MITIGATION BANKING INSTRUMENT

Honey Springs Mitigation Bank
McIntosh County, Oklahoma
USACE Project Number: SWT-2019-218

Prepared For:

Green Country Wetland Mitigation, LLC
PO Box 1326
Carthage, Texas 75633

And

Hoffman Environmental, Inc.
PO Box 452
Sulphur Springs, Texas 75483

Prepared By:

Hoffman Environmental, Inc.
PO Box 452
Sulphur Springs, Texas 75483

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TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

I.0 INTRODUCTION

Green Country Wetland Mitigation, LLC (GCWM) and Hoffman Environmental, Inc. (HEI) will develop a mitigation bank to be known as the Honey Springs Mitigation Bank (HSMB) that would enhance, restore, and protect approximately 162 acres of wetland, riparian, upland buffer and stream habitat in McIntosh County, Oklahoma.

Section 404 of the Clean Water Act (CWA) (33 USC 1344 et seq.) and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) authorize the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill material into waters of the United States, including wetlands, and for activities in, or affecting, navigable waters of the United States. The Department of the Army (DA), through the U.S. Army Corps of Engineers (USACE) Regulatory Program makes decisions to issue or deny permits based on public interest review (33 CFR Parts 320-330) and, for activities subject to regulation under Section 404, in compliance with the U.S. Environmental Protection Agency's (EPA) "Guidelines for the Specification of Disposal Sites for Dredged and Fill Material" (40 CFR Part 230), known as section 404(b)(1) guidelines. The USACE requires mitigation for adverse impacts to waters of the United States, including wetlands, associated with activities regulated under Sections 404 and 10 that are likely to occur, and would be of importance to the human or aquatic environment. The Council on Environmental Quality has defined mitigation to include avoiding and minimizing impacts, rectifying impacts, reducing impacts, and compensating for impacts. The 404(b)(1) guidelines provide tools to evaluate impacts to the aquatic ecosystem and measures that can minimize those impacts. For impacts that remain after all appropriate steps to avoid and minimize adverse impacts have been taken, appropriate and practicable compensatory mitigation is required to offset remaining unavoidable adverse impacts.

Guidance pertaining to the type and extent of mitigation that may be required by the USACE is provided in *Compensatory Mitigation for Losses of Aquatic Resources* (EPA 2008) which states that preference shall be given, to the maximum extent practicable, to the use of mitigation banks. The guidance also emphasizes the importance of a national goal to achieve an overall no net loss of the nation's remaining wetlands base. Compensatory mitigation includes restoring, enhancing, creating, and preserving aquatic system functions that would be lost or impaired due to a USACE-authorized activity. Compensatory mitigation may be implemented to offset adverse impacts of one or more USACE–authorized projects within a single consolidated mitigation project. Consolidated mitigation projects may result in greater overall environmental benefit than those achieved with numerous small, individual mitigation projects and are usually more cost-effective to implement.

Mitigation banking is the restoration, enhancement, creation, and, in exceptional circumstances, preservation undertaken to compensate in advance for adverse impacts to the aquatic ecosystem. The bank sponsor typically funds the establishment of the bank in anticipation of recouping that investment by selling shares, or credits, in the bank to provide a means for USACE permittees to offset adverse project impacts to the aquatic ecosystem. The USACE and other federal agencies recognize the potential benefits of mitigation banking to the aquatic ecosystem, permit applicants under Sections 404 or 10, regulatory and natural resources agencies, and the general public.

2.0 LEGAL AUTHORITY

The HSMB is established in accordance with, and consideration of, the following federal and state statutes, regulations, and policies:

- Clean Water Act Section 404 (33 USC 1251 et seq.)
- Rivers and Harbors Act of 1899 Section 10 (33 USC 403, et seq.)
- Environmental Protection Agency, Section 401(b)(1) Guidelines (40 CFR Part 230). Guidelines for Specification of Disposal Sites for Dredged or Fill Material
- Department of the Army, Section 404 Permit Regulations (33 CFR Parts 320-330), Policies for Evaluating permit applications to discharge dredged or fill material
- Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (February 6, 1990)
- National Environmental Policy Act (42 USC 4321 et seq.), including the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508)
- Fish and Wildlife Coordination Act (16 USC 661 et seq.)
- Fish and Wildlife Service Mitigation Policy (46 FR 7644-7663, 1981)
- Regulatory Guidance Letter No. 08-03. U.S. Army Corps of Engineers, October 10, 2008.

Nothing in this agreement shall be construed as altering the requirements of any agency responsibilities as specified in existing law, regulation and policy.

3.0 SCOPE OF AGREEMENT

This Mitigation Banking Instrument (MBI) shall serve as the agreement authorizing Green Country Wetland Mitigation, LLC (Sponsor) and Hoffman Environmental, Inc. (Sponsor) to establish and operate the HSMB in McIntosh County, Oklahoma. For purposes of this agreement, "Sponsors" shall mean Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc., or any subsequent sponsors (successors) of the HSMB. Under the terms of this agreement, the Sponsor shall:

- Implement and maintain the HSMB as specified in this document, and
- Establish a perpetual conservation easement on lands contained within the HSMB, and
- Maintain current accounting records on the HSMB, and
- Monitor the HSMB property for ecological sustainability and conduct required remedial activities, and
- Achieve all performance standards.

The following agencies participated in the development of this MBI as members of the Interagency Review Team (IRT):

- Oklahoma Department of Environmental Quality (ODEQ)
- U.S. Army Corps of Engineers, Tulsa District (USACE)
- U.S. Fish and Wildlife Service (USFWS)
- Environmental Protection Agency, Region 6 (EPA)
- Natural Resources Conservation Service (NRCS)
- Oklahoma Department of Wildlife Conservation (ODWC)
- Oklahoma Conservation Commission (OCC)

The USACE shall serve as chair of the IRT and be responsible for making final decisions regarding the terms and conditions of this document where consensus among the IRT members cannot otherwise be reached within a reasonable time frame. Notwithstanding any provision of the MBI to the contrary, 401 certification is required by the State of Oklahoma.

4.0 PURPOSE AND GOALS OF THE MITIGATION BANK

The purpose of the HSMB is to compensate for losses of aquatic resources resulting from projects authorized by the USACE. HSMB will provide environmentally responsible, economical, efficient, and flexible off-site compensatory mitigation opportunities for those seeking to develop land in accordance with the relevant Federal, State, and local regulations. HSMB will be established to compensate for losses of aquatic resources from authorized development within the defined and established HSMB *Geographical Service Area* in a manner that contributes to improvements in the long-term ecological function of the Arkansas River Watershed. Four primary objectives of HSMB are summarized below:

1. Provide for the replacement of the chemical, physical, and biological functions of wetlands and other aquatic resources that are lost or degraded as a result of USACE-authorized impacts.
2. Provide USACE permit applicants greater flexibility in compensating for unavoidable adverse impacts to the aquatic ecosystem after appropriate and practicable measures have been taken to avoid and minimize project-related impacts on site, and after practicable compensation has been conducted, or shown not to be in the best interest of the environment, especially when those impacts would be relatively minor.
3. Provide more extensive, higher quality, and more cost-effective protection of wetlands and other aquatic resources over that typically achieved by other forms of compensatory mitigation for activities that have minor adverse impacts on the aquatic ecosystem.
4. Provide enhancement, restoration, protection, and maintenance of 162.02 acres of degraded and altered streams and bottomland, riverine, and wet prairie ecosystems by developing native, self-sustaining, and diverse herbaceous and forest communities indigenous to the Arkansas River Basin.

The objective of HSMB is to develop a wetland and stream mitigation bank in the Arkansas River Watershed in association with the granting of Department of Army permits through restoration and enhancement of perennial, intermittent, and ephemeral streams, forested and emergent wetland habitat, and associated riparian and upland buffers along associated tributary streams. The specific design objectives of HSMB include:

1. Promoting water quality by enhancing, restoring and protecting jurisdictional wetlands adjacent to Elk Creek and associated tributaries.
2. Restoration of historic Elk Creek bottomland forested communities, defragmentation of habitat, and improved wildlife travel corridors.
3. Restoration of connectivity and natural stream flow of ephemeral and intermittent streams.
4. Prevent further erosion of incised streams and protect streams from future instability.
5. Enhancement of native, herbaceous-dominated, mineral soil flat, wetland habitat.
6. Restoration of riparian corridors to promote aquatic and terrestrial habitats by improving substrate and in-stream cover, addition of woody debris, reduction in water temperature due to shading, increase of spatial extent of natural area, and improved aesthetics.
7. Enhance and protect high quality bottomland forested wetland habitat.
8. Mitigation activities will provide additional wildlife habitat, travel corridors and a reduction in habitat fragmentation.
9. Upland Buffer Protection.

More specifically, HSMB will enhance existing altered streams and wetlands to their natural stable condition, considering recent and future watershed conditions. The streams and wetlands will be protected with a perpetual conservation easement, and fences will be constructed, where needed and/or feasible, at the limits of site to exclude cattle and other anthropogenic actions. However, at the very minimum where fencing is not practicable or feasible, appropriate signage demarcating the bank boundary will be established. The long-term goal is a net gain of stable stream and wetland functions and services. HSMB will establish stable natural streams with riparian buffers and forested and emergent wetland communities that will provide a positive contribution to water quality, native plant and animal habitat, and erosion control. Ultimately, HSMB will encourage and contribute to a net ecological uplift in the Arkansas River Watershed.

5.0 BANK OWNERSHIP

All real property to be included within the HSMB site is owned in fee simple by Jack Dunnavant, owner of Green Country Wetland Mitigation, LLC, and has been pledged for use in the bank consistent with this MBI. Green Country Wetland Mitigation (Jack Dunnavant) and Hoffman Environmental, Inc. (Jason Hoffman) will be the owners and Sponsors of HSMB and shall be responsible for developing, operating, and maintaining HSMB subject to the requirements of this MBI, but may convey ownership or sponsorship of the bank to a successor as provided below. There are no plans to transfer title of the property to another party at his time, and it is the intention of the Sponsors to maintain the property in perpetuity as highly functioning habitat in accordance with the terms of the long-term management plan and the conservation easement. The conservation easement shall restrict any development of the site in perpetuity and shall stay with the property in the instance that the title to the property is transferred to another party. The inclusion of Mr. Dunnavant's property in the bank, and the granting of a conservation easement restricting future land uses for the benefit of the bank, shall not convey or establish any property interest on the part of any party to this instrument nor to any purchaser of bank credits.

This MBI does not authorize, nor shall it be construed to permit, the establishment of any lien, encumbrance, or other claim with respect to the property, with the sole exception of the right on the part of USACE to require the Sponsors to implement elements of this MBI, including recording any conservation easement required as a condition of the issuance of a permit under Section 404 of the Clean Water Act for discharge of dredged and fill material into waters of the U.S. associated with construction, operation, and maintenance of the bank.

Sponsors may convey fee simple title to, or other forms of property interest in, any property included within the bank, provided the necessary conservation easements have been recorded for any property that is the subject of a previously withdrawn credit. In the event of a transfer in ownership, Sponsors will ensure that the property is conveyed to an environmentally responsible party. The Sponsors may transfer sponsorship of the bank to another public or private party, such as a non-profit land trust or governmental entity, provided the USACE, after coordination with the IRT, approves the transfer and the new Sponsor agrees to abide by the terms of this MBI or an approved modified MBI. Any such request shall be submitted in writing to the USACE. The IRT reserves the right to review and approve any party to whom responsibility for construction, maintenance, or monitoring may be transferred under this MBI. IRT approval shall not be unreasonably withheld. Upon approval of the transfer, all obligations for future performance of the original Sponsors shall be terminated. Unless a substitute financial assurance mechanism is established, all unused funds in the Financial Assurances, as well as the right to draw against the account, will be transferred to the third party Sponsor successor. The physical ownership of the bank lands and the operating rights (Sponsorship) are separable components of the bank and may be transferred independently.

6.0 LOCATION AND BASELINE CONDITIONS

6.1 Site Location

The 162.02-acre HSMB site consists of two separate tracts of land located near Rentiesville, McIntosh County, Oklahoma (Figure 1). Tract #1, hereinafter referred to as the Elk Creek Tract, consists of 86.64 acres and Tract #2, hereinafter referred to as the Old Field Tract, consists of 75.38 acres. The Elk Creek Tract is located north of E1030 Rd. and east of Hwy. 69 and centered at Latitude 35.525876 N; Longitude -95.508081 W in Section 9, Township 12 North, Range 17 East. The Old Field Tract is located south of E1020 Rd. and east of N4180 Rd. and centered at Latitude 35.534704 N; Longitude -95.569953 W in Section 12, Township 12 North, Range 16 East. Both tracts consist of primarily undeveloped, rural land located in the Central Irregular Plains Ecoregion of Oklahoma. McIntosh County has a humid, subtropical climate characterized by relatively high rainfall which averages 45 inches per year. The average daily high temperature is 73°F and the average low temperature is 49°F. The growing season in McIntosh County spans from March to November, approximately 216 days. A copy of the legal descriptions and plats for the HSMB site are provided as Appendix H.

6.2 Historic and Current Site Conditions and Adjacent Lands

The land that we see today on the HSMB can only be understood in light of the conditions of the past. The original pre-Columbian woodland was a medley of forest types and openings on a very large scale. Natural disturbances such as windstorms, wildfire, tornadoes, and ice storms worked with disease and insect infestations to create this mosaic pattern. Native American inhabitants would clear openings and set fires, adding to the disturbance of the forest. The concept of a perfectly stable forest community is not only a false one, but is ecologically impossible. It is rather a continuum in which the parts are in an unstable equilibrium. The idea of a climax forest loses its usually accepted meaning when considered in light of this continual change. The forest can reach a point of relative stability in human life span terms, but true long-term forest community management will look far beyond this. The ecosystem must be accepted on its terms, not ours.

Since European settlement, there has been significant and widespread alteration and destruction of wetland and stream habitat across Oklahoma. According to Oklahoma's Comprehensive Wetlands Conservation Plan (OCC, 1996), approximately 67% of Oklahoma's wetlands have been lost over the past 200 years as a result of conversion to agriculture, a drop in groundwater levels due to irrigation, levee construction, river management and navigation programs, urban development activities, and other actions. Impoundment of major streams has had a negative impact on in-stream functions, and inundation from lakes has also likely caused a significant loss of wetlands associated with river systems. Other causes of historic wetland and wildlife habitat loss within the bank's watershed include agricultural conversion, urbanization, and sedimentation caused by detrimental land use practices. Another significant contributor to wetland and habitat loss within the watershed is bed degradation of the Arkansas River and many of its larger tributaries. This has caused considerable loss of wetlands due to a lower water table within the Arkansas River floodplain and a reduction in sand/point bar habitat which is essential for many species of wildlife.

After the Second World War, life in the U.S. was dramatically changed. With memories of the 1930's still in mind, family farms were abandoned in favor of steadier jobs in the urban areas such as Oklahoma City and Tulsa. This mass exodus began in the 1940's, and farms began to be reclaimed by native forest species. These recovered farms, combined with woods that had naturally regenerated after the early 1900's harvesting, formed yet a Second Forest. Increased use of land for cattle and hay production in the last thirty years brought about the next large-scale change. By creating the extremely clean pastureland we see today, wildlife species such as bobwhite quail have suffered from the lack of proper habitat. Indiscriminate timber harvesting and

a total lack of management investment have combined with large-scale cattle production to severely impact the entire forest community. The reversal of this trend (i.e., the shift toward active forest management, restoration efforts, tree planting, and multiple resource management), is the beginning of the Third Forest for most Oklahoma lands. This is what we see today on the HSMB property - an assortment of woodlands, fields, wetlands, uplands and bottomlands; the combined result of time and nature along with 100 years of man's impact on the ecosystem.

McIntosh County, including the HSMB site, has historically seen a large percentage of the acreage in the county used for farming and ranching which has driven the economy for many years. Small and large acreage farms dominated by agriculture, specifically cotton and grains, peaked in the 1950's with over 235,000 acres dedicated to these crops. By the 1970's large-scale farming had declined significantly and cattle ranching became the dominant land use for the county. Today much of the land in McIntosh County is dominated by improved grasslands. HSMB is no different in this regard as the Old Field Tract has remained open grassland for many years. Based on historic aerial photography (Appendix E), the majority of the Elk Creek Tract was farmed or maintained as open ground until the early 1980's.

The HSMB land base is located within the watershed of Elk Creek, in McIntosh County, Oklahoma. The bank site is located in the Central Irregular Plains Level III Ecoregion of Oklahoma. The land base presents a mosaic of habitat types including bottomland forested and emergent wetlands, stream channels and associated riparian habitat, sloughs, beaver ponds, upland forest, improved grass pasture habitat, and miscellaneous features such as roads and stock ponds. This results in an increased overall diversity, as various portions of the property have characteristics of upland, mesic, bottomland, and riverine habitat. The topography of both sites is relatively flat and uniform, except for some hill land on the west side of the Elk Creek Tract and slight undulations associated with the streams on the Old Field Tract. A large portion of the forested bottomland habitat on the Elk Creek Tract has been significantly altered by timber harvests, past agricultural activities and livestock grazing. The majority of the habitat found on the Old Field Tract is currently improved pasture and has been maintained as such for many years. Historically, this area would have been dominated by tallgrass prairie with wooded riparian corridors. A review of historic aerial photographs and topographic maps (Appendix E) indicates that over 90% of the property included in the HSMB Elk Creek Tract was maintained as open land, either for cattle grazing or farming activities, since before 1940 until the mid-1980's. Currently, approximately 60% of the Elk Creek Tract is maintained as open ground. The entirety of the Old Field Tract has been maintained as improved pasture since well before the 1940's. Sometime around the mid-1990's, maintenance along the intermittent streams was stopped and subsequently today we see a re-growth of low quality and undesirable tree species; however, to date the vast majority of the land base is still maintained as open ground.

The majority of the land surrounding the HSMB site is privately owned. The Elk Creek Tract is bordered by private land on the majority of the south, west and east sides, except for a small strip of land adjacent to the west and south boundary that is owned by the State of Oklahoma and is associated with Hwy. 69. There is also a tract of land adjacent to the north boundary that is owned by the State of Oklahoma (Figure 8). The land on the north, east and south sides of the Elk Creek Tract consists of undeveloped forest land. The Old Field Tract is surrounded entirely by privately owned land. Based on aerial photography, the surrounding habitat is open grassland, and the current land use is dominated by cattle grazing (Figure 9).

6.3 Baseline Information

The HSMB site is ecologically suitable for wetland, stream, and riparian corridor restoration and enhancement. It contains a long stretch of a perennial stream (Elk Creek), four intermittent streams that require riparian corridor restoration, with one in particular requiring stabilizing efforts to stop incision, one impounded ephemeral stream that requires restoration to restore hydrologic

function, and several additional ephemeral stream channels that require riparian corridor restoration and enhancement. As a result, HSMB has great potential for enhancing and reestablishing riparian corridors along these streams systems and the aquatic habitat value of the site. Additionally, the Old Field Tract currently supports large expanses of emergent wetlands located on upland land forms but contain mineral soil flats that were historically cleared and maintained as improved pasture for cattle grazing. Restoring and enhancing the forested and emergent wetland areas will increase habitat opportunities for a multitude of species. The restored and enhanced wetlands will decrease the amount of nutrients traveling to downstream waters. The restored and enhanced riparian corridors will reduce the amount of sediment eroding from the stream banks into Elk Creek and placement of check dams in the ephemeral streams will increase site hydrology, restore proper sediment transport processes, increase the aquatic habitat value of the site and prevent future stream erosion.

The two properties associated with the HSMB land base total approximately 170.9 acres (total including non-bank acres), with the majority of the Elk Creek Tract located in the floodplain of Elk Creek and the Old Field Tract located on flat uplands adjacent to a major tributary of Elk Creek, in McIntosh County, Oklahoma. The bank site is located in the Central Irregular Plains Level III Ecoregion of Oklahoma. The combined land base presents a mosaic of habitat types including bottomland forest and pasture, mineral soil flats, upland pasture and forest, stream channels, oxbow sloughs, riparian habitat, and other features such as roads, on-channel impoundments and beaver ponds. This mixture of land uses and habitats results in an increased overall diversity as various portions of the property have characteristics of upland, mesic, bottomland, and riverine habitat. The topography of both sites is relatively flat and uniform, except for hill land adjacent to the Elk Creek floodplain on the Elk Creek Tract. Most of the forested areas on the Elk Creek Tract have been significantly altered by timber harvests, past agricultural activities and grazing by livestock, but there are some forested bottomland areas around Elk Creek that have naturally regenerated and have not been harvested in 50 to 60 years. The Old Field Tract has been dominated by improved grassland, at least to the 1940's (earliest historic aerial photography available) and remains so today.

In October of 2018, HEI conducted an on-site assessment of the HSMB site to characterize habitat types, with particular emphasis on vegetation, soils, and hydrology. The following subsections give the results from this baseline assessment and are shown on Figures 2-5. A breakdown of the habitat types and other land uses for each tract are listed below.

Elk Creek Tract – 31.4 acres of herbaceous dominated emergent wetlands (bottomland pasture), 30.9 acres of mature bottomland forested wetlands, 3.4 acres of juvenile forested wetlands, 0.2 acres of beaver ponds, 6.2 acres of upland forested habitat, 12.6 acres of upland field habitat, 0.5 acres of perennial stream (3,117 lf), 0.2 acres of intermittent stream (1,637 lf), 0.2 acres of ephemeral streams (3,711 lf), and 2.1 acres of stock ponds and roads.

Old Field Tract – 19.5 acres of mineral flats (emergent wetlands in pasture), 43.8 acres of upland field (fallow improved pasture), 13.3 acres of mixed shrub/scrub and emergent wetland riparian habitat, 1.6 acres of on-channel ponds, 0.3 acres of beaver ponds, 1.1 acres of intermittent stream (9,082 lf), 0.1 acres of ephemeral streams (4,672 lf), and 3.5 acres of easements and roads.

1. Plant Communities

A baseline plant community survey was conducted in association with the wetland assessment within the HSMB site. Plant communities associated with the Elk Creek Tract and Old Field Tract are distinctly different and are described separately in this section. A list of plants identified within HSMB (Elk Creek and Old Field Tracts) is included as Appendix D. Elk Creek Tract contained five dominant and distinct plant communities, or habitat types. These five habitat types consisted of herbaceous dominated wetlands (bottomland pasture), mature

bottomland forested wetlands, juvenile bottomland forested wetlands, upland field and upland forest. The Old Field Tract contained three dominant and distinct plant communities, or habitat types. These three habitat types consisted of herbaceous dominated mineral flat wetlands (emergent pasture), shrub/scrub and emergent wetland dominated riparian habitat and upland fallow field. The vegetational component for each of the identified habitat types for each tract is characterized below and representative photographs are located in Appendix B.

Elk Creek Tract

Emergent Wetlands (Bottomland Pasture)

A total of 31.4 acres of herbaceous dominated emergent wetlands were identified within HSMB –Elk Creek Tract (Photographs 30-37). These areas were cleared many years ago and have been maintained as open ground to date. The vegetation dominating these areas consists of pecan (*Carya illinoinensis*), sumpweed (*Iva annua*), white prairie aster (*Symphotrichum falcatum*), Pennsylvania smartweed (*Persicaria lapathifolia*), Florida paspalum (*Paspalum floridanum*), knotroot bristlegrass (*Setaria parvoflora*), annual ragweed (*Ambrosia artemisiifolia*), late boneset (*Eupatorium serotinum*), curly dock (*Rumex crispus*), switchgrass (*Panicum virgatum*) and Chinese bush-clover (*Lespedeza cuneata*).

Forested Wetlands

A total of 34.3 acres of mature, bottomland, hardwood, forested wetlands were identified within the HSMB – Elk Creek Tract (Photographs 42-50). The vegetation dominating these areas consists of pecan, Shumard oak (*Quercus shumardii*), western soapberry (*Sapindus saponaria*), hackberry (*Celtis laevigata*), boxelder (*Acer negundo*), silver maple (*Acre saccharinum*), green ash (*Fraxinus pennsylvanica*), bois d' arc (*Maclura pomifera*), American elm (*Ulmus americana*), possumhaw (*Ilex decidua*), coralberry (*Symphoricarpos orbiculatus*), Chinese privet (*Ligustrum sinense*), Indian woodoats Cherokee sedge (*Carex cherokeensis*), Canada wildrye (*Elymus canadensis*), nutsedge (*Cyperus rotundus*), American germander (*Teucrium canadense*), Canadian black snakeroot (*Sanicula canadensis*), Devil's beggarticks (*Bidens frondosa*), trumpet creeper (*Campsis radicans*), common greenbrier (*Smilax rotundifolia*) and Japanese honey suckle (*Lonicera japonica).* A small area of juvenile forested wetland habitat dominated by pecan was located near the southwest corner of the Elk Creek Tract (Photographs 40 & 41).

Upland Field Habitat

A total of 12.6 acres of upland fallow field habitat were identified within the HSMB – Elk Creek Tract (Photographs 62-66). These areas were cleared many years ago and have been maintained as open ground to date. The vegetation dominating these areas consists of pecan, common persimmon (*Diospyros virginiana*), honey locust (*Gleditsia triacanthos*), sumpweed, common bermuda grass (*Cynodon dactylon*), Oklahoma blackberry (*Rubus oklahomus*), Carolina horsenettle (*Solanum carolinense*), white prairie aster, knotroot bristlegrass, annual ragweed and Chinese bush-clover.

Upland Forested Habitat

A total of 6.2 ac of mature, upland, hardwood, forested habitat were identified within the HSMB – Elk Creek Tract (Photographs 60 & 61). The vegetation dominating these areas consists of pecan, Shumard oak, post oak (*Quercus stellata*), winged elm (*Ulmus alata*), Chinese privet, eastern redcedar (*Juniperus virginiana*), Canadian black snakeroot, Canada wildrye, nutsedge, Indian woodoats (*Chasmanthium latifolium*), wild rose (*Rosa* spp.), coralberry, Japanese honeysuckle and common greenbrier.

Old Field Tract

Emergent Wetlands (Mineral Flat Wetlands)

A total of 19.5 acres of mineral flat wetlands (emergent wetlands) located in fallow pasture were identified within the HSMB – Old Field Tract (Photographs 20-28). These areas have been maintained as improved pasture used for cattle grazing for many years. The vegetation dominating these areas consists of narrow-leaf marsh elder (*Iva angustifolia*), velvet panicum (*Dichanthelium scoparium*), knotroot bristlegrass, late boneset, broomsedge (*Andropogon virginicus*), white prairie aster, Florida paspalum, Oklahoma blackberry, bushy aster (*Symphotrichum dumosum*), blue mistflower (*Conoclinium coelestinum*) and prairie false foxglove (*Agalinis heterophylla).* It should be noted that while this habitat does have several native species present, narrow-leaf marsh elder constitutes 85-90 percent of the total cover.

Mixed Shrub/Scrub and Emergent Riparian Habitat

A total of 13.3 acres of mixed shrub/scrub and emergent wetland riparian habitat were identified within the HSMB – Old Field Tract (Photographs 31-41). The vegetation dominating these areas consists of pecan, green ash, American elm, Shumard oak, roughleaf dogwood (*Cornus drummondii*), Canada wildrye, giant goldenrod (*Solidago gigantea*), Oklahoma blackberry, broomsedge, velvet panicum, frost grape (*Vitis vulpina*) and poison ivy (*Toxicodendron radicans*).

Upland Field (Fallow Pasture)

A total of 43.8 acres of upland, herbaceous-dominated, field habitat located in fallow pasture were identified within the HSMB – Old Field Tract (Photographs 49-54). These areas have been maintained as improved pasture used for cattle grazing for many years The vegetation dominating these areas consists of winged elm, coralberry, honey locust, cockspur hawthorn (*Crataegus crus-galli*), shining sumac (*Rhus copallinum*), bitter sneezeweed (*Helenium amarum*), common Bermudagrass, Canada goldenrod (*Solidago canadensis*), woolly croton (*Croton capitatus*), Carolina horsenettle, velvet panicum, knotroot bristlegrass, broomsedge, white prairie aster, Oklahoma blackberry, annual ragweed, Indiangrass (*Sorghastrum nutans*), switchgrass, Chinese bush-clover, common greenbrier and Japanese honeysuckle*.*

2. Soils

The *NRCS Web Soil Survey for McIntosh County* was used to determine mapped soil series for the HSMB site. The revised official series descriptions were used to confirm profile matrix, redox features, and texture of soils underlying the site. The soil survey shows that the Elk Creek Tract may be underlain by the Coweta-Bates complex, 3 to 8 percent slopes (9), Dennis silt loam, 3 to 5 percent slopes, severely eroded (15), Eram clay loam, 1 to 5 percent slopes (21), Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded (54), and Verdigris silt loam, 0 to 1 percent slopes, frequently flooded (55) (Figure 8). The Soil Survey shows that the Old Field Tract may be underlain by the Coweta-Bates complex, 3 to 8 percent slopes (9), Dennis silt loam, 1 to 3 percent slopes (12), Dennis-Verdigris complex, 0 to 8 percent slopes (16), Eram clay loam, 1 to 3 percent slopes (19), and Taloka silt loam, 0 to 1 percent slopes (52) (Figure 9). The Eram clay loam, Taloka silt loam and Verdigris silt loam are listed as hydric soil on both the local list (NRCSA Web Soil Survey 2010) and the national list (NRCS 2010 National Hydric Soils List by State). The remaining soils are not listed as hydric.

Soil samples were observed between the surface and approximately 18 inches below grade within each of the dominant habitat types. The depth of each sample was sufficient to determine changes in upper horizons and to observe field indicators of hydric soils. Field data indicate that the majority of the bottomland pasture and forested habitat located on the Elk Creek Tract is underlain by silt loam soils, similar to the mapped Verdigris series. The upland

portions of the Elk Creek Tract have a clay to clay loam soil similar to the mapped Eram series. Wetland criterion for hydric soils was met at all six sample locations located in the identified wetland habitat (Appendix C – Data Sheets SP1, SP2, SP2A, SP2B, SP5 & SP6, Appendix B - Soil Profile Photographs 38, 39, 51, 52 & 67). All of the data locations, except for the uplands, were located in the floodplain and exhibited some degree of wetland hydrology. Field data indicate that the majority of the mineral soil flat wetlands and riparian wetland habitat located on the Old Field Creek Tract are underlain by silt loam soils, similar to the mapped Dennis and Verdigris series. The upland portions of the Old Field Tract have a silty sand to sandy soil that not similar to any of the mapped series. The wetland criterion for hydric soils was met at six sample locations located in the identified wetland habitat (Appendix C – Data Sheets SP7–SP11 & SP13, Appendix B – Soil Profile Photographs 29 & 30). All of the data locations associated with hydric soils also exhibited some degree of wetland hydrology.

3. Hydrology

The HSMB site is located in the Dirty-Greenleaf Watershed within the U.S. Geological Survey (USGS) Hydrologic Cataloguing Unit 11110102. The Dirty-Greenleaf Watershed is a subwatershed of the Lower Arkansas River Watershed. The portion of the Elk Creek Tract that is located in the floodplain of Elk Creek is relatively flat with elevations ranging from 550-560 feet above the National Geodetic Vertical Datum (NGVD) for mean sea level (Figure 4). Sources of hydrology on the site are primarily rainfall sheet flow and outbanking from Elk Creek and associated tributaries. The site drains primarily southwest to northeast into Elk Creek which ultimately drains into the Arkansas River approximately 25 miles east of the site. Elk Creek is the primary hydrological feature and receiving water within the Elk Creek Tract.

The Old Field Tract is located on a different landform in that it is not situated in the Elk Creek floodplain, but rather is in the rolling plains adjacent to and above the Elk Creek floodplain. Elevations associated with the Old Field Tract range from approximately 600-625 feet above the National Geodetic Vertical Datum (NGVD) for mean sea level (Figure 5). Sources of hydrology on-site are primarily rainfall sheet flow for the majority of the site, except for the narrow floodplain regions associated with the intermittent streams that receive periodic flooding from out of bank events. The site drains west to east into an unnamed intermittent stream which ultimately drains into Elk Creek approximately 0.5 miles east of the site.

Elk Creek Tract

The primary receiving water associated with the HSMB Elk Creek Tract is a perennial stream identified as Elk Creek. Elk Creek enters the property from the east near the southeast corner and flows west and makes a horseshoe style bend before exiting the property on the east side just north of the midpoint on the east boundary (Photographs 22-27). In total, there is approximately 3,117 lf of perennial stream identified on the Elk Creek Tract. This stream is a large, natural, stable channel with significant sinuosity and has an average Ordinary High Water Mark (OHWM) of 20 ft. This stream also has a large watershed that drains approximately 96 square miles upstream of the site. It should be noted that the portion of the Elk Creek channel that crosses the Elk Creek Tract is transitioning to the historic primary channel for Elk Creek. Sometime after 2012 (see Historic Aerial Photographs and Topo Maps in Appendix E), a secondary channel developed east of the Elk Creek Tract that effectively straightened out the channel and turned the horseshoe bend section that is on the Elk Creek Tract into what may eventually be an oxbow slough. However, currently the section of Elk Creek that is on the Elk Creek Tract still functions as an active channel and carries a large portion of the Elk Creek stream flow, especially during high-flow events.

There is one intermittent tributary of Elk Creek totaling 1,637 lf identified within the Elk Creek Tract. This stream enters from the west near the northwest corner and runs southeast for

approximately 1,637 lf before entering Elk Creek. This stream has an average OHWM of 5 to 8 ft with 3 to 9 ft banks (Photographs 17-21) and appears to receive seasonal groundwater influence. Seven ephemeral tributaries of Elk Creek were identified during the baseline study.

Ephemeral Streams 1, 2 and 3 (Photographs 1-9) were 716 lf, 849 lf and 409 lf in length respectively. These streams had OHWM's that averaged 3 to 6 ft with 1 to 4 ft banks. Ephemeral Streams 4, 5, 6 and 7 (Photographs 10-16) were 798 lf, 180 lf, 381 lf and 378 lf in length respectively. These streams had OHWM's ranging from 1 to 5 ft. These four ephemeral streams entered the previously described intermittent stream just above the point where the intermittent stream entered Elk Creek. Ephemeral Stream 2 contained a well-developed beaver dam (Photograph 59) located in the lower third of the reach just below the confluence with Ephemeral Stream 3. The resulting beaver pond (Photographs 57 & 58) was approximately 0.2 ac in size. All of the ephemeral streams were not flowing water at the time of investigation and appeared to receive flow only after localized rainfall events. There were also two small stock ponds located in the upland habitat (Photographs 68-70). Additionally, multiple abandoned channels or oxbow sloughs were observed in the bottomland forested habitat within the Elk Creek floodplain (Photographs 28 & 29).

Old Field Tract

The primary receiving water associated with the HSMB Old Field Tract is an unnamed intermittent stream (Intermittent Stream 1). This stream is a primary tributary of Elk Creek and has a watershed area of approximately 2.3 square miles. This stream enters the property from the south near the southeast corner and flows north-northeast for approximately 2,980 lf before exiting the property at the northeast corner. This stream had an OHWM that averaged 5 to 8 ft with 2 to 5 ft banks. The southern half of this stream had silty bed material (Photographs (4, 5 & 7) while the northern half of the stream consisted of bedrock (Photographs 6 & 8-10). Two additional intermittent streams (Intermittent Streams 2 & 3) were also identified during the baseline study. Intermittent Streams 2 and 3 are tributaries of Intermittent Stream 1 and were approximately 4,901 lf and 1,201 lf in length respectively. Intermittent Stream 2 (Photographs 11-17) had an average OHWM of 3 to 5 ft with 2 to 4 ft banks while Intermittent Stream 3 (Photographs 18 & 19) had an average OHWM of 2 to 3 ft with 1 to 3 ft banks. All of the identified intermittent streams appeared to receive seasonal groundwater influence. On first inspection, it would appear that Intermittent Streams 2 and 3 are a braided system; however, based on historic aerial photography, it is evident that an on-channel pond (Photographs 44 & 45), approximately 0.3 ac in size, was constructed on Intermittent Stream 2 many years ago and that the spillway, or overflow point, was dammed by beavers which resulted in the stream developing a second channel (Intermittent Stream 3) that flows north then east before reentering Intermittent Stream 2.

Five ephemeral tributaries were also identified during the baseline study of the Old Field Tract. Ephemeral Stream 1 (Photograph 1) is a tributary of Intermittent Stream 2 and was approximately 2,175 lf in length and Ephemeral Stream 5 (Photographs 2 & 3) is a tributary of Intermittent Stream 3 and was approximately 1,105 lf in length. Ephemeral Streams 2, 3 and 4 are tributaries of Intermittent Stream 1 and are approximately 721 lf, 310 lf and 361 lf in length respectively. All of the ephemeral streams had OHWM's ranging from 1 to 3 ft with 1 to 3 ft banks. All of the ephemeral streams were not flowing at the time of investigation and appeared to receive flow only after localized rainfall events. An on-channel pond (Photographs 42 & 43), approximately 1.6 acres in size, was identified on Ephemeral Stream 1.

Wetland hydrologic indicators observed at the Elk Creek Tract included oxidized rhizospheres on living roots, water marks, drift lines (Photographs 53 & 54), rack lines (Photographs 55 & 56), geomorphic position, sediment deposits, water-stained leaves, and saturation visible on aerial photography. The wetland criterion for hydrology was met at six out of eight sample

locations established to characterize the Elk Creek Tract. Wetland hydrologic indicators observed at the Old Field Tract included oxidized root channels, water marks, drainage patterns, sediment deposits, drift lines (Photographs 46-48), geomorphic position, and saturation visible on aerial photography. The wetland criterion for hydrology was also met at 6 out of 8 sample locations established to characterize the site. It should be noted that the only primary wetland hydrology indicator observed within the mineral flat wetland habitat was oxidized rhizospheres on living roots.

6.4 Existing Waters of the U.S.

A Preliminary Wetland Determination (PWD) and Vegetation Survey/Inventory were conducted by HEI in October and December 2018 to determine the presence of potential waters of the U.S., including wetlands (WOUS), within the boundaries of the HSMB (Figures 2-5). The identified WOUS were delineated and their boundaries were recorded using a handheld GPS unit. The GPS data was mapped using ArcMap software. The results of the assessment revealed the presence of 50.9 acres of emergent wetlands, 34.3 acres of forested wetlands, 13.3 acres of shrub/emergent riparian habitat, 0.5 acres of beaver ponds, 3,117 lf (0.5 ac) of perennial stream (Elk Creek), 10,719 lf (1.3 ac) of intermittent stream, and 8,383 lf (0.3 ac) of ephemeral stream as listed in Table 1 below. Potential WOUS maps and wetland delineation data sheets have been included in Appendices A and C respectively.

A total of three existing easements were removed from the HSMB site (Appendix H). All three easements were associated with the Old Field Tract and included two McIntosh County section line easements on the west and north boundaries, and a natural gas pipeline easement on the south boundary. Also, a small area was also removed from the Old Field Tract near the entrance in the northwest corner of the property for parking and staging of equipment. No easements or additional acreage was removed from the Elk Creek Tract. All told, of the 170.9 total acreage of the two properties, 8.9 acres of easements (one pipeline and two County section lines) and muster area were removed, resulting in 162 acres, more or less, within the HSMB.

Table 1. Existing waters of the U.S. and other habitat within the HSMB site.

Waters of the U.S.	**Elk Creek Tract – 87.7 Ac. (Acres/Linear Feet)**	**Old Field Tract – 83.2 Ac. (Acres/Linear Feet)**
Emergent Wetlands	31.4 ac.	19.5 ac.
Forested Wetlands	34.3 ac.	NA
Shrub/Emergent Riparian	NA	13.3 ac.
Beaver Ponds	0.2 ac.	0.3 ac.
Perennial Streams	0.5 ac. (3,117 lf.)	NA
Intermittent Streams	0.2 ac. (1,637 lf.)	1.1 ac. (9,082 lf.)
Ephemeral Streams	0.2 ac. (3,711 lf.)	0.1 ac. (4,672 lf.)
On-Channel Pond	NA	1.6 ac.
Total	**66.8 ac.**	**35.9 ac.**

6.5 Short-Term and Long-Term Off-Site Threats

There are no foreseen short-term or long-term threats to the site. The remote location of the HSMB site removes surrounding urbanization as a potential threat. Additionally, the surrounding properties are rural and agricultural in nature so there are no foreseeable hazards to the site caused by incompatible surrounding land uses.

7.0 WATERSHED APPROACH

7.1 Watershed Boundary

The watershed boundary considered by the Sponsors in the location and establishment of HSMB is predicated on an 8-digit HUC as shown on Figure 10. The watershed boundary (primary service area) consists of two 8-digit HUCs that include HUC 11110101 Polecat-Snake and HUC 11110102 Dirty-Greenleaf, which the bank is located within. Elk Creek is the primary receiving water for HSMB and is a tributary of the Arkansas River. The location of HSMB is in the Lower Arkansas 6-digit HUC 111101. Major tributaries that feed the Lower Arkansas watershed include the North and South Canadian Rivers, Deep Fork River, Cimarron River and Verdigris River. Oklahoma City, Tulsa and many of the most densely populated areas in Oklahoma contribute to the lower Arkansas River basin. The Sponsors utilized a watershed selection process to evaluate potential aquatic resource replacement needs within the bank's geographical service area. Through the establishment and use of the HSMB, the Sponsors seek to provide a wide variety of landscape, resource, and habitat types to enhance, restore, and protect aquatic resource functions to improve water quality and wildlife habitat within the HSMB watershed.

7.2 Water Quality Issues

The Arkansas River is listed on the EPA's 2016 303(d) list of impaired waters. Additionally, Dirty Creek, Elk Creek, Snake Creek, and Polecat Creek, all of which are located in the Primary Service Area of HSMB, are also listed on the 303(d) list of impaired waters. To help protect water quality and aquatic resources associated with these waters, there is a need for mitigation within the watersheds. Currently, there are no established mitigation banks located within the boundaries of any of these watersheds. When considering population growth for the region, subsequent development, the boom in oil and gas exploration, and the current impaired status of many of the aquatic resources in the HSMB service area, there is a considerable need for a watershed level bank with a developed and proven concept of promoting restoration and enhancement of ecosystem integrity and function by focusing on landscape-scale mitigation opportunities that provide the potential for ecological connectivity, restoration, enhancement, and protection for many of the natural resources in the watershed.

Currently, the Arkansas River and Dirty Creek watersheds are impaired for enterococcus, and low dissolved oxygen. The Elk Creek watershed is impaired for low dissolved oxygen, pH and sulfates, and Robert S. Kerr Lake is impaired for turbidity. These impairments are attributed to both point sources and nonpoint sources. Within the watersheds, likely sources of nonpoint and point source pollution and nutrients include: agricultural runoff, sedimentation from erosion in disturbed watersheds, sludge application from waste water treatment facilities, seepage from septic tanks, and many urban runoff sources. Wetlands and stream improvements can help offset water quality issues like low dissolved oxygen levels, E. coli, enterococcus, turbidity and sulfates. Wetland restoration and enhancement efforts will take up excess movement of nutrients, sediment, and organic matter that historically were transferred to Elk Creek, and ultimately the Arkansas River, as runoff. Also, restored stream bank and riparian vegetation will help maintain stable water temperatures.

7.3 Immediate and Long-Term Watershed Needs

The *Geographical Service Area* for HSMB includes northeast Oklahoma, of which Tulsa is the metropolitan hub of the region and the second largest city in Oklahoma. The Tulsa metropolitan area has a population of approximately 1.2 million and accounts for 25% of the population of Oklahoma. Tulsa is a financial center and a city of many corporate headquarters, which indicates that continued development can be anticipated. Along with this development, additional transportation and infrastructure needs will be required to support the growth in population. Furthermore, 5 of the top 10 fastest growing cities in Oklahoma for 2019, which include Jenks, Owasso, Bixby, Glenpool and Collinsville, are located within 15 miles of Tulsa. These Tulsa area cities have experienced 25-35% growth over the last several years and these growth trends are expected to continue. The recent economic upswing has increased growth, specifically urban development, transportation projects, oil and gas production, and commercial and retail development are on the rise again, which will most likely result in unavoidable adverse impacts to aquatic resources in the Arkansas River watershed in northeast Oklahoma.

Second, a critical requirement of the CWA is that there must not only be "no net loss" of WOUS, associated with USACE-permitted projects, but there must be a net gain. This requirement saddles not only the perspective permittee with the task of sourcing and securing adequate mitigation, but can hinder the USACE's ability to process and approve projects. HSMB will provide permittees in the Tulsa region a valuable and viable mitigation option. To further illustrate the need for mitigation in the Tulsa region, the USACE processed approximately 100 individual permits from 2008 to date. Of these 100 projects, approximately half were in the Tulsa region and half were in the Oklahoma City region. Of the 50 or so projects that were in the Oklahoma City region, around 13 were within the primary service area of Excel Mitigation Center and the Deep Fork Mitigation Bank, the latter being the only USACE-approved mitigation bank currently operating in Oklahoma. The remaining 50 projects located in the Tulsa region had 37 projects that fell within the primary service area of HSMB. This example illustrates that a single strategically located mitigation bank in the Tulsa region can alleviate and capture required project-related mitigation needs at three times the rate of multiple banks in the Oklahoma City region simply due to the geographic concentration of impacts in the Tulsa region.

Long-term water quality needs for the watershed include: a reduction in excessive nutrient and sediment loading, reduction in stream bank erosion, reduction in impervious surface, and protection and restoration of wetlands and riparian areas. Long-term habitat needs are restoration of native wetlands and riparian corridors. Native prairie is the predominant historical ecological land cover within the watershed. Very little of this native prairie remains. Riparian corridors and wetlands are important not only for water quality, but they also are a critical habitat element for terrestrial and aquatic organisms. HSMB will help to offset some of these needs by increasing the size of riparian corridors which will reduce sediment and nutrient loading, stream bank erosion, and runoff. Stream bank stabilization activities will limit stream instability, sediment-loading, and bank erosion. Stream habitat restoration will remove invasive species, restore site hydrology, and improve habitat for aquatic fauna. With this in mind, HSMB is located approximately 50 miles southeast of the Tulsa metropolitan area and currently there is not a privately owned, USACE-approved, wetland and stream mitigation bank in the Arkansas watershed. HSMB will provide a valuable option to permittees to purchase stream and wetland mitigation credits from a bank that has mitigation available where the impacts to aquatic resources will occur within the region.

8.0 GEOGRAPHIC SERVICE AREA

A wetland or stream mitigation bank's *Service Area* is the geographical region, primarily based on watersheds or HUCs, within which a mitigation bank may be utilized to offset, or compensate

for, adverse impacts to the aquatic ecosystem anticipated by the Tulsa District, USACE-permit applicants. The HSMB service area encompasses several contiguous 8-digit HUCs in order to provide HSMB the best opportunity to fulfill the watershed approach contained in the mitigation banking rule. The service area was determined by selecting an area large enough to support an economically viable mitigation bank while ensuring appropriate aquatic resources provided by HSMB will effectively compensate for adverse environmental impacts across the service area.

The Compensatory Mitigation for Loss of Aquatic Resources; Final Rule [33 CFR 332.8 (6)(ii)(A)] states "*The service area must be appropriately sized to ensure that the aquatic resources provided will effectively compensate for adverse environmental impacts across the entire service area. For example, in urban areas, a U.S. Geological Survey 8-digit hydrologic unit code (HUC) watershed or a smaller watershed may be an appropriate service area. In rural areas, several contiguous 8-digit HUCs or a 6-digit HUC watershed may be an appropriate service area. Delineation of the service area must also consider any locally-developed standards and criteria that may be applicable*. *The economic viability of the mitigation bank or in-lieu fee program may also be considered in determining the size of the service area*". With this is mind, it is important to note that the HSMB site is in a very rural area located approximately 50 miles southeast of Tulsa and approximately 20 miles southwest of Muskogee. The HSMB site is located in the Dirty-Greenleaf 8-digit HUC, which is a small HUC with a watershed area of approximately 900 square miles. The primary service area for HSMB consists of two contiguous 8-digit HUC's (11110101 & 11100102) comprised of the Dirty-Greenleaf and Polecat-Snake. Both HUC's run in a southeast-northwest direction and the southern portion of HUC 11110101 goes through south Tulsa and the north portion of HUC 11110102 includes Muskogee. Second, in the opinion of the Sponsors, it is critical for HSMB to include HUC 11110101 in the primary service in order for the bank to be economically viable. If HSMB only included HUC 11110102 the largest populated area that the bank could service would be Muskogee. Third, from an ecological standpoint, approximately 75% of the primary service area is located within one Level III Ecoregion, the Central Irregular Plains.

The geographic service area for HSMB is graphically described on Figure 10. Any aquatic resource impacts which occur within the described service area, subject to USACE approval, will be eligible for credit withdrawal from HSMB. The HSMB Service Area shall be as follows:

1. ***Primary Service Area***

   In-kind habitat and out-of-kind habitat types associated with the Dirty-Greenleaf Watershed (HUC 11110102) and Polecat-Snake Watershed (HUC 11110101), specifically including all or portions of the following counties: Creek, Cherokee, Haskell, McIntosh, Muskogee, Okmulgee, Osage, Sequoyah, Tulsa, and Wagoner. Level III Ecoregions in the primary service area include the Cross Timbers, Central Irregular Plains, Ozark Highlands, Boston Mountains and Arkansas Valley.

2. ***Secondary Service Area***

   In-kind habitat and out-of-kind habitat types associated with all or part of the Lower Verdigris Watershed (HUC 11070105), Bird Watershed (HUC 11070107), and the portion of the Caney Watershed (HUC 11070106) south of Hwy. 60, specifically including all or portions of the following counties: Mayes, Nowata, Osage, Rogers, Tulsa, Wagoner and Washington. Level III Ecoregions in the secondary service area include the Cross Timbers, Central Irregular Plains and Flint Hills.

3. ***Case by Case Basis***

   In exceptional cases, the USACE would consider, and may approve, the use of HSMB for compensatory mitigation located outside the primary and secondary service areas but within the regulatory boundary of the USACE, Tulsa District.

For impacts occurring outside of HSMB's primary service area, but within the secondary service area, crediting ratios will include a 1.5 multiplier (i.e. 1.5 credits would be required instead of 1 credit for projects/impacts in the secondary service area). At the USACE's discretion, projects not included within the primary or secondary service areas will be evaluated on a case-by-case basis to determine the eligibility for credit withdrawal. If a project located outside the primary and secondary service areas is approved by the USACE, the ratio of mitigation to impact will be 3:1.

9.0 MITIGATION PLAN

9.1 Objectives

The Sponsors have developed a mitigation plan for the HSMB. Implementing this plan would restore and enhance exiting WOUS for the site and provide additional aquatic ecosystem functioning for the watershed. Under this MBI, the Sponsors will create the HSMB which will be approximately 162.02 acres in area. To achieve this goal, the Sponsors propose to undertake the following activities:

- Restore 28.4 acres of Forested Wetlands
- Enhance 35.1 acres of Forested Wetlands
- Enhance 18.4 acres of Emergent Wetlands
- Enhance 22.5 acres of Riparian Buffer
- Enhance 8,183 linear feet of Ephemeral Streams
- Enhance 10,654 lineal feet of Intermittent Streams
- Enhance 3,117 linear feet of Perennial Streams
- Protect 52.7 acres of Upland Buffer

All of these activities are in accordance with the provisions of this MBI and the *Site Development Plan* detailed in Section 10.0. The Sponsors shall then maintain the bank in such condition in perpetuity. The aquatic benefits provided by the planned restoration and enhancement activities will compensate for the loss of such habitats within the *Geographic Service Area* of the bank. Implementation and management of HSMB will undoubtedly improve water quality by filtering surface and subsurface water that drains across the property and will store and treat water that floods the site when Elk Creek, or its tributaries, overflow their banks and flood portions of the property. All these benefits (wetland restoration and enhancement, riparian corridor restoration and enhancement, stream enhancement, and upland buffer protection) are practices that are sorely needed in the Arkansas River watershed to prevent erosion, capture erosion from other sources, improve water quality, and improve stream bank stability.

9.2 Site Selection

The HSMB property was selected by the Sponsors for several reasons, including but not limited to, the amount of degraded or altered stream channels onsite which offer great potential for restoration and enhancement. Favorable topography and hydric soils also afford a great opportunity for wetland restoration and enhancement, as well as the potential for enhancing hydrology that has been reduced due to channel incision and erosion. HSMB has a landscape position that will allow for significant water quality benefits, not only in the Elk Creek watershed, but in the greater Arkansas River basin as well. The property's location immediately adjacent to Elk Creek will create important benefits for the watershed as runoff will be filtered as it flows across the HSMB. The bank's position adjacent to a large perennial stream and large intermittent tributaries makes it ideal for forested bottomland and riparian restoration. Restoring and enhancing large wetland areas and riparian corridors will increase habitat connectivity for

migratory waterfowl between existing wetland and open water habitats. Finally, by enhancing existing riparian corridors and reestablishing non-existent corridors, the bank will enhance wildlife corridors already used by animals that travel in and through Elk Creek and its tributaries.

The feasibility of restoring and enhancing streams and wetlands within HSMB is considered excellent for several reasons. First, the majority of the wetlands and streams identified on the site have been heavily degraded or altered as a result of past agricultural or grazing activities. As a result, there is ample opportunity to restore and enhance streams and wetlands on the site. Additionally, there is excellent potential to restore and enhance streams and wetlands within the site due to relatively flat topography and poor drainage characteristics of the soil. There are multiple locations with this combination of traits where previously cleared forested wetlands, or degraded emergent wetlands, can be restored or enhanced without altering topography or using artificial hydrology.

Second, the primary source of water for wetlands located within HSMB is precipitation and overbanking from Elk Creek and its tributaries. Based on this, another objective of HSMB will be to install check dams into several of the ephemeral streams to promote more frequent out-of-bank events whereby hydrology within the Elk Creek floodplain will be enhanced. Third, opportunity exists to restore and enhance ephemeral and intermittent tributaries by reestablishing and enhancement riparian corridors, removing man-made dams, installing in-stream structures to stop channel incision and erosion. Finally, the HSMB site is currently being utilized for cattle grazing and consists of open ground with easy access and few constraints. Management of HSMB will limit anthropogenic disturbance that would degrade sensitive species and habitats as well as ensure monitoring of conditions to identify and reduce challenges to long-term viability of the project.

9.3 Water Rights

It is important to note that the Sponsors control sufficient water rights to ensure success of the HSMB. The overall approach to establishing and maintaining HSMB is restoration and enhancement of naturally occurring and functioning aquatic systems that have been altered or degraded by anthropogenic activities. The aquatic resources that exist at the HSMB site derive necessary hydrology from localized rainfall and periodic overbanking from Elk Creek and its tributaries. The Sponsors make no warranty, either currently or in the future, that the availability of water for the site will not decrease due to the watershed being built out. While that assurance cannot be made, location and land use do help alleviate that concern for the HSMB. First, HSMB is located in a very rural area that has seen very little development, other than homesteads, and development of any consequence within a 20-30 mile radius in the next 20-30 years is very unlikely.

Second, streams on HSMB are near the headwaters of a natural drainage system. The streams will be enhanced to improve interaction with the floodplain, which will help to sustain vegetation in wetlands and riparian habitat. No disturbance to the upstream watershed which would negatively affect or divert flow in these streams is anticipated. Third, adjacent lands surrounding HSMB (Elk Creek Tract) consist of over one hundred acres that are owned by the State of Oklahoma. Remaining lands surrounding HSMB consist of privately owned vacant tracts predominantly used as grazing lands or maintained as wood lots. This will provide a certain measure of protection for a significant portion of the watershed upstream of the HSMB site. Finally, there are no temporary or long-term structural management requirements associated with the wetland and/or restoration and enhancement activities that are needed to assure hydrologic/vegetative restoration.

9.4 Threatened and Endangered Species

Threatened and endangered species were assessed in conjunction with the PWD of the HSMB site. Species accounts and habitat requirements were collected and reviewed from the USFWS. According to county lists provided by the USFWS's Information for Planning and Conservation (IPaC) website, interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), red knot (*Calidris cantus rufa*), whooping crane (*Grus americana*), American burying beetle (*Nicrophorus americanus*) and northern long-eared bat (*Myotis septentrionalis*) are federally listed as threatened or endangered in McIntosh County (USFWS, 2018).

Least Tern

Potential nesting habitat for the least tern often includes sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. Sandbars do occur within the Elk Creek basin; however, they are small and infrequent. For feeding, least terns need shallow water with an abundance of small fish. Shallow water areas of lakes, ponds, and rivers located close to nesting areas are preferred.

Piping Plover

Piping plovers in the Great Plains make their nests on open, sparsely vegetated sand or gravel beaches adjacent to alkali wetlands, and on beaches, sand bars, and dredged material islands of major river systems. Elk Creek offers very little in the way of potential nesting habitat for piping plover.

Red Knot

Red knot breeding grounds consist of sparsely vegetated hillsides in drier tundra areas in the Artic. Outside of the breeding season, the red knot utilizes intertidal, marine habitats near costal inlets, estuaries, and bays. While the HSMB obviously does not contain suitable habitat for the red knot, the potential for utilizing the site as a stopover during annual migration may occur.

Whooping Crane

The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Whooping cranes breed and nest in wetland habitat in Canada. During migration, whooping cranes use a variety of habitats; however, wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands. The whooping crane is a bi-annual migrant, traveling between its summer habitat in central Canada, and its wintering grounds on the Texas coast, across the Great Plains of the U.S. in the spring and fall of each year. Based on the habitat requirements of the whooping crane, the HSMB site may be utilized during migration.

American Burying Beetle

Current information suggests that the American burying beetle is a habitat generalist, or one that lives in many types of habitat, with a slight preference for grasslands and open understory oak hickory forests. Historical records show that this beetle once lived in 35 states, the District of Columbia, and three Canadian provinces. Now, natural populations are known to occur in only four states: Rhode Island, Oklahoma, Arkansas, and Nebraska. Based on known populations of beetles in this region of Oklahoma, it is likely that the HSMB contains suitable habitat for the American burying beetle.

Northern Long-Eared Bat

Northern long-eared bats spend winters hibernating in caves and mines. During the summer, they roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. The northern long-eared bat primarily flies through the understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles. The northern long-eared bat's range includes much of the eastern and north central United States, including Oklahoma. Based on habitat requirements of the northern long-eared bat, it is likely that the HSMB contains suitable summer and feeding habitat.

It is the opinion of the Sponsors that implementation of stream and wetland restoration and enhancement activities required to establish and develop the HSMB will have no effect on potential threatened and endangered species or their habitat. On the contrary, the Sponsors believe that establishment of HSMB and implementation of habitat improvement activities and long-term protection will benefit several of the previously described listed species.

9.5 Cultural Resources

A Phase I Cultural Resources Survey was conducted by Tejas Archaeology in August 2019 for the HSMB site. The purpose of the survey was to determine if there were previously documented sites and/or undiscovered sites that may eligible for listing on the National Register of Historic Places (NRHP) and that may be impacted by activities associated with the project. The results of the survey indicated that the HSMB site contains no cultural resources that meet the criteria for listing on the NRHP. If any cultural resources are encountered in the course of development of HSMB, all work will cease until a determination of significance can be made by the USACE. A copy of the archaeological survey report has been included as Appendix G.

10.0 SITE DEVLOPMENT PLAN

The overall management objective of HSMB is to restore and enhance wetlands and streams on the subject site which will ultimately have a water quality benefit to the Elk Creek watershed and the Arkansas River Basin. The Sponsors propose to develop HSMB according to the Site Development Plan outlined in the following sections (see Figures 6 & 7). The basic natural resource management approach for habitat manipulation is to recreate vegetative communities that closely approximate natural, self-sustaining, native, plant communities, associated with the Elk Creek and Arkansas River watersheds. Bottomland habitat associated with Elk Creek, and the larger streams found on the Old Field Tract, historically were heavily forested as captured by C.H. Fitch who documented forests in the region with his *Woodlands of Indian Territory* map in 1899. Management planning emphasizes efforts to determine the appropriate nature of potential natural vegetation for the area. Targeted plant communities will be those that best represent potential natural vegetation expected for the respective range and woodland/forest site conditions (i.e. soils, climate, hydrology, fire, etc.) for the area. Concurrently, management planning also considers potentially destabilizing impacts of changes in soils, hydrology, fire, and non-native plant invasions on the site, and long-term maintenance of targeted native plant communities. In addition, management begins with current conditions and works gradually to achieve sustainable, low maintenance, plant community objectives. The general approach will be to first reverse or modify historic vegetative alterations to provide conditions suitable for hydrophytic species and then plant native tree species, as well encourage the natural establishment of native plants.

To establish HSMB, the Sponsors will restore and enhance bottomland forested wetland habitat, enhance degraded mineral flat wetlands, enhance ephemeral, intermittent and perennial streams, enhance riparian corridors, enhance hydrology associated with the Elk Creek floodplain, and protect upland buffers. In summary, HSMB will restore and enhance 63.5 acres of forested

wetlands, 18.4 acres of emergent wetlands, 22.5 acres of riparian habitat, 3,117 lf of perennial stream (0.5 acres), 10,654 lf of intermittent stream (0.4 acres), 7,805 lf of ephemeral stream (0.4 acres), and protect 52.7 acres of upland buffer. The goal of HSMB is to protect and maintain these restored and enhanced aquatic resources in perpetuity. The work will be performed in accordance with the provisions of an approved MBI and regulatory permits (to be reviewed and approved by the USACE and IRT). The Sponsors realize that the USACE and other IRT member agencies may regard some enhancement or restoration efforts as having a higher ecologically significance than others. Efforts will be made to conduct mitigation activities with the following level of order:

1. Forested Wetland Enhancement and Restoration (Bottomland Hardwood)
2. Mineral Flat Wetland Enhancement (Emergent Wetlands)
3. Stabilize Incised Intermittent Stream and Reconnect Impounded Ephemeral Stream
4. Stabilize Remaining Ephemeral Streams on Elk Creek Tract
5. Riparian Habitat Enhancement Associated with Elk Creek Tract Tributaries
6. Riparian Habitat Enhancement Associated with Old Field Tract Tributaries
7. Hydrology Enhancement of the Elk Creek Floodplain
8. Upland Buffer Protection

Once established, HSMB will improve aquatic functions and services (water quality and wildlife habitat). The restored and enhanced streams, wetlands, riparian and upland buffers will provide habitat for a wide variety of water-dependent and terrestrial wildlife species.

10.1 Forested Wetland Restoration & Enhancement

The EPA utilizes the definition of restoration as described in 1992 National Research Council (NRC) report, *Restoration of Aquatic Ecosystems*, as the "*return of an ecosystem to a close approximation of its condition prior to disturbance."* That report also states*, "The term restoration means the reestablishment of predisturbance aquatic functions and related physical, chemical, and biological characteristics. Restoration is a holistic process not achieved through the isolated manipulation of individual elements. Merely recreating a form without the functions, or the functions in an artificial configuration bearing little resemblance to a natural form, does not constitute restoration. The objective is to emulate a natural, self-regulating system that is integrated ecologically with the landscape in which it occurs. Often, restoration requires one or more of the following processes: reconstruction of antecedent physical conditions, chemical adjustment of the soil and water; and biological manipulation, including the reintroduction of absent native flora and fauna*".

Accordingly, the Sponsors propose to restore and enhance approximately 63.5 acres of bottomland forested wetland habitat on HSMB. There are approximately 28.4 acres of forested wetland restoration on the Elk Creek Tract that was cleared and is currently maintained as bottomland pasture and 3.4 acres of forested wetland enhancement that consists of young hardwood dominated by pecan. Additionally, there are 27.3 acres of existing forested wetland habitat proposed for enhancement by removing cattle only. The Old Field Tract has approximately 4.4 acres of forested wetland restoration that currently consists of shrub/scrub and emergent wetland habitat outside the riparian areas adjacent to the intermittent streams. Restoration and enhancement of these areas will be accomplished by planting an appropriate mixture of native bottomland hardwood species during the standard planting season (December-March).

Within the restoration areas, seedlings will be planted using 12 x 12 foot spacing, for an initial stand density of at least 302 seedlings per acre. Within the enhancement areas, seedlings will be understory planted using a 14 x 14 foot spacing, for an initial stand density of at least 225 seedlings per acre. A mixture of at least 50 percent hard/soft mast and 50 percent light seeded

species, will be planted in both the restoration and enhancement areas in accordance with the species listed in Table 2. If seedling availability affects the ability to achieve the desired mixture of hard and soft-mast or light-seeded species listed above, then adaptive management will be employed to delay planting until the designated species can be obtained or additional, native hard-soft mast and light-seeded species may be substituted on approval from the USACE.

In determining the desired stocking level and species composition for bottomland forested wetland restoration and enhancement prescriptions, it is important to remember that little information is available for characterizing old growth bottomland hardwood forests in East-Central Oklahoma. Comparisons can be drawn by looking at isolated pockets within other portions of Central Irregular Plains Ecoregion; however, very few examples exist in the region of the HSMB site. With this in mind, it is widely accepted that the appropriate bottomland hardwood community for mitigation projects should be an even-aged stand dominated by large, hard-mast producing species, with complete canopy coverage, despite the fact that very few documented old growth, or remnant, hardwood stands located in other parts of the U.S. exhibit these traits. Thus, a quandary of sorts, exists for the entity tasked with realizing this vision. It is widely accepted that old growth forests are dynamic and fluid, and are extremely diverse. This idea runs counter to the normal picture painted for old growth forests being static systems dominated by a few very large species. In fact, old growth forests are primarily uneven-aged due to fires, floods, tornadoes, insects, and other natural events. Tree species range from pioneer to climax, or hard-mast producing to light-seeded, and stem densities can vary wildly from 60 to 70 to several thousand per acre. In short, there are no guidelines for reestablishing an old growth bottomland forest community.

Table 2. List of native tree and shrub species to be planted on the HSMB site.

Common Name	Scientific Name	Hard Mast	Soft Mast	Light Seeded	Location*
Shumard Oak	*Quercus shumardii*	x			W/R
Bur Oak	*Quercus macrocarpa*	x			W/R
Post Oak	*Quercus stellata*	x			W/M
Northern Pin Oak	*Quercus palustris*	x			W/R
Sweet Pecan	*Carya illinoensis*	x			W/R
Bitternut Hickory	*Carya cordiformis*	x			W/R
Black Hickory	*Carya texana*	x			M
Black Walnut	*Juglans nigra*	x			M
Black Cherry	*Prunus serotina*		x		M
Buttonbush	*Cephalanthus occidentalis*		x		W
Persimmon	*Diospyros virginiana*		x		W/R
American Elm	*Ulmus americana*			x	W/R
Hackberry	*Celtis laevigata*			x	W/R
Black Willow	*Salix nigra*			x	R
Sycamore	*Platanis occidentalis*			x	R
Boxelder	*Acer negundo*			x	R
Cottonwood	*Populus deltoides*			x	W/R
Green Ash	*Fraxinus pennsylvanica*			x	W/R
River Birch	*Betula nigra*			x	R

* Location abbreviations are as follows: Wetland (W), Riparian (R), and Mesic (M)

With that being said, since no data exists for characterizing stand dynamics of old growth bottomland hardwood forests in this part of Oklahoma, the Sponsor has developed reforestation

prescriptions, utilizing widely accepted native tree species for the region and hardwood reestablishment stocking rates commonly used by the NRCS, USFWS, and Forest Service. Existing data suggests that typical mature hardwood bottom forests from Illinois to East Texas contain an oak component ranging from 25 to 50 percent with an average stocking level from 130 to 150 trees per acre (Allen 1997). The standard spacing utilized by the Natural Resource Conservation Service (NRCS) and the U.S. Fish and Wildlife Service (USFWS) for hardwood restoration projects is 12 ft x 12 ft, or 302 trees per acre (Allen et al. 2004). When considering hardwood restoration, research conducted by the NRCS and USFWS has shown that fewer seedlings are required per acre and may be just as effective in meeting project goals. A wider spacing of planted hard-mast species will allow for establishment of light-seeded species and will ultimately produce a more diverse and ecologically rich forest. Based on USDA Forest Service guidance for southern hardwood management, they recommend planting 100 to 450 trees per acre, with 300 to 400 trees per acre being more desirable to account for mortality (USDA 1994). Finally, the NRCS in Oklahoma currently utilizes a prescription of 302 trees per acre (12 ft x 12 ft spacing) for all hardwood reforestation projects in McIntosh County associated with the Wetland Reserve Program (unpublished guidance).

Site preparation activities associated with the forested wetland restoration and enhancement areas will include removal of invasive herbaceous species and pioneer tree species that have encroached around the margins of these management units. Broadcast and selective herbicide treatments will be utilized during the spring and early summer to remove undesirable herbaceous vegetation and sapling-sized light-seeded species in preparation for planting. Additionally, dense areas of light-seeded tree species will be mechanically removed by clearing and piling. The resulting piles will be left in place for wildlife habitat; however, the piles will be small, less than 1/10th-acre in size, and will be evenly spaced across the site.

An additional component of the forested wetland enhancement objective consists of approximately 28.4 acres of high quality bottomland forested wetland habitat located adjacent to, and in the floodplain of, Elk Creek on the Elk Creek Tract. Based on historic aerial photography, this forested habitat has been intact and undisturbed for the past 60 years. This forested wetland habitat consists of mature, diverse, logistically-significant, forest vegetation with undisturbed hydric soils, and is subject to jurisdictional wetland hydrology. Forest characteristics include 60-year age class, good species diversity, significant hard-mast component, good vertical stratification, and abundant cavity trees and snags. Protection of existing forested wetland resources will remove a threat to, or prevent the decline of, functions such as surface and sub-surface water storage and retention; will maintain the system's ability to remove pathogens, soluble chemicals (including nutrients), and particulates from the water column; and will provide physical structure for habitat and landscape patch structure for wildlife. While only minor enhancement activities, consisting of removing cattle, are prescribed for this area, the main goal is to protect the integrity of this habitat forever. This habitat is important because it provides a vision forward for the HSMB project as a whole, and a reminder of what once was because of the intrinsic, almost primitive essence, which is uncommon for forests in the area today. As such, the realization of the importance of this type of habitat is the primary reason it is valuable mitigation.

10.2 Mineral Flat Wetlands Restoration (Emergent Wetlands)

Mineral flats, or flatwoods as they are commonly referred to in the Gulf Coastal Region, are a hydrogeomorphically unique type of wetland that are characterized by poorly drained soils, seasonal drying cycles, flat topography, and are typically located on terraces, interfluves, or old lake beds (Marshall 2011). The main source of water is precipitation, and they receive virtually no groundwater discharge, which distinguishes them from depressions and slopes. Dominant hydrodynamics are vertical fluctuations and water loss is by evapotranspiration, overland flow and seepage to groundwater (Marshall 2011). They are different from flat upland areas due to poor soil drainage, both vertically and laterally, and have low hydraulic gradients.

The emergent wetlands identified on HSMB are located on the Old Field Tract and consist of a patchwork of emergent wetland areas interspersed with uplands (Figure 3) and total approximately 18.4 acres. The current habitat associated with these wetlands is essentially a monoculture dominated by narrowleaf marsh elder (*Iva angustifolia*). This habitat was converted to improved pasture and maintained as such for many years. This part of Oklahoma, and more specifically the land associated with the Old Field Tract, would have historically been dominated by tallgrass prairie consisting of little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardi*), Indiangrass (*Sorghastrum nutans*) and switchgrass (*Panicum virgatum*) before farming and ranching began in earnest the early 1900's. Table 3 lists the upland and wetland plant species most commonly associated with tallgrass prairie for the region and reestablishing some combination of these plants, or additional native, facultative or wetter plants not listed, would be the goal for restoring these areas. More specifically, the enhancement strategy for the mineral flat wetlands is to establish a vegetation community dominated by grasses such as little bluestem, big bluestem, prairie cordgrass, Indiangrass and switchgrass along with grass likes such as spikerush (*Eleocharis* spp.), sedges (*Carex* spp.), rushes (*Juncus* spp.) and flatsedge (*Cyperus* spp.). Additionally, it is anticipated that many other native forbs, or broadleaf herbaceous plants, will also reestablish the site as a result of the management goals. As a result, the delineated mineral flats are degraded emergent wetland habitat and part of the overall goal of HSMB is to restore these areas to diverse, highly functioning, self-sustaining wetlands dominated by native species.

Table 3. Plant species common to tallgrass prairie ecosystems in Oklahoma.

Common Name	Scientific Name	Grass	Forb	Sedge/Rush
Long-Stem Spikerush	*Eleocharis palustrus*			x
Emory Sedge	*Carex emoryi*			x
Fescue Sedge	*Carex brevior*			x
Fox Sedge	*Carex vulpinoidea*			x
Inland Rush	*Juncus interior*			x
Flat-Stem Spike-Sedge	*Eleocharis compressa*			x
Heavy Sedge	*Carex gravida*			x
Woodland Sedge	*Carex blanda*			x
Yellow Nutsedge	*Cyperus esculentus*			x
Torrey's Sedge	*Juncus torreyi*			x
Ravenfoot Sedge	*Carex crus-corvi*			x
Common Rush	*Juncus effusus*			x
Prairie Cordgrass	*Spartina pectinata*	x		
Little Bluestem	*Schizachyrium scoparium*	x		
Big Bluestem	*Andropogon gerardii*	x		
Indiangrass	*Sorghastrum nutans*	x		
Switchgrass	*Panicum virgatum*	x		
Broadleaf Arrowleaf	*Sagittaria latifolia*		x	
Lead Plant	*Amorpha canescens*		x	
Indian Plantain	*Arnoglossum plantagineum*		x	
Heath Aster	*Symphyotrichum ericoides*		x	
Pallid Coneflower	*Echinacea pallida*		x	
Ashy Sunflower	*Helianthus mollis*		x	
Missouri Goldenrod	*Solidago missouriensis*		x	

The primary restoration strategy for these areas will be to utilize the native seed source that is already present in the soil but cannot out-compete narrowleaf marsh elder and other dominant invasive species. To accomplish this, one or more of the following methods will be used singularly or in combination: mowing annually in late summer (before seed drop), removing cattle, controlled burning, targeted herbicide treatments, and/or supplemental planting. While there are other native grass and herbaceous species in these wetland areas, they represent a small portion of the total cover. It is expected that by not allowing narrowleaf marsh elder to repopulate and dominate these areas every year, that the native grass and herbaceous seed source that is already in place, can reclaim these areas and thrive once again.

Specific techniques for enhancement of emergent wetland mineral flats will include, but are not limited to, mowing, burning, herbicide, and planting. During the first year of reestablishment, growth of native, grasses and perennial forbs may not appear impressive. Most growth of these plants will be below ground in the development of root systems. Mowing will be necessary during the first two years to control competing non-native and invasive species. These areas will be mowed to a height of no less than 4 inches to reduce competition from undesirable grasses and forbs. It will also serve to reduce moisture loss from the soil. It may take 2 to 3 years, or longer, for native grasses and forbs to dominate the site. Perennial forbs should respond sooner and become established along with annuals. Timing for mowing will have to be determined on-site and will require regular attention. While grazing is not typically preferred on mitigation projects or required for grassland/native prairie restoration, controlled burning is a tool that can be used for management of grasslands and herbaceous wetlands. No burning will occur during the first three years during reestablishment of native grasses. After that time, if the site has developed sufficiently and forage and thatch becomes excessive, burning on a 3 to 4 year rotation can be initiated. Burning will stimulate growth of dormant forb seed, promote growth of above ground vegetation, improve soil fertility, and help control the invasion of undesirable woody species. Fire releases nutrients back into the soil and reduces shading of new grass and forb seedlings. Many new species will also germinate from the existing soil seed bank. Winter burns benefit warm-season dominant plants, whereas summer burns promote growth of cool-season plants.

Depending on individual site management strategies, the use of prescribed mowing, herbicide and burning will be the primary tools used for the emergent wetland enhancement portion of HSMB. If, after two years, the performance standards for these areas are not being met for the site, the Sponsors will incorporate planting of commercially available tallgrass prairie seed mixes to supplement the reestablishment efforts. While not part of the mineral flat wetland restoration efforts, adjacent upland field habitat will be mowed, burned, or grazed annually as well which will allow native grass and herbaceous to repopulate these areas. As a result, it is anticipated that instead of just restoring a few acres of wetlands surrounded by uplands, that enhancement efforts will reestablish a much larger, more complex, more diverse, viable example of the interplay between uplands and wetlands once common in tallgrass prairie ecosystems.

10.3 Riparian Restoration

Riparian zones, or buffers, is the habitat directly adjacent to streams and can include trees, shrubs, or herbaceous plants. Riparian buffers provide many functions including flood storage and attenuation, stream bank stabilization, water quality improvement by trapping sediment and nutrients, in-stream benefits from stream shading, water temperature reduction, increased dissolved oxygen, and wildlife habitat (Anderson and Masters). Riparian buffers are integral to improving and maintaining stream integrity, water quality, and overall watershed health. Additionally, long-term protection of riparian areas adjacent to streams on HSMB will ensure that vegetation cannot be removed at some point in the future which would substantially reduce stream bank stability and negatively affect water quality.

In association with the stream enhancement activities on HSMB, the Sponsors propose to enhance approximately 22.5 acres of previously cleared riparian buffer adjacent to all of the Ephemeral Streams 1-5 and Intermittent Streams 1-3 on the Old Field Tract, and Ephemeral Streams 1-6 and a portion of the Intermittent Stream on the Elk Creek Tract. The ephemeral streams and the majority of the intermittent stream on the Elk Creek Tract have little to no riparian corridors. These streams were cleared in years past to increase tillable acreage and have been maintained as such to this day. Mitigation activities associated with these streams will consist of reestablishing riparian habitat. All of the ephemeral streams located on the Old Field Tract have no intact riparian habitat. This property has historically been utilized as grazing land, and unlike the Elk Creek Tract, is not in the floodplain and is maintained as improved pasture. Like the ephemeral streams, the intermittent streams on the Old Field Tract are degraded and have minimal riparian corridors. Based on historic aerial photography, no trees are visible anywhere on the Old Field Tract in 1984. By 1995, sporadic re-growth along the intermittent streams can be seen, but as evidenced by the riparian habitat seen today, mowing and grazing has retarded or reversed much of the natural riparian reestablishment. The riparian habitat present today, along the intermittent streams, consists of a very sporadic and narrow riparian corridor, dominated by sapling and shrub species, along the western half of Intermittent Stream 2 and no riparian on the east end. Intermittent Stream 3 has no riparian corridor at all. The southern one-third of Intermittent Stream 1 has a narrow riparian corridor with a few scattered large trees; however, the northern two-thirds of the stream has little riparian habitat.

Riparian enhancement activities associated with these streams will consist of designating a 25 ft buffer on each side of the top bank of each stream. Riparian establishment will be accomplished by planting an appropriate species mixture of bottomland and mesic hardwoods during the standard planting season (December-March). Within the riparian areas, seedlings will be planted using 12 x 12 foot spacing, for an initial stand density of at least 302 seedlings per acre. A mixture of at least 50 percent hard and soft-mast and a maximum of 50 percent light-seeded tree and shrub species will be planted in the riparian areas in accordance with the species listed in Table 2. If seedling availability affects the ability to achieve the desired mixture of hard and soft-mast or light-seeded species listed above, then adaptive management will be employed to delay planting until the designated species can be obtained or additional, native hard-soft mast and light-seeded species may be substituted on approval from the USACE.

The Sponsors maintain that the designated riparian buffer width of 50 ft (25 ft on each side of streams) for all of the streams associated with the HSMB is in compliance with the U.S. Army Corps of Engineers, Tulsa District, Aquatic Resource Mitigation and Monitoring Guidelines which states *"To be effective for mitigation purposes, buffers should be at least 50 feet wide. For all linear aquatic systems (e.g., streams), a minimum 50-foot buffer should be included on each side where possible. Where this minimum buffer width cannot be attained, permit applicants may implement a variable-width buffer to achieve an average width of 50 feet. For better protection, buffers widths in excess of 100 feet on each side may be included in a plan."* More specifically, all of the streams within the HSMB not only include a designated 50 ft riparian buffer but also include adjacent wetland and upland habitat, which is protected as part of the mitigation bank, as well. Therefore, the total buffer width for every stream within HSMB far exceeds the recommended 100 ft total buffer width.

10.4 Stream Enhancement

The objective of proposed stream mitigation actions is first and foremost to protect and enhance stream channels on HSMB. However, secondary benefits of these actions will enhance on-site aquatic resources and increase the hydrologic connection between the streams and the floodplain. Stream enhancement efforts will consist of riparian restoration/enhancement, channel reconnection, and in-stream work to address current channel instability and/or deter future instability.

Work on the Old Field Tract will consist primarily of riparian restoration/enhancement for all of the channels, except for Ephemeral Stream 1, which consists of reconnection and reestablishment of natural stream flow. Work on the Elk Creek Tract will consist of a combination of riparian restoration/enhancement and in-stream work. A detailed work plan is included in Appendix I, entitled *Honey Springs Mitigation Bank Stream Enhancement and Stability Plan* (Dutnell 2019), which discusses the need for improvement, design objectives, location and design of in-stream work on HSMB. Existing streams on HSMB are 1st, 2nd, and 3rd order streams that contribute to the Arkansas River watershed. A total of seventeen streams are included in the HSMB management scope, consisting of twelve ephemeral streams, four intermittent streams and one perennial stream, Elk Creek. The Elk Creek Tract has seven ephemeral streams that total approximately 3,711 lf while the Old Field Tract has five ephemeral streams that total approximately 4,672 lf. There are three intermittent streams located on the Old Field Tract that total 9,082 lf and one intermittent stream located on the Elk Creek Tract that totals 1,637 lf.

Elk Creek Tract

A section of Elk Creek, or a secondary/remnant section of Elk Creek, crosses the Elk Creek Tract and constitutes a portion of the east boundary. Elk Creek is a large, stable, natural, stream with significant sinuosity and a very large watershed. This stream totals approximately 3,117 lf, is a major tributary of the Arkansas River and one of the larger tributaries in McIntosh County. The mitigation actions for Elk Creek and Ephemeral Streams 5-7 consist of minor enhancement activities consisting of removing cattle. For remaining Ephemeral Streams 1-4 and the Intermittent Stream, enhancement activities consist of in-stream structures to promote stability. The following paragraphs contain excerpts from the previously mentioned *Honey Springs Mitigation Bank Stream Enhancement and Stability Plan* (Dutnell 2019) and details the in-stream work that will be performed on Elk Creek Tract.

Stream enhancement design for HSMB is based on the principals of fluvial geomorphology and the fact that, in natural systems, function and form are interrelated. The primary concern, from a fluvial geomorphological perspective, is the incision of Elk Creek and the resulting head cuts and channel incision of the ephemeral and intermittent channels on the tract. Addressing the incision of Elk Creek is beyond the scope of the project. Therefore, stream enhancement efforts are focused on stopping the advancing headcuts and channel incision on the ephemeral and intermittent channels, using natural channel design techniques, and cross vane structures. Stopping the head cuts will also protect, and enhance the wetlands. Other proposed structures (earthen channel plugs, rock weirs, and log jams) are designed primarily to enhance the wetlands, by backing up water and causing out of channel flows, but have the added benefit of enhancing the stream channels downstream by reducing the peak discharges in the channel, thus lowering the shear stresses in the channel, which should help to reduced head cutting downstream.

The intermittent stream on the Elk Creek Tract has been impacted by construction of Hwy. 69 which has increased streamflow velocities and has resulted in significant erosion and incision. This stream has also been degraded by cattle grazing and the majority of the stream's length does not have a riparian buffer. Therefore, the objective is to prevent future bed degradation. The channel appears to currently be at Stage V of Simon's channel evolution model. The proposed in-stream structures were designed to stabilize the bed from future degradation as a result of the incision of Elk Creek, and allow the channel to continue its evolution to Stage VI. Thus, the key parameter in evaluating the effectiveness of the design is the channel slope. The channel slope should not change significantly over the reach. Also, one would expect the width-depth ratio to first increase, then to decrease, as the channel evolves from Stage V to VI, whereas the entrenchment ratio should increase slightly over time, and the bank height ratio should decrease.

Should monitoring indicate trends that are contrary to these, the need for corrective action may be indicated. As a result, the mitigation actions for the intermittent stream on the Elk Creek Tract

consist of minor enhancement activities including removing cattle and more significant enhancement and restoration activities consisting of improving and reestablishing riparian zones. Additionally, in-stream work is proposed for this stream which will include installing four cross-vane structures to stop further incision and head cutting. The structures will be built mostly out of rock, but may also be constructed of wood and rock.

The remaining ephemeral streams on the Elk Creek Tract have varying degrees of bank erosion, channelization, and incision and have little to no riparian buffer. Mitigation prescriptions for Ephemeral Streams 1-4 include removing cattle, riparian enhancement through reestablishment and in-stream work that includes installing a series of in-stream structures to reduce erosion, prevent incision, preserve channel integrity and induce ponding and out-of-bank events. The goal of these structures, from a fluvial geomorphological perspective, is to prevent head cuts from moving up the ephemeral channels as a result of the incision of Elk Creek. A secondary benefit is that hydrology, and subsequently wetlands, will be enhanced, by backing up water and causing an increase of out of channel flows. At the downstream end, success of the project depends on the structures preventing the headcuts from advancing upstream. If the width-depth and/or the entrenchment ratio decreases, at cross-sections upstream of the structures, it may be an indication that the structure(s) are not effectively performing the task for which they were designed, and require corrective action. At the upstream end, success of the project depends on the structures backing water up and inducing out of channel flows. With this in mind, the plan for Ephemeral Streams 1-4 will consist of installing cross vanes in lower stream reaches to stop head cuts from extending up the channel by reducing peak discharges in the channel, thus lowering the shear stresses. Earthen plugs, rock weirs, and log jams will be installed in the upper and midstream sections which will encourage out of channel flows and ponding. Earthen plugs are simple check dams built out of material obtained on-site. These structures will be used at the upper ends of the streams where the channels are not well developed. Log jams are proposed in the streams where the channels are larger and more defined. Log jams are constructed of logs, boulders, cobble and gravel, and stair-step up from the existing invert elevation to the top of the bank. The proposed rock weirs are located in the ephemeral streams where the channels are still larger, and it is feared that log jams would prove unsuitable. These structures are to be constructed using a gravel/cobble mix, with some local dirt added to fill the spaces.

Success of the previously described in-stream work will be dependent on the successfulness of the structures in accomplishing their varying objectives. The cross-vanes in the intermittent channels are designed to stabilize the bed of the channel and prevent future channel incision, whereas the cross-vanes in the ephemeral channels are designed to stop advancement of the head cuts, to preserve upstream channel/floodplain connectivity. The earthen channel plugs, rock weirs, and log jams are designed to back up water and induce out of channel flows.

Old Field Tract

On the Old Field Tract, Intermittent Stream 1, which totals 2,980 lf, consists of two distinct sections. The southern one-third is characterized as a stable, silty bottom, highly sinuous stream with a sporadic and degraded riparian buffer and beaver activity. The northern two-thirds of the stream is characterized as an eroded, bedrock bottom stream with no riparian buffer. Mitigation actions for Intermittent Stream 1 consist of removing cattle and restoring riparian buffers. Intermittent Stream 2, which totals 4,901 lf, has a small on-channel pond that was constructed in the late 1940's or early 1950's. As a result, the remaining downstream section of Intermittent 2 was cut off from the main channel. Sometime in the late 1950's or 1960's beaver dammed up the spillway and diverted the primary water flow from Intermittent 2 into what is now Intermittent Stream 3, which totals 1,201 lf. Enhancement efforts proposed for Intermittent Streams 2 and 3 consist of restoration of riparian habitat and removal of cattle.

Ephemeral Stream 1, which totals 2,175 lf, on the Old Field Tract, currently has an on-channel pond. Mitigation actions are considered significant enhancement efforts that consist of removing the dam and restoring natural stream flow to the bisected channel. These efforts will restore a hydraulic connection for the entire length of the stream within the HSMB site. Additionally, this stream currently has no riparian buffer, so mitigation efforts will also include reestablishment of a riparian buffer corridor. A third mitigation action will consist of removing cattle. Ephemeral Streams 2-5 on the Old Field Tract will consist of removing cattle and reestablishing riparian buffers. An integral part of stream enhancement efforts will be the reestablishment of riparian buffers on both sites. This will provide in-stream benefits by increasing stream bank stability and will shade the channels as trees mature and canopies close, whereby water temperatures will be reduced and dissolved oxygen increased. Like the wetland restoration and enhancement areas, riparian buffer areas will be planted with native tree and shrubs.

10.5 Hydrology

Although not a component of the management strategy for HSMB, hydrology enhancement for wetlands associated with the floodplain of Elk Creek is anticipated as a result of stream enhancements. By installing structures in the streams to promote long-term stability and reduce incision, a secondary benefit will be an increase of out-of-bank events. As a result, additional hydrology will be provided for existing wetlands and restored and enhanced forested wetlands and will augment wetland functions on the site. Current hydrologic input to existing wetlands consists of groundwater, direct precipitation, surface runoff, and stream outbanking. Due to the incised nature of Elk Creek and past channelization and drainage improvements to the ephemeral streams to facilitate agricultural activities, out of bank events are less frequent. As a result, forested wetland enhancement and restoration areas will benefit by stream enhancement activities. It is important to clarify that hydrology enhancements are just that and no hydrology restoration is proposed because it is not needed. Furthermore, significant and prominent wetland hydrology indicators are present within the entire previously described wetland habitat on the Elk Creek Tract. Wetlands on the site have sufficient hydrology and are self-sustaining.

Alteration to natural hydrology on the site has occurred over the years, and the only modification consists of channelization of a few ephemeral streams and a portion of the intermittent stream to facilitate drainage, which has led to the incision of Elk Creek. However, it is appropriate to say that all of the ephemeral and intermittent streams on the Elk Creek Tract are degraded to some extent due to past and current activities. All of the streams have little to no riparian habitat, Ephemeral Streams 1-6 appear to have been channelized, or altered, to some degree as a result of past agricultural activities, and the lower section of Ephemeral Stream 2 is heavily incised. Degraded streams suffer from a lack of surface, groundwater and floodplain hydrologic connectivity, which is particularly true for incised streams which have a limited floodplain connection (Portugal E. 2015). Disruption in water connectivity limits the extent of aquatic habitat, raises water temperature, and reduces the extent of wetland and riparian habitat. One way to overcome this deficiency is to promote more frequent out-of-bank events. In nature this would be accomplished by beaver dams and debris jams which perform the same function as man-made check dams. Check dams, and other similar structures, and have been shown to influence stream hydrology by altering the primary function of streams which is to transport water and sediment. Surface water ponding upstream of these dams elevates the water table and groundwater levels and has been shown to attenuate water table decline during the dry season and alleviate, or diminish, the effects of drought (Portugal E. 2015).

10.6 Upland Buffer

HSMB will place a high priority on maintaining upland buffers adjacent to restored and enhanced wetland habitats and streams to ensure those features are protected and can be self-sustaining. Buffers may augment aquatic resource functions and help increase overall ecological functions of restored and enhanced wetland and riparian habitat. Non-wetland areas often provide

important habitat and hydrologic functions complementary to those provided by wetlands, and many biological processes require both wetland and non-wetland areas. For example, the life history of most amphibians includes both aquatic and terrestrial stages. It is understood that those uplands increase overall ecological functioning of the bank or other aquatic resources in the watershed or ecoregion. Likewise, uplands may provide connections between aquatic habitats that are essential to preserve certain species, such as amphibians. Approximately 52 acres of upland buffer, consisting of forest and pasture, will be protected on HSMB. These areas will continue to provide uninterrupted attenuating benefits to wetlands and streams on-site, and the pasture habitat will be allowed to develop native grass and herbaceous plant communities. These upland buffers are integral to current and future protection of wetland and stream features, especially on the Old Field Tract, where the mosaic of mineral soil flats and upland areas have a complex spatial and hydrological interconnection. No performance standards will be required for acreage associated with upland buffer acreage included as part of HSMB.

Upland buffer located on the Elk Creek Tract consists of fallow improved pasture. The long-term goal for this area is to allow reestablishment of native grass and herbaceous species. Upland buffer on the Old Field Tract consists of fallow improved pasture and the long-term goal is the same as the Elk Creek Tract. However, instead of allowing these areas to reestablish naturally, management operations wiil be the same as the mineral flat wetlands enhancement efforts.

11.0 BANK OPERATION

11.1 Credit Valuation

As discussed in the *Site Development Plan* in Section 10.0, data support the assessment that ecological functions are operating at a generally low level on the property. Therefore, the potential is demonstrated for substantial improvement through restoration and enhancement practices. Consequently, establishment of HSMB can be expected to produce considerable gains in ecological function for the site. There are several assessment methods available to determine the potential for restoring functions of HSMB wetlands and streams. At present, the Tulsa District USACE does not use a functional assessment method to determine both the amount of credits necessary to replace wetland or stream functions impacted by authorized projects or the credits available for a particular mitigation project. Therefore, the Sponsors have chosen to utilize specific indices, typically associated with qualitative and quantitative assessment methods, in order to generate a viable credit valuation, albeit subjective in nature, for the expected increases in functional value, or uplift, and the corresponding amount of wetland and stream credit that will be generated, per acre for wetlands and per foot for streams, as a result of site restoration and/or enhancement activities. The mitigation credits will become available in accordance with the *Credit Release Schedule* detailed in Section 14.0.

When considering, qualitatively, the amount of credit, or uplift, that the previously described restoration and enhancement activities will generate for the streams and wetlands within the site, it is necessary to consider the pre and post prescription conditions of the landscape, biota, physical, chemical, and biological processes of the water resources and hydrology. First, vegetation manipulation is a key component in the overall management strategy for the site. As previously stated, the majority of the site currently consists of previously cleared and maintained herbaceous dominated emergent wetlands, degraded mineral flat wetlands, and low quality to non-existent riparian habitat. The Sponsors propose to reestablish self-sustaining, native, diverse, high quality, bottomland forests, mineral soil flat wetlands and riparian communities that will increase the overall wetland function of HSMB and provide substantial uplift for the Elk Creek watershed, and ultimately, the Arkansas River Watershed. Vegetation manipulation will consist of planting native hard and soft-mast and light-seeded tree and shrub species in the herbaceous dominated wetlands and riparian buffers and promoting the reestablishment of native herbaceous

wetland species in the mineral flat wetlands. The habitat improvements will work in concert with hydrology and stream enhancement efforts to substantially increase the physical, chemical, and biological process for the aquatic resources associated with HSMB.

Second, sufficient hydrology is needed for the development and maintenance of wetland functions and is an objective of HSMB's landscape-scale approach the Elk Creek Tract. While a majority of the site still retains wetland characteristics, the floodplain has been landplaned, leveled and drained in years past to facilitate agricultural activities. It is evident from historic photography that Ephemeral Streams 1-6 were channelized to drain excess water from the site. Whether these features are man-made or natural, they currently function as ephemeral drainages. While it is not the intent of the Sponsors to reconstruct streams with more sinuosity to promote more outbank events, it is the intent to promote more frequent interaction between streams and the floodplain. Subsequently, hydrology enhancement efforts will not only accentuate a localized hydraulic connection between Elk Creek tributaries and the local floodplain, but moreover it will promote localized wetland functions such as flood storage, ground water recharge, increased soil moisture, sediment filtration, water quality enhancement, sediment reduction, and nutrient removal.

HSMB is approximately 162 acres and currently includes a mosaic of emergent and forested wetlands, streams, riparian buffers, and non-wetland habitat (see Figures 2 & 3). After the mitigation bank is complete, the Sponsors anticipate that approximately 157 acres of wetland habitat and streams will be restored and enhanced including 63.5 acres of forested wetlands, 18.4 acres of emergent wetlands, 22.5 acres of riparian habitat, 52.7 acres of upland buffer, 3,117 lf of perennial stream (0.5 acres), 10,654 lf of intermittent stream (0.4 acres), and 7,805 lf of ephemeral stream (0.4 acres). Credit valuation ratios listed in Table 3 account for the restoration and enhancement of existing degraded features into the proposed features. As such, although the total site area is approximately 162 acres, there will be an estimated 157 acres of credits generated as compensatory mitigation through the restoration and enhancement of bottomland hardwoods, emergent wetlands, riparian habitat, streams, and upland buffer.

As evidenced in previous sections, it is expected that significant increases in wetland functions will occur as a result of the establishment of HSMB. Therefore, the Sponsors will request 3 credits for every acre of emergent wetland enhancement (Old Field Tract), 4 credits for every acre of forested wetland enhancement (Elk Creek Tract Forested Wetland 2 & Old Field Tract), 5 credits for every acre of forested wetland restoration (Elk Creek Tract Forested Wetlands 1) and 1 credit for every 1 acre of forested wetland enhancement (Elk Creek Tract Forested Wetland 3). In consideration of the streams, Sponsor will request 1 credit for every 1 linear foot of perennial stream that is enhanced (Elk Creek Tract), 4 credits for every 1 linear foot of intermittent stream (Elk Creek Tract), 3 credits for every 1 linear foot of intermittent stream (Old Field Tract), 3 credits for every linear foot of ephemeral stream enhanced (Elk Creek Tract Ephemeral Streams 1-6 and Old Field Tract Ephemeral Stream 1) and 2 credits for every linear foot of ephemeral stream enhanced (Old Field Tract Ephemeral Streams 2-5). Sponsors will not request any credit for Ephemeral Stream 7 on the Elk Creek Tract.

1. Wetland Credits

Elk Creek Tract

Upon approval of this document, the USACE, in consultation with the IRT, grants the bank five (5) credits for every acre of forested wetland habitat that is restored (Forested Wetland 1), as shown in Table 3, for a total of 142.0 forested wetland restoration credits. Furthermore, the USACE, in consultation with the IRT, grants the bank four (4) credits for every acre of forested wetland that is enhanced (Forested Wetland 2) and one (1) credit for every acre of forested wetland that is enhanced (Forested Wetland 3) for a total of 40.9 forested wetland enhancement credits. The release of these credits shall follow the schedule described in Section 14.0.

Old Field Tract

Upon approval of this document, the USACE, in consultation with the IRT, grants the bank four (4) credits for every acre of forested wetland habitat that is enhanced, as shown in Table 3, for a total of 17.6 forested wetland enhancement credits. Furthermore, the USACE, in consultation with the IRT, grants the bank three (3) credits for every acre of emergent wetland habitat that is enhanced, for a total of 55.2 emergent wetland enhancement credits. The release of these credits shall follow the schedule described in Section 14.0.

Areas proposed to receive forested and emergent wetland credits for restoration and enhancement have been observed to contain all three criteria necessary for wetland determination (wetland hydrology, hydrophytic vegetation, and hydric soils) but provide limited ecological function as a result of degradation from anthropogenic impacts.

2. Stream Credits

Elk Creek Tract

Upon signature of this document, the USACE, in consultation with the IRT, grants the bank one (1) credit for every linear foot of perennial stream that is enhanced, as shown in Table 3, for a total of 3,117.0 perennial stream credits. Furthermore, the USACE, in consultation with the IRT, grants the bank four (4) credits for every linear foot of intermittent stream that is enhanced for a total of 6,548.0 intermittent stream credits. Furthermore, the USACE, in consultation with the IRT, grants the bank three (3) credits for every linear foot of ephemeral stream that is enhanced (Ephemeral Streams 1-6) for a total of 9,999.0 ephemeral stream credits.

Old Field Tract

Upon signature of this document, the USACE, in consultation with the IRT, grants the bank three (3) credits for every linear foot of intermittent stream that is enhanced, as shown in Table 3, for a total of 27,051.0 intermittent stream credits and. Furthermore, the USACE, in consultation with the IRT, grants the bank three (3) credits for every linear foot of ephemeral stream that is enhanced (Ephemeral Stream 1) and two (2) credits for every linear foot of ephemeral stream that is enhanced (Ephemeral Streams 2-5) for a total of 11,119.0 ephemeral stream credits.

The Sponsor has not requested credit for riparian habitat restoration or enhancement. Instead, the Sponsor has included the expected ecological uplift generated by riparian enhancement and restoration into credit determination for the streams. The release of these credits shall follow the schedule described in Section 14.0.

3. Upland Buffer

Approximately 52 acres of upland buffer will be included within the HSMB boundary and will of consist of 17.5 acres located in the western portion of the Elk Creek Tract and 35.2 acres scattered throughout the Old Field Tract. These buffers will separate the wetlands and streams from adjacent properties. These buffers are in addition to the dedicated riparian buffer associated with all the stream channels in HSMB.

Since these upland buffers are not required for development or long-term viability of the mitigation bank, they are included to provide an additional layer of protection for the wetlands and streams. The inclusion of these buffers will improve aquatic resources within the bank by filtering runoff and by preventing the establishment of undesirable vegetation through the creation of a mature perennial plant community. No wetland credit will be attributed to upland buffer acreage within the bank.

Table 4. Mitigation activities and credit valuation ratios for the HSMB.

Mitigation Activity	Existing Feature	Proposed Feature/Actions	Linear Feet	Acres	Credit Valuation Ratio	Total Stream Credits	Total Wetland Credits
Elk Creek Tract							
Forested Wetland Restoration (1)*	Low Quality Emergent Wetlands	Hardwood Restoration & Remove Cattle	-	28.4	5:1	-	142.0
Forested Wetland Enhancement (2)*	Low Quality Forested Wetlands	Interplanting & Remove Cattle	-	3.4	4:1	-	13.6
Forested Wetland Enhancement (3)*	High Quality Forested Wetlands	Minor Enhancement – Remove Cattle	-	27.3	1:1	-	27.3
Perennial Stream Enhancement	Erosion	Remove Cattle	3,117	-	1:1	3,117.0	-
Intermittent Stream Enhancement	Erosion & Degraded Riparian	Riparian Restoration & Remove Cattle	1,637	-	4:1	6,548.0	-
Ephemeral Stream Enhancement (#1-6)	Erosion & No Riparian	Restore Riparian, Increase Outbank & Remove Cattle	3,333	-	3:1	9,999.0	-
Ephemeral Stream Enhancement (#7)	Natural Stable Stream	Minor Enhancement – Remove Cattle	378	-	0:0	0.0	-
Riparian Enhancement*	No and/or Low Quality Riparian	Restore Riparian – Harwood plantings	-	7.0	0:0	0.0	0.0
Upland Buffer*	Pasture & Native Forest	Promote Native Species & Remove Cattle	-	17.5	0:0	-	0.0
Tract Total			**8,465**	**83.6**	**-**	**19,664.0**	**182.9**
Old Field Tract							
Emergent Wetland Enhancement	Low Quality Emergent Wetlands	Promote Native Emergent Wetlands & Remove Cattle	-	18.4	3:1	-	55.2
Forested Wetland Enhancement	Low Quality Shrub/Emergent Wetland	Hardwood Restoration & Remove Cattle	-	4.4	4:1	-	17.6
Intermittent Stream Enhancement	Restore Riparian & Remove Cattle	Riparian & Watershed Improvements	9,017	-	3:1	27,051.0	-
Ephemeral Stream Enhancement (#1)	Remove Dam, Restore Riparian & Remove Cattle	Restore Natural Streamflow & Riparian	2,175	-	3:1	6,525.0	-
Ephemeral Stream Enhancement (#2-5)	Restore Riparian & Remove Cattle	Riparian & Watershed Improvements	2,297	-	2:1	4,594.0	-
Riparian Enhancement*	No and/or Low Quality Riparian	Restore Riparian - Hardwood Planting	-	15.5	0:0	-	0.0
Upland Buffer*	Pasture	Promote Native Species & Remove Cattle	-	35.2	0:0	-	0.0
Tract Total			**13,489**	**73.5**	**-**	**38,170.0**	**72.8**
Bank Total			**21,954**	**157.1**	**-**	**57,834.0**	**255.7**

*No credit is attributed to riparian enhancement or the inclusion of upland buffer.

The Sponsors have not requested any credit for riparian habitat restoration and/or enhancement or upland buffer protection. Instead, the Sponsors have requested stream mitigation credit for riparian buffer acreage that is restored and/or enhanced. Additionally, the Sponsors have not requested any credit for expected hydrology enhancement that would be a secondary benefit as a result of installing in-stream structures in ephemeral and intermittent streams on the Elk Creek Tract. The applicable mitigation activity for the existing and proposed features, the acreage/linear feet of each feature, and the credit valuation ratio is detailed in Table 4 above.

11.2 Mitigation Ratios

USACE permit applicants may purchase mitigation credits from HSMB to provide compensatory mitigation for authorized unavoidable adverse impacts to the aquatic environment if approved by the USACE on a case-by-case basis. Any USACE permit applicant proposing to use the HSMB in lieu of other forms of compensatory mitigation must, at a minimum, demonstrate to the USACE that:

1. There is no practicable alternative to the discharge of dredged or fill material into a wetland or other water of the United States, and
2. All appropriate and practicable measures to minimize adverse impacts to the aquatic ecosystem have been included in the project, and
3. All appropriate and practicable compensatory mitigation for unavoidable adverse impacts is included in the project.

To adequately replace aquatic functions that would be lost or degraded in the project area, in-kind compensation of aquatic resource impacts will generally be required. USACE guidance defines in-kind mitigation as replacing an aquatic resource of a similar structural and functional type to the impacted resource type. Conversely, out-of-kind mitigation would be replacing different structural and functional aquatic resource type from the impacted resource type. More specifically, resource types would be wetlands and streams. As such, in-kind mitigation at HSMB will allow all wetland types (i.e. forested, emergent, shrub/scrub) to be mitigated with the mitigation types available at HSMB which consist of forested and emergent wetlands. HSMB can provide forested wetland credit for mitigation of impacts to emergent and shrub/scrub wetlands or emergent wetland credits for forested or shrub/scrub wetland impacts. In essence, HSMB will provide wetland credits that will offset emergent, shrub/scrub and forested wetland impacts.

Regarding in-kind mitigation for different order streams (i.e. ephemeral versus intermittent) on the HSMB, mitigation needs in the Tulsa District USACE are predominantly driven by impacts to streams. Impacts to ephemeral and intermittent streams make up the majority of permitted impacts, with ephemeral streams comprising the bulk of these impacts. While perennial stream impacts do occur, they are substantially less than ephemeral or intermittent stream impacts. In-kind mitigation implies replacing the impacted resource with the same “type” of resource and mitigation equivalency is the principle that offsets should provide habitat, functions, values and other attributes that are similar in type to the affected stream or wetland. Since the regional aquatic resource need for the Tulsa District is ephemeral stream mitigation and since off-site mitigation options are limited, the Sponsors maintain that the availability for in-kind mitigation for different order streams at the HSMB is not only needed but warranted. However, even though “inter-order” stream mitigation will be allowed at HSMB, all stream mitigation off-sets will be evaluated and approved by the USACE.

The primary functions of a stream are to transport water and sediment (Rosgen 1996). With that in mind, ephemeral, intermittent and perennial streams perform the same primary functions, albeit on different volumetric scales. In this sense, all streams perform these basic functions. Value is a non-quantifiable term, unlike function, and is used subjectively when an ecological feature is given

preference over another feature based on predetermined variables. So, if the primary function of all streams is the same, but a higher value is attributed to perennial streams than ephemeral streams, then this differential can be compensated for through higher mitigation ratios. With that said, the Sponsors do understand that perennial streams provide substantially greater functions and values than do ephemeral and intermittent streams. As such, ephemeral and intermittent stream mitigation will not be available to off-set perennial stream impacts at HSMB. Finally, no out-kind mitigation (i.e. wetland mitigation for stream impacts) will be allowed at HSMB.

The USACE shall have the final authority in determining the number of credits required to compensate for unavoidable adverse project impacts to waters of the United States. The USACE shall determine on a permit-by-permit basis the relative quality of the aquatic resources that would be adversely impacted unless another IRT member requests in writing to coordinate with the USACE on a particular case or all subsequent cases. In the absence of consensus among the USACE and coordinating IRT member or members on the quality of an impacted area, some other IRT-approved assessment methodology shall be used to determine the relative quality (low, medium or high) of the aquatic resources impacted. Credits in the credit availability account may be used to compensate for adverse impacts to waters of the U.S. For applicants choosing to utilize HSMB for adverse impacts to waters of the U.S., the following wetland and stream mitigation ratios below may be applied:

1. Wetlands

For adverse impacts to waters of the U.S., other than streams, that have been authorized by a DA permit occurring in the HSMB's Primary Service Area, the credit availability account may be debited as follows and detailed in Table 5:

A. Emergent Wetlands

- Emergent Wetlands for Emergent Wetlands - Two (2) credits, three (3) credits, and four (4) credits for each acre of low quality, medium quality, and high quality emergent wetlands adversely impacted, respectively.
- Emergent Wetlands for Shrub/Scrub Wetlands - Four (4) credits, five (5) credits, and six (6) credits for each acre of low quality, medium quality, and high quality shrub/scrub wetlands adversely impacted, respectively.
- Emergent Wetlands for Forested Wetlands - Six (6) credits, seven (7) credits, and eight (8) credits for each acre of low quality, medium quality, and high quality forested wetlands adversely impacted, respectively.

B. Shrub/Scrub Wetlands

- Forested Wetlands for Shrub/Scrub Wetlands - Two (2) credits, three (3) credits, and four (4) credits for each acre of low quality, medium quality, and high quality shrub/scrub wetlands adversely impacted, respectively.
- Emergent Wetlands for Shrub/Scrub Wetlands - Four (4) credits, five (5) credits, and six (6) credits for each acre of low quality, medium quality, and high quality shrub/scrub wetlands adversely impacted, respectively.

C. Forested Wetlands

- Forested Wetlands for Forested Wetlands - Three (3) credits, five (5) credits, and seven (7) credits for each acre of low quality, medium quality, and high quality forested wetlands adversely impacted, respectively.

- Forested Wetlands for Shrub/Scrub Wetlands - Two (2) credits, three (3) credits, and four (4) credits for each acre of low quality, medium quality, and high quality shrub/scrub wetlands adversely impacted, respectively.
- Forested Wetlands for Emergent Wetlands - One (1) credit, two (2) credits, and three (3) credits for each acre of low quality, medium quality, and high quality emergent wetlands adversely impacted, respectively.

Table 5. Wetland mitigation ratios for projects in the HSMB service area.

Wetland Impact Type / Quality	**Wetland Mitigation Ratio (Mitigation : Impact)**		
	Emergent	**Shrub/Scrub**	**Forested**
Emergent (Low)	2:1	-	1:1
Emergent (Medium)	3:1	-	2:1
Emergent (High)	4:1	-	3:1
Shrub/Scrub (Low)	4:1	-	2:1
Shrub/Scrub (Medium)	5:1	-	3:1
Shrub/Scrub (High)	6:1	-	4:1
Forested (Low)	6:1	-	3:1
Forested (Medium)	7:1	-	5:1
Forested (High)	8:1	-	7:1

Note: Projects located in the secondary service area will required the addition of a 1.5 multiplier.

2. Streams

For adverse impacts to streams that have been authorized by a DA permit occurring in the HSMB's primary service area, the credit availability account may be debited as follows and detailed in Table 6:

A. Ephemeral Streams

- Ephemeral Stream for Ephemeral Stream – One and one-half (1.5) credits, two (2.0) credits, and two and one-half (2.5) credits per linear foot of low quality, medium quality, and high quality ephemeral stream adversely impacted, respectively.

*Note: Though typically uncommon, the USACE may elect to allow the utilization of Ephemeral Stream mitigation for Intermittent Stream impacts. In such instances, the mitigation ratios will be as follows: Three (3) credits, four (4) credits, and five (5) credits per linear foot of low quality, medium quality, and high quality intermittent stream adversely impacted, respectively.

B. Intermittent Streams

- Intermittent Stream for Intermittent Stream – One and one-half (1.5) credits, two (2.0) credits, and two and one-half (2.5) credits per linear foot of low quality, medium quality, and high quality intermittent stream adversely impacted, respectively.
- Intermittent Stream for Ephemeral Stream - One (1) credit, one and one-half (1.5) credits, and two (2) credits per linear foot of low quality, medium quality, and high quality ephemeral stream adversely impacted, respectively.

C. Perennial Streams

- Perennial Stream for Perennial Stream – One and one-half (1.5) credits, two (2.0) credits, and two and one-half (2.5) credits per linear foot of low quality, medium quality, and high quality perennial stream adversely impacted, respectively.
- Perennial Stream for Intermittent Stream – One (1) credit, one and one-half (1.5) credits, and two (2) credits per linear foot of low quality, medium quality, and high quality intermittent stream adversely impacted, respectively.
- Perennial Stream for Ephemeral Stream – One-half (0.5) credit, one (1) credit, and one and one-half (1.5) credits per linear foot of low quality, medium quality, and high quality ephemeral stream adversely impacted, respectively.

Table 6. Stream mitigation ratios for projects in the HSMB service area.

Stream Impact Type / Quality	**Stream Mitigation Ratio (Mitigation : Impact)**		
	Ephemeral	**Intermittent**	**Perennial**
Ephemeral (Low)	1.5:1	1:1	0.5:1
Ephemeral (Medium)	2:1	1.5:1	1:1
Ephemeral (High)	2.5:1	2:1	1.5:1
Intermittent (Low)	*	1.5:1	1:1
Intermittent (Medium)	*	2:1	1.5:1
Intermittent (High)	*	2.5:1	2:1
Perennial (Low)	-	-	1.5:1
Perennial (Medium)	-	-	2:1
Perennial (High)	-	-	2.5:1

Note: Projects located in the secondary service area will required the addition of a 1.5 multiplier.

For adverse impacts to waters of the United States in HSMB's secondary service area authorized by a DA permit, the credit availability account will be debited as stated above but with the addition of a minimum 1.5 multiplier. At the USACE's discretion, projects not included within the HSMB's primary or secondary service areas will be evaluated on a case-by-case basis to determine eligibility for credit withdrawal. If a project located outside the primary and secondary service areas is approved by the USACE, the credit availability account will be debited as stated above but with a minimum 3.0 multiplier.

A minimum of one-tenth (0.1) credit shall be debited from the credit availability account for each transaction. If the number of credits required for compensation is not a whole number, then it shall be rounded to the nearest one-tenth credit.

The USACE shall determine on a permit-by-permit basis the relative quality of the aquatic resources that would be adversely impacted unless an IRT member requests in writing to coordinate with the USACE on a particular case or all subsequent cases. In the absence of consensus between the USACE and coordinating IRT member or members regarding the quality of an impacted area, IRT-approved functional assessment technique will be used to determine the relative quality (low, medium, or high) of the aquatic resource impacted.

It should be noted that if the Tulsa District USACE approves and implements the *Oklahoma Stream Mitigation Method*, or other stream and/or wetland assessment methodology, at some point in the future, and requires permittees to utilize that method to determine impacts to waters of the U.S., quantitative methods can used by permittees to correlate impacts to the qualitative based mitigation ratios designated for HSMB.

11.3 Ecological Performance Standards

In order for the HSMB to be considered an acceptable mechanism for mitigating wetland impacts associated with USACE permits, wetlands and streams that have been enhanced or restored within the site must satisfy wetland criteria described in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (U.S. Army Corps of Engineers, Wetland Regulatory Assistance Program 2010). In order to be considered fully successful, efforts within the HSMB must result in the restoration and/or enhancement of viable streams and wetlands capable of performing the important functions lost as a result of projects it is intended to mitigate. The following criteria will be used to determine the minimum level of success in reaching the ecological goals of the mitigation efforts:

1. Site Protection

A. The Sponsor shall dedicate in perpetuity, by an appropriate conservation easement, the entire 162.02-acre HSMB as a condition of credit release.

B. The Sponsor shall secure USACE-approved financial assurances, in compliance with the requirements of Section 13.5, as a condition of credit release.

2. Forested Wetland and Riparian Restoration and Enhancement

The goal of the forested wetland and riparian restoration and enhancement effort is to reestablish habitats that exhibit the characteristics of viable bottomland hardwood forested wetland and riparian habitat communities commensurate with the age of the stand and site conditions. These characteristics include canopy cover, density and diameter of trees, species diversity, vertical stratification, and other factors. Measurables used to assess the success of these efforts are listed below:

A. A minimum of 150 woody stems of native trees and shrubs per acre (including volunteers) within forested wetland and riparian restoration areas shall be achieved by the end of the first growing season following planting and maintained each monitoring year. The initial hard/soft mast to light-seeded ratio of 50% to 50% will be maintained and the site will be managed to minimize populations of exotic/invasive species throughout the monitoring period.

B. A minimum of 112 woody stems of native trees and shrubs per acre (including volunteers) within forested wetland and riparian enhancement areas shall be achieved by the end of the first growing season following planting and maintained each monitoring year. The initial hard/soft mast to light-seeded ratio of 50% to 50% will be maintained and the site will be managed to minimize populations of exotic/invasive species throughout the monitoring period.

C. Native, non-invasive, herbaceous absolute plant coverage shall be at least 50% by the end of the first growing season, and at least 70% each monitoring year thereafter.

D. No more than 1% of tree or shrub stems in any area designated as forested wetland and/or riparian enhancement or restoration area may be made up by invasive or exotic species.

E. Of the total required average trees per acre (150 for restoration and 120 for enhancement) the following growth metrics will be required as part of the performance standards during the 15-year monitoring period. The required growth metrics will apply to any native tree listed in Table 2, irrespective of species, including hard-mast or light-seeded species.

Year 3 – Minimum 5% of trees will be at least 3 feet in height and at least 0.25 inches in diameter at ground level.

Year 5 – Minimum 15% of trees will be between 3 and 4 feet in height and between 0.25 and 0.5 inches in diameter at ground level, and
Minimum 5% of trees will be greater than 4 feet in height and greater than 0.5 inches in diameter at ground level.

Year 7 - Minimum 25% of trees will be between 4 and 5 feet in height and between 0.25 and 0.75 inches in diameter at ground level, and
Minimum 5% of trees will be greater than 5 feet in height and greater than 0.75 inches in diameter at ground level.

Year 9 - Minimum 35% of trees will be between 4 and 6 feet in height and between 0.25 and 1.0 inches in diameter at ground level, and
Minimum 5% of trees will be greater than 6 feet in height and greater than 1.0 inch in diameter at ground level.

Year 11 – Minimum 45% of trees will be between 4 and 7 feet in height and between 0.25 and 1.25 inches in diameter at ground level, and
Minimum 5% of trees will be greater than 7 feet in height and greater than 1.25 inches in diameter at ground level.

Year 13 – Minimum 55% of trees will be between 4 and 8 feet in height and between 0.25 and 1.5 inches in diameter at ground level, and
Minimum of 5% of trees will be greater than 8 feet in height and greater than 1.5 inches in diameter at ground level.

Year 15 - Minimum 65% of trees will be between 5 and 9 feet in height and between 0.75 and 1.75 inches in diameter at ground level, and
Minimum 5% of trees will be greater than 9 feet in height and greater than 1.75 inches in diameter at ground level.

3. Emergent Wetland Habitat

The goal of the mineral flats, or emergent wetland, enhancement effort is to reestablish habitats that exhibit the characteristics of viable herbaceous dominated wetland communities commensurate with native vegetation and site conditions. These characteristics include species diversity, percent of desirable and non-desirable species, and other factors. Measurables used to assess the success of these efforts will consist of required minimum desirable, native, facultative or wetter, non-invasive herbaceous cover, and control of invasive and/or exotic species. Specific measurables for these areas will consist of the following:

A. Absolute Cover (native, non-invasive, plant species versus invasive and/or non-native plant species).

Year 1 – Establishment (implementation of management actions)

Year 3 - At least 30% relative cover by native, non-invasive species and less than 70% relative cover by non-native, invasive species.

Year 5 - At least 50% relative cover by native, non-invasive species and less than 50% relative cover by non-native, invasive species.

Year 7 - At least 75% relative cover by native, non-invasive species and less than 25% relative cover by non-native, invasive species.

B. Species Richness.

Year 1 – Establishment (Implementation of management actions)

Year 3 – At least 5 native, non-invasive plant species.

Year 5 – At least 10 native, non-invasive plant species.

Year 7 – At least 15 native non-invasive plant species.

C. Dominant Species (Dominance Test by 50/20 rule).

Year 1 - Establishment (Implementation of management actions)

Year 3 - At least 2 native, non-invasive dominant plant species.

Year 5 – At least 3 native, non-invasive dominant plant species.

Year 7 – At least 4 native, non-invasive dominant plant species.

D. Hydrophytic Absolute Cover (FAC, FACW and/or OBL plant species).

Year 1 - Establishment (Implementation of management actions)

Year 3 - At least 30% relative cover by native, non-invasive hydrophytic species.

Year 5 - At least 50% relative cover by native, non-invasive hydrophytic species.

Year 7 - At least 75% relative cover by native, non-invasive hydrophytic species.

4. Stream Enhancement

The goals for stream and riparian mitigation success are to stabilize the ephemeral and intermittent streams, reestablish riparian corridors, enhance aquatic resources and ensure that the streams within HSMB remain within the natural range of variability for existing stream baseline characteristics. In order to accomplish these goals, the Sponsors have included a suite of performance standards based on the prescriptions and recommendations developed by a qualified fluvial geomorphologist and detailed in the *Honey Springs Mitigation Bank Stream Enhancement and Stability Plan* (Appendix I) that was prepared specifically for HSMB. The following performance standards criteria will apply to stream enhancement activities:

A. As Built Surveys

Immediately following construction, an as-built survey will be conducted at each of the streams that include in-stream work (Elk Creek Tract – Intermittent Stream and Ephemeral Streams 1-4) to document the number and location of in-stream structures and will be provided to the USACE. For all of the streams included in the HSMB, monumented cross-sections will be established and fluvial geomorphological surveys will be conducted annually for the duration of the monitoring period. These surveys will include cross-section and longitudinal profile evaluations to establish baseline data for entrenchment ratio (W_{FPA}/W_{BF}), width-depth ratio (W_{BF}/H_{BF}), bank-height ratio (D_{TOB}/D_{BF}), channel slope (S), and sinuosity (K) of the various stream reaches. A bed material analysis will also be conducted in each reach. In the ephemeral channels the maximum depth and wetted perimeter upstream of the structures will also be determined.

B. Channel Characteristics

Stream reach stability will be evaluated for all of the streams within HSMB streams using stream channel morphology surveys consisting of longitudinal and cross-section analysis to evaluate: 1) stream classification, 2) width/depth ratio, 3) entrenchment ratio, 4) bank/height ratio 5) slope, 6) sinuosity and 7) channel bed materials in order to determine whether a particular stream segment has aggraded, degraded, widened, or narrowed to the point where it has become unstable or will cause instability.

Specific measurables for the streams will consist of the following:

- Stream Classification – No significant deviation from baseline.
- Channel Slope – No significant deviation from baseline and/or any measurable aggradation or degradation of the bed.
- Entrenchment Ratio (W_{FPA}/W_{BF}) – No significant decrease from baseline.
- Width/Depth Ratio (W_{BF}/H_{BF}) – No significant increase or decrease from baseline.
- Bank/Height Ratio (D_{TOB}/D_{BF}) – No significant decrease or increase from baseline.
- Individual Index Values of the Bank Erodibility Hazard Index (BEHI) rating for any identified reach shall be equal to or less than the previous year's Index Value and/or shall have a Total Score of "Moderate" by Monitoring Year 3, and a Total Score of "Low" by Monitoring Year 5.

Stream assessment will be conducted annually by a qualified fluvial geomorphologist and will consist of permanent transects at predetermined intervals for each stream reach at HSMB. The results of the field assessment will enable each stream to be categorized and measured against established channel characteristics using the Rosgen Classification of Natural Rivers to determine the range of values for which the criteria can deviate within the same stream type. The proper channel type will be stable only within the ranges of the classification criteria; therefore, each stream channel will be evaluated based on these characteristics to determine if the stream is still stabile or if remedial action is required.

The USACE and IRT will use best professional judgment, visual observations, and monitoring reports to evaluate fulfillment of performance standards in determining whether all or part of the bank site is successful, and if corrective actions are warranted.

C. Biotic Characteristics

Habitat assessments will be conducted allowing year to year comparisons of riparian restoration and enhancement activities described in the previous Section 11.3 - 2 *Forested Wetland, Riparian, and Upland Restoration and Enhancement*. The survival of planted trees and stocking level of naturally established woody (tree and shrub) species will be the same as the restored and enhanced forested wetland survival criteria previously described. Additionally, habitat assessment will monitor percent cover of herbaceous, shrub and tree cover as well as stream bank shading.

Assessments will be conducted annually and will consist of permanent transects at predetermined intervals for each stream reach at the HSMB. Quadrat sampling will be used to monitor absolute cover for herbaceous vegetation, 1/100th acre plots will be used for monitoring percent cover for trees and shrubs, and a spherical densitometer will be used to monitor stream bank shading.

12.0 MONITORING AND REPORTING REQUIREMENTS

12.1 Monitoring Plan

The Sponsors agree to perform all necessary work to monitor the HSMB in order to demonstrate compliance with the performance standards established in this MBI. A long-term monitoring program is required to determine if the objectives of the proposed wetland and stream enhancement and restoration efforts have been, and are being, met. Monitoring will evaluate fulfillment of the performance standards in determining whether all or part of the mitigation actions are successful and if corrective actions are warranted. Monitoring will be conducted annually and the monitoring period for forested and emergent wetland, riparian, and upland buffer restoration and enhancement will be a minimum of 10 years, and stream restoration and enhancement will be a minimum of 10 years, unless the mitigation project has met its performance standards prior to these terms. If the mitigation project has met its performance standards in less than 10 years for wetland and stream improvement activities, the monitoring terms can be reduced if there are at least three consecutive monitoring reports that demonstrate that success, and with USACE approval. The site will also be monitored for invasive species and animal damage during these visits. The methods described in the 1987 Corps of Engineers Wetlands Delineation Manual and its regional supplements provide a snapshot view of wetland conditions at one moment in time, but by evaluating data taken repeatedly, this monitoring method will provide information on wetland conditions along a timeline, specifically the frequency and duration of wetland hydrology.

The Sponsors shall monitor the condition of the bank and its progress toward achieving the goals and performance standards of the HSMB by conducting periodic surveys until the Sponsors can demonstrate to the satisfaction of the USACE and IRT that all performance standards have been achieved. The Sponsors shall establish the minimum number of monitoring stations necessary to reliably evaluate the ecological processes and document the success of the bank. All sampling stations will be located across the ecological gradient of each area. Stream monitoring transects will be permanently identified with a t-post and labeled using field verified GPS coordinates on a site map to be included with each monitoring report. Wetland sampling locations will consist of random plots.

1. Forested Wetland and Riparian Restoration/Enhancement

A. Visual Description. Visual descriptions shall be provided with each monitoring report in narrative form along with documentation and ground level photographs taken from stations located adjacent to vegetation plot.

B. Vegetation. Sample plots shall be located on a stratified random basis over the site in order to sample all areas of restored and enhanced wetlands at locations adjacent to each photo location marker. The vegetation data shall include:

- Dominant vegetation species identification
- Coverage assessment
- Number of woody plant stems (total and #/acre)
- Percent survival of planted species
- An invasive/noxious species assessment, including percent cover
- Average height and diameter at ground level of woody species (including volunteers) in each sample

The following minimum numbers of samples will be required:

- If the site is < 5 acres, then a minimum of 3 plots/acre is necessary
- If the site is > 5 acres but less than 20 acres, then a minimum of 2 plots/acre is necessary
- If the site is > 20 acres, then a minimum of 1 plot/acre is necessary

Each plot shall be 1/100th-acre (11.8 foot radius) for woody plants and a nested 3'x3' plot for herbaceous plants (or circular with approximately the same surface area). Alternative sampling methods may be submitted for IRT review and approval.

C. Timing. The vegetation data shall be collected at the end of the growing season (October – November) and at least once during the 1st, 3rd, 5th, 7th, 9th, 11th, 13th and 15th growing seasons following completion of planting. In addition, monitoring shall adhere to the following schedules:

- For any year in which planting was conducted, monitoring of woody vegetation shall take place no sooner than at the end of the first growing season following planting.
- If all performance criteria are not been met in the 15th year, then a monitoring report shall be required for each consecutive year until three sequential annual reports indicate that all criteria have been successfully satisfied.
- A final monitoring report (typically prepared the 15th growing season following completion of planting).

2. Emergent Wetland Enhancement

A. Visual Description. Visual descriptions shall be provided with each monitoring report in narrative form along with documentation and ground level photographs taken from stations located adjacent to vegetation plot.

B. Vegetation. Sample plots shall be located on a stratified random basis over the site in order to sample all areas of enhanced wetlands at locations adjacent to each photo location marker. The vegetation data shall include:

- Relative Cover
- Species Richness
- Dominant Species
- Hydrophytic Relative Cover

The following minimum numbers of samples will be required:

- If the site is < 5 acres, then a minimum of 3 plots/acre is necessary
- If the site is > 5 acres but less than 20 acres, then a minimum of 2 plots/acre is necessary
- If the site is > 20 acres, then a minimum of 1 plot/acre is necessary

Each plot shall be 3'x3' plot for herbaceous plants (or circular plot with approximately the same surface area). Alternative sampling methods may be submitted for IRT review and approval.

C. Timing. The vegetation data shall be collected during the growing season (March August) and at the end of the growing season (October – November) and at least once

during the 1st, 2nd, 3rd, 5th, 7th and 10th growing seasons following completion of planting. In addition, monitoring shall adhere to the following schedules:

- If all performance criteria are not been met in the 10th year, then a monitoring report shall be required for each consecutive year until three sequential annual reports indicate that all criteria have been successfully satisfied.
- A final monitoring report (typically prepared the 10th growing season following completion of planting).

3. Stream Enhancement

A. Visual Description. Visual descriptions shall be provided with each monitoring report in narrative form along with documentation and ground level photographs taken from stations located adjacent to vegetation plot (permanent markers shall be established to ensure that the same locations are monitored in each monitoring period), for the purpose of documenting vegetation and stream stability. The photographs will be taken annually at representative cross-sections and will clearly show the channel upstream and downstream, the riparian buffer area, and each stream bank.

B. Channel and Biotic Characteristics. For linear footage of stream enhancement permanent monumented cross-sections shall be established to ensure that the same locations are used each monitoring year. A minimum of one cross-section per 500 linear feet will be required. Total number required will vary depending on project length and complexity. Additional cross-sections may be required to show areas where aggradation, degradation, erosion, and mid-channel bars may have developed. The following will be documented at each cross-section:

- Sample plots for streambank vegetation (1/100th Acre) shall be located on each bank at each sample location within representative sections of streambank where streambank plantings were completed.
- A surveyed longitudinal profile and cross-section of the stream within the thalweg with measurements to determine Width/Depth Ratio (W_{BF}/H_{BF}), Entrenchment Ratio (W_{FPA}/W_{BF}), Bank Height Ratio (D_{TOB}/D_{BF}), Slope (S) and sinuosity (K) of each stream reach.
- A bed material analysis will also be conducted in each reach. In the ephemeral channels, the maximum depth and wetted perimeter upstream of the structures will also be determined.
- Bank Erodibility Hazard Index (BEHI) rating for each stream reach.

C. Timing. The stream data shall be collected concurrent with the forest restoration/enhancement sampling (October – November) and at least once during the 1st, 2nd, 3rd, 5th, 7th and 10th monitoring years. In addition, monitoring shall adhere to the following schedules:

- If all performance criteria are not been met in the 10th year, then a monitoring report shall be required for each consecutive year until three sequential annual reports indicate that all criteria have been successfully satisfied.
- A final monitoring report will be prepared the 10th year.

4. Hydrology

As previously stated, hydrology enhancement is not a component of the management strategy for HSMB; however, hydrology enhancement for wetlands associated with the

floodplain of Elk Creek is anticipated as a result of intermittent and ephemeral stream enhancements. By installing the in-stream structures in the intermittent and ephemeral streams to promote long-term stability, a secondary benefit will be an increase of out-of-bank events. As a result of the increased out-of-bank events for the intermittent and ephemeral streams on HSMB, on-site hydrology for aquatic features will be enhanced on the Elk Creek Tract. Out-of-bank events will be assessed using water level data loggers that will be placed in the streams and at grade on the floodplain. These data loggers will be monitored to assess the frequency of out-of-bank events. HOBO brand data loggers will be placed in Ephemeral Streams 1-4 and the Intermittent Stream on the Elk Creek Tract and Ephemeral Stream 1 and Intermittent Streams 1-3 on the Old Field Tract at the bankfull level. Additionally, one data logger will be placed at grade in the floodplain of Elk Creek and within the Elk Creek Channel. The data loggers will record the presence of water that passes through these locations and this data can be compared to river gage data to verify the presence of stream flow and out-of-bank events.

12.2 Reporting

The Sponsors shall submit an annual monitoring report to the USACE for review, for distribution to the other members of the IRT after USACE approval, in accordance with USACE Regulatory Guidance Letter 08-03, or any future relevant guidance, for a period of 10 years, or until the minimum success criteria are met, whichever is earlier, after final construction and planting. The monitoring report will be of sufficient content to accurately describe the progress, or lack thereof, of the bank in meeting the performance standards. Monitoring reports will include as-built drawings, maps, and ground photography illustrating the site conditions and interpretation of the current site conditions.

The Sponsors shall provide a progress report to the USACE by November 30th of each year for the first 10 years after this MBI is signed, or until the minimum success criteria are met, whichever is earlier. Each report shall document the following:

1. A detailed discussion of the relative success of restoration and enhancement activities conducted to date, including the Sponsor's conclusions about the likely cause and impact of any setback or failure that occurred and recommendations for future actions and strategies that might resolve those problems.
2. An overview of the current general ecological condition of the bank including a description of the vegetative and wildlife communities, effectiveness of the enhancement and restoration activities accomplished to date, and relative progress of the bank in achieving the ecological goals of the bank.
3. Pertinent additional information on such aspects of the bank as hydrology, soils, vegetation, wildlife use of the area, recreational and scientific use of the bank, and acts of nature, such as disease, wildfire, and flooding, that occurred.
4. Summary of management activities and resulting conditions, as well as proposals for any additional contingency or remedial measures to promote the health of the developing wetland habitats
5. Photographs of the bank taken from permanent locations that are accurately drawn on a photo location map. The photographs are intended to document the progress of each component of the bank, as well as the bank in general, toward achieving the goals and performance standards of the bank.
6. A summary of the credit transactions for the year and a total number of available credits. Separate stream and wetland credit ledgers will be maintained.
7. Financial assurance accounting statement.

13.0 SITE MANAGEMENT AND MAINTENANCE

The Sponsors shall restore and enhance wetland and streams described in the *Site Development Plan* in Section 10.0 and shall operate HSMB in accordance with the provisions of this MBI. The Sponsors shall receive wetland and stream credits upon satisfaction of the *Ecological Performance Standards* contained in Section 11.3 and according to the *Credit Release Schedule* contained in Section 14.0. After all ecological performance standards have been met and after all credits have been released to the Sponsors, the bank will have received a total of 255.7 wetland credits, 21,118.0 ephemeral stream credits, 33,599.0 intermittent stream credits and 3,117.0 perennial stream credits to use as compensatory mitigation for impacts to WOUS in accordance with all applicable requirements. Credits will be sold to third parties at an appropriate market rate to be determined by the Sponsors. Per 33 CFR 332.3(j)(1)(ii), proposed restoration and enhancement activities may address requirements of multiple regulatory programs and authorities for the same activity.

13.1 Long-Term Management and Maintenance Plan

The Sponsors shall dedicate in perpetuity the 162.02-acre HSMB as an aquatic ecosystem preserve. HSMB shall not be disturbed, except by those IRT-approved activities that would not adversely affect the intended extent, condition and function of the bank or those activities specifically provided for in this MBI. The Sponsors shall record the IRT-approved conservation easement with the McIntosh County Clerk and provide a copy of the recorded conservation easement to the Regulatory Branch, USACE, Tulsa District. The conservation easement shall not be removed or modified without written approval of the USACE, after coordination with the IRT. Conveyance of any interest in the property shall be subject to the conservation easement.

There are no long-term plans to transfer title of the property to another party. It is the intention of the Sponsors to maintain the property in perpetuity as highly functioning habitat in accordance with the terms of the long-term management plan and conservation easement. The site's conservation easement shall stay with the property in the instance that the title to the property is transferred to another party. Maintenance of the bank property will be carried out by the Sponsors for a minimum of 10 years after approval of the final banking instrument and all performance standards have been met, whichever is earlier, at which point the ecosystems on the property will be self-sustaining and self-regulating. Long-term maintenance needs will focus on vegetation management, trespass prevention, and removal of trash. Supplemental tree plantings and mowing will be the primary tasks implemented on an every other year rotation. Timber Stand Improvement (TSI) may be an important management activity. TSI activities may include selective cutting of early successional deciduous species, removal of softwoods, girdling, and removal of invasive woody species.

Additional maintenance tasks like trash removal and vandalism repairs will be conducted as identified at bi-yearly maintenance visits. Other activities, such as hunting and wildlife food plots, may be conducted within the bank provided the activity will enhance aquatic ecosystem functions such as wildlife habitat or water quality, and not interfere with the long-term ecological objectives of HSMB. All structures and facilities within the bank, including fences, roads, and trails, etc. shall be properly maintained in perpetuity or for as long as each is needed to accomplish the goals of the bank and achieve the requirements of this MBI. Protective fencing will be used, where applicable and necessary, to control trespassing and prevent incidental grazing from neighboring properties. Most of the adjoining properties are comprised of pasture or undeveloped land that, with the existing fence lines, should act to further reduce the risk of grazing and other deleterious activities.

Recreational activities on the part of the property owners and their invitees such as bird watching, hunting, fishing, and nature hikes are appropriate, if conducted so as to have minimal adverse

effects on the aquatic environment. Other recreational activities may be conducted within HSMB provided the activities are authorized in this MBI or otherwise would not degrade water quality, wildlife habitat, or other wetland or stream functions and are approved by the USACE after coordination with the IRT.

HSMB is vulnerable to acts of nature such as wildfires, climatic instability, and disease. Occurrence of such an act, following attainment of performance standards may require changes to HSMB, including revision of this MBI, to allow for maintenance activities to offset and counteract negative impacts. Depending upon the circumstances, however, it may be appropriate to let nature take its course, particularly when wetland vegetation is expected to reestablish due to continued existence of seed sources, wetland hydrology, hydric soils, and restrictions on incompatible land uses. Decisions on such issues shall be subject to approval by the USACE after coordination with the IRT.

1. Maintenance Plan

Long-term maintenance will be conducted annually and will include the following provisions:

A. Patrol the site for signs of trespass and vandalism. Maintenance will include reasonable actions to deter trespass by posting “No Trespassing” signs and repair vandalized features (e.g. collect/dispose of trash).

B. Monitor the condition of structural elements and facilities of the bank site such as signage, fencing, access roads and maintain and repair these improvements as necessary to achieve the objectives of the bank and comply with the provisions of the real estate instrument providing protection to the site.

C. Inspect the bank site to locate invasive species. Any invasive or exotic plant species listed in Table 7 that is discovered on the Bank site and occupying more than 1% cover in in the overstory and 5% in the understory should be controlled. In the event the USACE determines that the site has become infested with these species in the future, so that their effective control on the bank site is either no longer practicable or unreasonably expensive, the USACE, in coordination with the IRT, will consider appropriate changes to the Long-Term Management Plan.

2. Invasive Species Management

Management of invasive and exotic species will be undertaken as is suitable to maintain biodiversity and wetland function within HSMB. Until the monitoring period is complete, invasive and exotic species shall be controlled as follows. During development of HSMB (i.e. tree and shrub planting), invasive and exotic herbaceous and tree vegetation will be controlled, or eliminated, as part of the site preparation activities for forested wetland restoration and enhancement areas as described in Section 10.1 *Bottomland Hardwood Restoration and Enhancement*.

The goal of site preparation activities is to remove invasive and exotic tree/herbaceous species that have encroached within the proposed planting areas. Methods of control will include broadcast herbicide treatments to remove existing populations. Invasive and exotic tree and herbaceous species of concern for the project site are detailed in Table 7 and will be controlled upon observation. These species shall not, in the aggregate, comprise more than 1% of the overstory and/or 5% of understory within any area of HSMB.

Table 7. List of invasive and exotic species to be managed on the HSMB.

Common Name	Scientific Name	Tree/Shrub	Herbaceous / Vine
Tree-of-heaven	*Ailanthus altissima*	x	
Mimosa	*Albizia julibrissin*	x	
Giant reed	*Arunda donax*		x
Paper mulberry	*Broussonetia papyrifera*	x	
Russian olive	*Elaeegnus angustifolia*	x	
Thorny olive	*Elaeegnus pungens*	x	
Eastern redcedar	*Juniperus virginiana*	x	
Chinese privet	*Ligustrum sinense*	x	
Bush honeysuckle	*Lonicera maackii*		x
Japanese climbing fern	*Lygodium japonicum*		x
Chinaberry tree	*Melia azedarch*	x	
Kudzu	*Pueraria montana*		x
Sericea Lespedeza	*Lespedeza cuneata*		x
Sugarcane plumegrass	*Saccharum ravennae*		x
Salt cedar	*Tamarix spp.*	x	
Chinese tallow tree	*Triadica sebifera*	x	

After the second growing season for planted trees, weeds may be controlled by mowing or by broadcast spraying with herbicides in the spring or early summer. It is expected that most, if not all, invasive and exotic herbaceous species, including most pioneer tree species, will diminish as the trees in reforested areas mature, canopies close, and the herbaceous layer becomes shaded. As a result, long-term control of invasive and exotic herbaceous species is not considered a high priority management objective for the project. However, if any invasive or exotic herbaceous species comprises more than 5% cover or tree species comprises more than 1% cover in any management area, then the Sponsors will utilize selective removal methods such as ringing, herbicide injection, or spot broadcast spraying to control and/or remove these species.

Ten to fifteen years after planting, the forested wetlands may benefit from a timber stand thinning or release cutting. If the sponsors propose any invasive or weedy vegetation control or timber stand improvements after construction is complete, the Sponsors will submit plans for such activity for approval from the USACE.

3. Mineral Resources

The exploration for, and production and transportation of, subsurface mineral resources beneath HSMB, is acceptable provided that the resulting ground disturbing activities and surface alterations are minimized to the maximum extent practicable; activities are conducted in a manner that minimizes adverse environmental impacts; impacted areas are restored to pre-existing conditions as soon as practicable; reasonable and appropriate compensatory mitigation is achieved; and the entity conducting these activities complies with all applicable regulatory requirements, including those under Section 404 of the Clean Water Act. Recognizing that landowners in the state of Oklahoma cannot control a mineral owner's access to those minerals, the Sponsors shall take all reasonable steps to develop

a mineral management plan with the mineral owner(s) prior to the initiation of any mineral exploration or extractions activities. The mineral management plan shall include a listing of all surface or subsurface ownerships, a description of the anticipated impacts of the exploration and extraction activities on the local aquatic ecosystem functions and values, and a set of guidelines or best management practices that would minimize the adverse impact of those activities on the local aquatic ecosystem. The number of credits in the bank shall be reduced by the number of acres adversely impacted by the activities. If sufficient unused bank credits are not available, the USACE will require other appropriate off-site compensatory mitigation. The bank Sponsors may propose appropriate compensatory action subject to approval by the USACE.

13.2 Site Protection Instrument

To ensure that HSMB remains in the desired state in perpetuity, the Sponsors shall dedicate in perpetuity by appropriate conservation easement the 162.02-acre HSMB site as a wetland and stream preserve as provided in this MBI. HSMB shall not be disturbed, except by those USACE-approved activities that would not adversely affect the intended purpose, condition, and function of HSMB. The Sponsors shall record a USACE-approved conservation easement with the McIntosh County Clerk and provide a copy of the recorded conservation easement to the USACE, Tulsa District. The conservation easement shall not be removed or modified without written approval of the USACE. Conveyance of any interest in the property shall be subject to the conservation easement. All conservation easements shall be granted in perpetuity without encumbrances or other reservations, unless such encumbrances or reservations (e.g., retention of hunting and fishing by the landowners) do not adversely affect the ecological viability of HSMB. Terms and conditions of the conservation easement shall be both explicitly included in any transfer, conveyance, or encumbrance of Restricted Property or any part thereof, and; any instrument of transfer, conveyance, or encumbrance affecting all or any part of Restricted Property shall set forth the terms and conditions of this document. The terms of the easement will be enforceable by the USACE and Land Legacy, a non-profit conservation organization, that will monitor the Sponsor's compliance with the conservation easement. After the bank is approved, copies of the recorded conservation easement shall be provided to the USACE. A 60-day advance notice will be provided to the district engineer prior to taking any action should the sponsor or other entity propose changes to the site protection instrument.

The Sponsors will maintain HSMB and enforce the terms of the conservation easement until such obligations are transferred to a land management entity approved by the USACE. There are no short-term or long-term plans to transfer title of the property to another party. It is the intention of the Sponsors to maintain the property in perpetuity as highly functioning habitat in accordance with the terms of the long-term management plan and conservation easement. However, in the instance that the title is transferred to another party the conservation easement shall stay with the property. A copy of the conservation easement has been included as Appendix F.

13.3 Default Provisions & Corrective Actions

Sponsors shall monitor and report on the progress of HSMB toward achieving the goals and performance standards established by the MBI and take all reasonable actions necessary to remediate any problem that prevents a component of the bank from achieving the goals and performance standards. Sponsors will provide annual monitoring reports by November 30th of each year to the USACE, for distribution to the IRT, on short-term and long-term success of HSMB and to identify any problems requiring corrective action. In the event that monitoring reveals that initial success criteria have not been met, Sponsors will take measures to achieve the criteria the following year. Monitoring, reporting, and remedial actions will be conducted in accordance with the following:

1. Upon discovering that a component of the bank does not comply with the requirements of this MBI, including the conservation easement, the Sponsors shall take all appropriate actions to bring that component into compliance, as soon as practicable. During the period that a component of the bank is out of compliance, the USACE may, after providing written notice and a reasonable opportunity to cure the noncompliance, suspend its approval of the use of bank credits from that component area as compensatory mitigation for USACE-authorized projects.

2. If remedial action taken by the Sponsors under the provisions of the preceding paragraph does not result in the failing component of the bank complying with the requirements of this MBI despite reasonable efforts, or if it is otherwise determined by the Sponsors that compliance is no longer practicable based on changed circumstances, the Sponsors may submit to the USACE proposed modifications to this MBI. Any modification of the MBI requires the approval of the USACE before it may be implemented. The Sponsors shall provide written notice to the USACE of the Sponsor's intent to discontinue efforts to achieve performance standards for, and cease operation of, that component of the bank. Upon providing such notice, no credits may be established for the component of the bank that is ceasing operation and the Sponsors shall be released from future maintenance and monitoring obligations for that component. Any credits previously established for the component of the bank that is ceasing operation shall be removed from bank accounts. If there are insufficient unused credits in the remaining operational components of the bank to replace any credits previously withdrawn from the component of the bank that is ceasing operation, the Sponsors shall implement other appropriate compensatory mitigation as determined by the USACE as necessary to compensate for withdrawn credits for the component of the bank that is ceasing operation. In such event, the USACE shall provide written consent to the Sponsors for removal of the conservation easement required under Section 13.2 of this MBI for the affected component of the bank after all remedial actions have been completed to the satisfaction of the USACE.

3. If the failure of one or more components of HSMB to comply with the requirements of this MBI adversely affects the ability of the bank to meet its goals and objectives, or the Sponsors do not make a reasonable effort to bring the bank into compliance with this MBI, the USACE may terminate this MBI and operation of the bank after providing the Sponsors with written notice and a reasonable opportunity to resolve noncompliance. Sponsors shall implement other appropriate compensatory mitigation, as determined by the USACE to compensate for withdrawn credits representing components of the bank that failed to comply with the requirements of this MBI. In such event, the USACE shall provide written consent to the Sponsors for removal of the conservation easement required under Section 13.2 of this MBI for the affected components of the bank after all remedial actions have been completed to the satisfaction of the USACE.

4. In the event that a natural disaster destroys all or part of the bank, all debiting from the bank shall cease immediately. Natural disasters include floods, tornados, fires, earthquakes, droughts, disease, regional pest infestation, etc., which the USACE determines is beyond the control of the Sponsors to prevent or mitigate. The Sponsors shall not be responsible for restoring acreage for credits which were sold prior to any such natural disaster. However, the Sponsors shall be responsible for restoring acreage for which credits have been released to the Sponsors if those credits are unsold at the time of the natural disaster. If damage is so severe that the Sponsors and the USACE determine that project success is unattainable, then the Sponsor will not be obligated to restore any portion of the mitigation bank.

13.4 Adaptive Management Plan

If the site cannot be constructed in accordance with the *Site Development Plan* included in Section 10.0, the Sponsors will notify the USACE. Any significant modifications to the *Site Development Plan* must be approved by the USACE. After initial site construction, the Sponsors shall maintain the property using an adaptive management approach that will provide flexibility when dealing with unforeseen issues. The Sponsors have extensive experience with successional plant assemblages and HSMB will be planted with primarily young mast-producing hardwood plantings that will eventually be the dominant species as the site matures and as shaded conditions proliferate.

If the site is not able to be constructed to match the *Site Development Plan* or if site monitoring and maintenance activities determine that the project, as planned, is unable to meet the *Ecological Performance Standards* contained in Section 11.3, then the Sponsors will approach the USACE and IRT with suggestions of design changes, site modifications, or revisions to monitoring or maintenance requirements in order to ensure that the bank provides aquatic resource benefits similar to the objectives described in Section 9.0. If necessary, the *Ecological Performance Standards* contained in Section 11.3 may have to be revised to address deficiencies in management strategies or objectives if the new standards provide for ecological benefits that are comparable or superior to those previously proposed.

13.5 Financial Assurances

1. Short-Term Financial Assurances

For the advance release of credits (not to exceed 20% of the total number of credits) the Sponsors agree to provide adequate Financial Assurances in the form of liability insurance, performance bond, letter of credit, escrow account or trust fund, or obtain some other form of financial assurance that is capable of ensuring that aquatic resources will be restored and enhanced on the HSMB site and is suitable to the USACE. The amount of the assurances will be sufficient to complete the initial mitigation activities and annual maintenance and monitoring in the event of a default. Release of funds from this Financial Assurance will be recommended by the USACE once they have reviewed and approved the annual monitoring report which demonstrates that performance standards have been met for the type of credits previously released (i.e. stream or wetland). Complete release of the financial assurance agreement may only occur if the submitted report demonstrates that sufficient area has met the specific performance standard (as stated herein) to offset the advanced release of credits.

A. Construction Phase

Based on the *Credit Release Schedule* identified in Section 14.0, 20% of credits will be available for sale upon signing and recordation of the final conservation easement (Year 0), and 25% of the credits will be available upon completion of initial mitigation bank establishment activities, including but not limited to, tree planting, herbicide, mowing and stream improvements (Year 1). The Sponsors hold an unencumbered fee simple title to the bank site; therefore, no financial assurances are required for land acquisition. The Sponsors agree to provide financial assurances in the form of a performance bond or casualty insurance for the sum of $170,000 U.S. Dollars for the initial work, or construction phase, described above and detailed in this MBI. This sum was derived by calculating the costs necessary to carry out the wetland and stream mitigation restoration and enhancement activities outlined in Section 10.0 *Site Development Plan* in this MBI. A breakdown of costs associated with each activity is shown in Table 8. Historical averages provide guidance for budgeted restoration and enhancement activities. For the purpose of financial assurance

determination, the averages have been increased by 1.25 percent in order to provide additional funds for unplanned expenses including inflation.

Table 8. Costs for initial establishment activities on the HSMB.

Mitigation Action	Requirement	Treatment Amount	Cost/Unit*	Total Cost
Elk Creek Tract				
Planting (Restoration)	302 trees/acre	28.4 ac	$350/acre x 1.25	$12,425.00
Planting (Enhancement)	225 trees/acre	3.4 ac	$350/acre x 1.25	$1,487.50
Stream Improvements	Rock Vanes	15	$2,2825.10 x 1.25	$52,970.62
Stream Improvements	Earthen Plugs	6	$1,565.37 x 1.25	$11,740.27
Stream Improvements	Rock Weirs	2	$4,858.37 x1.25	$12,145.92
Stream Improvements	Log Jams	4	$2,736.57 x 1.25	$13,682.85
Mowing (Enhancement)	1 treatment	16 hr	$125/hour x 1.25	$2,500.00
Herbicide (Enhancement)	1 treatment	31.8 ac	$150/acre x 1.25	$5,962.50
Fencing/Signage	1 treatment	1,400 ft	$3.50/foot x 1.25	$6,125.00
Tract Total				$119,039.66
Old Field Tract				
Planting (Enhancement)	225 trees/acre	4.4 ac	$350/acre x 1.25	$1,925.00
Stream Improvements	1 treatment	8 hr	$150/hour x 1.25	$1,500.00
Mowing (Enhancement)	2 treatments/year for 5 years	16 hr	$125/hour x 1.25	$25,000.00
Herbicide (Enhancement)	1 treatment	22.8 ac	$150/acre x 1.25	$4,275.00
Fencing/Signage	1 treatment	4,000 ft	$3.50/foot x 1.25	$17,500.00
Tract Total				$50,200.00
Project Total				**$169,239.66**

*Unplanned expenses and annual inflation rate of 1.25 percent.

B. Monitoring Phase

The remaining credit releases (55%) are based upon annual maintenance and monitoring reports that assess the fulfillment of performance standards and bank success as outlined in Section 11.3 *Ecological Performance Standards* in this MBI. Therefore, financial assurances are provided for those credits available throughout the monitoring term. One percent (1%) of all cash proceeds from credit transactions shall be placed in a custody agreement account (escrow account) to be called the *Maintenance and Monitoring Fund*. If the required monitoring or maintenance is not conducted as specified in Section 12.0 of this instrument, then the USACE shall request release of funds to the third party easement holder, or other capable mitigation contractor/provider as determined by the USACE, from this account sufficient to cover the necessary monitoring or maintenance activities.

One-tenth of this fund (0.1% of the total cash proceeds from wetland and stream credit sales) shall be released to the Sponsors on each January 1st after the USACE has reviewed and approved the most recently submitted monitoring report that documents that part or all

of the Restoration/Enhancement portions of the site satisfies the Ecological Performance Standards to cover the expected costs of maintenance and monitoring over the required 10 year monitoring period for wetland and stream restoration and enhancement activities. The last one-tenth of the fund for wetlands and two-tenths for streams shall be held until the final monitoring report is submitted and approved.

Post-establishment maintenance tasks at a mitigation bank may include replanting of trees and shrubs, selective spraying of invasive species, site mowing, and annual monitoring. Based on the Sponsor's management of Excel Mitigation Center and Deep Fork Mitigation Bank, historical averages for maintenance and monitoring have been used to provide guidance for budgeting future maintenance activities. This sum was derived by calculating the costs necessary to insure that performance standards are achieved and that annual maintenance and monitoring requirements can be met. The associated costs for these actions are detailed in Table 9. For the purpose of financial assurance determination, averages are increased by 1.25 in order to provide additional funds for unplanned expenses including inflation. The Sponsors shall establish an escrow account for maintenance and monitoring activities.

Table 9. Costs associated for monitoring and maintenance activities on the HSMB.

Mitigation Action	Requirement	Treatment Amount	Cost/Unit*	Total Cost
Elk Creek Tract				
Replant (Restoration)	302 trees/acre	28.4 ac	$350/acre x 1.25	$12,425.00
Replant (Enhancement)	225 trees/acre	3.4 ac	$350/acre x 1.25	$1,487.50
Stream Structure Maint.	10% of initial cost (10 years)	Annual	$9,053.96 x 10 x 1.25	$113,174.50
Mowing (Enhancement)	5 treatments	8 hr	$125/hour x 1.25	$6,250.00
Monitoring & Reporting	10 Years	Annual	$2,500/visit x 1.25	$31,250.00
Tract Total				$164,587.00
Old Field Tract				
Planting (Enhancement)	225 trees/acre	4.4 ac	$350/acre x 1.25	$1,925.00
Mowing (Enhancement)	1 treatments/year for 5 years	24 hr	$125/hour x 1.25	$18,750.00
Monitoring & Reporting	10 Years	Annual	$2,500/visit x 1.25	$31,250.00
Tract Total				$51,925.00
Project Total				**$216,512.00**

*Unplanned expenses and annual inflation rate of 1.25 percent.

The Sponsors may elect, at their discretion, to revise or replace the existing financial assurances with a different type of financial assurance at any point during the life of the bank. The Sponsors shall provide the USACE with notice prior to replacement or modification of any of the financial assurances, and a draft of the new instrument with the revised financial assurances shall be provided to the USACE for review and approval before any changes are implemented. The provisions of the new instrument shall conform to the provisions of the former instrument.

2. Long-Term Financial Assurances

Once the monitoring phase has ended, money set aside in the escrow account will be moved to a long-term endowment called the *Catastrophic Event and Long Term Management Fund*. Damages from the catastrophic events identified below are permitted to be repaired using the principal and interest accumulated in the Catastrophic Event and Long Term Management Fund by either the Sponsors or the Long-Term Steward, the funds being provided to whichever entity has responsibility to repair the resulting damages. Expenditures shall be approved by the USACE and IRT if the damage occurs within the 10-year monitoring period associated with bank establishment. The Sponsors are responsible for demonstrating to the USACE and IRT's satisfaction that catastrophic damage has taken place. Expenditures may be approved to address issues including, but not limited to, floods, tornados, hurricanes, earthquakes, extreme drought, fire, and insect or animal damage to planted vegetation.

Long-term (past 10 years) maintenance requirements will be determined on a site-specific basis. However, any such activities shall be the responsibility of the Long-Term Steward. The mitigation bank site has been designed for low-maintenance and long-term self-sustainability. As long as the bank site is owned by the Sponsors, it will be maintained for its designated use. After the mitigation bank has achieved the required performance standards and the bank has been approved for closure, the Sponsors may transfer the site to a third party non-profit conservation group for long-term stewardship. Such a transfer shall not require a commitment from the Sponsors to provide funds to the third party to support management activities.

The bank Sponsors and Assurance Provider will notify the USACE at least 120 days in advance of any modification, termination, or revocation of any financial assurance mechanism associated with bank operations. If ownership of HSMB is conveyed to a successor, the financial assurance may be modified, transferred, or replaced by another financial assurance, with the written approval of the USACE, after coordination with the IRT. Failure to maintain an adequate financial assurance shall constitute good cause for suspending or terminating operation of HSMB. However, prior to taking such action, the USACE, after coordination with the IRT, shall provide the Sponsors reasonable opportunity to correct any alleged financial assurance deficiencies.

14.0 CREDIT RELEASE SCHEDULE

1. Credit Release Provisions

The credit release approval process shall follow the schedule described in 33 CFR Part 332.8(o)(9). Credits shall be released to the Sponsors by the USACE, in consultation with the IRT, following the credit release schedule described below. As the Sponsors reach stated performance milestones, documentation shall be submitted to the USACE demonstrating that appropriate milestones for credit release have been achieved along with a request for the release of credits. The USACE will provide copies of this documentation to the IRT members for review. IRT members must provide any comments to the USACE within 15 days of receiving this documentation. However, if the USACE determines that a site visit is necessary, IRT members must provide any comments to the USACE within 15 days of the site visit. The USACE must schedule the site visit so that it occurs as soon as it is practicable, but the site visit may be delayed by seasonal considerations that affect the ability of the USACE and the IRT to assess whether the applicable credit release milestones have been achieved. After full consideration of any comments received, the USACE will determine whether milestones have been achieved and credits can be released. The USACE shall make a decision within 30 days of the end of that comment period, and shall notify the Sponsors and IRT of their decision.

The USACE, in consultation with the IRT, may modify the credit release schedule, reduce the number of available credits or suspend credit sales or transfers altogether when deficiencies in the performance standards have been observed or specific requirements of the instrument have not been met. The USACE, or any IRT member, will provide the Sponsors a minimum of 24 hours' notice before any compliance inspection or other visit to the bank site.

2. Credit Release Schedule

Upon submittal of all appropriate documentation by the Sponsors and subsequent written approval by the USACE, it is agreed that credits will become available for use by the Sponsors, or for transfer to a third party, in accordance with the following schedule and detailed in Table 10.

A. Site Protection (Year 0)

20% of the total number of anticipated wetland and stream credits shall be available for debiting immediately upon implementation of the following:

- Approved Mitigation Banking Instrument, and
- Establishment and funding of the bank's financial assurances; and
- Copy of the approved and recorded conservation easement is provided to USACE and IRT.

B. Forested and Emergent Wetlands, Streams, and Riparian Restoration and Enhancement

For those credits associated with forested and emergent wetlands, streams, and riparian restoration and enhancement activities, release of credits beyond 20% will adhere to the following schedule:

Year 1 – Initial Treatments

25% (45% cumulative) of the total number of anticipated forested and emergent wetlands, streams, and riparian credits will be released as each mitigation type is restored or enhanced pursuant to the *Site Development Plan* Section 10.0.

Year 3 – Treatment Success

25% (70% cumulative) of the total number of anticipated forested and emergent wetlands, streams, and riparian credits will be released after USACE approval of the second year monitoring report which documents compliance pursuant to the performance standards in Section 11.3 *Ecological Performance Standards*.

Year 5 – Treatment Success

15% (85% cumulative) of the total number of anticipated forested and emergent wetlands, streams, and riparian credits will be released after USACE approval of the fourth year monitoring report which documents compliance pursuant to the performance standards in Section 11.3 *Ecological Performance Standards*.

Year 7 – Treatment Success

15% (100% cumulative) of the total number of anticipated forested and emergent wetlands, streams, and riparian credits will be released after USACE approval of the sixth year monitoring report which documents compliance pursuant to the performance standards in Section 11.3 *Ecological Performance Standards*.

Table 10. Wetland and Stream Credit Release Schedule for HSMB.

Mitigation Action	Year	Release Action	Individual Credit Release	Cumulative Credit Release
Site Protection	0	Executed MBI, Conservation Easement, & Financial Assurances	20%	20%
Wetlands/ Streams	1	After Tree Planting & Stream Improvements	25%	45%
	3	Approval of 2nd Year Monitoring & Performance Standards	25%	70%
	5	Approval of 4th Year Monitoring & Performance Standards	15%	88%
	7	Approval of 6th Year Monitoring & Performance Standards	15%	100%

Note: Sponsors may request the release of credits for wetland areas or stream segments either together or separately depending upon variability in achievement of performance standards.

15.0 ACCOUNTING PROCEDURES

Sponsors will submit a Ledger Statement to the USACE each time credits are debited or additional credits are approved for release. If requested, the USACE may distribute the Ledger Statement to other members of the IRT or the public. In addition, Sponsors will submit an Annual Ledger Statement to the USACE for distribution to all members of the IRT, showing all transactions at HSMB for the previous year.

1. Use of Credits

The USACE, after coordination with the IRT, will determine the eligibility of projects to use the bank for compensatory mitigation on a case-by-case basis. Projects that can be considered will be determined by the USACE and will include those requiring authorization under Section 404 and/or Section 401 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act, as well as mitigation projects, unauthorized activities, non-compliance actions, and after-the-fact permits. The number and type(s) of credits required to compensate for the authorized impacts of each DA permit will be based on the mitigation ratios detailed in Section 11.2.

2. Credit Ledger

The Sponsors will establish and maintain a credit ledger for HSMB in order to account for all credit transactions. This credit ledger will show all credit transactions for the bank and will include the beginning and current balance of available credits for each credit type (wetland and stream), all additions and subtractions of credits, and any other changes in credit availability, such as additional credits released or suspended credit sales. The Sponsors will notify the USACE in writing each time a credit transaction occurs and will supply the USACE with an updated ledger with each transaction within 30 days of the transaction.

3. Credit Ledger Accounting Reports

A credit ledger report will be submitted to the USACE on an annual basis after the first of each calendar year and will be part of the administrative record for the bank. The credit ledger report will show the beginning and ending balance of available credits and permitted impacts for each resource type, including types of credits debited, all additions and subtractions of credits, and any other changes in credit availability. The USACE will distribute copies of this ledger to the other IRT members.

4. RIBITS

The USACE will be responsible for maintaining the HSMB credit ledger in the Regulatory In-Lieu Fee and Bank Information System (RIBITS).

16.0 BANK CLOSURE PROVISIONS

Bank closure will occur when the terms and conditions of this MBI have been determined by the USACE, after coordination with the IRT, to be fully satisfied or until all credits have been debited, whichever is later. Subsequent to bank closure, site management and maintenance will remain the responsibility of the Sponsors. If adaptive management strategies are unsuccessful and performance standards are unattainable, the USACE may close or suspend bank operations until modifications, including release schedule changes, remedial activities, etc. are completed.

17.0 VALIDITY AND TENURE OF AGREEMENT

USACE approval of this Instrument constitutes the regulatory approval required for the Honey Springs Mitigation Bank to be used to provide compensatory mitigation for Department of the Army permits pursuant to 33 C.F.R. 332.8(a)(l). This Instrument is not a contract between the Sponsors and/or Property Owner and USACE or any other agency of the federal government. Any dispute arising under this Instrument will not give rise to any claim by the Sponsors and/or Property Owner for monetary damages. This provision is controlling notwithstanding any other provision or statement in the Instrument to the contrary.

This agreement is effective immediately on the date it is signed by the Sponsors, the USACE and the signatory agencies, but in no event later than the date it is signed by the Sponsor and the USACE, and shall remain in effect until it is modified or revoked by mutual agreement among the signatories. Any signatory to this agreement may terminate its participation in this agreement at any time upon written notice to the other signatories. If either the Sponsors or the USACE terminate their participation, the agreement is terminated or revoked. Notwithstanding any future termination, revocation or modification of this agreement, the conservation easement that directs the bank to protect the aquatic ecosystem is perpetual.

This agreement may be modified as mutually agreed to by the Sponsor and the USACE, after coordination with the IRT. The IRT will work to reach a consensus among the signatories regarding all modifications and shall follow the dispute resolution procedure guidance of the November 28, 1995, “Federal Guidance for the Establishment, Use and Operation of Mitigation Banks” in the event of disagreements. No recourse shall be taken against any individuals who have contracted with the Sponsors prior to modification, nor against said parties in the event the agreement is terminated. In the event of termination of the agreement, the Sponsors or subsequent bank Sponsor(s) shall maintain the mitigation to the degree required by the applicable Section 404 permit. Nothing in this agreement shall be construed as altering the responsibilities or empowering new authority in favor of the signatory agencies. The Sponsors will be allowed to

implement supplemental mitigation actions or activities to protect or enhance ecological services on the bank provided that such activities are not inconsistent with this MBI or governing Conservation Easement.

Once a DA permit applicant has purchased credits from the Sponsors and the USACE has recorded the purchase of those credits from the bank as satisfying all or a portion of the mitigation responsibilities of the permit applicant, the legal responsibilities for providing compensatory mitigation for any project impacts to jurisdictional waters of the U.S. is transferred from the permit applicant to the Sponsors.

To the extent that specific language in this document changes, modifies, or deletes terms and conditions contained in those documents that are incorporated into this MBI by reference, and that are not legally binding, the specific language within this MBI shall be controlling.

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

SPONSOR, GREEN COUNTRY WETLAND MITIGATION, LLC

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

SPONSOR, HOFFMAN ENVIRONMENTAL, INC

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

U.S. FISH AND WILDLIFE SERVICE

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

U.S.D.A. NATURAL RESOURCES CONSERVATION SERVICE

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

Name Date

18.0 IRT SIGNATORIES

In accordance with The Final Rule for 33 CFR 332 and 40 CFR 230 Compensatory Mitigation for Losses of Aquatic Resources (Federal Register I V. 73 No. 70 pages 19594-19642, 04-10-2008) this document has been prepared to describe the provisions for establishment, use, and operation of the Honey Springs Mitigation Bank in McIntosh County, OK by Green Country Wetland Mitigation, LLC and Hoffman Environmental, Inc. The undersigned agencies hereby agree that this banking instrument shall provide the basis for proceeding with establishment and operation of the Honey Springs Mitigation Bank site in accordance with its terms as approved or as subsequently amended with the concurrence of all signatory agencies.

OKLAHOMA CONSERVATION COMMISSION

Name Date

19.0 LITERATURE CITED

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APPENDIX A

FIGURES:

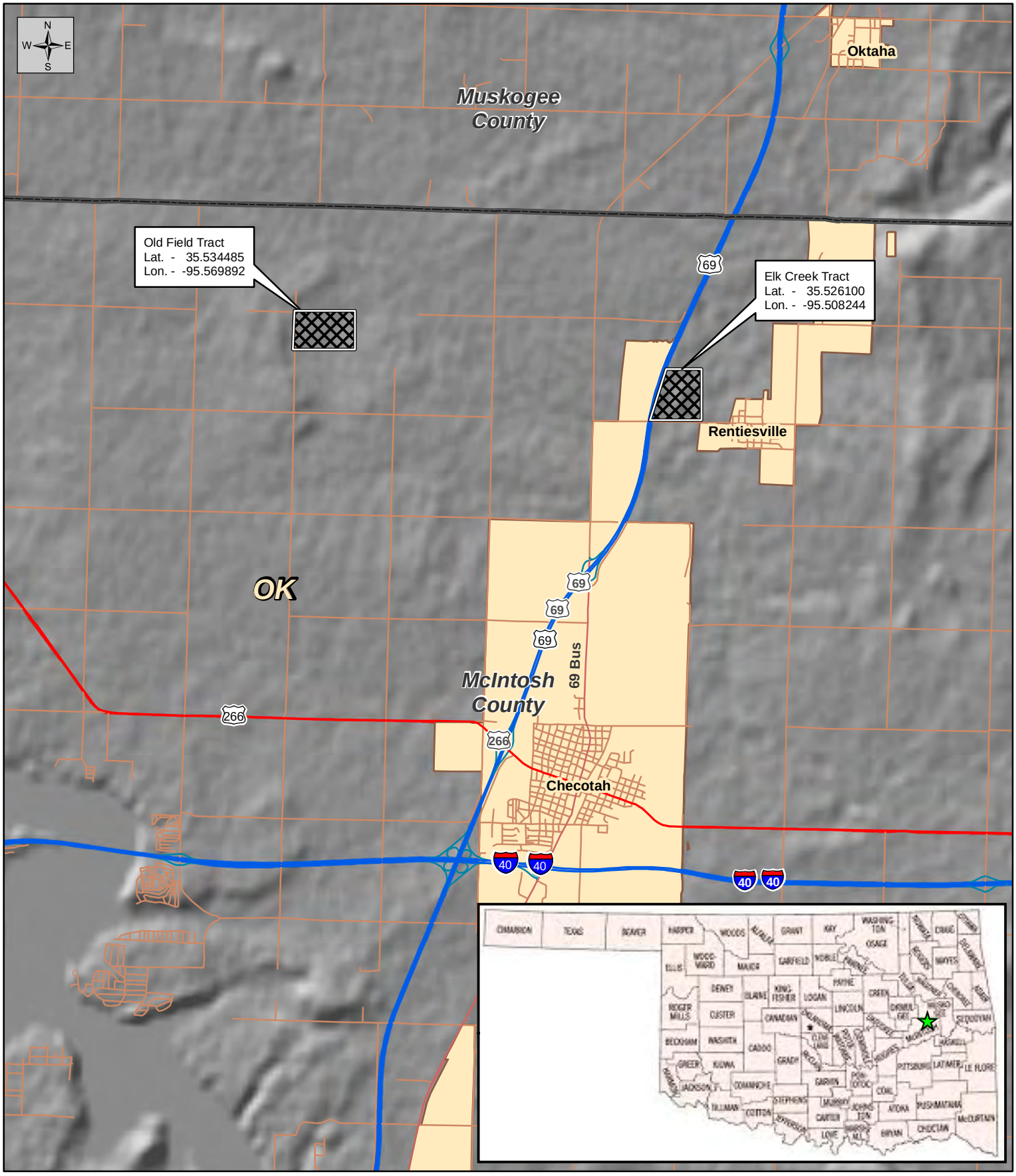


Figure 1 of 10 Location Map	**Honey Springs Mitigation Bank**	**Date: January 11, 2019**

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

0 1 2 3 4 Miles

Section 9 - T12N - R17E
Section 12 - T12N - R16E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

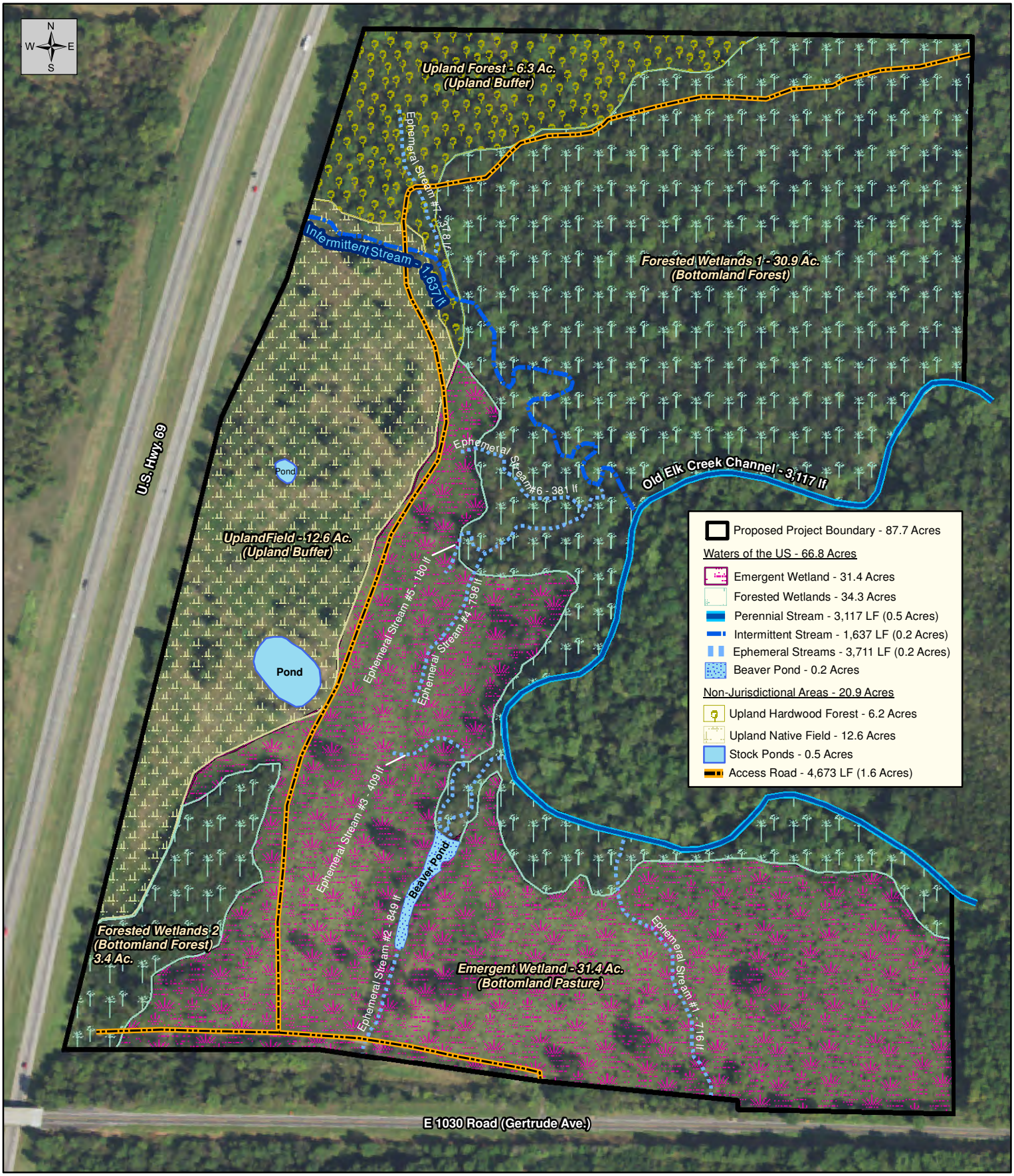


Figure 2 of 10
Waters of the US
2015 Aerial Map

Honey Springs Mitigation Bank - Elk Creek Tract

Date: January 11, 2019

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

0 100 200 300 400 500 600 700 800 900 1,000 1,100 Feet

Section 9 - T12N - R17E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

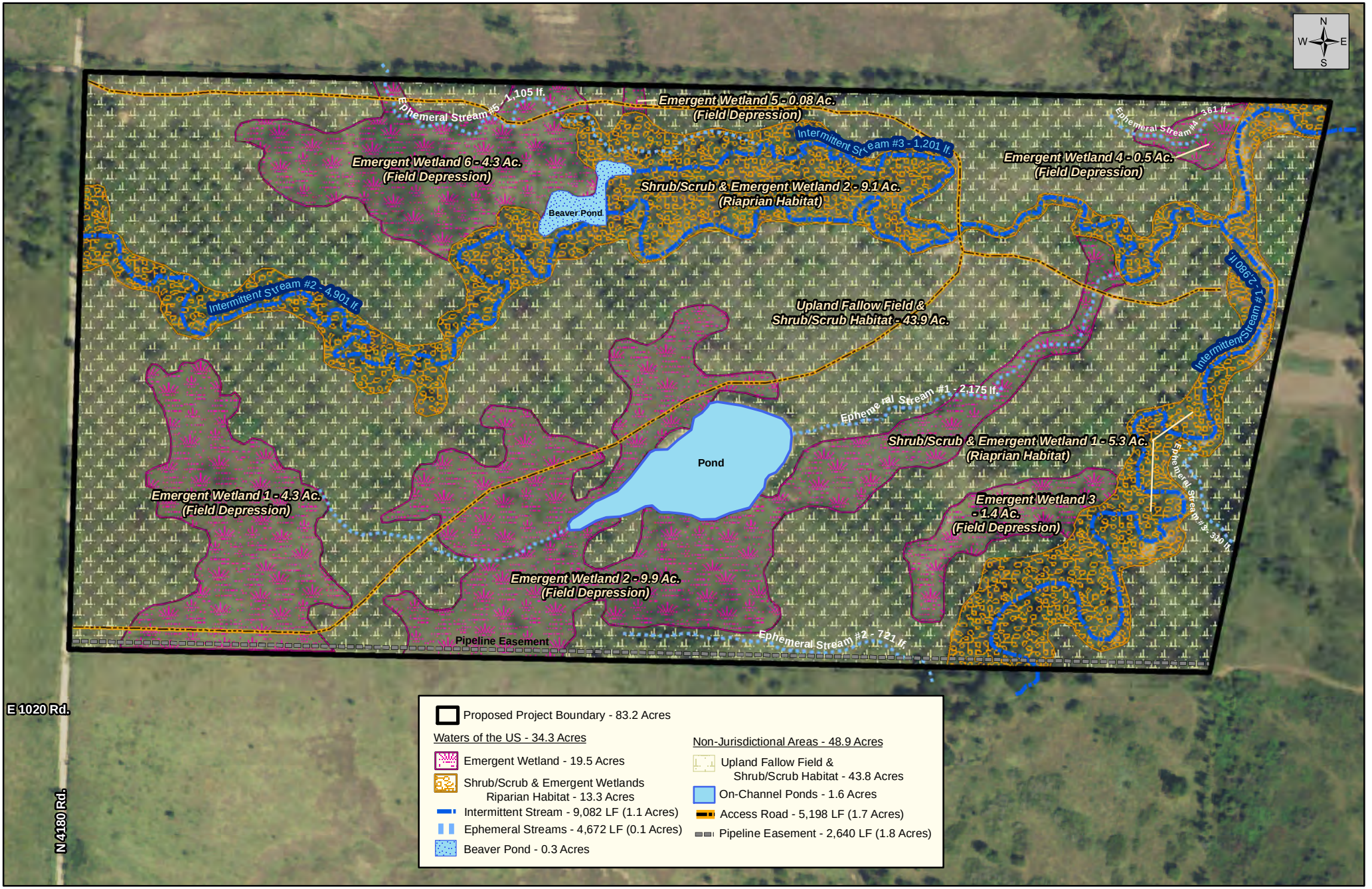


Figure 3 of 10
Waters of the US
2015 Aerial Map

Honey Springs Mitigation Bank - Old Field Tract

Date: January 14, 2019

0 200 400 600 800 1,000 1,200 1,400 1,600 Feet

Section 12 - T12N - R16E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

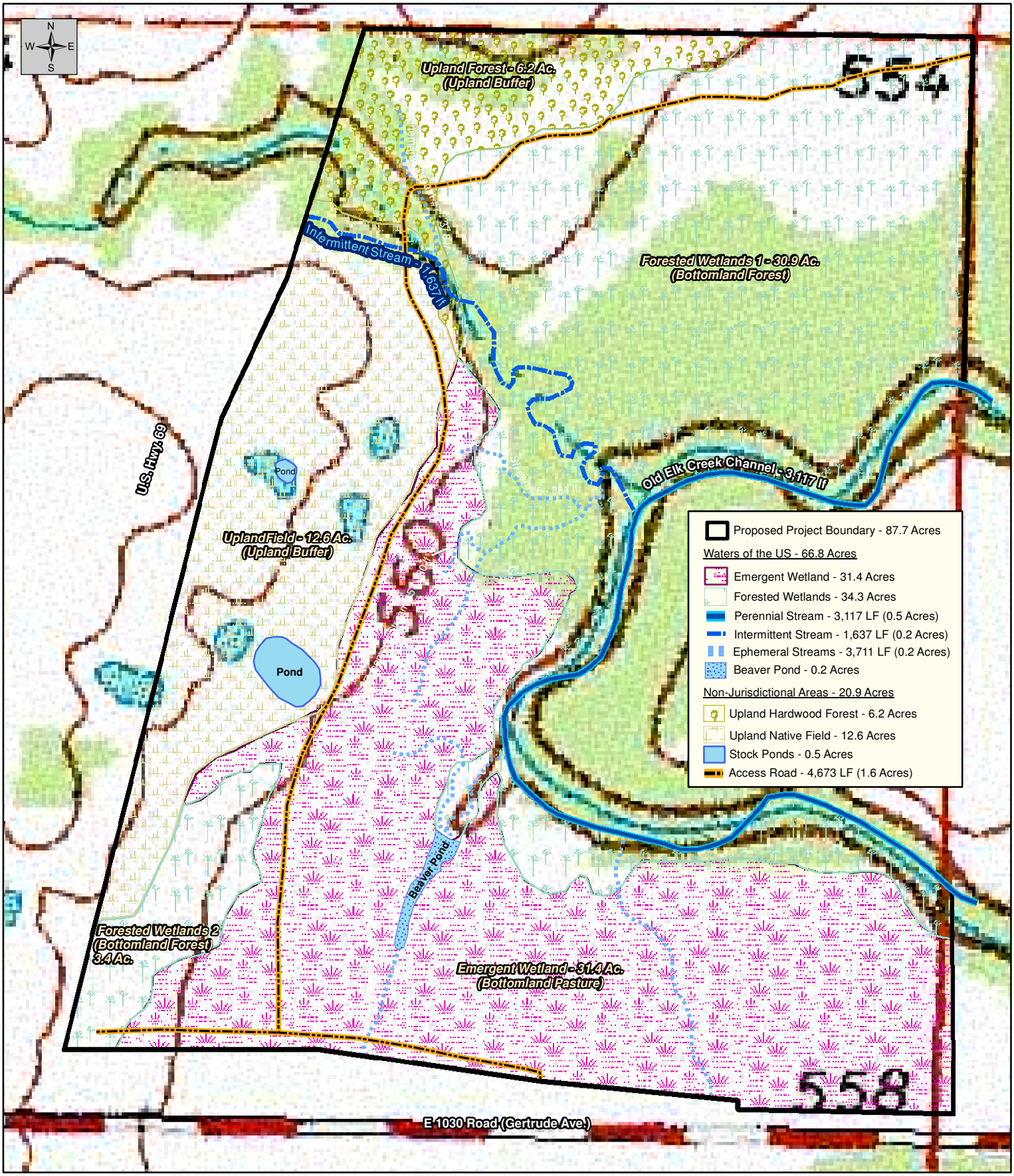


Figure 4 of 10
Waters of the US
Topographic Map

Honey Springs Mitigation Bank - Elk Creek Tract

Date: January 11, 2019

0 100 200 300 400 500 600 700 800 900 1,000 1,100 Feet

Section 9 - T12N - R17E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: USGS
Vector Source: HEI

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

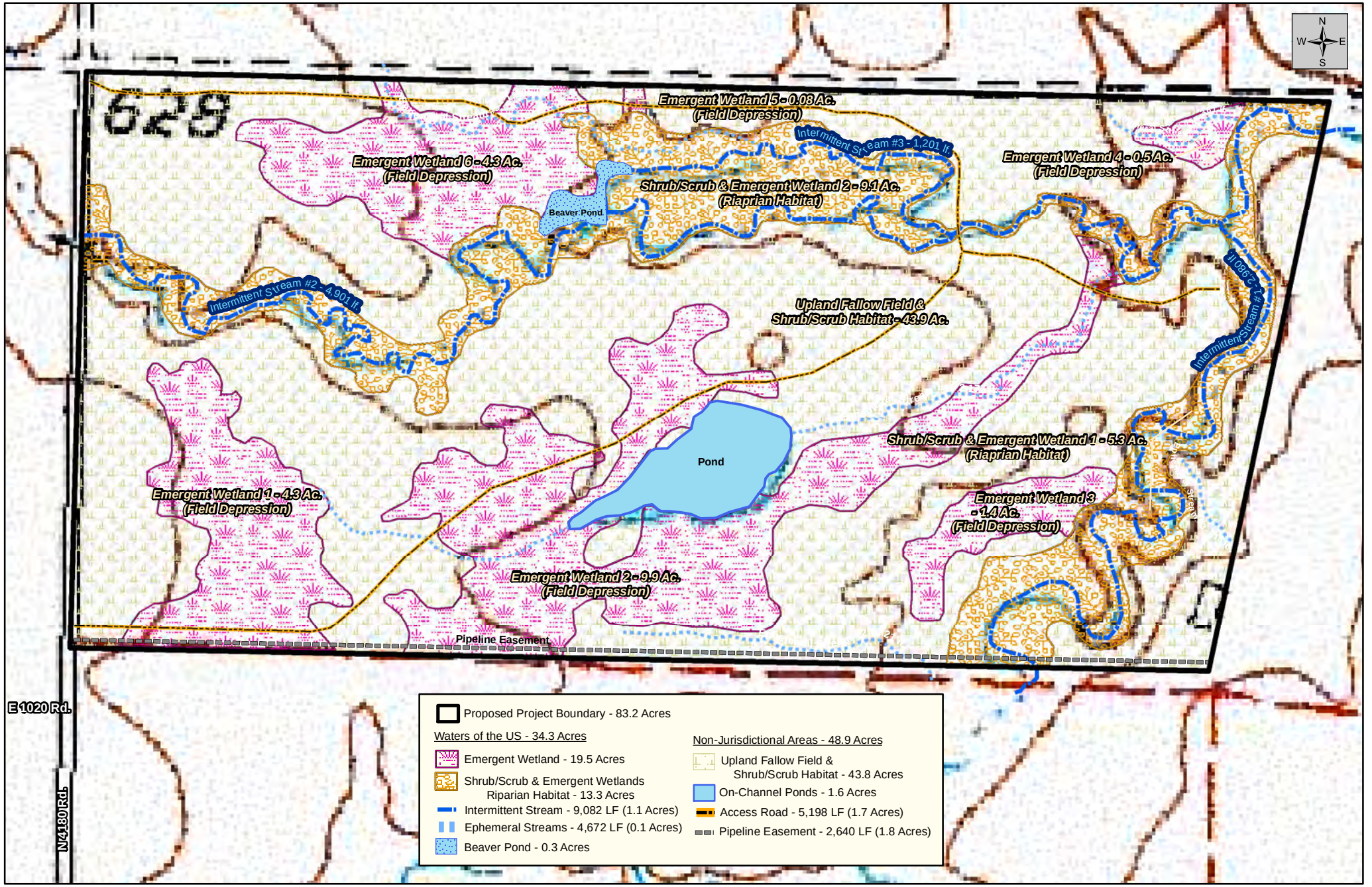


Figure 5 of 10
Waters of the US
Topographic Map

Honey Springs Mitigation Bank - Old Field Tract

Date: January 14, 2019

0 200 400 600 800 1,000 1,200 1,400 1,600 Feet

Section 12 - T12N - R16E
McIntosh County, Oklahoma

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: USGS
Vector Source: HEI

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

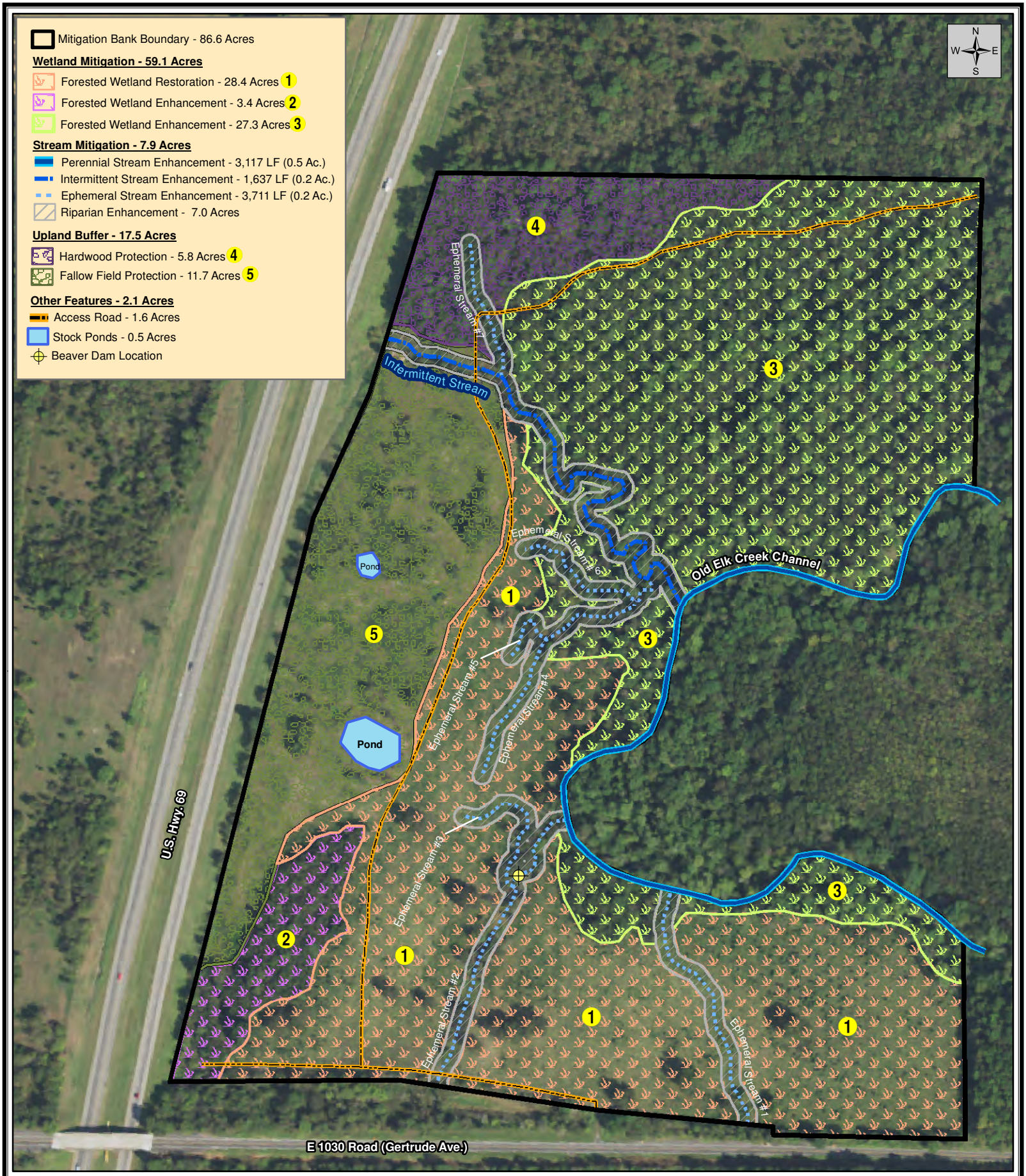


Figure 6 of 10
Site Development
2015 Aerial Map

Honey Springs Mitigation Bank - Elk Creek Tract

Date: August 07, 2019

Feet
0 150 300 450 600 750 900 1,050 1,200

Section 9 - T12N - R17E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

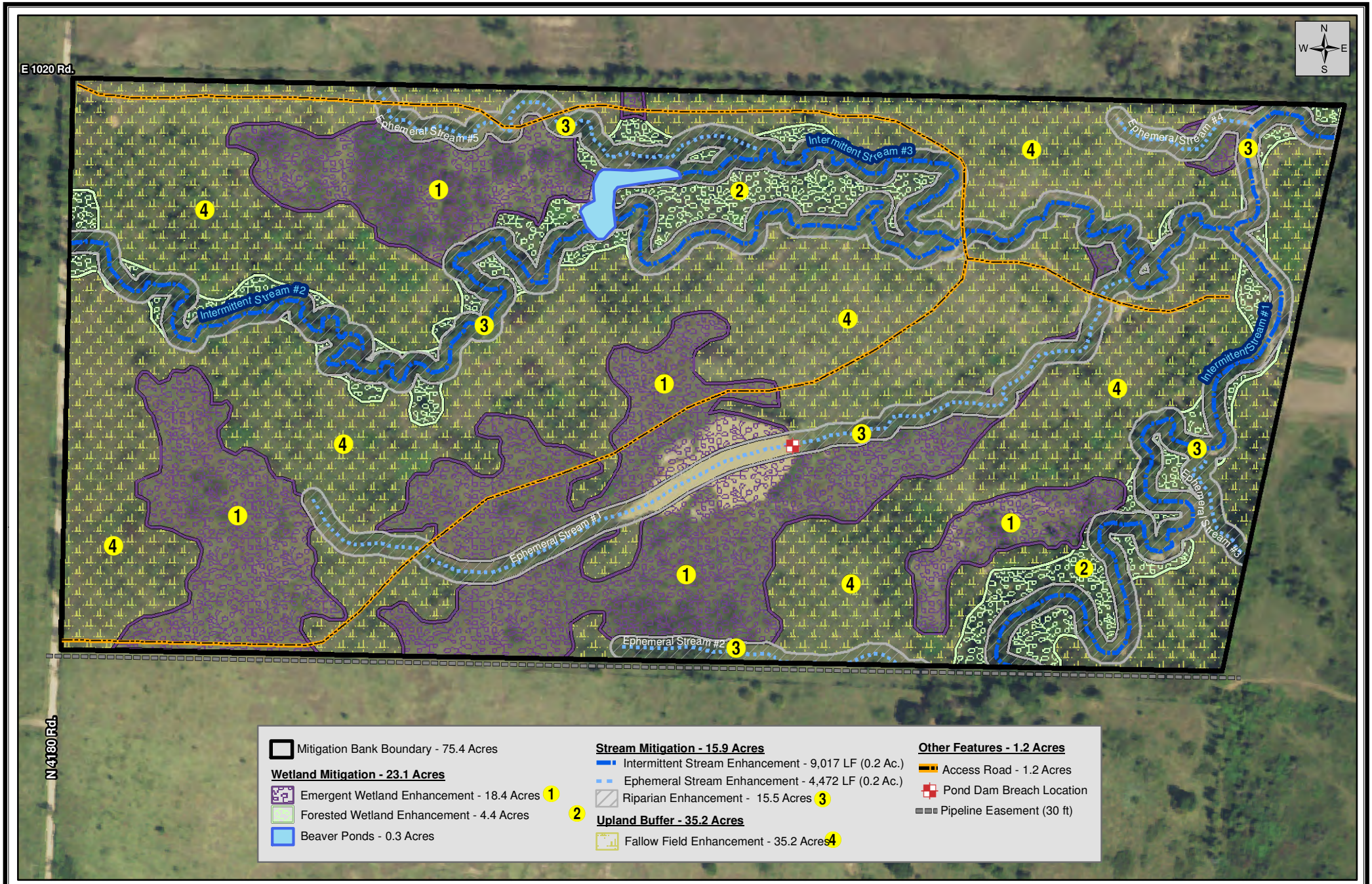


Figure 7 of 10
Site Development
2015 Aerial Map

Honey Springs Mitigation Bank - Old Field Tract

Date: September 05, 2019

0 200 400 600 800 1,000 1,200 1,400 Feet

Section 12 - T12N - R16E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

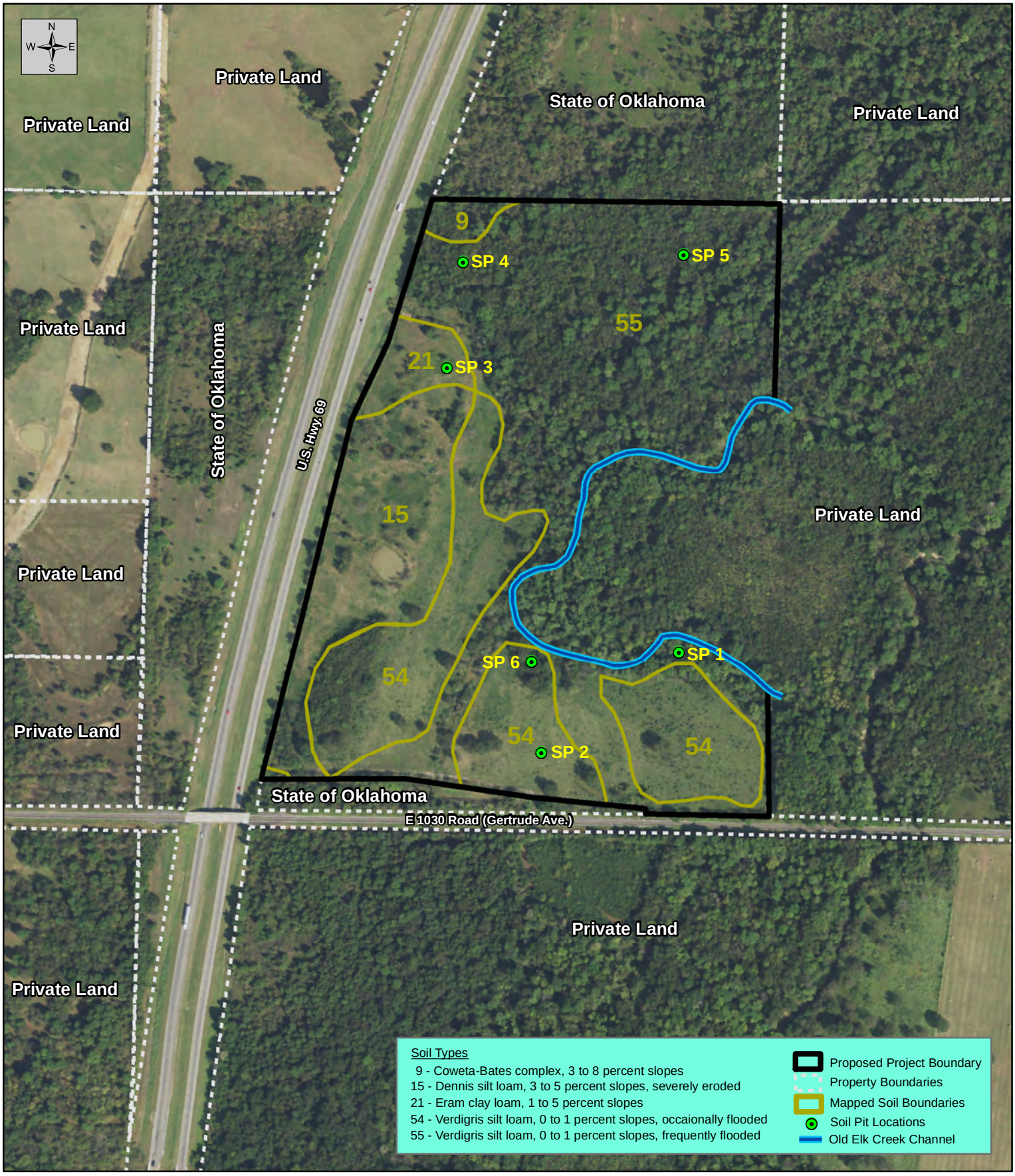


Figure 8 of 10
Soils & Adjacent Land Use
2015 Aerial Map

Honey Springs Mitigation Bank - Elk Creek Tract

Date: January 11, 2019

0 500 1,000 1,500 2,000 Feet

Section 9 - T12N - R17E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: USGS
Vector Source: HEI

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

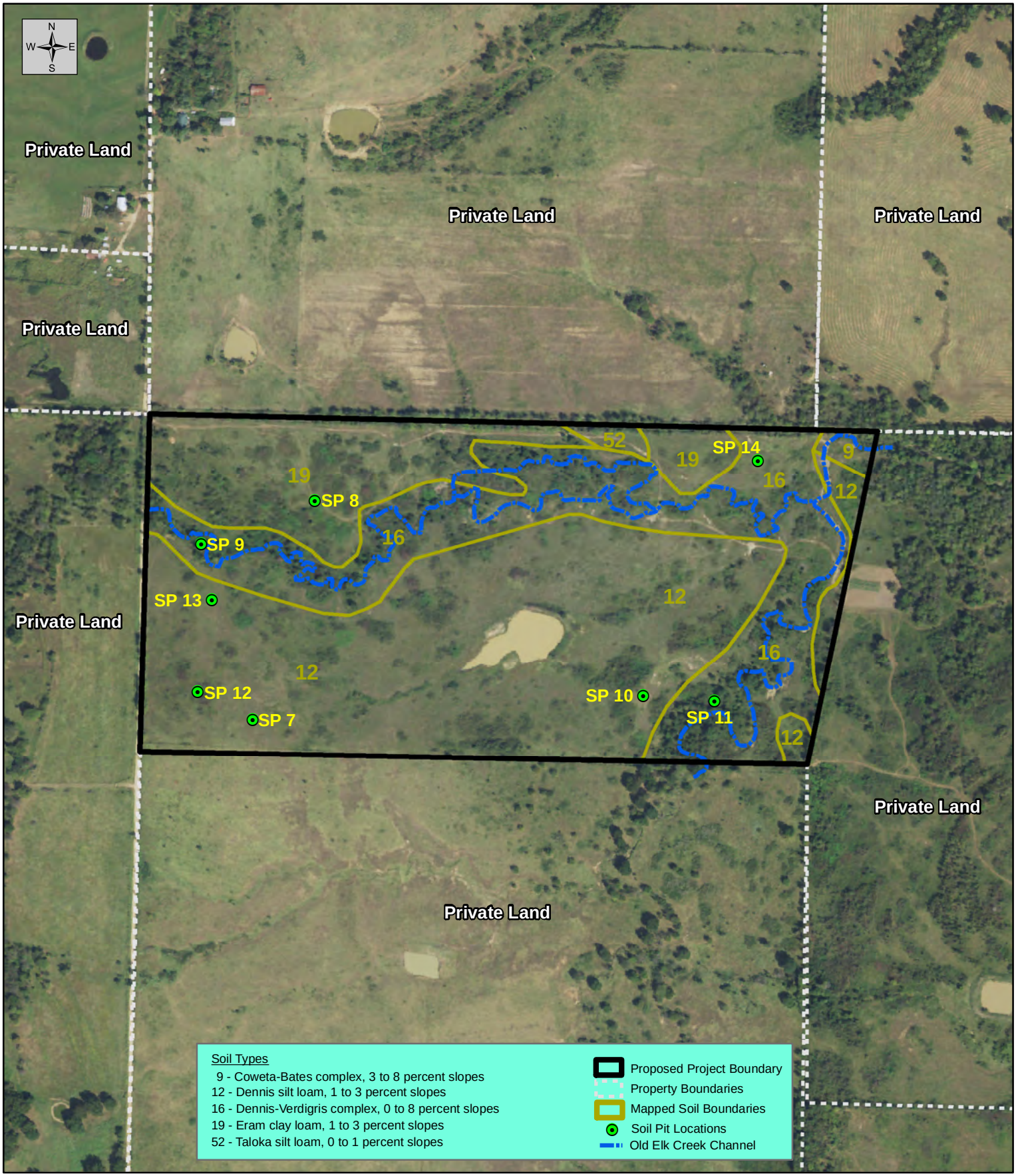


Figure 9 of 10
Soils & Adjacent Land Use
2015 Aerial Map

Honey Springs Mitigation Bank - Old Field Tract

Date: January 11, 2019

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

0 250 500 750 1,000 1,250 1,500 1,750 Feet

Section 12 - T12N - R16E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: USGS
Vector Source: HEI

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

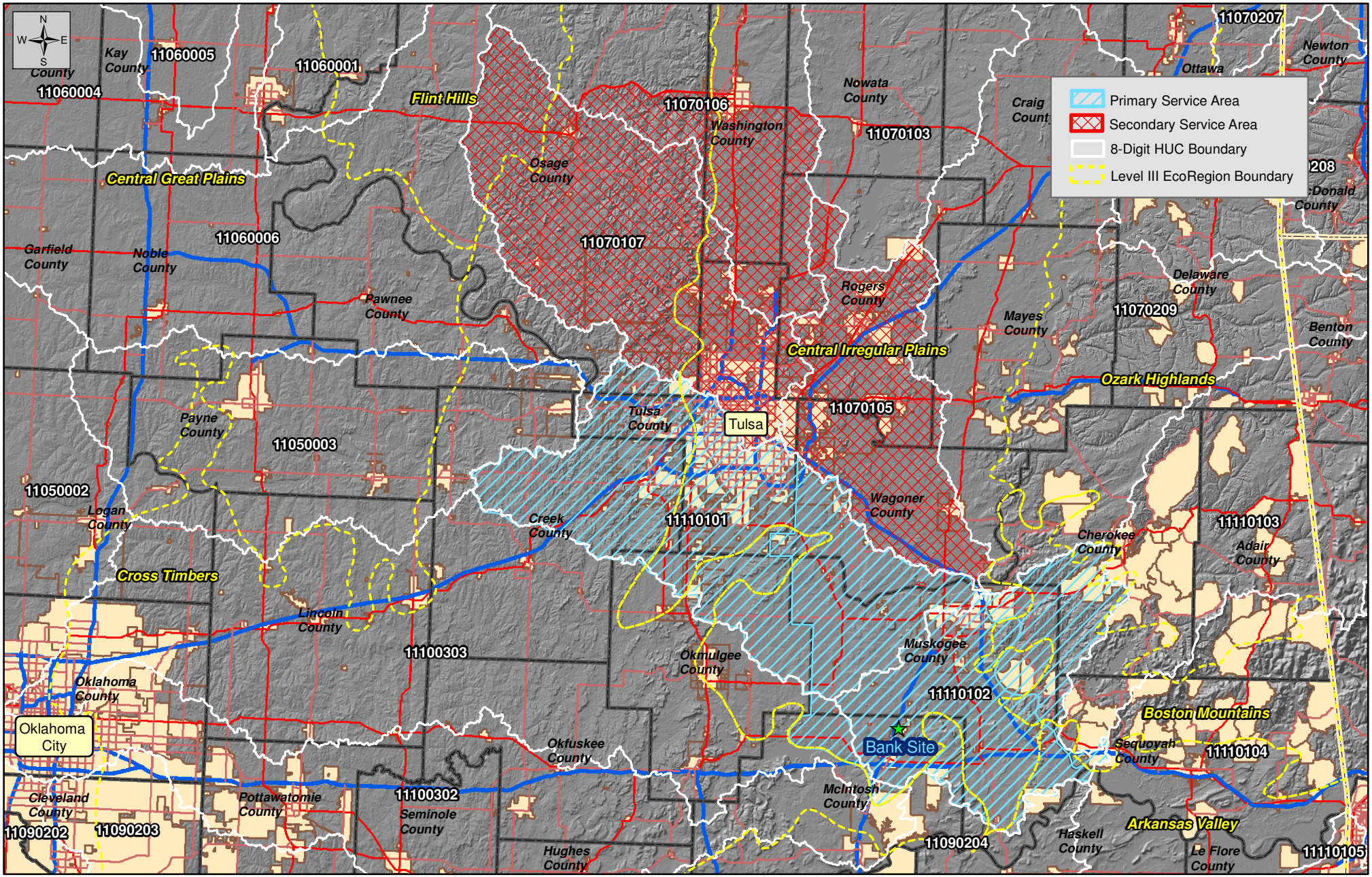


Figure 10 of 10 **Service Area Map**	**Honey Springs Mitigation Bank**	**Date Revised:** **July 17, 2019**

HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0304

0 10 20 30 40 50 60 70 80 90 100 Miles

McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: ESRI
Vector Source: HEI

Green Country Wetland Mitigation
Carthage, TX 903.694.2428

APPENDIX B

SITE PHOTOGRAPHS:

HSMB Elk Creek Tract Photographs

Photograph 1. Ephemeral Stream #1 at the point where it leaves the bottomland pasture and enters Forest Wetland 1.

Photograph 2. View of Ephemeral Stream #1 near the confluence with the Old Elk Creek channel.

Photograph 3. View of Ephemeral Stream #1 near the south end looking north..

Photograph 4. View of Ephemeral Stream #2 north of the beaver pond and confluence with Ephemeral Stream #3.

Photograph 5. View of Ephemeral Stream #2 near the confluence with the Old Elk Creek channel looking south.

Photograph 6. View of Ephemeral Stream #2 south of the beaver pond looking south.

HSMB Elk Creek Tract Photographs

Photograph 7. Another view of Ephemeral Stream #2 south of the confluence with the Old Elk Creek .

Photograph 8. View of Ephemeral Stream #3 at the point where it leaves the bottomland pasture.

Photograph 9. View of Ephemeral Stream #3 near the confluence with Ephemeral Stream #2 looking south.

Photograph 10. View of Ephemeral Stream #4 near the confluence with Ephemeral Stream #5 looking north.

Photograph 11. View of Ephemeral Stream #4 near the midpoint of the stream.

Photograph 12. View of Ephemeral Stream #4 near the confluence with Ephemeral Stream #6.

HSMB Elk Creek Tract Photographs

Photograph 13. View of Ephemeral Stream #4 near the confluence with the Old Elk Creek channel looking north.

Photograph 14. View of Ephemeral Stream #6 at the point where the stream leaves the bottomland pasture.

Photograph 15. View of Ephemeral Stream #6 near the confluence with the Old Elk Creek channel looking east.

Photograph 16. View of Ephemeral Stream #7 and adjacent upland habitat.

Photograph 17. View of Intermittent Stream near the confluence with the Old Elk Creek channel.

Photograph 18. View of Intermittent Stream in the lower third of the stream course.

HSMB Elk Creek Tract Photographs

Photograph 19. View of Intermittent Stream in the middle portion of the stream course.

Photograph 20. View of Intermittent Stream near the point where the stream enters the bottomland pasture.

Photograph 21. View of Intermittent Stream at the northern end of the stream looking northwest.

Photograph 22. View of a segment of the Old Elk Creek channel located east of the Intermittent Stream.

Photograph 23. View of a segment of the Old Elk Creek channel near Ephemeral Stream #1.

Photograph 24. View of a segment of the Old Elk Creek channel at the confluence with the Intermittent Stream.

HSMB Elk Creek Tract Photographs

Photograph 25. View of a segment of the Old Elk Creek channel located between Ephemeral Streams 1 and 2.

Photograph 26. Segment of the Old Elk Creek channel located south of confluence with the Intermittent Stream.

Photograph 27. View of a segment of the Old Elk Creek channel located east of the Intermittent Stream.

Photograph 28. Typical oxbow slough located in the floodplain of Elk Creek in Forested Wetlands 1.

Photograph 29. Typical oxbow slough located in the floodplain of Elk Creek in Forested Wetlands 1.

Photograph 30. View of bottomland pasture located west of Ephemeral Stream #1 looking northeast (late summer).

HSMB Elk Creek Tract Photographs

Photograph 31. View of bottomland pasture habitat located near the south gate looking north (late summer).

Photograph 32. View of bottomland pasture habitat located near the south gate looking northwest (late summer).

Photograph 33. View of bottomland pasture habitat located near east boundary looking north (late summer).

Photograph 34. View of bottomland pasture habitat located near the south gate looking northeast (late summer).

Photograph 35. View of bottomland pasture habitat located located between Ephemeral Streams 3 and 4 (late summer).

Photograph 36. View of bottomland pasture habitat located near the south gate looking east (early winter).

HSMB Elk Creek Tract Photographs

Photograph 37. View of bottomland pasture habitat located near the south gate looking west (early winter).

Photograph 38. Typical soil profile in bottomland pasture habitat - Old Elk Creek floodplain (Data Sheet EC EWL1).

Photograph 39. Typical soil profile in bottomland pasture habitat - Old Elk Creek floodplain (Data Sheet EC EWL2).

Photograph 40. Juvenile bottomland hardwood habitat (Forested Wetland 2) located in Old Elk Creek floodplain.

Photograph 41. Juvenile bottomland hardwood habitat (Forested Wetland 2) located in Old Elk Creek floodplain.

Photograph 42. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

HSMB Elk Creek Tract Photographs

Photograph 43. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 44. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 45. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 46. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 47. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 48. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

HSMB Elk Creek Tract Photographs

Photograph 49. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 50. High quality bottomland hardwood (Forested Wetland 1) located in Old Elk Creek floodplain.

Photograph 51. Soil profile for bottomland hardwood habitat in Old Elk Creek floodplain (Data Sheet EC FWL1).

Photograph 52. Soil profile - bottomland hardwood habitat in Old Elk Creek floodplain (Data Sheet EC FWL2).

Photograph 53. View of typical drift lines located throughout the floodplain of Old Elk Creek channel.

Photograph 54. View of typical drift lines located throughout the floodplain of Old Elk Creek channel.

HSMB Elk Creek Tract Photographs

Photograph 55. View of substantial rack lines located adjacent to Ephemeral Stream #2.

Photograph 56. View of substantial rack lines located adjacent to Ephemeral Stream #2.

Photograph 57. View of beaver pond located on Ephemeral Stream #2 – looking south.

Photograph 58. View of beaver pond located on Ephemeral Stream #2 – looking south.

Photograph 59. View of beaver dam and pond located on Ephemeral Stream #2.

Photograph 60. View of upland forested habitat located east of Ephemeral Stream #7.

HSMB Elk Creek Tract Photographs

Photograph 61. View of upland forested habitat located in the vicinity of Ephemeral Stream #7.

Photograph 62. View of upland field habitat located just south of the intermittent stream looking southwest.

Photograph 63. View of upland field habitat located just south of the intermittent stream looking south.

Photograph 64. View of upland field habitat located just south of the intermittent stream looking east.

Photograph 65. View of upland field habitat located between the two stock ponds.

Photograph 66. View of upland field habitat located just south of the larger stock pond looking southeast.

HSMB Elk Creek Tract Photographs

Photograph 67. View of soil profile associated with the upland field habitat (Data Sheet: EC UPL PAS1).

Photograph 68. View of small stock pond located in the upland field habitat near the west property boundary.

Photograph 69. Another view of small stock pond located in the upland field habitat near the west property boundary.

Photograph 70. View of a second small stock pond located in the upland field habitat near the west property boundary.

HSMB Old Field Tract Photographs

Photograph 1. View of upper end of Ephemeral Stream #1 and adjacent upland fallow field habitat.

Photograph 2. View of Ephemeral Stream #5 within Emergent Wetland #6.

Photograph 3. View of Ephemeral Stream #5 within Emergent Wetland #6.

Photograph 4. View of Intermittent Stream #1 near the south end of the property.

Photograph 5. View of Intermittent Stream #1 just north of the confluence with Ephemeral Stream #3.

Photograph 6. View of Intermittent Stream #1 within the southern third of the stream course.

Old Field Tract Photographs

Photograph 7. View of Intermittent Stream #1 south of the confluence with Ephemeral Stream #3.

Photograph 8. View of Intermittent Stream #1 just south of the confluence with Intermittent Stream #2.

Photograph 9. View of Intermittent Stream #1 just north of the confluence with Intermittent Stream #2.

Photograph 10. View of Intermittent Stream #1 near the north end of the property.

Photograph 11. View of Intermittent Stream #2 at the confluence with Intermittent Stream #1.

Photograph 12. View of Intermittent Stream #2 near the west end of the property.

Old Field Tract Photographs

Photograph 13. View of Intermittent Stream #2 near the west end of the property

Photograph 14. View of Intermittent Stream #2 at the west property boundary and crossing of N 4180 Rd.

Photograph 15. View of Intermittent Stream #2 just downstream of the beaver pond.

Photograph 16. View of Intermittent Stream #2 upstream of beaver pond.

Photograph 17. View of Intermittent Stream #2 just upstream of the beaver pond.

Photograph 18. View of Intermittent Stream #3 between the beaver pond and confluence with Intermittent Stream #2.

Old Field Tract Photographs

Photograph 19. View of Intermittent Stream #3 between the beaver pond and confluence with Intermittent Stream #2.

Photograph 20. View of the Emergent Wetland #1 habitat in the middle of the wetland area.

Photograph 21. View of the Emergent Wetland #1 habitat near the southern property boundary.

Photograph 22. View of the Emergent Wetland #1 habitat near Intermittent Stream #2.

Photograph 23. View of the Emergent Wetland #2 habitat and adjacent upland fallow field habitat.

Photograph 24. View of the Emergent Wetland #1 habitat along the southern property boundary.

Old Field Tract Photographs

Photograph 25. View of sumpweed (*Iva annua*) dominated habitat typical of identified emergent wetlands.

Photograph 26. View of the Emergent Wetland #3 habitat and adjacent upland fallow field.

Photograph 27. View of the Emergent Wetland #2 habitat located at the upper end of the on-channel pond.

Photograph 28. View of the Emergent Wetland #2 habitat located southwest of the on-channel pond.

Photograph 29. View of soil profile observed within the Emergent Wetland 1 habitat (Data Sheet OF EWL1).

Photograph 30. View of soil profile observed within the Emergent Wetland 2 habitat (Data Sheet OF EWL2)

Old Field Tract Photographs

Photograph 31. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #2.

Photograph 32. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #2.

Photograph 33. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #2.

Photograph 34. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1.

Photograph 35. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1

Photograph 36. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1.

Old Field Tract Photographs

Photograph 37. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1.

Photograph 38. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1.

Photograph 39. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #1.

Photograph 40. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #3.

Photograph 41. View of mixed shrub/scrub and emergent wetland habitat associated with Intermittent Stream #3.

Photograph 42. View of on-channel pond and adjacent Emergent Wetland 2.

Old Field Tract Photographs

Photograph 43. View of on-channel pond and adjacent Emergent Wetland 2.

Photograph 44. View of beaver pond at the point where Intermittent Stream #1 enters pond.

Photograph 45. Another view of beaver pond at the point where Intermittent Stream #1 enters pond.

Photograph 46. View of substantial drift lines at the south end of Intermittent Stream 1 and typical of all intermittents.

Photograph 47. Substantial drift lines in the southern third of Intermittent Stream 1 and typical of all intermittents.

Photograph 48. Substantial drift lines near midpoint of Intermittent Stream 1 and typical of all intermitent streams.

Old Field Tract Photographs

Photograph 49. View of upland fallow field habitat near Emergent Wetland #1.

Photograph 50. View of upland fallow field habitat north of Intermittent Stream #2 and west of Emergent Wetland #6.

Photograph 51. View of upland fallow field habitat north of Emergent Wetland #2 and south of Intermittent Stream #2.

Photograph 52. View of upland fallow field habitat north of Intermittent Stream #2 and south of Emergent Wetland #6.

Photograph 53. View of upland fallow field habitat between Emergent Wetland #2 and Emergent Wetland #3.

Photograph 54. View of upland fallow field habitat north of Ephemeral Stream #1 and south of Intermittent Stream #2.

APPENDIX C

WETLAND DELINEATION DATA SHEETS:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP5

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.528618 Long: -95.505896 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, frequently flooded NWI classification: Uplands

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:

Mature bottomland forested wetland habitat in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus shumardii	35	Yes	FACW
2. Carya illinoinensis	20	Yes	FACW
3. Fraxinus pennsylvanica	20	Yes	FACW
4. Ulmus americana	15	No	FACW
5. Maclura pomifera	4	No	FACU
	94	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Ilex decidua	8	Yes	FACW
2. Ligustrum sinense	3	Yes	FACU
3.			
4.			
5.			
	11	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Cyperus rotundus	10	Yes	FAC
2. Elymus canadensis	4	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	14	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Smilax rotundifolia	6	Yes	FAC
2. Lonicera japonica	4	Yes	FACU
	10	= 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: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.6% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Mature bottomland forested wetland habitat in Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP5

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	10YR 3/2	90	5YR 4/6	10	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Observed profile matches mapped hydric soil. Hydric soil indicators observed. Criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- X Sediment Deposits (B2)
- X 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)
- 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)
- X 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:

NA

Remarks:

Five primary and one secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP4

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 0-1 Lat: 35.528807 Long: -95.509158 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, frequently flooded NWI classification: Uplands

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 _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Mixed-aged upland forested habitat adjacent to Elk Creek floodplain. One of three wetland criteria met. Site is not a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	35	Yes	FACW
2. Quercus stellata	30	Yes	FACU
3. Quercus shumardii	15	No	FACW
4.			
5.			
	80	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Symphoricarpos orbiculatus	14	Yes	FACU
2. Ulmus alata	5	Yes	FACU
3. Juniperus virginiana	3	No	FACU
4. Ligustrum sinense	1	No	FACU
5.			
	23	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Sanicula canadensis	8	Yes	FACU
2. Elymus canadensis	5	Yes	FACU
3. Cyperus rotundus	4	Yes	FAC
4. Chasmanthium latifolium	2	No	FACW
5. Rosa spp.	1	No	FAC
6.			
7.			
8.			
9.			
10.			
	20	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Lonicera japonica	8	Yes	FACU
2. Smilax rotundifolia	4	Yes	FAC
	12	= 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: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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 _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

Mixed-aged upland forested habitat adjacent to Elk Creek floodplain. Hydrophytic vegetation was not dominant. Criteria not met.

SOIL

Sampling Point: SP4

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	10YR 3/2	100					Loam	Clay Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed. Criteria not met.

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)
- ___ 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 _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

NA

Remarks:

No primary or secondary indicators of wetland hydrology observed. Criteria not met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP3

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 1-5 Lat: 35.527420 Long: -95.509152 Datum: WGS84

Soil Map Unit Name: Eram clay loam, 1 to 5 percent slopes NWI classification: Uplands

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 _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Herbaceous dominated upland field habitat located adjacent to Elk Creek floodplain. One of three wetland criteria met. Site is not a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Diospyros virginiana	4	Yes	FAC
2. Carya illinoinensis	2	Yes	FACW
3. Gleditsia triacanthos	1	No	FACU
4.			
5.	7		
	= Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Lespedeza cuneata	40	Yes	UPL
2. Iva annua	30	Yes	FAC
3. Setaria parvoflora	20	No	FAC
4. Cynodon dactylon	18	No	FACU
5. Rubus oklahomus	10	No	FACU
6. Solanum carolinense	5	No	FACU
7. Symphyotrichum falcatum	3	No	FAC
8. Ambrosia artemisiifolia	2	No	FACU
9.			
10.	128	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
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 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Herbaceous dominated habitat located fallow field adjacent to Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP3

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	10YR 3/2	100					Loam	Gravelly Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed. Criteria not met.

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)
- ___ 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 _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

NA

Remarks:

No primary or secondary indicators of wetland hydrology observed. Criteria not met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP2B

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.526660 Long: -95.508540 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: Uplands

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:

Emergent wetland habitat located in maintained field in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Carya illinoinensis	2	Yes	FACW
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Iva annua	60	Yes	FAC
2. Panicum virgatum	15	Yes	FAC
3. Ambrosia artemisiifolia	12	No	FACU
4. Setaria parvoflora	10	No	FAC
5. Symphyotrichum falcatum	8	No	FAC
6. Paspalum floridanum	7	No	FACW
7. Eupatorium serotinum	5	No	FAC
8. Lespedeza cuneata	3	No	UPL
9. Rumex crispus	1	No	FAC
10. Persicaria lapathaifolia	1	No	FACW
	122 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
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	0	x 1 =	0
FACW species	3	x 2 =	6
FAC species	6	x 3 =	18
FACU species	1	x 4 =	4
UPL species	1	x 5 =	5
Column Totals:	11 (A)		33 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Emergent wetland habitat located in maintained field in Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP2B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	85	5YR 4/6	15	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- X Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Hydric soil indicators observed. Criteria met. Verdigris series listed as hydric.

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)
- X 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)
- ___ 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X 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:

NA

Remarks:

Two primary and two secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP2A

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.523770 Long: -95.507990 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: Uplands

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:

Emergent wetland habitat located in maintained field in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Carya illinoinensis	4	Yes	FACW
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Iva annua	65	Yes	FAC
2. Panicum virgatum	25	No	FAC
3. Ambrosia artemisiifolia	12	No	FAC
4. Setaria parvoflora	10	No	FACU
5. Eupatorium serotinum	7	No	FAC
6. Symphyotrichum falcatum	6	No	FAC
7. Rumex crispus	2	No	FAC
8.			
9.			
10.			
	127 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	1	x 2 =	2
FAC species	6	x 3 =	18
FACU species	1	x 4 =	4
UPL species	0	x 5 =	0
Column Totals:	8 (A)		24 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Emergent wetland habitat located in maintained field in Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP2A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	90	5YR 4/6	10	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Hydric soil indicators observed. Criteria met. Verdigris series listed as hydric.

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)
- X 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)
- ___ 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X 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:

NA

Remarks:

Two primary and two secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP2

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.522823 Long: -95.507457 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: Uplands

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:

Emergent wetland habitat located in maintained field in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	3	Yes	FACW
2.			
3.			
4.			
5.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Carya illinoinensis	8	Yes	FACW
2.			
3.			
4.			
5.			
	_____	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Iva annua	70	Yes	FAC
2. Panicum virgatum	20	No	FAC
3. Setaria parvoflora	10	No	FAC
4. Ambrosia artemisiifolia	10	No	FACU
5. Eupatorium serotinum	5	No	FAC
6. Symphyotrichum falcatum	5	No	FAC
7. Rumex crispus	3	No	FAC
8. Lespedeza cuneata	3	No	UPL
9. Persicaria lapathifolia	1	No	FACW
10. Paspalum floridanum	1	No	FACW
	128	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	4	x 2 =	8
FAC species	6	x 3 =	18
FACU species	1	x 4 =	4
UPL species	1	x 5 =	5
Column Totals:	12 (A)		35 (B)

Prevalence Index = B/A = 2.9

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Emergent wetland habitat located in maintained field in Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	85	5YR 4/6	15	C	PL	Loam	Clay Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Hydric soil indicators observed. Criteria met. Verdigris series listed as hydric.

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)
- X 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)
- ___ 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X 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:

NA

Remarks:

Two primary and two secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP1

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.524211 Long: -95.505725 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, frequently flooded NWI classification: Uplands

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:

Mature bottomland forested wetland habitat in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	35	Yes	FACW
2. Acer saccharinum	20	Yes	FACW
3. Celtis laevigata	15	No	FACW
4. Ulmus americana	15	No	FACW
5. Fraxinus pennsylvanica	10	No	FACW
	95	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Symphoricarpos orbiculatus	10	Yes	FACU
2. Ilex decidua	5	Yes	FACW
3. Ligustrum sinense	3	No	FACU
4.			
5.			
	18	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Teucrium canadense	12	Yes	FACW
2. Sanicula canadensis	8	Yes	FACU
3. Bidens frondosa	4	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	34	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Lonicera japonica	3	Yes	FACU
2.			
	3	= 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: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57.1% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Mature bottomland forested wetland habitat in Elk Creek floodplain. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	96	5YR 4/6	4	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Observed profile matches mapped hydric soil. Hydric soil indicators observed. Criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- X Sediment Deposits (B2)
- X 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)
- 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)
- X 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:

NA

Remarks:

Five primary and one secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Elk Creek Tract City/County: McIntosh Sampling Date: 10/18/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP6

Investigator(s): JH Section, Township, Range: Sec. 9 - T12N - R17E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-1 Lat: 35.524218 Long: -95.507829 Datum: WGS84

Soil Map Unit Name: Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: Uplands

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:

Mature bottomland forested wetland habitat in Elk Creek floodplain. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	30	Yes	FACW
2. Celtis laevigata	25	Yes	FACW
3. Acer saccharinum	15	No	FACU
4. Ulmus americana	15	No	FACW
5. Fraxinus pennsylvanica	5	No	FACW
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Symphoricarpos orbiculatus	15	Yes	FACU
2. Sapindus saponaria	8	Yes	UPL
3. Ilex decidua	5	No	FACW
4. Ulmus americana	5	No	FACW
5. Carya illinoinensis	4	No	FACW
	37	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex cherokeensis	12	Yes	FACW
2. Sanicula canadensis	8	Yes	FACU
3. Elymus canadensis	6	No	FACU
4. Teucrium canadense	5	No	FACW
5. Bidens frondosa	3	No	FACW
6.			
7.			
8.			
9.			
10.			
	34	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Campsis radicans	8	Yes	FACU
2. Smilax rotundifolia	5	Yes	FAC
	13	= 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: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	1	x 3 =	3
FACU species	5	x 4 =	20
UPL species	1	x 5 =	5
Column Totals:	17 (A)		48 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Mature bottomland forested wetland habitat in Elk Creek floodplain. Hydrophytic vegetation was not dominant, but prevalence test was less than 3.0. Criteria met.

SOIL

Sampling Point: SP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	97	5YR 4/6	3	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Observed profile matches mapped hydric soil. Hydric soil indicators observed. Criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- X 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)
- X 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:

NA

Remarks:

Three primary and one secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP13

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Flat Uplands Local relief (concave, convex, none): Concave

Slope (%): 1-3 Lat: 35.534576 Long: -95.573968 Datum: WGS84

Soil Map Unit Name: Dennis silt loam, 1 to 3 percent slopes NWI classification: Uplands

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:

Herbaceous dominated emergent wetland habitat in flatwoods topography. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Iva angustifolia	75	Yes	FAC
2. Dichanthelium scoparium	8	Yes	FACW
3. Setaria parvoflora	6	No	FAC
4. Eupatorium serotinum	5	No	FAC
5. Andropogon virginicus	5	No	FACU
6.			
7.			
8.			
9.			
10.			
	102 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	1	x 2 =	2
FAC species	3	x 3 =	9
FACU species	1	x 4 =	4
UPL species	_____	x 5 =	_____
Column Totals:	5 (A)		15 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Herbaceous dominated emergent wetland habitat in flatwoods topography. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	85	10YR 4/6	15	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

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)
- ___ 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)
- X 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:

NA

Remarks:

One primary and one secondary indicator of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP12

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Flat Upland Local relief (concave, convex, none): Convex

Slope (%): 1-3 Lat: 35.533437 Long: -95.574114 Datum: WGS84

Soil Map Unit Name: Dennis silt loam, 1 to 3 percent slopes NWI classification: Uplands

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 _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Upland herbaceous dominated fallow field habitat. No wetland criteria met. Site is not a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Ulmus alata	5	Yes	FACU
2. Symphoricarpos orbiculatus	5	Yes	FACU
3. Gleditsia triacanthos	3	No	FACU
4. Crataegus crus-galli	2	No	FAC
5. Rhus copallinum	1	No	UPL
	16	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Andropogon virginicus	25	Yes	FACU
2. Dichanthelium scoparium	20	Yes	FACW
3. Solidago canadensis	15	Yes	FACU
4. Panicum virgatum	10	No	FAC
5. Ambrosia artemisiifolia	10	No	FACU
6. Setaria parvoflora	8	No	FAC
7. Rubus oklahomus	8	No	FACU
8. Symphyotrichum falcatum	5	No	FAC
9. Sorghastrum nutans	4	No	FACU
10. Lespedeza cuneata	3	No	UPL
	108	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Lonicera japonica	3	Yes	FACU
2. Smilax rotundifolia	2	Yes	FAC
	5	= 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: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 28.5% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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 _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

Upland herbaceous dominated fallow field habitat. Hydrophytic vegetation was not dominant. Criteria not met.

SOIL

Sampling Point: SP12

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	10YR 3/2	100					Loam	Sandy Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed. Criteria not met.

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)
- ___ 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 _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

NA

Remarks:

No wetland hydrology indicators observed. Criteria not met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP11

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-8 Lat: 35.533459 Long: -95.567381 Datum: WGS84

Soil Map Unit Name: Dennis-Verdigris Complex, 0 to 8 percent slopes NWI classification: Uplands

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:

Mixed herbaceous-shrub/scrub riparian habitat associated with Intermittent Stream #1. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	10	Yes	FACW
2.			
3.			
4.			
5.			
	10	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Carya illinoinensis	25	Yes	FACW
2. Fraxinus pennsylvanica	8	No	FACW
3. Symphoricarpos orbiculatus	6	No	FACW
4. Quercus shumardii	4	No	FACW
5. Ilex decidua	3	No	FACU
	46	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Solidago gigantea	30	Yes	FACW
2. Rubus oklahomus	15	Yes	FACU
3. Andropogon virginicus	10	No	FACU
4. Dichanthelium scoparium	5	No	FACW
5. Elymus canadensis	5	No	FACW
6. Symphyotrichum dumosum	3	No	FAC
7.			
8.			
9.			
10.			
	68	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Toxicodendron radicans	15	Yes	FAC
2. Smilax bona-nox	5	Yes	FACU
	20	= 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: 66.6% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Mixed herbaceous-shrub/scrub riparian habitat associated with Intermittent Stream #1. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	90	10YR 4/6	10	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- X Sediment Deposits (B2)
- X 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)
- ___ 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)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X 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:

NA

Remarks:

Four primary and two secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP10

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Flat Upland Local relief (concave, convex, none): Concave

Slope (%): 1-3 Lat: 35.533672 Long: -95.568026 Datum: WGS84

Soil Map Unit Name: Dennis silt loam, 1 to 3 percent slopes NWI classification: Uplands

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:

Herbaceous-dominated emergent wetland located in flatwoods fallow field habitat. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Nnoe			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Iva angustifolia	80	Yes	FAC
2. Setaria parvoflora	10	No	FAC
3. Andropogon virginicus	5	No	FACU
4. Dichanthelium scoparium	5	No	FACW
5. Symphyotrichum falcatum	2	No	FAC
6. Paspalum floridanum	1	No	FACW
7.			
8.			
9.			
10.			
	103 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (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 = _____
FACW species 2	x 2 = 4
FAC species 3	x 3 = 9
FACU species 1	x 4 = 4
UPL species _____	x 5 = _____
Column Totals: 6 (A)	16 (B)

Prevalence Index = B/A = 2.6

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Herbaceous-dominated emergent wetland located in flatwoods fallow field habitat. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/1	80	10YR 4/6	20	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

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)
- ___ 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)
- X 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:

NA

Remarks:

One primary and one secondary indicator of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP9

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None

Slope (%): 0-8 Lat: 35.535131 Long: -95.574096 Datum: WGS84

Soil Map Unit Name: Dennis-Verdigris Complex, 0 to 8 percent slopes NWI classification: Uplands

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:

Shrub-dominated, mixed shrub/scrub-emergent wetland riparian habitat located adjacent to Intermittent Stream #2. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoinensis	5	Yes	FACW
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Carya illinoinensis	25	Yes	FACW
2. Fraxinus pennsylvanica	20	Yes	FACW
3. Ulmus americana	10	No	FACW
4. Quercus shumardii	5	No	FACW
5. Cornus drummondii	3	No	FAC
	63 = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Solidago gigantea	30	Yes	FACW
2. Rubus oklahomus	25	Yes	FACU
3. Andropogon virginicus	5	No	FACU
4. Elymus canadensis	5	No	FACW
5. Dichanthelium scoparium	2	No	FACW
6. Symphyotrichum dumosum	1	No	FAC
7.			
8.			
9.			
10.			
	68 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. Vitis vulpina	8	Yes	FAC
2. Toxicodendron radicans	5	Yes	FAC
	13 = 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 _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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-dominated, mixed shrub/scrub-emergent wetland riparian habitat located adjacent to Intermittent Stream #2. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	85	10YR 4/6	15	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

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)
- X Sediment Deposits (B2)
- X 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)
- ___ 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)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X 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:

NA

Remarks:

Three primary and two secondary indicators of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP8

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Flat Uplands Local relief (concave, convex, none): Concave

Slope (%): 1-3 Lat: 35.535800 Long: -95.571343 Datum: WGS84

Soil Map Unit Name: Eram clay loam, 1 to 3 percent slopes NWI classification: Uplands

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:

Herbaceous dominated emergent wetland habitat in flatwoods topography. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Iva angustifolia	65	Yes	FAC
2. Rubus oklahomus	15	No	FACU
3. Dichanthelium scoparium	5	No	FACW
4. Andropogon virginicus	5	No	FACU
5. Eupatorium serotinum	4	No	FAC
6. Setaria parvoflora	3	No	FAC
7.			
8.			
9.			
10.			
	97 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (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 =	
FACW species 3	x 2 =	6
FAC species 1	x 3 =	3
FACU species 2	x 4 =	8
UPL species	x 5 =	
Column Totals: 6 (A)		17 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Herbaceous dominated emergent wetland habitat in flatwoods topography. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	95	5YR 4/6	5	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

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)
- ___ 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)
- X 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:

NA

Remarks:

One primary and one secondary indicator of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP7

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 1-3 Lat: 35.533302 Long: -95.573456 Datum: WGS84

Soil Map Unit Name: Dennis silt loam, 1 to 3 percent slopes NWI classification: Uplands

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:

Herbaceous dominated emergent wetland habitat in flatwoods topography. All three wetland criteria met. Site is a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
	_____	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Iva angustifolia	70	Yes	FAC
2. Dichanthelium scoparium	8	No	FACW
3. Andropogon virginicus	6	No	FACU
4. Setaria parvoflora	5	No	FAC
5. Rubus oklahomus	4	No	FACU
6. Eupatorium serotinum	3	No	FAC
7. Paspalum floridanum	3	No	FACW
8. Symphyotrichum dumosum	1	No	FAC
9. Conoclinium coelestinum	1	No	FACW
10. Agalinis heterophylla	1	No	FAC
	102	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (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 = _____
FACW species 3	x 2 = 6
FAC species 5	x 3 = 15
FACU species 2	x 4 = 8
UPL species _____	x 5 = _____
Column Totals: 10 (A)	29 (B)

Prevalence Index = B/A = 2.9

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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.)

Herbaceous dominated emergent wetland habitat in flatwoods topography. Hydrophytic vegetation was dominant. Criteria met.

SOIL

Sampling Point: SP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	85	5YR 4/6	15	C	PL	Loam	Silt Loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Hydric soil indicators observed. Criteria met.

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)
- ___ 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)
- X 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:

NA

Remarks:

One primary and one secondary indicator of wetland hydrology observed. Criteria met.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HSMB - Old Field Tract City/County: McIntosh Sampling Date: 10/17/18

Applicant/Owner: Dunnavant & Hoffman State: OK Sampling Point: SP14

Investigator(s): JH Section, Township, Range: Sec. 12 - T12N - R16E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex

Slope (%): 0-8 Lat: 35.536009 Long: -95.566723 Datum: WGS84

Soil Map Unit Name: Dennis-Verdigris Complex, 0 to 8 percent slopes NWI classification: Uplands

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 _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Upland herbaceous dominated fallow field habitat. No wetland criteria met. Site is not a wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Symphoricarpos orbiculatus	8	Yes	FACU
2. Gleditsia triacanthos	3	Yes	FACU
3.			
4.			
5.			
	11	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Andropogon virginicus	30	Yes	FACU
2. Rubus oklahomus	20	Yes	FACU
3. Cynodon dactylon	15	Yes	FACU
4. Helenium amarum	12	No	FACU
5. Ambrosia artemisiifolia	10	No	FACU
6. Solanum carolinense	8	No	FACU
7. Setaria parvoflora	5	No	FAC
8. Dichanthelium scoparium	5	No	FACW
9. Croton capitatus	4	No	NI
10. Lespedeza cuneata	2	No	UPL
	111	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. None			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - 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 _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

Upland herbaceous dominated fallow field habitat. Hydrophytic vegetation was not dominant. Criteria not met.

SOIL

Sampling Point: SP14

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	10YR 3/2	100					Sand	Silty Sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked 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)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

No hydric soil indicators observed. Criteria not met.

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)
- ___ 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 _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

NA

Remarks:

No wetland hydrology indicators observed. Criteria not met.

APPENDIX D

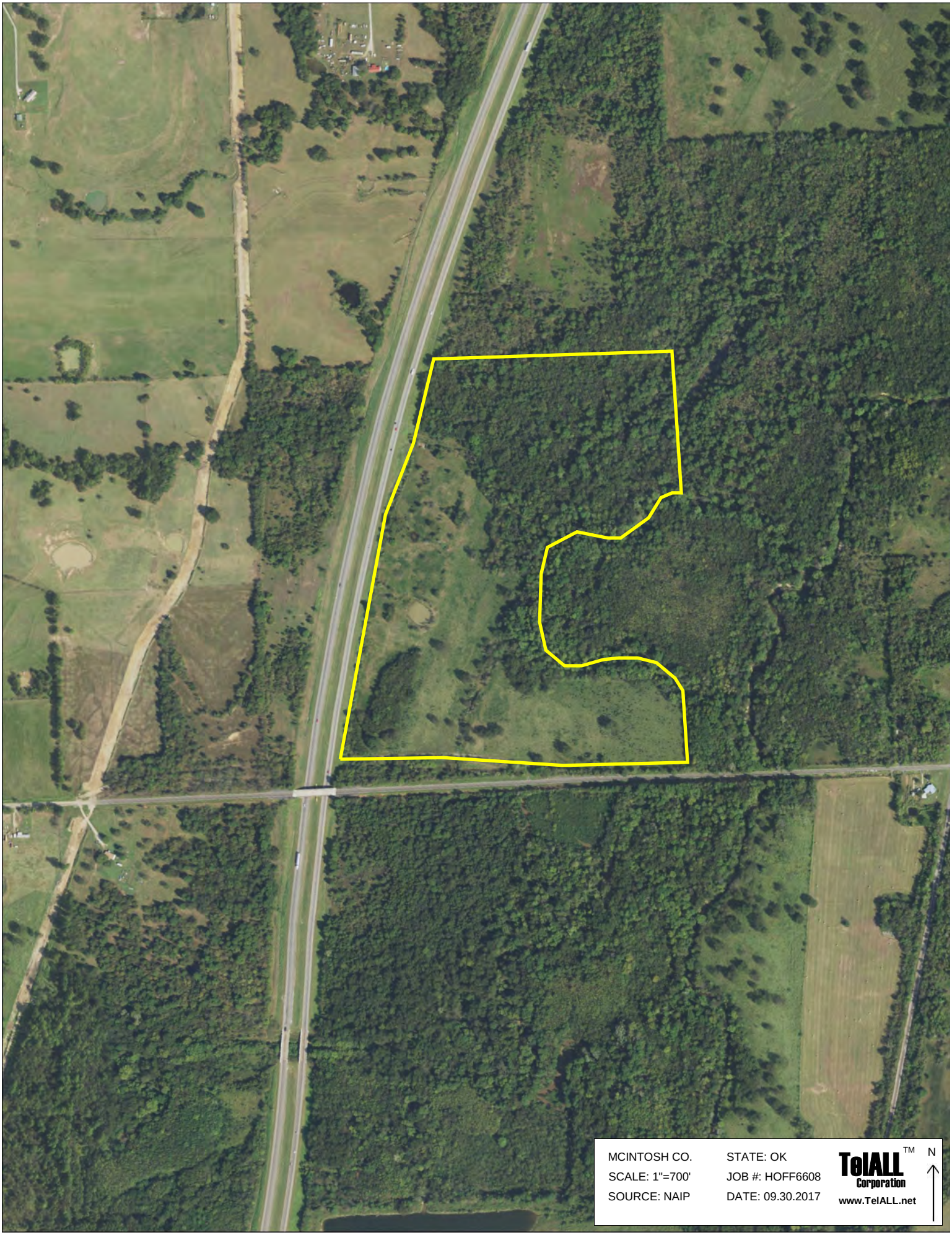
HSMB PLANT LIST:

APPENDIX D - HSMB PLANT LIST

Box Elder	(*Acer negundo*)
Silver Maple	(*Acer saccharinum*)
Prairie False Foxglove	(*Agalinis heterophylla*)
Annual Ragweed	(*Ambrosia artemisiifolia*)
Broomsedge	(*Andropogon virginicus*)
Devil's Beggartick	(*Bidens frondosa*)
Trumpet Creeper	(*Campsis radicans*)
Cherokee Sedge	(*Carex cherokeensis*)
Pecan	(*Carya illinoinensis)*
Hackberry	(*Celtis laevigata*)
Blue Mistflower	(*Conoclinium coelestinum*)
Roughleaf Dogwood	(*Cornus drummondii*)
Cockspur Hawthorn	(*Crataegus crus-galli*)
Woolly Croton	(*Croton capitatus*)
Bermuda Grass	(*Cynodon dactylon*)
Nutsedge	(*Cyperus rotundus*)
Velvet Panicum	(*Dichanthelium scoparium*)
Common Persimmon	(*Diospyros virginiana*)
Canada Wild Rye	(*Elymus canadensis*)
Late Boneset	(*Eupatorium serotinum*)
Green Ash	(*Fraxinus pennsylvanica*)
Honey Locust	(*Gleditsia triacanthos*)
Bitter Sneezeweed	(*Helenium amarum*)
Possumhaw	(*Ilex decidua*)
Narrowleaf Marshelder	(*Iva angustifolia*)
Sumpweed	(*Iva annua*)
Eastern Redcedar	(*Juniperus virginiana*)
Chinese Bush-Clover	(*Lespedeza cuneata*)
Chinese Privet	(*Ligustrum sinense*)
Japanese Honeysuckle	(*Lonicera japonica*)
Bois d' Arc	(*Maclura pomifera*)
Switchgrass	(*Panicum virgatum*)
Florida Paspalum	(*Paspalum floridanum*)
Pale Smartweed	(*Persicaria lapathifolia*)
Bur Oak	(*Quercus macrocarpa*)
Shumard Oak	(*Quercus shumardii*)
Post Oak	(*Quercus stellata*)
Shining Sumac	(*Rhus copallinum*)
Oklahoma Blackberry	(*Rubus oklahomus*)
Curly Dock	(*Rumex crispus*)
Canadian Black Snakeroot	(*Sanicula canadensis*)
Soapberry	(*Sapindus saponaria*)
Knotroot Bristlegrass	(*Setaria parviflora*)
Saw Greenbrier	(*Smilax bona-nox*)
Common Greenbrier	(*Smilax rotundifolia*)
Carolina Horsenettle	(*Solanum carolinense*)
Canada Goldenrod	(*Solidago canadensis*)
Giant Goldenrod	(*Solidago gigantea*)
Indiangrass	(*Sorghastrum nutans*)
Smut Grass	(*Sporabolis indicus*)
Coralberry	(*Symphoricarpos orbiculatus*)
Bushy Aster	(*Symphyotrichum dumosum*)
White Prairie Aster	(*Symphyotrichum falcatum*)
American Germander	(*Teucrium canadense*)
Poison Ivy	(*Toxicodendron radicans*)
Winged Elm	(*Ulmus alata*)
American Elm	(*Ulmus americana*)

APPENDIX E

HISTORIC AERIALS: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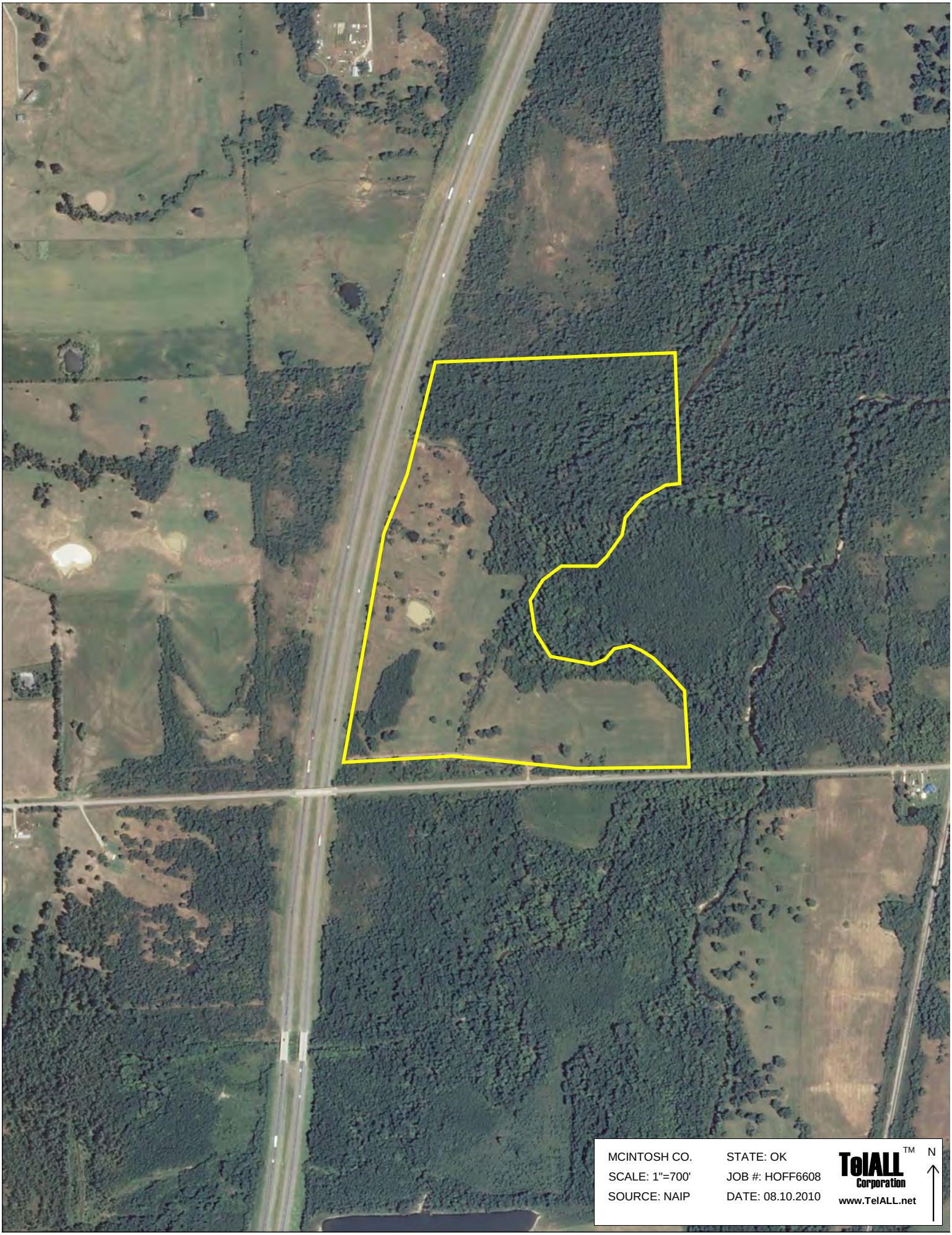
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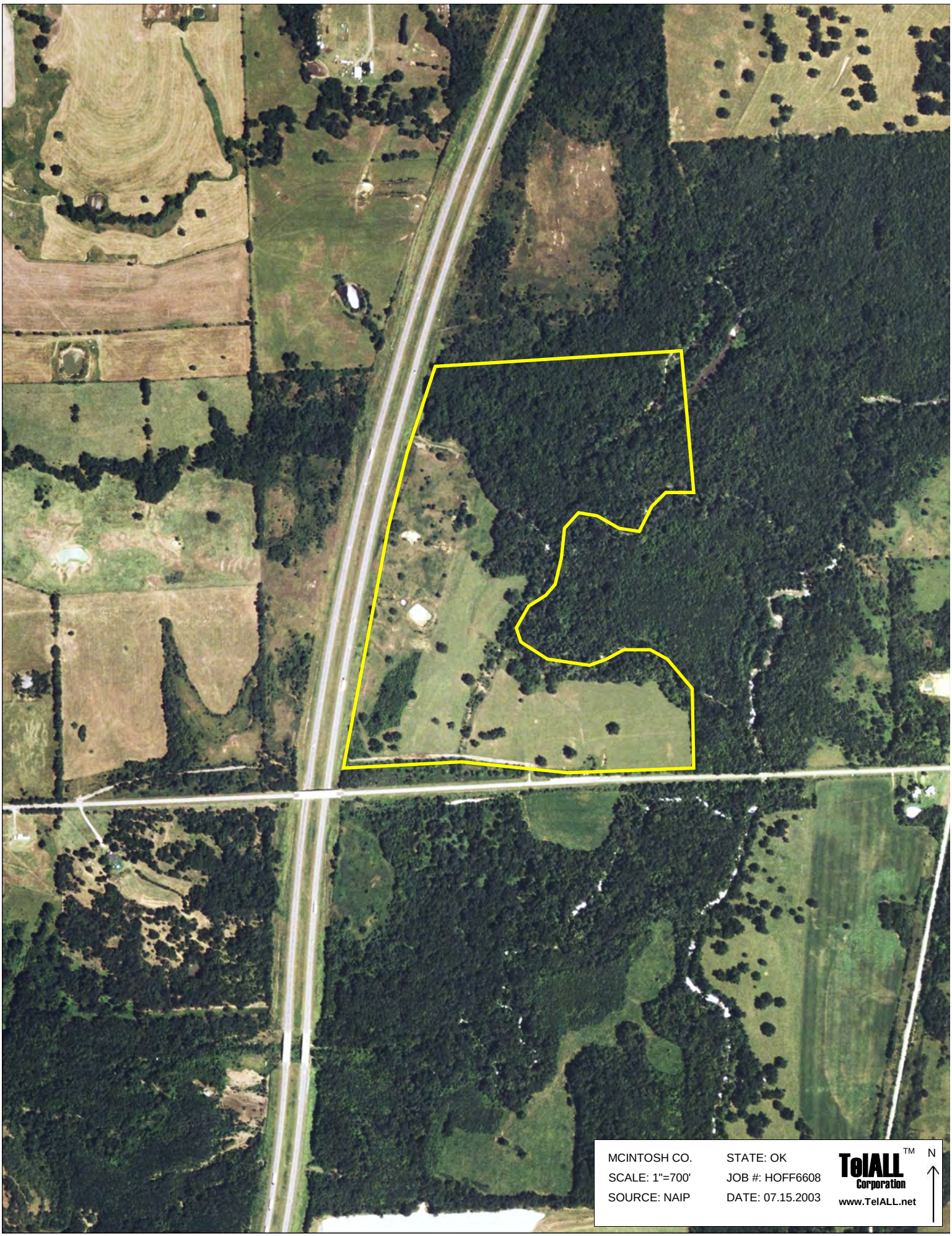
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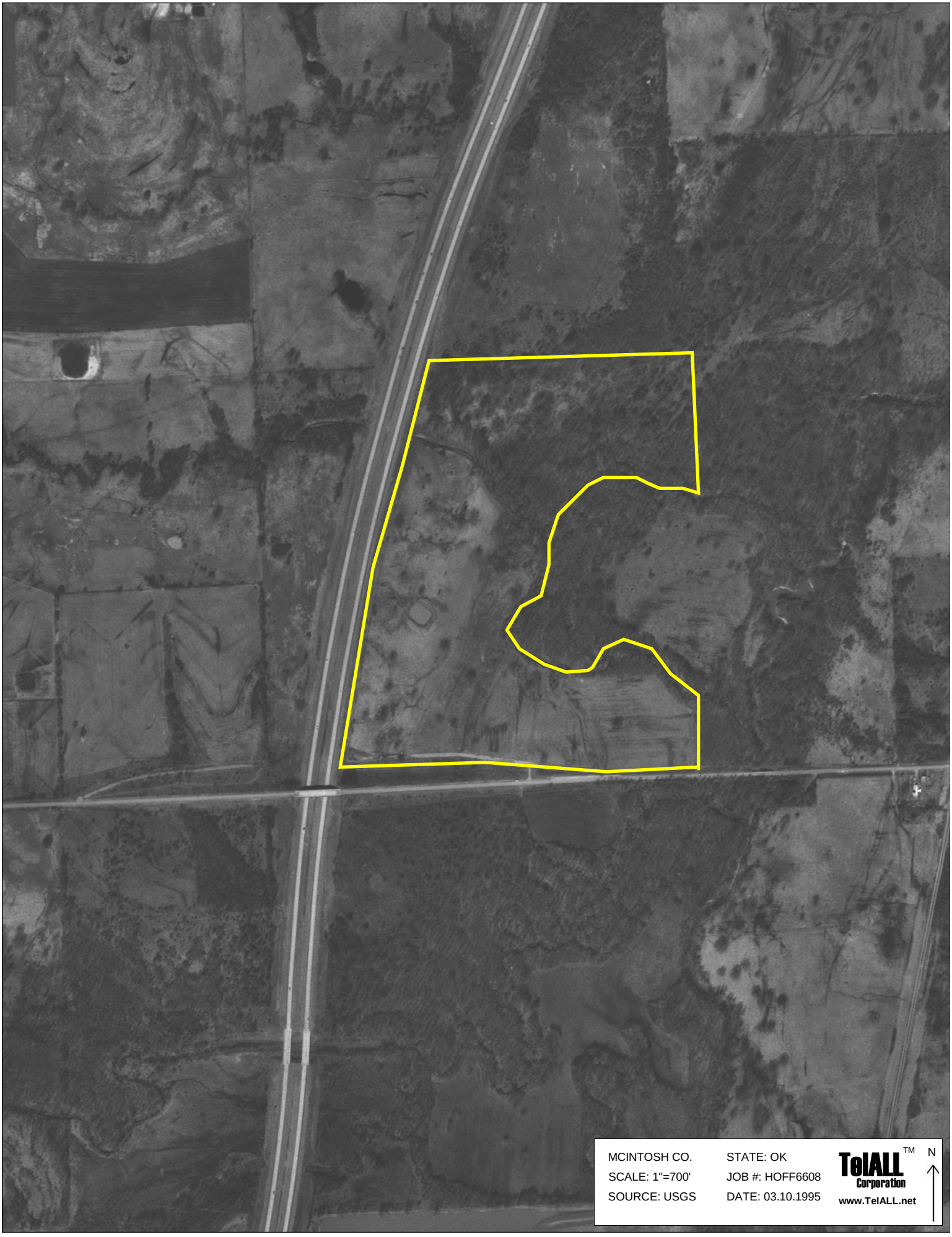
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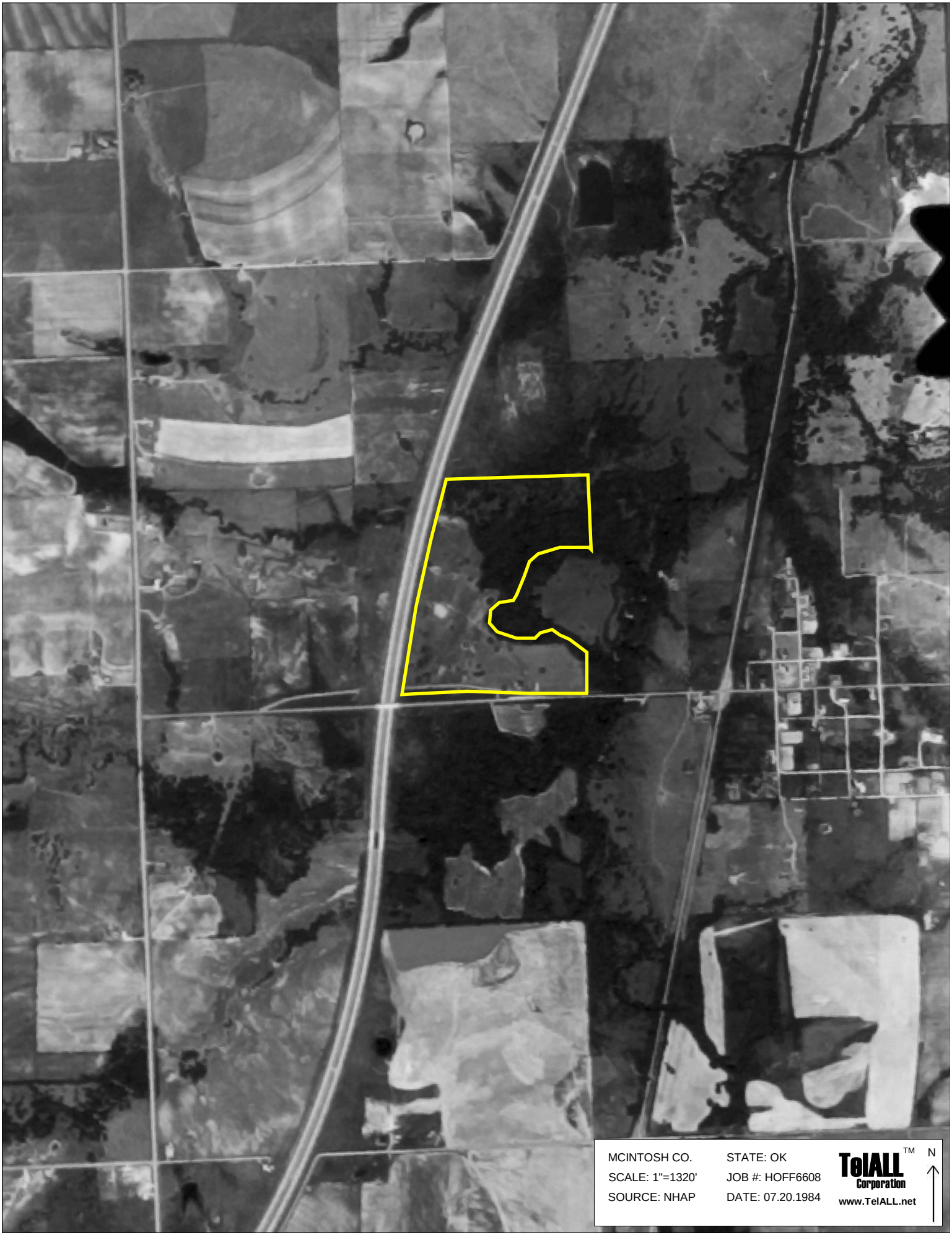
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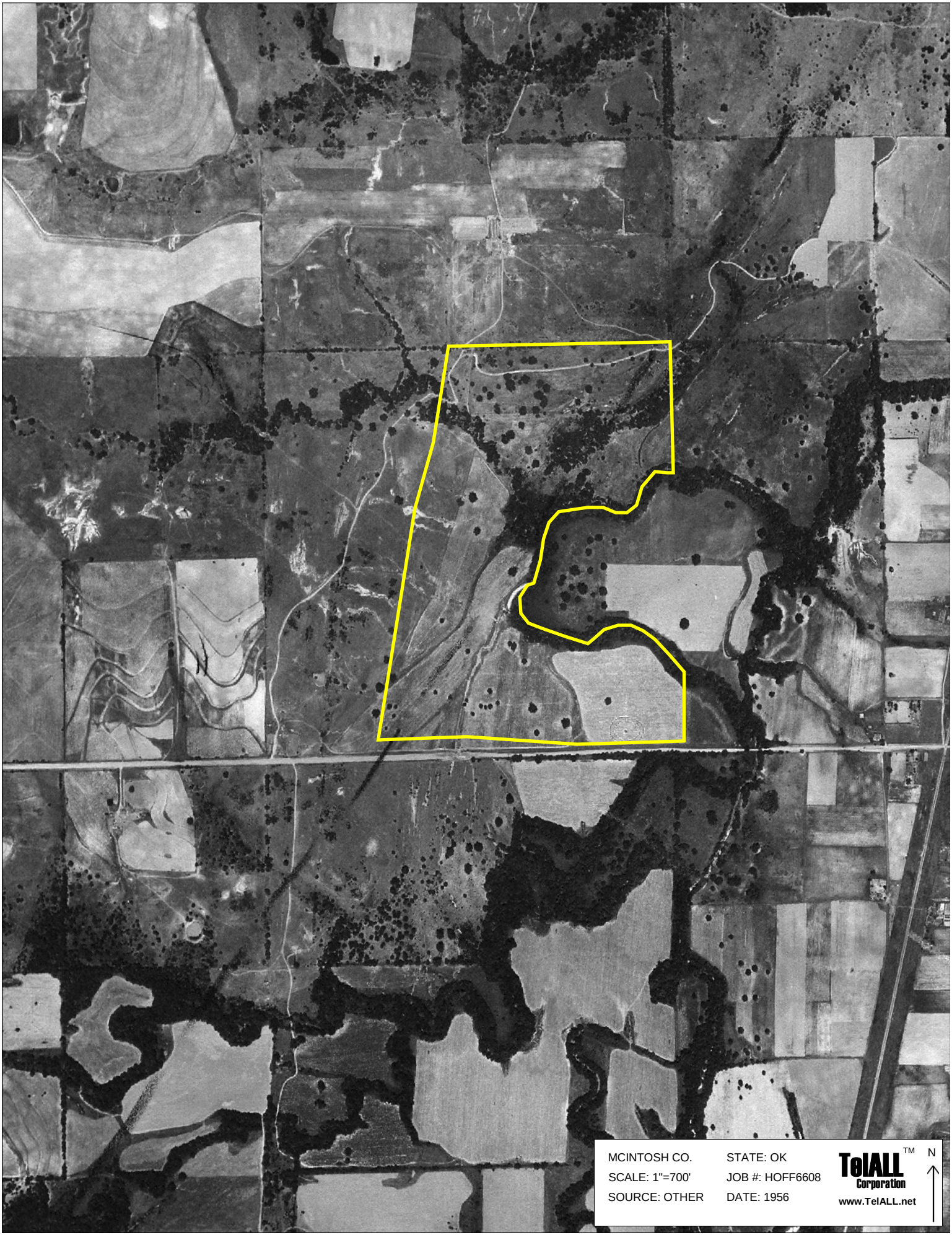
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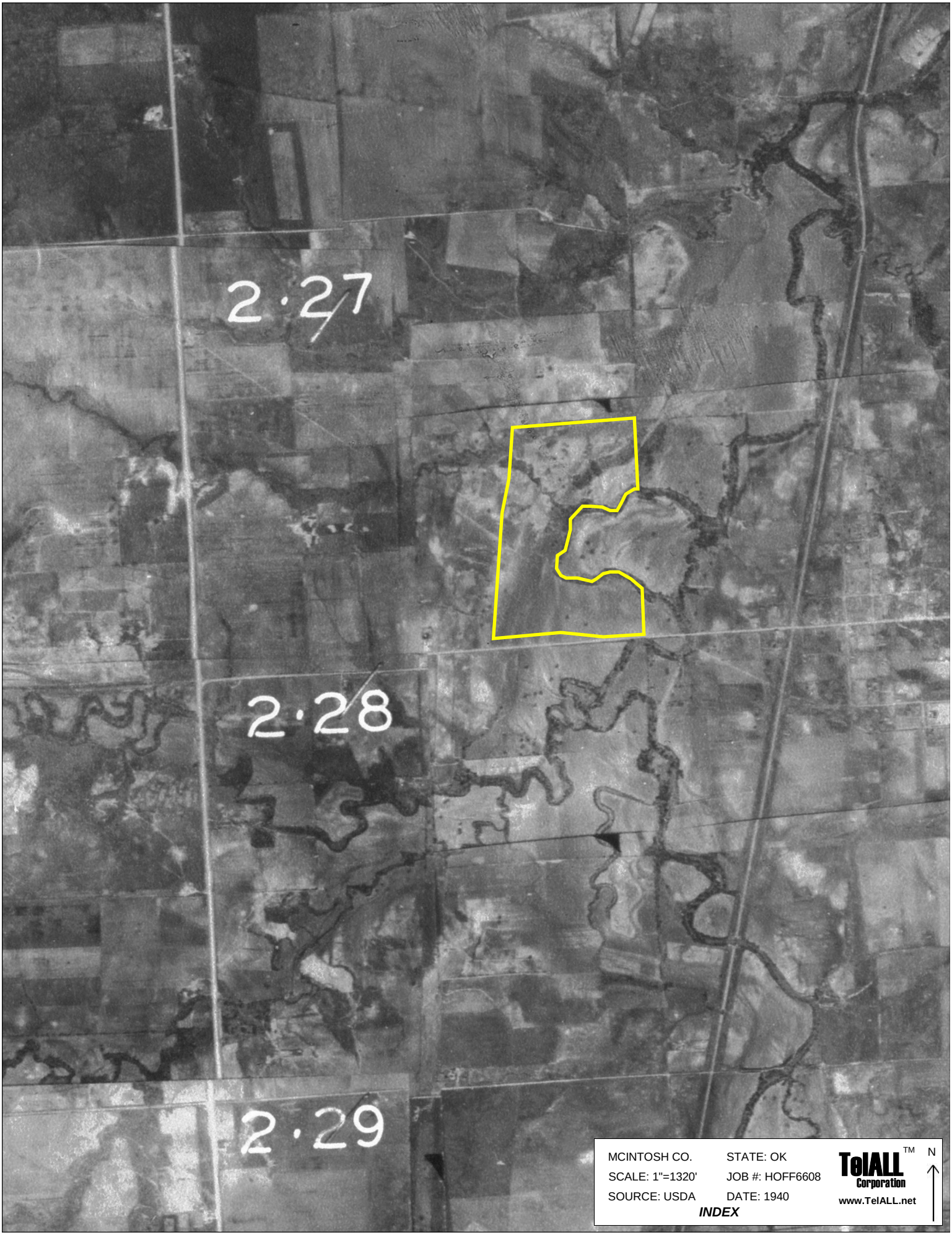

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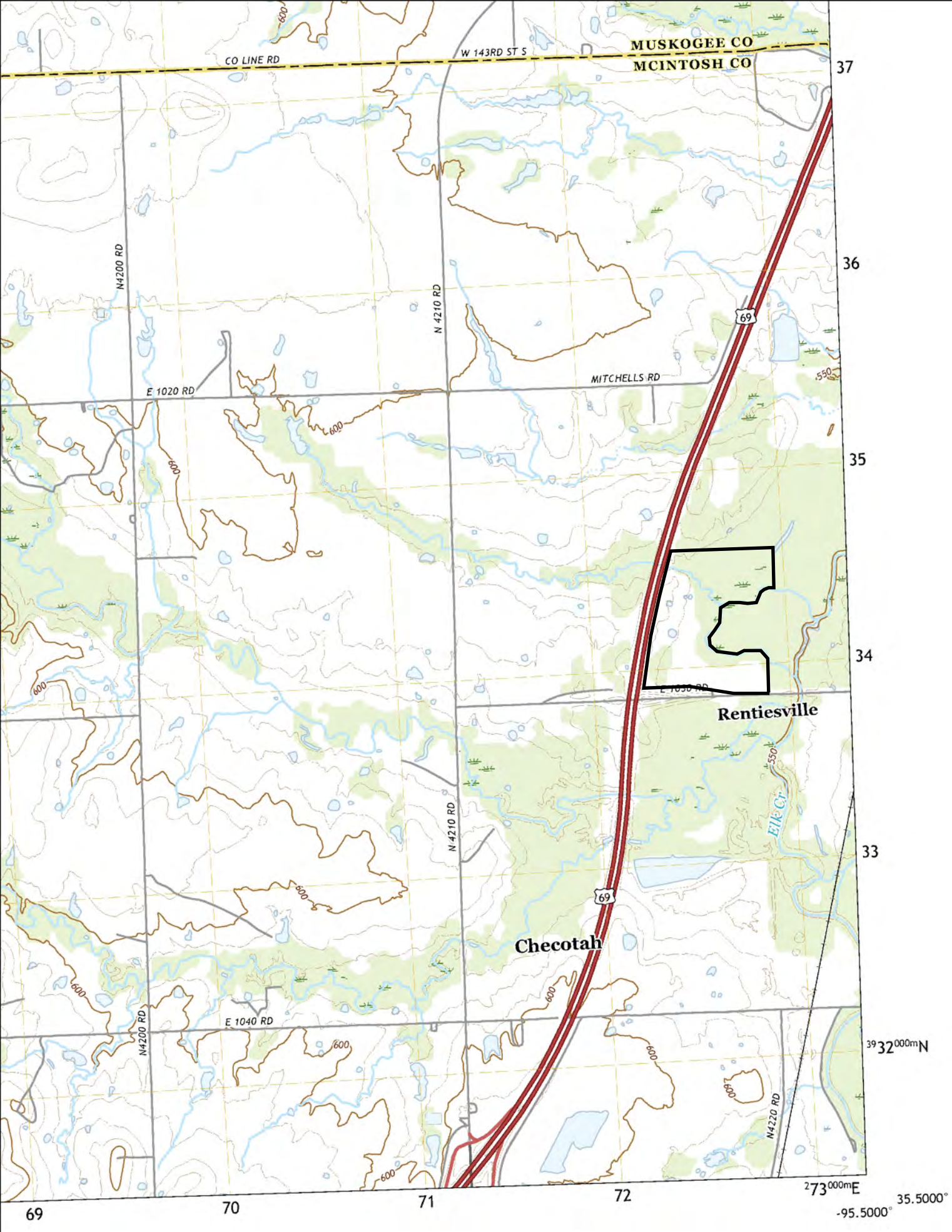
MUSKOGEE CO
MCINTOSH CO
CO LINE RD
W 143RD ST S
N4200 RD
N 4210 RD
E 1020 RD
MITCHELLS RD
69
Rentiesville
Elk Cr
Checotah
E 1040 RD
N4220 RD
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35
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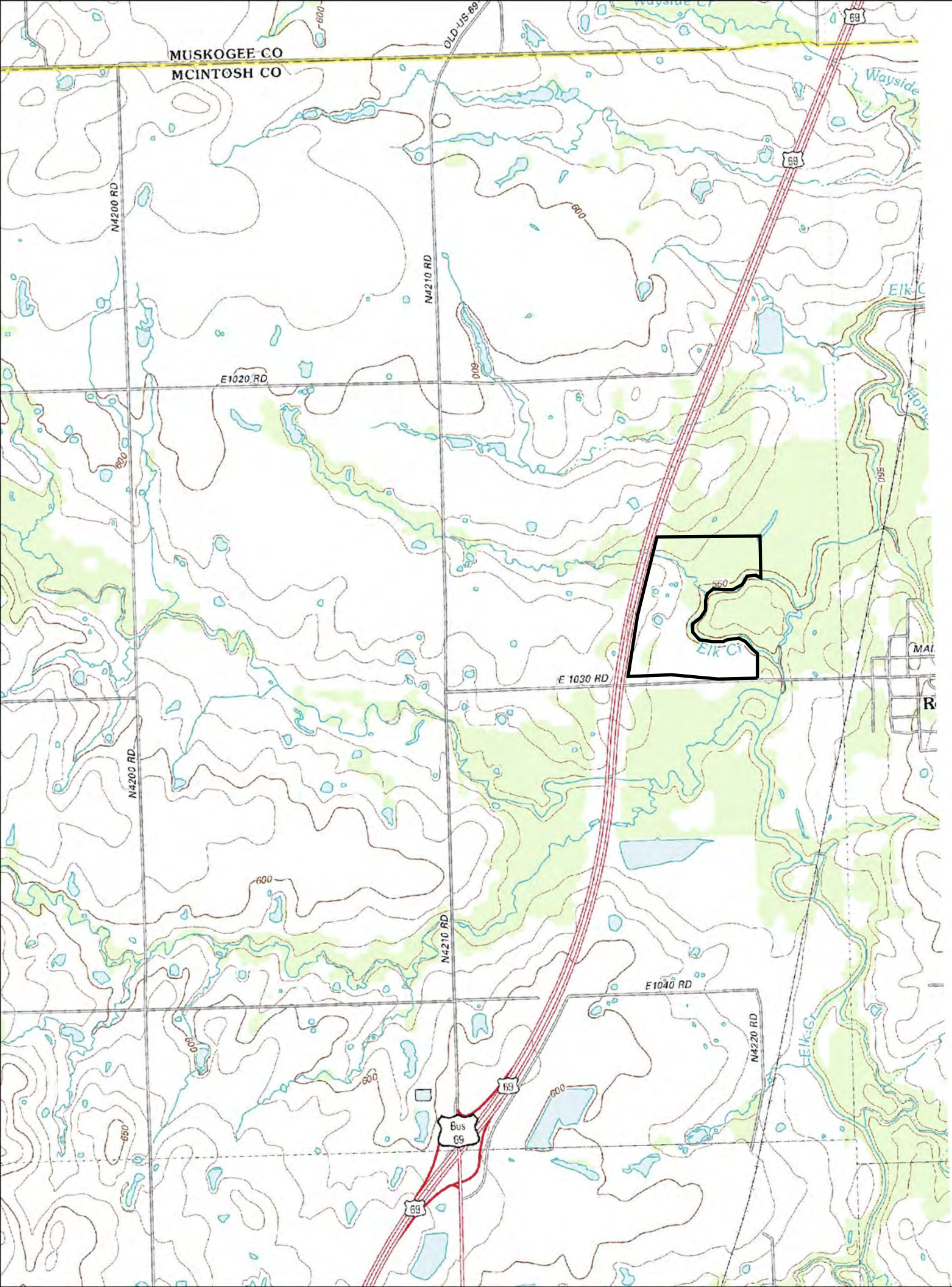
33
69
70
71
72
39 32.000m N
273.000m E
35.5000°
-95.5000°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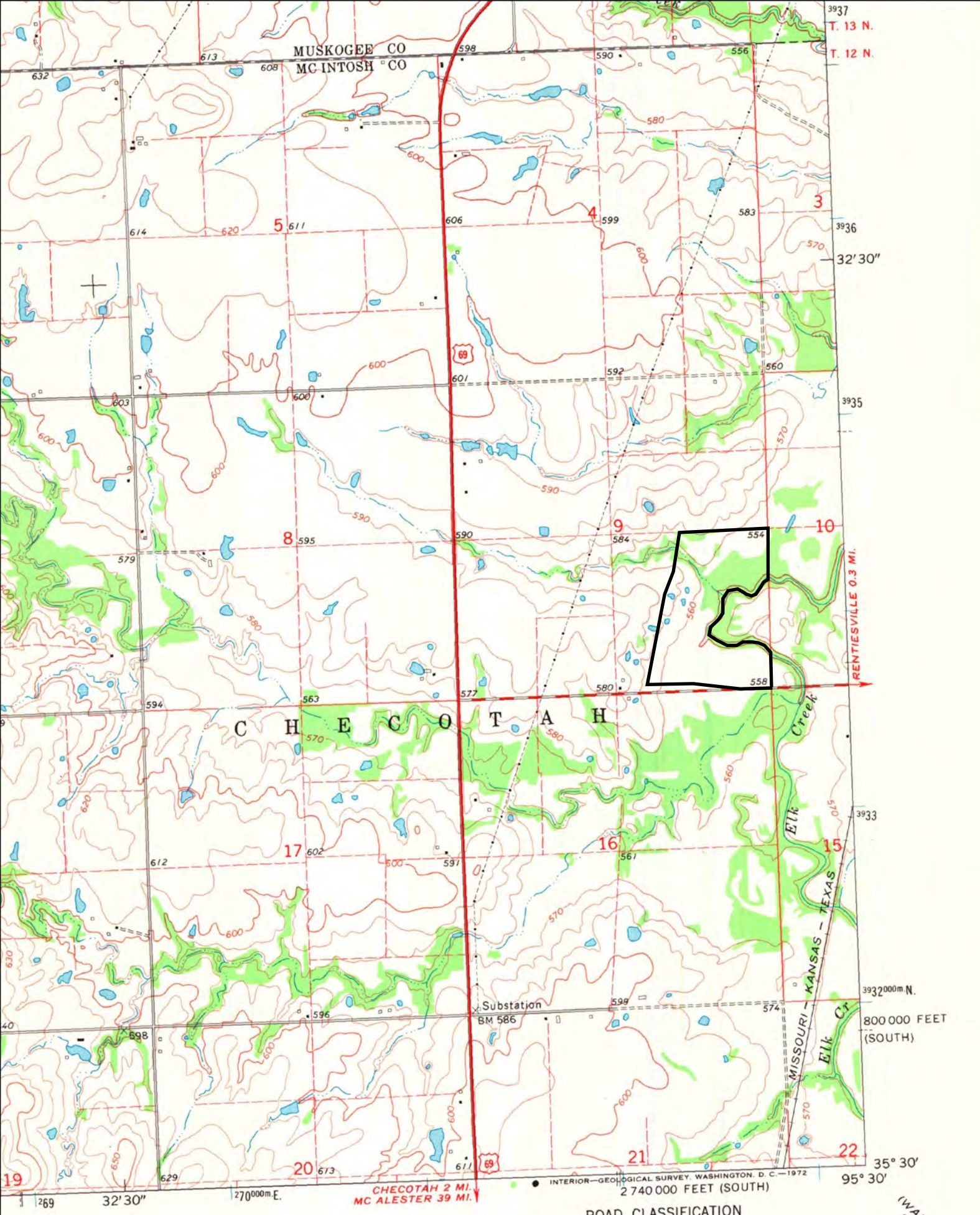
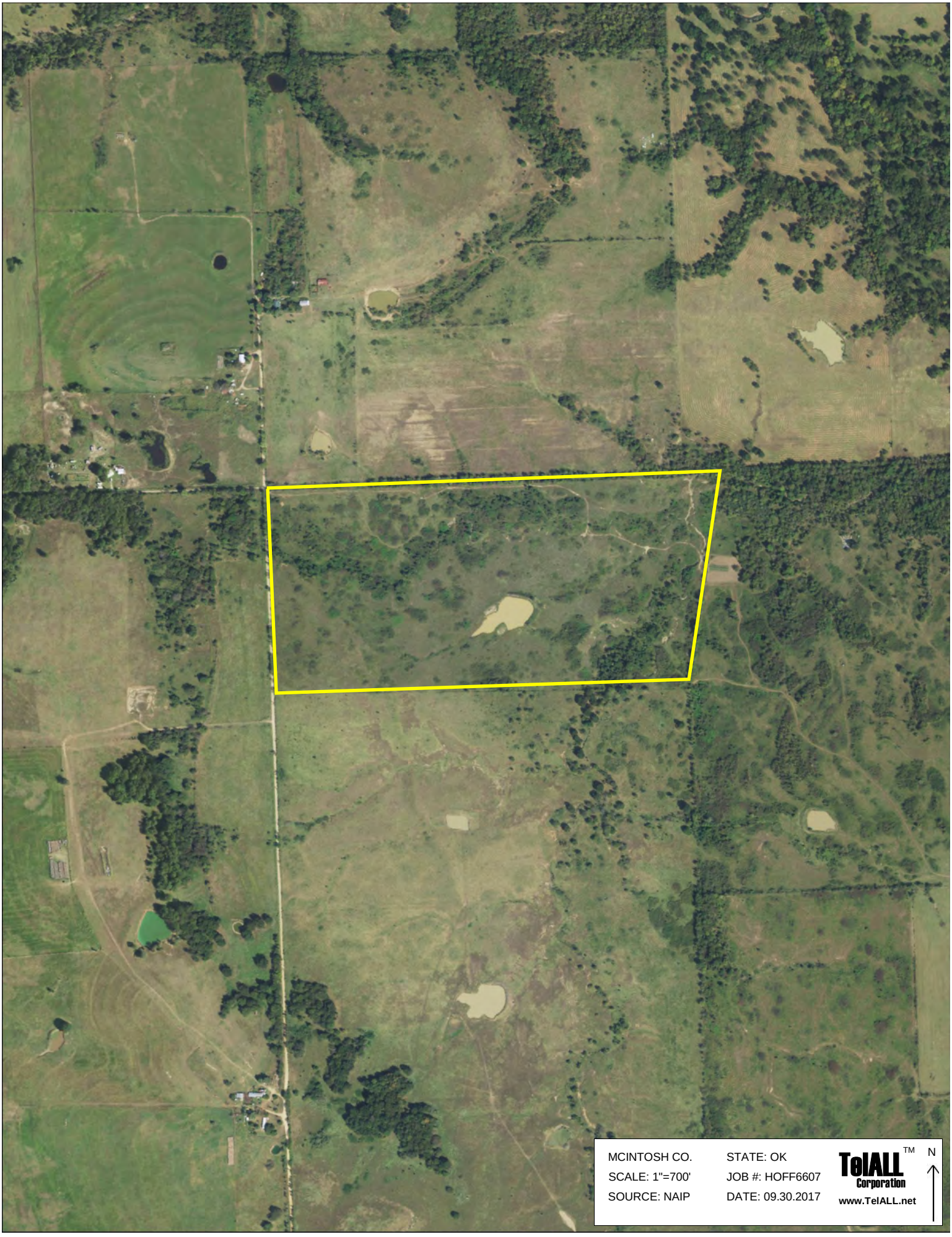
600
650
Bus
69
69


MUSKOGEE CO
MC INTOSH CO
T. 13 N.
T. 12 N.
3937
3936
3935
3933
3932000m.N.
32'30"
RENTIESVILLE 0.3 MI.
C H E C O T A H
Elk Creek
Elk Cr
MISSOURI - KANSAS - TEXAS
Substation
BM 586
800 000 FEET
(SOUTH)
CHECOTAH 2 MI.
MC ALESTER 39 MI.
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1972
2 740 000 FEET (SOUTH)
35° 30'
95° 30'
269
270000m.E.
1 MILE
0 FEET
ROAD CLASSIFICATION
Primary highway, all weather, hard surface
Secondary highway, all weather, hard surface
Light-duty road, all weather, improved surface
Unimproved road, fair or dry weather
(WARNER NW)
6954 IV NW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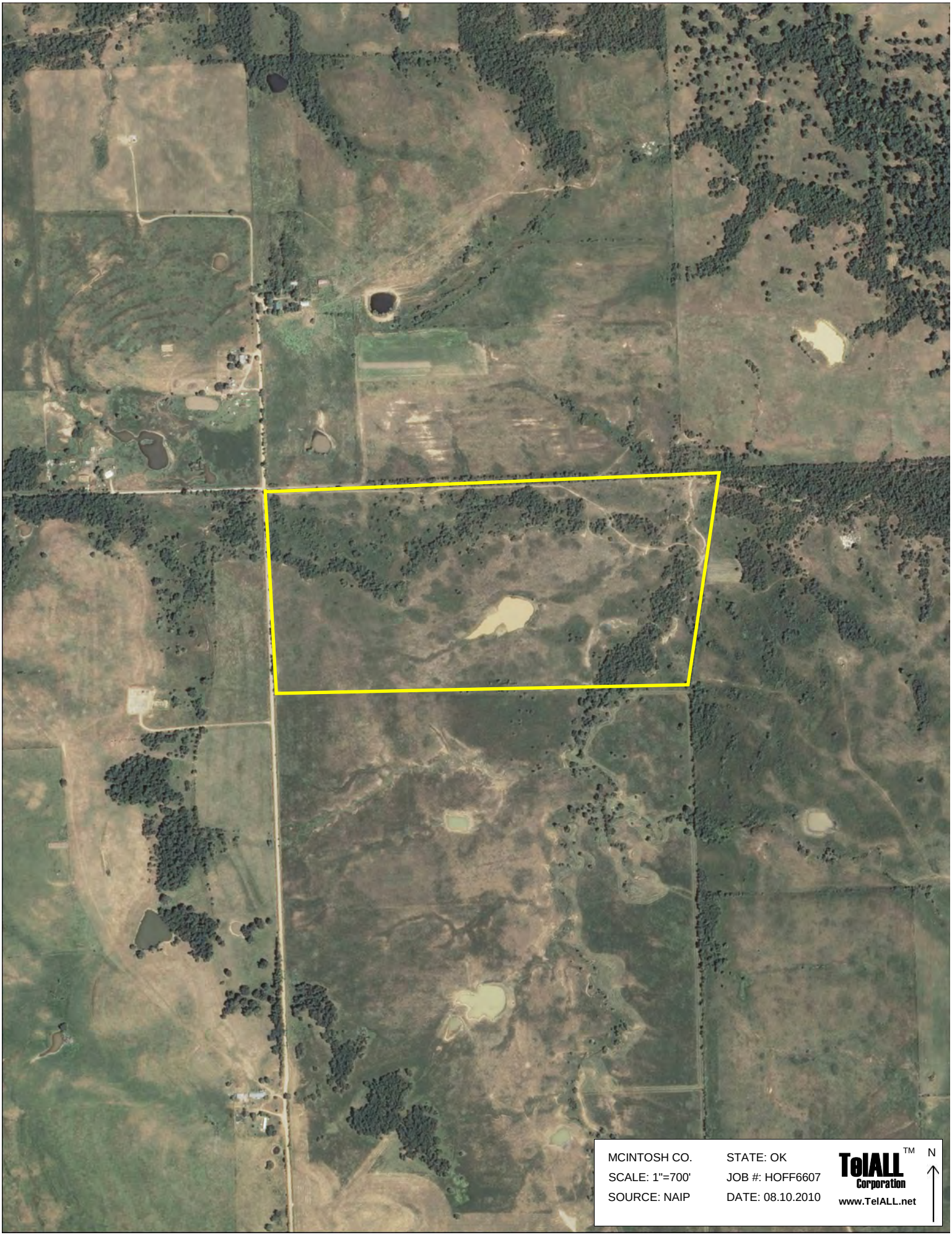
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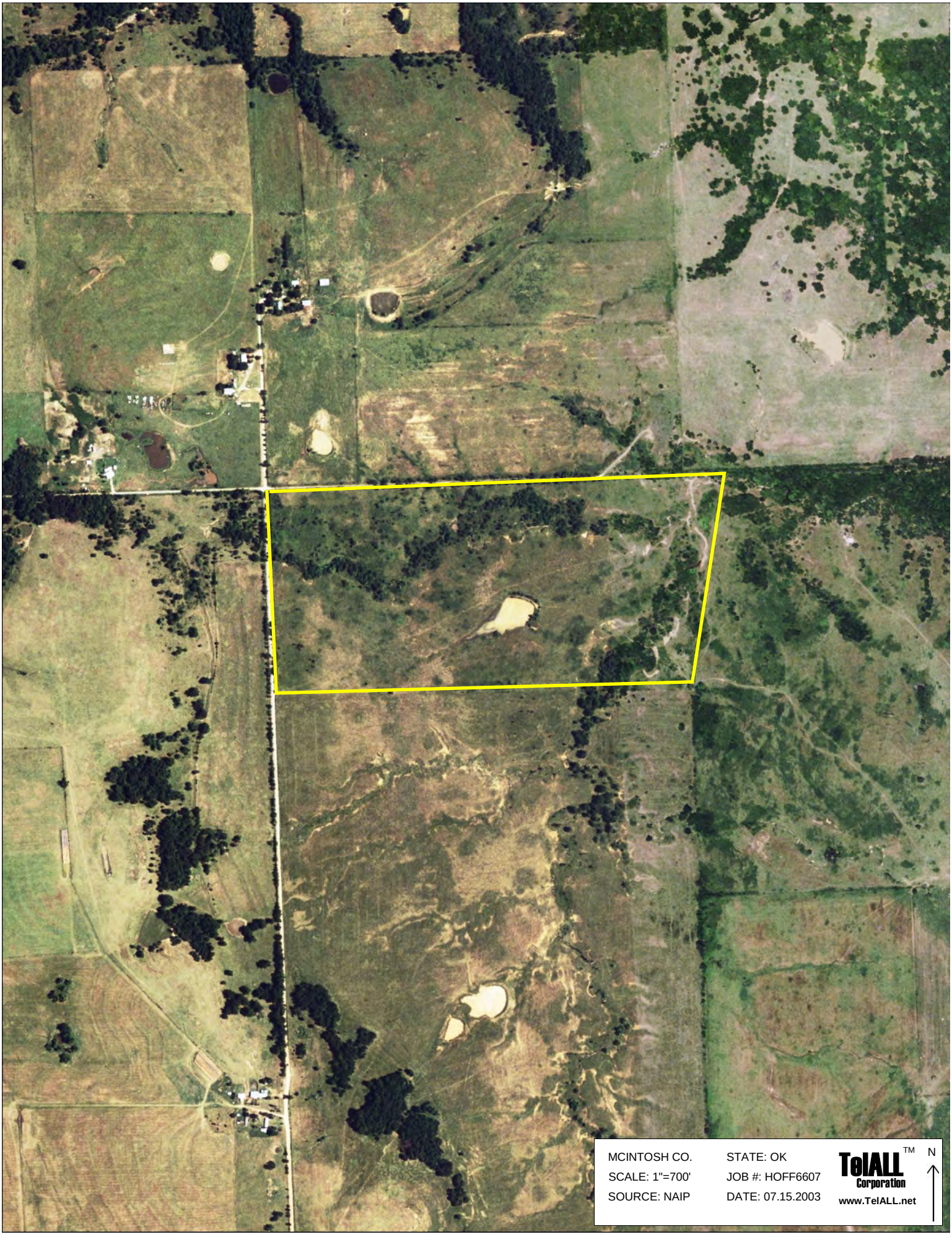
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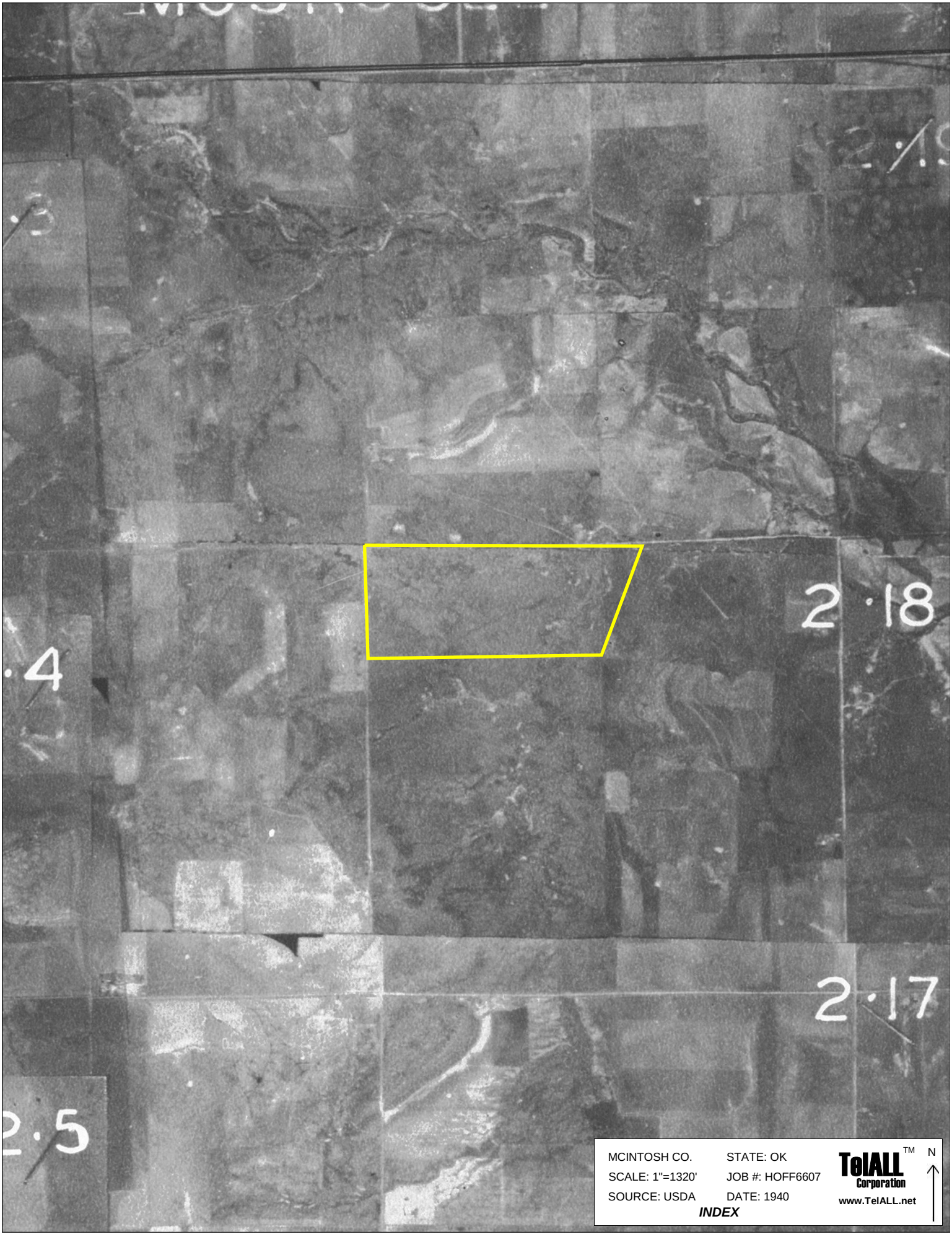

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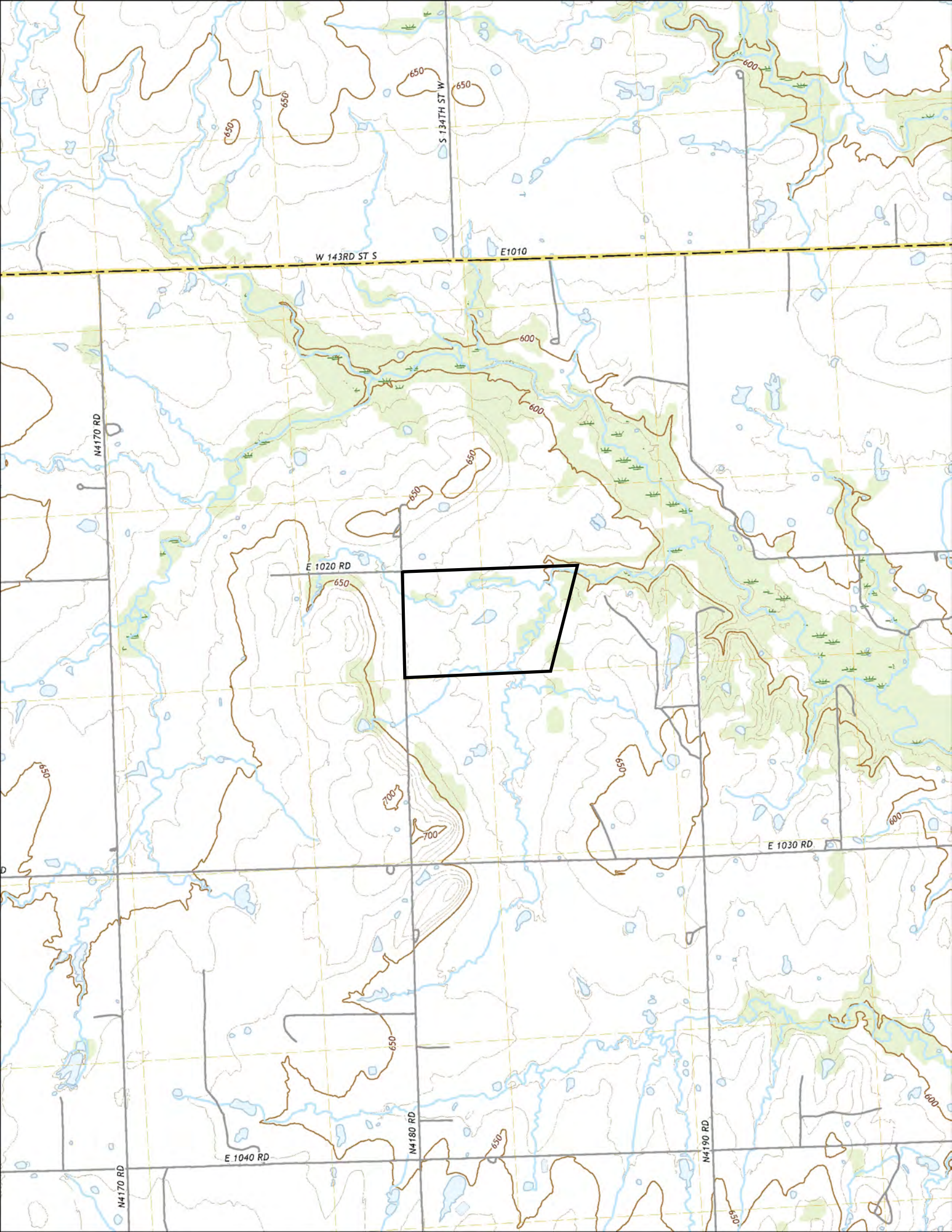
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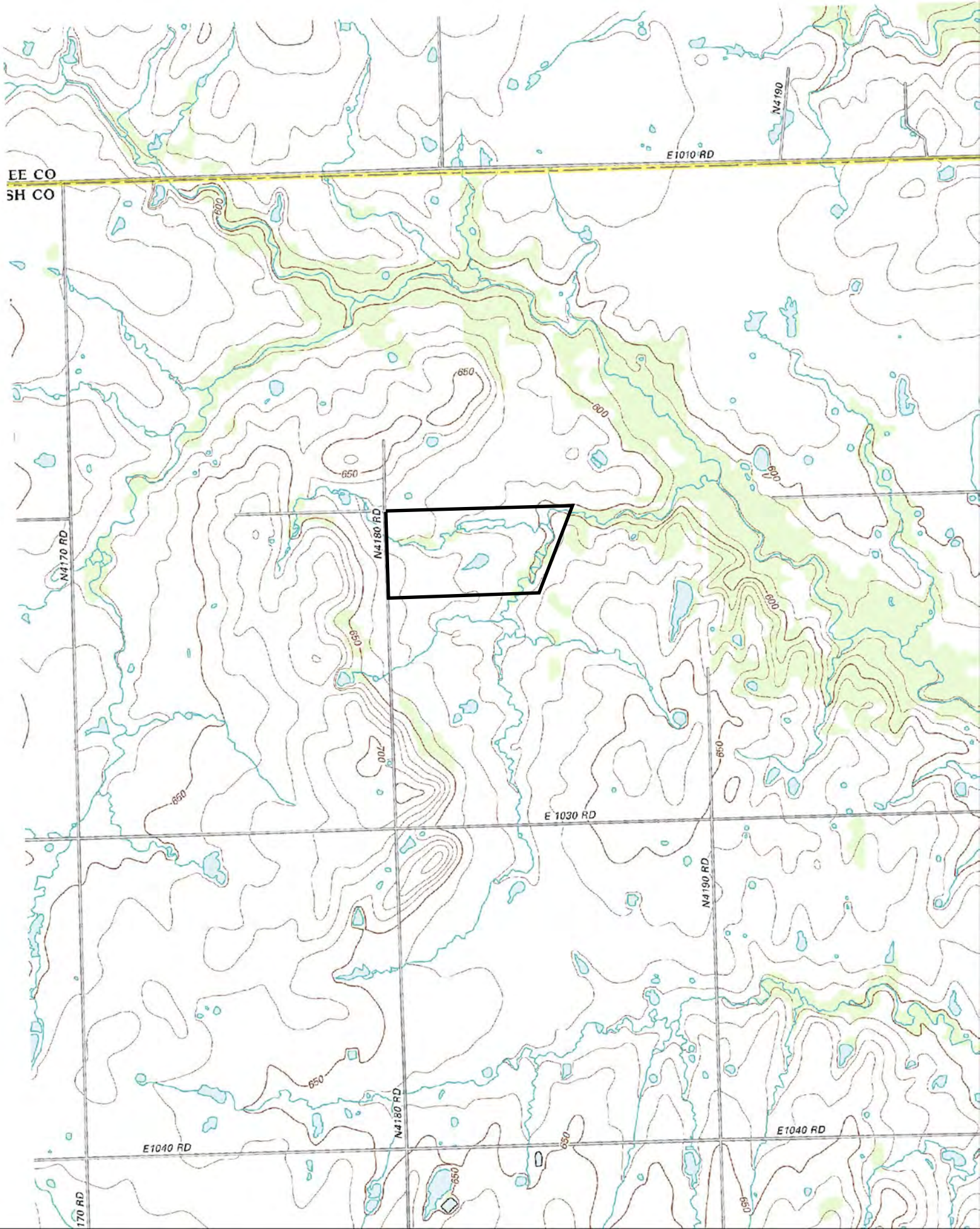
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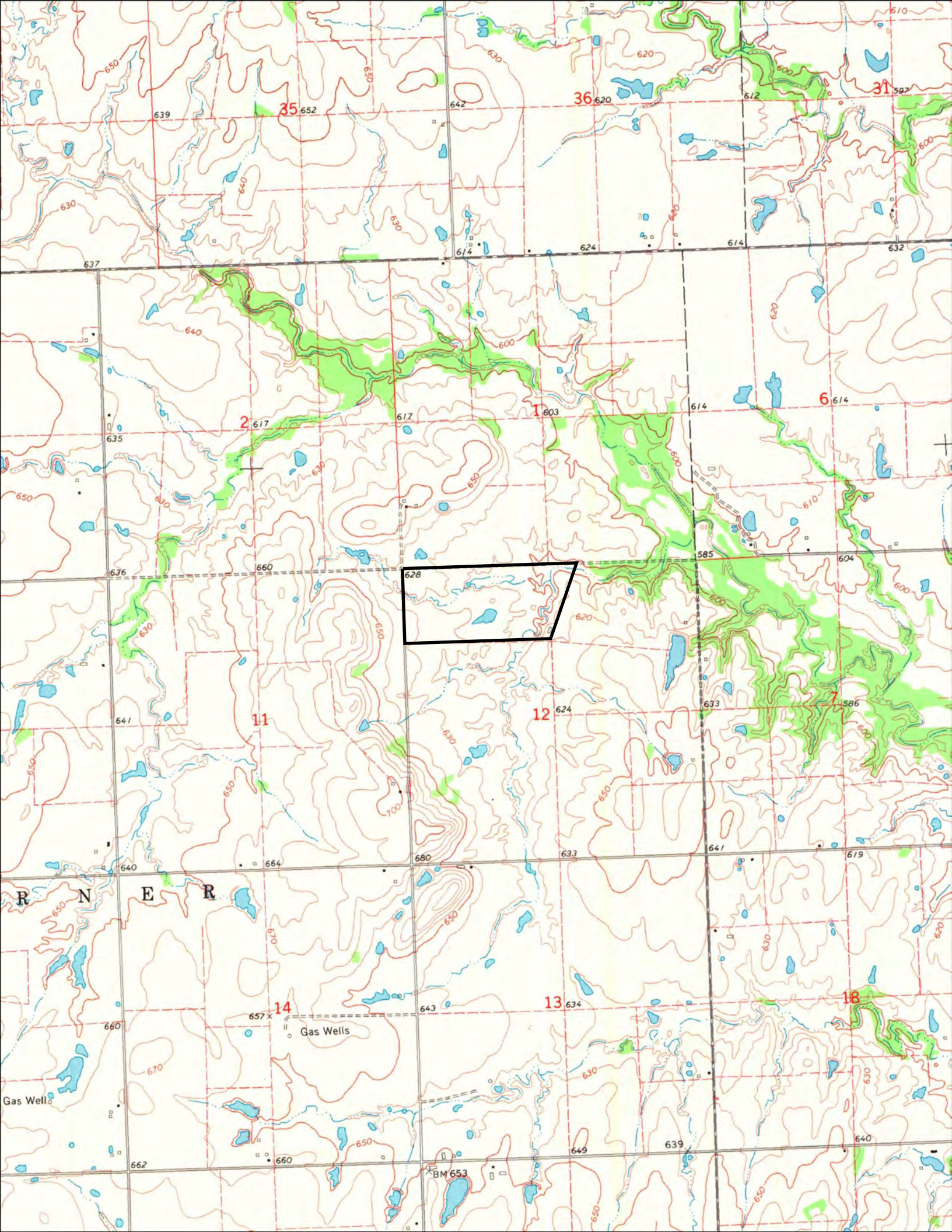
R N E R
Gas Wells
Gas Well
BM 653

APPENDIX F

SITE PROTECTION INSTRUMENT:

DEED OF CONSERVATION EASEMENT

THIS DEED OF CONSERVATION EASEMENT (this "Easement") is made on this _____ day of _____, 20_____, by **Jack Dunnavant**, having an address of PO Box 1326, Carthage, Texas 75633 ("Grantor") and **Land Legacy, Inc.**, an Oklahoma non-profit public benefit corporation authorized to do business in Oklahoma, having as address at 822 E. 6th Street, Suite 200, Tulsa, Oklahoma 74120 ("Grantee"); and the **U.S. Army Corps of Engineers, Tulsa District** ("Third Parties").

WITNESSETH:

WHEREAS, Grantor is the sole owner in fee simple title of certain real property, which consists of 162.02 acres, situated in McIntosh County, Oklahoma, more particularly described in **Exhibit A**, attached hereto and incorporated herein ("Property"); and

WHEREAS, Department Permit No. SWT-2019-218 of the U.S. Army Corps of Engineers ("Corps") (hereinafter referred to as the "Permit") authorizes certain activities which affect waters of the United States; and

WHEREAS, the Corps is not authorized to hold conservation easements and the Grantee has agreed to hold the easement on behalf of the Corps; and

WHEREAS, the Permit requires that Grantor preserve, enhance, restore, or mitigate wetlands or uplands located on the Property; and

WHEREAS, Grantor, in consideration of the issuance of the Permit to construct and operate the permitted activity, and as an inducement to the issuance of the Permit, is willing to grant a perpetual Conservation Easement over the Property; and

WHEREAS, the Parties recognize that this Easement is inferior and subject to the superior rights of those parties that hold easements, rights of way or other encumbrances on the Property or that own mineral rights to the Property as of the date of this Easement; and

WHEREAS, Grantee's oversight of Grantor's implementation of the approved Mitigation Banking Instrument (MBI) which shall govern activities on the Property and be enforceable by the Corp, is a key element of this Easement; and

WHEREAS, the Parties intend that if any conflict should arise between the terms of this Easement and the terms of the approved MBI for the subject property, the terms of the approved MBI, as applicable, shall prevail over the terms of the Easement; and

WHEREAS, Grantor wishes to maintain the Property in its present state for its present conservation values and for the benefit of future generations and to rely upon Grantee to oversee Grantor's execution of the approved MBI; and

WHEREAS, Grantor intends that the conservation values of the Property be preserved and maintained by the continuation of land use patterns.

WHEREAS, the State of Oklahoma has recognized the importance of both public and private efforts to conserve and protect natural values of real property by enacting the Oklahoma Uniform Conservation Easement Act (60 O.S. 49.1–49.8) (the "Conservation Easement Act"), and the Parties believe the Property has significant conservation values as recognized under the Act; and

WHEREAS, Grantor further intends, as owner of the Property and/or Sponsor of the mitigation bank project, to convey to Grantee and its successors and assigns the right and duty to preserve and protect the conservation values of the Property in perpetuity; and

WHEREAS, Grantee is a non-profit, tax exempt organization under Section 501(c)(3) of the Internal Revenue Code and is a qualified conservation easement holder under the Conservation Easement Act and is a qualified organization under Section 170(h)(3) of the Internal Revenue Code to receive and to hold conservation easements; and

WHEREAS, Grantee agrees by accepting this grant to honor the intentions of Grantor stated herein and to preserve and protect in perpetuity the conservation values of the Property for the benefit of this generation and the generations to come and to foster the conservation by overseeing and supporting Grantor's implementation of the MBI; and

WHEREAS, this Easement is intended to be enforceable by Grantee, Grantor and the Corps;

NOW, THEREFORE, in consideration of the above and the mutual covenants, terms, conditions and restrictions contained herein, Grantor hereby voluntarily grants and conveys to Grantee a conservation easement in perpetuity over the Property of the nature and character and to the extent hereinafter set forth:

1. Purpose. The purpose of this Conservation Easement is to retain and maintain land or water areas on the Property in their natural, vegetative, hydrologic, scenic, open, or wooded condition and to retain such areas as suitable habitat for fish, plants, or wildlife. Those wetland or upland areas that are to be restored, enhanced, created, or preserved on the Property shall be retained and maintained in the restored, enhanced, created, or preserved condition as described in the Permit and/or in the associated mitigation plan (**Exhibit B**) for the Property. The duration of this Easement shall be in perpetuity.

Grantor shall not perform, nor knowingly allow others to perform, any act on or affecting the Property that is inconsistent with the purposes of this Easement or the proper execution of the MBI. However, nothing in the Easement shall require Grantor to take any action to restore the condition of the Property after any catastrophic act of God or other event over which Grantor has no control.

2. Rights of Grantee. To accomplish the purpose, the following rights are perpetually conveyed to Grantee by this Easement:

(a) To preserve and protect the environmental values of the Property;

(b) To enter upon the Property at reasonable times in order to monitor Grantor's compliance with and otherwise to enforce the terms of this Easement, provided that such entry shall be upon prior reasonable notice to Grantor, and Grantee shall not unreasonably interfere with Grantor's use and quiet enjoyment of the Property;

(c) To prevent any activity on or use of the Property that is inconsistent with the purpose of this Easement and to require the restoration of such areas or features of the Property that may be damaged by any inconsistent activity or use, pursuant to paragraph 6; and

(d) To monitor Grantor's implementation of the MBI and bring to the attention of Grantor and Third Parties any material non-compliance with the MBI.

3. Perpetually Prohibited Uses and Activities. Any activity on or use of the Property inconsistent with the MBI or the purposes of this Easement is prohibited. Without limiting the generality of the foregoing, the following activities are expressly prohibited:

(a) The construction or fabrication of any residential, commercial, recreational or industrial facility on the Property or any other structure not specifically reserved herein or approved in advance by Grantor or Third Parties;

(b) Surface mining or quarrying of soil, sand, or other minerals;

(c) Agricultural uses of any kind, including livestock grazing;

(d) Subdivision of the Property, whether by physical or legal process;

(e) Erection of commercial, institutional or other similar types of signage;

(f) Altering the surface or general topography of the Property or covering surfaces with impervious material, other than as needed to implement the MBI;

(g) Any dumping or accumulation of any kind of trash, ashes, refuse, waste, bio-solids or hazardous waste on the Property or any placement of bulk soil on the Property that could contaminate surface waters or that would be inconsistent with the MBI;

(h) Installation of new electrical power line, unless such installation is carried out on a small scale by existing mineral interest or easement holders in support of their surface rights. If any lawfully constructed utility line is installed on or through the Property by such a mineral interest or easement holder, Grantor shall use its best efforts to persuade that party to restore the physical features of the Property to their general pre-disturbance condition within one year from the initial date of disturbance;

(i) Erection of electrical generating windmills or solar arrays;

(j) Construction or continued maintenance of confined animal feeding lots or operations;

(k) Recreational facilities, resort structures, golf courses, sports fields or other public or commercial facilities. However, passive recreational uses may be carried out on the Property by the landowner or its invites, so long as those uses do not conflict with the MBI and do not entail the creation of new horseback or bike trails on the Property;

(l) Selling or transferring any easement, right of way or other encumbrance on the Property to a third party, other than as approved in advance by Grantee and Third Parties;

(m) Use of off-road vehicles or any other motorized vehicles except on existing vehicle trails, except for the purpose of implementing the MBI or conducting research and/or monitoring activities in accordance with the MBI;

(n) Removing, destroying, or cutting of trees, shrubs or other vegetation, except as required for (i) maintenance of forest health, (ii) fire breaks, (iii) maintenance of existing foot trails or roads, or (iv) habitat management as provided for in the MBI;

(o) Engaging in any use or activity that may violate, or may fail to comply with, relevant federal, state or local laws or regulations;

(p) Manipulating, impounding, polluting or altering any natural water course on the Property, except for alterations designed for the purpose of implementing the MBI;

(q) Planting, introduction or active dispersal or non-native or exotic plant or animal species;

(r) Unseasonable watering activities or such use of fertilizers, pesticides, biocides, herbicides or other agricultural chemicals that is not authorized by the MBI and could interfere with the purposes of this Easement, recognizing that the use of such chemicals either may be required by the MBI or otherwise justifiable from an ecological perspective, such as the use of Corps-approved chemical application techniques for control of invasive species of plants.

Grantor further understands that the above list of prohibited uses and activities is not exclusive. Grantor further recognizes that nothing in this Easement relieves Grantor of any obligation or restriction on the use of the Property imposed by law.

4. Reserved Rights. Grantor reserves to itself, and to its successors and assigns, all rights accruing from its ownership of the Property, including the right to engage in or permit or invite others to engage in all uses of the Property that are not prohibited herein, are consistent with the MBI and are not inconsistent with the purposes of this Easement. Without limiting the generality of the foregoing, passive recreation such as low-impact hiking, jogging, horseback and non-motorized bike riding, hunting, bird-watching and camping on the Property is expressly reserved to the Grantor and its successors and assigns.

5. Remedies of Grantee. If Grantee determines that Grantor is in violation of the terms of this Easement or that a violation is threatened, Grantee shall give written notice of such violation by certified mail to Grantor and Third Parties at the addresses specified in Section 18 below and demand corrective action sufficient to cure the violation, and , where the violation involves injury to the Property resulting from any use or activity inconsistent with the purpose of this Easement, to restore the portion of the Property so injured. If Grantor fails to cure the violation within thirty (30) days after receipt of notice thereof from Grantee, or, under circumstances where the violation cannot be reasonably cured within such thirty (30) day period, fails to begin curing such violation within such thirty (30) day period, or fails to continue diligently to cure such violation until finally cured, Grantee may bring an action at law or in equity in a court of competent jurisdiction to (a) enforce the terms of this Easement, (b) enjoin the violation, ex parte as necessary, by temporary or permanent injunction, (c) recover any damages to which Grantee or Corps may be entitled for violation of the terms of this Easement or injury to any conservation values protected by this Easement, including, without limitation, damages for the loss of environmental or conservation values, and/or (d) require the restoration of the Property to the condition that existed prior to any such injury. Without limiting Grantor's liability, any damages recovered in connection with such a proceeding shall be devoted to the cost of undertaking any corrective action on the Property.

If Grantee, in its sole discretion, determine that circumstances require immediate action to prevent or mitigate significant damage to the conservation values of the Property, one or more of them may pursue its remedies under this paragraph without prior notice to Grantor or without waiting for the period provided for cure to expire. Grantee's rights under this paragraph apply equally in the event of either actual or threatened violations of the terms of this Easement.

6. Acts Beyond Grantor's Control. Nothing contained in this Easement shall be construed to entitle Grantee or Corps to bring any action against Grantor for any injury to or change in the Property resulting from any act of God or events beyond Grantor's control, including, without limitation, natural wildfire, flood, storm and earth movement, or from any prudent action taken by Grantor under emergency conditions to prevent, abate or mitigate significant injury to the Property resulting from such causes.

Nothing in this Easement shall require Grantor to take any action to restore the condition of the Property after any catastrophic act of God or event over which Grantor had no control.

7. Costs of Enforcement. Any costs incurred by Grantee in enforcing the terms of this Easement against Grantor, including, without limitation, costs of suits and attorney's fees, and any costs of restoration necessitated by Grantor's violation of the terms of this agreement shall be borne by Grantor. If Grantor prevails in any action to enforce the terms of this Easement, Grantor's cost of suit, including, without limitation, attorney's fees, shall be borne by Grantee.

8. Enforcement Discretion; Scope of Grantee's Enforcement Power. Enforcement of the terms of this Easement shall be at the discretion of Grantee, and any forbearance by Grantee to exercise its rights under this Easement in the event of any breach of any terms of this Easement by Grantor shall not be deemed or construed to be a waiver by Grantee of such term or of any subsequent breach of the same or any other term of this Easement, or of any of Grantee's rights under this Easement. No delay or omission by Grantee in the exercise of any right or remedy upon any breach by Grantor shall impair such right or remedy or be construed as a waiver.

9. Waiver of Certain Defenses. Grantor hereby waives any defense of laches, estoppel or prescription.

10. Costs and Liabilities. Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to property taxes, insurance, ownership, operation, upkeep or maintenance of the Property.

11. Extinguishment. If circumstances arise in the future such as to render the purpose of this Easement impossible to accomplish or obsolete, this Easement may only be terminated or extinguished, whether in whole or in part, by judicial proceedings in a court of competent jurisdiction, and proceeds from any sale, exchange or involuntary conversion of all or any portion of the Property subsequent to such termination or extinguishment shall be payable to Grantor.

12. Condemnation. If protected compensatory mitigation property is taken in whole or in part through eminent domain, the consequential loss in the value of the property protected by the Corps' Regulatory Program is the cost of the replacement of the conservation functions, services and values of the aquatic and terrestrial resources on the compensatory mitigation property.

13. Assignment of Easement. Grantee may assign its rights and obligations under this Easement only to (a) an organization that is approved in advanced by the Corps and is a qualified organization at the time of transfer under Section 170(h) of the Internal Revenue Code of 1954, as amended (or any successor provision then applicable), and the applicable regulations promulgated thereunder, and authorized to acquire and hold conservation easements under the Conservation Easement Act (or any successor provision then applicable), or (b) any public natural resources protection agency. As a condition of such transfer, Grantee shall require that the conservation purposes that this Easement and the MBI are intend to advance continue to be carried out.

14. Subsequent Transfer or Merger of Property Interest. Grantor agrees to incorporate the terms of this Easement in any deed, other legal instrument, sub-surface mineral lease or permitted surface extraction agreement by which Grantor enters into or divests itself of any interest in all or a portion of the Property, including, without limitation, a leasehold interest. Grantor shall notify Grantee and Third Parties prior to the transfer of any such interest. Should Grantor transfer the Property, the new owner shall be required to perform the duties and obligations of Grantor herein. Grantee shall agree to hold the transferee responsible for compliance of the obligations of Grantor under this Easement arising from and after the date of such conveyance.

The doctrine of merger shall not operate to extinguish this Conservation Easement if the Conservation Easement and the Mitigation Property become vested in the same party. If the doctrine of merger applies to extinguish the Conservation Easement then, unless Grantor, Grantee and the Signatory Agencies otherwise agree in writing, a replacement conservation easement or restrictive covenant containing the same protections embodied in the conservation easement shall be recorded against the Mitigation

Property. The owner of the Mitigation Property may suggest a new conservation easement holder and upon approval by the agencies, grant a conservation easement protecting the Mitigation Property.

15. Amendment of Easement. This Easement may be amended only with the prior written consent of Grantor, Grantee and Third Parties.

16. Notices. Any notice, demand, request, consent, approval or communication that a Party desires or is required to give to any other Party shall be in writing and either served personally or sent by first class mail, postage prepaid, addressed as follows or to such other address as any Party from time to time shall designate by written notice to the other Parties:

To Grantors:

Jack Dunnavant
PO Box 1326
Carthage, TX 75633
To Grantee:

Land Legacy
822 E. 6th Street, Suite 200
Tulsa, Oklahoma 74120
Attn: Executive Director

To Third Parties:

U.S. Army Corps of Engineers
Tulsa District – Regulatory Branch
1645 South 101 East Avenue
Tulsa, Oklahoma 74128

17. Recordation. Grantee shall record this Easement in timely fashion in the official property records of McIntosh County, Oklahoma, and Grantee or Grantor may re-record this Easement at any time as may be required to preserve its rights in this Easement. Grantee shall provide a timely copy of the recordation to Grantor and Third Parties.

18. Subsequent Liens of Property. No provision of this Easement should be construed as impairing the ability of Grantor to use the Property as collateral for subsequent borrowing, provided that any mortgage or other lien arising from such a borrowing in all circumstances shall be subordinate to this Easement.

19. Access. No right of access by the general public to any portion of the Property is conveyed by this Easement.

20. General Provisions.

(a) Controlling Law. The interpretation and performance of this Easement shall be governed by the laws of the state of Oklahoma.

(b) Liberal Construction. Any general rule of construction to the contrary nothwithstanding, this Easement shall be liberally construed in favor of Grantee and Third Parties to affect the purpose of this Easement, the policy and purpose of the Conservation Easement Act and the MBI. If any provision in this Easement is found to be ambiguous, an interpretation consistent with the purpose of this Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

(c) Severability. If any provision of this Easement, or the application thereof to any person or circumstances, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provision to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

(d) Entire Agreement. This Easement sets forth the entire agreement of the parties with respect to the matters described herein and supersedes all prior discussions, negotiations, understandings or agreements relating to thereto, all of which are merged herein. However, nothing in this Easement shall be interpreted to alter or limit Grantor's obligations to Third Parties under any contracts, permits, or agreements that pre-date this Easement.

(e) No Forfeiture. Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

(f) Joint Obligation. The obligations imposed by this Easement upon Grantor shall be ongoing and several.

(g) Successors. The covenants, terms, conditions and restrictions of this Easement shall be binding upon, and inure to the benefit of, the Parties and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property.

(h) Termination of Rights and Obligations. A party's rights and obligations under this Easement terminate upon transfer of the party's interest in this Easement or Property, except that liability for acts or omissions occurring prior to the transfer shall survive transfer.

(i) Counterparts. The parties may execute this instrument in two or more counter-parts, which shall, in the aggregate, be signed by all Parties; each counterpart shall be deemed an original instrument as against any Party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto Grantee, its successors and assigns forever.

[Remainder of page intentionally left blank]

IN WITNESS WHEREOF each of the Parties hereto, intending to be legally bound, has executed this Easement as of the date first written above.

Grantor: Jack Dunnavant

by _____
Jack Dunnavant

its _Owner_____

Subscribed and sworn before me this _____ of _____.

_____
Notary Public

My Commission Expires:

_____

Grantee: Land Legacy, Inc.

by _____
Michael Patton

its Executive Director

Subscribed and sworn before me this _____ of _____.

_____
Notary Public

My Commission Expires:

_____

APPENDIX G

CULTURAL RESOURCES PHASE I SURVEY REPORT:

Archaeological Survey of the Proposed Honey Springs Mitigation Bank Project, McIntosh County, Oklahoma

Bo Nelson and Timothy K. Perttula

Timothy K. Perttula, Principal Investigator

Letter Report No. 85

Tejas Archaeology, Pittsburg, Texas

January 2020, Revised March 2020

Table of Contents

List of Figures

List of Figures, cont.

List of Tables

Abstract

The proposed Honey Springs Mitigation Bank project is located in the northern part of McIntosh County in eastern Oklahoma. The proposed mitigation bank has two locations totaling 170.9 acres. Location 1 (Elk Creek Tract), 87.7 acres, is located about 0.5 miles west of the town of Rentiesville, while location 2 (Old Field Tract), 83.2 acres, is about 4.5 miles northwest of Rentiesville. The two project areas are on the Wainwright 7.5' 1970 USGS topographic quadrangle. The Elk Creek Tract location is Section 9, T12N R17E, and the Old Field Tract is Section 12, T12N-R16E in McIntosh County.

Since streams and wetland areas are present on the properties, a Section 404 permit of the Clean Water Act (CWA), Permit SWT-2019-218-IP application, is necessary for the development of the project area to proceed. The current permit application is for proposed enhancement and restoration of streams, wetland areas, native plants, and bottomland hardwood timber. An archaeological survey was requested by the United States Army Corps of Engineers (USACE), Tulsa District, for both locations of the proposed mitigation properties. The USACE has jurisdictional authority to regulate the use and development of tributary streams and wetlands in the proposed mitigation bank project area. Under this authority, the USACE requested that an archaeological survey be done of both locations of the proposed Honey Springs Mitigation Bank under Section 106 of the National Historic Preservation Act, as these areas falls under the purview of Section 106 and 36 CFR Part 800, its implementing regulations. Tejas Archaeology conducted the archaeological survey of the project undertaking at the request of Hoffman Environmental, Inc. for Green County Wetland Mitigation, LLC, on August 9-22, 2019.

During the course of the intensive archaeological survey and shovel testing of the 170.9-acre project undertaking, two new prehistoric archaeological sites of unknown age were identified and recorded in the project undertaking (34MI405 and 34MI406), along with an apparent mid-20th century collapsed barn (34MI408), based on maps, landowner records, and the character of the debris from the ruined barn. The shallow depth of the archaeological deposits at the sites, as well as the low density and lack of diversity of recovered artifacts, indicate that the prehistoric sites do not have any potential to contribute substantive archaeological data concerning eastern Oklahoma prehistoric research problems (see Wyckoff and Baugh 1983). 34MI408 has no associated archaeological deposits.

It is our recommendation that the Old Field (34MI405), Elk Creek (34MI406), and Old Field Tract (34MI408) sites are not eligible for inclusion in the National Register of Historic Places (NRHP). The sites do

not meet any of the four NRHP criteria (36 CFR Part 60.4a-d), nor do their deposits possess archaeological integrity. It is our recommendation that the sites are not eligible for inclusion in the NRHP.

Based on the results of the pedestrian archaeological survey and intensive shovel testing of the proposed 170.9-acre Honey Springs Mitigation Bank project area in McIntosh County, Oklahoma, there is the absence of any archaeological sites in the project area that are recommended eligible for inclusion in the NRHP. It is our recommendation that the proposed project will not have an effect on any sites eligible for inclusion in the NRHP. Consequently, the proposed Honey Springs Mitigation Bank project should be allowed to proceed without further consultation under the National Historic Preservation Act and its implementing regulations.

Introduction

The proposed Honey Springs Mitigation Bank project is located in the northern part of McIntosh County in eastern Oklahoma. The proposed mitigation bank is comprised of two locations. Location 1 (Elk Creek Tract), with 87.7 acres, is located about 0.5 miles west of the town of Rentiesville, while location 2 (Old Field Tract), with 83.2 acres, is about 4.5 miles northwest of Rentiesville (Figure 1). The two project areas are on the Wainwright 7.5' 1970 USGS topographic quadrangle. The Elk Creek Tract location is Section 9, T12N R17E, and the Old Field Tract is in Section 12, T12N R16E in McIntosh County.

Since streams and wetland areas are present on the properties, a Section 404 permit application of the Clean Water Act (CWA), Permit SWT-2019-218-IP application, is necessary for the development of the project area to proceed. The current permit application is for proposed enhancement and restoration of streams, wetland areas, native plants, and bottomland hardwood timber. An archaeological survey was requested by the United States Army Corps of Engineers (USACE), Tulsa District, for both locations of the proposed mitigation properties.

The USACE has jurisdictional authority to regulate the use and development of tributary streams and wetlands in the proposed mitigation bank project area. Under this authority, as noted above, the USACE has requested that an archaeological survey be done of both locations—totaling 170.9 acres of the proposed Honey Springs Mitigation Bank—under Section 106 of the National Historic Preservation Act, as these areas falls under the purview of Section 106 and 36 CFR Part 800, its implementing regulations. Tejas Archaeology conducted the archaeological survey of the 170.9 acres project undertaking at the request of Hoffman Environmental, Inc. for Green County Wetland Mitigation, LLC, the project developers, on August 9-22, 2019.

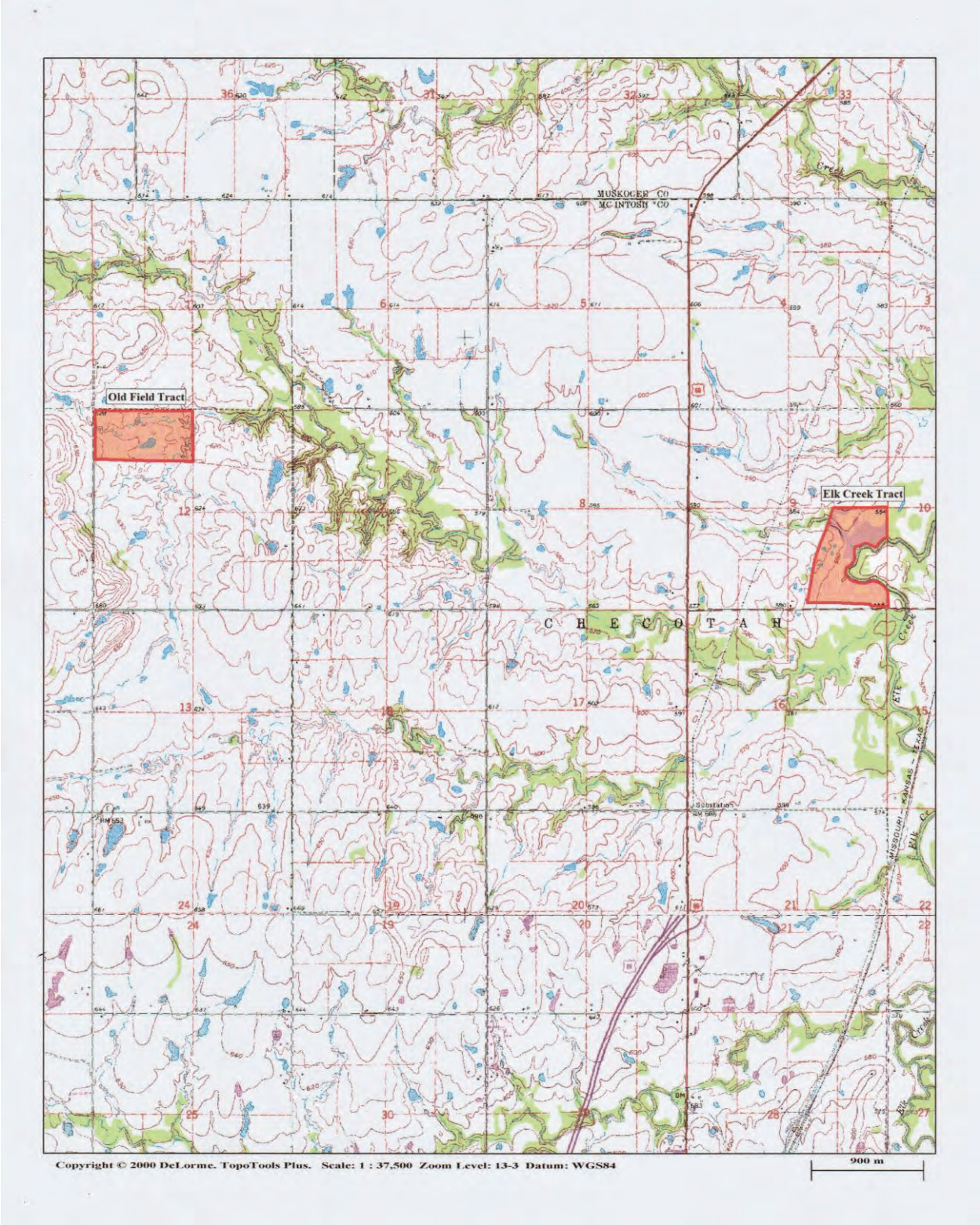

Figure 1. Location of the Old Field and Elk Creek project tracts, Wainwright 7.5' USGS topographic quadrangle, McIntosh County, Oklahoma.

Project Setting

McIntosh County lies within the Eastern Sandstone Cuesta Plains and Claremore Cuesta Plains geomorphic provinces of Oklahoma (Curtis et al. 2008:8). The Claremore Cuesta Plains extend into central portions of the county while the Eastern Sandstone Cuesta Plains are along the east and west county boundaries (Goins and Goble 2006:5). The topography of the area is characterized as a gently rolling upland of shale bedrock interrupted by hills capped with resistant sandstone (Goins and Goble 2006:5).

The vegetation of the area is part of a larger transitional ecotone between the Southeastern forests and that portion of the grassland-dominated Southern Plains known as the Osage Savanna (Morris et al. 1976; Blair and Hubbell 1938). The region receives an average annual rainfall of around 40 inches (102 cm) (Goins and Goble 2006:18), supporting an area primarily covered in mixed oak scrub forest with interspersed areas of open tall grass prairie (Hoagland 2008:9).

The two project areas lie within the Arkansas River drainage basin but are situated along the divide between the Arkansas and Canadian River drainage basins (Goins and Goble 2006:12). Elk Creek or its tributaries are present in both project areas. Elk Creek flows several miles to the northeast to Dirty Creek from the east project tract. Dirty Creek then flows east about 20 miles (32 km) into the Arkansas River just north of its junction with the Canadian River.

The U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of McIntosh County, Oklahoma (Swafford and Allgood 1981) was used in determining soil types within the proposed survey areas. Additionally, the Natural Resources Conservation Service (NRCS) website was utilized to update current official soil series names and descriptions from earlier soil surveys (NRCS 2019). The soil series present within the Elk Creek Tract are Dennis silt loam with severely eroded 1-5 percent slopes, Eram clay loam with eroded 1-5 percent slopes, and Verdigris silt loam with frequently flooded 0-1 percent slopes. In the Old Field Tract, the soils are Coweta-Bates Complex with 3-8 percent slopes, Dennis silt loam with 1-5 percent slopes (severely eroded), Dennis silt loam with 1-3 percent slope, Dennis-Verdigris Complex with 0-8 percent slopes, Eram clay loam with 1-3 percent slopes, and Taloka silt loam with 0-1 percent slopes. The shovel tests excavated across the two project tracts had a sediment matrix that contained small pieces of flat sandstone and shell fragments that comprised between 25 to 30 percent of shovel test volumes.

Cultural Background

This part of eastern Oklahoma has been occupied from at least 13,000 years ago to the 20th century by Native Americans, as well as possibly before 13,000 years in Pre-Clovis times. This is based on wide-ranging archaeological investigations in eastern Oklahoma and the broader region (Sabo et al. 1990; Wyckoff 1980), including a variety of projects conducted in the Lake Eufaula area (Berryman and Cheever 2008; Bell 1949; Beverly 2015; Dowling et al. 2011; Hokanson and Fariello 2006; Largent 1995; McKay

et al. 2003; Orr 1941; Perino and Caffey 1980; Proctor 1953; Wenner 1948; Wyckoff and Brooks 1983) and elsewhere in McIntosh County (Briscoe 1977; Butler et al. 2014, 2015; Henry 2007).

The first Native Americans to use these lands were mobile hunter-gatherers (during the Paleoindian period, ending ca. 10,000 years B.P.) that roamed the forested woodlands and savanna ecoregions, marked by several types of lanceolate projectile points, including Clovis, Folsom, and Plainview types in surface or mixed contexts, and Late Paleoindian Dalton (see Galm and Hofman 1984; Ballenger 2001), and San Patrice (Jennings 2008) types. These mobile hunter-gatherers with their diverse tool kits continued to use the area for millennia as foragers. Archaic groups in the Early Archaic (ca. 10,000-8000 B.P.), Middle Archaic (ca. 8000-5000 B.P.), and Late Archaic (ca. 5000-2500 B.P.) were also mobile hunter-gatherers that relied on the procurement of locally available plants and animals from forest and riverine resources for sustenance.

The period of time when the distinctive Calf Creek series basally-notched point were made and used, from ca. cal. 6000-5800 years B.P., falls in the latter part of the Middle Archaic period in Oklahoma (see Wyckoff 1995). Such Middle Archaic groups had highly mobile foraging adaptations along the major rivers and in interior uplands away from major drainages in the western Ozarks, northern Ouachita Mountains, and the Osage Savannah uplands (Wyckoff 1995:190), with expedient lithic technologies. Most sites of this age were briefly used, but may have tended to concentrate in the larger drainages within the region. Sometime during the Middle Archaic period, apparently after ca. 6000-5500 years B.P., fairly substantial and extensive occupations can be recognized within the major basins in the region, with a rather limited use of smaller tributaries and headwater areas. Components of this period are open camps dominated by hunting tools and generalized cutting/scraping tools, debris, ground stone tools, and cores. Burned rock features (possible hearths, ovens, and cooking pits) and burned rock concentrations are present in Middle Archaic contexts at a few sites suggesting that an important activity was the cooking and processing of plant foods, but mainly by small groups for short-term use

The tool kits found at seasonal Archaic encampments (including some sites with midden deposits suggesting an increasingly sedentary lifeway), such as 34PS279 dated as early as 6500 B.C. (Wallis 1989:103) and 3300 B.C. (Brosowske and Vehik 1999), the Scott site (34Lf11) (Galm and Flynn 1978), 34SQ352, dated to ca. 3500 years B.P. (Bartlett 2016), and the Dyer site (34PS96) (Ferring and Peter 1982), included a variety of dart point types (both expanding and contracting stem forms as well as notched forms), chipped stone tools such as scrapers and flake tools, gravers, drills, bifacial knives, and choppers, and ground stone metates, manos, and pitted stones, often associated with hot rock cooking features. Subsistence pursuits remained much the same as during the Middle Archaic, with an emphasis on wild plant and animal resources, including deer and small game, nuts, and mussel shells.

About 2000-2500 years ago, during the Woodland period, the prehistoric Native Americans living in the Arkansas and Canadian River basin began to settle down in small

hamlets and camps dispersed across recognizable territories (Schambach 2002; Leith 2011; Hammerstedt and Savage 2019), sometimes with wood post structures and midden deposits. These Native Americans, ancestral Caddo peoples of the Fourche Maline Culture, made thick (>1 cm) and plain grog-tempered pottery with "flower pot" shapes, as well as Williams Boneware, Williams Incised, and LeFlore Plain, and used contracting stem Gary and Kent dart points for hunting and other tasks as well as chipped stone bifacial and flake tools as well as ground stone tools such as metates and manos (Margolis et al. 2014). About A.D. 700, these groups began to make and use small stemmed arrow points for hunting purposes. At the Falling Cat site (34SQ81) in the Lee Creek basin, a Woodland period component dated to A.D. 550 $\pm$ 70, macrobotanical remains of seeds were recovered that are associated with the Eastern Agricultural Complex (Albert 1991); wild plant foods and animals from forest and riverine resources continued to be gathered as part of subsistence efforts, and burned rock features used in hot rock cooking around A.D. 660 have been documented at 34OG13 on the Deep Fork of the North Canadian River (Bartlett et al. 2015).

The principal occupation of McIntosh County in prehistoric and early historic times (up to the mid-17th century) was by Caddo-speaking Indian groups in the Northern Caddo area that lived in settled horticultural and agricultural communities after about A.D. 800-850. The sites dating from ca. A.D. 1100-1450 have been assigned to the Harlan, Norman, and Spiro phases, followed by the post-A.D. 1450-1660 Fort Coffee phase (Rohrbaugh 2012). These communities were composed principally of farmsteads and small hamlets, such as at the Plantation site (34MI63) on Pecan Creek in the northern Part of the county (Briscoe 1977) in the Canadian River basin, but larger villages were situated along the major rivers during much of the prehistoric and historic era with public architecture and cemeteries. Caddo archaeological sites in the region are known to be primarily located on elevated landforms (alluvial terraces and rises, natural levees, and upland edges) adjacent to the major streams, as well as along spring-fed branches and smaller tributaries with dependable water flow. They are also located in proximity to arable sandy loam soils, presumably for cultivation purposes with digging sticks and stone celts. Bison hunting developed in earnest in Fort Coffee phase sites (Rohrbaugh 2012)

These Caddo groups were powerful theocratic chiefdoms that built earthen mounds (like the Eufaula site mound, see Orr [1941] and Regnier et al. [2019:202-225] that dates from the Harlan phase, and the Spiro mound complex, see Brown [1996]) for political and religious purposes, functions, and rituals, traded extensively across the region and with non-Caddoan speaking groups, and developed intensive maize-producing economies. Due to diseases introduced by Europeans after the mid-16th century, and the incursions of the Osage to obtain deer hides and Caddo slaves, by the early 18th century, if not before, eastern Oklahoma had been abandoned by Caddo groups.

In historic times, after an 1825 Treaty of Indian Springs with the U.S. Government, what became McIntosh County area after statehood was settled by Native Americans of the Muscogee (Creek) Nation removed from the eastern United States in what came to be considered Indian Territory, along with the Seminole; the Canadian

River was the border between the Choctaw and Creek lands. Through the 1830s-1860s, their land in Indian Territory was also settled by other Southeastern tribes, and their holdings were effectively halved during that time and immediately after the Civil War because the Creeks had been Confederate allies.

A pivotal battle of the Civil War took place at Honey Springs on the Texas Road in McIntosh and Muskogee counties, Oklahoma in July 1863; this was the largest battle fought in Indian Territory. The Elk Creek survey tract for the project is less than 1.0 mile from one of the battlefield core areas (Figure 2). The Lower Muscogee (Creek) fought as allies with Texan Confederate troops, in hopes of having an Indian state after the war, along with Cherokee, Choctaw, and Chickasaw, while the Upper Muscogee (Creek) fought for the Union (Freeman 1935; Wright 1951; Yates et al. 1981); the Union forces also had African-American units. In the late spring of 1863, General Douglas Cooper and his Confederate forces were preparing an offensive against the Union forces holding Fort Gibson. Cooper established his headquarters and supply depot at Honey Springs (Yates et al. 1981). On July 17, 1863, as a surprise maneuver, the Union Army commanded by General James Blunt attacked the Confederates before their offensive plans could take place (Cheek 1976). The Union attack was successful, and the Confederates were forced to burn their supplies during their retreat. The Honey Springs Battle allowed Union forces to control Indian Territory north of the Arkansas River (Freeman 1935). Union forces were also able to send a federal supply train to Fort Gibson (Yates et al. 1981:10 and Figure 2) near the confluence of the Arkansas, Verdigris, and Neosho rivers. They effectively drove the Confederate forces from Indian Territory. Creek towns and villages were burned by the Union forces as reprisals for their Confederate alliance.

The Texas Road, also known originally as the Osage Trace, and later as the Shawnee Trail, was one of the first significant trails of the region. The Texas Road dates back to around the first part of the 19th century when Osage groups travelled the route from Missouri to trade at August Chouteau's posts along Grand River and at Three Forks north of Honey Springs (Cheek 1976; Foreman 1936; Yates et al. 1981). The trail was extended south, and later used by emigrants to Texas. When Fort Gibson was established in 1824, the trail was used by the military, and played a significant role during the Civil War battle at Honey Springs (Foreman 1936; Yates et al. 1981). Before the railroads, the trail was used for cattle drives from Texas to Kansas. The known routes of the trail place it just on the east side of the later Missouri, Kansas, and Texas railroad (Yates et al. 1981:41). One of the mapped routes of the old Texas Road would have been approximately 0.88 mile east of the Elk Creek Tract project area.

The Creek Nation in eastern Oklahoma held on to as much of their land as possible until the 1890s, when the Federal government opened the "Unassigned lands" in 1889 in the central part of the state. In 1893 the allotments by the Dawes Commission of the lands of the Five Civilized Tribes were used to dissolve their lands to individual members of the tribes (Wright 1951:72-73). Cession of lands in Indian Territory went along with the individual allotments.

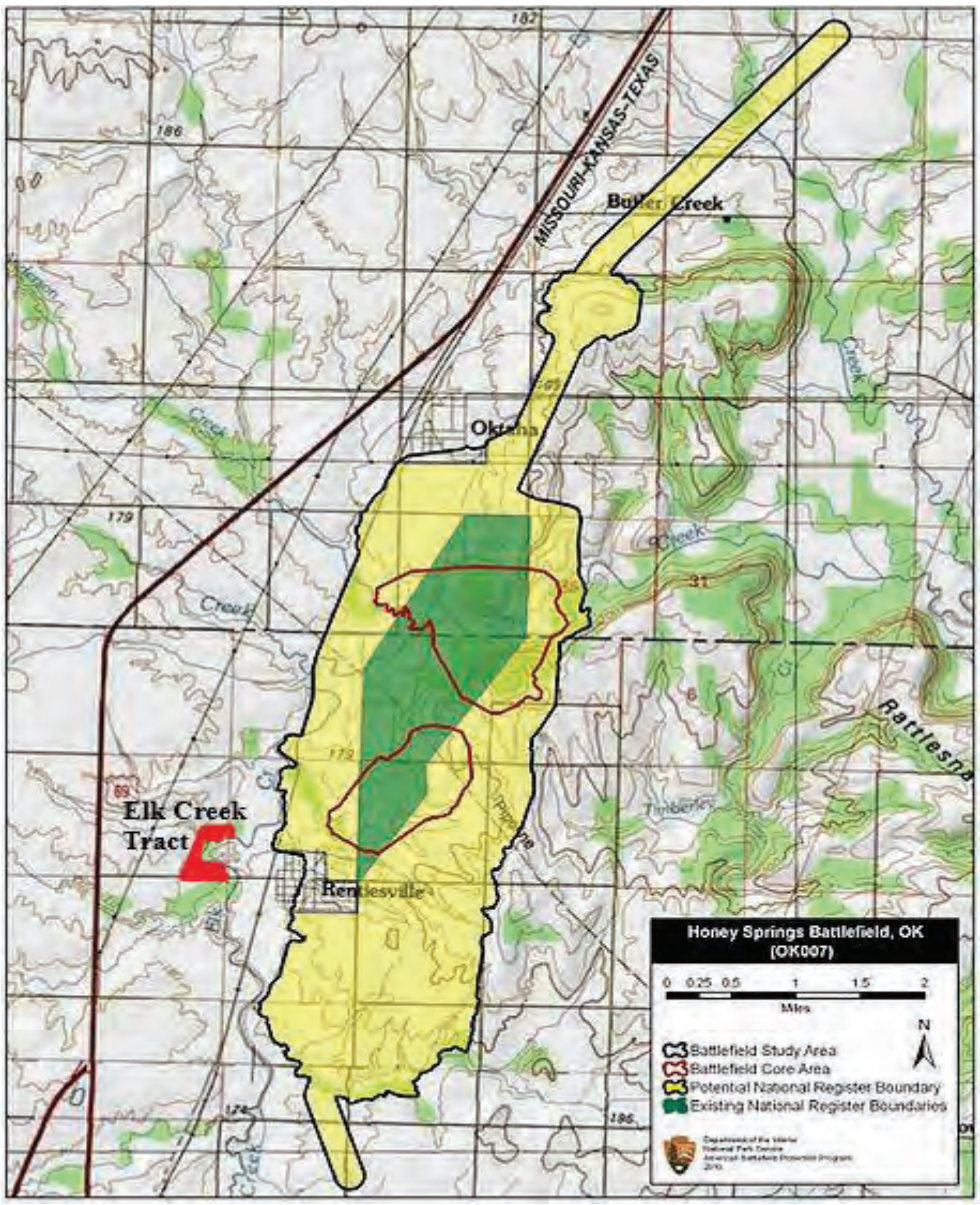

Figure 2. The location of the Elk Creek project tract relative to the boundaries of the Honey Springs Civil War battlefield.

By 1907 and Statehood, there were population increases in the area, with almost 18,000 population in McIntosh County, as well as an increase in carrel ranching and farming; lumbering activities became less important, and there were migrations from rural areas to larger towns in the region (O'Dell 2009). In the 2000 census, there were more than 19,400 people living in the county. Several important railroads were built across what was to become the county (Missouri-Kansas-Texas Railway and the Missouri, Oklahoma and Gulf Railway) between the 1870s and early 20th century and several communities were built along the lines. The Missouri, Kansas, and Texas Railway, commonly known as the Katy, was the first railroad to enter Indian Territory. The railway was built between1870 to 1872, and its route approximated the Texas Road

(Masterson 1952). The railroad became an important commercial transport between Texas and the Midwest in bringing cattle north and grain south. The railway also became a transportation venue for settlers when the Indian Territory became the state of Oklahoma. The Missouri, Kansas, and Texas line is now the Missouri-Pacific Railroad. The railroad is located approximately 0.33 mile east of the Elk Creek Tract mitigation area.

The town of Rentiesville is located about 0.5 mile east of the proposed Elk Creek mitigation bank tract. The community was founded in 1903, named for a local landowner, William Rentie (O'Dell 2019). It is one of 50 all-black towns in Oklahoma and one of 13 that still survives. The population was listed as 128 in the 2010 census.

Previous Archaeological Survey Investigations in the Vicinity of the Project

Prior to the fieldwork, historic maps and aerial photographs, Oklahoma Archeological Survey (OAS) files, General Land Office maps, Oklahoma Geological Survey maps, Oklahoma Department of Transportation maps, National Register of Historic Places listings, and Oklahoma Landmarks Inventory listings of the project area were reviewed to identify any previously recorded information near the project areas. The 2019 literature search and records review of the OAS files found four Cultural Resource Management (CRM) archaeological survey projects conducted in the vicinity of the current project areas. In 1973, the Oklahoma Highway Archaeological Survey (OHAS) conducted an archaeological survey for the expansion and re-alignment of U.S. Highway 69 (Lopez 1973a; Lopez and Keith 1979). During that OHAS survey two sites (34MI63 and 34MI64) were identified (Lopez 1973b, 1973c), and the two sites are a short distance south of the Elk Creek Tract project area. Currently, one surveyed portion of the re-routed U.S. Highway 69 serves as the western boundary for the Elk Creek Tract.

In 1980, the OAS conducted an extensive survey for prehistoric and historic archaeological resources of the Honey Springs Civil War Battlefield area for a proposed park (Yates et al. 1981). The OAS work identified several archaeological sites in their project area, with two of the sites (34MI287 and 34MI288) (Yates 1980a, 1980b) located within a mile to the east of the Elk Creek Tract project area. The 1980 OAS work defined the future area for a National Register of Historic Places (NRHP) District around the battlefield. The southern corner of the Honey Springs Battlefield NRHP is ca. 1 mile east of the Elk Creek Tract (see Figure 2). The Oklahoma Historical Society now maintains a small section of the Battle of Honey Springs NRHP District as a battlefield park, and the site was declared a National Historic Landmark in 2013. The NRHP property boundaries is located one mile of the Elk Creek Tract project area. The listed Honey Springs Battlefield National Register District and National Historic Landmark boundaries surround the areas associated with the Civil War Battle of Honey Springs, fought on July 17, 1863, in the area between Oktaha and Rentiesville, Oklahoma.

In 2007, D.O. Henry completed an archaeological survey of five segments of waterlines for the Shady Grove Rural Water District (Henry 2007). The survey recorded archaeological sites, but none within the vicinity of this project area.

In 2014, SWCA Environmental Consultants surveyed 126 miles in Oklahoma for a proposed Diamond Pipeline route (Butler et al. 2014). A portion of the proposed pipeline route was located along the north side of the Honey Springs Battlefield NRHP District. It was determined that the section of the proposed pipeline near the northern boundary of the NRHP District should be re-routed away from unknown areas of the Honey Springs Civil War engagements in the proximity. A pipeline re-route was chosen south and west of the NRHP district. The new re-route section is just on the western side of the Elk Creek Tract project area and just parallel to the west side of U.S. Highway 69. The SWCA re-route survey (Butler et al. 2015) did not locate any new archaeological sites near to the Elk Creek Tract project area.

The 2019 literature search and records review of the OAS files found four previously recorded archaeological sites located within one mile of the project areas. All four sites (34MI63, 41MI64, 41MI287, and 41MI288) were located during the course of two aforementioned CRM survey projects.

The Plantation site (34MI63) was originally recorded by David Lopez of the Research Division of the Oklahoma State Highway Department in 1973 during a survey of the proposed alignment of U.S. Highway 69 (Lopez 1973b; Lopez and Keith 1979). The Plantation site was identified as a Late Prehistoric Caddo village site (Lopez 1973b). In 1977, ahead of bridge and highway construction, the site was investigated by personnel from the Oklahoma State Highway Department (Briscoe 1977). The excavations identified two structures, eight pits, and nine burials, as well as an associated material culture assemblage. The Plantation site represents an Early Caddo period or Harlan phase habitation and cemetery (Briscoe 1977). This site is located approximately 0.25 mile from the southern Elk Creek Tract project area boundary.

The Tabor site (34MI64) was also originally recorded by David Lopez of the Research Division of the Oklahoma State Highway Department in 1973 during a survey of the proposed alignment of U.S. Highway 69 (Lopez 1973b; Lopez and Keith 1979). The Tabor site is located a short distance north of the Plantation site. Artifacts identified at the site include an unidentified expanding stemmed projectile point, a mano, three other possible tools, two modified flakes, and 37 unmodified flakes (Lopez and Keith 1979). The site is located approximately 0.16 mile south of the Elk Creek Tract project area boundary.

The Old House #1 site (34MI287) was originally recorded by Yates in 1980 during a survey of the Honey Springs Battlefield area (Yates 1980a; Yates et al. 1981). The Old House #1 site is a standing early 20th century structure (Yates 1980a; Yates et al. 1981). The structure is located approximately 0.98 mile east of the Elk Creek Tract project area boundary. The Old House #2 site (34MI288) was also originally recorded by Yates in 1980 during a survey of the Honey Springs Battlefield area (Yates 1980b; Yates et al. 1981). The Old House #2 site is also a standing early 20th century structure. The structure is located just north of the Old House #1 site, and approximately 0.98 mile east of the Elk Creek Tract project area boundary.

The Oklahoma 1898 General Land Office (GLO) survey maps for McIntosh County (BLM 2019) were inspected to determine if any information regarding structures or other features were located within the two project areas. The GLO survey maps were reviewed for the locations of the Old Field Tract (Section 12, T12N R16E) and the Elk Creek Tract (Section 9, T12N R17E) project areas. In the Old Field Tract, there are no structures located within the project. In the Elk Creek Tract, there are no structures, and the project area is listed as wooded.

Additional maps used to determine if any structures or other features were present in the two project areas were the 1900 Oklahoma Indian Territory Canadian Quadrangle Topographical map, 1916 Oklahoma Department of Highways for McIntosh County, the 1936 General Highway and Transportation Map for McIntosh County, and 1948 aerial Section maps on file at the Oklahoma Geological Survey. There were no structures or other features on any of the maps within the two project areas locations.

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Archaeological Survey Methods

The archaeological survey was performed following the guidelines of the U.S. Army Corps of Engineers (USACE), Tulsa District, the Oklahoma Archeological Survey (OAS), and the Secretary of the Interior's Standards and Guidelines. The objective of this archaeological survey was to locate any previously recorded or unrecorded prehistoric and historic archaeological sites within the proposed project area. If such sites were to be found during the archaeological survey, then the investigations would next delineate the vertical and horizontal extent of each site, determine each site's integrity based on recognized soil zones that contain artifacts, the character and diversity of recovered artifacts, and their depths, and provide an evaluation of each site's eligibility for inclusion in the National Register of Historic Places (NRHP) based on archaeological survey data.

The survey methods used for the two proposed mitigation tracts project consisted of a 100 percent pedestrian survey of the 170.9 acres selected by the USACE for archaeological survey by personnel from Tejas Archaeology. The pedestrian survey included shovel testing (using shovel tests about 35 cm in diameter) excavated up to 100 cm bs (the depth easily reachable by shovel) along with examination of any cut banks, as well as erosional profiles, etc. that existed within the project area. The two survey tracts generally had poor surface visibility, usually less than 10 percent, except for a few erosional areas and the cut banks along the intermittent stream beds. All soil matrix in the shovel tests was screened in 20 cm levels through 1/4-inch hardware cloth to recover buried archaeological materials. The soil matrix colors were identified with a Munsell Soil Color Chart. Each shovel tests were recorded using a handheld Garmin Montana 610 Global Positioning System (GPS) receiver. The GPS location was recorded on shovel test forms along with all soil data encountered in the shovel tests.

No backhoe trenches were excavated during the investigations at the two proposed mitigation bank tracts. Only minimal surface disturbance will take place during the restoration and enhancement phases in the two mitigation tracts. The planting of

seedling trees is the only sub-surface disturbance anticipated, and the depth of shovel testing will be well below the depth of any tree planting activities.

The proposed mitigation activities for restoring wetlands include hand planting hardwood tree species with dibble bars on an approximately 4 x 4 m (13 x 13 ft.) spacing across the mitigation area. The reforestation activities will only result in the penetration of soil surface at the specific location where the seedlings are inserted into the soil at an average depth of approximately 20-25 cm (8-10 inches). Planting with dibble bars basically requires that the dibble bar be pressed into the ground to create a fissure in which the seedling is planted. The fissure is then closed with the dibble bar. Generally, no soil is lifted from the fissure. This planting method creates minimal ground disturbance during planting specifically to reduce root-shock of new seedlings. Reforestation activities will occur in both mitigation area, with ground penetration at a depth of less than 30 cm (12 inches).

The survey employed a non-collection strategy with artifacts to be described, sketched, and/or photo-documented in the field and replaced in the same location in which they were found. All field-generated documents will be temporarily curated at the Tejas Archaeology office in Pittsburg, Texas. These documents and photographs will be organized and catalogued according to OAS curation standards and placed at this curation facility when the project is completed.

Results of the Archaeological Investigations

Old Field Tract

The Old Field Tract (Section 12, T12N R16E) is 83.2 acres of a proposed mitigation bank project (see Figure 1). The property has previously been maintained as improved pasture used for cattle grazing for many years. The livestock have been removed, and the pastureland has been allowed to become overgrown in the last few years. Hoffman Environmental conducted a wetland assessment on the property in 2018, and characterized the property as 19.5 acres of mineral flats (emergent wetlands in pasture), 43.8 acres of upland field (fallow improved pasture), 13.3 acres of mixed shrub/scrub and emergent wetland riparian habitat, 1.6 acres of on-channel ponds, 0.3 acres of beaver ponds, 1.1 acres of intermittent stream (9,082 linear feet), 0.1 acres of ephemeral streams (4,672 linear feet), and 3.5 acres of easements and roads.

The 2018 Hoffman assessment lists the vegetation types for each of the following Old Field Tract areas as:

- The 19.5 acres of mineral flats (emergent wetlands in pasture) consist of narrow-leaf marsh elder (*Iva angustifolia*), velvet panicum (*Dichanthelium scoparium*), knotroot bristlegrass, late boneset, broomsedge (*Andropogon virginicus*), white prairie aster, Florida paspalum, Oklahoma blackberry, bushy aster

(*Symphotrichum dumosum*), blue mistflower (*Conoclinium coelestinum*) and prairie false foxglove (*Agalinis heterophylla).*

- The 43.8 acres of upland field (fallow improved pasture) consist of Bermuda grass, Canada goldenrod (*Solidago canadensis*), woolly croton (*Croton capitatus*), Carolina horsenettle, velvet panicum, knotroot bristlegrass, broomsedge, white Bermudagrass, Canada goldenrod (*Solidago canadensis*), woolly croton (*Croton capitatus*), Carolina horsenettle, velvet panicum, knotroot bristlegrass, broomsedge, white prairie aster, Oklahoma blackberry, annual ragweed, Indiangrass (*Sorghastrum nutans*), switchgrass, Chinese bush-clover, common greenbrier, and Japanese honeysuckle.

- The 13.3 acres of mixed shrub/scrub and emergent wetland riparian habitat consist of pecan, green ash, American elm, Shumard oak, roughleaf dogwood (*Cornus drummondii*), Canada wildrye, giant goldenrod (*Solidago gigantea*), Oklahoma blackberry, broomsedge, velvet panicum, frost grape (*Vitis vulpina*), and poison ivy (*Toxicodendron radicans*); and

- The Old Field Tract has a livestock tank covering 1.3 acres in the south-central area of the property (Figure 3). A small beaver pond of about 0.3 acres built on the northern intermittent stream is located in the northern portion of the tract. The 9,082 linear feet of intermittent streams have eroded channels from 20-30 m in width, and from 2-3 m in depth. The 4,672 linear feet of the smaller ephemeral streams range up to 10 m in width and from 1-1.5 m in depth. In most of the stream channels, they have eroded below a sedimentary black shale layer with sandstone gravel beds. The streams are small tributaries forming Elk Creek.

Most of the terrain in the Old Field Tract is relatively level with a gradual slope (600-630 feet amsl) from the west side to the east side of the property towards a north/south intermittent stream. Along the east side of the stream, the terrain rises gradually from 600-610 ft. amsl. towards the east side of the tract (see Figure 3).

The Old Field Tract has a pipeline right of way paralleling the southern mitigation bank boundary (see Figure 3). The right of way is about 10 m in width covering approximately 1.9 acres of the property. The property road entrances in the northwest and southwest parts of the tract form a U-shape with an eastern spur to access the tract. The 4-5 m wide roads have been used through the years, and they have eroded from the surface at least 50 cm to 1 m in depth. The access roads cover approximately 1.6 acres of the property.

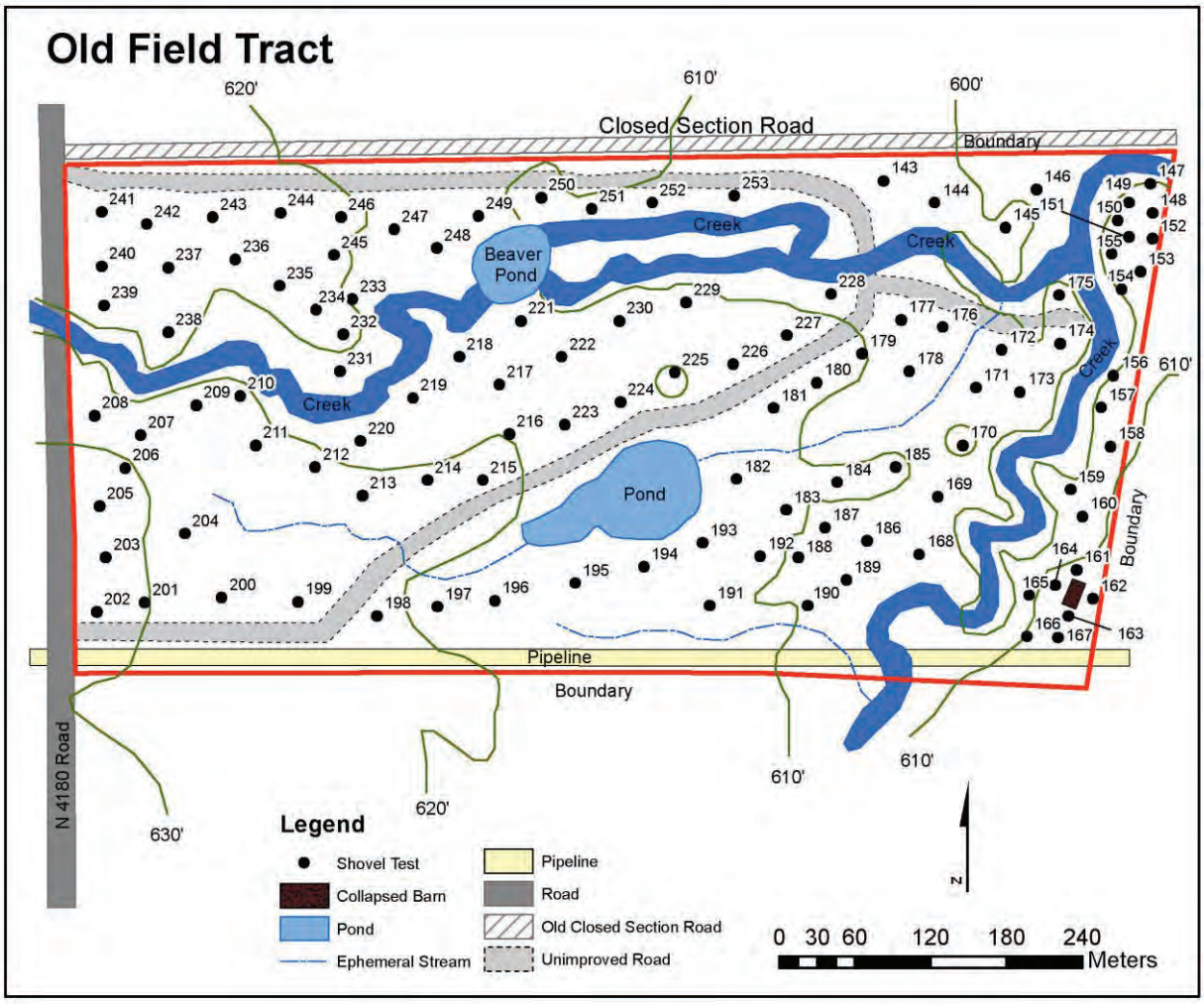

Figure 3. The Old Field Tract, developments, ponds, ephemeral streams, and the locations of ST 143-253.

A north/south section road (N 4180) forms the western mitigation bank boundary of the Old Field Tract. A closed east/west section road (E 1020) forms the northern boundary of the mitigation bank. A pipeline right of way with a barbed wire fence on the south side of the pipeline forms the southern boundary. Along the east side of the tract, a barbed wire fence separates the eastern boundary from other private property (see Figure 3).

The soils present within the Old Field Tract Mitigation Bank include Coweta-Bates complex 3-8 percent slope, Dennis silt loam 1-3 percent slope, Dennis-Verdigris complex 0-8 percent slope, Eram clay loam 1-3 percent slope, and Taloka silt loam 0-1 percent slope. Twenty-five to 30 percent of the matrix in the shovel tests had flat sandstone and shale fragments.

A total of 111 (ST 143-253) shovel tests were excavated in the proposed Old Field Tract mitigation bank tract of 83.2 acres, or ca. 1.3 shovel tests per acre (Figure 4

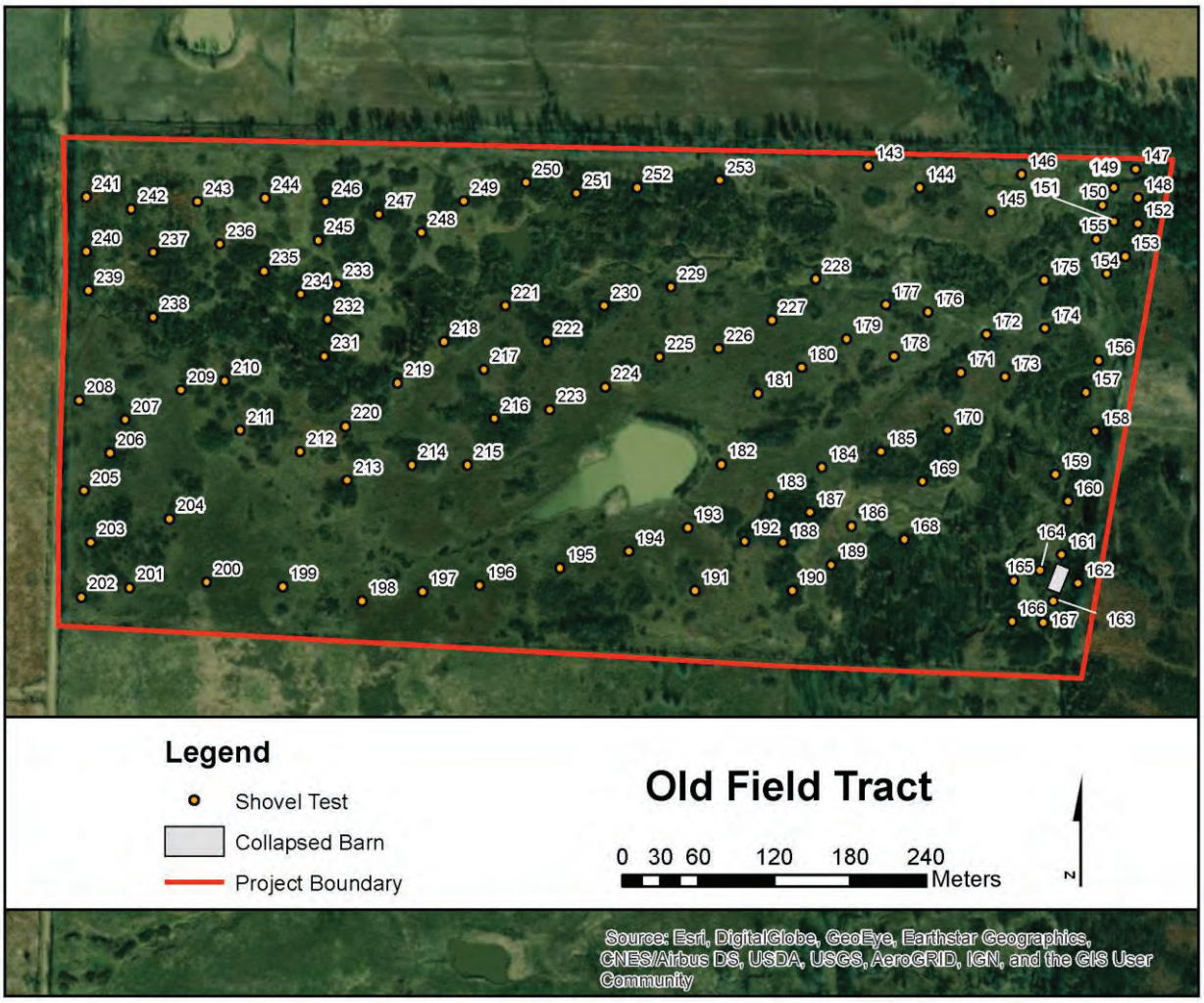

Figure 4. The locations of ST 143-253 on an aerial photograph of the Old Field Tract.

and Table 1 see also Figure 3). Cultural materials (i.e., lithic debris) were recovered in three of the shovel tests (ST 147, ST 150, and ST 151). The area of the artifacts within the mitigation tract was recorded as the Old Field site (34MI405).

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract.

ST No.	Sediment Descriptions
ST 143	0-60 cm+, dark grayish-brown silt loam
ST 144	0-55 cm+, dark grayish-brown silt loam
ST 145	0-63 cm+, dark grayish-brown silt loam
ST 146	0-58 cm+, dark grayish-brown silt loam
ST 147	0-12 cm, dark grayish-brown silt loam; 12-29 cm, brown silt loam; 29-39 cm+, strong brown clay

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract, cont.

ST No.	Sediment Descriptions
ST 148	0-14 cm, dark grayish-brown silt loam; 14-31 cm, brown silt loam; 31-40 cm+, strong brown clay
ST 149	0-14 cm, dark grayish-brown silt loam; 14-29 cm, brown silt loam; 29-39 cm+, strong brown clay
ST 150	0-10 cm, dark grayish-brown silt loam; 10-33 cm, brown silt loam; 33-40 cm+, strong brown clay
ST 151	0-6 cm, dark grayish-brown silt loam; 6-35 cm, brown silt loam; 35-40 cm+, strong brown clay
ST 152	0-19 cm, dark grayish-brown silt loam; 19-32 cm, brown silt loam; 32-35 cm+, strong brown clay
ST 153	0-15 cm, dark grayish-brown silt loam; 15-35 cm, brown silt loam; 35-39 cm+, strong brown clay
ST 154	0-29 cm, brown silt loam; 29-40 cm+, strong brown clay
ST 155	0-5 cm, dark grayish-brown silt loam; 5-27 cm, brown silt loam; 27-34 cm+, strong brown clay
ST 156	0-13 cm, dark grayish-brown silt loam; 13-33 cm, brown silt loam; 33-37 cm+, strong brown clay
ST 157	0-11 cm, dark grayish-brown silt loam; 11-29 cm, brown silt loam; 29-35 cm+, strong brown clay
ST 159	0-20 cm, dark grayish-brown silt loam; 20-31 cm, brown silt loam; 31-35 cm+, strong brown clay
ST 160	0-22 cm, dark grayish-brown silt loam; 22-35 cm, brown silt loam; 35-42 cm+, strong brown clay
ST 161	0-25 cm, dark grayish-brown silt loam; 25-34 cm, brown silt loam; 34-38 cm+, strong brown clay
ST 162	0-16 cm, dark grayish-brown silt loam; 16-26 cm, brown silt loam; 26-30 cm+, strong brown clay
ST 163	0-15 cm, dark grayish-brown silt loam; 15-30 cm, brown silt loam; 30-36 cm+, strong brown clay
ST 164	0-12 cm, dark grayish-brown silt loam; 12-24 cm, brown silt loam; 24-30 cm+, strong brown clay
ST 165	0-12 cm, dark grayish-brown silt loam; 12-28 cm, brown silt loam; 28-33 cm+, strong brown clay
ST 166	0-12 cm, dark grayish-brown silt loam; 12-29 cm, brown silt loam; 29-39 cm+, strong brown clay
ST 167	0-19 cm, dark grayish-brown silt loam; 19-31 cm, brown silt loam; 31-35 cm+, strong brown clay
ST 168	0-16 cm, dark grayish-brown silt loam; 16-34 cm, brown silt loam; 34-38 cm+, strong brown clay
ST 169	0-12 cm, dark grayish-brown silt loam; 12-29 cm, brown silt loam; 29-39 cm+, strong brown clay

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract, cont.

ST No.	Sediment Descriptions
ST 170	0-10 cm, dark grayish-brown silt loam; 10-36 cm, brown silt loam; 36-40 cm+, strong brown clay
ST 171	0-14 cm, dark grayish-brown silt loam; 14-39 cm, brown silt loam; 39-43 cm+, strong brown clay
ST 172	0-9 cm, dark grayish-brown silt loam; 9-29 cm, brown silt loam; 29-32 cm+, strong brown clay
ST 173	0-16 cm, dark grayish-brown silt loam; 16-31 cm, brown silt loam; 31-35 cm+, strong brown clay
ST 174	0-12 cm, dark grayish-brown silt loam; 12-30 cm, brown silt loam; 30-34 cm+, strong brown clay
ST 175	0-13 cm, dark grayish-brown silt loam; 13-29 cm, brown silt loam; 29-32 cm+, strong brown clay
ST 176	0-22 cm, dark grayish-brown silt loam; 22-39 cm, brown silt loam; 39-43 cm+, strong brown clay
ST 177	0-19 cm, dark grayish-brown silt loam; 19-39 cm, brown silt loam; 39-42 cm+, strong brown clay
ST 178	0-23 cm, dark grayish-brown silt loam; 23-41 cm, brown silt loam; 41-45 cm+, strong brown clay
ST 179	0-25 cm, dark grayish-brown silt loam; 25-45 cm, brown silt loam; 45-49 cm+, strong brown clay
ST 180	0-20 cm, dark grayish-brown silt loam; 20-40 cm, brown silt loam; 40-44 cm+, strong brown clay
ST 181	0-18 cm, dark grayish-brown silt loam; 18-37 cm, brown silt loam; 37-39 cm+, strong brown clay
ST 182	0-29 cm, brown silt loam; 29-33 cm+, strong brown clay
ST 183	0-21 cm, dark grayish-brown silt loam; 21-40 cm, brown silt loam; 40-45 cm+, strong brown clay
ST 184	0-13 cm, dark grayish-brown silt loam; 13-26 cm, brown silt loam; 26-30 cm+, strong brown clay
ST 185	0-10 cm, dark grayish-brown silt loam; 10-27 cm, brown silt loam; 27-30 cm+, strong brown clay
ST 186	0-15 cm, dark grayish-brown silt loam; 15-33 cm, brown silt loam; 33-35 cm+, strong brown clay
ST 187	0-22 cm, dark grayish-brown silt loam; 22-39 cm, brown silt loam; 39-42 cm+, strong brown clay
ST 188	0-12 cm, dark grayish-brown silt loam; 12-28 cm, brown silt loam; 28-34 cm+, strong brown clay
ST 189	0-14 cm, dark grayish-brown silt loam; 14-32 cm, brown silt loam; 32-36 cm+, strong brown clay
ST 190	0-8 cm, dark grayish-brown silt loam; 8-25 cm, brown silt loam; 25-30 cm+, strong brown clay

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract, cont.

ST No.	Sediment Descriptions
ST 191	0-16 cm, dark grayish-brown silt loam; 16-30 cm, brown silt loam; 30-34 cm+, strong brown clay
ST 192	0-22 cm, dark grayish-brown silt loam; 22-35 cm, brown silt loam; 35-39 cm+, strong brown clay
ST 193	0-20 cm, brown silt loam; 20-25 cm+, strong brown clay
ST 194	0-12 cm, dark grayish-brown silt loam; 12-29 cm, brown silt loam; 29-32 cm+, strong brown clay
ST 195	0-18 cm, dark grayish-brown silt loam; 18-36 cm, brown silt loam; 36-39 cm+, strong brown clay
ST 196	0-20 cm, dark grayish-brown silt loam; 20-40 cm, brown silt loam; 40-42 cm+, strong brown clay
ST 197	0-15 cm, dark grayish-brown silt loam; 15-32 cm, brown silt loam; 32-35 cm+, strong brown clay
ST 198	0-17 cm, dark grayish-brown silt loam; 17-35 cm, brown silt loam; 35-39 cm+, strong brown clay
ST 199	0-11 cm, dark grayish-brown silt loam; 11-27 cm, brown silt loam; 27-30 cm+, strong brown clay
ST 200	0-19 cm, dark grayish-brown silt loam; 19-36 cm, brown silt loam; 36-39 cm+, strong brown clay
ST 201	0-12 cm, dark grayish-brown silt loam; 12-25 cm, brown silt loam; 25-29 cm+, strong brown clay
ST 202	0-5 cm, dark grayish-brown silt loam; 5-22 cm, brown silt loam; 22-25 cm+, strong brown clay
ST 203	0-10 cm, dark grayish-brown silt loam; 10-26 cm, brown silt loam; 26-29 cm+, strong brown clay
ST 204	0-20 cm, dark grayish-brown silt loam; 20-31 cm, brown silt loam; 31-34 cm+, strong brown clay
ST 205	0-19 cm, dark grayish-brown silt loam; 19-35 cm, brown silt loam; 35-39 cm+, strong brown clay
ST 206	0-22 cm, dark grayish-brown silt loam; 22-31 cm, brown silt loam; 31-34 cm+, strong brown clay
ST 207	0-13 cm, dark grayish-brown silt loam; 13-30 cm, brown silt loam; 30-32 cm+, strong brown clay
ST 208	0-10 cm, dark grayish-brown silt loam; 10-25 cm, brown silt loam; 25-30 cm+, strong brown clay
ST 209	0-29 cm, brown silt loam; 29-31 cm+, strong brown clay
ST 210	0-15 cm, brown silt loam; 15-20 cm+, strong brown clay
ST 211	0-25 cm, dark grayish-brown silt loam; 25-41 cm, brown silt loam; 41-45 cm+, strong brown clay
ST 212	0-20 cm, dark grayish-brown silt loam; 20-39 cm, brown silt loam; 39-42 cm+, strong brown clay

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract, cont.

ST No.	Sediment Descriptions
ST 213	0-20 cm, dark grayish-brown silt loam; 20-37 cm, brown silt loam; 37-40 cm+, strong brown clay
ST 214	0-17 cm, dark grayish-brown silt loam; 17-34 cm, brown silt loam; 34-37 cm+, strong brown clay
ST 215	0-19 cm, dark grayish-brown silt loam; 19-35 cm, brown silt loam; 35-38 cm+, strong brown clay
ST 216	0-15 cm, dark grayish-brown silt loam; 15-30 cm, brown silt loam; 30-34 cm+, strong brown clay
ST 217	0-22 cm, dark grayish-brown silt loam; 22-39 cm, brown silt loam; 39-41 cm+, strong brown clay
ST 218	0-12 cm, dark grayish-brown silt loam; 12-29 cm, brown silt loam; 29-32 cm+, strong brown clay
ST 219	0-26 cm, brown silt loam; 26-30 cm+, strong brown clay
ST 220	0-19 cm, dark grayish-brown silt loam; 19-36 cm, brown silt loam; 36-40 cm+, strong brown clay
ST 221	0-27 cm, brown silt loam; 27-30 cm+, strong brown clay
ST 222	0-20 cm, dark grayish-brown silt loam; 20-37 cm, brown silt loam; 37-39 cm+, strong brown clay
ST 223	0-10 cm, dark grayish-brown silt loam; 10-29 cm, brown silt loam; 29-33 cm+, strong brown clay
ST 224	0-12 cm, dark grayish-brown silt loam; 12-26 cm, brown silt loam; 26-30 cm+, strong brown clay
ST 225	0-25 cm, dark grayish-brown silt loam; 25-45 cm, brown silt loam; 45-49 cm+, strong brown clay
ST 226	0-17 cm, dark grayish-brown silt loam; 17-36 cm, brown silt loam; 36-40 cm+, strong brown clay
ST 227	0-16 cm, dark grayish-brown silt loam; 16-32 cm, brown silt loam; 32-35 cm+, strong brown clay
ST 228	0-5 cm, dark grayish-brown silt loam; 5-22 cm, brown silt loam; 22-25 cm+, strong brown clay
ST 229	0-24 cm, brown silt loam; 24-29 cm+, strong brown clay
ST 230	0-14 cm, dark grayish-brown silt loam; 14-31 cm, brown silt loam; 31-35 cm+, strong brown clay
ST 231	0-12 cm, dark grayish-brown clayey loam; 12-15 cm+, dark grayish-brown clay
ST 232	0-22 cm, dark grayish-brown clayey loam; 22-25 cm+, dark grayish-brown clay
ST 233	0-10 cm, dark grayish-brown clayey loam; 10-17 cm+, dark grayish-brown clay
ST 234	0-20 cm, dark grayish-brown clayey loam; 20-23 cm+, dark grayish-brown clay

Table 1. Descriptions of the sediments in ST 143-253 in the Old Field Tract, cont.

ST No.	Sediment Descriptions
ST 235	0-15 cm, dark grayish-brown clayey loam; 15-19 cm+, dark grayish-brown clay
ST 236	0-12 cm, dark grayish-brown clayey loam; 12-16 cm+, dark grayish-brown clay
ST 237	0-23 cm, dark grayish-brown clayey loam; 23-28 cm+, dark grayish-brown clay
ST 238	0-15 cm+, dark grayish-brown clay
ST 239	0-10 cm, dark grayish-brown clayey loam; 10-15 cm+, dark grayish-brown clay
ST 240	0-16 cm, dark grayish-brown clayey loam; 16-20 cm+, dark grayish-brown clay
ST 241	0-14 cm+, dark grayish-brown clay
ST 242	0-15 cm+, dark grayish-brown clay
ST 243	0-20 cm+, dark grayish-brown clay
ST 244	0-20 cm+, dark grayish-brown clay
ST 245	0-10 cm+, dark grayish-brown clay
ST 246	0-16 cm+, dark grayish-brown clay
ST 247	0-12 cm, dark grayish-brown clayey loam; 12-15 cm+, dark grayish-brown clay
ST 248	0-6 cm, dark grayish-brown clayey loam; 6-12 cm+, dark grayish-brown clay
ST 249	0-20 cm+, dark grayish-brown clay
ST 250	0-10 cm+, dark grayish-brown clay
ST 251	0-12 cm+, dark grayish-brown clay
ST 252	0-16 cm+, dark grayish-brown clay
ST 253	0-10 cm+, dark grayish-brown clay

Old Field Site (34MI405)

The Old Field site is a prehistoric site of unknown age on a landform (600 feet amsl) above the confluence of two intermittent streams with poor surface visibility (Figure 5). The site is defined by three positive shovel tests. The Old Field site area covers ca. 1,500 square meters (0.37 acres): 50 m north-south and 30 m east-west (Figure 6); the project boundary is immediately to the east, and it is possible that the site may extend to the east outside of the project boundaries. The archaeological deposits here extend from 0-40 cm, and 50 percent of the recovered artifacts have been recovered from 0-20 cm bs and the remaining 50 percent are from 20-40 cm bs. The density of the prehistoric artifacts is a low 2.0 per positive shovel test at the site, or ca. 16.0 artifacts per square meter of archaeological deposits.

The prehistoric artifacts recovered in the shovel testing at the Old Field site are all non-cortical pieces of lithic debris, likely the product of the final maintenance or resharpening of chipped stone tools. These pieces are on dark grayish-brown chert (n=2), light gray and translucent chert (n=1), and grayish-brown chert (n=2). All of the lithic debris are from light to dark gray-colored cherts, probably from outcrops throughout the Ozark uplift and in gravel beds along the Arkansas River.

These artifacts were recovered from the following shovel tests:

ST 147, 0-20 cm bs: 2 light gray non-cortical chert lithic debris (Figure 7);

ST 150, 20-40 cm bs: 2 grayish-brown non-cortical chert lithic debris; 1 dark grayish-brown non-cortical chert lithic debris (Figure 8); and

ST 151, 0-20 cm bs: 1 dark grayish-brown non-cortical chert lithic debris (Figure 9).

The shallow depth of the archaeological deposits at the Old Field site, as well as the low density of recovered artifacts—only 2.0 artifacts (lithic debris only) per positive shovel test—indicate that the site does not have any potential to contribute to any research problems proposed by Wyckoff and Brooks (1983) for the eastern region of Oklahoma.

Figure 5. Looking north at the Old Field site (34MI405).

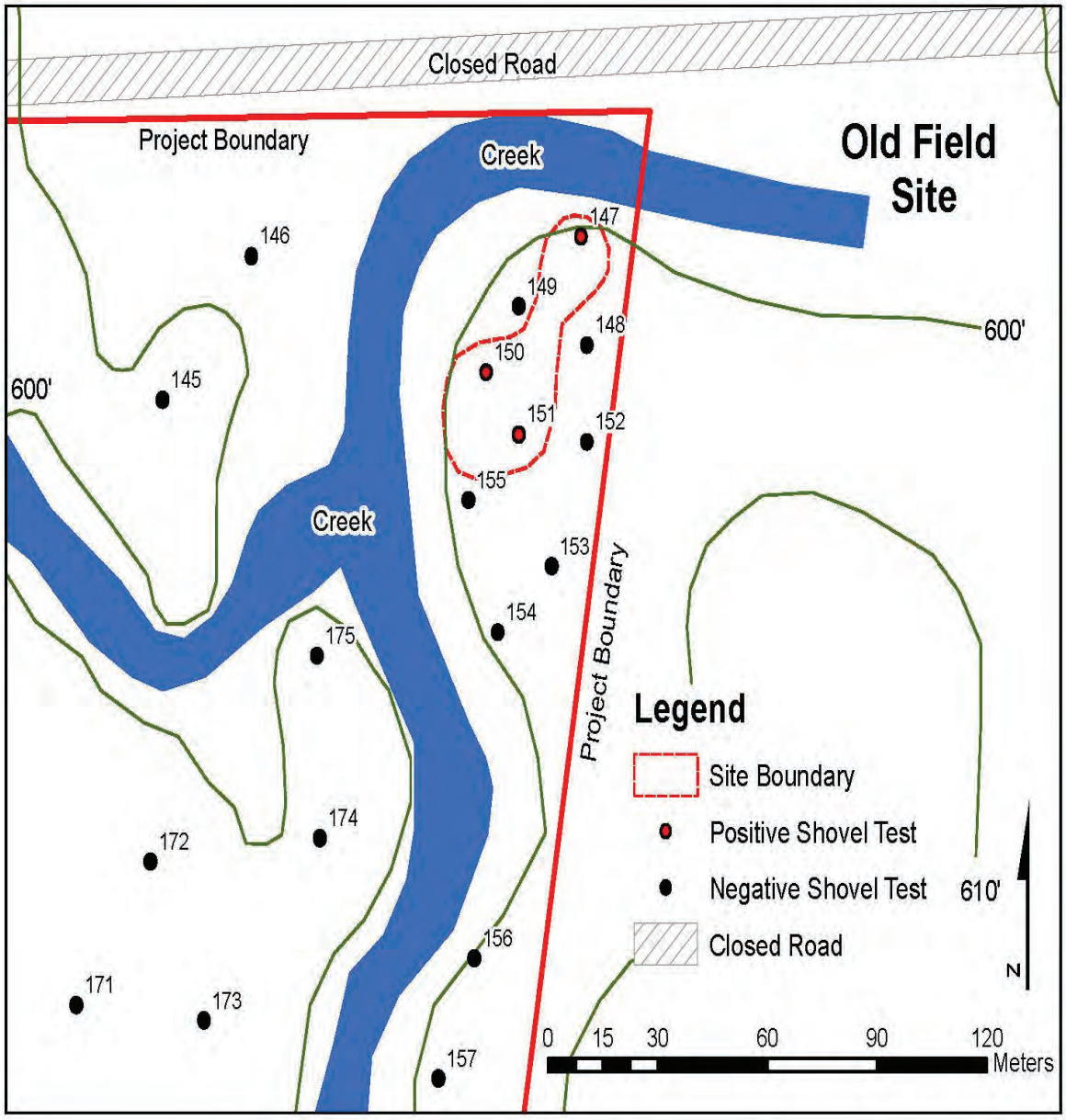

Figure 6. Map of the Old Field site (34MI405).

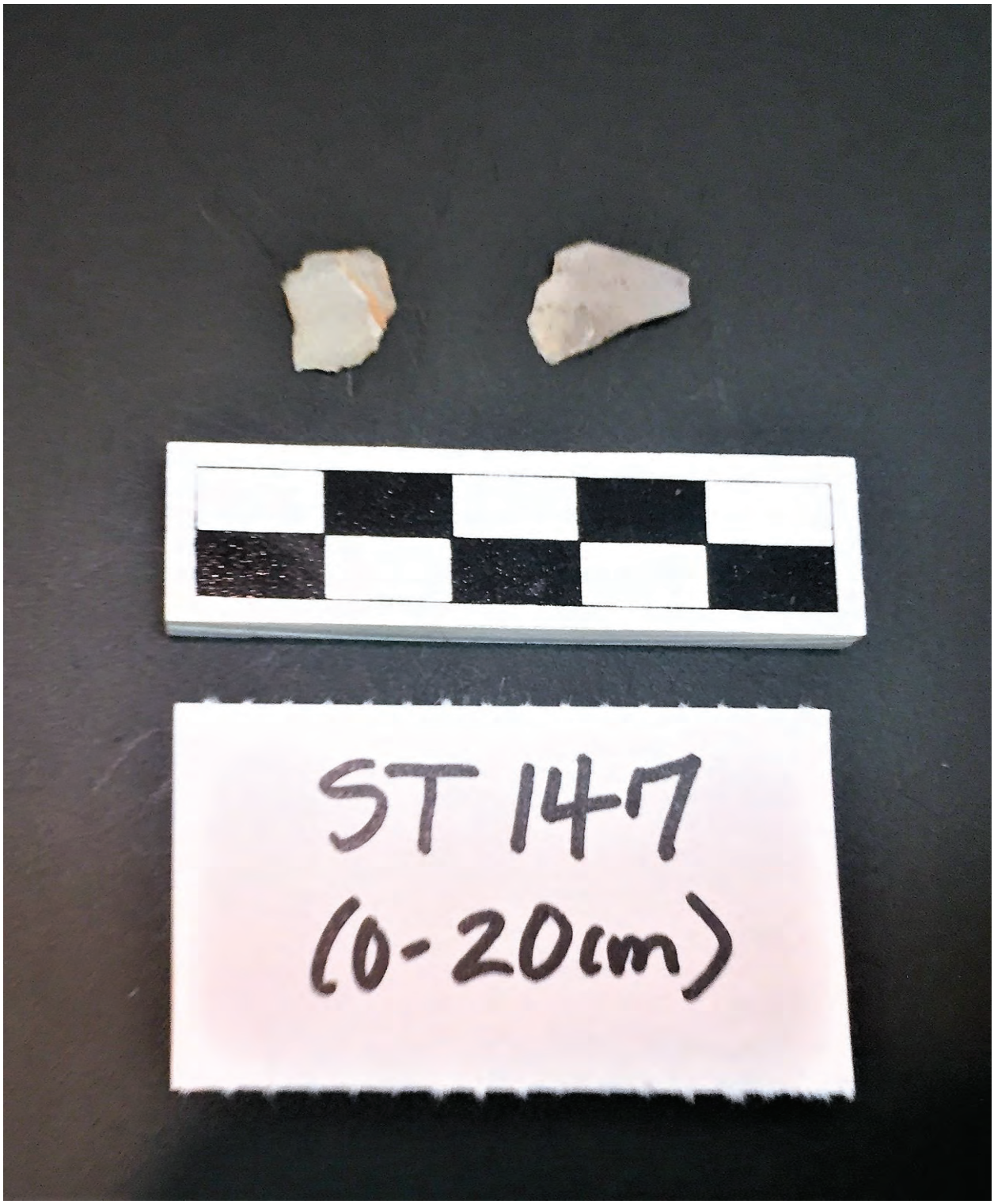

Figure 7. Artifacts recovered from ST 147 (0-20 cm bs) at the Old Field site.

Figure 8. Artifact recovered from ST 150 (20-40 cm bs) from the Old Field site.

Figure 9. Artifact recovered from ST 151 (0-20 cm bs) at the Old Field site.

Old Field Tract Barn site (34MI408)

The Old Field Tract Barn site is a destroyed/collapsed barn that is at least 50 years of age, based on its plotting on the 1970 topographic quadrangle of the project area. The barn is not located on the earlier 1948 aerial Section map on file at the Oklahoma

Geological Survey (1948b). The 1970 topographic quadrangle and the 1948 aerial map are the only maps available that allow a determination of the likely age and physical location of the barn. location.

The site is on an upland landform (610 ft. amsl) in the southeast corner of the Old Field Tract mitigation property, in an overgrown pasture with a nearby small stream that is a tributary to Elk Creek. The surface visibility is less than 10 percent across the site area, and shovel tests encountered Dennis silt loam sediments with a shallow B-horizon. None of the seven shovel tests around the collapsed/destroyed barn contained cultural materials (Figure 10). The shovel tests were placed along the landform at 20 m intervals to cover the entire portion of the landform in the project area.

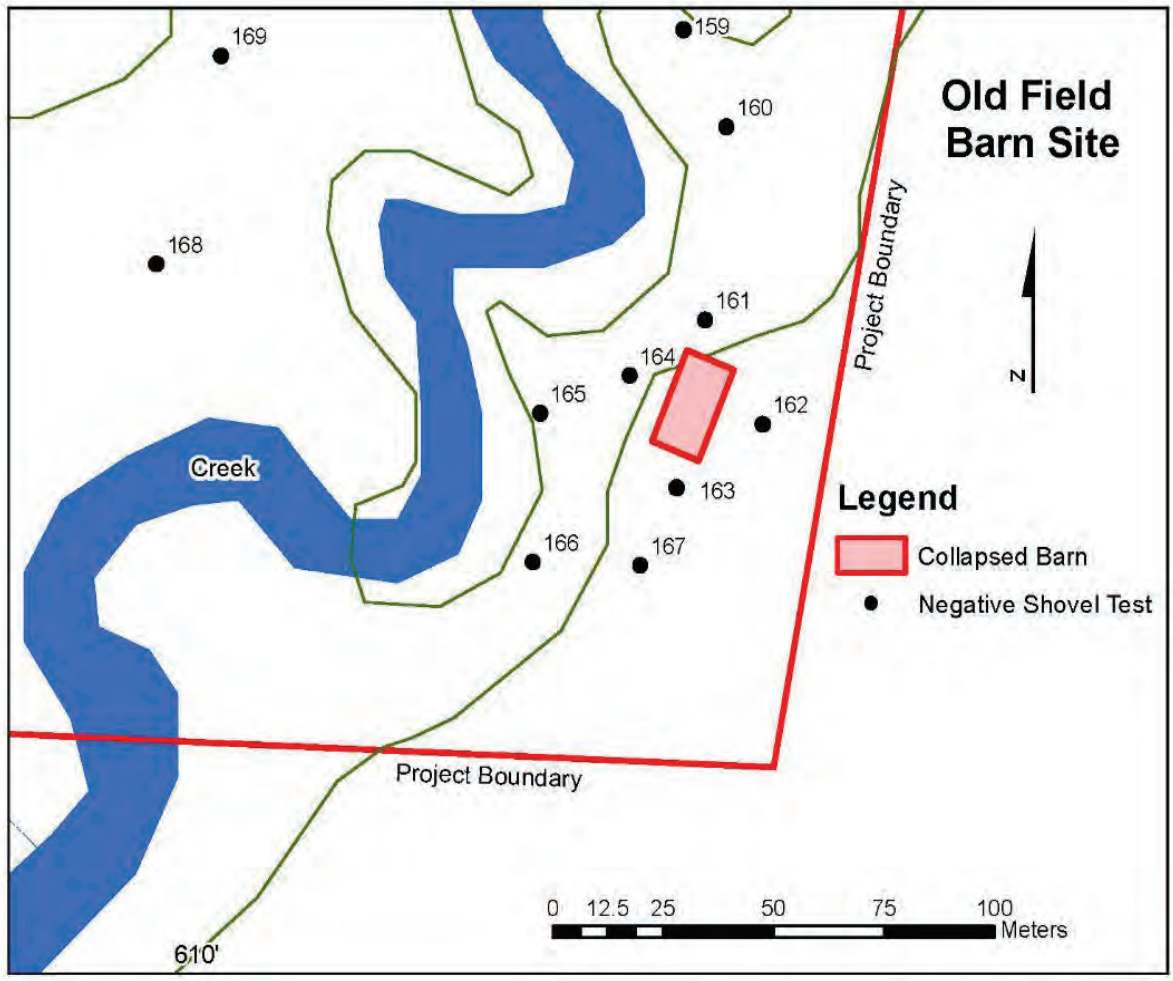

Figure 10. Map of the Old Field Tract Barn site (34MI408).

The site consists of a collapsed pole barn with pieces of corrugated metal or tin sheeting and wood boards scattered across about 2 acres around the barn location (Figures 11 and 12). The collapsed barn has 6-inch diameter poles still standing or partially standing that form a 60 x 20 ft. structure base with a dirt floor. The framework is

2 x 6-inch boards for support nailed to the poles, and 1 x 6-inch boards nailed to the 2 x 6s to attach the tin to the barn.

Figure 11. Looking west at the Old Field Tract Barn site.

Figure 12. Looking south at the Old Field Tract Barn site.

The building materials at the Old Barn site date the construction of the pole barn to between 1966 and 1970, suggesting that the barn's age range is between 50 to 54 years. Several methods of dating construction materials assist in narrowing down the time frame for the construction of the pole barn in the project area. Lumber size standards came into use in the early 20th century to meet the needs of the mills and markets. Initially rough lumber was full nominal size, but after World War I, the increasing demand for construction materials led to the first national size standard in 1924 (Smith and Wood 1964). The lumber standard has changed numerous times through the years, resulting in decreased dimensions in lumber sizes. The last revision of standard lumber sizes was in 1964, and this standard is still in use. The lumber thickness sizes at the Old

Barn site (the 1.5 x 5.5-inch and 0.75 x 5.5-inch boards) match the 1964 standard lumber sizes.

The corrugated steel sheeting commonly known as tin may also place a date of construction for the Old Barn site. The tin sheets are 8-10 ft. in length and 26 inches in width with corrugated 1.25-inch ribs. The sheets are coated by a process of placing a thin coating of zinc and aluminum mix to resist corrosion called zinclume. The zinclume process first began in 1966 (Spennemann 2015).

The barn appears to have been destroyed by high winds with all of the tin being well scattered. Using Google Earth historical imagery, the barn at the Old Barn site was still relatively intact on August 22, 2003 imagery but was mostly scattered and dispersed on the July 8, 2005 imagery. No cultural materials were recovered in any of the shovel tests excavated around the barn (see Figures 3 and 10).

In December 1949, Etheridge T. and Lela Carney purchased the property where the Old Barn site is located from the heirs of George Hay, all residing in the State of Illinois (McIntosh County, Oklahoma, Deed Record Volume 77D, Page 7). The property stayed within the Carney family until it was recently sold for the proposed mitigation bank. Etheridge T. Carney passed away in 1989, leaving the property to his son, Raymond E. Carney, according to McIntosh Probate Records (Book 382, page 381). Also, according to the McIntosh County Probate Records, the Carney family all lived in the town of Checotah, Oklahoma. Thus, the barn feature at the Old Barn site was probably utilized for any agricultural-related activities related to the property, but the barn was not associated with a farmstead at the site or in proximity to it.

Elk Creek Tract

The Elk Creek Tract (Section 9, T12N R17E) is 87.7 acres of the proposed mitigation bank project (Figure 13; see also Figure 1). The property has previously been maintained as a partially improved pasture, with scattered large pecan trees, used for cattle grazing for many years, and a forested area in the northern portion of the tract north of the tributary to Elk Creek that contains a mixture of small to large hardwood trees. The trees also line the tributary and Elk Creek. The livestock have been removed, and the pasture land has been allowed to become overgrown in the last few years.

Hoffman Environmental conducted a wetland assessment on the property in 2018, and characterized the property as 31.4 acres of herbaceous-dominated emergent wetlands (bottomland pasture), 34.3 acres of juvenile and mature bottomland forested wetlands, 6.2 acres of upland forested habitat, 12.6 acres of upland field habitat, 0.5 acres of perennial stream (3,117 linear feet), 0.2 acres of intermittent stream (1,637 linear feet), 0.2 acres of ephemeral streams (3,711 linear feet), 0.2 acres of beaver ponds, and 2.1 acres of stock ponds and roads.

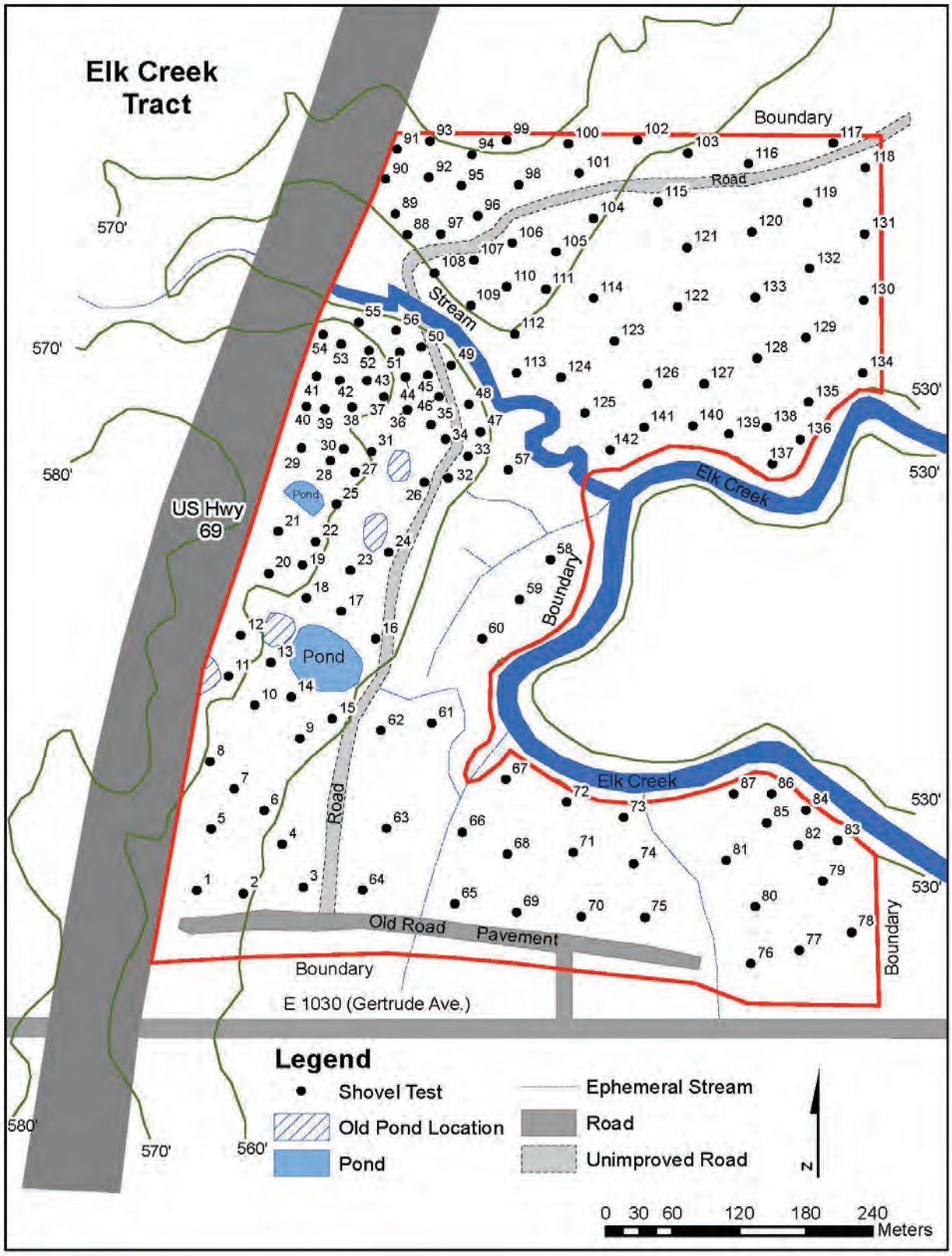

Figure 13. The Elk Creek tract, pond locations, roads, and ST 1-142.

The 2018 Hoffman assessment lists the vegetation types for each of the following Elk Creek Tract areas as:

- The 31.4 acres of herbaceous-dominated emergent wetlands consist of pecan (*Carya illinoinensis*), sumpweed (*Iva annua*), white prairie aster (*Symphotrichum falcatum*), Pennsylvania smartweed (*Persicaria lapathifolia*), Florida paspalum (*Paspalum floridanum*), knotroot bristlegrass (*Setaria parvoflora*), annual ragweed (*Ambrosia artemisiifolia*), late boneset (*Eupatorium serotinum*), curly dock (*Rumex crispus*), switchgrass (*Panicum virgatum*) and Chinese bush-clover (*Lespedeza cuneata*).

- The 34.3 acres of juvenile and mature bottomland hardwood forested wetlands consist of pecan, Shumard oak (*Quercus shumardii*), western soapberry (*Sapindus saponaria*), hackberry (*Celtis laevigata*), boxelder (*Acer negundo*), silver maple (*Acre saccharinum*), green ash (*Fraxinus pennsylvanica*), bois d' arc (*Maclura pomifera*), American elm (*Ulmus americana*), possumhaw (*Ilex decidua*), coralberry (*Symphoricarpos orbiculatus*), Chinese privet (Ligustrum sinense), Indian woodoats Cherokee sedge (*Carex cherokeensis*), Canada wildrye (*Elymus canadensis*), nutsedge (*Cyperus rotundus*), American germander (*Teucrium canadense*), Canadian black snakeroot (*Sanicula canadensis*), Devil's beggarticks (*Bidens frondosa*), trumpet creeper (*Campsis radicans*), common greenbrier (*Smilax rotundifolia*) and Japanese honey suckle (*Lonicera japonica).*

- The 6.2 acres of mature upland hardwood forested habitat consist of pecan, Shumard oak, post oak (*Quercus stellata*), winged elm (*Ulmus alata*), Chinese privet, eastern redcedar (*Juniperus virginiana*), Canadian black snakeroot, Canada wildrye, nutsedge, Indian woodoats (*Chasmanthium latifolium*), wild rose (*Rosa* spp.), coralberry, Japanese honeysuckle and common greenbrier; and

- The 12.6 acres of upland fallow field habitat consist of pecan, common persimmon (*Diospyros virginiana*), honey locust (*Gleditsia triacanthos*), sumpweed, common bermuda grass (*Cynodon dactylon*), Oklahoma blackberry (*Rubus oklahomus*), Carolina horsenettle (*Solanum carolinense*), white prairie aster, knotroot bristlegrass, annual ragweed and Chinese bush-clover.

The Elk Creek Tract has several livestock tanks, but many do not retain water any longer, and are now depressions covering about 0.6 acre in surface area. The two livestock ponds that do contain water cover an area of about 0.5 acres (see Figure 13). A small beaver pond of about 0.2 acres built on an intermittent stream at its confluence with Elk Creek is near the southwestern edge of the creek. The 1,637 linear feet of the intermittent stream has an eroded channel from 30-40 m in width, and from 3-6 m in depth. Elk Creek in the project area is 3,117 linear feet of perennial stream forming part of the eastern boundary of the tract. The Elk Creek channel is also about 30-40 m wide with a 4-6-m cut bank. Along the Elk Creek banks are numerous low areas that are probably filled in cut channels that make small seasonal sloughs. The smaller 3,117 linear feet of ephemeral streams range up to 10 m in width and are 1-1.5 m in depth. The depths

of the stream channels have eroded below a sedimentary black shale layer with sandstone gravel beds.

In the Elk Creek Tract, the terrain slopes towards Elk Creek in two different directions (see Figure 13). North of the intermittent stream, the terrain slopes southward along the north boundary from 570-530 ft. amsl towards the creek. South of the intermittent stream, the terrain slopes eastward from the west tract boundary from 580-530 ft. amsl towards Elk Creek. The slopes are fairly gradual with benches and shelves on the slopes before reaching floodplain areas.

The Elk Creek Tract has a section of pavement parallel to the southern boundary (see Figure 13). The pavement appears to be section of an old re-routed roadway. Since it is also parallel to the Section Road E 1030 (Gertrude Road), it may be where the original road was located before sections of U.S. Highway 69 were moved to its current location. The paved portion of the road measures about 315 m in length, and 6 m in width, covering approximately 0.47 acres. The property entrance road begins in the south from the existing E 1030 (Gertrude Road), and travels west along the old pavement section before turning north, where it crosses the intermittent stream before then turning to the northeast and exiting outside the northern corner of the project boundary (see Figure 10). The property access road is unimproved, runs about 0.66 mile, and is from 4-5 m wide. The road has been used through the years, and it has eroded to a depth of 50 cm to 1 m. The access roads cover approximately 1.32 acres of the property.

A U.S. Highway 69 right of way hog wire fence forms the western mitigation bank boundary of the Elk Creek Tract (see Figure 13). The north boundary is also fenced with hog wire separating the mitigation bank and private property in the north. The eastern boundary is mostly bounded by a channel of Elk Creek with fencing on the north and south sides of the creek. The southern boundary is fenced, and it is separated by the section road by a marshy area along most of the boundary.

The soils present within the Elk Creek Tract Mitigation Bank area include Dennis silt loam 3-5 percent slope severely eroded, Eram clay loam 1-6 percent slope eroded, and Verdigris silt loam 0-1 percent slope occasionally and frequently flooded. The shovel tests had flat sandstone and shale fragments in the sediment matrices.

ST 1-142 (Table 2) were excavated within the proposed Elk Creek Tract mitigation bank area (87.7 acres), or approximately 1.6 shovel tests per acre (Figure 14; see also Figure 13). Cultural materials were recovered in five of the shovel tests (ST 43, ST 49, ST 50, ST 51, and ST 53). The area of the artifacts within the mitigation tract is recorded as the Elk Creek site (34MI406).

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract.

ST No.	Sediment Description
ST 1	0-22 cm, dark brown silt loam; 22-27 cm, brown silty clay loam; 27-32 cm+, strong brown clay
ST 2	0-20 cm, dark brown silt loam; 20-26 cm, brown silty clay loam; 26-30 cm+, strong brown clay
ST 3	0-26 cm, dark brown silt loam; 26-32 cm, brown silty clay loam; 32-35 cm+, strong brown clay
ST 4	0-28 cm, dark brown silt loam; 28-31 cm, brown silty clay loam; 31-34 cm+, strong brown clay
ST 5	0-22 cm, dark brown silt loam; 22-27 cm, brown silty clay loam; 27-32 cm+, strong brown clay
ST 6	0-20 cm, dark brown silt loam; 20-25 cm, brown silty clay loam; 25-29 cm+, strong brown clay
ST 7	0-18 cm, dark brown silt loam; 18-24 cm, brown silty clay loam; 24-28 cm+, strong brown clay
ST 8	0-15 cm, dark brown silt loam; 15-20 cm, brown silty clay loam; 20-24 cm+, strong brown clay
ST 9	0-20 cm, dark brown silt loam; 20-26 cm, brown silty clay loam; 26-31 cm+, strong brown clay
ST 10	0-18 cm, dark brown silt loam; 18-22 cm, brown silty clay loam; 22-25 cm+, strong brown clay
ST 11	0-5 cm, brown silty clay loam; 5-12 cm+, strong brown clay
ST 12	0-12 cm, brown silty clay loam; 12-17 cm+, strong brown clay
ST 13	0-10 cm, brown silty clay loam; 10-16 cm+, strong brown clay
ST 14	0-12 cm, mixed sediments; 12-18 cm+, strong brown clay
ST 15	0-13 cm, dark brown silt loam; 13-17 cm, brown silty clay loam; 17-22 cm+, strong brown clay
ST 16	0-21 cm, dark brown silt loam; 21-25 cm, brown silty clay loam; 25-28 cm+, strong brown clay
ST 17	0-20 cm, dark brown silt loam; 20-25 cm, brown silty clay loam; 25-29 cm+, strong brown clay
ST 18	0-10 cm, dark brown silt loam; 10-15 cm, brown silty clay loam; 15-19 cm+, strong brown clay
ST 19	0-22 cm, dark brown silt loam; 22-27 cm, brown silty clay loam; 27-32 cm+, strong brown clay
ST 20	0-14 cm, dark brown silt loam; 14-19 cm, brown silty clay loam; 19-23 cm+, strong brown clay
ST 21	0-18 cm, dark brown silt loam; 18-24 cm, brown silty clay loam; 24-27 cm+, strong brown clay
ST 22	0-15 cm, dark brown silt loam; 15-20 cm, brown silty clay loam; 20-24 cm+, strong brown clay

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract, cont.

ST No.	Sediment Description
ST 23	0-20 cm, dark brown silt loam; 20-25 cm, brown silty clay loam; 25-28 cm+, strong brown clay
ST 24	0-22 cm, mixed sediments; 22-27 cm+, strong brown clay
ST 25	0-16 cm+, strong brown clay
ST 26	0-22 cm, dark brown silt loam; 22-27 cm, brown silty clay loam; 27-32 cm+, strong brown clay
ST 27	0-24 cm, dark brown silt loam; 24-29 cm, brown silty clay loam; 29-32 cm+, strong brown clay
ST 28	0-20 cm, dark brown silt loam; 20-26 cm, brown silty clay loam; 26-30 cm+, strong brown clay
ST 29	0-15 cm, dark brown silt loam; 15-19 cm, brown silty clay loam; 19-22 cm+, strong brown clay
ST 30	0-18 cm, dark brown silt loam; 18-27 cm, brown silty clay loam; 27-30 cm+, strong brown clay
ST 31	0-31 cm, dark brown silt loam; 31-37 cm, brown silty clay loam; 37-40 cm+, strong brown clay
ST 32	0-22 cm, dark brown silt loam; 22-26 cm, brown silty clay loam; 26-28 cm+, strong brown clay
ST 33	0-22 cm, dark brown silt loam; 22-27 cm, brown silty clay loam; 27-30 cm+, strong brown clay
ST 34	0-15 cm, dark brown silt loam; 15-20 cm, brown silty clay loam; 20-24 cm+, strong brown clay
ST 35	0-19 cm, dark brown silt loam; 19-26 cm, brown silty clay loam; 26-30 cm+, strong brown clay
ST 36	0-20 cm, dark brown silt loam; 20-24 cm, brown silty clay loam; 24-27 cm+, strong brown clay
ST 37	0-10 cm, dark brown silt loam; 10-17 cm, brown silty clay loam; 17-20 cm+, strong brown clay
ST 38	0-16 cm, dark brown silt loam; 16-20 cm, brown silty clay loam; 20-24 cm+, strong brown clay
ST 39	0-24 cm, dark brown silt loam; 24-30 cm, brown silty clay loam; 30-32 cm+, strong brown clay
ST 40	0-21 cm, dark brown silt loam; 21-25 cm, brown silty clay loam; 25-27 cm+, strong brown clay
ST 41	0-22 cm, dark brown silt loam; 22-28 cm, brown silty clay loam; 28-30 cm+, strong brown clay
ST 42	0-20 cm, dark brown silt loam; 20-25 cm, brown silty clay loam; 25-30 cm+, strong brown clay
ST 43	0-25 cm, dark brown silt loam; 25-31 cm, brown silty clay loam; 31-35 cm+, strong brown clay

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract, cont.

ST No.	Sediment Description
ST 44	0-23 cm, dark brown silt loam; 23-27 cm, brown silty clay loam; 27-30 cm+, strong brown clay
ST 45	0-20 cm, dark brown silt loam; 20-24 cm, brown silty clay loam; 24-27 cm+, strong brown clay
ST 46	0-18 cm, dark brown silt loam; 18-24 cm, brown silty clay loam; 24-27 cm+, strong brown clay
ST 47	0-25 cm, dark brown silt loam; 25-30 cm, brown silty clay loam; 30-34 cm+, strong brown clay
ST 48	0-28 cm, dark brown silt loam; 28-31 cm, brown silty clay loam; 31-35 cm+, strong brown clay
ST 49	0-26 cm, dark brown silt loam; 26-30 cm, brown silty clay loam; 30-33 cm+, strong brown clay
ST 50	0-22 cm, dark brown silt loam; 22-26 cm, brown silty clay loam; 26-29 cm+, strong brown clay
ST 51	0-20 cm, dark brown silt loam; 20-24 cm, brown silty clay loam; 24-30 cm+, strong brown clay
ST 52	0-18 cm, dark brown silt loam; 18-24 cm, brown silty clay loam; 24-27 cm+, strong brown clay
ST 53	0-23 cm, dark brown silt loam; 23-28 cm, brown silty clay loam; 28-32 cm+, strong brown clay
ST 54	0-25 cm, dark brown silt loam; 25-30 cm, brown silty clay loam; 30-33 cm+, strong brown clay
ST 55	0-30 cm, dark brown silt loam; 30-36 cm, brown silty clay loam; 36-39 cm+, strong brown clay
ST 56	0-26 cm, dark brown silt loam; 26-31 cm, brown silty clay loam; 31-34 cm+, strong brown clay
ST 57	0-16 cm, very dark brown silt loam; 16-45 cm+, brown silty clay loam
ST 58	0-32 cm+, brown silty clay loam
ST 59	0-30 cm+, brown silty clay loam
ST 60	0-34 cm+, brown silty clay loam
ST 61	0-10 cm, very dark brown silt loam; 10-35 cm+, brown silty clay loam
ST 62	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam
ST 63	0-14 cm, very dark brown silt loam; 14-32 cm+, brown silty clay loam
ST 64	0-12 cm, very dark brown silt loam; 12-33 cm+, brown silty clay loam
ST 65	0-8 cm, very dark brown silt loam; 8-30 cm+, brown silty clay loam
ST 66	0-34 cm+, brown silty clay loam
ST 67	0-30 cm+, brown silty clay loam
ST 68	0-14 cm, very dark brown silt loam; 14-32 cm+, brown silty clay loam
ST 69	0-5 cm, very dark brown silt loam; 5-33 cm+, brown silty clay loam
ST 70	0-35 cm+, brown silty clay loam
ST 71	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract, cont.

ST No.	Sediment Description
ST 72	0-22 cm, very dark brown silt loam; 22-41 cm+, brown silty clay loam
ST 73	0-28 cm+, brown silty clay loam
ST 74	0-10 cm, very dark brown silt loam; 10-33 cm+, brown silty clay loam
ST 75	0-24 cm+, brown silty clay loam
ST 76	0-13 cm, very dark brown silt loam; 13-30 cm+, brown silty clay loam
ST 77	0-12 cm, very dark brown silt loam; 12-33 cm+, brown silty clay loam
ST 78	0-15 cm, very dark brown silt loam; 15-35 cm+, brown silty clay loam
ST 79	0-17 cm, very dark brown silt loam; 17-31 cm+, brown silty clay loam
ST 80	0-10 cm, very dark brown silt loam; 10-30 cm+, brown silty clay loam
ST 81	0-30 cm+, brown silty clay loam
ST 82	0-15 cm, very dark brown silt loam; 15-35 cm+, brown silty clay loam
ST 83	0-22 cm, very dark brown silt loam; 22-43 cm+, brown silty clay loam
ST 84	0-27 cm, very dark brown silt loam; 27-46 cm+, brown silty clay loam
ST 85	0-12 cm, very dark brown silt loam; 12-37 cm+, brown silty clay loam
ST 86	0-20 cm, very dark brown silt loam; 20-40 cm+, brown silty clay loam
ST 87	0-12 cm, very dark brown silt loam; 12-33 cm+, brown silty clay loam
ST 88	0-25 cm, dark brown silt loam; 25-31 cm, brown silty clay loam; 31-36 cm+, strong brown clay
ST 89	0-22 cm, dark brown silt loam; 22-28 cm, brown silty clay loam; 28-32 cm+, strong brown clay
ST 90	0-20 cm, dark brown silt loam; 20-25 cm, brown silty clay loam; 25-30 cm+, strong brown clay
ST 91	0-15 cm, dark brown silt loam; 15-20 cm, brown silty clay loam; 20-25 cm+, strong brown clay
ST 92	0-19 cm, dark brown silt loam; 19-25 cm, brown silty clay loam; 25-28 cm+, strong brown clay
ST 93	0-20 cm, dark brown silt loam; 20-26 cm, brown silty clay loam; 26-29 cm+, strong brown clay
ST 94	0-12 cm, dark brown silt loam; 12-17 cm, brown silty clay loam; 17-20 cm+, strong brown clay
ST 95	0-22 cm, dark brown silt loam; 22-29 cm, brown silty clay loam; 29-32 cm+, strong brown clay
ST 96	0-20 cm, dark brown silt loam; 20-26 cm, brown silty clay loam; 26-30 cm+, strong brown clay
ST 97	0-24 cm, dark brown silt loam; 24-30 cm, brown silty clay loam; 30-33 cm+, strong brown clay
ST 98	0-12 cm, dark brown silt loam; 12-17 cm, brown silty clay loam; 17-22 cm+, strong brown clay
ST 99	0-6 cm, brown silty clay loam; 6-14 cm+, strong brown clay
ST 100	0-5 cm, brown silty clay loam; 5-10 cm+, strong brown clay

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract, cont.

ST No.	Sediment Description
ST 101	0-14 cm, dark brown silt loam; 14-20 cm, brown silty clay loam; 20-24 cm+, strong brown clay
ST 102	0-5 cm, brown silty clay loam; 5-10 cm+, strong brown clay
ST 103	0-12 cm, dark brown silt loam; 12-15 cm, brown silty clay loam; 15-20 cm+, strong brown clay
ST 104	0-12 cm, very dark brown silt loam; 12-33 cm+, brown silty clay loam
ST 105	0-22 cm, very dark brown silt loam; 22-35 cm+, brown silty clay loam
ST 106	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam
ST 107	0-20 cm, very dark brown silt loam; 20-30 cm+, brown silty clay loam
ST 108	0-20 cm+, brown silty clay loam
ST 109	0-26 cm+, brown silty clay loam
ST 110	0-14 cm, very dark brown silt loam; 14-25 cm+, brown silty clay loam
ST 111	0-23 cm, very dark brown silt loam; 23-36 cm+, brown silty clay loam
ST 112	0-10 cm, very dark brown silt loam; 10-20 cm+, brown silty clay loam
ST 113	0-23 cm+, brown silty clay loam
ST 114	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam
ST 115	0-23 cm, very dark brown silt loam; 23-33 cm+, brown silty clay loam
ST 116	0-21 cm, very dark brown silt loam; 21-35 cm+, brown silty clay loam
ST 117	0-10 cm, very dark brown silt loam; 10-25 cm+, brown silty clay loam
ST 118	0-23 cm+, brown silty clay loam
ST 119	0-13 cm, very dark brown silt loam; 13-28 cm+, brown silty clay loam
ST 120	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam
ST 121	0-23 cm, very dark brown silt loam; 23-33 cm+, brown silty clay loam
ST 122	0-18 cm, very dark brown silt loam; 18-29 cm+, brown silty clay loam
ST 123	0-22 cm, very dark brown silt loam; 22-31 cm+, brown silty clay loam
ST 124	0-16 cm+, brown silty clay loam
ST 125	0-13 cm+, brown silty clay loam
ST 126	0-12 cm, very dark brown silt loam; 12-25 cm+, brown silty clay loam
ST 127	0-5 cm, very dark brown silt loam; 5-23 cm+, brown silty clay loam
ST 128	0-14 cm, very dark brown silt loam; 14-27 cm+, brown silty clay loam
ST 129	0-18 cm, very dark brown silt loam; 18-30 cm+, brown silty clay loam
ST 130	0-20 cm, very dark brown silt loam; 20-30 cm+, brown silty clay loam
ST 131	0-13 cm+, brown silty clay loam
ST 132	0-15 cm, very dark brown silt loam; 15-30 cm+, brown silty clay loam
ST 133	0-19 cm, very dark brown silt loam; 19-33 cm+, brown silty clay loam
ST 134	0-4 cm, very dark brown silt loam; 4-18 cm+, brown silty clay loam
ST 135	0-12 cm, very dark brown silt loam; 12-23 cm+, brown silty clay loam
ST 136	0-18 cm+, brown silty clay loam
ST 137	0-14 cm, very dark brown silt loam; 14-30 cm+, brown silty clay loam
ST 138	0-10 cm, very dark brown silt loam; 10-20 cm+, brown silty clay loam
ST 139	0-12 cm, very dark brown silt loam; 12-24 cm+, brown silty clay loam

Table 2. Shovel test descriptions for ST 1-142 in the Elk Creek tract, cont.

ST No.	Sediment Description
ST 140	0-16 cm+, brown silty clay loam
ST 141	0-19 cm+, brown silty clay loam
ST 142	0-10 cm+, brown silty clay loam

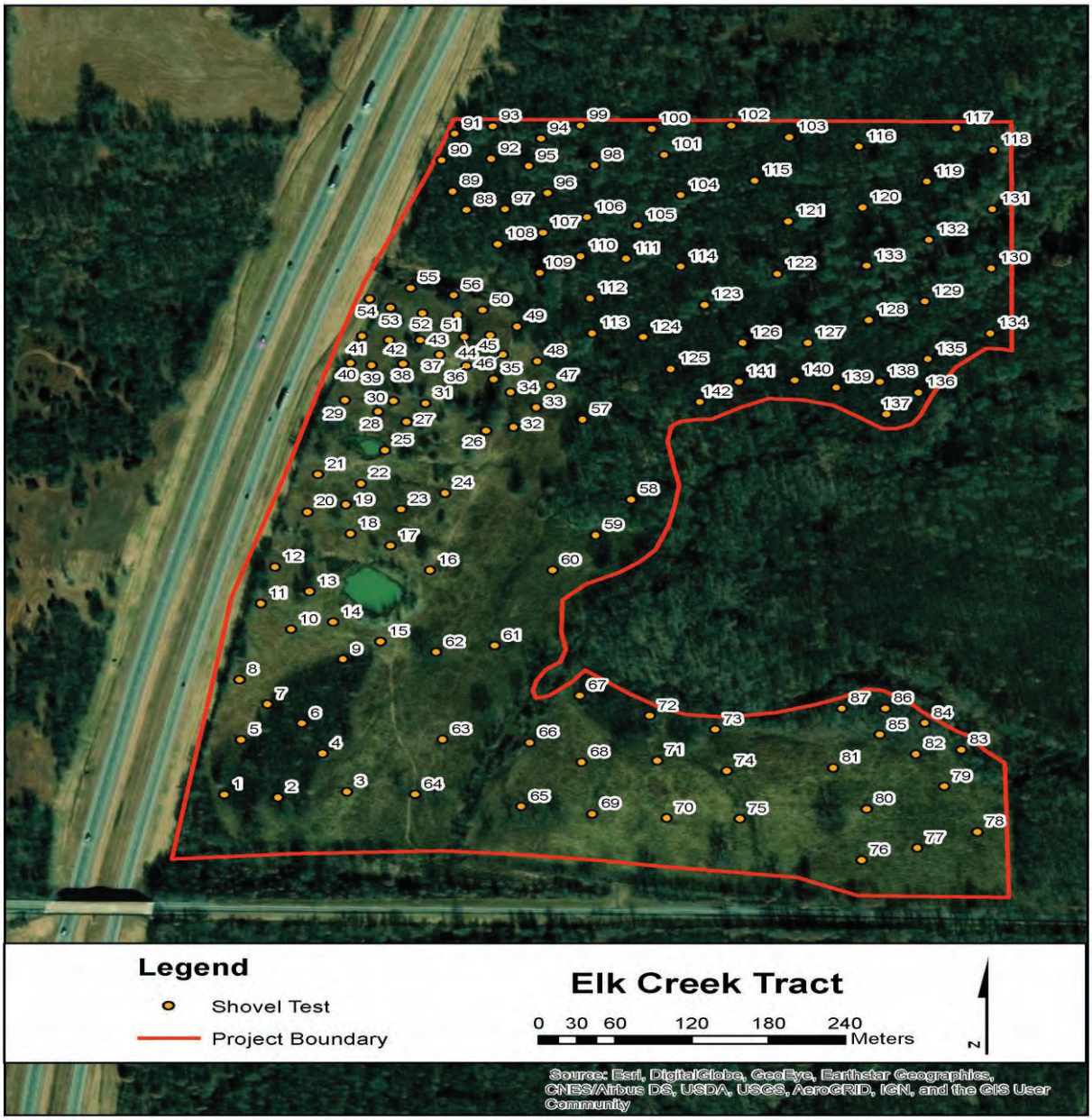

Figure 14. Shovel tests 1-142 plotted on an aerial photo of the Elk Creek tract.

The Tract is near the Honey Springs Civil War Battlefield (see Figure 2), and if any of the shovel tests were found to contain any 19th century historic artifacts, then a gridded metal detection area was to be placed near to such an artifact recovery area. Since no historic age artifacts were located during the archaeological survey, no metal detection over the tract took place.

Elk Creek Site (34MI406)

Five positive shovel tests define the spatial dimensions of the prehistoric Elk Creek site on a small toe slope landform adjacent to and above (560-570 feet amsl) an intermittent stream channel. The landform slopes gradually to the east to a small stream, a tributary of Elk Creek. The site is in an overgrown pasture with a mixture of small to medium-sized hardwoods along the small stream. The surface visibility is less than 10 percent across the site area (Figure 15). The soil is Dennis silt loam with a shallow clay B-horizon.

The Elk Creek site area covers an area of ca. 3,300 square meters (0.82 acres), 30 m north-south and 110 m east-west (Figure 16). The archaeological deposits at the site extend from 0-33 cm bs, but 67 percent (n=6) of the recovered artifacts (n=9) occur only from 0-20 cm bs, and the remainder occur from 20-33 cm bs. The density of the prehistoric artifacts is a low 1.8 per positive shovel test or ca. 14.4 artifacts per square meter of archaeological deposits.

The prehistoric artifacts recovered in the shovel testing at the Elk Creek site are all non-cortical pieces of lithic debris, likely removed during the final maintenance or resharpening of chipped stone tools. These pieces are on dark grayish-brown chert (n=5), light gray and translucent chert (n=2), dark reddish-brown chert (n=1), and gray chert (n=1). All of the lithic debris are probably from outcrops throughout the Ozark uplift and in gravel beds along the Arkansas River.

These cultural materials were recovered as follows by shovel test:

ST 43, 0-20 cm bs: 1 dark grayish-brown non-cortical chert lithic debris (Figure 17);

Figure 15. Looking south at the Elk Creek site (34MI406).

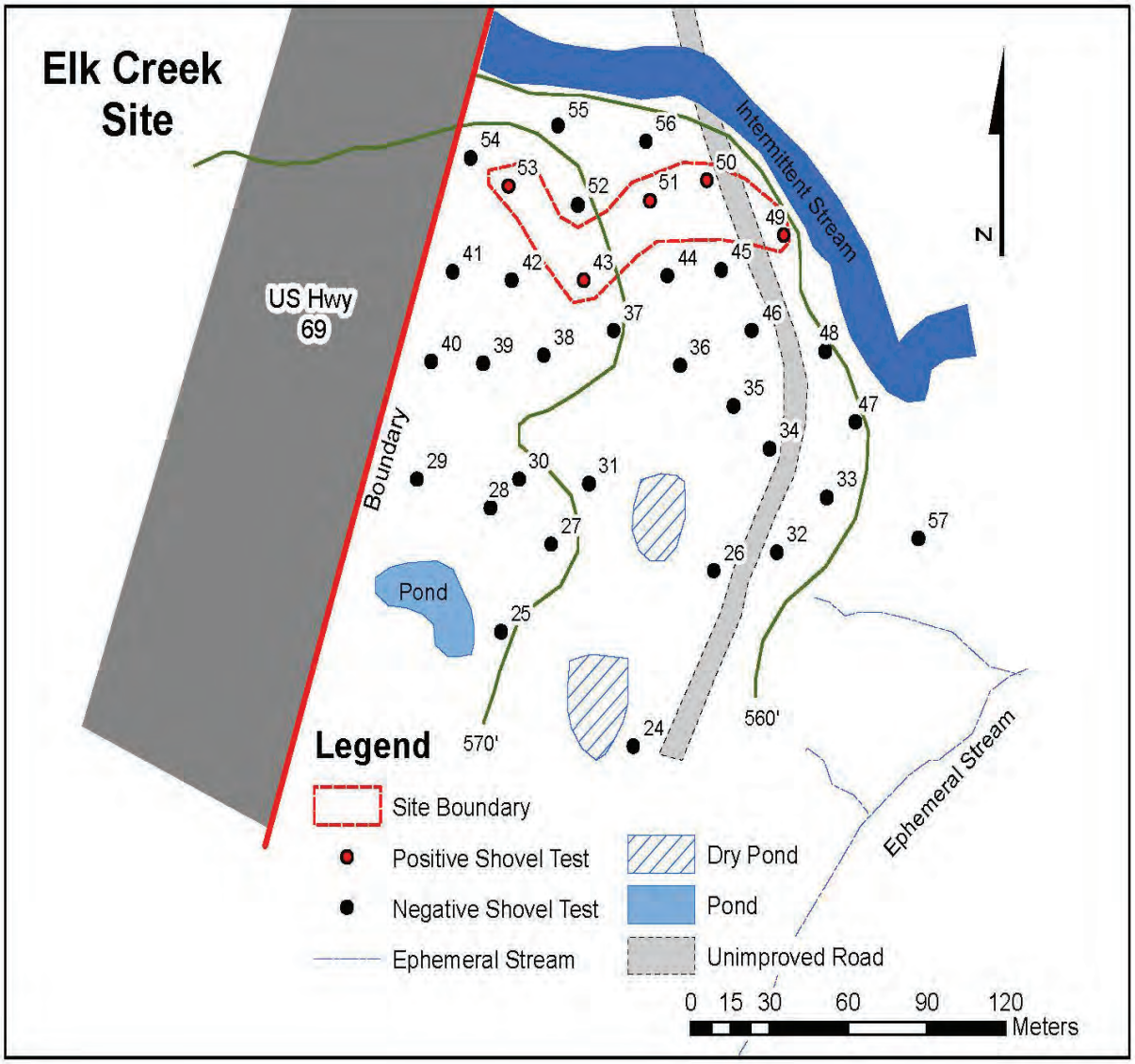

Figure 16. Map of the Elk Creek site (34MI406) and nearby shovel tests.

Figure 17. Lithic debris from ST 43 (0-20 cm bs) at the Elk Creek site.

ST 49, 20-33 cm bs: 3 dark grayish-brown non-cortical chert lithic debris (Figure 18);

ST 50, 0-20 cm bs: 1 light gray non-cortical chert lithic debris; 1 gray non-cortical lithic debris (Figure 19);

ST 51, 0-20 cm bs: 1 light gray non-cortical chert lithic debris; 1 dark grayish-brown non-cortical chert lithic debris (Figure 20); and

Figure 18. Lithic debris from ST 49 (20-33 cm bs) at the Elk Creek site.

Figure 19. Lithic debris from ST 50 (0-20 cm bs) at the Elk Creek site.

Figure 20. Lithic debris from ST 51 (0-20 cm bs) at the Elk Creek site.

ST 53, 0-20 cm bs: 1 dark reddish-brown non-cortical chert lithic debris (Figure 21).

Figure 21. Lithic debris from ST 53 (0-20 cm bs) at the Elk Creek site.

The shallow depth of the archaeological deposits at the Elk Creek site, as well as the low density of recovered artifacts—only 1.8 artifacts (lithic debris only) per positive shovel test—indicate that the site does not have any potential to contribute to any research problems proposed by Wyckoff and Brooks (1983) for the eastern region of Oklahoma.

Summary and Recommendations

The proposed Honey Springs Mitigation Bank project is located in the northern part of McIntosh County in eastern Oklahoma. The proposed mitigation bank is comprised of two locations totaling 170.9 acres. Location 1 (Elk Creek Tract), 87.7 acres, is located about 0.5 miles west of the town of Rentiesville, while location 2 (Old Field Tract), 83.2 acres, is about 4.5 miles northwest of Rentiesville. The two project areas are on the Wainwright 7.5' 1970 USGS topographic quadrangle. The Elk Creek Tract location is Section 9, T12N R17E, and the Old Field Tract is Section 12, T12N R16E in McIntosh County.

Since streams and wetland areas are present on the properties, a Section 404 permit of the Clean Water Act (CWA), Permit SWT-2019-218-IP application, is necessary for the development of the project area to proceed. The current permit application is for proposed enhancement and restoration of streams, wetland areas, native plants, and bottomland hardwood timber. An archaeological survey was requested by the United States Army Corps of Engineers (USACE), Tulsa District, for both locations of the proposed mitigation properties. The USACE has jurisdictional authority to regulate the use and development of tributary streams and wetlands in the proposed mitigation bank project area. Under this authority, the USACE requested that an archaeological survey be done of both locations of the proposed Honey Springs Mitigation Bank under Section 106 of the National Historic Preservation Act, as these areas falls under the purview of Section 106 and 36 CFR Part 800, its implementing regulations. Tejas Archaeology conducted the archaeological survey of the project undertaking at the request of Hoffman Environmental, Inc. for Green County Wetland Mitigation, LLC, on August 9-22, 2019.

During the course of the intensive archaeological survey and shovel testing of the 170.9-acre project undertaking, two new prehistoric archaeological sites of unknown age were identified and recorded in the project undertaking (34MI405 and 34MI406). The shallow depth of the archaeological deposits at the sites, as well as the low density and lack of diversity of recovered artifacts, indicate that the sites do not have any potential to contribute substantive archaeological data concerning eastern Oklahoma prehistoric research problems (see Wyckoff and Baugh 1983). Also recorded was a mid-20th century collapsed and destroyed barn site—the Old Field Tract Barn site (34MI408)—with no associated archaeological deposits and no intact architectural elements; there are a few wood poles standing but the lumber supports and tin roof covering have been scattered around the barn location.

Under 36 CFR Part 60 (National Register of Historic Places), and the authority of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et. seq.), cultural resources and sites affected by federal undertakings under Section 106 of the NHPA will be evaluated for their National Register of Historic Places (NRHP) eligibility as a means "to indicate what properties should be considered for protection from destruction or impairment" (36 CFR Part 60.2). According to 36 CFR Part 60.4, districts, sites, buildings, structures, and objects eligible for inclusion in the NRHP will

have a "quality of significance in American history, architecture, archaeology, engineering, and culture [that] is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association," and meet four basic criteria (36 CFR Part 60.4a-d):

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 significant persons in or 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 history or prehistory.

It is our recommendation that the Old Field (34MI405), Elk Creek (34MI406), and Old Field Tract Barn (34MI408) sites are not eligible for inclusion in the NRHP. The sites do not meet any of the four NRHP criteria (36 CFR Part 60.4a-d), nor do their deposits possess archaeological integrity.

In conclusion, based on the results of the pedestrian archaeological survey and intensive shovel testing of the proposed 170.9-acre Honey Springs Mitigation Bank project area in McIntosh County, Oklahoma, there is the absence of any archaeological sites in the project area that are eligible for inclusion in the NRHP. It is our recommendation that the proposed project will not have an effect on any sites eligible for inclusion in the NRHP. Consequently, the proposed Honey Springs Mitigation Bank project should be allowed to proceed without further consultation under the National Historic Preservation Act and its implementing regulations.

Acknowledgments

We would like to thank Jason Hoffman, with Hoffman Environmental, Inc., for the opportunity to conduct the archaeological survey, and for his assistance in providing us with appropriate information and project maps. Michael Margolis with the USACE provided guidance in determining the survey methods. Jim Briscoe graciously assisted us by sharing his knowledge of the project area, locating maps, and provided reference materials from his private library. Dr. Don G. Wyckoff also pointed out some helpful reference materials. Kim Hinson prepared the maps for the report.

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Appendix 1, Site Locations (Redacted for Final Report) in the Project Areas

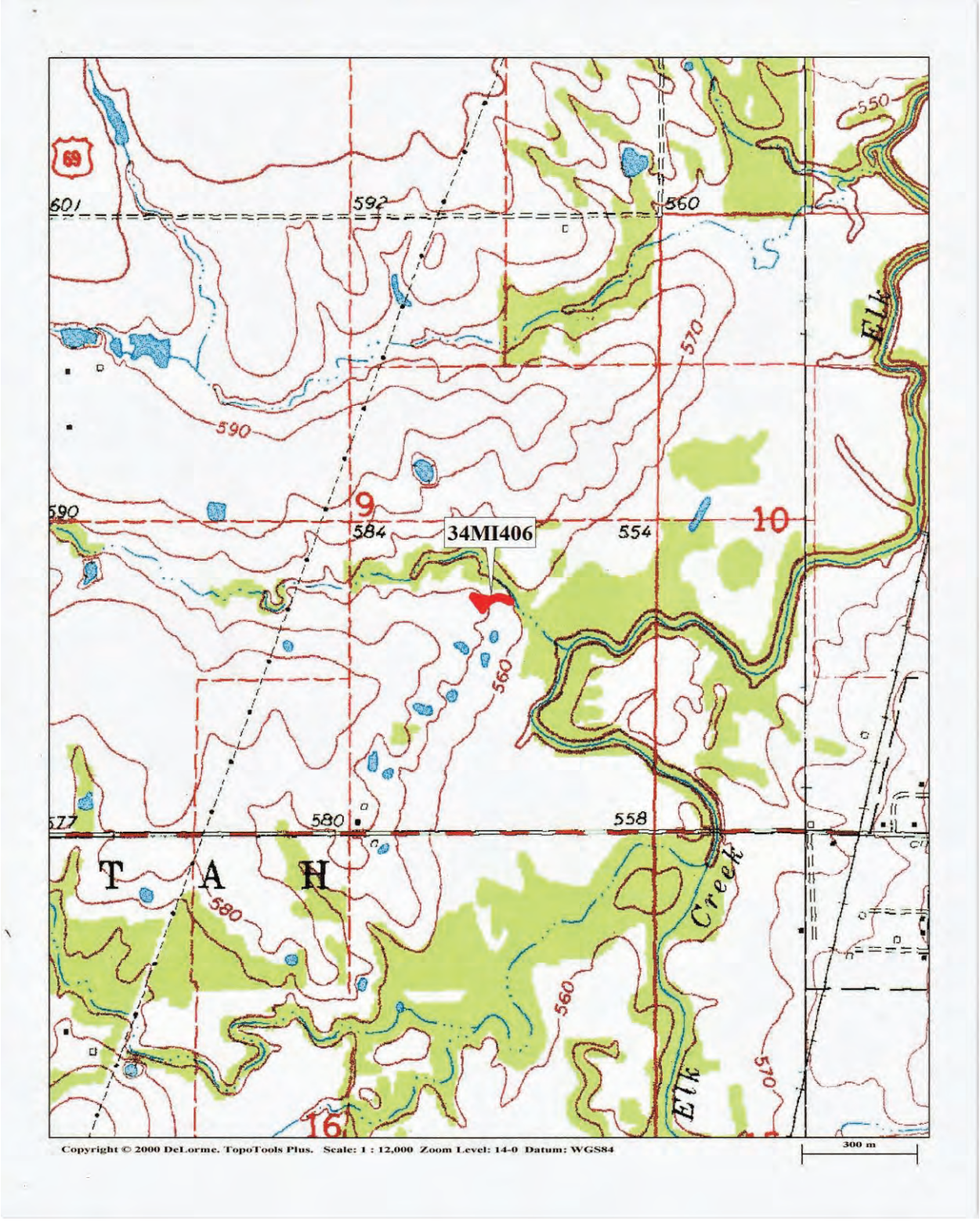

Figure A1-1. Elk Creek site (34MI406).

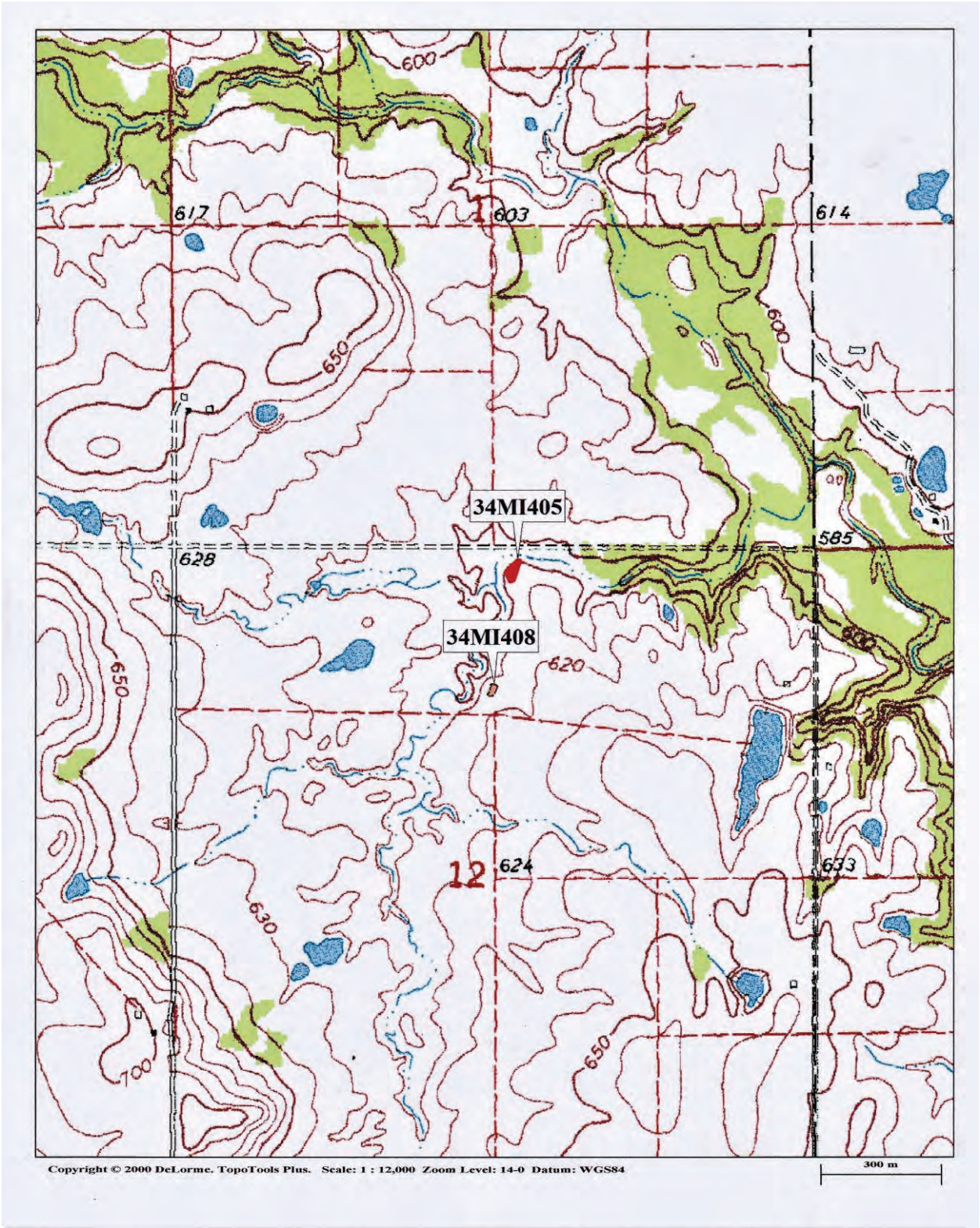

Figure A1-2. Old Field site (34MI405) and Old Barn site (34MI408).

OKLAHOMA ARCHEOLOGICAL SITE SURVEY FORM

Field Code WT #1

SITS# 34 MI405

1. Site Name Old Field

County McIntosh

---

2. Site Location

Zone: 15S **UTM** 3935510 **N** **UTM** 267410 **E**

Legal Description

NW	QQQ	NW	QQ	NE	Q	Section	12	Township	12N	Range	16E
	QQQ		QQ		Q	Section		Township		Range	
	QQQ		QQ		Q	Section		Township		Range	

Quad Name (s): Wainwright 7.5 (1970)

Quad Date (revised):

Other Locational References (i.e., benchmarks, road intersections, bridges, etc., please give distance and bearing to site):

The site is located from the intersection of Section Roads N 4180 and E 1020 travel East approximately 0.5 mile down E 1020, the site is 30 meters south from this point in the road in the property corner.

---

3. Owner(s) of Property

Name: Jack Dunnavant (Green Country Wetland Mitigation, LLC.)

Street and Number: P.O. Box 132

City/Town, State: Carthage, Texas

Zip: 75633

---

4. Site Surveyed by:

Recorded by: Bo Nelson

Date Recorded (mm/dd/year): 08/18/19

Person-Hours Spent at Site: 7.0

5. Cultural Affiliation - Cultural Periods: (check all that apply)

Unassigned prehistoric ☑

Paleoindian:
- Early ☐
- Middle ☐
- Late ☐

Archaic:
- Early ☐
- Middle ☐
- Late ☐

Woodland:
- Eastern – maybe eastern? ☐
- Plains ☐

Village Farming/Mississippi ☐

Plains Village ☐

Protohistoric/Historic Ind. ☐

Historic non-Indian ☐

Archaeological Cultures, Phases, etc., represented:

Unknown Prehistoric

How was cultural affiliation determined (diagnostic artifacts, radiocarbon dates, etc):

Only Lithic Debris recovered in Shovel Tests

6. Historic Phase Identification (Ethnic): (Check appropriate group)

1. Choctaw ☐	9. Kiowa-Apache ☐	17. Cheyenne ☐	25. Missouri-Otos ☐
2. Cherokee ☐	10. Kickapoo ☐	18. Caddo ☐	26. Iowa ☐
3. Saux-Fox ☐	11. Pawnee ☐	19. Shawnee ☐	27. Anglo-American ☐
4. Pottawatomie ☐	12. Arapaho ☐	20. Delaware ☐	28. French ☐
5. Seminole ☐	13. Ottawas ☐	21. Creek ☐	29. Spanish ☐
6. Comanche ☐	14. Wichita ☐	22. Dakotas ☐	30. Other ☐
7. Apache ☐	15. Quapaw ☐	23. Chickasaw ☐	
8. Kiowa ☐	16. Osage ☐	24. 12 & 17 ☐	

How was historic identification determined?:

7. Historic Site Range (check one)**:**

0. Missing data; unknown	☐	5. 1890-1929	☐
1. pre-1800	☐	6. 1930-1950	☐
2. 1800-1830	☐	7. 1800-1900	☐
3. 1830-1859	☐	8. 1800 - present	☐
4. 1860-1889	☐	9. 1900 - present	☐

8. Inferred Site Type: (check all that apply)

Prehistoric Categories		***Historic Categories***	
Open habitation w/o mounds	☑	Historic farmstead/homestead	☐
Open habitation with mounds	☐	Historic mill/industrial	☐
Earth mound (not midden mound)	☐	Historic fort or other military	☐
Mound complex	☐	Dugout	☐
Stone mounds/rock piles Burned	☐	Historic trash dump	☐
Rock concentrations Non-mound	☐	School house	☐
Earthworks	☐	Trading post	☐
Rock shelter	☐	Historic town/settlement	☐
Cave	☐	Historic irrigation/land modification	☐
Quarry	☐	Church	☐
Workshop	☐	Historic Cemetery	☐
Petroglyph/pictograph	☐	Transportation	☐
Burials	☐	Post office	☐
Specialized activity sites	☐	Reservoir/dam	☐
Rock alignments (tepee rings)	☐	Bridge	☐
Isolated animal remains	☐	Cattle camp/trail	☐
Kill site	☐	Boundary marker	☐
		Mission	☐
Other		Historic oil well/pipeline	☐
		Historic quarry	☐

9. Type of Midden Present: (check one)

Don't know	☐	Earth	☐	Rock	☐
Absent	☑	Shell	☐		

10. Description of Cultural Material (quantity and identify artifacts):

ST 147 (0-20cm) - 2 Light Grey Chert Lithic Debris
ST 150 (0-20cm) - 3 Grey Chert Lithic Debis
ST 151 (0-20cm) - 1 Grey Chert Lithic Debris

6 **# Artifacts** None **# Artifacts Collected**

Name and address of owner of other collections from site:

None Known

11. Artifact Repository:

Non-Collection USACE 404 survey

12. Evidence of Recent Vandalism Observed? (yes or no) no

13. Site Condition: (check one):

1. disturbed	☐	5. 76-99% disturbed	☐
2. <25 disturbed	☑	6. destroyed	☐
3. 26-50 disturbed	☐	7. disturbed, % unknown	☐
4. 51-75 disturbed	☐		

14. Current Land Use: (check all that apply)

Cultivated field	☐	Modern Cemetery	☐	Residential	☐
Pasture	☑	Mining	☐	Military	☐
Woods, forest	☐	Inundated	☐	Logging/fire break	☐
Scrub/secondary growth	☐	Industrial	☐	Landfill	☐
Road/trail	☐	Recreation	☐	Oil field	☐
Ditch/dike/borrow pit	☐	Commercial	☐	Modern dump	☐
				Other	

15. Ground Surface Visibility:

1. < -25%	☑	3. 26-50%	☐	5. 76-90%	☐
2. 11-25%	☐	4. 51-75%	☐	6. 91-100%	☐

Survey Conditions: (wet, dry, windy, sunny, overcast)

Hot, Sunny, Summer Day

16. Physiographic Division: (check one)

1. High Plains	☐	6. Sandstone Hills	☐
2. Gypsum Hills	☐	7. Prairie Plains	☑
3. Wichita Mountains	☐	8. Ozark Plateau	☐
4. Red Bed Plains	☐	9. Ouachita Mountains	☐
5. Arbuckle Mountains	☐	10. Red River Plains	☐

17. Landform Type: (check one)

1. Floodplain	☐
2. Terrace	☐
3. Hillside -Valley wall	☑
4. Dissected uplands	☐
5. Undissected uplands	☐
6. Other landform	Small Toeslope

18. Locality Type: (check one)**:**

1. Level	☐	6. Slope	☑
2. Knoll - low land	☐	7. Bluff crest	☐
3. Blowout	☐	8. Bluff base	☐
4. Ridge - upland	☐	9. Other locality	Small Toeslope
5. Mesa	☐		

19. Soils: Order/Great Group**:** Mollisols/Argiudolls

Series: Dennis Silt Loam

Parent Material:

20. Elevation/Slope/View Shed:

Elevation amsl: 600

Slope (degrees):

Slope Facing Direction: West

View Degree:

View Distance:

21. Natural Vegetation: (check one)

1. Short grasses	☐	6. Mesquite	☐
2. Tall grasses	☑	7. Juniper-pinion	☐
3. Mixed grasses	☑	8. Oak-hickory forest	☐
4. Cross Timber	☐	9. Oak-pine	☐
5. Shin-Oak	☐	10. Loblolly pine forest	☐

22. Site Area:

Square meters: 1,500 m

Basis for area estimate:

1. Taped ☐ 2. Paced ☑ 3. Visual Estimate ☐ 4. GIS ☑

5. Other (explain)

23. Description of Site:

Give physical description of the site and its setting, including dimensions, features, nature of materials and artifact concentrations. Include **color photos** of the site that reflect its current condition and a copy of a **USGS 1:24,000 topographic map** with site location and boundaries marked. Include a smaller inset map at a larger scale if necessary to more legibly display the site's boundaries. Include a sketch map if appropriate of any subsurface probing/testing that was conducted. The use of a GIS-based or similar computerized mapping is preferred. Non-professional archaeologists who do not have access to computer-based mapping software may contact OAS for assistance.

The Old Field site is a prehistoric site with lithic debris recovered during shovel testing. The site is located on the northern edge of a portion of a small toeslope landform at about 600 feet amsl. The landform slopes gradually to the west to a small stream, a tributary of Elk Creek. The site is in an overgrown pasture with a the small stream along the western edge. The surface visibility is less than 10 percent across the site area. The soil is Dennis silt loam with a shallow clay B-horizon.

The site area covers an area of ca. 1,500 square meters (0.37 acres), 50 m north-south and 30 m east-west, as demarcated by 3 positive shovel tests. The project boundary is immediately to the east, and the site may extend more to the east. The artifacts were recovered from (0-20 cm bs), and the tests contained lithic debris. The lithic artifacts from the site are pieces of lithic debris (n=6) from the manufacture and/or maintenance of chipped stone tools. All of the lithic debris are from light to dark grey colored cherts, probably from obtainable outcrops throughout the Ozark uplift and along the Arkansas River.

24. Description of Subsurface Testing:

A total of 9 shovel tests were placed in the area of the Old Field site on the portion of the landform within the project area. Three of the tests contained cultural materials. The shovel tests were excavated in Dennis silt loam to debts up to 40 cm bs to a clay B horizon. The tests were placed along the landform in 20 meter or less intervals covering the entire portion of the small toeslope within the project area.

25. Drainage: (check one)

1. Arkansas	☐	10. Muddy Boggy	☐
2. Beaver - N. Canadian	☐	11. Neosho	☐
3. Canadian	☑	12. North Fork Red	☐
4. Caney	☐	13. Poteau	☐
5. Cimarron	☐	14. Red	☐
6. Deep Fork	☐	15. Salt Fork Arkansas	☐
7. Illinois	☐	16. Salt Fork Red	☐
8. Kiamichi	☐	17. Verdigris	☐
9. Little R. (McCurtain County)	☐	18. Washita	☐

26. Nearest Natural Source of Water: (check one)

1. Permanent stream/creek	☐	6. River	☐
2. Intermittent stream	☑	7. Slough oxbow lake	☐
3. Permanent spring	☐	8. Relic stream channel	☐
4. Intermittent spring/seep/bog/marsh	☐	9. Water well (historic sites)	☐
5. Natural lake	☐		

27. Distance to Water (meters):

Distance to Permanent: ca. 800

Distance to Seasonal: 10

28. Investigation Type: (check one)

1. Reconnaissance (survey) ☐
2. Intensive (survey & testing) ☑
3. Excavation ☐
4. Volunteered report ☐

29. Statement of Site Integrity:

The Old Field site is an unknown prehistoric archaeological deposit that covers only ca. 1,500 square meters in the proposed project area and has sparse archaeological materials in three shovel tests that extend only from 0-20 cm bs. There are no preserved cultural features associated with the deposits, nor any significant concentrations of artifacts or a diverse range of artifacts. Accordingly, the Old Field site has a low research potential and cannot contribute to research questions such as the range of artifacts used at the site in the context of everyday life or the use of space and landscapes. Essentially, the archaeological record at the site in the proposed project area is not sufficiently robust or discrete enough to fully comprehend the character of the site in McIntosh County, Oklahoma.

30. Statement of Site Significance:

It is our determination that the Old Field site is not National Register of Historic Places eligible. It is our recommendation that the proposed project will not have an effect on any sites eligible for inclusion in the National Register of Historic Places.

Significance Status: (check one)

National Register Property	☐
Eligible for National Register	☐
Nominated to National Register by SHPO	☐
Considered eligible but not nominated by SHPO	☐
Inventory site	☑
National Register status not assessed	☐

31. Forthcoming Report on the Site:

Title: An Archaeological Survey of the Honey Creek Mitigation Bank in McIntosh County, Oklahoma

Author(s): Bo Nelson and Timothy K. Perttula

OKLAHOMA ARCHEOLOGICAL SITE SURVEY FORM

Field Code WT #3

SITS# 34 MI408

1. Site Name Old Field Tract Barn

County McIntosh

2. Site Location

Zone: 15S **UTM** 3935215 **N** **UTM** 267355 **E**

Legal Description

SW	QQQ	NW	QQ	NE	Q	Section	12	Township	12N	Range	16E
	QQQ		QQ		Q	Section		Township		Range	
	QQQ		QQ		Q	Section		Township		Range	

Quad Name (s): Wainwright 7.5 (1970)

Quad Date (revised):

Other Locational References (i.e., benchmarks, road intersections, bridges, etc., please give distance and bearing to site):

The site is located from the intersection of Section Roads N 4180 and E 1020 travel East approximately 0.5 mile down E 1020, the site is 350 meters south from this point in the road in the property corner.

3. Owner(s) of Property

Name: Jack Dunnavant (Green Country Wetland Mitigation, LLC.)

Street and Number: P.O. Box 132

City/Town, State: Carthage, Texas

Zip: 75633

4. Site Surveyed by:

Recorded by: Bo Nelson

Date Recorded (mm/dd/year): 01/03/20

Person-Hours Spent at Site: 2.0

5. Cultural Affiliation - Cultural Periods: (check all that apply)

Unassigned prehistoric ☐

Paleoindian:
- Early ☐
- Middle ☐
- Late ☐

Archaic:
- Early ☐
- Middle ☐
- Late ☐

Woodland:
- Eastern – maybe eastern? ☐
- Plains ☐

Village Farming/Mississippi ☐

Plains Village ☐

Protohistoric/Historic Ind. ☐

Historic non-Indian ☑

Archaeological Cultures, Phases, etc., represented:

1970s Hay Barn

How was cultural affiliation determined (diagnostic artifacts, radiocarbon dates, etc):

Topographical map and construction materials

6. Historic Phase Identification (Ethnic): (Check appropriate group)

1. Choctaw ☐	9. Kiowa-Apache ☐	17. Cheyenne ☐	25. Missouri-Otos ☐
2. Cherokee ☐	10. Kickapoo ☐	18. Caddo ☐	26. Iowa ☐
3. Saux-Fox ☐	11. Pawnee ☐	19. Shawnee ☐	27. Anglo-American ☑
4. Pottawatomie ☐	12. Arapaho ☐	20. Delaware ☐	28. French ☐
5. Seminole ☐	13. Ottawas ☐	21. Creek ☐	29. Spanish ☐
6. Comanche ☐	14. Wichita ☐	22. Dakotas ☐	30. Other ☐
7. Apache ☐	15. Quapaw ☐	23. Chickasaw ☐	
8. Kiowa ☐	16. Osage ☐	24. 12 & 17 ☐	

How was historic identification determined?:

Structural remains

7. Historic Site Range (check one)**:**

0. Missing data; unknown	☐	5. 1890-1929	☐
1. pre-1800	☐	6. 1930-1950	☐
2. 1800-1830	☐	7. 1800-1900	☐
3. 1830-1859	☐	8. 1800 - present	☐
4. 1860-1889	☐	9. 1900 - present	☑

8. Inferred Site Type: (check all that apply)

Prehistoric Categories		*Historic Categories*	
Open habitation w/o mounds	☐	Historic farmstead/homestead	☐
Open habitation with mounds	☐	Historic mill/industrial	☑
Earth mound (not midden mound)	☐	Historic fort or other military	☐
Mound complex	☐	Dugout	☐
Stone mounds/rock piles Burned	☐	Historic trash dump	☐
Rock concentrations Non-mound	☐	School house	☐
Earthworks	☐	Trading post	☐
Rock shelter	☐	Historic town/settlement	☐
Cave	☐	Historic irrigation/land modification	☐
Quarry	☐	Church	☐
Workshop	☐	Historic Cemetery	☐
Petroglyph/pictograph	☐	Transportation	☐
Burials	☐	Post office	☐
Specialized activity sites	☐	Reservoir/dam	☐
Rock alignments (tepee rings)	☐	Bridge	☐
Isolated animal remains	☐	Cattle camp/trail	☐
Kill site	☐	Boundary marker	☐
		Mission	☐
Other		Historic oil well/pipeline	☐
		Historic quarry	☐

9. Type of Midden Present: (check one)

Don't know	☐	Earth	☐	Rock	☐
Absent	☑	Shell	☐		

10. Description of Cultural Material (quantity and identify artifacts):

Metal Sheeting (Tin), 2x4 and 2x6 lumber, and 6 -inch poles are scattered over a ca. 2-acre area around where a hay barn structure one stood.

0 **# Artifacts** None **# Artifacts Collected**

Name and address of owner of other collections from site:

None Known

11. Artifact Repository:

Non-Collection USACE 404 survey

12. Evidence of Recent Vandalism Observed? (yes or no) no

13. Site Condition: (check one):

1. disturbed	☐	5. 76-99% disturbed	☑
2. <25 disturbed	☐	6. destroyed	☐
3. 26-50 disturbed	☐	7. disturbed, % unknown	☐
4. 51-75 disturbed	☐		

14. Current Land Use: (check all that apply)

Cultivated field	☐	Modern Cemetery	☐	Residential	☐
Pasture	☑	Mining	☐	Military	☐
Woods, forest	☐	Inundated	☐	Logging/fire break	☐
Scrub/secondary growth	☐	Industrial	☐	Landfill	☐
Road/trail	☐	Recreation	☐	Oil field	☐
Ditch/dike/borrow pit	☐	Commercial	☐	Modern dump	☐
				Other	

15. Ground Surface Visibility:

1. < -25%	☑	3. 26-50%	☐	5. 76-90%	☐
2. 11-25%	☐	4. 51-75%	☐	6. 91-100%	☐

Survey Conditions: (wet, dry, windy, sunny, overcast)

Hot, Sunny, Summer Day (Observed in August 2019)

16. Physiographic Division: (check one)

1. High Plains	☐	6. Sandstone Hills	☐
2. Gypsum Hills	☐	7. Prairie Plains	☑
3. Wichita Mountains	☐	8. Ozark Plateau	☐
4. Red Bed Plains	☐	9. Ouachita Mountains	☐
5. Arbuckle Mountains	☐	10. Red River Plains	☐

17. Landform Type: (check one)

1. Floodplain	☐
2. Terrace	☐
3. Hillside -Valley wall	☑
4. Dissected uplands	☐
5. Undissected uplands	☐
6. Other landform	Small Toeslope

18. Locality Type: (check one)**:**

1. Level	☐	6. Slope	☑
2. Knoll - low land	☐	7. Bluff crest	☐
3. Blowout	☐	8. Bluff base	☐
4. Ridge - upland	☐	9. Other locality	Small Toeslope
5. Mesa	☐		

19. Soils: Order/Great Group**:** Mollisols/Argiudolls

Series: Dennis Silt Loam

Parent Material:

20. Elevation/Slope/View Shed:

Elevation amsl: 610

Slope (degrees):

Slope Facing Direction: West

View Degree:

View Distance:

21. Natural Vegetation: (check one)

1. Short grasses	☐	6. Mesquite	☐
2. Tall grasses	☑	7. Juniper-pinion	☐
3. Mixed grasses	☑	8. Oak-hickory forest	☐
4. Cross Timber	☐	9. Oak-pine	☐
5. Shin-Oak	☐	10. Loblolly pine forest	☐

22. Site Area:

Square meters: 112 m

Basis for area estimate:

1. Taped ☐ 2. Paced ☑ 3. Visual Estimate ☐ 4. GIS ☑

5. Other (explain) Structure size on the Topo map

23. Description of Site:

Give physical description of the site and its setting, including dimensions, features, nature of materials and artifact concentrations. Include **color photos** of the site that reflect its current condition and a copy of a **USGS 1:24,000 topographic map** with site location and boundaries marked. Include a smaller inset map at a larger scale if necessary to more legibly display the site's boundaries. Include a sketch map if appropriate of any subsurface probing/testing that was conducted. The use of a GIS-based or similar computerized mapping is preferred. Non-professional archaeologists who do not have access to computer-based mapping software may contact OAS for assistance.

The Old Field Tract Barn site is a destroyed/collapsed that is between 45 to 50 years of age historic barn site. The site is located on the northern edge of a portion of a small toeslope landform at about 610 feet amsl. The landform slopes gradually to the west to a small stream, a tributary of Elk Creek. The site is in an overgrown pasture with a the small stream along the western edge. The surface visibility is less than 10 percent across the site area. The soil is Dennis silt loam with a shallow clay B-horizon.

The site area covers an area of ca. 112 square meters, 18.3 m north-south and 6.1 m east-west, as demarcated by the wooden poles at barn corners. The site is located in the southeast corner of the Old Field Tract mitigation property is a collapsed pole barn with pieces of corrugated metal or tin sheeting scattered across about 2 acres around the barn location. The collapsed barn has 6-inch diameter poles still standing or partially standing that form a 60 x 20 ft. structure base with a dirt floor. The framework is 2 x 6-inch boards for support nailed to the poles, and 1 x 6-inch boards nailed to the 2 x 6s to attach the tin to the barn. The barn appears to have been destroyed by high winds with all of the tin being well scattered. No cultural materials were recovered in shovel testing around the barn

24. Description of Subsurface Testing:

A total of 7 shovel tests were placed in the area around the Old Field Tract Barn site on the portion of the landform within the project area. None of the tests contained cultural materials. The shovel tests were excavated in Dennis silt loam to debts up to 40 cm bs to a clay B horizon. The tests were placed along the landform in 20 meter or less intervals covering the entire portion of the small toeslope within the project area.

25. Drainage: (check one)

1. Arkansas	☐	10. Muddy Boggy	☐
2. Beaver - N. Canadian	☐	11. Neosho	☐
3. Canadian	☑	12. North Fork Red	☐
4. Caney	☐	13. Poteau	☐
5. Cimarron	☐	14. Red	☐
6. Deep Fork	☐	15. Salt Fork Arkansas	☐
7. Illinois	☐	16. Salt Fork Red	☐
8. Kiamichi	☐	17. Verdigris	☐
9. Little R. (McCurtain County)	☐	18. Washita	☐

26. Nearest Natural Source of Water: (check one)

1. Permanent stream/creek	☐	6. River	☐
2. Intermittent stream	☑	7. Slough oxbow lake	☐
3. Permanent spring	☐	8. Relic stream channel	☐
4. Intermittent spring/seep/bog/marsh	☐	9. Water well (historic sites)	☐
5. Natural lake	☐		

27. Distance to Water (meters):

Distance to Permanent: ca. 800

Distance to Seasonal: 50

28. Investigation Type: (check one)

1. Reconnaissance (survey) ☐
2. Intensive (survey & testing) ☑
3. Excavation ☐
4. Volunteered report ☐

29. Statement of Site Integrity:

The Old Field Tract Barn site is historic barn between 45 to 50 years of age that covers only ca. 112 square meters in the proposed project area and has been destroyed/collapsed by seasonal elements . The barn has a few wooded poles still intact, but the lumber supports and tin covering is scattered around the barn location. Accordingly, the Old Field Tract Barn site has a low research potential. Essentially, the archaeological record at the site in the proposed project area is not sufficiently robust or discrete enough to fully comprehend the character of the site in McIntosh County, Oklahoma.

30. Statement of Site Significance:

It is our determination that the Old Field site is not National Register of Historic Places eligible. It is our recommendation that the proposed project will not have an effect on any sites eligible for inclusion in the National Register of Historic Places.

Significance Status: (check one)

National Register Property	☐
Eligible for National Register	☐
Nominated to National Register by SHPO	☐
Considered eligible but not nominated by SHPO	☐
Inventory site	☑
National Register status not assessed	☐

31. Forthcoming Report on the Site:

Title: An Archaeological Survey of the Honey Creek Mitigation Bank in McIntosh County, Oklahoma

Author(s): Bo Nelson and Timothy K. Perttula

OKLAHOMA ARCHEOLOGICAL SITE SURVEY FORM

Field Code ET #1

SITS# 34 MI406

1. Site Name Elk Creek

County McIntosh

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2. Site Location

Zone: 15S **UTM** 3934450 **N** **UTM** 272490 **E**

Legal Description

SE	QQQ	NW	QQ	SE	Q	Section	9	Township	12N	Range	17E
	QQQ		QQ		Q	Section		Township		Range	
	QQQ		QQ		Q	Section		Township		Range	

Quad Name (s): Wainwright 7.5 (1970)

Quad Date (revised):

Other Locational References (i.e., benchmarks, road intersections, bridges, etc., please give distance and bearing to site):

From the US Hwy 69 overpass and E 1030 Road about 0.5 mile east from Rentiesville, the site is located approximately 20 degrees at 600 meters from the overpass.

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3. Owner(s) of Property

Name: Jack Dunnavant (Green Country Wetland Mitigation, LLC.)

Street and Number: P.O. Box 132

City/Town, State: Carthage, Texas

Zip: 75633

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4. Site Surveyed by:

Recorded by: Bo Nelson

Date Recorded (mm/dd/year): 08/18/19

Person-Hours Spent at Site: 8.0

5. Cultural Affiliation - Cultural Periods: (check all that apply)

Unassigned prehistoric ☑

Paleoindian:

- Early ☐
- Middle ☐
- Late ☐

Archaic:

- Early ☐
- Middle ☐
- Late ☐

Woodland:

- Eastern – maybe eastern? ☐
- Plains ☐

Village Farming/Mississippi ☐

Plains Village ☐

Protohistoric/Historic Ind. ☐

Historic non-Indian ☐

Archaeological Cultures, Phases, etc., represented:

Unknown Prehistoric

How was cultural affiliation determined (diagnostic artifacts, radiocarbon dates, etc):

Only Lithic Debris recovered in Shovel Tests

6. Historic Phase Identification (Ethnic): (Check appropriate group)

1. Choctaw ☐	9. Kiowa-Apache ☐	17. Cheyenne ☐	25. Missouri-Otos ☐
2. Cherokee ☐	10. Kickapoo ☐	18. Caddo ☐	26. Iowa ☐
3. Saux-Fox ☐	11. Pawnee ☐	19. Shawnee ☐	27. Anglo-American ☐
4. Pottawatomie ☐	12. Arapaho ☐	20. Delaware ☐	28. French ☐
5. Seminole ☐	13. Ottawas ☐	21. Creek ☐	29. Spanish ☐
6. Comanche ☐	14. Wichita ☐	22. Dakotas ☐	30. Other ☐
7. Apache ☐	15. Quapaw ☐	23. Chickasaw ☐	
8. Kiowa ☐	16. Osage ☐	24. 12 & 17 ☐	

How was historic identification determined?:

7. Historic Site Range (check one)**:**

0. Missing data; unknown	☐	5. 1890-1929	☐
1. pre-1800	☐	6. 1930-1950	☐
2. 1800-1830	☐	7. 1800-1900	☐
3. 1830-1859	☐	8. 1800 - present	☐
4. 1860-1889	☐	9. 1900 - present	☐

8. Inferred Site Type: (check all that apply)

Prehistoric Categories		***Historic Categories***	
Open habitation w/o mounds	☑	Historic farmstead/homestead	☐
Open habitation with mounds	☐	Historic mill/industrial	☐
Earth mound (not midden mound)	☐	Historic fort or other military	☐
Mound complex	☐	Dugout	☐
Stone mounds/rock piles Burned	☐	Historic trash dump	☐
Rock concentrations Non-mound	☐	School house	☐
Earthworks	☐	Trading post	☐
Rock shelter	☐	Historic town/settlement	☐
Cave	☐	Historic irrigation/land modification	☐
Quarry	☐	Church	☐
Workshop	☐	Historic Cemetery	☐
Petroglyph/pictograph	☐	Transportation	☐
Burials	☐	Post office	☐
Specialized activity sites	☐	Reservoir/dam	☐
Rock alignments (tepee rings)	☐	Bridge	☐
Isolated animal remains	☐	Cattle camp/trail	☐
Kill site	☐	Boundary marker	☐
		Mission	☐
Other		Historic oil well/pipeline	☐
		Historic quarry	☐

9. Type of Midden Present: (check one)

Don't know	☐	Earth	☐	Rock	☐
Absent	☑	Shell	☐		

10. Description of Cultural Material (quantity and identify artifacts):

ST 43 (0-20cm) - 1 Grey Chert Lithic Debris
ST 49 (20-33cm) - 3 Grey Chert Lithic Debis
ST 50 (0-20cm) - 2 light Grey Chert Lithic Debris
ST 51 (0-20cm) - 2 Grey Chert Lithic Debris
ST 53 (0-20cm) - 1 Brown Chert Lithic Debris

9 **# Artifacts** None **# Artifacts Collected**

Name and address of owner of other collections from site:

None Known

11. Artifact Repository:

Non-Collection USACE 404 survey

12. Evidence of Recent Vandalism Observed? (yes or no) no

13. Site Condition: (check one):

1. disturbed	☐	5. 76-99% disturbed	☐
2. <25 disturbed	☑	6. destroyed	☐
3. 26-50 disturbed	☐	7. disturbed, % unknown	☐
4. 51-75 disturbed	☐		

14. Current Land Use: (check all that apply)

Cultivated field	☐	Modern Cemetery	☐	Residential	☐
Pasture	☑	Mining	☐	Military	☐
Woods, forest	☐	Inundated	☐	Logging/fire break	☐
Scrub/secondary growth	☐	Industrial	☐	Landfill	☐
Road/trail	☑	Recreation	☐	Oil field	☐
Ditch/dike/borrow pit	☐	Commercial	☐	Modern dump	☐
				Other	

15. Ground Surface Visibility:

1. < -25% ☑	3. 26-50% ☐	5. 76-90% ☐
2. 11-25% ☐	4. 51-75% ☐	6. 91-100% ☐

Survey Conditions: (wet, dry, windy, sunny, overcast)

Hot, Sunny, Summer Day

16. Physiographic Division: (check one)

1. High Plains	☐	6. Sandstone Hills	☐
2. Gypsum Hills	☐	7. Prairie Plains	☑
3. Wichita Mountains	☐	8. Ozark Plateau	☐
4. Red Bed Plains	☐	9. Ouachita Mountains	☐
5. Arbuckle Mountains	☐	10. Red River Plains	☐

17. Landform Type: (check one)

1. Floodplain	☐
2. Terrace	☐
3. Hillside -Valley wall	☑
4. Dissected uplands	☐
5. Undissected uplands	☐
6. Other landform	Small Toeslope

18. Locality Type: (check one)**:**

1. Level	☐	6. Slope	☑
2. Knoll - low land	☐	7. Bluff crest	☐
3. Blowout	☐	8. Bluff base	☐
4. Ridge - upland	☐	9. Other locality	Small Toeslope
5. Mesa	☐		

19. Soils: Order/Great Group**:** Mollisols/Argiudolls

Series: Dennis Silt Loam

Parent Material:

20. Elevation/Slope/View Shed:

Elevation amsl: 560-570

Slope (degrees):

Slope Facing Direction: East

View Degree:

View Distance:

21. Natural Vegetation: (check one)

1. Short grasses	☐	6. Mesquite	☐
2. Tall grasses	☑	7. Juniper-pinion	☐
3. Mixed grasses	☑	8. Oak-hickory forest	☑
4. Cross Timber	☐	9. Oak-pine	☐
5. Shin-Oak	☐	10. Loblolly pine forest	☐

22. Site Area:

Square meters: 3,300 m

Basis for area estimate:

1. Taped ☐ 2. Paced ☑ 3. Visual Estimate ☐ 4. GIS ☑

5. Other (explain)

23. Description of Site:

Give physical description of the site and its setting, including dimensions, features, nature of materials and artifact concentrations. Include **color photos** of the site that reflect its current condition and a copy of a **USGS 1:24,000 topographic map** with site location and boundaries marked. Include a smaller inset map at a larger scale if necessary to more legibly display the site's boundaries. Include a sketch map if appropriate of any subsurface probing/testing that was conducted. The use of a GIS-based or similar computerized mapping is preferred. Non-professional archaeologists who do not have access to computer-based mapping software may contact OAS for assistance.

The Elk Creek site is a prehistoric site with lithic debris recovered during shovel testing. The site is located on the northeastern edge of a portion of a small toeslope landform at about 560-570 feet amsl. The landform slopes gradually to the east to a small stream, a tributary of Elk Creek. The site is in an overgrown pasture with a mixture of small to medium-sized hardwoods along the small stream. The surface visibility is less than 10 percent across the site area. The soil is Dennis silt loam with a shallow clay B-horizon.

The site area covers an area of ca. 3,300 square meters (0.82 acres), 30 m north-south and 110 m east-west, as demarcated by 5 positive shovel tests. The artifacts were recovered from (0-33 cm bs), and the tests contained lithic debris. The lithic artifacts from the site are pieces of lithic debris (n=9) from the manufacture and/or maintenance of chipped stone tools. All of the lithic debris are from light to dark grey colored cherts, probably from obtainable outcrops throughout the Ozark uplift and along the Arkansas River.

24. Description of Subsurface Testing:

A total of 25 shovel tests were placed in the area of the Elk Creek site with 5 tests containing cultural materials. The shovel tests were excavated in Dennis silt loam to debts up to 39 cm bs to a clay B horizon. The tests were placed along the landform in 20 meter or less intervals covering the entire portion of the small toeslope within the project area.

25. Drainage: (check one)

1. Arkansas	☐	10. Muddy Boggy	☐
2. Beaver - N. Canadian	☐	11. Neosho	☐
3. Canadian	☑	12. North Fork Red	☐
4. Caney	☐	13. Poteau	☐
5. Cimarron	☐	14. Red	☐
6. Deep Fork	☐	15. Salt Fork Arkansas	☐
7. Illinois	☐	16. Salt Fork Red	☐
8. Kiamichi	☐	17. Verdigris	☐
9. Little R. (McCurtain County)	☐	18. Washita	☐

26. Nearest Natural Source of Water: (check one)

1. Permanent stream/creek	☑	6. River	☐
2. Intermittent stream	☑	7. Slough oxbow lake	☐
3. Permanent spring	☐	8. Relic stream channel	☐
4. Intermittent spring/seep/bog/marsh	☐	9. Water well (historic sites)	☐
5. Natural lake	☐		

27. Distance to Water (meters):

Distance to Permanent: 180

Distance to Seasonal: 10

28. Investigation Type: (check one)

1. Reconnaissance (survey) ☐
2. Intensive (survey & testing) ☑
3. Excavation ☐
4. Volunteered report ☐

29. Statement of Site Integrity:

The Elk Creek site is an unknown prehistoric archaeological deposit that covers only ca. 3,300 square meters in the proposed project area and has sparse archaeological materials in five shovel tests that extend only from 0-33 cm bs. There are no preserved cultural features associated with the deposits, nor any significant concentrations of artifacts or a diverse range of artifacts. Accordingly, the Elk Creek site has a low research potential and cannot contribute to research questions such as the range of artifacts used at the site in the context of everyday life or the use of space and landscapes. Essentially, the archaeological record at the site in the proposed project area is not sufficiently robust or discrete enough to fully comprehend the character of the site in McIntosh County, Oklahoma.

30. Statement of Site Significance:

It is our determination that the Elk Creek site is not National Register of Historic Places eligible. It is our recommendation that the proposed project will not have an effect on any sites eligible for inclusion in the National Register of Historic Places.

Significance Status: (check one)

National Register Property	☐
Eligible for National Register	☐
Nominated to National Register by SHPO	☐
Considered eligible but not nominated by SHPO	☐
Inventory site	☑
National Register status not assessed	☐

31. Forthcoming Report on the Site:

Title: An Archaeological Survey of the Honey Creek Mitigation Bank in McIntosh County, Oklahoma

Author(s): Bo Nelson and Timothy K. Perttula

APPENDIX H

HSMB LEGAL DESCRIPTIONS & PLATS:

Project

HONEY SPRINGS MITIGATION BANK

Company

GREEN COUNTRY WETLANDS MITIGATION, LLC.
&
HOFFMAN ENVIRONMENTAL, INC.

LEGAL DESCIPTION

A tract of land lying in the Southeast Quarter (SE/4) of Section Nine (9), Township Twelve (12) North, Range Seventeen (17) East of the Indian Meridian, McIntosh County, Oklahoma and further described as follows:

Beginning at the Southeast Corner of said SE/4; thence N 01°25'56" W along the East Line of said SE/4 for a distance of 24.75 feet to the North Right-of-Way line of the South line of said SE/4; thence S 88°03'16" W along said Right-of-Way line for a distance of 24.75 to the Point of Beginning said point also lies of the West Right-of-Way line of the East line of said SE/4; thence S 88°03'16 W along said Right-of-Way line for a distance of 509.70 feet; thence N 02°08'42" W for a distance of 25.07 feet; thence N 84°06'22" W for a distance of 959.54 feet; thence S 87°48'22" W for a distance of 639.51 feet to the East Right-of-Way of U.S. Highway No. 69 thence in a Northeasterly direction on a nontangent curve to the right having a Radius of 17,023.71 feet, with an arc bearing and distance of N 11°08'23" E, 1584.14 feet and having an arc distance of 1584.71 feet; thence N 22°55'47" E along said East Right-of-Way line for a distance of 300.12 feet; thence in a Northeasterly direction on a nontangent curve to the right having a Radius of 16,978.71 feet, with a chord bearing and distance of N 15°57'12" E, 679.60 feet and having an arc distance of 679.64 feet to the North line of the SE/4; thence N 87°53'02" E along said North line for a distance of 1429.58 feet to the West Right-of-Way line of the East line of the SE/4; thence S 01°25'56" E along said Right-of-Way line for a distance of 857.28 feet to the centerline of the ancient Elk Creek; thence N 60°15'57 W along said centerline for a distance of 2.25 feet; thence N 64°12'56" W along said centerline for a distance of 64.40 feet; thence S 86°54'32" W along said centerline for a distance of 35.80 feet; thence S 58°41'08" W along said centerline for a distance of 26.02 feet; thence S 43°22'26" W along said centerline for a distance of 47.84 feet; thence S 37°39'39" W along said centerline for a distance of 42.71 feet; thence S 25°41'18" W along said centerline for a distance of 55.74 feet; thence S 18°26'31" W along said centerline for a distance of 61.09 feet; thence S 15°44'18" W along said centerline for a distance of 71.25 feet; thence S 48°22'46" W along said centerline for a distance of 34.90 feet; thence S 78°18'48" W along said centerline for a distance of 28.62 feet; thence N 81°06'05" W along said centerline for a distance of 81.18 feet; thence N 68°58'18" W along said centerline for a distance of 40.38 feet; thence N 88°15'50" W along said centerline for a distance of 63.81 feet; thence N 87°35'30" W along said centerline for a distance of 91.89 feet; thence S 83°39'49" W along said centerline for a distance of 52.50 feet; thence S 76°56'09" W along said centerline for a distance of 55.56 feet; thence S 67°01'15" W along said centerline for a distance of 69.28 feet; thence S 58°54'11" W along said centerline for a distance of 65.46 feet; thence S 55°08'14" W along said centerline for a distance of 38.87 feet; thence S 26°34'25" W along said centerline for a distance of 21.60 feet; thence S 03°00'19" W along said centerline for a distance of 97.05 feet; thence S 09°09'59" W along said centerline for a distance of 94.23 feet; thence S 13°38'00" W along said centerline for a distance of 101.90 feet; thence S 29°22'03" W along said centerline for a distance of 55.09 feet; thence S 61°56'23" W along said centerline for a distance of 51.03 feet; thence S 82°52'41" W along said centerline for a distance of 48.41 feet; thence S 56°19'09" W along said centerline for a distance of 32.47 feet; thence S 35°19'22" W along said centerline for a distance of 88.27 feet; thence S 14°56'28" W along said centerline for a distance of 46.59 feet; thence S 23°12'26" E along said centerline for a distance of 91.42 feet; thence S 34°23'35" E along said centerline for a distance of 69.09 feet; thence S 67°31'47" E along said centerline for a distance of 94.21 feet; thence S 74°39'56" E along said centerline for a distance of 89.85 feet; thence S 79°24'12" E along said centerline for a distance of 120.92 feet; thence S 74°11'18" E along said centerline for a distance of 153.34 feet; thence N 63°56'36" E along said centerline for a distance of 69.93 feet; thence N 44°23'17" E along said centerline for a distance of 149.16 feet; thence N 73°03'56" E along said centerline for a distance of 40.61 feet; thence S 89°25'42" E along said centerline for a distance of 48.21 feet; thence S 76°45'49" E along said centerline for a distance of 81.58 feet; thence S 64°13'54" E along said centerline for a distance of 104.40 feet; thence S 54°15'24" E along said centerline for a distance of 94.10 feet; thence S 35°43'29" E along said centerline for a distance of 172.89 feet to the West Right-of-Way line of the East line of the SE/4; thence S 01°25'56" E along said Right-of-Way line for a distance of 535.87 feet to the Point of Beginning, containing 86.6448 acres more or less.

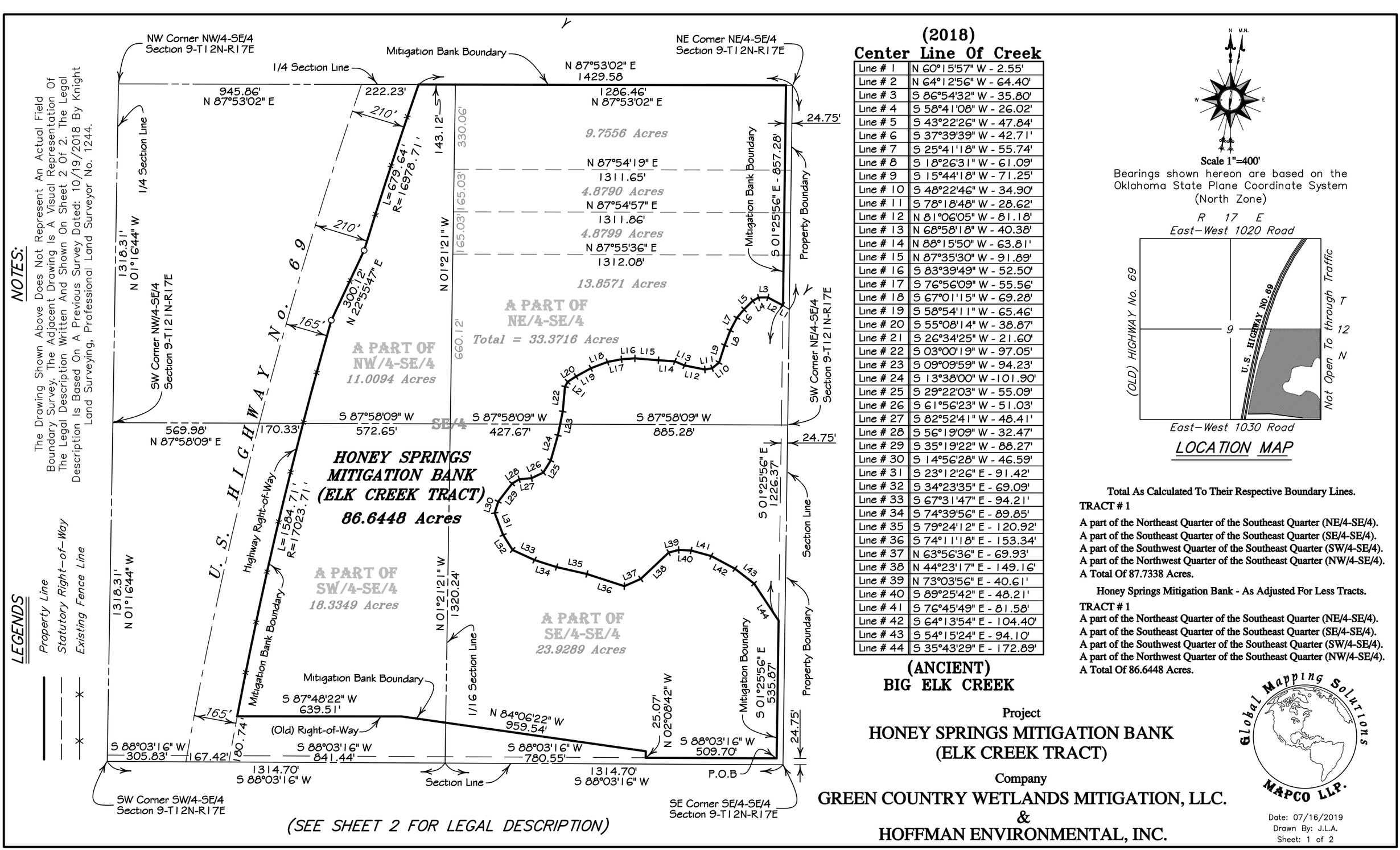
GREEN COUNTRY WETLANDS MITIGATION LLC.
&
HOFFMAN ENVIRONMENTAL INC.

HONEY SPRINGS MITIGATION BANK
(OLD FIELD TRACT)

SITE LOCATION
A Part Of The SE/4-SE/4 AND SW/4-SE/4 AND
NW/4-SE/4 AND NE/4-SE/4 OF SECTION
9-T12N-R16E I.M.
MCINTOSH COUNTY, OKLAHOMA

Global Mapping Solutions
MAPCO LLP.

Date: 07/16/2019
Drawn By: J.L.A.
Sheet: 1 of 2



(SEE SHEET 2 FOR LEGAL DESCRIPTION)

NOTES:

The Drawing Shown Above Does Not Represent An Actual Field Boundary Survey. The Adjacent Drawing Is A Visual Representation Of The Legal Description Written And Shown On Sheet 2 Of 2. The Legal Description Is Based On A Previous Survey Dated: 10/19/2018 By Knight Land Surveying, Professional Land Surveyor No. 1244.

LEGENDS

- Property Line
- Statutory Right-of-Way
- Existing Fence Line

(2018) Center Line Of Creek

Line # 1	N 60°15'57" W - 2.55'
Line # 2	N 64°12'56" W - 64.40'
Line # 3	S 86°54'32" W - 35.80'
Line # 4	S 58°41'08" W - 26.02'
Line # 5	S 43°22'26" W - 47.84'
Line # 6	S 37°39'39" W - 42.71'
Line # 7	S 25°41'18" W - 55.74'
Line # 8	S 18°26'31" W - 61.09'
Line # 9	S 15°44'18" W - 71.25'
Line # 10	S 48°22'46" W - 34.90'
Line # 11	S 78°18'48" W - 28.62'
Line # 12	N 81°06'05" W - 81.18'
Line # 13	N 68°58'18" W - 40.38'
Line # 14	N 88°15'50" W - 63.81'
Line # 15	N 87°35'30" W - 91.89'
Line # 16	S 83°39'49" W - 52.50'
Line # 17	S 76°56'09" W - 55.56'
Line # 18	S 67°01'15" W - 69.28'
Line # 19	S 58°54'11" W - 65.46'
Line # 20	S 55°08'14" W - 38.87'
Line # 21	S 26°34'25" W - 21.60'
Line # 22	S 03°00'19" W - 97.05'
Line # 23	S 09°09'59" W - 94.23'
Line # 24	S 13°38'00" W - 101.90'
Line # 25	S 29°22'03" W - 55.09'
Line # 26	S 61°56'23" W - 51.03'
Line # 27	S 82°52'41" W - 48.41'
Line # 28	S 56°19'09" W - 32.47'
Line # 29	S 35°19'22" W - 88.27'
Line # 30	S 14°56'28" W - 46.59'
Line # 31	S 23°12'26" E - 91.42'
Line # 32	S 34°23'35" E - 69.09'
Line # 33	S 67°31'47" E - 94.21'
Line # 34	S 74°39'56" E - 89.85'
Line # 35	S 79°24'12" E - 120.92'
Line # 36	S 74°11'18" E - 153.34'
Line # 37	N 63°56'36" E - 69.93'
Line # 38	N 44°23'17" E - 149.16'
Line # 39	N 73°03'56" E - 40.61'
Line # 40	S 89°25'42" E - 48.21'
Line # 41	S 76°45'49" E - 81.58'
Line # 42	S 64°13'54" E - 104.40'
Line # 43	S 54°15'24" E - 94.10'
Line # 44	S 35°43'29" E - 172.89'

(ANCIENT) BIG ELK CREEK

Scale 1"=400'

Bearings shown hereon are based on the Oklahoma State Plane Coordinate System (North Zone)

LOCATION MAP

Total As Calculated To Their Respective Boundary Lines.

TRACT # 1

A part of the Northeast Quarter of the Southeast Quarter (NE/4-SE/4).
A part of the Southeast Quarter of the Southeast Quarter (SE/4-SE/4).
A part of the Southwest Quarter of the Southeast Quarter (SW/4-SE/4).
A part of the Northwest Quarter of the Southeast Quarter (NW/4-SE/4).
A Total Of 87.7338 Acres.

Honey Springs Mitigation Bank - As Adjusted For Less Tracts.

TRACT # 1

A part of the Northeast Quarter of the Southeast Quarter (NE/4-SE/4).
A part of the Southeast Quarter of the Southeast Quarter (SE/4-SE/4).
A part of the Southwest Quarter of the Southeast Quarter (SW/4-SE/4).
A part of the Northwest Quarter of the Southeast Quarter (NW/4-SE/4).
A Total Of 86.6448 Acres.

Project

HONEY SPRINGS MITIGATION BANK (ELK CREEK TRACT)

Company

GREEN COUNTRY WETLANDS MITIGATION, LLC. & HOFFMAN ENVIRONMENTAL, INC.

Global Mapping Solutions
MAPCO LLP.

Date: 07/16/2019
Drawn By: J.L.A.
Sheet: 1 of 2

Project

HONEY SPRINGS MITIGATION BANK

Company

GREEN COUNTRY WETLANDS MITIGATION, LLC.

&

HOFFMAN ENVIRONMENTAL, INC.

LEGAL DESCRIPTION

TRACT # 1

A tract of land lying in the North–Half of the Northwest Quarter (N/2–NW/4) of Section Twelve (12), Township Twelve (12) North, Range Sixteen (16) East of the Indian Meridian, Mcintosh County, Oklahoma and further described as Commencing at the Northwest Corner of said N/2–NW/4; thence S 00°07'11" E along the West line of said N/2–NW/4 for a distance of 24.75 feet to the South Right–of–Way line of the North line of the N/2–NW/4; thence N 89°57'45" E along said South Right–of–Way line for a distance of 24.75 feet to the Point of Beginning, said point also lying on the East Right–of–Way line of the West line of the N/2–NW/4; thence N 89°57'45" E along said South Right–of–Way line for a distance of 2595.87 feet to the East line of said N/2–NW/4; thence S 00°08'35" E along said East line for a distance of 1265.24 feet to a point lying 30.00 feet North of the South line of said N/2–NW/4; thence S 89°59'04" W and parallel to the South line of said N/2–NW/4 for a distance of 2596.39 feet to the East Right–of–Way line of the West line of said N/2–NW/4; thence N 00°07'11" W along said East Right–of–Way line for a distance of 1264.25 feet to the Point of Beginning, containing 75.38 acres more or less.

AND

TRACT # 2

A tract of land lying in the West–Half of the West–Half of the West–Half of the Northeast–Quarter (W/2–W/2–W/2–NE/4) of Section 12, Township 12 North, Range 16 East of the Indian Meridian, Mcintosh County, Oklahoma and further described as Commencing at the Northwest Corner of said W/2–W/2–W/2–NE/4; thence S 00°08'35" E along the West line of said W/2–W/2–W/2–NE/4 for a distance of 24.75 feet to the South Right–of–Way line of the North line of said W/2–W/2–W/2–NE/4; thence N 89°57'45" E along said South Right–of–Way line for a distance of 237.50 feet; thence S 09°50'06" W for a distance of 501.17 feet; thence S 09°40'09" W for a distance of 782.70 feet to a point lying 30.00 feet North of the South line of the North–Half of the Northeast Quarter (N/2–NE/4); thence S 89°59'04" W and parallel to said South line for a distance of 17.27 feet to the West line of said W/2–W/2–W/2–NE/4; thence N 00°08'35" W along said West line for a distance of 1265.24 feet to the Point of Beginning, containing 3.69 acres more or less.

GREEN COUNTRY WETLANDS MITIGATION LLC.

&

HOFFMAN ENVIRONMENTAL INC.

HONEY SPRINGS MITIGATION BANK
(OLD FIELD TRACT)

SITE LOCATION

A Part Of The N/2–NW/4 AND A PART OF THE W/2–W/2–W/2–NE/4 OF SECTION 12–T12N–R16E I.M. MCINTOSH COUNTY, OKLAHOMA

Global Mapping Solutions

MAPCO LLP.

Date: 07/09/2019
Drawn By: J.L.A.
Sheet: 1 of 2

Project

HONEY SPRINGS MITIGATION BANK

Company

GREEN COUNTRY WETLANDS MITIGATION, LLC.
&
HOFFMAN ENVIRONMENTAL, INC.

Scale 1"=300'
Bearings are Geodetic

Total As Calculated To Their Respective Boundary Lines.

TRACT # 1
North-Half of the Northwest Quarter (N/2-NW/4) - Total 79.39 Acres.

TRACT # 2
Meets and Bounds Description Lying In West-Half of the West-Half of the West-Half of the Northeast Quarter (W/2-W/2-W/2-NE/4) - Total 3.98 Acres

Honey Springs Mitigation Bank - As Adjusted For Less Tracts

TRACT # 1
North-Half of the Northwest Quarter (N/2-NW/4) - Total 75.38 Acres.

TRACT # 2
Meets and Bounds Description Lying In West-Half of the West-Half of the West-Half of the Northeast Quarter (W/2-W/2-W/2-NE/4) - Total 3.69 Acres

TOTAL OF TRACTS No. 1 & No. 2 = 79.07 ACRES

NOTES:

The Drawing Shown Above Does Not Represent An Actual Field Boundary Survey. The Above Drawing Is A Visual Representation Of The Legal Description Written And Shown On Sheet 2 Of 2. The Legal Description Is Based On A Previous Survey Dated: 10/19/2018 By Knight Land Surveying, Professional Land Surveyor No. 1244.

LEGEND

- Property Line
- Statutory Right-of-Way
- Existing Petroleum Pipe Line

(SEE SHEET 2 FOR LEGAL DESCRIPTION)

GREEN COUNTRY WETLANDS MITIGATION LLC.
&
HOFFMAN ENVIRONMENTAL INC.

HONEY SPRINGS MITIGATION BANK
(OLD FIELD TRACT)

SITE LOCATION

A Part Of The N/2-NW/4 AND A PART OF THE W/2-W/2-W/2-NE/4 OF SECTION 12-T12N-R16E I.M. MCINTOSH COUNTY, OKLAHOMA

Global Mapping Solutions
MAPCO LLP.

Date: 07/09/2019
Drawn By: J.L.A.
Sheet: 1 of 2

APPENDIX I

HSMB Stream Enhancement and Stability Plan

Honey Springs Mitigation Bank
Stream Enhancement and Stability Plan

Russell C. Dutnell, Ph.D., P.E.; Riverman Engineering, P.L.C.

Introduction

This report presents a conceptual design developed to stabilize and enhance the ephemeral and intermittent stream channels and emergent wetland present on the Elk Creek Tract of the Honey Springs Mitigation Bank.

Site Description

The Elk Creek Tract, shown in Appendix A, has as its eastern border 3,117 feet of the Old Elk Creek channel. The 87.7 acre site includes 31.4 acres of emergent wetland, 1,637 foot linear feet of an intermittent stream, and seven ephemeral stream channels totaling 3,711 linear feet.

A survey of the site was conducted in the late summer and autumn of 2019. Appendix B shows the existing conditions of the intermittent stream channel and ephemeral stream channels #1 to #4, including the existing channel plan form, longitudinal profile, and cross-section. Ephemeral channels #5, #6 and #7 were not surveyed because no work is planned for them.

The Old Elk Creek channel, like many of Oklahoma's creek channels is incising, and as a result, incision and head cutting are present in the intermittent and ephemeral channels flowing into it. If left to nature, the head cuts will propagate upstream, resulting in widening and deepening of the channels, increased sediment supply, and potential degradation of the surrounding emergent wetland.

Design Objectives

The primary objectives of the proposed project are to 1) stabilize the ephemeral and intermittent stream channels on the Elk Creek Tract of the Honey Springs Mitigation Bank, and 2) to enhance and protect the emergent wetlands on the site.

Conceptual Design

In order to accomplish the design objectives, the first priority must be to stop the head cuts working up the ephemeral stream channels and prevent further degradation of the intermittent stream channel. The second priority is to increase out of channel flows in the ephemeral streams in order to reduce the peak discharges in the channel, which would reduce the shear stresses on the channel bed and banks and reduce head cutting of the channel downstream, while simultaneously enhancing the emergent wetland.

The proposed project will achieve these objectives utilizing multiple structures constructed of wood, boulders, cobble, gravel and soil. Figure 1 shows the location of the proposed structures, which include cross vanes, to stop the head cutting, and earthen channel plugs, rock weirs, and log jams to encourage out of channel flows and ponding. Schematic diagrams of the proposed structures are provided in Figures 2, 3 and 4.

The proposed design includes fifteen cross vanes, eight in the intermittent stream channel to prevent further incision of the channel bed, and seven at the downstream ends of the ephemeral stream channels to stop the head cuts. Cross vanes were created by Dave Rosgen as a means of grade control in "natural" stream restoration projects. The structures are built mostly out of rock (boulders), but may also be constructed of wood and rock. The "arms" of cross vanes extend upstream from the bank full level, at an angle of 20^{o}-30^{o} from the bank, sloping down so that at a third of the way across the channel the top of the structure is at the invert of the channel. The center third of the structure is constructed at the desired invert elevation and acts as grade control

for the channel. The orientation of the arms, pointing upstream and sloping down and in, slows the water down at the upper levels of the banks, and turns the water to the center of the channel, resulting in a plunge pool immediately downstream of the structure, providing cooler water and improved habitat for larger fish.

As with many things in architecture and engineering, form follows function, so it is imperative that the structures be constructed correctly, and that they maintain their shape, or they cease to function properly and can then accentuate the problem rather than mitigate it. The biggest threats to the integrity of cross vanes are undercutting or flanking. If the structure is undercut, the rocks fall irregularly into the resulting void, the structure loses its form and the grade control function for which it was designed. If the channel flanks the structure, then obviously it is of little use, and again ceases to provide the grade control function for which it was designed. It is therefore necessary to go deep and wide, with sufficient footer rocks to avoid scouring, and extension of the structure arms into the bank to avoid flanking. It is better to have too much rock than too little.

The remaining three structures, earthen channel plugs, rock weirs, and log jams are designed to encourage out of channel flows and ponding. The three earthen channel plugs are simply dams built out of material obtained on-site, either just upstream of the structure, or off to the side to create a low swale. These structures will be used at the upper ends of the ephemeral streams where the channels are not well developed, and were they not to have been subject to more than 60 years of agricultural use, would likely not exist.

The four log jams are proposed in the ephemeral streams where the channels are larger and more defined. The log jams are constructed of logs, boulders, cobble and gravel, and stair-step up from the existing invert elevation up to the top of the bank. As with cross vanes, the biggest threats to the integrity of the log jams are undercutting or flanking, so it important to have sufficient footer logs and/or rocks under the structure and adequate protection on the banks.

The two proposed rock weirs are located in the ephemeral streams where the channels are still larger, and it is feared that log jams would prove unsuitable. These structures are to be constructed using a gravel/cobble mix, with some local dirt added to fill the spaces. They will be notched into the stream bed, and extend up to the top of the bank. The structure will extend ten feet into the banks to prevent flanking. These structures are the least desirable, in the designer's opinion, and the option of replacing these rock weirs with log jams will be given serious consideration prior to and during construction.

Project Implementation

It is anticipated that implementing the proposed project will require the use of a large track-hoe, equipped with a hydraulic thumb, and a front-end loader. It may also be beneficial to employ a bull-dozer and thumb equipped small track-hoe (or back-hoe).

It is estimated that implementation of the project will require the acquisition of approximately 475 tons of boulders (2'x2'), 300 cubic yards of a large gravel/small cobble mix, and 70 trees. Locating the boulders and gravel/small cobble mix should not be difficult, as there are rock quarries fairly close by. Locating the trees may prove more difficult. It will be a matter of getting word out to people in the vicinity who are in the process of tree clearing. Ideally, the trees would be 20 feet long with a 2' diameter and still have a root wad. If only smaller trees can be located, then the design will have to be altered somewhat to accommodate it.

It is estimated that it will take two to three weeks to implement the project.

Monitoring and Reporting

A long-term monitoring program will be implemented to determine if the objectives of the proposed mitigation design have been met, and thus evaluate the successfulness of the project. The monitoring will evaluate fulfillment of performance standards in determining whether all or part of the mitigation bank site is successful, and if corrective actions are warranted.

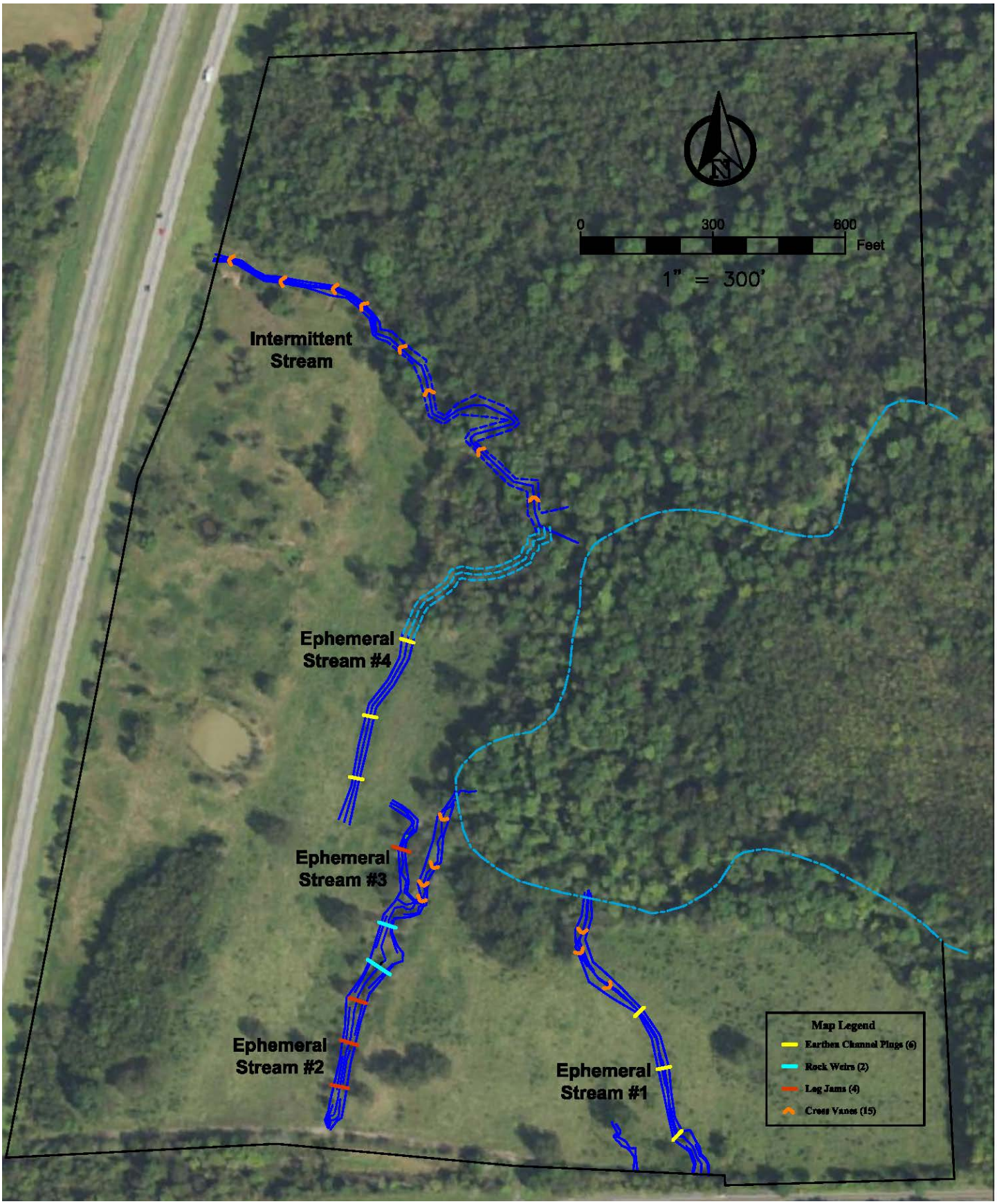


Figure 1: Location of proposed structures

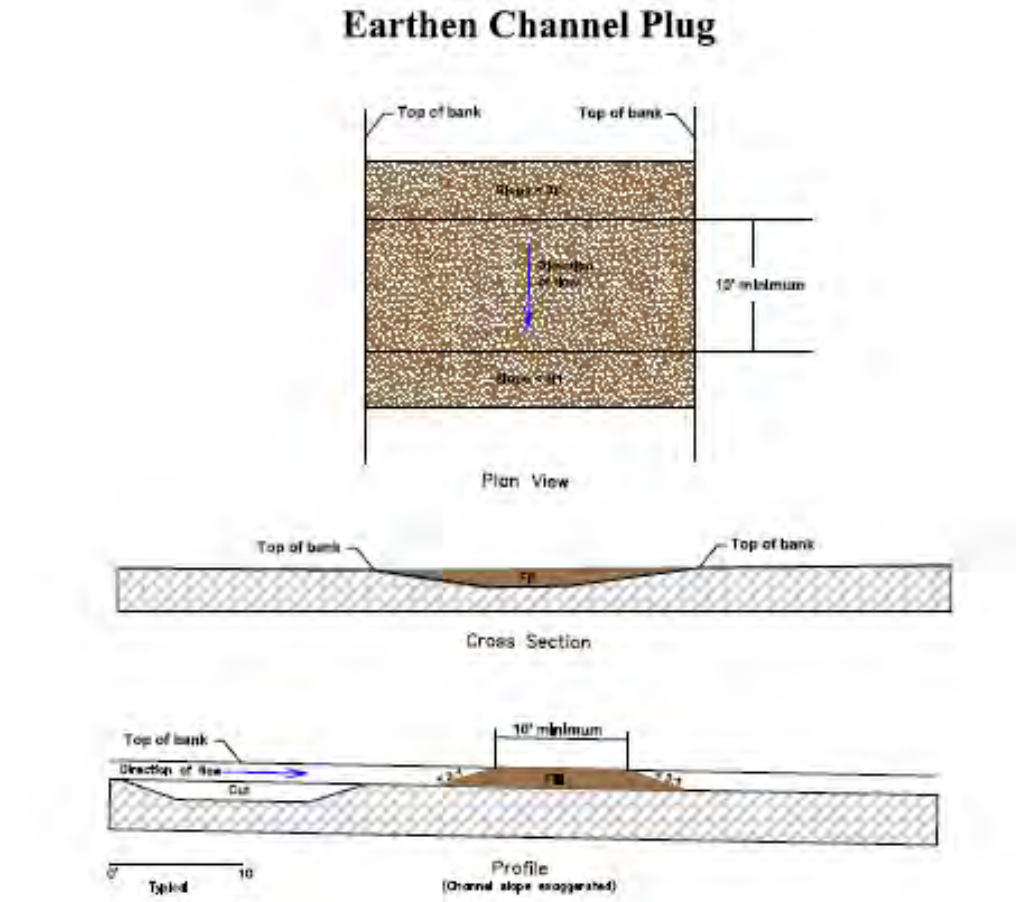


Figure 2: Schematic diagrams of earthen channel plugs and cross-vanes.

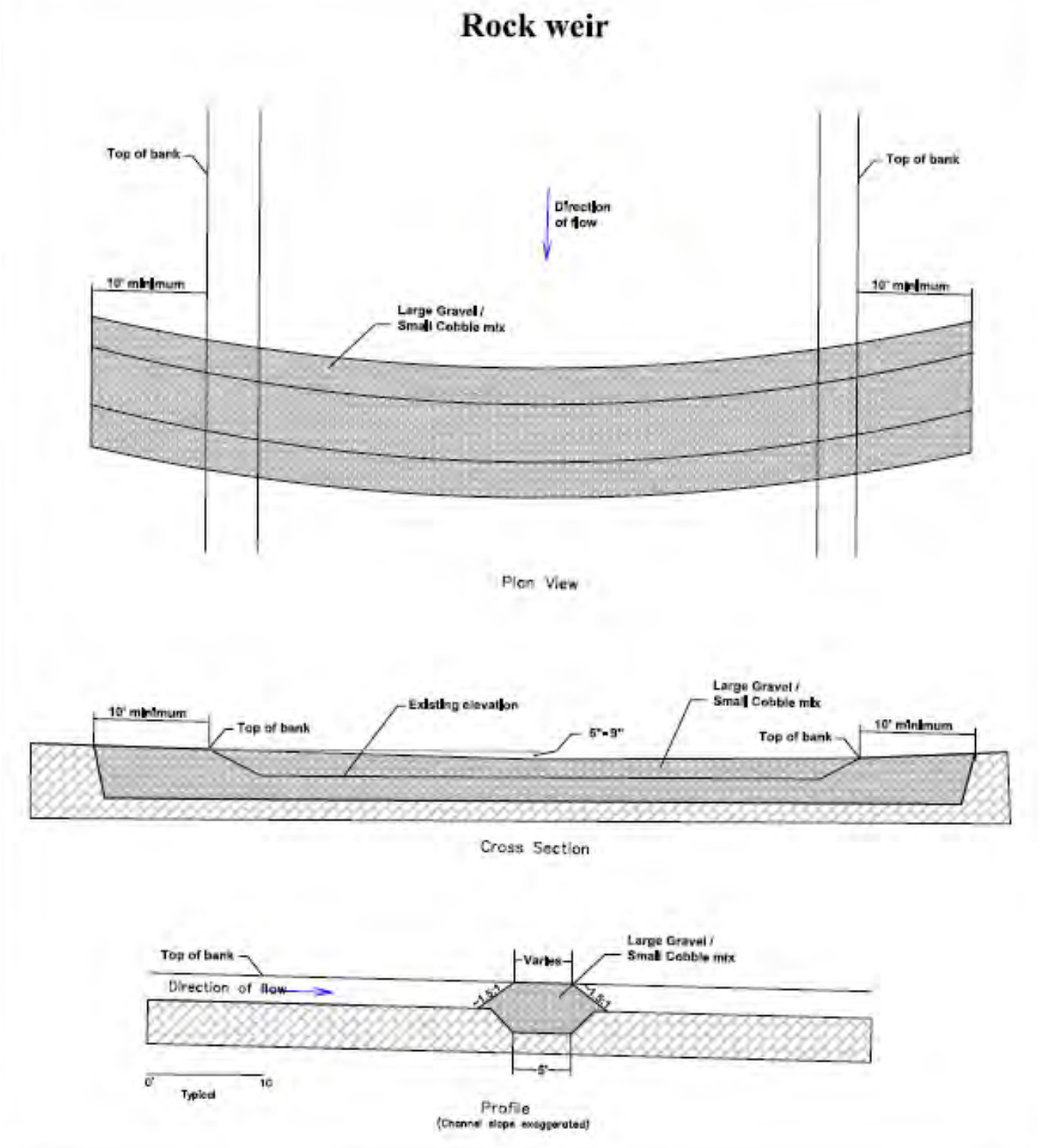


Figure 3: Schematic diagrams of rock weirs

The success of this project will be dependent on the successfulness of the structures in accomplishing their varying objectives. The cross-vanes in the intermittent channels are designed to stabilize the bed of the channel and prevent future channel incision, whereas the cross-vanes in the ephemeral channels are designed to stop advancement of the head cuts, to preserve upstream channel/floodplain connectivity. The earthen channel plugs, rock weirs, and log jams are designed to back up water and induce out of channel flows.

Immediately following construction, an as-built survey will be conducted at each structure and photographs of the structures will be taken. Monumented cross-sections will be established (at locations to be determined) and fluvial geomorphological surveys will be conducted on all of the stream channels on the tract, including those where in-stream work is not to be conducted. These surveys will include cross-section and longitudinal profile surveys to determine the entrenchment ratio (W_{FPA}/W_{BF}), the width-depth ratio (W_{BF}/H_{BF}), the channel slope (S), and the sinuosity (K) of the various stream reaches. A bed material analysis will also be conducted in each reach. In the ephemeral channels, the maximum depth and wetted perimeter upstream of the structures will also be determined.

Subsequent monitoring shall be conducted annually (or as otherwise required).

Performance Standards

As previously stated, the success of the project is dependent on the successfulness of the structures in accomplishing their varying objectives. The success of all of the structures will require that they not be undermined or circumvented. If they are, they will not function. Thus, if monitoring indicates excessive settling of a structure, or potential circumvention of the flow around a structure, corrective action should be taken to prevent it.

In the intermittent channel, the objective is to prevent future channel bed degradation. The channel appears to currently be at Stage V of Simon's channel evolution model. The proposed structures were designed to stabilize the bed from future degradation as a result of the incision of Elk Creek, and allow the channel to continue its evolution to Stage VI. Thus, the key parameter in evaluating the effectiveness of the design is the channel slope. The channel slope should not change significantly over the reach. Also, one would expect the width-depth ratio to first increase, then to decrease, as the channel evolves from Stage V to VI, whereas the entrenchment ratio should increase slightly over time, and the bank height ratio should decrease. Should monitoring indicate trends that are contrary to these, the need for corrective action may be indicated.

In the ephemeral channels, the objective is two-fold. At the downstream end, success of the project depends on the structures preventing the headcuts from advancing upstream. If the width-depth and/or the entrenchment ratio decreases, at cross-sections upstream of the structures, it may be an indication that the structure(s) are not effectively performing the task for which they were designed, and require corrective action. At the upstream end, success of the project depends on the structures backing water up and inducing out of channel flows. This will be evaluated by observing changes in the maximum depth and aerial wetted perimeter upstream of the structures, with increases in these features indicating success.

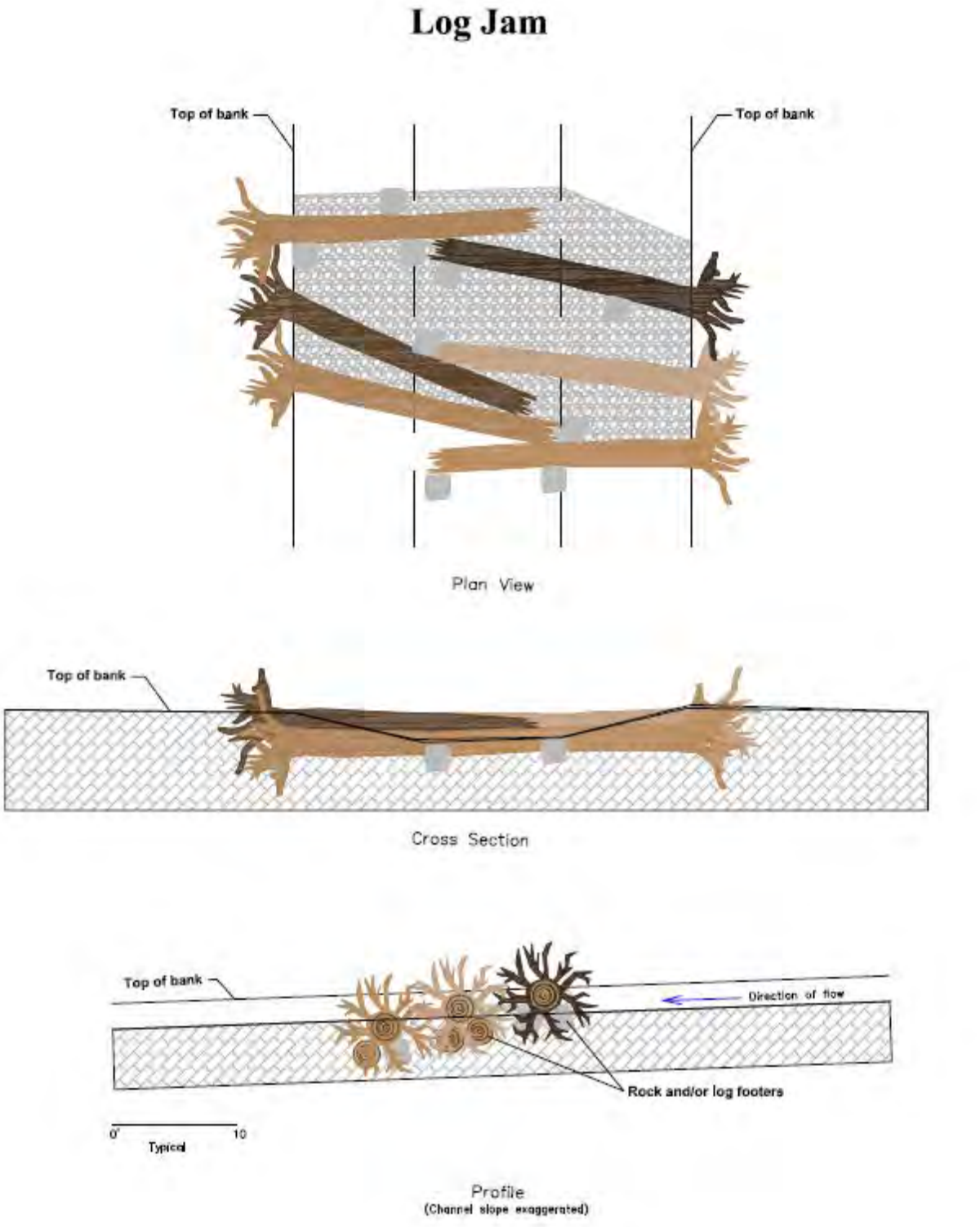


Figure 3: Schematic diagrams of log jams

Appendix A: Site Map

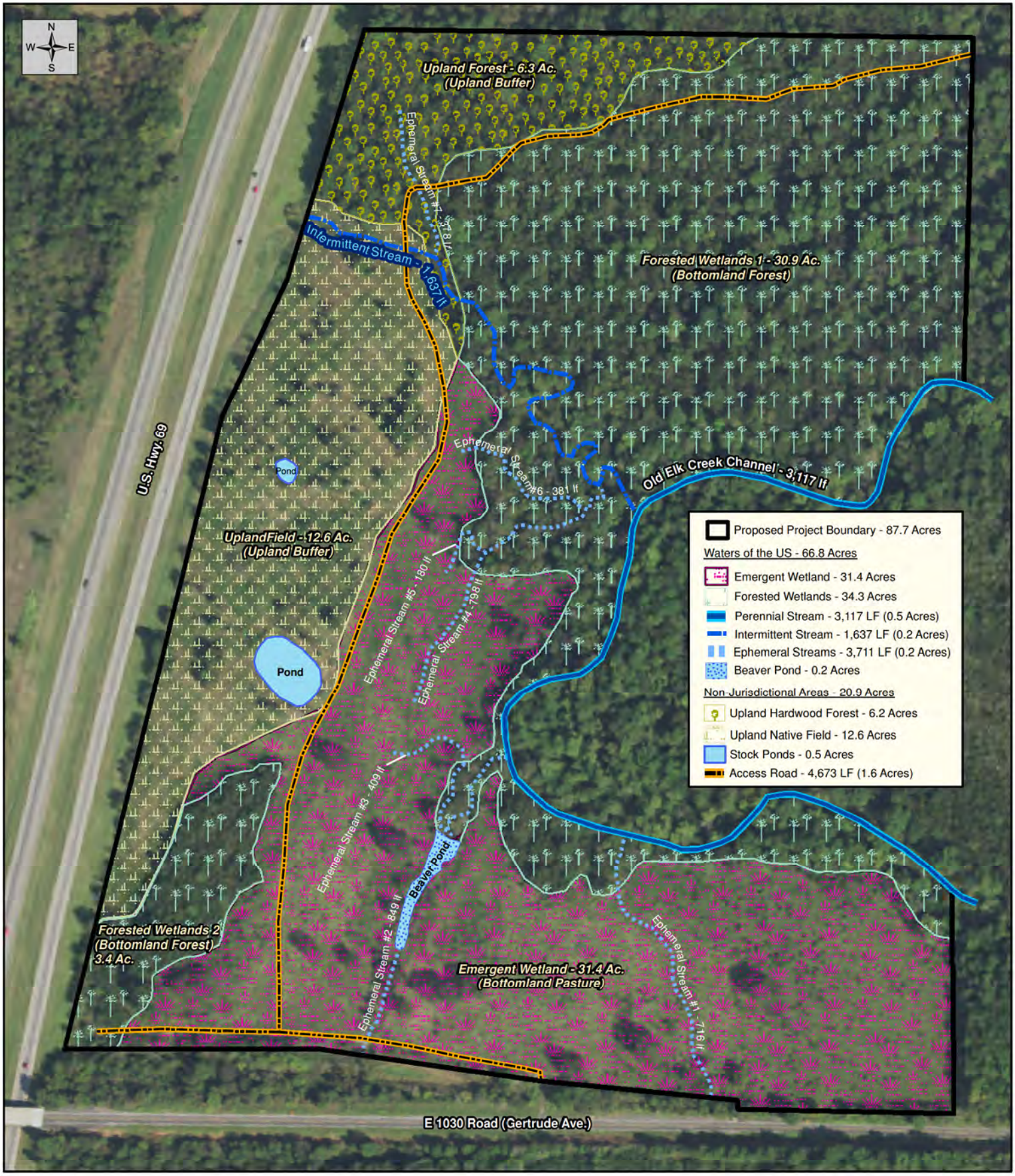


Figure 2 of 10
Waters of the US
2015 Aerial Map

Honey Springs Mitigation Bank - Elk Creek Tract

Date: January 11, 2019

0 100 200 300 400 500 600 700 800 900 1,000 1,100 Feet

Section 9 - T12N - R17E
McIntosh County, Oklahoma

Created By:
Jason Hoffman
HEI Project No. HEI-19-15

Datum: NAD83
Imagery Source: NAIP
Vector Source: HEI

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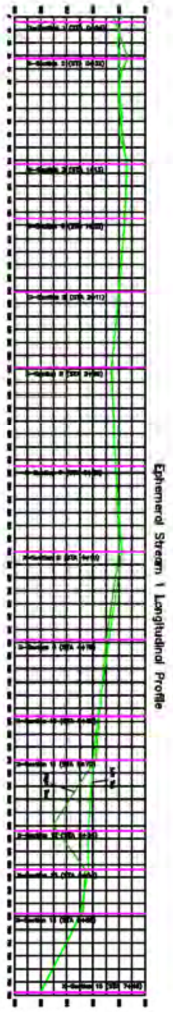
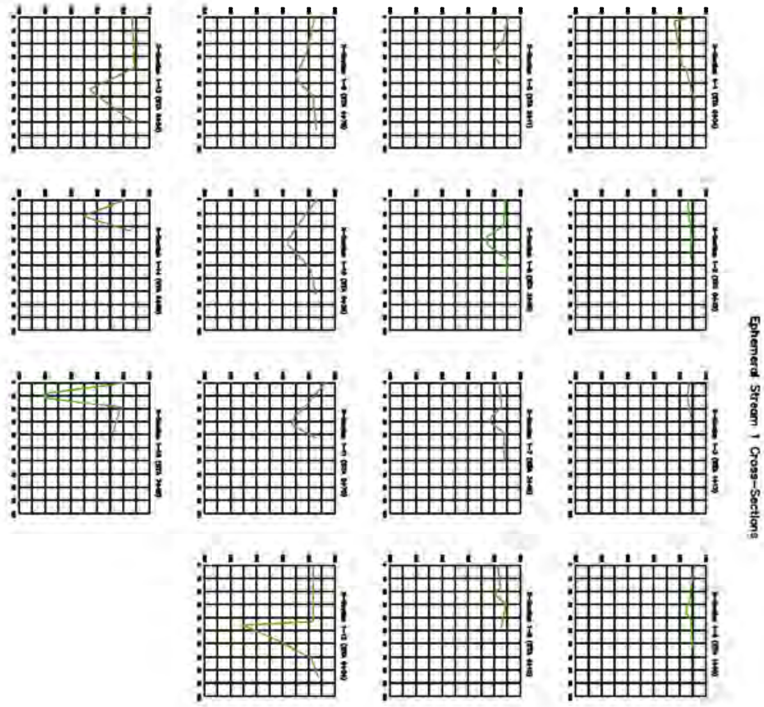
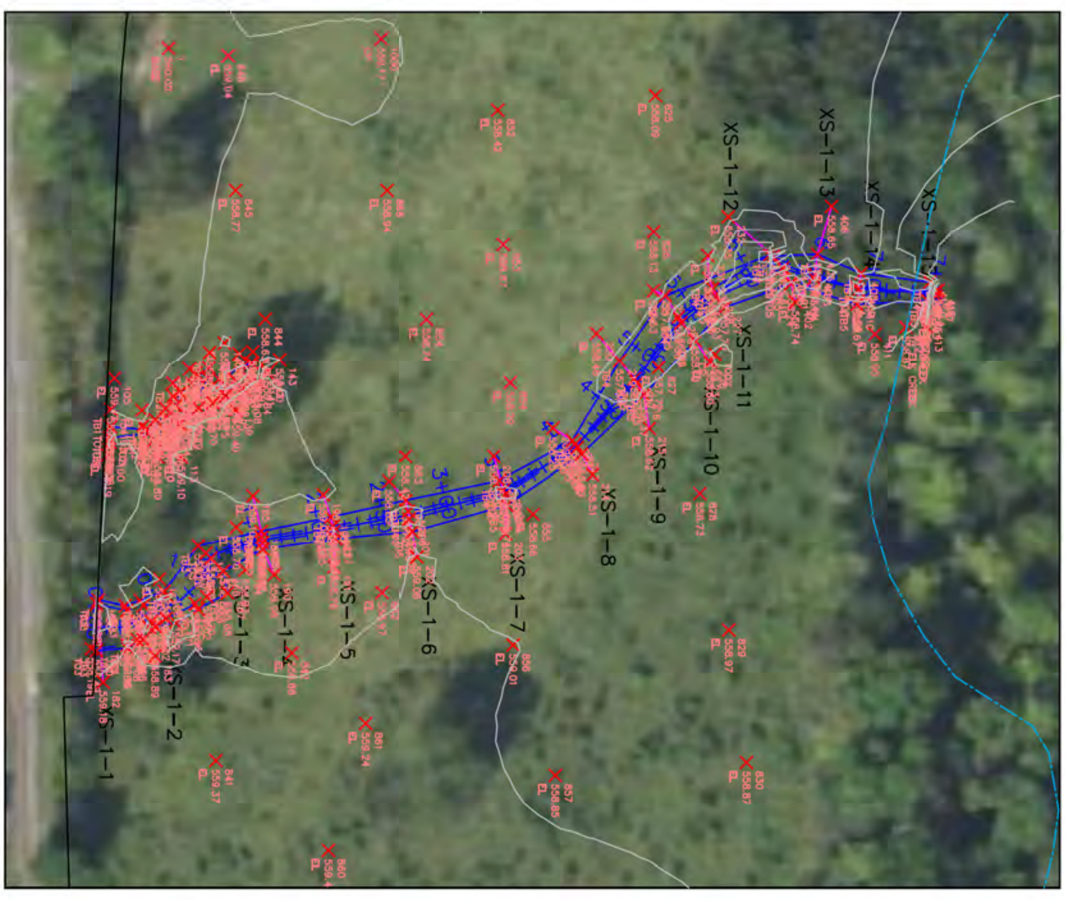
Sulphur Springs, TX 903.885.0304

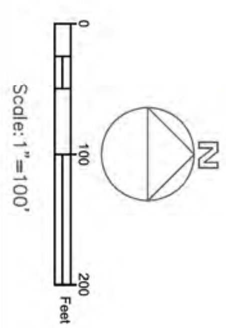
Green Country Wetland Mitigation
Carthage, TX 903.694.2428

Appendix B: Existing Conditions Plots









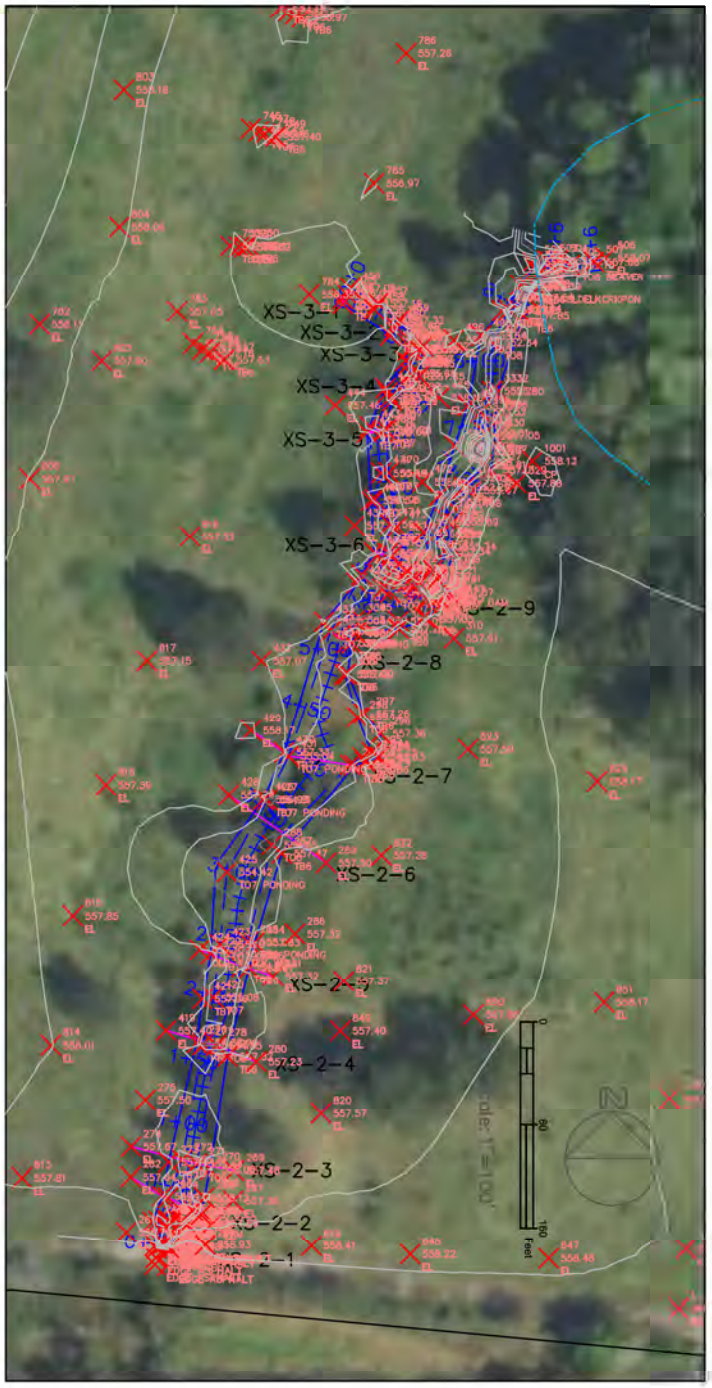
HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0004

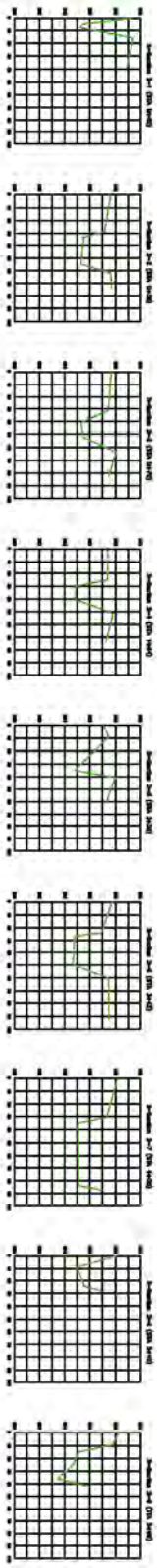
Green Country Wetland Mitigation
Carthage, TX 903.694.2428

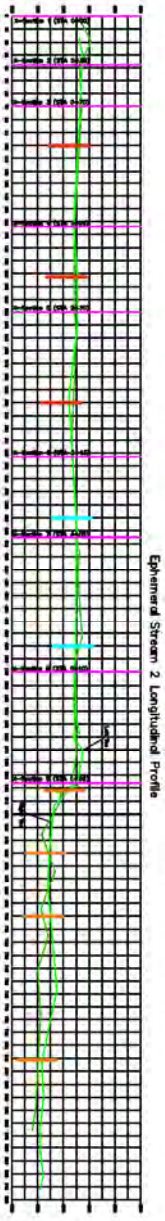
Honey Springs Mitigation Bank - Elk Creek Tract
Ephemeral Stream #1 - Existing Conditions

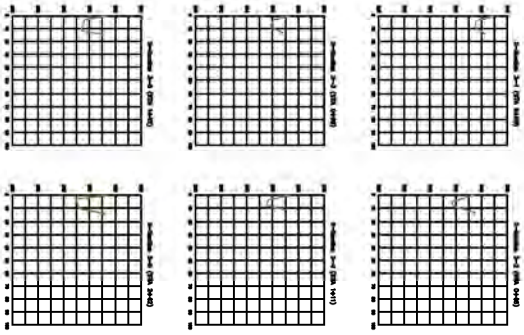
Riverman Engineering

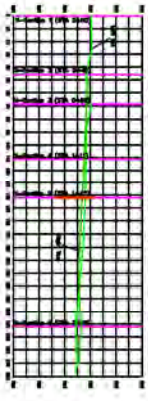
Riverman Engineering, PLC
1504 Ann Arbor Drive
Norman, Oklahoma 73069
(405) 620-2004
russ@riverman-engineering.com







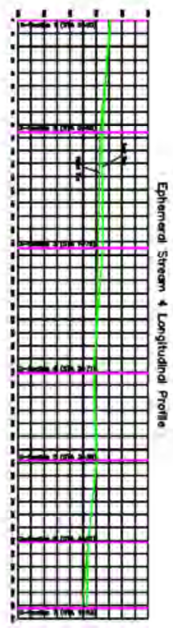


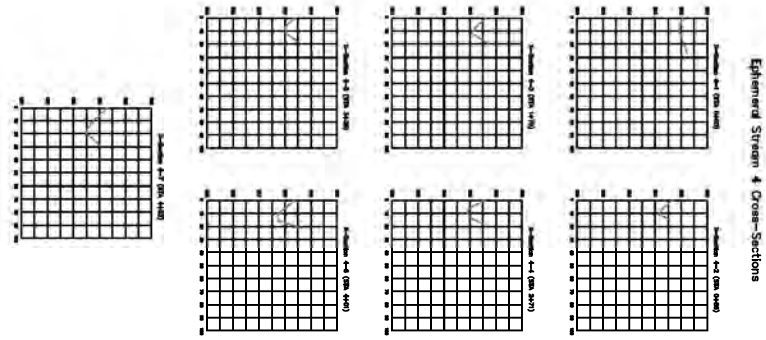


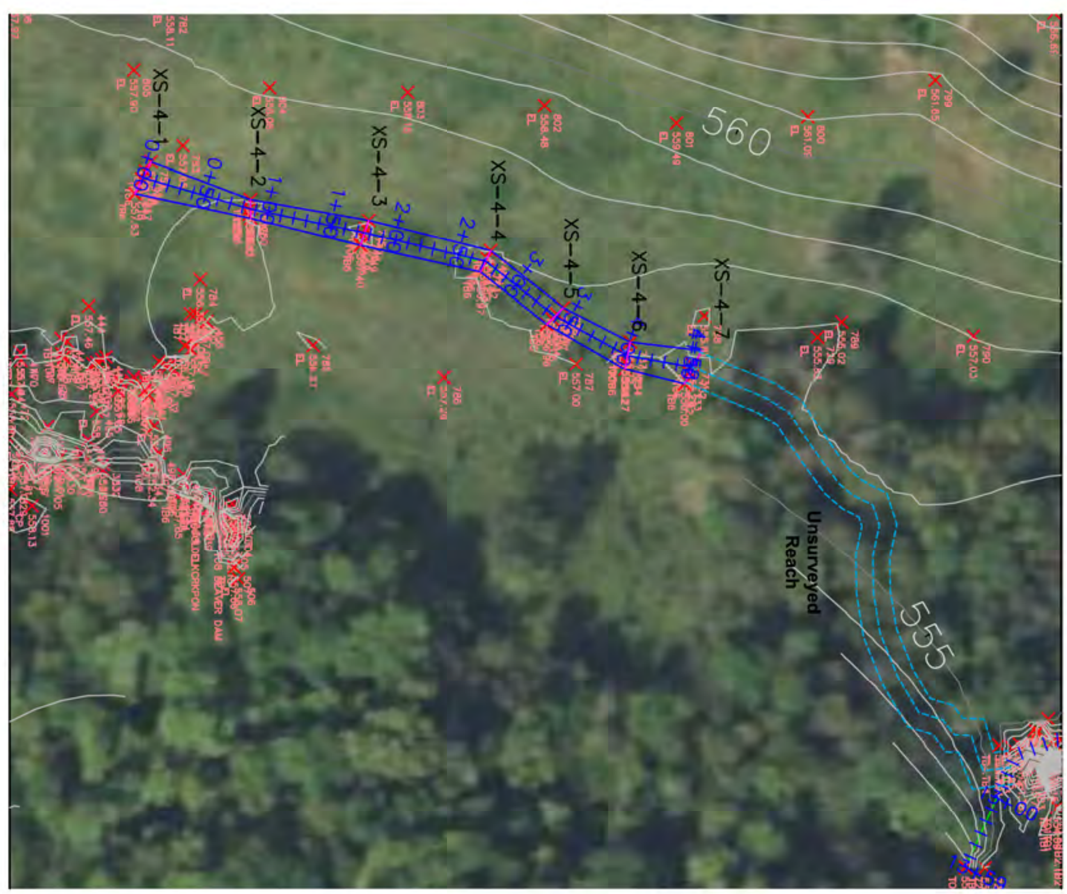
HOFFMAN ENVIRONMENTAL, INC
Sulphur Springs, TX 903.885.6304
Green Country Wetland Mitigation
Carthage, TX 903.694.2428

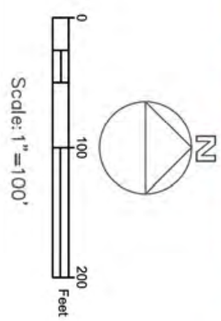
Honey Springs Mitigation Bank - Elk Creek Tract
Ephemeral Streams #2 & #3 - Existing Conditions

Riverman Engineering
Riverman Engineering, PLLC
1304 Ann Arbor Drive
Norman, Oklahoma 73069
(405) 626-2084
ross@riverman-engineering.com





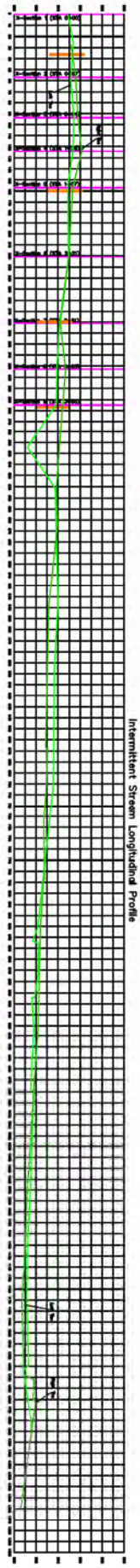


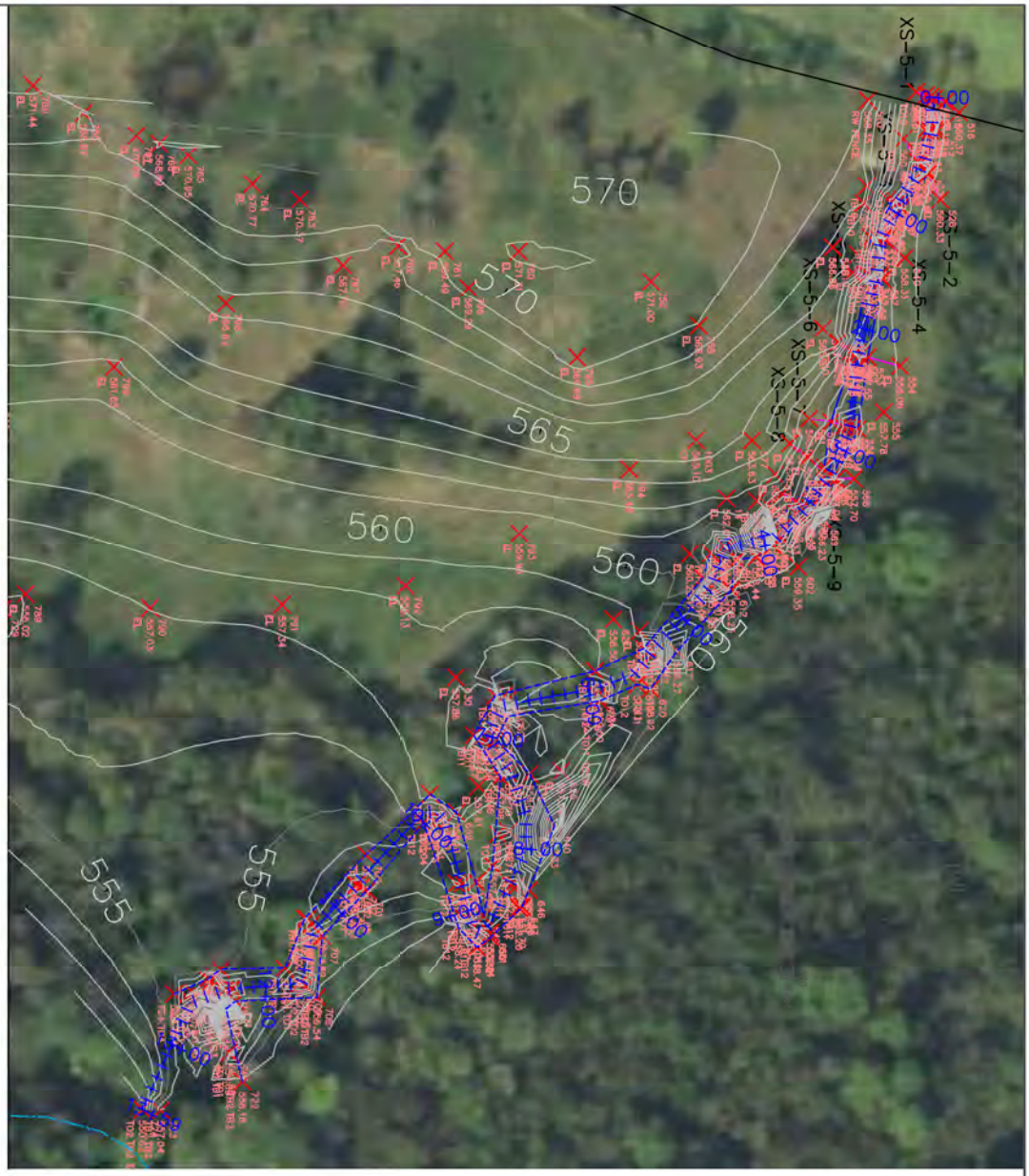


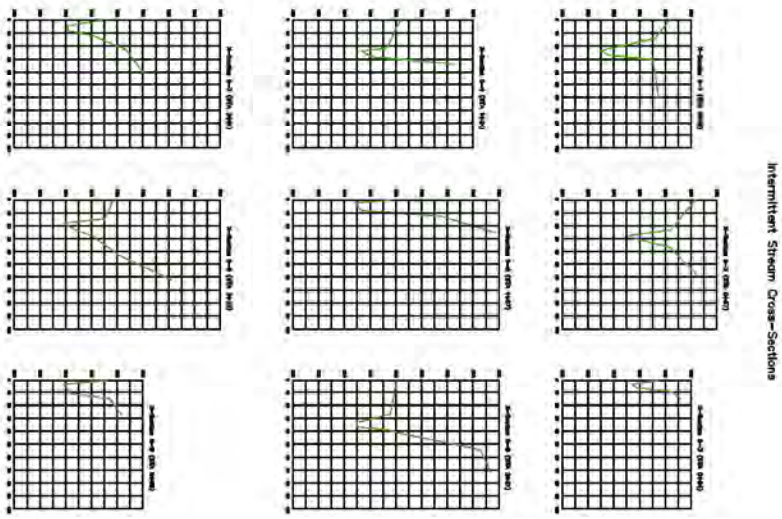
HOFFMAN ENVIRONMENTAL, INC.
Sulphur Springs, TX 903.885.0104
Green Country Wetland Mitigation
Carthage TX 903.694.2428

Honey Springs Mitigation Bank - Elk Creek Tract
Ephemeral Stream #4 - Existing Conditions

Riverman Engineering
Riverman Engineering, PLC
1504 Ann Arbor Drive
Norman, Oklahoma 73069
(405) 620-2004
rust@rivermanengineering.com







HOFFMAN ENVIRONMENTAL, INC
Sulphur Springs, TX 903.885.0304
Green Country Wetland Mitigation
Carthage, TX 903.694.2428

Honey Springs Mitigation Bank - Elk Creek Tract
Intermittent Stream Existing Conditions

Riverman Engineering
Riverman Engineering, PLC
1504 Ann Arbor Drive
Norman, Oklahoma 73069
(405) 620-2004