May 31, 2024
File No. 27220345.00

Mr. Jeff Biddick
Oklahoma Department of Environmental Quality
Division of Land Protection
707 N. Robinson
P.O. Box 1677
Oklahoma City, OK 73101-1677

Subject: **Tier III Permit Modification**
American Environmental Landfill
ODEQ Permit No.: 3557021

Dear Mr. Biddick:

On behalf of our Client, American Environmental Landfill, Inc., SCS Engineers is submitting this permit modification to permit the approximate 203-acre lateral expansion, establish permit base grades for such area, and permit a leachate storage impoundment at the American Environmental Landfill.

We trust this Tier III Permit Modification includes all information sufficient for your approval. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 265-3960. Thank you very much for your time and effort in this matter.

Sincerely,

Wade J. Miller
Project Director
SCS Engineers

Floyd Cotter, P.E.
Vice President
SCS Engineers

cc: Mr. Todd Green – American Environmental Landfill, Inc.

APPLICATION TO MODIFY A SOLID WASTE DISPOSAL FACILITY PERMIT

Date: May 20, 2024 County: Osage

Send to:

Solid Waste Permitting Unit
Land Protection Division
Dept. of Environmental Quality
707 N. Robinson (PO Box 1677)
Oklahoma City, OK
73101-1677

FOR DEQ USE

DEQ Log No. _____
No. Copies _____

Date Received: _____

American Environmental Landfill, Inc. proposes to modify the permit of
(Applicant's Name)
the American Environmental Landfill, located at See Attached
(Facility Name) *(Exact legal description:*

metes & bounds, platted lot, or land survey. Append extra sheets if necessary)

in Osage County, Oklahoma. We hereby make application for a modification of existing permit number 3557021 as required by the **Oklahoma Solid Waste Management Act** and the Rules pursuant thereto.

Remarks & brief description of proposed modification:
Approximate 203 acre expansion of the landfill permit boundary.

Applicant or Authorized Agent:

Signature

Todd Green
Typed Name

Address: 1420 W. 35th Street, Suite B
City: Tulsa State: OK

Date signed: 5-21-24
Phone: (918) 245-7786

Preparing Engineer:

Signature

Floyd Cotter
Typed Name

Address: 8575 W. 110th St. Suite 100
City: Overland Park State: KS

Date signed: 5-22-24
Phone: 913-681-0030

Facility Address (if any):
212 North 177th West Avenue
Sand Springs, Oklahoma 74063

DEQ USE ONLY

July 2016
DEQ Form #515-020

VERIFICATION[1]

STATE OF OKLAHOMA)
) ss
COUNTY OF Tulsa)

Todd Green, of lawful age, being first duly sworn, upon oath state that I have read the foregoing APPLICATION TO MODIFY A SOLID WASTE DISPOSAL FACILITY PERMIT, that I am familiar with the matters set forth therein, and that the same are true to the best of my information and belief.

American Environmental Landfill, Inc.
Applicant

Subscribed and sworn to before me this 21st day of May, 2024,
by Sarah Abbott (Applicant or legal representative).

SARAH ABBOTT
Notary Public In and
STATE OF OKLAHO
Commission #2100
Expires: 12 Apr 2025

Notary Public

My commission expires:

April 12, 2025

[1] This Verification is required for a Tier III modification application.

American Environmental Landfill, Inc. Legal Description:

The Northeast Quarter (NE/4) of the Southeast Quarter (SE/4) and the East Half (E/2) of the Northwest Quarter (NW/4) of the Southeast Quarter (SE/4) and the Northwest Quarter (NW/4) of the Northwest Quarter (NW/4) of the Southeast Quarter (SE/4) of Section 36, Township 20 North, Range 10 East of the Indian Meridian, Osage County, Oklahoma.

AND

A tract of land being a part of the West Half (W/2) of Section 36 and the East Half (E/2) of Section 35, Township 20 North, Range 10 East of the Indian Meridian, Osage County, Oklahoma and being more particularly described as follows:

BEGINNING at the Southwest corner of said Section 36;

Thence North 01°10'20" East along the West line of said Section 36, a distance of 354.62 feet to the Southwest corner of the North Half (N/2) of the Southwest Quarter (SW/4) of said Section 36;

Thence South 89°15'49" West along the South line of the East Half (E/2) of the Northeast Quarter (NE/4) of the Southeast Quarter (SE/4) of said Section 35, a distance of 320.25 feet;

Thence North 01°03'24" West, a distance of 1413.21 feet;

Thence North 88°56'36" East, a distance of 273.38 feet;

Thence North 00°03'14" East parallel to and 100.00 feet West of the East line of the Northeast Quarter (NE/4) of said Section 35, a distance of 564.60 feet;

Thence North 88°42'49" East a distance of 100.03 feet to the Northwest corner of the South Half (S/2) of the South Half (S/2) of the Northwest Quarter (NW/4) of said Section 36;

Thence continuing North 88°42'49" East along the North line of the South Half (S/2) of the South Half (S/2) of the Northwest Quarter (NW/4) of said Section 36, a distance of 1318.42 feet;

Thence South 01°01'16" East, a distance of 606.18 feet;

Thence North 88°58'44" East, a distance of 400.00 feet;

Thence North 01°01'16" West, a distance of 608.04 feet to a point on the North line of the South Half (S/2) of the South Half (S/2) of the Northwest Quarter (NW/4) of said Section 36;

Thence North 88º42'49" East along the North line of the South Half (S/2) of the South Half (S/2) of the Northwest Quarter (NW/4) of said Section 36, a distance of 921.97 feet to the Northeast corner of the South Half (S/2) of the South Half (S/2) of the Northwest Quarter (NW/4) of said Section 36;

Thence South 00º06'30" East along the East line of the West Half (W/2) of said Section 36, a distance of 2360.46 feet to the Southeast corner of the Southwest Quarter (SW/4) of said Section 36;

Thence South 89º16'14" West along the South line of the Southwest Quarter (SW/4) of said Section 36, a distance of 2679.26 feet to the POINT OF BEGINNING.

Said tract of land contains 150.09 acres, more or less.

AND

The South 50.00 feet of the East 1165.11 feet of the Southeast Quarter (SE/4) of the Northeast Quarter (NE/4) of Section 36, Township 20 North, Range 10 East of the Indian Meridian, Osage County, Oklahoma.

Said tract of land contains 1.34 acres, more or less.

AND

A Tract of land in the East Half (E/2) of Section Thirty-five (35) and the West Half of the West Half (W/2 W/2) of Section Thirty-six (36), Township Twenty (20) North, Range Ten (10) East of the Indian Meridian, Osage County, Oklahoma and being more particularly described as follows:

BEGINNING at the Southeast Corner of said Section 35;

Thence S89°51'44"W on the South Line of said Section 35 a distance of 2,624.40 feet to the Southwest Corner of said E/2;

Thence N0°10'55"E on the West Line of said E/2 a distance of 2,083.00 feet;

Thence N44°26'58"E a distance of 1,254.02 feet to a point on the South Line of the North Half of the Northeast Quarter (N/2 NE/4) of said Section 35;

Thence N16°00'28"E a distance of 330.70 feet;

Thence N88°51'08"E parallel with the North Line of said E/2 a distance of 1684.00 feet to a point on the East Line of said Section 35;

Thence N87°55'47"E parallel with the North Line of said W/2 W/2 of Section 36 a distance of 1319.51 feet to a point on the East Line of said W/2 W/2;

Thence S0°03'02"E on the East Line of said W/2 W/2 a distance of 1006.10 feet to the Southeast Corner of the North Half of the Southwest Quarter of the Northwest Quarter (N/2 SW/4 NW/4) of said Section 36;

Thence S88°42'53"W on the South Line of said N/2 SW/4 NW/4 a distance of 1.84 feet to a Chiseled Cross found for a corner of the existing Permit Boundary (also the Northwest Corner of the tract known as the Cemetery, as described in JOURNAL ENTRY OF JUDGEMENT, Recorded in Book 1429 @ Page 693);

Thence continuing S88°42'53"W on the existing Permit Boundary and on the South Line of said N/2 SW/4 NW/4 a distance of 1318.20 feet to the Southwest Corner of said N/2 SW/4 NW/4;

Thence continuing S88°42'53"W on the existing Permit Boundary, entering said Section 35, a distance of 100.03 feet;

Thence S0°00'35"W on the existing Permit Boundary, parallel with the East Line of said Section 35 a distance of 564.60 feet;

Thence S88°57'36"W on the existing Permit Boundary a distance of 273.49 feet;

Thence S1°02'24"E on the existing Permit Boundary a distance of 1413.79 feet to a point on the South Line of the Northeast Quarter of the Southeast Quarter (NE/4 SE/4) of said Section 35;

Thence N89°12'15"E on the existing Permit Boundary and on the South Line of said NE/4 SE/4 a distance of 320.25 feet to the Southeast Corner of said NE/4 SE/4;

Thence S1°11'51"W on the existing Permit Boundary and on the East Line of said Section 35 a distance of 354.62 feet to the POINT OF BEGINNING, containing 202.5 acres more or less.

Tier III Permit Application
American Environmental Landfill

American Environmental Landfill, Inc.
207 North 177th West Avenue
Sand Springs, Oklahoma 74063

SCS ENGINEERS

27220345.00 | May 2024

8575 W. 110th Street, Suite 100
Overland Park, KS 66210
913-681-0030

INDEX AND CERTIFICATION PAGE

REPORT INDEX

CERTIFICATION

This report has been prepared for exclusive use by American Environmental Landfill, Inc. for the American Environmental Landfill (AEL) for specific application to the project discussed, and it has been prepared in accordance with good engineering practices including consideration of industry standards and the requirements of the Oklahoma Department of Environmental Quality.

Prepared by:

Floyd Cotter, PE
SCS Engineers

Table of Contents

Section Page

Tables

Permit Drawings

0. Coversheet
1. Existing Contour Map
2. Site Layout
3. Seasonal High-Water Level
4. Top of Subgrade Grading Plan
5. Top of Clay Grading Plan
6. Top of Final Cover Grading Plan
7. Cross Section Locator Map
8. Fill Cross Section A-A'
9. Fill Cross Section B-B'
10. Fill Cross Section C-C'
11. Fill Cross Section D-D'
12. Watershed Plan
13. Details
14. Details
15. Details
16. Details
17. Details
18. Details

Appendices

1.0 INTRODUCTION

SCS Engineers, on behalf of American Environmental Landfill, Inc., is submitting the necessary documents to expand the permit boundary, establish permit base grades for such area, and permit a leachate storage impoundment at the American Environmental Landfill (AEL). The AEL is located near Sand Springs, Oklahoma in Sections 35 and 36, Township 20 North, Range 10 East, in Osage County, Oklahoma. The project site is on the Wekiwa Oklahoma 7.5 Minute USGS Quadrangle map. AEL is bordered by the Arkansas River to the South (Figure 1). The AEL operates under the Oklahoma Department of Environmental Quality (ODEQ) Permit Number 3557021.

The current landfill has a permit boundary of approximately 222-acres, 150 of which are currently in operation. The proposed landfill lateral expansion area is approximately 203-acres located north and west of the existing permit boundary. Therefore, following approval of a Tier III permit modification, in accordance with Oklahoma Department of Environmental Quality (ODEQ), Oklahoma Administrative Code (OAC) 252:4-7-60, the landfill permit boundary will be comprised of approximately 425-acres. The proposed lateral expansion area will be utilized for a municipal solid waste (MSW) disposal area.

The AEL, (then Shell Creek Landfill) was issued Permit No. 3557021 on September 14, 1981 by the Oklahoma Department of Environmental Quality (ODEQ) and operates as a Subtitle D facility.

2.0 FILING OF APPLICATION & PUBLIC PARTICIPATION

In accordance with the Uniform Environmental Permitting Act and OAC 252:4-7-13(g)(1), the AEL will publish notice of the filing of this application in *The Sand Springs Leader* newspaper. The published notice will serve as the legal notice to the public. The publication will identify locations where the application may be reviewed by the public, including a location in Osage County, where the site is located. The publication will include notice of a 30-day opportunity to request a process meeting. If the ODEQ receives timely requests and determines that a significant degree of public interest in the application exists, the ODEQ shall schedule and hold a process meeting. In addition, notices will be provided by certified mail and return receipt request to adjacent landowners whose property may be affected by the lateral expansion of the AEL.

Upon conclusion and approval of the technical review for this Tier III application, the ODEQ will prepare a draft permit. Notice of the draft permit shall be given by the AEL by publishing a legal notice in *The Sand Springs Leader* newspaper. The notice shall identify locations where the draft permit and the application may be reviewed by the public, including a location in Osage County, where the site is located. The publication will include notice of a 30-day opportunity to request a public meeting on the permitting process. If the ODEQ receives timely requests and determines that a significant degree of public interest in the application exists, the ODEQ shall schedule and hold a public meeting. In addition, notices of the draft permit will be provided by certified mail and return receipt request to adjacent landowners whose property may be affected by the lateral expansion of the AEL.

Should the ODEQ determine the need for a public meeting, the ODEQ shall expeditiously schedule and hold a formal public meeting no more than 120 days after the date the notice was published. The public meeting shall be held at a location convenient to and near the AEL. At the meeting, any person may submit oral or written statements and data concerning the draft permit or permit application. The public comment period shall automatically be extended at the close of the public meeting. A representative of the AEL shall be present at the meeting to respond to questions.

After the public comment period, the ODEQ shall prepare a response to comments and issue a final denial or a proposed permit. If a proposed permit is prepared, the AEL shall provide notice of the proposed permit by publishing a legal notice in The Sand Springs Leader newspaper. The notice shall identify locations where the proposed permit and the ODEQ response to comments may be reviewed by the public, including a location in Osage County, where the site is located. The publication will include notice of a 20-day opportunity to request an administrative hearing. In addition, notices will be provided by certified mail and return receipt request to adjacent landowners whose property may be affected by the lateral expansion of the AEL.

The opportunity to request an administrative hearing shall be available to the AEL and any person or qualified interest group who claims that the construction or operation of the landfill would directly and adversely affect their interests. If no written administrative hearing request is received by the ODEQ by the end of the 20-day opportunity, the final permit shall be issued.

If an administrative hearing is timely requested on the proposed permit, the ODEQ shall schedule a hearing. All timely requests shall be combined in a single hearing, and the hearing shall be conducted by an Administrative Law Judge. A representative of the AEL shall attend the hearing, which shall be scheduled within 60-days of the end of the 20-day hearing request opportunity. Upon final issuance or denial of a permit for this Tier III application, the ODEQ shall provide public notice of the final permit decision and availability of the response to comments, if any. A written affidavit of all notice publications by the AEL should be submitted to ODEQ within 20-days of the publication.

3.0 GENERAL INFORMATION

Under solid waste disposal permit number 3557021, the AEL is allowed to accept municipal solid waste for disposal, including household waste, commercial solid waste, construction and demolition waste, non-hazardous industrial waste, contaminated soil, sludge, non-friable asbestos, friable asbestos, liquid waste, special waste, and approval from the EPA to accept CERCLA waste in Subtitle D areas of the permit waste footprint . The disposal of any quantity of hazardous, radioactive, regulated untreated infectious biomedical waste, or regulated polychlorinated biphenyl (PCB) waste is prohibited at the AEL. The general information for the facility is provided in the following table.

Table 1. General Information

Facility Name:	American Environmental Landfill
Mailing Address:	207 North 177th W. Ave. Sand Springs, Oklahoma 74063
Physical Location:	207 North 177th W. Ave. Sand Springs, Oklahoma 74063
Facility Owner/Operator:	American Environmental Landfill, Inc.
Facility Phone Number:	(918) 245-7786
Hours of Operation:	Monday-Friday 7:00am-5:00pm, Saturday 7:00am-3:00pm
Primary Contact:	Todd Green

3.1 OATH

OAC 252:515-3-33 requires the applicant to sign the permit application under oath on forms provided by the ODEQ. The signed oath is attached to the cover letter of this application.

3.2 LEGAL DESCRIPTION

The legal description of the AEL permit boundary is as follows: The North ½ of Section 35 and West ½ of Section 36, Township 20 North, Range 10 East, in Osage County, Oklahoma.

3.3 LEGAL RIGHT TO PROPERTY

OAC 252:515-3-34(a)(1) requires that the AEL have a true and correct copy of a legal document filed in Osage County, demonstrating that the applicant possesses a legal right to access and use the property in the manner outlined in this application. Documentation showing that American Environmental Landfill, Inc. owns the property containing the AEL and its proposed expansion area is included as part of the Closure and Post-Closure Plan found in Appendix K of this application.

3.4 ADJACENT PROPERTY OWNER NOTIFICATION

Notification of the proposed landfill expansion was provided to adjacent properties owners and copies of the notification letters and delivery confirmations are included in Appendix A.

3.5 AESTHETIC ENHANCEMENT

Due to the site's rural location and the dense vegetation surrounding the site, it is anticipated that the lateral expansion of the AEL will have a minimal effect on aesthetics. The guidelines outlined in the facility's Operations Plan, included in Appendix I, should control vectors at the site and keep the AEL aesthetically pleasing.

3.6 AIR QUALITY

The AEL will conform to applicable ambient air quality and source control regulations. The AEL's current permitted capacity is greater than 2.5-million-cubic-yards as detailed in Section 6.2.1 and is subject to 40 CFR 60, Subpart XXX permitting. AEL operates under Operating Permit No. 2018-1562-TVR2. Odors will be controlled at the site through proper operations and, more specifically, through proper application of daily, intermediate, and final cover. Cover requirements are further discussed in Section 13. Dust and emission control is discussed in the site's Operations Plan included in Appendix I.

3.7 VARIANCE REQUEST

This permit modification includes one variance requests in accordance with OAC 252:515-3-32. The variance requests is for the location of the permit expansion with an area designated as alluvium or terrace deposits.

OAC 252:515-5-51 (a)(1) states that no area within the permit boundary of a new land disposal facility, or expansion of the permit boundary of an existing land disposal facility, shall be located within an area designated as alluvium or terrace deposits and their recharge areas, as shown on "Map of Aquifers and Recharge Areas in Oklahoma" compiled by Kenneth S. Johnson, Oklahoma Geological Survey (1991). As allowed by O.A.C. 252:515-5-51 (a)(2), Site-specific hydrological and geological data and other information may be submitted to demonstrate clearly and convincingly that the proposed location does not lie in a prohibited area.

Figure 2.5 of Appendix B contains a map showing the permit area on the referenced map is near an area designated as terrace or alluvium deposits. This map indicates there may be a portion of the proposed expansion that overlaps the area identified as terrace deposits on the map. However, as discussed in the Work Plan, previous boring logs from the Phase IV area east of the 203-acre expansion indicate sandstones and shales underlay the expansion site, which are consolidated formations and not terrace deposits. Borings performed for this investigation, only identified a few areas where unconsolidated materials will be beneath the planned expansion excavation and the materials were identified primarily as silty clay or sandy clay. Materials composed of primarily silt or primarily sand, indicative of terrace deposits, were not identified below the planned expansion excavation. However, few borings south of the planned waste boundary encountered material comprised primarily of sand and/or silt indicative of terrace deposits. Figure 3.4 of Appendix B, show the proposed excavation grades within the waste disposal boundary are within the bedrock that underlies the site. Figure 3.3 of Appendix B shows the proposed excavation grades that are outside the limits of waste and are located in an area proposed for a stormwater detention structure. As detailed in Appendix G, any unstable areas will be undercut to firm material and refilled with suitable compacted earth fill.

To protect the health, environment, and safety of the people and their property, the AEL waste disposal boundary does not overlay the terrace or alluvium deposits located along the southern boundary of the property.

4.0 LOCATION RESTRICTIONS

All active solid waste disposal facilities are subject to the location restrictions set forth by the ODEQ in OAC 252:515-5. The subchapters of this section show compliance with the location restrictions for solid waste disposal facilities.

4.1 SCENIC RIVERS

No area within the permit boundary of the lateral expansion shall be located within the drainage basin of any river designated by the Oklahoma Scenic Rivers Commission Act. Appendix A contains a map provided by the OWRB showing that the AEL is not located in a drainage basin of any Oklahoma Scenic River.

4.2 RECREATION AND PRESERVATION AREAS

No area within the permit boundary of the lateral expansion shall be located within one-half mile of any area formally dedicated and managed for public recreation or natural preservation by a federal, state, or local government agency. Appendix A contains correspondences from the Oklahoma Archeological Survey dated June 12, 2020 and the Oklahoma Tourism and Recreation Department dated July 7, 2020. A letter was issued to the US Department of the Interior – Bureau of Reclamation dated June 2, 2020. No correspondence with the Bureau of Reclamation was received. Delivery confirmation is included in Appendix A. The letters indicate that the expansion of the AEL will not be within one-half mile of any area formally dedicated and managed for public recreation or national preservation.

4.3 ENDANGERED OR THREATENED SPECIES

For the AEL lateral expansion area, statements from the Oklahoma Department of Wildlife Conservation (ODWC), the United States Fish and Wildlife Service (USFWS), and the Oklahoma Biological Survey (OBS) shall be submitted regarding current information about endangered or threatened wildlife or plant species listed in state and federal laws that exist within one-mile of the expansion area. Appendix A contains correspondences from the USFWS dated February 10, 2020, the ODWC dated April 14, 2020, and the OBS dated February 6, 2020. The letters indicate that it is unlikely for endangered or threatened wildlife or plant species listed in state and federal laws to be located within one-mile of the expansion area and/or stating that the AEL lateral expansion is not likely to adversely affect any threatened or endangered species in the area.

4.4 WETLANDS

No solid waste disposal facility shall be located within wetland areas as designated by the Oklahoma Conservation Commission (OCC) or other appropriate agency. Appendix A includes correspondence that was submitted to the U.S. Army Corps of Engineers and response dated September 21, 2017 stating that no jurisdictional wetlands were located within the reviewed area. However, the unnamed tributary of the Arkansas River was determined to be a regulated waterway. SCS submitted a Section 404 Individual Permit Application in May 2020 for the relocation of the jurisdictional waters. The U.S. Army Corps of Engineers granted a Section 404 Individual Permit (Permit No. SWT-2017-00339) in a response dated October 30, 2020. The correspondence and Section 404 Individual Permit is included in Appendix A.

4.5 WELLHEAD PROTECTION AREA

Under OAC 252:515-5-32(c), if the lateral expansion area is located within two-miles of a public water supply well, a wellhead protection area shall be identified and submitted to the ODEQ, as specified by the State Wellhead Protection Plan. Appendix A contains a map provided by the OWRB showing that the AEL is not located within two-miles of a public water supply well.

4.6 PUBLIC WATER SUPPLY

No solid waste disposal facilities shall be located within one-mile upgradient of an existing public water supply surface intake, including those permitted for construction, or within a one-year time of travel of a public water supply well. Appendix A contains a map provided by the OWRB showing that the AEL is not located within one-mile upgradient of an existing public water supply surface intake or is it located within a one-year time of travel of a public water supply well.

4.7 100-YEAR FLOODPLAIN

No solid waste disposal facilities shall be located within the 100-year floodplain. Appendix A of this application shows the Flood Insurance Rate Map for Osage County (Map Number 40113C1215K) published by the NFIP and effective on April 2, 2008. According to the map, the proposed expansion is not in or near the floodplain.

4.8 TERRACE DEPOSITS

OAC 252:515-5-51(a)(1) states, “no area within the permit boundary of a new land disposal facility, or expansion of the permit boundary of an existing land disposal facility, shall be located within an area designated as alluvium or terrace deposits and their recharge areas, as shown on "Map of Aquifers and Recharge Areas in Oklahoma" compiled by Kenneth S. Johnson, Oklahoma Geological Survey (1991). However, OAC 252:515-5-51(a)(2) states. “Site-specific hydrological and geological data and other information may be submitted to demonstrate clearly and convincingly that the proposed location does not lie in a prohibited area”. Appendix A contains a map showing the permit area on the referenced map is near an area designated as terrace or alluvium deposits. Results and determinations of the subsurface investigation are provided in Appendix B.

4.9 KARST TERRAIN

Appendix A contains maps provided by the ODEQ GIS Data Server that no karst terrain exists in the vicinity of the proposed expansion area.

4.10 EARTHQUAKE EPICENTER AREA

No solid waste disposal facilities shall be located within five-miles of a known epicenter of an earthquake of more than 4.0 on the Richter Scale, or a number V on the modified Mercalli (MM) scale, as recorded by the Oklahoma Geological Survey. Appendix A contains a map provided by the ODEQ GIS Data Server that no magnitude 4.0 and/or MM V earthquakes have occurred within five-miles of the expansion area.

4.11 FAULT AREAS

No solid waste disposal facilities shall be located within 200-feet of a fault that has had displacement in Holocene time. Appendix A contains a map provided by the ODEQ GIS Data Server

showing that no known Holocene faults have occurred within 200-feet of the lateral expansion area. A topographic map of the area is included as Figure 3.

4.12 SEISMIC IMPACT ZONES

No solid waste disposal facilities shall be located in a seismic impact zone. This restriction may be waived upon successful demonstration that all containment structures, including liners, leachate collection system, and surface water control systems, are designed to resist the maximum horizontal and vertical displacement in lithified earth material for the site. Appendix A contains a map provided by the ODEQ GIS Data Server showing that the site is not located in a seismic impact zone, an area in which it is probable that the maximum horizontal acceleration will exceed .10-.11g in 250 years. Regardless, the Liner and Final Cover System Stability Analysis in Appendix C of this application demonstrate that the containment structures are designed to resist the potential maximum horizontal and vertical displacement.

4.13 UNSTABLE AREAS

No solid waste disposal facilities shall be located over a subsurface mining area or any other unstable area. Appendix A contains correspondence from the Oklahoma Department of Mines, dated July 8, 2020, stating that no known coal, non-coal permits, or any other surface reclamation efforts on record were located near the site location.

4.14 UTILITY/TRANSMISSION LINES

A minimum horizontal separation of 25-feet shall be maintained between disposal areas of land disposal facilities and any aboveground or underground pipeline or transmission line. Information on the locations and owners of all such lines and easements shall be provided to the ODEQ. Appendix A contains a certified mail receipt from a submittal to the Oklahoma Corporation Commission, dated June 2, 2020, but no response was received from the agency.

No utility or transmission line is located within 25-feet of the proposed waste boundary.

4.15 AIRPORTS

No solid waste disposal facilities shall be located within 10,000-feet of any airport runway end used by turbojet aircraft or within 5,000-feet of any airport runway end used by only piston-type aircraft. The Pogue Airport is located East and Northeast of the AEL and is used by turbojet aircraft. Appendix A contains a map showing that the AEL Expansion Area is not located within the 10,000-foot requirement for turbojet aircraft and therefore satisfies the location restriction for airports.

Since the AEL lateral expansion area is located within a 5-mile radius of the Pogue Airport, the airport and the Federal Aviation Administration (FAA) have been notified in writing of the planned expansion in accordance with OAC 252:515-5-52(e)(1). No responses were received. Copies of the certified mail receipts and the letters mailed to the FAA and the Pogue Airport are included in Appendix A.

4.16 BUFFER ZONES

In accordance with OAC 252:515-19-38(b)(2), municipal solid waste landfills incorporating land not permitted for disposal prior to July 1, 1994 shall have a waste-free buffer zone of at least 100-feet in width from the site's property boundary. As shown in the Permit Drawings of this application, the waste boundary of the proposed expansion area is 100-feet away from the property boundary of the AEL.

5.0 SUBSURFACE INVESTIGATION

In accordance with Oklahoma Administrative Code (OAC) 252:515-7, a subsurface investigation of approximately 203-acres was completed between November 2020 and August 2021. The field investigation for determining subsurface soil and groundwater characteristics consisted of drilling 42 exploratory borings, 13 of which were completed as piezometers. The results of the investigation are detailed in the report *Hydrogeologic and Geotechnical Investigation* prepared by SCS Engineers, dated December 2023, is included in this application as Appendix B. Results of the subsurface investigation were considered while designing the lateral expansion area for the AEL.

6.0 LANDFILL DEVELOPMENT

This section, in conjunction with the accompanying drawings and appendices, addresses the various design and operational elements of the AEL lateral expansion.

6.1 DESIGN CRITERIA

The development of the AEL lateral expansion was based on the following design criteria:

- Compliance with Subtitle D requirements
- Final side slopes will be created at a maximum 4:1. The slope of the top of the landfill (crown) will be no less than 4 percent.
- Drainage swales and letdowns will be developed to improve surface water drainage
- Surface water diversionary structures will be capable of handling at a minimum the 25-year 24-hour storm event
- Seismic and stability design criteria established in the Liner and Final Cover Stability Analysis (Appendix C) are to be incorporated into the design

The applicable regulations followed in part or entirely are as follows:

- OAC 252:515
- 40 CFR Part 257 and 258 (Subtitle D)

6.2 LANDFILL DEVELOPMENT

The current landfill has a permit boundary of approximately 222-acres, 150 of which are currently in operation. The proposed landfill lateral expansion area is approximately 203-acres located north and west of the existing permit boundary. Therefore, following approval of a Tier III permit modification, in accordance with Oklahoma Department of Environmental Quality (ODEQ), Oklahoma Administrative Code (OAC) 252:4-7-60, the landfill permit boundary will be comprised of approximately 425-acres.

6.2.1 Capacity Increase

A summary of the capacity increase is listed below.

Table 2. Capacity Increase

Item	Volume
Current Design Capacity	24,175,616 Cubic Yards
Expansion Increased	55,765,504 Cubic Yards
Proposed Capacity	79,941,120 Cubic Yards

6.2.2 Sequence of Development

The landfill will be developed through the construction of phases. The first phase of the lateral expansion to be constructed will be the southern portions of Cell 7. Following the initial construction, the northern portions of Cell 7 will be constructed. The northern portions of the remaining Cells 8 – 10 will be constructed east to west utilizing temporary sumps. The final construction or the southern portions of Cells 8 - 10 will take place west to east and will feature permanent sumps.

Filling should begin at the lowest elevations of each phase and work toward higher elevations to prevent excess leachate generation. Temporary drainage swales and channels should be constructed, as needed, on intermediate contours to control surface water and minimize leachate generation. It should be recognized that the phasing plans are conceptual in nature and may require revision during the operation of the facility.

Under the area fill method, waste is placed next to the previous day's waste until an established row length is reached. Another row is then started parallel to the previously constructed row. As the rows form lifts over each area, the top of each landfill lift should slope in such a manner to allow surface runoff to drain away from the working face. After a number of rows have been constructed (creating a lift), a second lift is constructed over the first lift. Waste placement will alternate between various lifts of waste and will allow landfill traffic to discharge waste at various levels. This method will allow the earthmoving equipment to stockpile daily cover at the top of the day's waste, if necessary.

The main two criteria used when establishing the sequence of fill are as follows:

- Areas should be small enough to allow organized, controlled development
- Development should be sequenced such that surface water runoff does not flow into the working area

A layer of 6-inches of daily cover or approved alternative daily cover will be placed on the top of waste each day.

The landfill will be developed to provide for long-term stability of the entire landfill. Included in Appendix C is a Liner and Final Cover Stability Analysis for the AEL. This analysis confirms the landfill is stable under active, intermediate, and final development of the landfill. The design of the expansion area, particularly the base grades and cap components, are based on meeting factor of safety requirements and site-specific conditions.

7.0 GROUNDWATER MONITORING

A detailed hydrogeologic and geotechnical investigation has been conducted at this site. The report for this investigation entitled, *Hydrogeologic and Geotechnical Investigation,* is included in Appendix B. Results of this subsurface investigation were used in selecting locations for groundwater monitoring detection wells. A Groundwater Monitoring Plan has been included with this application in Appendix D. The Groundwater Monitoring Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record. The Groundwater Monitoring Plan contains pertinent information for existing and proposed detection wells and piezometers, as well as schedules and proper sampling and statistical analysis procedures to complete groundwater monitoring events.

8.0 EXPLOSIVE GAS MONITORING

The decomposition of encapsulated solid waste within a landfill is known to produce landfill gas, typically consisting of approximately 50% methane (CH_4) and 50% carbon dioxide (CO_2). Trace amounts of non-methane organic compounds (NMOCs), oxygen, hydrogen sulfide, and reactive organic gases are also present (*Engineering and Design Landfill Off-Gas Collection and Treatment Systems*, U.S. Army Corps of Engineers, 1995).

Per OAC 252:515-15-2, the concentration of methane gas generated by the facility shall not exceed twenty-five percent (25%) of the lower explosive limit (LEL) for methane in all structures within the permit boundary or exceed the LEL for methane at the permit boundary. The LEL is defined as the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25°C and atmospheric pressure. The LEL for methane is 5% by volume in air.

OAC 252:515-15-3(a) requires an Explosive Gas Monitoring Plan to be submitted and approved by the ODEQ to demonstrate how compliance with the LEL listed in OAC 252:515-15-2 will be achieved. A copy of the Explosive Gas Monitoring Plan is included with this application as Appendix E. The Explosive Gas Monitoring Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record.

9.0 STORMWATER MANAGEMENT

9.1 OKR05 PERMIT REQUIREMENTS

State law requires an Oklahoma Pollutant Discharge Elimination System (OPDES) Permit be obtained to allow stormwater to discharge from this facility. Under state regulations, the AEL is subject to requirements of the ODEQ Department of Water Quality Division Sector L Industrial General Permit OKR05 (OKR05). Under the requirements of OKR05, the facility is to prepare and maintain a Stormwater Pollution Prevention Plan (SWP3). The SWP3 describes the AEL and its operations, identifies potential sources of stormwater pollution at the facility, recommends appropriate Best Management Practices (BMPs) or pollution control measures to reduce the discharge of pollutants in stormwater runoff, and provides procedures for regular inspections, stormwater monitoring, recordkeeping and reporting, and periodic review of the SWP3.

The SWP3 for the facility is maintained at the AEL. As shown in the Permit Drawings, the proposed permit modification will alter surface water drainage and outfall locations from their present locations. As stormwater confluence is altered at the facility, the site's SWP3 shall be amended accordingly.

9.2 RUN-ON CONTROL SYSTEMS

In accordance with OAC 252:515-17-2(1), the AEL has been designed to have a run-on control system to prevent flow onto active portions of the facility during the peak discharge from a 24-hour, 25-year storm event. The Permit Drawings show the design for a temporary separation berm. The temporary separation berms will be constructed, as needed, between phases as the landfill is expanded. Additional run-on control features such as diversion berms will be constructed upgradient of the construction areas and active portions of the landfill.

9.3 RUN-OFF CONTROL SYSTEMS

The peak volume and flow were calculated using the SCS TR-55 Hydrology Method and the SCS TR-55 Time of Concentration Method associated with Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2020. The flows for each surface water structure were determined to show that the run-off controls are adequately sized to handle a 24-hour, 25-year single storm event. Surface water model results and calculations are included in the Stormwater Design System Report included as Appendix F.

The following surface water management structures will be constructed to control surface water flow:

- Drainage swales
- Letdown channels
- Perimeter channels
- Stormwater Detention Structures

9.3.1 Drainage Swales

The drainage swales are V-shaped, with 4:1 uphill side slope and 2:1 downhill side slope. The drainage swales have a height of 3.5-feet and will be sloped at approximately 1.0 percent towards the letdown channels on side slopes, as shown in the Permit Drawings. Design calculations for drainage swales can be found in Appendix F.

9.3.2 Letdown Channels

The drainage area for the letdown channel was determined based on channel and sheet flow from each sub-basin draining to the letdown channel. A peak flow was determined by utilizing a time of concentration for the worst-case point (i.e., the point within the drainage area located furthest away from the letdown) and applying that time of concentration to the entire area. Thus, a conservative design is achieved. Calculations for the letdown channel are shown in the Surface Water System Design Report located in Appendix F.

The letdown is trapezoidal shaped with 2:1 side slope, a bottom width of 8-feet, and a depth of 2-feet. The letdown channels are sloped at approximately 25 percent towards the perimeter drainage channels. Alternate materials may be used to line the letdown channel such as HDPE, Rip-Rap, manufactured erosion controls, etc., but must be approved by ODEQ prior to installation.

9.3.3 Perimeter Drainage Channels

The perimeter drainage channels will vary in dimension but generally will be vegetated channels or lined with rip-rap, 3-feet to 3.5-feet deep with a bottom width of 0-feet to 10-feet and 3:1 side slope. The channels will be sloped toward a discharge point at an approximate average slope of 1 to 6 percent. Design calculations for perimeter ditches can be found in the Surface Water System Design Report in Appendix F.

9.3.4 Detention Structures

There are two stormwater detention structures proposed for the AEL. A North Stormwater Detention Structure and a South Stormwater Detention Structure are proposed to allow for the discharge of stormwater to impaired waterbodies. These stormwater detention structures allow for a settling period, to achieve the quality of stormwater as set by the 2022 OKR05 General Permit, by discharging stormwater through a perforated riser. The stormwater detention structures are designed to discharge typical stormwater events (25-year, 24-hour storm event) through a perforated riser. Secondary discharge structures associated with the stormwater detention structures were designed to discharge stormwater from a 100-year, 24-hour storm event while maintaining minimum freeboard requirements. Design calculations for the stormwater detention structures can be found in the Surface Water System Design Report in Appendix F.

10.0 LINER CONSTRUCTION

A composite liner system will be constructed to protect groundwater quality. The composite liner system will maintain a minimum 5-foot vertical separation between the highest groundwater elevation and the lower most surface on which waste will be placed, conform to specifications included in OAC 252:515-11, and consist of the following layers from bottom to top:

- Compacted subgrade
- 24-inches of compacted soil liner (less than or equal to $1x10^{-7}$ centimeters per second (cm/sec) hydraulic conductivity)
- 60-mil high density polyethylene (HDPE) smooth or double-sided textured geomembrane liner
- 8 oz/sy non-woven geotextile fabric cushion layer
- 24-inches of granular drainage/protective cover material (greater than or equal to $1x10^{-3}$ cm/sec hydraulic conductivity)

Where fill is necessary to achieve subgrade elevations, the subgrade component of the liner will be placed in uniform lifts that do not exceed 9-inches in loose thickness and are compacted to at least 95 percent of standard Proctor (ASTM D 698) at a moisture content ranging from one percentage point below optimum to three percentage points above optimum. The top 6-inches of compacted fill material underlying the soil liner will have a maximum particle size of 2-inch diameter. Where excavation is necessary to achieve subgrade elevations, the upper 6 inches of soil subgrade will be recompacted and graded to provide a relatively smooth workable surface on which to construct the compacted soil liner component.

The compacted soil liner will be constructed by placing uniform lifts that do not exceed 9-inches in loose thickness to produce compacted lifts of approximately 6-inches. The soil liner will be compacted to a moisture content and density condition consistent with that necessary to produce a competent liner with a hydraulic conductivity less than or equal to 1×10^{-7} cm/sec. The appropriate moisture content and density condition will be determined prior to construction for each type of material to be used.

Generally, densities greater than 95 percent of Standard Proctor maximum dry density and moisture contents exceeding the optimum moisture content are necessary to achieve a hydraulic conductivity of less than or equal to 1×10^{-7} cm/sec. Compaction will be completed utilizing an appropriately heavy, properly ballasted, penetrating-foot compactor (such as a CAT 815 or equivalent). Dozer or scraper equipment will not be used for primary compaction efforts. One of the goals of compaction is to allow thorough remolding of the clay by kneading action. Following construction, the compacted soil liner will be protected from desiccation or freeze/thaw cycles by geosynthetics and protective cover materials as necessary.

The soils used in the construction of the compacted soil liner will meet the following minimum specifications:

- Contain less than or equal to 20 percent gravel (dry-weight percentage retained on the No. 4 sieve)
- Allow more than 30 percent passage through a Number 200 Sieve
- Have a liquid limit greater than or equal to 24 percent
- Have a plasticity index greater than or equal to 10 percent
- Particle size shall be less than 1-inch diameter
- After the soil is compacted, the water content of the soil shall be equal to or greater than optimum
- After the soil is compacted, the minimum density of the soil shall be greater than or equal to 95 percent of the standard proctor density (ASTM D698) or 90 percent of the modified proctor density (ASTM D1557)

The geomembrane will be installed in accordance with the manufacturer's recommendation for a facility of this type. A geotextile cushion layer will then be placed in accordance with manufacturer's recommendations to protect the geomembrane from the overlying granular leachate collection layer.

Specific information pertaining to quality assurance and quality control during construction of the liner system is included in the Quality Assurance / Quality Control (QA/QC) Plan for Liner and Leachate Collection System Installation and Testing, which is included with this application in Appendix G. The QA/QC Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record.

Appendix C includes liner stability calculations. These calculations confirm the stability of the liner system for the proposed design.

11.0 LEACHATE COLLECTION AND MANAGEMENT

SCS Engineers utilized the Hydrologic Evaluation of Landfill Performance (HELP) model, Version 4.0 Beta (2018) for the design of the leachate collection system (LCS). The following criteria applies:

- Minimum slope along the leachate pipe is 0.5 percent
- Minimum slope to the leachate pipe is 0.5 percent
- Twelve inches or less of head must be maintained on the liner during all phases (active, interim, and closed). To accomplish this, a drainage media will be used and will have a minimum hydraulic conductivity of 1.0×10^{-3} cm/sec.

The LCS, designed to collect and remove leachate from the landfill and reduce the potential leachate head on the liner system, has been included in the design of the expansion. This system has been designed in accordance with OAC 252:515-13 to effectively manage leachate for both the operating life of the landfill and the 30-year post closure period. Specifically, the system has been designed to function without clogging through the scheduled operating life, closure, and post-closure of the landfill. In general, the LCS will use gravity drainage from the existing landfill as well as in the expansion area to drain to the sumps at the perimeter of the landfill.

The LCS will consist of the following:

- Collection pipe network
- 8-oz/sy non-woven geotextile
- 24-inches of granular material
- Leachate collection sumps
- Associated leachate pumping systems
- Leachate evaporation pond

An 8-oz/sy non-woven geotextile will be placed directly on top of the 60-mil HDPE geomembrane liner prior to placement of the granular material for cushioning purposes. The effectiveness of the LCS has been evaluated using the Hydrologic Evaluation of Landfill Performance (HELP) model, Version 4.0. Design details of the landfill and weather data for the Sand Springs, Oklahoma area were used to determine leachate volumes produced during the life of the landfill as well as the maximum hydraulic head created on the liner system.

The HELP model was run for three operating scenarios to model the landfill at various stages of its development (active, interim, and closed). The table below summarizes the modeling scenarios.

Table 3. HELP Model Scenarios

ACTIVE – 20-FEET OF MSW IN PLACE
INTERIM – 120-FEET OF MSW IN PLACE
CLOSED – 397-FEET OF MSW IN PLACE

Modeling indicated that the design will not result in a leachate head greater than 12-inches on the liner system for each scenario as required by OAC 252:515-13-31(b)(1). HELP model results are located in Appendix H.

HELP modeling was completed on a "1-acre" basis to allow for leachate generation quantities to be applied to various operating stages of the landfill. Specifically, active, interim, and closed leachate generation quantities were applied to the estimated acreage of active, interim, and closed conditions, respectively, to estimate leachate volumes at different stages of landfill development. A summary of leachate generation quantities is included in Appendix H.

11.1 LEACHATE DRAINAGE LAYER

A leachate drainage layer is necessary above the liner to drain leachate away from the waste to the leachate collection sumps. The leachate drainage layer will consist of a minimum of 12-inches of granular material placed on top of the bottom liner system. Prior to placement of the granular material, an 8-oz/sy non-woven geotextile cushion will be placed directly on top of the geomembrane liner to cushion and protect the geomembrane liner from the overlying granular leachate collection material. The granular material should be clean, with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec.

Aggregate placement/spreading techniques that minimize the potential for damage to the underlying geomembrane liner shall be used. Specifically, the granular material will be placed by advancing the aggregate in fingers across the underlying geotextile and geomembrane liner. Low ground pressure equipment, such as a light-weight, wide-tracked dozer, will be used for spreading the aggregate. A 12-inch granular protective cover layer will be placed on top of the 12-inch leachate collection layer. The 12-inch granular leachate collection layer and 12-inch protective layer will likely consist of the same material and be installed in conjunction.

Specific information pertaining to quality assurance and quality control during construction of the leachate collection system is included in the Quality Assurance / Quality Control (QA/QC) Plan for Liner and Leachate Collection System Installation and Testing, which is included with this application in Appendix G. The QA/QC Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record.

11.2 LEACHATE COLLECTION PIPE NETWORK

In the expansion area, perforated, 6-inch HDPE SDR 7.3 leachate collection pipes will be strategically placed on top of the geosynthetic liner and geotextile within the granular drainage material to direct leachate flow to the collection sump. The collection pipes are located to minimize the distance that leachate will flow through the drainage layer prior to intercepting a collection pipe. The collection pipes are sloped at a minimum of 0.5 percent toward leachate collection sumps located along the Southern berm of the landfill.

The 6-inch collection pipes will be constructed of HDPE material with a Standard Dimension Ratio (SDR) of 7.3 or equivalent. Pipe perforations will consist of three rows of 0.5-inch diameter holes drilled at a 60-degree angle from vertical on the bottom of each side of the pipe. Holes will be spaced in 4-inch increments. The collection pipes will be bedded in granular material and protected by a geotextile to serve as a filtering mechanism to keep silt and other fines from clogging the pipes. Per OAC 252:515-13-34, the leachate collection pipes shall be cleaned out after placement of protective cover layer, again after the placement of the first lift of waste, and once per year thereafter.

Design calculations were completed to evaluate the structural strength imposed by the overlying waste and potential equipment loads (see Appendix H for calculations). Typical details for collection pipes, pipe perforations, and surrounding granular material are shown in the Permit Drawings.

11.3 LEACHATE COLLECTION SUMPS

Four leachate collection sumps are proposed. The sumps will provide collection points from which leachate can be removed from the landfill. Leachate will drain into the sumps through collection pipes directly from the drainage layer. The sumps will be located on the South side of the expansion area and will have dimensions of approximately 24-feet by 24-feet by 2-feet deep. The sumps will be filled with clean, non-carbonate drainage stone to an elevation even with the surrounding granular material layer.

11.4 LEACHATE PUMPING SYSTEM

Leachate will be removed from the sumps using submersible pumps or above ground pumps. One, 18-inch diameter perforated PVC or HDPE pipe, holding submersible pumps, will be buried in the sump to access the leachate. The 18-inch HDPE SDR 11 or PVC Schedule 80 perforated pipes will exit the sump as a solid pipe and follow the 3:1 side slope to the top of the landfill composite liner system, where it can be accessed outside of the landfill footprint. This access point will allow pumps and associated hoses and cables to be lowered into the sump and removed, as needed, for maintenance or replacement. The leachate collection system will be equipped with a system for automatic and continuous removal of leachate not requiring intervention by the owner/operator. Leachate levels will be monitored with a pressure transducer and level readout at the surface. The system will also be equipped with a high-level alarm to inform site personnel when the leachate head on the liner exceeds 12-inches.

11.5 LEACHATE STORAGE AND DISPOSAL

Leachate generated within existing Phase IV A-N collects and is pumped to the existing leachate storage impoundments located East and West of existing landfill.

Leachate collected in the proposed expansion area, Cells 7-10, will be pumped up the side slope to a dual contained force main and transported via the dual contained force main to the proposed leachate storage impoundment. The proposed leachate storage impoundment will be constructed in accordance with the Quality Assurance/Quality Control Plan for Liner and Leachate Collection System Installation and Testing. A composite liner system will be constructed to protect groundwater quality. The composite liner system will conform to specifications included in OAC 252:515-11 and consist of the following layers from bottom to top:

- Compacted subgrade
- 24-inches of compacted soil liner (less than or equal to $1x10^{-7}$ centimeters per second (cm/sec) hydraulic conductivity)
- 60-mil high density polyethylene (HDPE) smooth on floor and double-sided textured geomembrane liner on slope

The HELP model calculated the highest daily leachate drainage collected rate which occurred during peak interim condition and is equal to 5.98 gallons/acre/day. Based upon the approximate 163-acres of proposed cell development within Cells 7-10, the estimated annual drainage collected is 355,780 gallons/year. The design capacity considers the two existing leachate storage impoundments located East and West of the existing landfill. The existing leachate storage capacity is 12,131,166-gallons and 6,550,018-gallons respectively. Therefore, the proposed leachate storage impoundment will maintain a minimum 3-feet of freeboard with a design capacity of 19,155,653-gallons.

Leachate stored in the leachate storage impoundments will be recirculated in accordance with their approved plan.

12.0 SITE OPERATIONS

In accordance with OAC 252:515-19, an Operations Plan has been prepared and is included with this application in Appendix I. The Operations Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record. The Operations Plan provides pertinent operational methods and procedures to provide public access control, control litter, control emissions, control disease vectors, place waste, and measure and report incoming waste. The Operations Plan outlines acceptable waste streams, limitations on incoming waste streams, as well as recordkeeping and reporting requirements for the AEL.

Acceptable and prohibited wastes for the AEL are outlined in depth in the Waste Exclusion Plan, included with this application in Appendix J. The Waste Exclusion Plan is intended to be used as a standalone document, a copy of which is maintained within the facility's operating record. The Waste Exclusion Plan also provides information on restrictions for the disposal of bulk liquids, restrictions on the disposal of municipal sewages, as well as recordkeeping and reporting requirements for incoming waste streams.

This permit application includes a Salvage and Recycling Plan. The plan is part of the site's Operations Plan, included as Appendix I. The recycling/salvage operation at the AEL will be conducted as outlined in the Operations Plan.

13.0 COVER AND SOIL BORROW REQUIREMENTS

Cover will be applied to reduce fire hazards, infiltration, odors, and blowing litter; to control gas venting and vectors; to discourage scavenging; and to provide a pleasing appearance.

13.1 DAILY AND INTERMEDIATE COVER

Daily soil cover or an alternative daily cover will be applied at the end of each operating day, regardless of weather, as required by ODEQ, to deter disease vectors, fires, odors, and blowing litter. The daily soil cover material should consist of nominally compacted earthen material free of garbage, trash, or other unsuitable material. The minimum thickness of the daily soil cover will be 6-inches.

Intermediate cover will consist of at least 12-inches of nominally compacted soil over refuse. Proper surface grades and side slopes will be maintained to promote runoff and minimize infiltration without excessive erosion. Internal side slopes will not exceed a slope of 3:1 and external side slopes will not exceed a slope of 4:1. The final top of slope will be graded to a minimum of 4 percent.

13.2 FINAL COVER SYSTEM

The final cover system will be constructed once the landfill reaches final grade. The AEL is permitted to use an alternate evapotranspiration final cover system. The cover system conforms to ODEQ specifications and includes the following components from bottom to top:

- 12-inches of intermediate cover soil
- 24-inches of vegetation support soil
- 12-inches of vegetation top soil

Once the cover system and surface water control structures are constructed as prescribed, the vegetative soil layer will be fertilized, seeded, and mulched to develop a thick stand of vegetation.

Each layer of this final cover system will be supportive of vegetative growth. The soils that make up the vegetative topsoil layer will be tested for proper application of lime, fertilizer, or other soil conditioning amendments. Once the proper amendments have been disked into the soil, seeding of a hardy grass mixture such as fescue and clover will take place. At the conclusion of seeding, the vegetative layer will be mulched to prevent soil erosion and assist with soil moisture retention and seed germination. The vegetative crop will be cared for (e.g., irrigated, reseeded, etc.) to establish a healthy stand of grass as quickly as possible. Both the crown and side slopes of the completed portions of the landfill will be seeded in the fall or early spring. The vegetative soil cover will be tested to determine the lime and fertilizer rates as needed.

13.3 BORROW SOURCES

The active borrow area for the site is located North and West of the existing landfill in the proposed expansion area. Based on proposed base and final grades for the expansion area, it is estimated that approximately 17,710,976 CY of soil will need to be excavated and 428,782 CY of soil will need to be filled in the expansion area to achieve top of subgrade elevations.

13.4 BORROW AREA RECLAMATION

The borrow areas should have a gently sloping topography which provides wet weather drainage. The borrow areas will be excavated in a manner which results in final contours similar to those present before disturbance, except the area will have a lower elevation. A minimum of approximately 12-inches of unconsolidated material will be left in place. The area will be excavated in a manner to provide positive drainage and to possibly create one or more impoundments. In the case that impoundments are proposed or constructed, all applicable permits will be obtained and copies provided to the ODEQ. Activities will be scheduled to minimize erosion and sedimentation. Disturbance of vegetation will be limited to the extent possible. Attempts will be made to save trees where practicable. The borrow areas will be regraded in a manner to provide sufficient soil material for the re-establishment of vegetation. Revegetation activities should be scheduled for spring and fall.

14.0 CLOSURE AND POST-CLOSURE

A Closure and Post-Closure (CPC) Plan is included in Appendix K. The CPC Plan is in general accordance with OAC 252:515-25. The CPC Plan is intended to be used as a standalone document, a copy of which will be maintained within the facility's operating record. The CPC Plan includes the necessary actions to be completed at the site before the facility can be certified closed and sets forth the maintenance and monitoring requirements during the post-closure period. The post-closure period will be in effect for 30 years. The closed landfill facility will be maintained in order to retain its integrity and will not pose a threat to human health or the environment. The CPC Plan also addresses cost estimates and financial assurance requirements for the AEL.

15.0 GENERAL COMMENTS

This permit application is based on the available information as provided by SCS Engineers. If, upon further evaluation or during construction, inconsistencies become apparent, re-evaluation of this report will be necessary.

This report has been prepared for the exclusive use of the AEL and American Environmental Landfill, Inc. for the specific application to the project discussed and has been prepared in accordance with generally accepted engineering practices. No warranties, expressed or implied, are intended or made. In the event of any changes in the nature, design, or location of the project as outlined in this report, this report shall not be considered valid, unless the changes are reviewed and this report modified or verified in writing by the engineer.

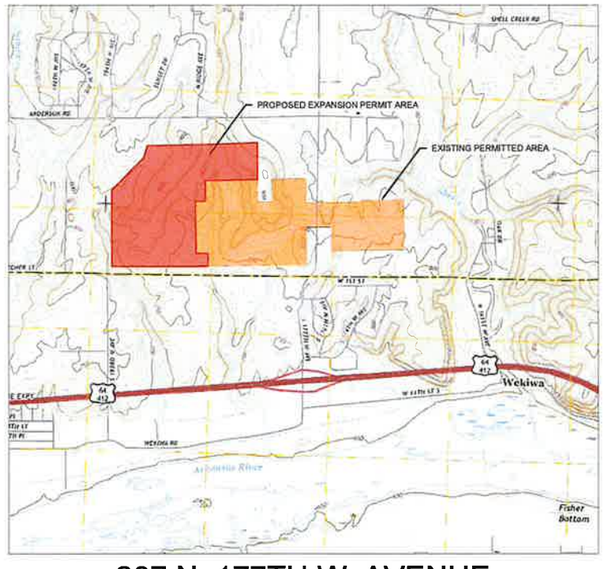
Permit Drawings

AMERICAN ENVIRONMENTAL LANDFILL
WEST EXPANSION PERMITTING

ODEQ Permit No. 3510007

May 2024

PREPARED FOR
AMERICAN ENVIRONMENTAL LANDFILL



207 N. 177TH W. AVENUE
SAND SPRINGS, OKLAHOMA

SHEET LIST TABLE	
Sheet Number	Sheet Title
0	Cover
1	Existing Contour Map
2	Site Layout
3	Seasonal High Water Level
4	Top of Subgrade Grading Plan
5	Top of Clay Grading Plan
6	Top of Final Cover Grading Plan
7	Cross Section Locator Map
8	Fill Cross Section A-A'
9	Fill Cross Section B-B'
10	Fill Cross Section C-C'
11	Fill Cross Section D-D'
12	Watershed Plan
13	Details
14	Details
15	Details
16	Details
17	Details
18	Details

PREPARED BY

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas
PH (913) 681-0030 FAX (913) 681-0012
Project No. 27220345.00

FOR PERMITTING PURPOSES ONLY

K:\AE\PROJECTS\2022\27220345.00 - LATERAL EXPANSION PERMITTING\TASK 4 - DRAWINGS\2023 PERMIT DRAWINGS PACKAGE\COVER\SHEET.DWG

1000.46' BETWEEN PARALLEL LINES

1000.00' BETWEEN PARALLEL LINES

TOTAL WATERSHED AREA IS APPROXIMATELY 262.45 ACRES

EXISTING OUTFALL 006

LEGEND:

- EXISTING 2' MINOR CONTOUR
- EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING BODY OF WATER
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- EXISTING STREAM
- SURFACE DRAINAGE
- EXISTING WATERSHED

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA

STATE OF OKLAHOMA REGISTERED PROFESSIONAL ENGINEER FLOYD E. COTTER 5/30/24

N

600 0 600 1200

SCALE FEET

REV.	DATE	DESCRIPTION	CK. BY
1			
2			
3			
4			
5			
6			

SHEET TITLE: EXISTING CONTOURS

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
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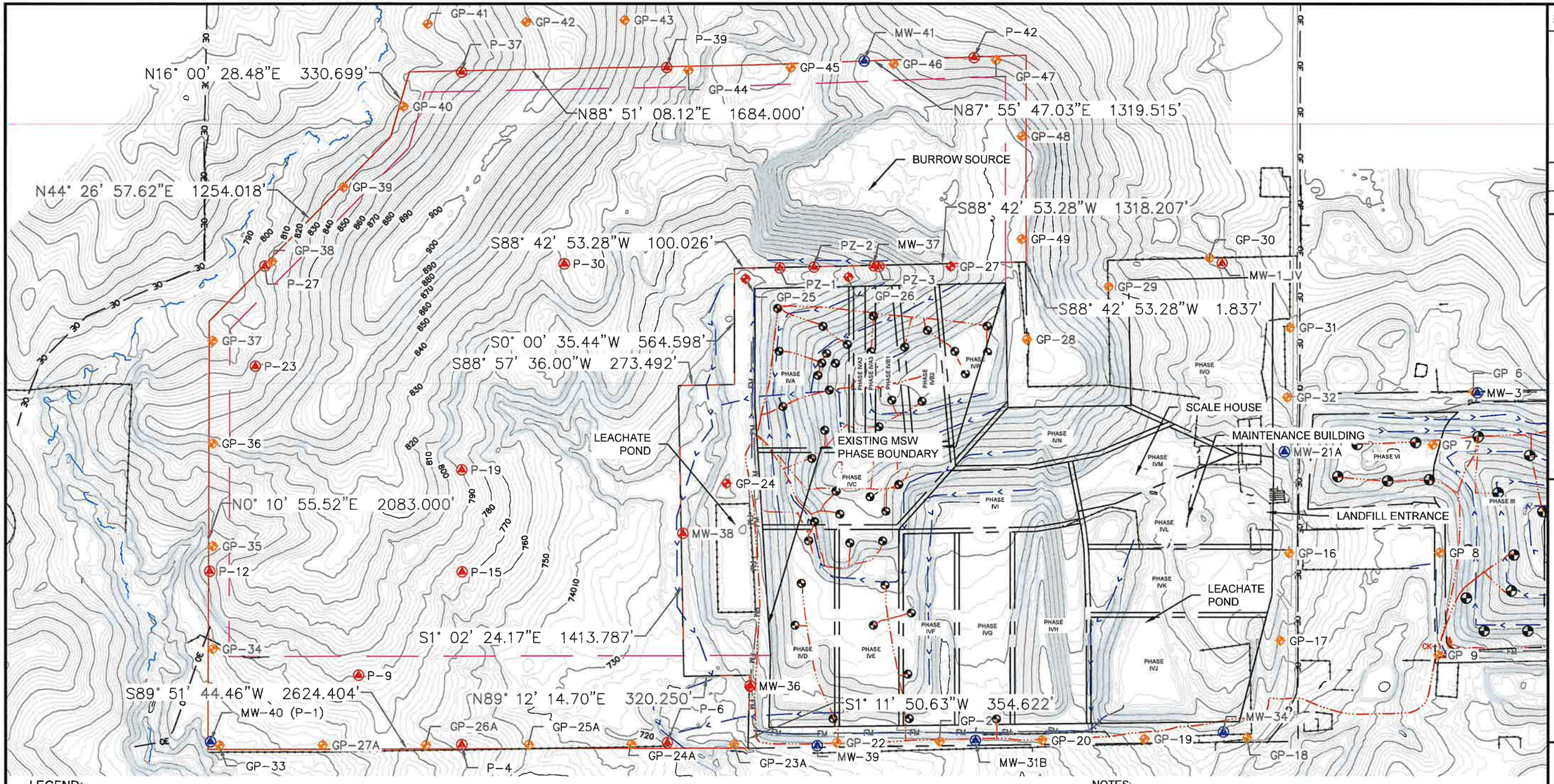
PROJ. NO.	DSN. BY:	DWN. BY:	CHK. BY:	O/A RVW BY:	PROJ. MGR.
27220345.00	TWL	TWL	CF	W.M	W.M

CADD FILE: SITE LAYOUT.DWG

DATE: 12/8/23

SCALE: 1"=600'

DRAWING NO. 1 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- 1570 EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- OE OE EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING BODY OF WATER
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- FM FM LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- EXISTING STREAM
- SURFACE DRAINAGE

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA

REGISTERED PROFESSIONAL ENGINEER
FLOYD E. COTTER
17783
OKLAHOMA
5/30/24

N

500 0 500 1000
SCALE FEET

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: SITE LAYOUT

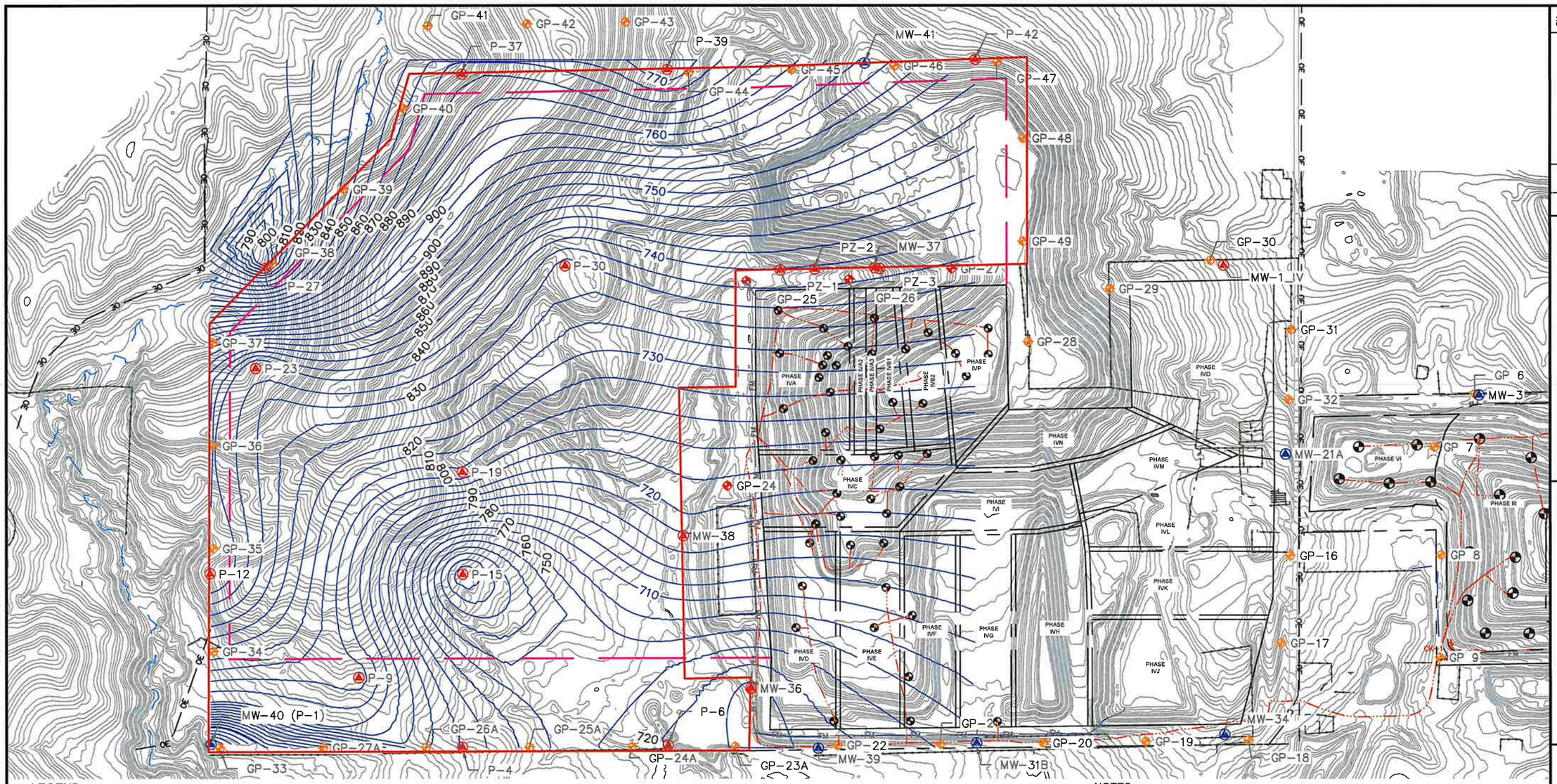
PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO. 27220345.00
DSGN. BY: TWL
DRWN. BY: TWL
CHK. BY: CF
QA/QC BY: W.J.M
PROJ. MGR: W.J.M

CADD FILE: SITE LAYOUT2
DATE: 12/8/23
SCALE: 1"=500'
DRAWING NO. 2 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- 820 EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- OE OE EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING BODY OF WATER
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- FM FM LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- EXISTING STREAM
- 730 2' GROUNDWATER CONTOUR

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA

REGISTERED PROFESSIONAL ENGINEER
FLOYD E. COTTER
17883
OKLAHOMA
5/30/24

N

500 0 500 1000
SCALE FEET

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: SEASONAL HIGH WATER LEVEL

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

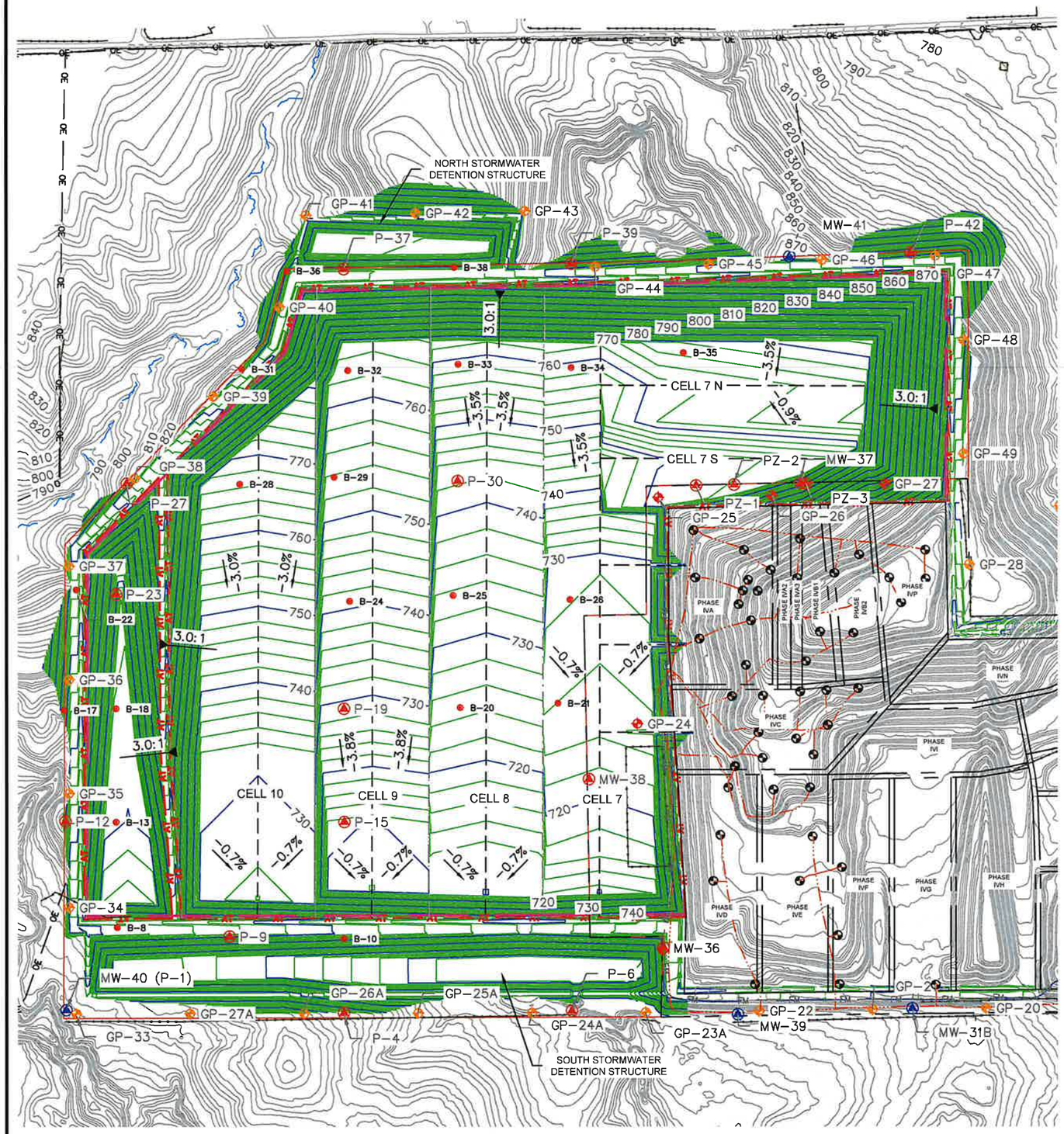
PROJ. NO.	DRWN. BY	CHK. BY	QA/QC BY	PROJ. MGR.
27220345.00	TWL	CF	WJM	WJM

CADD FILE: PREPARERS SURFACE MAP.DWG

DATE: 12/8/23

SCALE: 1"=500'

DRAWING NO. 3 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- 1570 EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- OE OE EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING STREAM/WATER BODY
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- FM FM LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- PROPOSED CELL BOUNDARY
- PROPOSED LEACHATE COLLECTION TRENCH
- PROPOSED MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- AT AT PROPOSED ANCHOR TRENCH
- BORE HOLE LOCATION

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA.
3. MAXIMUM AND MINIMUM SLOPES ARE SHOWN FOR EACH PROPOSED CELL.

N

500 0 500 1000

SCALE FEET

OKLAHOMA REGISTERED PROFESSIONAL ENGINEER
FLOYD E. COTTER
17783
5/30/24

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: TOP OF SUBGRADE GRADING PLAN

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

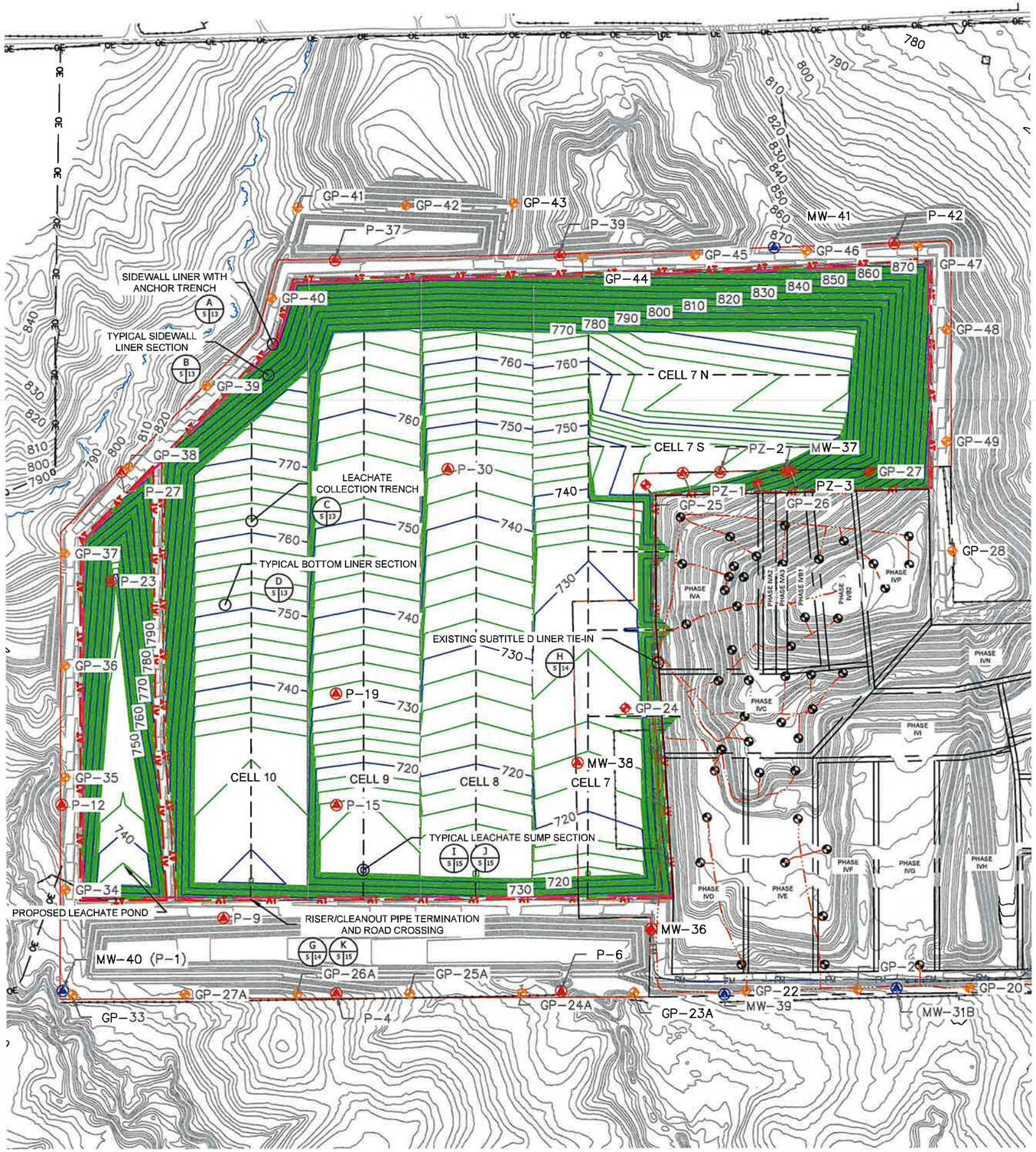
PROJ. NO.	DWN. BY:	QA/A RVW BY:
27220345.00	TWL	WJM
DSN. BY:	CHK. BY:	PRCL. SUBM:
TWL	CF	WJM

CADD FILE: TOP OF GRADING PLAN.DWG

DATE: 11/14/23

SCALE: 1"=500'

DRAWING NO. 4 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING STREAM/WATER BODY
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- PROPOSED CELL BOUNDARY
- PROPOSED LEACHATE COLLECTION TRENCH
- PROPOSED MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED ANCHOR TRENCH

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA.
3. EXTERIOR GRADING IS SHOWN AS EXISTING CONTOURS WHERE EXCAVATION/FILL WILL OCCUR.

500 0 500 1000
SCALE FEET

CK. BY	DESCRIPTION	REV. DATE

SHEET TITLE: TOP OF CLAY GRADING PLAN

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DSN. BY:	C/A REVIEW BY:
27220345.00	TWL	WJM
DSC. BY:	CHK. BY:	PROJ. MGR:
TWL	CF	WJM

CADD FILE: TOP OF GRADING PLAN.DWG

DATE: 11/14/23

SCALE: 1"=500'

DRAWING NO. 5 of 18

LEGEND:

- EXISTING 2' MINOR CONTOUR
- 1570 EXISTING 10' MAJOR CONTOUR
- SOLID WASTE PERMIT BOUNDARY
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- PROPOSED MINOR CONTOURS
- PROPOSED MAJOR CONTOURS

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA
3. EXTERIOR GRADING IS SHOWN AS EXISTING CONTOURS

PROFESSIONAL ENGINEER
FLOYD E. COTTER
OKLAHOMA
5/30/24

N

500 0 500 1000
SCALE FEET

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE
TOP OF FINAL COVER GRADING PLAN

PROJECT TITLE
AEL LATERAL EXPANSION PERMITTING

CLIENT
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

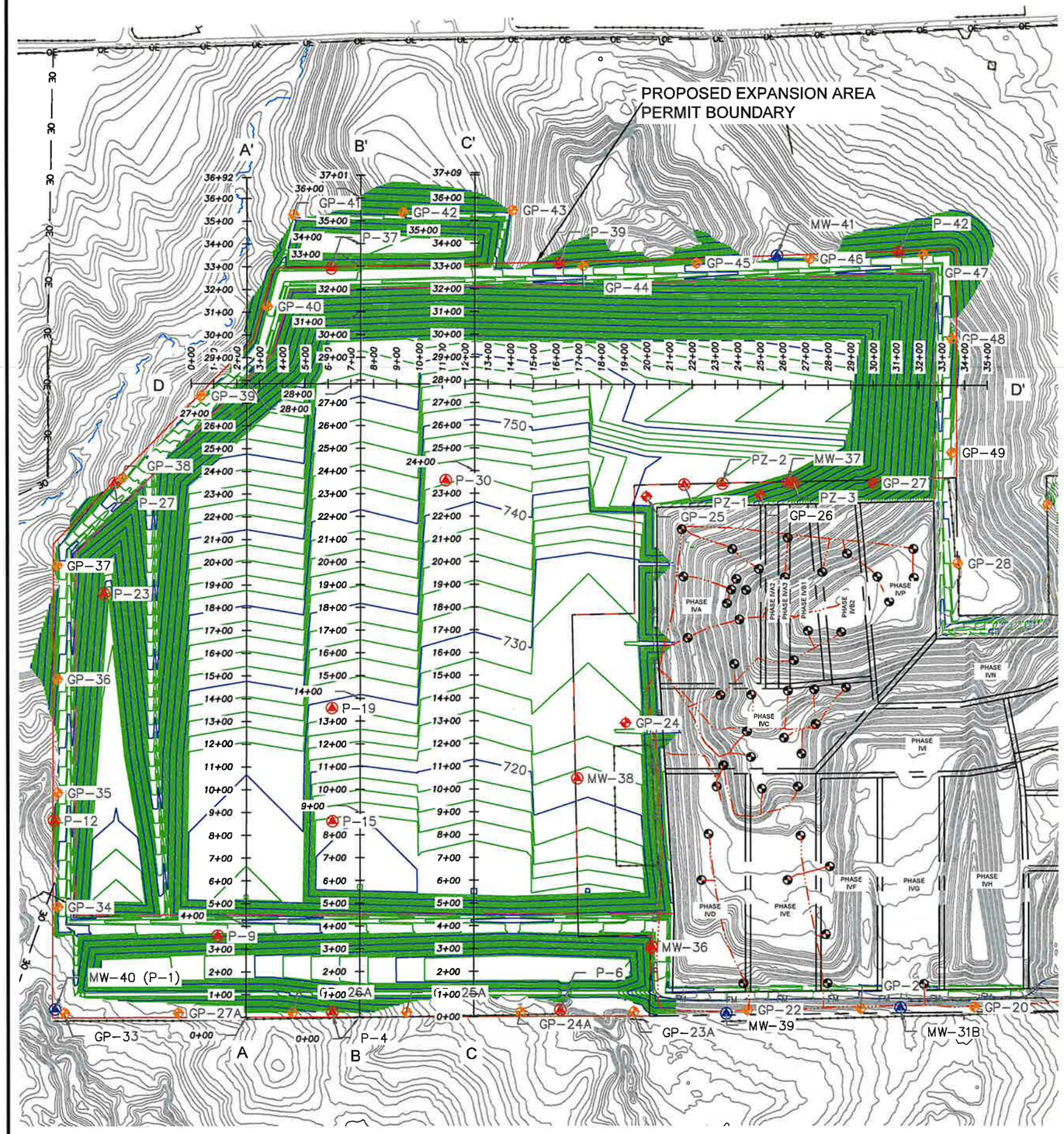
PROJ. NO.	DWN. BY:	CHK. BY:	QA/QC BY:	FINAL SIGN
27.20345.00	TWL	CF	W.J.M	W.J.M

CADD FILE:
FINAL COVER LAYOUT2.DWG

DATE: 12/8/23

SCALE: 1"=500'

DRAWING NO.
6 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- EXISTING 10' MAJOR CONTOUR
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING STREAM/WATER BODY
- SOLID WASTE PHASE BOUNDARY
- SOLID WASTE PERMIT BOUNDARY
- ELECTRICAL CONDUIT
- LEACHATE FORCEMAIN
- LANDFILL GAS COLLECTION SYSTEM PIPING
- EXTRACTION WELL
- GAS PROBE
- MONITORING WELL
- MONITORING WELL ABANDONMENT
- GAS PROBE ABANDONMENT
- PROPOSED EXPANSION AREA PERMIT BOUNDARY
- PROPOSED LIMITS OF WASTE
- TOP OF SUBGRADE MINOR CONTOURS
- TOP OF SUBGRADE MAJOR CONTOURS

NOTES:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. PROPOSED GAS PROBES AND MONITORING WELLS ARE DEPICTED WITHIN THE EXPANSION AREA.

N

500 0 500 1000

SCALE FEET

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: CROSS SECTION LOCATOR MAP

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

DWN. BY	CHK. BY	QA/QC BY	PROJ. MGR.
TWL	CF	WJM	WJM

PROJ. NO. 27220345.00
DSGN. BY: TWL

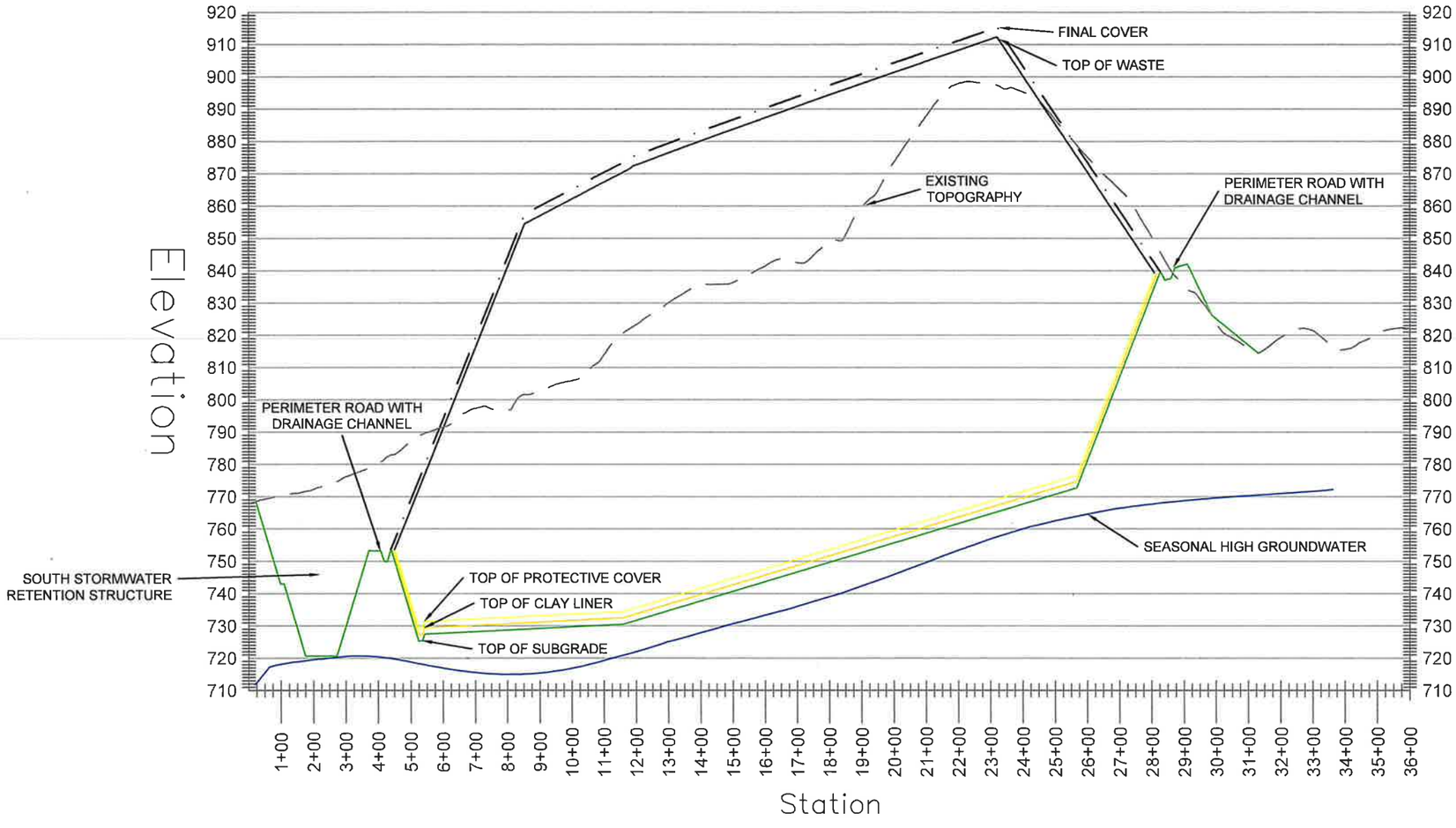
CADD FILE:

DATE: 12/8/23

SCALE: 1"=500'

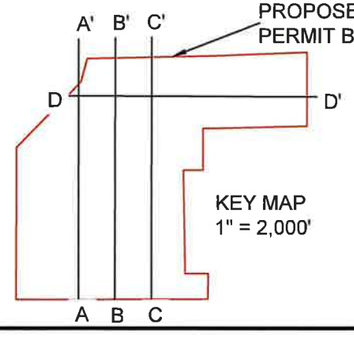
DRAWING NO. 7 of 18

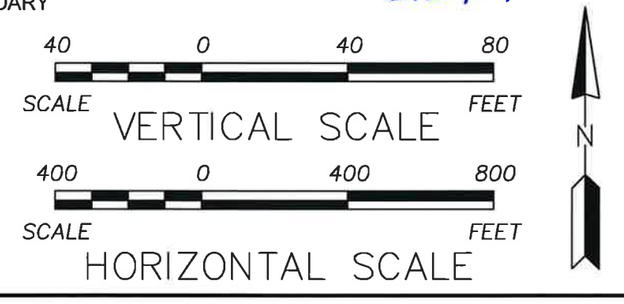
A – A'



LEGEND:

- EXISTING TOPOGRAPHY
- TOP OF SEASONAL HIGH GROUNDWATER
- TOP OF SUBGRADE
- TOP OF CLAY LINER
- TOP OF PROTECTIVE COVER
- TOP OF WASTE
- TOP OF FINAL COVER





5/30/24

REV.	DATE	DESCRIPTION	CK. BY
0			

SHEET TITLE: FILL CROSS SECTION A-A'

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

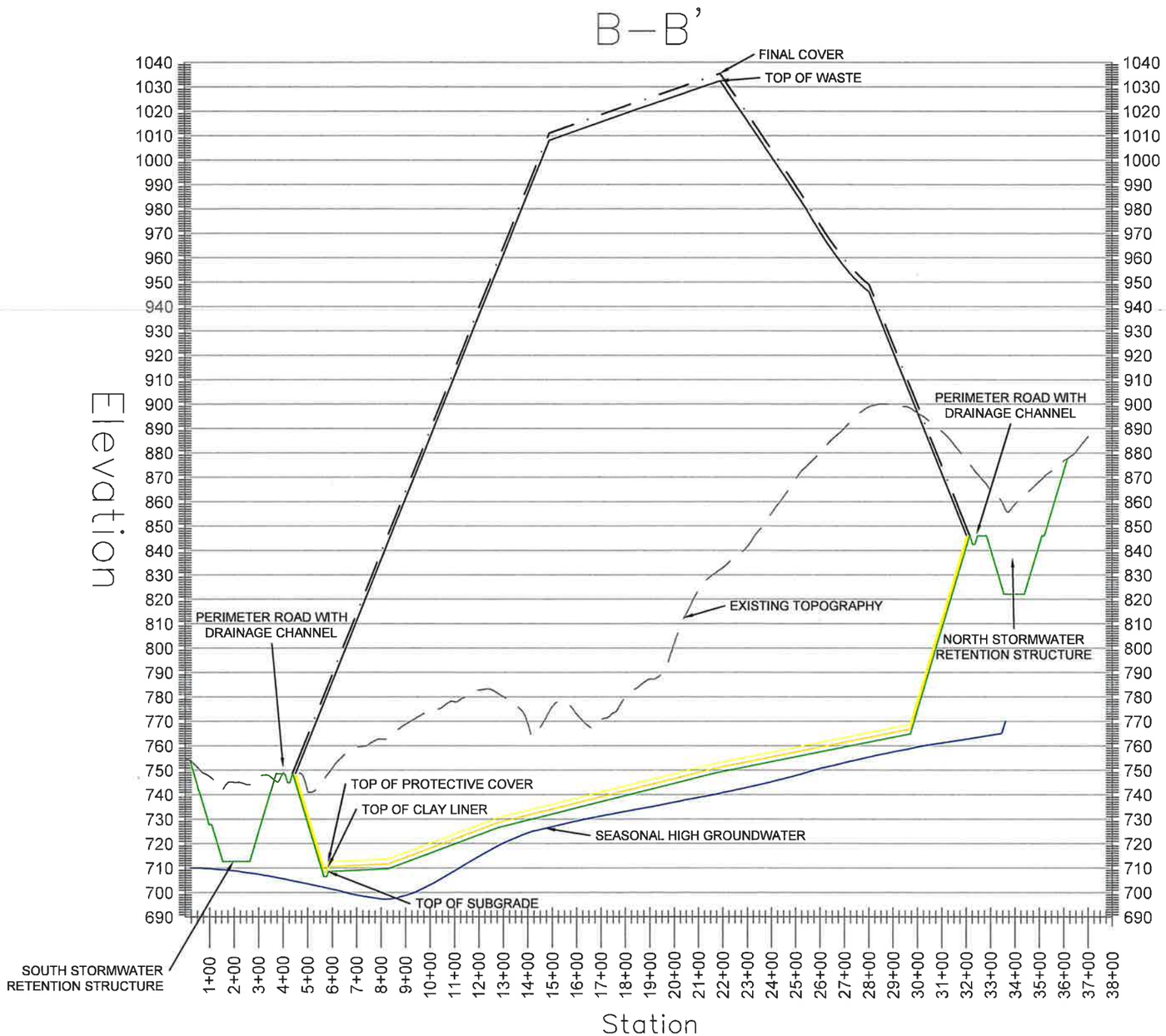
PROJ. NO.	DSN. BY:	Q/A REVIEW BY:
27220345.00	TWL	W.M
TASK BY:	CHK. BY:	PROJ. MGR:
TWL	CF	W.M

CADD FILE:

DATE: 12/8/23

SCALE: VARIES

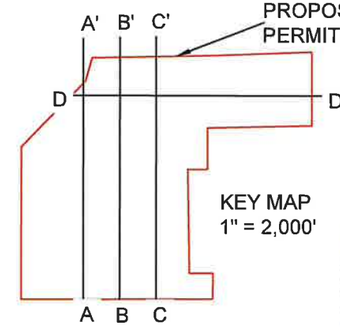
DRAWING NO. 8 of 18



LEGEND:

- EXISTING TOPOGRAPHY
- TOP OF SEASONAL HIGH GROUNDWATER
- TOP OF SUBGRADE
- TOP OF CLAY LINER
- TOP OF PROTECTIVE COVER
- TOP OF WASTE
- TOP OF FINAL COVER

NOTES:
1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.



KEY MAP
1" = 2,000'

5/30/24

50 0 50 100
SCALE FEET
VERTICAL SCALE

500 0 500 1000
SCALE FEET
HORIZONTAL SCALE

N

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: FILL CROSS SECTION B-B'

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DWN. BY	CHK. BY	QA/QC BY	PROJ. MGR
27220345.00	TWL	CF		WJM

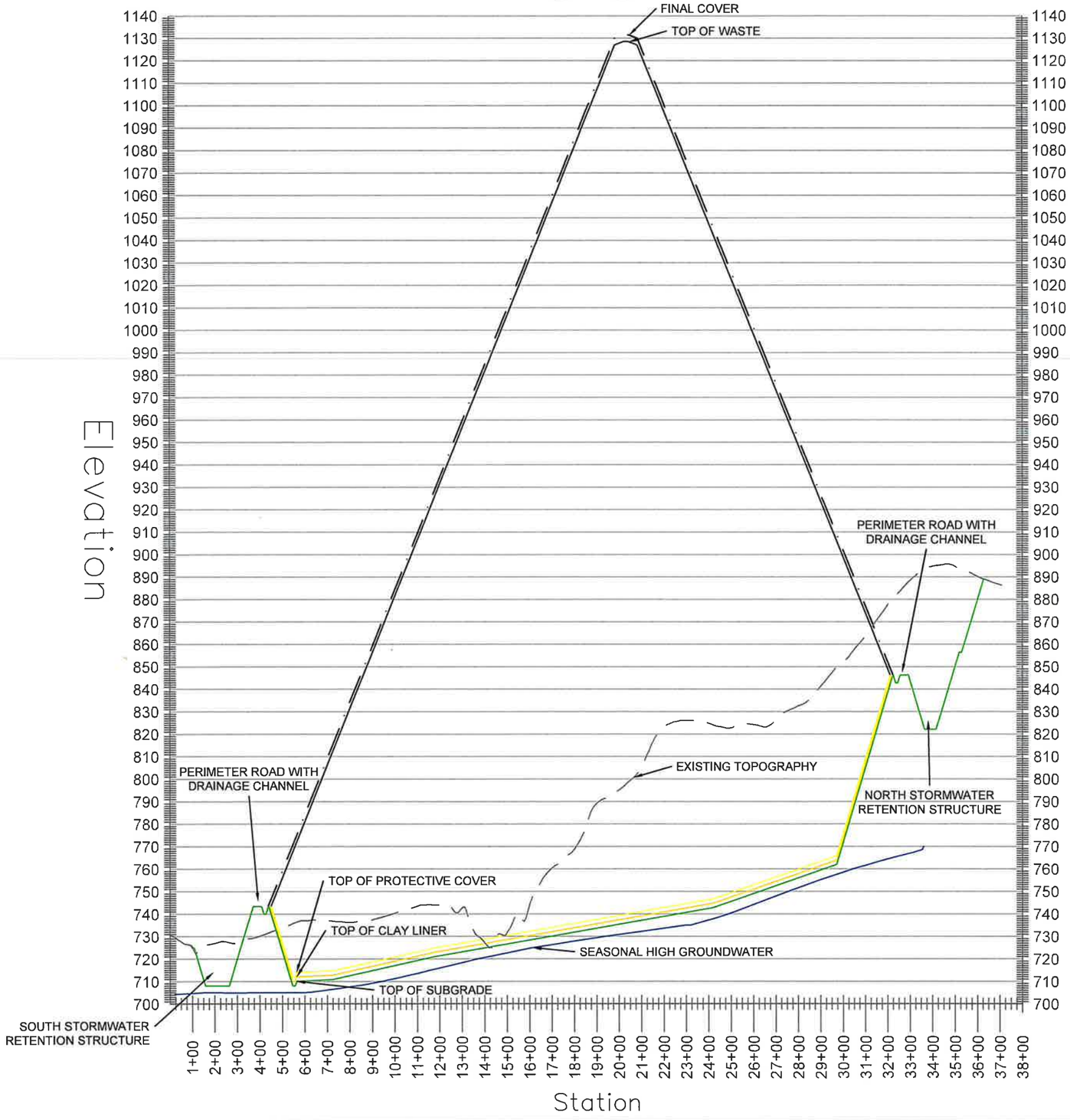
CADD FILE:

DATE: 12/8/23

SCALE: VARIES

DRAWING NO. 9 of 18

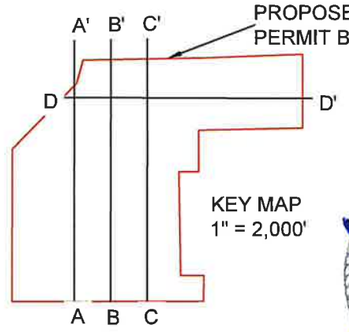
C – C'



LEGEND:

- EXISTING TOPOGRAPHY
- TOP OF SEASONAL HIGH GROUNDWATER
- TOP OF SUBGRADE
- TOP OF CLAY LINER
- TOP OF PROTECTIVE COVER
- TOP OF WASTE
- TOP OF FINAL COVER

NOTES:
1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.



5/30/24

50 0 50 100
SCALE FEET
VERTICAL SCALE

500 0 500 1000
SCALE FEET
HORIZONTAL SCALE

N

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: FILL CROSS SECTION C-C'

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO. 27220345.00
DSN. BY: TWL
DRW. BY:
CHK. BY: CF
QA/QC BY: W.J.M
FINAL SIGN: W.J.M

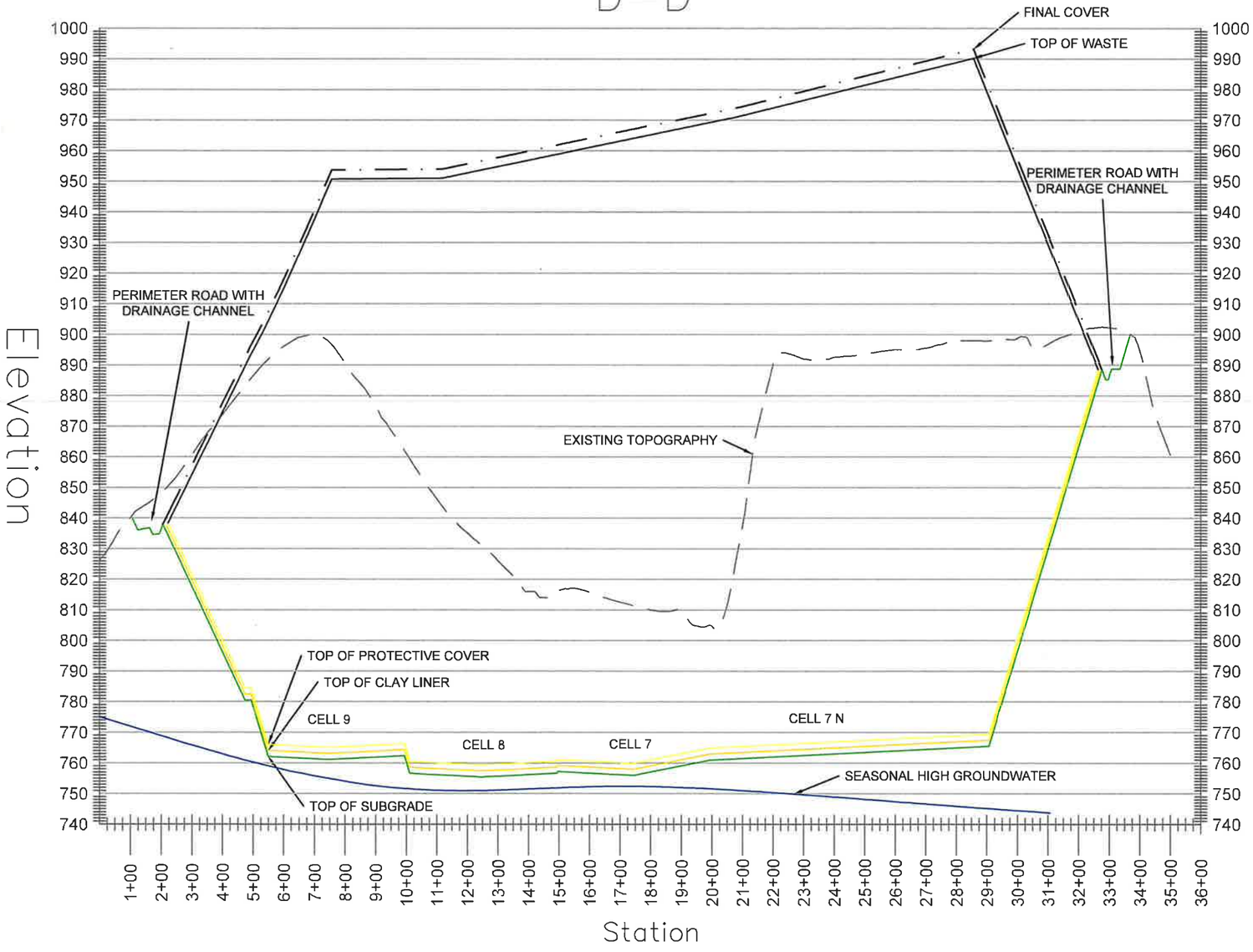
CADD FILE:

DATE: 12/8/23

SCALE: VARIES

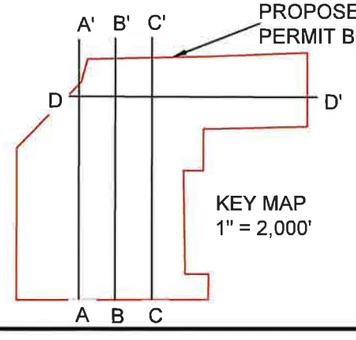
DRAWING NO. 10 of 18

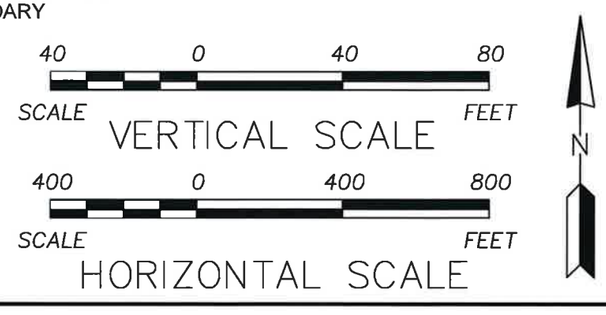
D – D'



LEGEND:

- EXISTING TOPOGRAPHY
- TOP OF SEASONAL HIGH GROUNDWATER
- TOP OF SUBGRADE
- TOP OF CLAY LINER
- TOP OF PROTECTIVE COVER
- TOP OF WASTE
- TOP OF FINAL COVER





5/30/24

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: FILL CROSS SECTION D-D'

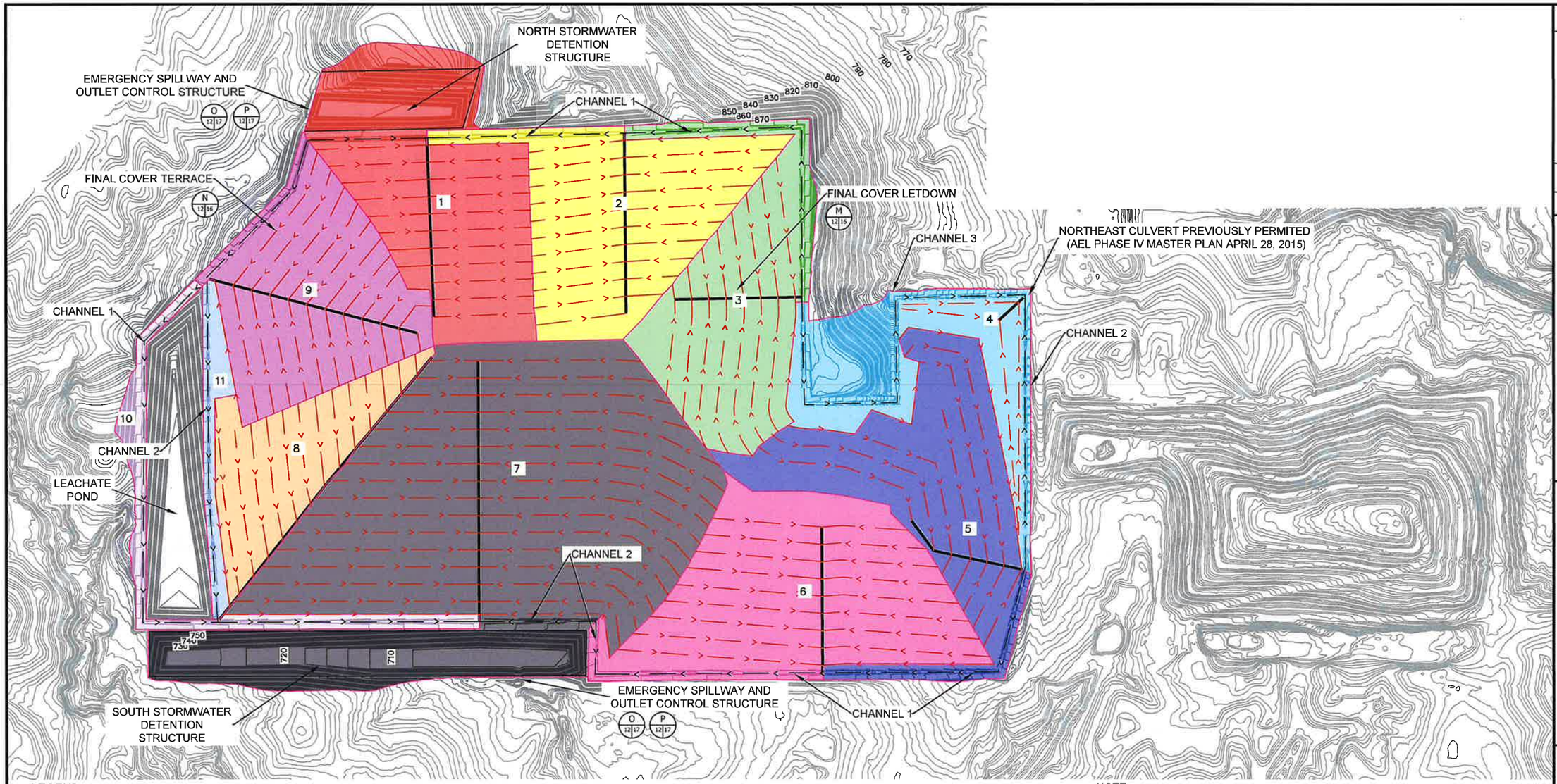
PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO. 02227045.00
DSN. BY: TWL
DWN. BY: TWL
CHK. BY: CF
Q/A BY: WJM
FIELD WORK: WJM

CADD FILE:
DATE: 12/8/23
SCALE: VARIES
DRAWING NO. 11 of 18



LEGEND:

- EXISTING 2' MINOR CONTOUR
- EXISTING 10' MAJOR CONTOUR
- PROPOSED STORMWATER TERRACE
- PROPOSED STORMWATER LETDOWN
- PROPOSED WATERSHED BOUNDARY
- PERIMETER CHANNEL

WATERSHED DATA

COLOR	BASIN NUMBER	DRAINAGE AREA (AC)	DRAINAGE CHANNEL	OUTFALL/STRUCTURE
	1	35.60	CHANNEL 1	NORTH STORMWATER DETENTION STRUCTURE
	2	29.95		
	3	28.29		
	4	20.42	CHANNEL 2/3	NORTHEAST CULVERT
	5	31.82	CHANNEL 1	SOUTH STORMWATER DETENTION STRUCTURE
	6	39.24	CHANNEL 1/2	
	7	95.41		
	8	16.33	CHANNEL 1	
	9	28.21		
	10	7.71		
	11	4.27	CHANNEL 2	

NOTE:

1. AERIAL TOPOGRAPHY PERFORMED BY AERIAL DATA SERVICES, LLC ON JANUARY 27, 2023.
2. WATERSHED 4 REMAINS UNCHANGED FROM THE AEL PHASE IV MASTER PLAN PREVIOUSLY APPROVED BY THE ODEQ ON APRIL 28, 2015.

N

600 0 600 1200

SCALE FEET

PROFESSIONAL ENGINEER FLOYD E. COTTER 22783 OKLAHOMA 5/30/24

REV.	DATE	DESCRIPTION	CK. BY

SHEET TITLE: WATERSHED PLAN

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OK

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

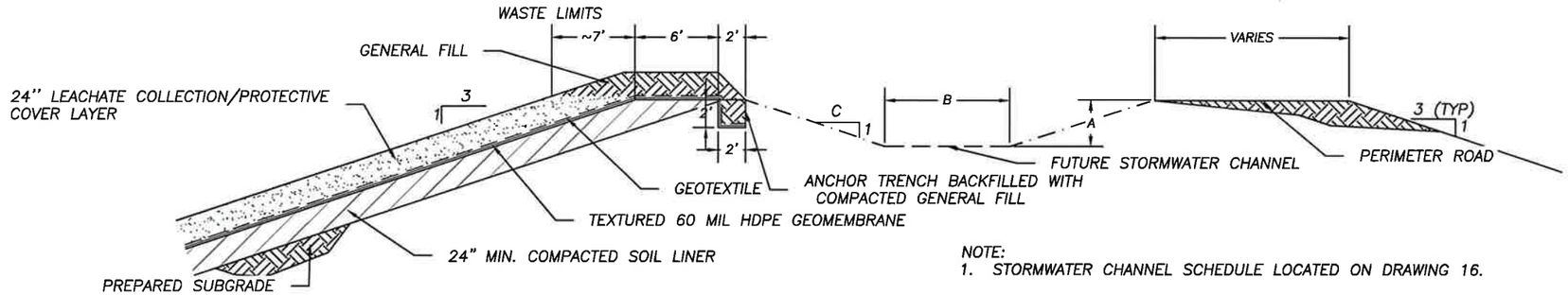
PROJ. NO. 27220345.00
DSN. BY: TWL
DWN. BY: EM
CHK. BY: CF
O/A RVW BY: W.M
PROJ. MGR: W.M

CADD FILE:

DATE: 12/8/23

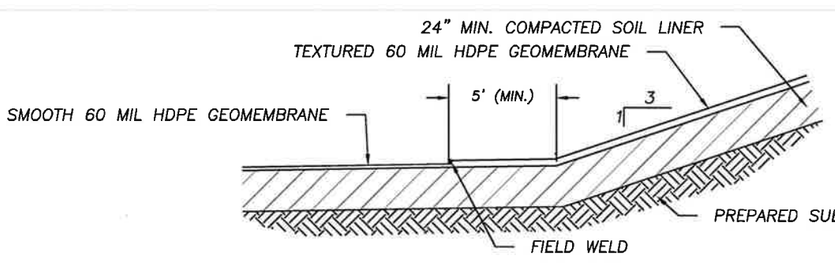
SCALE: 1"=600'

DRAWING NO. 12 of 18

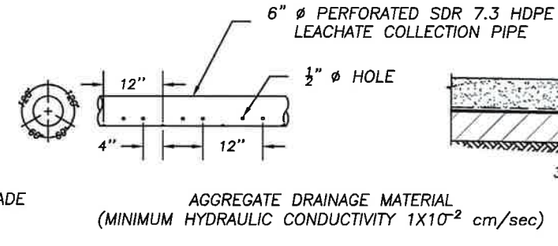


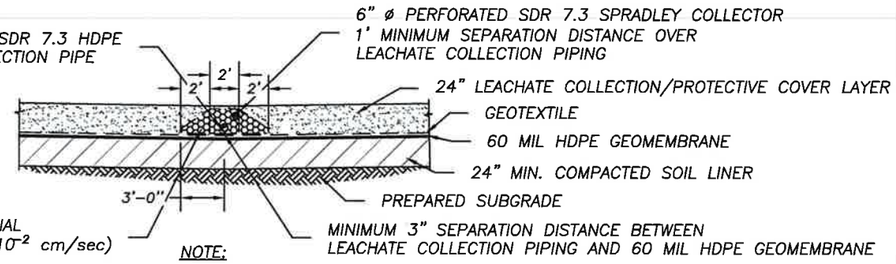
NOTE:
1. STORMWATER CHANNEL SCHEDULE LOCATED ON DRAWING 16.

A SIDEWALL LINER WITH ANCHOR TRENCH
A | 5 | 13
Scale: NTS



B TYPICAL SIDEWALL LINER SECTION
B | 5 | 13
Scale: NTS

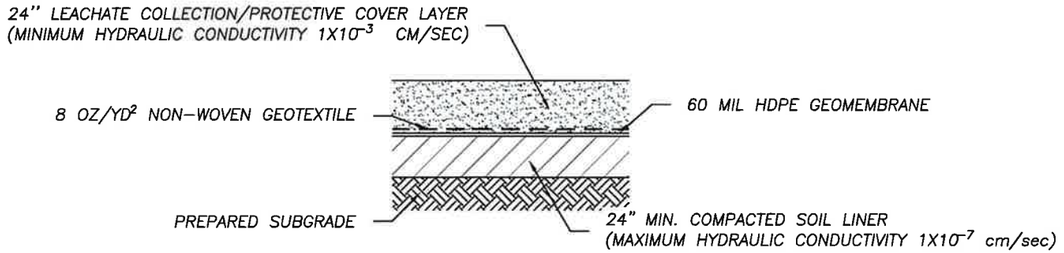




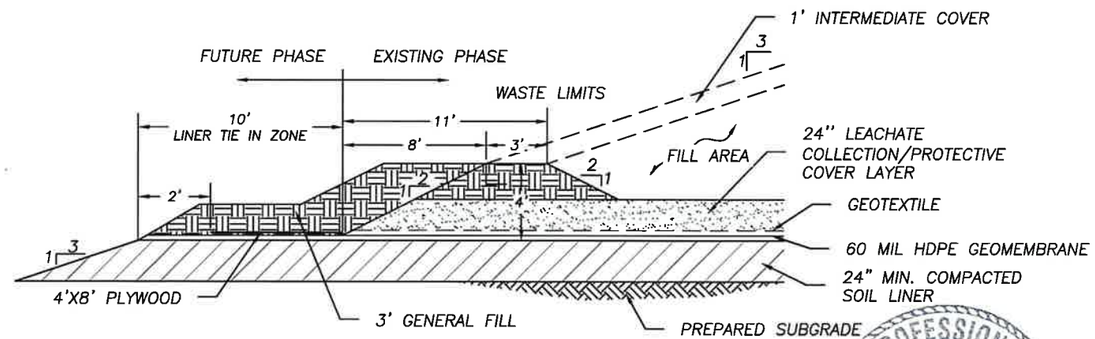
NOTE:

1. THE GRANULAR DRAINAGE MATERIAL SHALL BE OF A SIZE THAT NOT MORE THAN 10% WILL PASS ½" SIEVE.

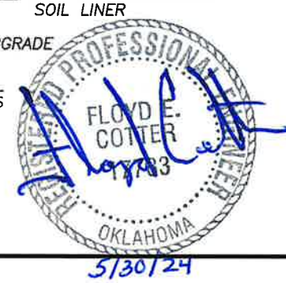
C LEACHATE COLLECTION TRENCH
C | 5 | 13
Scale: NTS



D TYPICAL BOTTOM LINER SECTION
D | 5 | 13
Scale: NTS



E FUTURE LINER TIE-IN/ TERMINATION BERM
- | -
Scale: NTS



5/30/24

REV.	DATE	DK. BY

SHEET TITLE: DETAILS

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

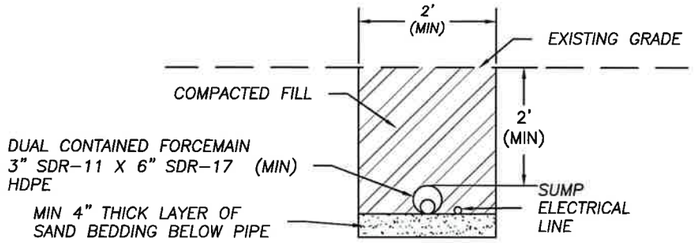
DSNR. BY:	CHKD. BY:	QA/A RVW BY:	PROJ. MGR:
TWL	CF	W.J.M	W.J.M

PROJ. NO. 27220345.00
DSGN. BY: TWL

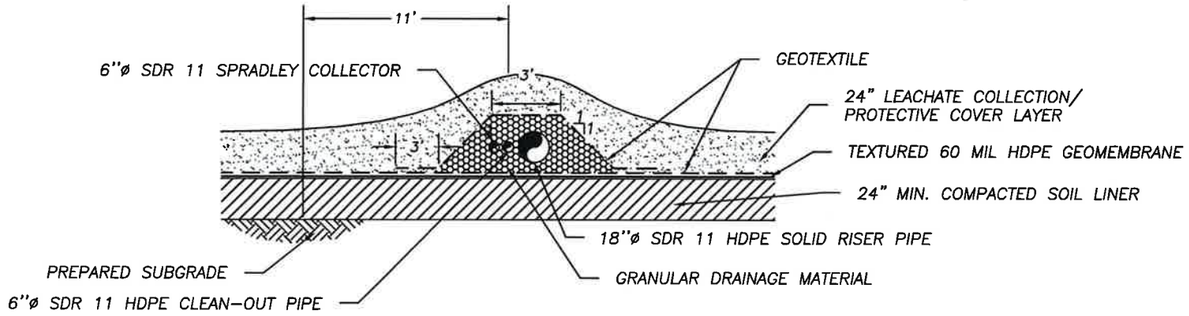
CADD FILE:

DATE: 12/8/23

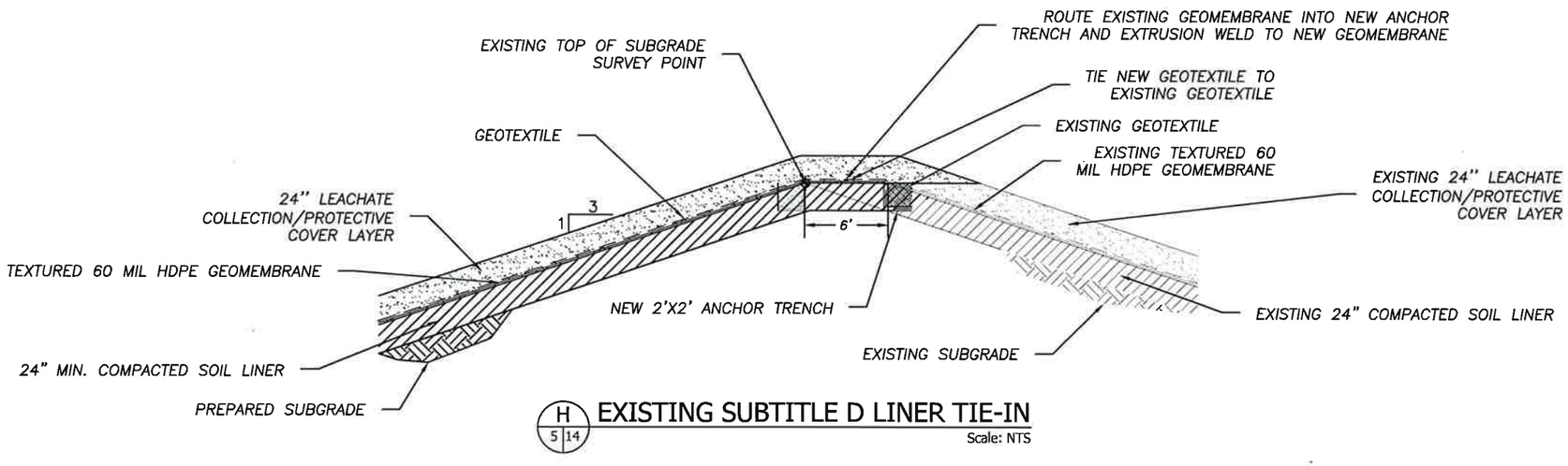
DRAWING NO. 13 of 18



F - F LCS FORCEMAIN TRENCH
Scale: NTS



G - 5 | 14 RISER/CLEANOUT PIPE SIDEWALL SECTION
Scale: NTS



H - 5 | 14 EXISTING SUBTITLE D LINER TIE-IN
Scale: NTS

REV.	DATE	BY
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

SHEET TITLE: DETAILS

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

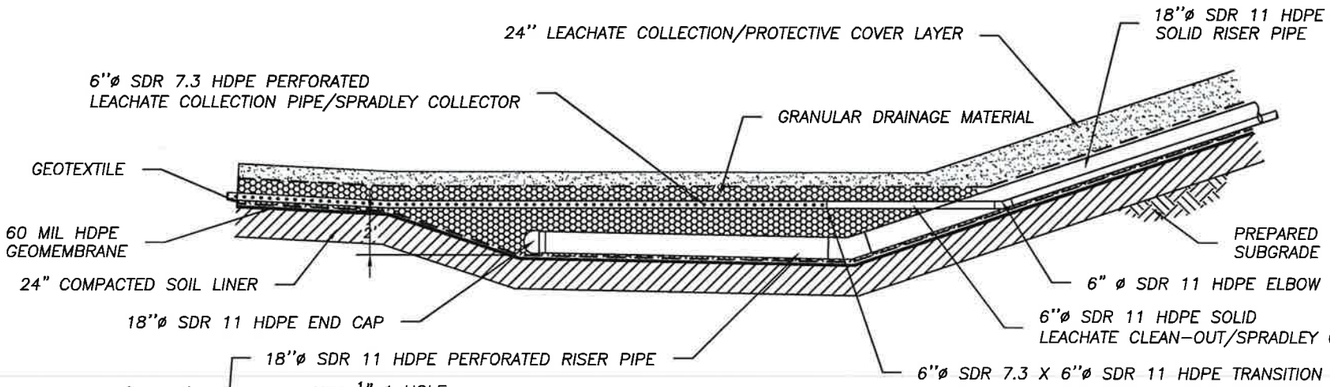
CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO. 27220345.00
DSN. BY: TWL
CHK. BY: CF
DSN. BY: TWL
S/A RVW BY: WJM
PROJ. MGR: WJM

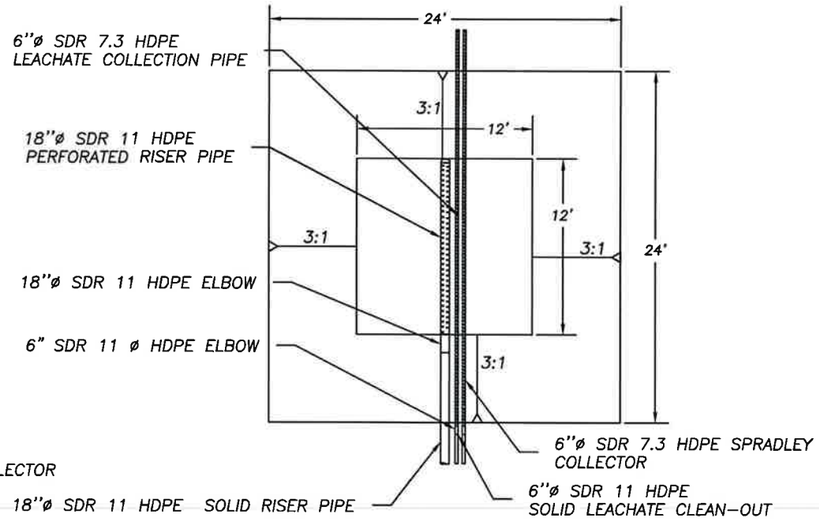
CADD FILE: DETAILS.DWG
DATE: 12/8/23
DRAWING NO. 14 of 18

K:\AEL\Projects\2020\27220345.00 - Lateral Expansion Permitting\Task 4 - Drawings\2023 Permit Drawings Package\Details.dwg Dec 08, 2023 - 12:30pm Layout Name: 2 By: 4810twl



I 5 15 TYPICAL LEACHATE SUMP SECTION

Scale: NTS

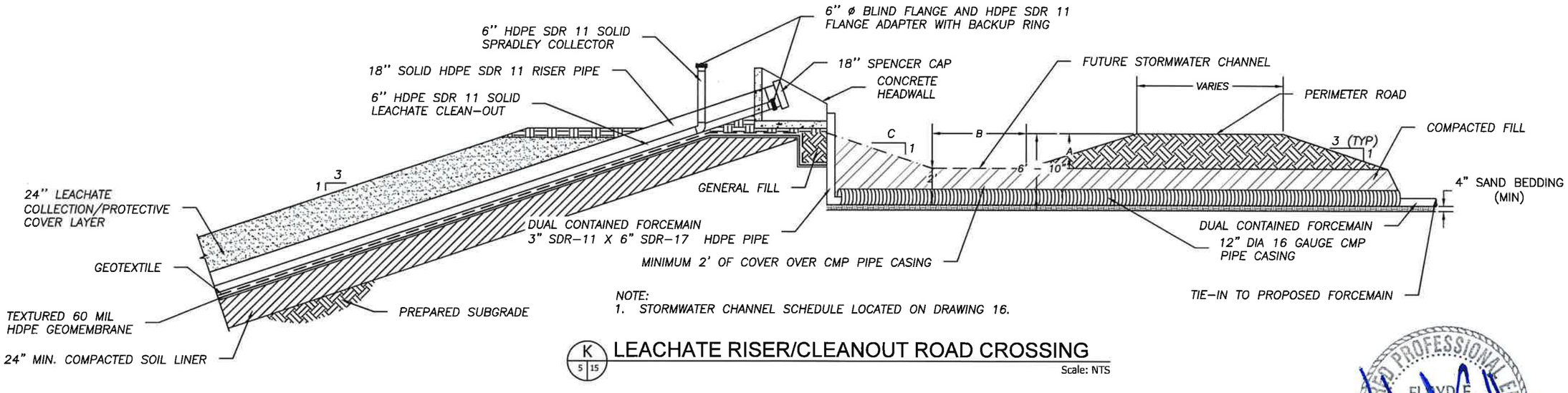


J 5 15 TYPICAL LEACHATE SUMP SECTION

Scale: NTS

NOTE:

1. THE GRANULAR DRAINAGE MATERIAL SHALL BE OF A SIZE THAT NOT MORE THAN 10% WILL PASS ½" SIEVE.



NOTE:

1. STORMWATER CHANNEL SCHEDULE LOCATED ON DRAWING 16.

K 5 15 LEACHATE RISER/CLEANOUT ROAD CROSSING

Scale: NTS

CK. BY | REV. | DATE

DETAILS

SHEET TITLE

PROJECT TITLE
AEL LATERAL EXPANSION PERMITTING

CLIENT
AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

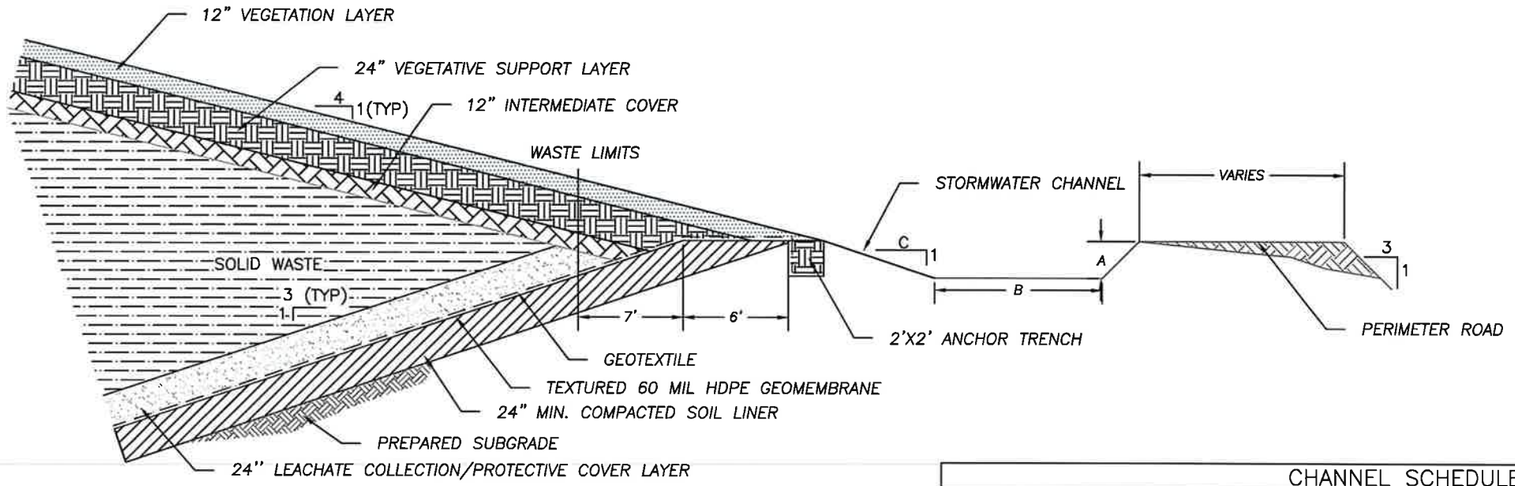
PROJ. MGR. TWL
DSN. BY: TWL
DSC. BY: TWL
QA REW BY: W.J.M
PROJ. MGR: W.J.M
CF

CADD FILE:

DATE: 12/8/23

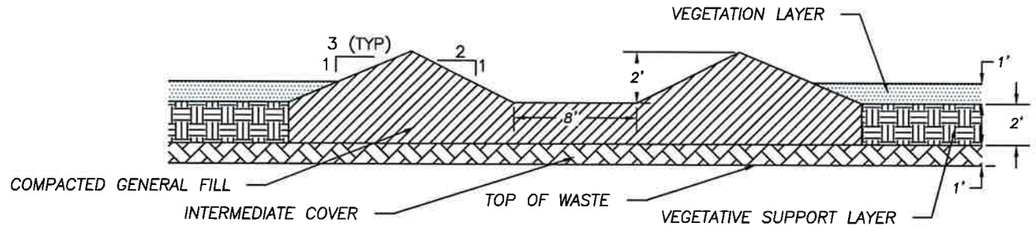
DRAWING NO. 15 of 18

K:\AEL\Projects\2020\27220345.00 - Lateral Expansion Permitting\Task 4 - Drawings\2023 Permit Drawings Package\Details.dwg Dec 08, 2023 - 12:30pm Layout Name: 3 By: 4810twl

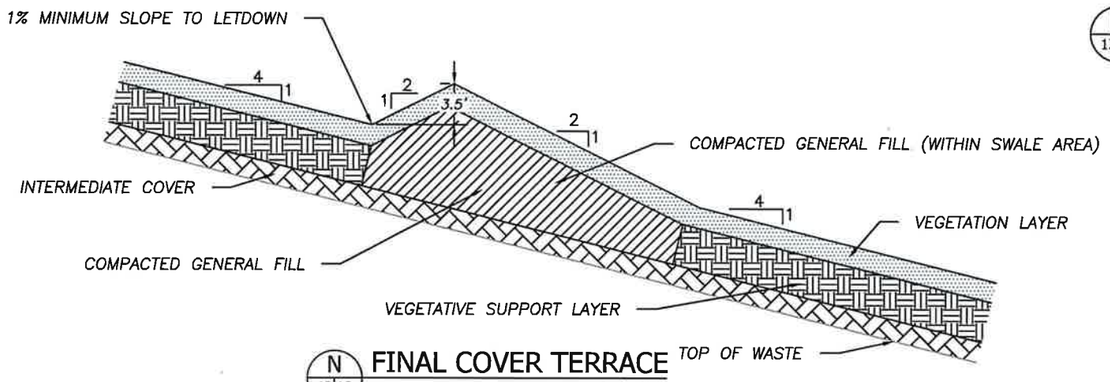


L 6|16 **FINAL COVER TIE-IN**
Scale: NTS

CHANNEL SCHEDULE				
	A (FT)	B (FT)	C	LINING MATERIAL
TERRACE	3.50	0.00	4:2	GRASS
LETDOWN	2.00	8.00	2	HDPE
CHANNEL 1	3.50	9.00	3	RIP RAP (24" THICK D_{50} = 12")
CHANNEL 2	3.00	0.00	3	GRASS
CHANNEL 3	3.00	10.00	3	GRASS



M 12|16 **FINAL COVER LETDOWN**
Scale: NTS



N 12|16 **FINAL COVER TERRACE**
Scale: NTS

REV.	DATE	BY	CK. BY
	-	-	-

SHEET TITLE: **DETAILS**

PROJECT TITLE: **AEL LATERAL EXPANSION PERMITTING**

CLIENT
AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DSN. BY:	CHK. BY:	S/A REV BY:	PROJ. MGR:
27220345.00	TWL	CF		WJM

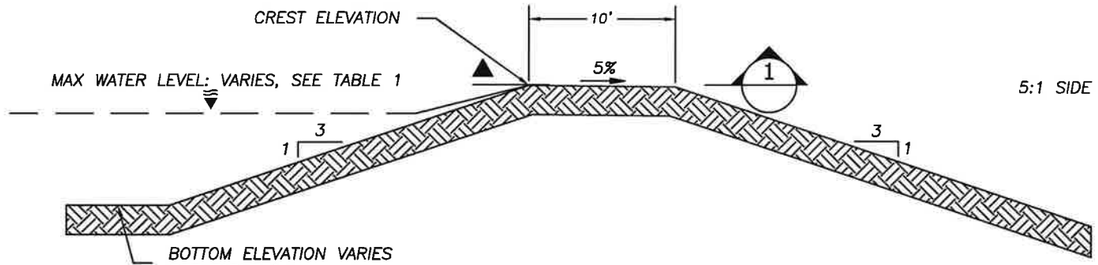
DSN. BY: TWL

CADD FILE:
DETAILS.DWG

DATE: 12/8/23

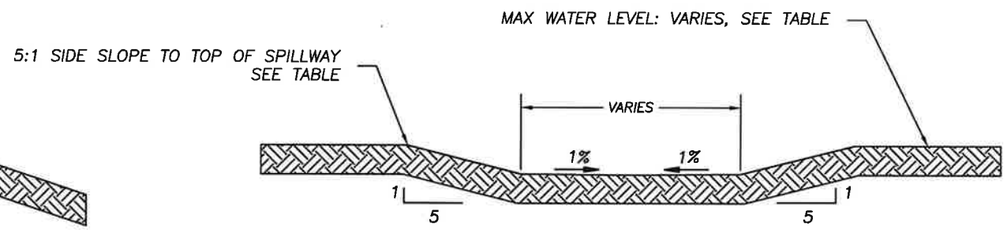
DRAWING NO. **16** of 18

K:\AEL\Projects\2020\27220345.00 - Lateral Expansion Permitting\Task 4 - Drawings\2023 Permit Drawings Package\Details.dwg Dec 08, 2023 - 12:30pm Layout Name: 4 By: 4810twl



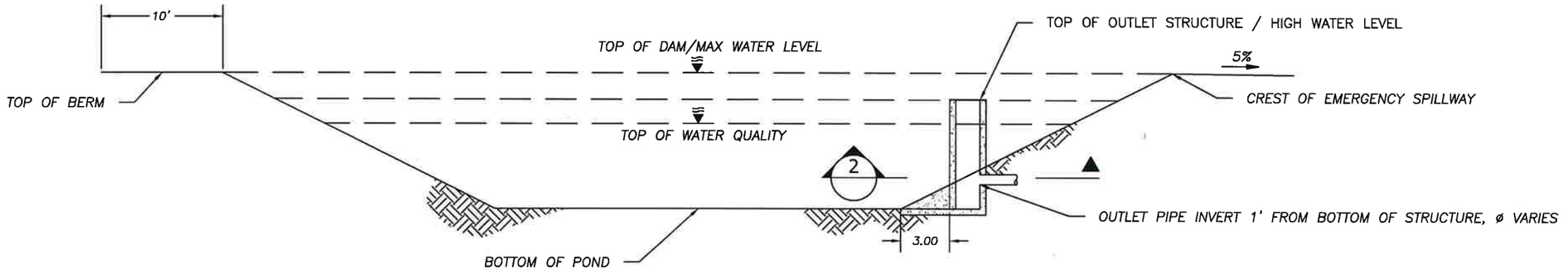
O 12|17 STORMWATER DETENTION STRUCTURE EMERGENCY SPILLWAY

Scale: NTS



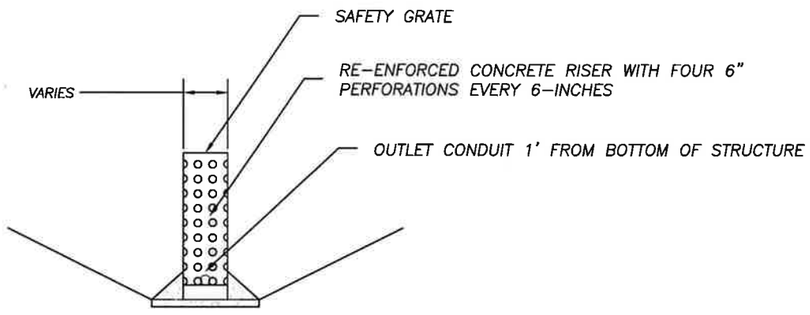
1 SECTION VIEW

STORMWATER QUALITY STRUCTURE						
STORMWATER DETENTION STRUCTURE	BOTTOM OF POND ELEVATION (FT)	MAX WATER LEVEL (FT)	DEPTH OF WATER AT MWL (FT)	TOP OF SPILLWAY (FT)	WIDTH OF SPILLWAY (FT)	FREEBOARD (FT)
NORTH STRUCTURE	822.00	840.00	18.00	837.00	5.00	1.00
SOUTH STRUCTURE	708.00	725.00	17.00	722.00	30.00	1.00



P 12|17 STORMWATER DETENTION STRUCTURE AND OUTLET CONTROL STRUCTURES

PLAN VIEW



2 SECTION VIEW

OUTLET SCHEDULE						
STORMWATER DETENTION STRUCTURE	TOP OF OUTLET STRUCTURE ELEVATION (FT)	TOP OF WATER QUALITY ELEVATION (FT)	OUTLET PIPE INVERT ELEVATION (FT)	OUTLET PIPE LENGTH (FT)	OUTLET PIPE SLOPE %	DIAMETER (IN)
NORTH STRUCTURE	835.00	833.00	823.00	100.00	1.70	24
SOUTH STRUCTURE	720.00	720.00	709.00	180.00	1.00	48

CK BY | DATE | REV.

SHEET TITLE: DETAILS

PROJECT TITLE: AEL LATERAL EXPANSION PERMITTING

CLIENT: AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH. (913) 681-0030 FAX. (913) 681-0012

Q/A RVW BY: WJM | PROJ. MGR: WJM
DWN. BY: TWL | CHK. BY: CF
PROJ. NO. 27220345.00 | DSN. BY: TWL

CADD FILE: DETAILS.DWG

DATE: 12/8/23

DRAWING NO. 17 of 18

SURFACE SEAL: CONCRETE OR CEMENT GROUT PLACED ABOVE THE ANNULAR SEAL FROM A DEPTH OF 2–FT TO GROUND SURFACE.

ANNULAR SEAL: BENTONITE CHIPS, CEMENT/BENTONITE GROUT, OR BENTONITE GROUT (SEE NOTE 1) PLACED FROM FILTER PACK SEAL TO WITHIN 2–FT OF GROUND SURFACE

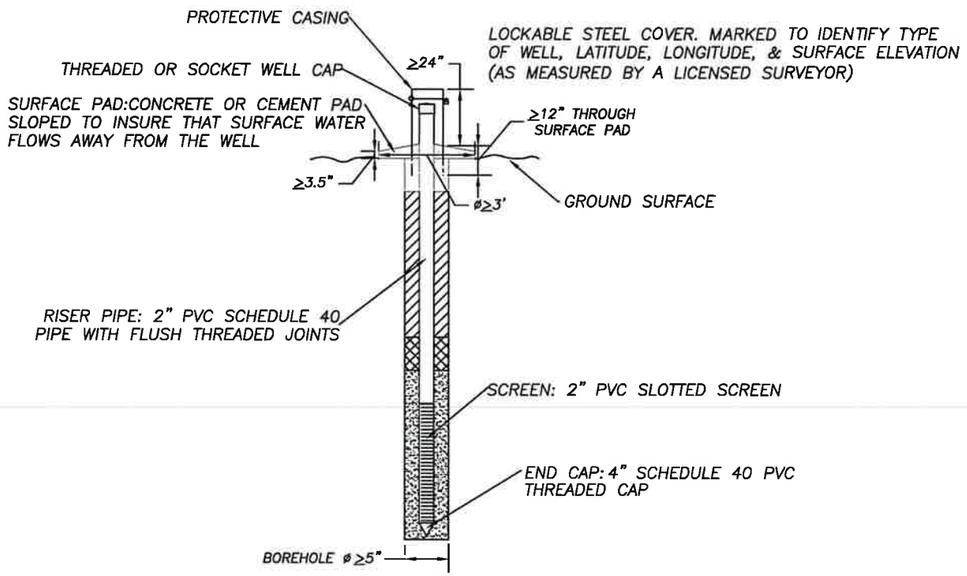
FILTER PACK SEAL: AT LEAST 2–FT OF HYDRATED BENTONITE (0.25"–0.75" IN SIZE) PLACED ABOVE FILTER PACK.

FILTER PACK: SILICA SAND; PLACED FROM BOTTOM OF BOREHOLE TO 2–FT ABOVE THE TOP OF SCREEN.

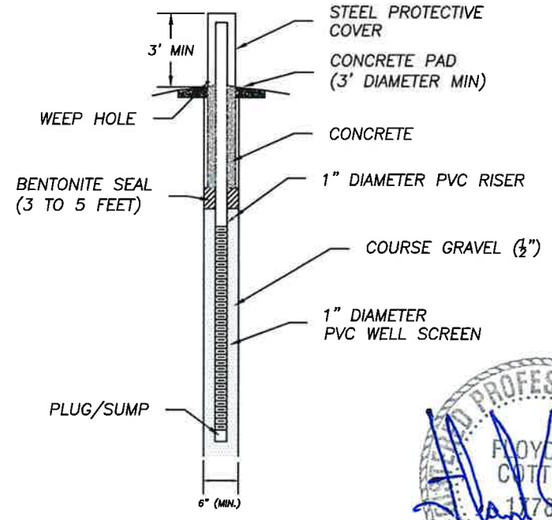
NOTES:

1. ANNULAR SEAL: CEMENT GROUT MIX RATIO OF 94–LBS CEMENT TO A MAXIMUM OF 6–GAL WATER IS USED, AND MIXED TO THE CONSISTENCY RECOMMENDED BY THE CEMENT MANUFACTURER. MAXIMUM OF TWENTY PERCENT (20%) BENTONITE BY DRY WEIGHT MAY BE ADDED TO THE CEMENT GROUT TO FORM THE CEMENT/BENTONITE GROUT MIXTURE. THE BENTONITE IS PREHYDRATED TO THE MANUFACTURER'S RECOMMENDED CONSISTENCY. THE BENTONITE GROUT HAS AT LEAST TWENTY PERCENT (20%) BENTONITE BY DRY WEIGHT, AND IS MIXED ACCORDING TO THE MANUFACTURER'S RECOMMENDED CONSISTENCY.

2. WHEN THE PLACEMENT OF GROUT WILL EXCEED 20–FT, THE GROUT IS PLACED THROUGH A TREMIE PIPE AND FILLED OR PUMPED FROM THE BOTTOM UPWARD.



Q GROUNDWATER MONITORING WELL
Scale: NTS



R GAS MONITORING PROBE
Scale: NTS

REGISTERED PROFESSIONAL ENGINEER
FLOYD E. COTTER
17783
OKLAHOMA
5/30/24

REV.	DATE	CK. BY

DETAILS

SHEET TITLE

PROJECT TITLE
AEL LATERAL EXPANSION PERMITTING

CLIENT
AMERICAN ENVIRONMENTAL LANDFILL, INC
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SCS ENGINEERS
8575 West 110th Street, Suite 100
Overland Park, Kansas 66210
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DRWL BY:	Q/A REW BY:
27220345.00	TWL	W.M
DSGL BY:	CHEC. BY:	PROJ. MGR.
TWL	CF	W.M

CADD FILE:
DETAILS.DWG

DATE:
12/8/23

DRAWING NO.
18 of 18

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Appendix A

Adjacent Property Owner Notifications, Location Restriction Correspondences, and Figures

Appendix A

Adjacent Property Owner Notification

Certified Mail Receipts

Location Restriction Summary Table

Location Restriction Correspondence Letters

Adjacent Property Owner Notification

May 14, 2024
File No. 27220345.00

See addresses attached.

Subject: **American Environmental Landfill**
Proposed Landfill Expansion Notification
ODEQ Permit No.: 3557021

As required by the Oklahoma Department of Environmental Quality, SCS Engineers is submitting this notification associated with the proposed expansion of the American Environmental Landfill, which is owned and operated by American Environmental Landfill, Inc. As an adjacent property owner, Oklahoma law requires you to be notified of the application filing. The proposed landfill expansion consists of approximately 203 acres and is located on North 177th Ave, 5.5 miles West of Sand Springs. The expansion is more accurately described as the North ½ of Section 35 and West ½ of Section 36, Township 20 North, Range 10 East, in Osage County, Oklahoma.

If you have any questions or comments, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you for your time and effort in this matter.

Sincerely,

Trevar Lytle, P.E.
Senior Project Professional
SCS Engineers

Wade J. Miller
Project Director
SCS Engineers

cc: Mr. Todd Green – American Environmental Landfill

Certified Mail Receipients

Adjacent Property Owners to Americal Envionmental Landfill				
Name	**Street Address**	**City**	**State**	**Zip**
David and Nadine Hardy	1285 W Anderson Rd	Sand Springs	OK	74063
David Hunter and Frances Hawkins	52 N 194th W Ave	Sand Springs	OK	74063
James and Christine King	1317 Anderson Rd	Sand Springs	OK	74063
Jason and Karen Kearns	42 N Sunset Ave	Sand Springs	OK	74063
Jerry and Peggy Easter	PO Box 384	Sand Springs	OK	74603
John and Laura Bright	43 N Sunset Ave	Sand Springs	OK	74063
Karen Wilder	1157 Andreson Rd	Sand Springs	OK	74063
LPU Group Investments	8215 S Mingo Rd, #150	Tulsa	OK	74133
Lynn Ingram and Nancy Delwater	1100 N 197th W Place	Sand Springs	OK	74063
Michael and Teina Burns	818 Anderson Rd	Sand Springs	OK	74063
Michael Lobsinger and Brandee Harris	2301 N 193rd W Ave	Sand Springs	OK	74063
Paul and Holly Shreffler	86 N Sunset Ave	Sand Springs	OK	74063
Robert and Virginia Humphrey	1625 Anderson Rd	Sand Springs	OK	74063
Salvador and Belen Ruiz	19 Eagle Drive	Sand Springs	OK	74063
Sand Springs Home	PO Box 278	Sand Springs	OK	74063
Stanley and Barbara Gomez	201 W First St	Sand Springs	OK	74063
Stephen and Chaleah Lane	29 N 194th W Ave	Sand Springs	OK	74063

Certified Mail Receipts

7020 0640 0000 9699 6053

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For delivery information, visit our website at www.usps.com®.

Sand Springs, OK 74063

Certified Mail Fee	$4.40
Extra Services & Fees (check box, add fee as appropriate)	
☐ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

Postmark Here
MAY 14 2024
05/14/2024
USPS

David Hunter and Frances Hawkins
52 North 194th W. Ave.
Sand Springs, OK 74063

7022 0410 0002 7224 4106

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Extra Services & Fees (check box, add fee as appropriate)	
☐ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

Postmark Here
MAY 14 2024
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USPS

James and Christine King
1317 Anderson Rd.
Sand Springs, OK 74063

7022 0410 0002 7224 4304

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Extra Services & Fees (check box, add fee as appropriate)	
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☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

Postmark Here
MAY 14 2024
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David and Nadine Hardy
1285 W Anderson Rd.
Sand Springs, OK 74063

7022 0410 0002 7224 4120

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☐ Return Receipt (electronic)	$0.00
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☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

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MAY 14 2024
05/14/2024
USPS

Jerry and Peggy Easter
PO Box 384
Sand Springs, OK 74063

7022 0410 0002 7224 4298

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Extra Services & Fees (check box, add fee as appropriate)	
☐ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

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Stanley and Barbara Gomez
201 W First St
Sand Springs, OK 74063

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Sand Springs, OK 74063

Certified Mail Fee	$4.40
Extra Services & Fees (check box, add fee as appropriate)	
☐ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

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MAY 14 2024
05/14/2024
USPS

7022 0410 0002 7224 4144

Lynn Ingram and Nancy Delwater
1100 N 197th W. Place
Sand Springs, OK 740663

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Extra Services & Fees (check box, add fee as appropriate)	
☐ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.68
Total Postage and Fees	$8.73

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05/14/2024
USPS

7022 0410 0002 7224 4144

Karen Wilder
1156 Anderson Rd
Sand Springs, OK 74063

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LPU Group Investments, LLC
8215 S Mingo Rd #150
Tulsa, OK 74133

for Instructions

Location Restriction Summary Table

SUMMARY OF LOCATION RESTRICTION LETTERS AND FIGURES
AEL LATERAL EXPANSION
PROJECT NO. 27220345.00

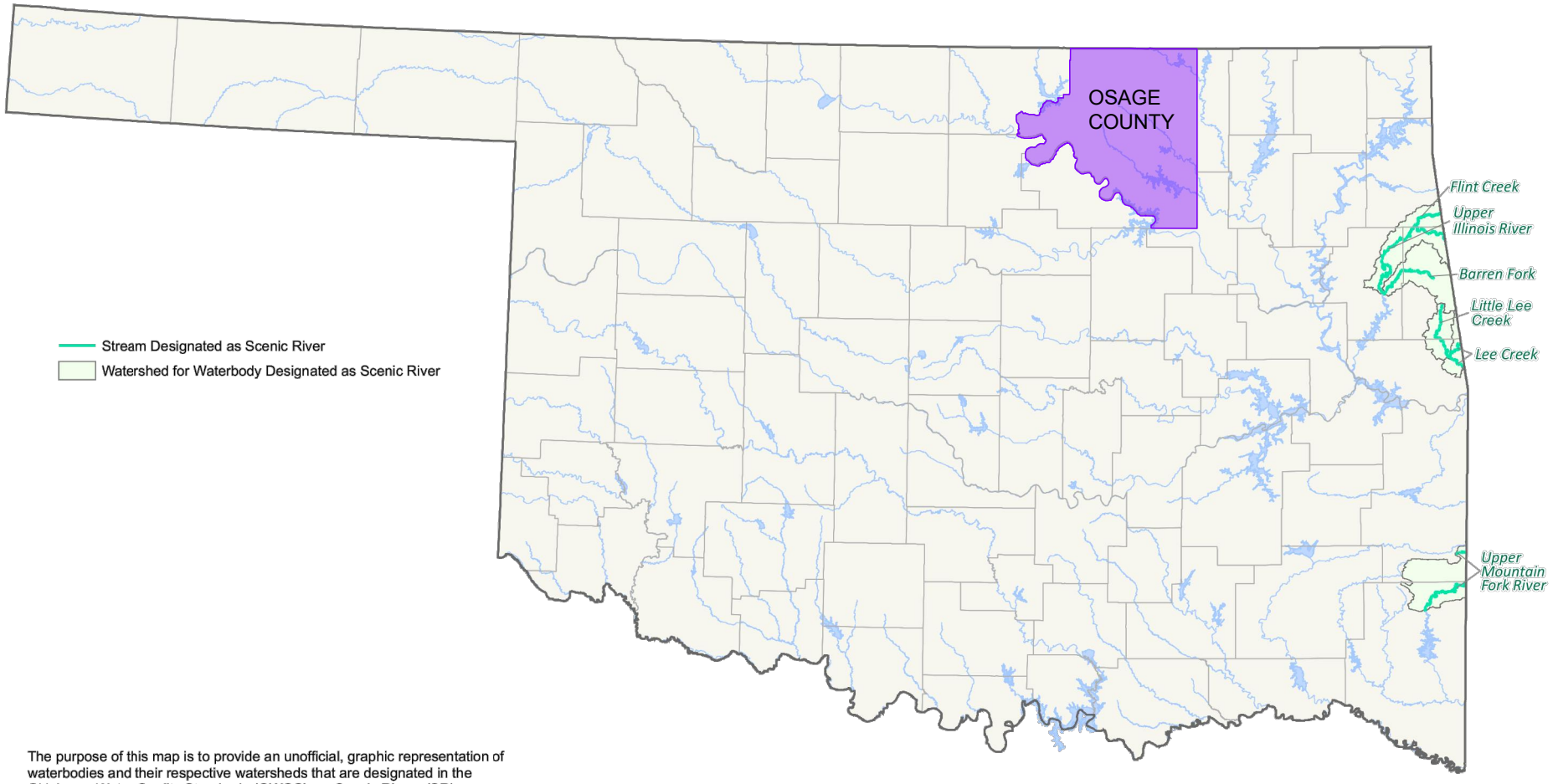
	Authorized Agency	Letter Mailed (date)	USPS Certified Mail Receipt No.	Letter Recvd (date)	Response Recvd (date)	Additional Info Needed (Y/N)	Additional Info Mailed (date)	Additional Info Recvd (date)	Additional Info Response Recvd (date)	Approval (Y/N)	Comments
Scenic Rivers	Oklahoma Scenic Rivers Commission										Figure Only
Recreation/Preservation Areas	State Historic Preservation Office	06/02/2020	70192970000224477665	06/05/2020							Only reviews Federal Undertakings
	Oklahoma Archeological Survey	06/02/2020	70192970000224477696		06/12/2020	N				Y	
	US Department of the Interior - Bureau of Reclamation	06/02/2020	70192970000224477689	06/05/2020							No response
	Oklahoma Tourism and Recreation Department	06/02/2020	70192970000224476032	06/08/2020	07/07/2020	N				Y	Email response included sketch of the Keystone Ancient Forest
Endangered or Threatened Species	Oklahoma Department of Wildlife Conservation	04/24/2019									Threatened and Endangered Species Habitat Assessment Report
	US Fish and Wildlife Service	04/24/2019			02/10/2020	N				Y	Threatened and Endangered Species Habitat Assessment Report
	Oklahoma Biological Survey				02/06/2020	N				Y	Email resonse
100 Year Floodplain	Federal Emergency Management Agency										Figure Only
Public Water Supply	ODEQ - Water Quality										Figure Only
	Oklahoma Water Resources Board										Figure Only
Wetlands	Oklahoma Conservation Commission	01/27/2020									Email including Preliminary Wetland Jurisdictional Determination Report
	Corps of Engineers	05/01/2020			10/30/2020					Y	404 Individual Permit Application SWT-2017-339 Mitigation Plan with Approved Permit Number SWT-2017-00339 and ODEQ Approval
Utility/Transmission Lines	Oklahoma Corporation Commission	06/02/2020	70192970000224477726	06/08/2020							No Response
Fault Areas	Oklahoma Geological Survey										Figure Only
Seismic Impact Zones											Figure Only
Karst Terrain											Figure Only
Earthquake Epicenter Areas											Figure Only
Alluvium & Terrace Deposits											Figure Only
Unstable Areas	Oklahoma Department of Mines	06/02/2020	70192970000224477672	06/05/2020	07/08/2020	N				Y	
Airports	Federal Aviation Administration	06/02/2020	70192970000224477702								No Certified Mail Recipt and No Response
	Pogue Airport	06/02/2020	70192970000224477719	6/5/2020							No Response
Wellhead Protection Area	ODEQ - Water Quality										Figure Only

Location Restriction Correspondence Letters

Oklahoma Scenic Rivers Commission

Oklahoma Water Quality Standards

Scenic Rivers (SR)



The purpose of this map is to provide an unofficial, graphic representation of waterbodies and their respective watersheds that are designated in the Oklahoma Water Quality Standards (OWQS), as Scenic Rivers (SR). The official version of the OWQS is published by the Oklahoma Secretary of State in the Oklahoma Administrative Code at Title 785, Chapter 45 (http://www.sos.ok.gov). A complete but unofficial version of the OWQS is available through the OWRB homepage (http://www.owrb.ok.gov).
7/1/2011

State of Oklahoma
OWRB
Water Resources Board
the water agency

EDITED BY SCS ENGINEERS TO HIGHLIGHT COUNTY OF SITE

Oklahoma Archaeological Survey

June 2, 2020
File No. 27219016.00

Dr. Debra Green
Oklahoma Archeological Survey
111 East Chesapeake, Room 102,
Norman, Oklahoma 73019-0575

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Dr. Green:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-31(b), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *no area within the permit boundary of a new solid waste disposal facility, or an expansion of the permit boundary of an existing solid waste disposal facility, shall be located within one-half mile of any area formally dedicated and managed for public recreation or natural preservation by a federal, state, or local government agency unless the appropriate management agency provides a statement that the proposed facility is not expected to adversely affect the existing recreation or natural preservation area.*

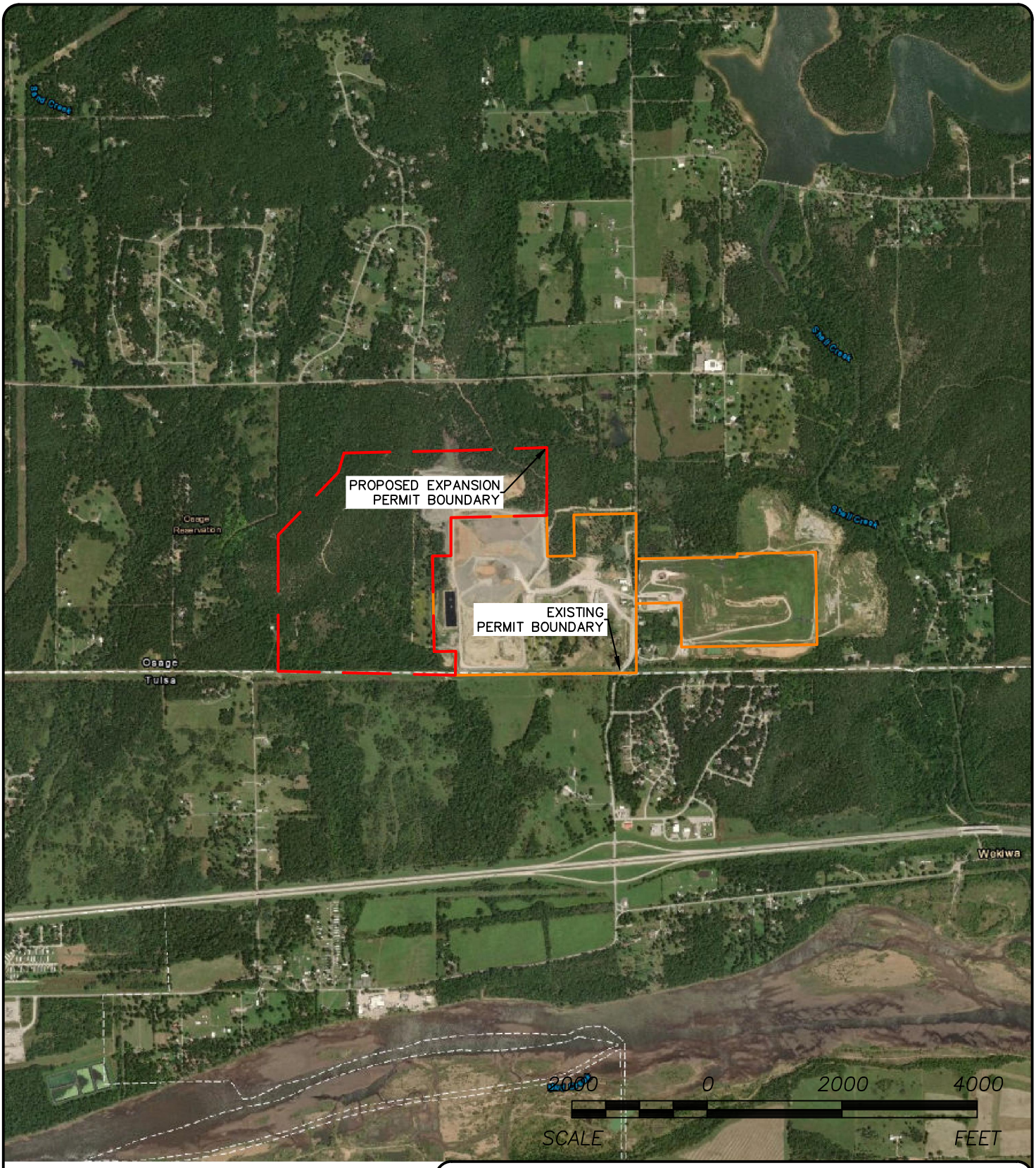
On behalf of our client, we request you review the enclosed maps and provide this determination as required by the ODEQ within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers

Encl. 2 General Site Location Maps



LEGEND

EXISTING PERMIT BOUNDARY

PROPOSED EXPANSION PERMIT BOUNDARY

Aerial Image Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

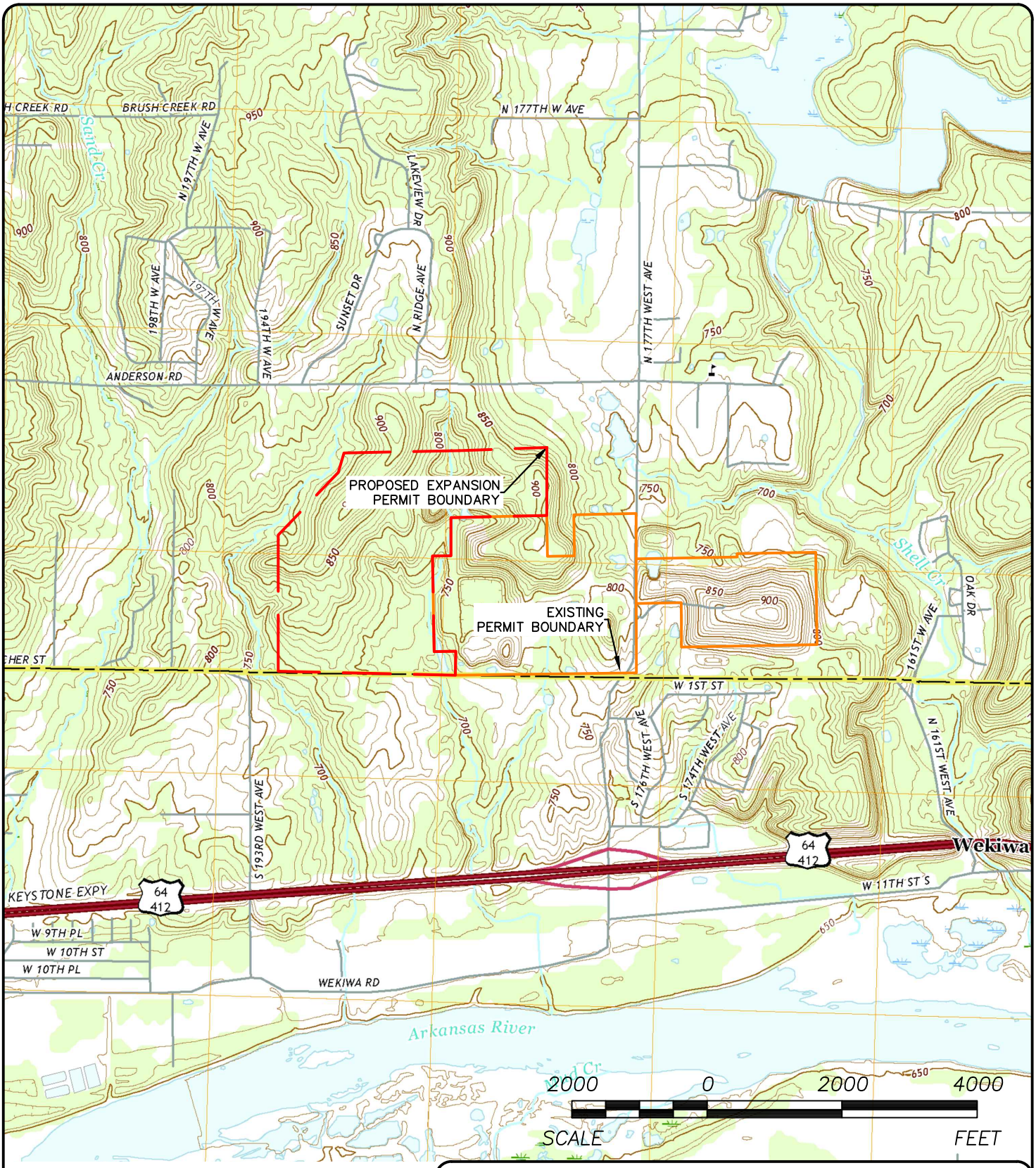
SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.

SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/28/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 1



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

N

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

Oklahoma Archeological Survey
THE UNIVERSITY OF OKLAHOMA

June 12, 2020

SCS Engineers
Attn: Wade Miller
Project Director
1817 Commons Circle, Ste. 1
Yukon, OK 73099

Re: OAS FY20-2378 SCS Engineers Proposes American Environmental Landfill, Inc (AEL)
Proposed Landfill Expansion: 207 North 177th West Ave, Sand Springs.
Legal Description: Portions of Section 35 & 36, T20N, R10E, Osage County, Oklahoma.

Dear Mr. Miller:

The Community Assistance Program staff of the Oklahoma Archeological Survey has reviewed the above referenced project in order to identify areas that may potentially contain prehistoric or historic archeological materials (historic properties). The location of your project has been crosschecked with the state site files containing approximately 26,000 archaeological sites, which are currently recorded for the state of Oklahoma. No Sites are listed as occurring within your project area, and based on the topographic and hydrologic setting, no archaeological materials are likely to be encountered. Thus, an archaeological field inspection is not considered necessary. Please contact this office at (405) 325-7211 if buried archaeological materials such as chipped stone tools, pottery, bone, historic crockery, glass, metal items or building materials are exposed during construction activities.

This environmental review and evaluation is done in cooperation with the State Historic Preservation Office, Oklahoma Historical Society. The responsible federal agency or their official delegate must also have a letter from that office to document consultation pursuant to Section 106 of the National Historic Preservation Act.

In addition to our review comments, under 36CFR Part 800.3 you are reminded of your responsibility to consult with the appropriate Native American tribe/groups to identify any concerns they may have pertaining to this undertaking and potential impacts to properties of traditional and/or ceremonial value.

Sincerely,

Debra K. Green, Ph.D.
Assistant State Archaeologist

Kary L. Stackelbeck, Ph.D.
State Archaeologist

: ksw
cc: SHPO

CULTURAL RESOURCE SURVEY FOR THE AMERICAN ENVIRONMENTAL LANDFILL IN SAND SPRINGS OSAGE COUNTY, OKLAHOMA

Prepared by

Christy Stewart, MA, RPA and Haley Rush, MA, RPA (Principal Investigators)
Contributions by Marcus Huerta, MS
Cox | McLain Environmental Consulting, Inc.
320 S. Boston Ave.
Suite 1104
Tulsa, Oklahoma 74103

Prepared for

SCS Engineers
1817 Commons Circle, Suite 1
Yukon, Oklahoma 73099

Cox | McLain Environmental Consulting, Inc. Archeological Report 264
(CMEC-AR-264)

COX | McLAIN
Environmental Consulting

February 28, 2020

This report contains archeological site location information (not for public disclosure.)

MANAGEMENT SUMMARY

American Environmental Landfill in Sand Springs proposes to expand the city landfill located approximately 5 miles northwest of town in Sand Springs, Osage County, Oklahoma. The proposed project requires a U.S. Army Corps of Engineers (USACE) Permit. Due to USACE involvement, this is a federal undertaking and is, therefore, subject to Section 106 of the National Historic Preservation Act, as amended.

In August and September 2019 and February 2020, an intensive cultural resources survey was performed for the proposed American Environmental Landfill, Sand Springs expansion. The area of potential effects (APE) is considered to be the entire proposed expansion area, which consists of 277 acres north and west of the current American Environmental Landfill in Sand Springs. This includes a 10-acre mitigation area and a 62-acre area that will not be subject to ground disturbance.

The survey included the excavation of 344 shovel test units. No cultural materials were observed or recorded in any of the excavated shovel test units or on the ground surface anywhere within the APE. One archeological isolated find (IF-01) and one built environment resource were recorded. Site IF-01 is a rock wall of unknown age; no other cultural materials were observed at this location. The built environment resource is a house built in 1955 and an associated non-historic age shed.

Site IF-01 was assessed for the National Register of Historic Places (NRHP) under Criteria B and D. No connections with significant individuals were made and no additional information is likely to be found through further archeological investigations.

One built environment resource was identified in the survey, it is recommended not eligible for the NRHP and was assessed under Criterions A, B, C, and D. No further work is recommended at this time.

Archeological fieldwork was carried out by Christy Stewart (Principal Investigator and Project Archeologist), Haley Rush (Principal Investigator), Craig Cosby, Delaney Cooley, Hannah Pottage, Shane Manion, Kim Wright, Savanna Cometa, and Barry Dwiggins of CMEC. Marcus Huerta (Historian) consulted on the built environment resources.

If any unanticipated cultural materials or deposits are found at any stage of the proposed action, the work should cease, and USACE and the State Historic Preservation Office should be notified immediately.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Overview of the Project

American Environmental Landfill in Sand Springs has proposed the construction of a landfill expansion located approximately 8 kilometers (roughly 5 miles) northwest of town in Sand Springs, Osage County, Oklahoma. The proposed landfill expansion covers approximately 277 acres and will extend north and west of the existing landfill. This includes a 10-acre wetland mitigation area and a 62-acre area that has already been subjected to ground disturbance.

Cox | McLain Environmental Consulting, Inc. (CMEC) was contracted by SCS Engineers to perform cultural resources investigations including pedestrian archeological survey with shovel testing and an examination of the built environment within the 277-acre study area (**Figure 1**). SCS Engineers has been contracted with the American Environmental Landfill in Sand Springs. The archeological area of potential effects (APE), or study area, includes the 277-acre area for the new landfill, 62-acre area that has already been disturbed, and a 10-acre wetland mitigation area. The legal location of the project area is E ½ of Section 35 Township 20N Range 10E and NW ¼ Section 36 Township 20N Range 10E.

Regulatory Responsibility

The project will require a permit from the U.S. Army Corps of Engineers (USACE). Due to USACE involvement, this project is a federal undertaking and is, therefore, subject to Section 106 of the National Historic Preservation Act (NHPA), as amended (16 United States Code 470; 36 Code of Federal Regulations [CFR] 800).

Methodological and Logistical Considerations

Craig Cosby, Delaney Cooley, Hannah Pottage, Shane Manion, Kim Wright, and Barry Dwiggins of CMEC, under the direction of Christy Stewart (Principal Investigator and Project Archeologist) and Haley Rush (Principal Investigator), performed the archeological fieldwork in August and September of 2019. Lead staff meet the Professional Qualification Standards as defined in the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 CFR 44716).

The APE was thoroughly inspected through archeological pedestrian survey including the excavation of 341 shovel tests and was examined for historic-aged built resources.

Structure of the Report

Following this introduction, Chapter 2 presents the project's environmental and cultural contexts, as well as a summary of previous archeological research near the APE; Chapter 3 discusses research goals, relevant methods, and the underlying regulatory considerations; Chapter 4 presents the results of the survey and summarizes the implications of the investigations, and Chapter 5 presents references cited.

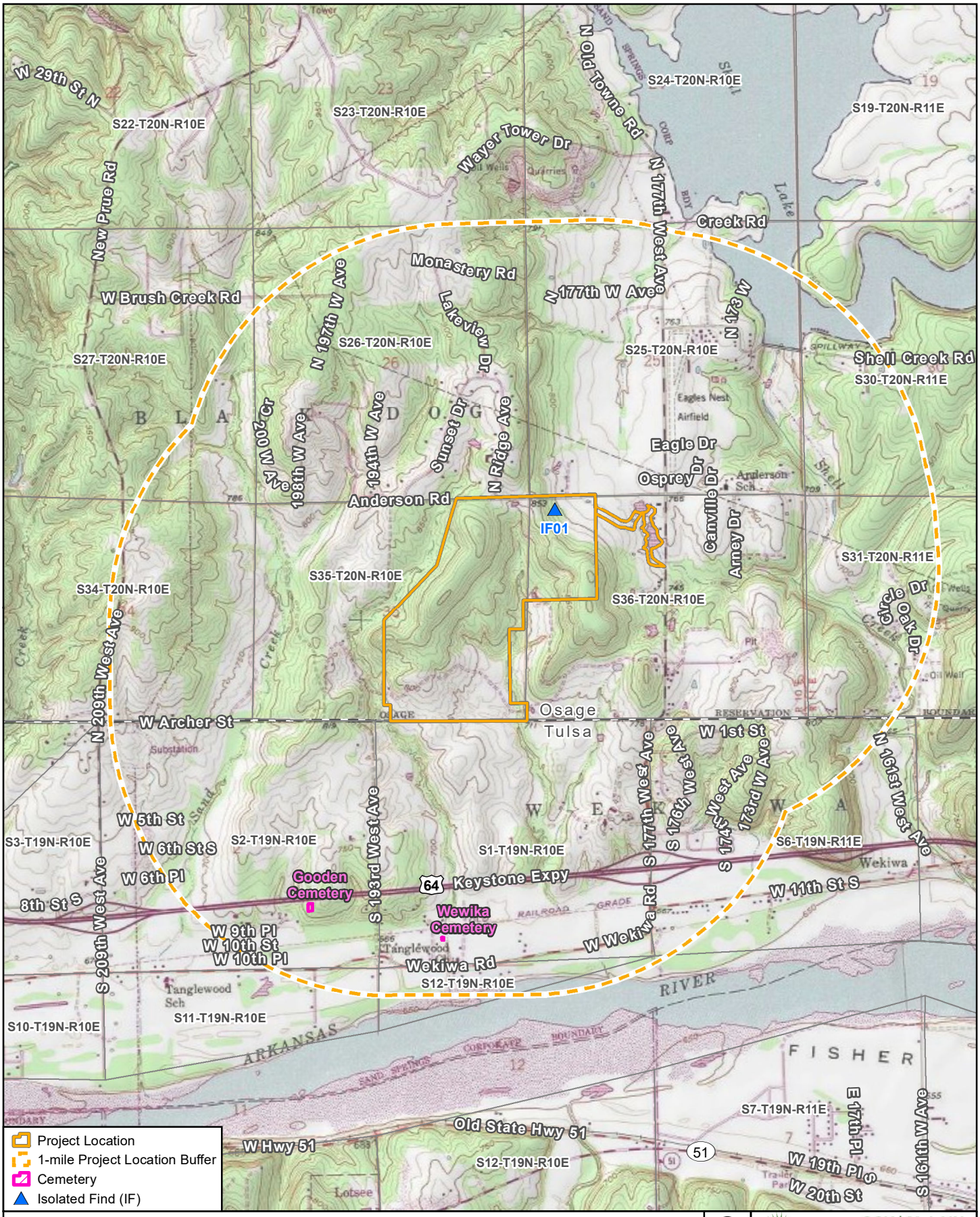


Figure 1. Location of Archaeological APE

American Environmental Landfill, Sand Springs
Osage County, Oklahoma

Data Sources: CMEC (2019-2020), OU CSA (2017)
Topographic Source: USGS Wekiwa 7.5' Quadrangle (1983)

COX | McLAIN Environmental Consulting

0 2,500 Feet
0 800 Meters

1 inch = 2,500 feet
Scale: 1:30,000
Date: 2/25/2020

G:\Projects\SCS_Aquaterra\Sand_Springs_Landfill\CR_Figure 1_CR APE_Topo_20200225.mxd

2 ENVIRONMENTAL AND CULTURAL CONTEXTS

Topography, Vegetation, Geology, and Soils

The APE ranges in elevation from approximately 221 to 279 meters (728 to 918 feet) above mean sea level (see **Figure 1**). The APE begins 421 meters (1,383 feet) west of the intersection of Anderson Road and North 177th West Avenue northwest of town and covers 277 acres north- and west-adjacent to the current American Environmental Landfill in Sand Springs.

The APE is mapped within the Osage Cuestas subregion of the Central Irregular Plains ecoregion, which is characterized by a mosaic of rangeland, grassland, cropland, and woodland covered with mostly tall grass prairie; pastureland is the primary land use activity in this region (Woods et al. 2005). Geologically, the APE is underlain by three lithological units: Middle Pennsylvanian-age Iola Limestone, Middle Pennsylvanian-age Chanute Formation, and Pleistocene-age Terrace Deposits. The Iola Formation, located in the northwest portion of the project area, ranges in thickness between 1 to 30 meters (4 to 100 feet) and consists of limestone, and shale. The Chanute Formation, located in the northeast portion of the project area, ranges in thickness between 3 to 45 meters (10 to 150 feet) thick and is comprised of fine to coarse-grained sandstone and shale. Terrace deposits, located in the southern portion of the project area, have a maximum thickness of around 23 meters (75 feet) along major streams and consist of fine gravel, sand, silt, and clay (U.S. Geological Survey [USGS] 2018a).

According to Natural Resources Conservation Service (NRCS) data, nine soils or soil complexes are within the APE; these are detailed in **Table 1.** The southern and middle portion of the APE are predominately Niotaze-Bigheart rock outcrop, while the northern portion of the APE is mostly Norge silt-loam and some Niotaze-Bigheart rock outcrop. Niotaze-Bigheart rock outcrops are sloped landforms; these tend to lack the conditions necessary for deeply buried cultural deposits due to thin soils and are considered to have low potential for buried cultural resources. The Agra-Ashport soil complex, Parsons-Pharoah soil complex, Norge silt Loam, Eufaula soil series and Dougherty soil series all have shallow A-horizons that extend between 0 and 30 centimeters (11.8 inches) below ground surface. No buried A-horizons or paleosols are mapped in the project area, and these soils have a low potential for intact buried cultural resources.

Table 1: Summary of Soil and Soil Complexes in Project APE (North to South)

Soil Name	Slope Percent	Dominant Texture Type	Drainage Class	Geomorphology
Agra-Ashport	0–12	Multiple	Moderately well drained	Hillslopes/backslope
Parsons-Pharoah	0–3	Multiple	Somewhat poorly drained	Paleoterraces
Norge	5–8	Silt Loam	Well drained	Paleoterraces
Niotaze-Bigheart	0–15	Rock Outcrop	Somewhat poorly drained	Hillslopes/backslope
Bigheart-Niotaze	3–5	Rock Outcrop	Somewhat poorly drained	Hillslopes/backslope

Soil Name	Slope Percent	Dominant Texture Type	Drainage Class	Geomorphology
Norge	3–5	Silt Loam	Well drained	Paleoterraces
Niotaze-Bigheart	15–25	Rock Outcrop	Somewhat poorly drained	Hillslopes/backslope
Eufaula	3–15	Loamy Fine Sand	Well drained	Dune fields/ terraces
Dougherty	3–8	Loamy Fine Sand	Well drained	Hillslope/backslope

Source: Soil Survey Staff 2019.

Archeological Chronology for Northeastern Oklahoma

The archeological chronology of Oklahoma is relatively uniform across the entire state for the earliest periods of human occupation (i.e., Pre-Clovis and Paleoindian), with regional distinctions appearing later in the Archaic and Woodland Periods. **Table 2** presents a general chronology supplemented with more detail for the periods relevant to the current study area (i.e., the eastern portion of the state).

Table 2: Archeological Chronology for Oklahoma

Period	Years Before Present (BP)
Pre-Clovis	35,000 (?) – 12,000
Paleoindian	12,000–8,000
Clovis	12,000–11,000
Folsom	11,000–10,000
Dalton	10,500–9,900
Archaic	8,000–2,000
Wister Phase	3,500–2,000
Woodland	2,000–1,200
Wister Phase (continued)	2,000–1,700
Fourche Maline	1,700–1,200
Villager	1,200–500
Protohistoric	500

Sources: Data from Bell (1984, ed.), Brooks (2009); Galm (2009)

Many sites recorded in Oklahoma are now underneath reservoirs and lakes. Archeological salvage projects for these reservoir and lake projects, completed between 1935 and 1972, provide most of what is known archeologically about eastern Oklahoma (Wyckoff 1984). Most of the data on the earliest inhabitants of Oklahoma (i.e., from the Paleoindian Period) come from the western part of the state (Gettys 1984).

Prehistoric groups demonstrated remarkable adaptability to diverse settings and changing environmental conditions across what is now Oklahoma. For years, the Clovis Period (approximately 11,000 to 12,000 years ago), was thought to represent the initial inhabitants of the New World. However, recent studies suggest that the peopling of the Americas may have occurred 20,000 to 30,000 years ago. Two sites in Oklahoma (the Cooperton mammoth site and the Burnham site) both produced

radiocarbon dates between 28,000 and 32,000 years ago, and both contained Pleistocene-age animal remains. Because of uncertain contexts at both sites, the lifeways of these early inhabitants are poorly understood (Brooks 2009; Gettys 1984). Also contributing to a general ambiguity is the fact that many of these early sites in Oklahoma were recorded based only on surface scatters of lithics.

The Paleoindian Period is divided into the earlier Clovis Period (11,000 to 12,000 years ago) and the Folsom Period (around 10,000 years ago). The people who lived during the Clovis and Folsom Periods are termed "Specialized Hunters" by some (Brooks 2009). Gettys (1984) distinguishes between Clovis and Folsom as "Elephant" and "Bison" hunters, respectively. Generally, Paleoindian groups were nomadic, following large animal migrations. Their method of stalking and killing large game required complex knowledge and strategy and the use of highly specialized, well-designed chipped stone tools and weapons. Evidence suggests that people at this time were also incorporating edible plants into their diet (Gettys 1984).

Clovis Period artifacts are found across the state of Oklahoma, but rarely in contexts that have integrity. The Domebo Site is one of the only well-documented Clovis sites within the state. Folsom Period sites are restricted to the western portion of the state. The eastern part of the state was inhabited by people of the Dalton Culture, which is distinguished by occupations within woodland habitats, larger group sizes and a subsistence strategy combining hunting with collecting (Gettys 1984). For example, the Packard Site is a well-documented site with a Dalton component located in Mayes County, which is located west of Delaware County. In the central and western part of the state the Calf Creek Culture was quite prevalent. This nomadic culture was widespread throughout the region, during an especially hot and arid period, specializing in stone tools and Plains hunting.

During the Archaic period (8,000 to 2,000 years ago), native peoples in the eastern and central part of the state continued to focus on hunting and collecting, added a greater range of edible plants to their gathering, and added trading to their economies (Brooks 2009; Wyckoff 1984). Although still quite mobile, these people only moved their settlements from one seasonally available set of resources to another. This change resulted in a more diverse tool kit—primarily a set of tools related to plant procurement. As populations increased and group mobility and access to resources became more restricted, conflicts occurred. In addition to conflict, more frequent interactions among these larger populations increased opportunities for trade. These shifts necessitated more complex political and social leadership and fostered the development of formalized religious beliefs and rituals (Brooks 2009; Wyckoff 1984). Many of the themes discussed here are speculative; the Packard Site (34MY66) is the only site in eastern Oklahoma that has dated Early Archaic deposits (Wyckoff 1984), as well as the Dalton component mentioned above.

During the latter part of the Archaic period, archeological sites offer evidence that many diverse groups occupied eastern Oklahoma (Brooks 2009; Galm 1984; Wyckoff 1984). Archeological evidence suggests that groups who lived north of the Arkansas River were distinctly different from groups that lived south of the river. During this time, known as the Wister Phase, the groups who lived south of the

Arkansas River and north of the Ouachita Mountains would likely have depended on riverine resources (Galm 2009).

According to Galm (2009), the Wister Phase is generally limited to the Arkoma Basin of east-central Oklahoma and dates from approximately 1,500 to 300 BCE. Pottery was adopted at the end of the Wister Phase, which corresponds to the beginning of the Fourche Maline Phase and the Woodland Period (discussed below). Common artifacts include Gary points, bone, shell, and ground stone artifacts. The connecting features of the period in this region are "midden mounds," which are formed when a locale is repeatedly used for disposal. These mounds contain stratified deposits dating from the Archaic to the Woodland Period and often contain burials (Galm 1984, 2009). Evidence suggests that the people living during the Wister Phase occupied midden-mound sites year-round, although likely intermittently.

A distinctive culture is seen within the central portion of the state, though it was quite similar to its eastern counterparts. The more central groups differed from their eastern contemporaries in several ways: they were much more dispersed than before, they lived less intensively than their counterparts, and they focused on less sedentary hunting and gathering of plains flora and fauna (Galm 2009).

The Woodland (or Agricultural Beginnings) Period is an era of larger populations with reduced mobility and a greater knowledge of plant cultivation (the catalyst for the beginning of true agriculture, or more dependence on edible plants). The social, political, and religious changes with origins in the previous period became more expressive and widespread (Vehik 1984, 2009). Use of storage facilities and permanent dwellings also expanded. During this period, the introduction of the bow and arrow improved hunting and warfare abilities, the development of pottery permitted permanent and secure storage, and the manufacture of specialized axes and adzes for clearing and framing structures improved shelters (Brooks 2009; Wyckoff 1984).

The Fourche Maline Focus falls within the Woodland Period but is geographically restricted to the eastern part of the state (Brooks 2009; Galm 1984; Vehik 1984, 2009). The Fourche Maline Focus continues to see the formation of midden mounds but is marked by the appearance of ceramics, which separates it from the preceding Wister Phase. The Fourche Maline Focus may have begun as early as 300 BCE and terminates around 800 CE. The use of Gary points continues in this part of the Woodland Period, and the dominant ceramic type is Williams Plain (Brooks 2009).

In the Arkansas River Valley of the north-central part of the state, a distinctive culture akin to the Kansas City people has been observed during the Woodland period. Lithic technologies and pottery have been documented, specifically from sites such as Hammons and Hudsonpillar sites in Kay County, as has a continued use of plains flora and fauna. During this period, various sites in this region demonstrate the continuation of Archaic-period traditions such as hunting, gathering, and trading (Brooks 2009).

Numerous societies of Agricultural Villagers lived in settled farming communities all across Oklahoma. Permanent housing took the form of small hamlets and large villages strategically placed near highly

fertile soils, but outside areas in danger of flooding. Subsistence changed dramatically with increasing emphasis on certain edible plants and plant domestication. Hunting of a variety of animals continued as well. Technologies expanded during this period: the variety of plant-processing stone tools increased; variety in ceramic usage, forms, color, and decorations increased; extravagant ornaments began to appear; and material goods were increasingly used in ritual and religious contexts (Brooks 2009).

In the eastern part of the state, another cultural manifestation appeared: the construction of earthen mounds. These mounds served a variety of political and religious functions. The mound-building tradition was the beginning of the Caddoan tradition, which is well-documented along the Arkansas River and its tributaries in the eastern portion of the state (Brooks 2009). Documented Caddoan sites in the eastern part of the state include mound centers, rockshelters, large villages, small farmsteads, and temporary campsites (Wyckoff 1980).

The Caddo, or Caddoan Mississippians, are thought to be descendants of the Fourche Maline and Mossy Grove culture peoples from the Woodland period (Bell 1984). Early Caddo were linked to many other Eastern Woodlands cultures through extensive trade networks, which introduced Caddo people to pottery, bows, and other goods and tools (Carter 1995). By 800 CE, early Caddoan society began incorporating into one of the earlier Mississippian cultures, and villages began transitioning into socially stratified ritual and economic centers (Carter 1995).

Definitively "Caddo" society emerged by 1000 CE, and major sites such as Spiro and Battle Mound rose to prominence in the Arkansas and Red River Valleys, respectively (Carter 1995). These sites were surrounded by large expanses of fertile soils and extensive maize agriculture. Featuring a distinct type of ceramic wares, Caddo villages prospered by maintaining large food surpluses of maize, beans, squash, and pecans. Trade aided this prosperity as the Caddo became skilled manufacturers of bows and pottery. Following centuries of growth, Caddo populations peaked around the year 1400, when many ritual centers began to shrink in size and population. Caddo occupation became sparser and more centered around smaller farms and homesteads than large centers. Further information about the Caddo is presented below in the Tribal and Protohistoric section (Brooks 2009).

The Protohistoric period is one of drastic changes, primarily due to a cycle of drought conditions that began in the thirteenth century and lasted until about 200 years ago. Temperatures were also cooler, resulting in some abandonment or scaling back of agriculture. This allowed some Native societies to revert to more nomadic patterns as communal hunters of bison, which were quite plentiful (particularly on the plains). Villages in the east continued to be maintained but were abandoned seasonally to follow the bison herds. This cool, dry period also caused an influx of other groups from the west and north, which affected the societal balance in the area. The advent of Europeans in the western hemisphere caused further disruption to the already unstable dynamics of the local Native populations. Disease was the most devastating result of European exploration, but the introduction of the horse changed hunting and warfare. Metal goods, though used in a functionally consistent fashion, were also used to make arrow points, knives, and scrapers, all of which gradually replaced some stone tools (Brooks 2009).

The earliest European explorers to arrive in eastern Oklahoma were the Spanish and the French. European documents describe the people in this area as Caddoan speakers. The Caddo groups prospered by trading with the French, until constant raiding by the Osage caused the Caddo people to move further south. The Osage are thought to have occupied the Arkansas River valley by 1750. Due to constant raiding by the Osage, Fort Gibson was eventually established in the northeastern part of the state in 1824. During this time the Cherokee began to settle in the area. The Choctaws used the eastern part of the state for hunting and were later joined by the Chickasaws (Miller 1977).

Several battles of the Civil War took place in northeastern Oklahoma, with most of the tribes joining the Confederacy. After the loss of the war by the Confederacy, some tribes were forced to give up land to the U.S. government; however, most of the land held by the Cherokee, Choctaws, and Creeks (i.e., tribal lands in eastern Oklahoma) remained in their hands (Brooks 2009).

Tribal Context

The tribes and/or nations described below are those that are known to have been present in the study area in prehistory and/or been removed from, relocated to, or passed through the area during relocation. Exclusion of a tribe or nation does not mean that a tribe or nation does not have an interest in the study area.

Caddo Nation

At the time of European contact, the Caddo were centered around a cluster of villages near the great bend of the Red River, in what is now northeast Texas, southwest Arkansas, and southeast Oklahoma (Carter 1995). By 1520, an estimated 250,000 Caddo people lived in the area (Meredith 2009). The following 250 years would see a massive reduction in population because of disease, which spread across the trading networks that had been so advantageous for centuries. At some point after contact, Caddo people organized three confederacies: the Hasinai, Kadohadacho, and Natchitoches (Meredith 2009).

The Kadohadacho kept open contact with the Spanish, French, and Anglo-Americans, learning their languages as well as those of the nearby tribes. In 1835, the Kadohadacho and Natchitoches communities agreed to relocate from the U.S. to Mexico. In the then-Mexican province of Texas, these groups hoped to settle within the Hasinai confederacy, a task that was greatly complicated by the 1836 Texas Revolution (Meredith 2001).

When Texas became a state in 1845, the Kadohadacho and Hasinai were removed to the Brazos Reservation in Texas (Meredith 2001, 2009). This reservation was located on the Brazos River, about 75 miles west of Fort Worth, and was intended to house dwindling groups of Caddo, Wichita, and other tribespeople. White settlers soon encroached, and in 1859 these groups were again removed, this time to Indian Territory. Caddo life in Indian Territory was disrupted by the outbreak of the American Civil War, but in the years following the Civil War they learned to thrive in west-central Oklahoma. Caddo

populations were concentrated in and around their reservation between the Washita and Canadian Rivers; individuals often intermarried with people from other tribes. The Caddo were able to bolster their population during this time, but still struggled to endure forced assimilation into American society. The 1887 Dawes Act broke tribal lands into individual allotments, and in 1902 lands were granted to the Caddo and placed in trust by the U.S. government (Meredith 2001, 2009).

Under the Oklahoma Indian Welfare Act of 1936, the Kadohadacho, Hasinai, Hainai, and others established a government known as the Caddo Indian Tribe of Oklahoma. Today, this governing body continues as the Caddo Nation of Oklahoma, a federally recognized tribe. Overseen by a tribal council based in Binger, Oklahoma, at least 5,000 members are enrolled and at least 2,500 of them still reside in Oklahoma (U.S. Census Bureau [USCB] 2013). Caddo tribespeople continue to maintain tribal traditions of dance, song, story, and art and seek to preserve the language and values of their ancestors (Meredith 2001, 2009).

Cherokee Nation

Although there are multiple possible explanations of the origins of the Cherokee, the most-accepted version describes the Cherokee branching off from the Pisgah Phase of the Southern Appalachian Mississippian Culture between 1000 and 500 years ago (Clark 2009). The Cherokee expanded across Tennessee and North and South Carolina, constructing and residing in villages that included plazas and earthen mounds with temples. Mounds were no longer in use by the time European contact was made, but plaza spaces were still present. At the time of the first European contact, the Cherokee had the largest population in the Southeast, with approximately 30,000 people spread across 50 to 80 towns covering an area of 40,000 square miles (Clark 2009).

In the late 1600s, the Cherokee inhabited portions of what is now Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee and Kentucky (Conley 2005). This vast area was split into three regions of Cherokee: the upper region (or the Overhills), the middle region, and the lower region (or Lowerhill). Three different dialects were spoken, one in each of the regions. The middle region, the center of Cherokee habitation area, spoke the "Kituwah" dialect, the other dialects were the eastern or "Underhill" and western or "Overhill" dialects. James Mooney, a government ethnologist who lived among the Eastern Band of Cherokee Indians in North Carolina during the 1890s, explains that the name "Cherokee" had great significance for the Cherokee people, and that it was a Choctaw word meaning "pit or cave." Mooney also documented seven mother towns in the three regions, and in the center of the vast area was the town called Kituwah (from Leeds 1996). Kituwah represented the nucleus of the tribe. Mooney observed that many of the Cherokee people referred to themselves as Ani-Kitu-wha-gi, or 'people of Kituwah,' and that the Shawnee, Delaware, and other Northern tribes used Keetoowah and Cherokee interchangeably for reference to the tribe (Leeds 1996).

Interaction between European and Cherokee cultures changed the Cherokee economy and political system immensely (Clark 2009). Factions arose within the tribe when conflict arose between the

traditionalists and the acculturated Cherokees as the Cherokee were pulled back and forth between the European polities. During the Seven Years War, the traditionalist Cherokees sided with the French and moved to Arkansas at the conclusion of the war. After the Revolutionary war, the Cherokees that had sided with the British joined them in Arkansas. The Chickamauga Cherokees, another group that had broken with the larger Cherokee group due to disagreements over their associations with the white settlers, joined the Arkansas Cherokee in 1794 (Leeds 1996). The Arkansas Cherokee became known as the Western Cherokee and the "Old Settlers," and for a short while were recognized separately from the Eastern Cherokee (Cherokee that were located in their original territories in the southeast) by the new U.S. government (Leeds 1996).

By 1839, the Eastern Cherokee had been removed and relocated to Indian Territory from Tennessee and Georgia as part of a forced migration in what historically became known as the Trail of Tears. Roughly one-fourth of the Eastern Cherokee population perished because of starvation, disease, and the harsh environment during this trek to northeastern Oklahoma. With the Cherokees' arrival in Oklahoma the tribe remained a unified community and fought for an independent, sovereign Cherokee nation, despite great loses in population and a bitter civil war between divided Cherokee factions. As early as 1839 the Cherokee had unified and established a sovereign nation (Clark 2009).

By 1846, the tribe began to flourish as tribal members developed their own newspapers and educational institutions. During this period, the tribe had an increase in educational, cultural, and social institutions, which lead to the development of its own writing system and to greater economic prosperity.

By 1860, the Cherokee in Indian Territory struggled against constant and systematic attempts by the U.S. government to disenfranchise and dissolve the Cherokee community. Through institutionalized governmental policies, which included the practice of land allotment (the settling of tribal land by white settlers) and a myriad of other policies, the Cherokee suffered greatly for many decades (Clark 2009). These atrocities led to the dwindling of the Cherokee Nation and its identity and almost led to the extinguishment of the tribe. Since the 1950s, the tribe has been able to fight against the dissolution of their cultural community and has slowly reestablished itself through economic and cultural programs and the rebuilding of the Cherokee government (Clark 2009).

Today, the Cherokee Nation are proud that the tribe is in its seventh generation of tribal membership, and that the Nation has grown to over 365,000 currently enrolled citizens (Clark 2009). The Nation is headquartered in Tahlequah, Oklahoma, and is committed to protecting the tribe's sovereignty; preserving and promoting Cherokee culture, language and values; and enhancing the overall quality of life for Cherokee Nation citizens through numerous political, cultural, and economic ventures (Clark 2009).

Kaw Nation

Once known as the Kansa (or Konza) tribe, the people of Kaw Nation are descendants of Dhegiha-Siouan speakers. According to ethnohistorians, it is likely that Kaw, Osage, Ponca, Omaha, and Quapaw

people (the Dhegiha-Siouan Hopewell cultures) lived together as a larger group prior to the invasion of white settlers to North America during the late fifteenth century. Prompted by a search for more abundant resources and increasing pressure from the powerful Algonquians to the east, these groups (including the Kaw) emigrated to the Ohio River Valley (Unrau 2017).

As part of the "upstream people", Kaw settlers eventually moved into what is now Kansas from the lower Ohio Valley at some point before 1750. The Kaw assumed control of the region in and around present-day Kansas City, as well as the Kansas River Valley to the west. By the mid-eighteenth century, the "Wind People", as they were known to whites, were in possession of most of present-day northern and eastern Kansas. By 1800, imported diseases (such as smallpox, cholera, and influenza) decreased the Kaw population to less than 50 percent of its previous size, or around 1,500 men, women, and children (Unrau 2017).

In 1825, the Kaw agreed to cede 18 million of their 20 million acres of holdings in exchange for financial compensation in the form of cash, cattle, hogs, and fowl, as well as a government blacksmith, an agricultural instructor, and schools. Following this cession, the Indian Removal Act of 1830 forcibly transplanted nearly 100,000 people from many tribes onto lands claimed by the Kaw and Osage. This forced the Kaw to sign treaties ceding even more of their lands in return for promises from the U.S. government. Victims of nineteenth-century white land speculators, traders, and missionaries, and of the federal government's policy of tribal concentration and dissolution, the Kaw were forcibly removed to a small reservation in present-day Kay County, Oklahoma, in 1873 (Unrau 2017).

Following allotment in 1902, the Kaw tribe retained 260 acres of trust land from their former reservation. This tract was later flooded by the construction and filling of the Kaw Reservoir in the mid-1960s. As a result, the Kaw Council House and cemetery were relocated. In 2000, the Kaw Nation purchased the remainder of their pre-1873 reservation, near Council Grove, Kansas, which will be developed into an educational park. As of 2002, the Kaw Nation of Oklahoma lists 2,553 enrolled members, a figure more than ten times larger than the 249 individuals registered more than a century ago (Kaw Nation 2017).

Kialegee Tribal Town

Members of the Kialegee Tribal Town share ancestry with the Muscogee Creek people. According to their own oral tradition, the Kialegee are a daughter town of Tuckabatche, which split off from the larger Muscogee Creek while settling in modern Alabama and Georgia (Moore 2009). Eventually, Kialegee spawned two more Mvskoke-speaking towns: Auchenauhatche and Hutchachuppe.

Prior to suffering massive losses from disease and invaders, Kialegee Tribal Town had a population of over 20,000 and was one of the largest of the 50 towns that comprised the Muscogee Confederacy. Between 1814 and 1826 the Kialegee remained in Alabama and signed several land treaties with the U.S. Government. After the passing of the Indian Removal Act in 1835 they were removed to Indian Territory (Clark 2009). After removal, members of Kialegee Town lived south of present-day Henryetta,

Oklahoma. Following the allotment of lands, many relocated west near where the Kialegee administration building and tribal court building stand today (KTT 2011; Moore 2009).

Like the people of Thlopthlocco Creek Tribal Town, members of the Kialegee Tribal Town established their own tribal government following the Oklahoma Indian Welfare Act of 1936 (Clark 2009). Kialegee Tribal Town is currently headquartered in Wetumka, Oklahoma, and the tribe claims 700 enrolled tribal members (KTT 2011).

Muscogee (Creek) Nation

The Muscogee (Creek) people are descendants of the people of the Mississippian culture. Sites and artifacts from the Mississippian Period are found throughout the southeastern U.S. from roughly 1200 to 400 years ago (Worth 2000). These early ancestors of the Muscogee built expansive towns within the river valleys in areas now known as Alabama, Georgia, Florida, and South Carolina. At the time of European contact, the Muscogee population was concentrated in two main areas in Alabama and Georgia: along the Coosa and Tallapoosa Rivers and along the Chattahoochee and Flint Rivers. These groups were known to the English as the Upper Creeks and Lower Creeks. The Muscogee represent a union or confederacy of numerous tribes, including the Alabama, Coosa, Koasati, Tuskeegee, Coweta, Cusseta, Oakfuskee, Tuckabatchee, Yuchi, and many others (Isham and Clark 2009; Walker 2004).

In the early 1800s, U.S. policies on Indian removal forced the relocation of many southeastern tribes to areas west of the Mississippi River (Walker 2004). In 1832, the Muscogee signed the Treaty of Cusseta, which exchanged their ancestral homelands for land in Indian Territory, in what would become Oklahoma in 1907. Most Muscogee accepted relocation, but many were forcibly removed and relocated by the U.S. Army to Indian Territory in 1836 and 1837.

After arriving in Oklahoma, tribes from the Upper Creeks settled along the North Fork, Deep Fork, and Canadian Rivers, and tribes from the Lower Creeks settled near the Arkansas and Verdigris Rivers (Isham and Clark 2009). All the tribes set up farms and plantations to support themselves. This initial period in Oklahoma marked a time of relative prosperity for the Muscogee. Subsequently, the tribes experienced disastrous losses in the American Civil War as tribal members fought for both the Union and the Confederate armies (Clark 2009). Additionally, the 1866 reconstruction treaty took 3.2 million acres from the Muscogee, which represented roughly half of their domain.

The following year, the Muscogee or Creek Nation installed a new, modernized tribal government and ratified a new constitution (Clark 2009). Also in 1867, the Creek Nation established a new capital on the Canadian river, near Okmulgee. In 1878, the Creek Nation erected a stone Council House, which still stands as a National Historic Landmark in Okmulgee.

Today, the Muscogee (Creek) Nation is a federally recognized Indian Nation with a population of more than 88,000 headquartered in Okmulgee, Oklahoma (Muscogee [Creek] Nation 2016). Other related groups include the Poarch Band of Creek Indians, who are a federally recognized Indian Nation located

in modern Alabama, and four state-recognized tribes: the Cher-O-Creek Intra Tribal Indians, Ma-Chis Lower Creek Indian Tribe of Alabama, the Star Clan of Muscogee Creeks from Alabama, and the Lower Muskogee Creek Tribe of Georgia.

Osage Nation

The people of the Osage Nation are descendants of indigenous peoples hailing from the Ohio River Valley area near present-day Kentucky (Rollings 1995). By approximately 1200 CE, the Osage began migrating west to reach more resource-rich areas and to separate themselves from the invading Iroquois. This migration took the form of small groups traveling along the White River to Arkansas, Missouri, and eastern Oklahoma (Rollings 1995).

The Osage Nation's first interactions with white settlers came around 1673, when the French wrote of Osage settlement near the Osage River in modern western Missouri (Rollings 1995). By 1690, the Osage had adopted the horse (through raiding and trading), which enabled them to attack and defeat other tribes such as the Caddo. Through warfare, the Osage were able to establish dominance across the plains by 1750, and they controlled significant portions of modern Missouri, Arkansas, Oklahoma, and Kansas for nearly 150 years (Rollings 1995).

Due in part to their migratory past, the Osage culture bore elements of both Woodland and Great Plains peoples (Rollings 1995). While the Osage economy was heavily dependent upon hunting and gathering, the Osage people were also skilled agriculturalists with a vast trading network (Burns 1989).

The Spanish government was aware of the Osage by 1750, but was unable to control or dominate the experienced warfaring nation after the transfer of Louisiana from French ownership to Spanish ownership (Burns 1989). In 1804, Lewis and Clark reported groups of Osage along the Osage, Verdigris, and Arkansas Rivers, with a combined population of at least 5,500. The Osage Treaty of 1808 marked the beginning of the Osage's official dealings with the U.S. government and called for a cession of much of the Osage land in Missouri. As a result, the Osage moved from their homelands on the Osage River to western Missouri, with a major portion of the tribe moving to the Three-Forks region of Indian Oklahoma (Burns 1989; Rollings 1995).

Further treaties signed between 1818 and 1825 ceded more traditional Osage lands across Missouri, Arkansas, and Oklahoma in exchange for reservation lands and supplies slated to help the Osage adapt to farming and a more settled culture (Burns 2009). Creek County is included in the lands ceded to the U.S. government in 1825 (Wilson 2009). In the 1830s, the Osage land in present-day Kansas and Oklahoma was promised to the Cherokee and four other tribes. When these tribes arrived to find their promised lands occupied, conflict with the Osage over resources and territory arose. Following these conflicts, the tribe suffered severe losses from the smallpox pandemic of 1837–1838, which affected Native Americans across the U.S. and Canada (Rollings 1995).

After decades of loss, the Osage population recovered, building to a total of 5,000 members by 1850 (Burns 1989). Treaties in 1865 and 1870 called for the cession of the remaining Osage lands in Kansas and relocation of the remaining tribespeople to Indian Territory. That land consisted of approximately 500,000 acres in what is now Osage County and was part of the Cherokee Outlet.

In 1881, the Osage drafted a constitution modelled after the U.S. Constitution, creating the Osage National Council. In 1889, the U.S. government no longer recognized the council's legitimacy and eventually replaced the Osage National Council with the Osage Tribal Council as part of the 1906 Osage Allotment Act (Burns 1989). As part of this legislation, each of the 2,228 registered Osage received 657 acres (compared to the 150-acre allotment typical of other similar treaties). The tribe brought in a sizeable income through grazing leases on their lands. Additionally, the tribe managed to retain mineral rights to subsurface deposits in 1906, which lead to a further proliferation of wealth among the Osage's members (Burns 2009).

Today, the Osage Nation is a federally recognized tribe boasting over 13,300 members, centered around their tribal capital of Pawhuska, Oklahoma (USCB 2013). Roughly 6,700 Osage still live within the state of Oklahoma (Burns 2009).

Otoe-Missouria

Historically two separate tribes, the Otoe and Missouria coalesced as one tribe in the 1800's. Having similar histories, both tribes' ancestors hail from the northern Great Lakes region, relating ancestrally to the Siouan people. Around 1200 CE, the two groups began their migration southwest. By 1250, the Otoe are known to have been established in central Missouri, and the Missouria are known to have resided in Missouri by 1450. Both tribes were part of the Woodland culture, living sedentary lifestyles in earthen lodges, but were also occasionally part of Plains culture, hunting and subsisting on plains flora and fauna. In the 1700s, both tribes began trading with the arriving French, trading mainly bison hides and valuable minerals. By the 1700s, the Otoe emigrated to areas near the Platte River in southeastern Nebraska, and resided there until the late 1800s. In 1819, the two tribes officially formed a combined single nation (May 2009).

In 1880, Otoe-Missouria tribal members were removed from their lands by the United States government and relocated to a reservation in north central Oklahoma. Due to issues of assimilation, several factions briefly splintered from the tribe, but these groups eventually rejoined the tribe on the reservation. By 1904, a majority of the tribal lands had been unjustly taken by white settlers through the Dawes Act of 1887; in reaction the Otoe took up legal action to the Indian Claims Commission (ICC). By 1964, the tribes had won $1.2 million in compensation for their land from the I.C.C. (May 2009, OMT 2017).

Today, the Otoe-Missouria Tribe are a federally recognized tribe, and have had an operative tribal government and constitution since 1984. The tribe consists of 1,500 enrolled members, and the modern tribal headquarters are located within Noble County in the town of Red Rock (May 2009, OMT 2017).

Ponca Tribe of Indians of Oklahoma

The Kaw share lineage with the Ponca as descendants of the Dhegiha-Siouan Hopewell culture group. Several tribes lived together as a larger unit prior to the invasion of white settlers to North America during the late fifteenth century. Prompted by a search for more abundant resources and increasing pressure from the powerful Algonquians to the east, these groups (including the Ponca) emigrated to the Ohio River Valley. During the early 1700s, the Ponca split from the Omaha groups and settled in villages along the Niobrara River and Ponca Creek in modern-day Nebraska and South Dakota. Prior to the arrival of the Teton Sioux around 1750, the Ponca territory spanned the area between the Missouri River and the Black Hills. Disease decimated Ponca populations during the eighteenth and nineteenth centuries, and the Ponca were forced to withdraw to an area near the mouth of the Niobrara River by war-faring Sioux and Lakota bands (van de Logt 2017).

The Ponca were never engaged in an official war with the U.S. government, yet they signed their first peace treaty with the young nation in 1817, resulting in an expanded trade agreement in 1825. After more treaties in 1858 and 1865 ceded Ponca lands to government control, an onslaught of drought, war, and bison population decrease threatened the Ponca with widespread starvation. Compounding the issue, the U.S. government did not uphold their treaty obligations to the Ponca (as was the case with many other tribes). After giving lands reserved for the Ponca to the Sioux in 1868, the government relocated the Ponca to Indian Territory in 1877 (van de Logt 2017).

This removal was handled exceptionally poorly by the U.S. government, and nearly a third of the tribe perished during the Ponca's first years in Oklahoma. Ponca subchief Standing Bear returned to Nebraska with a group of followers, and his resulting arrest led to the landmark *Standing Bear v. Crook* case of 1879. The decision stemming from this trial stated that Indians were recognized as persons under the Fourteenth Amendment, and could therefore sue for their rights. This decision divided the tribe into two bands: the Ponca Tribe of Indians of Oklahoma and the Ponca Tribe of Indians of Nebraska (van de Logt 2017).

In 1911, large oil deposits were discovered on Ponca lands in Oklahoma, but the tribe and its population experienced mixed results from development activities. While some became wealthy because of these mineral deposits, other Ponca were taken advantage of by white settlers and speculators, and many lost their lands. Additionally, the processes of mining, drilling, and oil exploitation quickly created environmental problems for the tribe (van de Logt 2017).

Many Ponca served during World War I, and returning Ponca veterans founded the Buffalo Post 38 chapter of the American Legion. This center was used to revive traditional war dances (such as the *heluska* dance) within their community. Following 1936's Oklahoma Indian Welfare Act, the Ponca tribe reorganized their government, ratified a tribal constitution in 1950, and gained federal recognition. One of the most notable Ponca is Clyde Warrior, an activist who cofounded the National Indian Youth Council in 1961. Warrior called for tribal self-determination and paved the way for a new generation

of Indian activism. Today, the Ponca tribal headquarters are located south of Ponca City in White Eagle, Oklahoma (van de Logt 2017).

United Keetoowah Band of Cherokee Indians in Oklahoma

The United Keetoowah Band (UKB) of Cherokee Indians trace their lineage to the "Old Settler" Cherokees who settled in Arkansas in 1817 and relocated to present-day northeastern Oklahoma in 1828. The arrival of Cherokees from the Trail of Tears sparked a power struggle as the two populations tried to combine; this clash lead to a costly civil war (Clough 2009). This conflict was exacerbated during the American Civil War, when the Keetoowah fought with the Union while the majority of the Cherokee Nation joined with the Confederacy. Roughly 25 percent of the combined Cherokee/UKB population was lost between these two civil wars (Clark 2009). The Keetoowahs adopted a constitution in 1859, calling their newly-formed branch the "Keetoowah Society" (UKB 2011).

After the end of the American Civil War, the Keetoowah Society (which strongly opposed allotment and single statehood) reprimanded the Cherokee National Council for negotiating the reconstruction-era treaty with the United States (Clark 2009). As part of the treaty negotiations, the U.S. government punished tribes for siding with the Confederacy and confiscated large swaths of tribal lands. Oklahoma achieved statehood in 1907, and by 1920 an estimated 90 percent of the Cherokees' land in Oklahoma was taken or sold off to white settlers (Clark 2009). The Cherokee national government was dissolved in 1907, making the Keetoowahs the only federally recognized government of the Cherokee people until 1948. In 1950, the UKB ratified its constitution, bylaws, and corporate charter (Clough 2009).

Today the UKB retains its sovereign, separate government with headquarters located in Tahlequah, Oklahoma. The UKB has over 14,300 members (UKB 2011).

Wichita and Affiliated Tribes

The Wichita and Affiliated Tribes (WAT) includes the Wichita, Tawakoni, Waco, and Kichai (Pool 2018). Ancestors of the Wichita are from the southern plains region of the United States. The villages of the earliest Southern Plains Village tradition (documented Archeologically) were established by A.D. 800; they were located in an area that extended from the Smoky Hill River in Kansas to north-central Texas, thus occupying much of what is today the State of Oklahoma. Archeological evidence suggests that the Wichita were located primarily in the Washita River basin in central and western Oklahoma (WAT 2018).

The Wichita language descends from the Caddoan linguistic family as do the Caddo, Pawnee, and Arkiara languages (Clark 2009). Around 3,000 years ago the Caddoan language group split into the Northern and the Southern types; the Northern group includes Wichita and Pawnee.

Between 1350 and 1450, some Washita River people began to form larger villages featuring circular grass houses and fortifications. These populations traded extensively, and the economy featured

commodities such as glazed, painted pottery; turquoise pendants; shell beads from the Puebloan villages of New Mexico; and *bois d'arc* and engraved pottery from the Caddo people of Texas. The Wichita people comprised a loose confederation of related peoples on the Southern Plains, including groups such as the Tawakoni, Waco, Kichai, and Taovaya (Smith 2000). Each Wichita village was represented by leaders chosen by a warrior-class council, and ceremonial life was largely focused around seasonal economic activity. Dancing ceremonies were performed when the first new grass sprouts appeared; when corn crops ripened; and to ensure or celebrate successful harvests, buffalo hunts, or war parties. (WAT 2018)

Coronado's 1541 expedition encountered Wichita villages when it passed through Kansas, near present day Liberal (Kansas Historical Society 2018; Smith 2000). A later 1601 expedition led by Juan de Oñate crossed through north-central Oklahoma and encountered large villages of grass houses. The Wichita had guns and horses by 1719 when French explorers Jean Baptiste Bénard de La Harpe and Claude Du Tisné established trading posts at Wichita Villages along the Arkansas River in present-day Oklahoma (Pool 2018). These early European inhabitants estimated that the Wichita population was between 15,000 and 33,000 people, with upwards of 2,000 people living in larger villages.

The arrival of Spanish and French settlers and traders sparked massive shifts in Wichita culture. Although the acquisition of horses enabled the Wichita to follow and hunt buffalo more quickly and efficiently over an expanded range, the highly contagious diseases brought by the Europeans decimated local populations (WAT 2018). The Wichita were also harassed by the Osage. This harassment was one of several factors that caused the Wichita to move south toward the Red River. In their new location, the Wichita served as trade mediators between the French and the Spanish. By 1803 the United States gained control of the Wichita lands from the French; by 1830 those lands were designated as part of "Indian Territory."

The Wichita remained north of the Red River throughout the 1800s; during this period, hostilities between the Wichita and other tribes increased as many eastern tribes were forcibly removed to west-central Oklahoma or Indian Territory (Smith 2000). The federal government determined that part of the land the Wichita traveled through and resided on in southeastern Oklahoma belonged to the Osage and Quapaw tribes; nevertheless, the Osage and Quapaw tribes were forced to cede their land to the Cherokee, Choctaw, Muskogee (Creek), and Seminole.

In 1835, the United States–Wichita Treaty was signed at Camp Holmes, which uses "Wichita" to refer to the Wichita, Waco, and Tawakoni people (WAT 2018). The goals of the Camp Holmes Treaty were to recognize the Wichita homeland and to establish peace between the Plains tribes, the United States, and tribes being relocated to Indian Territory (May 2018). The treaty was only briefly successful in achieving those goals. After the Texas Republic was formed in 1836, the Wichita were again forced to defend themselves and their lands against white settlers (Pool 2018).

In 1859, the Wichita were assigned to a reservation near the Washita River. They were joined by some people from the Delaware, Caddo, Tawakoni, and Waco tribes, and by people from two Comanche bands who had been removed from Texas (Pool 2018). Again, peace was short-lived. By 1863, the Wichita people were forced north into Kansas by Confederate troops (WAT 2018). During their time in Kansas, the Wichita were left without farming land or allies, and many tribal members starved. When the Wichita returned to Indian Territory in 1867, their numbers had dwindled to 822. Portions of the 1859 reservation had been assigned under the Treaty of Medicine Lodge to the Kiowa, Comanche, Apache, Cheyenne, and Arapaho. The Wichita protested the assignation of Wichita lands to other tribes. In 1869 a separate agency was created for the WAT. In 1872 the United States recognized the Washita River, Canadian River, 98th Meridian, and 98°40' as the boundaries for the WAT (Pool 2018, WAT 2018). However, this agreement was never ratified.

The 1887 Dawes Act established the "allotment" system of reservations. Each tribal member was given 160 acres and the "surplus" was then opened for white settlers (Pool 2018). The Wichita tribe employed legal counsel to claim the land from the 1859 reservation and the geographic area described in 1872. The Dawes Commission rejected the Wichita land claim, and by 1901 the land had been surveyed and allotted and the "surplus" sold off to white settlers.

The original communal village lifeways of the Wichita, which had endured for centuries, were destroyed by these changes in land ownership. During this time, the Wichita, Tawakoni, and the Kichai were designated as the WAT, although they maintained separate identities for purposes of ration distribution and census records (Pool 2018). By the 1930s, grass lodges had given way to framed houses. As of 2009 the federally recognized Indian Nation of the WAT had 2,501 enrolled members, of which 1,884 resided in the state of Oklahoma (Pool 2018).

Osage County Historic Context

Located in northeastern Oklahoma, Osage County is Oklahoma's largest county. The area has been occupied since the Paleoindian period (detailed above). By 1760, the Osage Nation of Missouri expanded into what is now Osage County but by 1825, had surrendered their claim to the region and were subsequently removed to a Kansas reservation. By 1835, Osage County had been guaranteed to the Cherokee Nation through the Treaty of New Echota. In 1870, 1,570,059 acres of Osage County were purchased from the Cherokee Nation by the Osage Nation, and the Osage Agency was established in present-day Pawhuska in 1872 (May 2019a).

The Osage Nation reservation boundaries were established in 1875 and the reservation was included in Oklahoma territory in 1890, under the Organic Act. The reservation was made semiautonomous by the Enabling Act of 1906 and became Osage County at statehood in 1907. Osage allotment occurred between 1906 and 1909. In subsequent years, land within Osage County was leased out for farming and cattle ranging. Mineral rights within Osage County belong to the Osage Nation, held in trust by the federal government (May 2019a).

Osage County is also the home of the first successful commercial oil well in Oklahoma Territory. The subsequent oil boom, headed by Henry Foster and his family, made life difficult for many Osage. Many Osage were taken advantage of or became the targets of crime, including a string of unsolved murders in the 1920s that received nationwide interest (May 2019a).

Several railroads were constructed crossing Osage County, with the earliest completing construction in 1902. The closest railroad to the APE is the Midland Valley Railroad, which was constructed between 1905 and 1906. All railroads constructed in Osage County between 1902 and 1924 have been abandoned since 2002 (May 2019a).

At statehood, the population of Osage County was 15,332. This number peaked in the 1930s at 47,334 before gradually declining. Another population increase began in the 1980s and as of 2010, the population in Osage County was 44,093 (May 2019a).

The city of Barnsdall was originally called Bigheart, named for Osage Chief James Bigheart, and was officially renamed Barnsdall in 1922. The city was originally established along the Midland Valley Railway in March 1905. The city of Barnsdall was withheld from allotment and was auctioned off in May 1906. The Southwestern Refining Company was constructed in Bigheart around 1910 and was later acquisitioned by Barnsdall Refining Company in 1921 (May 2019b).

Previous Investigations and Previously Identified Resources

A site file review was conducted by Christy Stewart on July 31, 2019 at the Oklahoma Archeological Survey (OAS) to determine the extent of cultural resources surveys that have been conducted in the APE, as well as to identify any previously recorded archeological sites in the area.

According to OAS records, no archeological projects or sites have been recorded within the APE and no archeological sites are located within a 1.6-kilometer (1-mile) study area around the project area. However, two surveys have been conducted within 1 mile of the project area. In 2004, D. Dycus conducted a Phase 1 survey of the current landfill area, which is tangential to the eastern side of the APE, no sites were recorded but one standing structure was assessed. This standing structure is a ca. 1930 Craftsman-style home that was not assessed by Dycus but is still standing and outside of the current project area (Dycus 2004). The second survey was conducted by N. Garrett in 2004 for an oil well under the oversight of the Bureau of Indian Affairs oil well northeast of the project area, no sites were recorded during that survey (Garrett 2004).

No NRHP-eligible resources are located within the project area or within a 1.6-kilometer (1-mile) study area around the project area. However, one NRHP-listed resource is located 1.14 miles (2.25 kilometers) from the southwest edge of the project area. The Old Fort Arbuckle (TU-13) is the site where a fort was constructed in 1833 as an advanced post in the area. On October 22, 1834 troops were ordered to abandon Fort Arbuckle and return to Fort Gibson. No standing features are remaining at this site Excavations at the site by Dr. Annetta L. Cheek in 1977 revealed a portion of a sandstone

alignment and one rock accumulation that were likely part of Fort Arbuckle, and a small scatter of historic artifacts. Since the NRHP status of this site is not dependent upon the integrity of visual lines of sight and since it is located more than one mile away, the current project should have not cause any direct or indirect adverse impact to TU-13.

Map Review

A review of available General Land Office (GLO) maps, historic aerials, topographic maps, and other map resources was undertaken to determine how the study area has been utilized over time; these sources include Google Earth™, the Nationwide Environmental Title Research (NETR) website (NETR 2018), USGS Topographic Map Explorer (USGS 2019b), and Bureau of Land Management (BLM) records (BLM 2019).

Historic topographic maps from the years 1912, 1915, 1955, 1958, and 1990 (USGS 2019b) and aerial imagery from 1957, 1967, 1981, 1995, 2003, 2008, 2010, 2013, and 2015 (NETR 2019), and the 1873 and 1909 GLO survey maps (BLM 2019) were reviewed. According to the GLO survey map from 1873, no buildings were present in the APE. By the 1909 Dependent Resurvey, there are no structures mapped in the APE; however, within one mile of the APE three houses are mapped (BLM 2019).

The earliest topographic maps (1912 and 1915) for the APE do not have any structures mapped into the APE, and both show 10 houses mapped within one mile of the APE. The 1955 topographic map is too large of a scale to see any changes in the APE. By the 1958 topographic map, one house is mapped in the NW ¼ SW ¼ SE ¼ of Section 35 Township 20N Range 10E. Additionally, Anderson Road, which is directly north of the project and N 177th Ave, located directly east of the project area, are present on this map. This house is still extant and appears on all later maps and aerial images. The 1990 topographic map shows no changes to the APE (USGS 2019b).

The earliest aerial imagery from 1957 shows the house in the NW ¼ SW ¼ SE ¼ of Section 35 Township 20N Range 10 East, in addition to an associated outbuilding in the same area; these appear on all subsequent aerials. No major changes are shown on the 1967 aerial other than the thinning of trees in the northern portion of the project area. The 1981 aerials show one new structure in the project area in the NW ¼ NW ¼ NW ¼ of Section 36 Township 20N Range 10E. This seems to be an outbuilding associated with a house outside of the APE, approximately 130 meters (427 feet) northeast of the outbuilding. This structure is present on the 1995 aerial imagery but appears to have collapsed by the 2003 aerial. No changes were noted on the 1995 aerials (NETR 2019).

3 RESEARCH GOALS AND METHODS

Purpose of the Research

The present study was carried out to accomplish the following goals:

1. Identify all historic and prehistoric cultural resources located within the APE defined in Chapter 1
2. Perform a preliminary evaluation of any identified resources' potential for inclusion in the NRHP
3. Make recommendations for further research concerning the identified resources based on the field investigations and background research

NRHP Eligibility

The National Historic Preservation Act of 1966, as amended, provides a statement of federal authority, an administrative framework for agency coordination, and general principles for the assessment of cultural resources, including archeological sites (called "historic properties" in this regulatory context, regardless of actual historic or prehistoric dates), for their eligibility for inclusion in the NRHP (36 CFR 800; 9 TNRC 191; 13 TAC 26.24).

More specific rules relating to the NRHP nomination process, list management, relevant definitions, and other matters are described in 36 CFR 60. Most important to the present investigation are the criteria for significance (and therefore potential NRHP eligibility):

> …The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) that have yielded or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

Note that significance and NRHP eligibility are determined by two primary components: integrity and one of the four types of association and data potential listed under 36 CFR 60.4(a–d). The criterion most often applied to archeological sites is the last—and arguably the broadest—of the four (36 CFR 60.4[d]).

Survey Methods and Protocols

With the goals and guidelines above in mind, CMEC personnel conducted cultural resource investigations in August and September 2019.

For the archeological survey, 344 shovel tests were excavated within the 277-acre APE. Survey was conducted at transects spaced 30 meters apart, with shovel tests typically excavated at 30-meter intervals along transects. Shovel tests were not excavated in areas with steep slopes (i.e., greater than 20 percent), areas with bedrock or dense gravels at surface, and areas with severe disturbance.

Shovel tests were excavated in arbitrary 10-centimeter or 3.94-inch levels until dense cobbles, gravels, or basal clay was reached. Excavated matrix was screened through 0.635-centimeter (0.25-inch) hardware cloth, and deposits were described using conventional texture classifications and Munsell color designations. All observations were recorded on standard CMEC shovel test forms.

For the built environment historic resources survey, desktop research was conducted to identify parcels containing resources within or immediately adjacent to the APE. Research was also conducted to identify roadway features within or immediately adjacent to the APE. A pedestrian survey was then conducted to verify the location, age, and integrity of these resources, and to identify any other resources not revealed during the desktop review. All surveyed resources are discussed in the results section of this report, and those resources determined to be of historic age were recorded on Oklahoma State Historic Preservation Office (SHPO) Historic Preservation Resource Identification (HPRI) forms. For the purpose of this report, historic-age resources are those constructed prior to 1974. Consistent with SHPO standards, parcels containing historic-age resources are also referred to as building complexes. Furthermore, approximate dates (indicated as “c.”) are within five years of the indicated year. Lastly, parcels were documented only if a historic-age resource was within or immediately adjacent to the APE.

4 RESULTS AND RECOMMENDATIONS

General Field Observations

In August and September of 2019 and February 2020, CMEC personnel performed an archeological and built environment historic resources survey for the proposed American Environmental Landfill expansion in Sand Springs, Osage County, Oklahoma (**Figure 2**). The APE begins 421 meters (1,383 feet) west of the intersection of Anderson Road and North 177th West Avenue approximately 8 kilometers (5 miles) northwest of Sand Springs, covering 277 acres surrounding the north and western portions of the current American Environmental Landfill in Sand Springs.

The northeastern portion of the APE is mostly riparian forest except for the proposed mitigation area, which is grazed pastureland, and the landfill backfill in the southern portion of this area. The APE was steeply sloped at the center and northern portions of the study area and had more gradual hills in the southern and eastern portions of the study area. The southern portion of the APE is crossed by a series of deep and shallow drainages (**Figures 3**, **4**, and **5**). The landfill backfill comprises the excavated material from the landfill. To the west of the backfill area is an existing mitigation pond associated with the current existing backfill area (**Figures 6** and **7**). The northwestern and southwestern portions of the study area are mostly forested, with one pasture located in the far southeastern portion of the study area. Weather during the August and September 2019 survey began with warm and rainy weather, but gradually cleared as fieldwork progressed. The consistent rain at the beginning of the project did raise the water level at the stock ponds in the northern portion of the study area and some creeks in the southern portion of the study area (**Figure 8**). Upon revisit to the northeastern mitigation area, the majority of the project area is covered by stock ponds as well as a disturbed area where fill for the stock pond walls had been excavated.

Survey Results

A thorough pedestrian survey was conducted in areas of slope greater than 20 degrees or where bedrock was present at surface. Pedestrian survey was conducted throughout, with shovel tests in some areas on a 30-meter transect and in other areas judgmentally due to slope, bedrock at surface, and drainages. Pedestrian survey transects were walked in transects no wider than 30 meters, and shovel tests excavated at 30-meter intervals as allowed by sloped, bedrock, and disturbances (**Figure 2**).

Additional disturbances were identified during survey; for example, a two-track gravel road extends from Anderson Road north of the project area to Building 1A (detailed below). Additionally, landfill activities have heavily impacted portions of the project area surrounding the current landfill, including backfill piles (see **Figure 6**) and mitigation ponds (see **Figure 7**). Other disturbances include residential structures and stock ponds.

Due to the slopes and bedrock at surface, several areas were pedestrian surveyed with judgmental shovel tests excavated where possible. This included the northwestern half of the survey area and the western edge of the northeastern portion of the survey area. In these portions of the study area bedrock was present at surface (**Figures 9**, **10**, and **11**). Near the landfill backfill in the northeastern portion of the study area, the terrain was at an approximately 40-degree slope. Further, due to a series of both shallow and deep drainages in the southernmost portion of the APE, field methods had to be adjusted to ensure appropriate coverage (see **Figure 5; Figures 10** and **11**). In the northeastern mitigation area, shovel testing was judgmental because most of the area was covered by a series of stock ponds and disturbed areas from which fill had been excavated for the construction of a raised edge around one of the stock ponds (**Figure 12**).

In total, 344 shovel test units were excavated within the APE. Generally, soil profiles in the APE conformed to mapped soil profiles, with the exception that the southernmost portions of the study area had much deeper soil deposition than expected. Details are provided below.

In the northeastern portion of the study area in the non-sloped areas, soils typically consisted of brown (10YR 5/3) sandy clay loam from 0 to 30 centimeters (0 to 11.8 inches) below ground surface overlaying grayish brown (10YR 5/2) clay from 30 to 50 centimeters (11.8 to 19.7 inches) below surface. Shovel tests in this area were terminated at argillic horizons or compact soils.

Few shovel tests were excavated in the northwestern portion of the study area due to slope and the presence of bedrock at surface; most shovel test units were confined to the northern edge of the study area along Anderson Road. Soils in this area typically consisted of brown (10YR 5/3) sandy loam from 0 to 20 centimeters (0 to 7.8 inches) below ground surface overlaying yellow (10YR 7/8) sandy clay from 20 to 40 centimeters (7.8 to 15.7 inches) below ground surface overlaying sandstone. Shovel tests in this area were terminated at bedrock.

In the southern portion of the study area, shovel tests around the southern drainage consisted of deeper shovel tests. Shovel tests in this area typically consisted of dark yellowish brown (10YR 4/3) sand from 0 to 60 centimeters (0 to 23.6 inches) below ground surface overlaying strong brown (7.5YR 5/8) sandy clay from 60 to 70 centimeters (23.6 to 27.6 inches) below ground surface. Shovel tests were terminated at the argillic horizon.

Ground surface visibility varied widely throughout the study area. Dense woods cover most of the southern and northeastern portions of the study area (**Figure 13**). In the center of the project area, the woods were less dense and hand higher ground surface visibility (**Figure 14**). In the southeastern and edge of the northeastern portion of the study area are two grazed pastures with low ground surface visibility but less dense vegetation (**Figure 15**). Overall, ground surface visibility ranged from 10 percent in the densely vegetated woods to 80 percent in the areas with center of the project area with exposed bedrock.

Isolated Find IF-01

One archeological site (IF-01) was recorded; the site is a stacked rock wall (**Figure 16**). This site is located 643 meters (2,127 feet) southwest of the intersection of Anderson Road and N 177th W. Ave. This site is a stacked rock wall made of locally available rock that spans approximately 7 meters (22 feet) long. At its tallest point, the wall is about 1 meter (3.2 feet) tall and consisted of three courses of rock, generally oriented north-south following the slope. One negative shovel test was dug directly west of the wall, it was mostly sloped bedrock at surface surrounding the wall. Pedestrian survey found no artifacts or buildings associated with the site. Historic maps and aerial imagery do not show houses or buildings near the rock wall. As map and aerial imagery review did not provide information on the age of construction, deed research was undertaken in an attempt to find reference to a residence or occupation. The land was granted by Peter Bigheart to Henry P. Anderson on February 26, 1929 (Allotment Record Vol. 2 Page 281). The property was in the Anderson family's possession for only one year before it was granted to Amasa Warner in 1929 (Warranty Deed Record Vol. 36 Page 336). The property containing the wall was granted to Martin L. Bond in 1938 (Warranty Deed Record Vol. 81 Page 565) and then to Orvill Titus in 1951 (Warranty Deed Vol. 116 Page 13). Orvil Titus granted the property to Lyle L. Enyart in 1952 (Warranty Deed Vol. 116 Page 143); the Enyart family had the land until 2003.

Map and deed research were inconclusive to the age or the wall or its association with an occupation. In addition, the site lacks intact archeological deposits, historic integrity, and/or design distinction or associations with persons of historic significance. Therefore, per the criteria presented in 36CFR60.4 and in accordance with National Register Bulletin 15, CMEC recommends that this site is not eligible for inclusion in the NRHP under Criteria B and D.

Historic-Age Building Complex

One building complex was recorded. Building Complex 1 (Osage County Assessor Parcel ID 35-20-10-00300) is located at the southwest corner of the study area at the end of an unnamed road that meanders south/southwest from Anderson Road north of the project area. The building complex consists of a house (Building 1A; **Figure 17**) and a prefabricated metal shed (Building 1B). The Osage County Assessor website indicates the house was constructed in 1955. The shed was estimated by CMEC to have been constructed circa 1980 and is therefore not historic-age. Although the house appears to have been constructed in the 1950s, its windows, primary door, and roof have been replaced. Its westernmost bay has undergone structural modification, likely a later addition. The building does not display character-defining features of any architectural style.

The documented building complex contains a common house and storage shed; neither has any distinguishing characteristics. No associations were identified linking the complex to events or persons of historic significance and the complex has not been previously evaluated for NRHP eligibility. Building 1A does not embody distinctive characteristics of a type, period, or method of construction, nor does it represent the work of a master or possess high artistic value. Building 1B does not meet the age

requirement for NRHP eligibility, nor does it meet the exceptional significance standard for Criteria Consideration G for resources less than 50 years old. Therefore, these resources are recommended **not eligible** for NRHP listing, either individually or as a part of a historic district (**Table 3**).

Table 3: Historic Age Resources

Resource ID	Date of Construction	Stylistic Influence	NRHP Recommendation
Building Complex 1, off unnamed road in S35 T20N R10E, Sand Springs, OK			
Building 1A/House	1955	None	Not eligible
Building 1B/Shed	c. 1980	None	Not eligible

Figure 2a. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey
Disturbed Area
Landfill disturbance

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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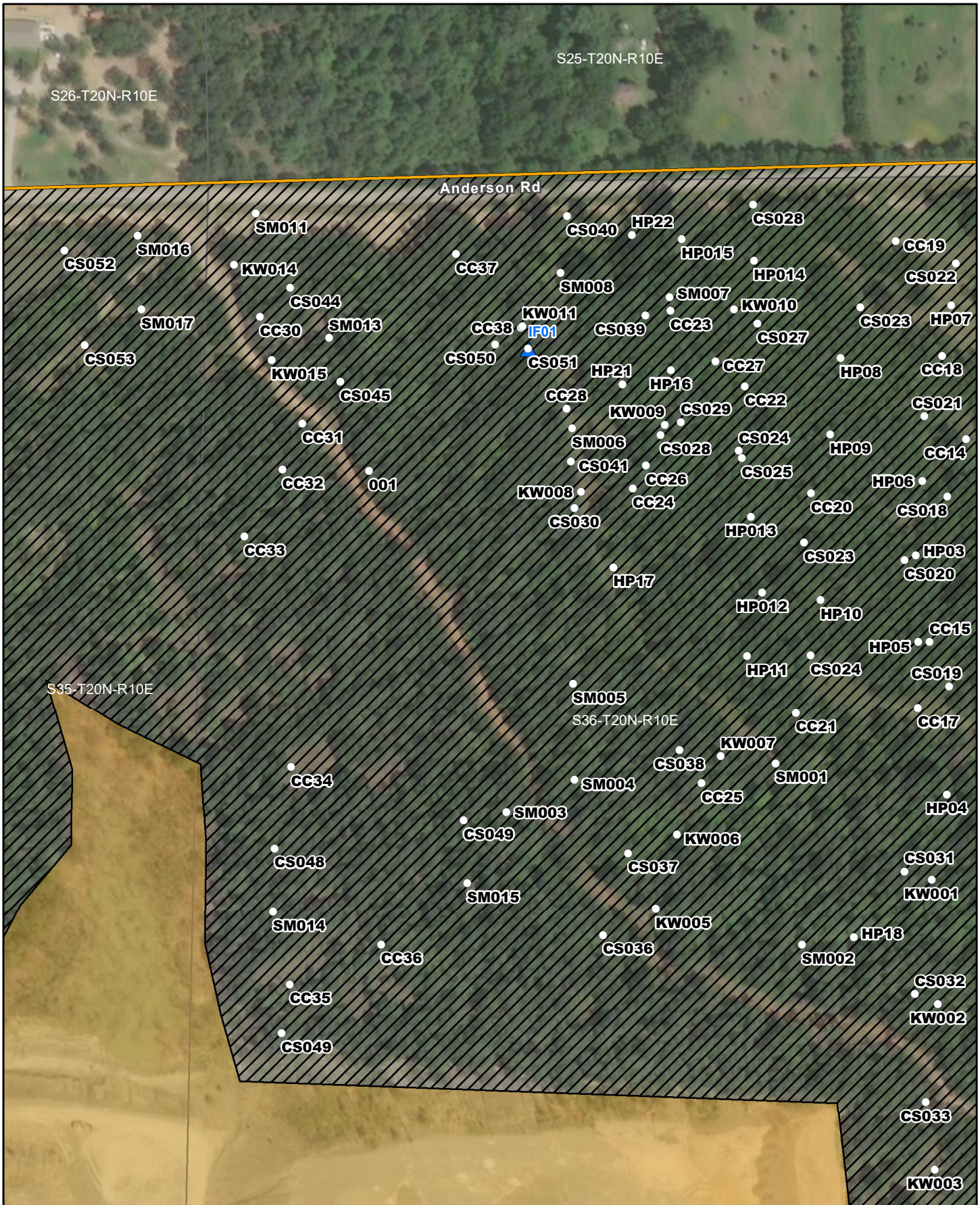

Figure 2b. Survey Results

American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

Project APE
Negative Shovel Test
Isolated Find (IF)
Section Line
Pedestrian Survey
Disturbed Area
Landfill disturbance

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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Figure 2c. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c d e f g h

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey
Disturbed Area
Under water

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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Figure 2d. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c d e f g h

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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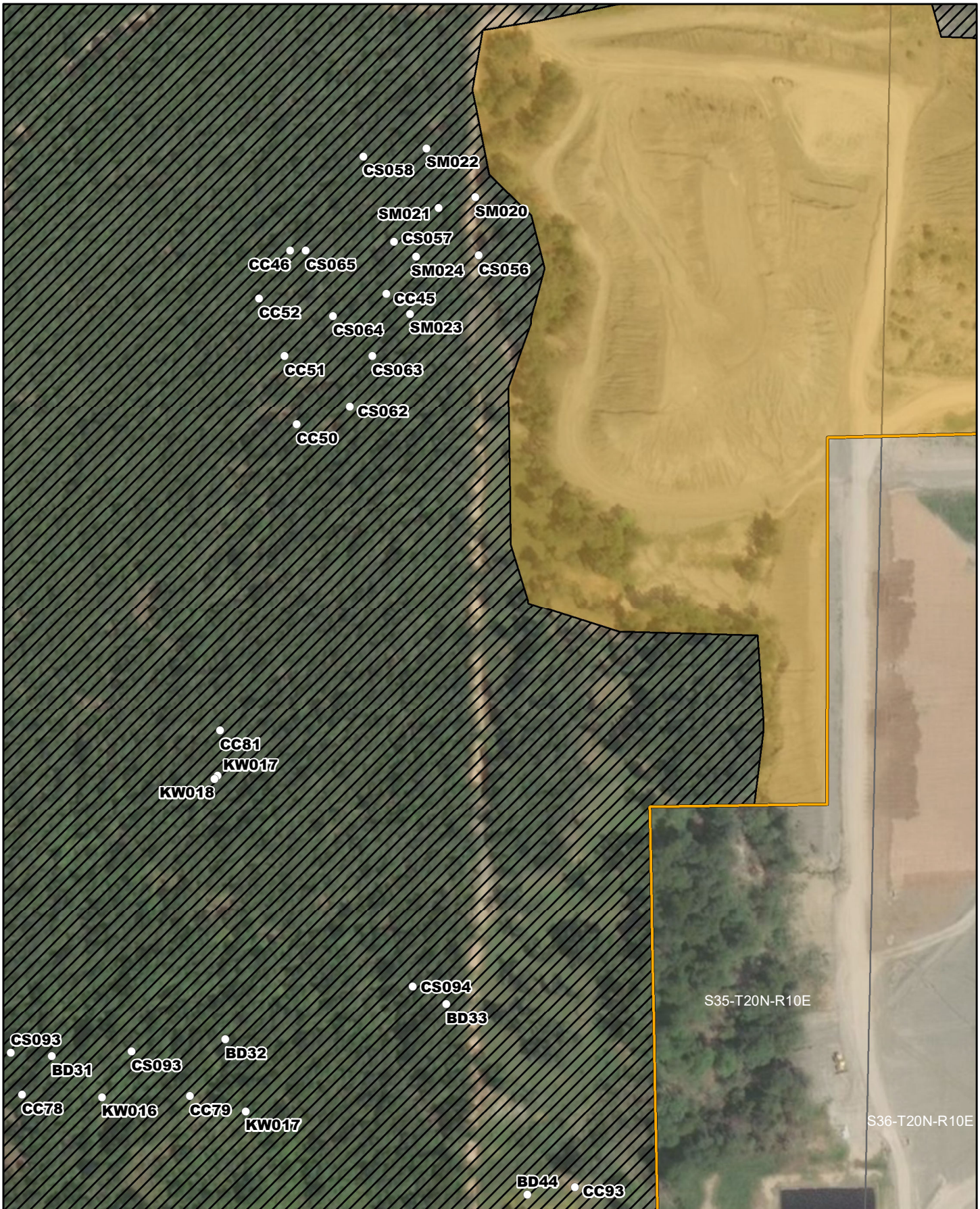

Figure 2e. Survey Results

American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c
d e f
g h

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey
Disturbed Area
Landfill disturbance

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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Figure 2f. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c d e f g h

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey
Disturbed Area
Landfill disturbance

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

G:\Projects\SCS_Aquaterra\Sand_Springs_Landfill\CR_Figure 2_Survey Results_aerial_20200225.mxd

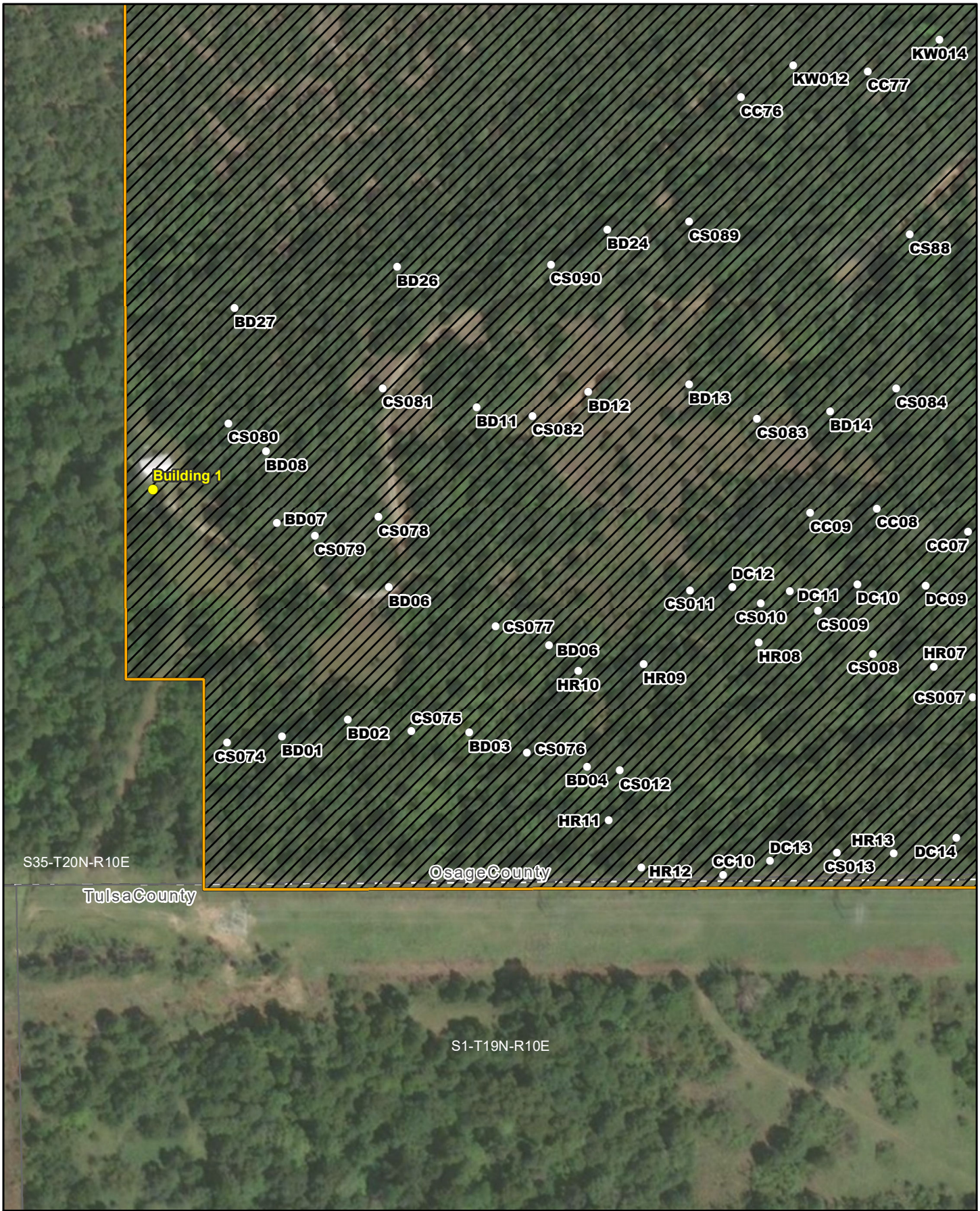

Figure 2g. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c d e f g h

Project APE
Negative Shovel Test
Section Line
Building
Pedestrian Survey

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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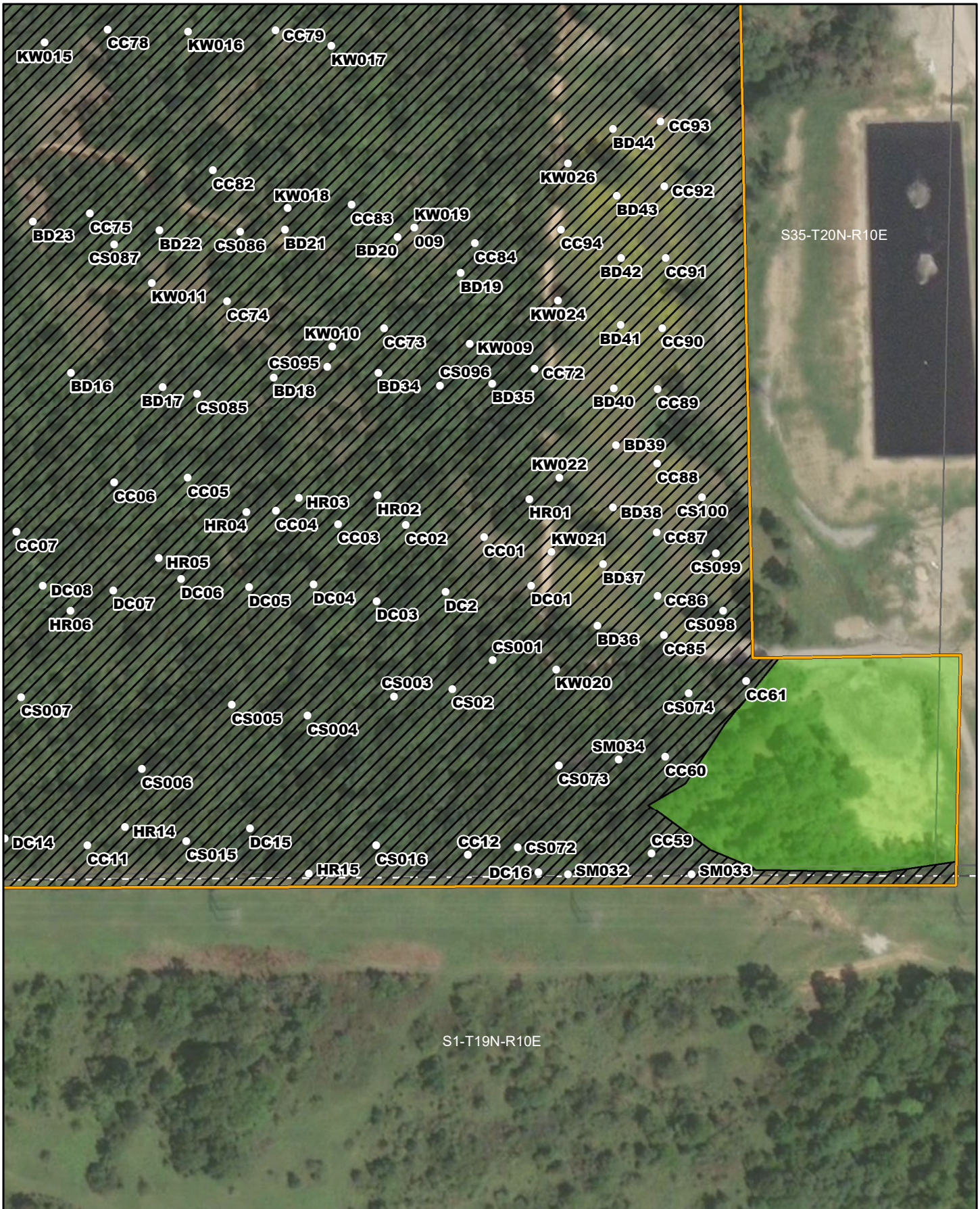

Figure 2h. Survey Results
American Environmental Landfill,
Sand Springs
Osage County, Oklahoma

a b c d e f g h

Project APE
Negative Shovel Test
Section Line
Pedestrian Survey
Disturbed Area
Deep drainages

Data Sources:
CMEC (2019),
OSU CSA (2017)
Aerial Source:
DigitalGlobe (2018)

COX | McLAIN
Environmental Consulting

0 200 Feet
0 60 Meters

1 in = 200 feet
Scale: 1:2,400
Date: 2/25/2020

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Figure 3: Typical drainage in the southern portion of the APE; facing west.

Figure 4. Typical drainage in the center of the APE; facing west.

Figure 5. Southernmost drainage in the APE; facing north.

Figure 6. View of backfill from the current landfill in APE; view to northwest.

Figure 7. Existing mitigation pond to north and west of the landfill backfill; facing south.

Figure 8. Flooded creeks in the southern portion of the APE; facing east.

Figure 9. Bedrock at surface in northern portion of the APE; facing southeast.

Figure 10. Bedrock at surface and rocky slopes in the middle of the APE; facing west.

Figure 11: Bedrock on slopes in the center of the APE; facing north.

Figure 12. A stock pond in the northeastern mitigation area; facing northwest.

Figure 13. Typical vegetation in the southern portion of the APE; facing north.

Figure 14. Typical vegetation in the center portion of the APE; facing west.

Figure 15. Pasture in the southern portion of the APE with the backfill in the background; facing northeast.

Figure 16. Rock wall at IF-01; facing west.

Figure 17. Building 1A; facing west.

Recommendations

Cultural resource specialists from CMEC performed intensive cultural resources investigations of the proposed American Environmental Landfill expansion in Sand Springs, which included an archeological pedestrian survey and the excavation of 344 shovel tests. One archeological site, IF-01, and one historic-age building (Building Complex 1) were documented. None of the resources documented are recommended eligible for listing on the NRHP. It is the recommendation of CMEC staff, that the project could proceed as proposed.

If any unanticipated cultural materials or deposits are found at any stage of the proposed action, the work should cease, and USACE, SHPO, OAS, and/or THPO personnel should be notified immediately. Further work may be required if the following occurs:

- If human remains or burial goods are impacted by construction, post-discovery procedures should be initiated, which includes coordination with the SHPO and OAS, according to the Burial Desecration Law (Oklahoma Statute Title 21 Chapter 47 Section 1168.0–1168.6).
- If the project scope changes, reexamination of the project under Section 106 of the NHPA may be required.

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Oklahoma Tourism and Recreation Department

June 2, 2020
File No. 27219016.00

Ms. Eve Atkinson
Oklahoma Tourism and Recreation Department
900 North Stiles
Oklahoma City, OK 73104

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Ms. Atkinson:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-31(b), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *no area within the permit boundary of a new solid waste disposal facility, or expansion of the permit boundary of an existing solid waste disposal facility, shall be located within one-half mile of any area formally dedicated and managed for public recreation or natural preservation by a federal, state, or local government agency, unless the appropriate management agency provides a statement that the proposed facility is not expected to adversely affect the existing recreation or natural preservation area.*

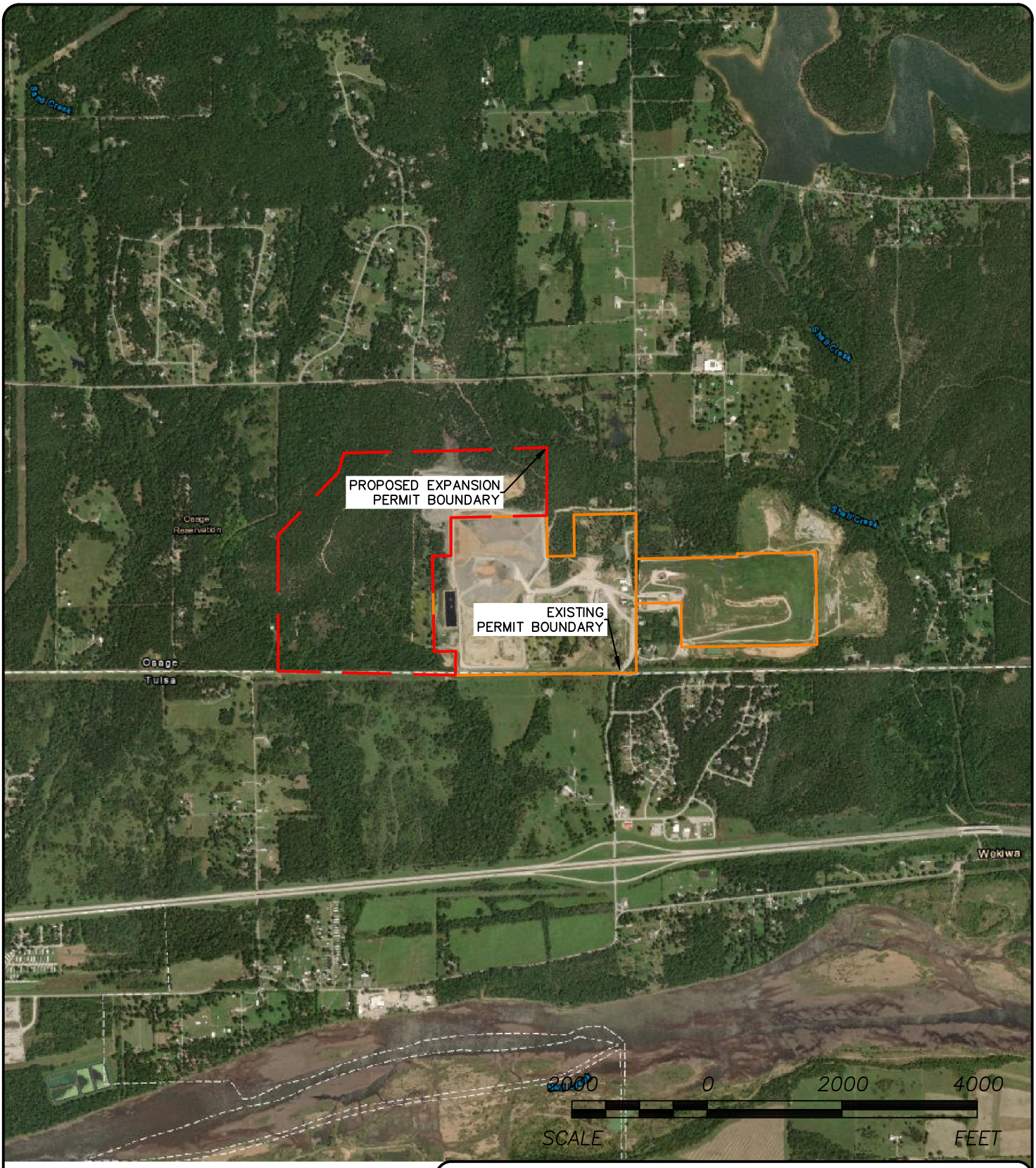
On behalf of our client, we request you review the enclosed maps and provide this determination as required by the ODEQ within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers

Encl. 2 General Site Location Maps



LEGEND

EXISTING PERMIT BOUNDARY

PROPOSED EXPANSION PERMIT BOUNDARY

Aerial Image Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

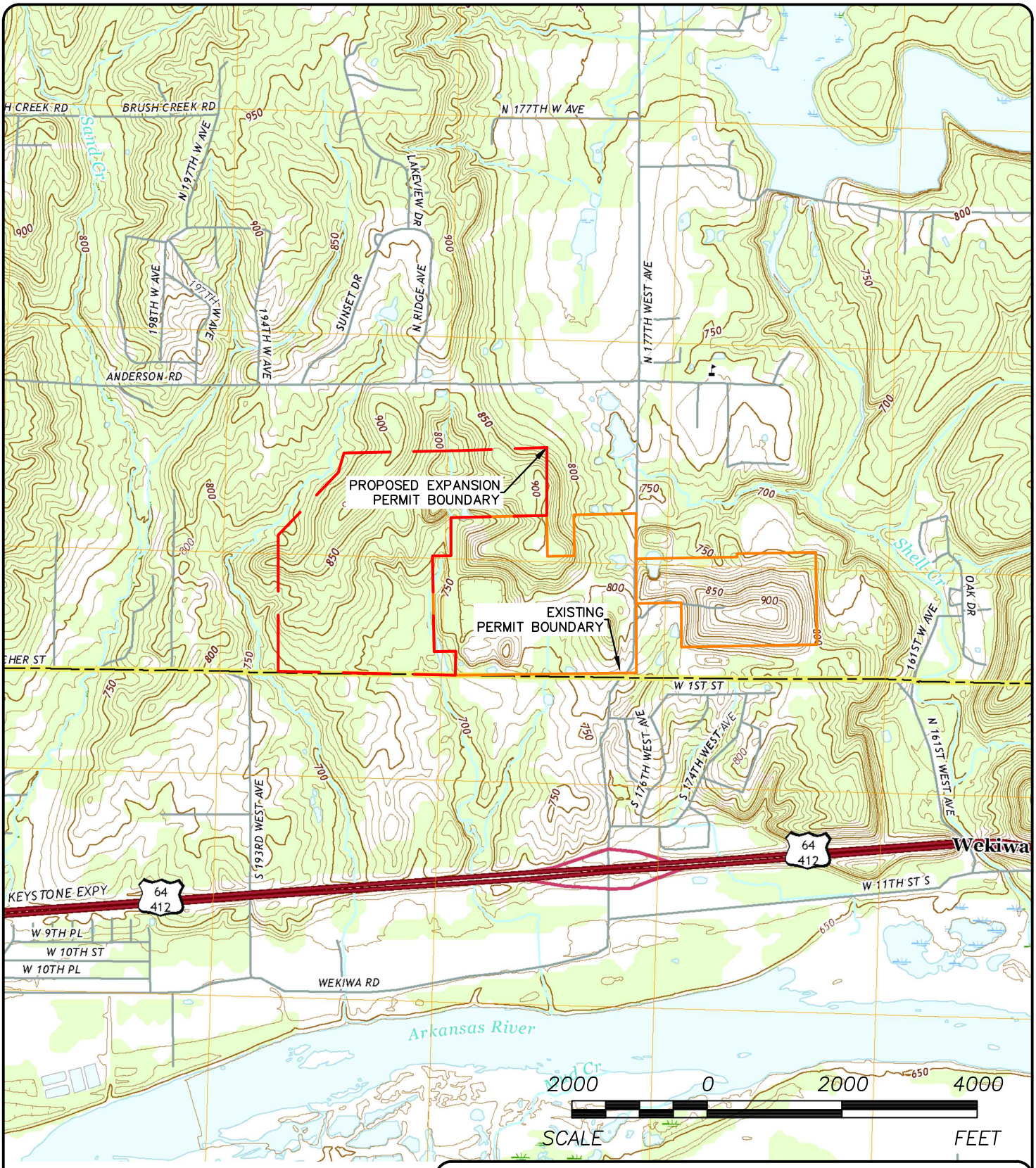
SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.

SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/28/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 1



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

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YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

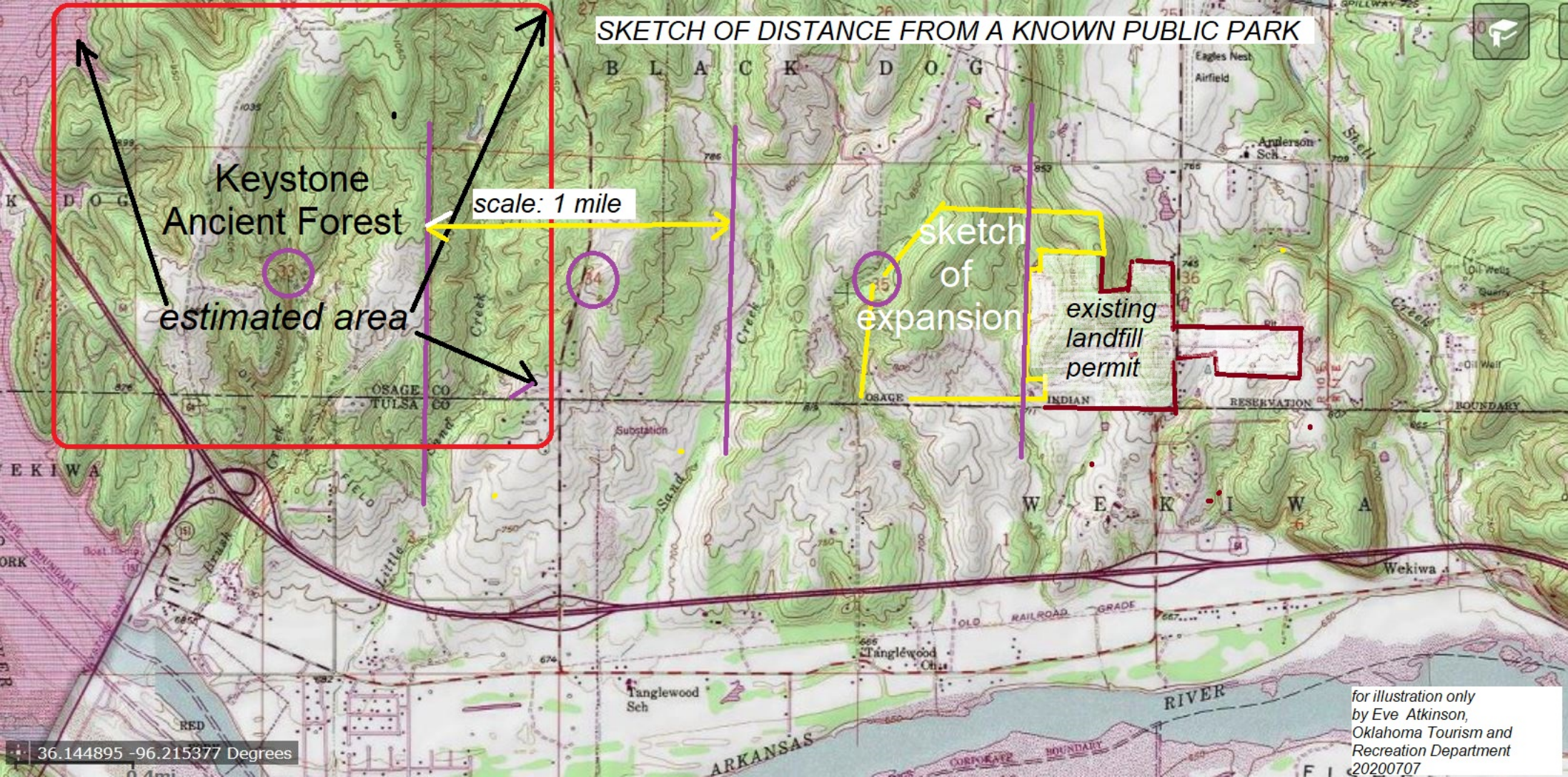
From: Eve Atkinson <Eve.Atkinson@travelok.com>
Sent: Tuesday, July 7, 2020 12:20 PM
To: wmiller@scsengineering.com
Cc: Susan Henry <Susan.Henry@travelok.com>
Subject: Osage County, Sand Springs proposed Landfill expansion, SCS Engineering

Although your proposal is further than ½ mile from a known public park or area with outdoor recreation resources, I am sending a sketch I made to show the distance from The Keystone Ancient Forest, as it does not appear on a USGS map or Google. The last known manager is the City of Sand Springs.

Your project proposal will have no significant adverse impact on any federally funded park or recreation area or state park, regarding the LWCF Act 54 U.S.C. 200305(f)(3) no land may be permanently used for private or non-outdoor recreation purposes (defined by the program).

Thank you for the opportunity to review your proposal.

Eve Atkinson
Planner II
Oklahoma Department of Tourism and Recreation
900 N. Stiles
Oklahoma City, OK 73104
405.522.9516.
Eve.Atkinson@travelok.com *****use this e-mail for rapid communication


SKETCH OF DISTANCE FROM A KNOWN PUBLIC PARK
Keystone
Ancient Forest
estimated area
scale: 1 mile
sketch
of
expansion
existing
landfill
permit
for illustration only
by Eve Atkinson,
Oklahoma Tourism and
Recreation Department
20200707
36.144895 -96.215377 Degrees

United States Department of the Interior – Bureau of Reclamation

June 2, 2020
File No. 27219016.00

Mr. Matt Warren
Bureau of Reclamation
Oklahoma City Field Office
5924 NW 2nd Street, Suite 200
Oklahoma City, OK 73127

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Mr. Warren:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-31(b), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *no area within the permit boundary of a new solid waste disposal facility, or expansion of the permit boundary of an existing solid waste disposal facility, shall be located within one-half mile of any area formally dedicated and managed for public recreation or natural preservation by a federal, state, or local government agency, unless the appropriate management agency provides a statement that the proposed facility is not expected to adversely affect the existing recreation or natural preservation area.*

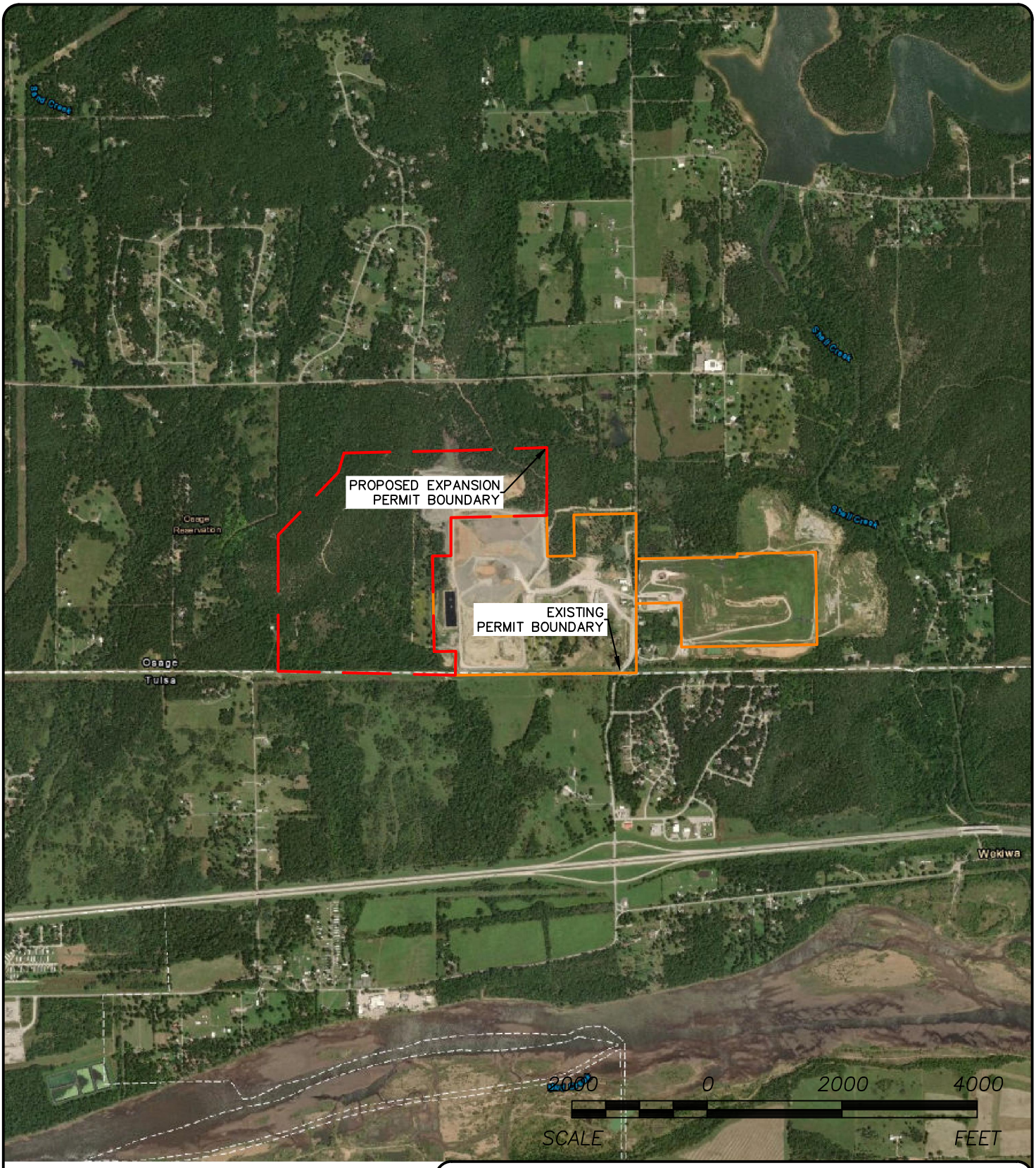
On behalf of our client, we request you review the enclosed maps and provide this determination as required by the ODEQ within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-3960. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers

Encl. 2 General Site Location Maps



LEGEND

EXISTING PERMIT BOUNDARY

PROPOSED EXPANSION PERMIT BOUNDARY

Aerial Image Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

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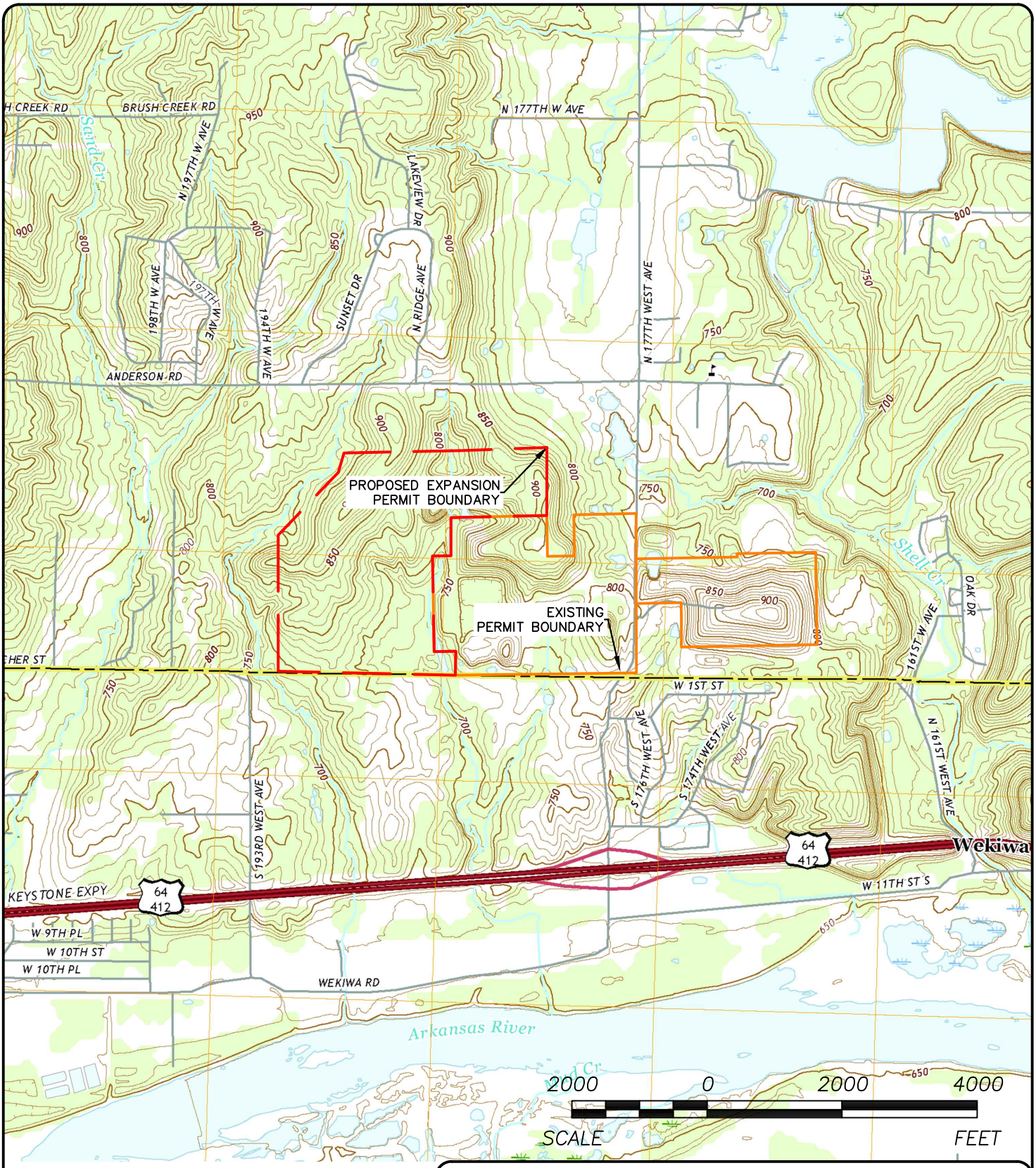
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.

SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/28/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 1



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

N

SCS ENGINEERS
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YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

Oklahoma Department of Wildlife Conservation

April 24, 2019
File No. 27216290.00

Oklahoma Department of Wildlife Conservation (ODWC)
PO Box 53465
Oklahoma City, OK 73152

Subject: AEL Expansion
Osage County Oklahoma

Dear ODWC Project Review Staff:

SCS Engineers (SCS) is submitting this request for project review on behalf of American Environmental Landfill (AEL) for a proposed western expansion of an active landfill located northwest of Sand Springs in Osage County, Oklahoma. The subject site includes approximately 435 acres in Sections 35 and 36, T20N, R10E, near Latitude 36.166643 Longitude -96.203007. See Figure 1 and Figure 2 for a more detailed project boundary.

The State of Oklahoma Solid Waste Permitting requires a consultation with the USACE to determine if jurisdictional waters might be impaired as a result of the proposed expansion. Consultation with the USACE did identify jurisdictional waters and a permit request is being prepared for submission. As part of the USACE permit process, consultations with other agencies is also being initiated. A request for project review has also been submitted to the U.S. Fish and Wildlife Service. This letter is being submitted to initiate consultation with the Oklahoma Department of Wildlife Conservation (ODWC).

SCS conducted a review of publically available resources to evaluate the potential occurrence of state and federally listed Threatened and Endangered Species (TES) within or in close proximity to the proposed expansion project. Although the ODWC county by county lists for TES are not currently available online, a previous search conducted in 2018 indicated state designated TES are not located is Osage County. See the 2018 ODWC species by county list attached. However, there are seven federally listed TES that may occur within the subject site or be impacted by the proposed project including:

- Northern Long-Eared Bat (*Myotis septentrionalis*)
- Least Tern (*Sterna antillarum*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Whooping Crane (*Grus americana*)
- American Burying Beetle (*Nicrophorus americanus*)
- Rattlesnake-Master Borer Moth (*Papaipema eryngii*)

The USFWS identified three additional species that may utilize the subject site and are protected under the Migratory Bird Treaty Act of 1918 (MBTA) and/or the Bald and Golden Eagle Protection Act of 1940 (BGEPA). These three species include the:

- Bald Eagle (*Haliaeetus leucocephalus*)
- Harris's Sparrow (*Zonotrichia querula*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)

See the attached official species list issued by USFWS for the proposed subject on March 27, 2019. Below is a likelihood of occurrence table generated by SCS for the proposed project. The rationale in the Table 1 is based on SCS staff assessments of species listing, habitat requirements, and an onsite field investigation conducted May 24th-25th 2018 to evaluate habitat. In addition, SCS is including a preliminary Habitat Assessment Report generated under separate cover for your reference.

Table 1: Likelihood of TES Occurrence within the Subject Site

Common Name	Federal Listing	Likelihood	Rationale
Northern Long-Eared Bat	Threatened	Possible	Suitable woodland habitat present
American Burying Beetle	Endangered	Likely	Suitable habitat present and subject site is located within the core of this species' population range
Whooping Crane	Endangered	Unlikely	Significant suitable habitat not present
Red Knot	Endangered	Unlikely	Significant suitable habitat not present and species has not been documented in this region in recent years
Piping Plover	Threatened	Unlikely	Significant suitable wetland habitat not present
Least Tern	Endangered	Unlikely	Significant suitable wetland habitat not present
Rattlesnake-Master Borer Moth	Candidate	Possible	Suitable prairie and woodland habitat present
Bald Eagle	MBTA and BGEPA	Possible	Significant suitable habitat not present, but occurs in large numbers at Keystone lake located 2.5 miles west of subject site and documented occurrence in vicinity of subject site

Common Name	Federal Listing	Likelihood	Rationale
Harris's Sparrow	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present
Red-headed woodpecker	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present

Species specific surveys have not been conducted for the proposed project. Construction for the expansion project is uncertain, but anticipated within 12-24 months of this request for project review pending USACE and all other agency permits and approvals.

We appreciate your review of the proposed project and request ODWC guidance to avoid and minimize impacts to TES or other sensitive species potentially located within or in close proximity to the subject site.

Sincerely,

Vaughn Weaver
Senior Project Professional
SCS Engineers

cc: Wade Miller

Encl. TES Habitat Assessment Report.

Threatened and Endangered Species (TES) Habitat Assessment Report

AEL's Proposed Expansion
Section 35 and 36, Township 20 South
Range 10 East
Osage County, Oklahoma

American Environmental Landfill
207 North 177th West Avenue
Sand Springs, Oklahoma
(918) 245-7786

SCS ENGINEERS

27216290.00 | July 3, 2018
Revised April 1, 2019

1817 Commons Circle, Suite 1
Yukon, Oklahoma 73099
(405) 265 3960

Table of Contents

Table of Contents

Section Page

Appendices

1.0 EXECUTIVE SUMMARY

SCS Engineers (SCS) has contracted with American Environmental Landfill (AEL) to complete a threatened and endangered species (TES) habitat assessment for a proposed western expansion of an active landfill located northwest of Sand Springs, Osage County, Oklahoma. AEL is in the planning stage of expanding their operations by constructing future cells west of their current landfill. The proposed expansion (subject site) would include the purchase and permitting of land adjacent to their western property boundary. The purpose of the TES habitat assessment is to evaluate the potential presence of state and/or federally listed TES and their associated habitats within the subject site and help determine if potential impacts to protected species may occur as a result of the proposed expansion development.

The following species were identified by the United States Fish and Wildlife Service (USFWS) as potentially occurring within or near the subject site:

- Northern Long-Eared Bat (*Myotis septentrionalis*)
- Least Tern (*Sterna antillarum*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Whooping Crane (*Grus americana*)
- American Burying Beetle (*Nicrophorus americanus*)
- Rattlesnake-Master Borer Moth (*Papaipema eryngii*)

A review of bird species that are protected under the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act of 1940 (BGEPA) identified three additional species that are a conservation priority and may utilize the habitat within the subject site. These three species include the:

- Bald Eagle (*Haliaeetus leucocephalus*)
- Harris's Sparrow (*Zonotrichia querula*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)

A desktop review was performed to evaluate the potential presence of state or federally listed TES and their habitats within the subject site. An on-site field investigation was completed May 24th - 25th, 2018 to verify if suitable habitat was present for TES within the subject site. Potential suitable habitat was observed within the subject site for three TES species including:

- Northern long-eared bat,
- American burying beetle (ABB)
- Rattlesnake-master borer moth

In addition, suitable habitat for all three MBTA/BGEPA listed species was observed within the subject site.

2.0 PROJECT OVERVIEW/INTRODUCTION

The State of Oklahoma solid waste permitting process requires that consultation with the United States Army Corp of Engineers (USACE) be completed prior to state approval. Clearance from the USFWS is also required for projects on federal lands, federally funded projects, and projects that require federal permits or approvals including prior approval for any USACE 404/401 permit. A wetland determination report for the subject site has been completed under a separate cover, which will help determine if impacts to Waters of the United States (WOUS) may occur as a result of the proposed.

This document provides information that aids in compliance with Section 7(a) of the Federal Endangered Species Act (ESA) and the Oklahoma Endangered Species Statute. These regulations are enforced by the USFWS and the Oklahoma Department of Wildlife Conservation (ODWC), respectively.

The following report discusses the findings and conclusions of a background published documentation review and an onsite field inspection for potential impacts to TES and their associated habitats within the proposed subject site.

3.0 SCOPE

3.1 PUBLISHED DOCUMENTATION REVIEW

A review of publically available information including USFWS Information for Planning and Consultation (IPAC) records, an official species list from the USFWS, ODWC TES list by county, aerial imagery, National Wetlands Inventory (NWI) maps, United States Geological Survey (USGS) topographic maps, and USGS Land Cover Data were reviewed to evaluate the potential presence of state or federally listed TES and their associated habitats within or adjacent to the subject site.

3.2 FIELD PROCEDURES

SCS Engineers conducted an onsite field investigation to determine if suitable habitat for state or federally listed TES is located within the subject site. A literature review of TES and their habitat preferences was completed prior to staff's field visit. Field investigation was conducted May 24th – May 25th, 2018 in concurrence with a preliminary wetland determination that has been summarized in a report being submitted under separate cover. In addition, an updated literature review was completed in March 2019 to supplement AEL's formal request to the USFWS for a project review.

SCS staff traversed the subject site from the north to the south to assess the different types of habitats, land features, vegetative cover, and soil features potentially suitable for the identified TES; existing habitats were assessed to determine if the area could be used by one or more of the identified TES. To maximize coverage of the heavily wooded areas with limited visibility, SCS staff dispersed and traversed up and down slopes. Habitats were qualified but not quantified for TES use. As this was a preliminary assessment of potential habitats, determination if potentially usable habitat by TES was the primary concern. The different observed habitats are discussed in more detail below.

4.0 PROJECT LOCATION AND SITE DESCRIPTION

The subject site includes approximately 435 acres located northwest of the City of Sand Springs, just southwest of the intersection of North 177th W. Avenue and Anderson Road in Osage County, Oklahoma. The subject site is located in Sections 35 and 36, T20N, R10E near Latitude 36.166643, Longitude -96.203007 **(Appendix A, Figure 1)**. The vegetative cover is predominantly mature oak/hickory woodlands with a native grass understory on steep sloping hills. Two drainage ways transect the subject site from north to the south

The subject site is located within the Northern Cross Timbers (Level 4 Ecoregion) of the Cross Timbers (Level 3 Ecoregion) of Oklahoma (Woods, 2005). This region includes a mosaic of oak savanna, scrubby oak forest, and tall grass prairie, which naturally cover the hills, cuestas, and ridges. Tall grass prairie occurs on fine-textured soils derived from limestone or shale. Soils are highly erodible when disturbed. There are two common stream types. A mixture of shaded riffles, runs, and pools that have gravel or cobble substrates characterizes the first. The second stream type has lower gradients and is typically found downstream of the first, it is characterized by wide, shallow, sand-choked channels. Uplands are mantled by Quaternary clayey silt-to-silt clay decomposition residuum, and sandy decomposition residuum. Valleys are veneered with Quaternary alluvium. The area is underlain by Pennsylvanian and Permian-age sandstone, shale, and limestone. Rock outcrops occur where sandstone blocks and boulders often litter hilltops and slopes. Soils consist of sandy and clayey residuum and colluvium overlaying Pennsylvanian sandstone, limestone and shale. The common soil series for uplands in this region include Darnell, Stephenville, Niotaze, Steedman, Coweta, Dennis, Bates, Clarita, Durant, Shidler, Newalla, Harrah, Chigley, and Konawa. The common soil series for floodplains include Verdigris, Port, Pulaski, and Garvin. Native vegetation is a combination of oak-hickory woodland and tallgrass prairie. Woodland areas are dominated by post oak (*Quercus stellate*), and blackjack oak (*Q. marilandica*) while tall grass prairie is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and Indiangrass (*Sorghastrum nutans*). Current land cover is woodland, grassland, rangeland, pastureland, and limited cropland. The main crops in this region include small grains, grain sorghum, hay and soybeans.

5.0 PUBLISHED DOCUMENTATION REVIEW

A desktop review was performed utilizing USFWS IPAC records, an official USFWS species list, ODWC TES lists by county **(Appendix B),** aerial photographs **(Appendix A, Figure 2)**, National Wetland Inventory (NWI) maps, USGS Topographic maps **(Appendix A, Figure 3)**, and USGS Land Cover Data. These resources were reviewed for the subject site to evaluate the potential presence of state and/or federally listed TES and their habitats within the subject site.

5.1 USFWS IPAC

A review of USFWS IPAC data (2011a) was conducted for the project site to determine the level of potential impacts to TES and their associated habitats **(Appendix B)**. In addition to the preliminary IPAC review, SCS received an official USFWS species list for the proposed project dated March 27, 2019 included in **Appendix B.** TES are protected by federal and state regulations to prevent further decline or extinction of these species. For species that may have the potential to receive impacts from the proposed development, considerations in the planning phase should evaluate ways to avoid, minimize and/or mitigate these potential impacts.

5.1.1 SPECIES LIST

The following species were identified by the USFWS official list as potentially occurring within or near the proposed subject site:

- Northern Long-Eared Bat (*Myotis septentrionalis*)
- Least Tern (*Sterna antillarum*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Whooping Crane (*Grus americana*)
- American Burying Beetle (*Nicrophorus americanus*)
- Rattlesnake-Master Borer Moth (*Papaipema eryngii*)

The following information provides a description of each species and its habitat requirements.

Northern Long-Eared Bat

The northern long-eared bat is federally listed as threatened. This medium sized bat typically hibernates in caves/rock crevices during the winter months then migrates to wooded areas in the summer where they roost and breed in mature, live trees and snags (NatureServe 2017; USFWS n.d.). This bat species occurs throughout portions of the Ozark highlands and Ouachita Mountains regions of eastern Oklahoma located approximately 50 miles east and 85 miles northwest of the subject site, respectively; there are nine known northern long-eared bat hibernacula with multiple individuals documented at additional cave locations in Oklahoma (ODWC 2017). Specific summer roosting habitat in Oklahoma is generally unknown, but this bat uses a variety of different tree species and frequently switch roosts (every 2-3 days) (ODWC 2017). Northern long-eared bats feed by flying through the understory of forested areas to glean insects from the surfaces of leaves and water. Reproductive females typically give birth to one pup each year/summer and gather in maternity colonies that vary from fewer than five individuals to more than fifty bats. Males and non-reproductive females use both trees and caves as roosts during the summer (ODWC 2017). White nose syndrome

is currently a predominant threat to this species. The northern long-eared bat is dependent on forested areas for summer roosting and foraging, therefore, loss and fragmentation of wooded areas during the summer months could affect this species. The northern long-eared bat may occur within the subject site due to the availability of suitable woodland habitat (e.g. mature canopy with an open understory) and insect/prey.

American Burying Beetle

The American burying beetle (ABB) is federally listed as endangered and is the largest carrion beetle in North America (USFWS 2014b). Historically this species could be found in 35 states but is currently limited to nine states including: Arkansas, Kansas, Massachusetts, Nebraska, Oklahoma, Ohio, Rhode Island, and South Dakota (Ratcliff 1996; USFWS n.d.). The largest populations of ABB are found in Oklahoma where it is currently known to occur in at least 29 counties in the eastern portion of the state (ODWC 2017). This beetle is dependent on small carrion (between 3-7ounces) to feed and reproduce (ODWC 2017). There is no critical habitat designation for this species, but the highest densities of ABB occur in open, oak-hickory forests with native grass cover; populations also occur in both closed-canopy forest and tallgrass prairie habitats. Preferred habitat for the ABB includes areas with loose soils and minimal human disturbance. This species has a short life span of approximately one year. The ABB is dormant (underground) in the winter when temperatures are less than 60 degrees Fahrenheit (˚F). During summer months, the adults are nocturnal and require a minimum nighttime air temperature of 60 ˚F for activity. Eggs are laid between April and September but predominantly in June and July and larvae require 48-60 days to develop (Ratcliff 1996). This species can travel up to two miles in a night and can occur in many undeveloped areas if the food opportunity is present. Soil disturbance from construction projects occurring during the cool/cold weather months are a concern for this species survivability. Based on the known current and historic range for this species, suitable soil conditions, and its ability to travel long distances, this species may occur within and/or adjacent to the subject site.

Whooping Crane

The Whooping Crane is a federally listed endangered species that occurs only in North America. It is North America's tallest bird, with males approaching 5 feet tall when standing erect (USFWS 2011c). The whooping crane adult plumage is snowy white except for black primary feathers, black or grayish alula (specialized feathers attached to the upper leading end of the wing), sparse black bristly feathers on the carmine crown and malar region (side of the head from the bill to the angle of the jaw), and a dark gray-black wedge-shaped patch on the nape (USFWS 2011c). Whooping Cranes are typically found in wetlands, marshes, pond and lake shorelines, shallow rivers, wet prairies, and crop fields near wetlands where they eat a varied diet of insects, crayfish, fish and seeds (ODWC 2011). Although rare, whooping cranes migrate through Oklahoma each spring and fall from their wintering grounds along the Texas Coast to their summer breeding grounds in Canada. The Salt Plains National Wildlife Refuge, located approximately 115 miles northwest of the subject site, is a valuable migration stopover area and is designated critical habitat for this species. The whooping crane is not likely to occur within the subject site due to the lack of suitable wetland or cropland habitat for feeding and loafing.

Red Knot

The Red Knot is a federally threatened species. It is the largest and most colorful of the North American peeps and has the longest yearly migratory route of any North American shore bird (Cornell 2015). This species can migrate from the southern tip of South America (Chile) to the Northern artic regions of North America. This species breeds in the dry, sparsely vegetated tundras of the North American Arctic. Outside of the breeding season, the red knot is found primarily in intertidal and marine habitats. With fewer than five birds reported annually, Oklahoma is not a critical breeding or

staging area for the species (ODWC 2017). The red knot is unlikely to occur within the subject site due to the lack of suitable habitat including marine shoreline and has an infrequent occurrence in the state.

Piping Plover

A federally listed threatened species the Piping Plover is a small shorebird that utilizes open, sand bars, mudflats, salt flats, and shallow wetlands for feeding and nesting (ODWC 2017; USFWS 2011b). Once widespread, this species is currently listed as threatened or endangered throughout its range. The Northern Great Plains population, which includes the Oklahoma population, is currently listed as federally threatened (USFWS 2011a, 2016a). The piping plover is a common spring and fall migrant through Oklahoma including Osage County (USFWS 2017), but there is only one nesting record for this species located in the panhandle of the state (ODWC 2017). Migration for this species in Oklahoma typically occurs from March through May and July through September. This shorebird is unlikely to occur within the subject site due to lack of suitable wetland or shallow riverine habitat with suitable sand/gravel bars for feeding or nesting.

Least Tern

A federally endangered species the least tern is the smallest North American shorebird. This species utilizes large river sandbars, saline flats, and marshes for feeding and nesting (USFWS n.d.). Least terns nest in colonies with peak egg laying from May-June and a completed breeding season by August. For feeding, least terns utilize shallow water areas of lakes, ponds, and rivers typically located close to the nesting areas. Nesting colonies are known from the Salt Plains National Wildlife Refuge in Oklahoma located more than 100 miles northwest of the subject site (ODWC 2017). Although this species is a known migrant in Oklahoma, this shorebird is unlikely to occur within the subject site due to the lack of suitable wetland and/riverine habitat. The thick woodland area and the lack of suitable gravel at the subject site limits this species preferred nesting and migratory habitat stop-overs. The available wetland features would not support the preferred food for offspring or adults due to the lack of extended inundation periods.

Rattlesnake-Master Borer Moth

The Rattlesnake-master borer moth is currently a candidate species for federal listing under the ESA. The candidate designation does not afford this species statutory protection, but candidate species are closely monitored as a conservation priority that may warrant future protection. This moth gets its name from the rattlesnake master plant (*Eryngium yuccifolium*); an herbaceous perennial that occurs in rocky woods, prairies and glades which is host to the moth's larvae. The rattlesnake-master borer moth may be present onsite depending upon the prevalence of the host plant on the subject site.

5.1.2 CRITICAL HAITAT DESIGNATION

Critical Habitat is federally designated and carries legal implications under the ESA. Critical habitats are specific geographic areas with features that are essential to the conservation of TES and may require additional management and protection. A review of state and federally designated critical habitats was conducted for the proposed subject site. Designated critical habitats are not located within the proposed subject site (ODWC 2016b; USFWS 2019).

5.1.3 MIGRATORY BIRDS

Migratory birds are afforded federal protection under the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act of 1940 (BGEPA). The USFWS has statutory authority and responsibility for enforcing the MBTA and BGEPA. Both acts make it illegal for anyone to take,

possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird/eagle, or the parts, nests, or eggs of such birds except under the terms of a valid permit issued pursuant to federal regulations (USFWS 2016a, 2017). Activities that may result in impacts to migratory birds, eagles and their habitats would need to follow appropriate protection regulations and implement appropriate conservation measures to minimize impacts to these species. Additional permitting may be required for any project that has the potential to disturb migratory birds/eagles. The following MBTA/BGEPA birds are identified by the USFWS IPAC tool as potentially being within or near the proposed expansions:

- Bald Eagle (*Haliaeetus leucocephalus*)
- Harris's Sparrow (*Zonotrichia querula*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)

The following information provides a description of each species and its habitat requirements.

Bald Eagle

Although the bald eagle has been removed from the TES list, under the ESA, this species continues to be protected by the MBTA and the BGEPA. Bald Eagles typically breed and winter in forested areas adjacent to large bodies of water. This species often selects large/mature trees that are open and accessible for roosting and nesting. The Bald Eagle is an opportunistic forager that may travel up to 50 miles in search of carrion, fish, bird, and mammalian prey. Some major threats to Bald Eagles include degradation of shoreline habitat, and disturbance at nest and roost sites. Eagles typically winter in Oklahoma from November through the end of March and are a common sight at large lakes and reservoirs including Kaw, Keystone, Texoma, Tenkiller, Ft. Gibson, Grand, Canton, Great Salt Plains, Tishomingo and Spavinaw lakes (ODWC 2016a, 2017). The subject site is located approximately 2.5 miles east of Keystone Lake, a known location for migrating and wintering bald eagles in Oklahoma. A Bald Eagle nest is along the north side of the Arkansas River approximately two miles southeast of the AEL entrance. Bald Eagles may occasionally occur foraging within the subject site, but are not anticipated to be adversely impacted by the proposed project due to the lack of suitable riverine habitat within the proposed expansions.

Harris's Sparrow

The Harris's Sparrow is the largest sparrow in North America and has a distinguishable black bib and pink bill. This species is a common favorite at backyard birdfeeders but is declining throughout its range. Harris's sparrows are winter residents and found nearly statewide in Oklahoma from mid-October to early May. This species is a non-breeding resident in Oklahoma and therefore would not breed within the subject site. Habitat descriptions for their winter range include: thickets/brush bordering streams, edges of low woodlands, brush and brushy places, hedgerows, and willow thickets in ravines (NatureServe 2017). The Harris's sparrow is primarily a ground feeder with a varied diet that includes insects, fruits and grains. The global status for this species is designated as G5, Secure (NatureServe 2017). This species likely occurs within the subject site during fall and winter due to the availability of suitable woodland habitat and known records on the area.

Red-headed Woodpecker

The red-headed woodpecker is a robin-sized woodpecker with a distinguishable and entirely red head (ODWC 2017). This species is frequently confused with the red-bellied woodpecker, which only has red plumage potions of the top and back of the head. Red-headed woodpeckers typically occur in mature oak woodlands, orchards and riparian woodlands with a relatively open understory particularly near creeks and ponds. They have a varied diet that includes insects, fruits, seeds and tree nuts such as acorns. Dead trees and snags along woodland perimeters provide valuable nesting habitat for this

species (Cornell 2015). They are uncommon in urban or residential neighborhoods. This species can be found breeding statewide in Oklahoma during the summer. In the winter, this species can be found across the eastern ¾ of Oklahoma; their winter numbers vary greatly from year to year depending upon acorn production and weather (ODWC 2017). The species is also listed as "Near Threatened" on the International Union for Conservation of Nature (IUCN) Red List (NatureServe 2017). This species likely occurs year-round within the subject site due to the availability of suitable woodland habitat for breeding, foraging and winter cover.

5.2 OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

The ODWC also maintains lists of state and federally listed TES for each county. According to the ODWC County list, there are no state listed TES or designated critical habitats in Osage County Oklahoma (ODWC 2016c). See also **Appendix B** for the ODWC County list.

5.3 AERIAL PHOTOGRAPH REVIEW

Aerial photographs dated 2018-2015, 2013-2010, 2008, 2006-2003, and 1995 were reviewed using Google Earth Pro Inc. (Google Earth 2018). Aerial photographs were reviewed to identify the proposed project expansion site and potential TES habitat located within or in close proximity to the subject site. Landscape features visible on aerial imagery within the subject site include woodland vegetation and grassland areas with multiple ponds of varying sizes. The subject site also contains some developed areas including two abandoned farmsteads and an access road that transects the subject site from the northeast to southwest **(Appendix A, Figure 2)**.

5.4 USGS TOPOGRAPHIC MAP REVIEW

The USGS 7.5 Minute Topographic Quadrangle (Wekiwa, Okls. Quadrangle, 1958,) indicates that the elevation ranged from 930 feet above mean sea level (amsl) near the north central area of the subject site to approximately 730 feet amsl near the southeast corner of the subject site. The topographic surface is represented as hills and valleys of two intermittent stream drainage ways. Three water features that include two intermittent streams and a freshwater pond are mapped within the subject site **(Appendix A, Figure 3)**.

5.5 NATIONAL WETLANDS INVENTORY MAP REVIEW

SCS conducted a NWI review for preliminary determination of the presence, location, size, and type of wetlands potentially located entirely or partially within the subject site. The U.S. Fish and Wildlife Service (USFWS) generates NWI maps through aerial imagery review, which may not accurately depict the extent or location of wetlands in an area. According to NWI data (USFWS, 2016b), thirteen mapped wetlands are located within the boundary of the subject site. These wetlands are identified as:

WS-1 NWI Features

1. **NWI-1**: A 0.19 Acre PUSCx (Palustrine, Unconsolidated Shore, Seasonally Flooded, Excavated) freshwater pond located near the north-center of the WS-1 Subject Site area.
2. **NWI-2**: A 0.20 Acre PUSCx freshwater pond located near the south-center of the WS-1 Subject Site area.
3. **NWI-3**: A 1.34 Acre PUBFh (Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded) freshwater pond located near the northeast corner of the WS-1 Subject Site area.

4. NWI-4: A 1.77 Acre PUBHh (Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded) freshwater pond located near the eastern Subject Site boundary, south of the 1.34 Acre PUBFh freshwater pond.
5. NWI-5: The northwest end of a 2.44 Acre R5UBF (Riverine, Unknown Perennial, Unconsolidated Bottom, Semipermanently Flooded) riverine habitat that begins at the southwest side of the previously discussed 1.77 Acre PUBHh freshwater pond. This riverine feature traverses off the Subject Site toward the southeast.
6. NWI-6: A 0.22 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary.
7. NWI-7: A 0.20 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary and west of the previously identified 0.22 Acre PUBFh freshwater pond.

WS-2 NWI Features

1. NWI-8: A 8.16 Acre R5UBF riverine feature located along the western third of the Subject Site running generally from the north to the south of the Subject Site.
2. NWI-9: A 0.25 Acre PUSCh (Palustrine, Unconsolidated Shore, Seasonally Flooded, Dike/Impounded) freshwater pond located near the north border of the Subject Site.
3. MW-10: A 0.22 Acre PUBFh freshwater pond is located near the center of WS-2 along the east slope.
4. NWI-11: A 0.11 Acre PUSCh freshwater pond located near the southeast corner of the subject site.

WS-3 NWI Features

1. NWI-12: A 6.33 Acre R5UBF riverine feature located along the eastern third of the Subject Site running generally from the north to the south of the Subject Site.

WS-4 NWI Features

1. NWI-13: A mid portion of a 6.21 Acre R5UBF riverine feature along the northwest corner of the WS-4 Subject Site Area.

All of the NWI mapped freshwater ponds appear to be excavated/impounded. A wetland determination/delineation report has been completed for the subject site and submitted under separate cover.

5.6 LAND USE LAND COVER

The USGS National Gap Analysis Program (GAP) Land Cover Data (2018) was reviewed to assess general land use and land cover within the subject site. Land cover data indicates that the subject site is dominated by forest/woodland vegetation with small scattered areas of introduced and semi-natural vegetation as well as developed areas (roads) and limited open water. The dominate vegetation within the subject site is described by the GAP as Crosstimbers Oak Forest and Woodland.

6.0 FIELD INVESTIGATION

SCS conducted an on-site field assessment May 24th - 25th, 2018 to evaluate the potential habitat for TES within the proposed subject site. A general assessment of landscape features, vegetative cover, and soils was conducted to characterize and categorize habitats observed and to evaluate the potential presence of listed species and/or their associated habitat.

6.1 OBSERVED HABITATS

The subject site includes a variety of land cover types including woodland, grassland, wetlands, and developed areas. Descriptions of each general habitat type are provided below.

6.1.1 WOODLAND

Most of the subject site is dominated by native oak woodland savannah habitat. Woodland areas are composed predominantly of oak species including blackjack oak (*Quercus marilandica*), Chinquapin Oak (*Q. muehlenbergii*), and post oak (*Q. stellata*) with some hickory (*Carya sp.*) and increasing cover of eastern red cedar (*Juniperus virginiana*). Lowland woodlands were comprised of a higher diversity of tree species including: American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), plains cottonwood (*Populus deltoides*), willow (*Salix spp.*), walnut (*Juglans spp.*), ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*) as well as other tree species. The aforementioned list of identified trees is not inclusive off all tree species within the subject site.

The woodlands were predominantly tall mature trees with generally an open understory. Woodland areas are located along in the east slope of the NE1/2 of the subject site, the western slope of the eastern watershed and all of the western watershed. Individual trees occurred within and around rock outcrops as well as along steep slopes, valleys and hill tops. The ground cover within the woodlands consisted of sparse vegetative cover mixed with prominent leaf litter. The woodlands were predominantly undisturbed and could provide suitable habitat for the Norther Long-Eared Bat. Several areas within the woodlands have soft silt-sandy soils that ABB would be able to utilize if proper prey opportunities were present.

AEL's operations, not including the active placement of solid waste, uses a portion of the subject site for facility equipment storage and to transport soil and equipment. An area that has had extensive tree removal completed is located inside of an access road used by AEL. The access road can be seen in aerial photographs beginning west of a large soil stockpile in the south ½ of the NE ¼ of the subject site. This access road traverses to the south along the west valley side of the east drainage. This access road then turns east near the middle of the SE ¼ of the subject site. This area was heavily wooded prior to 2013 but appears to have been thinned prior to 2015. This thinned area is currently a combination of scattered mature trees within a lowland grassland. This grassland area will be discussed below. Aside from this thinned area, the woodlands within the subject site had a uniform cover only broken by two access roads and two homestead structures.

6.1.2 GRASSLAND/RANGELAND

Grassland species observed within the subject site includes both native and introduced species. Dominant grassland species observed within the subject site includes: little bluestem, indian grass, Johnson grass (*Sorghum halepense*), and broomsedge bluestem (*Andropogon virginicus*). Two types of grasslands were observed within the subject site. A short grass vegetative community was observed along the tops of hills within breaks of the tree canopy; the soils in these areas were shallow and rocky.

The second type of grasslands were found in lowlands including the fore mentioned thinned woodland area. A mixture of tall and short grass prairie species with some invasive species dominated these lowland plant communities. Soils in these areas were loose and relatively thick with minimal rock within the soil profiles. Soils in lowland areas were often a combination of silt loam and sand. Small areas that had sparse vegetative cover often had erosional rills in these lowland areas. The observed grasslands were predominantly undisturbed and would provide suitable habitat for the Rattlesnake-Master Borer plant, which the Rattlesnake-Master Borer Moth are dependent on, and soils that are preferable to the ABB.

6.1.3 WETLANDS AND WATERCOURSES

The subject site is comprised of four watersheds associated with channels that typically drain from the north to the south. The east watershed includes a portion of AEL's active landfill operations and the west watershed is dominated by a mature woodland area. A USACE approved jurisdiction determination identified three stream channels and one pond that are jurisdictional. The jurisdictional channels are a combination of ephemeral and intermittent. The east channel will be impacted while the two west channels will remain undisturbed from the proposed expansion. The jurisdictional pond will remain undisturbed from the proposed expansion and mitigation.

A review of the NWI and NHD identified the four jurisdictional features. Observed hydric habitats ranged from permanent pools with true aquatic plants, fish, and benthic species to sparse hydric vegetative cover near surface water under a woodland canopy. Both west stream segments had sunfish species including green sunfish (*Lepomis cyanellus*) and bluegill (*L. macrochirus*). Mayflies (Ephemeroptera) and dragonfly nymphs (Odonata) in isolated pools along intermittent stream channels. Wetland plants were dominated by broadleaf cattail (*Typha angostifolia*), knot weed (*Persicaria bicornis*), coon's tail (*Ceratophyllum demersum*), green ash tree, and black willow (*Salix nigra*).

For additional information regarding wetland areas and watercourses within the project corridor, please reference the wetland delineation report prepared under separate cover.

7.0 OBSERVED TES AND/OR ASSOCIATED HABITATS

Numerous wildlife species were observed during the field investigation including but not limited to turkey vulture (*Cathartes aura*), white-tailed deer (*Odocoileus virginianus*), nine-banded armadillo (*Dasypus novemcinctus*), cottontail rabbits (*Sylvilagus floridanus*), northern bobwhite quail (*Colinus virginianus*), multiple songbird species, and snake species. Incidental occurrences of threatened, endangered or candidate species were not observed during the field assessment. However, this does not preclude the potential that a listed species could utilize suitable habitat within the subject site. The presence of potentially suitable habitat for TES was assessed based on the documentation reviewed and verified during field assessment. Table 1 below indicates the likelihood of TES occurring within the subject site based on SCS's assessment of publically available resources (documentation review) and on-site field observations. Species considered possible or likely to occur within the subject site are discussed in greater detail below the table. For those species that suitable habitat was not observed during the site visit and identified in the table as unlikely will not be discussed further.

Table 1: Likelihood of TES Occurrence within the Subject Site

Common Name	Federal Listing	Likelihood	Rationale
Northern Long-Eared Bat	Threatened	Possible	Suitable woodland habitat present
American Burying Beetle	Endangered	Likely	Suitable sandy-silty soils habitat present and subject site is located within the core of this species' population range
Whooping Crane	Endangered	Unlikely	Significant suitable habitat not present
Red Knot	Endangered	Unlikely	Significant suitable habitat not present and species has not been documented in this region in recent years
Piping Plover	Threatened	Unlikely	Significant suitable wetland habitat not present
Least Tern	Endangered	Unlikely	Significant suitable wetland habitat not present
Rattlesnake-Master Borer Moth	Candidate	Possible	Suitable prairie and woodland habitat present
Bald Eagle	MBTA and BGEPA	Possible	Significant suitable habitat not present, but occurs in large numbers at Keystone lake located 2.5 miles west of subject site and documented occurrence in vicinity of subject site
Harris's Sparrow	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present
Red-headed woodpecker	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present

7.1 NORTHERN LONG-EARED BAT

The northern long eared bat utilizes a variety of tree species in woodland areas as warm season roosts from mid-March through mid-October. Potential suitable woodland habitat for the northern long eared bat, was observed within the subject site during the desktop review and was confirmed during the field investigation. The northern long-eared bat could use the subject site for foraging, brood rearing and summer roosts. During the winter months, this species is not expected to occur within the subject site. SCS understands that during the period from mid-March through mid-October, the removal of trees within the woodlands could have an impact to northern long-eared bat individuals. Tree removal after mid-October and before mid-March should have little to no impact to individuals. If trees are removed during this period, no permit should be required.

If tree removal is necessary between mid-March through mid-October, there are options that help determine if the northern long-eared bat is present and could be impacted from tree removal. These options include:

1. conducting an acoustic monitoring survey that will help identify if high frequency myotis bat species are present
    a. if monitoring results indicate that high frequency myotis species are present then
        i. conduct a mist netting to help confirm the presence of protected species
            1. If protected species are captured and observed then mitigation for habitat impacts (tree removal) will likely be required
            2. If no protected species are captured then tree removal may proceed without a mitigation
        ii. Mitigation for habitat impacts based on the higher probability that protected species are present (no true confirmation)
    b. If acoustic monitoring results indicate that no high frequency species are present then tree removal may likely occur without mitigation requirements
2. Mist netting to identify bat species present to determine if protected species are present.
    a. If protected species are captured and observed then mitigation for habitat impacts (tree removal) will likely be required
    b. If no protected species are captured then tree removal may likely proceed without mitigation
3. Mitigate for potential impacts to protected bat species – regardless if bat species are present or not.

Regardless of the option, coordination with USFWS and ODWC is recommended to assure that an approved assessment plan meets with the agencies' oversite authority. The assessment option(s) chosen will determine the level of permitting that may be necessary to complete facility expansion. Construction activities, particularly tree clearing and/or ground disturbance, should be avoided until agency coordination and project review is complete.

7.2 AMERICAN BURYING BEETLE

There is no critical habitat designation for this species, but the highest densities of ABB occur in open, oak-hickory forests with native grass cover; populations also occur in both closed-canopy forest and tallgrass prairie habitats. The ABB prefers loose soils in areas with minimal human disturbance. Soil disturbance from construction projects are a concern for this species. Potential suitable habitat for this species was observed within the subject site during the field investigation. In addition, multiple records for the ABB are currently known for Osage County, Oklahoma. With potential habitat identified within the subject site and historical collections from the area, development from the proposed

expansion could have detrimental impacts to ABB individuals. To determine if ABB individuals are present within or near the subject site, SCS recommends an ABB presence/absence assessment be completed prior to any natural habitat disturbance. Because of their highly mobile capabilities, annual monitoring needs to be completed prior to any scheduled ground disturbance. Based on the ABB life cycle, monitoring for ABB would need to be completed between May 20 and September 20 (or when evening temperatures are consistently over 60°F). ABB monitoring in Oklahoma is divided into two sample periods. The first monitoring period is from May 20th through July 28th. This monitoring period provides results for potential disturbances that will occur within this period. The second monitoring period is from July 29th through September 20th. Results from this second monitoring period provide impact results from July 29th until May 20th of the following year. Monitoring results are good for only those dates discussed. Depending on the result of the ABB survey, an incidental take permit may be required prior to development of the subject site. Mitigation may be required as part of securing the incidental take permit. Coordination with USFWS and ODWC is recommended to avoid potential unauthorized impacts to this species. Construction activities that include soil compaction, soil disturbance and ground clearing should be avoided until agency review and approval is obtained.

7.3 RATTLESNAKE-MASTER BORER MOTH

The rattlesnake-master borer moth occupies a unique ecological niche associated specifically with the rattle snake master plant. This species is typically found in mesic prairies, glades and rocky woodlands where it blooms from May through August. Although the rattle snake master plant was not observed during the SCS site assessment, potential suitable habitat for this species was observed within the subject site.

SCS acknowledges that this species may be impacted from development activities associated with the proposed expansion. However, as a candidate for federal listing this species is not offered enforceable protection under the ESA. Nonetheless, SCS recommends that coordination with the USFWS be established to minimize impacts to this species. This plan would help minimize impacts to the rattlesnake-master borer moth while allowing for the continual development of the proposed expansion.

7.4 BALD EAGLE, HARRIS'S SPARROW AND RED-HEADED WOODPECKER

The bald eagle, Harris's sparrow, and red-headed woodpecker are not listed as TES but are afforded federal protection under the MBTA and/or the BGEPA. These species are currently known to occur in Osage County and utilize a variety of habitats observed within and adjacent to the subject site including woodlands. A bald eagle nest was observed by SCS Staff along the Arkansas River approximately two miles southeast of the subject site. The Harris's sparrow does not nest within the region but are winter residents. The red-headed woodpecker is known to both breed and winter within woodland areas of Osage County, Oklahoma. As a year round resident the redheaded woodpecker may be the most adversely impacted by construction activities associated with the subject site. Preliminary USFWS consultation guidance indicates that the red headed woodpecker breeds in this area from May 10 through September 10. Therefore, SCS recommends construction activities be conducted outside these nesting dates in areas of suitable habitat for the red-headed woodpecker. If individuals from these species are observed during construction activities, it is recommended that construction activities cease until the individuals vacate the area. If construction activities occur during the nesting period of the red-headed woodpecker, an active nest survey may need to be completed prior to further construction activities. SCS recommends that coordination with USFWS and ODWC be initiated

regarding these species so as to avoid potential impacts to these and other migratory bird species that may occur within the subject site.

8.0 CONCLUSION

A review of state and/or federally listed TES and designated critical habitats was conducted for the subject site. No designated critical habitats for TES are located within the subject site. However, the USFWS and ODWC list seven federally threatened, endangered, and/or candidate species which may occur within the proposed subject site including:

- Northern Long-Eared Bat
- Least Tern
- Piping Plover
- Red Knot
- Whooping Crane
- American Burying Beetle
- Rattlesnake-Master Borer Moth

For each species, an estimated level of impact that would result from the proposed expansion activities was determined based on their habitat preferences, diet, reproductive needs, and likelihood to occur within the subject site. In addition to the TES, the USFWS lists three additional migratory bird species that may occur within the subject site and are protected by MBTA and the BGEPA which include:

- Bald Eagle
- Harris's Sparrow
- Red-headed Woodpecker.

TES were not observed during the site assessment and potentially suitable habitat is not available or limited for the majority of TES species listed for the subject site. Nonetheless, three federally protected TES have the potential to occur within the subject site and include:

- The northern long-eared bat
- American Burying Beetle
- Rattlesnake-master Borer Moth

The potential presence of these three species was based on the availability of suitable habitat and documented species records for the area.

9.0 GENERAL COMMENTS

Conclusions drawn by others from the results of this work should recognize the limitation of the methods used. Please note that SCS does not warrant the work of regulatory agencies or other third parties supplying information used in assimilation of this report. This report is prepared in accordance with generally accepted environmental engineering practices, within the constraints of the client's directives. It is intended for the exclusive use of the client for specific application to the assessed property. No guarantees, express or implied, are intended or made.

10.0 REFERENCES

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Appendix A

Figure 1 - AEL Subject Site Location

Figure 2 – Aerial Photograph of the AEL Subject Site

Figure 3 – Topographic Map of AEL Proposed Expansion

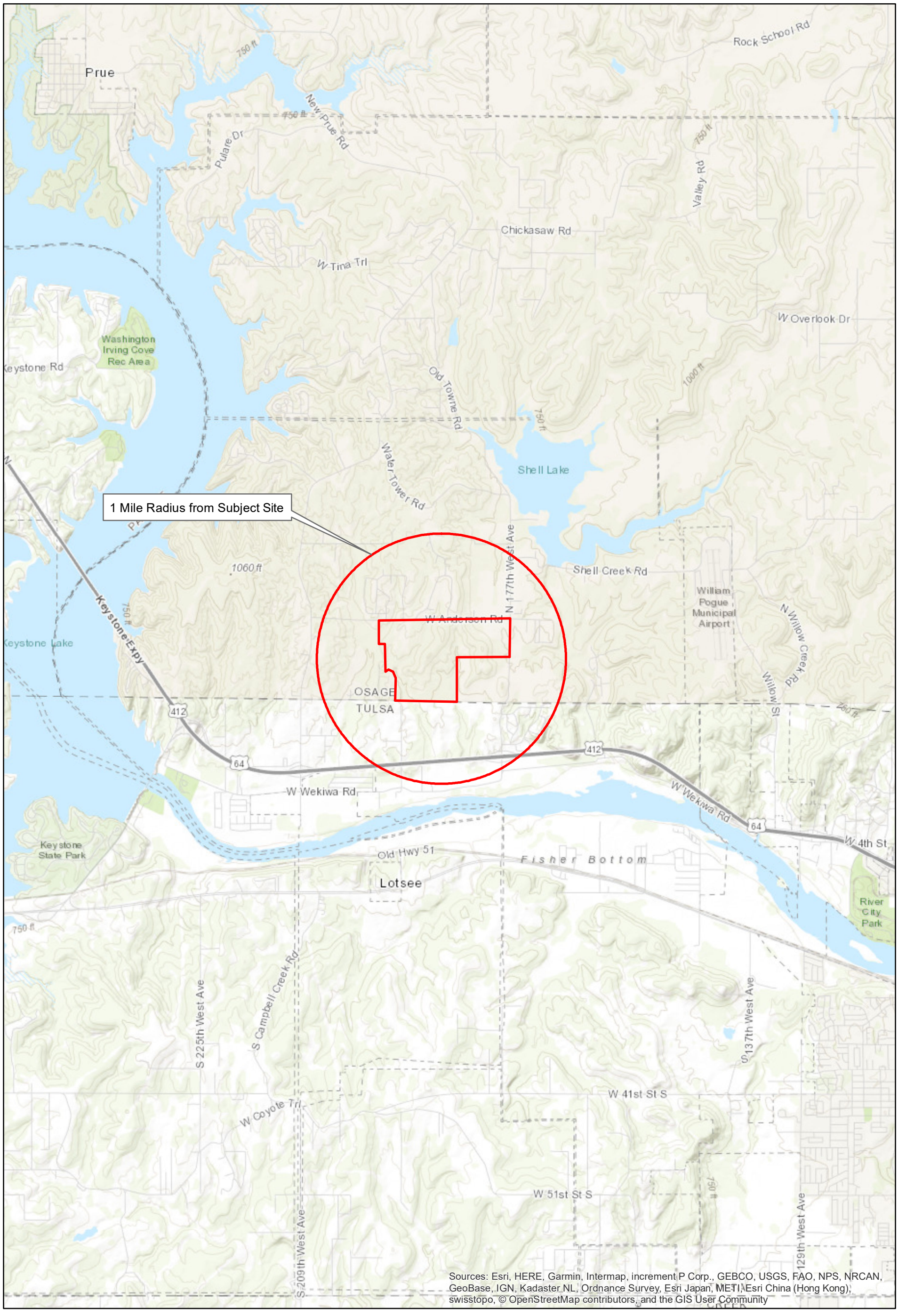

Figure 1.

AEL Subject Site Location
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 3,100 6,200 12,400 18,600 24,800 Feet

N

SCS ENGINEERS

CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501 FAX. (316) 315-4505

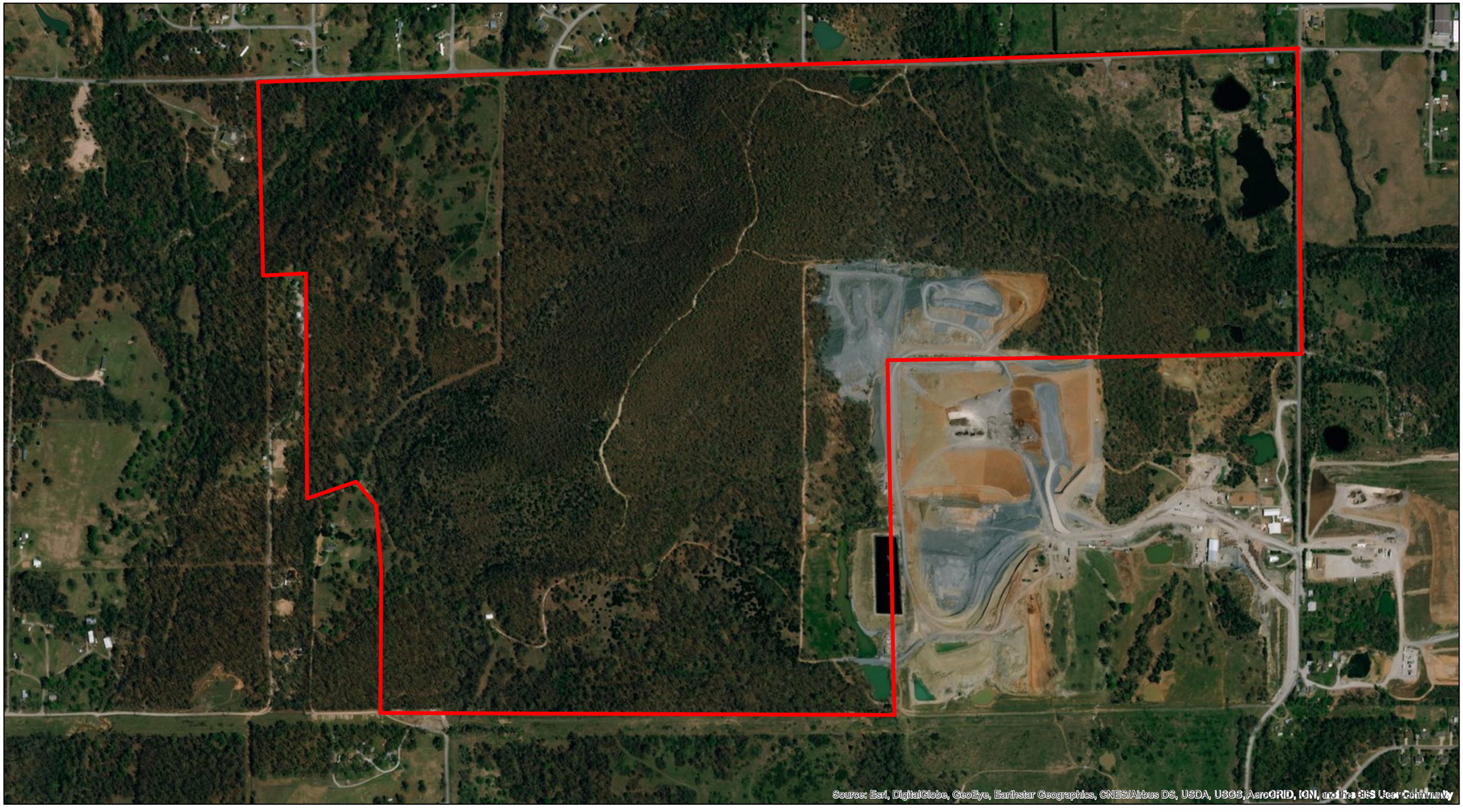

Figure 2. **Aerial Photograph of the AEL Subject Site**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

N

SCS ENGINEERS
CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501

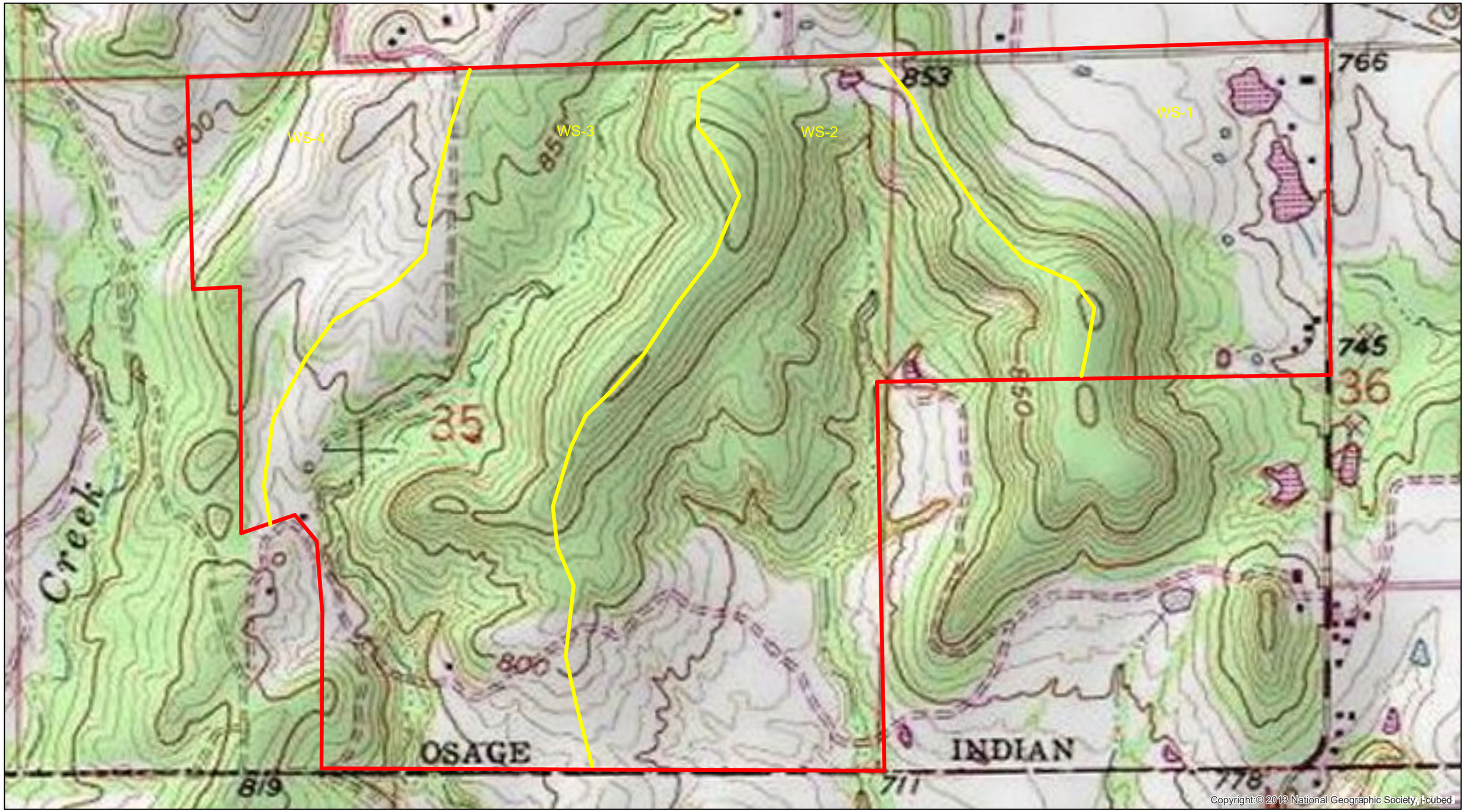

Figure 3. **Topographic Map of AEL Proposed Expansion**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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Appendix B

USFWS Official Species List

USFWS IPAC Resource List

ODWC County by County List of Endangered and Threatened Species

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:
Consultation Code: 02EKOK00-2019-SLI-1477
Event Code: 02EKOK00-2019-E-03451
Project Name: AEL Expansion

March 27, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/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: 02EKOK00-2019-SLI-1477

Event Code: 02EKOK00-2019-E-03451

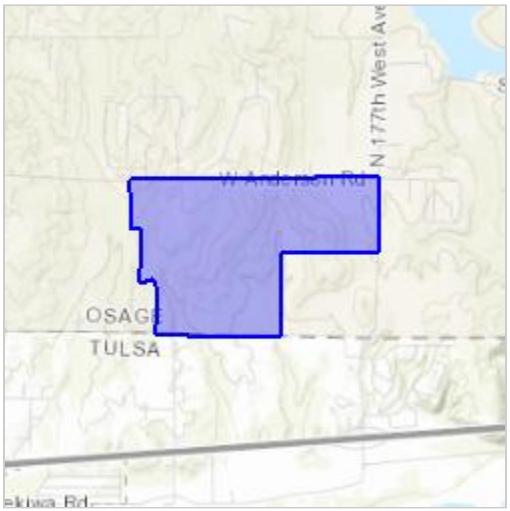
Project Name: AEL Expansion

Project Type: Landfill

Project Description: Landfill Expansion Project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.16725438085243N96.20463310289702W



Counties: Osage, OK | Tulsa, OK

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
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

Birds

NAME	STATUS
Least Tern *Sterna antillarum* Population: interior pop. No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered
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. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population 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/758	Endangered

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	Endangered
Rattlesnake-master Borer Moth *Papaipema eryngii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7863	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.

---

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
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
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.

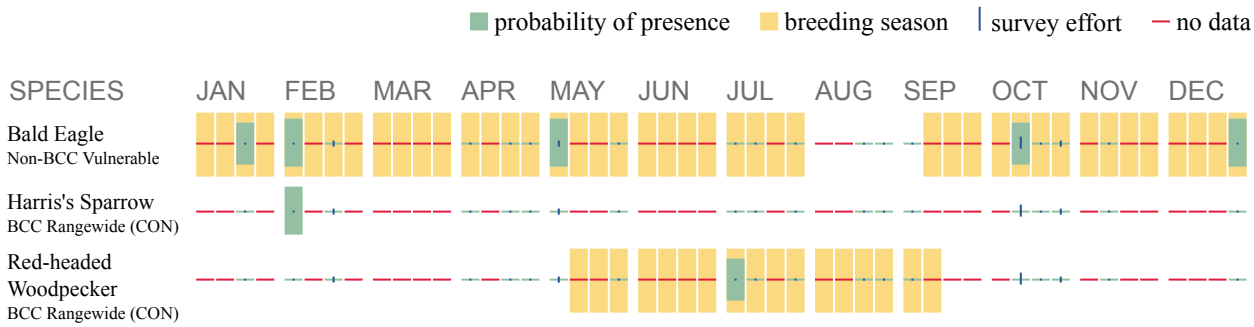
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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 and/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 E-bird Explore Data 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.

FRESHWATER POND

- PUBFh
- PUSCh
- PUBHh
- PUSCx

RIVERINE

- R5UBF

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Osage and Tulsa counties, Oklahoma

Local office

Oklahoma Ecological Services Field Office

(918) 581-7458
(918) 581-7467

9014 East 21st Street
Tulsa, OK 74129-1428

http://www.fws.gov/southwest/es/Oklahoma/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. 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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Least Tern Sterna antillarum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane Grus americana There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/758	Endangered

Insects

NAME	STATUS
American Burying Beetle Nicrophorus americanus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/66	Endangered
Rattlesnake-master Borer Moth Papaipema eryngii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7863	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

You should contact the local field office to determine whether critical habitat for the following species should be considered:

NAME	TYPE
Whooping Crane Grus americana https://ecos.fws.gov/ecp/species/758#crithab	Final

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.

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

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 (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY

	BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
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
Harris's Sparrow Zonotrichia querula This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

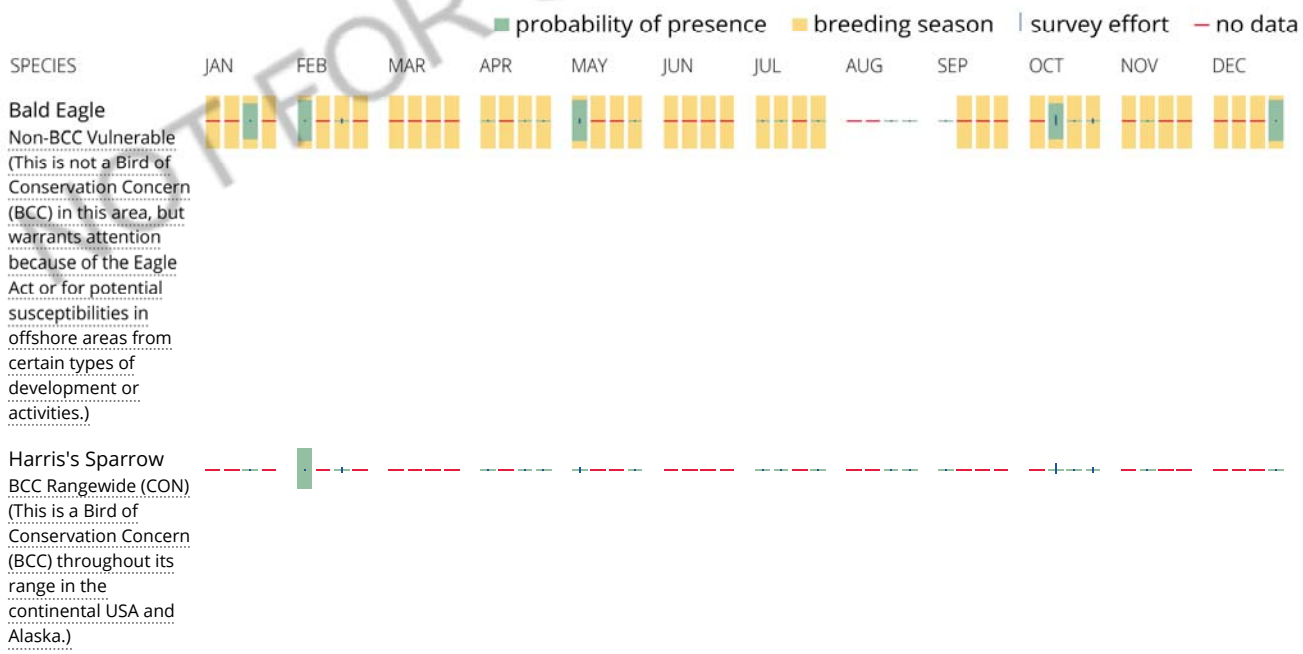
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.



Red-headed Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

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 and/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 E-bird Explore Data 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?

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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.

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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

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Facilities

National Wildlife Refuge lands

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 AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

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.

This location overlaps the following wetlands:

FRESHWATER POND

- PUBFh
- PUBHh
- PUSCx
- PUSCh

RIVERINE

- R5UBF

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

County by County List of Endangered and Threatened Species

Adair County
State-listed Threatened and Endangered Species:
Neosho Mucket (*Lampsilis rafinesqueana*) – endangered
Long-nosed Darter (*Percina nasuta*) – endangered
Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed threatened and endangered in this county may include:
Gray Bat (*Myotis grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered

Alfalfa County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Whooping Crane (*Grus americana*) - endangered

Atoka County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Beaver County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Whooping Crane (*Grus americana*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Beckham County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Blaine County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Bryan County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Caddo County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Canadian County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Carter County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Cherokee County
State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) - endangered

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (Myotis *grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Choctaw County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Scaleshell (*Leptodea leptodon*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Cimarron County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Mountain Plover (*Charadrius montanus*) – candidate species under evaluation

Cleveland County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Coal County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered

Comanche County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered

Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Cotton County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Craig County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) - endangered
Neosho Madtom (*Noturus placidus*) – threatened
Piping Plover (*Charadrius melodus*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Creek County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Custer County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Delaware County

State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) – endangered
Oklahoma Cave Crayfish (*Cambarus tartarus*) - endangered

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (Myotis *grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Dewey County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered

Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Ellis County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Garfield County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Garvin County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Grady County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Grant County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Greer County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Harmon County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Harper County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Haskell County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Hughes County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Jackson County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Jefferson County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Johnston County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Kay County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Kingfisher County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Kiowa County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Latimer County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

LeFlore County
State-listed Threatened and Endangered Species:

Black-sided Darter (*Percina maculata*) -threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

Lincoln County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Logan County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Love County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Major County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Marshall County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Mayes County
State-listed Threatened and Endangered Species:

None

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (*Myotis grisescens*) – endangered
Piping Plover (*Charadrius melodus*) – threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Dater (*Etheostoma cragini*) – candidate species under evaluation

McClain County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

McCurtain County
State-listed Threatened and Endangered Species:

Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Red-cockaded Woodpecker (*Picoides borealis*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Winged Mapleleaf (*Quadrula fragosa*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

McIntosh County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Murray County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Muskogee County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Noble County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Nowata County
State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) – endangered; historic occurrence in Verdigris River

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Okfuskee County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Oklahoma County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Okmulgee County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Osage County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Ottawa County
State-listed Threatened and Endangered Species:
Neosho Mucket (*Lampsilis rafinesqueana*)

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (*Myotis grisescens*) – endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) – threatened
Neosho Madtom (*Noturus placidus*) – threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Dater (*Etheostoma cragini*) – candidate species under evaluation

Pawnee County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Payne County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pittsburg County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pontotoc County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pottawatomie County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Arkansas River Shiner (*Notropis girardi*) – threatened

Pushmataha County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Red-cockaded Woodpecker (*Picoides borealis*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Winged Mapleleaf (*Quadrula fragosa*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

Roger Mills County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Rogers County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Seminole County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Sequoyah County

State-listed Threatened and Endangered Species:

Long-nosed Darter (*Percina nasuta*) - endangered
Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Stephens County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Texas County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Mountain Plover (*Charadrius montanus*) – candidate species under evaluation

Tillman County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Tulsa County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Wagoner County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Washington County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Piping Plover (*Charadrius melodus*) - threatened

Washita County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered

Woods County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Woodward County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

From: Horton, Russ
To: Weaver, Vaughn
Subject: Re: Follow up on AEL
Date: Tuesday, April 14, 2020 10:09:01 PM
Attachments: image001.jpg

Vaughn:

Having heard nothing back from my staff, we have no comments / concerns RE this project.

Thank you,

Russ Horton
Assistant Chief of Wildlife Division
Oklahoma Department of Wildlife Conservation
1801 North Lincoln Blvd
Oklahoma City OK 73105
(405) 521-2730 (Office)
(405) 202-5901 (Cell)
russ.horton@odwc.ok.gov

On Tue, Apr 14, 2020 at 10:26 AM Weaver, Vaughn <VWeaver@scsengineers.com> wrote:

> Mr. Horton,
>
> We sent a report to ODWC for review on February 10, 2020. I am checking to see if there are any concerns with the proposed project? I can't find a response from ODWC on this project and am just following up.
>
> Vaughn Weaver
>
> Senior Project Biologist
>
> 11120 E. 26th Street North
>
> Suite 1100
>
> Wichita, Kansas 67226

Office: 316-315-4501

Fax: 316-315-4505

Mobile: 316-207-7130

United States Department of the Interior – Fish and Wildlife Services

April 24, 2019
File No. 27216290.00

US Fish and Wildlife Service (USFWS)
Oklahoma Ecological Services Office
9014 E 21st Street
Tulsa, OK 74129

Subject: AEL Expansion
Osage County Oklahoma

Dear Project Review Staff:

SCS Engineers (SCS) is submitting this request for project review on behalf of American Environmental Landfill (AEL) for a proposed western expansion of an active landfill located northwest of Sand Springs in Osage County, Oklahoma (Figure 1). The subject site includes approximately 435 acres in Sections 35 and 36, T20N, R10E, near Latitude 36.166643 Longitude -96.203007. See Figure 2 and Figure 3 for a more detailed project boundary.

This request for project review is submitted in conjunction with an application for an Individual Permit from the U.S. Army Corps of Engineers (USACE).

There are seven Threatened and Endangered Species (TES) identified by the USFWS that may occur within the subject site or be impacted by the proposed project. See the attached official species list issued for the proposed subject on March 27, 2019 (Attachment 1). Below is the required Species Conclusion Table generated for the proposed project area, which includes the listed species for the site as well as the occurrence of suitable habitat, potential adverse impacts (if any or if known) as well as ESA determinations, based on the professional assessment of SCS staff. In addition, SCS is including a preliminary Habitat Assessment Report generated under separate cover for your reference.

Species Conclusion Table

Species	Habitat Determination	Notes/Documentation	ESA Determination
Northern Long-Eared Bat	Habitat present	Suitable mature woodland habitat present. No recent surveys	Recommend coordination with USFWS OK Field Office
American Burying Beetle	Habitat present	Suitable woodland/grassland habitat present and subject site is located within the core of this species' population range. No recent surveys.	Recommend coordination with USFWS OK Field Office

Species	Habitat Determination	Notes/Documentation	ESA Determination
Whooping Crane	No habitat present	No significant suitable wetland and cropland habitat present	No effect
Red Knot	No habitat present	Significant suitable habitat not present and species has not been documented in this region in recent years	No effect
Piping Plover	No habitat present	No large wetlands, salt flats or sand bars within or in close proximity to the subject site	No effect
Least Tern	No habitat present	No large wetlands, salt flats or sand bars within or in close proximity to the subject site	No effect
Rattlesnake-Master Borer Moth	Habitat present	Suitable prairie and woodland habitat present. No recent surveys	Recommend coordination with USFWS OK Field Office

Species specific surveys have not been conducted for the proposed project. Construction for the expansion project is uncertain, but anticipated within 12-24 months of this request for project review pending USACE and all other agency permits and approvals.

As part of the USACE permit process, an approved USFWS TES avoidance/minimization management plan shall be generated for the project area. This letter is to initiate consultation with the USFWS so as to establish a TES management plan.

We appreciate your review of the proposed project and request USFWS guidance to avoid and minimize impacts to TES or other sensitive species potentially located within the project area. Please contact Vaughn Weaver at 316-494-7518 or at vweaver@scsengineers.com. We look forward to working with the USFWS on this project.

Sincerely,

Vaughn Weaver
Senior Project Professional
SCS Engineers

Amy Zavala Garnsey
Biologist

c.c. Wade Miller

Encl.

Online BA/BE Review Request Form,
Figures 1, 2 and 3,
USFWS Official Species List,
SCS TES Habitat Assessment Report

OKESFO Online BA/BE Review Request

From: SCS Engineers on behalf of American Environmental Landfill (AEL)
1817 Commons Circle, Suite 1
Yukon, OK 73099
316-494-7518 (Vaughn Weaver)

To: U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 E 21st Street
Tulsa, Oklahoma 74129

April 24th, 2019

Re: Online Project Review Request

AEL Expansion Project in Osage County Oklahoma

We have reviewed the referenced project using the Oklahoma Ecological Services Field Office's online project review process and have followed all guidance and instructions in completing the review. We completed our review on March 27th, 2019 and are submitting our project review package in accordance with the instructions for further review.

Our proposed action consists of:

American Environmental Landfill is in the planning stage of expanding their operations by constructing future cells west of their current active landfill. The proposed expansion would include the purchase and permitting of land adjacent to their western property boundary. This request for project review is submitted in conjunction with an application for an Individual Permit from the U.S. Army Corps of Engineers (USACE).

The location of the project and the action area are identified on the enclosed map

SCS has generated both aerial and topographic maps to show the project boundary for the proposed expansion. GIS shapefiles of the project boundary can be provided if needed/requested.

The project is expected to be completed expansion will start as soon as feasible once permitting is a

This project review is needed for

This request for project review is submitted in conjunction with an application for an Individual Permit from the U.S. Army Corps of Engineers (USACE).

The enclosed project review package provides the information about the species and critical habitat considered in our review, and the species conclusions table included in the package identifies our determinations for the resources that may be affected by the project.

For additional information, please contact Vaughn Weaver at the address listed above.

Sincerely,

Vaughn Weaver

Enclosures:

1) ENTIRE PROJECT REVIEW PACKAGE:
   - ☑ Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This form (Online BA/BE Review Request)
   - ☑ Biological Assessment/Evaluation for Review
   - ☑ (Optional) Additional maps

2) Other relevant project data/documents

N/A

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:
Consultation Code: 02EKOK00-2019-SLI-1477
Event Code: 02EKOK00-2019-E-03451
Project Name: AEL Expansion

March 27, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/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: 02EKOK00-2019-SLI-1477

Event Code: 02EKOK00-2019-E-03451

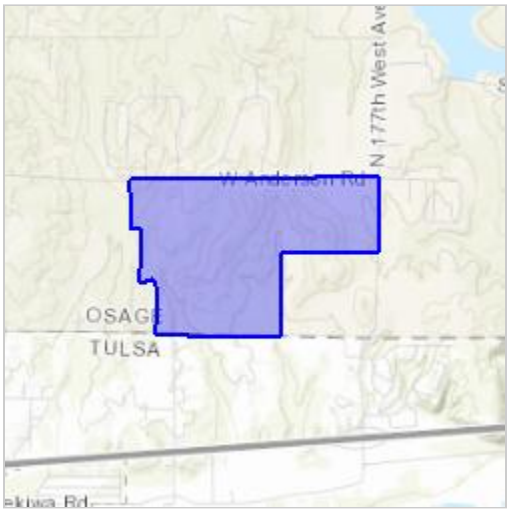
Project Name: AEL Expansion

Project Type: Landfill

Project Description: Landfill Expansion Project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.16725438085243N96.20463310289702W



Counties: Osage, OK | Tulsa, OK

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
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

Birds

NAME	STATUS
Least Tern *Sterna antillarum* Population: interior pop. No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered
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. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population 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/758	Endangered

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	Endangered
Rattlesnake-master Borer Moth *Papaipema eryngii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7863	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.

---

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
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
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.

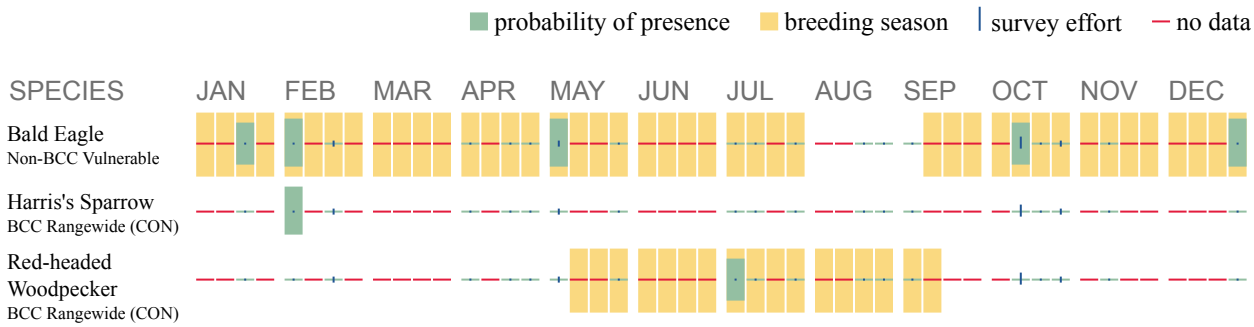
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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 and/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 E-bird Explore Data 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.

FRESHWATER POND

- PUBFh
- PUSCh
- PUBHh
- PUSCx

RIVERINE

- R5UBF

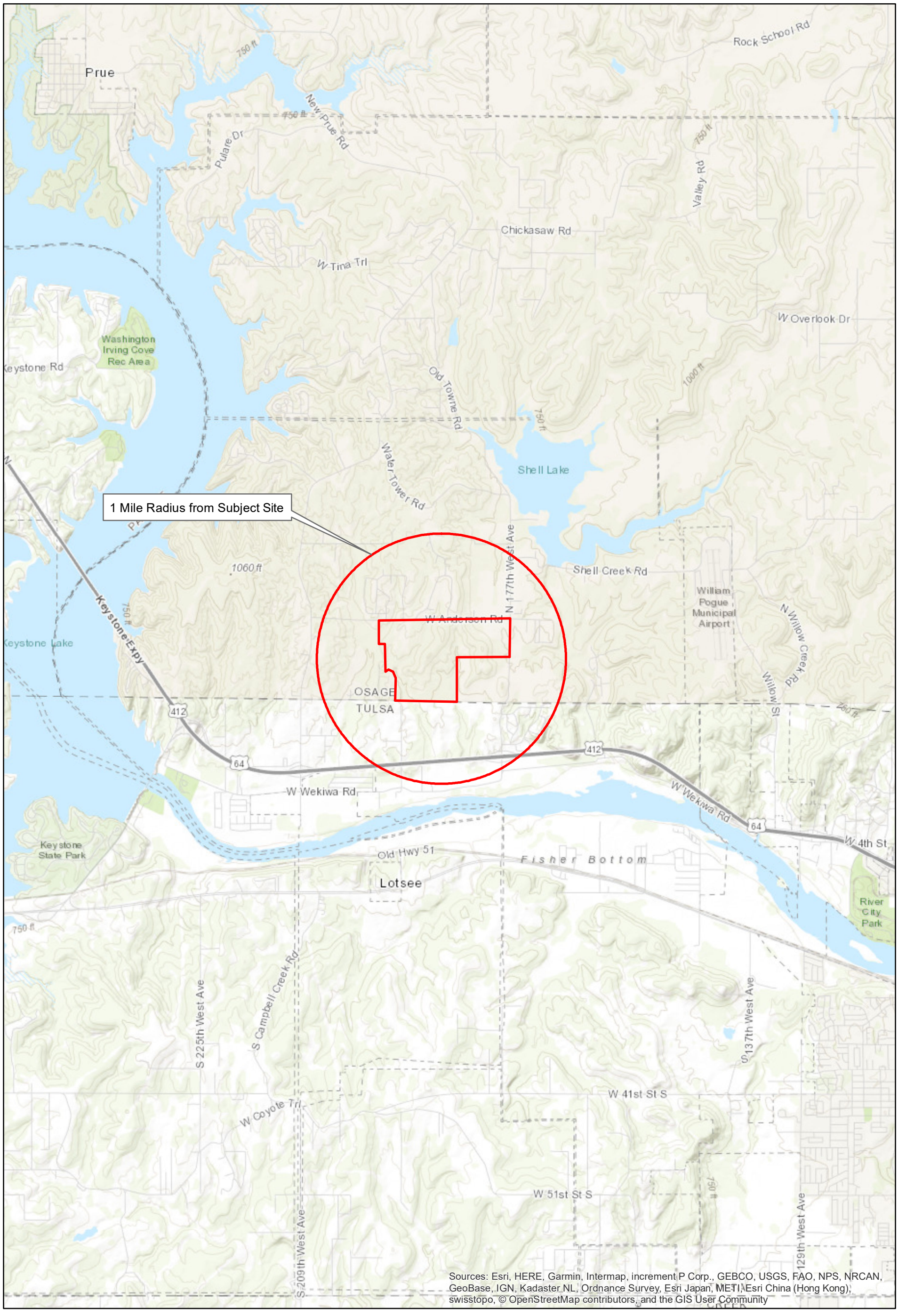


Figure 1.

AEL Subject Site Location
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 3,100 6,200 12,400 18,600 24,800 Feet

N

SCS ENGINEERS

CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501 FAX. (316) 315-4505

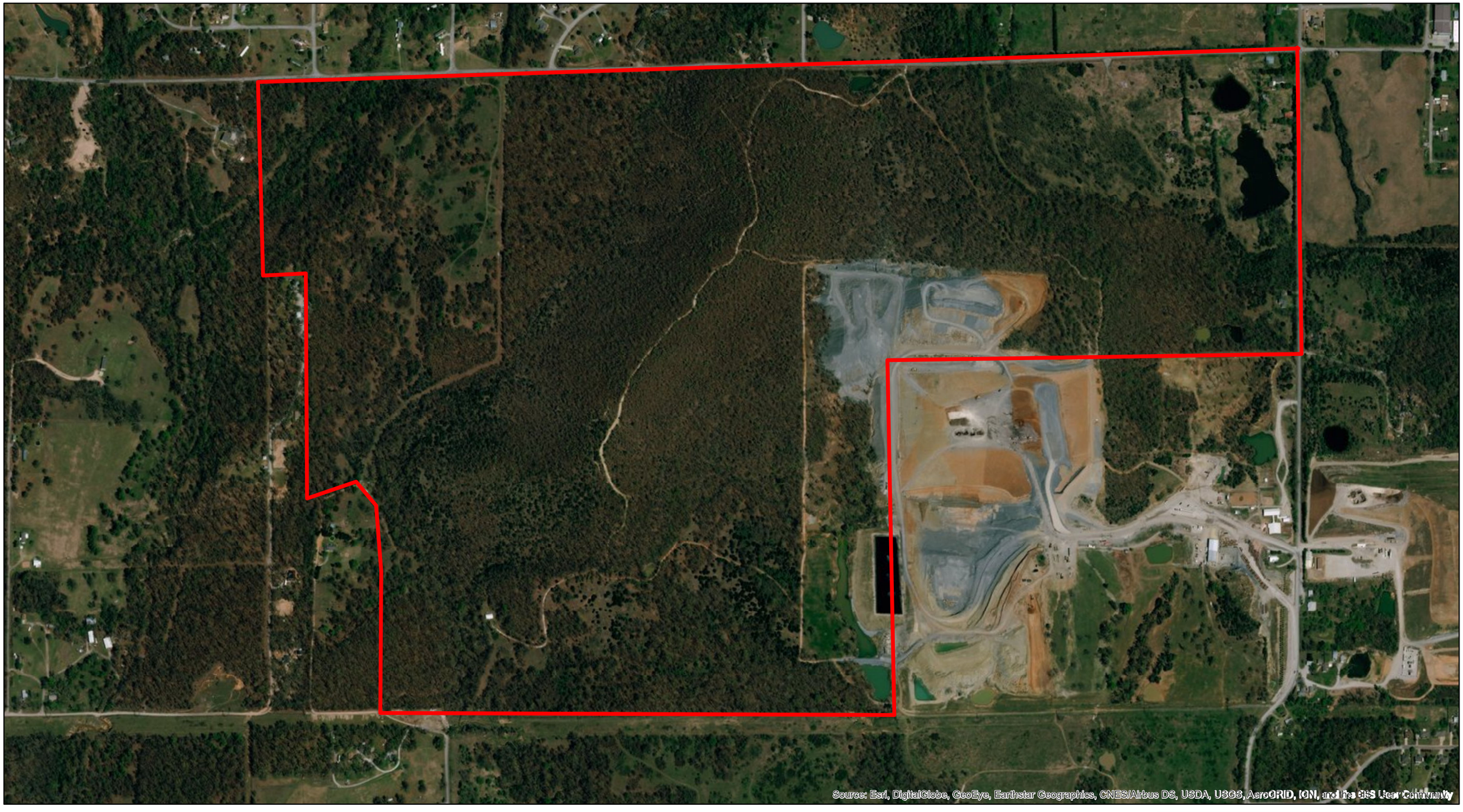


Figure 2. **Aerial Photograph of the AEL Subject Site**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

N

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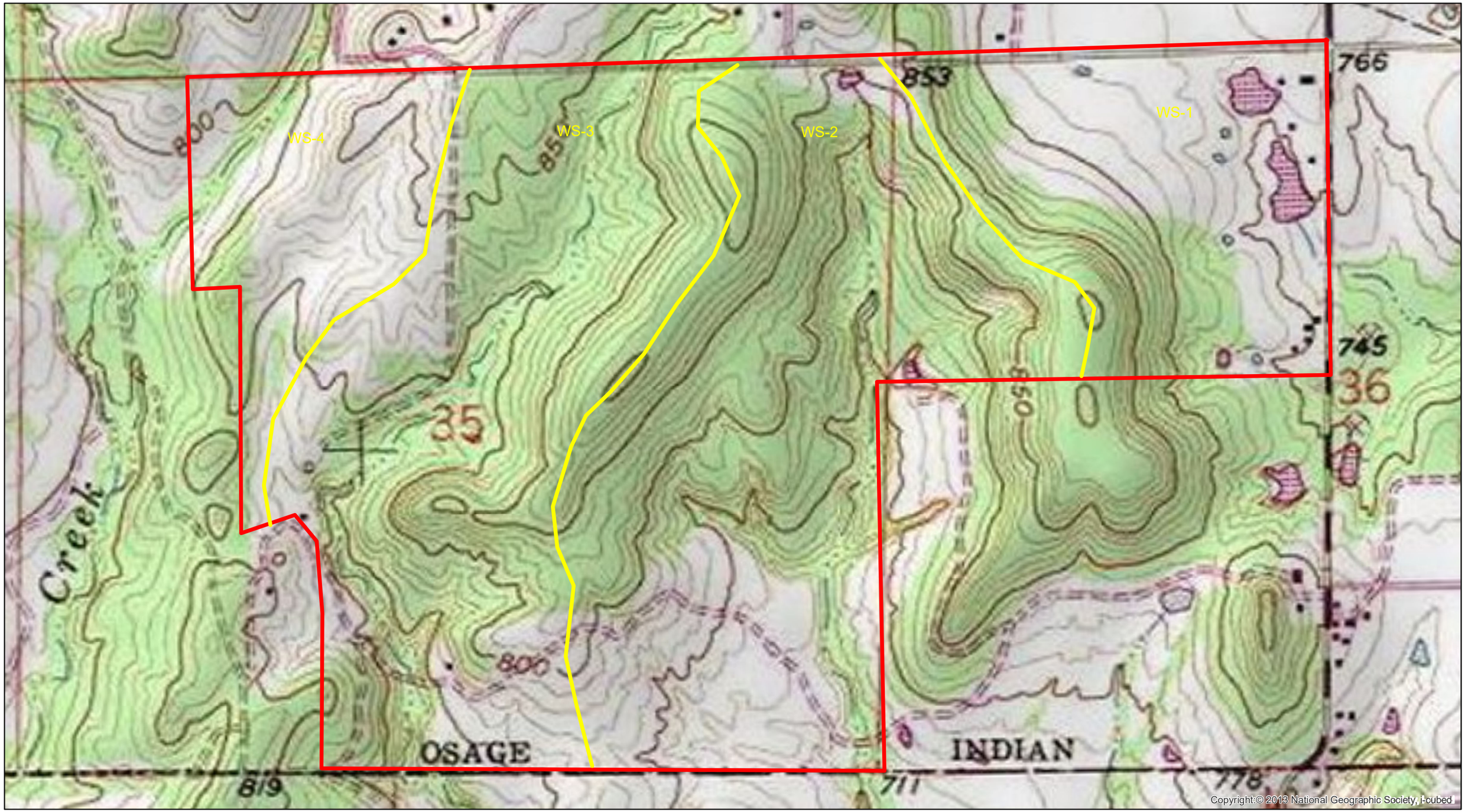

Figure 3. **Topographic Map of AEL Proposed Expansion**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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CONSULTING ENGINEERS, INC.
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Wichita, Kansas 67226
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Threatened and Endangered Species (TES) Habitat Assessment Report

AEL's Proposed Expansion
Section 35 and 36, Township 20 South
Range 10 East
Osage County, Oklahoma

American Environmental Landfill
207 North 177th West Avenue
Sand Springs, Oklahoma
(918) 245-7786

SCS ENGINEERS

27216290.00 | July 3, 2018
Revised April 1, 2019

1817 Commons Circle, Suite 1
Yukon, Oklahoma 73099
(405) 265 3960

Table of Contents

Table of Contents

Section Page

Appendices

1.0 EXECUTIVE SUMMARY

SCS Engineers (SCS) has contracted with American Environmental Landfill (AEL) to complete a threatened and endangered species (TES) habitat assessment for a proposed western expansion of an active landfill located northwest of Sand Springs, Osage County, Oklahoma. AEL is in the planning stage of expanding their operations by constructing future cells west of their current landfill. The proposed expansion (subject site) would include the purchase and permitting of land adjacent to their western property boundary. The purpose of the TES habitat assessment is to evaluate the potential presence of state and/or federally listed TES and their associated habitats within the subject site and help determine if potential impacts to protected species may occur as a result of the proposed expansion development.

The following species were identified by the United States Fish and Wildlife Service (USFWS) as potentially occurring within or near the subject site:

- Northern Long-Eared Bat (*Myotis septentrionalis*)
- Least Tern (*Sterna antillarum*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Whooping Crane (*Grus americana*)
- American Burying Beetle (*Nicrophorus americanus*)
- Rattlesnake-Master Borer Moth (*Papaipema eryngii*)

A review of bird species that are protected under the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act of 1940 (BGEPA) identified three additional species that are a conservation priority and may utilize the habitat within the subject site. These three species include the:

- Bald Eagle (*Haliaeetus leucocephalus*)
- Harris's Sparrow (*Zonotrichia querula*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)

A desktop review was performed to evaluate the potential presence of state or federally listed TES and their habitats within the subject site. An on-site field investigation was completed May 24th - 25th, 2018 to verify if suitable habitat was present for TES within the subject site. Potential suitable habitat was observed within the subject site for three TES species including:

- Northern long-eared bat,
- American burying beetle (ABB)
- Rattlesnake-master borer moth

In addition, suitable habitat for all three MBTA/BGEPA listed species was observed within the subject site.

2.0 PROJECT OVERVIEW/INTRODUCTION

The State of Oklahoma solid waste permitting process requires that consultation with the United States Army Corp of Engineers (USACE) be completed prior to state approval. Clearance from the USFWS is also required for projects on federal lands, federally funded projects, and projects that require federal permits or approvals including prior approval for any USACE 404/401 permit. A wetland determination report for the subject site has been completed under a separate cover, which will help determine if impacts to Waters of the United States (WOUS) may occur as a result of the proposed.

This document provides information that aids in compliance with Section 7(a) of the Federal Endangered Species Act (ESA) and the Oklahoma Endangered Species Statute. These regulations are enforced by the USFWS and the Oklahoma Department of Wildlife Conservation (ODWC), respectively.

The following report discusses the findings and conclusions of a background published documentation review and an onsite field inspection for potential impacts to TES and their associated habitats within the proposed subject site.

3.0 SCOPE

3.1 PUBLISHED DOCUMENTATION REVIEW

A review of publically available information including USFWS Information for Planning and Consultation (IPAC) records, an official species list from the USFWS, ODWC TES list by county, aerial imagery, National Wetlands Inventory (NWI) maps, United States Geological Survey (USGS) topographic maps, and USGS Land Cover Data were reviewed to evaluate the potential presence of state or federally listed TES and their associated habitats within or adjacent to the subject site.

3.2 FIELD PROCEDURES

SCS Engineers conducted an onsite field investigation to determine if suitable habitat for state or federally listed TES is located within the subject site. A literature review of TES and their habitat preferences was completed prior to staff's field visit. Field investigation was conducted May 24th – May 25th, 2018 in concurrence with a preliminary wetland determination that has been summarized in a report being submitted under separate cover. In addition, an updated literature review was completed in March 2019 to supplement AEL's formal request to the USFWS for a project review.

SCS staff traversed the subject site from the north to the south to assess the different types of habitats, land features, vegetative cover, and soil features potentially suitable for the identified TES; existing habitats were assessed to determine if the area could be used by one or more of the identified TES. To maximize coverage of the heavily wooded areas with limited visibility, SCS staff dispersed and traversed up and down slopes. Habitats were qualified but not quantified for TES use. As this was a preliminary assessment of potential habitats, determination if potentially usable habitat by TES was the primary concern. The different observed habitats are discussed in more detail below.

4.0 PROJECT LOCATION AND SITE DESCRIPTION

The subject site includes approximately 435 acres located northwest of the City of Sand Springs, just southwest of the intersection of North 177th W. Avenue and Anderson Road in Osage County, Oklahoma. The subject site is located in Sections 35 and 36, T20N, R10E near Latitude 36.166643, Longitude -96.203007 **(Appendix A, Figure 1)**. The vegetative cover is predominantly mature oak/hickory woodlands with a native grass understory on steep sloping hills. Two drainage ways transect the subject site from north to the south

The subject site is located within the Northern Cross Timbers (Level 4 Ecoregion) of the Cross Timbers (Level 3 Ecoregion) of Oklahoma (Woods, 2005). This region includes a mosaic of oak savanna, scrubby oak forest, and tall grass prairie, which naturally cover the hills, cuestas, and ridges. Tall grass prairie occurs on fine-textured soils derived from limestone or shale. Soils are highly erodible when disturbed. There are two common stream types. A mixture of shaded riffles, runs, and pools that have gravel or cobble substrates characterizes the first. The second stream type has lower gradients and is typically found downstream of the first, it is characterized by wide, shallow, sand-choked channels. Uplands are mantled by Quaternary clayey silt-to-silt clay decomposition residuum, and sandy decomposition residuum. Valleys are veneered with Quaternary alluvium. The area is underlain by Pennsylvanian and Permian-age sandstone, shale, and limestone. Rock outcrops occur where sandstone blocks and boulders often litter hilltops and slopes. Soils consist of sandy and clayey residuum and colluvium overlaying Pennsylvanian sandstone, limestone and shale. The common soil series for uplands in this region include Darnell, Stephenville, Niotaze, Steedman, Coweta, Dennis, Bates, Clarita, Durant, Shidler, Newalla, Harrah, Chigley, and Konawa. The common soil series for floodplains include Verdigris, Port, Pulaski, and Garvin. Native vegetation is a combination of oak-hickory woodland and tallgrass prairie. Woodland areas are dominated by post oak (*Quercus stellate*), and blackjack oak (*Q. marilandica*) while tall grass prairie is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and Indiangrass (*Sorghastrum nutans*). Current land cover is woodland, grassland, rangeland, pastureland, and limited cropland. The main crops in this region include small grains, grain sorghum, hay and soybeans.

5.0 PUBLISHED DOCUMENTATION REVIEW

A desktop review was performed utilizing USFWS IPAC records, an official USFWS species list, ODWC TES lists by county **(Appendix B),** aerial photographs **(Appendix A, Figure 2)**, National Wetland Inventory (NWI) maps, USGS Topographic maps **(Appendix A, Figure 3)**, and USGS Land Cover Data. These resources were reviewed for the subject site to evaluate the potential presence of state and/or federally listed TES and their habitats within the subject site.

5.1 USFWS IPAC

A review of USFWS IPAC data (2011a) was conducted for the project site to determine the level of potential impacts to TES and their associated habitats **(Appendix B)**. In addition to the preliminary IPAC review, SCS received an official USFWS species list for the proposed project dated March 27, 2019 included in **Appendix B.** TES are protected by federal and state regulations to prevent further decline or extinction of these species. For species that may have the potential to receive impacts from the proposed development, considerations in the planning phase should evaluate ways to avoid, minimize and/or mitigate these potential impacts.

5.1.1 SPECIES LIST

The following species were identified by the USFWS official list as potentially occurring within or near the proposed subject site:

- Northern Long-Eared Bat (*Myotis septentrionalis*)
- Least Tern (*Sterna antillarum*)
- Piping Plover (*Charadrius melodus*)
- Red Knot (*Calidris canutus rufa*)
- Whooping Crane (*Grus americana*)
- American Burying Beetle (*Nicrophorus americanus*)
- Rattlesnake-Master Borer Moth (*Papaipema eryngii*)

The following information provides a description of each species and its habitat requirements.

Northern Long-Eared Bat

The northern long-eared bat is federally listed as threatened. This medium sized bat typically hibernates in caves/rock crevices during the winter months then migrates to wooded areas in the summer where they roost and breed in mature, live trees and snags (NatureServe 2017; USFWS n.d.). This bat species occurs throughout portions of the Ozark highlands and Ouachita Mountains regions of eastern Oklahoma located approximately 50 miles east and 85 miles northwest of the subject site, respectively; there are nine known northern long-eared bat hibernacula with multiple individuals documented at additional cave locations in Oklahoma (ODWC 2017). Specific summer roosting habitat in Oklahoma is generally unknown, but this bat uses a variety of different tree species and frequently switch roosts (every 2-3 days) (ODWC 2017). Northern long-eared bats feed by flying through the understory of forested areas to glean insects from the surfaces of leaves and water. Reproductive females typically give birth to one pup each year/summer and gather in maternity colonies that vary from fewer than five individuals to more than fifty bats. Males and non-reproductive females use both trees and caves as roosts during the summer (ODWC 2017). White nose syndrome

is currently a predominant threat to this species. The northern long-eared bat is dependent on forested areas for summer roosting and foraging, therefore, loss and fragmentation of wooded areas during the summer months could affect this species. The northern long-eared bat may occur within the subject site due to the availability of suitable woodland habitat (e.g. mature canopy with an open understory) and insect/prey.

American Burying Beetle

The American burying beetle (ABB) is federally listed as endangered and is the largest carrion beetle in North America (USFWS 2014b). Historically this species could be found in 35 states but is currently limited to nine states including: Arkansas, Kansas, Massachusetts, Nebraska, Oklahoma, Ohio, Rhode Island, and South Dakota (Ratcliff 1996; USFWS n.d.). The largest populations of ABB are found in Oklahoma where it is currently known to occur in at least 29 counties in the eastern portion of the state (ODWC 2017). This beetle is dependent on small carrion (between 3-7ounces) to feed and reproduce (ODWC 2017). There is no critical habitat designation for this species, but the highest densities of ABB occur in open, oak-hickory forests with native grass cover; populations also occur in both closed-canopy forest and tallgrass prairie habitats. Preferred habitat for the ABB includes areas with loose soils and minimal human disturbance. This species has a short life span of approximately one year. The ABB is dormant (underground) in the winter when temperatures are less than 60 degrees Fahrenheit (˚F). During summer months, the adults are nocturnal and require a minimum nighttime air temperature of 60 ˚F for activity. Eggs are laid between April and September but predominantly in June and July and larvae require 48-60 days to develop (Ratcliff 1996). This species can travel up to two miles in a night and can occur in many undeveloped areas if the food opportunity is present. Soil disturbance from construction projects occurring during the cool/cold weather months are a concern for this species survivability. Based on the known current and historic range for this species, suitable soil conditions, and its ability to travel long distances, this species may occur within and/or adjacent to the subject site.

Whooping Crane

The Whooping Crane is a federally listed endangered species that occurs only in North America. It is North America's tallest bird, with males approaching 5 feet tall when standing erect (USFWS 2011c). The whooping crane adult plumage is snowy white except for black primary feathers, black or grayish alula (specialized feathers attached to the upper leading end of the wing), sparse black bristly feathers on the carmine crown and malar region (side of the head from the bill to the angle of the jaw), and a dark gray-black wedge-shaped patch on the nape (USFWS 2011c). Whooping Cranes are typically found in wetlands, marshes, pond and lake shorelines, shallow rivers, wet prairies, and crop fields near wetlands where they eat a varied diet of insects, crayfish, fish and seeds (ODWC 2011). Although rare, whooping cranes migrate through Oklahoma each spring and fall from their wintering grounds along the Texas Coast to their summer breeding grounds in Canada. The Salt Plains National Wildlife Refuge, located approximately 115 miles northwest of the subject site, is a valuable migration stopover area and is designated critical habitat for this species. The whooping crane is not likely to occur within the subject site due to the lack of suitable wetland or cropland habitat for feeding and loafing.

Red Knot

The Red Knot is a federally threatened species. It is the largest and most colorful of the North American peeps and has the longest yearly migratory route of any North American shore bird (Cornell 2015). This species can migrate from the southern tip of South America (Chile) to the Northern artic regions of North America. This species breeds in the dry, sparsely vegetated tundras of the North American Arctic. Outside of the breeding season, the red knot is found primarily in intertidal and marine habitats. With fewer than five birds reported annually, Oklahoma is not a critical breeding or

staging area for the species (ODWC 2017). The red knot is unlikely to occur within the subject site due to the lack of suitable habitat including marine shoreline and has an infrequent occurrence in the state.

Piping Plover

A federally listed threatened species the Piping Plover is a small shorebird that utilizes open, sand bars, mudflats, salt flats, and shallow wetlands for feeding and nesting (ODWC 2017; USFWS 2011b). Once widespread, this species is currently listed as threatened or endangered throughout its range. The Northern Great Plains population, which includes the Oklahoma population, is currently listed as federally threatened (USFWS 2011a, 2016a). The piping plover is a common spring and fall migrant through Oklahoma including Osage County (USFWS 2017), but there is only one nesting record for this species located in the panhandle of the state (ODWC 2017). Migration for this species in Oklahoma typically occurs from March through May and July through September. This shorebird is unlikely to occur within the subject site due to lack of suitable wetland or shallow riverine habitat with suitable sand/gravel bars for feeding or nesting.

Least Tern

A federally endangered species the least tern is the smallest North American shorebird. This species utilizes large river sandbars, saline flats, and marshes for feeding and nesting (USFWS n.d.). Least terns nest in colonies with peak egg laying from May-June and a completed breeding season by August. For feeding, least terns utilize shallow water areas of lakes, ponds, and rivers typically located close to the nesting areas. Nesting colonies are known from the Salt Plains National Wildlife Refuge in Oklahoma located more than 100 miles northwest of the subject site (ODWC 2017). Although this species is a known migrant in Oklahoma, this shorebird is unlikely to occur within the subject site due to the lack of suitable wetland and/riverine habitat. The thick woodland area and the lack of suitable gravel at the subject site limits this species preferred nesting and migratory habitat stop-overs. The available wetland features would not support the preferred food for offspring or adults due to the lack of extended inundation periods.

Rattlesnake-Master Borer Moth

The Rattlesnake-master borer moth is currently a candidate species for federal listing under the ESA. The candidate designation does not afford this species statutory protection, but candidate species are closely monitored as a conservation priority that may warrant future protection. This moth gets its name from the rattlesnake master plant (*Eryngium yuccifolium*); an herbaceous perennial that occurs in rocky woods, prairies and glades which is host to the moth's larvae. The rattlesnake-master borer moth may be present onsite depending upon the prevalence of the host plant on the subject site.

5.1.2 CRITICAL HAITAT DESIGNATION

Critical Habitat is federally designated and carries legal implications under the ESA. Critical habitats are specific geographic areas with features that are essential to the conservation of TES and may require additional management and protection. A review of state and federally designated critical habitats was conducted for the proposed subject site. Designated critical habitats are not located within the proposed subject site (ODWC 2016b; USFWS 2019).

5.1.3 MIGRATORY BIRDS

Migratory birds are afforded federal protection under the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act of 1940 (BGEPA). The USFWS has statutory authority and responsibility for enforcing the MBTA and BGEPA. Both acts make it illegal for anyone to take,

possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird/eagle, or the parts, nests, or eggs of such birds except under the terms of a valid permit issued pursuant to federal regulations (USFWS 2016a, 2017). Activities that may result in impacts to migratory birds, eagles and their habitats would need to follow appropriate protection regulations and implement appropriate conservation measures to minimize impacts to these species. Additional permitting may be required for any project that has the potential to disturb migratory birds/eagles. The following MBTA/BGEPA birds are identified by the USFWS IPAC tool as potentially being within or near the proposed expansions:

- Bald Eagle (*Haliaeetus leucocephalus*)
- Harris's Sparrow (*Zonotrichia querula*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)

The following information provides a description of each species and its habitat requirements.

Bald Eagle

Although the bald eagle has been removed from the TES list, under the ESA, this species continues to be protected by the MBTA and the BGEPA. Bald Eagles typically breed and winter in forested areas adjacent to large bodies of water. This species often selects large/mature trees that are open and accessible for roosting and nesting. The Bald Eagle is an opportunistic forager that may travel up to 50 miles in search of carrion, fish, bird, and mammalian prey. Some major threats to Bald Eagles include degradation of shoreline habitat, and disturbance at nest and roost sites. Eagles typically winter in Oklahoma from November through the end of March and are a common sight at large lakes and reservoirs including Kaw, Keystone, Texoma, Tenkiller, Ft. Gibson, Grand, Canton, Great Salt Plains, Tishomingo and Spavinaw lakes (ODWC 2016a, 2017). The subject site is located approximately 2.5 miles east of Keystone Lake, a known location for migrating and wintering bald eagles in Oklahoma. A Bald Eagle nest is along the north side of the Arkansas River approximately two miles southeast of the AEL entrance. Bald Eagles may occasionally occur foraging within the subject site, but are not anticipated to be adversely impacted by the proposed project due to the lack of suitable riverine habitat within the proposed expansions.

Harris's Sparrow

The Harris's Sparrow is the largest sparrow in North America and has a distinguishable black bib and pink bill. This species is a common favorite at backyard birdfeeders but is declining throughout its range. Harris's sparrows are winter residents and found nearly statewide in Oklahoma from mid-October to early May. This species is a non-breeding resident in Oklahoma and therefore would not breed within the subject site. Habitat descriptions for their winter range include: thickets/brush bordering streams, edges of low woodlands, brush and brushy places, hedgerows, and willow thickets in ravines (NatureServe 2017). The Harris's sparrow is primarily a ground feeder with a varied diet that includes insects, fruits and grains. The global status for this species is designated as G5, Secure (NatureServe 2017). This species likely occurs within the subject site during fall and winter due to the availability of suitable woodland habitat and known records on the area.

Red-headed Woodpecker

The red-headed woodpecker is a robin-sized woodpecker with a distinguishable and entirely red head (ODWC 2017). This species is frequently confused with the red-bellied woodpecker, which only has red plumage potions of the top and back of the head. Red-headed woodpeckers typically occur in mature oak woodlands, orchards and riparian woodlands with a relatively open understory particularly near creeks and ponds. They have a varied diet that includes insects, fruits, seeds and tree nuts such as acorns. Dead trees and snags along woodland perimeters provide valuable nesting habitat for this

species (Cornell 2015). They are uncommon in urban or residential neighborhoods. This species can be found breeding statewide in Oklahoma during the summer. In the winter, this species can be found across the eastern ¾ of Oklahoma; their winter numbers vary greatly from year to year depending upon acorn production and weather (ODWC 2017). The species is also listed as "Near Threatened" on the International Union for Conservation of Nature (IUCN) Red List (NatureServe 2017). This species likely occurs year-round within the subject site due to the availability of suitable woodland habitat for breeding, foraging and winter cover.

5.2 OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

The ODWC also maintains lists of state and federally listed TES for each county. According to the ODWC County list, there are no state listed TES or designated critical habitats in Osage County Oklahoma (ODWC 2016c). See also **Appendix B** for the ODWC County list.

5.3 AERIAL PHOTOGRAPH REVIEW

Aerial photographs dated 2018-2015, 2013-2010, 2008, 2006-2003, and 1995 were reviewed using Google Earth Pro Inc. (Google Earth 2018). Aerial photographs were reviewed to identify the proposed project expansion site and potential TES habitat located within or in close proximity to the subject site. Landscape features visible on aerial imagery within the subject site include woodland vegetation and grassland areas with multiple ponds of varying sizes. The subject site also contains some developed areas including two abandoned farmsteads and an access road that transects the subject site from the northeast to southwest **(Appendix A, Figure 2)**.

5.4 USGS TOPOGRAPHIC MAP REVIEW

The USGS 7.5 Minute Topographic Quadrangle (Wekiwa, Okls. Quadrangle, 1958,) indicates that the elevation ranged from 930 feet above mean sea level (amsl) near the north central area of the subject site to approximately 730 feet amsl near the southeast corner of the subject site. The topographic surface is represented as hills and valleys of two intermittent stream drainage ways. Three water features that include two intermittent streams and a freshwater pond are mapped within the subject site **(Appendix A, Figure 3)**.

5.5 NATIONAL WETLANDS INVENTORY MAP REVIEW

SCS conducted a NWI review for preliminary determination of the presence, location, size, and type of wetlands potentially located entirely or partially within the subject site. The U.S. Fish and Wildlife Service (USFWS) generates NWI maps through aerial imagery review, which may not accurately depict the extent or location of wetlands in an area. According to NWI data (USFWS, 2016b), thirteen mapped wetlands are located within the boundary of the subject site. These wetlands are identified as:

WS-1 NWI Features

1. **NWI-1**: A 0.19 Acre PUSCx (Palustrine, Unconsolidated Shore, Seasonally Flooded, Excavated) freshwater pond located near the north-center of the WS-1 Subject Site area.
2. **NWI-2**: A 0.20 Acre PUSCx freshwater pond located near the south-center of the WS-1 Subject Site area.
3. **NWI-3**: A 1.34 Acre PUBFh (Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded) freshwater pond located near the northeast corner of the WS-1 Subject Site area.

4. NWI-4: A 1.77 Acre PUBHh (Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded) freshwater pond located near the eastern Subject Site boundary, south of the 1.34 Acre PUBFh freshwater pond.
5. NWI-5: The northwest end of a 2.44 Acre R5UBF (Riverine, Unknown Perennial, Unconsolidated Bottom, Semipermanently Flooded) riverine habitat that begins at the southwest side of the previously discussed 1.77 Acre PUBHh freshwater pond. This riverine feature traverses off the Subject Site toward the southeast.
6. NWI-6: A 0.22 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary.
7. NWI-7: A 0.20 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary and west of the previously identified 0.22 Acre PUBFh freshwater pond.

WS-2 NWI Features

1. NWI-8: A 8.16 Acre R5UBF riverine feature located along the western third of the Subject Site running generally from the north to the south of the Subject Site.
2. NWI-9: A 0.25 Acre PUSCh (Palustrine, Unconsolidated Shore, Seasonally Flooded, Dike/Impounded) freshwater pond located near the north border of the Subject Site.
3. MW-10: A 0.22 Acre PUBFh freshwater pond is located near the center of WS-2 along the east slope.
4. NWI-11: A 0.11 Acre PUSCh freshwater pond located near the southeast corner of the subject site.

WS-3 NWI Features

1. NWI-12: A 6.33 Acre R5UBF riverine feature located along the eastern third of the Subject Site running generally from the north to the south of the Subject Site.

WS-4 NWI Features

1. NWI-13: A mid portion of a 6.21 Acre R5UBF riverine feature along the northwest corner of the WS-4 Subject Site Area.

All of the NWI mapped freshwater ponds appear to be excavated/impounded. A wetland determination/delineation report has been completed for the subject site and submitted under separate cover.

5.6 LAND USE LAND COVER

The USGS National Gap Analysis Program (GAP) Land Cover Data (2018) was reviewed to assess general land use and land cover within the subject site. Land cover data indicates that the subject site is dominated by forest/woodland vegetation with small scattered areas of introduced and semi-natural vegetation as well as developed areas (roads) and limited open water. The dominate vegetation within the subject site is described by the GAP as Crosstimbers Oak Forest and Woodland.

6.0 FIELD INVESTIGATION

SCS conducted an on-site field assessment May 24th - 25th, 2018 to evaluate the potential habitat for TES within the proposed subject site. A general assessment of landscape features, vegetative cover, and soils was conducted to characterize and categorize habitats observed and to evaluate the potential presence of listed species and/or their associated habitat.

6.1 OBSERVED HABITATS

The subject site includes a variety of land cover types including woodland, grassland, wetlands, and developed areas. Descriptions of each general habitat type are provided below.

6.1.1 WOODLAND

Most of the subject site is dominated by native oak woodland savannah habitat. Woodland areas are composed predominantly of oak species including blackjack oak (*Quercus marilandica*), Chinquapin Oak (*Q. muehlenbergii*), and post oak (*Q. stellata*) with some hickory (*Carya sp.*) and increasing cover of eastern red cedar (*Juniperus virginiana*). Lowland woodlands were comprised of a higher diversity of tree species including: American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), plains cottonwood (*Populus deltoides*), willow (*Salix spp.*), walnut (*Juglans spp.*), ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*) as well as other tree species. The aforementioned list of identified trees is not inclusive off all tree species within the subject site.

The woodlands were predominantly tall mature trees with generally an open understory. Woodland areas are located along in the east slope of the NE1/2 of the subject site, the western slope of the eastern watershed and all of the western watershed. Individual trees occurred within and around rock outcrops as well as along steep slopes, valleys and hill tops. The ground cover within the woodlands consisted of sparse vegetative cover mixed with prominent leaf litter. The woodlands were predominantly undisturbed and could provide suitable habitat for the Norther Long-Eared Bat. Several areas within the woodlands have soft silt-sandy soils that ABB would be able to utilize if proper prey opportunities were present.

AEL's operations, not including the active placement of solid waste, uses a portion of the subject site for facility equipment storage and to transport soil and equipment. An area that has had extensive tree removal completed is located inside of an access road used by AEL. The access road can be seen in aerial photographs beginning west of a large soil stockpile in the south ½ of the NE ¼ of the subject site. This access road traverses to the south along the west valley side of the east drainage. This access road then turns east near the middle of the SE ¼ of the subject site. This area was heavily wooded prior to 2013 but appears to have been thinned prior to 2015. This thinned area is currently a combination of scattered mature trees within a lowland grassland. This grassland area will be discussed below. Aside from this thinned area, the woodlands within the subject site had a uniform cover only broken by two access roads and two homestead structures.

6.1.2 GRASSLAND/RANGELAND

Grassland species observed within the subject site includes both native and introduced species. Dominant grassland species observed within the subject site includes: little bluestem, indian grass, Johnson grass (*Sorghum halepense*), and broomsedge bluestem (*Andropogon virginicus*). Two types of grasslands were observed within the subject site. A short grass vegetative community was observed along the tops of hills within breaks of the tree canopy; the soils in these areas were shallow and rocky.

The second type of grasslands were found in lowlands including the fore mentioned thinned woodland area. A mixture of tall and short grass prairie species with some invasive species dominated these lowland plant communities. Soils in these areas were loose and relatively thick with minimal rock within the soil profiles. Soils in lowland areas were often a combination of silt loam and sand. Small areas that had sparse vegetative cover often had erosional rills in these lowland areas. The observed grasslands were predominantly undisturbed and would provide suitable habitat for the Rattlesnake-Master Borer plant, which the Rattlesnake-Master Borer Moth are dependent on, and soils that are preferable to the ABB.

6.1.3 WETLANDS AND WATERCOURSES

The subject site is comprised of four watersheds associated with channels that typically drain from the north to the south. The east watershed includes a portion of AEL's active landfill operations and the west watershed is dominated by a mature woodland area. A USACE approved jurisdiction determination identified three stream channels and one pond that are jurisdictional. The jurisdictional channels are a combination of ephemeral and intermittent. The east channel will be impacted while the two west channels will remain undisturbed from the proposed expansion. The jurisdictional pond will remain undisturbed from the proposed expansion and mitigation.

A review of the NWI and NHD identified the four jurisdictional features. Observed hydric habitats ranged from permanent pools with true aquatic plants, fish, and benthic species to sparse hydric vegetative cover near surface water under a woodland canopy. Both west stream segments had sunfish species including green sunfish (*Lepomis cyanellus*) and bluegill (*L. macrochirus*). Mayflies (Ephemeroptera) and dragonfly nymphs (Odonata) in isolated pools along intermittent stream channels. Wetland plants were dominated by broadleaf cattail (*Typha angostifolia*), knot weed (*Persicaria bicornis*), coon's tail (*Ceratophyllum demersum*), green ash tree, and black willow (*Salix nigra*).

For additional information regarding wetland areas and watercourses within the project corridor, please reference the wetland delineation report prepared under separate cover.

7.0 OBSERVED TES AND/OR ASSOCIATED HABITATS

Numerous wildlife species were observed during the field investigation including but not limited to turkey vulture (*Cathartes aura*), white-tailed deer (*Odocoileus virginianus*), nine-banded armadillo (*Dasypus novemcinctus*), cottontail rabbits (*Sylvilagus floridanus*), northern bobwhite quail (*Colinus virginianus*), multiple songbird species, and snake species. Incidental occurrences of threatened, endangered or candidate species were not observed during the field assessment. However, this does not preclude the potential that a listed species could utilize suitable habitat within the subject site. The presence of potentially suitable habitat for TES was assessed based on the documentation reviewed and verified during field assessment. Table 1 below indicates the likelihood of TES occurring within the subject site based on SCS's assessment of publically available resources (documentation review) and on-site field observations. Species considered possible or likely to occur within the subject site are discussed in greater detail below the table. For those species that suitable habitat was not observed during the site visit and identified in the table as unlikely will not be discussed further.

Table 1: Likelihood of TES Occurrence within the Subject Site

Common Name	Federal Listing	Likelihood	Rationale
Northern Long-Eared Bat	Threatened	Possible	Suitable woodland habitat present
American Burying Beetle	Endangered	Likely	Suitable sandy-silty soils habitat present and subject site is located within the core of this species' population range
Whooping Crane	Endangered	Unlikely	Significant suitable habitat not present
Red Knot	Endangered	Unlikely	Significant suitable habitat not present and species has not been documented in this region in recent years
Piping Plover	Threatened	Unlikely	Significant suitable wetland habitat not present
Least Tern	Endangered	Unlikely	Significant suitable wetland habitat not present
Rattlesnake-Master Borer Moth	Candidate	Possible	Suitable prairie and woodland habitat present
Bald Eagle	MBTA and BGEPA	Possible	Significant suitable habitat not present, but occurs in large numbers at Keystone lake located 2.5 miles west of subject site and documented occurrence in vicinity of subject site
Harris's Sparrow	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present
Red-headed woodpecker	MBTA	Likely	Documented occurrences in vicinity and suitable habitat present

7.1 NORTHERN LONG-EARED BAT

The northern long eared bat utilizes a variety of tree species in woodland areas as warm season roosts from mid-March through mid-October. Potential suitable woodland habitat for the northern long eared bat, was observed within the subject site during the desktop review and was confirmed during the field investigation. The northern long-eared bat could use the subject site for foraging, brood rearing and summer roosts. During the winter months, this species is not expected to occur within the subject site. SCS understands that during the period from mid-March through mid-October, the removal of trees within the woodlands could have an impact to northern long-eared bat individuals. Tree removal after mid-October and before mid-March should have little to no impact to individuals. If trees are removed during this period, no permit should be required.

If tree removal is necessary between mid-March through mid-October, there are options that help determine if the northern long-eared bat is present and could be impacted from tree removal. These options include:

1. conducting an acoustic monitoring survey that will help identify if high frequency myotis bat species are present
    a. if monitoring results indicate that high frequency myotis species are present then
        i. conduct a mist netting to help confirm the presence of protected species
            1. If protected species are captured and observed then mitigation for habitat impacts (tree removal) will likely be required
            2. If no protected species are captured then tree removal may proceed without a mitigation
        ii. Mitigation for habitat impacts based on the higher probability that protected species are present (no true confirmation)
    b. If acoustic monitoring results indicate that no high frequency species are present then tree removal may likely occur without mitigation requirements
2. Mist netting to identify bat species present to determine if protected species are present.
    a. If protected species are captured and observed then mitigation for habitat impacts (tree removal) will likely be required
    b. If no protected species are captured then tree removal may likely proceed without mitigation
3. Mitigate for potential impacts to protected bat species – regardless if bat species are present or not.

Regardless of the option, coordination with USFWS and ODWC is recommended to assure that an approved assessment plan meets with the agencies' oversite authority. The assessment option(s) chosen will determine the level of permitting that may be necessary to complete facility expansion. Construction activities, particularly tree clearing and/or ground disturbance, should be avoided until agency coordination and project review is complete.

7.2 AMERICAN BURYING BEETLE

There is no critical habitat designation for this species, but the highest densities of ABB occur in open, oak-hickory forests with native grass cover; populations also occur in both closed-canopy forest and tallgrass prairie habitats. The ABB prefers loose soils in areas with minimal human disturbance. Soil disturbance from construction projects are a concern for this species. Potential suitable habitat for this species was observed within the subject site during the field investigation. In addition, multiple records for the ABB are currently known for Osage County, Oklahoma. With potential habitat identified within the subject site and historical collections from the area, development from the proposed

expansion could have detrimental impacts to ABB individuals. To determine if ABB individuals are present within or near the subject site, SCS recommends an ABB presence/absence assessment be completed prior to any natural habitat disturbance. Because of their highly mobile capabilities, annual monitoring needs to be completed prior to any scheduled ground disturbance. Based on the ABB life cycle, monitoring for ABB would need to be completed between May 20 and September 20 (or when evening temperatures are consistently over 60°F). ABB monitoring in Oklahoma is divided into two sample periods. The first monitoring period is from May 20th through July 28th. This monitoring period provides results for potential disturbances that will occur within this period. The second monitoring period is from July 29th through September 20th. Results from this second monitoring period provide impact results from July 29th until May 20th of the following year. Monitoring results are good for only those dates discussed. Depending on the result of the ABB survey, an incidental take permit may be required prior to development of the subject site. Mitigation may be required as part of securing the incidental take permit. Coordination with USFWS and ODWC is recommended to avoid potential unauthorized impacts to this species. Construction activities that include soil compaction, soil disturbance and ground clearing should be avoided until agency review and approval is obtained.

7.3 RATTLESNAKE-MASTER BORER MOTH

The rattlesnake-master borer moth occupies a unique ecological niche associated specifically with the rattle snake master plant. This species is typically found in mesic prairies, glades and rocky woodlands where it blooms from May through August. Although the rattle snake master plant was not observed during the SCS site assessment, potential suitable habitat for this species was observed within the subject site.

SCS acknowledges that this species may be impacted from development activities associated with the proposed expansion. However, as a candidate for federal listing this species is not offered enforceable protection under the ESA. Nonetheless, SCS recommends that coordination with the USFWS be established to minimize impacts to this species. This plan would help minimize impacts to the rattlesnake-master borer moth while allowing for the continual development of the proposed expansion.

7.4 BALD EAGLE, HARRIS'S SPARROW AND RED-HEADED WOODPECKER

The bald eagle, Harris's sparrow, and red-headed woodpecker are not listed as TES but are afforded federal protection under the MBTA and/or the BGEPA. These species are currently known to occur in Osage County and utilize a variety of habitats observed within and adjacent to the subject site including woodlands. A bald eagle nest was observed by SCS Staff along the Arkansas River approximately two miles southeast of the subject site. The Harris's sparrow does not nest within the region but are winter residents. The red-headed woodpecker is known to both breed and winter within woodland areas of Osage County, Oklahoma. As a year round resident the redheaded woodpecker may be the most adversely impacted by construction activities associated with the subject site. Preliminary USFWS consultation guidance indicates that the red headed woodpecker breeds in this area from May 10 through September 10. Therefore, SCS recommends construction activities be conducted outside these nesting dates in areas of suitable habitat for the red-headed woodpecker. If individuals from these species are observed during construction activities, it is recommended that construction activities cease until the individuals vacate the area. If construction activities occur during the nesting period of the red-headed woodpecker, an active nest survey may need to be completed prior to further construction activities. SCS recommends that coordination with USFWS and ODWC be initiated

regarding these species so as to avoid potential impacts to these and other migratory bird species that may occur within the subject site.

8.0 CONCLUSION

A review of state and/or federally listed TES and designated critical habitats was conducted for the subject site. No designated critical habitats for TES are located within the subject site. However, the USFWS and ODWC list seven federally threatened, endangered, and/or candidate species which may occur within the proposed subject site including:

- Northern Long-Eared Bat
- Least Tern
- Piping Plover
- Red Knot
- Whooping Crane
- American Burying Beetle
- Rattlesnake-Master Borer Moth

For each species, an estimated level of impact that would result from the proposed expansion activities was determined based on their habitat preferences, diet, reproductive needs, and likelihood to occur within the subject site. In addition to the TES, the USFWS lists three additional migratory bird species that may occur within the subject site and are protected by MBTA and the BGEPA which include:

- Bald Eagle
- Harris's Sparrow
- Red-headed Woodpecker.

TES were not observed during the site assessment and potentially suitable habitat is not available or limited for the majority of TES species listed for the subject site. Nonetheless, three federally protected TES have the potential to occur within the subject site and include:

- The northern long-eared bat
- American Burying Beetle
- Rattlesnake-master Borer Moth

The potential presence of these three species was based on the availability of suitable habitat and documented species records for the area.

9.0 GENERAL COMMENTS

Conclusions drawn by others from the results of this work should recognize the limitation of the methods used. Please note that SCS does not warrant the work of regulatory agencies or other third parties supplying information used in assimilation of this report. This report is prepared in accordance with generally accepted environmental engineering practices, within the constraints of the client's directives. It is intended for the exclusive use of the client for specific application to the assessed property. No guarantees, express or implied, are intended or made.

10.0 REFERENCES

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Appendix A

Figure 1 - AEL Subject Site Location

Figure 2 – Aerial Photograph of the AEL Subject Site

Figure 3 – Topographic Map of AEL Proposed Expansion

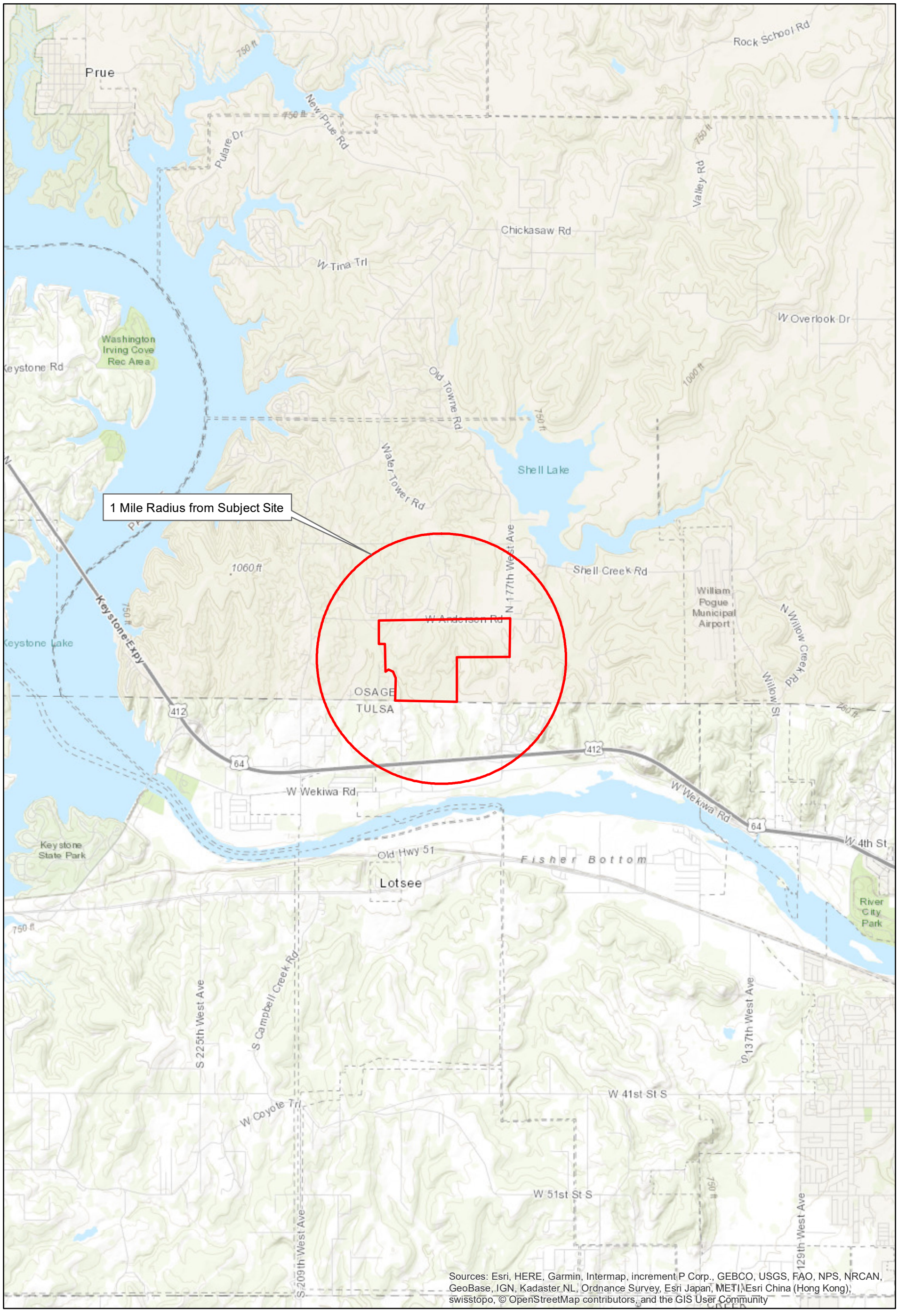

Figure 1.

AEL Subject Site Location
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 3,100 6,200 12,400 18,600 24,800 Feet

N

SCS ENGINEERS

CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501 FAX. (316) 315-4505

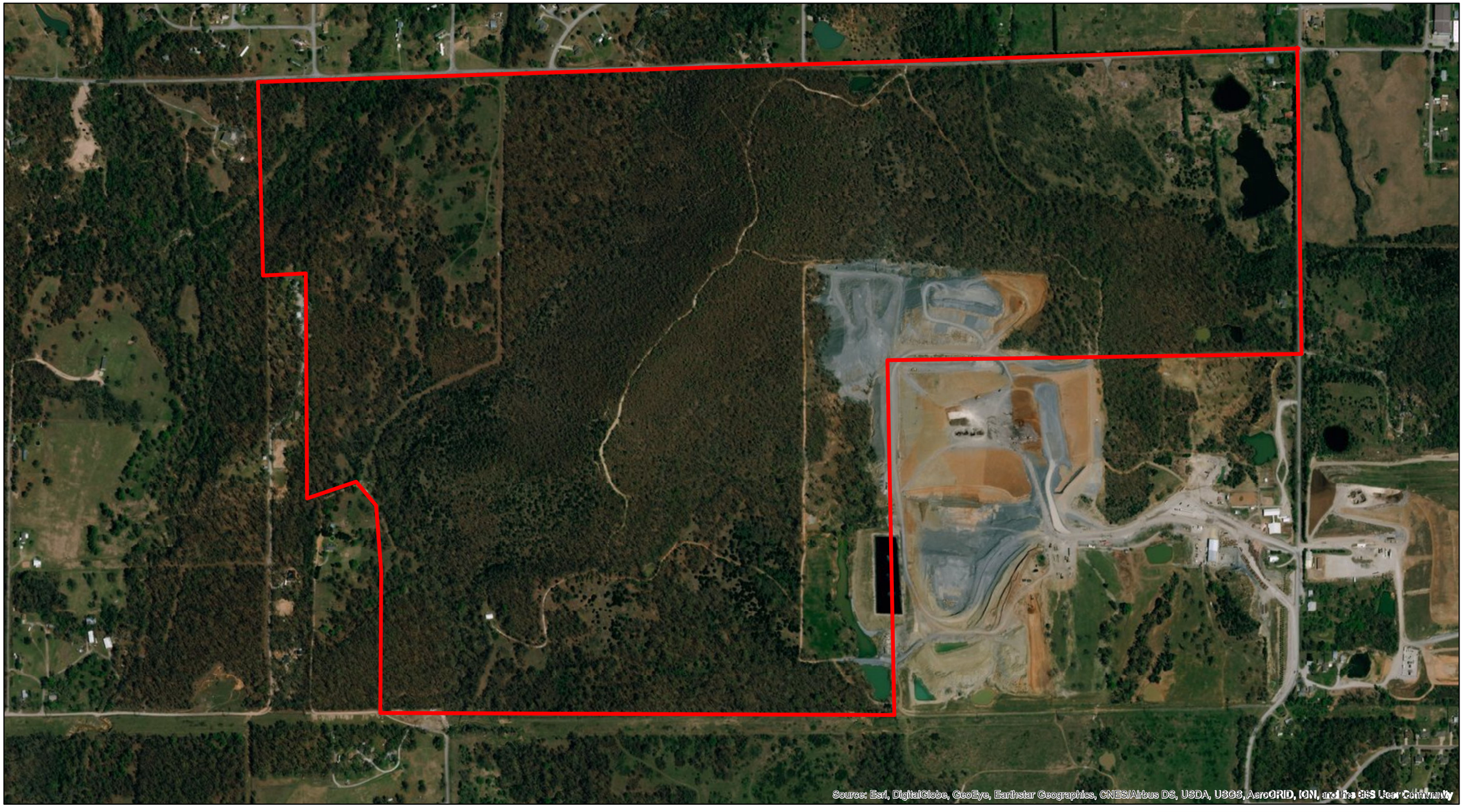

Figure 2. **Aerial Photograph of the AEL Subject Site**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

N

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CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501

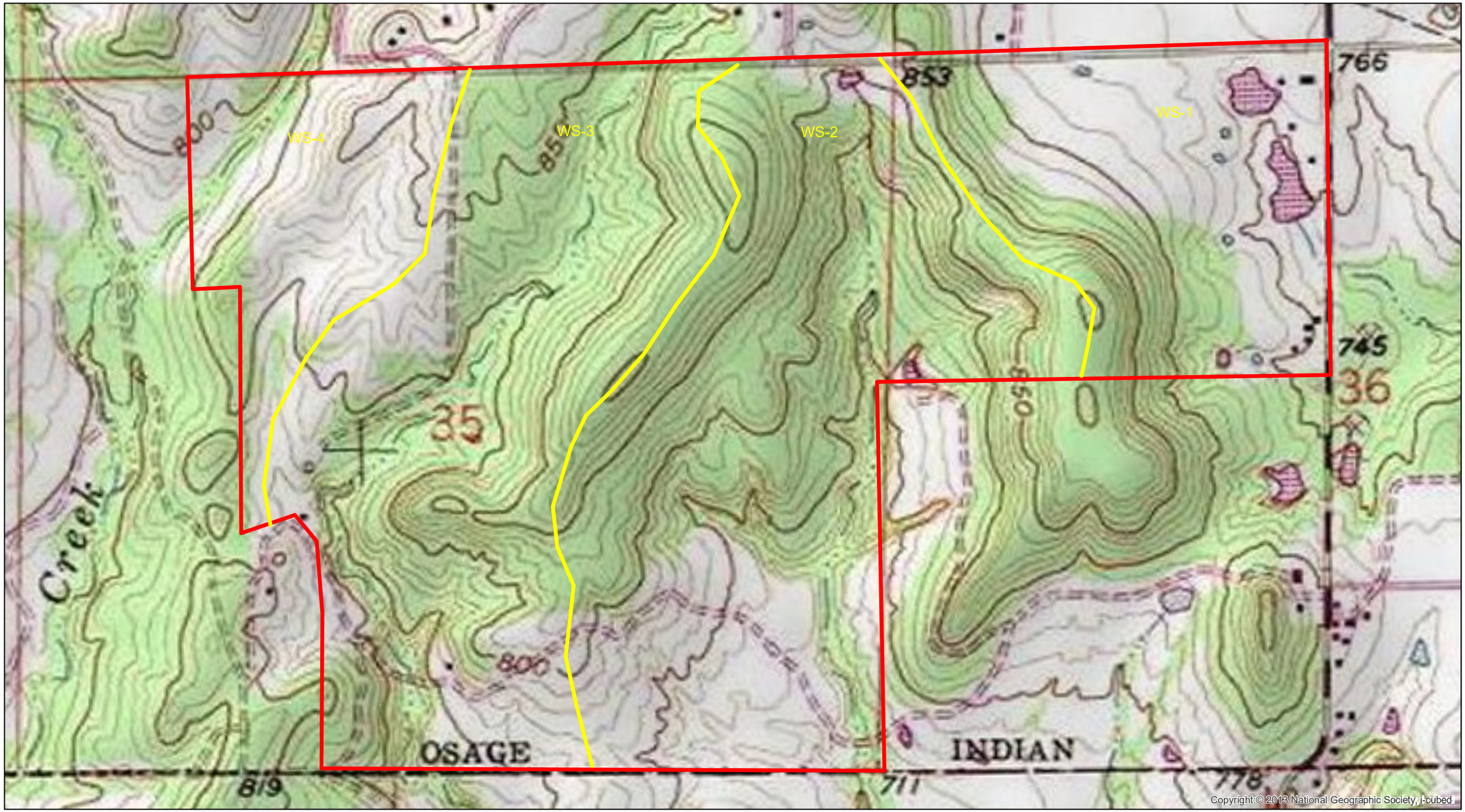

Figure 3. **Topographic Map of AEL Proposed Expansion**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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Appendix B

USFWS Official Species List

USFWS IPAC Resource List

ODWC County by County List of Endangered and Threatened Species

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:
Consultation Code: 02EKOK00-2019-SLI-1477
Event Code: 02EKOK00-2019-E-03451
Project Name: AEL Expansion

March 27, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/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: 02EKOK00-2019-SLI-1477

Event Code: 02EKOK00-2019-E-03451

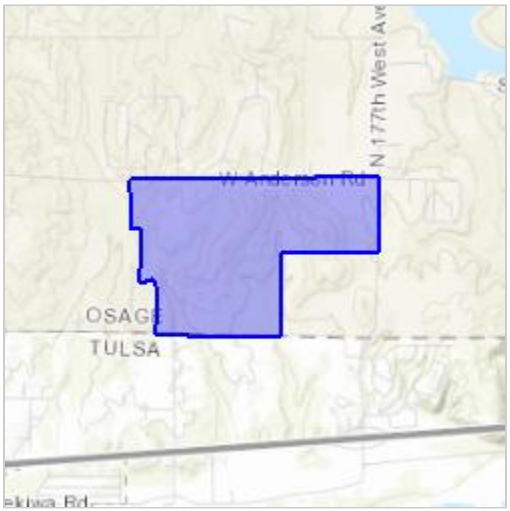
Project Name: AEL Expansion

Project Type: Landfill

Project Description: Landfill Expansion Project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.16725438085243N96.20463310289702W



Counties: Osage, OK | Tulsa, OK

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
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

Birds

NAME	STATUS
Least Tern *Sterna antillarum* Population: interior pop. No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered
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. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: Wherever found, except where listed as an experimental population 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/758	Endangered

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	Endangered
Rattlesnake-master Borer Moth *Papaipema eryngii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7863	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)

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
Harris's Sparrow *Zonotrichia querula* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
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.

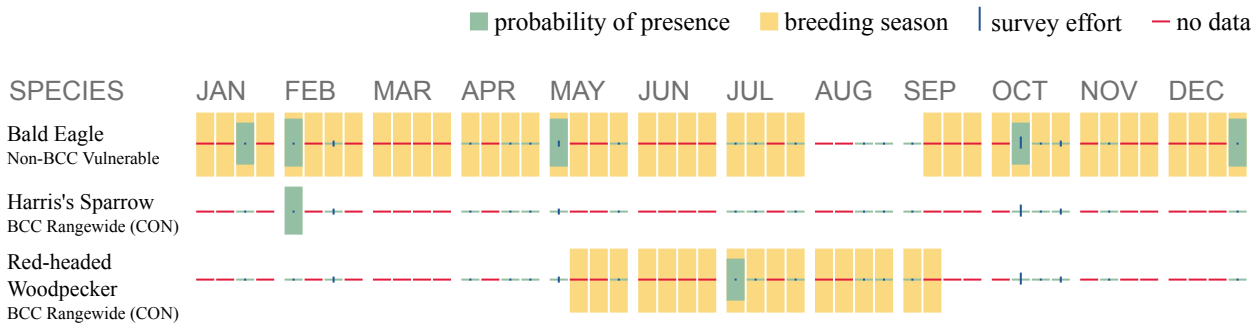
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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 and/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 E-bird Explore Data 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.

FRESHWATER POND

- PUBFh
- PUSCh
- PUBHh
- PUSCx

RIVERINE

- R5UBF

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Osage and Tulsa counties, Oklahoma

Local office

Oklahoma Ecological Services Field Office

(918) 581-7458
(918) 581-7467

9014 East 21st Street
Tulsa, OK 74129-1428

http://www.fws.gov/southwest/es/Oklahoma/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. 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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Least Tern Sterna antillarum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane Grus americana There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/758	Endangered

Insects

NAME	STATUS
American Burying Beetle Nicrophorus americanus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/66	Endangered
Rattlesnake-master Borer Moth Papaipema eryngii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7863	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

You should contact the local field office to determine whether critical habitat for the following species should be considered:

NAME	TYPE
Whooping Crane Grus americana https://ecos.fws.gov/ecp/species/758#crithab	Final

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.

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

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 (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY

	BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
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
Harris's Sparrow Zonotrichia querula This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

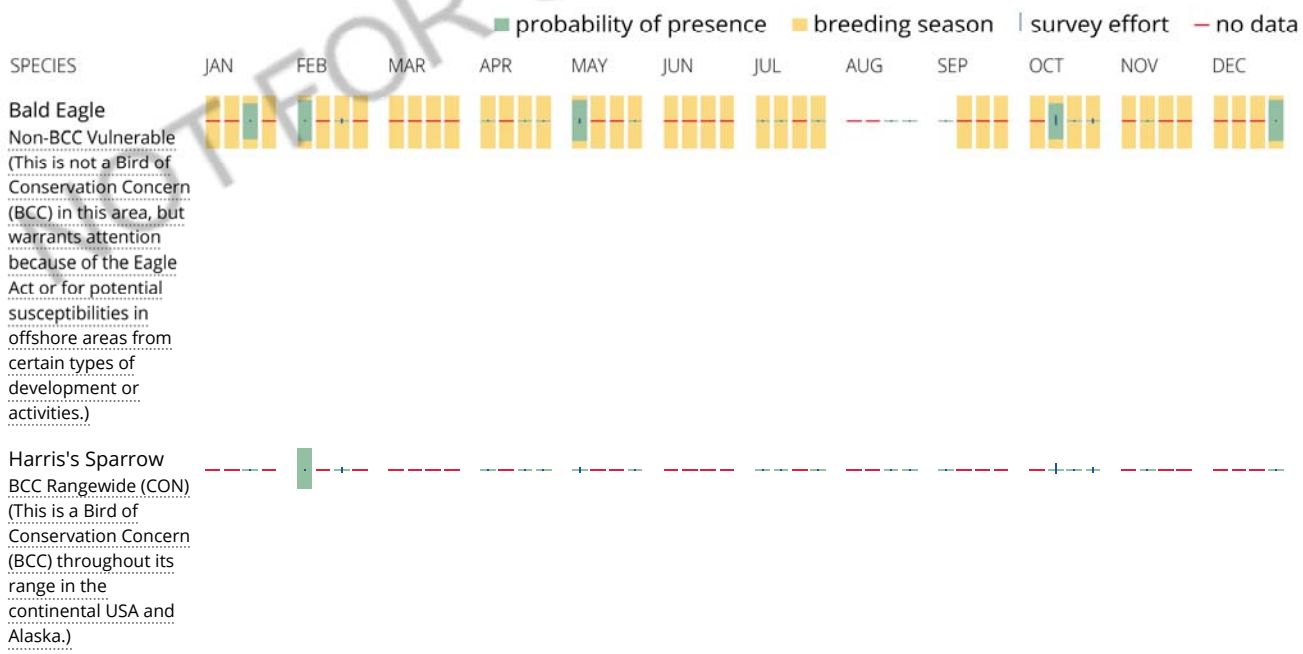
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.



Red-headed Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

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 and/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 E-bird Explore Data 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.

Facilities

National Wildlife Refuge lands

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 AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

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.

This location overlaps the following wetlands:

FRESHWATER POND

- PUBFh
- PUBHh
- PUSCx
- PUSCh

RIVERINE

- R5UBF

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

County by County List of Endangered and Threatened Species

Adair County
State-listed Threatened and Endangered Species:
Neosho Mucket (*Lampsilis rafinesqueana*) – endangered
Long-nosed Darter (*Percina nasuta*) – endangered
Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed threatened and endangered in this county may include:
Gray Bat (*Myotis grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered

Alfalfa County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Whooping Crane (*Grus americana*) - endangered

Atoka County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Beaver County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Whooping Crane (*Grus americana*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Beckham County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Blaine County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Bryan County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Caddo County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Canadian County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Carter County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Cherokee County
State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) - endangered

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (Myotis *grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Choctaw County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Scaleshell (*Leptodea leptodon*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Cimarron County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Mountain Plover (*Charadrius montanus*) – candidate species under evaluation

Cleveland County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Coal County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered

Comanche County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered

Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Cotton County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Craig County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) - endangered
Neosho Madtom (*Noturus placidus*) – threatened
Piping Plover (*Charadrius melodus*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Creek County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Custer County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Delaware County

State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) – endangered
Oklahoma Cave Crayfish (*Cambarus tartarus*) - endangered

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (Myotis *grisescens*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
American Burying Beetle (*Nicrophorus americanus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

Dewey County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered

Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Ellis County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Garfield County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Garvin County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Grady County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Grant County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Greer County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Harmon County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Harper County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Haskell County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Hughes County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Jackson County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Jefferson County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Johnston County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Kay County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Kingfisher County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Kiowa County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Black-capped Vireo (*Vireo atricapillus*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Latimer County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

LeFlore County
State-listed Threatened and Endangered Species:

Black-sided Darter (*Percina maculata*) -threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

Lincoln County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Logan County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Love County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Major County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Marshall County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Mayes County
State-listed Threatened and Endangered Species:

None

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (*Myotis grisescens*) – endangered
Piping Plover (*Charadrius melodus*) – threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Dater (*Etheostoma cragini*) – candidate species under evaluation

McClain County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

McCurtain County
State-listed Threatened and Endangered Species:

Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Red-cockaded Woodpecker (*Picoides borealis*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Winged Mapleleaf (*Quadrula fragosa*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

McIntosh County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Murray County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered

Muskogee County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Noble County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Nowata County
State-listed Threatened and Endangered Species:

Neosho Mucket (*Lampsilis rafinesqueana*) – endangered; historic occurrence in Verdigris River

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Okfuskee County
State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Oklahoma County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Okmulgee County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Piping Plover (*Charadrius melodus*) - threatened

Osage County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Ottawa County
State-listed Threatened and Endangered Species:
Neosho Mucket (*Lampsilis rafinesqueana*)

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Gray Bat (*Myotis grisescens*) – endangered
Ozark Big-eared Bat (*Corynorhinus* (= *Plecotus*) *townsendii ingens*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) – threatened
Neosho Madtom (*Noturus placidus*) – threatened
Ozark Cavefish (*Amblyopsis rosae*) - threatened
Arkansas Dater (*Etheostoma cragini*) – candidate species under evaluation

Pawnee County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Payne County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Whooping Crane (*Grus americana*) – endangered

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pittsburg County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pontotoc County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Pottawatomie County
State-listed Threatened and Endangered Species:
none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Arkansas River Shiner (*Notropis girardi*) – threatened

Pushmataha County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Red-cockaded Woodpecker (*Picoides borealis*) - endangered
Ouachita Rock Pocketbook (*Arkansia wheeleri*) – endangered
Scaleshell (*Leptodea leptodon*) - endangered
Winged Mapleleaf (*Quadrula fragosa*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Leopard Darter (*Percina pantherina*) - threatened

Roger Mills County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Rogers County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Seminole County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened

Sequoyah County

State-listed Threatened and Endangered Species:

Long-nosed Darter (*Percina nasuta*) - endangered
Black-sided Darter (*Percina maculata*) - threatened

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Indiana Bat (*Myotis sodalis*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Stephens County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Texas County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Mountain Plover (*Charadrius montanus*) – candidate species under evaluation

Tillman County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Tulsa County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact

the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

American Burying Beetle (*Nicrophorus americanus*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Wagoner County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened

Washington County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Piping Plover (*Charadrius melodus*) - threatened

Washita County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:
Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered

Woods County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation

Woodward County

State-listed Threatened and Endangered Species:

none

Federal-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Please contact the U.S. Fish and Wildlife Service for the most accurate and current information. Federally listed endangered and threatened species in this county may include:

Whooping Crane (*Grus americana*) – endangered
Interior Least Tern (*Sterna antillarum*) - endangered
Piping Plover (*Charadrius melodus*) - threatened
Arkansas River Shiner (*Notropis girardi*) – threatened
Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) – candidate species under evaluation
Arkansas Darter (*Etheostoma cragini*) – candidate species under evaluation

From: Echo-Hawk, Patricia
To: Weaver, Vaughn
Subject: Re: AEL TES Summary report
Date: Monday, February 10, 2020 9:55:48 AM
Attachments: image001.jpg

Greetings Vaughn,

I've reviewed the TES report you recently sent, the survey methods, and the negative results for the presence of T&E species.

The Service concurs with the determination of "not likely to adversely affect" for American burying beetle and Northern long-eared bat. As there is no habitat for the rattlesnake master borer moth, a "no affect" determination is more accurate in this instance.

Thank you for consulting with the Service.

Best Regards,

Patricia D. Echo-Hawk
Fish and Wildlife Biologist
Region 2 Dive Officer

U.S. Fish and Wildlife
Oklahoma Ecological Services Field Office
9014 E. 21st Street
Tulsa, OK, 74129
phone # 918-382-4505
fax # 918-581-7467

Patricia_echo-hawk@fws.gov

Anyone can find the dirt in someone. Be the one that finds the gold.
Only when the last tree has died, the last river poisoned and the last fish caught, will we realize we can't eat money.
-Cree Proverb

From: Weaver, Vaughn <VWeaver@scsengineers.com>
Sent: Wednesday, February 5, 2020 4:59 PM
To: Echo-Hawk, Patricia
Subject: [EXTERNAL] AEL TES Summary report

Patricia,

I talked with you last week about submitting a TES report for the AEL proposed expansion. After we talked, I learned that there was not a report completed a report was completed.

Now that the report is done, how would you like to receive it. Traditional mail/hard copy with an electronic CD or an electronic copy be sufficient.

Sorry for the delay in getting this report to you.

Vaughn Weaver
Senior Project Professional
[SCS_Engineers_short_bar-small]
11120 E. 26th Street North
Suite 1100
Wichita, Kansas 67226
Office: 316-315-4501
Fax: 316-315-4505
Mobile: 316-207-7130

Oklahoma Biological Survey

OBS Ref. 2020-090-BUS-SCS

Dear Mr. Weaver, Feb. 6, 2020

We have reviewed occurrence information on federal and state threatened, endangered or candidate species, as well as non-regulatory rare species and ecological systems of importance currently in the Oklahoma Natural Heritage Inventory database for the following location you provided:

Sec. 35 and 36-T20N-R10E, Osage County

We found 16 occurrence(s) of relevant species within the vicinity of the project location as described.

Species Name	Common Name	Federal Status
Sternula antillarum athalassos	**Interior Least Tern**	**Endangered**
County	***TRS***	***Count***
Tulsa	Sec. 12-T19N-R10E	1
Haliaeetus leucocephalus	**Bald Eagle**	**Protected**
County	***TRS***	***Count***
Tulsa	Sec. 2-T19N-R10E	1
Tulsa	Sec. 9-T19N-R10E	1
Tulsa	Sec. 11-T19N-R10E	1
Tulsa	Sec. 12-T19N-R10E	2
Tulsa	Sec. 5-T19N-R11E	1
Tulsa	Sec. 6-T19N-R11E	1
Tulsa	Sec. 7-T19N-R11E	1
Tulsa	Sec. 8-T19N-R11E	1
Tulsa	Sec. 9-T19N-R11E	2
Tulsa	Sec. 10-T19N-R11E	1
Tulsa	Sec. 15-T19N-R11E	1
Osage	Sec. 21-T20N-R10E	1
Osage	Sec. 24-T20N-R10E	1

Additionally, absence from our database does not preclude such species from occurring in the area.

If you have any questions about this response, please send me an email, or call us at the number given below.

Although not specific to your project, you may find the following links helpful.

ONHI, guide to ranking codes for endangered and threatened species:
http://vmpincel.ou.edu/heritage/ranking_guide.html

Information regarding the Oklahoma Natural Areas Registry:
http://www.oknaturalheritage.ou.edu/registry_faq.htm

Todd Fagin
Oklahoma Natural Heritage Inventory
(405) 325-4700
tfagin@ou.edu

Oklahoma Conservation Commission

January 27, 2020
27216290.00

Mr. Brooks Tramell
Director of Monitoring, Assessment and Wetlands Programs
Oklahoma Conservation Commission
2800 N. Lincoln Blvd, Suite 200
Oklahoma City, OK 73105
405-545-6997
Brooks.tramell@conservation.ok.gov

Subject: **Review Wetland Assessment Report for American Environmental Landfill Proposed Expansion.**

Transmitted via e-mail to brooks.tramell@conservation.ok.gov.

Dear Mr. Tramell:

SCS Engineers (SCS) is submitting this request for project review on behalf of American Environmental Landfill (AEL) for a proposed western expansion of an active landfill located northwest of Sand Springs in Osage County, Oklahoma. The Subject Site includes approximately 317 acres in the E1/2 and the E1/2 of the SW1/4 of Section 35, T20N, R10E, near Latitude 36.166643 Longitude -96.203007. See Figure 1 for a more detailed Subject Site boundary.

This request for project review is submitted in conjunction with an application for an Individual Permit (IP) with the U.S. Army Corps of Engineers (USACE). The Bureau of Indian Affairs is also involved in the proposed project due to the location of the Subject site on Osage Reservation Land.

Included with this letter is the completed wetland assessment report. An Approved Jurisdictional Determination (AJD) has been made by US. Army Corps of Engineers for the Subject Site. The IP for this project is accepting the AJD that there are four jurisdictional features that include:

- Three jurisdictional ephemeral stream channels
- One jurisdictional pond

If there are any question or comments regarding the attached reports or figures, please contact:

Vaughn Weaver
1100 E. 26th St. North, Suite 1100
Wichita, KS. 67226
316-494-7518
vweaver@scsengineers.com

Thank you for your time in reviewing these project documents.

Sincerely,

Vaughn Weaver
Senior Project Professional
SCS Engineers

Encl. Figure 1 and Preliminary Wetland Jurisdictional Determination Report SWT-2018-578

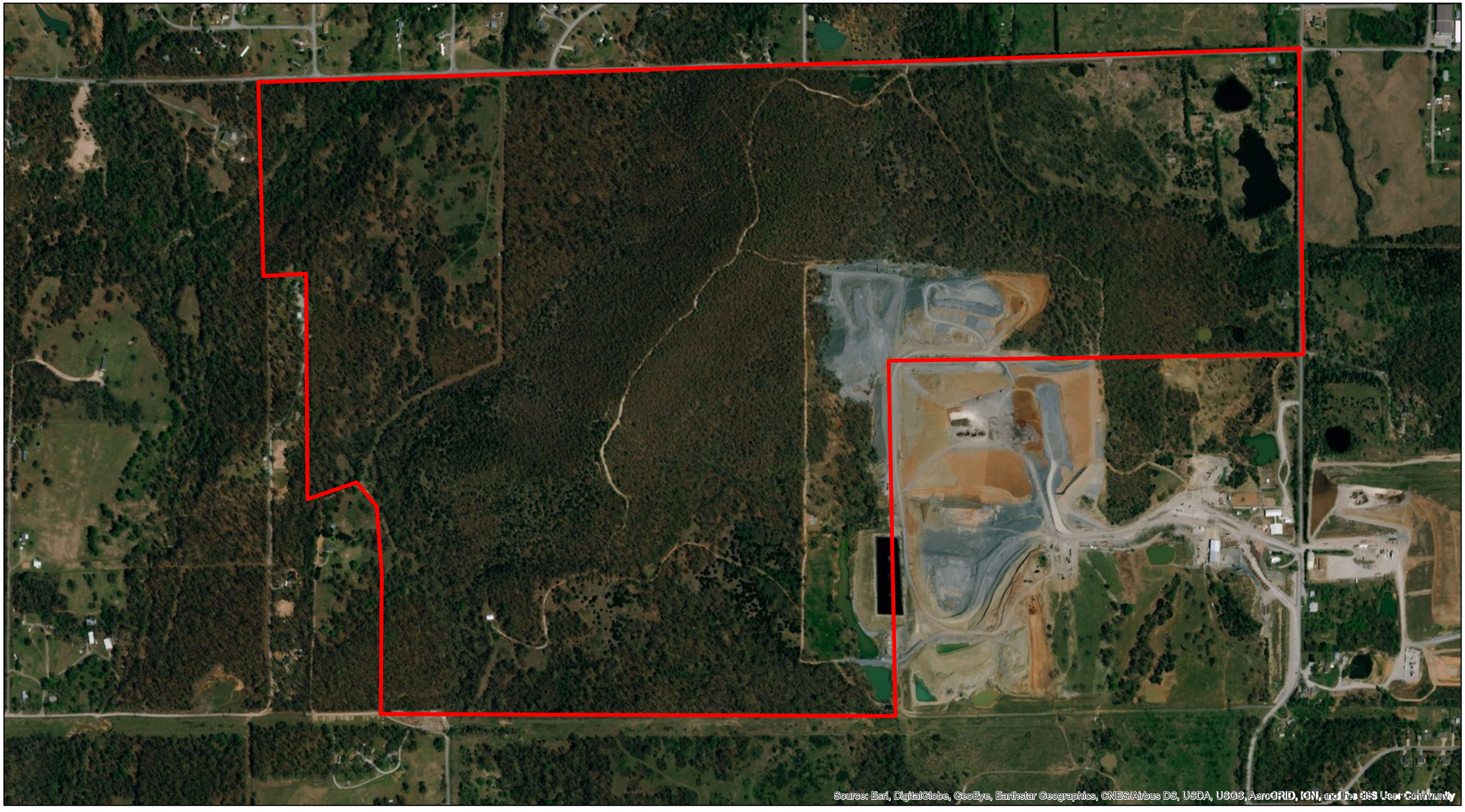


Figure 1. **Aerial Photograph of the AEL Subject Site**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

N

SCS ENGINEERS
CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501

Preliminary Wetland Jurisdictional Determination Report
SWT-2018-578

American Environmental Landfill Proposed Lateral Expansion
Sections 35 and 36, Township 20 South
Range 10 East
Osage County, Oklahoma

American Environmental Landfill
207 North 177th West Avenue
Sand Springs, Oklahoma
(918) 245-7786

SCS ENGINEERS

27216290.00 | November 26, 2018

1817 Commons Circle, Suite 1
Yukon, Oklahoma 73099
(405) 265 3960

November 27, 2018
File No. 27216290.00

Mr. Marcus Ware
U.S. Army Corps of Engineers
Regulatory Branch
1645 South 101st East Avenue
Tulsa, OK 74128-4629

Subject: **American Environmental Landfill**
SWT-2018-578

Dear Mr. Ware:

On behalf of American Environmental Landfill, SCS Engineers (SCS) is submitting the Preliminary Wetlands Jurisdictional Determination Report for the proposed lateral expansion of the active landfill. We trust that the report includes all of the information sufficient for your review.

If you have any questions or comments, or need additional information, please do not hesitate to contact the undersigned at (405) 265-3960. Thank you for your time and effort in this matter.

Sincerely,

Vaughn Weaver
Senior Project Professional
SCS ENGINEERS

Amy Dzialowski
Project Director
SCS ENGINEERS

cc: Mr. Todd Green – American Environmental Landfill

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Section Page

1 EXECUTIVE SUMMARY

1.1 PURPOSE

SCS Engineers (SCS) has completed a wetlands determination and delineation for a proposed lateral expansion of the active American Environmental Landfill (AEL) located northwest of Sand Springs, Oklahoma. The proposed lateral expansion would include state required permitting of land adjacent to the west and north of the current AEL permitted boundary for development. As part of the state permitting process, an assessment of jurisdictional waters of the United States (WOTUS) regulated by the U.S. Army Corps of Engineers (USACE) is required. Wetland determination and delineations are part of the assessment process.

For the purpose of this report, wetland(s) are defined as any hydric feature that may be identified as WOTUS and could be subject to USACE jurisdictional authority. These hydric features can include, but are not limited to:

- Rivers, Streams, Creeks
- Swamps, Bogs, Playas, Fens, Marshes
- Ponds, Lakes, Reservoirs

Field identified wetland features are identified as "Potential Wetlands" to denote that they may or may not be under USACE jurisdictional control. Upon request, the USACE will provide jurisdictional determinations (JD) on identified hydric features.

1.2 PROJECT AREA DESCRIPTION

The project area includes approximately 463 acres on the west and north sides of the existing permit boundary (Subject Site) **(Appendix A, Figure 1)**. From the intersection of Anderson Road and N 177th West Avenue in Osage County, OK, the Subject Site extends west approximately 1.3 miles and south approximately 0.83 miles. This described boundary also includes part of the existing AEL permitted operations and is not considered part of the Subject Site. The following insert from Figure 1 indicates the identified Subject Site.

AEL is located 3.25 miles northwest of Sand Springs, Oklahoma. The Subject Site is located in the East 4/5 of Section 35 and the NW 1/4 of Section 36, T20N, R10E near Latitude 36.166643, Longitude -96.203007. The vegetative cover consists predominantly of mature oak/hickory woodlands located on steep sloping hills and grassland/pastures located on flat areas in the northeast and northwest corners of the Subject Site.

Figure 1. The proposed Subject Site.

The Subject Site was divided into four watersheds (WS) for easier discussion of identified features. A review of publicly available data identified thirteen potential wetland features within the Subject Site **(Appendix A, Figure 3)**. There were ten additional mapped wetland features within 0.25 miles of the Subject Site.

1.3 ASSESSMENT

The preliminary wetland determinations were performed in accordance with the USACE Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the USACE Wetland Delineation Manual: Midwest Region (Version 2.0) (USACE 2010). Evaluations determined if the features met the three USACE wetland criteria:

1. Dominant Hydrophytic Vegetation
2. Hydric Soil Characteristics
3. Presence of Hydrology

Figure 2. The Subject Site with described watershed divisions.

In addition to the physical characteristics that are used to identify wetlands, a significant nexus with WOTUS must exist for these features to be subject to jurisdictional authority of the USACE.

On May 24-25, and August 1-2, 2018 SCS staff conducted field assessments that included wetland determination and edge delineations for fourteen potential wetlands (W-1, W-2, through W-14) and

center of channel delineations for three stream segments (S-1, S-2 and S-3) **(Table 1) (Appendix A, Figure 8)** within the Subject Site. Five features, identified from the desktop review and assessed in the field, failed to exhibit the three required wetland characteristics (D-1 through D-5). Three desktop identified features (NHD 1, NWI 10, and NWI 11) were not assessed during the site visit because the feature(s) no longer exists or were not found. An attempt by SCS field staff to locate and examine these three features was completed when assessments for these general locations were made.

In Field Identified Feature	Desktop Identified Feature	Exhibits all three Corps Features	Possible Significant Nexus with WOTUS	Delineated Length / Acres of Feature
W-1	NWI 9	Yes	--	0.31 Ac
W-2	**--**	**Yes**	**Yes**	**0.08 Ac**
W-3	Photo	Yes	--	0.18 Ac
W-4	--	Yes	--	0.034 Ac
W-5	--	Yes	--	0.039 Ac
W-6	--	Yes	--	0.018 Ac
In field Identified Feature	**Desktop Identified Feature**	**Exhibits all three Corps Features**	**Possible Significant Nexus with WOUS**	**Delineated Length / Acres of Feature**
W-7	Topo 1	Yes	--	0.148 Ac
W-8	Photo	Yes	--	0.019 Ac
W-9	NWI 7	Yes	--	0.29 Ac
W-10	NWI 6	Yes	--	0.19 Ac
W-11	NWI 2	Yes	--	0.24 Ac
W-12	**NWI 4**	**Yes**	**Yes**	**2.93 Ac**
W-13	NWI 1	Yes	--	0.14 Ac
W-14	**NWI 3**	**Yes**	**Yes**	**1.11 Ac**
S-1	**NWI 12**	**Yes**	**Yes**	**4,494 Ft**
S-2	**NWI 8**	**Yes**	**Yes**	**147 Ft**
S-3	**NWI 13**	**Yes**	**Yes**	**1,285 Ft**
D-1	NWI 8	No	--	1.514 Ft
D-2	NWI 8	No	Yes	3.15 Ac
D-3	NWI 8, 11	No	Yes	380 Ft
D-4	NWI 12	No	Yes	3,243 Ft
D-5	NWI 5	No	Yes	--
--	NHD 1	--	--	--
--	NWI 10	--	--	--
--	NWI 11	--	--	--

Table 1. Assessed hydric features identified from desktop and/or field verification.

1.4 SUMMARY OF FINDINGS

Twenty-five potential hydric features were identified from a review of available public databases and a completed site assessment of the subject site. Of these twenty-five features, field staff assessed twenty-two. Each of these twenty-two features were assessed as to the probability of being jurisdictional based on the criteria of exhibiting the three hydric criteria and having a potential significant nexus with WOTUS.

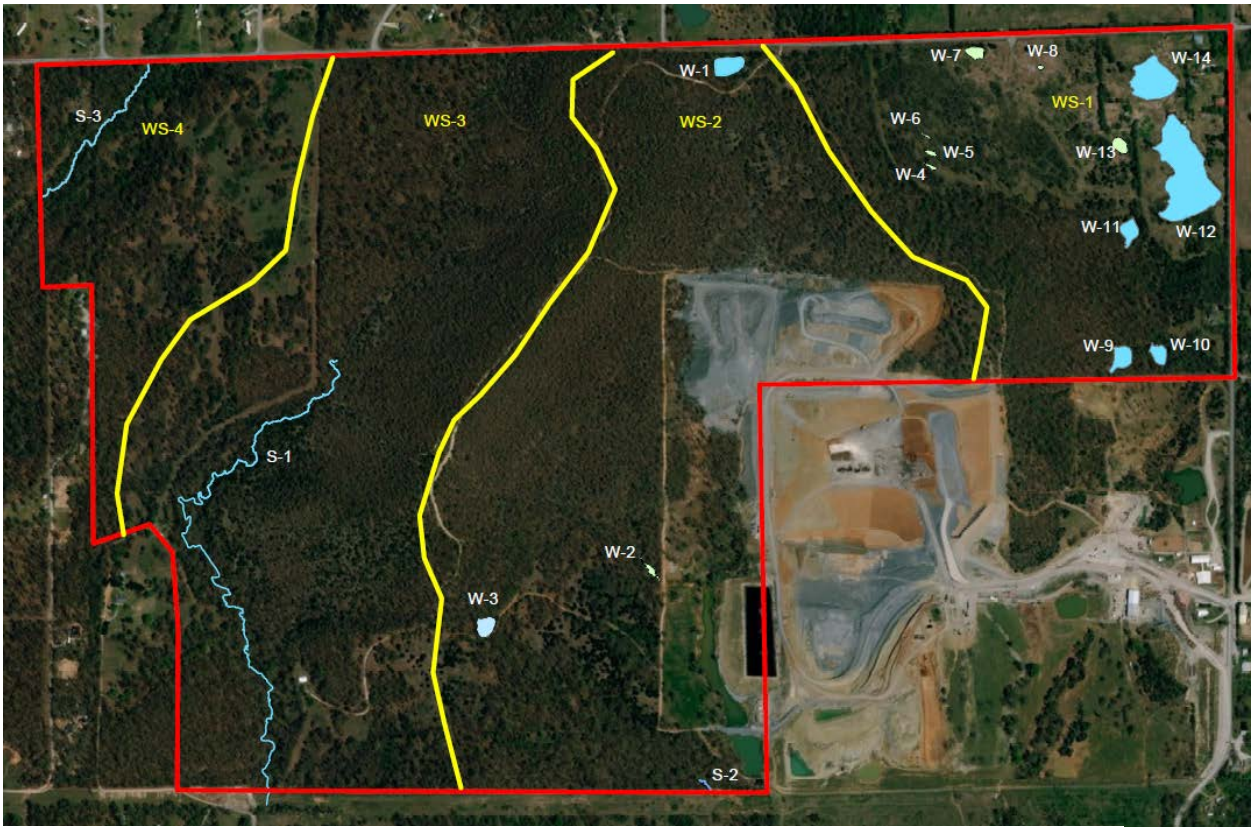


Figure 8. Subject Site's wetland features that exhibit all three hydric characteristics.

Of the twenty-five identified features:

- It is SCS's opinion that six wetland features appear to have a significant nexus with WOTUS and therefore would have jurisdictional oversite from the USACE
    - Wetlands/ponds – W-2, W-12, W-14,
    - Streams – S-1, S-2, and S-3
- Eleven features exhibited all three of the discussed hydric characteristics but a significant nexus could not be established.
- Five NWI mapped features were designated as non-qualified wetlands because they did not exhibit one or more of the required hydric characteristics used by the USACE to identify potential jurisdictional wetland.
- Three desktop identified features were not assessed during the site visit because they no longer exist or were not able to be located.

SCS recognizes that the USACE has the official authority to make rulings on jurisdictional determinations. The findings in this report are based on SCS's understanding of current rules that are used by the USACE to determine their jurisdictional responsibility. This report is being provided to assist the USACE in their determinations for the discussed features within this report.

2 PROJECT OVERVIEW

SCS completed a wetlands determination and delineation for a proposed lateral expansion of the active landfill northwest of Sand Springs, Oklahoma. The proposed lateral expansion would include the permitting of land, adjacent to the north and west of the current AEL landfill permit boundary for development. The State of Oklahoma solid waste permitting process requires that consultation with the USACE be completed prior to state approval. Wetland determinations and delineations were completed to determine if impacts to WOTUS may occur within the Subject Site and could possibly incur impacts as a result of the proposed lateral expansion. The project area is approximately 463 acres and located adjacent to the western and northern boundaries of the existing permitted boundary located approximately 3.25 miles northwest of Sand Springs in Osage County, Oklahoma **(Appendix A, Figure 1)**.

3 SCOPE

This preliminary wetland determination report will include the following components:

- Background document review of published data that helps identify existing and historic hydric features
- Field reconnaissance to identify location and size of wetlands within the Subject Site
- Generation of maps illustrating the size and location of field identified wetlands
- Preparation of this report summary for submittal

The term "wetland" in this report is consistent with the NWI database use, which includes all forms of hydric features as wetlands. For the purpose of this report, wetland(s) are defined as any hydric feature that maybe identified as WOTUS and could be subject to USACE jurisdictional authority. These hydric feature can include, but not limited to:

- River, Streams, and Creeks
- Swamps, Bogs, Playas, Fens, Marshes
- Ponds, Lakes, Reservoirs

Field identified wetland features are identified as potential wetlands to denote that they may not be under USACE jurisdictional control. Upon request, the USACE will provide jurisdictional determinations on identified hydric features.

This report will utilize published and field collected data to determine if potential wetlands satisfy the necessary jurisdictional criteria identified by the USACE. This report is a preliminary determination and can be submitted, along with a JD request, to the USACE. Recommendations in this report on potential JD designations are SCS's opinion based on available data.

3.1 PUBLISHED DATA REVIEW

A review of publically available information for the Subject Site was performed in order to evaluate the overall water resource characteristics of the Subject Site. This review included:

- Aerial imagery,
- NWI maps,
- United States Geological Survey (USGS) topographic maps,
- National Hydrography Dataset (NHD),
- Federal Emergency Management Agency (FEMA) Federal Insurance Rate Map (FIRM), and
- the United States Department of Agriculture Natural Resource Conservation Service (NRCS) County Soil Survey maps

A field investigation was conducted to determine if published and unpublished wetlands or watercourses are located within the Subject Site and to delineate WOTUS boundaries, as required for potential jurisdictional determination under Section 404 of the CWA.

3.2 FIELD PROCEDURES

SCS followed wetland preliminary determination method guidelines outlined in the USACE Wetlands Delineation Manual and the Regional Supplement to the USACE Wetland Delineation Manual: Midwest Region (Version 2.0) (USACE, 1987) (USACE, 2010). A wetland determination is typically based on a three-parameter approach that requires evidence of the following wetland indicators:

1. Dominant Hydrophilic Vegetation
2. Hydric Soil Characteristics
3. Presence of Wetland Hydrology

A potential wetland must meet all three wetland indicator criteria (except where noted in the USACE 1987 and 2010 manuals) to be considered a jurisdictional wetland. Hydric plant and soils for each potential wetland area are used to delineate the wetland boundary. A significant nexus may not be determined in the field. The use of desktop and field collected data will be used to assess a potential significant nexus for each field identified potential wetland feature that exhibits the three previously described wetland characteristics.

4 PROJECT LOCATION AND SITE DESCRIPTION

The project area includes approximately 463 acres on the west and north sides of the existing permit boundary (Subject Site) **(Appendix A, Figure 1)**. From the intersection of Anderson Road and N 177th West Avenue in Osage County, OK, the Subject Site extends west approximately 1.3 miles and south approximately 0.83 miles.

AEL is located 3.25 miles northwest of Sand Springs, Oklahoma. The Subject Site is located in the East 4/5 of Section 35 and the NW 1/4 of Section 36, T20N, R10E near Latitude 36.166643, Longitude -96.203007. The vegetative cover consisted predominantly of mature oak/hickory woodlands located on steep sloping hills and grassland/pastures located on flat areas in the northeast and northwest corners of the Subject Site.

Figure 1. Subject Site Area.

The Subject Site is located within portions of four watersheds **(Appendix A, Figure 2)**. These watersheds are identified from east to west as:

- Watershed 1 (WS-1) is located along the west side of North 177th West Avenue
- Watershed 2 (WS-2) is located adjacent to the west side of WS-1
- Watershed-3 (WS-3) is located adjacent to the west side of WS-2
- Watershed 4 (WS-4) is located adjacent to the west side of WS-3

4.1 WATERSHED LOCATION DESCRIPTION

Figure 2. Subject Site with the identified watersheds.

WS-1 is located in the north east corner of the Subject Site and sheds water toward the southeast (Appendix A, Figure 2). Land cover is a combination of woodland, grassland, and several homesteads. Three homesteads are located along the west side of North 177th West Avenue. The terrane in this watershed is a combination of steep hillsides and flat grasslands. The steep hillsides are dominated by mature woodlands and rock outcroppings. Several drainages channels were observed along the steep slopes. The grasslands are flat and appear to have been used for grazing livestock as there were several fence rows and a small coral. The soils in the grasslands were dominated by silty loam over clay/clay loam.

WS-2 is located along the west edge of WS-1 and encompasses the length of the Subject Site from the northern to the southern boundaries (Appendix A, Figure 2). This watershed is dominated by steep sloping hills with mature woodlands. A steep drainage channel, which starts near the northern boundary, traverses the Subject Site from the north to the south. The southeastern half of this watershed is the current AEL operation. The western slope of this watershed has remained mostly undisturbed with the woodland cover and large rock outcropping.

WS-3 is located along the western side of WS-2 and encompasses the length of the Subject Site from the northern to the southern boundaries (Appendix A, Figure 2). This watershed is similar to WS-2 with steep slopes dominated by mature woodlands. The drainage channel traverses from the north to the south across the Subject Site. The western slope of WS-3 has a section of grassland along the northwest corner of this watershed in the Subject Site. Much of this watershed is undisturbed except for an abandoned homestead near the southern Subject Site border

WS-4 is located along the northwest corner of the Subject Site along the west side of WS-3 (Appendix A, Figure 2). This watershed is a combination of prairie and mature woodlands. A diverse plant community of prairie plants, shrubs, and trees is present throughout this watershed. A stream channel traverses this watershed from the northeast to the southwest entering the Subject Site along the northern border and exits the site along the western border. The soil throughout this watershed is dominated by a sandy/sandy-loam soil. This watershed's terrain exhibits a more gradual slope than the other three watershed's hilly slopes

4.2 ECOREGION DESCRIPTION

The Subject Site is located within the Northern Cross Timbers (Level 4 Ecoregion) of the Cross Timbers (Level 3 Ecoregion) of Oklahoma (Woods, 2005). This region is characterized by a mosaic of oak savanna, scrubby oak forest, and tall grass prairie naturally covering the hills, cuestas, and ridges. Tall grass prairie naturally occurs on fine-textured soils derived from limestone or shale. Soils are highly erodible when disturbed. There are two common stream types. A mixture of shaded riffles, runs, and pools that have gravel or cobble substrates characterizes the first. The second stream type has lower gradients and is found typically downstream of the first, it is characterized by wide, shallow, sand-chocked channels. Uplands are mantled by Quaternary clayey silt-to-silt clay decomposition residuum, and sandy decomposition residuum. Valleys are veneered with Quaternary alluvium. The area is underlain by Pennsylvanian and Permina-age sandstone, shale, and limestone. Where rock outcrops occur sandstone blocks and boulders often litter hilltops and slopes. Soils consist of sandy and clayey residuum and colluvium overlaying Pennsylvanian sandstone, limestone and shale. The common soil series in this region for uplands include Darnell, Stephenville, Niotaze, Steedman, Coweta, Dennis, Bates, Clarita, Durant, Shidler, Newalla, Harrah, Chigley, and Konawa. The common soil series for floodplains include Verdigris, Port, Pulaski, and Garvin. Native vegetation is a combination of oak-hickory woodland and tallgrass prairie. Woodland areas are dominated by post oak (*Quercus stellate*), and blackjack oak (*Q. marilandica*) while tall grass prairie is dominated by big bluestem (Andropogon gerardii), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and Indiangrass (*Sorghastrum nutans*). Current land cover is woodland, grassland, rangeland, pastureland, and limited cropland. The main crops in this region are small grains, grain sorghum, hay and soybeans.

5 PUBLISHED DOCUMENTATION REVIEW

A desktop review was performed utilizing NWI Maps **(Appendix A, Figure 3)**, aerial photographs **(Appendix A, Figure 1)**, USGS Topographic Maps **(Appendix A, Figure 4)**, NHD **(Appendix A, Figure 5)**, FEMA National Flood Hazards Maps **(Appendix A, Figure 6)**, and NRCS County Soil Survey Maps **(Appendix A, Figure 7)**. These resources were reviewed for the Subject Site to evaluate the potential location and extent of wetlands, watercourses, and other aquatic features.

5.1 NATIONAL WETLANDS INVENTORY MAP REVIEW

SCS conducted a NWI review of the Subject Site for preliminary determination for the presence, location and size of potential wetlands located entirely or partially within the Subject Site. The U.S. Fish and Wildlife Service (USFWS) generates NWI Maps through aerial imagery review, which may not accurately depict the extent or location of wetlands in an area **(Appendix A, Figure 3)**. According to the NWI data, thirteen mapped wetland features are located within the boundary of the Subject Site (USFWS, 2016). These wetlands are identified as:

Figure 3. NWI mapped features within the Subject Site.

5.1.1 WS-1 NWI FEATURES

1. **NWI-1**: A 0.19 Acre PUSCx (Palustrine, Unconsolidated Shore, Seasonally Flooded, Excavated) freshwater pond located near the north-center of the WS-1 Subject Site area.
2. **NWI-2**: A 0.20 Acre PUSCx freshwater pond located near the south-center of the WS-1 Subject Site area.
3. **NWI-3**: A 1.34 Acre PUBFh (Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded) freshwater pond located near the northeast corner of the WS-1 Subject Site area.

4. NWI-4: A 1.77 Acre PUBHh (Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded) freshwater pond located near the eastern Subject Site boundary, south of the 1.34 Acre PUBFh freshwater pond.
5. NWI-5: The northwest end of a 2.44 Acre R5UBF (Riverine, Unknown Perennial, Unconsolidated Bottom, Semipermanently Flooded) riverine habitat that begins at the southwest side of the previously discussed 1.77 Acre PUBHh freshwater pond. This riverine feature traverses off the Subject Site toward the southeast.
6. NWI-6: A 0.22 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary.
7. NWI-7: A 0.20 Acre PUBFh freshwater pond located adjacent to the southern Subject Site boundary and west of the previously identified 0.22 Acre PUBFh freshwater pond.

5.1.2 WS-2 NWI FEATURES

1. NWI-8: A 8.16 Acre R5UBF riverine feature located along the western third of the Subject Site running generally from the north to the south of the Subject Site.
2. NWI-9: A 0.25 Acre PUSCh (Palustrine, Unconsolidated Shore, Seasonally Flooded, Dike/Impounded) freshwater pond located near the north border of the Subject Site.
3. MW-10: A 0.22 Acre PUBFh freshwater pond is located near the center of WS-2 along the east slope.
4. NWI-11: A 0.11 Acre PUSCh freshwater pond located near the southeast corner of the subject site.

5.1.3 WS-3 NWI FEATURES

1. NWI-12: A 6.33 Acre R5UBF riverine feature located along the eastern third of the Subject Site running generally from the north to the south of the Subject Site.

5.1.4 WS-4 NWI FEATURES

1. NWI-13: A mid portion of a 6.21 Acre R5UBF riverine feature along the northwest corner of the WS-4 Subject Site Area.

5.1.5 NWI FEATURES NEAR THE SUBJECT SITE

Ten NWI wetlands are mapped within 0.25 mile of the Subject Site. The NWI-mapped wetland designations on surrounding properties include:

1. A 0.21 Acre PUBFh freshwater pond is located approximately 0.11 miles north of the WS-1 Subject Site.
2. A 0.28 Acre PUBFh freshwater pond is located approximately 0.14 miles north of the WS-1 Subject Site.
3. A 0.65 Acre R5UBF riverine habitat located approximately 0.22 miles north of the WS-1 Subject Site.
4. A 0.30 Acre PUBFx freshwater pond located approximately 0.13 miles southeast of WS-1 Subject Site.
5. A 0.75 Acre PUBFh freshwater pond located approximately 0.10 miles south of WS-1 and 0.44 miles east of WS-2.

6. A 0.22 Acre PUBFh (Palustrine, Unconsolidated bottom, Semipermanently flooded, Dike/Impounded) freshwater Pond adjacent to the center of the WS-2 eastern Subject Site boundary.
7. A 0.74 Acre PUBFh freshwater pond is located approximately 0.18 miles north of the WS-2 Subject Site.
8. A 0.32 Acre PUSCh freshwater pond located approximately 0.09 miles east of the south corner of the WS-2 Subject Site.
9. A 0.25 Acre PUBFh freshwater pond is located approximately 0.19 miles south of the WS-3 Subject Site.
10. A 6.98 Acre PF01A (Palustrine, Forested, Broad-Leaved deciduous, Temporary flooded) freshwater forested/shrub wetland is located approximately 0.12 miles west of the west edge of the WS-4 Subject Site.

All of the NWI freshwater ponds appear to be excavated/impounded freshwater ponds.

5.2 AERIAL PHOTOGRAPH REVIEW

Aerial photographs dated 2018-2015, 2013-2010, 2008, 2006-2003, and 1995 were reviewed using Google Earth Pro Inc. (Google Earth 2018). Aerial photographs were reviewed to identify potential wetlands or other hydrological features located within or in close proximity to the Subject Site. A review of historic aerial photographs helps to identify potential hydric features that may not be observed from year to year or in current aerial photographs. Visible landscape features around the Subject Site include pasture/grassland and woodland areas with multiple ponds of varying sizes. The Subject Site was dominated by woodlands and grasslands **(Appendix A, Figure 1)**. A total of 14 observable ponds/potential wetlands and three drainage/stream channels were observed within the Subject Site in aerial photographs.

5.2.1 WS-1 AERIAL REVIEW

A review of aerial photographs for WS-1 revealed a total of eight potential wetland features within this watershed. From 1995 through 2008, this watershed contained seven potential water features including **W-7**, **W-9** through **W-14.** After 2009, an additional small water feature (**W-8**) was observed east of a pump-jack installed sometime between June 2005 and April 2006. A drainage channel could be seen, when leaf cover was minimal, along the southern third of this watershed traversing from the west to the east and ending near a small pond (**W-13**).

5.2.2 WS-2 AERIAL REVIEW

A review of aerial photographs for WS-2 identified seven possible wetland features including a drainage/stream channel within the WS-2 watershed located in the Subject Site. Starting in 1995, three ponds were observed near the center drainage line of the watershed and included:

- **NWI-8** (**D-1, D-2**)
- **W-1** (**NWI-9**)
- **NWI-10**
- **NWI-11**

These ponds all appear to have a constructed dike structure/access road that has restricted or dammed water draining from the surrounding watershed. Starting in 2003, a fourth pond could be seen on the west slope of WS-2 (**W-3)**. This new pond appears along the west side of a recently constructed two-track road. After March 2015 two more hydric features (one pond (**D-1**), one potential wetland (**W-2**)) could be observed within WS-2. Five of the six ponds could be observed in 2018 aerial imagery.

- **NWI-9 (W-1)**
- **NWI-11**
- **W-2**
- **W-3**
- **NWI-8 (D-1's southern third)**

Both of these recent hydric features (**W-2 and D-1's southern end**) appear to be associated with AEL operational activities. Both of these recent features are located in historic drainage channels. One pond, that was initially observed in 1995 (**NWI-10**), is no longer found in aerial photographs after June 2011. This pond was along the eastern border of the Subject Site and was located predominantly within the previously permitted landfill boundary.

5.2.3 WS-3 AERIAL REVIEW

A review of aerial photographs for WS-3 revealed a single drainage/stream channel that traversed from the north to the south with a western meander (**NWI-12**). No other potential water features were observed throughout the years. A small homestead building was observed in all the aerial photographs located in the southwest ¼ of the WS-3 Subject Site. An access road was observed to run from the homestead up to the northeast joining Anderson Road along the norther border of the Subject Site. This road appears to be the dividing line between WS-2 and WS-3.

5.2.4 WS-4 AERIAL REVIEW

Like WS-3 a review of aerial photographs for WS-4 revealed a single drainage/stream channel (**NWI-13**). This channel traversed from the northeast to the southwest along the northwest corner of the Subject Site. No other hydric features were observed throughout this watershed within the Subject Site.

5.3 USGS TOPOGRAPHIC MAP REVIEW

The USGS 7.5 Minute Topographic Quadrangle (Wekiwa, Okls. Quadrangle, 1958) indicates that the Subject Site's elevation ranged from approximately 930 feet above mean sea level (amsl) near the

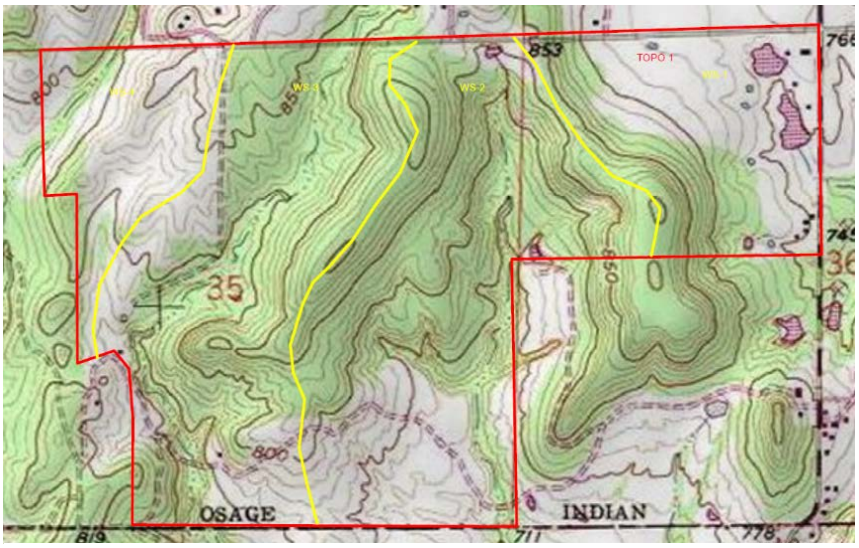


Figure 4. Topographic Map includes the "Topo 1" feature in the top right corner.

north central area to approximately 730 feet amsl near the southeast corner. Features mapped on the topographic map are discussed for each watershed within the subject site.

5.3.1 WS-1 USGS REVIEW

Topographic depicted hydric features for WS-1 include seven ponds and one intermittent stream. Six of these ponds have previously been identified as NWI mapped features and include W-9 through W-14. A pond (Topo 1(W-7)) is located on the topographic map near the north border of WS-1 is an additional mapped pond that was not identified by the NWI database **(Appendix A, Figure 4)**. The intermittent stream is in the same general location as the NWI-5 features.

5.3.2 WS-2 USGS REVIEW

Topographic depicted hydric features for WS-2 include three ponds and one intermittent stream. All hydric features within the WS-2 Subject Site area were previously identified in NWI database and include W-1, S-2, D-1 and D-2 (NWI-8 through NWI-11) **(Appendix A, Figure 4)**.

5.3.3 WS-3 USGS REVIEW

Topographic depicted hydric features for WS-3 include one intermittent stream. This intermittent stream was identified as the NWI-12 (S-1 and D-1) feature **(Appendix A, Figure 4)**.

5.3.4 WS-4 USGS REVIEW

Topographic depicted hydric features for WS-4 include one intermittent stream. This intermittent stream identified as NWI-13 (S-3) feature **(Appendix A, Figure 4)**.

5.3.5 ADDITIONAL USGS HYDRIC FEATURES

Twelve water features that include ten freshwater ponds and two intermittent streams are mapped within approximately 0.2 mile of the Subject Site **(Appendix A, Figure 4)**. The topographic surface within the Subject Site is represented as areas of steep hills with vegetative cover transitioning to gradual sloping terrain.

5.4 NATIONAL HYDROGRAPHY DATASET

A review of the NHD identified eleven ponds and four intermittent streams within the Subject Site (USGS 2017) **(Appendix A, Figure 5)**. Nine of these ponds correspond with the previously discussed NWI features identified within the Subject Site. The inserted clip from **Figure 5** shows the general location of the NHD features.

Figure 5. NHD mapped features including the identified NHD 1 feature.

5.4.1 WS-1 NHD REVIEW

Two additional ponds were identified in the WS-1 Subject Site area that were not identified in the NWI database. W-7 was a pond identified in the topographic map and is located near the north border of WS-1. The remaining pond (NHD 1) was not identified by either the NWI or topographic map and is located west of W-14, a freshwater pond. The intermittent stream channel NWI-5 drains and confluences with Shell Creek east of the Subject Site.

5.4.2 WS-2 NHD REVIEW

Three ponds and one stream channel are identified within WS-2 by the NHD. These three ponds are in similar locations W-1, NWI-10, and D-2 (NWI-11 and S-1). The intermittent stream is in the same general area as NWI-8 (D-1 and D-2). No new hydric features were identified from the NHD. This intermittent stream channel confluences with the Arkansas River approximately one mile south of the Subject Site.

5.4.2 WS-3 REVIEW

A single stream channel is identified within WS-3 that correspond with previously identified NWI-12 (S-1 and D-1). This stream channel confluences with the Arkansas River approximately one mile south of the subject site.

5.4.3 WS4 REVIEW

A single stream channel is identified within WS-4. This stream channel has previously been identified as NWI -13 (S-3). The Intermittent stream drains to the southwest and confluences with Sand Creek west of the Subject Site.

5.5 FEMA FLOODPLAIN REVIEW

A review of FEMA FIRM floodplain maps (FEMA n.d.) was conducted to identify if the Subject Site is located within a flood hazard zone and what, if any, designation(s) that may include part or all of the Subject Site. The Subject Site is located within the Osage County 40013C FIRM map. This FEMA Floodplain map shows that all of the Subject Site is located within a Zone X area of minimal Flood Hazard **(Appendix A, Figure 6)**. Zone X is identified as areas that are outside the 1 percent (100 year) and 0.2 percent (500 year) annual chance floodplains. The Subject Site has a minimal chance of being impacted from flooding events.

5.6 SOIL SURVEY REVIEW

The NRCS Web Soil Survey (USDA-NRCS 2017) lists ten soil types within the Subject Site. These soils include:

5.6.1 WS-1 SOIL REVIEW

WS-1 soils include:

1. 17 – Agra-Pharaoh complex, 1 to 5 percent slopes
2. 18 – Agra-Ashport, frequently flooded, complex, 0 to 12 percent slopes
3. 38 – Norge silt loam, 1 to 3 percent slopes
4. 39 – Norge silt loam, 3 to 5 percent slopes
5. 40 – Norge silt loam, 5 to 8 percent slopes
6. 49 – Parsons-Pharaoh complex, 0 to 3 percent slopes
7. 57 – Steedman-Lucien complex, 3 to 15 percent slopes
8. 65 – Vanoss silt loam, 1 to 3 percent slopes
9. NBRE - Niotaze-Bighear-Rock outcrop complex, 1 to 8 percent slopes
10. NBRF – Niotaze-Bighear-Rock outcrop complex, 15 to 25 percent slopes, extremely stony

The approximate location of each soil type is presented in **Appendix A, Figure 7**.

5.6.2 WS-2 SOIL REVIEW

WS-2 soils include:

11. 18 – Agra-Ashport, frequently flooded, complex, 0 to 12 percent slopes
12. 20 – Dougherty loamy fine sand, 3 to 8 percent slopes
13. 39 – Norge silt loam, 3 to 5 percent slopes
14. 42 – Norge, Agra, and Prue soils, 3 to 8 percent slopes, gullied

15. BNRD – Bigheart-Niotaze_Rock outcrop complex, 1 to 8 percent slopes
16. NBRF – Niotaze-Bigheart-Rock outcrop complex, 15 to 25 percent slopes

The approximate location of each soil type is presented in **Appendix A, Figure 7**.

5.6.3 WS SOIL REVIEW

WS-3 soils include:

17. 20 - Dougherty loamy fine sand, 3 to 8 percent slopes
18. 21 - Eufaula loamy fine sand, 3 to 15 percent slopes
19. 67 – Verdigris silt loam, 0 to 1 percent slopes, frequently flooded
20. BNRD – Bighear-Niotaze-Rock outcrop complex, 1 to 8 percent slopes
21. NBRF – Niotaze-Bigheart-Rock outcrop complex, 15 to 25 percent slopes, very stony

Of these soils, Verdigris silt loam, 0 to 1 percent slopes, frequently flooded is considered hydric by the NRCS (USDA-NRCS 2018). The approximate location of each soil type is presented in **Appendix A, Figure 7**.

5.6.4 WS SOIL REVIEW

WS-4 soils include:

22. 20 – Dougherty loamy fine sand, 3 to 8 percent slopes
23. 21 – Eufaula loamy fine sand, 3 to 15 percent slopes
24. 67 – Verdigris silt loam 0 to 1 percent slopes, frequently flooded

Of these soils, Verdigris silt loam, 0 to 1 percent slopes, frequently flooded is considered hydric by the NRCS (USDA-NRCS 2018). The approximate location of each soil type is presented in **Appendix A, Figure 7**.

6 WATERS AND WETLANDS FIELD ASSESSMENT

SCS conducted a preliminary wetland determination on May 24-25 and August 1-2, 2018 to determine if potential jurisdictional wetlands may be located within the Subject Site. Portions of four watersheds are located within the Subject Site (WS-1 through WS-4). Seventeen potential wetlands were identified within the Subject Site during the site visits (Table 1). These identified hydric features will be discussed in more detail below. Potential wetlands will be discussed as to the watershed they are located in.

In field Identified Feature	Desktop Identified Feature	Latitude	Longitude	Identified near an NWI feature	Identified on aerial Photographs	Identified on a topographic map	Identified on the NHD	Exhibits all three Corps Features	Possible Significant Nexus with WOUS	Delineated Length / Acres of Feature
W-1	NWI 9	36.172764	96.198287	Pond	Yes	Yes	Yes	Yes	--	0.31 Ac
W-2	--	36.164736	96.200233	--	--	--	--	Yes	Yes	0.08 Ac
W-3	--	36.164009	96.230394	--	Yes	--	--	Yes	--	0.18 Ac
W-4	--	36.171237	96.19462	--	--	--	--	Yes	--	0.034 Ac
W-5	--	36.17135	96.194651	--	--	--	--	Yes	--	0.039 Ac
W-6	--	36.171497	96.194658	--	--	--	--	Yes	--	0.018 Ac
W-7	Topo 1	36.172836	96.193619	--	Yes	Yes	Yes	Yes	--	0.148 Ac
W-8	--	36.172682	96.192494	--	Yes	--	--	Yes	--	0.019 Ac
W-9	NWI 7	36.167974	96.190973	Pond	Yes	Yes	Yes	Yes	--	0.29 Ac
W-10	NWI 6	36.167888	96.190309	Pond	Yes	Yes	Yes	Yes	--	0.19 Ac
W-11	NWI 2	36.170126	96.190927	Pond	Yes	Yes	Yes	Yes	--	0.24 Ac
W-12	NWI 4	36.170699	96.190131	Pond	Yes	Yes	Yes	Yes	Yes	2.93 Ac
W-13	NWI 1	36.17117	96.190877	Pond	Yes	Yes	Yes	Yes	--	0.14 Ac
In field Identified Feature	**Desktop Identified Feature**	**Latitude**	**Longitude**	**Identified near an NWI feature**	**Identified on aerial Photographs**	**Identified on a topographic map**	**Identified on the NHD**	**Exhibits all three Corps Features**	**Possible Significant Nexus with WOUS**	**Delineated Length / Acres of Feature**
W-14	NWI 3	36.172346	96.190646	Pond	Yes	Yes	Yes	Yes	Yes	1.11 Ac
S-1	NWI 12	36.16675	96.207981	Riverine	Yes	Yes	Yes	Yes	Yes	4,494 Ft
S-2	NWI 8	36.161365	96.199248	Riverine	--	Yes	Yes	Yes	Yes	147 Ft
S-3	NWI 13	36.1719896	96.2108786	Riverine	--	Yes	Yes	Yes	Yes	1,285 Ft
D-1	NWI 8	36.171467	96.198346	Riverine	--	Yes	Yes	No	--	1.514 Ft
D-2	NWI 8	36.16469	96.199254	Riverine	Yes	Yes	Yes	No	Yes	3.15 Ac
D-3	NWI 8, 11	36.161962	96199429	Riverine, Pond	Yes	Yes	Yes	No	Yes	380 Ft

In field Identified Feature	Desktop Identified Feature	Latitude	Longitude	Identified near an NWI feature	Identified on aerial Photographs	Identified on a topographic map	Identified on the NHD	Exhibits all three Corps Features	Possible Significant Nexus with WOUS	Delineated Length / Acres of Feature
D-4	NWI 12	36.170459	96.203946	Riverine	Yes	Yes	Yes	No	Yes	3,243 Ft
D-5	NWI 5	--	--	Riverine	--	Yes	Yes	No	Yes	--
--	NHD 1	--	--	--	Yes	--	Yes	--	--	--
--	NWI 10	--	--	Pond	Yes	Yes	Yes	--	--	--
--	NWI 11	--	--	Pond	Yes	Yes	Yes	--	--	--

Table 1. Potential WOTUS features. Figures 2-6 and 8-9 have data represented in this table.

6.1 WS-1 POTENTIAL HYDRIC FEATURES

Eleven potential wetland features were located in WS -1 and include W-4 through W-14 **(Figure 8, 8-1)**. Six of these features would be described as freshwater ponds and five as emergent wetlands. The inserted clip of **Figure 8-1** indicates the location and size of each potential wetland in WS-1. The following WS-1 potential wetlands include:

6.1.1 POTENTIAL WETLAND W-4

Potential wetland **W-4** is located in the western third of the Subject Site's WS-1 along the base of the steep slope. The area appears to have been an old terrace or a possible "two-track" access road. The area around W-4 is relatively flat. Runoff from the surrounding land appears to drain into a depression (W-4) that allows for pooling. W-4 is completely within the WS-1 Subject Site boundary. No water was observed within W-4 during the site visit. The determination location was at latitude 36.171237, longitude -96.194620 **(Appendix A, Figure 8-1)**. Inland sedge (*Juncus interior*), pinkweed (*Persicaria pensylvanica*), and beaked cut-throat grass (*Coleataenia anceps*) dominated the herbaceous stratum. The size of this potential wetland is approximately 0.034 acres. The hydric soils were consistent with redox depression Matrix (F8). Hydrological features consisted of sparsely vegetated concave surface. No public available data source identified a potential wetland in the vicinity of W-4 **(Table 1)**. A photograph of W-4 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-4 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-4 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.2 POTENTIAL WETLAND W-5

Figure 8-1. WS-1 field determined wetland features.

Potential wetland W-5 is located in the western third of the Subject Site's WS-1 along the base of the steep slope northeast of W-4. The area appears to have been an old terrace or a possible "two-track" access road. The area around W-5 was relatively flat. Runoff from the surrounding land appears to drain into a depression (W-5) that allows for pooling. W-5 is completely within the WS-1 Subject Site boundary. No water was observed within W-5 during the site visit. The determination location was at latitude 36.171350, longitude -96.194651 **(Appendix A, Figure 8-1)**. Woolly sedge (*Carex pellita*), inland sedge, and beaked cut-throat grass dominated the herbaceous stratum. The size of this potential wetland is approximately 0.039 acres. The hydric soils were consistent with redox depression Matrix (F8). Hydrological features consisted of sparsely vegetated concave surface. No public available data source identified a potential wetland in the vicinity of W-5 **(Table 1)**. A photograph of W-5 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-5 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-5 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.3 POTENTIAL WETLAND W-6

Potential wetland W-6 is located in the western third of the Subject Site's WS-1 along the base of the steep slope northeast of W-5. The area appears to have been an old terrace or a possible "two-track" access road. The area around W-6 was relatively flat. Runoff from the surrounding land appears to drain into a depression (W-6) that allows for pooling. W-6 is completely within the WS-1 Subject Site boundary. No water was observed within W-6 during the site visit. The determination location was at latitude 36.171497, longitude -96.194658 **(Appendix A, Figure 8-1)**. Inland sedge, Woolly sedge, and beaked cut-throat grass dominated the herbaceous stratum. The size of this potential wetland is approximately 0.018 acres. The hydric soils were consistent with redox depression Matrix (F8). Hydrological features consisted of sparsely vegetated concave surface. No public available data source identified a potential wetland in the vicinity of W-6 **(Table 1)**. A photograph of W-6 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-6 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-6 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.4 POTENTIAL WETLAND W-7

Potential wetland W-7 is located in the western third of the Subject Site's WS-1 along the northern Subject Site boundary, south of Anderson Road. W-7 appears to be an old farm pond with a constructed berm along the north and east sides. Water from the surrounding area and the ditch along the south side of Anderson Road appear to drain into W-7. W-7 is completely within the WS-1 Subject Site boundary. Surface water was present near the middle of W-7 during the site visit. The determination location was at latitude 36.172836, longitude -96.193619 **(Appendix A, Figure 8-1)**. American Elm (*Ulmus Americana)* dominated the tree stratum while soft-stem bulrush (*Schoenoplectus tabernaemontani*), pinkweed, and woolly sedge dominated the herbaceous stratum. The size of this potential wetland is approximately 0.148 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of surface water, saturation, and true aquatic plants. This feature was identified by aerial imagery, NHD, and topographic maps **(Table 1)**. A photograph of W-7 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-7 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-7 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.5 POTENTIAL WETLAND W-8

Potential wetland W-8 is located in the central third of the Subject Site's WS-1 near the northern boundary. W-8 appears to be an old borrow pit area that provided material for a pump-jack pad. This pad area is adjacent to W-8's western boundary. Water from the surrounding area appears to drain and pool in this constructed depression. W-8 is completely within the WS-1 Subject Site boundary. No surface water was present during the site visit. The determination location was at latitude 36.172682, longitude -96.192494 **(Appendix A, Figure 8-1)**. Flat-stem spike-rush (*Eleocharis compressa*) soft-stem bulrush and yellow-fruit sedge (*Carex annectens*) dominated the herbaceous stratum. The size of this potential wetland is approximately 0.019 acres. The hydric soils were consistent with redox depressions matrix (F8). Hydrological features consisted of, sparsely vegetated concave surface and oxidized rhizospheres. No public available data source identified a potential wetland in the vicinity of W-8 **(Table 1)**. A photograph of W-8 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-8 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-8 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.6 POTENTIAL WETLAND W-9

Potential wetland W-9 is located in the central third of the Subject Site's WS-1 near the southern boundary. W-9 appears to be a constructed pond with a berm along the east side. Runoff from the hill west of W-9 appears to be directed into this constructed pond by means of ditches along an access road. Recent dirt work on the berm has removed most of the vegetation along the berm area. W-9 is completely within the WS-1 Subject Site boundary. Surface water was present during the site visit. The determination location was at latitude 36.167974, longitude -96.190973 **(Appendix A, Figure 8-1)**. American sycamore (*Platanus occidentalis*) dominated the tree stratum while coon's tail

(*Ceratophyllum demersum*) dominated the herbaceous stratum. Hydric vegetation along the shoreline was restricted to approximately three feet from the water's edge and sparse due to recent work on the berm. The size of this potential wetland is approximately 0.29 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of, surface water, aquatic fauna and true aquatic plants. All public available data sources identified W-9 as a potential wetland including a NWI designation of PUBFh (NWI 7) **(Table 1)**. A photograph of W-9 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-9 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-9 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.7 POTENTIAL WETLAND W-10

Potential wetland W-10 is located in the eastern third of the Subject Site's WS-1 near the southern boundary. W-10 appears to be a constructed pond with a berm along the east side. Runoff from W-9 appears to overflow into W-10. W-10 is completely within the WS-1 Subject Site boundary. Surface water was present during the site visit. The determination location was at latitude 36.167888, longitude -96.190309 **(Appendix A, Figure 8-1)**. Gray's sedge (*Carex grayi*) and coon's tail dominated the herbaceous stratum. Hydric shore line vegetation was restricted to approximately three feet from the water's edge. The size of this potential wetland is approximately 0.19 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of, surface water, aquatic fauna and true aquatic plants. All public available data sources identified W-10 as a potential wetland a NWI designation of PUBFh (NWI 6) **(Table 1)**. A photograph of W-10 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-10 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-10 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.8 POTENTIAL WETLAND W-11

Potential wetland W-11 is located in the eastern third of the Subject Site's WS-1 near the center. W-11 appears to be a constructed pond with a berm along the east side. A drainage channel, from the hillside west of W-11, intersects the southwest corner of W-11. No water was flowing into W-11 from this drainage. W-11 is completely within the WS-1 Subject Site boundary. Surface water was present during the site visit. The determination location was at latitude 36.170126, longitude -96.190927 **(Appendix A, Figure 8-1)**. flat-stem spike-rush, and blue water speedwell (*Veronica anagallis-aquatica*) dominated the herbaceous stratum. The size of this potential wetland is approximately 0.24 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of, surface water, aquatic fauna and oxidized rhizospheres on living roots. All public available data sources identified W-11 as a potential wetland including a NWI designation of PUSCx (NWI 2) **(Table 1)**. A photograph of W-11 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-11 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-11 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.9 POTENTIAL WETLAND W-12

Potential wetland W-12 is located in the eastern third of the Subject Site's WS-1 near the center and northeast of W-11. W-12 appears to be a pond with a constructed berm along the south end. No water was flowing into or out of W-12 during the site visit. W-12 is completely within the WS-1 Subject Site boundary. Surface water was present during the site visit. The determination location was at latitude 36.170699, longitude -96.190131 **(Appendix A, Figure 8-1)**. False indigo (*Amorpha fruticose*) dominated the shrub stratum while the flat-stem spike-rush and water primrose (*Ludwigia peploides*) dominated the herbaceous stratum. The size of this potential wetland is approximately 2.93 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of, surface water, aquatic fauna and oxidized rhizospheres on living roots. All public available data sources identified W-12 as a potential wetland including a NWI designation of PUBHh (NWI 4) **(Table 1)**. A photograph of W-12 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-12 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-12 does appear to have a significant nexus with an identifiable WOTUS feature. The NWI 5 riverine feature would provide a connectivity of W-12 with Shell Creek, located approximately 0.51 miles east of the Subject Site.

6.1.10 POTENTIAL WETLAND W-13

Potential wetland W-13 is located in the eastern third of the Subject Site's WS-1 near the center and west of W-12. W-13 appears to be a constructed farm pond with a berm along the east side. No water was present in W-13 during the site visit. W-13 is completely within the WS-1 Subject Site boundary. The determination location was at latitude 36.171170, longitude -96.190877 **(Appendix A, Figure 8-1)**. Woolly sedge and pinkweed dominated the herbaceous stratum. The size of this potential wetland is approximately 0.14 acres. The hydric soils were consistent with redox depression matrix (F8). Hydrological features consisted of oxidized rhizospheres on living roots and inundation visible on aerial imagery. All public available data sources identified W-13 as a potential wetland including a NWI designation of PUSCx (NWI 1) **(Table 1)**. A photograph of W-13 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-13 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-13 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.1.11 POTENTIAL WETLAND W-14

Potential wetland W-14 is located in the eastern third of the Subject Site's WS-1 near the center and west of W-12. W-13 appears to be a constructed farm pond with a berm along the east side. No water was present in W-13 during the site visit. W-13 is completely within the WS-1 Subject Site boundary. The determination location was at latitude 36.172346, longitude -96.190646 **(Appendix A, Figure 8-1)**. Water primrose and pinkweed dominated the herbaceous stratum. The size of this potential wetland is approximately 0.1.11 acres. The hydric soils were consistent with redox dark surface matrix (F6). Hydrological features consisted of surface water, saturation, aquatic fauna and true aquatic plants. All public available data sources identified W-14 as a potential wetland including a NWI designation of PUBFh (NWI 3) **(Table 1)**. A photograph of W-14 can be found in **Appendix B,**

Photographic Log. The completed wetland determination datasheet for W-14 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-14 does appear to have a significant nexus with an identifiable WOTUS feature. W-14 appears to overflow into W-12. W-12's significant nexus with Shell Creek has previously been discussed.

6.2 WS-2 POTENTIAL HYDRIC FEATURES

Four potential wetland features were observed WS-2 and include W-1 through W-3 and S-2. The field identified potential wetlands include two freshwater ponds and one emergent wetland and one stream segment. The inserted clip of **Figure 8-2** indicates the location and size of each potential wetland in WS-2. The following WS-2 potential wetlands include:

Figure 8-2. W-2 with field determined wetland features that exhibit all three hydric characteristics.

6.2.1 POTENTIAL WETLAND W-1

Potential wetland W-1 is located in the eastern half of the Subject Site's WS-2 near the northern border. This feature appears to be an excavated pond with a constructed berm along the southern edge. Water appears to be persistent throughout the year. W-1 is completely within the Subject Site boundary. No water was flowing in or out of this feature during the site visit. The determination location was at latitude 36.172764, longitude -96.198287 **(Appendix A, Figure 8-2)**. Tree stratum was dominated by green ash (*Fraxinus pennsylvanica*) and eastern red cedar (*Juniperus virginiana*) while broadleaf cattail (*Typha angostifolia*) dominated the herbaceous stratum. The size of this potential wetland is approximately 0.31 acres. The hydric soils consisted of Loamy Gleyed Matrix (F2). Hydrological features consisted of surface water, saturation, and true aquatic plants. All public available data sources identified W-1 as a potential wetland including a NWI designation of PUSCh (NWI 9) **(Table 1)**. A photograph of W-1 can be found in **Appendix B, Photographic Log**. The completed wetland determination datasheet for W-1 is located in **Appendix C, Data Forms**. Based on the public and field data, it is SCS's opinion that W-1 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.2.2 POTENTIAL WETLAND W-2

Potential wetland W-2 is located in the western half of the Subject Site's WS-2 near the center of WS-2. This feature appears to be the lower portion of the drainage channel located on the western slope of the eastern watershed. An access road with a placed culvert pipe is located east of the wetland. It appears that the natural flow of the drainage has been altered by the construction of the access road. This constructed access road may contribute to retention of runoff from the western slope. No water was flowing through W-2 or the culvert pipe during the site visit, although there was standing water within W-2 at the time the determination was completed. During runoff events, water appears to flow from the west to the east through W-2. This runoff water would then confluence with D-2 (discussed below) on the east of the access road. The determination location was at latitude 36.164736, longitude -96.200233 (Appendix A, Figure 8-2). The area of this potential wetland within the Subject Site is approximately 0.08 acres. Broadleaf wood-oats (*Chasmanthium latifolium*) and pinkweed dominated the sparse herbaceous stratum. The shrub stratum was dominated by green ash and black willow. The hydric soils consisted of a Sandy Redox (S5) on top of a Loamy Gleyed Matrix (F2) within the top eighteen inches. Hydrological features consisted of surface water and water-stained leaves which were observed throughout W-2. Aerial photographs identified a potential wetland in the vicinity of W-2 (Table 1). A photograph of W-2 can be found in Appendix B, Photographic Log. The completed wetland determination datasheet for W-2 is located in Appendix C, Data Forms. Based on the public and field data, it is SCS's opinion that W-2 does appear to have a possible significant nexus with an identifiable WOTUS feature. During periods that water would flow from W-2, flow from W-2 would pass through D-2 and D-3 into S-2 (D-2, D-3 and S-2 will be discussed below).

6.2.3 POTENTIAL WETLAND W-3

Potential wetland W-3 is located in the southwest quarter of the Subject Site's WS-2. W-3 appears to be a freshwater pond located within the upper reaches of a drainage channel on the western slope. A constructed access road is elevated above the hillside and allows for the retention of runoff waters from the western slope. W-3 had no apparent spillway or overflow pipes that controlled water levels. No water was flowing in or out of this feature during the site visit. The determination location was at latitude 36.164009, longitude -96.203394 (Appendix A, Figure 8-2). The size of this potential wetland is approximately 0.18 acres and is fully within the Subject Site. White oak (*Quercus alba*) dominated the tree stratum while pinkweed and coon's tail dominated the herbaceous stratum. The hydric soils consisted of a Sandy Redox (S5) and Redox Dark Surface (F6) within the top eighteen inches. Hydrological features include surface water and true aquatic plants were observed throughout W-3. No public available data source identified a potential wetland in the vicinity of W-3 (Table 1). A photograph of W-3 can be found in Appendix B, Photographic Log. The completed wetland determination datasheet for W-3 is located in Appendix C, Data Forms. Based on the public and field data, it is SCS's opinion that W-3 does not appear to have a significant nexus with an identifiable WOTUS feature.

6.2.4 POTENTIAL WETLAND S-2

Potential wetland S-2 is located along the southern border of the Subject Site's WS-2. S-2 is a small segment along the south end of the NWI 8's drainage channel, within the Subject Site, exhibited ephemeral and/or intermittent steam characteristics (Table 1). S-2's stream segment begins at the southern end of D-3 (D-3 will be discussed below) (Appendix A, Figures 8-2). This short stream channel has a hard clay pan substrate with isolated pools. Substrate lacked loose silt, sand, gravel and cobble. The banks along S-2 were highly incised with vertical cuts of more than twenty feet in areas. This stream segment transitioned from D-3's clay pan substrate to clay-pan and large pools. Several of the pools had fish including sunfish (*Centrarchidae*). Soils along the channel edges and above the clay pan substrate appear to be highly erodible. Several locations along the bank walls showed stress cracks or had sloughed into the channel. High flow velocities appear to be common through S-2 as indicated by the steep incised banks and smooth clay-pan channel bottom. Although a wetland determination could not be determined due to the lack of wetland plants within the channel and clay soils that didn't exhibit hydric conditions, the persistent pools containing varying sizes of sunfish along the channel segment suggest that intermittent stream conditions are persistent. A review of the publicly available data indicates that NWI 8 has a confluence with the Arkansas River approximately one-mile south of the Subject Site. Based on the information available, it is SCS's opinion that S-2 has a significant nexus with WOTUS.

6.3 WS-3 POTENTIAL HYDRIC FEATURES

WS-3 had one potential wetland feature that will be discussed. This potential wetland is an ephemeral/intermittent stream. The inserted clip of Figure 8-3 indicates the location and size of the potential wetland in WS-3.

6.3.1 POTNETIAL WETLAND S-1

Potential wetland S-1 is located in the southern half of the Subject Site's WS-3. S-1 is the southern half of NWI 12 within the Subject Sites boundary **(Table 1)**. S-1 is approximately 4,494 feet (0.54 miles) long and appears to transition from a dry drainage channel (D-4) into an ephemeral and then an intermittent stream channel (D-4 will be discussed below) **(Appendix A, Figure 8-3)**. This transition was observed near the middle of the Subject Site's WS-3. The transition was determined where larger reaches of sandy substrate and an increase in hydric vegetation began to occur within and along the channel edges. This transitional area was topographically flatter compared to the northern reach. The upper S-1 channel reach contained small isolated pools scattered along a predominantly dry channel. No flowing water was seen between pools near the beginning of S-1. As the channel progressed down the watershed valley, the channel's sinuosity became apparent and width increased from four to six feet. Outside banks became more incised along east and west outside bends. The ordinary high water mark (OHWM) of the channel ranging from one to two feet. As the channel traversed south, the frequency and size of the pools increased with some small runs connecting a few of the pools

Figure 8-3. W-3 with field determined wetland features that exhibit the three hydric characteristics.

S-1's southern reach transitioned from an ephemeral to an intermittent stream segment. This segment had more persistent flow and began downstream a breached rock and cement dam. This dam is located in the southern half of the S-1 stream segment. The breach in the dam had no water flowing through it, but water was flowing from under the dam into a plunge pool located at the base of the dam. From this pool down to the southern boundary of the Subject Site, aquatic fauna, including fish and benthics, were observed numerous times. Hydric plants were dominant along the water's edge. A typical pool, riffle, run pattern could be observed throughout this reach of the channel. Gravel/sand bars occurred within the 6 to 20-foot-wide channel bottom. A review of the publicly available data indicates that NWI 12 has a confluence with the Arkansas River approximately one-mile south of the Subject Site. Based on the information available, it is SCS's opinion that S-1 has a significant nexus with WOTUS.

6.4 WS-4 POTENTIAL HYDRIC FEATURES

WS-4 had one potential wetland feature that will be discussed below. The inserted clip of **Figure 8-4** indicates the location and size of the potential wetland in WS-4.

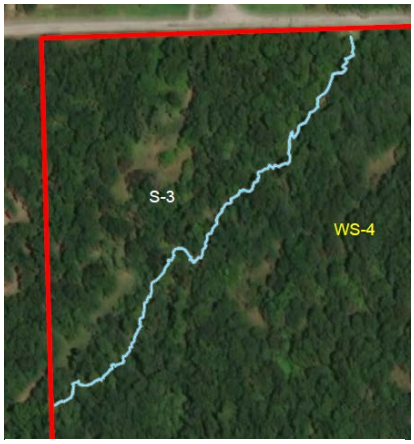


Figure 8-4. W-4 with field determined wetland features that exhibit all three hydric characteristics.

6.4.1 POTENTIAL WETLAND S-3

Potential wetland S-3 is located in the northwest quarter of the Subject Site's WS-4. S-3 corresponds with the segment of NWI 13 within the Subject Sites boundary **(Table 1)**. S-3 is approximately 1,285 feet (0.24 miles) long **(Appendix A, Figure 8-4)**. S-3 enters the Subject Site through a culvert under Anderson Road along the center of WS-4's northern border. S-3 traversed from the northeast to the southwest exiting the Subject Sites western border. Water flowing over sand and cobble was observed throughout S-3 segment. Most of the cobble stone was discolored with a thin algal layer. A pool, run riffle channel configuration exited through the S-3 reach. The width of the active channel was approximately four feet wide. The ordinary OHWS was approximately one foot above the water surface and was with a floodplain bench. The total width of the floodplain and stream was approximately twelve feet wide. A secondary bank, outside the floodplain, varied from three feet up to ten feet in height. Hydric plants dominated the floodplain while upland species dominated the secondary bank area. This stream segment is consistent with an intermittent/perineal stream. A review of the publicly available data indicates that NWI 13 has a confluence with Sand Creek approximately 1.900 feet southwest Subject Site. Based on the information available, it is SCS's opinion that S-3 has a significant nexus with WOTUS.

7 NON-QUALIFIED HYDRIC FEATURES

Non-qualified hydric features are potential wetland features that were identified from public available data sets, but after field assessed, failed to exhibit one or more of the three hydric characteristics previously discussed. The following features have been identified as non-qualified based off this criteria.

7.1 WS-1 NON-QUALIFIED HYDRIC FEATURES

One feature identified by public available data failed to exhibit the three hydric characteristics during field assessments. This feature is discussed below.

7.1.1 NON-QUALIFIED FEATURE D-5

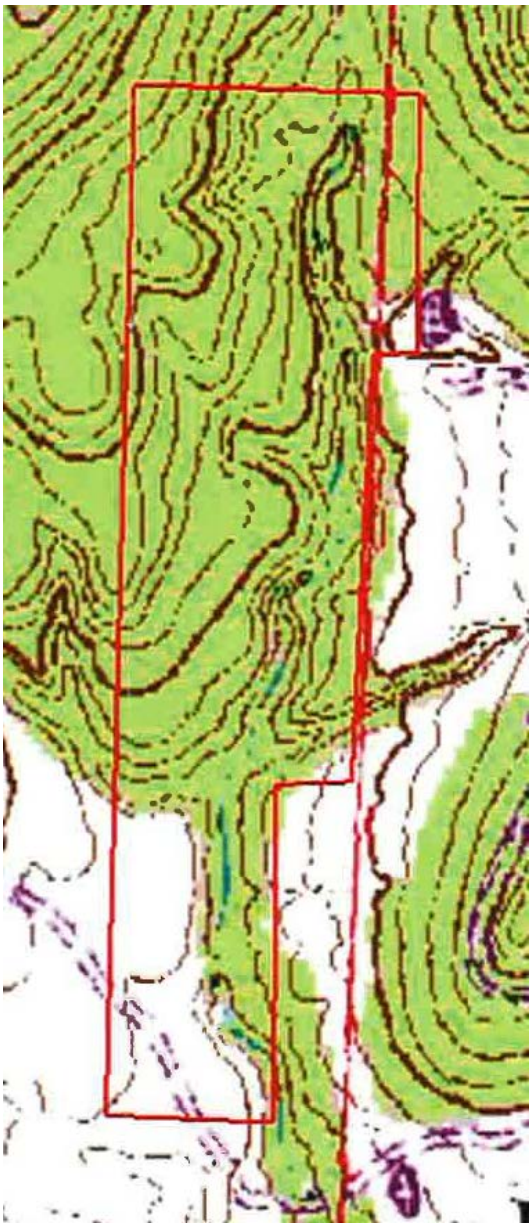
Non-qualified D-5 is located in the central portion of the Subject Site's WS-1 eastern border and beginning at the south end of W-12. D-5 is a dry channel that is a segment of the NWI feature identified in Table 1 as NWI 5. NWI 5 is described as a riverine wetland and appears to be associated with NWI 1 (W-12). D-5 began at an overflow pipe in the southern end of W-12 (Appendix A, Figure 9-1). This overflow pipe discharges into a well vegetated channel that traverses toward the southeast. No discharge from W-12 into D-5 was observed during the site visit. No water was observed within the channel during the site visit. D-5 did exhibit a defined channel, but existing conditions did not exhibit characteristics common with ephemeral or intermittent stream channels within the Subject Site. The channel didn't have a dominant hydric community within the Subject Site. It is SCS's opinion that this drainage segment does not met the USACE wetland criteria.

7.2 WS-2 NON-QUALIFIED HYDRIC FEATURES

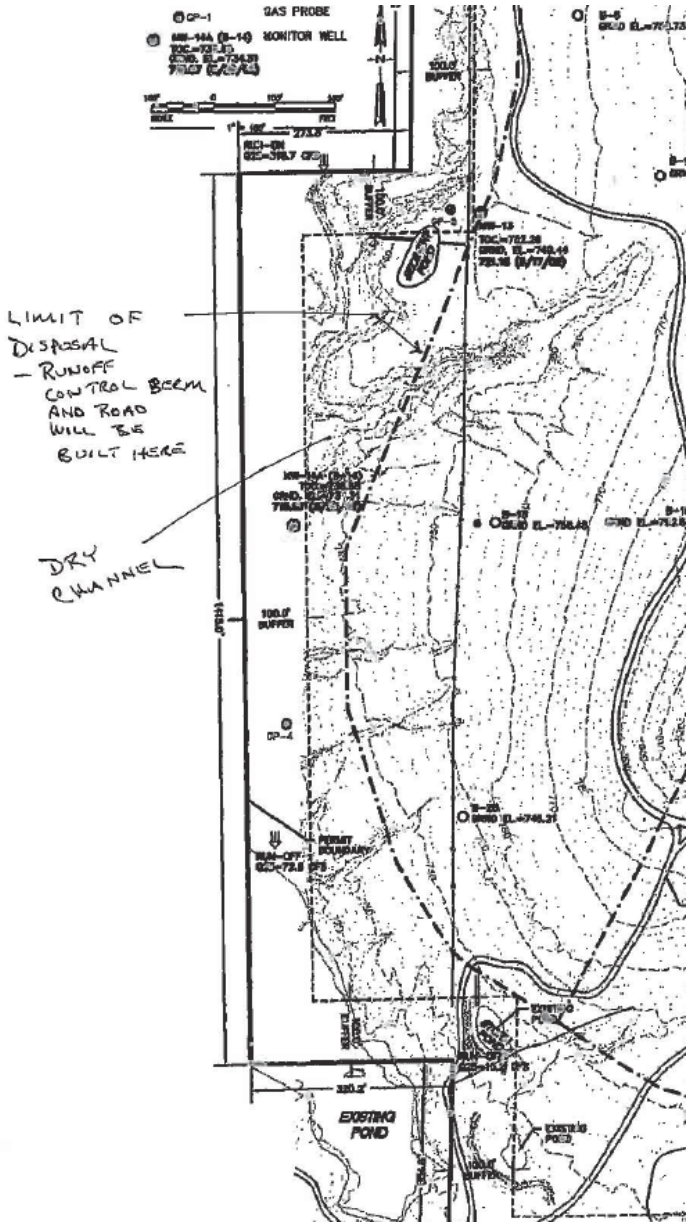
Three features in the Subject Site's WS-2 which were assessed for hydric features failed to exhibit all three USACE wetland characteristics. These three features are associated with NWI 8 riverine wetland feature that drains from the north to the south.

The USACE has identified an "unnamed tributary" (NWI-8) as a potential jurisdictional feature in a preliminary determination issued by the USACE on September 21, 2017 (Appendix D, Attachment 1). There was also a statement that the "property contains no jurisdictional wetlands". The scope of inquiry for the USACE "preliminary determination" was limited to the narrow reach along the southern 2/3 of the NWI-8 feature. Within this USACE September 21, 2017 determination report, the USACE identifies that only public available data was used to designate "a preliminary jurisdictional determination". SCS completed a similar public available data search and arrived at the same assessment that the drainage way identified as NWI-8 was a potential wetland feature and that a field confirmation should be completed. SCS also reviewed a prior JD request issued by the USACE on July 23, 2003 that stated that the then proposed expansion area did not require a permit as there were no identified jurisdictional waters that would be impacted as a result of the proposed expansion (APPENDIX D, Attachment 2). The two USACE JD assessments share a common boarder that is in proximity to the NWI-8 feature. As seen in the two figure inserts below, the west side of the 2003 JD

is the east side of the 2017 preliminary JD. The 2003 USACE reports state that no jurisdictional wetlands were identified within the assessment area, although the 2017 preliminary JD does identify the unnamed tributary. The entire reach of NWI-8 was assessed in the field. The result of the field assessment is in the discussion below.



Attachment 1. The east edge of the 2017 review request identifies the west edge of the 2003 proposed expansion permitted area.



Attachment 2. The west edge of the 2003 proposed expansion (dashed line) denote the edge of the landfill permit area.

7.2.1 NON-QUALIFIED FEATURE D-1

Non-qualified D-1 is located in the center of the Subject Site's WS-2 in through the middle of the north half of WS-2 traversing from the north to the south. Assessments began at the north end of D-1 drainage channel and stopped at the north end of an impoundment pool at the south end of D-1 (Appendix A, Figure 9-1). The pool is located north of a large stockpile of soil used by AEL. D-1's channel changed from an almost flat grassy channel to a steep boulder dominated wash. When water overflows from W-1, during wet periods, water flows into an approximate one-foot wide shallow drainage channel (D-1). This narrow channel appears to have a series of low head-cuts along the toe of W-1's constructed berm. This narrow channel transitions into a relatively flat grassy channel south of an access road. Below (south) the grassy waterway, the drainage channel transitioned into a steep boulder dominated channel with minimal channel definition. The drainage's elevation dropped approximately 50 feet over a 400-foot length of channel. At the bottom of these boulders, the channel's gradient leveled out. The substrate transitioned from large boulders to coble and small boulders in this lower reach. Assessment of D-1's potential hydric conditions stopped at the edge of impounded water. This impounded water appears to be the result of a large soil stockpile that has been placed through the WS-2 valley's bottom. Hydric plant dominancy and hydric soils were not observed along D-1's channel from the north to the south. It is SCS's opinion that this drainage segment does not met the USACE wetland criteria.

The pool associated with D-1's southern end was generated by the landfills soil stockpile by soil placed across the bottom of WS-2. Watermarks on the surrounding landscape suggests that the water level in this impoundment area has been more than ten feet above the levels observed during the site visit. A thin layer of grey sediment covered most ground features. During the site visit, there was a pump on the south end of this impoundment moving water into water trucks, which was being used for dust suppression of landfill activities. A wetland determination was conducted near the impoundment. Hydric soils and a dominant hydric plant community could not be determined for D-1's channel or impoundment. The review of aerial photographs showed that water first appeared in this impounded area in 2015. Upon assessing the length of D-1, the drainage channel exhibited a drainage way that conveys water to the south, but no hydric soils or dominant hydric plant communities were observed within the segment or along the edge of the impoundment pool. D-1 does not appear to be consistent with an ephemeral or intermittent stream and the pool at the southern end doesn't appear to have been a persistent pool long enough to allow for the propagation of hydric plants or the establishment of hydric soils. D-1 is located in the northern portion of NWI 8's riverine feature (Table 1). Although there is hydrological features that support discharge flows it is SCS Engineers opinion that the lack of wetland plants and hydric soils dis-qualifies this feature as a wetland as indicated by USACE criteria.

7.2.2 NON-QUALIFIED FEATURE D-2

Non-Qualified D-2 is located in the southern half of the Subject Site's WS-2. D-2 was assessed for a wetland but failed to exhibit all three wetland characteristics (Appendix A, Figure 9-2). In historic aerial photographs, this area could be seen with a narrow drainage channel prior to 2015. In aerial photographs for 2016 through 2018, the area D-2 can be seen with varying conditions including being inundated with water and dry with a wide grey colored channel bottom. D-2 has an access road crossing in the southern quarter. This access road has three culvert pipes connecting the northern section to the southern section tying these two sections together. The plant community within the

channel expressed a varying level of FACW (pinkweed) and UPL (sunflowers) plant species. The substrate throughout D-2 is sand. The soil profile for the channel consisted of a 10YR 4/6 for the top 18 inches. No redox or reductions zones were observed. These soil conditions suggest that extended periods of continuous saturation may not occur. D-2 appears to receive runoff with sedimentation from the active landfill. Discussion with AEL staff indicated that the area identified as D-2 is used as a storm-water sedimentation basin.

The southern end of D-2 was partially filled in and flush with the surrounding land. The fill was being placed to create a working deck for an excavator to remove the sediment from the storm-water sedimentation basin and restore to original depths. The area that was being filled-in is where the NWI 11 freshwater pond is indicated **(Appendix A, Figure 3)**. A ditch located south of D-2 and along the southern most reach of NWI 8 was vegetated with upland plants. No hydric plants were observed within this ditch. There was no observed discharge point from D-2 into this southern ditch. This indicated stream reach did not exhibit stream characteristics. Although the south ditch area may have received water from the upper reaches of NWI 8 at one time, there was no visible signs that flows through this southern ditch area was still occurring.

Water that flows through D-2 discharges into an incised channel (D-3) located along the southwest corner of D-2 and south of the access road crossing. This incised channel begins with a large head cut that is approximately four feet deep and is the connecting point with D-2. D-3 will be discussed below. Although there are hydrological features, the clean scoured channel bottom and a lack of bank edge vegetation indicated that flows through this feature are fast and limited to runoff events. It is SCS's opinion that the lack of hydric soils with an active head-cut near D-2 dis-qualifies this feature as a potential wetland.

7.2.3 NON-QUALIFIED FEATURE D-3

Non-Qualified D-3 is located along the southern boundary of the Subject Site's WS-2 and west of D-2's southern end. D-3 was assessed but failed to exhibit all three wetland characteristics **(Appendix A, Figure 9-2)**. D-3 is an incised channel that originates from the west side of D-2's southwestern corner. D-3 initially traverses west before turning to the south **(Appendix A, Figure 9-2)**. D-3's substrate consisted of a thin sandy bottom near the discharge point from D-2 and transitioned into a smooth clay-pan bottom with minimal sand coverage. The sandy substrate observed in D-3's upper reach was similar to D-2 sandy substrate. The clay-pan under the sandy substrate was a restrictive layer when shovel tested. The southern half of D-3 transitioned into a steeper gradient hard clay-pan channel. Incised banks ranged from approximately 3 feet near the D-2 outfall to approximately 20 feet near the southern end of D-3. Several areas of incised banks were unstable and multiple locations had sloughed material in the channel. The channel's width ranged from ten to 15 feet wide. No plants, surface water, seeps, or springs were observed along D-3's channel bottom. The southern end of D-3's transitioned to a hard clay pan channel bottom with pools. This transition is the identified beginning of the intermittent stream previously discussed as S-2 **(Appendix A, Figure 9-2)**. D-3's channel appears to be maintained by high flow velocities with little to no sediment deposition on the southern half's clay-pan substrate. A conducted shovel test was restricted by the hard clay-pan and revealed that no hydric soils could be determined to due to lack of suitable soils above the clay-pan layer. Plant species were restricted to the top of the incised banks and were not hydric. Although there are hydrological features that support high flow events, it is SCS's opinion that the lack of wetland plants and hydric soils dis-qualifies this feature as a potential wetland.

7.2.4 REMOVED NWI 10

The NWI 10 freshwater pond that was identified in WS-2 publicly available data review could not be located during the site visit. NWI 10 stopped appear in aerial photographs after 2011, NWI 10 was no longer visible. This feature appears to have been removed as the result of AEL operations. This feature was not located during the site visit.

7.3 WS-3 NON-QUALIFIED HYDRIC FEATURES

One feature identified by public available data in the WS-3 failed to exhibit the three hydric characteristics identified by the USACE for wetland features. This feature is discussed below.

7.3.1 NON-QUALIFIED FEATURE D-4

Non-Qualified D-4 is located in the northern half of the Subject Site's WS-3. A drainage channel (D-4) approximately 3,243 feet (0.45 mile) long **(Appendix A, Figure 8)**. This drainage channel transitioned from a dry drainage channel at the north end to an intermittent stream along the south end **(Appendix A, Figures 8-3 and 9-3)**. Channel assessments started downstream of a culvert pipe under Anderson Road along the north edge of the Subject Site. This north reach was narrow averaging about three feet wide and approximately one foot in depth. The edge of the channel was dominated by upland vegetation. Little to no vegetation was in the channel bed which was predominantly large flat slate stones and occasional gravel beds. No standing water was observed within the northern half of NWI 12. Soils, where sampled within the channel, were dominated by sand and coarse gravel. No hydric soil conditions were observed. Other than the drainage channel, no observable hydric characteristics were observed along the northern section of NWI 12. Several smaller drainage channels had confluences with the assessed drainage channel. None of these smaller drainages were discharging water into the assessed drainage channel. The lack of hydric vegetation and soils throughout the D-4 channel section does not exhibit characteristics typically associated with either ephemeral or intermittent stream channels. Although there are hydrological features that support discharge flow events, the lack of wetland plants and hydric soils dis-qualifies this feature as a potential wetland.

8 SUMMARY

Upon completion of field determinations and delineations a total off seventeen potential wetlands were identified within the Subject Site (Table 1) (Appendix A, Figure 8). These include:

- WS-1 hydric features
  - Eleven wetlands
    - Six freshwater ponds
      - W-9 through W-14
    - Five emergent wetlands
      - W-4 through W-8
- WS-2 hydric features
  - Three wetlands
    - Two freshwater ponds
      - W-1 and W-3
    - One emergent wetland
      - W-2
  - One stream segment
    - S-2
- WS-3 hydric feature
  - One stream segment
    - S-1
- WS-4 hydric feature
  - One stream segment
    - S-3

Several features identified by public available sources did not exhibit all three USACE wetland characteristics when assessed in the field. These features are described as non-qualified hydric features and are being discussed because they appeared on public available datasets that are used to help locate and identify hydric features. These public data sources do identify that their information may not be accurate and that a site visit is typically needed to verify the accuracy of the available data. SCS completed the site visit and assessed these previously discussed features to determine if the mapped features exhibit all three wetland characteristics defined by the USACE. These that did not exhibit one or more hydric characteristics include:

- WS-1
  - NWI 5 – A riverine feature that did not have a dominant hydric plant community
- WS-2
  - NWI 8 – A riverine feature that did not have a dominant hydric plant community and hydric soils. This feature was identified as D-1 and D-2.
  - NWI 10 – This feature was not located due to the construction and surface modification of the current facility operations.
  - NWI 11 - This feature is near the lower end of D-2. Fill was being placed in this area to create a working deck for an excavator to remove the sediment from the storm-water sedimentation basin and restore to original depths.

- WS-3
    - NWI 12 – This upper channel reach failed to exhibit a dominant hydric plant community.

A total of twenty-five potential wetland features were documented in this report. Of these twenty-five, twenty-two were assessed during the field site visit. Seventeen of these twenty-two potential wetland features exhibited the three characteristics that the USACE use to identify wetlands. The need for jurisdictional oversight by the USACE, a significant nexus must exist with WOTUS. Six of the seventeen identified potential wetland appear to have a significant nexus and are therefore, in SCS's opinion, are subject to jurisdictional oversite. These six features include three wetlands and three stream segments:

- S-1 – Nexus with the Arkansas River
- S-2 – Nexus with the Arkansas River
- S-3 – Nexus with Sand Creek
- W-2 – Nexus with the Arkansas River
- W-12 – Nexus with Shell Creek
- W-14 – Nexus with Shell Creek

9 CONCLUSION

SCS completed a site assessment for a proposed lateral expansion at AEL. The project area is approximately 463 acres and is located west and north of the existing landfill. Twenty-five features were identified and discussed within this report. Of the twenty five discussed features, twenty-two were assessed within the field. A review of public available information identified thirteen potential wetland features. SCS identified and delineated seventeen potential wetland features within the Subject Site (W-1 through W-14 and S-1 through S-3). Of the seventeen features that exhibited the three USACE identified wetlands characteristics, six of these features also exhibited a significant nexus with WOTUS. After reviewing public data and completing a field assessment of the Subject Site, a significant nexus could be determined for three identified wetlands (W-2, W-12, and W14) and for three stream segments (S-1, S-2, and S-3). It is SCS's opinion that these six features are subject to the USACE oversight and any modifications, alterations, or impacts that may occur to these features as a result of the proposed expansion would require prior approval from the USACE. SCS recognizes that the USACE has the official authority to make rulings on jurisdictional determinations for WOTUS. This report is being supplied to help provide site-specific data to assist the USACE with their jurisdictional determination on the potential wetlands discussed within this report.

10 GENERAL COMMENTS

This report includes analysis of the available information. Conclusions drawn by others from the results of this work should recognize the limitation of the methods used. Please note that SCS does not warrant the work of regulatory agencies or other third parties supplying information used in assimilation of this report. This report is prepared in accordance with generally accepted environmental engineering practices, within the constraints of the client's directives. It is intended for the exclusive use of the client for specific application to the assessed property. No guarantees, express or implied, are intended or made.

11 REFERENCES

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12 GLOSARY

USACE – United States Army Corps of Engineers

WOTUS – Waters of the United States

WS – Watershed

W-# - Field determined wetland

S-# - Field determined stream channel

D-# - Non-Qualified hydric feature

CWA – Clean Water Act

NWI – U.S. Fish and Wildlife Service National Wetland Inventory

NHD – National Hydrography Dataset

FEMA – Federal Emergency Management Agency

USGS – United States Geological Service

NRCS – United States Department of Agriculture Natural Resource Conservation Service

Appendix A

Figures

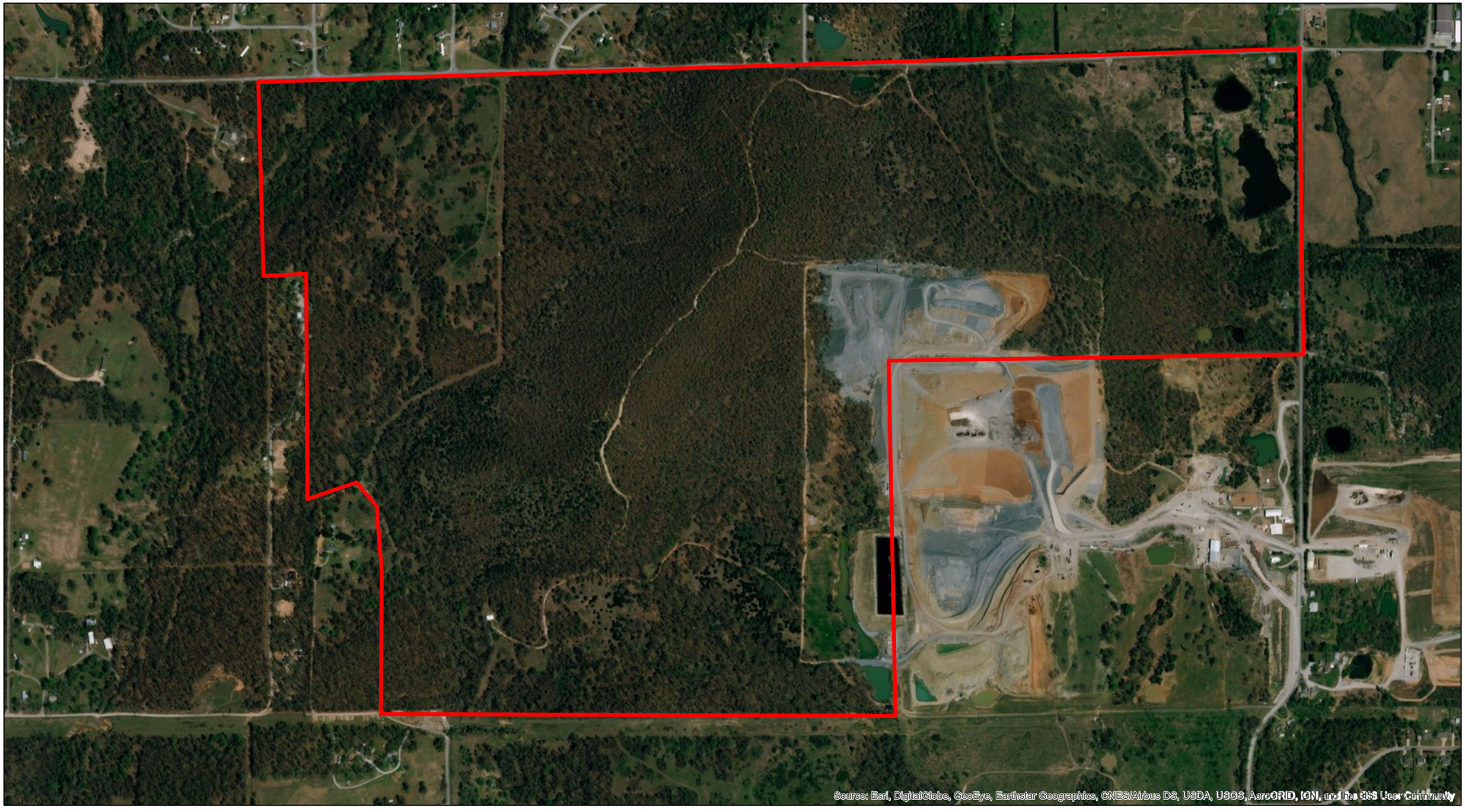

Figure 1. **Aerial Photograph of the AEL Subject Site**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

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SCS ENGINEERS
CONSULTING ENGINEERS, INC.
11120 E. 26th St. North, Suite 1100
Wichita, Kansas 67226
PH. (316) 315-4501

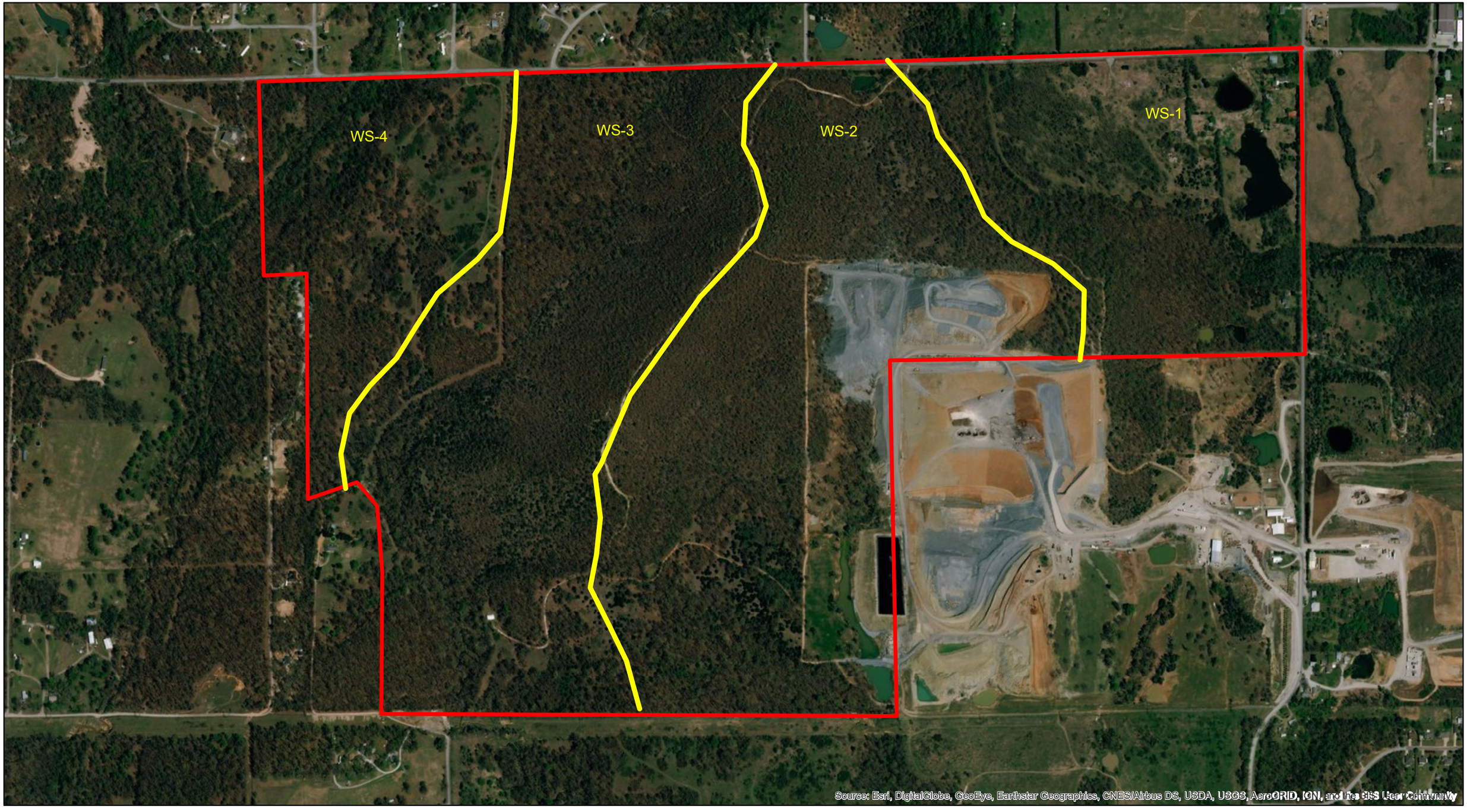

Figure 2.

Aerial Photograph of the AEL Subject Site
Including Estimated Watershed Boundaries
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 315 630 1,260 1,890 2,520
Feet

N

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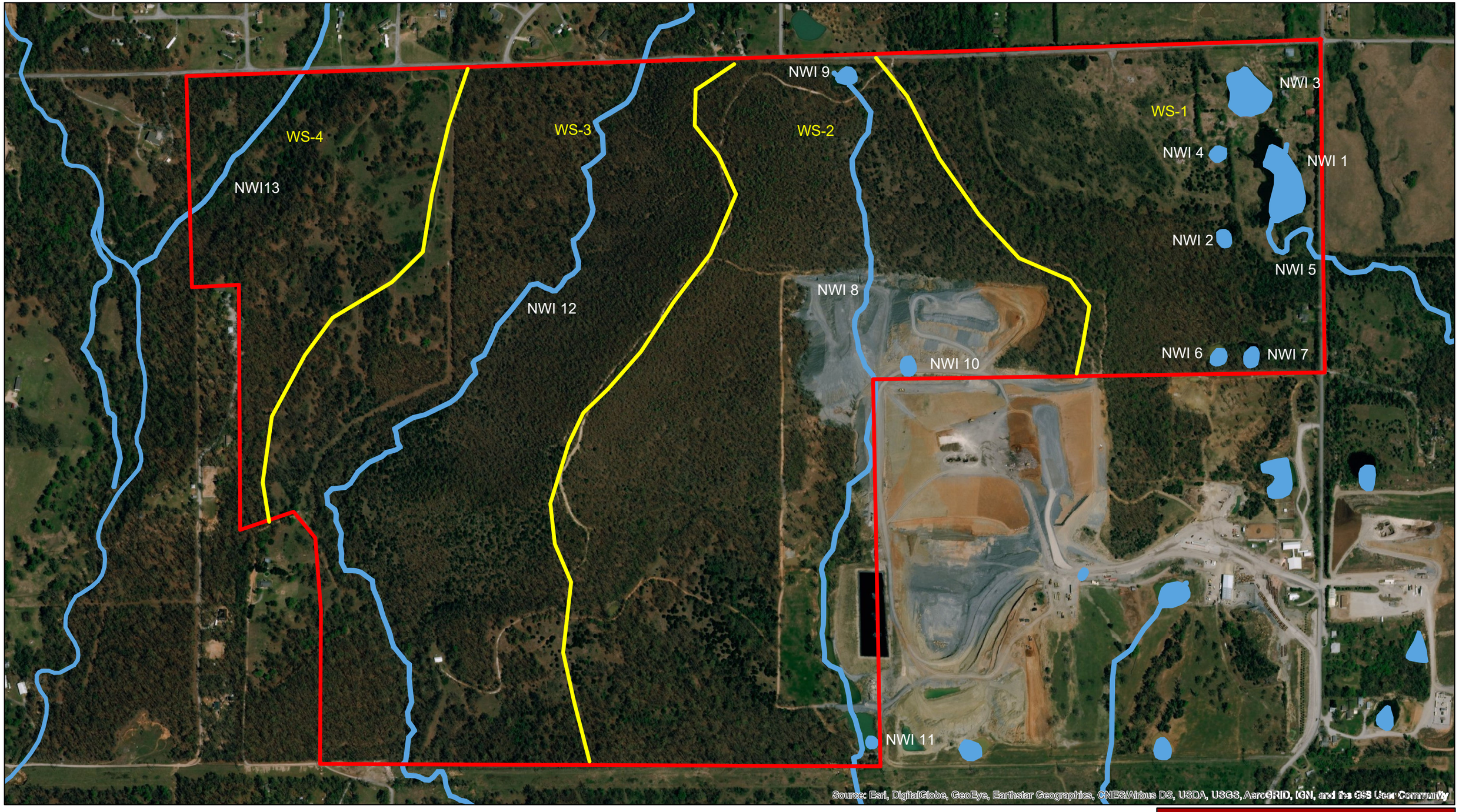

Figure 3.

National Wetland Inventory Map
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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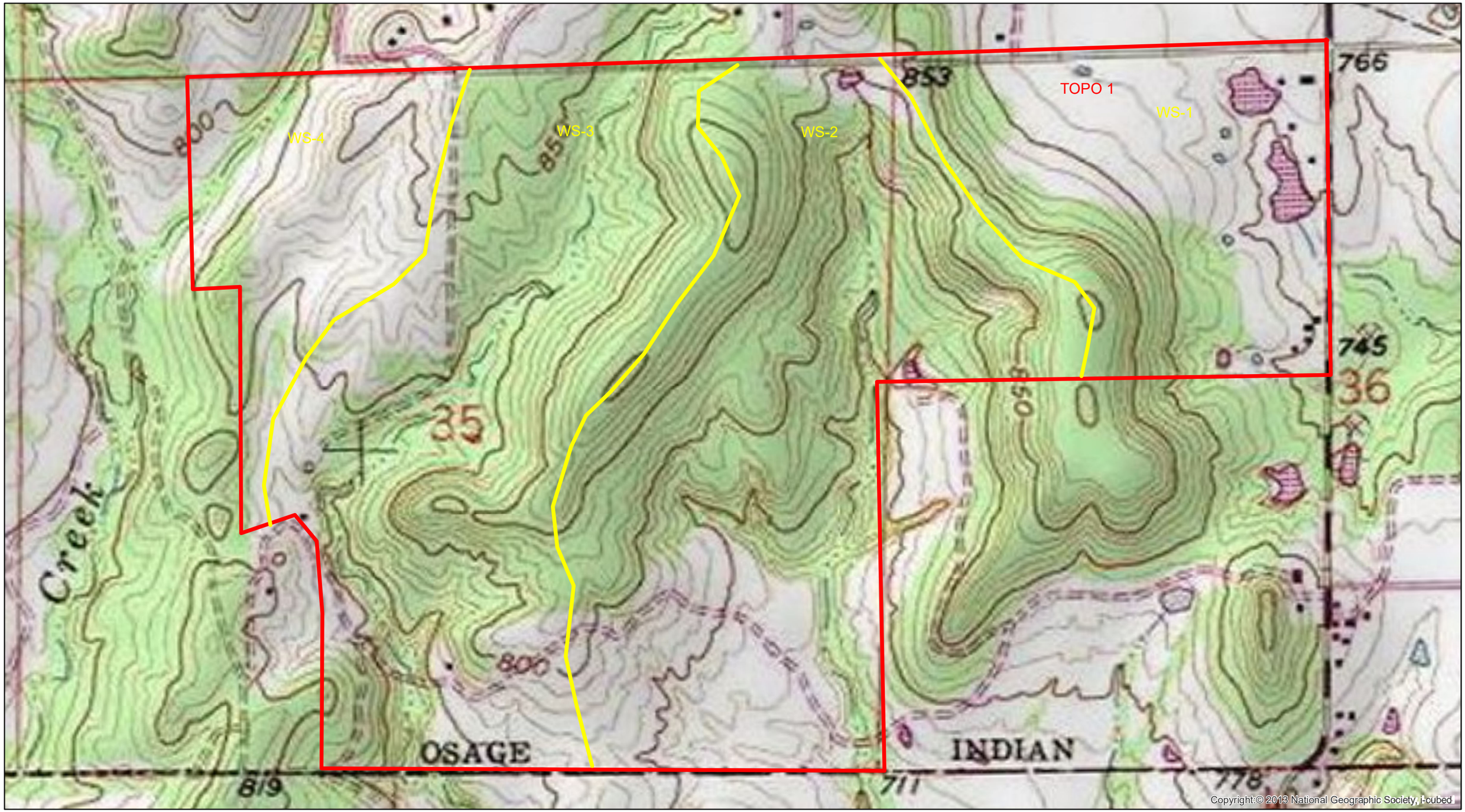

Figure 4. **Topographic Map of AEL Proposed Expansion**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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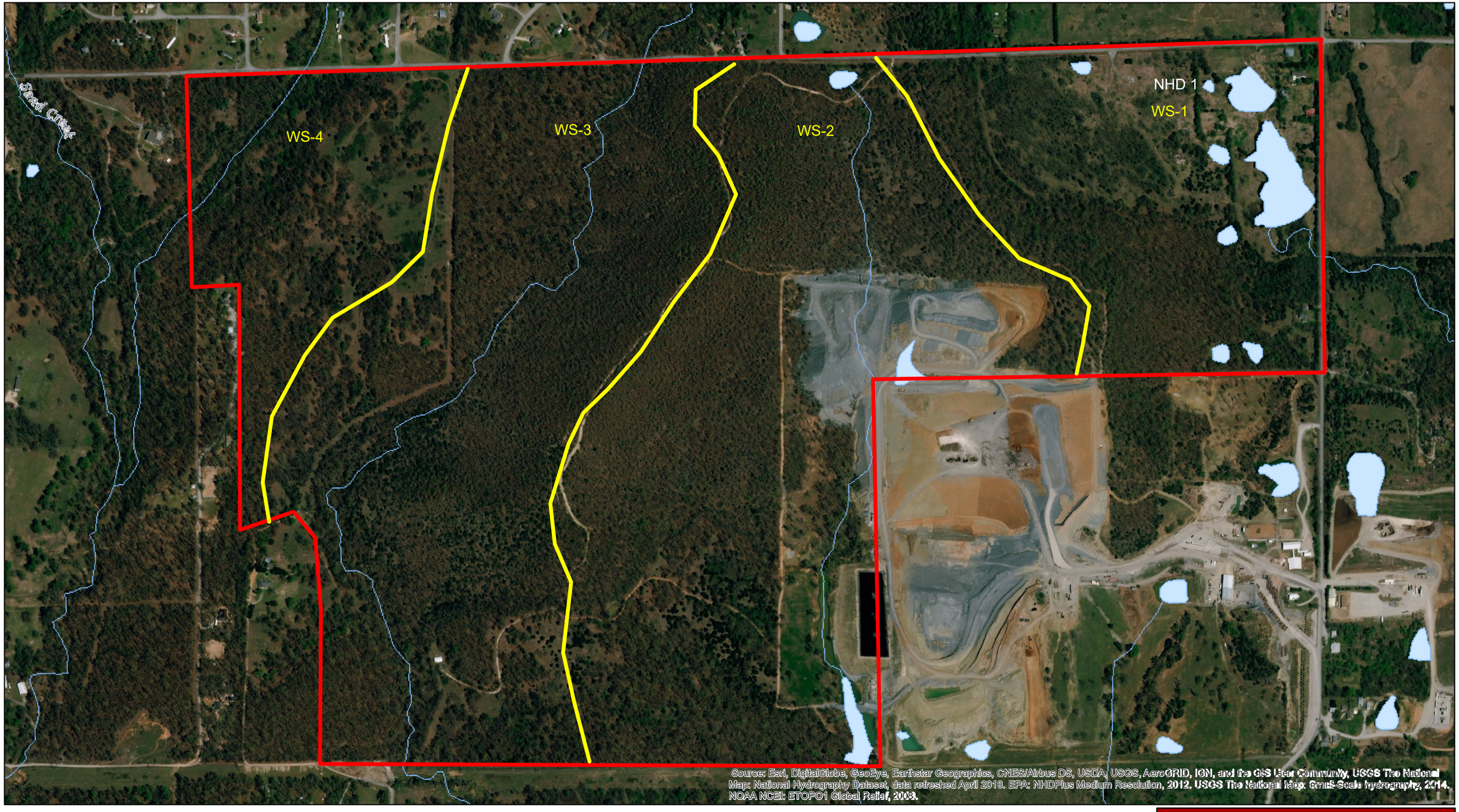

Figure 5.

National Hydrography Dataset Map
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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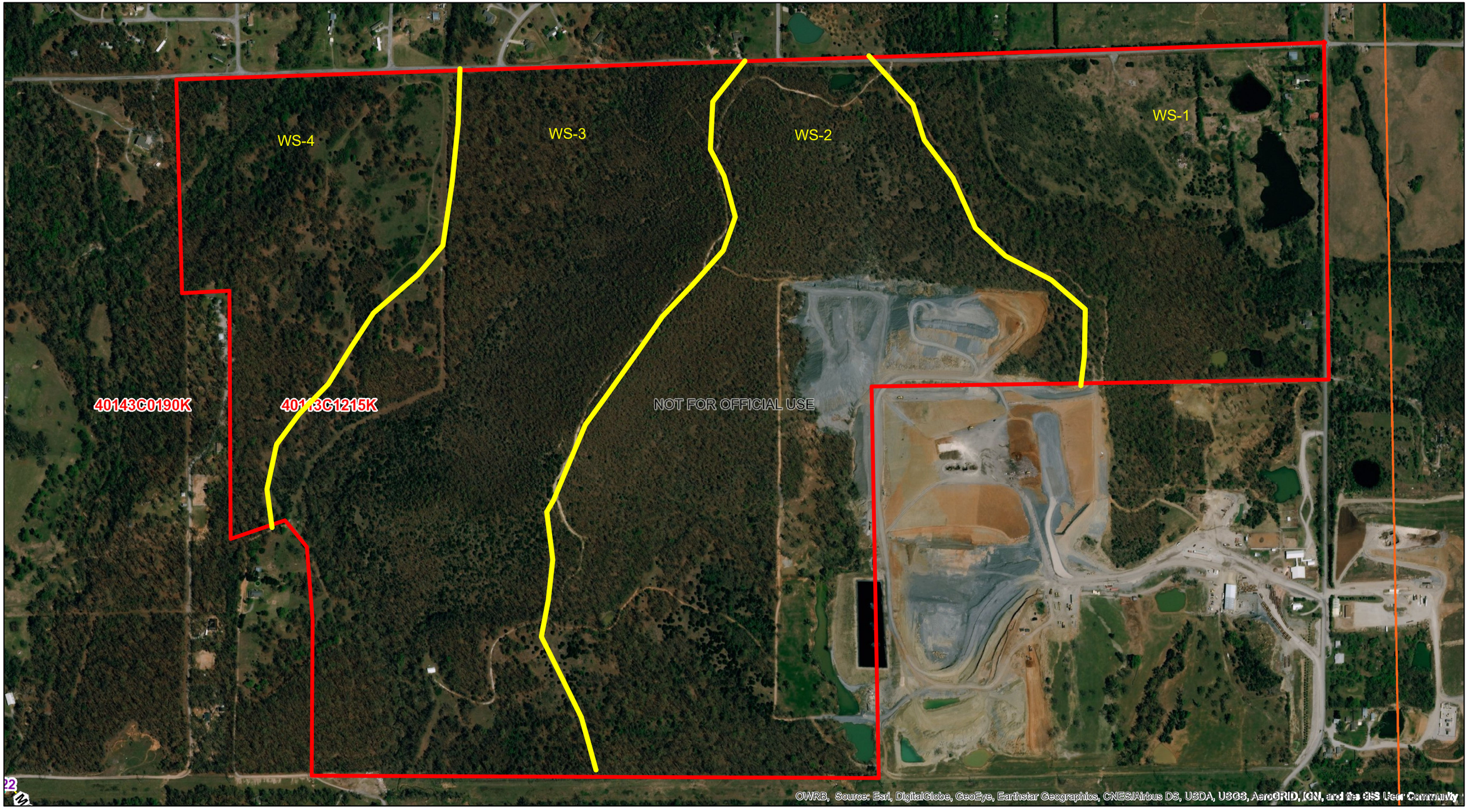

Figure 6.

FEMA Flood Harzard Zones
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280
Feet

N

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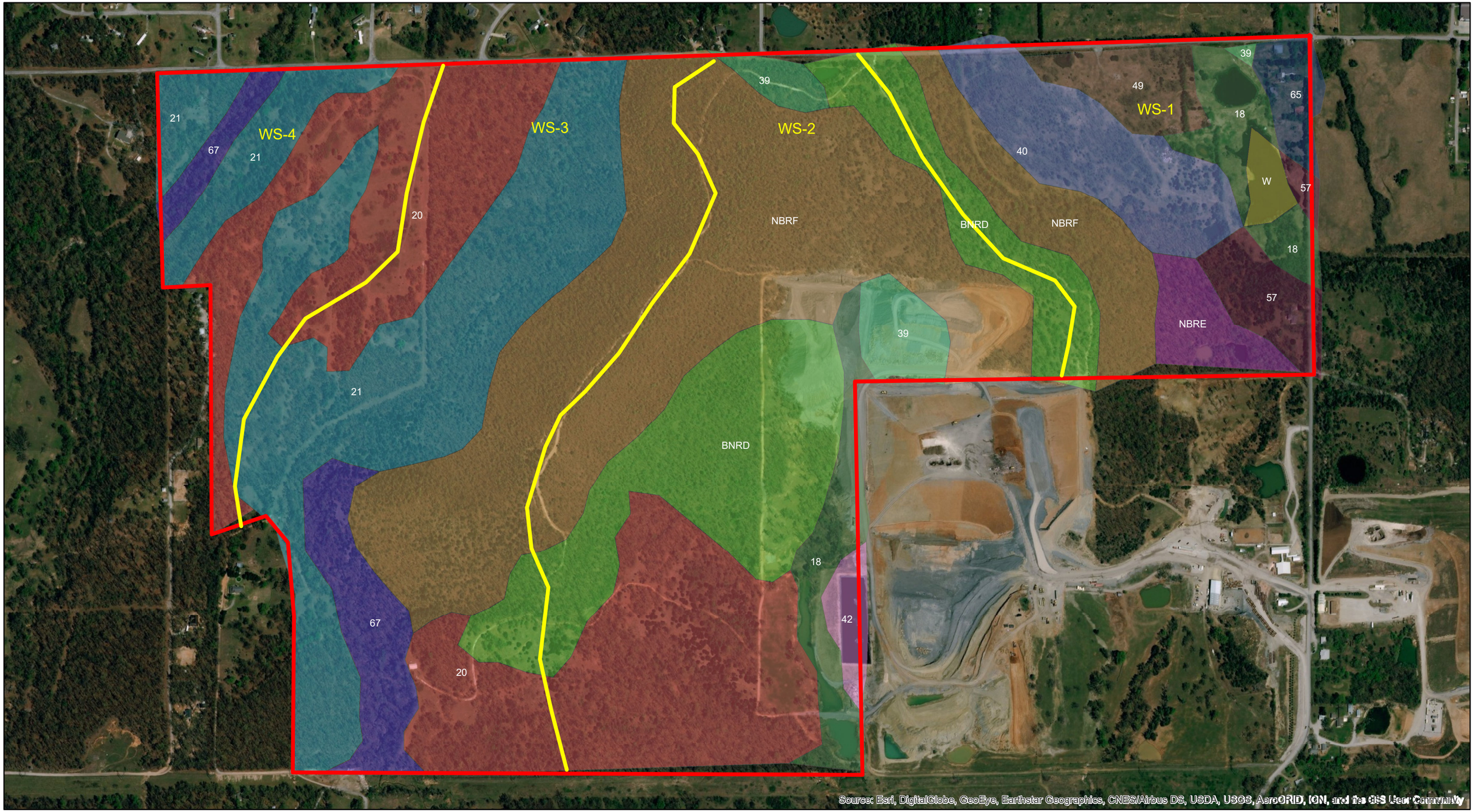

Figure 7.

NRCS Soil Map
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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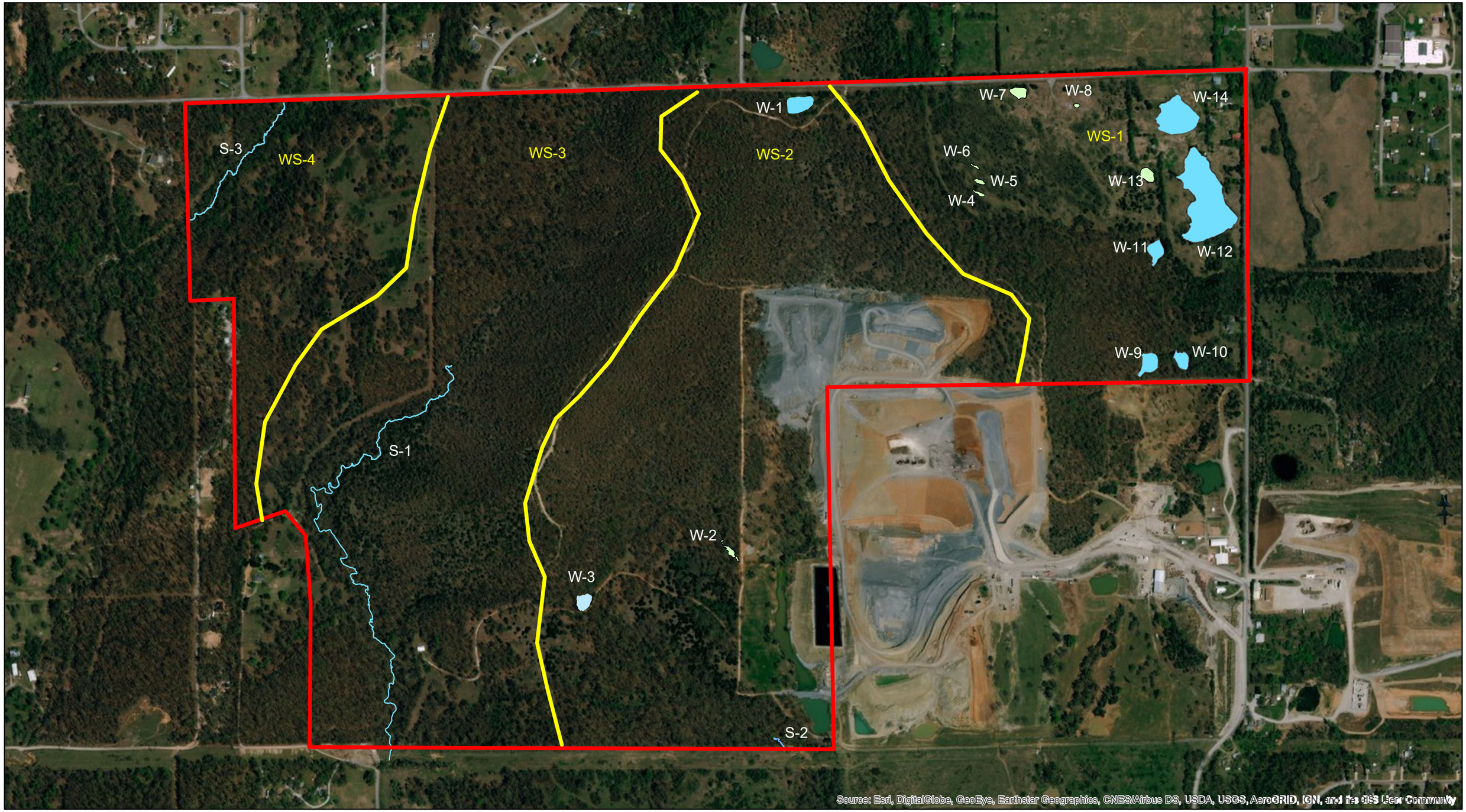

Figure 8.

Delineated Wetland Boundaries
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 310 620 1,240 1,860 2,480 Feet

N

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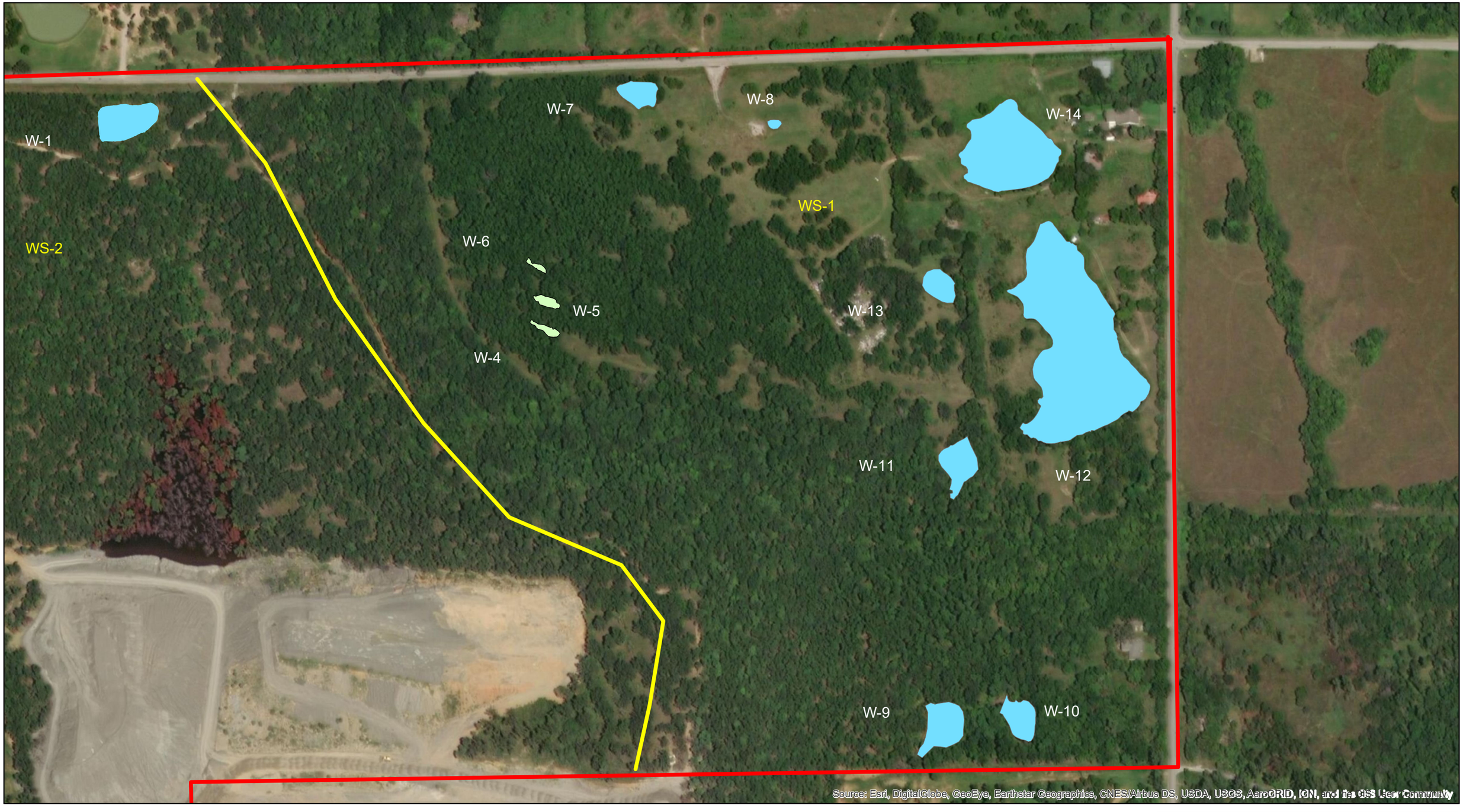

Figure 8-1.

Delineated Wetland Boundaries for WS-1
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 130 260 520 780 1,040 Feet

N

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Figure 8-2.

Delineated Wetland Boundaries for WS-2
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 155 310 620 930 1,240 Feet

N

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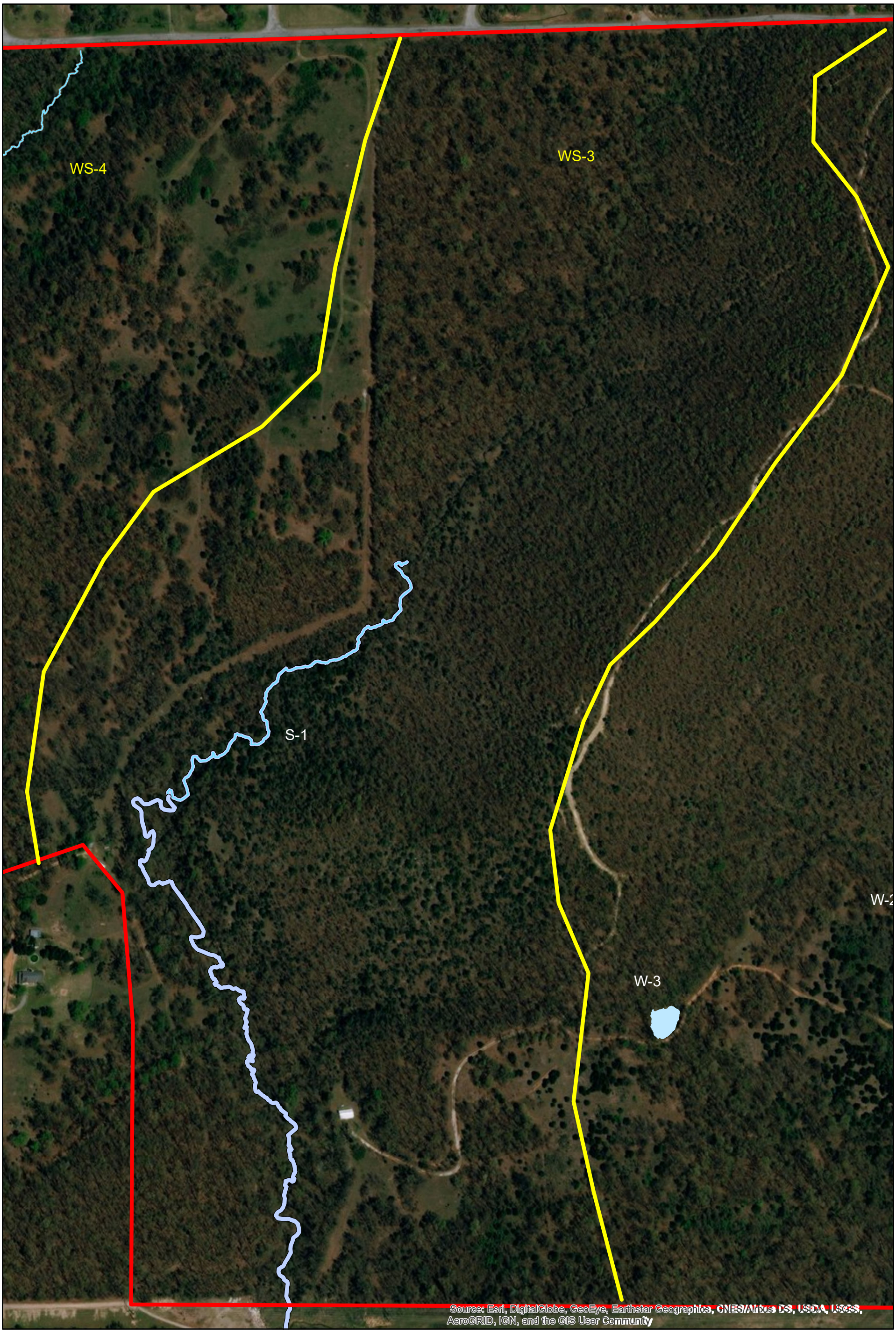

Figure 8-3.

Delineated Wetland Boundaries for WS-3
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 155 310 620 930 1,240 Feet

N

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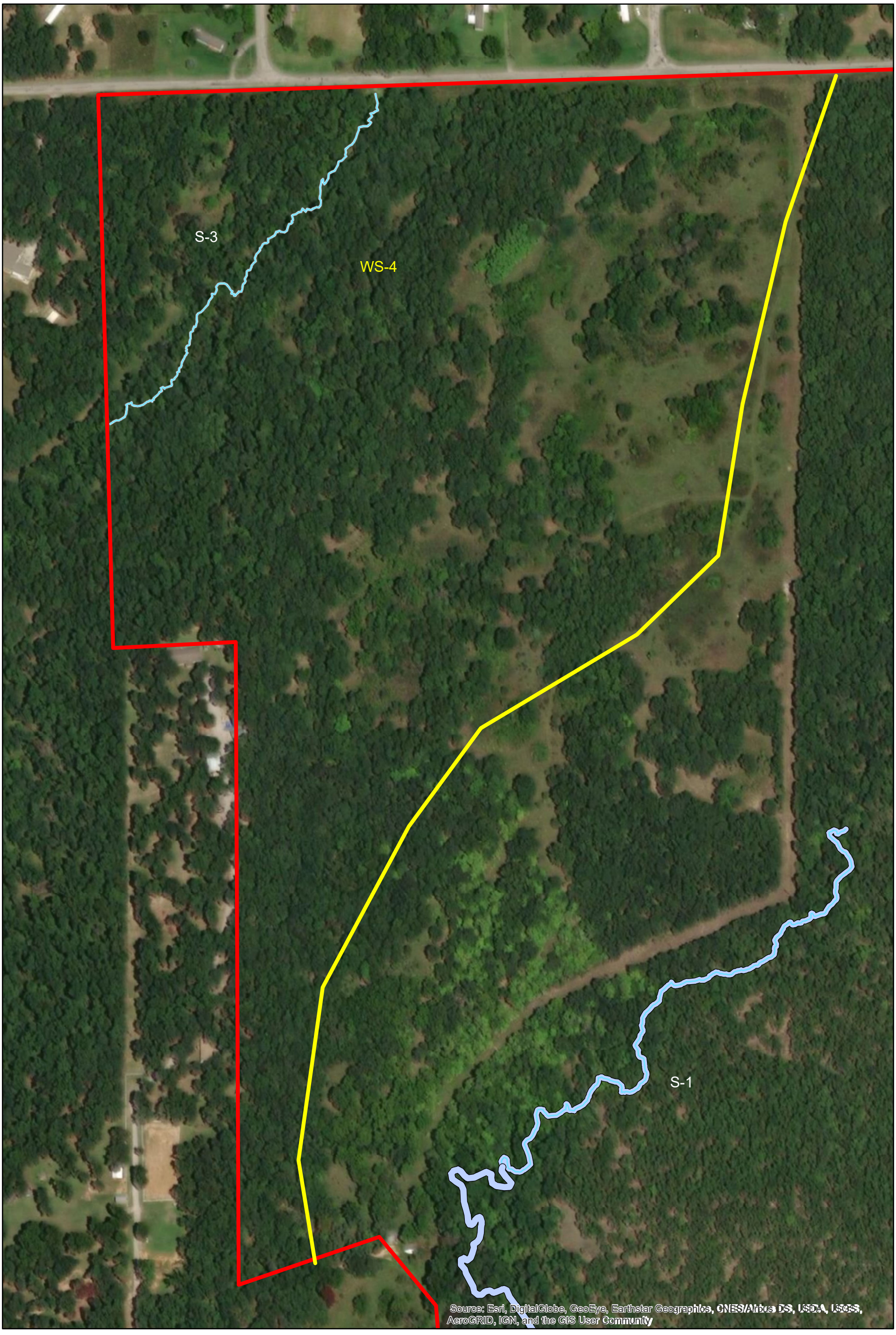

Figure 8-4.

Delineated Wetland Boundaries for WS-4
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 110 220 440 660 880 Feet

N

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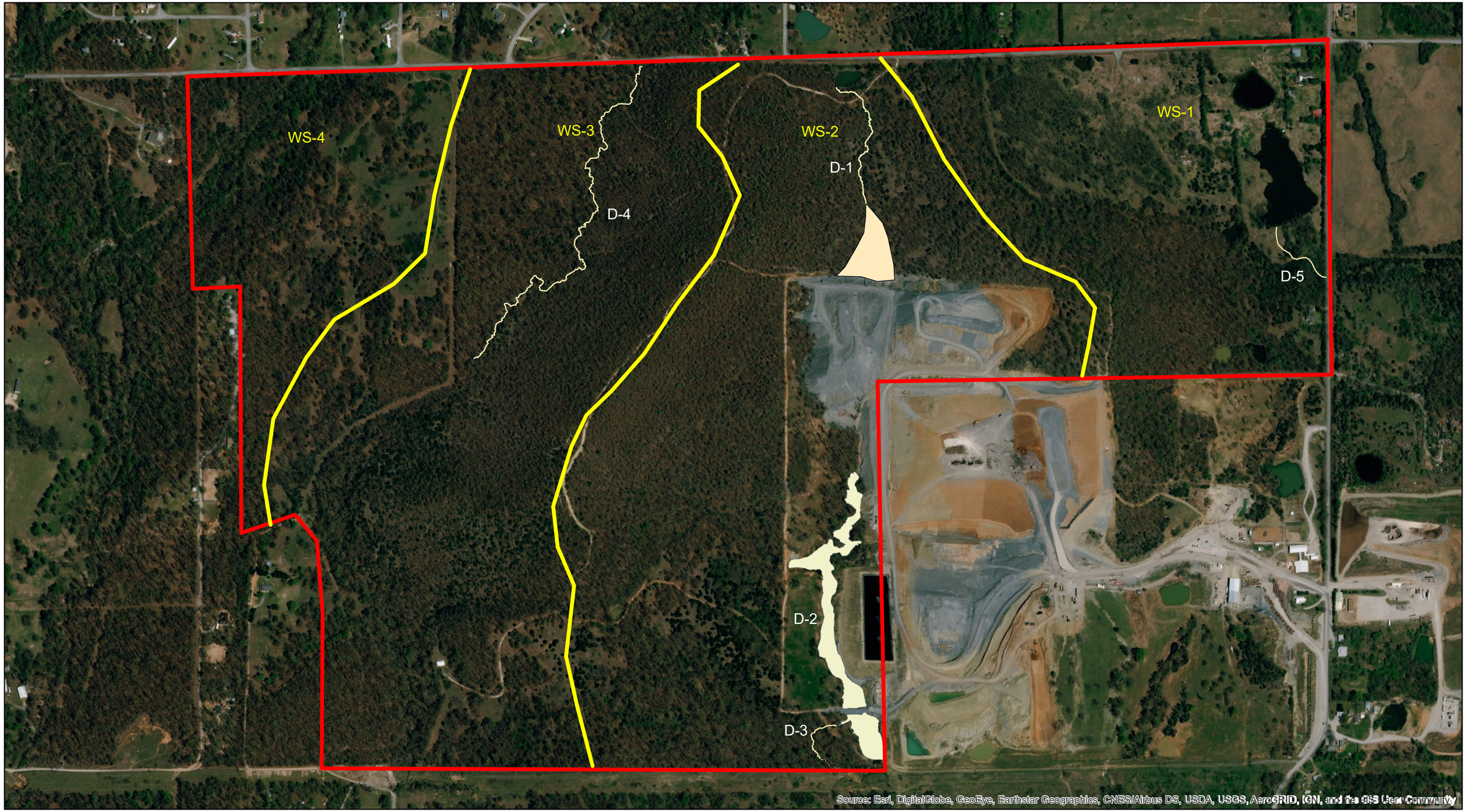

Figure 9.

Non-Qualified Assessed Features
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 285 570 1,140 1,710 2,280 Feet

N

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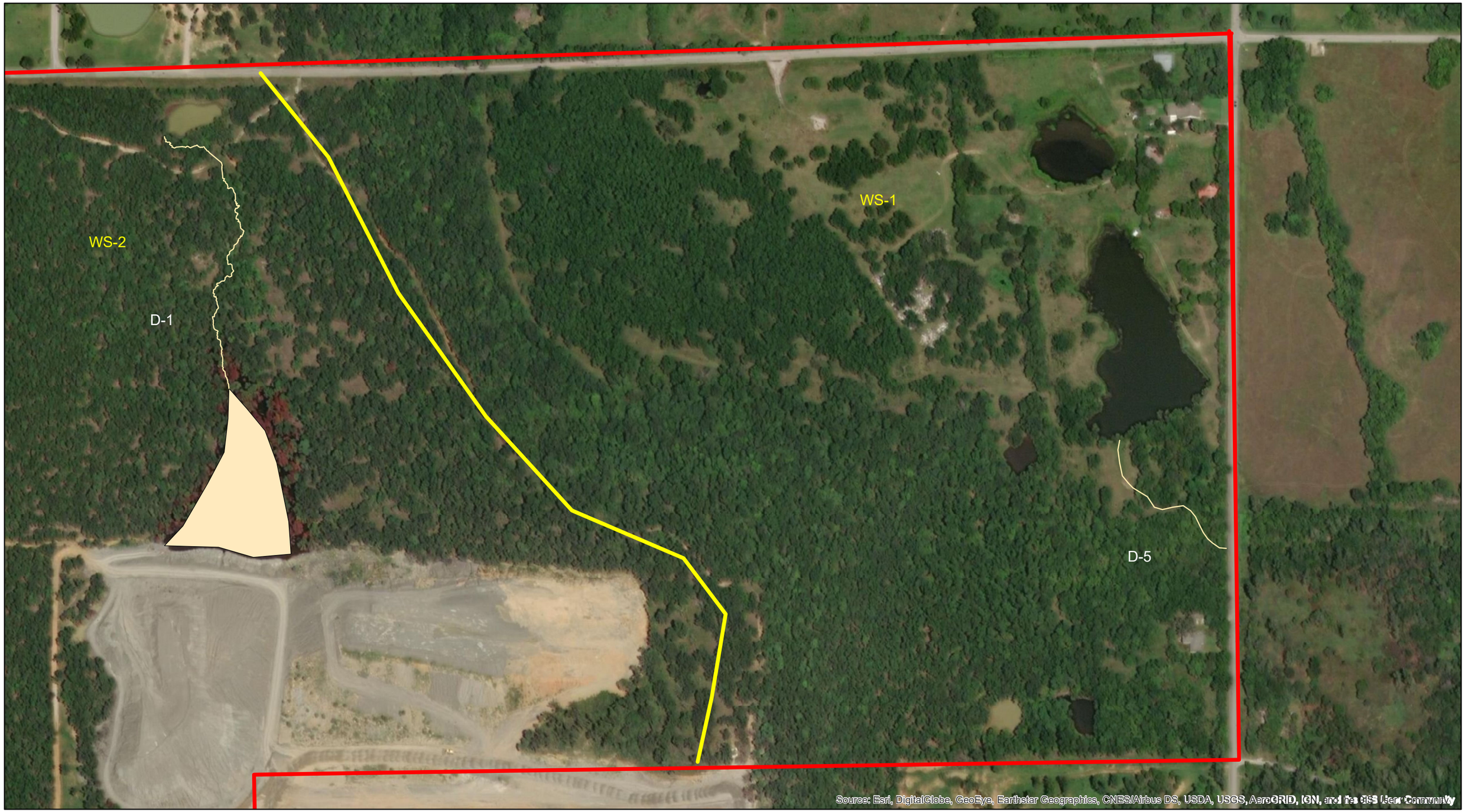

Figure 9-1. **Non-Qualified Assessed Features for WS-1**
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 130 260 520 780 1,040 Feet

N

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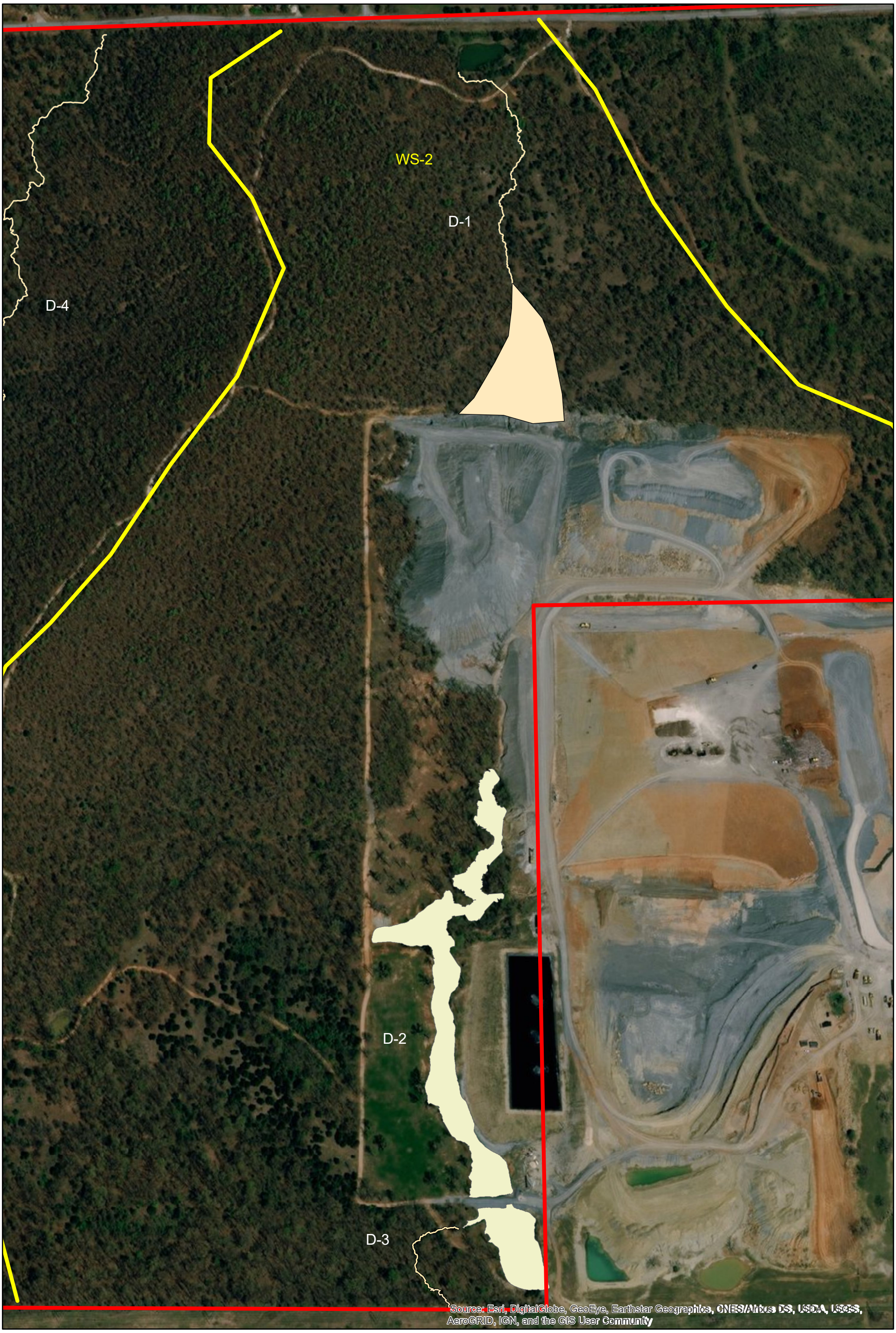

Figure 9-2.

Non-Qualified Assessed Features for WS-2
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 155 310 620 930 1,240 Feet

N

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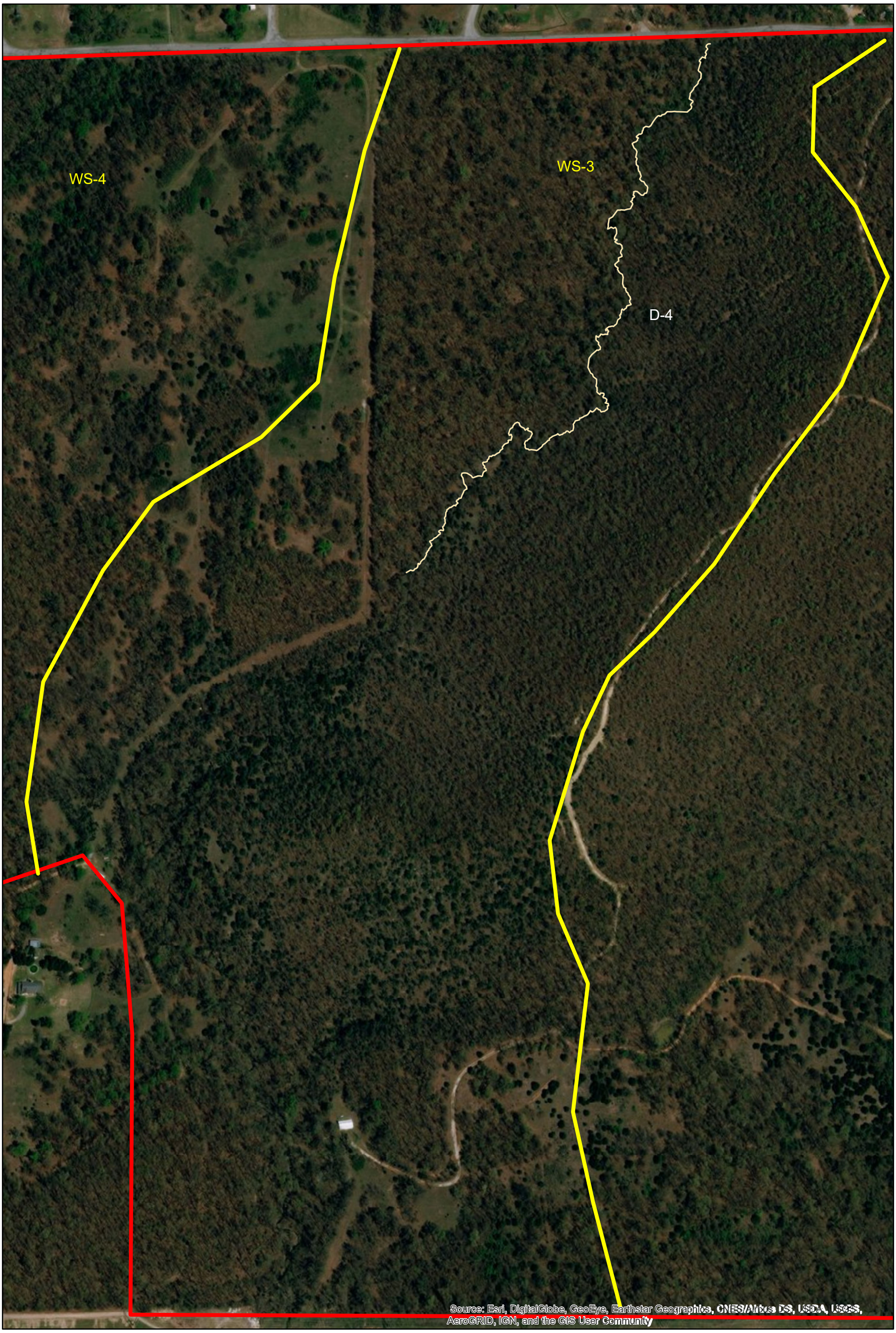

Figure 9-3.

Non-Qualified Assessed Features for WS-3
AEL Proposed Expansion
Osage County, Oklahoma
August 9, 2018

0 155 310 620 930 1,240
Feet

N

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Appendix B

Photographic Log

Photograph 1

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): North

Description: W-1 determination location along southeast side. Broadleaf cattails along more than half of W-1 shoreline.

Photograph 2

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): East

Description: W-1 probable overflow location into D-1 channel.

Photograph 3

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): South

Description: Starting point of D-1 drainage. Note dry channel with erosion scours. Photograph taken close to where Photograph 2 was taken.

Photograph 4

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): South

Description: Steep drainage channel of D-1. Channel appears more of a wash without channel features.

Photograph 5

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): Northwest

Description: Taken from the soil stockpile at the south end of D-1. Pump and water truck used to drain water from area. Note the high water mark behind water truck.

Photograph 6

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): South

Description: The broad sanding bottom of D-2. The sparse vegetation. Picture is near the north end looking down the length of D-2.

Photograph 7

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): South

Description: The beginning of S-2 stream channel with isolated pools. Note tree leaning across channel. The tree had fallen over due to undercutting. Channel bottom is hard clay pan with little to no loose sediment. D-3 is similar without the isolated pools.

Photograph 8

Taken by: V. Weaver

Date: May 24, 2018

Direction (facing): West

Description: Southeast end of W-2 looking up the drainage way toward the surrounding hills. Surface water and stained leaves in the foreground.

Photograph 9

Taken by: V. Weaver

Date: May 25, 2018

Direction (facing): West

Description: Northeast end of W-3 shoreline vegetation. Water clarity was good and easy to see coon's tail under the surface.

Photograph 10

Taken by: V. Weaver

Date: May 25, 2018

Direction (facing): South

Description: Culvert pipe under Anderson Road at the beginning of D-4.

Photograph 11

Taken by: V. Weaver

Date: May 25, 2018

Direction (facing): South

Description: Typical channel for D-4 throughout reach. Note leaf litter that doesn't appear to be stained from water.

Photograph 12

Taken by: V. Weaver

Date: May 25, 2018

Direction (facing): West

Description: The top reaches of S-1 showing pools near outside bend of stream channel. Note the high outside bank.

Photograph 13

Taken by: V. Weaver

Date: May 25, 2018

Direction (facing): North

Description: The breached rock and cement dam. S-1 flows through breach. Pool at the bottom of picture is the start of persistent flowing water that continued to the southern Subject Site boundary.

Photograph 14

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): Northwest

Description: W-4 determination location. Note the sparse vegetative cover. The area was flat and near the toe of a hill to the west.

Photograph 15

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): North

Description: W-5 is similar to W-4 and near the toe of a hill west of the site. Again the sparse vegetation surrounded by a thick groundcover.

Photograph 16

Taken by: A. Garnsey

Date: May 25, 2018

Direction (facing): North

Description: W-6 is similar to W-4 and W-5.

These three wetlands were located on flat areas that could have been terraces or access roads.

Photograph 17

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): North-Northeast

Description: W-7. Emergent wetland located along the South Side of Anderson Road in Watershed 1 (WS-1). True aquatic plants and aquatic fauna present.

Photograph 18

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): West

Description: W-8. Emergent wetland located east of W-7. Flat-stem spike rush (*Eleocharis compressa*) was prevalent at the determination point.

Photograph 19

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): Northwest

Description: W-9 determination location. Constructed pond with permanent surface water and an emergent wetland fringe. True aquatic plants and aquatic fauna present

Photograph 20

Taken by A. Garnsey

Date: September 1, 2018

Direction (facing): North

Description: W-10 determination location. In close proximity to W-9; also appears to be a newly constructed pond with permanent surface water and an emergent wetland fringe. True aquatic plants and aquatic fauna present.

Photograph 21

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): East

Description: W-11 determination location. Constructed pond with permanent surface water and an emergent wetland fringe. True aquatic fauna present. Water was murky with thick layer of sediment on bottom.

Photograph 22

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): East

Description: W-12. Large constructed pond with permanent surface water and an emergent wetland fringe along portions of the perimeter. True aquatic plants and aquatic fauna present.

Photograph 23

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): NA

Description: Culvert observed along south boundary of W-12. Likely an over flow pipe that drains into mapped blue line (D-5) during high water events. Photo was taken on the pond side.

Photograph 24

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): West

Description: W-13. Appears to be an old constructed pond. No surface water was present, Berm along the east side of pond.

Photograph 25

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): Northeast

Description: W-14. Appears to be a constructed pond with a large emergent wetland fringe. True aquatic flora and fauna present.

Photograph 26

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): Northeast

Description: S-3 with narrow wetland fringe. Aquatic fauna present. Defined bed and bank.

Photograph 27

Taken by: A. Garnsey

Date: September 1, 2018

Direction (facing): Northeast

Description: S-3 culvert located south of Anderson Road.

APPENDIX C

DATA FORMS

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 5/24/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-1

Investigator(s): V. Weaver, D. Daniels Section, Township, Range: Sec. 35, T20N, R10E

Landform (hillslope, terrace, etc.): Pond Local relief (concave, convex, none): Concave

Slope (%): 1-8 Lat: 36.172764 Long: -96.198287 Datum: WGS84

Soil Map Unit Name: Bigheart-Niotaze-Rock outcrop complex, 1 to 8 percent slopes NWI or WWI classification: PUSCh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus pennsylvanica*	15	Y	FACW
2. *Juniperus virginiana*	10	Y	FACU
3.			
4.			
5.			
	25	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5' Rad)			
1. *Typha angostifolia*	75	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	75	= Total Cover	
Woody Vine Stratum (Plot size: 30' Rad)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.67 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	75	x 1 =	75
FACW species	15	x 2 =	30
FAC species		x 3 =	0
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	100 (A)		145 (B)

Prevalence Index = B/A = 1.45

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Plant species that were located along the shoreline and within the hydric soil ban were identified for this assessment. Plants that were located outside of the hydric soil ban and away from the shoreline were not included in this determination. The hydric soil reached approximately 2-3 feet from edge of water.

SOIL

Sampling Point: W-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	Gley 1 5/10Y	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 5/24/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-2

Investigator(s): V. Weaver, D. Daniels Section, Township, Range: Sec. 35, T20N, R10E

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.164736 Long: -96.200233 Datum: WGS84

Soil Map Unit Name: BNRD - Bigheart-Niotaze-Rock outcrop comples, 1 to 8 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus muehlenbergii*	35	Y	FACU
2. *Fraxinus pennsylvanica*	25	Y	FACW
3. *Quercus alba*	10	N	FACU
4.			
5.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Cornus drummondii*	35	Y	FAC
2. *Salix nigra*	35	Y	OBL
3.			
4.			
5.			
	70	= Total Cover	
Herb Stratum (Plot size: 5' Rad)			
1. *Chasmanthium latifolium*	20	Y	FACW
2. *Persicaria pensylvanica*	15	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	35	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 85.7 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	35	x 1 =	35
FACW species	60	x 2 =	120
FAC species	35	x 3 =	105
FACU species	45	x 4 =	180
UPL species		x 5 =	0
Column Totals:	175 (A)		440 (B)

Prevalence Index = B/A = 2.51

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Shrub and herb stratum plants that were within the drainage feature were assessed. Trees included had trunks located along edge of hydric feature.

SOIL

Sampling Point: W-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 4/3	100					Sand	No visible redox
6-7	7.5YR 4/3	50	5YR 4/6	50	C	M	Clay/Sand	Redox limited to this layer
7-18	Gley1 3/10Y	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

The redox features were predominantly within the 1 in layer between sandy soils on top and clay soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Pooling looked to be a result of a culvert placed in the channel slightly above grade of the wetland feature.

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 5/25/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-3

Investigator(s): V. Weaver, D. Daniels Section, Township, Range: Sec. 35, T20N, R10E

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.164009 Long: -96.203394 Datum: WGS84

Soil Map Unit Name: BNRD - Bigheart-Niotaze-Rock outcrop comples, 1 to 8 percent slopes NWI or WWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus alba*	30	Y	FACU
2.			
3.			
4.			
5.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Fraxinus pennsylvanica*	20	Y	FACW
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Persicaria pensylvanica*	50	Y	FACW
2. *Ceratophyllum demersum*	20	Y	OBL
3. *Chasmanthium latifolium*	20	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: 30' Rad)			
1. *Smilax rotundifolia*	5	Y	FAC
2.			
	5 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	85	x 2 =	170
FAC species		x 3 =	0
FACU species	30	x 4 =	120
UPL species		x 5 =	0
Column Totals:	135 (A)		310 (B)

Prevalence Index = B/A = 2.30

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

Filamentous algae along shoreline substrate.

SOIL

Sampling Point: W-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	7.5YR 4/2	85	5YR 4/6	15	C	M	Sand	
7-18	7.5YR 4/2	20	5YR 4/6	80	C	M	Clay/Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 4"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The pond appears to be a result of a constructed access road that was located along the east side of the pond. The natural drainage flows into this pond. No culvert pipe is located under the access road to allow impounded water to drain out. Outside of a drainage way, no additional hydric features were observed down gradient of access road and pond.

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-4

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.171237 Long: -96.194620 Datum: WGS84

Soil Map Unit Name: 40 - Norge silt loam, 5 to 8 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Carya. cordiformis*	5	Y	FACU
2. *Juniperus virginiana*	3	Y	FACU
3.			
4.			
5.			
	8 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Juncus interior*	40	Y	FAC
2. *Persicaria pensylvanica*	15	Y	FACW
3. *Coleataenia anceps*	15	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	30	x 2 =	60
FAC species	40	x 3 =	120
FACU species	8	x 4 =	32
UPL species		x 5 =	0
Column Totals:	78 (A)		212 (B)

Prevalence Index = B/A = 2.72

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

No trees were located within the delineated wetland area. A bitternut hickory provided canopy cover for more than 50% of the delineated wetland, but the trunk was located outside the delineated boundary.

SOIL

Sampling Point: W-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 2.5/1	100					Org	Humus layer
2-16	7.5YR 3/3	70	7.5YR 4/6	30	C	M	sand/sltlm	Redox limited to this layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Depression is located along a possible terrace or an old two-track road overgrown.

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-5

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.171350 Long: -96.194651 Datum: WGS84

Soil Map Unit Name: 40 - Norge silt loam, 5 to 8 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Juniperus virginiana*	3	Y	FACU
2.			
3.			
4.			
5.			
	3 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Carex pellita*	40	Y	OBL
2. *C. interior*	20	Y	OBL
3. *Coleataenia anceps*	15	Y	FACW
4. *Persicaria pensylvanica*	10	N	FACW
5. *Rumex crispus*	5	N	FAC
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	25	x 2 =	50
FAC species	5	x 3 =	15
FACU species	3	x 4 =	12
UPL species		x 5 =	0
Column Totals:	93 (A)		137 (B)

Prevalence Index = B/A = 1.47

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

No trees were located within the delineated wetland area. A bitternut hickory provided canopy cover for more than 60% of the delineated wetland, but the trunk was located outside the delineated boundary.

SOIL

Sampling Point: W-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 2.5/1	100					Org	Humus layer
2-16	7.5YR 3/3	70	7.5YR 4/6	30	C	M	sand/silt/loam	Redox limited to this layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Depression is located along a possible terrace or an old two-track road overgrown.

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-6

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.171497 Long: -96.194658 Datum: WGS84

Soil Map Unit Name: 40 - Norge silt loam, 5 to 8 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Carya cordiformis*	3	Y	FACU
2.			
3.			
4.			
5.			
	3 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Carex interior*	40	Y	OBL
2. *C. pellita*	20	Y	OBL
3. *Coleataenia anceps*	15	Y	FACW
4. *Schedonorus arundinaceus*	5	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30' Rad)			
1. *Smilax hispida*	2	Y	FAC
2. *Lonicera japonica*	2	Y	FACU
	4 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	15	x 2 =	30
FAC species	2	x 3 =	6
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	87 (A)		136 (B)

Prevalence Index = B/A = 1.56

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

No trees were located within the delineated wetland area. A bitternut hickory provided canopy cover for more than 60% of the delineated wetland, but the trunk was located outside the delineated boundary.

SOIL

Sampling Point: W-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 2.5/1	100					Org	Humus layer
2-16	7.5YR 3/3	90	7.5YR 4/6	10	C	M	sand/siltloam	Redox limited to this layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Depression is located along a possible terrace or an old two-track road overgrown.

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-7

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.172836 Long: -96.193619 Datum: WGS84

Soil Map Unit Name: 49 - Parsons-Pharaoh complex, 0 to 3 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ulmus americana*	35	Y	FACW
2.			
3.			
4.			
5.			
	35 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Schoenoplectus tabernaemontani*	30	Y	OBL
2. *Persicaria pensylvanica*	40	Y	OBL
3. *Carex pellita*	25	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	95	x 1 =	95
FACW species	35	x 2 =	70
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	130 (A)		165 (B)

Prevalence Index = B/A = 1.27

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Water primrose and duckweed observed outside of assessment area near the center of wetland area.

SOIL

Sampling Point: W-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	7.5YR 3/1	85	7.5YR 4/6	15	C	P	Si/ClLm	
5-18	7.5YR 2.5/1	70	7.5YR 4/6	30	C	P/M	Cl-Lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The feature appears to be an old farm pond. The pond water level was low with only a small pool of water near the center.

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-8

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.172682 Long: -96.192494 Datum: WGS84

Soil Map Unit Name: 49 - Parsons-Pharaoh complex, 0 to 3 percent slopes NWI or WWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Eleocharis compressa*	65	Y	FACW
2. *Carex annectens*	20	Y	FACW
3. *Persicaria pensylvanica*	5	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	0
FACW species 90	x 2 =	180
FAC species	x 3 =	0
FACU species	x 4 =	0
UPL species	x 5 =	0
Column Totals: 90 (A)		180 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5YR 2.5/1	95	7.5YR 4/6	5	C	P	Si-Cl-Lm	
8-16	7.5YR 4/3	85	7.5YR 4/6	15	C	P/M	Cl	Hard soil at bottom

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Hard-pan soil

Depth (inches): 16

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This depression area looks to be a borrow area for the pump-jack pad adjacent to the

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-9

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.167974 Long: -96.190973 Datum: WGS84

Soil Map Unit Name: NBRE - Niotaze-Bigheart-Rock outcrop complex, 3 to 15 percent slopes, very ston NWI or WWI classification: PUBFh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Platanus occidentalis*	50	Y	FACW
2.			
3.			
4.			
5.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Certophyllum demersum*	45	Y	OBL
2. *Carex hystericina*	10	N	OBL
3. *Carex annectens*	5	N	FACW
4. *Mentha arvensis*	3	N	FACW
5. *Persicaria pensylvanica*	3	N	FACW
6.			
7.			
8.			
9.			
10.			
	66 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	55	x 1 =	55
FACW species	61	x 2 =	122
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	116 (A)		177 (B)

Prevalence Index = B/A = 1.53

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Bare ground consisted of approximately 40 percent of the ground cover.

SOIL

Sampling Point: W-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 4/2	100					Si-Cl-Lm	
1-16	10YR 4/3	70	7.5YR 7/8	30	C	M	Cl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

The shoreline appeared to have been recently maintained. Constructed berm along the east shorline.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-10

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.167888 Long: -96.190309 Datum: WGS84

Soil Map Unit Name: NBRE - Niotaze-Bigheart-Rock outcrop complex, 3 to 15 percent slopes, very ston NWI or WWI classification: PUBFh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Salix nigra*	3	Y	OBL
2. *Maclura pomifera*	3	Y	FACU
3.			
4.			
5.			
	6 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Carex grayi*	30	Y	FACW
2. *Carex hystericina*	15	N	OBL
3. *Veronica anagallis-aquatica*	15	N	OBL
4. *Mentha arvensis*	3	N	FACW
5. *Ceratophyllum demersum*	20	Y	OBL
6.			
7.			
8.			
9.			
10.			
	83 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	53	x 1 =	53
FACW species	33	x 2 =	66
FAC species		x 3 =	0
FACU species	3	x 4 =	12
UPL species		x 5 =	0
Column Totals:	89 (A)		131 (B)

Prevalence Index = B/A = 1.47

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Water level appears to be low allowing for an established nice hydric plant shoreline.

SOIL

Sampling Point: W-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/3	95	7.5 4/6	5	C	P	Si-Cl-Lm	
4-17	10YR 5/2	92	7.5YR 4/6	8	C	P	Cl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X **No** ___

Remarks:

Clay in soil retained most of the parent color. Redox was limited to pores.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): _____

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-11

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.170126 Long: -96.190927 Datum: WGS84

Soil Map Unit Name: 40 - Norge silt loam, 5 to 8 percent slopes NWI or WWI classification: PUSCx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 25' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus stellata*	10	Y	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' Rad)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 10' Rad)			
1. *Eleocharis compressa*	40	Y	FACW
2. *Veronica anagallis-aquatica*	20	Y	FAC
3. *Asteraceae sp.*	10	N	UPL
4. *Phalaris arundinacea*	8	N	FACW
5. *Teucrium canadense*	3	N	FACW
6.			
7.			
8.			
9.			
10.			
	81 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	0
FACW species 51	x 2 =	102
FAC species 20	x 3 =	60
FACU species 10	x 4 =	40
UPL species 10	x 5 =	50
Column Totals: 91 (A)		252 (B)

Prevalence Index = B/A = 2.77

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

No true aquatic hydric plants within the water. Water clarity poor. Muddy water conditions may inhibit plant growth.

SOIL

Sampling Point: W-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/2	95	7.5 4/6	5	C	P	Si-Cl	
2-17	10YR 5/2	90	7.5YR 4/6	10	C	P	Cl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

The east side of pond appeared to be a constructed berm overgrown with trees. Water clarity was poor with an obvious muddy water appearance.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 2

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Gomphidae trails were observed along the waters edge. Frogs and turtles could be seen in the pool upon arrival. Water level was down from historically higher levels.

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WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-12

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.170699 Long: -96.190131 Datum: WGS84

Soil Map Unit Name: 18 - Agra-Ashport, fequently flooded complex, 0 to 12 percent slopes NWI or WWI classification: PUBHh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Rad)			
1. *Amorpha fruticosa*	5	Y	FACW
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 5' Rad)			
1. *Eleocharis compressa*	35	Y	FACW
2. *Ludwigia peploides*	30	Y	OBL
3. *Ceratophyllum demersum*	15	N	OBL
4. *Asteraceae sp.*	15	N	UPL
5. *Tripsacum dactyloides*	5	N	FAC
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	45	x 1 =	45
FACW species	40	x 2 =	80
FAC species	5	x 3 =	15
FACU species		x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	105 (A)		215 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	90	7.5 4/6	10	C	P	Si-Cl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Shale/stone

Depth (inches): 6

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 2

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-13

Investigator(s): V. Weaver, A. Garnesy-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.171170 Long: -96.190877 Datum: WGS84

Soil Map Unit Name: 40 - Norge silt loam, 5 to 8 percent slope NWI or WWI classification: PUSCx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 25' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10' Rad)			
1. *Prunus serotina*	3	Y	FACU
2. *Carya cordiformis*	3	Y	FACU
3.			
4.			
5.			
	6 = Total Cover		
Herb Stratum (Plot size: 10' Rad)			
1. *Carex pellita*	50	Y	OBL
2. *Persicaria pensylvanica*	35	Y	FACW
3. *Ambrosia trifida*	15	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	35	x 2 =	70
FAC species	15	x 3 =	45
FACU species	6	x 4 =	24
UPL species		x 5 =	0
Column Totals:	106 (A)		189 (B)

Prevalence Index = B/A = 1.78

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/1	100						Organic Layer
1-16	7.5YR 4/3	70	5YR 4/6	30	C	P, M	Cl-Lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Reset Form | Print Form

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: AEL Proposed Expansion City/County: Osage Sampling Date: 8/1/18

Applicant/Owner: American Environmental Landfill State: OK Sampling Point: W-14

Investigator(s): V. Weaver, A. Garnsey-Zavala Section, Township, Range: Sec. 36, T20N, R10E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0-1 Lat: 36.172346 Long: -96.190646 Datum: WGS84

Soil Map Unit Name: 18 - Agra-Ashport, frequently flooded complex, 0 to 12 percent slopes NWI or WWI classification: PUBFh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 25' Rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10' Rad)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 10' Rad)			
1. *Ludwigia peploides*	50	Y	OBL
2. *Persicaria pensylvancia*	40	Y	FACW
3. *Eleocharis compressa*	10	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	50	x 2 =	100
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	100 (A)		150 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/1	100					Org.	
1-6	10YR 3/1	85	7.5YR 4/6	15	C	P,M	Si-Cl	
6-18	10YR 3/1	95	7.5 4/6	5	C	P, M	Cl-Lm	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- X True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 3

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D

ATTACHMENT 1
ATTACHMENT 2

Cardinal
ENGINEERING, INC.

June 12, 2003

U.S. Army Corps of Engineers
1645 South 101st East Avenue
Tulsa, OK 74128-4609

Dear Sir/Mam:

Cardinal Engineering, Inc. is in the process of completing a permit application with the Department of Environmental Quality for a municipal landfill expansion to be located in the S/2 of S/2 of the NW/4, and all of the SW/4 of Section 36. E/2 of SE/4 of the NE/4, E/2 of NE/4 of the SE/4, and N/2 of SE/4 of the SE/4 of Section 35. All in Township 20 North, Range 10 East, Osage County, Oklahoma, as shown on the enclosed U.S.G.S. topographic map.

Solid Waste Management Regulations, Oklahoma Administrative Code 252:515-5-31(b) states as follows:

> "No new solid waste site shall be located within one-half (½) mile of any area that is formally dedicated and managed for public recreation or natural preservation by a federal, state, or local government agency unless the application contains a statement from the appropriate management from the agency that the proposed site is not expected to adversely affect the recreation or natural area."

Please inform me as to whether or not the proposed site is located within one-half (½) mile of any area that is formally dedicated and managed for public recreation or natural preservation under your jurisdiction. Please also state whether or not the proposed site is expected to adversely affect the recreation or natural area.

Please address your response to my attention at the address listed below. If you have any questions please contact me at 405/842-1066. Thank you for your assistance in this matter.

Sincerely,

Patrick Riley
Environmental Scientist

enclosure

E:\pn00087\expansion\Letters\USCORPEN.WPD

FACSIMILE

Cardinal ENGINEERING, INC.

Client's Bill of Rights

Cardinal...

...will strive to provide its clients with economic solutions to environmental, engineering, and surveying challenges treating the clients' resources as we would our own.

...will seek knowledge and understanding of process and conditions using its resources, experience, and educational background to preclude, as much as possible, any additional data gathering expenses and hassles.

... is committed to working hard towards solutions that are needed and wanted by the client and deems a project complete only when the client is satisfied.

...will strive to meet its clients deadlines. Cardinal recognizes our work is normally part of a "bigger picture", and we must do our part as a member of the team.

...will diligently listen to and clearly communicate with its clients as a means of promoting respect and accomplishing tasks in an organized and deliberate manner. Cardinal affirms it cannot provide solutions or work products without first clearly understanding the client and his or her needs.

Date: 7-17-03

To: ALAN

Company: US ARMY CORP OF ENGINEER

Fax: 918-669-4306

Phone: 918-669-7618

From: PATRICK RILEY

Number of Pages: 2
(including cover)

Re: PROJECT NUMBER 13139
DETAIL OF WESTERN PROJECT BOUNDARY
LANDFILL EXPANSION, OSAGE COUNTY

Comments:

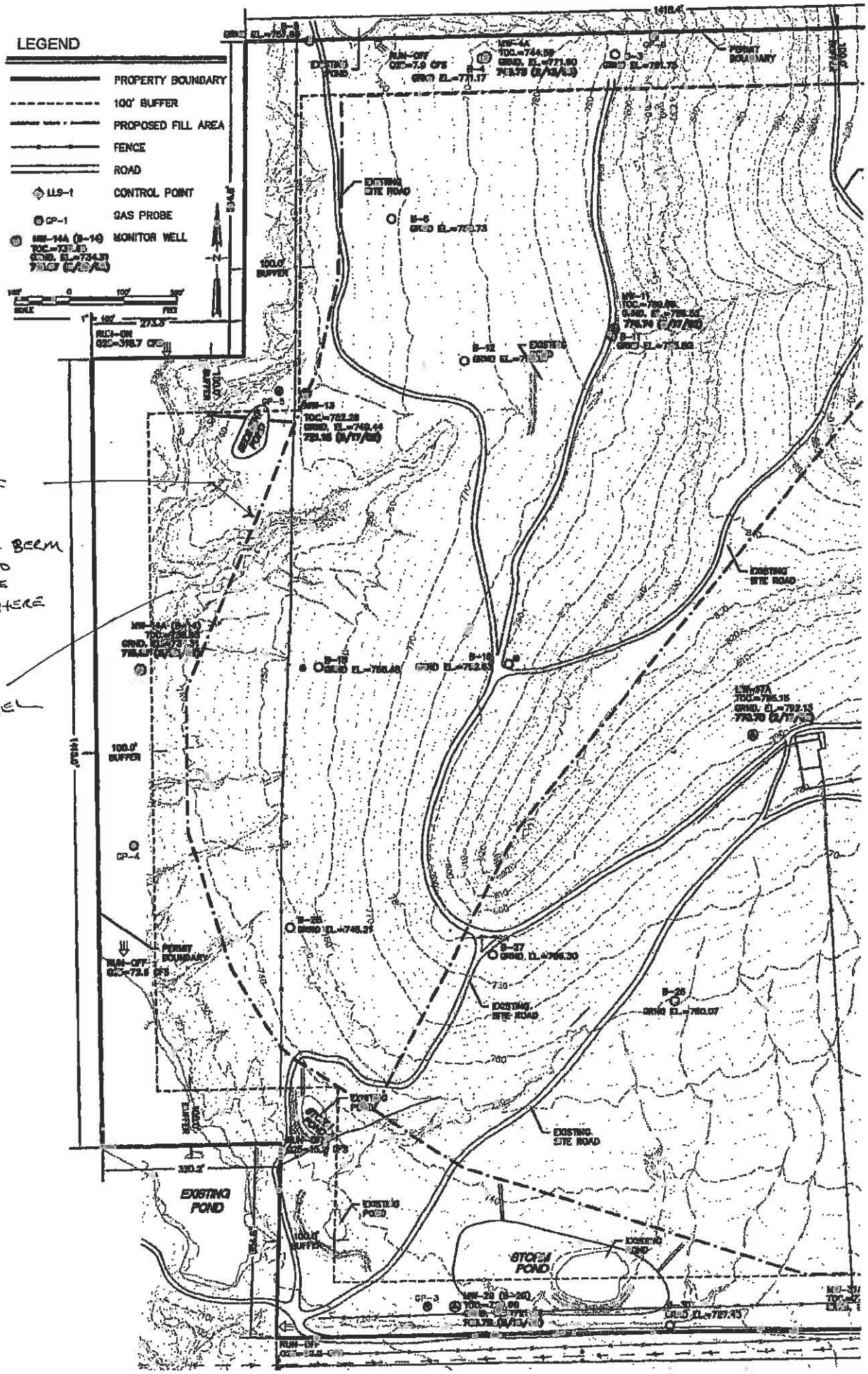
ALAN
REGARDING DEVELOPMENT ON WESTERN BOUNDARY OF PROJECT AREA, PROJECT ACTIVITIES ARE NOT ANTICIPATED TO IMPACT THE EXISTING STREAM TO THE WEST. THE PROJECT DOES CROSS A DRY CHANNEL. UNCONTAMINATED STORM WATER WILL DISCHARGE TO CREEK.

PLEASE CALL WITH ANY QUESTIONS. THANK YOU FOR YOUR HELP WITH THIS PROJECT.

This fax was sent from the following location:

☒ 6520 N Western, Ste 206	☐ 3625 W Main, Ste 106	☐ 237 N Broadway	☐ 3909½ Hawthorne Ave.
Oklahoma City, OK 73116	Norman, OK 73072	Edmond, OK 73034	Dallas, TX 75219
Phone: 405-842-1066	Phone: 405-366-8541	Phone: 405-359-3136	Phone: 214-528-0233
Fax: 405-843-4687	Fax: 405-366-8540	Fax: 405-340-5707	Fax: 214-521-8054

Visit us on the internet at www.cardinalengineers.com


LEGEND
PROPERTY BOUNDARY
100' BUFFER
PROPOSED FILL AREA
FENCE
ROAD
CONTROL POINT
GAS PROBE
MONITOR WELL
LIMIT OF DISPOSAL - RUNOFF CONTROL BERM AND ROAD WILL BE BUILT HERE
DRY CHANNEL
EXISTING SITE ROAD
EXISTING POND
STORM POND
PERMIT BOUNDARY
100.0' BUFFER

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101ST EAST AVENUE
TULSA, OKLAHOMA 74128-4609

July 23, 2003

Planning, Environmental, and Regulatory Division
Regulatory Branch

Mr. Patrick Riley
Cardinal Engineering, Inc.
6520 North Western, Suite 206
Oklahoma City, OK 73116

Dear Mr. Riley:

Please reference your facsimile of July 7, 2003, regarding the proposed expansion of an existing municipal solid waste landfill. The proposed project is located in Sections 35 and 36, Township 20 North, Range 10 East, west of Sand Springs, Osage County, Oklahoma.

The provided information does not indicate that a placement of dredged or fill material will be required, permanently or temporarily, into any "waters of the United States," including jurisdictional wetlands. Therefore, your proposal is not subject to regulation pursuant to Section 404 of the Clean Water Act, and a Department of the Army (DA) permit will not be required. Should your method of construction necessitate such a discharge, we suggest that you resubmit that portion of your project so that we may determine whether an individual DA permit will be required.

Although DA authorization is not required, this does not preclude the possibility that other Federal, State, or local permits may be required.

Your project has been assigned Identification Number 13139. Please refer to this number during future correspondence. If further assistance is required, contact Mr. Allen Ryan at 918-669-7618.

Sincerely,

Larry D. Hogue, P.E.
Chief, Planning, Environmental,
and Regulatory Division

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101ST EAST AVENUE
TULSA, OKLAHOMA 74128-4609

September 21, 2017

Regulatory Office

Wade Miller
SCS Engineers
1817 Commons Circle, Suite 1
Yukon, OK 73099

Dear Mr. Miller:

This is in reference to your letter of April 28, 2017, requesting a jurisdictional determination (JD) on property located in the Northeast 1/4, Southeast 1/4, Section 35, Township 20 North, Range 10 East, Osage County, Oklahoma. The area marked in red on the enclosed map denotes the approximate limits of the property examined under this request. We have reviewed the submitted data relative to Section 404 of the Clean Water Act (CWA).

The referenced property contains no jurisdictional wetlands. However, the unnamed tributary located within the reviewed property, as shown in blue on the enclosed map, is a regulated waterway. The placement of dredged or fill material in this waterway would require Department of the Army authorization pursuant to Section 404 CWA prior to commencement.

This JD is based solely upon available office resources, including contact with the Natural Resources Conservation Service, and not upon direct observation of the subject property. We believe this determination to be a reasonable assessment of the presence of jurisdictional waters, including wetlands, on the site subject to Section 404 of the CWA. However, this is only a preliminary determination, and as such, is not a definitive description of on-site wetlands or U.S. Army Corps of Engineers jurisdiction over the area. For an understanding of Administrative Appeal options regarding this preliminary JD, please read the enclosed information sheet.

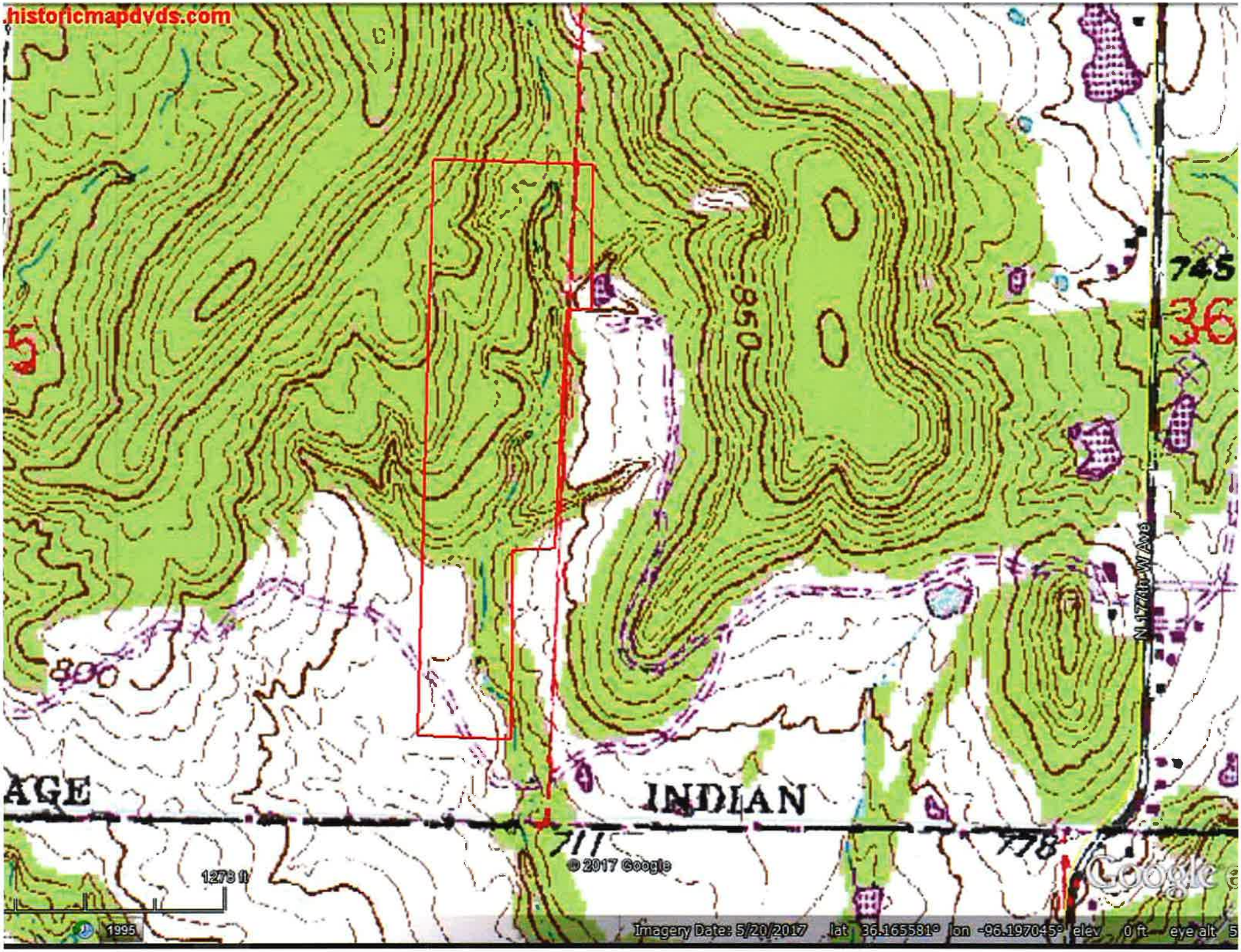
This delineation/determination has been conducted to identify the limits of the Corps CWA jurisdiction for the particular site identified in this request. This delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

Your request has been assigned Identification No. SWT-2017-339. Please refer to this number during future correspondence. If you have any questions, contact Mr. Bryan Noblitt at 918-669-4904.

Sincerely,

Andrew R. Commer
Chief, Regulatory Office

Enclosures


historicmapdvds.com
745
36
850
800
AGE
INDIAN
711
778
N 177th W Ave
© 2017 Google
1273 ft
1995
Imagery Date: 5/20/2017 lat 36.165581° lon -96.197045° elev 0 ft eye alt 5

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Mr. Wade Miller, SCS Engineering	File Number: SWT-2017-339	Date: 21-Sept-2017
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
X	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/appeals.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: Mr. Bryan Noblitt Regulatory Office U.S. Army Corps Of Engineers 1645 South 101st East Avenue Tulsa, OK 74128	If you only have questions regarding the appeal process you may also contact: Mr. Elliott Carman Administrative Appeals Review Officer (CESWD-PD-O) U.S. Army Corps of Engineers 1100 Commerce Street, Suite 831 Dallas , Texas 75242-1317 469-487-7061

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

District Office: Tulsa District | File/ORM #: SWT-2017-339 | PJD Date: Sep 21, 2017

State: OK | City/County: Osage County

Nearest Waterbody: Arkansas River

Location: TRS, LatLong or UTM: Northeast 1/4, Southeast 1/4, Section 35, Township 20 North, Range 10 East

Name/ Address of Person Requesting PJD: Wade Miller
SCS Engineers
1817 Commons Circle, Suite 1
Yukon, OK 73099

Identify (Estimate) Amount of Waters in the Review Area:

Non-Wetland Waters: 2,600 linear ft | 10 width | acres | Stream Flow: Intermittent

Wetlands: acre(s) | Cowardin Class:

Name of Any Water Bodies on the Site Identified as Section 10 Waters: Tidal: | Non-Tidal:

☑ Office (Desk) Determination
☐ Field Determination: Date of Field Trip:

SUPPORTING DATA: Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

- ☑ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: applicant attached map
- ☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps
- ☐ Corps navigable waters' study:
- ☑ U.S. Geological Survey Hydrologic Atlas:
  - ☑ USGS NHD data.
  - ☐ USGS 8 and 12 digit HUC maps.
- ☑ U.S. Geological Survey map(s). Cite quad name: Wekiwa, OK 1:24,000
- ☐ USDA Natural Resources Conservation Service Soil Survey. Citation:
- ☑ National wetlands inventory map(s). Cite name: ORM Data
- ☐ State/Local wetland inventory map(s):
- ☐ FEMA/FIRM maps:
- ☐ 100-year Floodplain Elevation is:
- ☑ Photographs: ☑ Aerial (Name & Date): Google Earth Pro, May 20, 2017
  - ☐ Other (Name & Date):
- ☐ Previous determination(s). File no. and date of response letter:
- ☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and Date of Regulatory Project Manager (REQUIRED)

Signature and Date of Person Requesting Preliminary JD (REQUIRED, unless obtaining the signature is ~~impracticable~~)

EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

Appendix A - Sites

District Office	Tulsa District	File/ORM #	SWT-2017-339	PJD Date:	Sep 21, 2017
State	OK	City/County	Osage County	Person Requestinq PJD	Wade Miller, SCS Engineering

Site Number	Latitude	Longitude	Cowardin Class	Est. Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
1	36.164104	-96.199810	Riverine	2,600	Non-Section 10 non-wetlanc

Notes:

United States Army Corps of Engineers

404 Individual Permit Application
SWT-2017-339 Mitigation Plan

American Environmental Landfill
Proposed Lateral Expansion
Sections 35 and 36, Township 20 South, Range 10 East
Osage County, Oklahoma

American Environmental Landfill
207 North 177th West Avenue
Sand Springs, Oklahoma
(918) 245-7786

SCS ENGINEERS

27216290.00 | May 1, 2020

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Table of Contents

Table of Contents

Appendices

1.0 INTRODUCTION

SCS Engineers, on behalf of American Environmental Landfill (AEL) is working with the Oklahoma Department of Environmental Quality (ODEQ) to permit a proposed landfill expansion to AEL's existing solid waste landfill facility. Unavoidable impacts to waters of the United States (WOTUS) were identified and a 404 permit request was completed. The unavoidable impacts are to 4,517 feet of a natural ephemeral channel (S-1) that traverses through the proposed landfill expansion area. These unavoidable impacts require offsetting mitigation, which this mitigation plan addresses. The on-site mitigation area is located within the northeast corner of land owned by AEL. Mitigation construction and management will be restricted to this mitigation area. The mitigation project area is identified in Drawing 2 in relation to AEL's property boundary.

1.1 PREREQUISITE TO DISCUSSION OF MITIGATOIN

In the 404 Individual Permit Application SWT-2017-339, avoidance and minimization alternatives were discussed and reviewed in the SWT-2017-339 application document. Ultimately, onsite mitigation was identified as the best option in order to minimize environmental impacts and costs associated with relocating the existing operations. This mitigation plan was developed to address the fundamental objective of compensatory mitigation to offset the unavoidable impacts identified in the SWT-2017-339 permit application.

1.2 METHOD OF COMPENSATION

Mitigation options approved by the USACE by preference include the use of mitigation banks, in-lieu-fees, and permittee-responsible. AEL has opted to go with the permittee-responsible mitigation to keep mitigation near the area of unavoidable impacts. At the beginning of the permit request, no in-lieu-fee providers were active in the Osage or Tulsa Counties. The Deep Fork Mitigation Bank in Lincoln County is available, but the distance to this bank would increase necessary credits due to the distance from the original impacts. After discussions with the USACE, the Corps agreed to accept a permittee-responsible mitigation. This is in line with USACE watershed management practices and is more economical for AEL while still meeting the necessary mitigation.

A combination of constructed channel and preservation of existing features will provide compensation of 4,517 feet of lost S-1 ephemeral stream function. The proposed constructed ephemeral channel will restore a majority of S-1's ephemeral function. Although the length of constructed channel does not equal the length of channel lost (3,298 to 4,517 feet), the constructed channel will increase the area of instream ephemeral habitat by an additional 0.77 acres (0.502 to 0.67 acres) (Table 1). To supplement for the lack of the full length of S-1 channel, an out-of-kind preservation of existing features of 1.129 acres of ponds and wetlands will be part of the mitigation package. Based on mitigation credit calculations, approximately 0.93 more acres will be created than the compensation requirement. The lost aquatic needs from S-1 is primarily conveyance of runoff water. The mitigation channel will provide the same need of conveying water from the upper reaches of the watershed to a tributary to the Arkansas River. The destination of the runoff will be the same waterbody as the S-1 natural channel. Increased aquatic function, beyond the ephemeral channel can be found in both the deep waters of the ponds and the emergent wetlands. In addition to the constructed mitigation channels, 1,283 feet of riparian corridor will be planted. This mitigation plan exceeds the minimum compensatory requirement.

Table 1. Compensatory Migitagatoin Credits Table.

	Length (feet) - (in-kind)	Area (acres) - (out-of-kind)		
Expected Impacts to existing streams	4517	0.502		
Proposed Mitigation	In-Kind mitigation	Out-of-Kind mitigation**	Adjusted Credits for Mitigation	Mitigation Ratio
Beginning Credits needed			- 5417 ft	
Constructed ephemeral channels (feet)	3298 ft/0.334 ac		- 1219 ft -1.119 ac^	1:1
Constructed ephemeral channel (acres)*		0.345 ac	- 0.77 ac	1:3.18
West Pond***		0.31 ac	- 0.46 ac	1:3.18
East Pond***		1.11 ac	0.65 ac	1:3.18
North Wetland^*		0.14 ac	0.79 ac	1:3.18
South Wetland^*		0.14 ac	0.93 ac	1:3.18
Totals Compensation Credits	3290 ft	2.045 ac		

^ 1.065 acres is the out-of-kind mitigation credits generated from the Mitigation Credit Multiplier Table.

* The constructed stream channel's area (acreage) is greater than the impacted streams area.

** The calculated ratio for out-of-kind mitigation is 6.02 based on the results from the Mitigation Credit Calculation table.

*** The constructed channel established a connectivity with WOTUS

^* The constructed channel's proximity to the wetland establishes a significant nexus.

1.3 OBJECTIVE

1.3.1 DESCRIPTION OF RESOURCE AND METHOD OF COMPENSATION

This mitigation plan is for proposed impacts to 4,517 feet of the S-1 stream channel that was identified in the permit application as an ephemeral channel located within the proposed expansion area. This mitigation plan includes the construction of an ephemeral stream (MS-1), and the preservation of existing ponds and wetlands currently not identified as WOTUS features. MS-1 will begin at a spillway located at the southeast corner of a farm pond (P-1) and traverse east to join a second pond (P-2). A smaller constructed ephemeral channel (MS-2) will connect P-2 via a spillway from the southeast

corner south to a 2.93 acre pond (W-1) **(Appendix A, Drawing 5)**. W-1 is a pond that has been identified as a WOTUS feature in an approved jurisdictional determination. A constructed ephemeral channel (MS-3) will direct overflow from the south end of W-1 to a culvert under N. 177th W Avenue. By establishing a connection with this WOTUS feature to the combination of constructed channels and previously identified non-jurisdictional ponds and wetlands, a jurisdictional nexus will be created.

The MS-1 channel will be similar in structure and function as the impacted natural ephemeral stream channel S-1 channel. S-1's natural stream characteristics include a defined bed and bank with a channel width that ranged from 2.97 to 7.2 feet and an average depth of 6 to 8 inches at the OHWM. The impacts to S-1 include the loss of 4,517 linear feet and an area of 0.502 acres. The bed material of S-1 is consistent with the surrounding parent material. S-1's streambed did not exhibit hydric soil characteristics based on three sample locations. Hydrophilic plants were not dominant within the streambed or shoreline throughout the S-1's existing channel reach. The northern portion of the S-1 channel was located under a forested riparian canopy. As part of the proposed mitigation plan, a constructed channel that has a streambed consistent with parent material and within the local forested/grassland plant community would establish similar ephemeral stream conditions as the current S-1 channel. A portion of the mitigation channel will include a riparian mitigation area.

MS-1 will have a stream reach of 2,721 linear feet with a channel surface area of 0.62 acres. The MS-2 channel will include an additional 199 linear feet and a channel surface area of 0.05 acres. MS-3 channel will include an additional 378 linear feet and a channel surface of 0.09 acres. These channels will be constructed to help offset the 4,517 linear and 0.501 acres that will be impacted in the S-1 reach. To help reach the required mitigation compensation, an additional 1.85 acres of existing wetlands and ponds will be included in the mitigation design via preservation. Two ponds (P-1 and P-2) will have a direct connection with the MS-1 stream channel. MS-1 will be connected to P-1 via a spillway that will release water from a 0.31 acre pond. Flow from P-1 and the surrounding watershed will discharge into P-2 **(Appendix A, Drawing 6).** Overflow from P-2 into the constructed MS-2 channel will then flow into W-1, the identified WOTUS feature. W-1 will discharge into MS-3 that will flow to existing culverts under N. 177th West Avenue. The MS-1 ephemeral stream channel will be constructed within 100 feet of two existing emergent wetland features identified as EW-1 and EW-2. EW-1 is located on the north side of MS-1 and along the western half of the channel. EW-2 is located along the south side of MS-1 and toward the eastern end of the channel. The construction of the MS-1 channel will allow the outside bend of the meandering channel to release water during high flows and sheet flow over to the EW-1 and EW-2 wetlands. Both wetlands will also be able to drain back toward MS-1 as the channel flows recede. The proximity of these wetlands will have a significant nexus, which establishes a jurisdictional status. By combining the construction of ephemeral channels with the preservation of existing hydric features and connecting them to an identified jurisdictional WOTUS, the mitigation plan complies with the objective of a compensatory mitigation plan as identified by the USACE. Incorporating the protection of existing functional wetlands into the mitigation plan allows for a more successful mitigation and provides better protection to WOTUS. The MS-1, MS-2 and MS-3 channels will provide a drainage way that allows runoff to converge with downstream WOTUS features, which will establish a connectivity. All historic upstream drainage (9.2 acre watershed) into P-1 will remain unchanged while the historic discharge of P-1 into S-1 will be rerouted through MS-1. The final destination of the watershed runoff remains the same, the Arkansas River. On-site functions will be similar between S-1 and MS-1 with temporary flows that discharge through native soil channels located in a combination of rock outcroppings and lowland Agra-Ashport soils.

1.3.2 MITIGATION RESOURCE AQUATIC FUNCTION

The aquatic function of S-1 ephemeral channel was to convey watershed runoff to the Arkansas River. The MS-1, MS-2, and MS3 ephemeral channels will convey watershed runoff to the Arkansas River through Shell Creek, east of the mitigation area. Forested riparian vegetation will provide canopy cover for the ephemeral MS-1 channel to compensate for lost riparian cover of 1,283 linear feet along S-1. All functions of S-1 will be part of MS-1's, MS-2's and MS-3's design and function including headwater capture area and discharge into the Arkansas River.

Aquatic function for S-1 exists in short flow durations consistent with ephemeral flows that are typically associated with runoff events from precipitation. During several site visits completed by SCS field staff, no visible water was observed with the S-1 channel. Temporary or persistent niche utilization of aquatic conditions do not appear probable in the natural channel of S-1. The lack of water in S-1 indicates that the aquatic function would be limited or not available to aquatic organisms.

1.4 SITE PROTECTION INSTRUMENT

As part of the USACE requirements, the constructed mitigation channels and connected hydric features will have a deed restriction placed on them. This deed restriction will be in-perpetuity protecting these features from future development. The deed restriction will be for the identified mitigation project area (Appendix A, Drawing 6).

The mitigation area is owned by AEL. The mitigation area and structures identified within the mitigation plan will be identified in a deed restriction. This deed restriction will identify the USACE as an objective third party that will have the right to enforce mitigation site protections. The USACE will be provided the resources to request outside independent entities to complete necessary monitoring. The USACE will have the authority to enforce site protection of identified mitigation features and on maintenance of channel stability and function.

A 60-day advanced notification to the USACE will be given prior to any action taken to void or modify the instrument, management plan, or long-term protection mechanism, including transfer of title to, or establishment of any other legal claims over, the compensatory mitigation site.

A deed restriction will be approved by the USACE prior to the beginning of mitigation construction. A USACE deed restriction form will be completed and submitted for approval after the mitigation plan is approved and prior to a site specific permit being issued to AEL.

1.5 SITE SELECTION

The mitigation area is located on adjacent land and neighboring sub-watershed of HUC 111101010301 to the east (WS-1) of the S-1 watershed (WS-2). Both sub-watersheds have similar topography and soil types (Drawing 6). The origination of the MS-1 channel is P-1, the same stock pond that discharges into S-1. This mitigation area has a natural slope for drainage toward the east with a combination of forested and grassland areas that have similar vegetative communities as the S-1 watershed with a predominantly natural ecosystem. The watershed headwaters to MS-1 are identical to S-1. Recent land use between WS-1 and WS-2 has been limited to livestock management. Signs of recent land use were limited to vehicle access roads and constructed fences and pens. The operation of the AEL landfill is the biggest difference between WS-1 and WS-2 land use practices. With similar topography, soil composition, recent land use, and native plant communities, the mitigation location for MS-1 is comparable to the location and ecology of the S-1 drainage way. The option to construct a full-length mitigation channel could have been completed, but runoff into existing aquatic

features would have been diminished. It was determined that providing a series of connections with existing aquatic structures was better for the hydrological function of the site. The additional water flowing through MS-1 from the WS-2 upper reaches would not exceed the storage and flow capacities of these existing features (EW-1, EW-2 and W-1) and would provide an increase in aquatic habitat niches **(Appendix D: American Environmental Landfill Stormwater Model and Calculations)**. With similar topography, soils, biota and final destination, the mitigation location is a suitable replacement for the lost S-1 channel functions.

1.5.1 ENVIRONMENTAL CONDITIONS

The mitigation area is a combination of an upland hardwood forest with rock out crops that transition into a tallgrass/woodland lowland mosaic. The forested area is dominant along the western third of the mitigation area while the lowland mixed tallgrass prairie/woodland section is dominant along the eastern end. The mitigation channel will be constructed through the oak/hickory hardwoods that dominate the upland forests and traverse into the tallgrass/woodland lowlands. Both forested and grassland areas are comprised of a diverse native plant community. The mitigation area has no existing channels, but does have scattered isolated emergent wetlands. Fences and small structures within the mitigation area indicate that past land use included some type of livestock management.

The vegetative cover of the west diversion option was dominated by an upland hardwood forest. The east diversion option provided a mix of forested area and grassland and a combination of drainage grades. The east option had a greater chance of increased instream habitats and established a cooperative surface water exchange with two ponds. The west option provided no existing non-jurisdictional hydric features to include for preservation, while the east option provided two emergent wetlands and a pond. With a more diverse vegetative community, including both woodlands and grasslands, the east diversion option was more suitable to maximize habitat niches included for mixed riparian corridors.

1.6 BASELINE ENVIRONMENTAL INFORMATION

1.6.1 IMPACTED STREAM REACH

Both the mitigation and the impact sites are within the Northern Cross Timbers ecoregion (Woods, 2005) and are in adjacent sub-watersheds of HUC 111101010301. The impacted S-1 stream channel is an ephemeral stream that originates at the spillway of a constructed farm pond near the Subject Site's north boundary. The impacted stream is identified with three segments so as to better identify the mitigation needs. The three segments include:

- **S-1 North Stream Segment** – Currently a non-impacted section that is located along a steep sloping rocky area that is 1,283 feet long. This stream segment initially begins as a grassy spillway along the southwest corner of the pond. Within a short distance of the spillway, the channel transitions into a series of low head-cuts. This shallow channel has a mixture of vegetative and non-vegetative channel bottom. No hydric soils or dominant hydric plant communities were observed throughout the north stream segment. This segment has a woodland canopy, but the trees along the channel's edge were not facultative, facultative wet, or obligate plants. The woodland canopy did provide some shading of the dry channel.

  The Northern Stream Segment transitions from a shallow channel to a poorly defined cascading area along the steep slopes of rocky outcrops. The stream channel loses the defined bed-and-bank configuration and appears as a mix of large boulders with sporadic

debris points. The elevation change along this steep slope/boulder section is approximately a 50 foot drop over a 400 foot reach of channel. At the base of the steep slope/boulder channel, the stream channel regains a defined bed-and-bank. The south end of this segment ends in an artificial impoundment. Aside from the artificial impoundment, no surface water was seen within this channel reach, even though the area had a rain event within 24 hours of the site visit.

- S-1 Central Stream Segment – This segment has been identified by the USACE as an impacted site and is one of the primary reasons for this mitigation plan. The identified impact of placing fill within jurisdictional waters prior to acquiring approval is a violation to the Clean Water Act. AEL is in the process of applying for an after the fact permit that includes this mitigation plan. This reach is 1,300 feet long and is comprised of a channel that has been filled with soil. The location of the natural channel could not be determined due to the volume of soil placed within this segment. Based on historical aerial photos, NWI maps, and topographic maps, the channel appears to be located along the valley bottom through the middle of the soil pile.

- S-1 Southern Stream Segment – This segment is 1,934 feet long and begins at the southern end of the soil pile that was discussed in the S-1 Central Stream Segment section above. This stream segment has been incorporated into the landfill's stormwater management system. Currently, AEL's stormwater management directs runoff toward the Southern Stream Segment channel for discharge of stormwater from the property. The S-1 Southern Stream Segment had an access road, with three large culvert pipes, located in the southern quarter of this stream segment. Above the culvert pipes, increased sedimentation from runoff of non-vegetative ground was observed. No flowing water was observed within this segment, and a mixture of upland and hydric plants were observed within the channel's bed. The substrate did not exhibit hydric soil characteristics.

The combined length of the stream to be mitigated is 4,517 feet. Of the 4,517 feet, currently 1,300 is impacted with 3,217 feet that will be impacted from the permitted expansion of the AEL landfill. The full stream reach of S-1 within the Subject Site has been identified as an ephemeral stream.

1.6.2 MITIGATION STREAM REACH

The mitigation site is located within the Northern Cross Timbers ecoregion (Woods, 2005) and is in an adjacent sub-watershed of HUC 111101010301. The topography is a combination of uplands with rock outcrops and oak/hickory hardwood forest. The forested area is dominated by mature trees at the higher topographic reliefs and a combination of young and mature trees along the slopes. The understory ground cover was comprised of tallgrass prairie plant community. Numerous old vehicle paths were present near the bottom of the hill. These vehicle paths had dense herbaceous growth. As the terrain transitioned from upland forested area to open grasslands, the herbaceous community increased in density and richness. The herbaceous community was consistent with a tallgrass prairie plant community from the toe of the hillside to the eastern pond (P-2). Mixed within the lowland grasslands were tree rows and several wetlands. Two of these wetlands appeared to be constructed stock ponds that had filled in with sediment. No stream channel was observed through the mitigation reach, although shallow drainage swales and scattered isolated wetlands were observed. Fences and small structures within the mitigation area indicate that past land use included some type of livestock management.

1.7 DETERMINATION OF CREDITS

1.7.1 IN-KIND MITIGATION CREDITS

To mitigate for impacts to 4,517 linear feet of ephemeral stream, a combined approach of in-kind and out-of-kind mitigation is proposed. In-kind mitigation (at a ratio of 1:1) will include the construction of 3,298 linear feet of new stream channel. Out-of-kind mitigation for the remaining 1,597 linear feet will include preservation of existing wetlands and ponds. A total of 1.128 acres of required out-of-kind mitigation will be included as part of the mitigation compensation (Table 2).

1.7.2 OUT-OF-KIND MITIGATION CREDITS

The following summary is how SCS derived the proposed out-of-kind mitigation credits using guidance from the USACE's Department of the Army Regulatory Program "Aquatic Resource Mitigation and Monitoring Guidelines" (2004). The three stream segments previously discussed were divided so as to address existing and proposed impacts. These segment current impact statuses are:

- S-1 Northern Stream Segment –not impacted
- S-1 Central Stream Segment – impacted
- S-1 Southern Stream Segment – not impacted

Each of these segments were assessed individually to determine the mitigation credits that the USACE will require. The different multipliers, that are identified in the USACE "Aquatic Resource Mitigation and Monitoring Guidelines" (2004), were considered to represent what stream conditions that currently or may have existed prior to impacts.

The remaining percentage of overall stream length, not accounted for by MS-1, was used to determine the three segments portions of the stream lengths used in the multiplier. The multiplier criteria were then used to calculate the out-of-kind mitigation ratios on the remaining 1,597-feet of stream length requiring mitigation compensation. These calculations are represented in Table 2. A total of 1.128 acres of required out-of-kind mitigation will be included as part of the mitigation compensation.

Table 2. Mitigation credit calculations based on USACE mitigation guidelines

Multiplier	S-1 Northern Stream Segment	S-1 Central Stream Segment	S-1 Southern Stream Segment	S-1 Northern Stream Segment Mitigation Value	S-1 Central Stream Segment Mitigation Value	Southern Stream Segment Mitigation Value	Total Stream Segment Mitigation Value
Stream Length (ft^2)	454	460	683	454	460	683	1597
Average width (Estimated ft) - Mitigation Value (ft^2)	3.23 ft.	4.52 ft.	6.13 ft	1464.15 ft^2	2077.498 ft^2	4189.385 ft^2	7731.033 ft^2
Calculated Acres	0	0	0	0.034 ac.	0.048 ac.	0.096 ac.	0.177 ac.
Increased distance of mitigation site from impact (10%/10miles)	0	0	0	0.034 ac.	0.048 ac.	0.096 ac.	0.177 ac.
High biological diversity of the impact site	0	0	0	0.034 ac.	0.048 ac.	0.096 ac.	0.177 ac.

Multiplier	S-1 Northern Stream Segment	S-1 Central Stream Segment	S-1 Southern Stream Segment	S-1 Northern Stream Segment Mitigation Value	S-1 Central Stream Segment Mitigation Value	Southern Stream Segment Mitigation Value	Total Stream Segment Mitigation Value
Physical or structural complexity	0.2	0.2	0.2	0.040 ac.	0.057 ac.	0.115 ac.	0.213 ac.
Ecological uniqueness -	0	0	0	0.040 ac.	0.057 ac.	0.115 ac.	0.213 ac.
Length of time necessary to achieve functional maturity (.2/year)	0.6	0.6	0.6	0.064 ac.	0.092 ac.	0.185 ac.	0.340 ac.
Situating the mitigation site in a different watershed	0	0	0	0.064 ac.	0.092 ac.	0.185 ac.	0.340 ac.
Situating the mitigation site in a different ecoregion	0	0	0	0.064 ac.	0.092 ac.	0.185 ac.	0.340 ac.
Increased lag time between impact and mitigation completion (.2/year)	0	0.6	0.6	0.064 ac.	0.147 ac.	0.295 ac.	0.506 ac.
Reasonable anticipated negative and detrimental influences	0	0	0	0.064 ac.	0.147 ac.	0.295 ac.	0.506 ac.
Inconsistency in the source of hydrology	0	0	0	0.064 ac.	0.147 ac.	0.295 ac.	0.506 ac.
Pre-existing easements, existing utilities, prior land uses	0	0	0	0.064 ac.	0.147 ac.	0.295 ac.	0.506 ac.
Necessity of significant soil amendment or soil replacement	0	0	0	0.064 ac.	0.147 ac.	0.295 ac.	0.506 ac.
Reliance on enhancement, or creation strategies as opposed to restoration	0.2	0.2	0.2	0.077 ac.	0.176 ac.	0.355 ac.	0.607 ac.
Reliance on preservation strategy as mitigation	0	0	0	0.077 ac.	0.176 ac.	0.355 ac.	0.608 ac.
Use of out-of-kind mitigation for incurred impacts	1	1	1	0.155 ac.	0.352 ac.	0.709 ac.	1.216 ac.
Mitigation requirements reduced by 10% if the mitigation is constructed at least 6 months prior to	0.1	0	0.1	0.139 ac.	0.352 ac.	0.638 ac.	1.129 ac.

Multiplier	S-1 Northern Stream Segment	S-1 Central Stream Segment	S-1 Southern Stream Segment	S-1 Northern Stream Segment Mitigation Value	S-1 Central Stream Segment Mitigation Value	Southern Stream Segment Mitigation Value	Total Stream Segment Mitigation Value
authorized project impacts							
Calculated required wetland acres				**0.139** ac.	**0.352** ac.	**0.638** ac.	**1.129** ac.

1.7.3 PRE-MULTIPLIER CONDITIONS

1.7.3.1 STREAM LENGTH

The stream lengths were obtained from data collected for the Preliminary Wetland Jurisdictional Determination Report SWT-2017-339, (2018) that has been submitted to the USACE. To determine average channel widths, data was collected on two on-site streams. Stream width averages were collected to better characterize the natural stream morphology within the Subject Site. Average widths for each of the three channel segments were calculated so that an area value could be determined. With the length and area of each stream segment, a ratio of stream segment to total length was established. These calculations were completed to determine the remaining area of each segment. A multiplier was then given to each stream segment areas to determine the total out-of-kind mitigation credits needed to meet the compensation requirements.

1.7.3.2 S-1 NORTHERN STREAM SEGMENT

The Northern Stream Segment includes the start of the S-1 channel below a constructed farm pond. The farm pond was not identified as jurisdictional, but visually was identified as a source of water during and for short periods after runoff events. This northern stream channel is approximately 1,283 linear feet with an average width of 3.2 feet and ends at the beginning of the impacted S-1 Central Stream Segment. This segment is 28.4 percent of the total impacted reach. MS-1 will not compensate for 454 feet of this stream segment. This 454 feet is used in the mitigation calculator to determine out-of-kind requirements.

1.7.3.3 S-1 CENTRAL STREAM SEGMENT

The central stream channel was identified by the USACE as an impacted WOTUS. This stream section has had fill placed within the jurisdictional boundary but does not have a current USACE permit. Therefore this non-authorized stream impairment requires mitigation for compliance and is a reason for this permit request. The USACE has identified that a total of 1,300 feet of stream length has been impacted for this section. Due to the existing condition and the inability to measure stream channel width, the estimated width was calculated as described below in section 6.5.2 – Stream Width. For this this segment, the calculated average width of 4.5 feet. This segment is 28.8 percent of the total impacted reach. MS-1 will not mitigate for 460 feet of this segment. This 460 feet is used in the mitigation calculator to determine out-of-kind requirements.

1.7.3.4 S-1 SOUTHERN STREAM REACH

The southern stream channel begins at the end of the 1,300 feet of central stream channel and ends at the southern AEL property boundary. This segment is approximately 1934 feet long and has a calculated average width of 6.1 feet. This segment is 42.8 percent of the total impacted reach. The proposed constructed channel will not mitigate for 683 feet of this steam segment. This 683 feet is used in the mitigation calculator to determine out-of-kind requirements.

1.7.4 STREAM WIDTH

The stream channel widths are based on measurements taken from two channels in the Subject Site. The channels that were the focus of this data collection are identified as S-1 and S-2 **(Preliminary Wetland Jurisdictional Determination Report SWT 2017-339)**. Both are identified by the USACE as jurisdictional. Both channels are ephemeral with a defined bed-and-bank. Channel widths measurement locations are identified as transects. Each transect includes three measured widths approximately ten feet apart that were averaged. Transects were spaced approximately three-hundred feet apart. All linear measurements were on stream lengths. Meanders/bends were included in stream lengths to account for total stream length. Transect averaged widths were analyzed with a linear slope regression (best fit). Linear slope regression values were used to determine the increase in channel width over stream length. Both channels were analyzed independently. An R-squared regression analysis for each best-fit line was done to assess the variance within the data set.

Four transects were collected for the S-1 channel and eleven transects for the S-2 channel. The S-1 channel had a slope of 0.35*(transect) while the S-2 channel slope was 0.3*(transect). These calculated slopes indicate that for every transect (300 feet in stream length), the channel width increases by 0.35 and 0.3 feet respectively. The R-squared regression analysis was 0.18 and 0.62 respectively. Because the R-square regression analysis for the S-2 channel is closer to 1.0 and has a better representation of the stream channel's average width over length, SCS used the S-2 channels slope with the S-1 channel starting width to calculate total area for mitigation of the three previously discussed S-1 stream channel areas.

1.7.5 CALCULATED AREA IMPACT

For the remaining portion of the three identified stream segments not compensated by the proposed constructed channel, a channel area was calculated using the remaining stream length and average width **(Table 3)**. These calculated areas are the starting values for calculating the requirements to meet the compensation of out-of-kind mitigation outlined by the USACE. The area values are used to convert linear stream impacts into mitigation acres. The starting impacted area value equals a 1:1 compensation ratio **(Table 3)**. The initial calculated areas include:

- North Stream Segment – 0.034 acres
- S-1 Central Stream Segment – 0.048 acres
- Southern Stream Segment – 0.096 acres

With these initial starting mitigation area values, the "Tulsa District Mitigation and Monitoring Guidelines" identified a number of factors that influence the ratio of mitigation required against losses. These factors (multipliers) were evaluated for each stream segment independently.

Table 3. Calculated area and fill of S-1 stream segments.

	S-1 North Stream Segment proposed impacts	S-1 Central Stream Segment existing impacts	S-1 Southern Stream Segment proposed impacts	Total Stream Segment impacts
Stream channel linear (feet)	1283	1300	1934	4517
Average channel width (feet)	3.225	4.516	6.134	
Stream channel (acres)	0.095	0.135	0.272	0.502
Average depth of OHWM (feet)	0.5	0.667	0.667	

1.7.6 MULTIPLIERS

Each multiplier is discussed with the suggested increase of compensation credits. The suggested increases are SCS's opinion. These multiplier values are a starting point for working with the USACE to determine final compensation costs for proposed and existing impacts to MS-1.

1.7.6.1 Increased Distance of Mitigation Site from Impact Site

An increase of 10 percent for each increment of 10 miles of distance. The proposed mitigation site is located in the northeast corner of the Subject Site and all mitigation will be located less than one mile from the impacted channel. With the mitigation site less than one mile, an increase in mitigation ratio of zero for each stream segment is suggested.

1.7.6.2 High Biological Diversity of the Impact Site

The stream channel has been identified as an ephemeral channel. The surrounding and in channel habitat does not support a highly diverse aquatic or terrestrial biota. Benthic and fish species would not be expected to exist in the impacted ephemeral streams. The stream channel traverses through a hardwood forest with sparse understory ground cover. In the North Stream Segment no observed pools were present and hydric plant communities were not dominant. The Central and Southern Stream Segments were filled or heavily modified and biological diversity conditions could not be assessed specific to these reaches. Based on the northern stream channel and the S-2 reach that was used to measure channel widths, the expected aquatic biological diversity would likely be consistent with the Northern Stream Segment. The channel bottom had non-hydric vegetation in several locations and areas that consisted of a shallow incised earthen channel. The existing undisturbed channel does not fit the narrative of a "high biological diversity" habitat. A multiplier increase of zero percent is suggested for this factor.

1.7.6.3 Physical or Structural Complexity of the Impact Site

This factor considers the in channel and riparian characteristics. A defined bed and bank have inherent complexities that allow for a stable channel system, which was observed within the Northern Stream Segment. A stable stream channel, regardless of existing flows, indicates that a level of hydrological complexity exists to maintain the bed and bank configuration. A multiplier increase of twenty percent for ephemeral stream structural complexity was identified for the Northern, Central, and Southern Stream Segments.

1.7.6.4 Ecological Uniqueness of the Impact Site

This factor considers the rarity of the in channel habitat. The instream aquatic habitat in the S-1 ephemeral stream is limited to periods of flow. Based on observations of the on-site stream channels, the S-1 stream channel does not retain temporary pools or flows beyond short durations. Establishment of aquatic fauna is unlikely to occur and would provide no ecological uniqueness to aquatic dependent biota. A multiplier increase of zero percent is suggested for this factor.

1.7.6.5 Length of Time Necessary to Achieve Functional Maturity

The time for a created feature to reach mature functionality is dependent on several environmental variables that make it difficult to accurately estimate a mature state. The proposed mitigation options include creating a new stream channel segment and to enhance and establish a connectivity with existing non-jurisdictional wetlands. It is estimated that the ephemeral streams will reach functional maturity quicker than modifications to intermittent or perennial streams. This is based on the existing ephemeral channel's current function as primarily a runoff conduit with no persistent aquatic complexes. To replicate this existing channel, a new channel will be proposed that conveys runoff through a new defined bed and bank channel that will over time develop an OHWM. Mature functionality should be obtained within three years after channel construction. As part of the channel re-alignment, this new channel location will be routed near existing non-jurisdictional wetlands establishing a connectivity/significant nexus. The modifications to establish a surface flow connectivity, during high flows, with wetlands would require time to re-establish mature functionality. Because these are not created wetlands, but modifications to existing wetlands, the time for them to recover is expected to be shorter. A conservative estimate on obtaining functional maturity for the constructed stream channel is three years, which has a multiplier of 60 percent.

1.7.6.6 Situating the Mitigation Site in a Different Watershed

Both the S-1 channel and mitigation project area are located in the same HUC 12 watershed (111101010301). With the proposed mitigation within the same HUC 12 and therefor the same HUC 8 watershed. A multiplier of zero percent for being in a different watershed is suggested.

1.7.6.7 Situating the Mitigation Site in a Different Ecoregion

Both the S-1 channel and proposed mitigation area are located in the Environmental Protection Agency (EPA) Level 4 Cross Timbers Ecoregion. With both the impacted and mitigation locations within the same ecoregion, a multiplier of zero percent for situating the mitigation site in a different ecoregion is suggested.

1.7.6.8 Increased Time Lag Between Construction Impact and Completion of Mitigation Activities

This factor considers when mitigation begins and links this time to when impacts will occur to the natural system. For the Northern Stream Segment, mitigation is expected to be in place and reach functional maturity prior to proposed impacts. For this segment, a multiplier increase of zero percent is suggested because of no loss of stream function over time. The S-1 Central Stream Segment has been identified as impacted and requires mandatory mitigation. The proposed mitigation will take time to construct and additional time to allow for functional maturity, functional maturity for this ephemeral stream is expected to be obtained within three years. The Central Stream Channel multiplier is equal to 20 percent per year for three years for a total multiplier of 60 percent. The Southern Stream Segment is proposed to be modified to address existing storm water quality concerns. Modifications to this segment will be made shortly after an approved USACE permit is obtained. This means that mitigation may not be established prior to impacts. As with the S-1 Central Stream Segment, it is expected to take three years for mitigation measures to reach functional maturity for a multiplier of 60 percent for the Southern Stream Segment.

1.7.6.9 Reasonably Anticipated Negative and Detrimental Influences on New Mitigation Sites

The proposed mitigation site is on private property and development in the area is anticipated to be little to none after completion of mitigation construction. A deed of restriction will be established for the mitigation project area. Little to no impacts to the new mitigation features are expected to occur. With little to no known impacts, the mitigation area will be maintained in a natural state. A multiplier of zero percent is given for this factor.

1.7.6.10 Inconsistency in the Source of Hydrology for the Mitigation Site

The mitigation project area will receive the runoff from the same headwaters area as the S-1 channel. The diversion of the upper watershed to the MS-1 channel is expected to retain hydrological consistence as the original (S-1) headwater stream. The mitigation channel will convey runoff for short durations similar to the natural channel. With redirecting runoff flows from WS-2 to the east WS-1, inconsistency in flows and durations, compared to S-1, should not occur within the constructed channel. Typical runoff from the surrounding land will be similar in WS-1 as in WS-2 in that the surrounding land will drain into the MS-1 channel increasing flow levels as the stream traverses down the topography **(Appendix A, Drawing 6)**. The remaining runoff within WS-2 will be collected within AEL's stormwater collection system. This stormwater will be treated prior to being discharged into the S-1 natural channel south of the Subject Site. A multiplier of zero percent is suggested for this factor.

1.7.6.11 Pre-Existing Easements, Existing Utilities, Prior Land Uses

In the design and construction of the mitigation features, easements and existing utilities will be avoided. Land will remain in non-developmental and non-agriculture use. The mitigation project area should not be affected by the constraints identified by these factors. A multiplier of zero percent is suggested for these factors.

1.7.6.12 Necessity of Significant Soil Amendment or Soil Replacement to Make Mitigation Site Viable

The S-1 bed and bank is consistent with the surrounding parent soil indicating that hydric soil conditions are not present in the natural ephemeral channel. Establishing a similar channel in the mitigation area would not require amendment to the soil. Plant communities within the mitigation area are similar to the plant community around the natural channel. The natural channel does not have a dominant hydric plant community along the banks or within the channel. The mitigation area will be constructed in similar parent material with similar hydric characteristics that are not expected to have dominant hydric plants and hydric soils. Incorporating the existing wetlands with minimal disturbances into a connectivity/significant nexus should not require soil augmentation. A multiplier of zero percent is suggested for this factor based on existing conditions within both the natural and neighboring mitigation watersheds.

1.7.6.13 Reliance on Enhancement, or Creation Strategies as Opposed to Restoration

Because the mitigation project area is likely to incorporate different mitigation strategies including creating an ephemeral channel and preservation of existing functional ponds and wetlands, a combined effect was evaluated. The construction of a new ephemeral channel will increase the multiplier. Because the stream channel will mimic an ephemeral stream with relatively low flow frequencies, the channel stability during short durations of flow would require a relatively simple design plan. This plan would not need to address instream aquatic habitat due to expected short flow durations (as indicated by the lack of hydric soils in the natural channel) that does not allow aquatic organisms to establish a niche utilization. By incorporating the existing wetland features that currently are not identified as jurisdictional, into the riparian corridor the ability to provide functional wetlands minimizes the challenges of enhancement or creation. The inclusion of two wetlands and two ponds into the wetland mitigation plan provides protection of existing hydric features. Protecting existing functional hydric features improves the mitigation system functionality while preserving previously non-jurisdictional features. Incorporating previously non-jurisdictional wetlands into a jurisdictional status, the requirement to provide viable and functional mitigation WOTUS features should be satisfied. A multiplier of 20 percent is suggested for this factor based on the minimal stream channel design and establishing a jurisdictional designation on currently non-jurisdictional features.

1.7.6.14 Reliance on Preservation Strategy as Mitigation.

The proposed mitigation strategy does not rely on the preservation of already identified WOTUS features solely within the mitigation area. Mitigation compensation will incorporate existing functional wetlands and ponds to improve mitigation success. The completed mitigation will result in new jurisdictional identified hydric features that will have USACE oversite in the future. A multiplier of zero percent for the use of preservation of four existing non-jurisdictional features that will become jurisdictional through this mitigation process.

1.7.6.15 Use of Out-of-Kind Mitigation for Incurred Impacts.

The use of out-of-kind mitigation is limited to the remainder of the S-1 stream reach that was not matched with the proposed MS-1 stream. A multiplier of 100 percent for out-of-kind mitigation is required by the USACE.

1.7.6.16 Mitigation requirement reduction.

Mitigation for the Northern Stream Segment should be constructed and reach maturity prior to impacts on the natural channel. The Southern Stream Segment is expected to be modified after the mitigation plan is in place. The S-1 Central Stream Segment is impacted prior to mitigation construction completion. For the Northern and Sothern Stream Segments, a -10 percent reduction is suggested. For the S-1 Central Stream Segments a multiplier of zero percent is suggested for mitigation reduction.

1.7.7 MITIGATION CREDITS

Impacts to WOTUS include a total of 4,517 linear feet of stream channel, which is equal to 0.502 acres (Table 1). Per a conversation with USACE project manager Marcus Ware on May 17, 2019, it was discussed with SCS that the USACE would accept a 1:1 mitigation ratio for created ephemeral stream channel length as part of the mitigation. The remaining unmatched impacted stream reach is 1595 feet. SCS completed a mitigation calculator to determine the out-of-kind acres needed to satisfy the required mitigation compensation (Table 1). The table indicated that 1.128 constructed/protected hydric features would meet the required out-of-kind compensation.

The out-of-kind compensation is based on acres instead of linear feet. The creation or protection of 1.128 acres of hydric features/wetlands/ponds in addition to the 2,920 linear feet of MS-1 channel is the combined mitigation compensation that SCS understands needs to be established for the lost aquatic function of 4,517 (feet) stream length.

To meet this obligation, SCS has designed a mitigation plan that includes the creation of a new ephemeral channel that is connected to or has a significant nexus with existing ponds and wetlands. These existing ponds and wetlands were identified as non-jurisdictional by the USACE. The excess channel area of the constructed channel, that was not used as part of the 1:1 mitigation match, will be used as part of the out-of-kind compensation match. The off-setting costs for the required mitigation are represented in Table 1.

The constructed channel will connect two ponds and will be located within 100 feet of existing emergent wetlands. The combination of ponds, constructed channels, and wetlands will all drain into an existing WOTUS pond. With the creation of these relationships and the connection with a WOTUS feature, this mitigation plan establishes a jurisdictional connection for all the associated features. This mitigation plan is combining the creation of a stream channel with the preservation of existing water bodies to meet the mitigation compensation requirements. When completed the mitigation will include 3298 feet of constructed ephemeral stream connecting a 0.31 ac. (P-1) pond to a 1.11 ac. pond (P-2) (Drawing 6). A shorter 199 feet constructed ephemeral stream will connect the 1.11 ac. pond (P-2) to an existing WOTUS pond (W-1). A third constructed ephemeral stream will (MS-3) connect the 1.11 ac. pond (W-1) to the existing downstream channel at the culvert under N 177th West Avnue. Along the longer stream channel, the new channel will be constructed near two existing wetlands (EA-1 and EW-2) so that when high flows exceed the channel capacity, the overflow will enter these existing 0.15 ac. wetlands. Like-wise, if the wetland's capacities are exceeded, excess water will drain back toward the MS-1 channel. When completed, this mitigation plan will include 3,298 linear feet of new stream channel that connects 1.42 ac. of ponds and establish a significant nexus with 0.30 ac. of established emergent wetlands.

The incorporation of existing hydric features into the mitigation design will improve the function and vitality of the mitigation project area beyond the minimum standard that is required. Additionally these viable features will improve the function of the mitigation project area sooner than just constructing mitigation features.

This mitigation plan will include a deed restriction on future development of the mitigation project area. This deed restriction will identify the jurisdictional authority on the mitigation project area and identify the mitigation features within this area.

1.8 MITIGATION WORK PLAN

1.8.1 WORK DESCRIPTION

The mitigation area is located across two sub-watersheds of HUC 111101010301 as represented in **Drawing 5.** The mitigation area includes:

- Three constructed channels (MS-1, MS-2, and MS) with a combined length of 3,298 linear feet.
- A riparian corridor that is a minimum of 1,283 feet long. The width of the riparian corridor is approximately 50 feet wide on both sides of the constructed channel. Existing riparian areas around P-1 and EW-2 are included in the riparian mitigation.
- Two existing ponds (P-1 and P-2) are included as part of the mitigation features
- Two existing emergent wetlands (EW-1 and EW-2) are included as part of the mitigation features.

A channel will be constructed starting from the southeast corner of the P-1 pond and traverse east through several meandering bends and connect with P-2 establishing 1,721 linear feet of mitigation channel **(Drawing 8).** The location of the channel will be in close proximity to two existing emergent wetlands that will have limited surface flow exchanges. The channel construction should be completed within 90 days. Herbaceous reseeding will be completed within 60 days of channel construction. Native seed planting will be restricted to December 1, through June 15, temporary ground cover will be planted after June 15 through November 30 followed with native seeding targeted from March through April. Tree planting will be restricted to mid-February and mid April.

Work will include the excavation of rock and soil to establish a flat bottomed channel that will be approximately 10 feet wide with banks that will have a 3:1 slope to existing grade **(Drawing 13)**. The channel bottom and banks will consist of native soils. In reaches where rock check dams will be installed, aggregate having a D_{50} of 9 inches or greater will be used **(Drawings 9 through 13)**. These check dams will be keyed into the channel bottom a minimum of 1 foot. Check dams will also be keyed into the banks with a minimum of 3 feet along straight sections and inside bends and a minimum of 5 feet into banks along outside bends. The top of check dams will have an elevation equal to the downstream toe of the preceding check dam or at an elevation where the channel gradient exceeds a 2% slope **(Drawing 13)**.

Material that is excavated and not used in the channel construction will be removed from site and used as daily cover at the AEL facility. No additional materials need to be brought on site.

The mitigation design drawings are located in **Appendix A – AEL Proposed Expansion Mitigation Design** and includes:

- Existing and proposed elevations **(Drawings 2, 5, 7-13)**
- Permit areas that include the mitigation and proposed landfill expansion areas **(Drawing 5)**
- Pre-construction soil profiles **(Drawing 6)**
- Source of hydrology for proposed site **(Drawing 2, 4-5, 7-12)**
- Area of watershed feeding proposed site **(Drawing 7)**

A Stormwater Pollution Prevention Plan (SWPP) that AEL functions under for daily operations will cover construction activities. This SWPP can be provided upon request.

1.8.2 WATER SOURCE

The water source for the mitigation area are represented in **Drawing 7**'s catchment hydrology. Flow volumes and velocities are included in the stormwater calculation **(Appendix D, American Environmental Landfill Stormwater Model and Calculations)**.

1.8.3 RIPARIAN VEGETATIVE PLANTING

Areas that were disturbed during channel construction will be re-established with a tallgrass native seed mix recomended for the region. Trees planted within the forested riparian corridors will be species native to the Cross Timbers region of Oklahoma. The details of these vegetation restorations are discussed in more detail below.

1.8.3.1 LIST OF PROPOSED PLANT SPECIES

The National Resource Conservation Service (NRCS) and the Osage County Extension office recommendations for the region have identified plant species for reseeding purposes in the area around AEL. This recommended plant community is consistent with a mixed grass prairie with dominant grasses that include:

- Big Bluestem (*Andropogon gerardii)*
- Little Bluestem (*Schizachyrium scoparium*)
- Indiangrass (*Sorghastrum nutans*)
- Switchgrass (*Panicum virgatum*)
- Buffalograss (*bouteloua dactyloides*)

The seed mix should include between five and 10 percent forbs consistent with a tallgrass prairie plant community. Seed mixes will maximize species richness suitable for the region.

The Subject Site is located in the EPA Ecoregion of Oklahoma's Cross Timbers (Woods, 20015). The Cross Timbers include the Post oak – Blackjack Forest and include several predominant oak and hickory tree species. These tree species include:

- Post Oak (*Quercus stellate*)
- Blackjack Oak (*Q. marilandica*)
- Black Oak (*Q. velutina*)
- Chinkapin Oak (*Q. prinoides*)
- Black Hickory (*Carya texana*)
- Bitternut Hickory (*C. cordiformis*)

Riparian mitigation tree planting will include bare root saplings of the fore mentioned species.

1.8.3.2 Planting Guidelines

The construction of an ephemeral stream channel will not require hydric plants. Reseeding will be limited to upland herbaceous plants. No live plantings will be used for the herbaceous stratum in the mitigation area. All herbaceous post construction plantings will utilize a tallgrass seed mix.

Bare root saplings will be planted for the riparian corridor mitigation. Tree saplings will include locally native species with a preference for hardwoods of the oak and hickory family. Bare root saplings will include the fore mentioned tree species for the region.

In addition to planting saplings, natural propagation of the existing tree community will be encouraged by protecting existing trees near the mitigation corridor. Mature trees adjacent to the mitigation corridor will be marked prior to construction so that heavy equipment operators can try and avoid harming these trees during construction. By preserving mature trees, natural propagation of the riparian mitigation will supplement the initial tree planting.

1.8.3.3 Herbaceous Stratum Planting Scheme

The post construction planting scheme will be consistent with the NRCS "Vegetation Guidelines for DEQ Land Restoration Program (2015). Native seed planting will be completed between December 1 and June 15. If possible, seeding will be targeted for March through April for optimum germination. If planting will be after June 15 and before December 1, a temporary cover crop will be established to minimize wind and water erosion.

Excess excavated material will be transported into the active landfill area for use as daily cover alleviating the need for supplemental conditioning of topsoil within the mitigation area. Areas that have been traversed with heavy equipment will be disked prior to planting to loosen compacted soils. Final seedbed preparation will be completed to a friable, smooth, firm seedbed without competitive cover.

Planting methods will use grass drill equipment with double disc or coulter furrow openers with depth band and press wheels, cultipacker, or drag chains. Seed will be planted between 1/8 and ½ inches deep.

Mulching will be either with 100% wood fiber or with a 70/30 percent wood to recycled paper mix. Hydromulching or bio-matting will be used on steep slopes where necessary to provide an initial erosional control prior to seed emergence.

Seed quantities will be based on percent of full rate application per acre. No seed mix will have greater than 40 percent of seed for a single grass species. Forbes and legumes will comprise between 5 and 10 percent of the total seed mix.

1.8.3.4 Tree Stratum Planting Scheme

A riparian mitigation corridor will be established for a minimum of 1,283 feet of linear stream. Trees planted around ponds and wetlands will have a half credit for each foot of tree cover. Existing trees along hydric features will be considered riparian woodlands. The riparian mitigation corridor will be 50 feet wide on both sides of the constructed channel. This will make the overall riparian area 110 feet wide – including the stream channel.

Bare-root saplings will be placed 18 to 24 feet apart to allow trees to reach maturity with minimal detrimental competition while providing suitable coverage if some samplings do not reach maturity. This riparian area will also have natural re-forestation from existing trees that are outside of the mitigation corridor. The combination of re-planting and natural re-forestation will provide the mitigation with a diverse tree community. Mature trees that will exist outside of the mitigation corridor will provide supplemental shading.

A spacing of 18 feet is the minimum recommended distance for bare-root trees to be planted so as to allow for minimal competitive growth of young trees. A spacing of 25 feet is approximately half the width of many mature oak species. With expectation that some of the planted trees will not reach maturity, the anticipated losses should have a minimal impact on the riparian mitigation corridor obtaining a full canopy of 70 percent. At maturity, the riparian mitigation corridor would need a

minimum of four trees for each hundred foot reach of channel to obtain 70 percent or greater canopy cover. The planting of 4 to 6 times more trees, than what is needed at maturity, provides an adequate compensation for tree loss at maturity.

Post construction tree planting in the riparian mitigation area will include bare root trees. Planting bare root trees should be completed from mid-February through April. Bare root trees should be soaked in water 3 to 6 hours before planting. Trees will be planted to a depth that covers all roots. No soil amendments, fertilizers, potting soils or chemical are used with bare root trees. Soil is firmly packed around roots and each tree is watered at the time they are planted. Additional watering may be needed for the first year after planting.

Bare root trees will be planted after herbaceous cover has been drilled. Mulching of the herbaceous layer will try and minimize material around base of planted sapling. If planting trees after mulching occurs, then the mulch will be moved away from each tree trunk after planting.

Trees will be mixed and placement will be random with the following guidelines:

- No tree will be planted in the constructed channel bottom, along the slope of the constructed channel or within 5 feet of the top of the channel.
- Trees will be planted with a minimum of 18 feet separation and no more than 30 feet.
- Trees will be planted on both sides of the channel out to 50 feet.
- Tree species should be mixed so that a more natural community of trees can be established.
- No tree species should be more than 20 percent of the planted trees.

Existing trees that exist within 50 feet of the constructed channel will be counted in the riparian mitigation corridor. Each tree over 20 feet will be considered a mature tree and would be equal to 5 bare root trees. Trees 10 to 20 feet will be considered equal 3 bare root trees. After mitigation construction is complete, an existing tree count, within the riparian mitigation corridor, will be conducted. After existing trees are counted and the numbers converted to bare root trees, the existing tree number will be subtracted from 3,900. If no live trees exist in the riparian mitigation corridor after construction, a total of 3,900 bare root trees will be planted.

For the first year, if rainfall is not sufficient, newly planted trees will be periodically watered. Each tree will be watered with 1 to 2 gals. Tree watering may be completed by mechanical irrigation, or spot watering. Periodic watering will be at a minimum of twice a month if rainfall in the area has not occurred for each month. Watering in the winter from beginning of December through March will not occur.

1.8.4 GRADING PLAN

The grading design and plans are represented in **Drawings 8 through 13.** An estimated 10,045 cy of cut material will be generated. From this material with the appropriate sized aggregate size, 5,175 cy will be placed in the constructed check dams throughout the channel. Constructed channel elevations are represented within **Drawings 8 through 13.** Soil erosion protection measures, as identified by the existing AEL stormwater pollution prevention plan will be implemented.

1.8.5 DISPOSAL SITE

All excess cut material and generated waste, not used within the channel's check dams, will be transported for use by AEL in on going landfill operations.

1.9 OPERATION AND MAINTENANCE

Operation of the mitigation area will resort back to an un-managed grassland/woodland/forest. Management of this area will be minimal. Maintenance of the mitigation area will be based on the results of the tri-annual monitoring. Issues that needs corrective action will be addressed on an item specific basis.

1.9.1 CHANNEL STABILITY

Channel stability after periods of flow is a priority. If, during the tri-annual monitoring and inspections, instability within the channel are identified, a corrective action plan will be established to correct/restore channel stability. These types of issues will be on an as needed bases to maintain channel continuity. Dirt work related issues will be addressed as soon as reasonably possible and at a minimum started prior to the end of the year. Examples of issues that may require corrective action include but not limited to:

- Vertical cut banks and increased incised channels greater than two times the previous years measured height
- Headcuts within the constructed channel that can incise/undercut and cause instability in check dams and pond spillways.
- Divergent channel formations which may result in channel shorting and increase flow velocities
- Channel blockages from excessive sedimentation and debris loading

1.9.2 HERBACEOUS STRATUM STABILITY

Corrective issues regarding the herbaceous stratum will be identified during the tri-annual monitoring and inspection periods. Areas that are identified as not adequately establish vegetative cover, a reseeding of these areas may be completed again. Areas that have an excessive erosion problem will be addressed by reshaping the ground surface, reseeding, and if necessary installation of erosion control structures until vegetative cover has been established.

If excessive invasive species coverage occurs, a selective eradication of invasive plants will be completed to control further expansion. Eradication options will be determined based on site specific needs of existing conditions. Eradication options may include but not limited to:

- Chemical treatments – not within identified local hydric features
    - Spot treatment of individual plants
    - Area chemical treatment of large plots dominated with invasive species
    - Treatment of cut stems
- Physical removal
    - Cut and removal of plant material
    - Disking and re-seeding

Chemical(s) that may be used will be specific for the identified invasive species

The mitigation area is not required to be mowed. Efforts to enhance and improve vegetative recovery within the mitigation area may be implemented as long as those practices do not contribute to deleterious surface water conditions or impairments to the vegetative recovery. The boundary property outside of the mitigation footprint is not included in the mitigation oversight.

1.9.3 TREE STRATUM STABILITY

Forested riparian stability corrective actions will include the replanting of bare root samplings in areas of the riparian mitigation area that have lost trees below a standard of 9 bare root samples per 100 feet of riparian corridor. For these areas, bare root trees will be replanted to bring the area back to the initial standard of 15 bare-root trees or equivalent for each 100-foot riparian reach. Each side of the stream channel will be treated independently for tree replanting purposes.

1.10 PERFORMANCE STANDARDS/MONITORING

Monitoring of the mitigation area will be completed on a tri-annual basis. The monitoring events will be during the growing season so as to accurately identify living plants. Monitoring will be completed by professionals that have been instructed on the monitoring objective and procedures. Monitoring staff will have a basic understanding of herbaceous and tree cover assessment with linear transects. Staff will also be able to identify different channel features and potential instability problems. As part of the monitoring program, the identification of maintenance issues is included. After field data is collected and analyzed, results of data findings will be included in a report to the USACE. End of year reports will be provided to the USACE 31st of the following year.

1.10.1 CONSTRUCTED CHANNEL MONITORING AND REPORTING

Channel assessment will include a full length inspection for structural integrity. Channel monitoring will be for ten years. If during this period three years of stability has been documented and verified by the USACE, AEL may petition the USCOE to reduce channel monitoring frequency or stop monitoring completely. The channel stability determination will be based on the channel's width and bed stability. Channel widths and sinuosity are expected to fluctuate over time as flows adjust and then re-establish stable channel conditions. The channel's average width and depth are expected to remain relatively consistent over time. Upon construction completion, the constructed channel will have ten transect locations established. These ten locations will be permanent and used for the subsequent monitoring events. A "T" post, GPS point, or other reference marker will be established during the initial assessment. Post construction measurements will be the baseline used to compare the channel stability for the next year's assessment. Channel width stability will exist when there is less than a ten percent increase in average channel width for the overall stream reach. Channel bed stability will exist when there is less than a one foot change in transect cut/fill channel-bottom height average for the overall channel reach.

Channel monitoring will be conducted during the same time that vegetative cover assessments are completed. Therefore channel stability assessments will be conducted three times a year. Each year's channel measurements will be compiled and compared to the previous year's measurements. The first year after construction will be compared to the post construction channel conditions. Channel stability will be established when three consecutive years show assessment values that are within the previously discussed stable standards. When data from three consecutive years indicate that the channel width is stable, a request to reduce or stop mitigation monitoring may be made to the USACE. If the USACE agrees that channel width stability has been established, then this monitoring may be stopped sooner than ten years.

Channel widths will be measured at the OHWM/toe of slope that denotes the edge of the channel bottom (toe of slope). Transect will be in the same locations as the initial post construction measurement. Each transect will include three width measurements that are spaced approximately ten feet apart. For consistency the three measurements will be completed so that:

- the first measurement will be approximately 10 feet up stream of transect marker
- The second measurement will be at the transect marker
- The third measurement will be approximately ten feet downstream of the transect marker.

Each transect's three measured widths will be averaged to determine the transect's average width. Transect average widths will be compiled to determine the average width for the overall channel reach. The yearly channel reach average widths will be compiled for the yearly width average. Yearly width averages will be compared to the following year's yearly averages to determine stream width stability. A stream channel width will be declared stable when the overall stream reach is less than ten percent wider than the previous year. When three consecutive years show less than a ten percent increase in stream channel width from the previous years the channel will be determined stable and may be removed from the remaining portion of the monitoring period with USACE consensus.

Channel depths will be measured at the same ten transects that widths were measured. Transects will be established perpendicular to the channel. A single transect line will be set up with a taut string/tape set across the top of the banks. The string/tape will be at ground level. Channel measurements will begin on the left OHWM/toe of slope and continue to the right OWHM/toe of slope. Each transect will include five measurements that will include:

- Left edge
- Left center
- Center
- Right center
- Right edge

Below is an example of a field sheet that may be used for stream channel monitoring.

Constructed Stream Channel Stability Monitoring Sheet
AEL Mitigation Project Area
Set Transect Locations

Year _____ Sample event 1st_____ 2nd_____ 3rd_____

	Channel Width				Channel Depth					
Transect	Upstream Width	Center Width	Downstream Width	Average Width	Left Edge	Left Center	Center	Right Center	Right Edge	Average Depth
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Stream Length Averages

Thalaweg Depth

Transect	Depth	Distance from Left Edge	Average Width
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Depth to top of Water

Left Edge	Left Center	Center	Right Center	Right Edge	Average Depth

Stream Length Averages

Each depth transect will average the five transect depths to determine an average transect depth. The transect average depths will be averaged to determine the overall streams reach average depth. The tri-annual average stream reach depths will be averaged to determine the yearly stream reach average depth. The yearly stream average depth will be compared to the previous and following years to determine channel depth stability. When data from three consecutive years indicated that the channel depth is stable, a request to stop mitigation monitoring may be made to the USACE. If the USACE agrees that channel depth stability has been established, them this monitoring may be stopped sooner than ten years.

Part of the channel reach assessment is the identification of unstable areas. These areas will be documented. Unstable areas are defined as locations of possible channel failures that include but are not limited to:

- Vertical cut banks and increased incised channels greater than two times the previous years measured height
- Headcuts within the constructed channel that can incise/undercut and cause instability in check dams and pond spillways.
- Divergent channel formations which may result in channel shorting and increase flow velocities
- Channel blockages from excessive sedimentation and debris loading

Individual unstable areas will be corrected as soon as reasonably possible to reduce the continued degradation of the channel. AEL will be responsible to address identified issues. Depending on the severity of the issue, AEL will use whatever means are necessary to repair/correct the channel instability while minimizing impacts to mitigated vegetative cover. Spot reseeding of heavily impacted mitigation areas may be done after channel repairs are complete. All reseeding will be in accordance to previously discussed planting guidelines.

1.10.2 HERBACEOUS COVER MONITORING AND REPORTING

Assessment of vegetative cover will determine percent of coverage and invasive species in post construction re-seeded areas. Monitoring will be for ten years or until vegetative cover is established with a minimum of seventy percent coverage after a minimum of three years. Vegetative cover will be determined using linear transects during the growing season. Tri-annual monitoring will be completed between April and October. The second and third tri-annual monitoring event will be no sooner than thirty days after previous tri-annual assessments. Ten, 50-foot transects well be established randomly throughout the re-seeded area. Each transect will be established by determining a random starting point and then a random direction. A 50-foot measuring tape will be placed on the ground and herbaceous ground cover will be measured along the tape. Below is an example of the vegetative cover field sheet that may be used. In areas that have greater than 50 percent tree canopy cover, transects will be re-stablished away from dense tree canopy areas. Canopy cover will be determined using a densiometer at the center of the transect line.

The maintenance and monitoring plan will include a tri-annual inspection of the mitigation project area. Inspections will include assessments of reseeded cover, channel bed and bank stability, and tree survival and canopy cover. These assessments will be for ten years. However, if herbaceous cover and/or channel stability are demonstrated to be stable after three years, then the length of monitoring may be reduced with USACE concurrence. Tree survival monitoring will be for a minimum of five years with demonstrated survival/recruitment. Review of the existing ponds and wetlands shall be limited to evaluating if unexpected impacts have occurred as a result of establishing a connectivity of these features with the constructed channel. No review of functionality for wetland features will be completed because these features are all currently functional.

Vegetative Cover Monitoring Sheet
AEL Mitigation Project Area
50' Random Transects

Year_____ Sample event 1st_____ 2nd_____ 3rd_____

	Transects (percent or 10ths of feet)									
Segment (Ft)	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
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39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										

Ground cover will be measured along linear transects to determine percent coverage. Coverage will be identified as vegetative cover of the herbaceous stratum. Invasive specie's cover will be identified during ground-cover measurements. Invasive species will also constitute no more than ten percent of the re-seeded area. Inspections will continue for ten years or until coverage goals are obtained. Each year's monitoring events will be included in the annual coverage averages. If the annual compiled coverage is seventy percent or greater, the standard for vegetative re-establishment will be met. Monitoring may stop if the USACE concurs.

If re-seeding goals are not obtained for proper coverage within ten years, a reseeding of the mitigation area may be completed again if concurrence with the USACE determine it necessary. Additional monitoring will continue on a yearly basis until vegetative stability is achieved.

If excessive invasive species coverage occurs, a selective eradication of invasive plants will be completed to control further expansion. Eradication options will be determined based on site specific needs of existing conditions. Eradication options may include but not limited to:

- Chemical treatments – not within identified local hydric features
    - Spot treatment of individual plants
    - Area chemical treatment of large plots dominated with invasive species
    - Treatment of cut stems
- Physical removal
    - Cut and removal of plant material
    - Disking and re-seeding

Chemical(s) that may be used will be specific for the identified invasive species

The mitigation area is not required to be mowed, but during the monitoring period the area may be mowed as part of the general management of the boundary property. Efforts to enhance and improve vegetative recovery within the mitigation area may be implemented as long as those practices do not contribute to deleterious surface water conditions or impairments to the vegetative recovery. The boundary property outside of the mitigation footprint is not included in the mitigation oversight.

1.10.3 RIPARIAN TREE COVER MONITORING AND REPORTING

Riparian tree mitigation will assess the persistence of viable trees within the constructed channel's riparian corridors. A riparian corridor is a 50-foot wide forested section along one bank of the channel. Two riparian corridors comprise a stream reach. Initially trees will be planted with an average coverage rate of 30 bare-root trees for each 100-foot reach of stream channel or 15 bare-root trees per riparian corridor. The mitigation tree density is based off the minimum and average spacing of 18 and 25 feet respectively. Mature oak tree canopy widths can be over 50 feet in diameter. Four mature oaks or hickory trees would provide the shading necessary to replace the lost riparian cover of S-1. The initial planting scheme provides a bare-root tree density that is almost 4 times the needed compensation. This scheme accounts for expected moderate losses of trees that will not reach maturity.

Each tri-annual assessments will include a tree count along three 200-foot transects. A 200-foot transect will be located entirely on one side of the channel reach and fully within the riparian mitigation area. The transect will be walked and all living trees, either planted or naturally occurring, will be counted regardless of height. Each riparian corridor will have at least one transect completed. In addition to number of trees, canopy cover along each transect will be taken at five evenly spaced locations. Canopy cover will be measured using a densiometer. Canopy values will be averaged to determine percent canopy cover.

A sub-transect of 100 feet of the 200 feet transect will include tree height measurements. This sub-transect will begin within the first hundred feet at a random location. All trees that are within this section will have their heights measured using a clinometer. Tree species will be recorded along with their height. All trees 10 feet or less will have their height recorded as "10 feet or less".

Three 100 feet transects will be established within the center of the constructed channel and a canopy cover measurement will be conducted using a densiometer at five evenly spaced locations along each transect. Canopy values will be averaged to determine percent coverage.

Standards for tree monitoring will include maintaining a percentage of live trees within a 100-foot stream reach at a ratio of 18 individual or greater of bare-root trees. As time passes, the number of live trees will decline, but the average tree height will increase. The primary reason for the restoration of a forested riparian corridor is to provide shade protection to the constructed channel. A goal of 70 percent canopy cover for the constructed channel will provide adequate shade protection.

Over the years, the number of trees will naturally be reduced while canopy cover will remain relatively consistent. As younger tree numbers decline, more mature tree numbers should increase. For this reason, trees with heights between 10 and 20 feet will be equal to three bare-root trees. Trees that are taller than 20 feet will be considered mature and are equal to five bare-root trees. A baseline density of 30 bare-root trees for every 100 feet of mitigation channel or 15 bare-root trees for each 100 feet of riparian corridor will be established after construction is complete. Establishing this density will be accomplished by planting bare-root trees. A loss of more than 20 percent of baseline density will denote a decline in riparian woodland recovery. If after three years, more than 40 percent (6 individuals per 100 feet of riparian corridor) of the baseline density has occurred, then replanting bare-root trees in areas of lowest densities may be completed to restore baseline densities.

Riparian re-establishment will be met when:

- the annual loss in tree density is less than 20 percent
- greater than 50 percent of the remaining trees are taller than 10 feet
- canopy cover is 70 percent or greater

If sometime after five years the above goals have been met, then the standard for a restored riparian corridor will have been met and continual monitoring may cease with USACE consent. Below is an example of the riparian mitigation field sheet that may be used.

Riparian Mitigation Field Sheet Page 1 or_____

Staff_____ Date_____

Transect #	Transect Starting Point	Bank L	Bank R

200 ft. Transect Species	# of Trees 0-50 ft.	# of Trees 50 -100 ft.	# of Trees 100-150 ft.	# of Trees 150-200 ft.
Oaks				
Hickory				
Cedars				
Other				
Total				

	Canopy Cover (200 ft.)	Canopy Cover Channel (100 ft.)
0		
50/25		
100/50		
150/75		
200/100		
Average		

Sub-Transect Starting Point: _____

Height of clinometer (VH): _____

100 ft. Sub-Transect	Height of Tree (Percent)	Distance to Tree	Calculated Height (H/100 x D + VH)	Species
1)				
2)				
3)				
4)				
5)				
6)				
7)				
8)				
9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				
21)				
22)				
23)				

1.10.4 YEARL SUMMARY

An annual summary of monitoring results will be submitted to the USACE by March 31 of the following year. The annual summary will provide the previous years collected data on plant cover and stream channel stability. Summary details will discuss the existing conditions and if there are issues that need to be addressed or have been identified and addressed prior to the report submission. If during the field assessments, issues with stream channel stability or vegetative cover are observed that are deleterious to the success of the mitigation plan, these issues will be addressed by AEL as soon as reasonably possible. Any issues addressed during the monitoring year will be included in the annual summary and will include the concern and the corrective measures taken.

1.11 LONG-TERM MANAGEMENT PLAN

The mitigation area is being reserved as an undeveloped natural area by AEL. This area will not be developed or modified and will retain a natural vegetative cover. After mitigation vegetative cover and stream channel stability have been established, annual inspection of the mitigation project area will be completed for five more years with a general assessment of channel continuity and natural vegetative persistence. Mowing, grazing, and limited tree management of select areas may take place as a means of managing the land, but cultivation and removal of mitigation features will not occur. Invasive species management may be completed, as AEL deems necessary, to maintain the natural vegetative cover. If individual unstable areas within the stream channel develop due to future flow changes, these issues will be addressed on a case by case basis to maintain stream channel integrity. Channel problems that may require the use of heavy equipment will have a notice of intent letter (NOI) provided to the USACE prior to in channel work is started. The NOI will provide the purpose for the corrective measure.

Temporary alterations to the features in the mitigation area may occur in the future from regional infrastructure improvements. After infrastructure improvements are completed, the mitigation features will be restored to pre-disturbance conditions for vegetative cover and channel stability. AEL will provide NOI to the USACE regarding the type and duration of the proposed disturbance. No disturbance of the mitigation area will be permanent.

The constructed mitigation channels and connected hydric features will have a deed restriction placed on them. This deed restriction will be in-perpetuity protecting these features from future development. The deed restriction will be for the identified mitigation project area (Appendix A, Drawing 5). As part of the deed restriction, the USACE will be identified as the responsible third party with authority to force corrective actions is a situation arises after monitoring is completed. AEL will be responsible for costs associated with required corrective actions. AEL will be responsible in obtaining an outside contractor to complete the work if AEL is not able to complete the corrective work. Annual inspection costs for the mitigation area will not exceed $5,000 unless corrective action is required. Cost of corrective actions will be determined by AEL with approval of the USACE on proposed corrective actions.

1.12 ADAPTIVE MANAGEMENT PLAN

If after performance standards are achieved and natural causes alter the mitigation channel and riparian areas beyond the defined mitigation boundary, AEL will provide protection to the existing

channel configuration with similar management as described in the "Long-term Management Plan" and protect the altered channel from development. If up gradient changes to the watershed are made by outside entities and these changes alter the flow patterns through the mitigation area, these new flow patterns will not be adjusted for by AEL. Instead, the changes to the mitigation area will be considered natural impacts and alterations will be managed, as described earlier, through a natural progression.

If AEL fails to construct the proposed mitigation area, they will be responsible for an outside contractor, acquired by the USACE, to complete construction on the identified mitigation area. If the outside contractor is unable to complete construction, the financial assurance value of $128,000 will be provided to an in-lieu-fee provider for off-site mitigation.

1.13 FINANCIAL ASSURANCES

A non-revocable letter of credit, performance bond, or escrow account will be established that identifies AEL as responsible for costs to maintain the mitigation project area for future repairs and maintenance. A financial assurance value of $128,000 will be placed on the mitigation area. This assurance value is based on the initial construction cost and reseeding/tree planting. Additional changes or enhancements to the mitigation area, beyond the initial design, will need to be approved by the USACE and AEL.

Financial assurances may be phased out once the mitigation area has been determined by the USACE to be successful in accordance with its performance standards. The standards, as discussed within the performance standards/monitoring section, identify when:

- Stream channel yearly stream average depths, compared to the previous and following years, determine channel depth stability has not exceeded greater than a 10% increase in channel incision/deposition and channel width expansion. When data from three consecutive years indicates that the channel depth is stable, channel stability has been established.
- If the annual herbaceous coverage is seventy percent or greater, herbaceous cover has been re-established and the standard for vegetative re-establishment will have been met
- Standards for tree monitoring will include maintaining a percentage of live trees within a 100-foot stream reach at a ratio of 20 or greater (10 bare-root trees per 100-foot corridor) of bare-root trees.

If these standard are met, then the mitigation area will have obtained the goal of a stable and viable ephemeral stream channel with forested riparian cover and herbaceous ground cover.

2.0 REFERENCES

NRCS, July 30, 2015, Vegetation Guidelines for DEQ Land Restoration Program.

USACE, Tulsa District, October 2004, Department of the Army Regulatory Program – Aquatic Resource Mitigation and Monitoring Guidelines.

USGS Wekiwa, Okls. Quadrangle, 1958, 7.5 Minute Topographic Quadrangle

Appendix A

Drawing 1 – Cover

Drawing 2 – Site Map

Drawing 3 – Proposed Permit Area

Drawing 4 – Proposed Landfill Expansion

Drawing 5 – Proposed Mitigation Area

Drawing 6 - Existing Soil Types

Drawing 7 – Catchment Hydrology

Drawing 8 – Proposed Realignment (Overview)

Drawing 9 – Proposed Realignment (0 to 9+00)

Drawing 10 – Proposed Realignment (9+00 to 19+00)

Drawing 11 – Proposed Realignment (19+00 to 27+23)

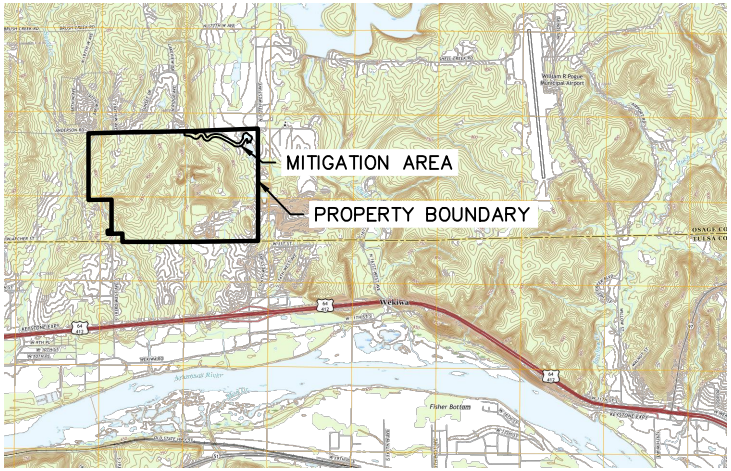
Drawing 12 – Proposed Realignment (27+23 to 29+22)

Drawing 13 – Proposed Realignment (29+22 to 33+00)

Drawing 14 - Details

AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN
JANUARY 2020

PREPARED FOR



AMERICAN ENVIRONMENTAL LANDFILL
207 N 177TH WEST AVENUE
SAND SPRINGS, OKLAHOMA

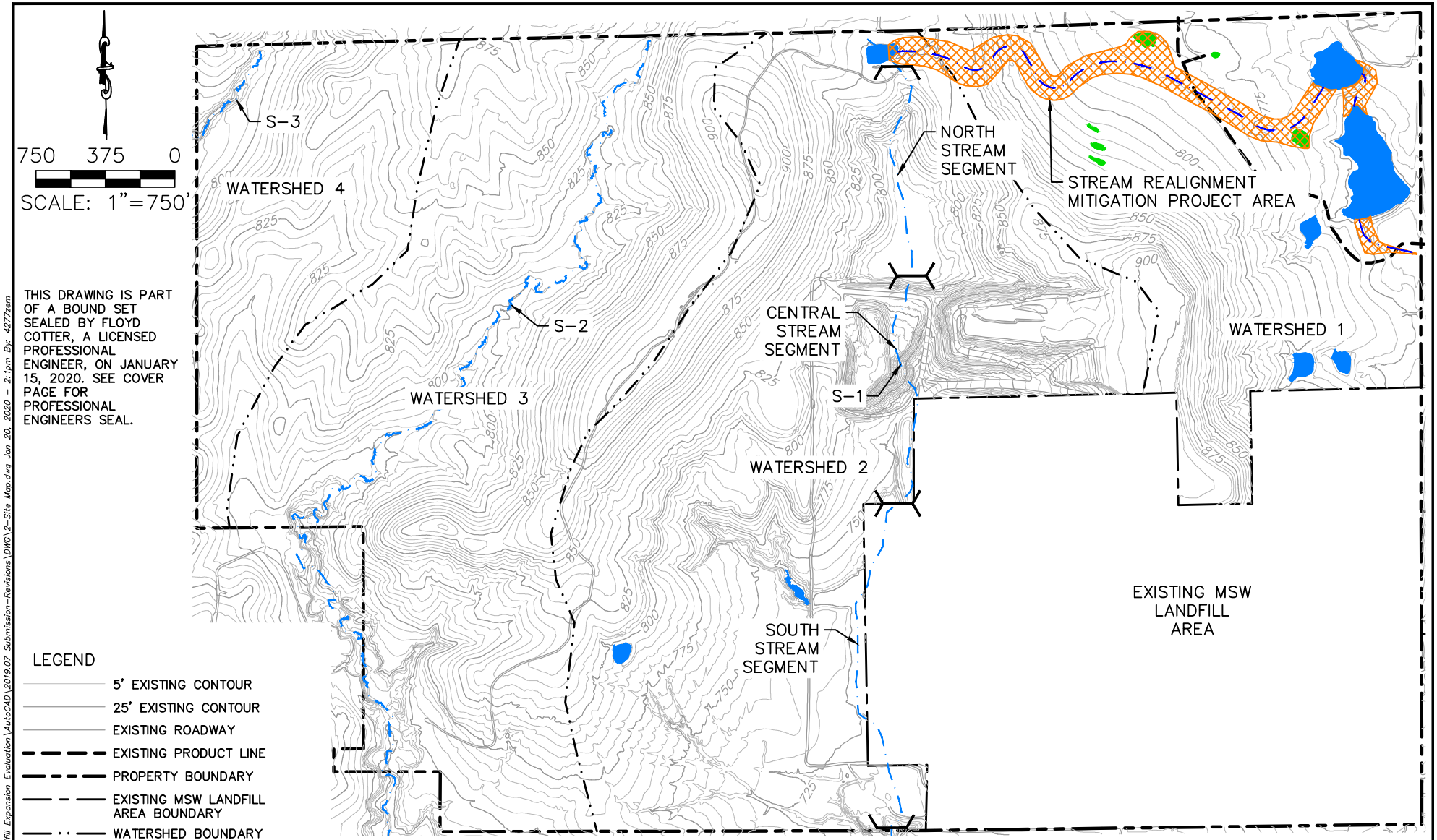
PREPARED BY

SCS ENGINEERS
8575 WEST 110TH STREET, SUITE #100
OVERLAND PARK, KANSAS 66210
PH. (913) 681-0030 FAX (913) 681-0012
PROJECT NO. 27219016.00

SHEET LIST TABLE	
SHEET NUMBER	**SHEET TITLE**
1	Cover
2	Site Map
3	Proposed Permit Area
4	Proposed Landfill Expansion
5	Proposed Mitigation Area
6	Existing Soil Types
7	Catchment Hydrology
8	Proposed Realignment (Overview)
9	Proposed Realignment (0 to 9+00)
10	Proposed Realignment (9+00 to 19+00)
11	Proposed Realignment (19+00 to 27+23)
12	Proposed Realignment (27+23 to 29+22)
13	Proposed Realignment (29+22 to 32+00)
14	Details

REGISTERED PROFESSIONAL ENGINEER
FLOYD E. COTTER
17783
OKLAHOMA
1-15-20

ENGINEERS SEAL APPLIES TO ALL DRAWINGS LISTED IN THE SHEET LIST TABLE.
ISSUE FOR PERMIT USE ONLY



THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

LEGEND

- 5' EXISTING CONTOUR
- 25' EXISTING CONTOUR
- EXISTING ROADWAY
- EXISTING PRODUCT LINE
- PROPERTY BOUNDARY
- EXISTING MSW LANDFILL AREA BOUNDARY
- WATERSHED BOUNDARY
- STREAM
- WETLAND
- POND
- PROPOSED MITIGATION–PROJECT AREA

NOTES:

1. EXISTING TOPOGRAPHY, PROPERTY BOUNDARY AND ROADWAYS FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
2. EXISTING PRODUCT LINE FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 22, 2019.
3. EXISTING STREAMS, WETLANDS, AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.

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27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

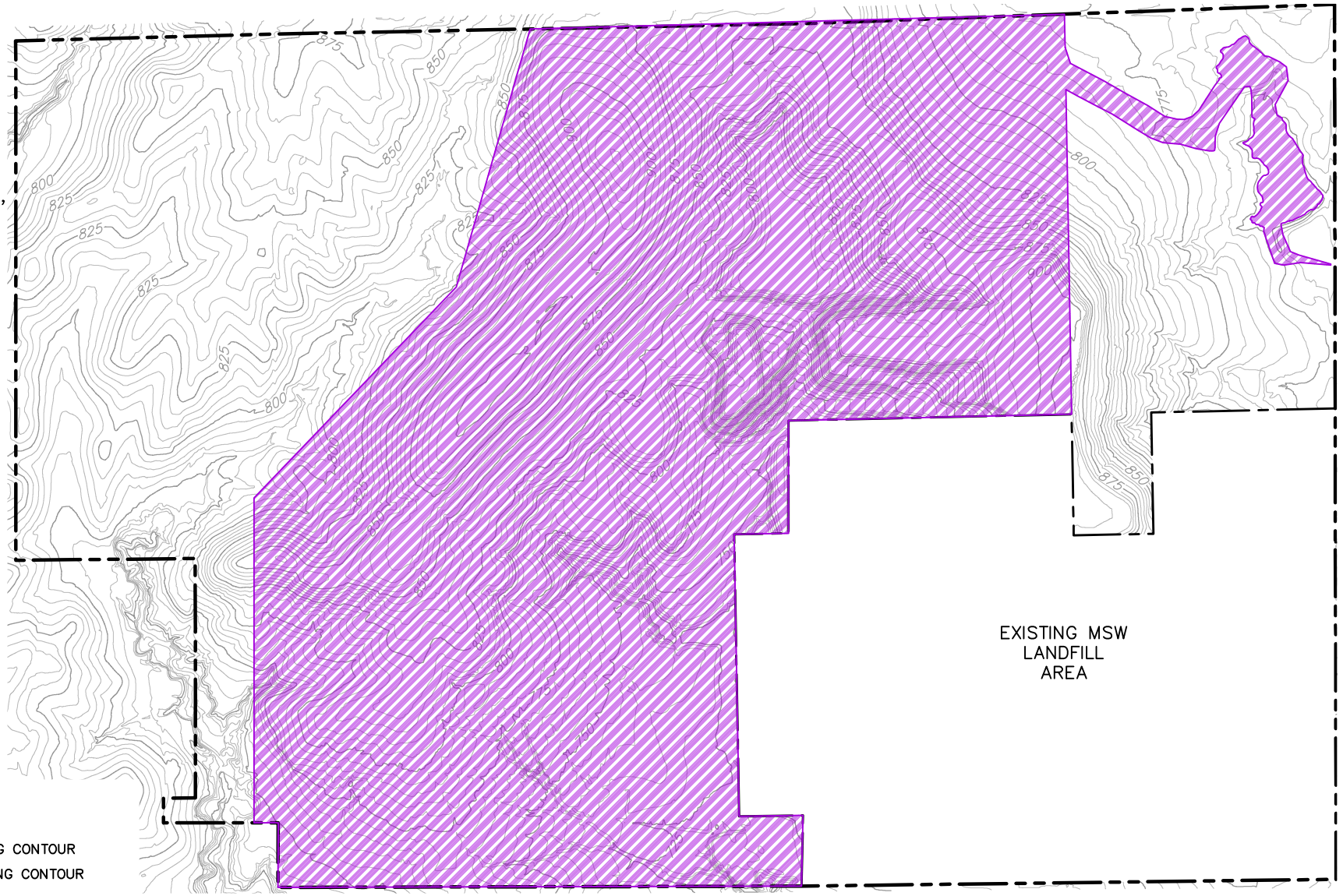
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
SITE MAP

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 2 of 14

K:\American Environmental Landfill\27219016.00 - Landfill Expansion Evaluation\AutoCAD\2019.07 Submission-Revisions\DWG\2-Site Map.dwg Jan 20, 2020 - 2:1pm By: 4277zem



THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

LEGEND

- 5' EXISTING CONTOUR
- 25' EXISTING CONTOUR
- PROPERTY BOUNDARY
- EXISTING MSW LANDFILL AREA BOUNDARY
- PROPOSED PERMIT AREA

NOTES:
1. EXISTING TOPOGRAPHY, PROPERTY BOUNDARY AND ROADWAYS FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.

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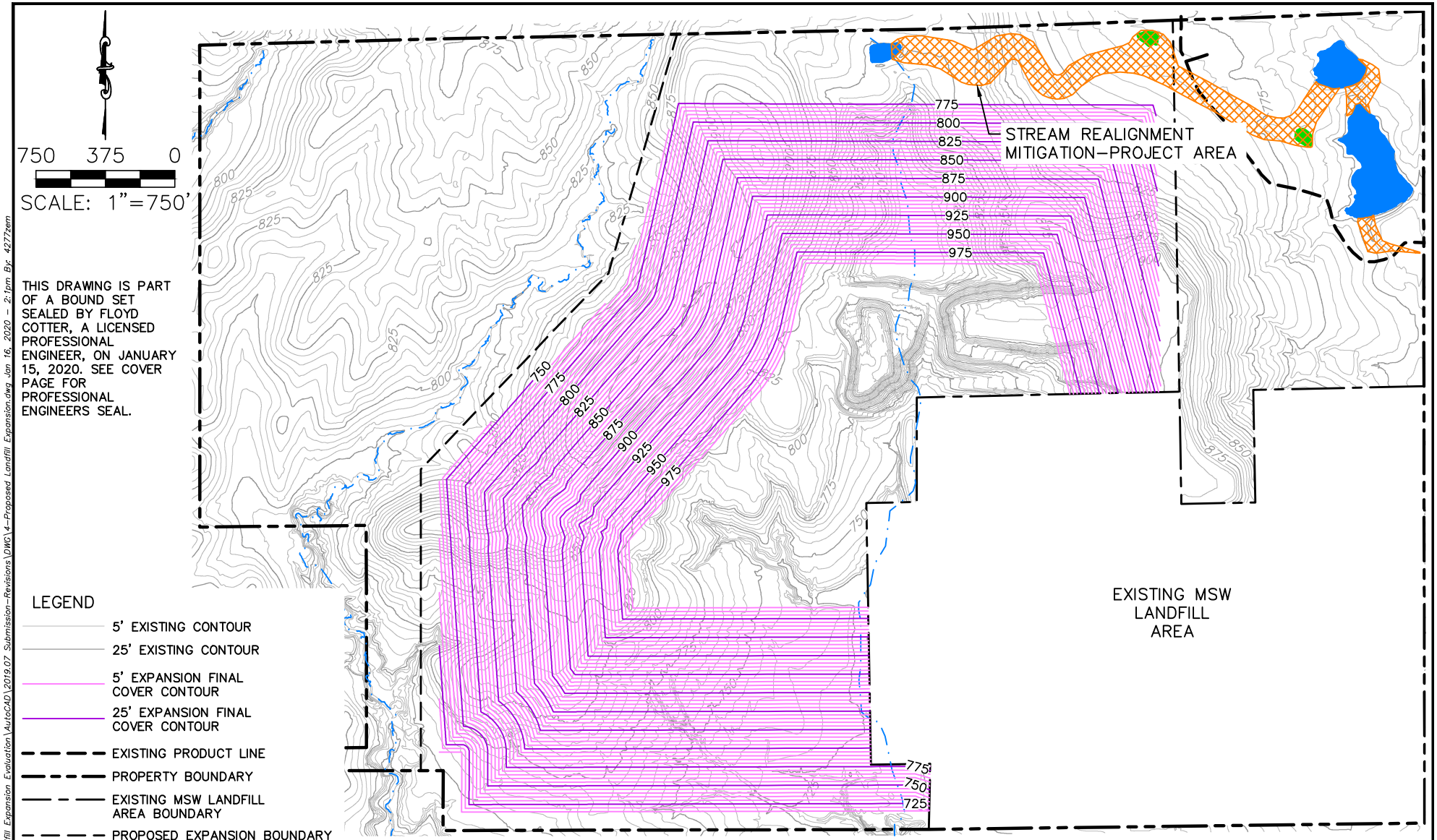
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED PERMIT AREA

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 3 of 14



NOTES:

1. EXISTING TOPOGRAPHY, PROPERTY BOUNDARY AND ROADWAYS FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
2. EXISTING PRODUCT LINE FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED
3. EXISTING STREAMS, WETLANDS, AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.
4. FINAL COVER CONTOURS SHOWN ARE FOR CONCEPTUAL PURPOSES ONLY.

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PH. (913) 681-0030 FAX. (913) 681-0012

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27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED LANDFILL EXPANSION

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 4 of 14

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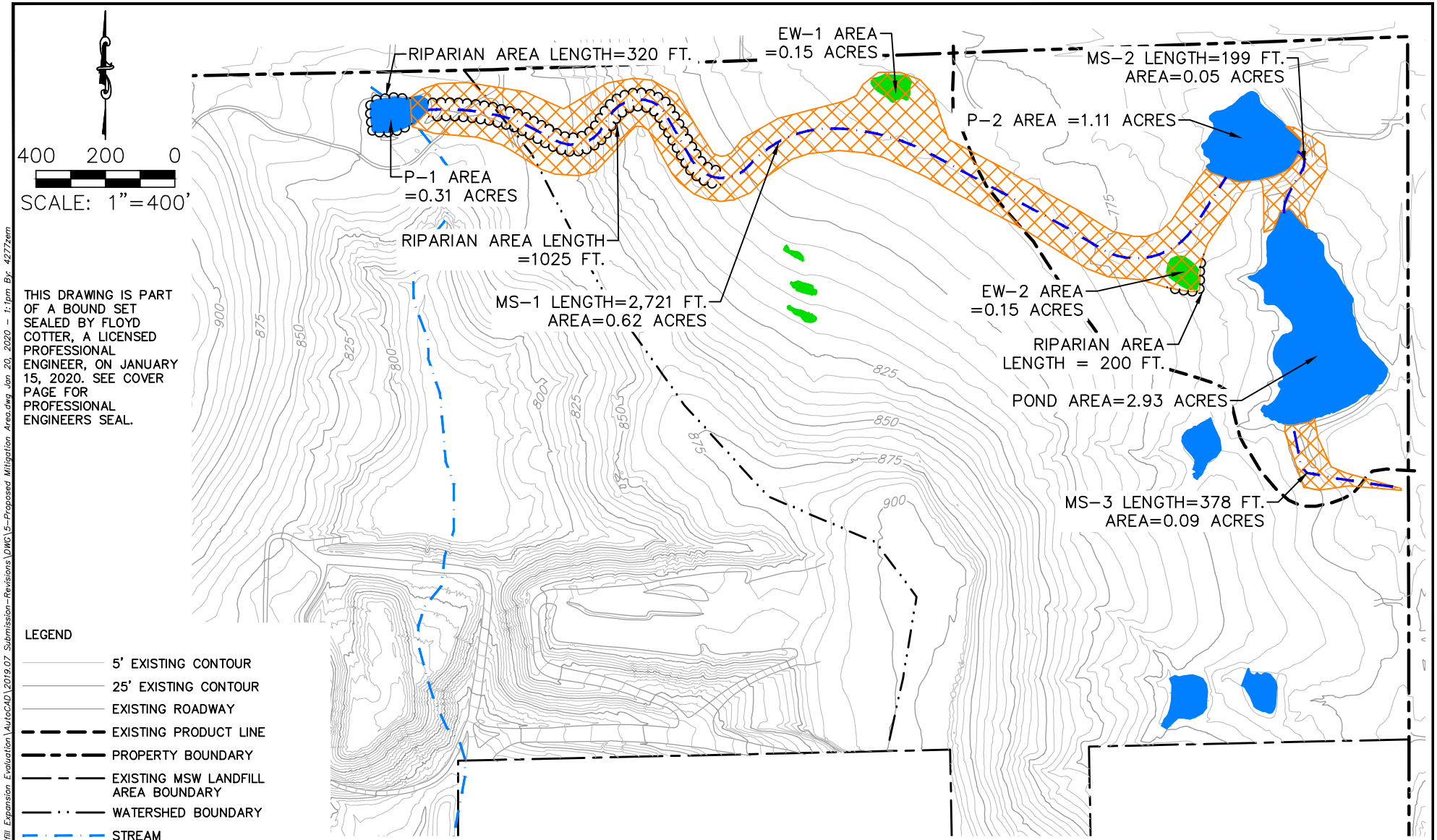

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LEGEND

- 5' EXISTING CONTOUR
- 25' EXISTING CONTOUR
- EXISTING ROADWAY
- EXISTING PRODUCT LINE
- PROPERTY BOUNDARY
- EXISTING MSW LANDFILL AREA BOUNDARY
- WATERSHED BOUNDARY
- STREAM
- RIPARIAN AREA
- WETLAND
- POND
- PROPOSED MITIGATION–PROJECT AREA

NOTES:

1. EXISTING TOPOGRAPHY, PROPERTY BOUNDARY AND ROADWAYS FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
2. EXISTING PRODUCT LINE FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 22, 2019.
3. EXISTING STREAMS, WETLANDS, AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.

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27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:

AMERICAN ENVIRONMENTAL LANDFILL, INC.

AMERICAN ENVIRONMENTAL LANDFILL

SAND SPRINGS, OKLAHOMA

SHEET TITLE:

PROPOSED MITIGATION AREA

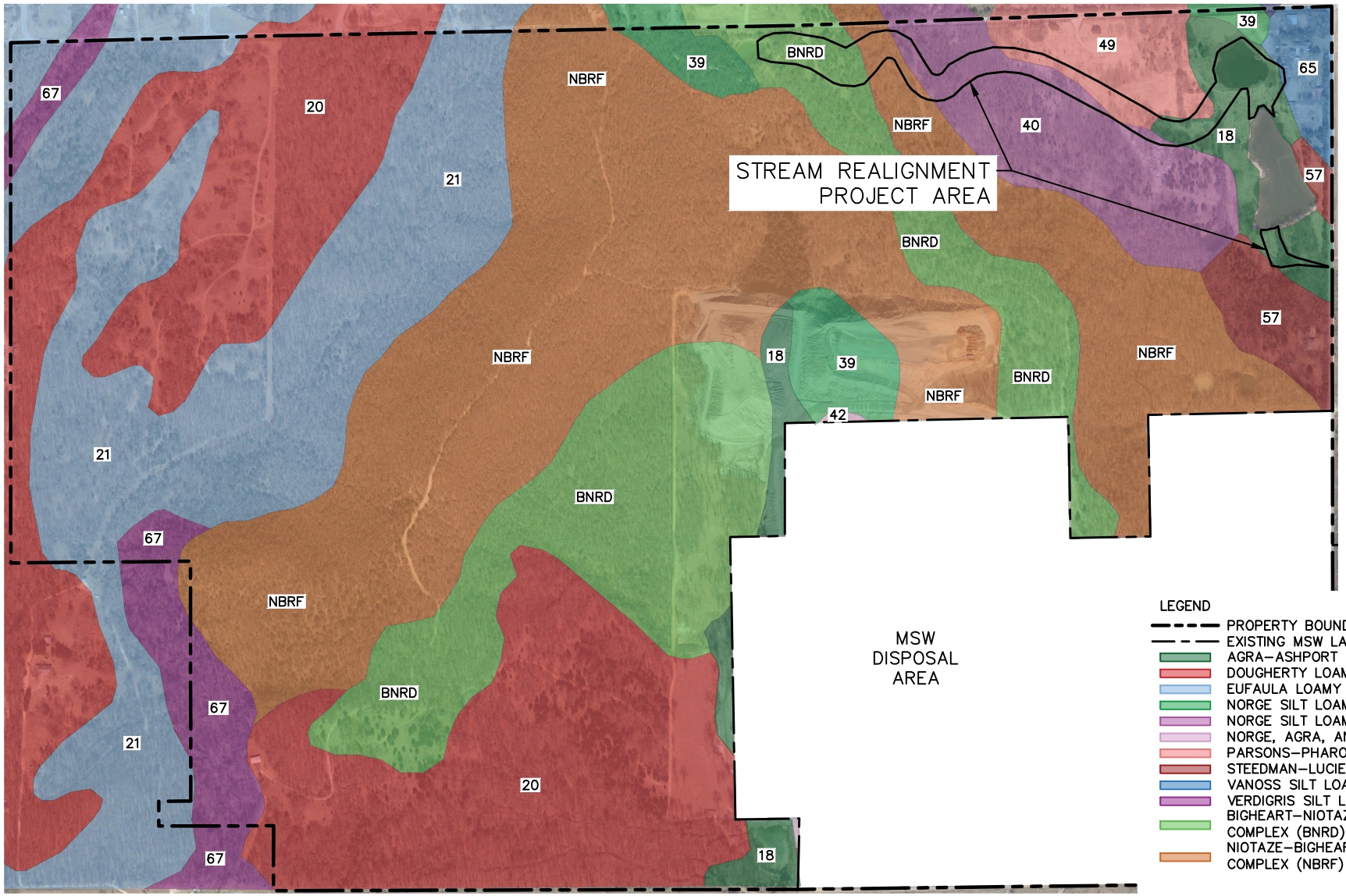
PROJECT TITLE:

PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20

SCALE: AS SHOWN

DRAWING NO. 5 of 14



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NOTES:
1. BACKGROUND IMAGERY AND PROPERTY BOUNDARY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA DATED MARCH 7, 2018.
2. SOILS DATA DOWNLOADED FROM NRCS SOIL WEB SURVEY ON APRIL 29, 2019.

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27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
EXISTING SOIL TYPES

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 6 of 14

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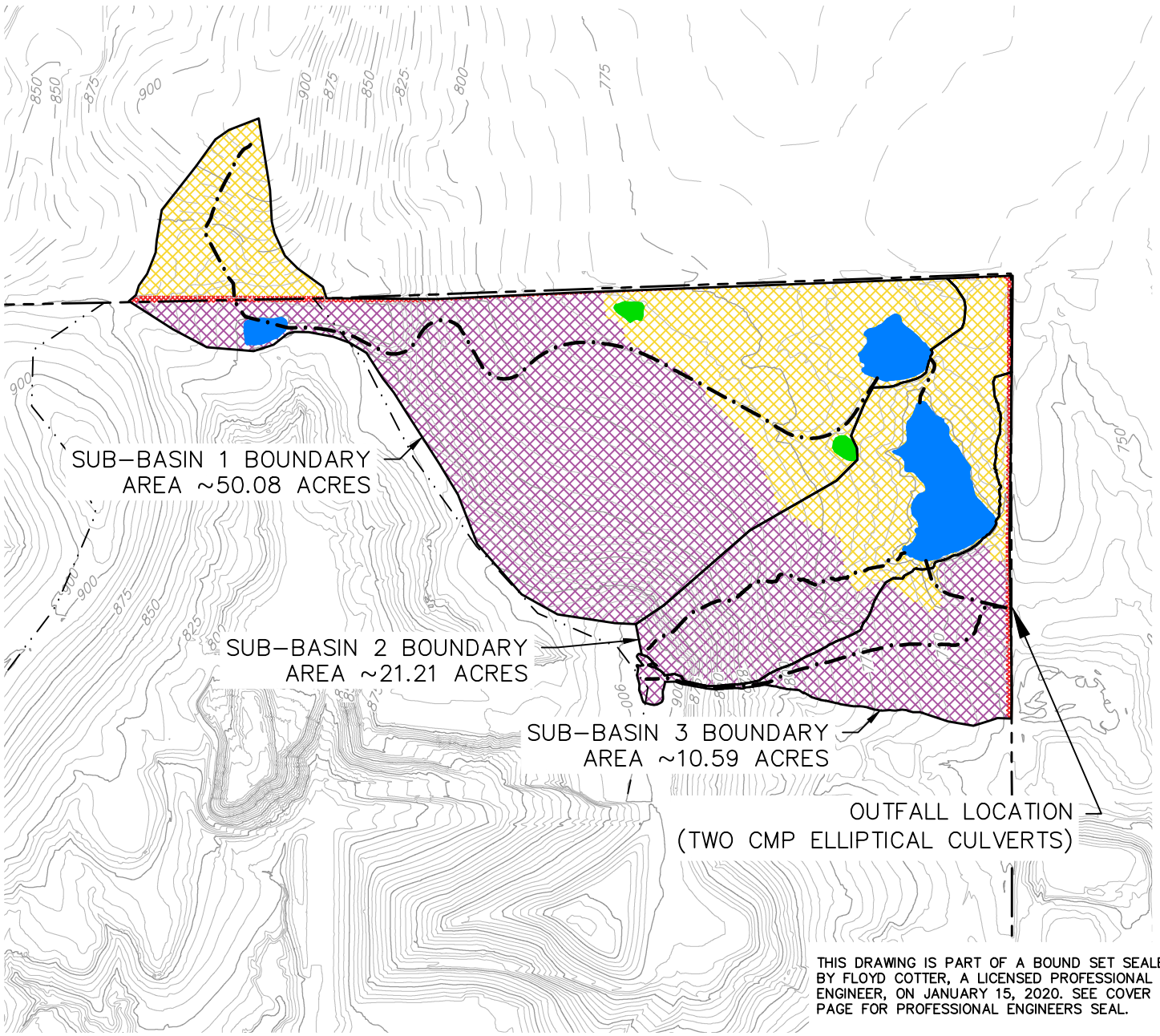


LEGEND

- 5' EXISTING CONTOUR
- 25' EXISTING CONTOUR
- 5' USGS CONTOUR
- 25' USGS CONTOUR
- PROPERTY BOUNDARY
- WETLAND
- POND
- CATCHMENT BOUNDARY
- FLOW LINE
- IMPERVIOUS SURFACE
- BRUSH AND GRASS
- WOODS

NOTES:

1. EXISTING TOPOGRAPHY AND PROPERTY BOUNDARY FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA DATED MARCH 7, 2018.
2. EXISTING WETLANDS AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.
3. PORTIONS OF CATCHMENT AREA WERE OUTSIDE LIMITS OF SITE SURVEY. USGS DATA WAS USED IN AREAS WHERE SITE SPECIFIC SURVEY INFORMATION WAS NOT AVAILABLE.

HYDROLOGIC PARAMETERS:

1. HYDROLOGY CALCULATED PER NRCS TR-55 METHOD AS IMPLEMENTED BY AUTODESK STORM AND SANITARY ANALYSIS 2018
2. TOTAL CATCHMENT AREA = 86.88 ACRES
   - 2.1. IMPERVIOUS SURFACE = 1.31 ACRES
   - 2.2. POND AREA = 4.05
   - 2.3. BRUSH AND GRASS AREA = 30.91 ACRES
   - 2.4. WOODED AREA = 50.62 ACRES
3. SOIL HYDRAULIC CLASS D FROM NRCS SOIL WEB SURVEY
4. CURVE NUMBERS
   - 4.1. IMPERVIOUS SURFACE = 93
   - 4.2. POND AREA = 100
   - 4.3. BUSH AND GRASS AREA = 73
   - 4.4. WOODED AREA = 77
   - 4.5. WEIGHTED CURVE NUMBER = 76.25
5. TIME OF CONCENTRATION = 36 MINUTES
6. DESIGN STORM
   - 6.1. 25 YEAR, 24 HOUR STORM FOR OSAGE COUNTY, OKLAHOMA
   - 6.2. TOTAL RAINFALL = 6.70 INCHES
   - 6.3. APPLIED ACCORDING TO SCS TYPE II 24-HR DISTRIBUTION
7. COMPUTED RUNOFF
   - 7.1. PEAK RUNOFF = 130 CFS
   - 7.2. MEAN RUNOFF = 7 CFS

THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

600 300 0

SCALE: 1"=600'

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

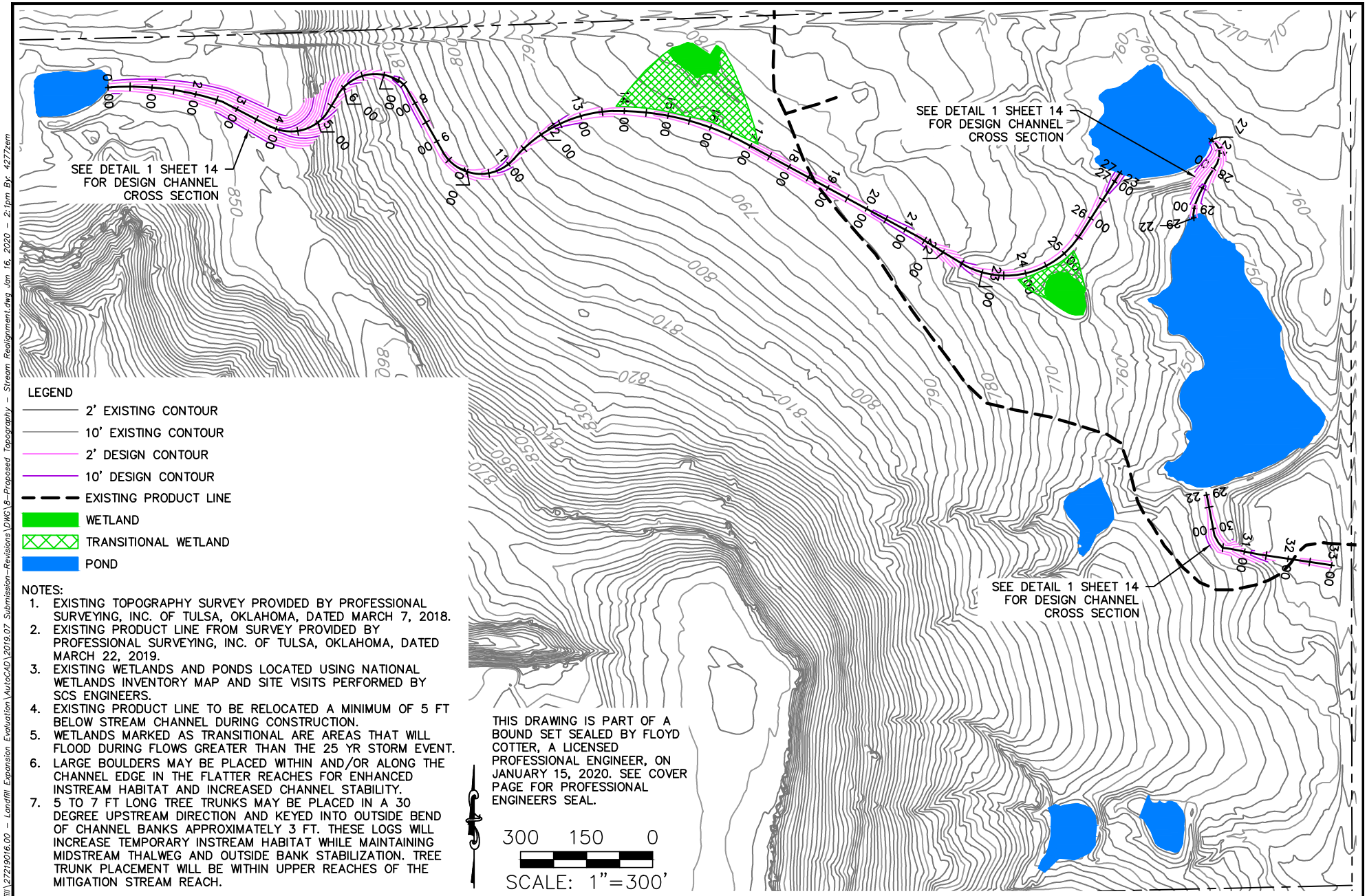
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
CATCHMENT HYDROLOGY

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 7 of 14

K:\American Environmental Landfill\27219016.00 - Landfill Expansion Evaluation\AutoCAD\2019.07 Submission-Revisions\DWG\7-Catchment Hydrology.dwg Jan 16, 2020 - 2:1pm By: 4277zem



NOTES:

1. EXISTING TOPOGRAPHY SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
2. EXISTING PRODUCT LINE FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 22, 2019.
3. EXISTING WETLANDS AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.
4. EXISTING PRODUCT LINE TO BE RELOCATED A MINIMUM OF 5 FT BELOW STREAM CHANNEL DURING CONSTRUCTION.
5. WETLANDS MARKED AS TRANSITIONAL ARE AREAS THAT WILL FLOOD DURING FLOWS GREATER THAN THE 25 YR STORM EVENT.
6. LARGE BOULDERS MAY BE PLACED WITHIN AND/OR ALONG THE CHANNEL EDGE IN THE FLATTER REACHES FOR ENHANCED INSTREAM HABITAT AND INCREASED CHANNEL STABILITY.
7. 5 TO 7 FT LONG TREE TRUNKS MAY BE PLACED IN A 30 DEGREE UPSTREAM DIRECTION AND KEYED INTO OUTSIDE BEND OF CHANNEL BANKS APPROXIMATELY 3 FT. THESE LOGS WILL INCREASE TEMPORARY INSTREAM HABITAT WHILE MAINTAINING MIDSTREAM THALWEG AND OUTSIDE BANK STABILIZATION. TREE TRUNK PLACEMENT WILL BE WITHIN UPPER REACHES OF THE MITIGATION STREAM REACH.

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300 150 0

SCALE: 1"=300'

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

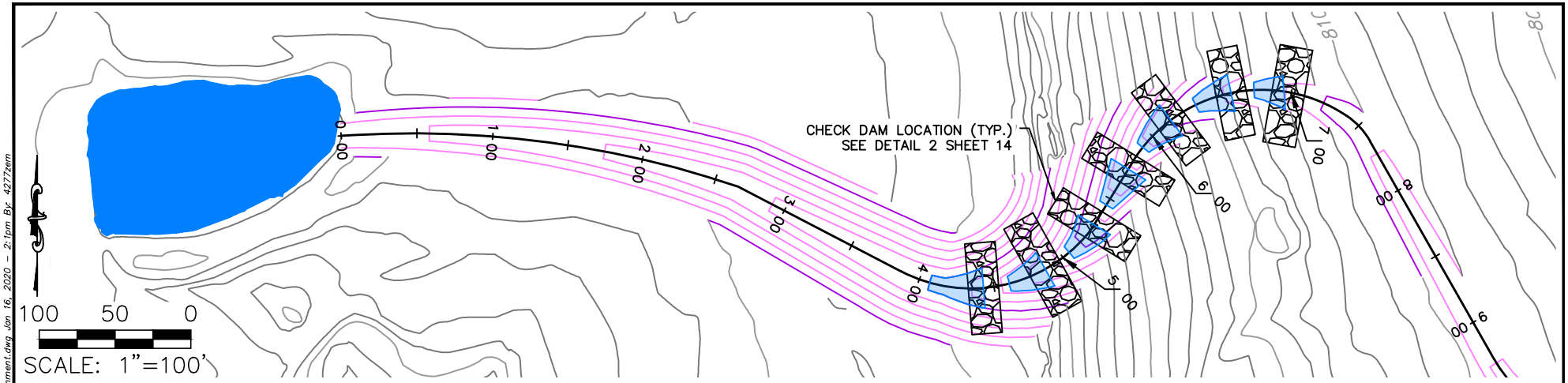
PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

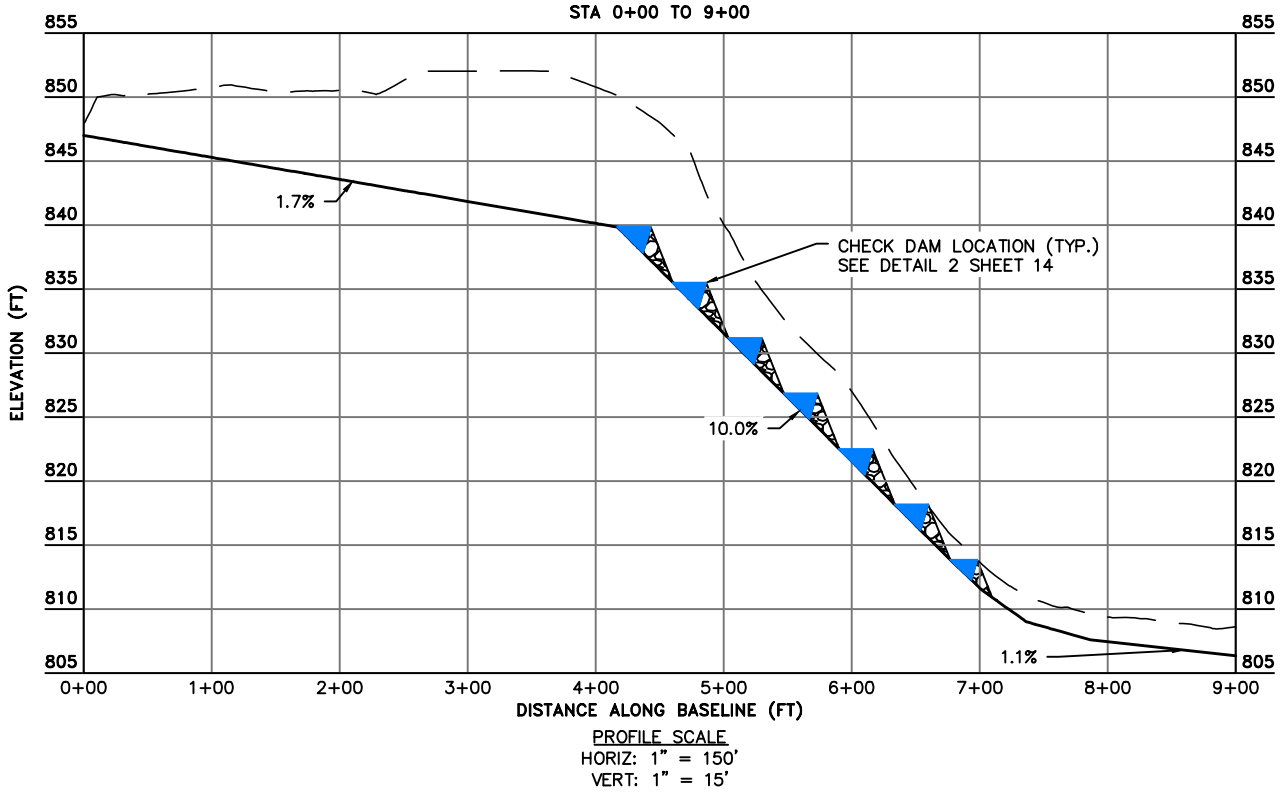
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (OVERVIEW)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 8 of 14





PROFILE SCALE
HORIZ: 1" = 150'
VERT: 1" = 15'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- POND
- CHECK DAM

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THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

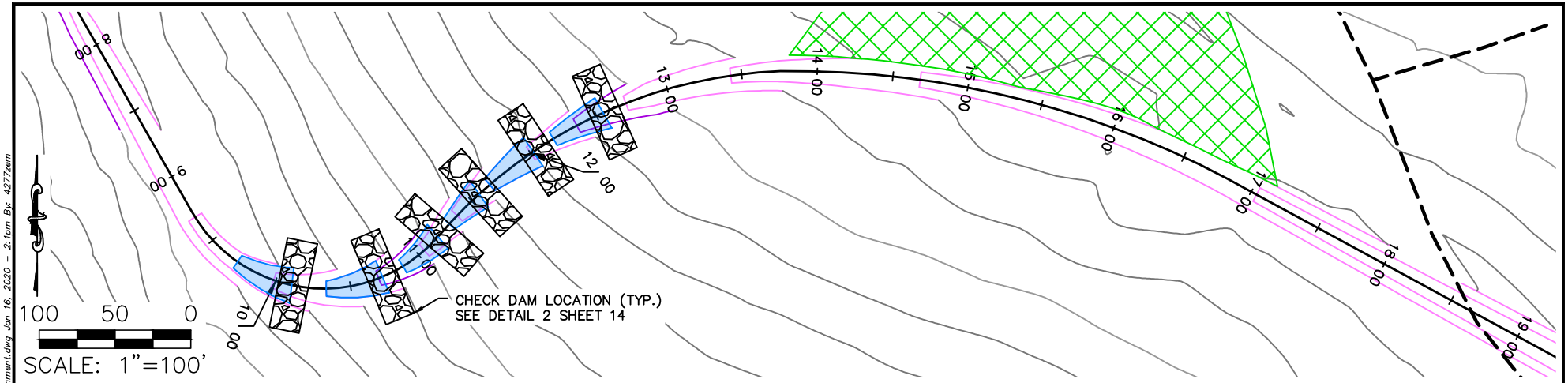
PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

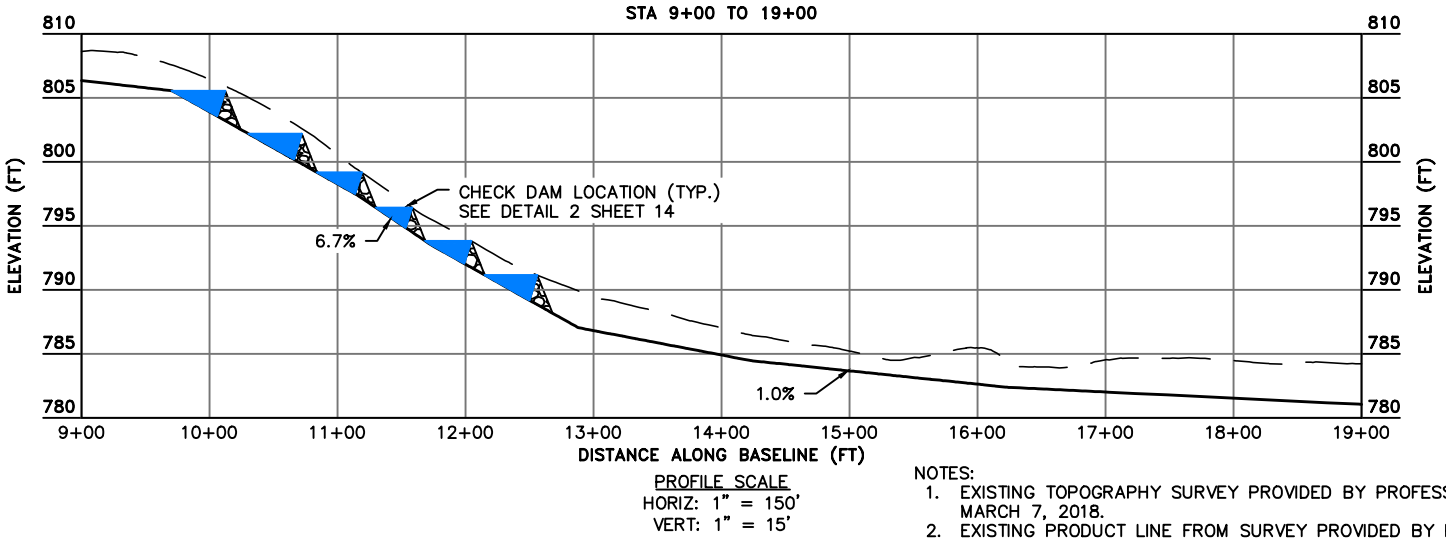
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (0 TO 9+00)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 9 of 14





PROFILE SCALE
HORIZ: 1" = 150'
VERT: 1" = 15'

LEGEND
- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- EXISTING PRODUCT LINE
- TRANSITIONAL WETLAND
- POND
- CHECK DAM

NOTES:
1. EXISTING TOPOGRAPHY SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
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THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

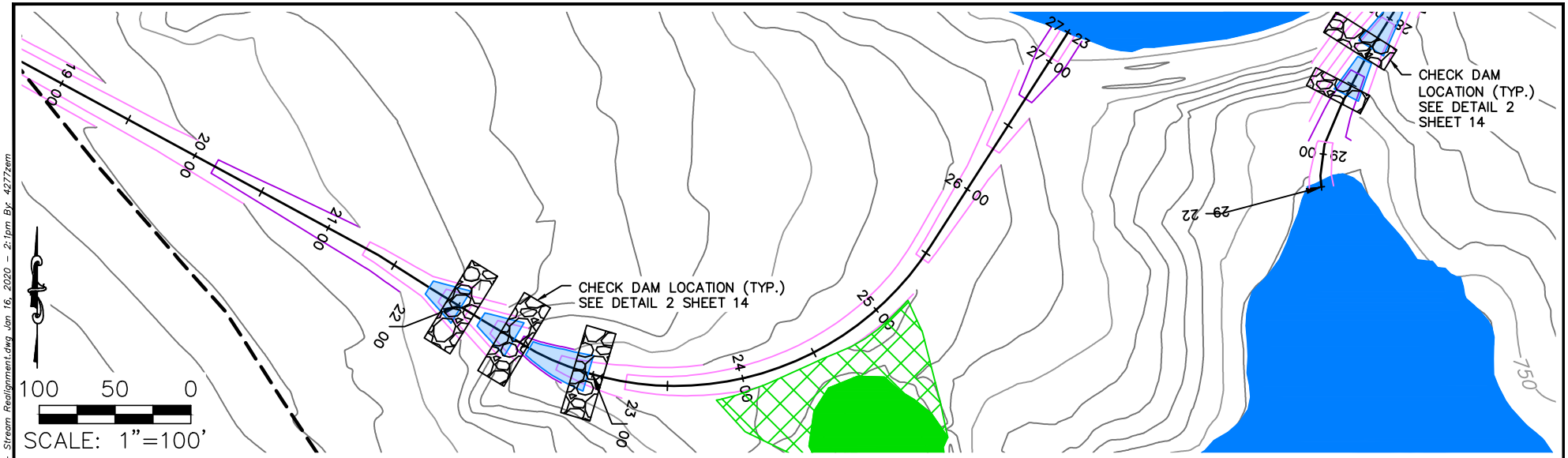
PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

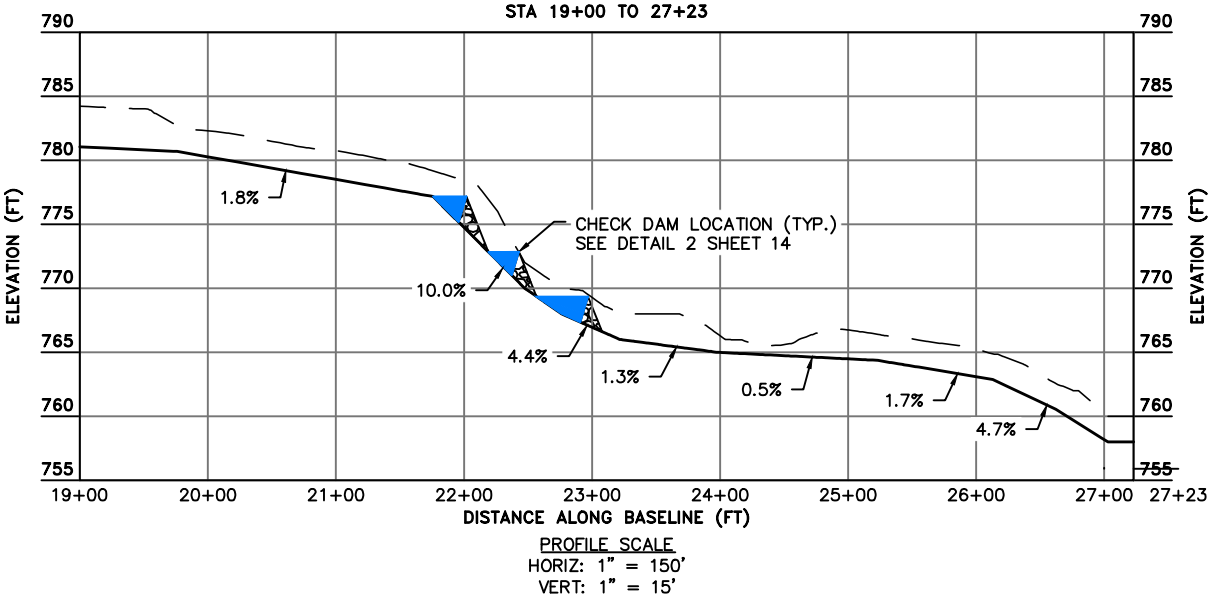
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (9+00 TO 19+00)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 10 of 14





PROFILE SCALE
HORIZ: 1" = 150'
VERT: 1" = 15'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- EXISTING PRODUCT LINE
- WETLAND
- TRANSITIONAL WETLAND
- POND
- CHECK DAM

NOTES:

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SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

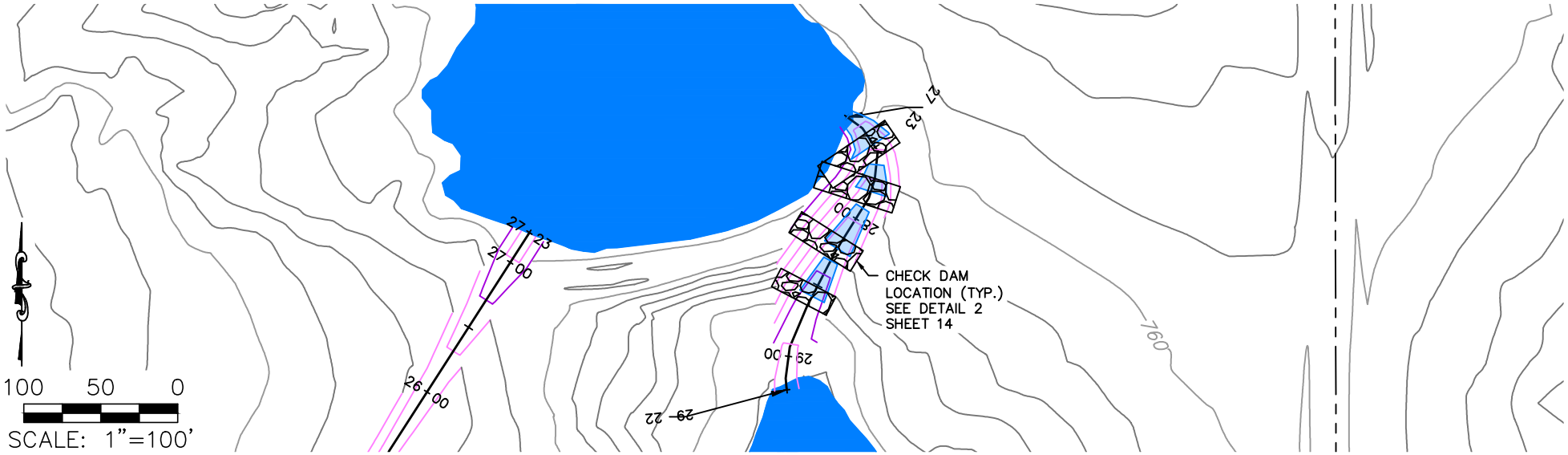
PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

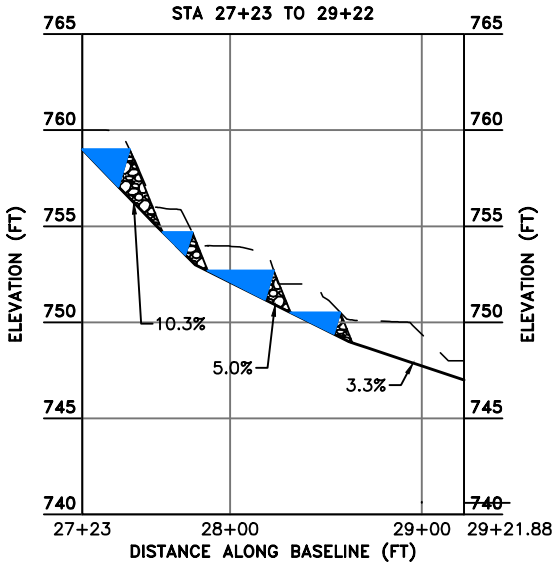
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (19+00 TO 27+23)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 11 of 14





PROFILE SCALE
HORIZ: 1" = 100'
VERT: 1" = 10'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- EXISTING PRODUCT LINE
- WETLAND
- TRANSITIONAL WETLAND
- POND
- CHECK DAM

NOTES:

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THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

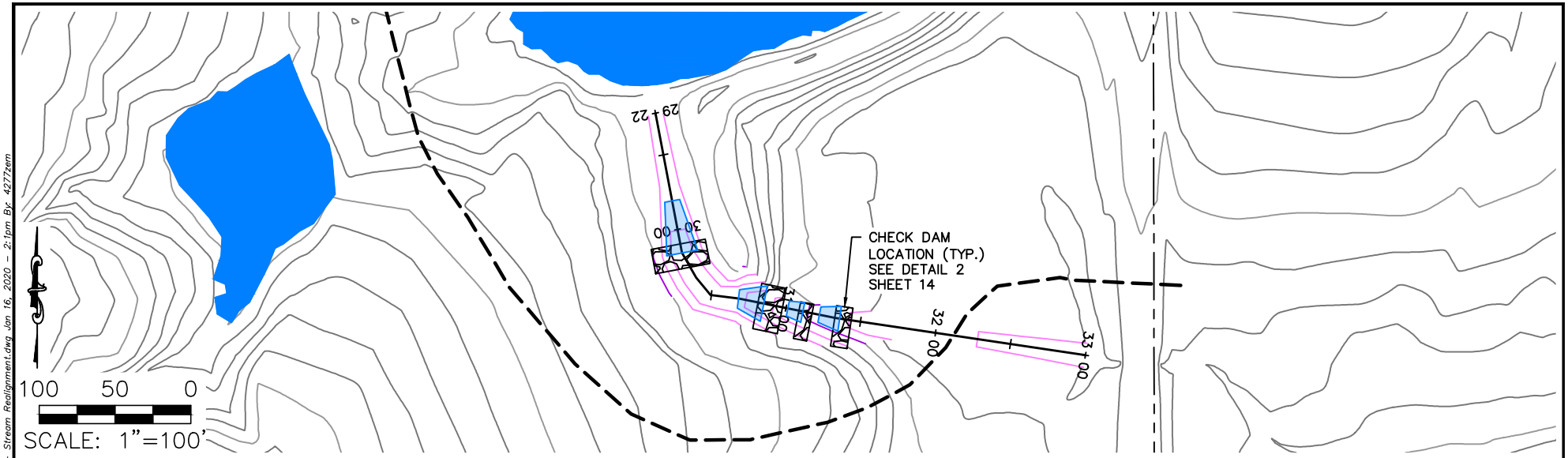
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

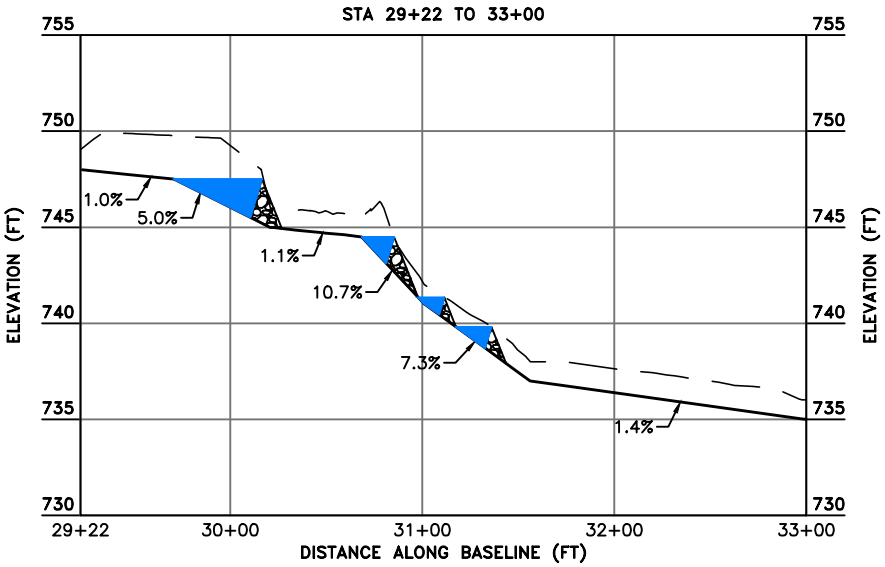
SHEET TITLE:
PROPOSED REALIGNMENT (27+23 TO 29+22)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 12 of 14

K:\American Environmental Landfill\27219016.00 - Landfill Expansion Evaluation\AutoCAD\2019.07 Submission-Revisions\DWG\8-Proposed Topography - Stream Realignment.dwg Jan 16, 2020 - 2:1pm By: 4277zem





PROFILE SCALE
HORIZ: 1" = 100'
VERT: 1" = 10'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- EXISTING PRODUCT LINE
- WETLAND
- TRANSITIONAL WETLAND
- POND
- CHECK DAM

NOTES:

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THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

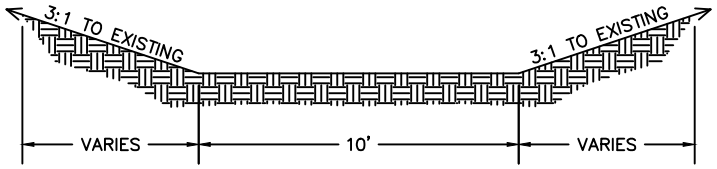
PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (29+22 TO 32+00)

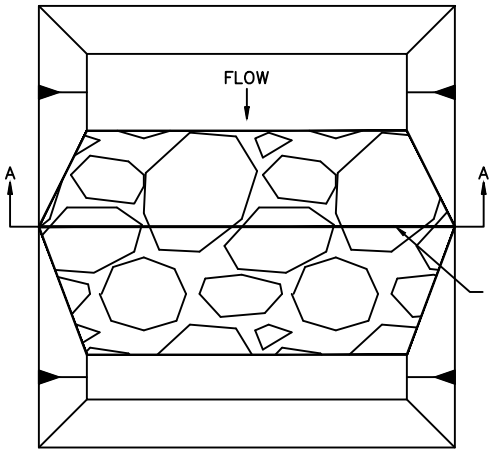
PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 13 of 14

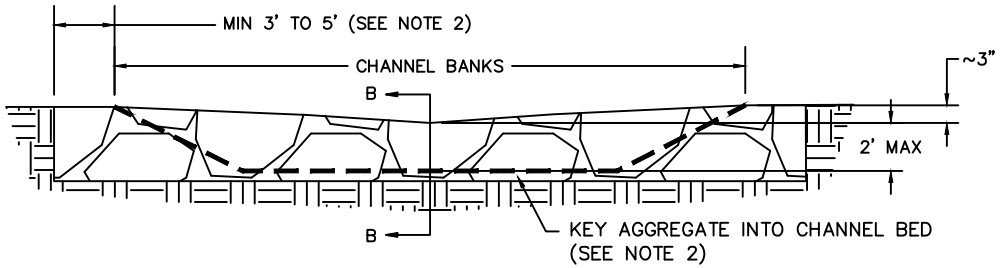


1 DESIGN CHANNEL CROSS SECTION
NOT TO SCALE

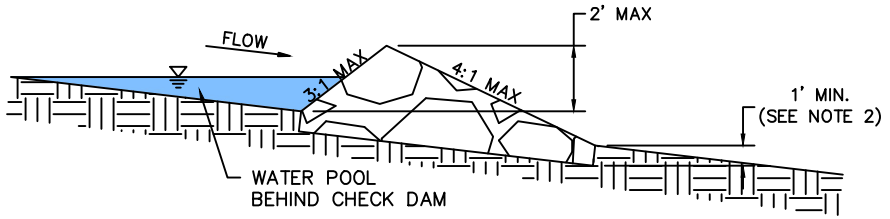
TOP VIEW



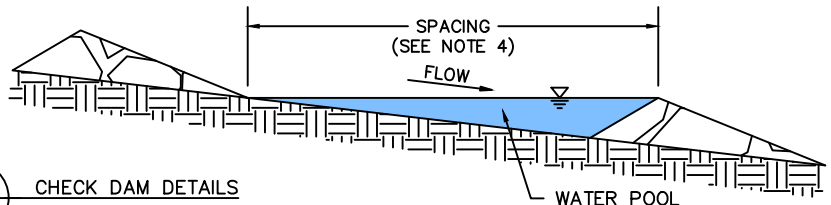
SECTION A–A



SECTION B–B



NOTES:
1. CHECK DAMS SHALL BE CONSTRUCTED OF NATIVE AGGREGATE HAVING A D_{50} EQUAL TO OR GREATER THAN 9 INCHES.
2. AGGREGATE FOR CHECK DAMS SHALL BE KEYED INTO CHANNEL BANKS A MINIMUM OF 3 FEET ON STRAIGHT SECTIONS AND INSIDE CURVES, A MINIMUM OF 5 FEET ON OUTSIDE CURVES, AND A MINIMUM OF 1 FOOT INTO THE CHANNEL BED TO REDUCE LIKELIHOOD OF BYPASS FLOW AND EXCESSIVE SCOUR.
3. CHECK DAMS SHALL BE CONSTRUCTED WITH THE LOWEST POINT LOCATED AT THE CHANNEL CENTERLINE TO DIRECT FLOW INTO THE CENTER OF THE CHANNEL.
4. CHECK DAMS SHALL BE SPACED SUCH THAT THE CREST OF THE DOWNSTREAM DAM IS APPROXIMATELY LEVEL WITH THE LOWEST ELEVATION OF THE UPSTREAM DAM.



2 CHECK DAM DETAILS
NOT TO SCALE

THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON JANUARY 15, 2020. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DWN. BY:	Q/A RVW. BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
DETAILS

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 1/15/20
SCALE: AS SHOWN
DRAWING NO. 14 of 14

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

October 30, 2020

Regulatory Office

Mr. Todd Green
American Environmental Landfill
207 North 117th West Avenue
Sand Springs, OK 74063

Dear Mr. Green:

Enclosed is an executed copy of your Department of the Army Permit No. SWT-2017-00339. Please retain this copy for your files.

We request that in conjunction with this permit, you complete and return the enclosed self-addressed "Permittee Construction Schedule" form. Should construction be initiated prior to 30 days from receipt of this letter, please return the completed form as soon as possible. If you prefer, you may contact Mr. Marcus Ware at 918-669-7403 to inform this office regarding the construction start date.

Following completion of your proposed activity, complete and return the enclosed self-addressed "Permittee Compliance Certification" form, as required by Permit Special Condition 2.

If you desire to complete a "Customer Service Survey" on your experience with the Corps Regulatory Program, you are invited to visit http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey on the internet at your convenience and submit your comments.

Sincerely,

Andrew R. Commer

Andrew R. Commer
Chief, Regulatory Office

Enclosures

cc:
Ms. Maria Martinez, U.S. Environmental Protection Agency
Ms. Elena Jigoulina, Oklahoma Department of Environmental Quality

DEPARTMENT OF THE ARMY PERMIT

Name of Permittee: Mr. Todd Green, American Environmental Landfill

Permit No.: SWT-2017-00339

Issuing Office: U.S. Army Corps of Engineers, Tulsa District, Regulatory Office

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: This permit authorizes the after-the-fact (ATF) permit for placement of fill material into an unnamed tributary of Arkansas River utilizing earthen material (514.71 cy) for approximately 4,517 lf (0.502 ac) and also includes the placement of fill material for the proposed lateral AEL expansion of the existing active solid waste landfill. The applicant has proposed to use earthen material (landfill cap) for a containment barrier to prevent the environment from the harmful effects of its contents and perhaps limiting the migration of the contents.

Work shall be completed in accordance with Attached Drawings 1 thru 8 of SWT-2017-339 AEL Enclosures.pdf.

The fill material may consist of earthen material. The work would be performed using conventional earth moving equipment.

Project Location: The proposed project is in the North ½ of Section 35 and West ½ of Section 36, Township 20 North, Range 10 East, in Sand Springs, Osage County, Oklahoma. The project site can be found on the Wekiwa Oklahoma 7.5 Minute USGS Quadrangle map.

North Latitude 36.165971 and West Longitude 96.199087

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on October 31, 2023. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least 1 month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. Permittee Construction Schedule: Prior to commencing construction, you shall complete and return the "Permittee Construction Schedule" form. Should construction be initiated prior to 30 days from validation of this permit, return the completed form as soon as possible. If you prefer, you may telephone 918-669-7400 to inform this office regarding the construction start date. A copy of the "Permittee Construction Schedule" form would accompany the validated permit and final authorization letter.

2. Compliance Certification: Following completion of the authorized activity, the permittee shall submit a signed certification regarding the completed work and any required mitigation. A copy of the "Permittee Compliance Certification" form would accompany the validated permit and final authorization letter.

3. Erosion Control Measures (ECM): The ECM, such as staked hay bales or silt screen barriers, shall be implemented and maintained during construction. Barriers shall remain in place and effective until sufficient vegetation coverage on exposed areas is established. Upon inspection of erosion control barriers, if there is any damage to the barrier, it shall be replaced or repaired within 24 hours of discovery. All exposed earthen areas, disturbed or newly created by the construction, shall be seeded immediately, replanted, or provided equivalent protection against subsequent erosion.

4. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately cease work and notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

5. Mitigation Success Verification: Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 5 will not be considered fulfilled until you have demonstrated compensatory mitigation project success and have received written verification of that success from the U.S. Army Corps of Engineers.

6. Restoration Plan: The permittee shall implement the American Environmental Landfill Project, Compensatory Mitigation Plan (SWT-2017-339) dated May 1, 2020, in addition to the following:

a. Financial Assurances: The permittee shall execute a bond or a letter of credit. The instrument shall be submitted the Corps within 60 days of the executed permit, no work shall begin until the condition is satisfied.

b. Protection of Riparian Corridor: The permittee shall minimize impacts to the riparian zone:

(1) You shall file the deed restriction at the Osage County Clerk office within 30 days. A copy of the deed restriction should be submitted to our office within 15 days after it has been filed with the Osage County Clerk.

(2) Signs shall be utilized to delineate the boundary of the mitigation areas. The signs shall include clear identification of a mitigation site, U.S. Army Corps of Engineers permit identification number SWT-2017-339, and contact information for responsible parties. The signs shall be placed in 200-foot intervals (or line of sight) on the perimeter of each mitigated feature.

(3) Fence: The permittee shall construct a fence around the mitigation area.

(4) Mowing: Lawn mowing will not be allowed within the restoration area. Maintenance mowing can be approved by the Corps after notification.

7. Fuels and Hazardous Materials: Any fuels or other hazardous materials used shall be stored or stockpiled above the Ordinary High Water Mark (OHWM) and shall be removed from a likely flood zone prior to any predicted flood.

8. Fueling: All vehicles and equipment shall be fueled and serviced above the OHWM.

9. Stockpile Area: The stockpile area shall not be located in a jurisdictional wetland or stream. You shall incorporate an ECM along the entire length of the stockpile area to prevent excavated material from eroding in the upland location.

10. Monitoring for Stream Impacts: The permittee shall monitor the unnamed tributary of the Shell Creek for destabilization upstream and downstream of the bank protection project for a period of 5 years. If stream destabilization occurs during this period, the permittee shall be required to notify the Corps, Regulatory Office immediately in writing.

This report shall assess the condition of the stream. The permittee shall include photographs of the stream channel and degraded area. After notification is made, the permittee may be required to submit a proposal to correct the destabilization of the stream channel.

11. Fill Material: You shall only use clean dredged or fill material free of contaminates.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:
( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).
( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

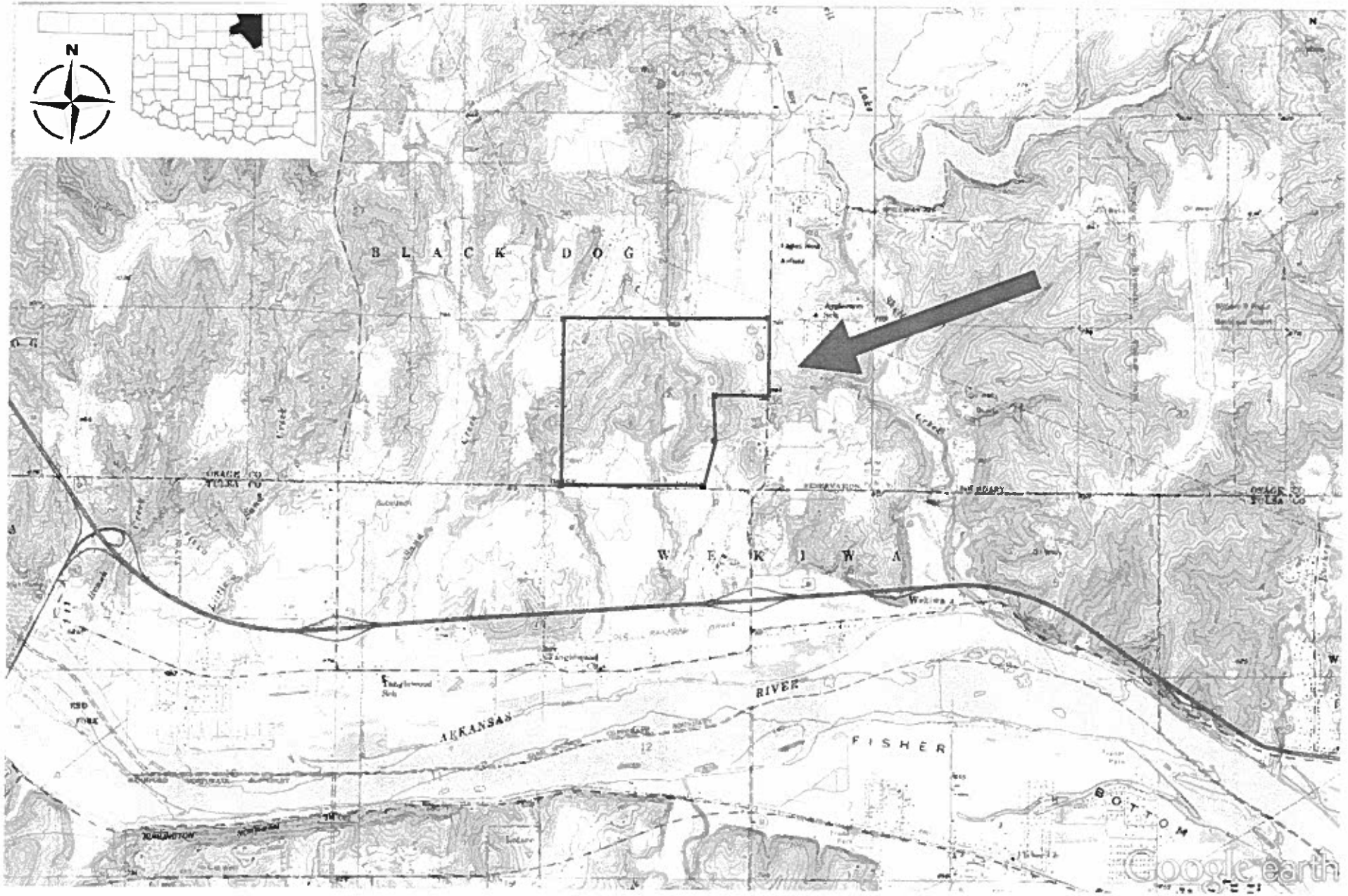
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

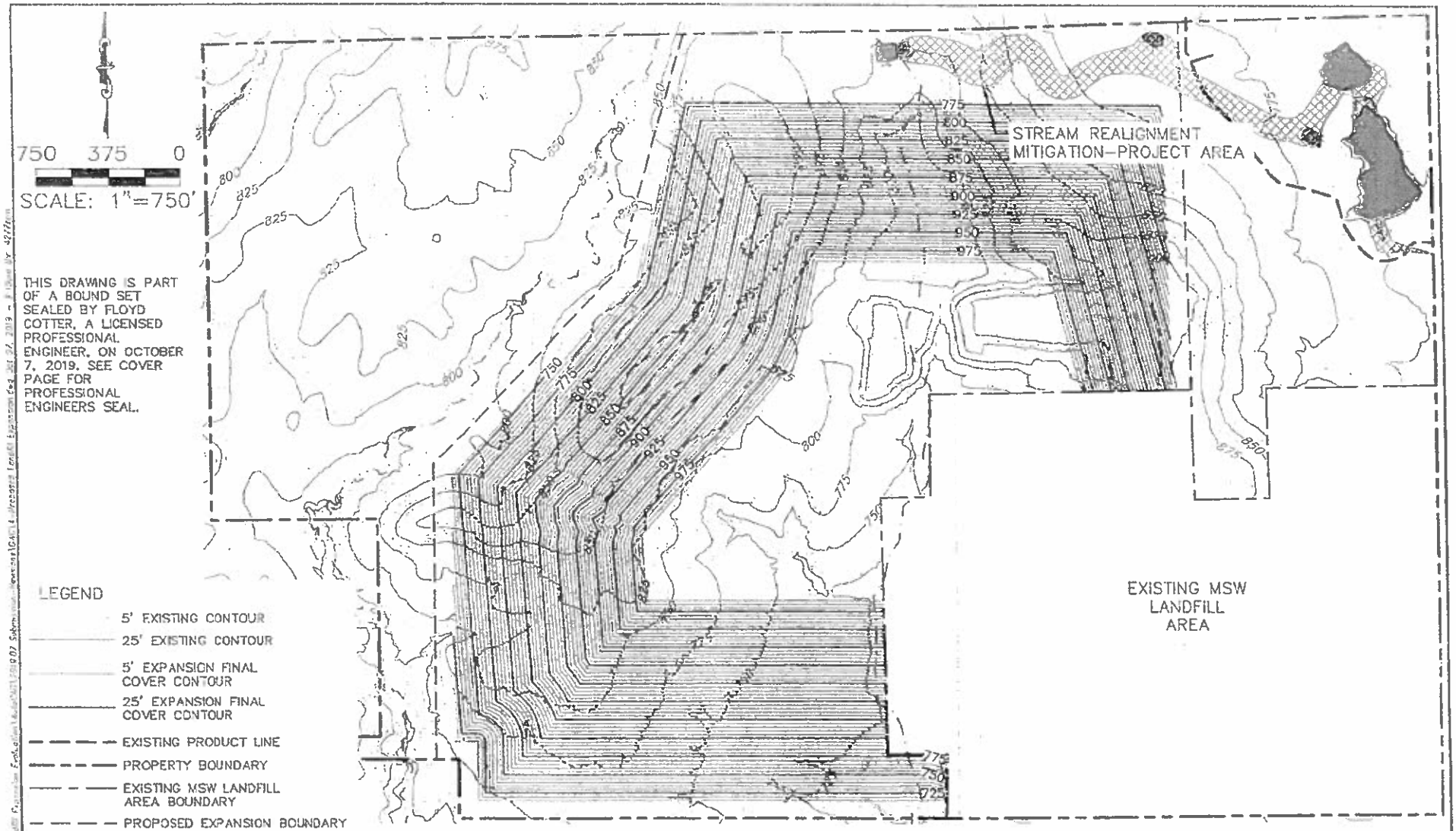
a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the


N
B L A C K D O G
W E K I W A
ARKANSAS RIVER
FISHER
B O T T O M
Google earth



THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON OCTOBER 7, 2019. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

NOTES:
1. EXISTING TOPOGRAPHY, PROPERTY BOUNDARY AND ROADWAYS FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED MARCH 7, 2018.
2. EXISTING PRODUCT LINE FROM SURVEY PROVIDED BY PROFESSIONAL SURVEYING, INC. OF TULSA, OKLAHOMA, DATED
3. EXISTING STREAMS, WETLANDS, AND PONDS LOCATED USING NATIONAL WETLANDS INVENTORY MAP AND SITE VISITS PERFORMED BY SCS ENGINEERS.
4. FINAL COVER CONTOURS SHOWN ARE FOR CONCEPTUAL PURPOSES ONLY.

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

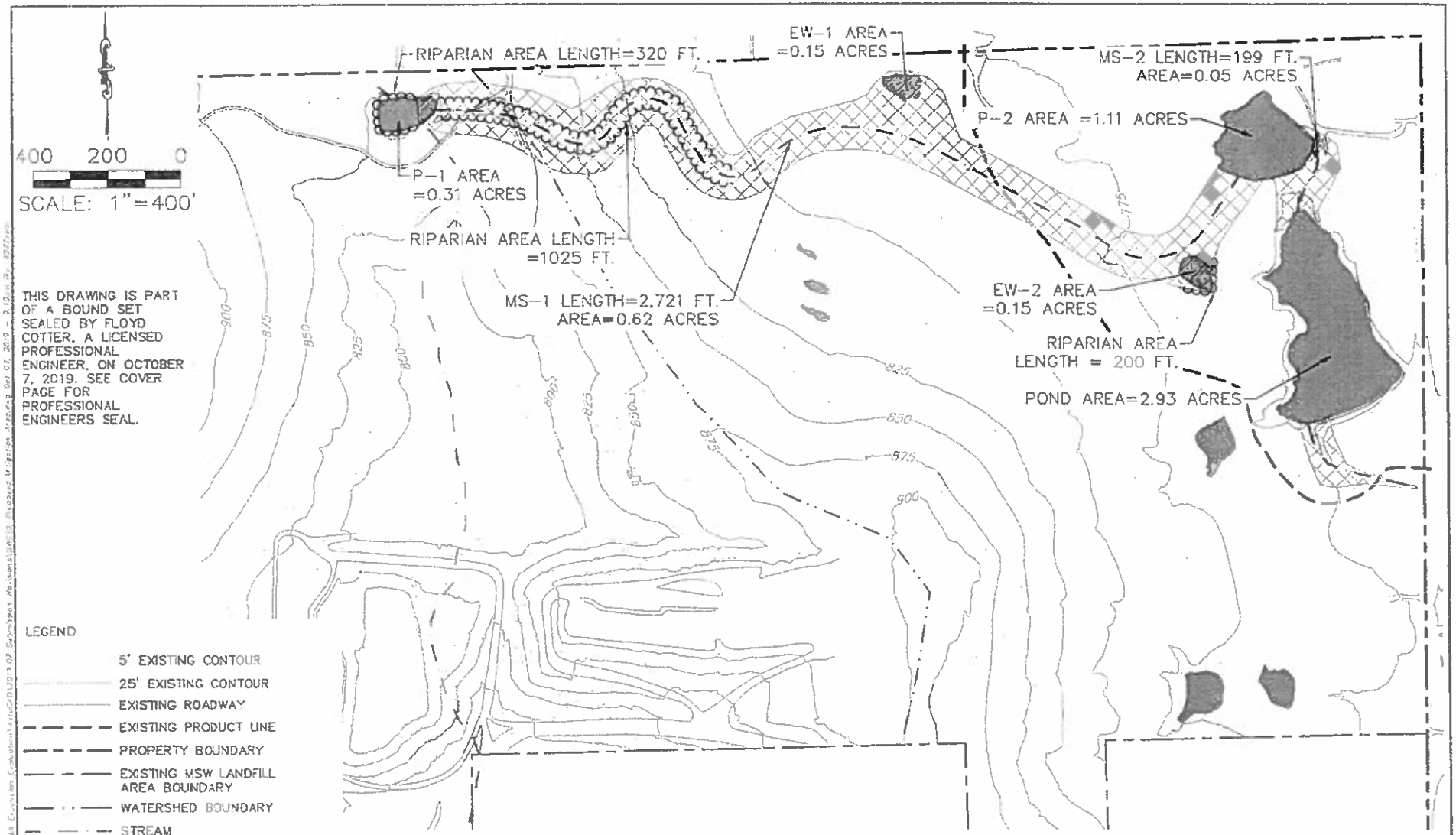
PROJ. NO.	DES. BY	Q/A REVIEW BY
27219016.00	ZEM	VW
DRN. BY	CHK. BY	PROJ. MGR.
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED LANDFILL EXPANSION

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 10/7/19
SCALE: SCALE
DRAWING NO. 4 of 13



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SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

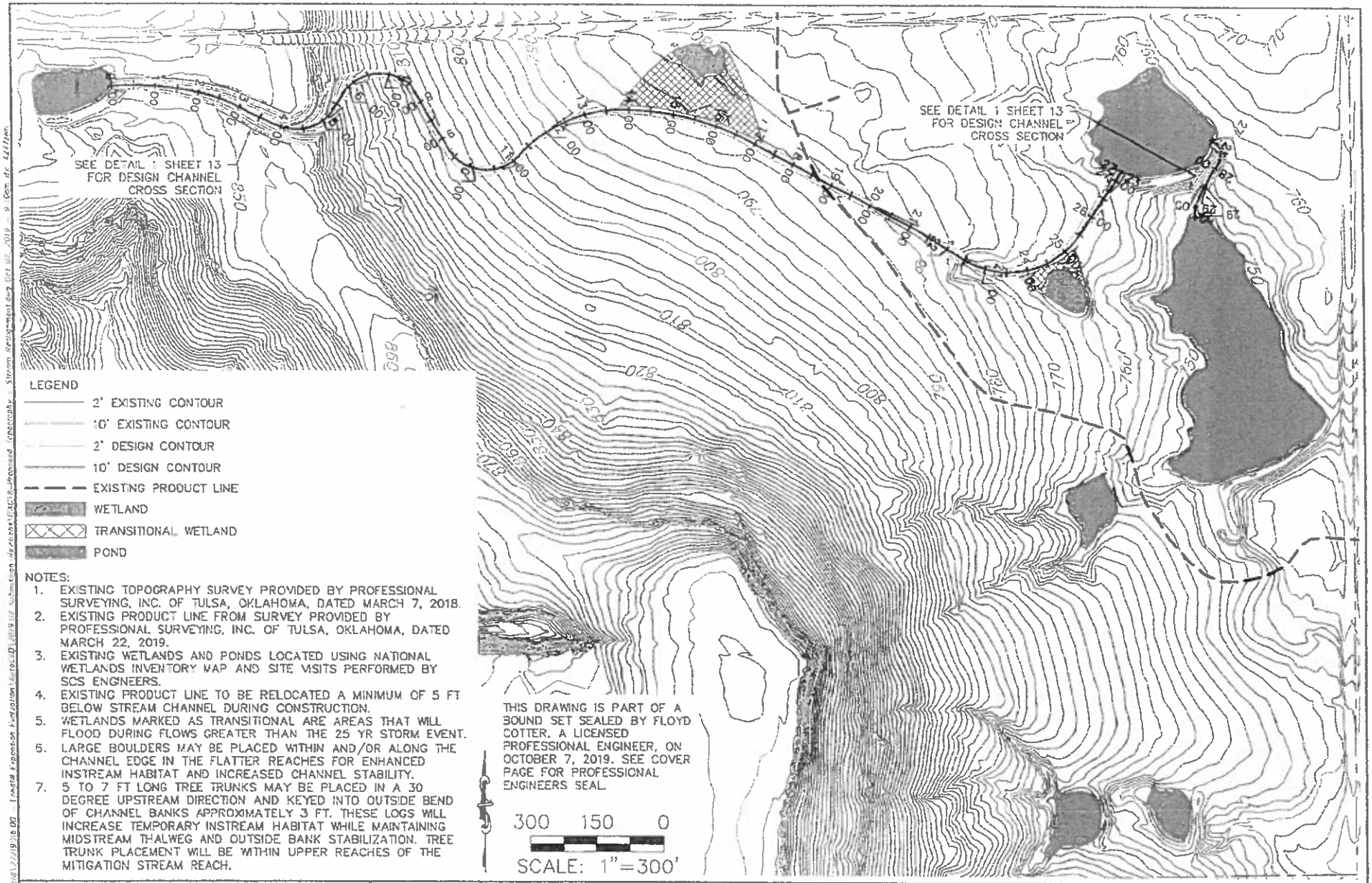
PROJ. NO.	DSN. BY	D/F PRE. BY
27219016.00	ZEM	VW
DSN. BY	CHK. BY	PROJ. MGR
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED MITIGATION AREA

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 10/7/19
SCALE: AS SHOWN
DRAWING NO. 5 of 13



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4. EXISTING PRODUCT LINE TO BE RELOCATED A MINIMUM OF 5 FT BELOW STREAM CHANNEL DURING CONSTRUCTION.
5. WETLANDS MARKED AS TRANSITIONAL ARE AREAS THAT WILL FLOOD DURING FLOWS GREATER THAN THE 25 YR STORM EVENT.
6. LARGE BOULDERS MAY BE PLACED WITHIN AND/OR ALONG THE CHANNEL EDGE IN THE FLATTER REACHES FOR ENHANCED INSTREAM HABITAT AND INCREASED CHANNEL STABILITY.
7. 5 TO 7 FT LONG TREE TRUNKS MAY BE PLACED IN A 30 DEGREE UPSTREAM DIRECTION AND KEYED INTO OUTSIDE BEND OF CHANNEL BANKS APPROXIMATELY 3 FT. THESE LOGS WILL INCREASE TEMPORARY INSTREAM HABITAT WHILE MAINTAINING MIDSTREAM THALWEG AND OUTSIDE BANK STABILIZATION. TREE TRUNK PLACEMENT WILL BE WITHIN UPPER REACHES OF THE MITIGATION STREAM REACH.

THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON OCTOBER 7, 2019. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

300 150 0

SCALE: 1"=300'

SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DES. BY	Q/A REVIEW BY
27219C16.00	ZEM	VW
DRAWN BY	CHK. BY	PRINT DATE
ZEM	MPP	VW

CLIENT:

AMERICAN ENVIRONMENTAL LANDFILL, INC.

AMERICAN ENVIRONMENTAL LANDFILL

SAND SPRINGS, OKLAHOMA

SHEET TITLE:

PROPOSED REALIGNMENT (OVERVIEW)

PROJECT TITLE:

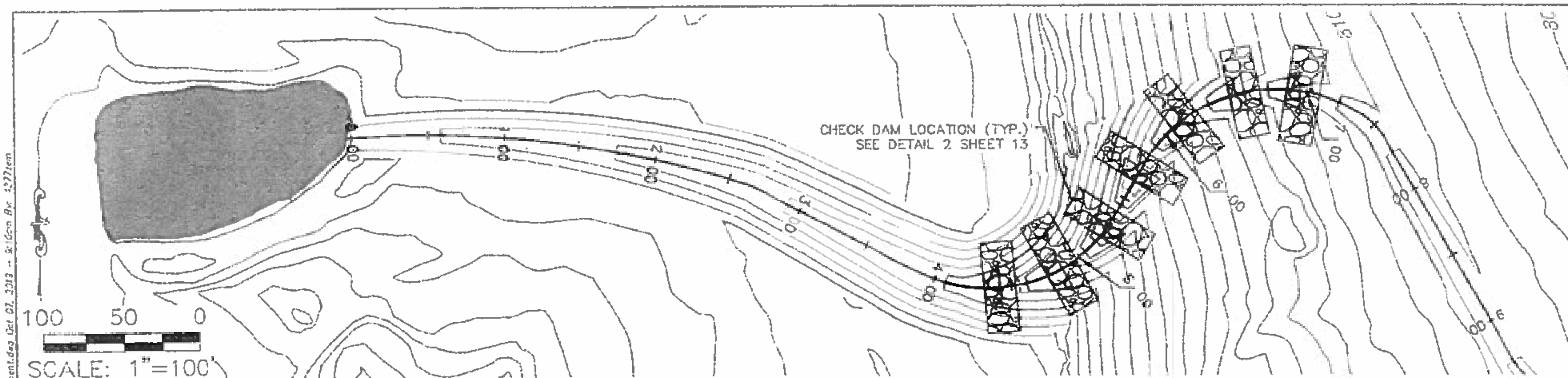
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

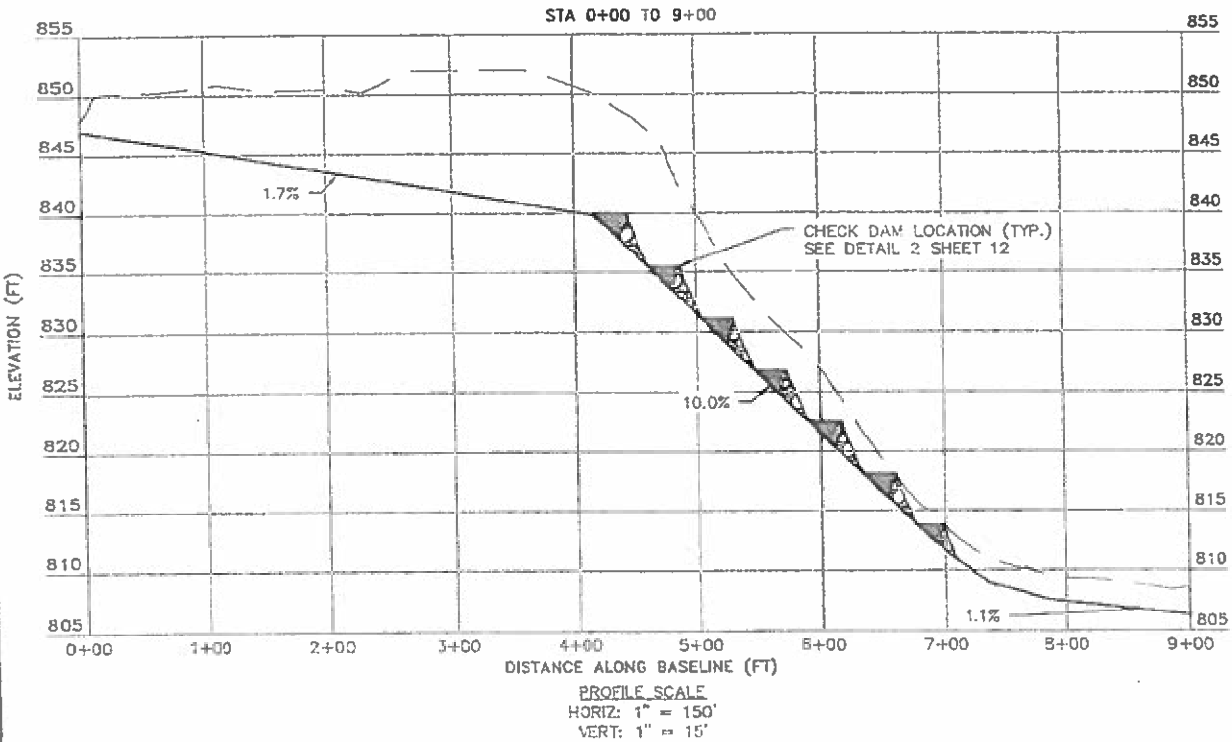
DATE: 10/7/19

SCALE: SCALE

DRAWING NO.

8 of 13





LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- POND
- CHECK DAM

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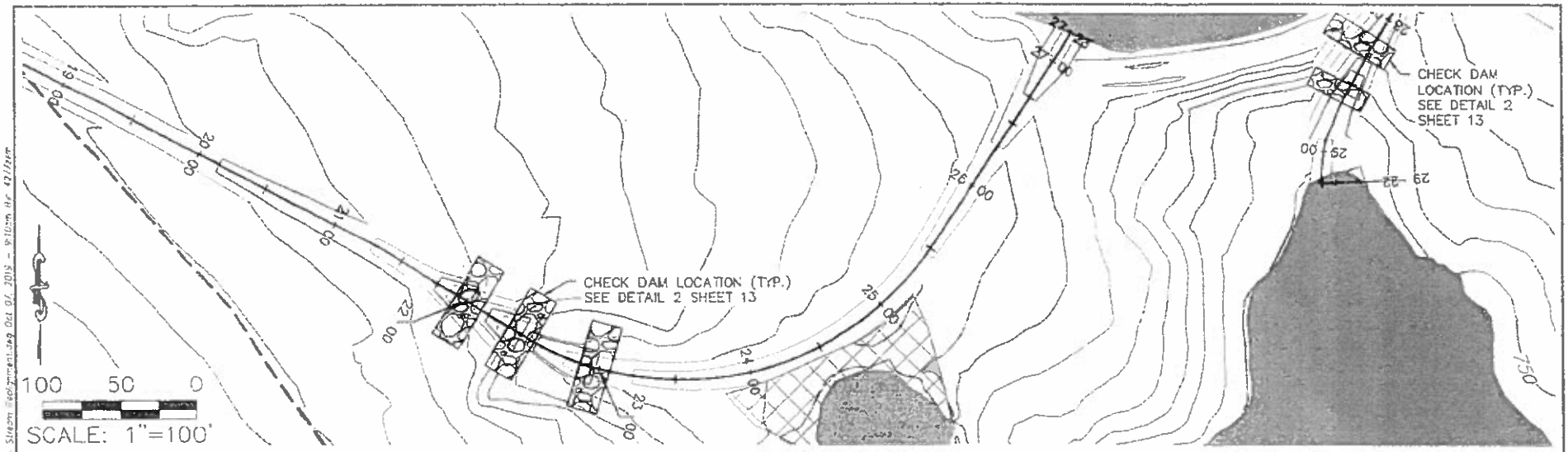
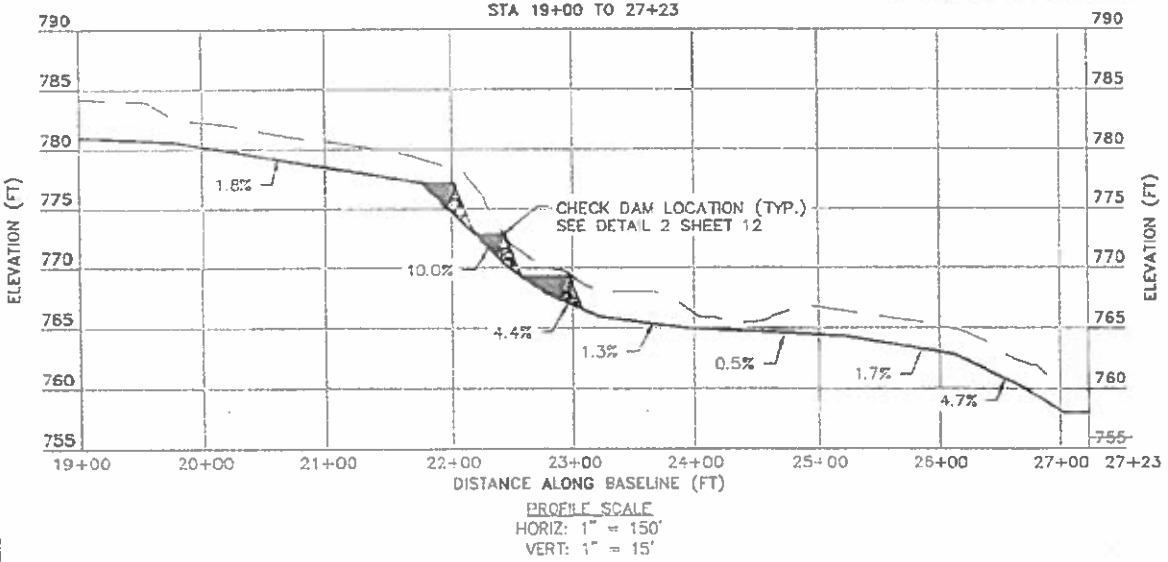
SCS ENGINEERS	CLIENT:	SHEET TITLE:	DATE:
8575 WEST 110TH ST. SUITE 100 OVERLAND PARK, KS 66210 PH. (913) 681-0030 FAX. (913) 681-0012	AMERICAN ENVIRONMENTAL LANDFILL, INC.	PROPOSED REALIGNMENT (0 TO 9+00)	10/7/19
PROJ. NO. 27219016.00 / DSN. BY ZEM / Q/A RVW. BY VW	AMERICAN ENVIRONMENTAL LANDFILL	PROJECT TITLE:	SCALE: SCALE
DR. BY ZEM / CHK. BY MPP / APP. BY VW	SAND SPRINGS, OKLAHOMA	PROPOSED EXPANSION AND STREAM MITIGATION DESIGN	DRAWING NO. 9 of 13





PROFILE SCALE
HORIZ: 1" = 150'
VERT: 1" = 15'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
- EXISTING PROFILE
- DESIGN PROFILE
- EXISTING PRODUCT LINE
- WETLAND
- TRANSITIONAL WETLAND
- POND
- CHECK DAM

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SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

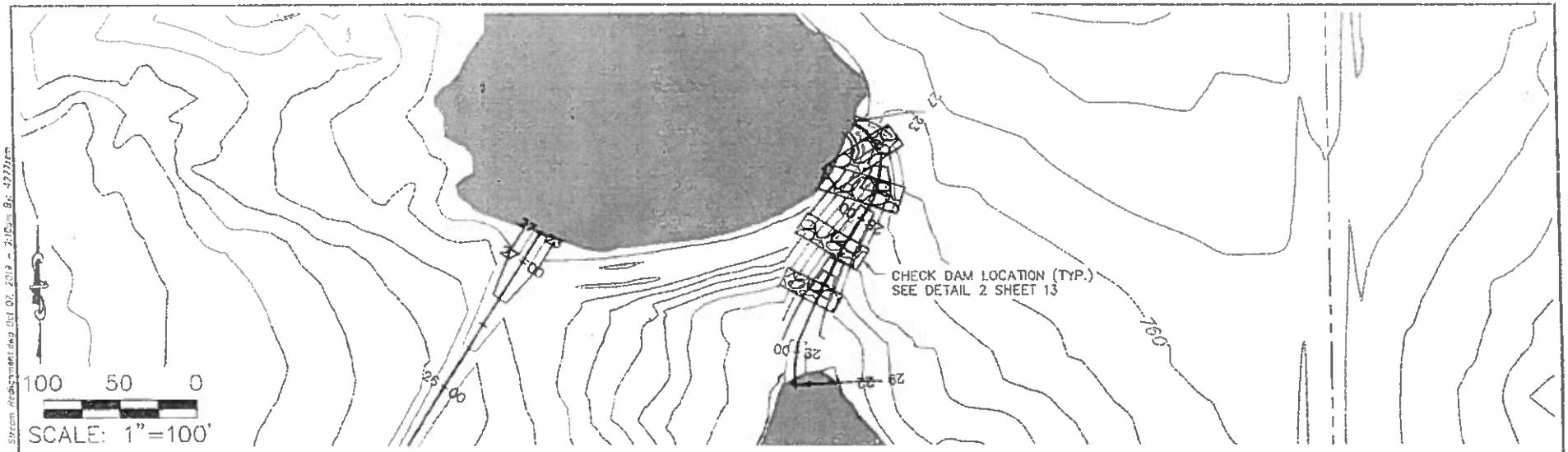
PROJ. NO.	DSN. BY:	Q/A REVIEW BY:
27219016.00	ZEM	VW
DSN. BY:	CHK. BY:	PROJ. MGR:
ZEM	MPP	VW

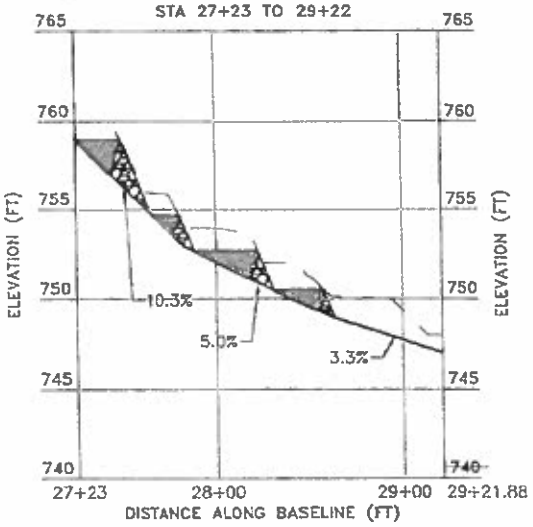
CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
PROPOSED REALIGNMENT (19+00 TO 27+23)

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 10/7/19
SCALE: SCALE
DRAWING NO. 11 of 13





PROFILE SCALE
HORIZ: 1" = 100'
VERT: 1" = 10'

LEGEND

- 2' EXISTING CONTOUR
- 10' EXISTING CONTOUR
- 2' DESIGN CONTOUR
- 10' DESIGN CONTOUR
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- DESIGN PROFILE
- EXISTING PRODUCT LINE
- WETLAND
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- POND
- CHECK DAM

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SCS ENGINEERS
8575 WEST 110TH ST. SUITE 100
OVERLAND PARK, KS 66210
PH. (913) 681-0030 FAX. (913) 681-0012

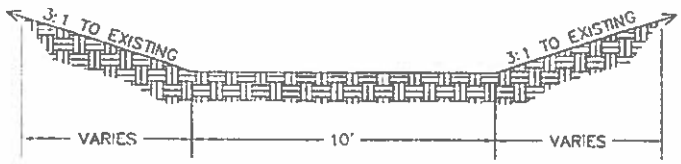
PROJ. NO.	DSN. BY	D/A RVL BY
27219016.00	ZEM	VW
CHK. BY	CHK. BY	PROJ. MGR.
ZEM	VPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

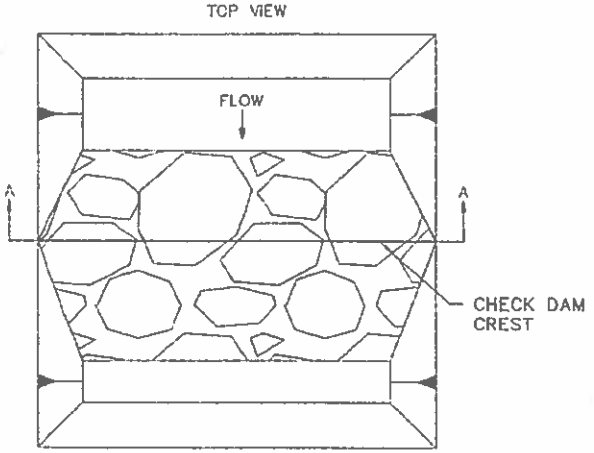
SHEET TITLE:
PROPOSED REALIGNMENT (27+23 TO 29+22)

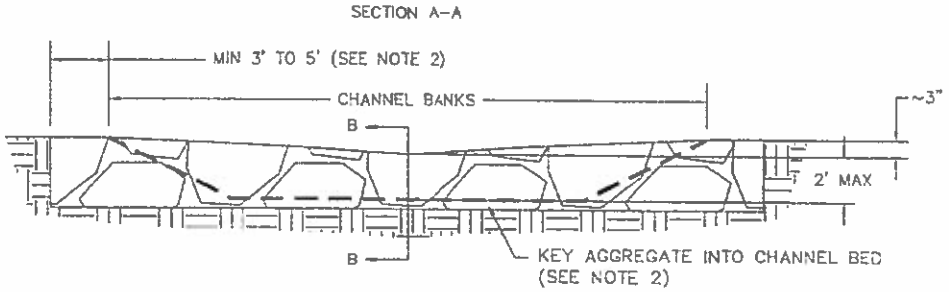
PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

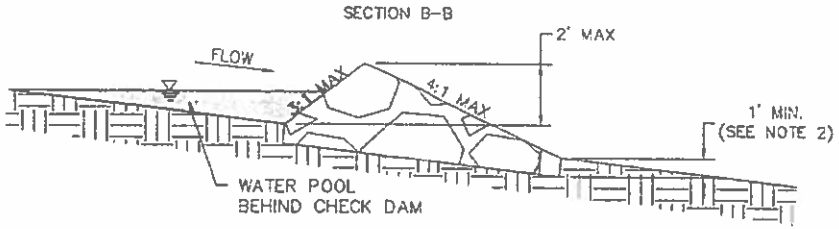
DATE: 10/7/19
SCALE: SCALE
DRAWING NO. 12 of 13

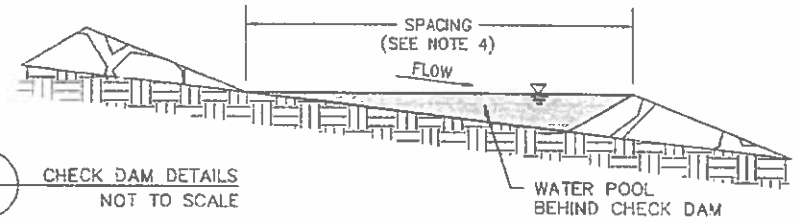


1 DESIGN CHANNEL CROSS SECTION
NOT TO SCALE









2 CHECK DAM DETAILS
NOT TO SCALE

NOTES:
1. CHECK DAMS SHALL BE CONSTRUCTED OF NATIVE AGGREGATE HAVING A D_{50} EQUAL TO OR GREATER THAN 9 INCHES.
2. AGGREGATE FOR CHECK DAMS SHALL BE KEYED INTO CHANNEL BANKS A MINIMUM OF 3 FEET ON STRAIGHT SECTIONS AND INSIDE CURVES, A MINIMUM OF 5 FEET ON OUTSIDE CURVES, AND A MINIMUM OF 1 FOOT INTO THE CHANNEL BED TO REDUCE LIKELIHOOD OF BYPASS FLOW AND EXCESSIVE SCOUR.
3. CHECK DAMS SHALL BE CONSTRUCTED WITH THE LOWEST POINT LOCATED AT THE CHANNEL CENTERLINE TO DIRECT FLOW INTO THE CENTER OF THE CHANNEL.
4. CHECK DAMS SHALL BE SPACED SUCH THAT THE CREST OF THE DOWNSTREAM DAM IS APPROXIMATELY LEVEL WITH THE LOWEST ELEVATION OF THE UPSTREAM DAM.

THIS DRAWING IS PART OF A BOUND SET SEALED BY FLOYD COTTER, A LICENSED PROFESSIONAL ENGINEER, ON OCTOBER 7, 2019. SEE COVER PAGE FOR PROFESSIONAL ENGINEERS SEAL.

SCS ENGINEERS
8575 WEST 110TH ST., SUITE 100
OVERLAND PARK, KS 66210
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO.	DES. BY	D/A REV. BY
27219016.00	ZEM	VW
DRN. BY	CHK. BY	PROJ. MGR.
ZEM	MPP	WM

CLIENT:
AMERICAN ENVIRONMENTAL LANDFILL, INC.
AMERICAN ENVIRONMENTAL LANDFILL
SAND SPRINGS, OKLAHOMA

SHEET TITLE:
DETAILS

PROJECT TITLE:
PROPOSED EXPANSION AND STREAM MITIGATION DESIGN

DATE: 10/7/19
SCALE: SCALE
DRAWING NO. 13 of 13

Oklahoma Department of Environmental Quality
404 Permit Approval

Scott Thompson
Executive Director

Kevin Stitt
Governor

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

March 31, 2020

Mr. Todd Green
American Environmental Landfill (AEL)
1420 W 35th Street
Tulsa 74107

RE: Application No. SWT-2017-339

Dear Mr. Green,

The Oklahoma 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. §1251 et seq. (1972)], for activities in an unnamed tributary to the Arkansas River 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 (2011) pursuant to 27A O.S. § 2-6-103(C)(2) (OSCN 1999). DEQ rules and regulations related to the 401 procedures are available at www.deq.state.ok.us/rules/611.pdf or through contacting the DEQ Office of External Affairs at (800) 869-1400.

We have reviewed and examined the proposed project as described in Public Notice No. SWT-2017-339 and your application documents. The unnamed tributary of the Arkansas River is assigned the following default beneficial uses in the Oklahoma Water Quality Standards (WQS): Warm Water Aquatic Community, Agriculture: Livestock and Irrigation, Primary Body Contact Recreation, and Aesthetics (OAC 785:45-5-3). The current Oklahoma WQS are available from the Oklahoma Water Resources Board at: http://www.owrb.ok.gov/util/rules/pdf_rul/RulesCurrent2011/Ch45-Current2011.pdf.

The purpose of the project is to expand a landfill. The project will include placement of 396 cubic yards of compacted grey clay and HDPE geomembrane into approximately 4,517 lf of the ephemeral stream. The filling will be done as part of the landfill foundation and liner system development. To offset the unavoidable impact to aquatic resources the applicant is proposing to create 2,920 lf stream flowing from west to the east into Shell Creek (a tributary to the Arkansas River). The constructed channel would be sinuous in nature, and will have built-in erosional protection features and will connect existing non-jurisdictional features with jurisdictional waters. In addition to the constructed channel, 1,283 feet of riparian corridor will be planted along the mitigation channel. To compensate for the remaining length of the impacted stream, out-of-kind preservation of 1.85 acres of existing wetlands and ponds is proposed. The constructed mitigation channels and connected hydric features will have a deed restriction placed on them. This deed restriction will be in-perpetuity protecting these features from future development.

The project is located on the unnamed tributary of the Arkansas River in Section 36, Township 20 North, Range 10 East, in Osage County, Oklahoma. The project site can be found on Wekiwa Oklahoma 7.5 Minute USGS Quadrangle map.

The conditions attached to this conditional Certification will be terms of the 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. This certification does not authorize the discharge of industrial stormwater discharges, stormwater runoff from construction sites, or municipal/domestic wastewater discharges.

The certification is granted subject to the following conditions:

1) All spills of fuel or other pollutants in excess of five gallons shall be reported to the DEQ, within twenty-four (24) hours, to the pollution prevention hotline at 1-800-522-0206.
2) All fueling and servicing of vehicles and equipment shall be done above the Ordinary High Water Mark (OHWM).
3) Permittees shall provide access to the property to the DEQ for inspection purposes.
4) Any material and fuels used in the project shall be stored and/or stockpiled above the Ordinary High Water Mark (OHWM) and shall be removed from a likely flood zone prior to any predicted flood.
5) Environmental control practices, including but not limited to, effective erosion control measures and sediment control measures, shall be utilized during construction.
6) All construction shall be done in a manner that will minimize increased turbidity and prevent downstream deposition of bank material during or after construction.
7) Work in a stream channel shall be limited to periods of low flow, when practicable, and with the minimum amount of equipment.
8) 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.
9) All excess fill material, waste materials, construction debris, etc., must be removed from the site upon completion of the project.

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: Marcus Ware, Regulatory Branch, U.S. Army Corps of Engineers, Tulsa
Barry Bolton, Fisheries Chief, Oklahoma Department of Wildlife Conservation

Bill Cauthron, Chief, Water Quality Programs Division, Oklahoma Water Resources Board
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

corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) 10.23.20
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

29 October 2020

(DISTRICT ENGINEER) Scott S. Preston
Colonel, U.S. Army
District Commander
(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)
(DATE)

PERMITTEE CONSTRUCTION SCHEDULE

* MAIL TO ADDRESS WITHIN 30 DAYS OF "DATE OF ISSUANCE"

Mail or E-mail to ceswt-ro@usace.army.mil to:

U.S. Army Corps of Engineers
CESWT-RO
2488 E. 81st Street
Tulsa, OK 74137-4290

PERMIT NO.: SWT-2017-00339

USACE PROJECT MANAGER: Mr. Marcus Ware

PERMITTEE NAME: Mr. Todd Green, AEL

ODOT **DATE OF ISSUANCE:** October 22, 2020

----------(fold here so that address shows on outside)--------

Please provide the following information.

Anticipated/Known Construction Start Date: 11-1-20

Anticipated Completion Date: 11-1-2022

I have read and understand the obligations and requirements of this authorization.

SIGNATURE: _____ **DATE:** 10/24/20

PERMITTEE: Mr. Todd Green, AEL

----------(fold here and tape closed)----------

(FOR AGENCY USE ONLY - DO NOT WRITE BELOW THIS LINE)

PROJECT MANAGER: _____

RECEIVED IN CESWT-RO: _____

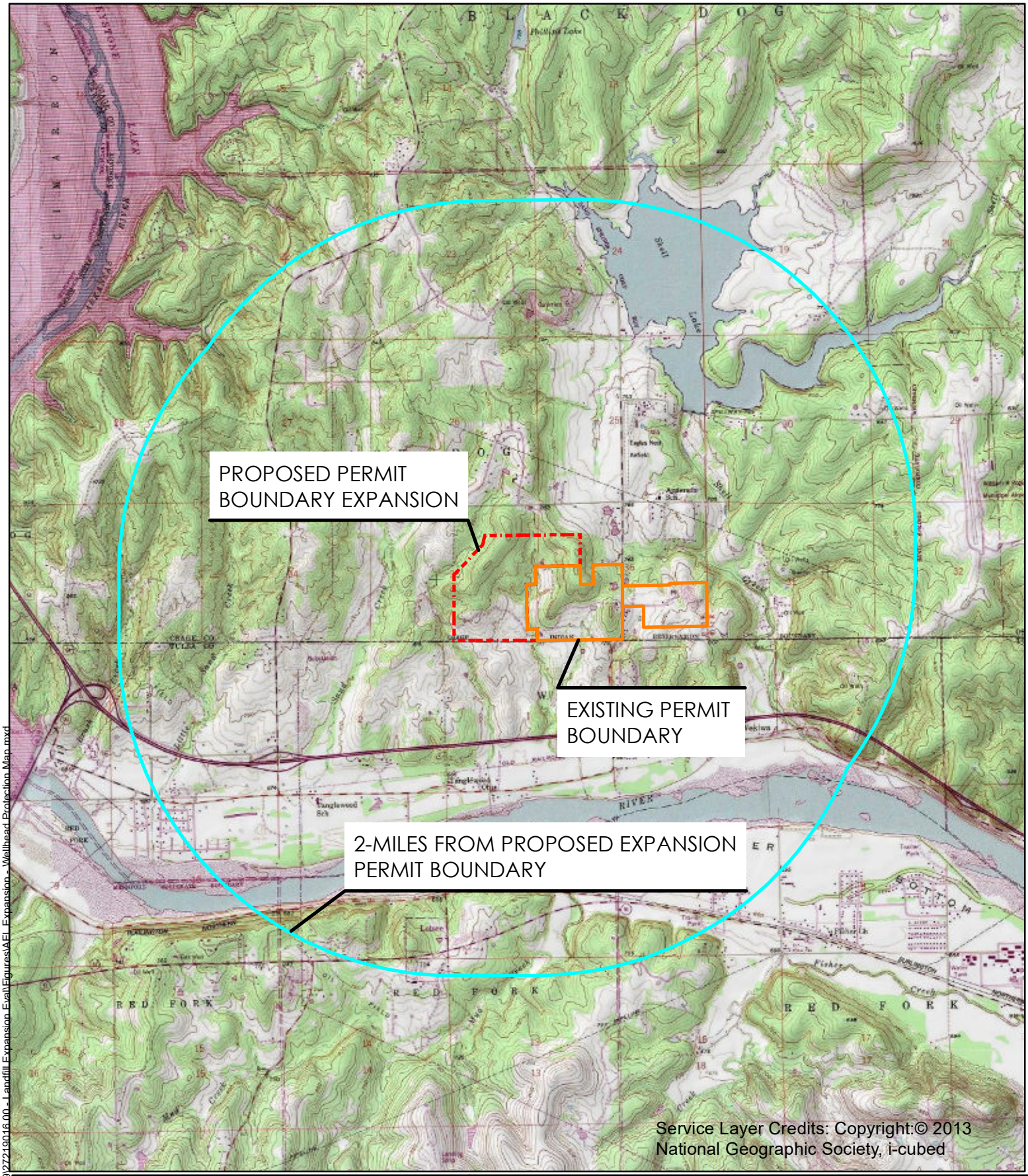
INSPECTION NEEDED: Y / N

CONSTRUCTION INSPECTION SCHEDULED: _____

FINAL INSPECTION SCHEDULED: _____

COUNTY: OSAGE

Oklahoma Department of Environmental Quality
Wellhead Protection Area



Legend

- Public Water Supply Well
- Existing Permit Boundary
- Proposed Expanded Permit Boundary
- 2-miles from Proposed Expansion Permit Boundary

FIGURE 2
AMERICAN ENVIRONMENTAL LANDFILL EXPANSION
WELLHEAD PROTECTION MAP
OSAGE COUNTY, OKLAHOMA

SCS ENGINEERS

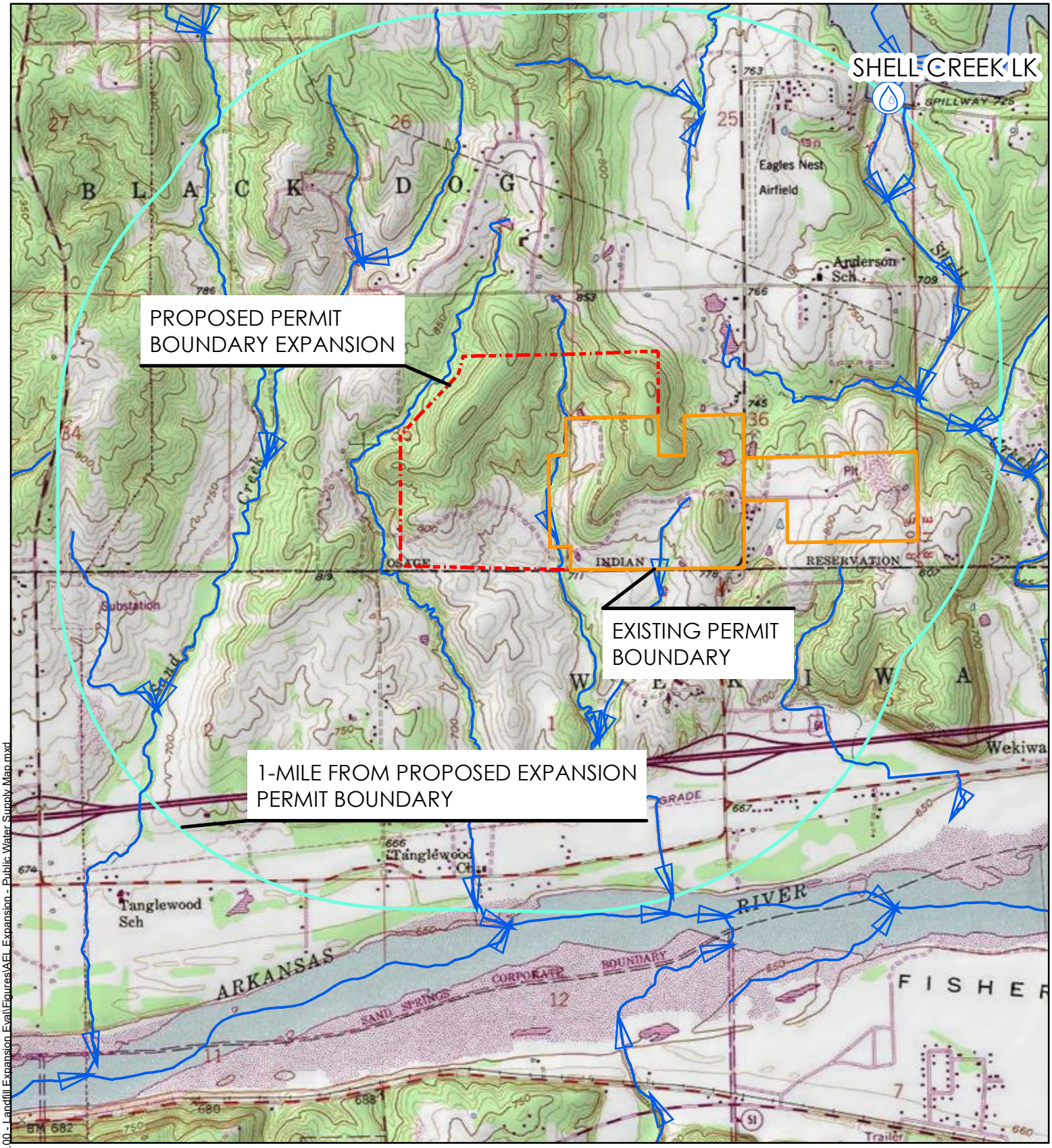
Yukon, OK | May 2020

0 2,000 4,000 Feet

N

Document Path: K:\AEL\Projects\2019\27219016.00 - Landfill Expansion Eval\Figures\AEL Expansion - Wellhead Protection Map.mxd

Oklahoma Water Resources Board



Layer Information from OWRB Open Data website. For flowlines, OWRB credits USGS and the National Hydrography Dataset (NHD). Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Legend

- Public Water Supply Surface Water Intake
- Public Water Supply Well
- Existing Permit Boundary
- Proposed Expanded Permit Boundary
- NHDFlowline
- 1-Mile from Proposed Expansion Permit Boundary

FIGURE 7
AMERICAN ENVIRONMENTAL LANDFILL EXPANSION
PUBLIC WATER SUPPLY LOCATIONS
OSAGE COUNTY, OKLAHOMA

SCS ENGINEERS

Yukon, OK | May 2020

0 1,000 2,000 Feet

N

Document Path: K:\AEL\Projects\2019\27219016.00 - Landfill Expansion Eval\Figures\AEL Expansion - Public Water Supply Map.mxd

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Tranverse Mercator (UTM) zone 14. The **horizontal datum** is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the SURDEX Corporation for the National Agricultural Imagery Program (NAIP) produced at a scale of 1:12,000 from photography dated 2003 or later.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA;

Phone: 800-358-9616
FAX: 800-358-9620
http://msc.fema.gov/

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

Approximate AEL Permit Boundary

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross Section Line
23 - - - 23	Transect Line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000M	1000-meter Universal Transverse Mercator grid values, zone 14
600000 FT	5000-foot grid ticks
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel).
• M1.5	River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
APRIL 2, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1215K

FIRM
FLOOD INSURANCE RATE MAP
OSAGE COUNTY,
OKLAHOMA AND
INCORPORATED AREAS

PANEL 1215 OF 1245

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
OSAGE COUNTY, UNINCORPORATED AREAS	400146	1215	K

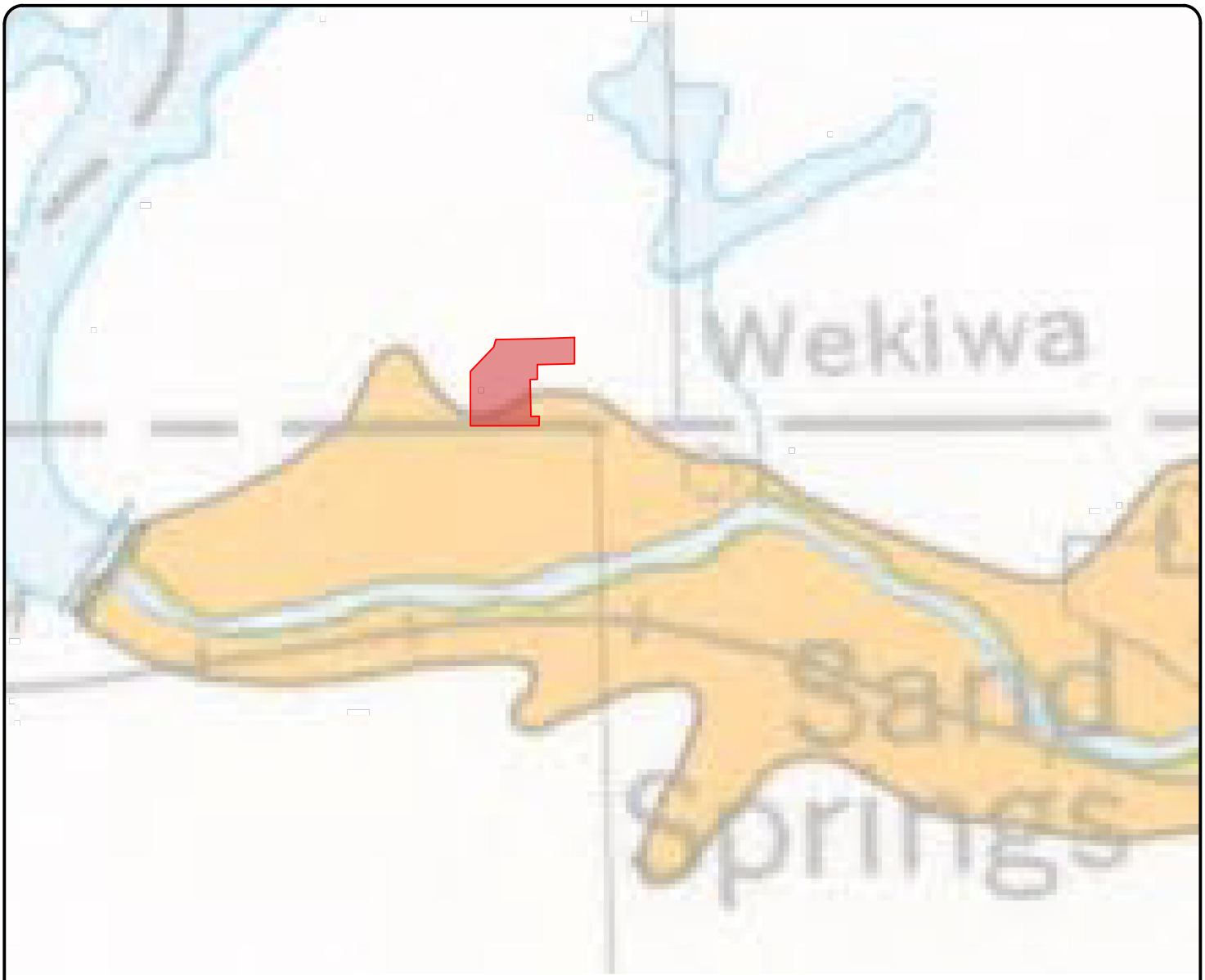
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
40113C1215K

EFFECTIVE DATE:
APRIL 2, 2008

Federal Emergency Management Agency

Oklahoma Geologic Survey



APPROXIMATE PROPOSED PERMIT BOUNDARY

TERRACE AND ALLUVIAL DEPOSITS AND THEIR RECHARGE AREAS

NOTE:
1. MAP FROM "MAP OF AQUIFERS AND RECHARGE AREAS IN OKLAHOMA" COMPILED BY KENNETH S. JOHNSON, OKLAHOMA GEOLOGICAL SURVEY (1991).

6,000 0 6,000 12,000

SCALE FEET

N

SCS ENGINEERS

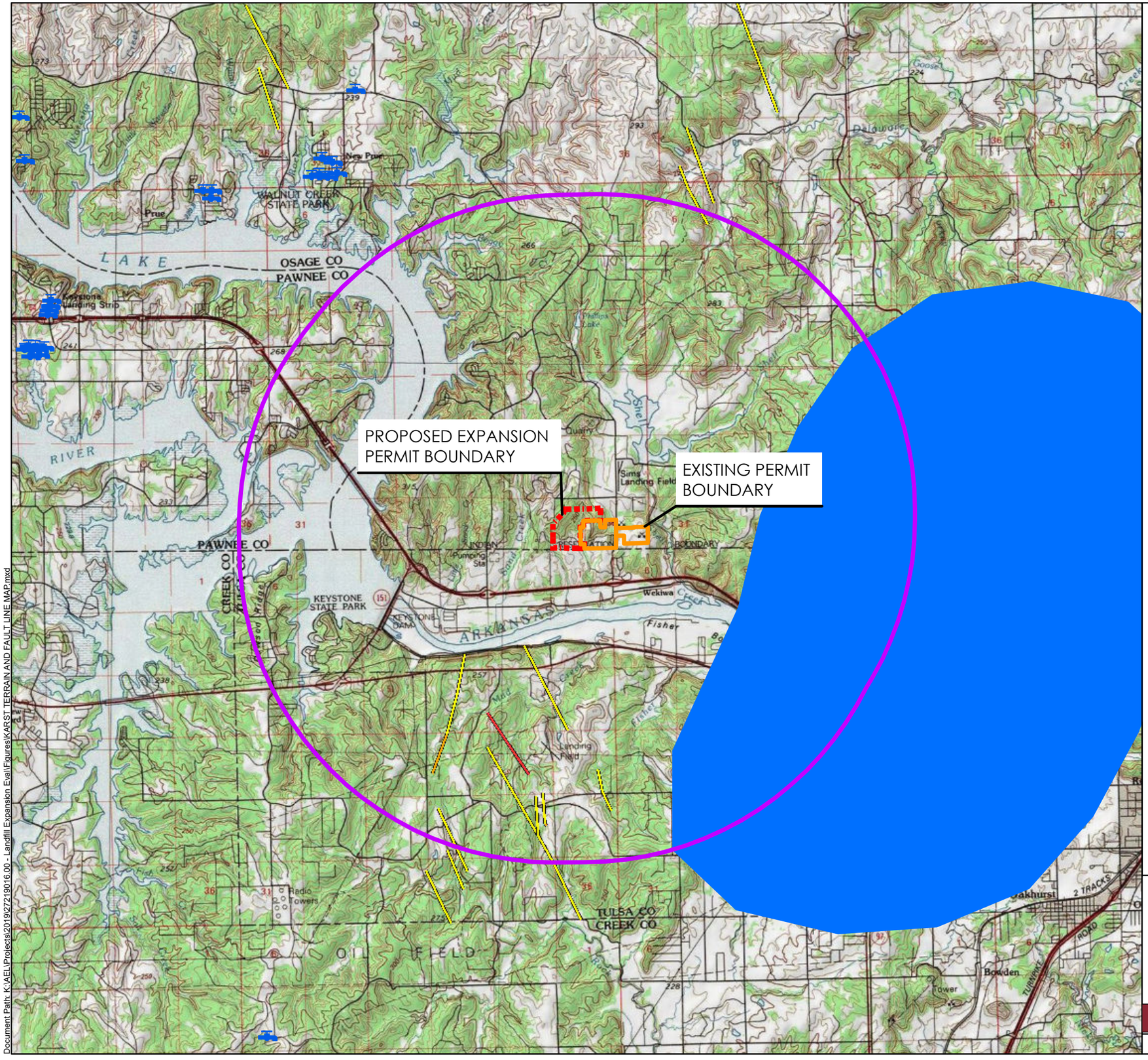
1817 Commons Cir #1
Yukon, Ok. 73099
Tel: +1-405-265-3960

American Environmental Landfill Inc.

American Environmental Landfill

Sand Springs, Ok.

CHK. BY: S.R.	DWN. BY: T.L.	DSN. BY: T.L.	PROJ. NO. 27220345.00
PROJ. MGR: W.M.	DATE: 3/6/20	CADD FILE: AQUIFER MAP.DWG	DRAWING NO. 1



Legend

- Public Water Supply Well
- Existing Permit Boundary
- Proposed Expanded Permit Boundary

Karst Type

- Carbonate
- Erosional
- Gypsum
- Volcanic

Oklahoma Earthquakes (2009-2019)

- ≤2.5
- ≤3.0
- ≤3.5
- ≤4.0
- ≤4.5
- ≤6.0

Fault Lines

Fault Orientation (Azimuth)

- Optimal — *Optimal (45°-60°, 105°-120° and 135°-150°)*
- Moderately Optimal — *Moderately Optimal (15°-45°, 60°-75°, 90°-105° and 120°-135°)*
- Sub-Optimal — *Sub-Optimal (0°-15°, 75°-90° and 150°-180°)*

FIGURE 4
AEL - DRILLING PLAN
KARST TERRAIN AND FAULT LINE MAP
OSAGE COUNTY, OKLAHOMA

SCS ENGINEERS | Yukon, OK | June 2020

0 4,000 8,000 Feet

N

Document Path: K:\AEL\Projects\20192721901 6.00 - Landfill Expansion Eval\Figures\KARST TERRAIN AND FAULT LINE MAP.mxd

Oklahoma Department of Mines

June 2, 2020
File No. 27219016.00

Mr. Mike Lewis, Geologist
Oklahoma Department of Mines
2915 N. Classen Blvd., Suite 213
Oklahoma City, OK 73106-5406

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Mr. Lewis:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-52(d), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *No new waste management or disposal areas of a land disposal facility shall be located over a subsurface mining area or any other unstable area.*

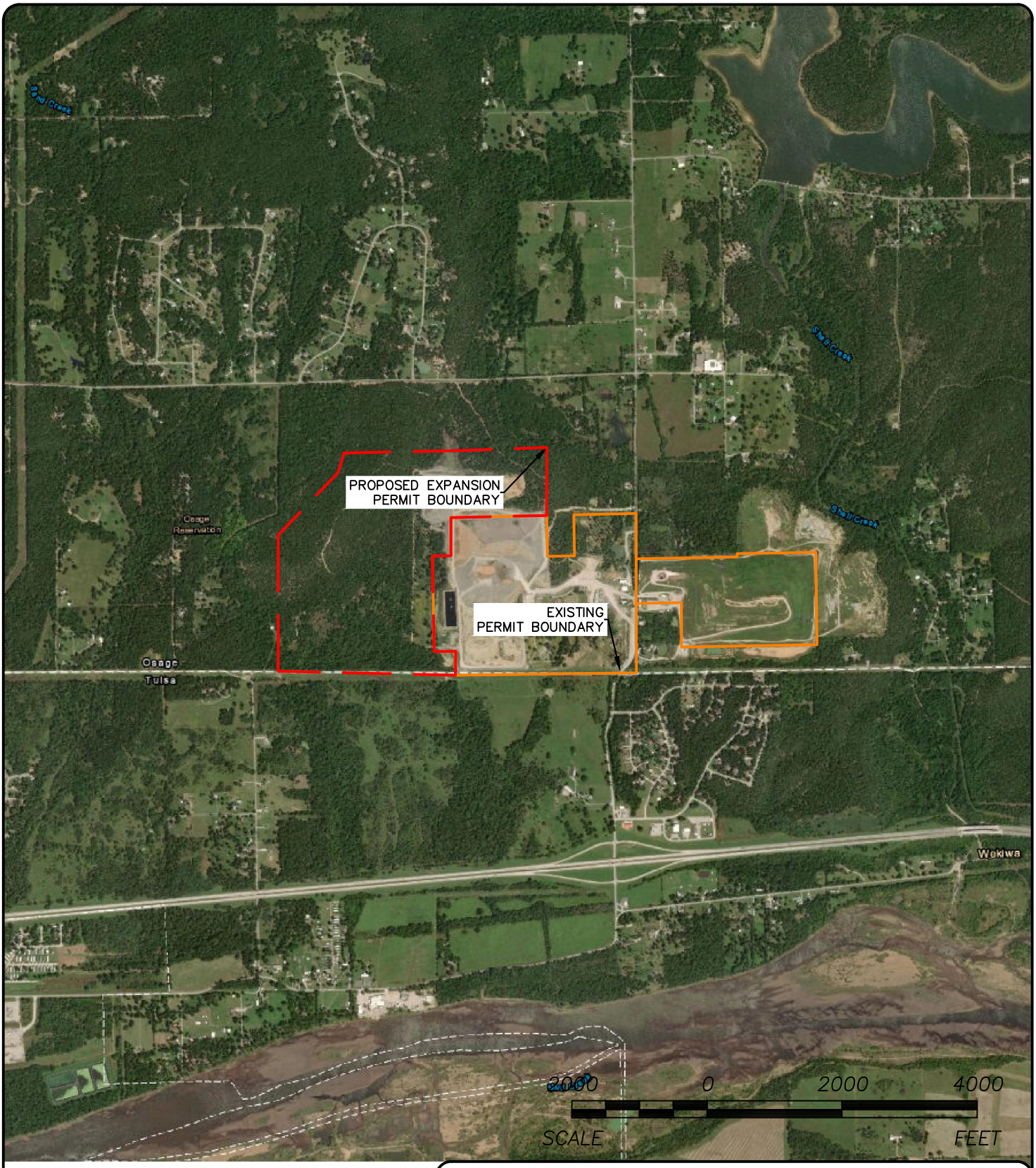
On behalf of our client, we request you review the enclosed maps and provide this determination as required by the ODEQ within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers

Encl. 2 General Site Location Maps



LEGEND

EXISTING PERMIT BOUNDARY

PROPOSED EXPANSION PERMIT BOUNDARY

Aerial Image Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

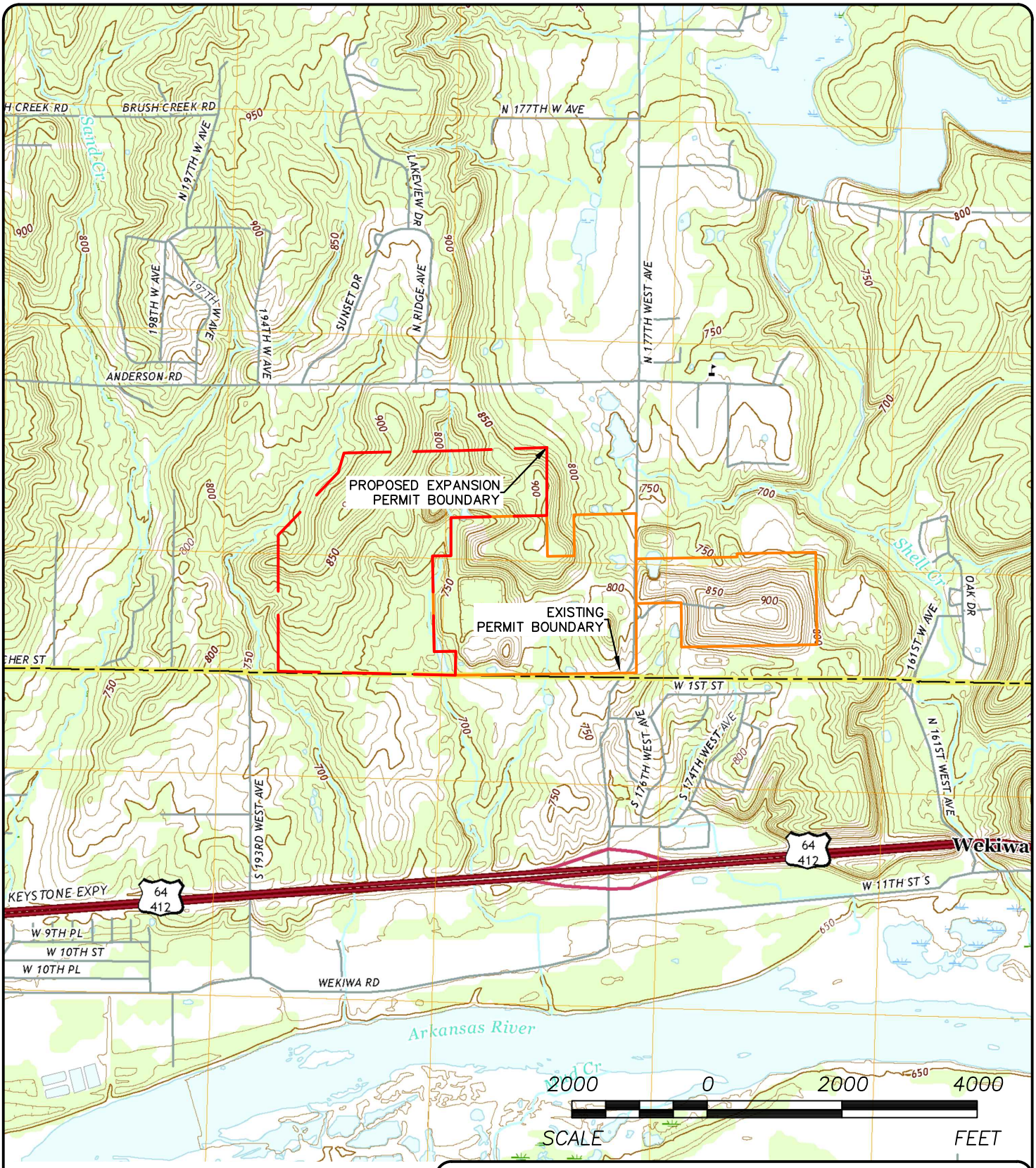
SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.

SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/28/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 1



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

N

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

MARY ANN PRITCHARD
DIRECTOR

J. KEVIN STITT
GOVERNOR

STATE OF OKLAHOMA
DEPARTMENT OF MINES

July 8, 2020

Ms. Sarah Rafalowski
Senior Project Professional
SCS Engineers
1817 Commons Circle, Suite 1
Yukon, OK 73099

Re: American Environmental Landfill
Proposed Landfill Expansion
Portions of S/2 NE/4 & SE/4 Section 35, T20N, R10E
SW/4 NW/4 Section 36, T20N, 10E
Osage County, Oklahoma

Dear Ms. Rafalowski:

The Oklahoma Department of Mines (ODM) received your request for information concerning the subject proposed expansion of the American Environmental Landfill project in Osage County, Oklahoma on June 5, 2020. As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-52(d) a determination is necessary for the proposed expansion. The ODEQ regulation states the following: No new waste management or disposal areas of a land disposal facility shall be located over a subsurface mining area or any other unstable area. After researching our current and historical data file, ODM did not find any coal, non-coal permits or any other surface reclamation efforts on record that might affect your project

If you have further questions or need clarification please contact me at (405) 522-9851.

Sincerely,

Mike Lewis
ODM Geologist, Technical Services

Cc: Rhonda Dossett, Coal Program Director, Stacy Woody, Coal Permit Officer-ODM

2915 N. CLASSEN, SUITE 213, OKLAHOMA CITY, OKLAHOMA 73106 TEL:405/427-3859 FAX: 405/427-9646

Oklahoma Corporation Commission

June 2, 2020
File No. 27219016.00

Ms. Brandy Wreath, Director
Public Utilities Division
Oklahoma Corporation Commission
P.O. Box 52000
Oklahoma City, OK 73152-2000

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Ms. Wreath:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-52 (a), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *A minimum horizontal separation of twenty-five feet (25') shall be maintained between all waste management and disposal areas of a land disposal facility and any above-ground or underground pipeline or transmission line. Information on the location and owners of all such lines and easements shall be provided to the DEQ.*

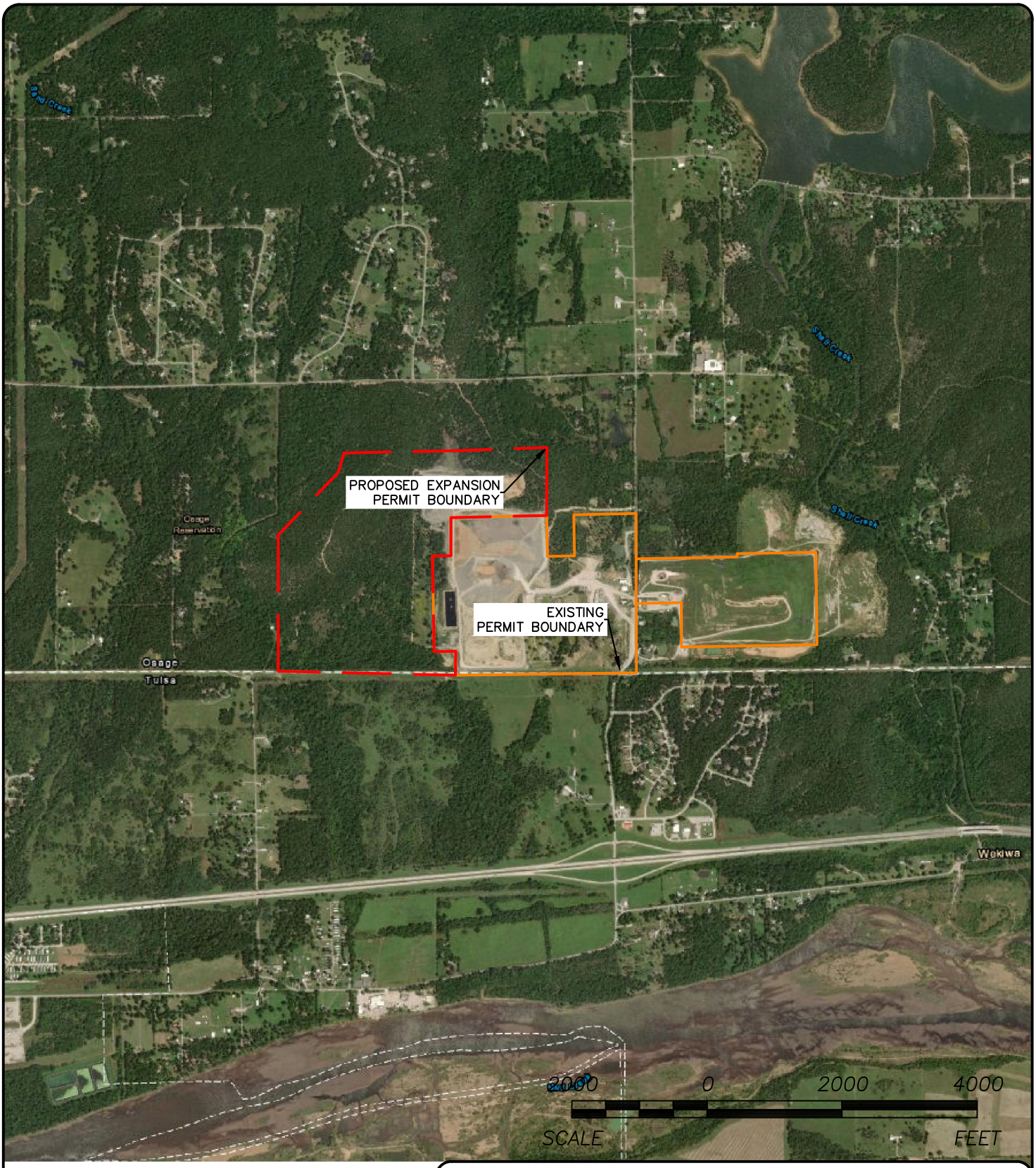
On behalf of our client, we request you review the enclosed maps and provide this determination as required by the ODEQ within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers

Encl. 2 General Site Location Maps



LEGEND

EXISTING PERMIT BOUNDARY

PROPOSED EXPANSION PERMIT BOUNDARY

Aerial Image Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

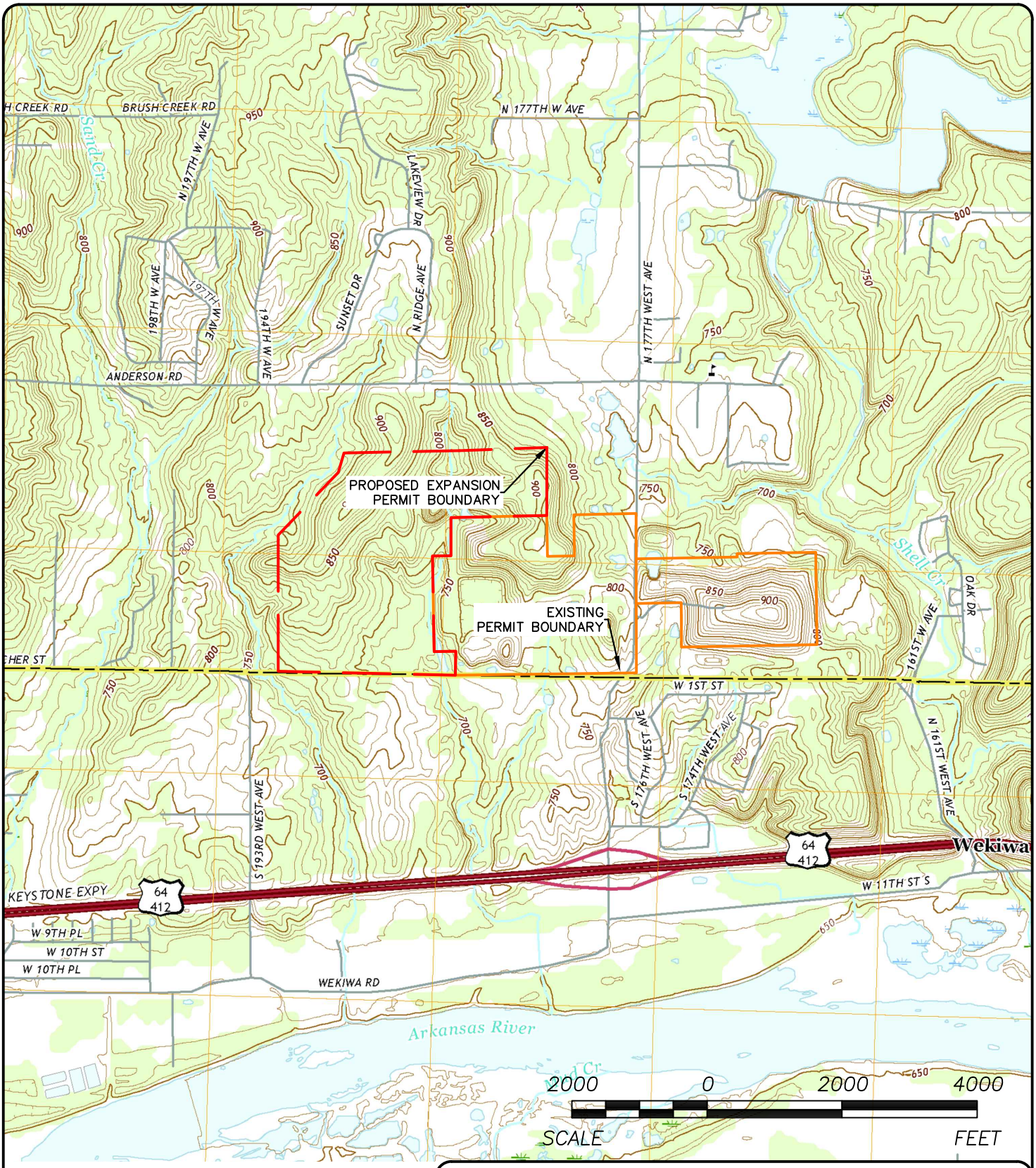
SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.

SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/28/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 1



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

N

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

Pogue Airport

June 2, 2020
File No. 27219016.00

Mr. Ken Madison
Pogue Airport
3200 N. Airport Rd
Sand Springs, OK 74063

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Mr. Madison:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-52(e), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *if any waste management or disposal area of a new land disposal facility, or expansion of waste management or disposal areas of an existing land disposal facility, is to be located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used by only piston-type aircraft, a demonstration that the facility will not pose a bird hazard to aircraft shall be provided to the DEQ.*

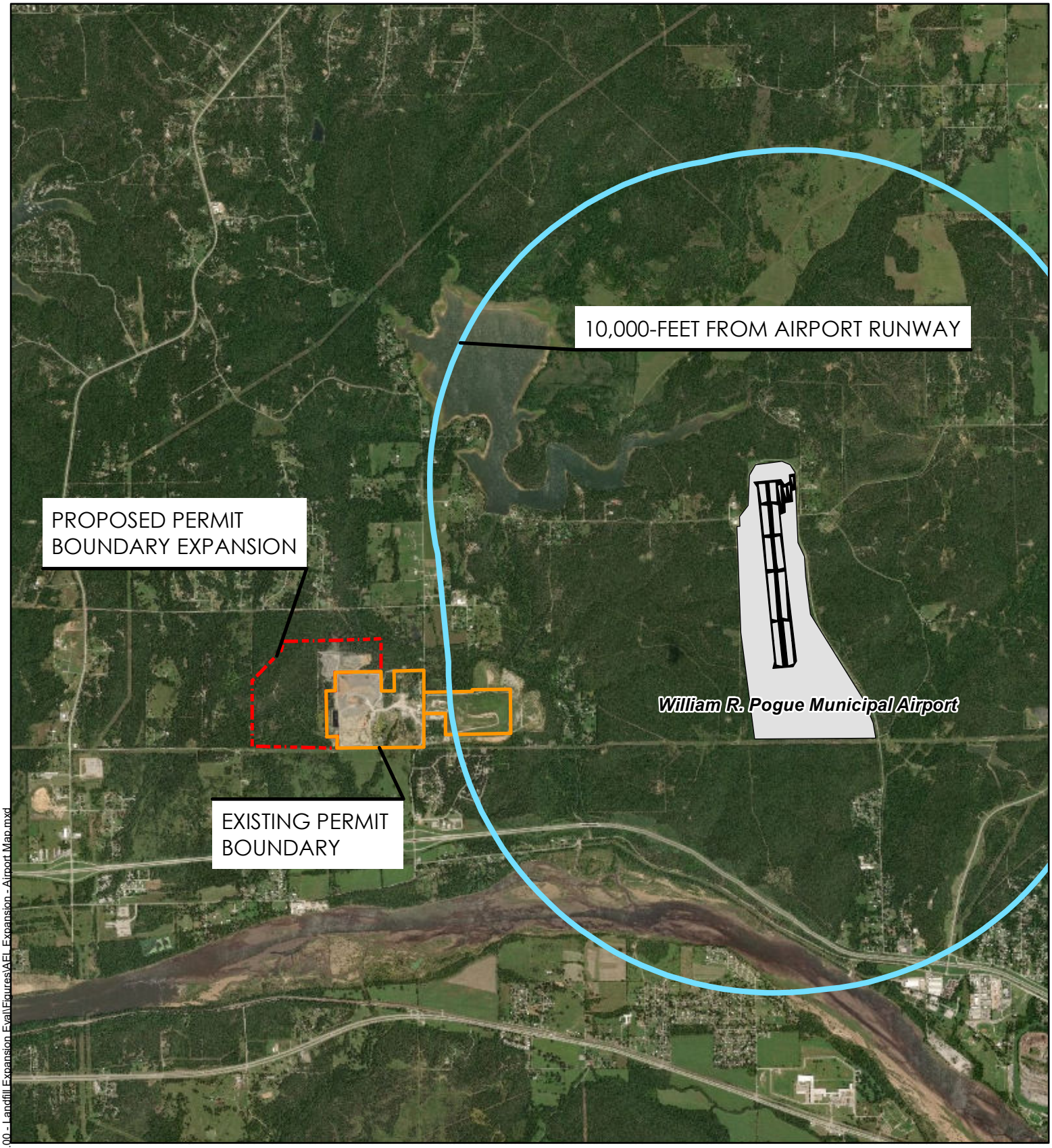
If any waste management or disposal areas of a new land disposal facility, or expansion of waste management or disposal areas of an active land disposal facility, will be located within a 5-mile radius of any airport runaway end used by turbojet or piston-type aircraft, the affected airport and the FAA must be notified and proof of such notification provided to the DEQ.

On behalf of our client, we request your review of the enclosed maps. Please advise us of any concerns that Pogue Airport may have with the proposed landfill expansion location within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-1574. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- 10,000 feet from Airport Runway
- Airport Area
- Airport Runway
- Existing Permit Boundary
- Proposed Expanded Permit Boundary

FIGURE 1
AMERICAN ENVIRONMENTAL LANDFILL EXPANSION
DISTANCE FROM AIRPORT RUNWAY
OSAGE COUNTY, OKLAHOMA

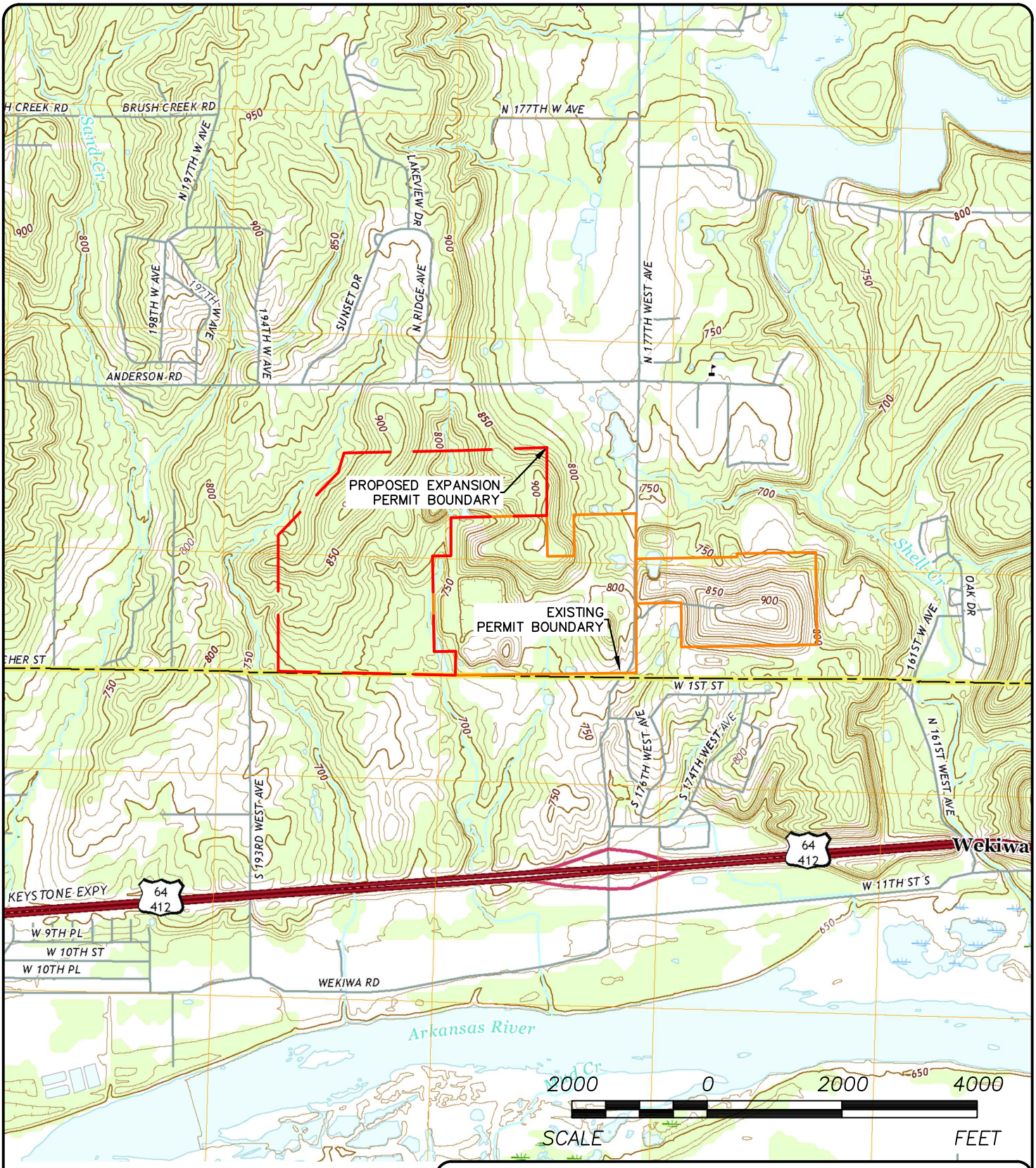
SCS ENGINEERS

Yukon, OK | May 2020

0 2,000 4,000 Feet

N

Document Path: K:\AEL\Projects\2019\27219016.00 - Landfill Expansion Eval\Figures\AEL Expansion - Airport Map.mxd



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
MAP AND CONTOURS SHOWN ARE FROM THE USGS 7.5' SERIES WEKIWA QUADRANGLE IN OSAGE AND TULSA COUNTIES, OKLAHOMA DATED 2018.

N

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

Federal Aviation Administration

June 17, 2020
File No. 27219016.00

Mr. Glenn Boles
Oklahoma Airports District Office, ASW-630
Federal Aviation Administration - Southwest Region
10101 Hillwood Parkway
Fort Worth, TX 76177

Subject: American Environmental Landfill
Proposed Landfill Expansion Notification
ODEQ Permit No. 3557021

Dear Mr. Boles:

As required by Oklahoma Department of Environmental Quality (ODEQ) Oklahoma Administrative Code 252:515-5-52(e), SCS Engineers is requesting a determination for the proposed expansion of the American Environmental Landfill which is owned and operated by American Environmental Landfill, Inc. (AEL). The proposed landfill expansion consists of approximately 203 acres and is located at 207 North 177th West Avenue, Sand Springs, Oklahoma 74063. Two general site location maps are enclosed.

The ODEQ regulation states the following: *if any waste management or disposal area of a new land disposal facility, or expansion of waste management or disposal areas of an existing land disposal facility, is to be located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used by only piston-type aircraft, a demonstration that the facility will not pose a bird hazard to aircraft shall be provided to the DEQ.*

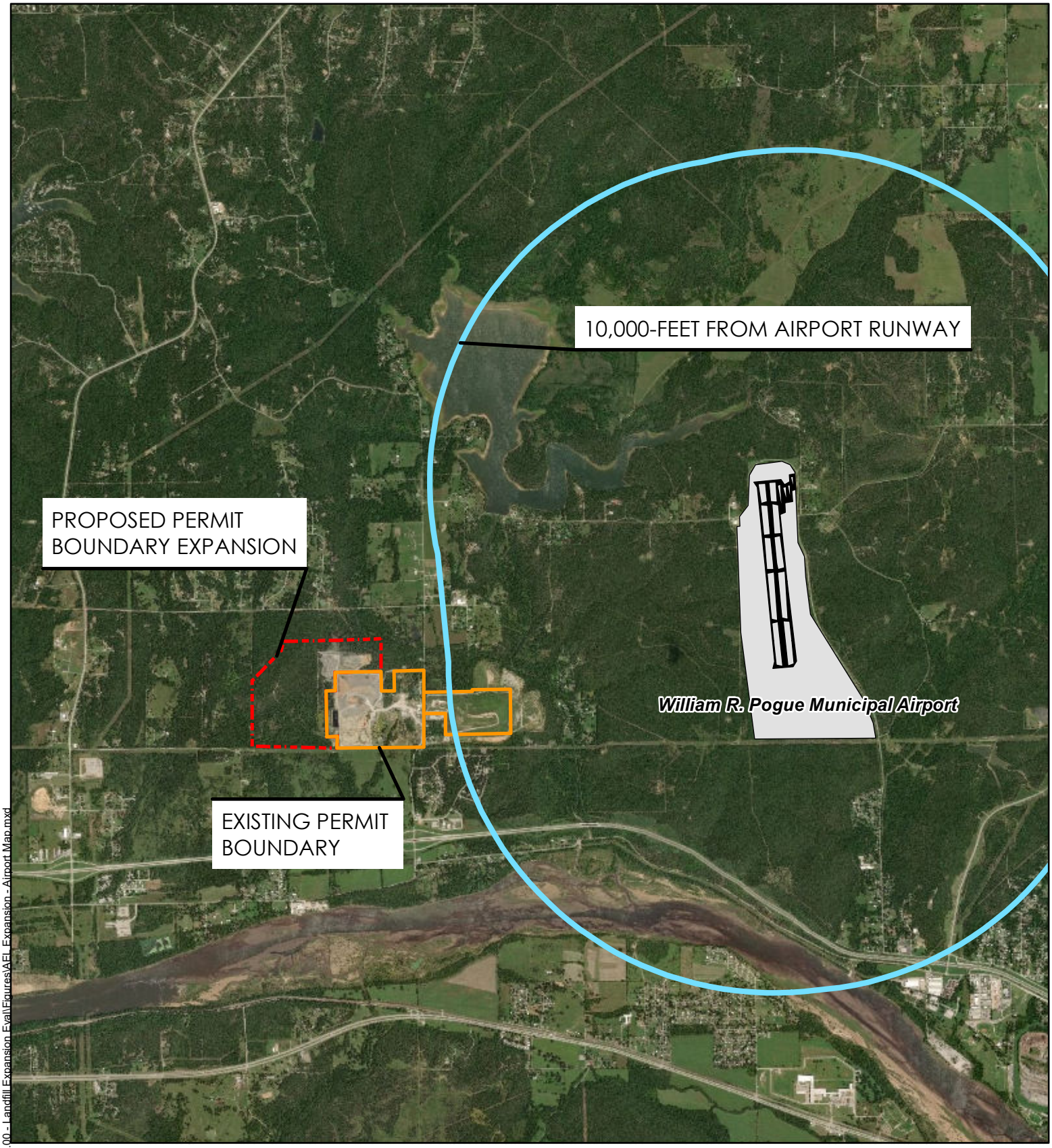
If any waste management or disposal areas of a new land disposal facility, or expansion of waste management or disposal areas of an active land disposal facility, will be located within a 5-mile radius of any airport runaway end used by turbojet or piston-type aircraft, the affected airport and the FAA must be notified and proof of such notification provided to the DEQ.

On behalf of our client, we request your review of the enclosed maps. Please advise us of any concerns the Federal Aviation Administration may have with the proposed landfill expansion location within 45 days of receipt of this letter. If you have any questions or comments or need additional information, please do not hesitate to contact the undersigned at (405) 246-3960. Thank you very much for your time and effort in this matter.

Sincerely,

Sarah Rafalowski, PE
Senior Project Professional
SCS Engineers

Wade Miller
Project Director
SCS Engineers



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- 10,000 feet from Airport Runway
- Airport Area
- Airport Runway
- Existing Permit Boundary
- Proposed Expanded Permit Boundary

FIGURE 1
AMERICAN ENVIRONMENTAL LANDFILL EXPANSION
DISTANCE FROM AIRPORT RUNWAY
OSAGE COUNTY, OKLAHOMA

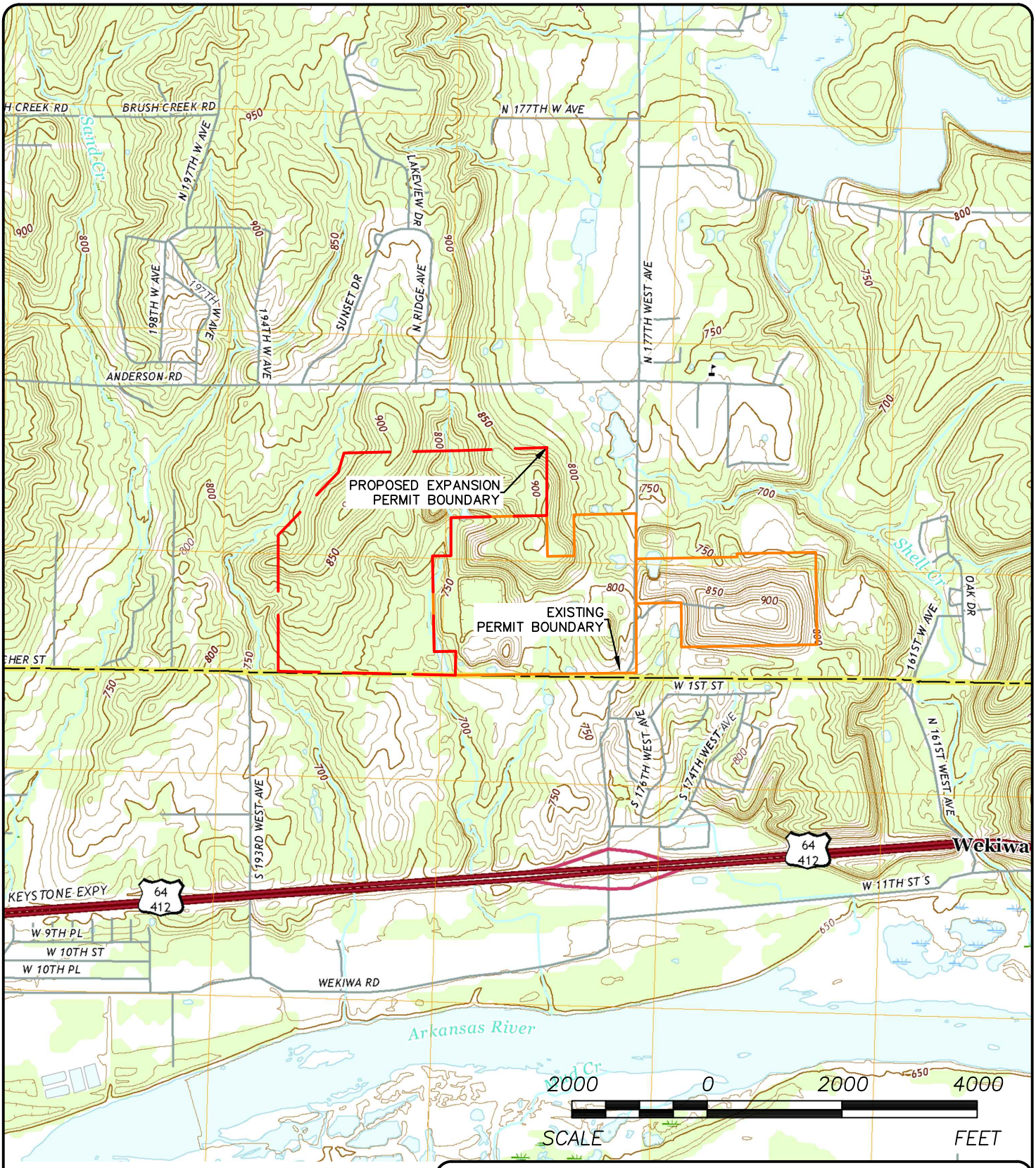
SCS ENGINEERS

Yukon, OK | May 2020

0 2,000 4,000 Feet

N

Document Path: K:\AEL\Projects\2019\27219016.00 - Landfill Expansion Eval\Figures\AEL Expansion - Airport Map.mxd



LEGEND

- EXISTING PERMIT BOUNDARY
- PROPOSED EXPANSION PERMIT BOUNDARY

NOTE:
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N

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1817 COMMONS CIRCLE, SUITE 1
YUKON, OKLAHOMA 73099
PH. (405) 265-3960

AMERICAN ENVIRONMENTAL LANDFILL, INC.
SAND SPRINGS, OKLAHOMA
OSAGE COUNTY

CHK. BY: WJM	DWN. BY: SAR	DSN. BY: SAR	PROJ. NO. 27219016.00
PROJ. MGR: WJM	DATE: 5/26/20	CADD FILE: SITE LOCATION MAP.DWG	DRAWING NO. 2

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1. Article Addressed to:

Mr. Matt Warren
Bureau of Reclamation
Oklahoma City Field Office
5924 NW 2nd Street, Suite 200
Oklahoma City, OK 73127

9590 9402 5425 9189 3448 73

2. Article Number *(Transfer from service label)*
7019 2970 0002 2447 7689

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A. Signature
X Gary Brownlee ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* C. Date of Delivery

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3. Service Type
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☐ Certified Mail Restricted Delivery
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☐ ured Mail
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er $500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

A. Signature ☐ Agent ☐ Addressee
X RECEIVED
B. Received by *(Printed Name)* C. Date of Delivery
By OESC
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
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☐ Adult Signature Restricted Delivery
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☐ Collect on Delivery
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500)

☐ Priority Mail Express®
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☐ Signature Confirmation
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SENDER: COMPLETE THIS SECTION

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- Print your name and address on the reverse so that we can return the card to you.
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1. Article Addressed to:

Ms. Catharine Wood
State Historic Preservation Office
800 Nazih Zuhdi Drive
Oklahoma City, OK 73105

9590 9402 5425 9189 3448 11

2. Article Number *(Transfer from service label)*
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A. Signature
X Daniels ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* C. Date of Delivery
6-5-20

D. Is delivery address different from item 1? ☐ Yes
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☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
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er $500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

Complete items 1, 2, and 3.
Print your name and address on the reverse so that we can return the card to you.
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1. Article Addressed to:

Ms. Brandy Wreath
Oklahoma Corporation Commission
PO Box 52000
Oklahoma [illegible]

9590 9402 5425 9189 3448 28

2. Article Number *(Transfer from service label)*
7019 2970 0002 2447 7726

A. Signature ☐ Agent ☐ Addressee
X
B. Received by *(Printed Name)* C. Date of Delivery
6-5-20
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
☒ Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
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500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

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1. Article Addressed to:

Mr. Ken Madison
Pogue Airport
3200 N. Airport Rd
Sand Springs, OK 74063

9590 9402 5425 9189 3448 59

2. Article Number *(Transfer from service label)*
7019 2970 0002 2447 7719

PS Form 3811, July 2015 PSN 7530-02-000-9053 Domestic Return Receipt

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A. Signature
X K Madison ☐ Agent ☐ Addressee

B. Received by *(Printed Name)* C. [illegible] Delivery
SS C19

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
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☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
☐ Mail
☐ Mail Restricted Delivery
500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

A. Signature ☐ Agent ☐ Addressee
X
B. Received by *(Printed Name)* C. Date of Delivery
Stephen M
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
☒ Certified Mail®
☐ Certified Mail Restricted Delivery
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500)

☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

mplete items 1, 2, and 3.
nt your name and address on the reverse
that we can return the card to you.
ach this card to the back of the mailpiece,
on the front if space permits.

icle Addressed to:

Ms. Eve Atkinson
Oklahoma Tourism and Recreation Dept
900 North Stiles
Oklahoma City, OK 73104

9590 9402 5425 9189 3448 66

2015 0640 0005 1068 4032
Transfer from service label)

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mr. Mike Lewis
Oklahoma Department of Mines
2915 N. Classen Blvd., Suite 213
Oklahoma City, OK 73106

9590 9402 5425 9189 3448 42

2. Article Number (Transfer from service label)
7019 2970 0002 2447 7672

PS Form 3811, July 2015 PSN 7530-02-000-9053

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A. Signature
X

☐ Agent
☐ Addressee

B. Received by (Printed Name)

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
☒ Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
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☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
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☐ Signature Confirmation Restricted Delivery

Domestic Return Receipt

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- ☐ Return Receipt (electronic) $
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- ☐ Adult Signature Restricted Delivery $

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City, State, ZIP+4® 3448 66

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$

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City, State, ZIP+4® 3448 04

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Extra Services & Fees *(check box, add fee as appropriate)*
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- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$ 6.90

Sent To Oklahoma Corp Commission

Street and Apt. No., or PO Box No. 9590 9402 5125

City, State, ZIP+4® 9189 3448 28

Postmark Here

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

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Extra Services & Fees *(check box, add fee as appropriate)*
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- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$ 6.90

Sent To SHPO

Street and Apt. No., or PO Box No. 9590 9402 5125

City, State, ZIP+4® 9189 3448 11

Postmark Here

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7019 2970 0002 2447 7696

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

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Extra Services & Fees *(check box, add fee as appropriate)*
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- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$ 6.90

Sent To OAS

Street and Apt. No., or PO Box No.

City, State, ZIP+4® 3448 35

Postmark Here

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7019 2970 0002 2447 7672

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

Certified Mail Fee
$

Extra Services & Fees *(check box, add fee as appropriate)*
- ☐ Return Receipt (hardcopy) $
- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$ 6.90

Postmark Here

Sent To ODM

Street and Apt. No., or PO Box No.

City, State, ZIP+4® 3448 42

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7019 2970 0002 2447 7719

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
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For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

Certified Mail Fee
$

Extra Services & Fees *(check box, add fee as appropriate)*
- ☐ Return Receipt (hardcopy) $
- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$ 6.90

Postmark Here

Sent To Roque Airport

Street and Apt. No., or PO Box No.

City, State, ZIP+4® 3448 59

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions