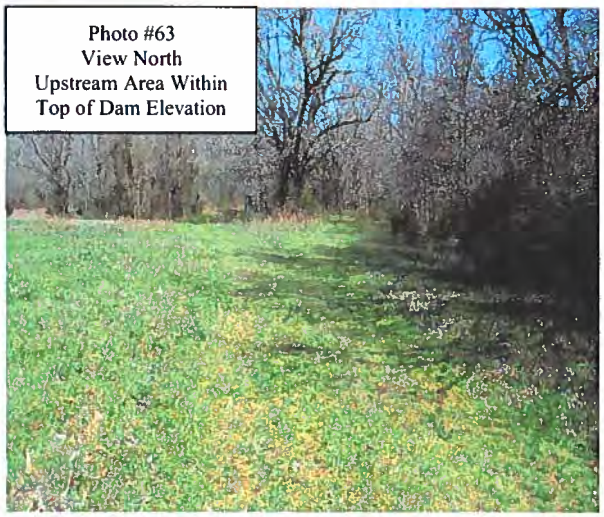


Photo #64
View NNE
Upstream Area Within
Top of Dam Elevation

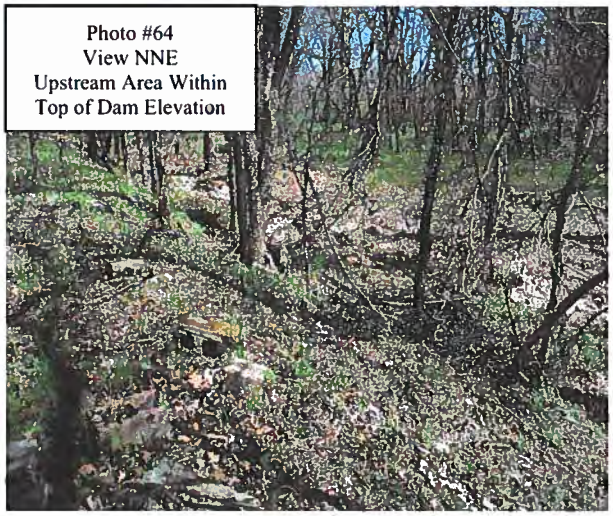


Photo #65
View WSW
Upstream Area Within
Top of Dam Elevation

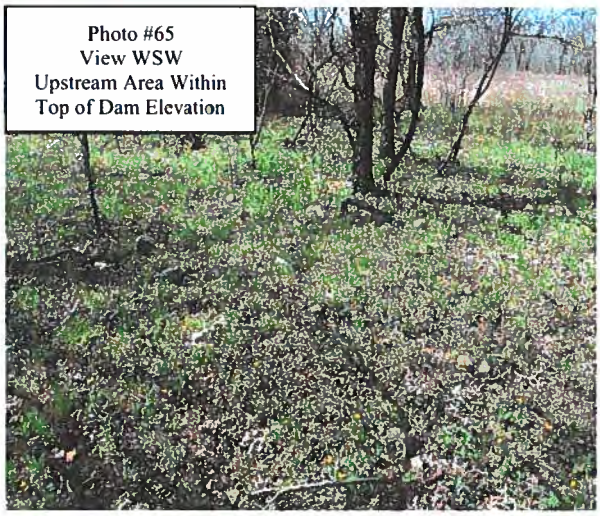


Photo #66
View ENE
Upstream Area Within
Top of Dam Elevation

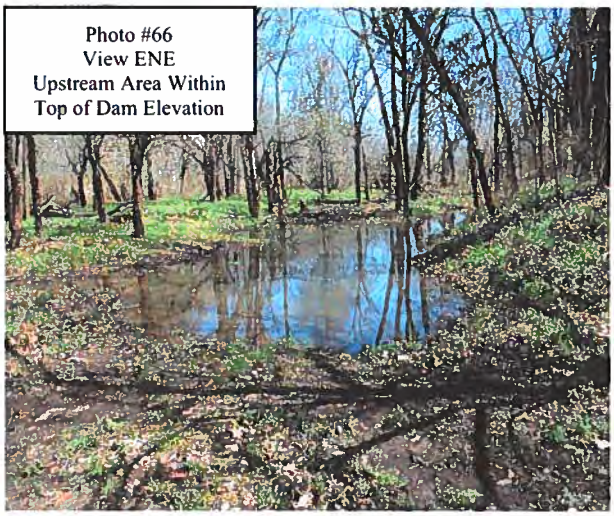


Photo #67
View SW
Upstream Area Within
Top of Dam Elevation

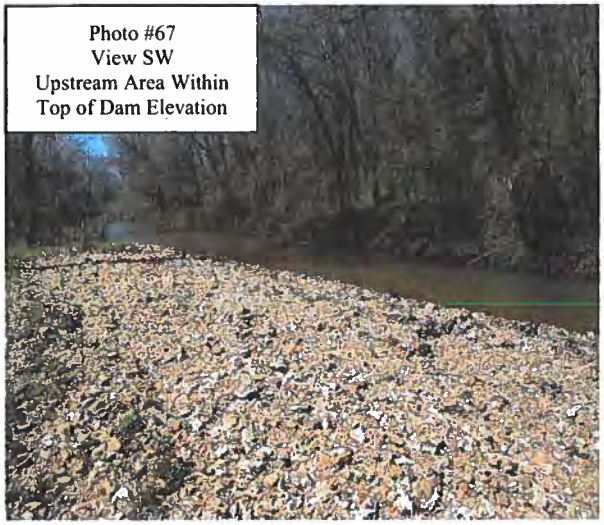


Photo #68
View NW
Upstream Area Within
Top of Dam Elevation

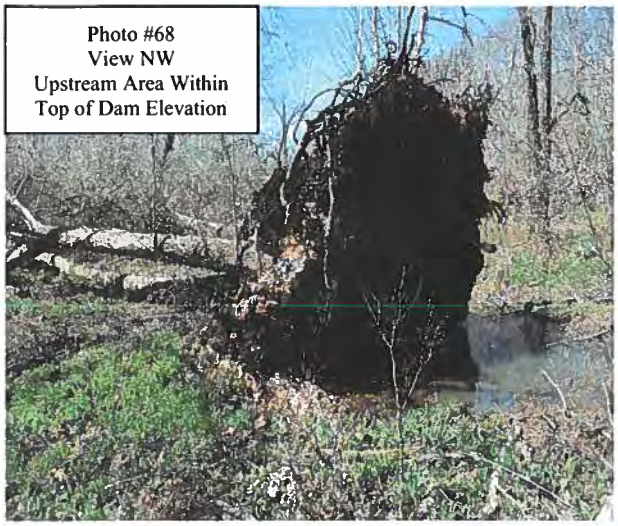


Photo #69
View NW
Upstream Area Within
Top of Dam Elevation



Photo #70
View WSW
Upstream Area Within
Top of Dam Elevation



Photo #71
View SW
Upstream Area Within
Top of Dam Elevation



Photo #72
View NNE
Upstream Area Within
Top of Dam Elevation

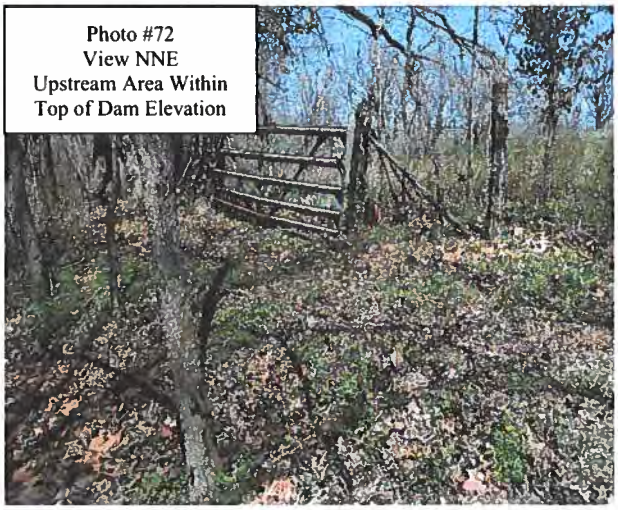


Photo #73
View NNW
Upstream Area Within
Top of Dam Elevation



Photo #74
View NNE
Upstream Area Within
Top of Dam Elevation



Photo #75
View North
Upstream Area Within
Top of Dam Elevation

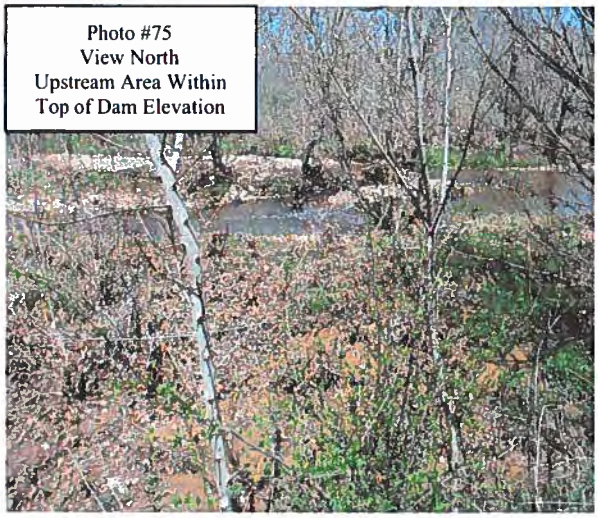


Photo #76
View NE
Upstream Area Within
Top of Dam Elevation

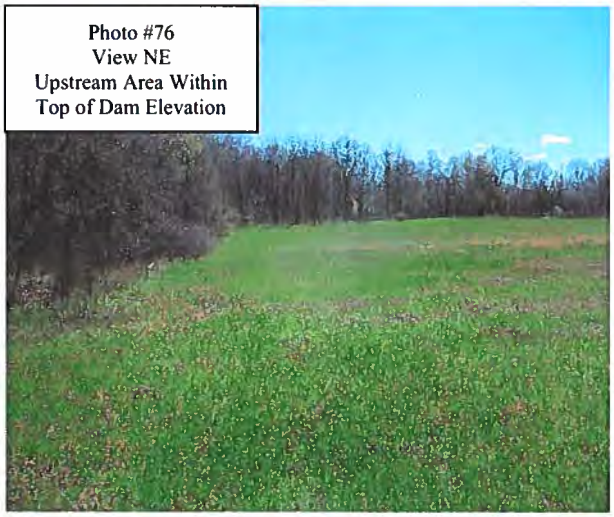


Photo #77
Hu: Elsah gravelly
loam, 0-1% slopes,
occasionally flooded

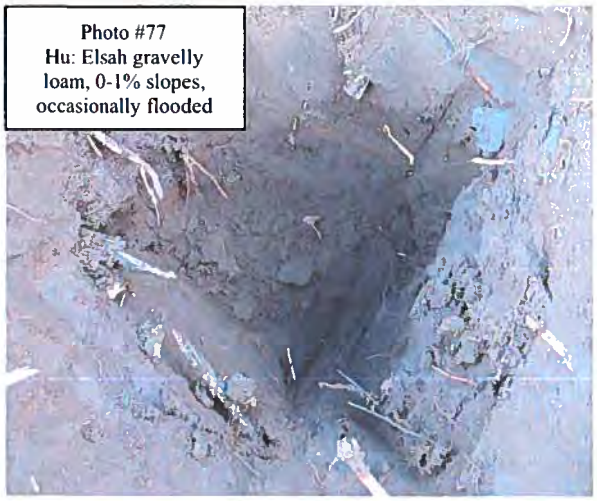
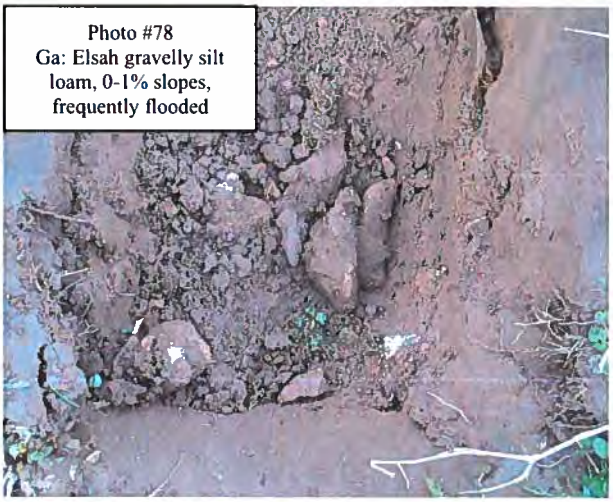


Photo #78
Ga: Elsah gravelly silt
loam, 0-1% slopes,
frequently flooded



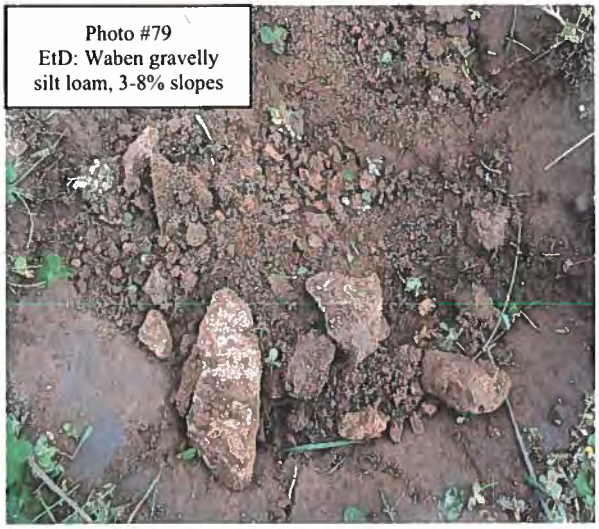


Photo #79
EtD: Waben gravelly silt loam, 3-8% slopes

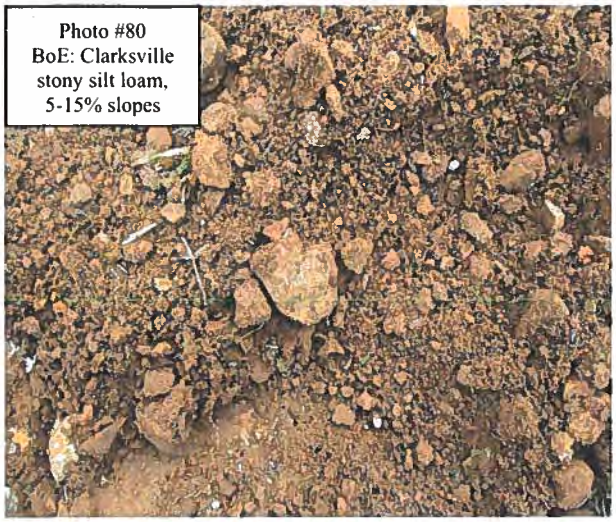


Photo #80
BoE: Clarksville stony silt loam, 5-15% slopes

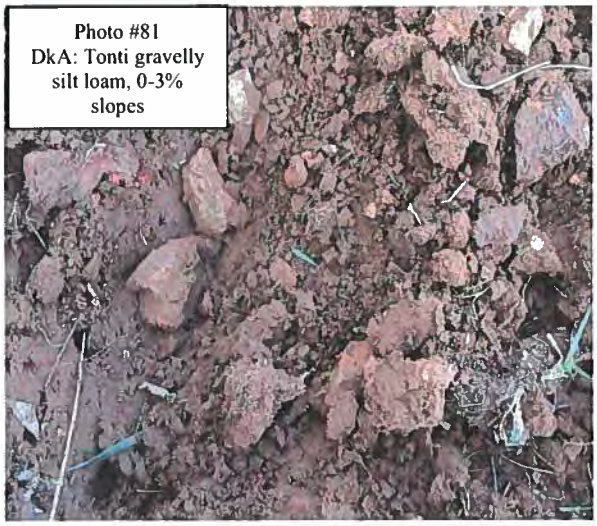


Photo #81
DkA: Tonti gravelly silt loam, 0-3% slopes

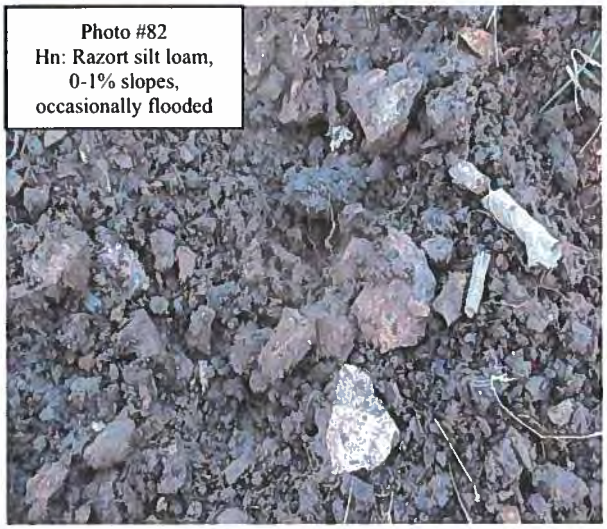


Photo #82
Hn: Razort silt loam, 0-1% slopes, occasionally flooded

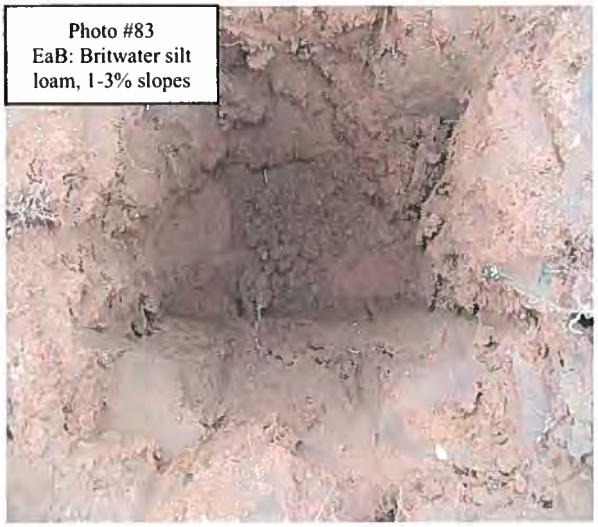


Photo #83
EaB: Britwater silt loam, 1-3% slopes

Limited Threatened and Endangered Species Habitat Assessment

Sallisaw Creek Watershed Dam No. 13

Adair County, Oklahoma

January 27, 2022

Terracon Project No. 96217693



Prepared for:
Natural Resource Conservation Service
Adair County, Oklahoma

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas

6911 Blanco Road
San Antonio, TX 78216
(210)641-2112
terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

January 27, 2022

Conservation Works JV, LLC
3116 North Dries Lane, Suite 100
Peoria, Illinois 61604

Attn: Mr. Terry Feldmann

RE: **Limited Threatened and Endangered Species Habitat Assessment**
Pro Project Name: Sallisaw Creek Watershed Dam No. 13
County, State: Adair County, Oklahoma
Terracon Project No. 96217693

Dear Mr. Feldmann:

Terracon is pleased to submit the Limited Threatened and Endangered Species Habitat Assessment the above-referenced project.

Terracon was retained by Conservation Works JV, LLC (client) to perform this task in accordance with our Terracon Project No. 9617693.

Terracon appreciated the opportunity to have worked for you on this project. Please feel free to contact the undersigned if you have any questions or require additional information.

Sincerely,
Terracon Consultants, Inc.

John Rathgeber
Senior Staff Scientist
Environmental Planning

Jennifer Peters
Group Manager
Environmental Planning

Aimee Steinbrecher
Staff Scientist
Environmental Planning

Enclosure

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Exhibit 2:	Site Map
Exhibit 3:	Topographic Map
Exhibit 4:	Vegetation Map
Exhibit 5:	Soil Map
Exhibits 6.1-6.3	Historic Aerial Images

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USFWS Verification 4(d) Letters – Long-Eared Bat and American Burying Beetle

APPENDIX C – COMMON ACRONYMS

Executive Summary

Terracon is pleased to submit this Executive Summary for a Limited Threatened and Endangered Species Habitat Assessment for the Sallisaw Creek Watershed Dam No. 13 in Adair County, Oklahoma.

Desktop Review:

Terracon reviewed published information such as topographic and aerial maps of the project area as well as the species are listed on USFWS Information for planning and Consultation (IPaC) web page (accessed October 21, 2021 consultation # 02EKOK00-2022-SLI-0163). Also, a review of the United States Fish and Wildlife Service (USFWS) Oklahoma office website was conducted to review the list of federally threatened and endangered species found in Adair County. The review was limited to a data review and did not include a site visit. Should actual conditions observed in the field differ, Terracon should be notified to re-evaluate and conduct a site visit.

This analysis finds that there could be a potential impact to federally listed threatened and endangered species on the basis that preferred habitat was not listed as a performed search during the field observation.

Recommendations:

Terracon does recommend further assessment of federally listed threatened and endangered species.

Project Description

Terracon Consultants, Inc. (Terracon) was retained by Conservation Works JV, LLC (client) to perform a Limited Threatened and Endangered Species Habitat Assessment in accordance Terracon Project No. 96217693. The project area can be seen on *Exhibit 1* in *Appendix A*.

The site, located in Adair County, approximately 11.3 miles to the southwest of Stilwell, Oklahoma and approximately 0.9 miles to the west of Hamlin Hollow (S 4637 Rd / Bunch Road). S-13 dam was constructed in 1966.

Desktop Review

Threatened and Endangered Species

Federally Listed Threatened and Endangered Species

The purpose of the Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) administer the ESA. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife. Under the ESA, species may be listed as threatened or endangered. "Threatened" means a species is likely to become endangered within the foreseeable future. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. Under the ESA, individual species and their habitat are protected.

Terracon conducted a preliminary review of the potential for federally listed threatened, endangered species to occur on the proposed project location or be affected by the proposed project for the purposes of due diligence in complying with federal laws. Terracon downloaded the USFWS Information, Planning, and Conservation (IPaC) web page (accessed October 21, 2021 consultation # 02EKOK00-2022-SLI-0163) (reference *USFWS Natural Resources of Concern* in *Appendix B*). The USFWS considers eight federally listed threatened or endangered species, including candidate species, as having potential to occur in Adair County. A summary of species and their habitat requirement listed for Adair County is provided in *Table 1*.

Table 1. Federally Listed Threatened and Endangered Species in Adair County, Oklahoma

Common Name	Scientific Name	Federal Status	Habitat Requirements	Designated Critical Habitat?	Critical Habitat Present?
Birds					
Piping Plover	*Charadrius melodus*	T	Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands.	No	No

Common Name	Scientific Name	Federal Status	Habitat Requirements	Designated Critical Habitat?	Critical Habitat Present?
Red Knot	*Calidris canutus rufa*	T	During the summer, inhibit dry tundra areas that include hillsides with sparse vegetation. During the winter, they migrate and prefer sandy beaches, coastal mudflats, and areas close to streams/ponds across the world.	No	No
Insects					
Monarch Butterfly	*Danaus plexippus*	C	Breeding habitat must include milkweeds including *Asclepias californica*, *Asclepias cryptoceras*, *Asclepias eriocarpa*, *Asclepias erosa*, *Asclepias glaucescens*, *Asclepias linaria*, *Asclepias oenotheroides*, *Asclepias subulata*, *Asclepias subverticillata*, and *Asclepias vestita*	No	No
American Burying Beetle	*Nicrophorus americanus*	T	Habitat includes a slight preference for grasslands and open understory oak hickory forests. However, the beetles are carrion specialists in that they need carrion the size of a dove or a chipmunk in order to reproduce. Carrion availability may be the greatest factor determining where the species can survive.	No	No
Mammals					
Gray Bat	*Myotis grisescens*	E	Primary habitat includes caves, where they will hibernate, and roost preferably found scattered along rivers and/or limestone karst areas.	No	No
Indiana Bat	*Myotis sodalis*	E	Require cool (between 32-50 degrees F) humid caves. Roosting habitat includes woody areas with dead or dying trees with loose bark.	No	No
Northern Long-eared Bat	*Myotis spetentrionalis*	T	Winer habitat requires caves and mines of various sizes, constant temperatures, high humidity, and no air currents. Roosting habitat requires woody areas with dead or dying trees with cavities or crevices. Also, may roost in caves or mines if cooler.	No	No
Ozark Big-eared Bat	*Corynorhinus (=Plecotus) townsendii ingens*	E	Primarily found in karst areas. Often will use the same cave year-round. Prefer caves surrounded mature hardwood forests (*Carya spp.*, *Fagus spp.*, and *Acer spp.*) and forage along habitats with intermittent streams and mountain slopes	No	No

T= threatened, E = Endangered, C = Candidate EXPN = experimental population, non-essential
Source: USFWS Endangered Species Website http://www.fws.gov/endangered/

Vegetative Types

Oklahoma Ecological Mapping Systems (EMS) maps use a combination of satellite land cover, soils types, thematic data, and other factors to produce land classifications for Oklahoma. These classifications help identify vegetation communities within the Site. The Site falls within ten mapped vegetation types of Adair County, Oklahoma. The vegetation map can be found in *Exhibit 4* in *Attachments*. The vegetative types and descriptions defined by the EMS are below.

Disturbed Soil Pasture
This type is mapped over soils defined as disturbed by digital soil surveys (e.g. Slick spots, pits). Non-native and disturbance species such as Bermudagrass (*Cynodon dactylon*), tall fescue (*Festuca arundinacea*), Johnsongrass (*Sorphum halepense*), Winged elm (*Ulmus alata*), and Honey locust (*Gleditsia triacanthos*) are common components of this vegetation type.

Eastern Great Plains: Herbaceous Wetland
This type circumscribes all varieties of herbaceous wetlands. Common components include varying species of sedges (*Carex spp*), rushes (*Juncus spp*), spike rush (*Eleocharis palustris*), cattails (*Typha*), smartweed (*Polygonum*), and moist-soil grasses.

Open Water
Open water during all seasons at the time of data acquisition.

Ozark-Ouachita: Dry Oak Woodland
This common and broadly circumscribed type is mapped on upland flats and moderate slopes. Common tree species include post oak (*Quercus stellate*), white oak (*Quercus alba*), black oak (*Quercus velutina*), blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), other hickory species (*Carya spp*), slippery elm (*Ulmus ribra*), sugar hackberry (*Celtis laevigata)*, and black walnut *(Juglans nigra)*. Shortleaf pine *(Pinus echinate)* or eastern redcedar *(Juniperus virginiana)* may also be components in low densities.

Ozark-Ouachita: Dry-Mesic Oak Forest
This type is mapped over slopes >20% and on low flats. Closed-canopy forest with species such as white oak *(Quercus alba)*, hickory species *(Carya spp)*, black oak (*Quercus velutina)*, northern red oak *(Quercus rubra)*, and chinkapin oak *(quercus muehlenbergii)* are characteristic of this type. The most medic areas may contain sugar maple *(Aver saccharum)* as an important component. Flowering dogwood *(Cornus florida)*, eastern redbud *(Cercis canadensis)*, hornbeam *(Carpinus spp)*, and sassafras *(Sassafras albidum)* are common woody understory species.

Ozark-Ouachita: Pasture/Prairie
This type encompasses a broad variation, bit in modern landscapes most representatives are grazed pastures. Common species are non-native and grazing tolerant grasses and forbs, such as Bermudagrass *(Cynodon dactylon)*, tall fescue *(Festuca arundinacea)*, annual ragweed *(Ambrosia artemisiifolia)*, field brome *(Bromus arvensis)*, purple top tridens *(Tridens flavus)*,

sericea lespedeza *(Lespedexa cuneata)*, prairie broom weed *(Amphiachyris dracunculoides)*, and sneezeweed *(Helenium spp)*. Less heavily grazed areas may support grassland species such as little and big bluestem and yellow Indiana grass. Woody species such as post oak, black walnut, common persimmon, winged elm, sumac species, and eastern redcedar may be present.

Ozark-Ouachita: Riparian Hardwood Woodland

This type is mapped along first and second order streams within narrow buffers and is represented by vegetation influenced by a variety of water regimes and human impacts. Steam gradients tends to be relatively high, and species such as sycamore *(Platanus occidentalis)*, river birch *(Betula nigra)*, sweetgum *(Liquidambar spp)*, maples *(Acer spp)*, oaks *(Quercus spp)*, and hazel alder *(Alnus serrulata)* may grow near steep banks or adjacent to stream bed cobble.

Ruderal Deciduous Woodland

Mapped on prairie soils across the state, this type consists of shrublands or woodlands where eastern redcedar is the most important species. Common woody components vary by region, and may include hackberry species (*Celtis spp*), winged elm *(Ulmus alata)*, other elm species *(Ulmus spp)*, ash species *(Fraxinus spp)*, post oak *(Quercus stellate)*, honey locust *(Fleditsia triacanthos)*, black locust (*Robinia pseudoacacia*), western soapberry *(Sapindus saponaria)*, lotebush *(Ziziphus obtusifolia)*, post oak *(Quercus stellata)*, and Osage orange *(Maclura pomifera)*.

South Central Interior: Bottomland Hardwood Forest

This vegetation type is mapped on bottomland soils across a variety of hydrologic regimes and various stages of disturbance. Common canopy dominants may include pecan *(Caya illinoinensis)*, green ash *(Fraxinus pennsylvanica)*, slippery elm *(Ulums ribra)*, sycamore *(Platanus occidentalis)*, sugar hackberry *(Celtis laevigata)*, honey locust *(Gelditsia triacanthos)*, boxelder *(Acer negundo)*, Shumard oak *(Quercus shumardii)*, bur oak *(Quercus macrocarpa)*, black willow *(Salix nigra)*, and American elm *(Ulmus americana)*. Vines such as eastern poison ivy *(Toxicodendron radicans)*, grape species *(Vitis spp)*, pepper vine species *(Ampelopsis arborea)*, Virginia creeper *(Parthenocissus quinquefolia)*, and green briar (*Smilax spp)* species may be conspicuous components. Herbaceous species may include species such as Virginia wildrye *(Ulmus virginicus)*, Indiana wood oats *(Chasmanthium latifolium)*, longleaf wood oats *(Unoila sessilliflora)*, Johnson grass *(Sorphum halepense)*, Bermudagrass *(Cynodon dactylon)*, and sedge species *(Carex spp)*.

South Central Interior: Bottomland Herbaceous Wetland

This type is mapped on bottomland soils across a variety of hydrologic regimes and may circumscribe a variety of herbaceous wetlands. Common components include sedge *(Carex spp)* and rush species *(Juncus spp)*, spike rush species *(Eleocharis palustris)*, cattails *(Typha spp)*, smartweeds *(Polygonum spp)*, and moist-soil grasses.

Soils

Data from the USDA Natural Resource Conservation Service (NRCS) Web Soil Survey (WSS) and the State Soil Data Access (SDA) Hydric Soils List were reviewed to characterize soils within the study area and vicinity, accessed October 21, 2021. A soil survey map is included as *Exhibit 5* in *Appendix A*. *Table 2* contains a summary of the mapped soil units within the study area and relevant physical characteristics.

Table 2 - Study Area Mapped Soil Types

Map Unit Symbol	Map Unit Name	Landform	Natural Drainage Class	Frequency of Ponding	Frequency of Flooding	Depth to Water Table	Hydric Soil Rating
Ga	Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	Floodplains on drainageways	Well Drained	Frequent	None	>80”	No
Hu	Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	Floodplains on drainageways	Well Drained	None, Occasional	None	>80”	No

Aerial Photographs

Terracon reviewed aerial photographs to review suspect wetland areas that may be present on the project tracts. Google Earth historical aerial photographs from 1995, 2005, and 2019 were analyzed. According to the aerial photographs, the land is undeveloped but disturbed. The site consists of a dam; constructed in 1966, woody vegetation, grassland with sparse trees, and wetland fringe. There is a mapped wetland feature in association with the pooled water from the dam. An aerial photograph from 1995, 2005, and 2019 are included in *Appendix A* as *Exhibits 6.1-6.3.*

Findings and Conclusions

Terracon conducted a desktop review of the site to identify potential Threatened and Endangered Species habitat that may require federal and/or local agency coordination. Should actual conditions observed in the field differ, Terracon should be notified to re-evaluate and conduct a site visit. Due to the presence of certain vegetation communities and soil types at the site, the potential for the American burying beetle (*Nicrophorus americanus)* and the Northern long-eared bat (*Myotis septentrionalis*) have potential to exist during the summer months; however, none of the habitat is directly located on the dam.

Due to the impact only occurring on Dam No. 13, the Programmatic Biological Opinion from the USFWS dated October 15, 2020, satisfies and concludes responsibilities under Act Section 7(a)(2) with respect to the American burying beetle as well as the Programmatic Biological Opinion dated on January 5, 2016 with respect to the Northern long-eared bat. Verification letters from the USFWS are located in *Appendix B.* Overall activities on or upstream of the dam “may

affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o)." This statement is under the assumption that no trees will be cleared (Northern long-eared bat assumption only).

IPaC contains specific Programmatic Biological Opinion (PBO) for species under the Endangered Species Act of 1973. The determination key asks a series of questions in the Qualification Interview to determine the project extent, actions taken, suitable habitat, and the potential affect by the proposed action. The Project Questionnaire is the second part of the IPaC POB that uses the acre size of the habitat for potential soil/habitat affected, temporary impacts, and permanent impacts of the habitat. The answers provided in both sections will provide the POB determination.

Based on the submission of the IPaC report for Dam No. 13, determined the action may affect the American Burying Beetle; however an incidental *take* [1] that may occur as a result of the action is not prohibited under the Act Section 4(d) rule adopted for this species at 50 CFR §17.47(d).

Terracon does recommend further assessment for federally listed threatened and endangered species.

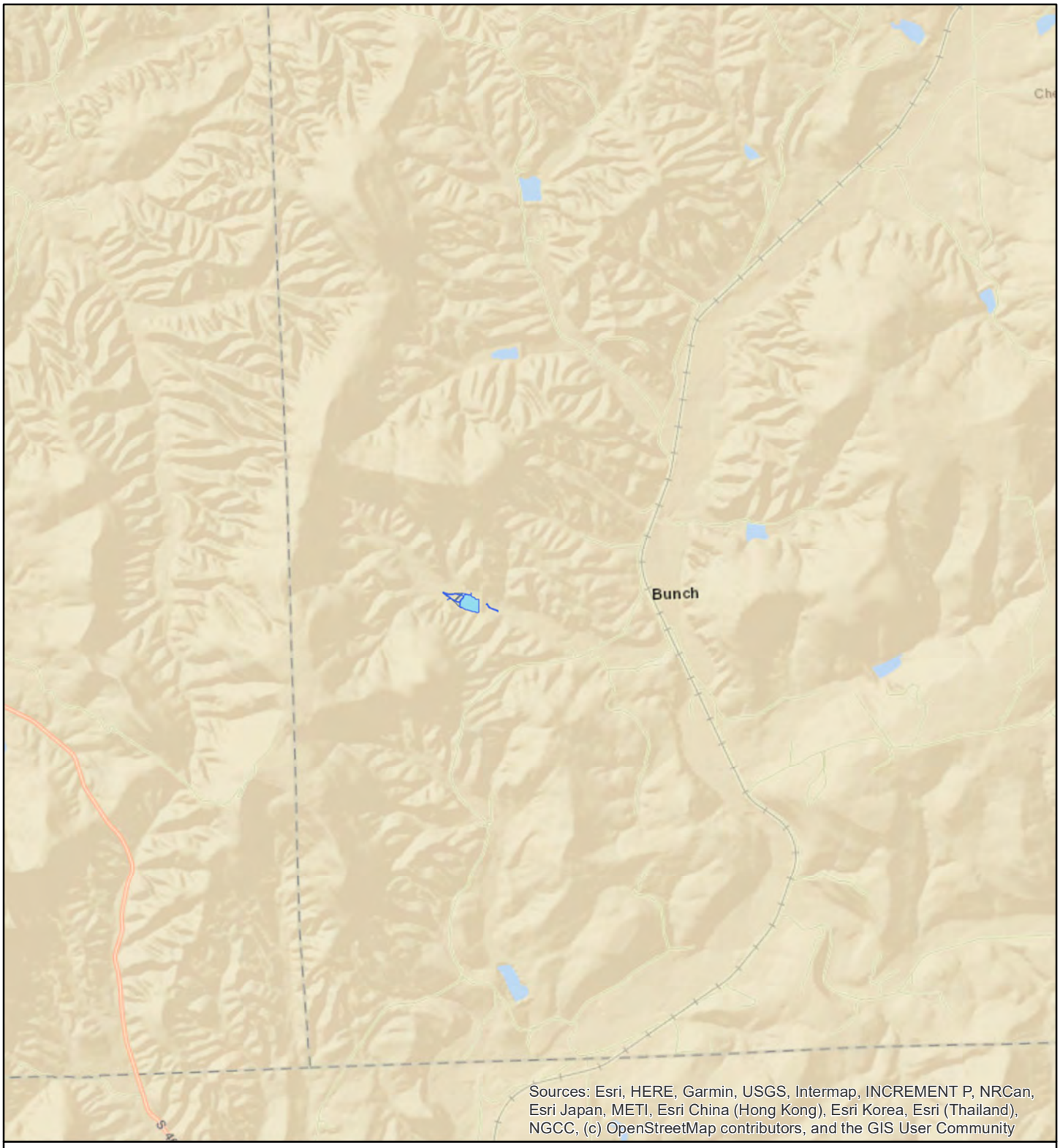
General Comments

The Limited Threatened and Endangered Species Habitat Assessment was performed in accordance with generally accepted practices of this profession undertaken in similar studies at the same time and in the same geographical area. The Review, such as the one performed on these tracts, is of limited scope, is noninvasive, and cannot eliminate the potential that habitat may be present on the project site beyond what is identified by the limited scope of these assessments. The limitations of this limited assessment should be recognized.

This report has been prepared for the exclusive use and reliance of Client, their successors, lenders and assigns. Use or reliance by any other party is prohibited without the written authorization of Client and Terracon.

Reliance on the Limited Listed Threatened and Endangered Species Habitat Assessment by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the project proposal.

APPENDIX A
Exhibits



Legend

- Fringe Wetland
- Pond
- Inlet Sheet Flow
- Steam Inlet

1 0.5 0 1 Miles

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 1 miles
TBPE Firm No.	F-3272
Date:	August 2021

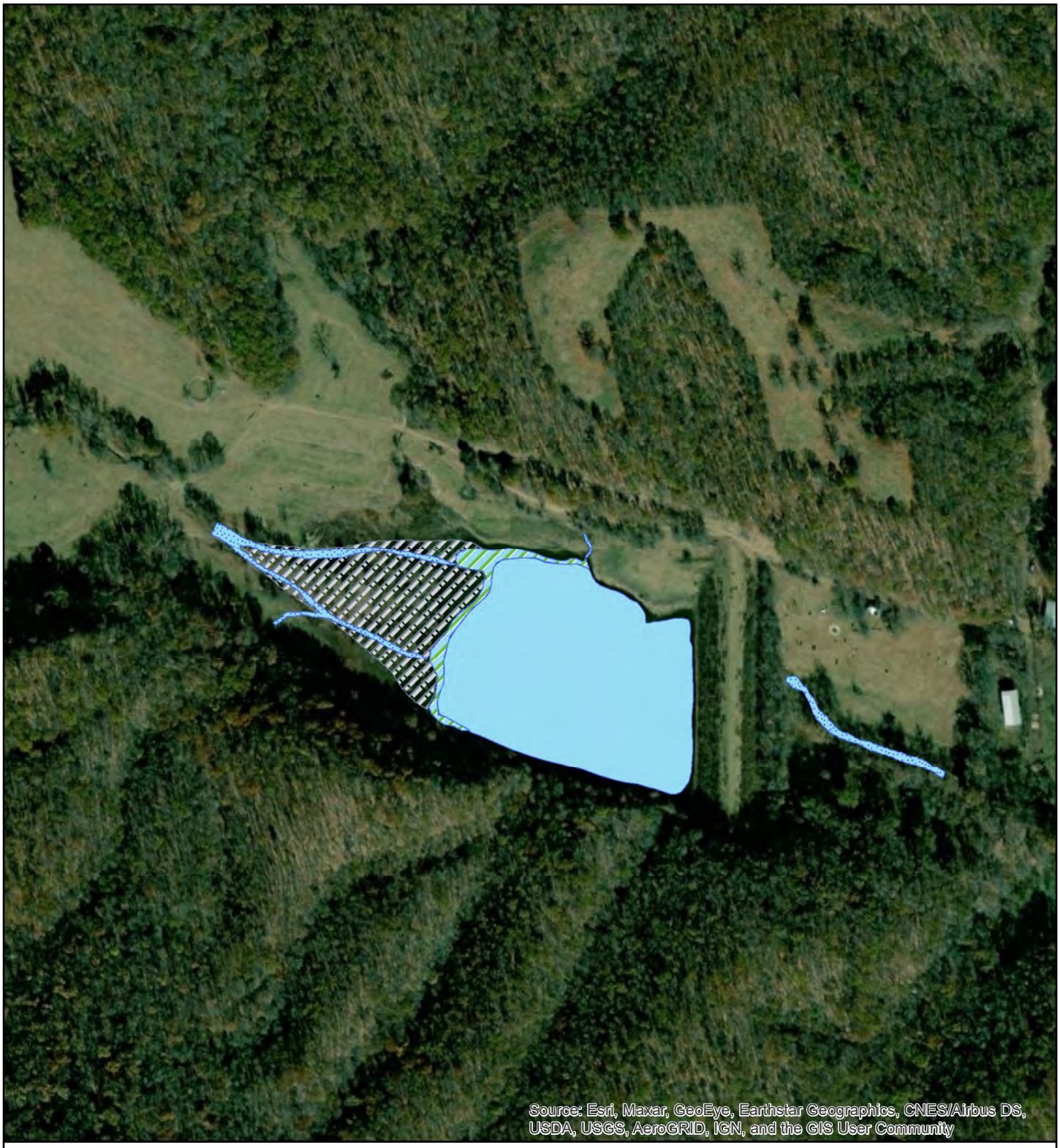
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vicinity Map

Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

1



Legend

Fringe Wetland
Pond
Inlet Sheet Flow
Steam Inlet

400 200 0 400
Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

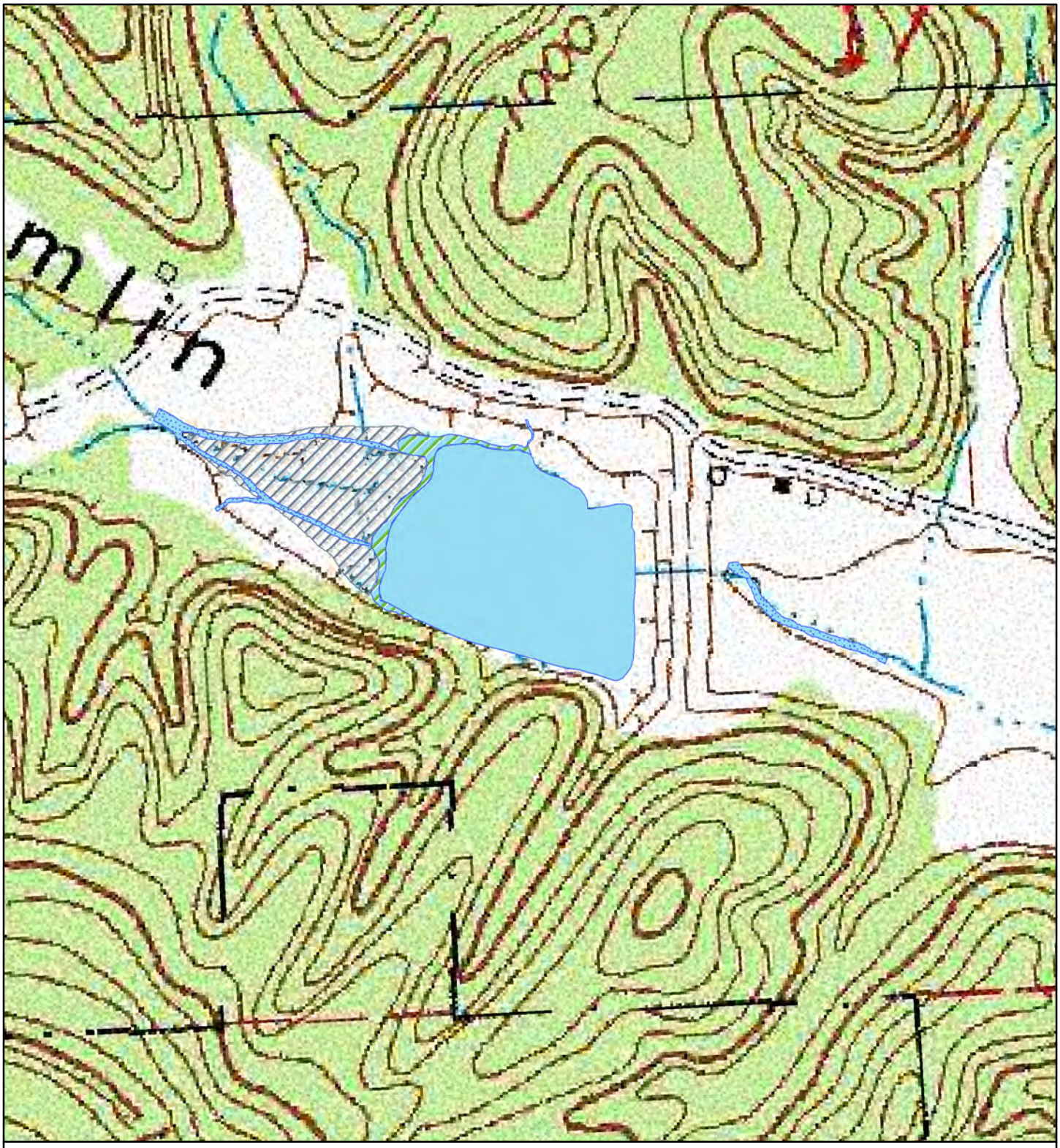
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Site Map

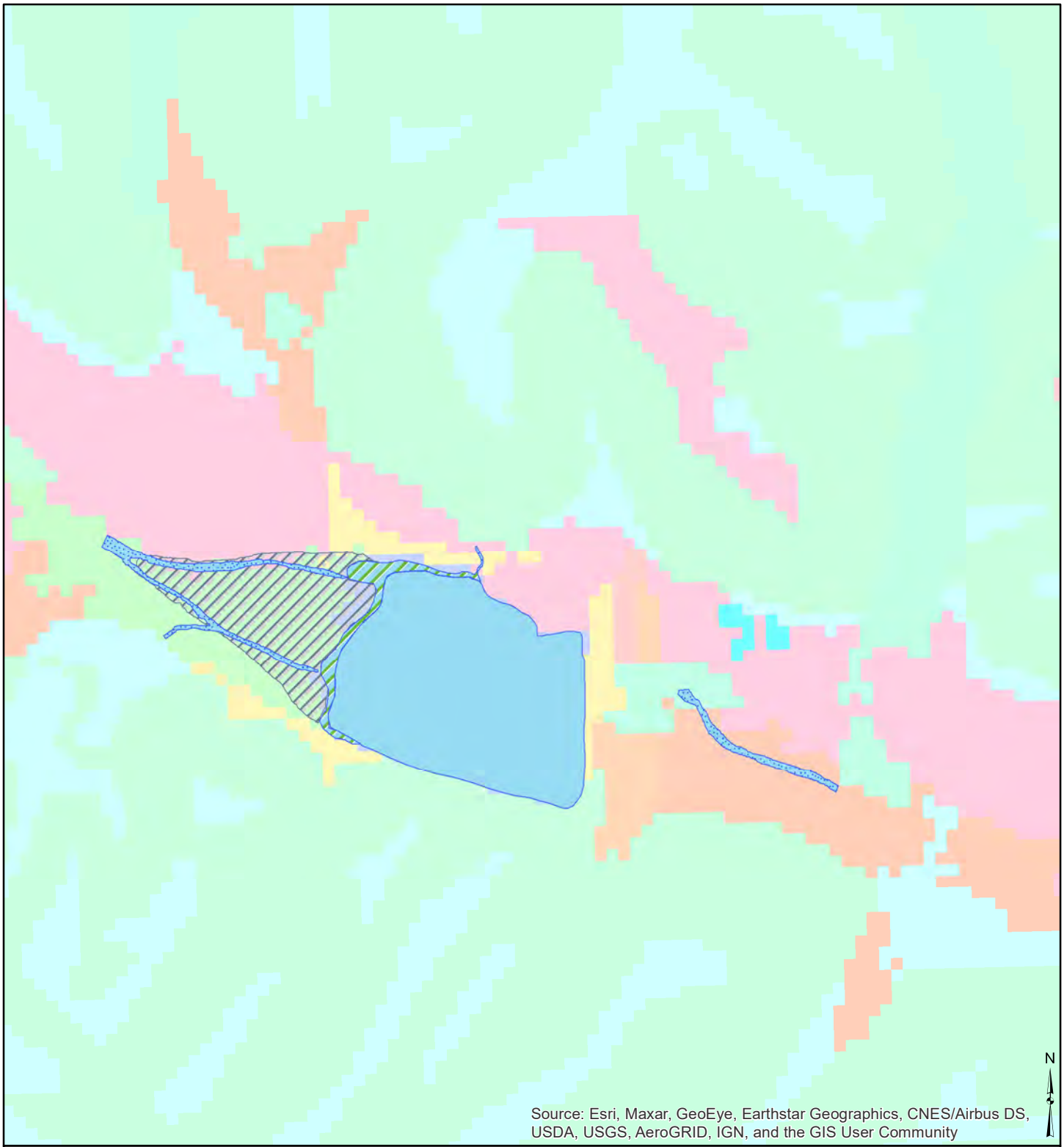
Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

2



Project Mngr: TMJ Drawn By: AA Checked By: JP Approved By: JEH	Project No. 9021P031 Scale: 1 in = 400 feet TBPE Firm No. F-3272 Date: August 2021	Terracon Consulting Engineers & Scientists 6911 Blanco Road San Antonio, TX 78216 PH (210) 641-2112 Fax (210) 641-2124	Topographic Map **Sillisaw Dam No. 13** **Stillwell, Adair County, Oklahoma**	Exhibit 3



Legend

- Fringe Wetland
- Inlet Sheet Flow
- Pond
- Steam Inlet

Vegetation Types

- Disturbed Soil Pasture
- Eastern Great Plains: Herbaceous Wetland
- Open Water
- Ozark-Ouachita: Dry Oak Woodland
- Ozark-Ouachita: Dry-Mesic Oak Forest
- Ozark-Ouachita: Pasture/Prairie
- Ozark-Ouachita: Riparian Hardwood Woodland
- Ruderal Deciduous Woodland
- South Central Interior: Bottomland Hardwood Forest
- South Central Interior: Bottomland Herbaceous Wetland
- Urban Low Intensity

400 200 0 400 Feet

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

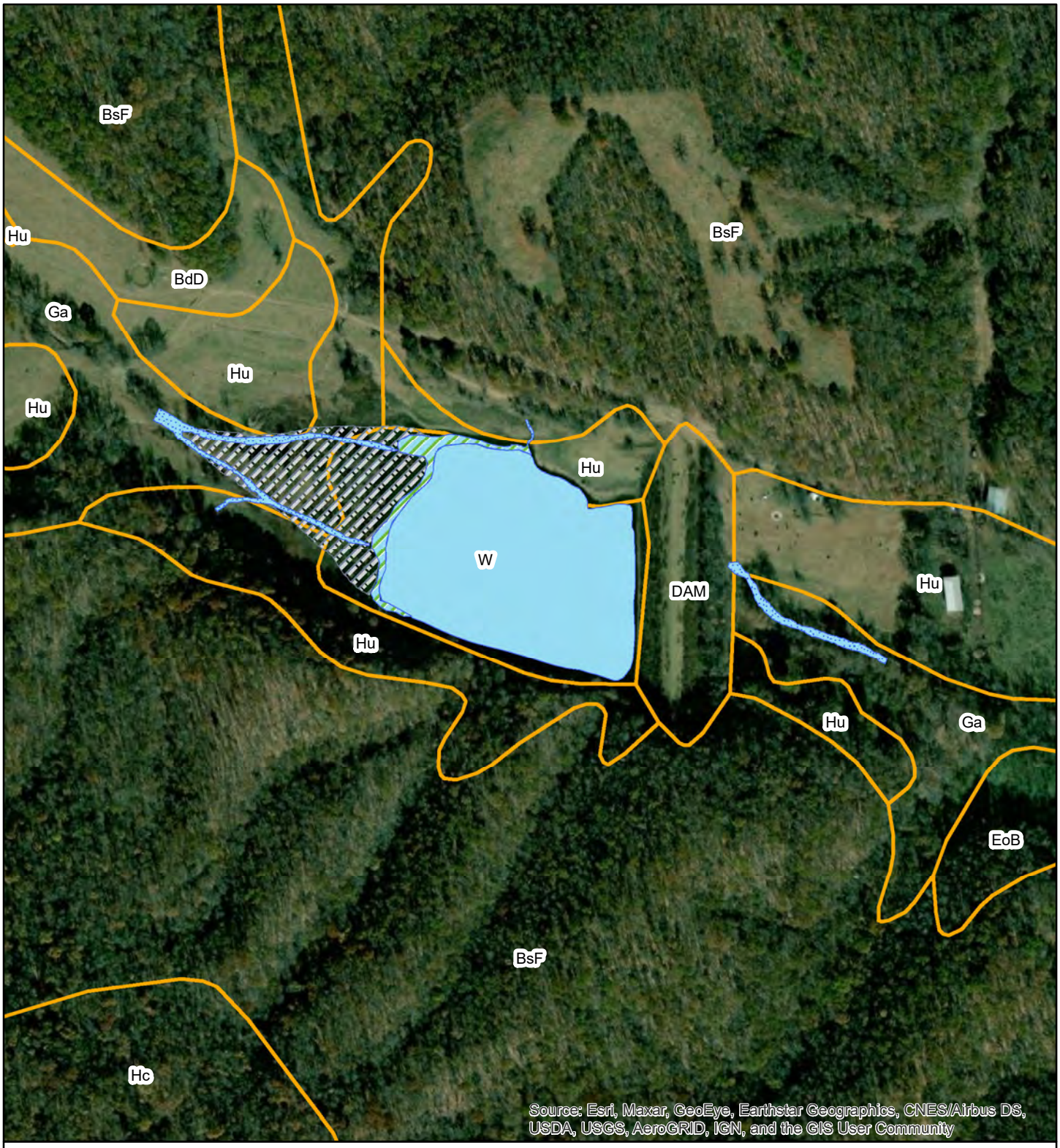
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vegetation Map

Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

4



Legend

Fringe Wetland
Pond
Soils
Inlet Sheet Flow
Steam Inlet

400 200 0 400
Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

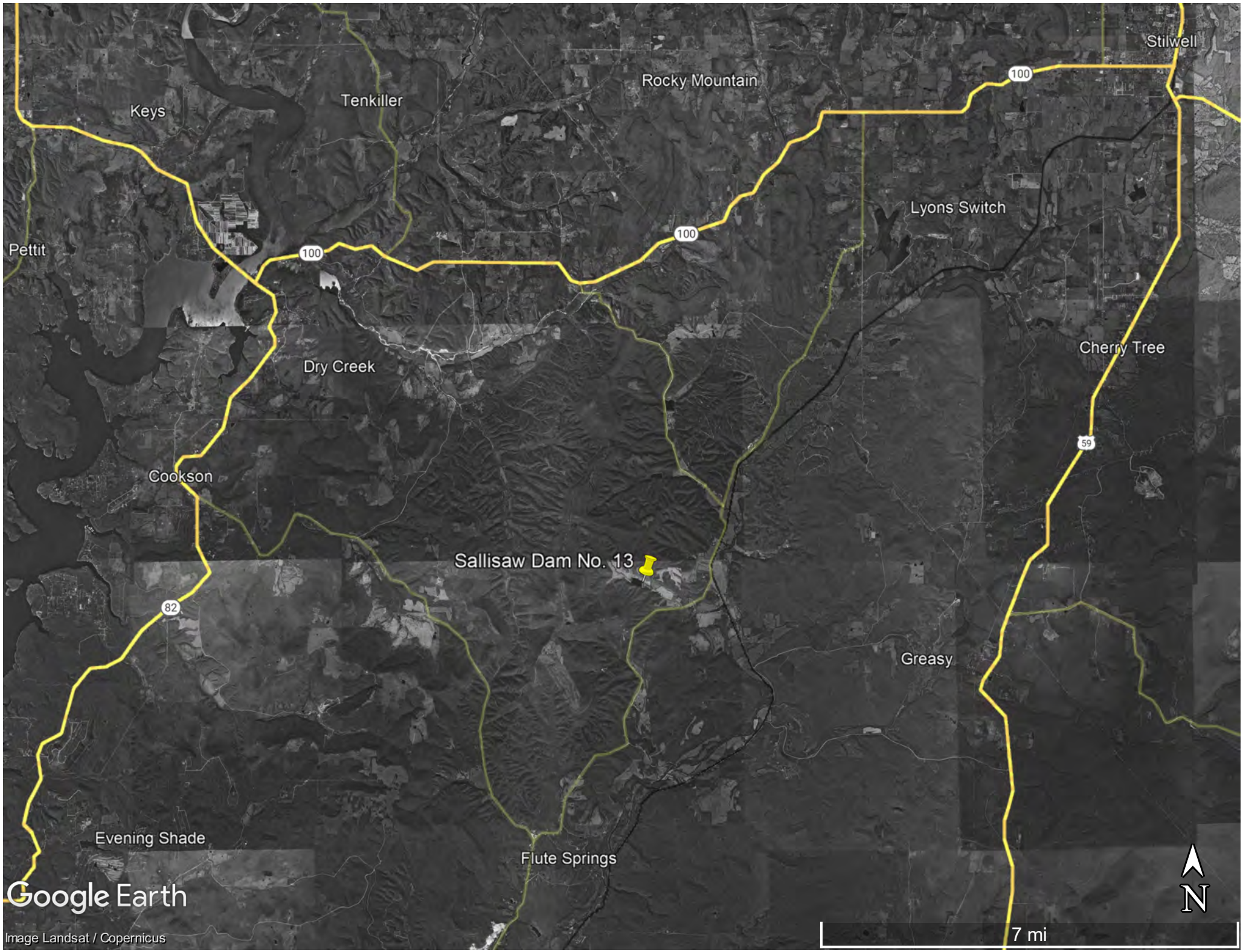
Terracon
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PH (210) 641-2112 Fax (210) 641-2124

Topographic Map

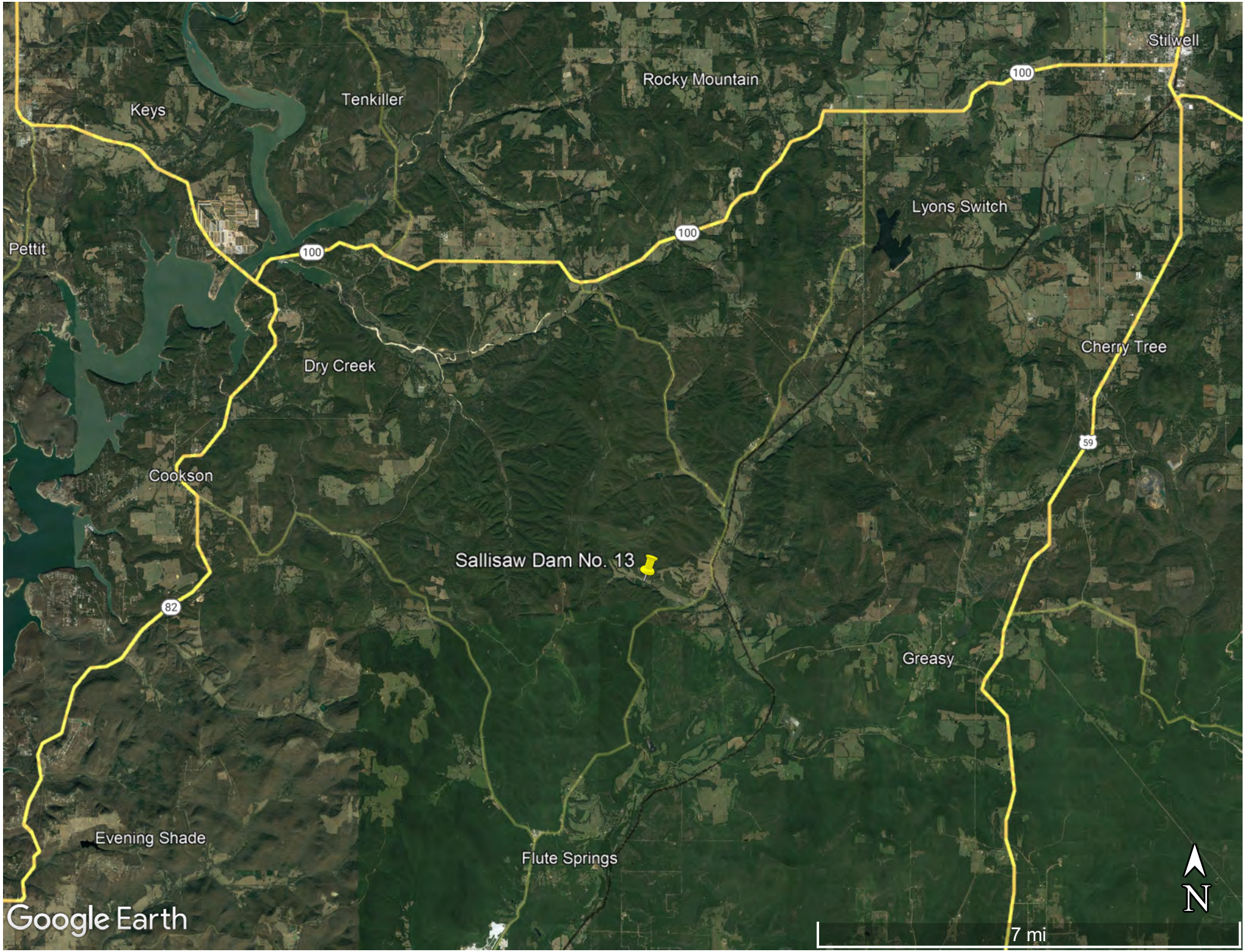
Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

5


Stilwell
Rocky Mountain
Tenkiller
Keys
100
Lyons Switch
Pettit
100
100
Dry Creek
Cherry Tree
59
Cookson
Sallisaw Dam No. 13
82
Greasy
Evening Shade
Flute Springs
Google Earth
Image Landsat / Copernicus
N
7 mi


Stilwell
Rocky Mountain
Tenkiller
Keys
100
Lyons Switch
Pettit
100
100
Cherry Tree
Dry Creek
59
Cookson
Sallisaw Dam No. 13
82
Greasy
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7 mi


Stilwell
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Cherry Tree
Dry Creek
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Sallisaw Dam No. 13
Greasy
Evening Shade
Flute Springs
100
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82
N
7 mi
Google Earth

APPENDIX B
IPAC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: October 21, 2021
Consultation Code: 02EKOK00-2022-SLI-0163
Event Code: 02EKOK00-2022-E-00597
Project Name: Sallisaw Dam No. 13

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Non-federal entities conducting activities that may result in take of listed species should consider seeking coverage under section 10 of the ESA, either through development of a Habitat Conservation Plan (HCP) or, by becoming a signatory to the General Conservation Plan (GCP) currently under development for the American burying beetle. Each of these mechanisms provides the means for obtaining a permit and coverage for incidental take of listed species during otherwise lawful activities.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit through our Project Review step-wise process http://www.fws.gov/southwest/es/oklahoma/OKESFO%20Permit%20Home.htm.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

Project Summary

Consultation Code: 02EKOK00-2022-SLI-0163
Event Code: Some(02EKOK00-2022-E-00597)
Project Name: Sallisaw Dam No. 13
Project Type: DAM
Project Description: A site evaluation of Dam No. 13 for determination of rehabilitation, Adair County, Oklahoma.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.685956000000004,-94.78542835267285,14z



Counties: Adair County, Oklahoma

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened
Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7245	Endangered

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Insects

NAME	STATUS
American Burying Beetle *Nicrophorus americanus* Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/66	Threatened
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

THERE ARE NO FWS MIGRATORY BIRDS OF CONCERN WITHIN THE VICINITY OF YOUR PROJECT AREA.

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical

Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
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Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: October 21, 2021
Consultation code: 02EKOK00-2022-TA-0163
Event Code: 02EKOK00-2022-E-00595
Project Name: Sallisaw Dam No. 13

Subject: Verification letter for the 'Sallisaw Dam No. 13' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Aimee Steinbrecher:

The U.S. Fish and Wildlife Service (Service) received on October 21, 2021 your effects determination for the 'Sallisaw Dam No. 13' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- American Burying Beetle *Nicrophorus americanus* Threatened
- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Sallisaw Dam No. 13

2. Description

The following description was provided for the project 'Sallisaw Dam No. 13':

> A site evaluation of Dam No. 13 for determination of rehabilitation, Adair County, Oklahoma.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.685956000000004,-94.78542835267285,14z



Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may

affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

United States Department of the Interior

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http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: October 21, 2021
Consultation code: 02EKOK00-2022-TA-0163
Event Code: 02EKOK00-2022-E-00592
Project Name: Sallisaw Dam No. 13

Subject: Verification letter for 'Sallisaw Dam No. 13' project under the October 15, 2020, Programmatic Biological Opinion on Final 4(d) Rule for the American burying beetle and Activities Excepted from Take Prohibitions (50 CFR § 17.47(d), Federal Register Citation 85 FR 65241).

Dear Aimee Steinbrecher:

The U.S. Fish and Wildlife Service (Service) received on **October 21, 2021** your effect determination(s) for the 'Sallisaw Dam No. 13' (the Action) using the American burying beetle (*Nicrophorus americanus*) determination key within the Information for Planning and Consultation (IPaC) system.

This determination key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's October 15, 2020, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from incidental "take"[1] prohibitions applicable to the American burying beetle under the Endangered Species Act of 1973 (Act) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the American burying beetle; however, any incidental take that may occur as a result of the Action is not prohibited under the Act Section 4(d) rule adopted for this species at 50 CFR §17.47(d). **Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under Act Section 7(a)(2) with respect to the American burying beetle.**

Please report any changes to the information about the Action that you submitted in IPaC, the results of any American burying beetle surveys conducted in the Action area, and any dead, injured, or sick American burying beetles that are found during Action implementation. If the

Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with Act Section 7(a)(2) only for the American burying beetle.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (Act, Section 3(19)).

This letter covers only the American burying beetle. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Northern Long-eared Bat *Myotis septentrionalis* Threatened
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If your project may affect additional listed species, you must evaluate additional DKeys for other species, or submit a request for consultation for the additional species to your local Ecological Services Field Office.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Sallisaw Dam No. 13

2. Description

The following description was provided for the project 'Sallisaw Dam No. 13':

> A site evaluation of Dam No. 13 for determination of rehabilitation, Adair County, Oklahoma.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.685956000000004,-94.78542835267285,14z



Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have “no effect” on the American burying beetle? (If you are unsure select "No")

   No

3. Will your activity **purposefully take** American burying beetles?

   No

4. Is your project wholly inside the 4d rule Analysis Area? For areas of your project occurring inside the Analysis Area (New England, Northern Plains, Southern Plains), your project may qualify for exemptions. For areas of your project occurring outside the Analysis Area, all incidental take is exempted according to the ABB 4d Rule.

   Automatically answered
   Yes

5. Is American burying beetle suitable habitat present within the action area?

   Yes

6. Will suitable habitat be affected by the proposed action? Suitable habitat may be impacted if the action involves soil disturbance, use of vehicles or heavy equipment, artificial lighting, vegetation removal, use of herbicides, pesticides, other hazardous chemicals.

   Yes

Project Questionnaire

Please select the activity that best matches your proposed action.

13. Other activities with soil disturbance - briefly describe below

If you chose 13 above, please describe below. If you did not choose 13 above, please type "0".

Soil disturbance related to heavy equipment rehabilitating a dam

Estimate the total acres of suitable American burying beetle habitat that may be affected.

5

Please estimate the total number of acres of **temporary impacts** to American burying beetle habitat. See definitions

5

Please estimate the total number of acres of **permanent impacts** to American burying beetle habitat. See definitions

0

APPENDIX C
Common Acronyms

COMMON ACRONYMS

CLMOR	Conditional Letter of Map Revision
EOR	Element Occurrence Record
FEMA	Federal Emergency Management Administration
GPS	Global Positioning System
HCP	Habitat Conservation Plan
IH	Interstate Highway
NDD	Natural Diversity Database
NRCS	Natural Resources Conservation Service
ROW	Right of Way
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

Limited Threatened and Endangered Species Habitat Assessment

Sallisaw Creek Watershed Dam No. 19

Adair County, Oklahoma

January 30, 2022

Terracon Project No. 96217693



Prepared for:
Natural Resources Conservation Service
Adair County, Oklahoma

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas

6911 Blanco Road
San Antonio, TX 78216
(210)641-2112
terracon.com

Terracon

Environmental • Facilities • Geotechnical • Materials

January 30, 2022

Conservation Works JV, LLC
3116 North Dries Lane, Suite 100
Peoria, Illinois 61604

Attn: Mr. Terry Feldmann

RE: **Limited Threatened and Endangered Species Habitat Assessment**
Sallisaw Creek Dam No. 19
Stillwell, Adair County, Oklahoma
Terracon Project No. 96217693

Dear Mr. Feldmann:

Terracon is pleased to submit the Limited Threatened and Endangered Species Habitat Assessment the above-referenced project.

Terracon was retained by Conservation Works JV, LLC (client) to perform this task in accordance with our Terracon Project No. 9617693.

Terracon appreciated the opportunity to have worked for you on this project. Please feel free to contact the undersigned if you have any questions or require additional information.

Sincerely,
Terracon Consultants, Inc.

John Rathgeber
Senior Staff Scientist
Environmental Planning

Jennifer Peters
Group Manager
Environmental Planning

Aimee Steinbrecher
Field Scientist
Environmental Planning

Enclosure

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USFWS Verification 4(d) Letters – Long-Eared Bat

APPENDIX C – COMMON ACRONYMS

Executive Summary

Terracon is pleased to submit this Executive Summary for a Limited Threatened and Endangered Species Habitat Assessment for the Sallisaw Creek Watershed Dam No. 19 in Adair County, Oklahoma.

Desktop Review:

Terracon reviewed published information such as topographic and aerial maps of the project area as well as the species are listed on USFWS Information for planning and Consultation (IPaC) web page (accessed October 21, 2021 consultation # 02EKOK00-2022-SLI-0164). Also, a review of the United States Fish and Wildlife Service (USFWS) Oklahoma office website was conducted to review the list of federally threatened and endangered species found in Adair County. The review was limited to a data review and did not include a site visit. Should actual conditions observed in the field differ, Terracon should be notified to re-evaluate and conduct a site visit.

This analysis finds that there would be no effect to federally listed threatened and endangered species on the basis that preferred habitat was not observed on the Site and no observations of species occurred.

Recommendations:

Terracon does not recommend further assessment of federally listed threatened and endangered species.

Project Description

Terracon Consultants, Inc. (Terracon) was retained by Conservation Works JV, LLC (client) to perform a Limited Threatened and Endangered Species Habitat Assessment in accordance Terracon Project No. 90217693. The project area can be seen on *Exhibit 1* in *Appendix A*.

The site, located in Adair County, approximately 2.9 miles to the southwest of Stilwell, Oklahoma and approximately 1.0 miles to the south of the railroad intersection of E 850 Rd / S4690 Rd and approximately 13-acre tract of undeveloped land.

Desktop Review

Threatened and Endangered Species

Federally Listed Threatened and Endangered Species

The purpose of the Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) administer the ESA. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife. Under the ESA, species may be listed as threatened or endangered. "Threatened" means a species is likely to become endangered within the foreseeable future. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. Under the ESA, individual species and their habitat are protected.

Terracon conducted a preliminary review of the potential for federally listed threatened, endangered species to occur on the proposed project location or be affected by the proposed project for the purposes of due diligence in complying with federal laws. Terracon downloaded the USFWS Information, Planning, and Conservation (IPaC) web page (accessed October 21, 2021 consultation # 01EOFW00-2022-SLI-0002) (reference *USFWS Natural Resources of Concern* in *Appendix A*). The USFWS considers seven federally listed threatened or endangered species, including candidate species, as having potential to occur in Adair County. A summary of species and their habitat requirement listed for Adair County is provided in *Table 1*.

Table 1. Federally Listed Threatened and Endangered Species in Adair County, Oklahoma.

Common Name	Scientific Name	Federal Status	Habitat Requirements	Designated Critical Habitat?	Critical Habitat Present?
Birds					
Piping Plover	*Charadrius melodus*	T	Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands.	No	No

Common Name	Scientific Name	Federal Status	Habitat Requirements	Designated Critical Habitat?	Critical Habitat Present?
Red Knot	*Calidris canutus rufa*	T	During the summer, inhibit dry tundra areas that include hillsides with sparse vegetation. During the winter, they migrate and prefer sandy beaches, coastal mudflats, and areas close to streams/ponds across the world.	No	No
Insects					
Monarch Butterfly	*Danaus plexippus*	C	Breeding habitat must include milkweeds including *Asclepias californica*, *Asclepias cryptoceras*, *Asclepias eriocarpa*, *Asclepias erosa*, *Asclepias glaucescens*, *Asclepias linaria*, *Asclepias oenotheroides*, *Asclepias subulata*, *Asclepias subverticillata*, and *Asclepias vestita*	No	No
Mammals					
Gray Bat	*Myotis grisescens*	E	Primary habitat includes caves, where they will hibernate, and roost preferably found scattered along rivers and/or limestone karst areas.	No	No
Indiana Bat	*Myotis sodalis*	E	Require cool (between 32-50 degrees F) humid caves. Roosting habitat includes woody areas with dead or dying trees with loose bark.	No	No
Northern Long-eared Bat	*Myotis spetentrionalis*	T	Winer habitat requires caves and mines of various sizes, constant temperatures, high humidity, and no air currents. Roosting habitat requires woody areas with dead or dying trees with cavities or crevices. Also, may roost in caves or mines if cooler.	No	No
Ozark Big-eared Bat	*Corynorhinus (=Plecotus) townsendii ingens*	E	Primarily found in karst areas. Often will use the same cave year-round. Prefer caves surrounded mature hardwood forests (*Carya spp.*, *Fagus spp.*, and *Acer spp.*) and forage along habitats with intermittent streams and mountain slopes	No	No

T= threatened, E = Endangered, C = Candidate EXPN = experimental population, non-essential
Source: USFWS Endangered Species Website http://www.fws.gov/endangered/

Vegetative Types

Oklahoma Ecological Mapping Systems (EMS) maps use a combination of satellite land cover, soils types, thematic data, and other factors to produce land classifications for Oklahoma. These classifications help identify vegetation communities within the Site. The Site falls within nine mapped vegetation types of Adair County, Oklahoma. The vegetation map can be found in *Exhibit 4* in *Attachments*. The vegetative types and descriptions defined by the EMS are below.

Open Water
Open water during all seasons at the time of data acquisition.

Ozark-Ouachita: Dry Oak Woodland
This common and broadly circumscribed type is mapped on upland flats and moderate slopes. Common tree species include post oak (*Quercus stellate*), white oak (*Quercus alba*), black oak (*Quercus velutina*), blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), other hickory species (*Carya spp*), slippery elm (*Ulmus ribra*), sugar hackberry (*Celtis laevigata)*, and black walnut *(Juglans nigra)*. Shortleaf pine *(Pinus echinate)* or eastern redcedar *(Juniperus virginiana)* may also be components in low densities.

Ozark-Ouachita: Dry-Mesic Oak Forest
This type is mapped over slopes >20% and on low flats. Closed-canopy forest with species such as white oak *(Quercus alba)*, hickory species *(Carya spp)*, black oak (*Quercus velutina)*, northern red oak *(Quercus rubra)*, and chinkapin oak *(quercus muehlenbergii)* are characteristic of this type. The most medic areas may contain sugar maple *(Aver saccharum)* as an important component. Flowering dogwood *(Cornus florida)*, eastern redbud *(Cercis canadensis)*, hornbeam *(Carpinus spp)*, and sassafras *(Sassafras albidum)* are common woody understory species.

Ozark-Ouachita: Pasture/Prairie
This type encompasses a broad variation, bit in modern landscapes most representatives are grazed pastures. Common species are non-native and grazing tolerant grasses and forbs, such as Bermudagrass *(Cynodon dactylon)*, tall fescue *(Festuca arundinacea)*, annual ragweed *(Ambrosia artemisiifolia)*, field brome *(Bromus arvensis)*, purple top tridens *(Tridens flavus)*, sericea lespedeza *(Lespedexa cuneata)*, prairie broom weed *(Amphiachyris dracunculoides)*, and sneezeweed *(Helenium spp)*. Less heavily grazed areas may support grassland species such as little and big bluestem *(Schizachyrim scoparium/Andropogon gerardii)* and yellow Indian grass *(Sorghastrum nutans)*. Woody species such as post oak *(Quercus stellata)*, black walnut*(Juglans nigra)*, common persimmon *(Diospyros virginiana)*, winged elm *(Ulmus alata)*, sumac species (*Plantanus spp)*, and eastern redcedar *(Juniperus virginiana)* may be present.

Ozark-Ouachita: Riparian Hardwood Woodland
This type is mapped along first and second order streams within narrow buffers and is represented by vegetation influenced by a variety of water regimes and human impacts. Steam gradients tends to be relatively high, and species such as sycamore *(Platanus occidentalis)*, river birch *(Betula nigra)*, sweetgum *(Liquidambar spp)*, maples *(Acer spp)*, oaks *(Quercus spp)*, and hazel alder *(Alnus serrulata)* may grow near steep banks or adjacent to stream bed cobble.

Ruderal Deciduous Woodland
Mapped on prairie soils across the state, this type consists of shrublands or woodlands where eastern redcedar is the most important species. Common woody components vary by region, and may include hackberry species (*Celtis spp*), winged elm *(Ulmus alata)*, other elm species *(Ulmus spp)*, ash species *(Fraxinus spp)*, post oak *(Quercus stellate)*, honey locust *(Fleditsia triacanthos)*,

black locust (*Robinia pseudoacacia*), western soapberry *(Sapindus saponaria)*, lotebush *(Ziziphus obtusifolia)*, post oak *(Quercus stellata)*, and Osage orange *(Maclura pomifera)*.

Ruderal Eastern Redcedar Woodland and Shrubland

This vegetation type is mapped on prairie soils across much of the state and consists of shrublands or woodlands where eastern redcedar *(Juniperus virginiana)* is the most important species. Common woody components vary by region, and may include hackberry species (*Celtis spp)*, winged elm *(Ulums alata)*, other elm species *(Ulmus spp)*, ash species *(Fraxinus spp)*, post oak *(Quercus stellata)*, honey locust *(Gleditsia triacanthos)*, black locust *(Robinia pseudoacacia)*, western soapberry *(Sapindus Saponaria)*, lotebush *(Ziziphus obtusifolia)*, post oak *(Quercus stellata)*, and Osage orange *(Maclura pomifera)*.

South Central Interior: Bottomland Hardwood Forest

This vegetation type is mapped on bottomland soils across a variety of hydrologic regimes and various stages of disturbance. Common canopy dominants may include pecan *(Caya illinoinensis)*, green ash *(Fraxinus pennsylvanica)*, slippery elm *(Ulums ribra)*, sycamore *(Platanus occidentalis)*, sugar hackberry *(Celtis laevigata)*, honey locust *(Gelditsia triacanthos)*, boxelder *(Acer negundo)*, Shumard oak *(Quercus shumardii)*, bur oak *(Quercus macrocarpa)*, black willow *(Salix nigra)*, and American elm *(Ulmus americana)*. Vines such as eastern poison ivy *(Toxicodendron radicans)*, grape species *(Vitis spp)*, pepper vine species *(Ampelopsis arborea)*, Virginia creeper *(Parthenocissus quinquefolia)*, and green briar (*Smilax spp)* species may be conspicuous components. Herbaceous species may include species such as Virginia wildrye *(Ulmus virginicus)*, Indiana wood oats *(Chasmanthium latifolium)*, longleaf wood oats *(Unoila sessilliflora)*, Johnson grass *(Sorphum halepense)*, Bermudagrass *(Cynodon dactylon)*, and sedge species *(Carex spp)*.

South Central Interior: Bottomland Shrubland and Young Woodland

This type is mapped on bottomland soils across a variety of hydrologic regimes and various stages of disturbance. Common shrubs or small trees include willow species *(Salix spp)*, common buttonbush *(Cephalanthus occidentalis)*, green ash *(Fraxinus pennsylvanica)*, winged elm *(Ulmus alata)*, gum bumelia *(Sideroxylon lanuginosum)*, sugar hackberry *(Celtis laevigata)*, boxelder *(Acer negundo)*, possum haw *(Ilex decidua)*, honey locust *(Gelditsia traicanthos)*, and black walnut *(Juglans nigra)*. Vines such as eastern poison ivy *(Toxicodendron radicans)*, grape species *(Vitis spp)*, pepper vine species *(Ampelopsis arborea)*, Virginia creeper *(Parthenocissus quinquefolia)*, and Greenbriar species *(Smalix spp)* may be conspicuous components. Herbaceous species many include species such as field brome *(Bromus arvensis)*, bermudagrass *(Cynodon dactylon)*, little barley *(Hordeum pusillum)*, Johnsongrass *(Sorphum halepense)*, Virginia wildrye *(Ulmus virginicus)*, and sedge species *(Carex spp)*.

Soils

Data from the USDA Natural Resource Conservation Service (NRCS) Web Soil Survey (WSS) and the State Soil Data Access (SDA) Hydric Soils List were reviewed to characterize soils within

the study area and vicinity, accessed October 21, 2021. A soil survey map is included as *Exhibit 5* in *Appendix A*. *Table 2* contains a summary of the mapped soil units within the study area and relevant physical characteristics.

Table 2 - Study Area Mapped Soil Types

Map Unit Symbol	Map Unit Name	Landform	Natural Drainage Class	Frequency of Ponding	Frequency of Flooding	Depth to Water Table	Hydric Soil Rating
BoE	Clarksville stony silt loam, 5 to 15 percent slopes	Back/Side slopes	Somewhat Excessively Drained	None	None	>80”	No
BdD	Clarksville very gravelly silt loam, 1 to 8 percent slopes	Backslopes	Somewhat Excessively Drained	None	None	>80”	No
DsF	Clarksville very gravelly silt loam, 20 to 50 percent slopes, stony	Back/Side slopes	Somewhat Excessively Drained	None	None	>80”	No
EoB	Waben gravelly silt loam, 0 to 1 percent slopes	Foot/Base slopes	Well Drained	None	None	>80”	No
EtD	Waben gravelly silt loam, 3 to 8 percent slopes	Foot/Base slopes	Well Drained	None	None	>80”	No
Ga	Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded	Floodplains on drainageways	Well Drained	Frequent	None	>80”	No
Hu	Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded	Floodplains on drainageways	Well Drained	None, Occasional	None	>80”	No

Aerial Photographs

Terracon reviewed aerial photographs to review suspect wetland areas that may be present on the project tracts. Google Earth historical aerial photographs from 1995, 2005, and 2017 were analyzed. According to the aerial photographs, the land is undeveloped but disturbed. The site consists of a dam; constructed in 1968 under the Sallisaw Creek Watershed Work Plan, drafted in 1961, woody vegetation, grassland with sparse trees, and wetland fringe. There is a mapped wetland feature in association with the pooled water from the dam. An aerial photograph from 1995, 2005, and 2019 are included in *Appendix A* as *Exhibits 6.1-6.3.*

Findings and Conclusions

Terracon conducted a desktop review of the site to identify potential Threatened and Endangered Species habitat that may require federal and/or local agency coordination. Should actual conditions observed in the field differ, Terracon should be notified to re-evaluate and conduct a site visit. Due to the presence of certain vegetation communities and soil types at the site, there is potential for the Northern long-eared bat (*Myotis septentrionalis*) during the summer months; however, none of the habitat is directly located on the dam.

Due to the impact only occurring on Dam No. 19, the Programmatic Biological Opinion from the USFWS dated October 15, 2020, satisfies and concludes responsibilities under Act Section 7(a)(2) with respect to the Northern long-eared bat. Verification letter from the USFWS is located in *Appendix B.* Overall activities on or upstream of the dam "may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o)." This statement is under the assumption that no trees will be cleared.

IPaC contains specific Programmatic Biological Opinion (PBO) for species under the Endangered Species Act of 1973. The determination key asks a series of questions in the Qualification Interview to determine the project extent, actions taken, suitable habitat, and the potential affect by the proposed action. The Project Questionnaire is the second part of the IPaC POB that uses the acre size of the habitat for potential soil/habitat affected, temporary impacts, and permanent impacts of the habitat. The answers provided in both sections will provide the POB determination.

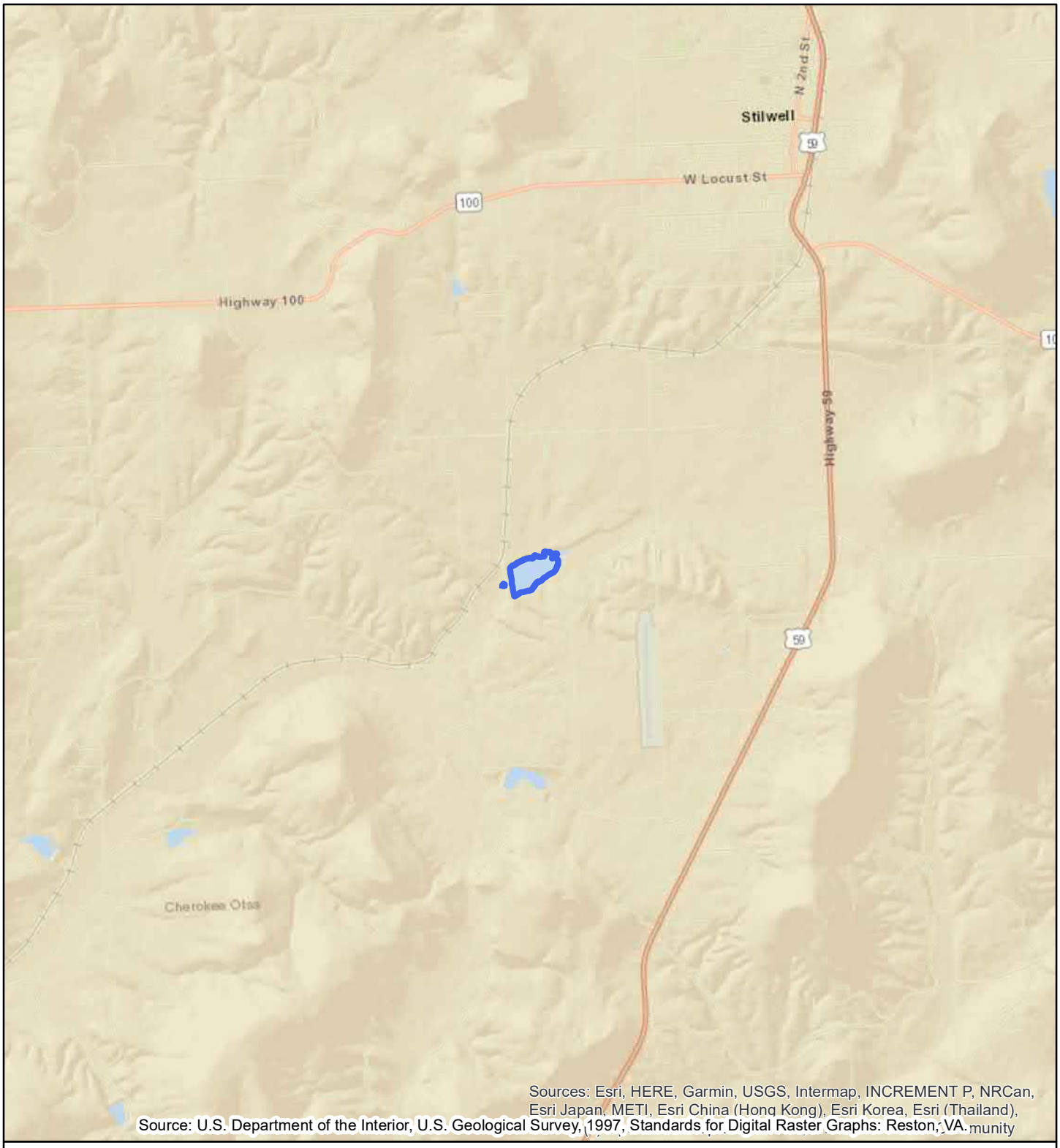
General Comments

The Limited Threatened and Endangered Species Habitat Assessment was performed in accordance with generally accepted practices of this profession undertaken in similar studies at the same time and in the same geographical area. The Review, such as the one performed on these tracts, is of limited scope, is noninvasive, and cannot eliminate the potential that habitat may be present on the project site beyond what is identified by the limited scope of these assessments. The limitations of this limited assessment should be recognized.

This report has been prepared for the exclusive use and reliance of Client, their successors, lenders and assigns. Use or reliance by any other party is prohibited without the written authorization of Client and Terracon.

Reliance on the Limited Listed Threatened and Endangered Species Habitat Assessment by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the proposal.

APPENDIX A
Exhibits



Legend

Pond Wetland

1 0.5 0 1 Miles

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 1 miles
TBPE Firm No.	F-3272
Date:	August 2021

Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vicinity Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

1



Legend

Pond Wetland

400 200 0 400

Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

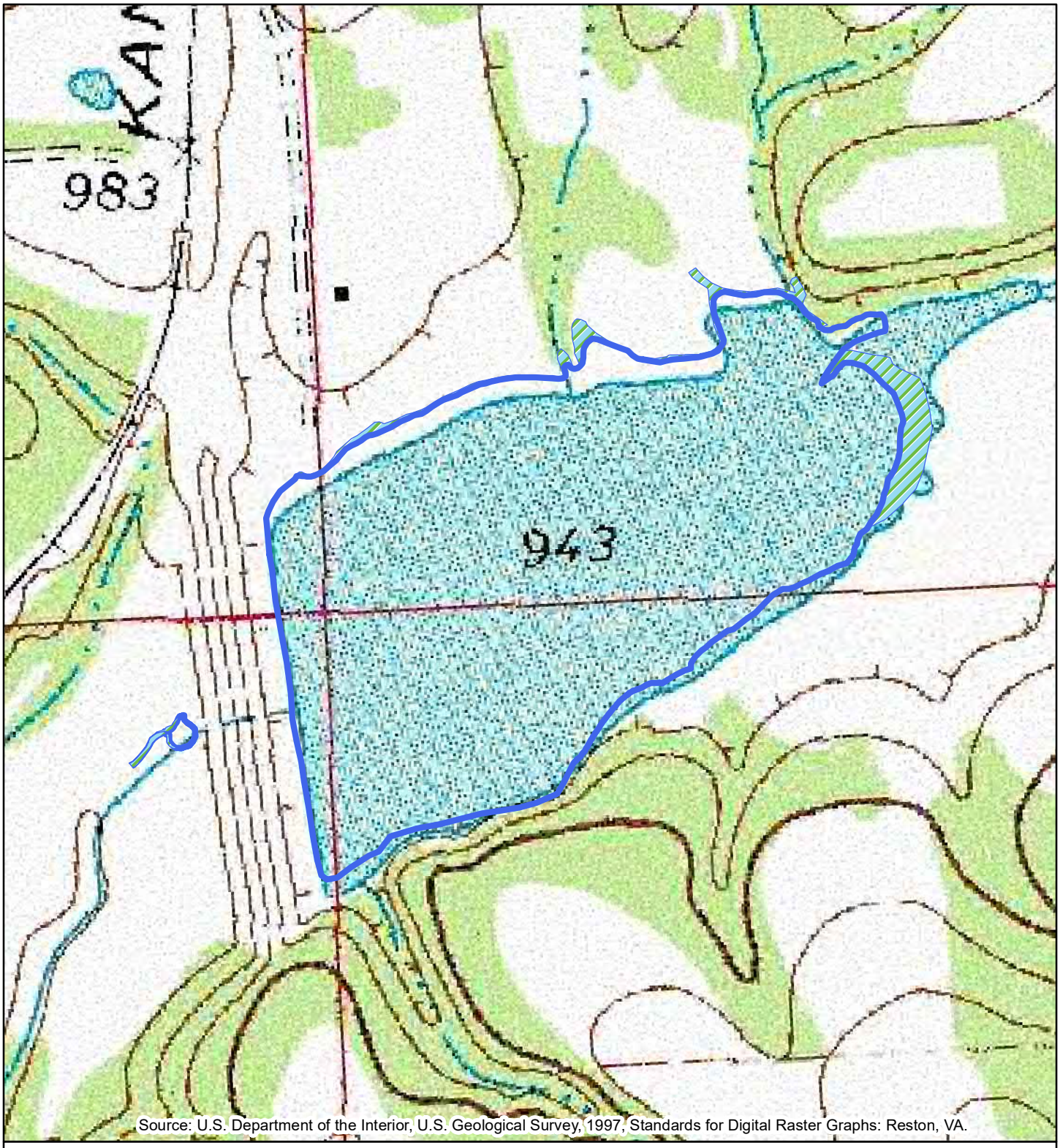
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Site Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

2



Legend

Pond Wetland

400 200 0 400
Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

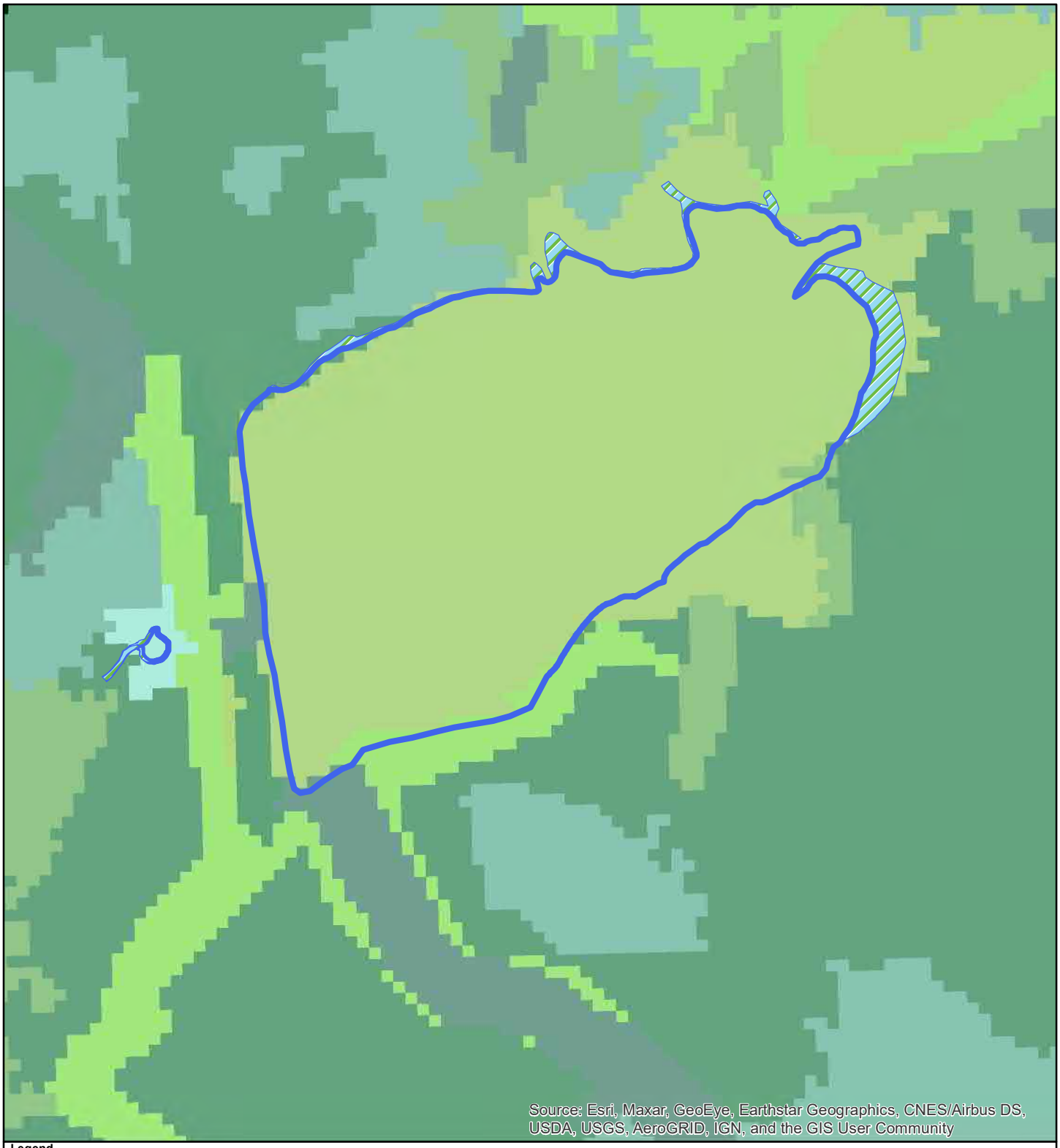
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Topographic Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

3



Legend

- Pond
- Wetland

Vegetation Type

- Open Water
- Ozark-Ouachita: Dry Oak Woodland
- Ozark-Ouachita: Dry-Mesic Oak Forest
- Ozark-Ouachita: Pasture/Prairie
- Ozark-Ouachita: Riparian Hardwood Woodland
- Ozark-Ouachita: Riparian Herbaceous Wetland
- Ruderal Deciduous Woodland
- Ruderal Eastern Redcedar Woodland and Shrubland
- South Central Interior: Bottomland Hardwood Forest
- South Central Interior: Bottomland Shrubland and Young Woodland

N

400 200 0 400

Feet

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vegetation Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

4



Legend

Pond Wetland Soils

400 200 0 400

Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Soils Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

5



Legend

Project Location

Project Manager: JTP	Project No. 9021P031
Drawn by: JTP	Scale: 1 Inch = 2000 feet
Checked by: JTP	File Name: 9021P031
Approved by: JJH	Date: 1/2022

Terracon
Consulting Engineers & Scientists
6911 BLANCO ROAD SAN ANTONIO, TX 78216
PH. (210) 641-2112 FAX. (210) 641-2124

2017 AERIAL MAP – PROVIDED BY GOOGLE

Sallisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit 6.1



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Legend

Project Location

Project Manager: JTP	Project No. 9021P031
Drawn by: JTP	Scale: 1 Inch = 2000 feet
Checked by: JTP	File Name: 9021P031
Approved by: JJH	Date: 1/2022

Terracon
Consulting Engineers & Scientists
6911 BLANCO ROAD SAN ANTONIO, TX 78216
PH. (210) 641-2112 FAX. (210) 641-2124

2003 AERIAL MAP – PROVIDED BY GOOGLE

Sallisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit 6.2



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Legend

Project Location

Project Manager: JTP	Project No. 9021P031
Drawn by: JTP	Scale: 1 Inch = 2000 feet
Checked by: JTP	File Name: 9021P031
Approved by: JJH	Date: 1/2022

Terracon
Consulting Engineers & Scientists
6911 BLANCO ROAD SAN ANTONIO, TX 78216
PH. (210) 641-2112 FAX. (210) 641-2124

1995 AERIAL MAP – PROVIDED BY GOOGLE

Sallisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit 6.3

APPENDIX B
IPAC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: October 21, 2021
Consultation Code: 02EKOK00-2022-SLI-0164
Event Code: 02EKOK00-2022-E-00599
Project Name: Sallisaw Dam No. 19

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Non-federal entities conducting activities that may result in take of listed species should consider seeking coverage under section 10 of the ESA, either through development of a Habitat Conservation Plan (HCP) or, by becoming a signatory to the General Conservation Plan (GCP) currently under development for the American burying beetle. Each of these mechanisms provides the means for obtaining a permit and coverage for incidental take of listed species during otherwise lawful activities.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit through our Project Review step-wise process http://www.fws.gov/southwest/es/oklahoma/OKESFO%20Permit%20Home.htm.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

Project Summary

Consultation Code: 02EKOK00-2022-SLI-0164
Event Code: Some(02EKOK00-2022-E-00599)
Project Name: Sallisaw Dam No. 19
Project Type: DAM
Project Description: A site evaluation of Dam No. 19 for determination of rehabilitation, Adair County, Oklahoma.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.768495900000005,-94.66466834952354,14z



Counties: Adair County, Oklahoma

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened
Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7245	Endangered

Birds

NAME	STATUS
Piping Plover *Charadrius melodus*	Threatened
Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	
Red Knot *Calidris canutus rufa*	Threatened
There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1864	

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate
No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

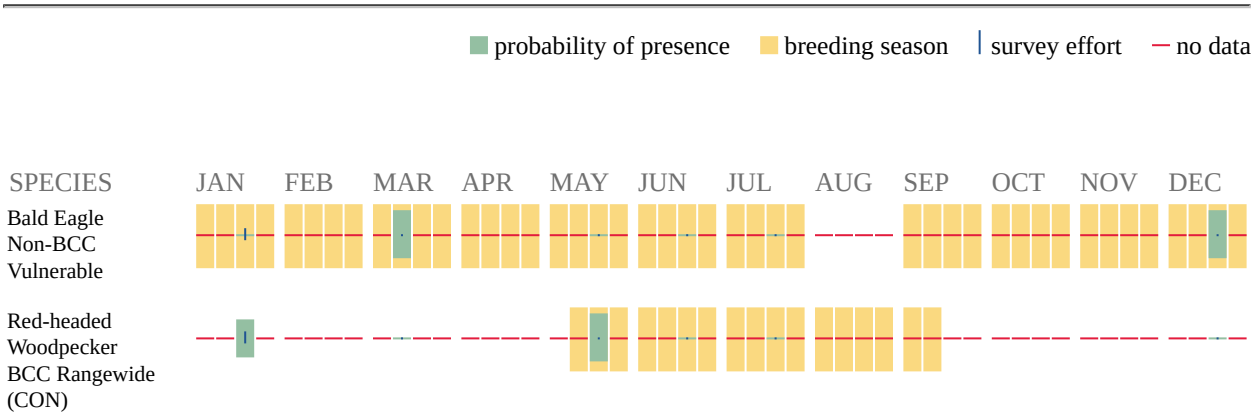
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: October 21, 2021
Consultation code: 02EKOK00-2022-TA-0164
Event Code: 02EKOK00-2022-E-00600
Project Name: Sallisaw Dam No. 19

Subject: Verification letter for the 'Sallisaw Dam No. 19' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Aimee Steinbrecher:

The U.S. Fish and Wildlife Service (Service) received on October 21, 2021 your effects determination for the 'Sallisaw Dam No. 19' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Ozark Big-eared Bat *Corynorhinus (=Plecotus) townsendii ingens* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Red Knot *Calidris canutus rufa* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Sallisaw Dam No. 19

2. Description

The following description was provided for the project 'Sallisaw Dam No. 19':

> A site evaluation of Dam No. 19 for determination of rehabilitation, Adair County, Oklahoma.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.768495900000005,-94.66466834952354,14z



Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may

affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

APPENDIX C
Common Acronyms

COMMON ACRONYMS

CLMOR	Conditional Letter of Map Revision
EOR	Element Occurrence Record
FEMA	Federal Emergency Management Administration
GPS	Global Positioning System
HCP	Habitat Conservation Plan
IH	Interstate Highway
NDD	Natural Diversity Database
NRCS	Natural Resources Conservation Service
ROW	Right of Way
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

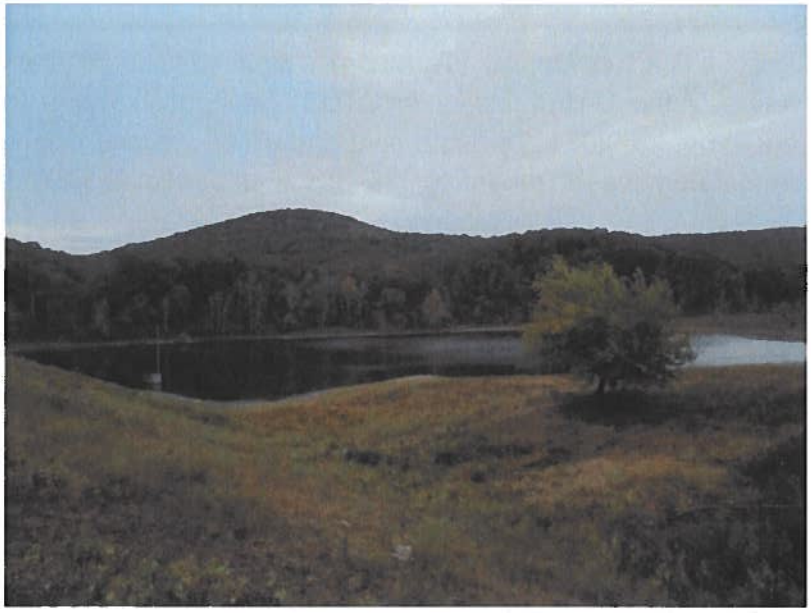
WOTUS Field Verification Report

Sallisaw Creek Watershed Dam No. 13

Adair County, Oklahoma

January 10, 2022

Terracon Project No. 96217693



Prepared for:
Natural Resources Conservation Service
Adair County, Oklahoma

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas

Attn: Mr. Terry Feldmann
Conservation Works JV, LLC

6911 Blanco Road (210)641-2112
San Antonio, TX 78216 terracon.com

Terracon

Environmental • Facilities • Geotechnical • Materials

January 10, 2022

3116 North Dries Lane, Suite 100
Peoria, Illinois 61604

Re: **Field Verification Report Waters of the U.S. Delineation**
Sallisaw Creek Dam No. 13
Stillwell, Adair County, Oklahoma
Terracon Project No. 96217693

Dear Mr. Feldmann:

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed Field Verification Report Waters of the United States (WOTUS) Delineation report for the above-referenced site. On September 29, 2021, Terracon sent a qualified wetland scientist to perform a delineation of the site to determine the presence/absence of jurisdictional WOTUS.

Based on site conditions at the time of reconnaissance, **it is Terracon's opinion that there are jurisdictional features present within the site**; however, the U.S. Army Corps of Engineers (USACE) is the official agency to make the final determination of the location, type, and extent of jurisdictional WOTUS. Should the proposed project change, please contact Terracon to discuss if formal coordination would be required. Note that the N*avigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020.

We appreciate the opportunity to be of service to you on this project. For more detailed information on all of Terracon's services please visit our website at www.terracon.com. If there are any questions regarding this report or if we may be of further assistance, please do not hesitate to contact John Rathgeber at (316) 448-3985 or by e-mail at Jnrathgeber@terracon.com.

Sincerely,
Terracon Consultants, Inc.

John Rathgeber
Senior Staff Scientist
Environmental Planning

Jennifer Peters
Group Manager
Environmental Planning

Aimee Steinbrecher
Field Scientist
Environmental Planning

Attachments

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Exhibit 3: USGS Topographic Map
Exhibit 4: National Wetland Inventory Map
Exhibit 5: Soils Map
Exhibit 6: Floodplain Map
Exhibits 7.1, 7.2, 7.3 Historic Aerials

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APPENDIX C COMMON ACRONYMS

EXECUTIVE SUMMARY

Terracon Consultants, Inc. (Terracon) conducted a delineation of waters of the United States (WOTUS) for a dam in Adair County, Oklahoma (Site). The location of the Site can be seen on *Exhibit 1* in *Appendix A*.

Terracon's qualified wetland scientists, John Rathgeber conducted a site visit on September 29, 2021 in order to assess the presence of potentially jurisdictional WOTUS within the site and the structure of the Dam to determine if rehabilitation is required. Dam No. 13 was constructed in 1966.

The site was reviewed for potential WOTUS including wetlands, following the current guidance from the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers (USACE) as presented in the USACE Jurisdictional Determination Form Instructional Guidebook. Note that the *Navigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020. The delineation of the site was conducted under the guidance of the new rule. The field work and associated report is for informational purposes only and not intended for use for permmiting.

Opinion

Terracon's opinion is that there are potentially jurisdictional features within the Site. According to the guidelines, wetland jurisdictional WOTUS are identified according to their flow regime as Traditional Navigable Waters (TNW), Relatively Permanent Waters (RPW), and Non-Relatively Permanent Waters (NRPW). Dam No. 13 has an approximately half an acre of wetland fringe assocatied with the lake and eight acres of open waters. Therefore, it is Terracon's opinion that the associated fringe wetland would be considered a WOTUS and would be subject to USACE jurisdiction under Section 404.

Terracon's opinion of potentially jurisdictional and non-jurisdictional waters is summarized as follows:

- Jurisdictional: Dam No. 13 assocated wetlands

This opinion is part of an executive summary and incomplete without the remainder of the Field Verification WOTUS report.

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) conducted a field verification of potential waters of the United States (WOTUS) for the associated wetland fringe for a dam in Adair County , Oklahoma (Site). The project is to determine the need for rehabilitation for the dam. The Site can be seen on *Exhibits 1 & 2* in *Appendix A*. Terracon conducted the field verification in order to assess the jurisdiction of WOTUS on the site. The following Exhibits are included in *Appendix A*:

- Vicinity Map (Exhibit 1)
- Site Map (Exhibit 2)
- USGS Topographic Map (Exhibit 3)
- National Wetland Inventory Map (Exhibit 4)
- Soils Map (Exhibit 5)
- Floodplain Map (Exhibit 6)

Terracon's qualified wetland scientist, Mr. John Rathgeber conducted a site visit on September 19, 2021 in order to assess the presence of potentially jurisdictional WOTUS within the site.

The site was reviewed for potential WOTUS including wetlands, following the current guidance from the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers (USACE) as presented in the USACE Jurisdictional Determination Form Instructional Guidebook. Note that the *Navigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020. The delineation of the site was conducted under the guidance of the new rule. The field work and associated report is for informational purposes only and no intended for use for permmiting

The observations and opinions contained in this report are based on guidance, regulations, and data available after June 22, 2020 as well as site conditions encountered at the time of the site reconnaissance. Guidance, regulations, data furnished by others, and site conditions are dynamic and subject to changes beyond the control of Terracon. A future evaluation may yield differing results.

This Field verification WOTUS report is prepared for the exclusive use and reliance of Conservation Works JV, LLC and the Natural Resouces Conservation Service (NRCS). Use or reliance by any other party except a governmental entity having jurisdiction over the site is prohibited without the written authorization of Conservation Works JV, LLC, NRCS and Terracon.

Reliance on the Field verification WOTUS report by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the proposal, Field verification WOTUS report, and the Agreement for Services.

2.0 PRELIMINARY DATA GATHERING AND ANALYSIS

Prior to performing the site visit, several map and aerial photograph resources were reviewed to assist with identifying suspect WOTUS, including wetlands, at the site. Each source of data is described below.

2.1 Topographic Map

The United States Department of the Interior Geologic Survey (USGS) 7.5-Minute Topographic Map of the site was reviewed to identify drainages or suspect WOTUS within the site. A portion of the Adair County quadrangle can be seen on *Exhibit 3* in *Appendix A*. The site slopes down to the pond created by the dam from approximately 1000 feet above mean sea level (MSL) to 900 feet above MSL. There appears to be multiple blueline features north, east, and west to the project Site. The blueline features do not appears to be physically connected to Sallisaw Creek. The presence of a blueline or blue feature, may indicate a potential WOTUS occurring but must be field verified to report present site conditions.

2.2 National Wetlands Inventory Map

The National Wetlands Inventory (NWI) Map of the site was reviewed to identify suspect wetland areas. The map for the site was published by the U.S. Department of the Interior's Fish and Wildlife Service (USFWS) and depicts suspect wetland areas based on stereoscopic analysis of high altitude aerial photographs. The NWI map does indicate the presence of two wetland features: Palustrine, unconsolidated bottom, flooded, diked/impounded (PUBHh) and Palustrine, emergent, persistent, seasonally flooded (PEM1C). PUBHh is associated with a freshwater pond on the west side of Dam No. 13. PEM1C is west of PUBHh and associated with a freshwater emergent wetland. Both wetlands are fed via riverine features, shown as blue lines found on *Exhibit 4* in *Appendix A*.

2.3 Soil Survey

According to the Natural Resources Conservation Service (NRCS) online Soil Data Mart and the 1980 Soil Survey of Adair County, Oklahoma, the project lies within one general soil type and two Land Resource Areas and one Region as listed in *Table 1 & 2*. *Table 3* lists the mapping units found on the site. Based on finding from the soil sampling conducted during the field survey, it appears this classification accurately describes most of the existing conditions within the Site. The soils map exhibits the general soil types and locations and is found on *Exhibit 5* in *Appendix A*.

Table 1. Soil Type

General Soil Type	Texture and Drainage	General Location	Percent of County
Lagloria Series	Deep, nearly level soils	Flood plains on drainageways	4.1

Table 2. Major Land Resource Area Land Resource Region

Major Land Resource	Land Resource Region N
Boston Mountains-117	East and Central Farming and Forest Region
Ozark Highlands-116A	East and Central Farming and Forest Region

Table 3. Mapping Units

Mapping unit	Permeability	Drainage Class	Listed as Hydric by NRCS
Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded (Ga)	0.6-2.00"/hr	Well Drained	No
Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded (Hu)	0.6-2.00"/hr	Well Drained	No

2.4 FEMA Flood Insurance Rate Map

Terracon downloaded and reviewed Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). According to the FIRM map, the site does fall within the 100-year floodplain (panel number 40001C0350D). East, or downstream of the dam, is identified as Zone A, which is defined as areas subject to inundation by the 1-percent-annual-chance flood event. The FEMA Map is included as *Exhibit 6* in *Appendix A*.

2.5 Aerial Photographs

Terracon reviewed aerial photographs to review suspect WOTUS, including wetland areas that may be present on the site. Aerial photographs from 1995, 2003, and 2019 (*Appendix A, Exhibits 7.1, 7.2, 7.3)* were analyzed to determine land use and historic changes to the site. The site is located in a mostly undeveloped Site approximately 0.9 miles west of Hamlin Hollow (S 4637 Rd / Bunch Rd). The site is bordered by riparian vegetation and agricultural land.

2.6 Wetland Hydrologic Index

Terracon downloaded and reviewed local climate data to identify current site hydrologic conditions. Data from the NRCS Agriculture Applied Climate Information System (AgACIS) was downloaded and reviewed using the Direct Antecedent Rainfall Evaluation Method (DAREM). The DAREM provides an index of climatic conditions, as they pertain to wetland hydrology, for the time period in which field data was collected. Rainfall data was obtained from the Muskogee Davis Field, OK weather station; the nearest weather station to the study area with the range of historic data available necessary to calculate the DAREM. *Table 4* and *Table 5* summarize the DAREM index data for the study area at the time of the site investigation on September 29, 2021. According to the DAREM, the Site was experiencing wetter than normal hydrologic conditions at the time of the site investigation, and field observations should be evaluated with those conditions in mind.

Table 4: Project Area Wetland Hydrologic Condition for August 2021

Prior Month	Month	WETS Percentile (in)		Measured Rainfall[1]	Condition[2]	Weight[3]	Score
		30th	70th				
1st	August	2.01	3.91	4.10	3	3	9
2nd	July	1.92	4.42	5.85	3	2	6
3rd	June	2.83	5.18	3.30	2	1	2
						Total:	17

[1]Measured rainfall recorded at Muskogee Davis Field, OK weather station
[2]Condition: 1 = monthly rainfall totals less than the 30-year Extreme Rainfall Distribution 30th percentile, 2 = monthly rainfall totals between the 30th and 70th percentile for the 30-year Extreme Rainfall Distribution, 3 = monthly rainfalls totals greater than the 70th percentile for the 30-year Extreme Rainfall Distribution
[3]Monthly weights equal 3 for the prior month, 2 for the second prior month, and 1 for the third prior month.

Table 5: DAREM Score Summary

DAREM Score (Observed Score)	6	7	8	9	10	11	12	13	14	15	16	**17**	18
DAREM Wetland Hydrologic Condition	Drier than normal				Normal					**Wetter than normal**			

3.0 FIELD OBSERVATIONS

3.1 Vegetative Community

During the site observation, three vegetation communities were found, including the *Persicaria spp* dominated species related to the assocated fringe, and the wooded acres and scattered trees with assocated grassland around the lake area. The wetland vegetation observed along the fringe area, and three stream inlets along the northern side of the lake is dominated by *Persicaria bicornis* (Pink smartweed) and *Persicaria pensylvanica* (Pennsylvania smartweed). The dominated woody species observed include various *Quercus spp* (oak species), *Ulmus spp* (elm

species) and *carya spp*. (hickory species). The understory was vegetated with saplings of the woody species, *Toxicodendron radicans* (poison ivy) and *Cornus spp.* (dogwood species). The canopy was approximately 50 percent and vegetative coverage of the forest floor with saplings and bushy wooded species at 15 percent. The area downstreamof the dam and on the north side of the lake was identified as grassland with scattered trees and woody areas.

3.2 Stream and Open Features

During the site visit, Terracon personnel identified un-named ephemeral/intermittent flow regime streams that feed into the pond assocated with Dam No. 13. These streams can be identified on the USGS topographic map as a blue line. These were observed throughout the site.

3.3 Wetlands

During the site visit, Terracon personnel performed a field reconnaissance for the presence of wetlands. No data points were taken, as the field work was limited to general observations of potential jurisdictional WOTUS and potential habitat for protected species to determine the impact of rehabilitation of Dam No. 13.

4.0 PRINCIPAL FINDINGS OF THE INVESTIGATION

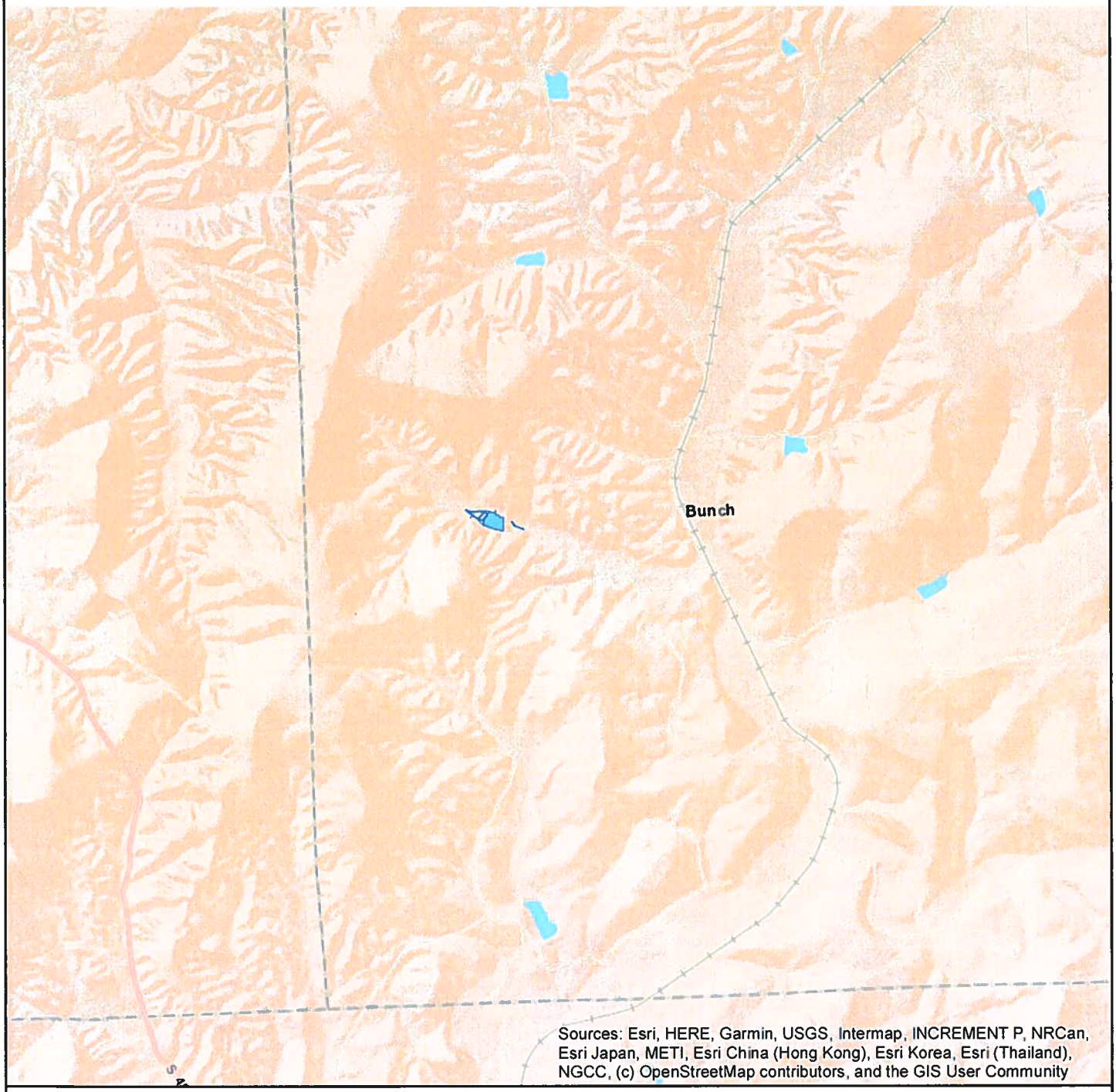
According to the Federal Register (*33CFR §328.3(a)*), WOTUS may include rivers and streams, including impoundments and other waters. Since the 2006 Supereme Court decision (*Rapanos* v. U.S., 547 S. Ct. 715), the USACE and EPA have continued to assert jurisdiction over traditionally navigable waters; non-navigable tributaries of traditionally navigable waters where the tributaries are relatively permanent waters (i.e. streams with perennial or intermittent flow); and wetlands directly abutting such tributaries.

Current USACE guidelines require a significant nexus evaluation for (1) waterbodies and tributaries that are not relatively permanent waters (i.e. ephemeral), including adjacent wetlands if present; and, (2) wetalnds adjacent to, but not directly abutting, a traditionally navigable or relatively permanent water. A significant nexus existis if the aquatic features in question have more than a speculative or insubstantial effect on the chemical, physical, or biological integrity of a traditionally navigable water. Establishment of a significant nexus is necessary to establish jurisdiction as a WOTUS.

Terracon did observe a feature within/adjacent the Site as described above; the wetlands assocated with the dam ponding to the west of Dam No. 13. Therefore, it is Terracon's opinion that the assocated wetlands would be considered a potential WOTUS and would be subject to USACE jurisdiction under Section 404. If rehabilitation of the dam was to occur, in association with compliance under NRCS TR 60 design criteria and performance standards regarding principal spillway capacity and freeboard capacity, and changes within the permanent pool

elevation was anticipated or if potentially jurisdictional wetlands impacted, mitigation for those impacts may be required.

APPENDIX A
EXHIBITS



Legend

- Fringe Wetland
- Pond
- Inlet Sheet Flow
- Steam Inlet

N

1 0.5 0 1 Miles

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 1 miles
TBPE Firm No.	F-3272
Date:	August 2021

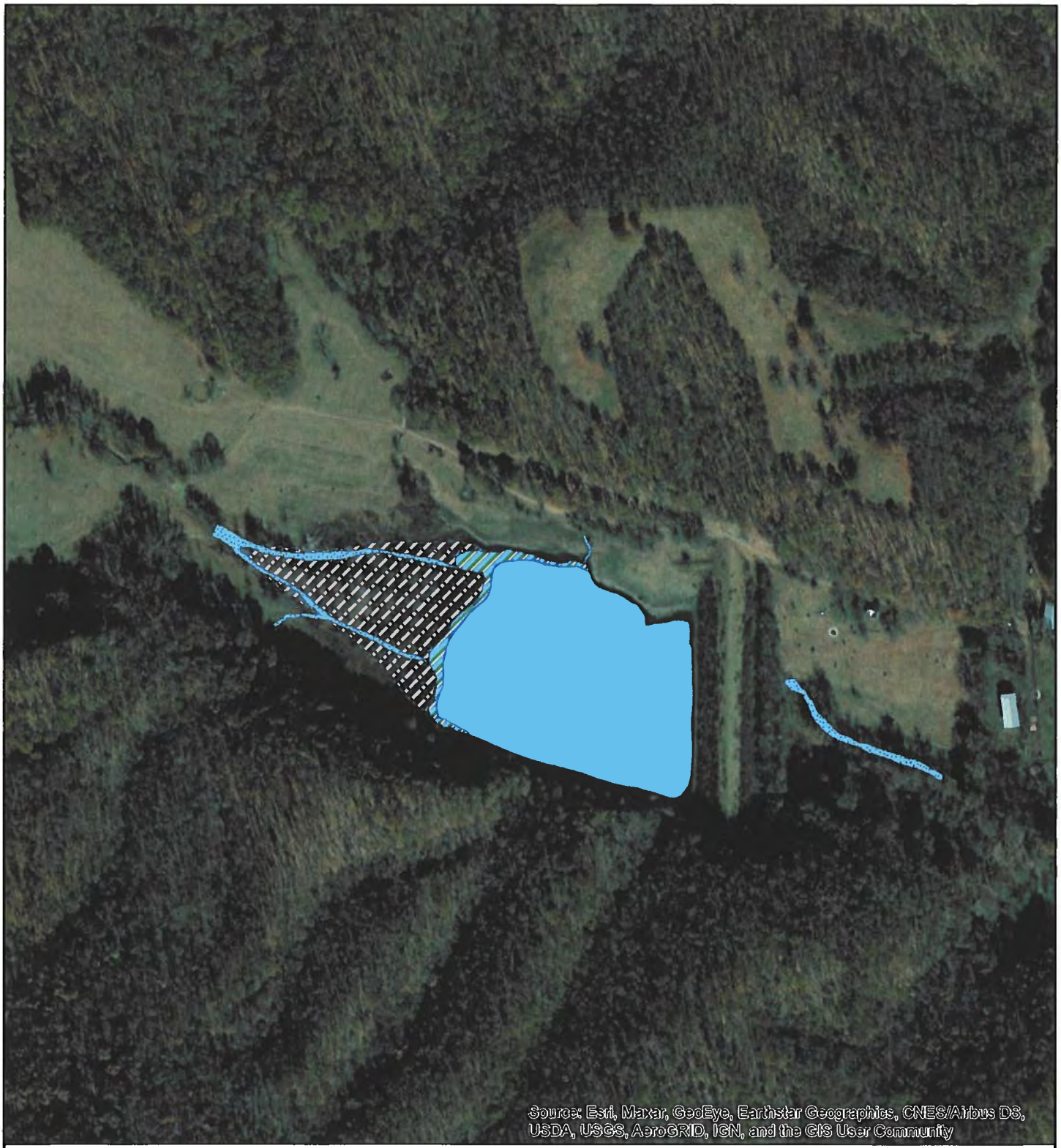
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vicinity Map

Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

1



Legend

Fringe Wetland

Pond

Inlet Sheet Flow

Steam Inlet

400 200 0 400

Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

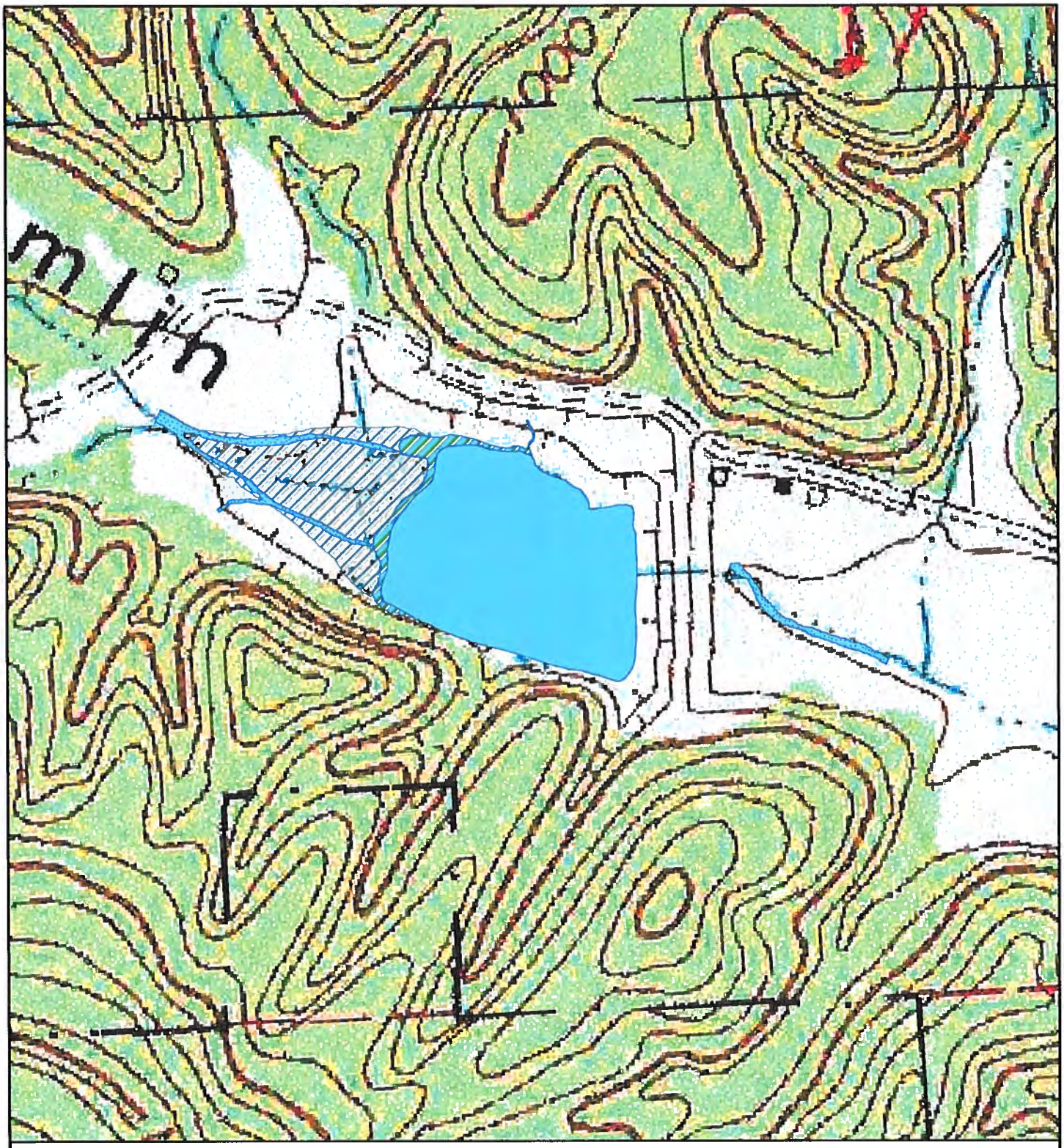
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Site Map

Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

2



Legend

Fringe Wetland

Pond

Inlet Sheet Flow

Steam Inlet

N

400 200 0 400

Feet

Project Mngr: TMJ Drawn By: AA Checked By: JP Approved By: JEH	Project No: 9021P031 Scale: 1 in = 400 feet TBPE Firm No: F-3272 Date: August 2021	Terracon Consulting Engineers & Scientists 6911 Blanco Road San Antonio, TX 78216 PH (210) 641-2112 Fax (210) 641-2124	Topographic Map **Sillisaw Dam No. 13** **Stillwell, Adair County, Oklahoma**	Exhibit 3



Legend

Fringe Wetland | Pond | NWI

Inlet Sheet Flow | Steam Inlet

N

400 200 0 400

Feet

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

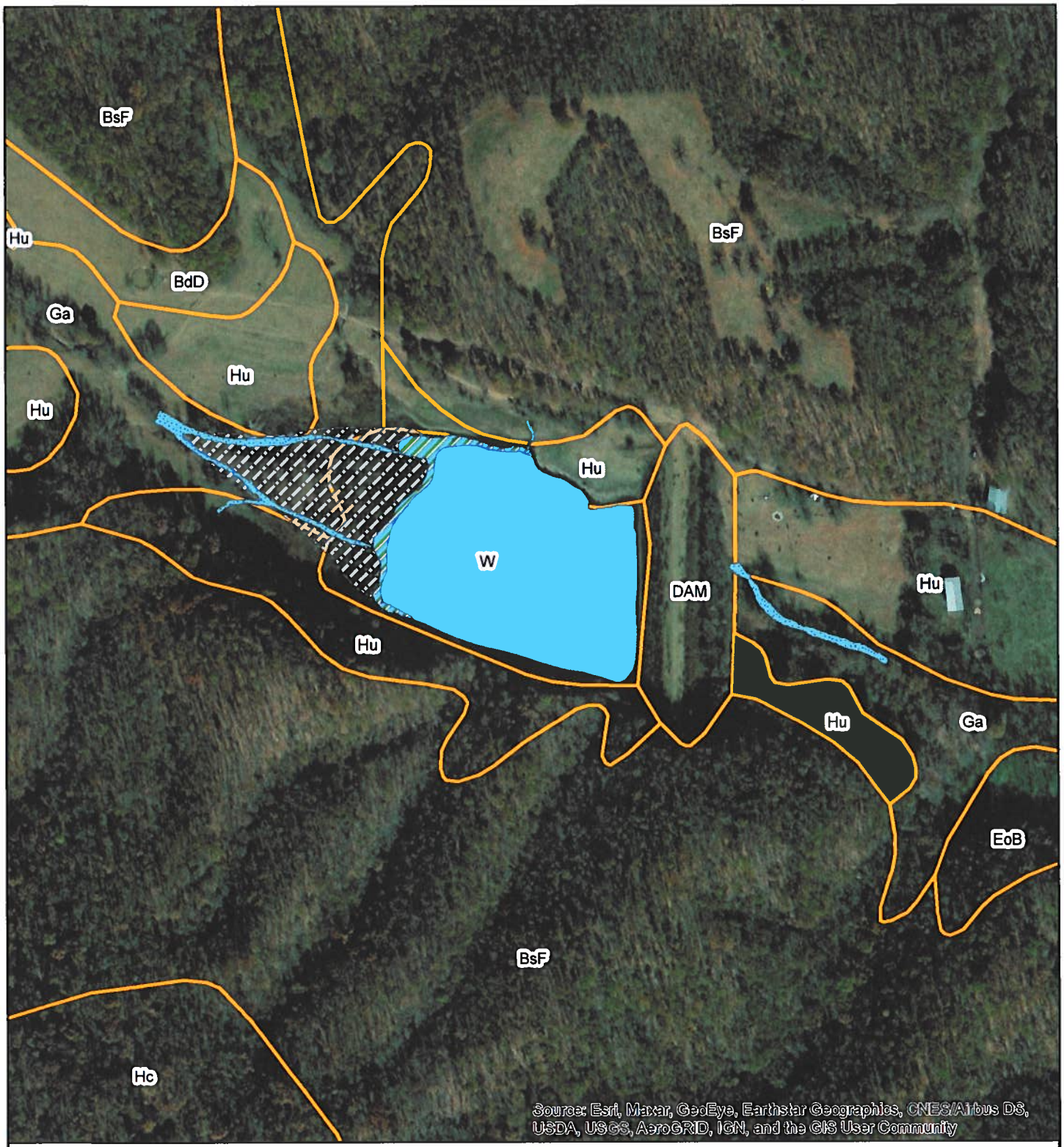
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

National Wetland Inventory Map

Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

4



Legend

Fringe Wetland | Pond | Soils

Inlet Sheet Flow | Steam Inlet

400 200 0 400 Feet

N

Project Mngr: TMJ	Project No: 9021P031	Terracon Consulting Engineers & Scientists	Topographic Map	Exhibit
Drawn By: AA	Scale: 1 in = 400 feet	6911 Blanco Road San Antonio, TX 78216	**Sillisaw Dam No. 13**	5
Checked By: JP	TBPE Firm No: F-3272	PH (210) 641-2112 Fax (210) 641-2124	**Stillwell, Adair County, Oklahoma**	
Approved By: JEH	Date: August 2021			



Legend

Fringe Wetland
Inlet Sheet Flow
Pond
Steam Inlet
A
X

400 200 0 400
Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

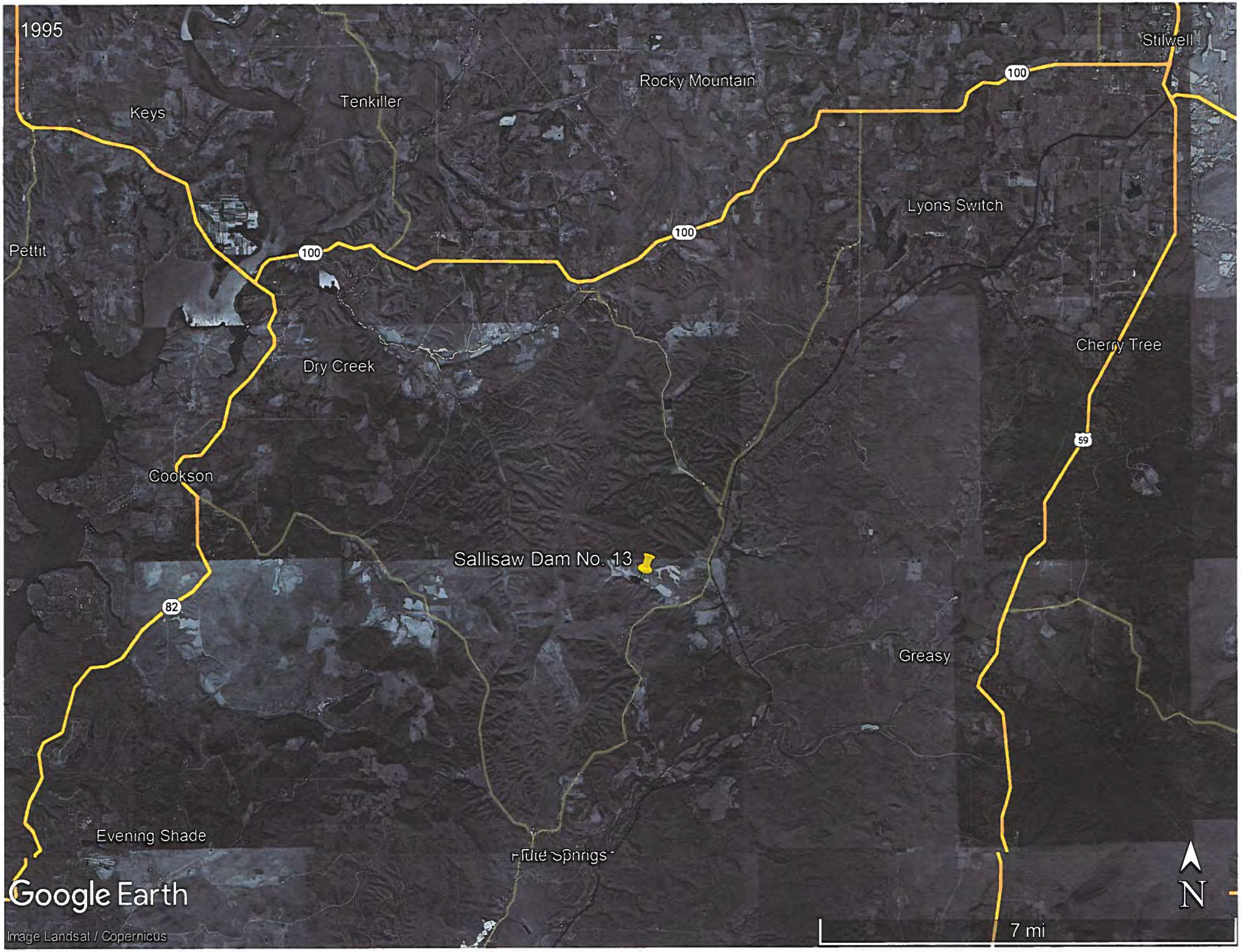
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Floodplain Map

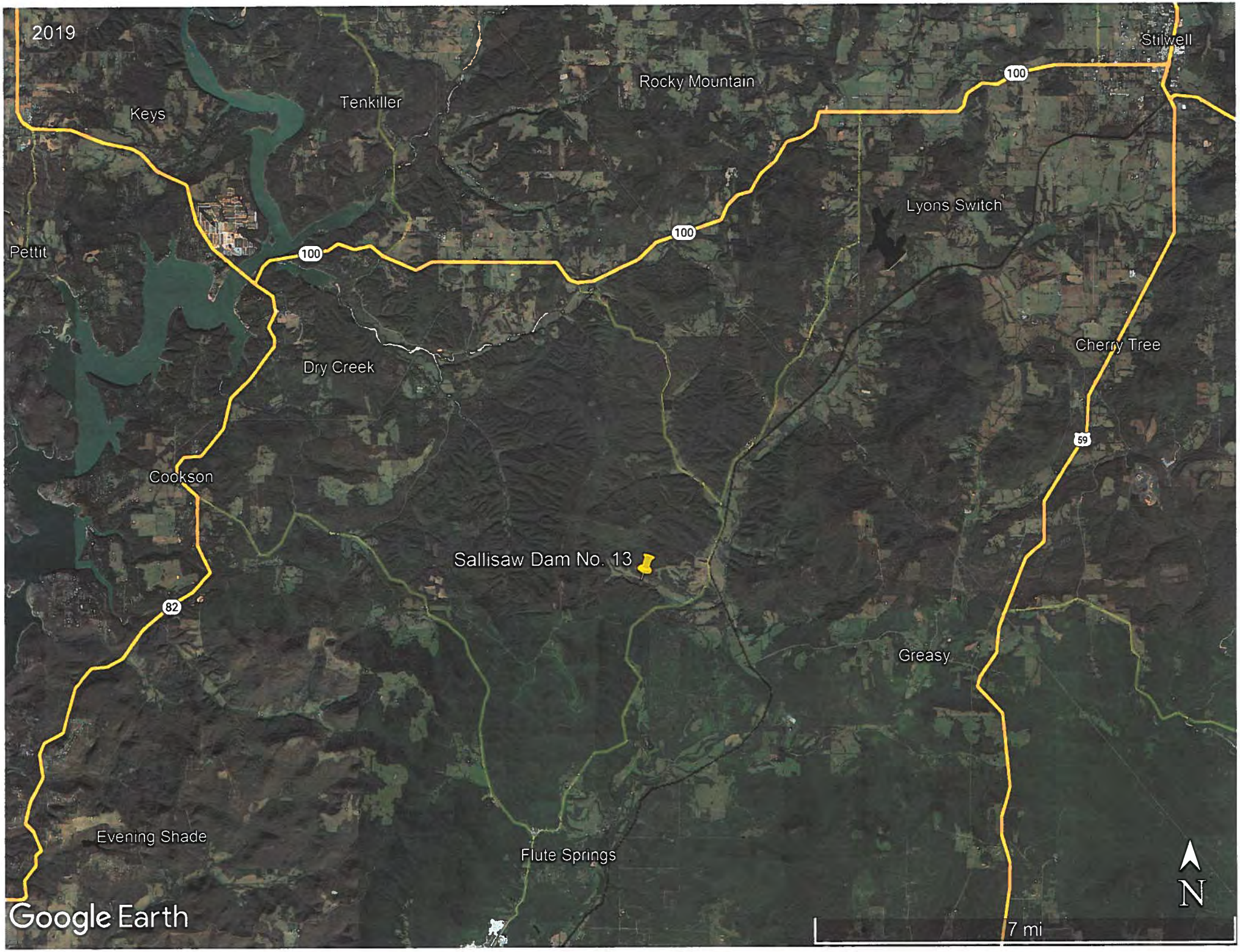
Sillisaw Dam No. 13
Stillwell, Adair County, Oklahoma

Exhibit

6


1995
Stilwell
Rocky Mountain
Tenkiller
Keys
100
Lyons Switch
Pettit
100
Cherry Tree
Dry Creek
59
Cookson
Sallisaw Dam No. 13
82
Greasy
Evening Shade
Flute Springs
Google Earth
N
7 mi
Image Landsat / Copernicus


2005
Stilwell
Rocky Mountain
Tenkiller
Keys
100
Lyons Switch
Pettit
100
100
Dry Creek
Cherry Tree
59
Cookson
Sallisaw Dam No. 13
82
Greasy
Evening Shade
Flute Springs
Google Earth
Image Landsat / Copernicus
N
7 mi


2019
Stilwell
Rocky Mountain
Tenkiller
Keys
100
Lyons Switch
Pettit
100
100
Cherry Tree
Dry Creek
59
Cookson
Sallisaw Dam No. 13
82
Greasy
Evening Shade
Flute Springs
N
Google Earth
7 mi

APPENDIX B
PHOTO LOG



Photo #1 View looking southwest from northeast portion of the dam.



Photo #2 View looking southeast from northwest portion of the lake.



Photo #3 View looking west along north shore.



Photo #4 View looking east across inlet area toward lake.



Photo #5 View of south channel west of the lake.



Photo #6 View of north channel west of the lake.



Photo #7 View of wooded area on south side of the lake.



Photo #8 View of outlet channel east of the dam.



Photo #9 View of wooded area southeast of the lake.



Photo #10 View of roadway along the north side of stream valley.

APPENDIX C
COMMON ACRONYMS

COMMON ACRONYMS

AgACIS	Agriculture Applied Climate Information System
CLOMR	Conditional Letter of Map Revision
CWA	Clean Water Act
DAREM	Direct Antecedent Rainfall Evaluation Method
DFIRM	Digital Flood Insurance Rate Map
DP	Data Point
EMS	Ecological Mapping Systems
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
GPS	Global Positioning System
IH	Interstate Highway
LiDAR	Light Detection and Ranging
NAIP	National Agricultural Imagery Program
NRCS	Natural Resources Conservation Service
NRPW	Non-Relatively Permanent Water
NWI	National Wetland Inventory
OHWM	Ordinary High Water Mark
PJD	Preliminary Jurisdictional Determination
RHA	Rivers and Harbors Act
RGL	Regional Guidance Letter
RPW	Relatively Permanent Water
TNW	Traditionally Navigable Water
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WOTUS	Waters of the U.S.

Preliminary WOTUS Field Verification Report

Sallisaw Creek Watershed Dam No. 19

Adair County, Oklahoma

January 10, 2022

Terracon Project No. 96217693



Prepared for:
Natural Resources Conservation Service
Adair County, Oklahoma

Prepared by:
Terracon Consultants, Inc.
San Antonio, Texas

6911 Blanco Road (210)641-2112
San Antonio, TX 78216 terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

January 10, 2022

Attn: Mr. Terry Feldmann
Conservation Works JV, LLC
3116 North Dries Lane, Suite 100
Peoria, Illinois 61604

Re: **Field Verification Report Waters of the U.S. Delineation**
Sallisaw Creek Dam No. 19
Stillwell, Adair County, Oklahoma
Terracon Project No. 96217693

Dear Mr. Feldmann:

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed Preliminary Waters of the United States (WOTUS) Delineation report for the above-referenced site. On September 29, 2021, Terracon sent a qualified wetland scientist to perform a delineation of the site to determine the presence/absence of jurisdictional WOTUS.

Based on site conditions at the time of reconnaissance, **it is Terracon's opinion that there are jurisdictional features present within the site**; however, the U.S. Army Corps of Engineers (USACE) is the official agency to make the final determination of the location, type, and extent of jurisdictional WOTUS. Should the proposed project change, please contact Terracon to discuss if formal coordination would be required. Note that the N*avigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020.

We appreciate the opportunity to be of service to you on this project. For more detailed information on all of Terracon's services please visit our website at www.terracon.com. If there are any questions regarding this report or if we may be of further assistance, please do not hesitate to contact John Rathgeber at (316) 448-3985 or by e-mail at John.rathgeber@terracon.com.

Sincerely,
Terracon Consultants, Inc.

John Rathgeber
Senior Staff Scientist
Environmental Planning

Jennifer Peters
Group Manager
Environmental Planning

Aimee Steinbrecher
Field Scientist
Environmental Planning

Attachments

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APPENDIX C COMMON ACRONYMS

EXECUTIVE SUMMARY

Terracon Consultants, Inc. (Terracon) conducted a delineation of waters of the United States (WOTUS) for a dam in Adair County, Oklahoma (Site). The location of the Site can be seen on *Exhibit 1* in *Appendix A*.

Terracon's qualified wetland scientists, John Rathgeber conducted a site visit on September 29, 2021 in order to assess the presence of potentially jurisdictional WOTUS within the site and the structure of the Dam to determine if rehabilitation is required. Dam No. 19 was constructed in 1968, drafted under then 1961 Sallisaw Creek Watershed Work Plan.

The site was reviewed for potential WOTUS including wetlands, following the current guidance from the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers (USACE) as presented in the USACE Jurisdictional Determination Form Instructional Guidebook. Note that the *Navigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020. The delineation of the site was conducted under the guidance of the new rule. The field work and associated report is for informational purposes only and not intended for use for permitting.

Opinion

Terracon's opinion is that there are potentially jurisdictional features within the Site. According to the guidelines, wetland jurisdictional WOTUS are identified according to their flow regime as Traditional Navigable Waters (TNW), Relatively Permanent Waters (RPW), and Non-Relatively Permanent Waters (NRPW). Dam No. 19 has an approximately three acres of wetland fringe assocatied with the lake and fourty acres of open waters. Therefore, it is Terracon's opinion that the associated fringe wetland would be considered a WOTUS and would be subject to USACE jurisdiction under Section 404.

Terracon's opinion of potentially jurisdictional and non-jurisdictional waters is summarized as follows:

- Jurisdictional: Dam No. 19 assocated wetlands

This opinion is part of an executive summary and incomplete without the remainder of the Field Verification WOTUS report.

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) conducted a field verification of potential waters of the United States (WOTUS) for the associated wetland fringe for a dam in Adair County , Oklahoma (Site). The project is to determine the need for rehabilitation for the dam. The Site can be seen on *Exhibits 1 & 2* in *Appendix A*. Terracon conducted the field verification in order to assess the jurisdiction of WOTUS on the site. The following Exhibits are included in *Appendix A*:

- Vicinity Map (Exhibit 1)
- Site Map (Exhibit 2)
- USGS Topographic Map (Exhibit 3)
- National Wetland Inventory Map (Exhibit 4)
- Soils Map (Exhibit 5)
- Floodplain Map (Exhibit 6)

Terracon's qualified wetland scientist, Mr. John Rathgeber conducted a site visit on September 19, 2021 in order to assess the presence of potentially jurisdictional WOTUS within the site.

The site was reviewed for potential WOTUS, including wetlands, following the current guidance form the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) as presented in the USACE Jurisdictional Determination Form Instructional Guidebook. Note that the *Navigable Waters Protection Rule to define "Waters if the United States"* took effect on June 22, 2020. The delineation of the site was conducted under the guidance of the new rule. The field work and associtated report is for informational purposes only and not intended for use of permitting.

The observations and opinions contained in this report are based on guidance, regulations, and data available after June 22, 2020 as well as site conditions encountered at the time of the site reconnaissance. Guidance, regulations, data furnished by others, and site conditions are dynamic and subject to changes beyond the control of Terracon. A future evaluation may yield differing results.

This Field verification WOTUS report is prepared for the exclusive use and reliance of Conservation Works JV, LLC and the Natural Resouces Conservation Service (NRCS). Use or reliance by any other party except a governmental entity having jurisdiction over the site is prohibited without the written authorization of Conservation Works JV, LLC, NRCS and Terracon.

Reliance on the Field Verification Report by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the proposal, Preliminary WOTUS Delineation report, and the Agreement for Services.

2.0 PRELIMINARY DATA GATHERING AND ANALYSIS

Prior to performing the site visit, several map and aerial photograph resources were reviewed to assist with identifying suspect WOTUS, including wetlands, at the site. Each source of data is described below.

2.1 Topographic Map

The United States Department of the Interior Geologic Survey (USGS) 7.5-Minute Topographic Map of the site was reviewed to identify drainages or suspect WOTUS within the site. A portion of the Adair County quadrangle can be seen on *Exhibit 3* in *Appendix A*. The site slopes down to the pond created by the dam from approximately 983 feet above mean sea level (MSL) to 943 feet above MSL. There appears to be multiple blueline features north, east, and west to the project Site. The presence of a blueline or blue feature, may indicate a potential WOTUS occurring but must be field verified to report present site conditions.

2.2 National Wetlands Inventory Map

The National Wetlands Inventory (NWI) Map of the site was reviewed to identify suspect wetland areas. The map for the site was published by the U.S. Department of the Interior's Fish and Wildlife Service (USFWS) and depicts suspect wetland areas based on stereoscopic analysis of high altitude aerial photographs. The NWI map does indicate the presence of one wetland feature: Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded (L1UBHh). There is a second wetland feature to the southwest of the dam that is potntally outside of the project area listed as a Palustrine, Forested, Broad-Leaved Deciduous, Temperary Flooded (PFO1A). The wetlands are fed via riverine features, shown as blue lines found on *Exhibit 4* in *Appendix A.*

Freshwater, Forested, Shurb, Wetlands are indicated to the southwest of the dam, adjacent to Sallisaw creek and downstream of the dam.

2.3 Soil Survey

According to the Natural Resources Conservation Service (NRCS) online Soil Data Mart and the 1980 Soil Survey of Adair County, Oklahoma, the project lies within three general soil types and One Land Resource Areas and Region as listed in *Table 1 & 2. Table 3* lists the mapping units found on the site. Based on finding from the soil sampling conducted during the field survey, it appears this classification accurately describes most of the existing conditions within the Site. The soils map exhibits the general soil types and locations and is found on *Exhibit 5* in *Appendix A*.

Table 1. Soil Type

General Soil Type	Texture and Drainage	General Location	Percent of County
Clarksville	Deep, steep soils	Back/Side Slopes	28.6
Wauben	Very deep, level soils	Foot/base Slopes	8.2
Elsah	Deep, Level soils	Floodplains on drainageways	4.1

Table 2. Major Land Resource Area Land Resource Region

Major Land Resource	Land Resource Region N
Ozark Highlands-116A	East and Central Farming and Forest Region

Table 3. Mapping Units

Mapping unit	Permeability	Drainage Class	Listed as Hydric by NRCS
Clarksville stony silt loam, 5 to 15 percent slopes (BoE)	0.60"-2.00"/hr	Somewhat Excessively Drained	No
Clarksville very gravelly silt loam, 20 to 50 percent slopes, stony (BsF)	0.06"-1.98"/hr	Somewhat Excessively Drained	No
Waben gravelly silt loam, 0 to 1 percent slopes (EoB)	2.00"-6.00"/hr	Well Drained	No
Waben gravelly silt loam, 3 to 8 percent slopes (EtD)	2.00"-6.00"/hr	Well Drained	No
Elsah gravelly silt loam, 0 to 1 percent slopes, frequently flooded (Ga)	0.60"-2.00"/hr	Well Drained	No
Elsah gravelly loam, 0 to 1 percent slopes, occasionally flooded (Hu)	0.60"-2.00"/hr	Well Drained	No

2.4 FEMA Flood Insurance Rate Map

Terracon downloaded and reviewed Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). According to the FIRM map, the site does fall within the 100-year floodplain (panel number 40001C0270D). The site is identified as Zone A, which is defined as areas subject to inundation by the 1-percent-annual-chance flood event. The FEMA Map is included as *Exhibit 6* in *Appendix A*.

2.5 Aerial Photographs

Terracon reviewed aerial photographs to review suspect WOTUS, including wetland areas that may be present on the site. Aerial photograph from 1995, 2003, and 2019 (*Appendix A, Exhibit 7-9*) was analyzed to determine land use and historic changes to the site. The site is located in a mostly undeveloped Site near the railroad intersection of E 850Rd/S4690 Rd and S-19. The site is bordered by riparian vegetation and agricultural land.

The downstream wetland feature noted on the NWI was not observed on the aerial photos, due to extensive aboroal cover.

2.6 Wetland Hydrologic Index

Terracon downloaded and reviewed local climate data to identify current site hydrologic conditions. Data from the NRCS Agriculture Applied Climate Information System (AgACIS) was downloaded and reviewed using the Direct Antecedent Rainfall Evaluation Method (DAREM). The DAREM provides an index of climatic conditions, as they pertain to wetland hydrology, for the time period in which field data was collected. Rainfall data was obtained from the Muskogee Davis Field, OK weather station; the nearest weather station to the study area with the range of historic data available necessary to calculate the DAREM. *Table 4* and *Table 5* summarize the DAREM index data for the study area at the time of the site investigation on September 29, 2021. According to the DAREM, the Site was experiencing wetter than normal hydrologic conditions at the time of the site investigation, and field observations should be evaluated with those conditions in mind.

Table 4: Project Area Wetland Hydrologic Condition for August 2021

Prior Month	Month	WETS Percentile (in)		Measured Rainfall[1]	Condition[2]	Weight[3]	Score
		30th	70th				
1st	August	2.01	3.91	4.10	3	3	9
2nd	July	1.92	4.42	5.85	3	2	6
3rd	June	2.83	5.18	3.30	2	1	2
						Total:	17

[1]Measured rainfall recorded at Muskogee Davis Field, OK weather station

[2]Condition: 1 = monthly rainfall totals less than the 30-year Extreme Rainfall Distribution 30th percentile, 2 = monthly rainfall totals between the 30th and 70th percentile for the 30-year Extreme Rainfall Distribution, 3 = monthly rainfalls totals greater than the 70th percentile for the 30-year Extreme Rainfall Distribution

[3]Monthly weights equal 3 for the prior month, 2 for the second prior month, and 1 for the third prior month.

Table 5: DAREM Score Summary

DAREM Score (Observed Score)	6	7	8	9	10	11	12	13	14	15	16	**17**	18
DAREM Wetland Hydrologic Condition	Drier than normal				Normal					**Wetter than normal**			

3.0 FIELD OBSERVATIONS

3.1 Vegetative Community

During the site observation, three vegetation communities were found, including fringe wetland, wooded acres, and scattered trees with assocated grassland around the lake area. The wetland vegetation observed along the fringe area, and three stream inlets along the northern side of the lake, and the outlet pool/fringe of Sallisaw Creek is dominated by *Persicaria bicornis* (Pink smartweed), *Persicaria pensylvanica* (Pennsylvania smartweed), and *Eleocharis palustris* (Spike rush). The dominated woody species observed include various *Quercus spp* (oak species), *Ulmus spp* (elm species) and *carya spp*. (hickory species). The understory was vegetated with saplings of the woody species, *Toxicodendron radicans* (poison ivy) and *Cornus spp.* (dogwood species). The canopy was approximately 60 percent and vegetative coverage of the forest floor with saplings and bushy wooded species at 10 percent. The area downstream of the dam and on the north side of the lake was identified as grassland with scattered trees and woody areas.

3.2 Stream and Open Features

During the site visit, Terracon personnel identified un-named ephemeral/intermittent flow regime streams that feed into the pond assocated with Dam No. 19. These streams can be identified on the USGS topographic map as a blue line. These were observed throughout the site.

3.3 Wetlands

During the site visit, Terracon personnel performed a field reconnaissance for the presence of wetlands. No data points were taken, as the field work was limited to general observations of potential jurisdictional WOTUS and potential habitat for protected species to determine the impact of rehabilitation of Dam No. 19.

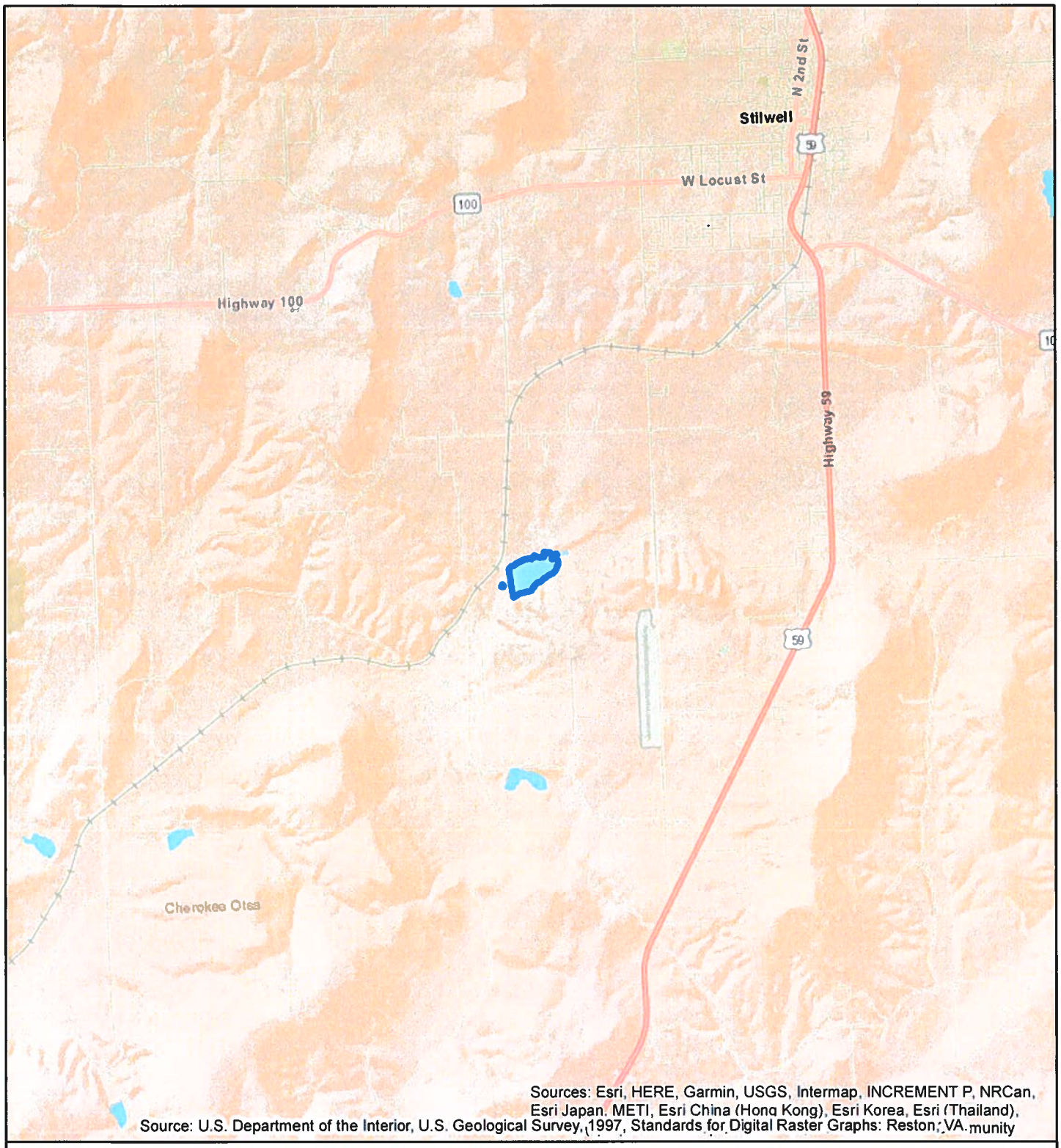
4.0 PRINCIPAL FINDINGS OF THE INVESTIGATION

According to the Federal Register (*33CFR §328.3(a)*), WOTUS may include rivers and streams, including impoundments and other waters. Since the 2006 Supereme Court decision (*Rapanos* v. U.S., 547 S. Ct. 715), the USACE and EPA have continued to assert jurisdiction over traditionally navigable waters; non-navigable tributaries of traditionally navigable waters where the tributaries are relatively permanent waters (i.e. streams with perennial or intermittent flow); and wetlands directly abutting such tributaries.

Current USACE guidelines require a significant nexus evaluation for (1) waterbodies and tributaries that are not relatively permanent waters (i.e. ephemeral), including adjacent wetlands if present; and, (2) wetalnds adjacent to, but not directly abutting, a traditionally navigable or relatively permanent water. A significant nexus existis if the aquatic features in question have more than a speculative or insubstantial effect on the chemical, physical, or biological integrity of a traditionally navigable water. Establishment of a significant nexus is necessary to establish jurisdiction as a WOTUS.

Terracon did observe a feature within/adjacent the Site as described above; the wetlands assocated with the dam ponding to the east of Dam No. 19. Therefore, it is Terracon's opinion that the assocated wetlands would be considered a potential WOTUS and would be subject to USACE jurisdiction under Section 404. If rehabilitation of the dam was to occur, in association with compliance under NRCS TR 60 design criteria and performance standards regarding principal spillway capacity and freeboard capacity, and changes within the permanent pool elevation was anticipated or if potentially jurisdictional wetlands impacted, mitigation for those impacts may be required.

APPENDIX A
EXHIBITS



Legend

Pond Wetland

1 0.5 0 1 Miles

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 1 miles
TBPE Firm No.	F-3272
Date:	August 2021

Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Vicinity Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

1



Legend

Pond Wetland

400 200 0 400

Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

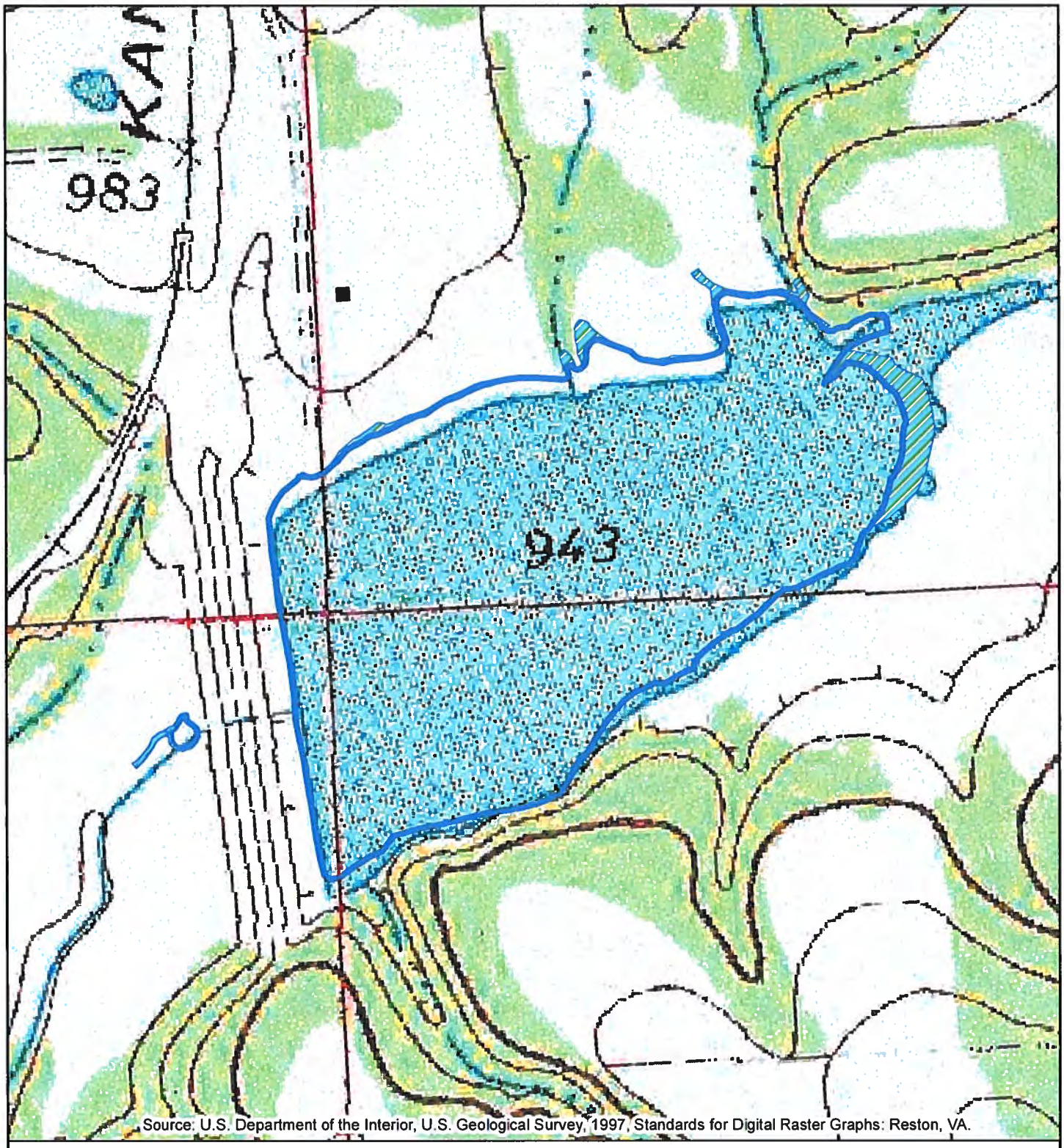
Terracon
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Site Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

2



Legend

Pond Wetland

400 200 0 400

Feet

N

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

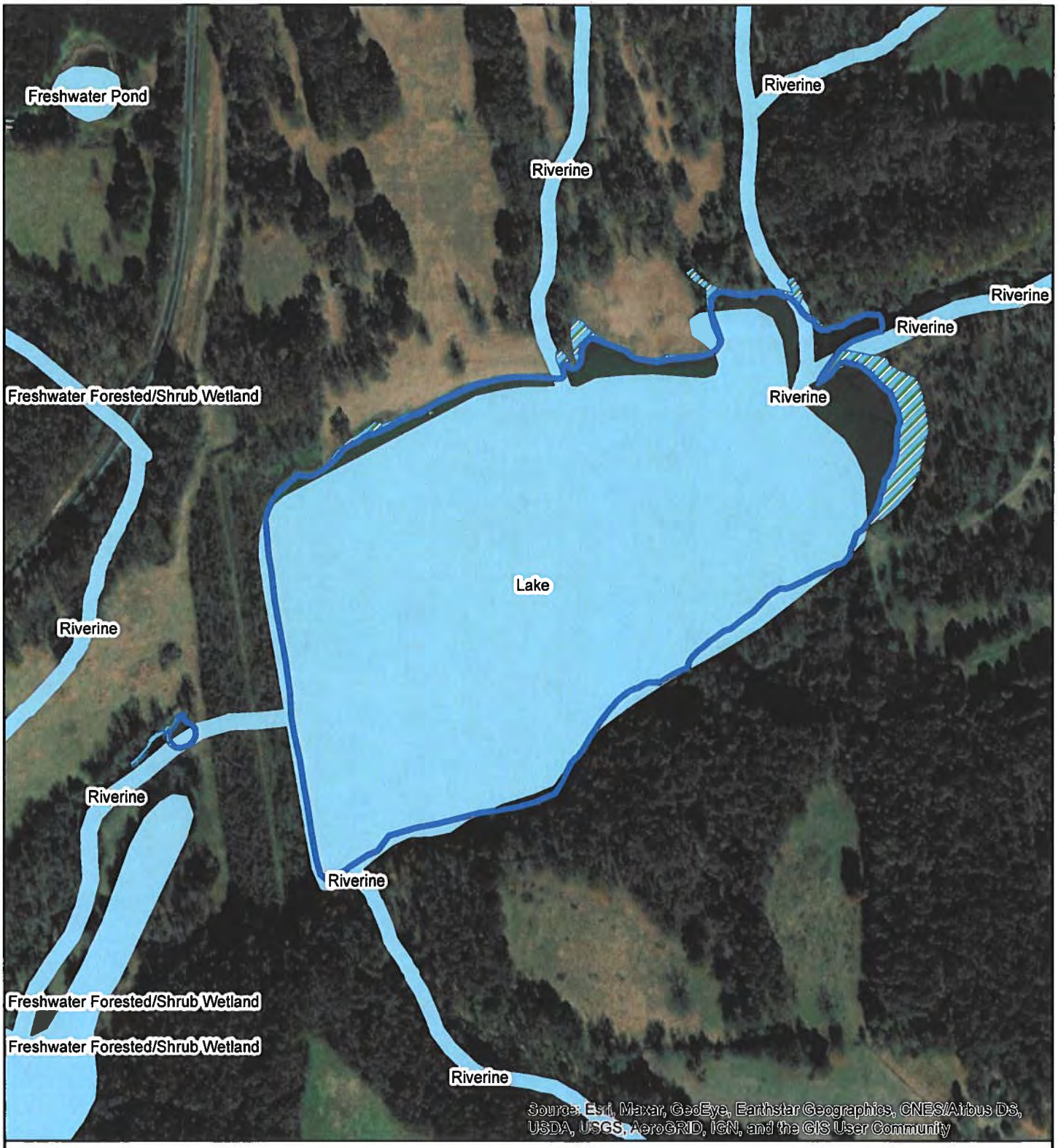
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

Topographic Map

Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

3



Legend

Pond | Wetland | NWI

400 200 0 400

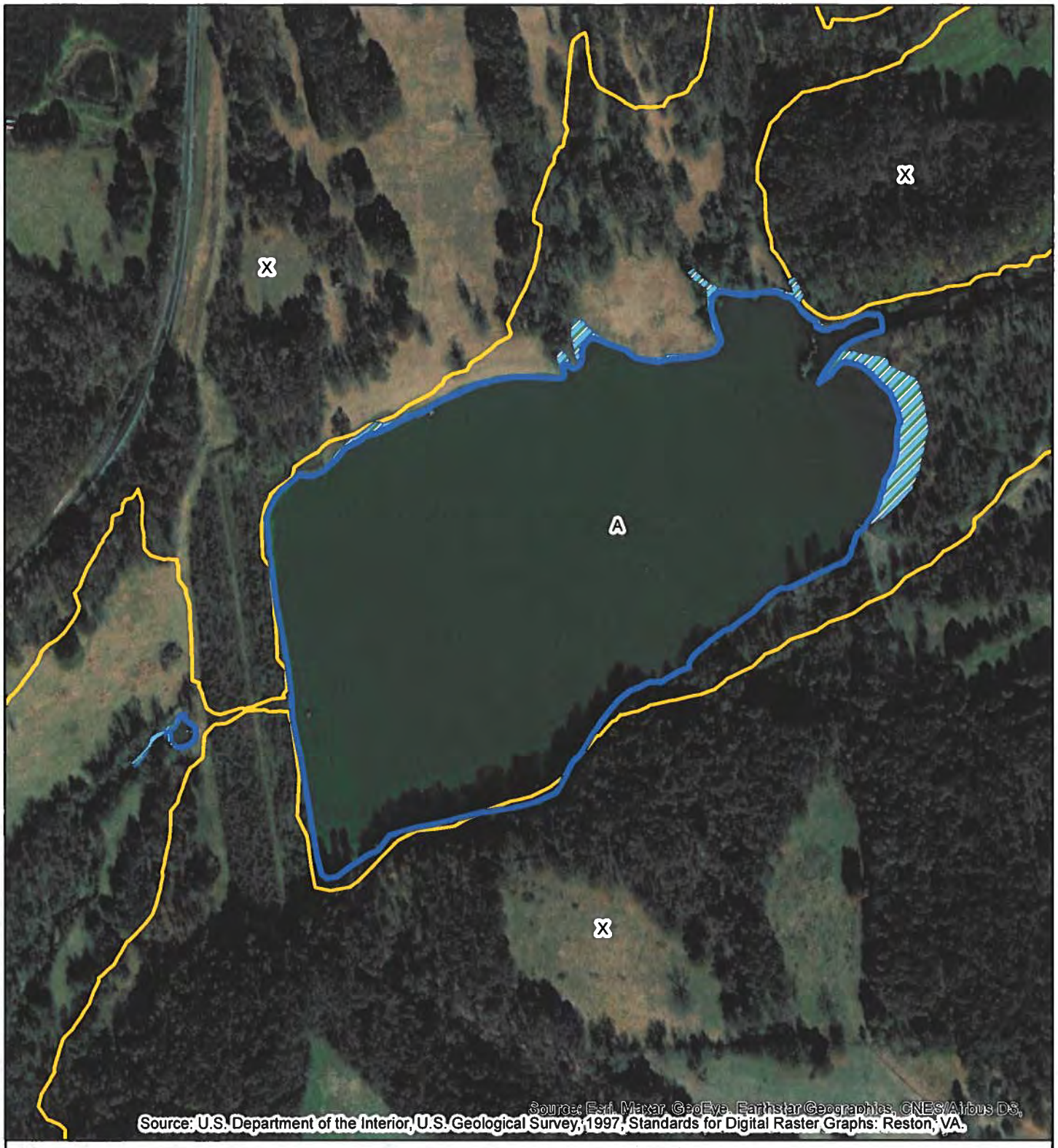
Feet

N

Project Mngr: TMJ Drawn By: AA Checked By: JP Approved By: JEH	Project No. 9021P031 Scale: 1 in = 400 feet TBPE Firm No. F-3272 Date: August 2021	Terracon Consulting Engineers & Scientists 6911 Blanco Road San Antonio, TX 78216 PH (210) 641-2112 Fax (210) 641-2124	NWI Map **Sillisaw Dam No. 19** **Stillwell, Adair County, Oklahoma**	Exhibit 4



Project Mngr: TMJ Drawn By: AA Checked By: JP Approved By: JEH	Project No. 9021P031 Scale: 1 in = 400 feet TBPE Firm No. F-3272 Date: August 2021	Terracon Consulting Engineers & Scientists 6911 Blanco Road San Antonio, TX 78216 PH (210) 641-2112 Fax (210) 641-2124	Soils Map **Sillisaw Dam No. 19** **Stillwell, Adair County, Oklahoma**	Exhibit 5



Legend

Pond
Wetland
A
X

N

400 200 0 400
Feet

Project Mngr:	TMJ
Drawn By:	AA
Checked By:	JP
Approved By:	JEH

Project No.	9021P031
Scale:	1 in = 400 feet
TBPE Firm No.	F-3272
Date:	August 2021

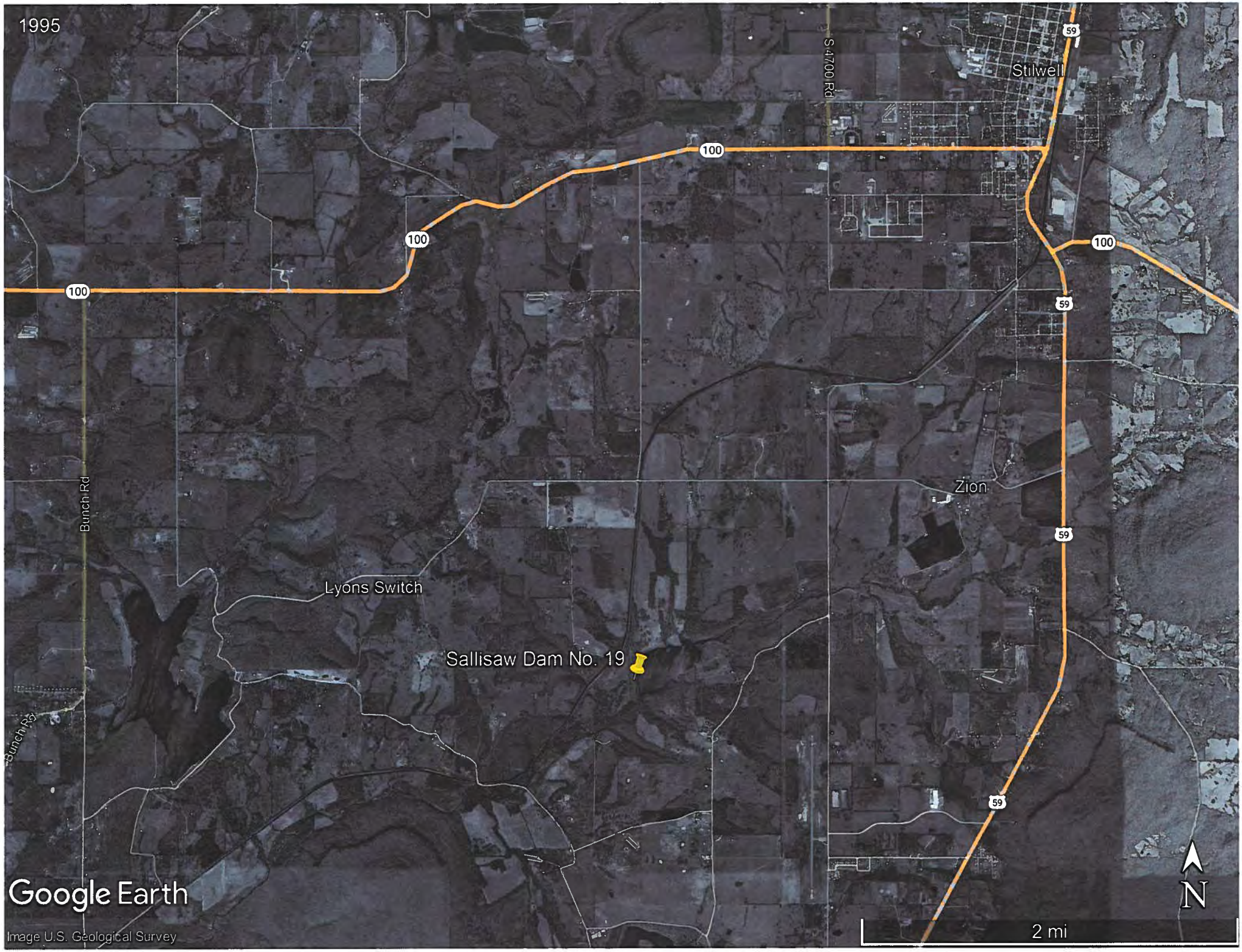
Terracon
Consulting Engineers & Scientists
6911 Blanco Road San Antonio, TX 78216
PH (210) 641-2112 Fax (210) 641-2124

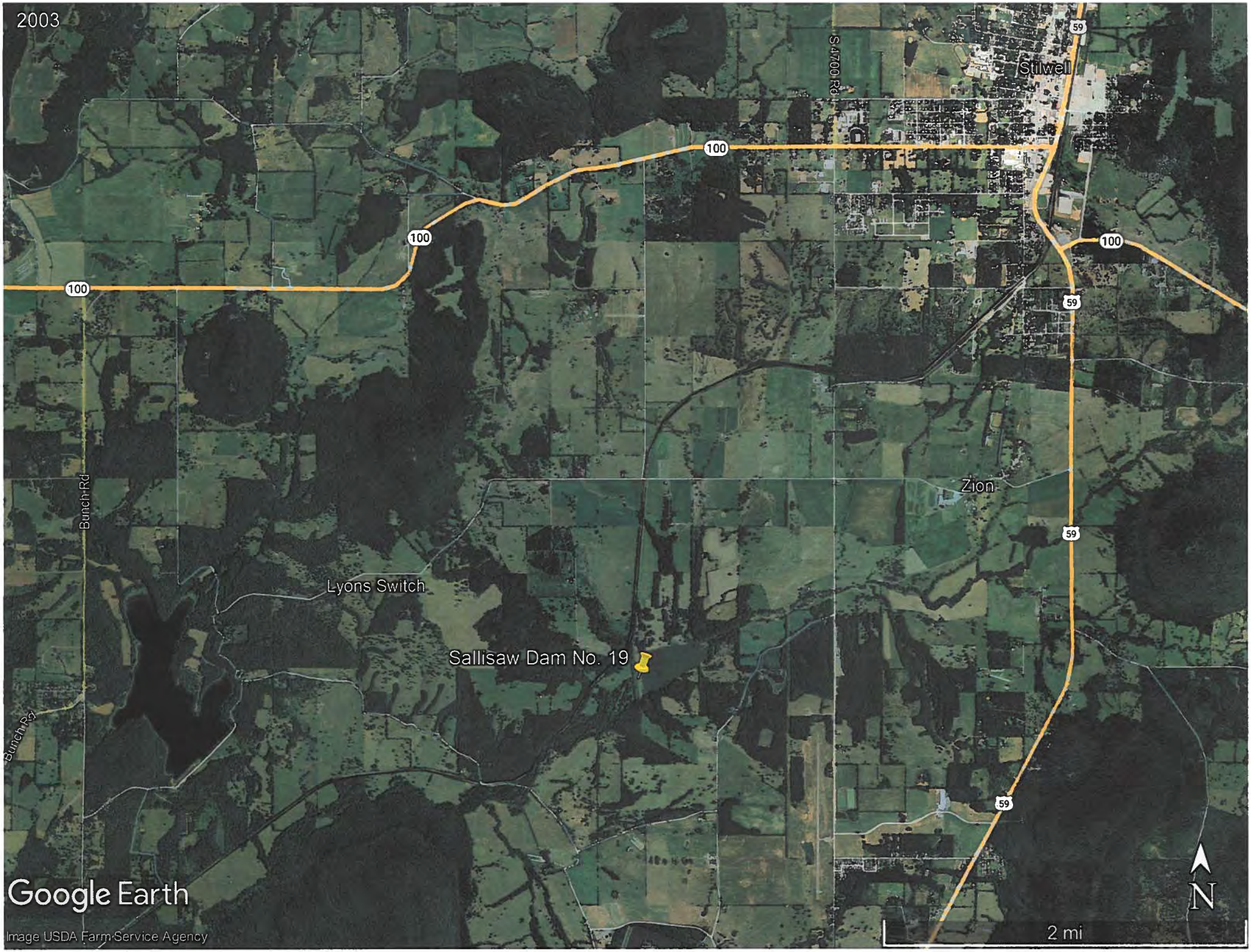
Floodplain Map

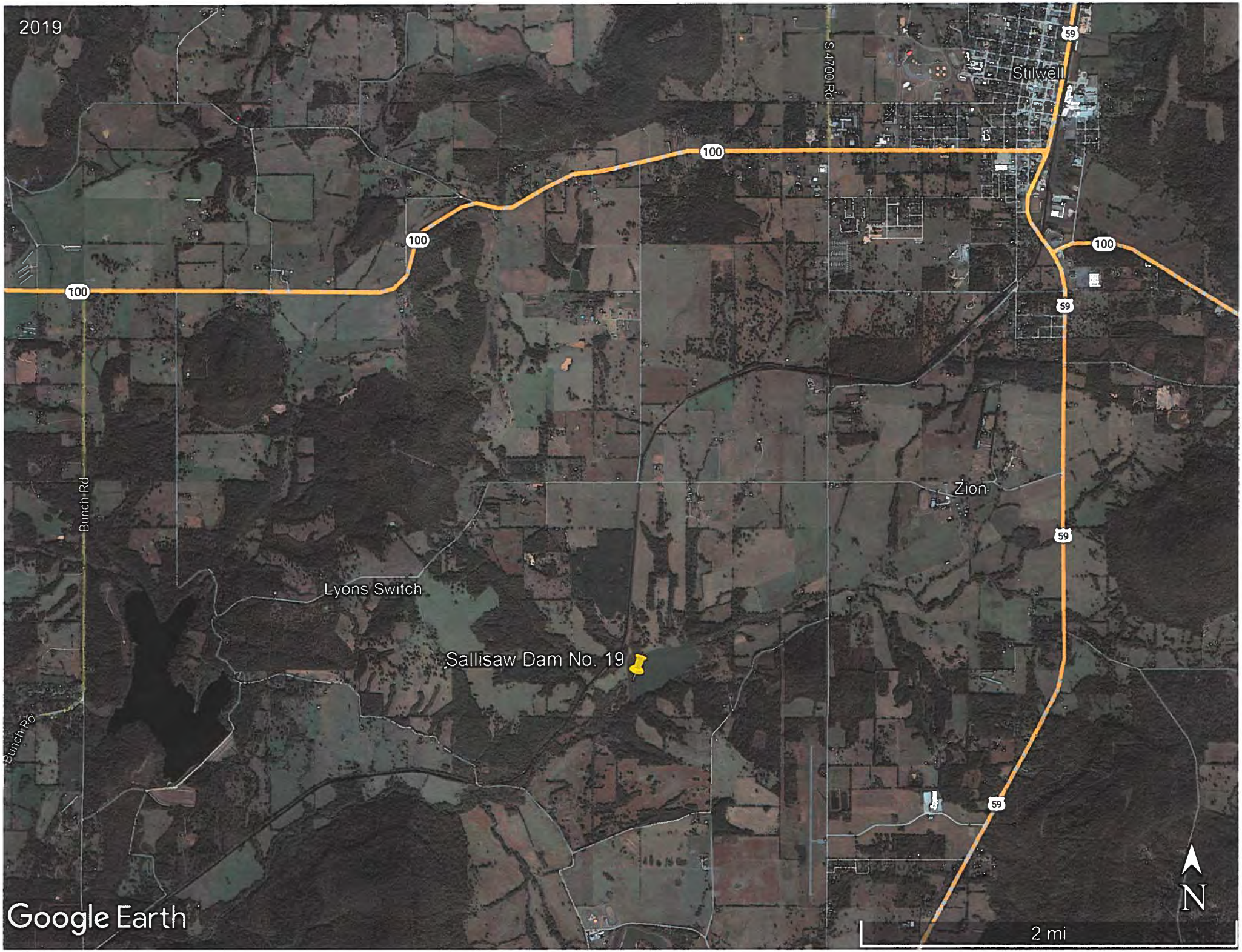
Sillisaw Dam No. 19
Stillwell, Adair County, Oklahoma

Exhibit

6


1995
S 4700 Rd
Stilwell
100
100
100
59
59
59
59
Bunch Rd
Zion
Lyons Switch
Sallisaw Dam No. 19
Bunch Rd
Google Earth
Image U.S. Geological Survey
N
2 mi


2003
S4700 Rd
Stilwell
59
100
100
100
59
Zion
59
Bunch Rd
Lyons Switch
Sallisaw Dam No. 19
Bunch Rd
59
Google Earth
Image USDA Farm Service Agency
N
2 mi


2019
S 4700 Rd
Stilwell
100
100
100
59
59
59
59
Bunch Rd
Bunch Rd
Zion
Lyons Switch
Sallisaw Dam No. 19
Google Earth
N
2 mi

APPENDIX B
PHOTO LOG



Photo #1 View looking east from southeast portion of the dam.



Photo #2 View looking southeast from northeast portion of the dam.



Photo #3 View of the outlet pool west of the dam.



Photo #4 View of Sallisaw Creek west of the outlet pool.



Photo #5 View of north shore looking east.



Photo #6 View of small inlet stream on north side of lake.



Photo #7 View of wooded area on south side of the lake.



Photo #8 View looking south at the northern end of site.



Photo #9 View of small inlet stream on north side of lake.



Photo #10 View of inlet stream on northeast side of lake.



Photo #11 Overview of inlet steam on the northeast side of the lake.



Photo #12 View channel of Sallisaw Creek upstream of the lake.

APPENDIX C
COMMON ACRONYMS

COMMON ACRONYMS

AgACIS	Agriculture Applied Climate Information System
CLOMR	Conditional Letter of Map Revision
CWA	Clean Water Act
DAREM	Direct Antecedent Rainfall Evaluation Method
DFIRM	Digital Flood Insurance Rate Map
DP	Data Point
EMS	Ecological Mapping Systems
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
GPS	Global Positioning System
IH	Interstate Highway
LiDAR	Light Detection and Ranging
NAIP	National Agricultural Imagery Program
NRCS	Natural Resources Conservation Service
NRPW	Non-Relatively Permanent Water
NWI	National Wetland Inventory
OHWM	Ordinary High Water Mark
PJD	Preliminary Jurisdictional Determination
RHA	Rivers and Harbors Act
RGL	Regional Guidance Letter
RPW	Relatively Permanent Water
TNW	Traditionally Navigable Water
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WOTUS	Waters of the U.S.