Federal Energy Regulatory Commission
Office of Energy Projects

September 2017

Spire STL Pipeline LLC

Docket Nos. CP17-40-000
CP17-40-001

Spire STL Pipeline Project

Environmental Assessment

Cooperating Agencies

US Army Corps of Engineers

Illinois Department of Agriculture

Washington, DC 20426

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 4
Spire STL Pipeline LLC
Spire STL Pipeline Project
Docket Nos. CP17-40-000
CP17-40-001

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this Environmental Assessment (EA) of the Spire STL Pipeline Project (Project) proposed by Spire STL Pipeline LLC (Spire) in the above-referenced docket. Spire requests authorization to construct, operate, and maintain new natural gas facilities in Illinois and Missouri consisting of (i) about 65 miles of 24-inch-diameter pipeline in Scott, Greene, and Jersey Counties, Illinois and St. Charles and St. Louis Counties, Missouri; and (ii) three new meter stations: one in Scott County, Illinois and two in St. Louis County, Missouri.

The EA assesses the potential environmental effects of the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA). The FERC staff concludes that approval of the Project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment.

The U.S. Army Corps of Engineers and Illinois Department of Agriculture participated as cooperating agencies in the preparation of the EA. Cooperating agencies have jurisdiction by law and/or have special expertise with respect to resources potentially affected by a proposal.

The FERC staff mailed copies of the EA to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the Project area. In addition, the EA is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link.

A limited number of copies of the EA are also available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Any person wishing to comment on the EA may do so. Your comments should focus on the potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they will be. To ensure that your comments are properly recorded and considered prior to a Commission decision on the proposal, it is important that the FERC receives your comments in Washington, DC on or before **October 30, 2017.**

For your convenience, there are three methods you can use to submit your comments to the Commission. In all instances, please reference the Project docket number (CP17-40-001) with your submission. The Commission encourages electronic filing of comments and has dedicated eFiling expert staff available to assist you at 202-502-8258 or FercOnlineSupport@ferc.gov.

(1) You may file your comments electronically by using the eComment feature, which is located on the Commission's website at www.ferc.gov under the link to Documents and Filings. An eComment is an easy method for interested persons to submit text-only comments on a project;

(2) You may file your comments electronically by using the eFiling feature, which is located on the Commission's website at www.ferc.gov under the link to Documents and Filings. With eFiling you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." You will be asked to select the type of filing you are making. A comment on a particular project is considered a "Comment on a Filing"; or

(3) You may file a paper copy of your comments at the following address:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

Although your comments will be considered by the Commission, simply filing comments will not serve to make the commentor a party to the proceeding. Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (Title 18 Code of Federal Regulations Part 385.214).[1] Only intervenors have the right to seek rehearing of the Commission's decision. Affected landowners and parties with environmental concerns may be granted intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding that would not be adequately represented by any other parties. **You do not need intervenor status to have your comments considered.**

Additional information about the Project is available from the Commission's Office of External Affairs, at **1-866-208-FERC (3372)** or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter the docket number excluding the last three digits in the Docket Number field (i.e., CP17-40). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, contact 1-202-502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription, which allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp.

[1] Interventions may also be filed electronically via the Internet in lieu of paper. See the previous discussion on filing comments electronically.

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SPIRE STL PIPELINE COMPANY LLC
SPIRE STL PIPELINE PROJECT

APPENDICES

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TECHNICAL ABBREVIATIONS AND ACRONYMS

AIMA	Agricultural Impact Mitigation Agreement
ATWS	additional temporary workspace
BA	Biological Assessment
CAA	Clean Air Act
Certificate	Certificate of Public Convenience and Necessity
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalents
Commission	Federal Energy Regulatory Commission
CRP	Conservation Reserve Program
CWA	Clean Water Act
dBA	decibels on the A-weighted scale
DOT	U.S. Department of Transportation
Dth/d	dekatherms per day
EA	environmental assessment
EI	environmental inspector
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gas
GWP	global warming potential
Clean Line	Grain Belt Express Clean Line
HAP	hazardous air pollutant
HCA	high consequence area
HDD	horizontal directional drill
HDD Plan	Horizontal Directional Drill Contingency Plan
HUC	hydrologic unit code
IDNR	Illinois Department of Natural Resources
IDOA	Illinois Department of Agriculture
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geology Survey
Laclede	Laclede Gas Company
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
LUB	lacustrine unconsolidated bottom
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act

MDOC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MLV	mainline valve
MoGas	MoGas Pipeline, LLC
MOU	Memorandum of Understanding
MP	milepost
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NGA	Natural Gas Act
NGPL	Natural Gas Pipeline Company of America, LLC
NHPA	National Historic Preservation Act
NOI	*Notice of Intent to Prepare an Environmental Assessment for the Planned Spire STL Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions*
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NO_x	nitrogen oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NWI	National Wetlands Inventory
OEP	Office of Energy Projects
PEM	palustrine emergent
PFO	palustrine forested
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
PM	particulate matter
$PM_{2.5}$	particles with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particles with an aerodynamic diameter less than or equal to 10 microns
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
Project	Spire STL Pipeline Project
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSS	palustrine scrub-shrub
PUB	palustrine unconsolidated bottom

REX	Rockies Express Pipeline LLC
Secretary	Secretary of the Federal Energy Regulatory Commission
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
Spire	Spire STL Pipeline Company, LLC
tpy	metric tons per year
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA-FS	U.S. Department of Agriculture - Forest Service
USDOI-NPS	U.S. Department of the Interior - National Parks Service
USEIA	U.S. Energy Information Administration
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
μg	microgram

A. PROPOSED ACTION

1. Introduction

On January 26, 2017, Spire STL Pipeline Company, LLC (Spire) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) in Docket No. CP17-40-000. On April 21, 2017, Spire filed an amended application in Docket No. CP17-40-001, reflecting a change in its proposed action to adopt a pipeline route alternative (the North County Extension) in lieu of the purchase and modification of Laclede's Line 880 in St. Louis County, Missouri. Notices of these filings were issued by the FERC as described in section A.4. Prior to these filings, Spire made use of the Commission's pre-filing process, which is also described in section A.4.

Spire is seeking a Certificate of Public Convenience and Necessity (Certificate) under Section 7(c) of the Natural Gas Act (NGA) to construct and operate about 59.2 miles of 24-inch-diameter pipeline (the Mainline) in Scott, Greene, and Jersey Counties, Illinois and St. Charles and St. Louis Counties, Missouri; and about 6.0 miles of 24-inch-diameter pipeline (the North County Extension) in St. Louis County, Missouri. This Spire STL Pipeline Project (Project) would also involve construction of three new meter stations: one in Scott County, Illinois and two in St. Louis County, Missouri.

We[1] prepared this environmental assessment (EA) in compliance with the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) regulations for implementing NEPA under Title 40 of the Code of Federal Regulations Parts 1500-1508 (40 CFR 1500-1508), and the Commission's implementing regulations under 18 CFR 380.

The FERC is the lead federal agency for authorizing interstate natural gas transmission facilities under the NGA, and the lead federal agency for preparation of this EA. Consistent with NEPA and their respective responsibilities and regulations, the U.S. Army Corps of Engineers (USACE) and Illinois Department of Agriculture (IDOA) participated as cooperating agencies in the preparation of this EA. Cooperating agencies have jurisdiction by law or special expertise with respect to the environmental impacts associated with Spire's proposal. The IDOA elected to cooperate because it is responsible for the development and execution of the Project's Agricultural Impact Mitigation Agreement (AIMA) to ensure that the agricultural land affected in Illinois is restored to pre-construction conditions. The USACE has authority pursuant to Title 33 of the United States Code Section 1344 [33 U.S.C. 1344]; Section 404 of the Clean Water Act (CWA), which governs the discharge of dredged or fill material into waters of the United States; Section 14 of the River and Harbors Act (33 U.S.C. 408), which authorizes the review of requests that could modify USACE civil works projects (e.g., federal channels); and Section 10 of the Rivers and Harbors Act (33 U.S.C. 403), which regulates

[1] "We," "us," and "our" refer to the environmental staff of the Office of Energy Projects.

any work or structures that potentially affect the navigable capacity of a waterbody. The major federal, state, and local permits, approvals, and consultations associated with the Project are discussed further in section A.10, below.

The assessment of environmental impacts is an integral part of the FERC's decision on whether to issue Spire a Certificate to construct and operate the proposed facilities. Our principal purposes in preparing this EA are to:

- identify and assess potential impacts on the natural and human environment that would result from the proposed action;
- identify and recommend reasonable alternatives and specific mitigation measures, as necessary, to avoid or minimize Project related environmental impacts; and
- facilitate public involvement in the environmental review process.

The EA will be used by the Commission in its decision-making process to determine whether to authorize Spire's proposal. Approval would be granted if, after consideration of both environmental and non-environmental issues, the Commission finds that the Project is in the public convenience and necessity.

2. Purpose and Need

According to Spire, the purpose of the Project is to provide about 400,000 dekatherms[2] per day (Dth/d) of year-round transportation service of natural gas to markets in the St. Louis metropolitan area, eastern Missouri, and southwest Illinois. The Project would link the greater St. Louis region to a new supply of gas, which would be the only supply source to the area that does not cross the New Madrid Seismic Zone, thereby enhancing infrastructure reliability and diversity. Also, Spire states that 87 percent of the current gas supply in this region comes from the existing Enable MRT system; thus, the Spire STL Pipeline Project would enhance infrastructure reliability and diversity.

Under Section 7(c) of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so,

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[2] A dekatherm is a unit of heating value often used by natural gas companies instead of volume for billing purposes. A dekatherm is equivalent to 10 therms or one million British thermal units. For conceptualization purposes only, a natural gas capacity of 400,000 Dth/d would be sufficient to power roughly 4.0 million homes annually (if it were used solely for residential energy production). This estimate assumes an average household energy consumption of 10,800 kilowatt hours per year (U.S. Energy Information Administration 2017). If the Project is approved, the natural gas could be used in a variety of applications, not solely for residential energy generation.

grants a Certificate to construct and operate them. The FERC's Certificate Policy Statement[3] provides guidance as to how the Commission evaluates proposals for new construction, and establishes criteria for determining whether there is a need for a proposed project and whether it would serve the public interest. The Commission bases its decision on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project. The Commission does not direct the development of the gas industry's infrastructure regionally or on a project-by-project basis, or redefine an applicant's stated purpose.

3. Scope of Environmental Assessment

The topics addressed in this EA include geology, soils, groundwater, surface water, wetlands, vegetation, aquatic resources, wildlife, threatened and endangered species, land use, visual resources, socioeconomics, cultural resources, air quality, noise, reliability and safety, cumulative impacts, and alternatives. The EA describes the affected environment as it currently exists, discusses the environmental consequences of the Project, and compares the Project's potential impact with that of various alternatives. The EA also presents our recommended mitigation measures.

4. Public Review and Comment

On July 22, 2016, the Commission granted Spire's request to use the FERC's pre-filing review process in Docket No. PF16-9-000. The pre-filing process was established to encourage early involvement by citizens, government entities, non-governmental organizations, and other interested parties in the development of planned natural gas transmission projects. During the pre-filing process, the FERC staff worked with Spire, cooperating agencies, and interested stakeholders, including federal and state agencies, to identify and resolve Project-related issues.

Spire hosted five open houses to inform stakeholders about the Spire STL Pipeline Project and provide an opportunity for stakeholders to ask questions and express concerns. The open houses were held as follows:

- August 16, 2016, in Scott County, Illinois;
- August 17, 2016, in Jersey County, Illinois;
- August 18, 2016, in St. Louis County, Missouri;

[3] The Policy Statement can be found on the FERC website at http://www.ferc.gov/legal/maj-ord-reg/PL99-3-000.pdf. Clarifying statements can be found by replacing "000" in the URL with "001" and "002."

- August 23, 2016, in St. Charles County, Missouri; and
- August 24, 2016, in Greene County, Illinois.

We also attended the open houses in order to explain the FERC environmental review process and answer related questions. About 10 to 30 people attended each evening, not including Spire or FERC personnel. In addition, we conducted site visits in the Project area, including field visits to the proposed crossings of the Mississippi and Missouri Rivers. Representatives from the USACE and U.S. Fish and Wildlife Service (USFWS) also attended the field visits.

On October 26, 2016, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment for the Planned Spire STL Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions* (NOI). After the issuance of this NOI, Spire filed with the Commission a potential pipeline route alternative in St. Louis County, Missouri. Therefore, on March 3, 2017, the Commission issued a *Supplemental Notice of Intent to Prepare an Environmental Assessment for the Proposed Spire STL Pipeline Project and Request for Comments on Environmental Issues*. The NOI and supplemental NOI were published in the Federal Register[4] and mailed to 1,141 and 342 interested parties, respectively, including federal, state, and local government representatives and agencies; elected officials; affected landowners; environmental and public interest groups; potentially interested Native American tribes; other interested parties; and local libraries and newspapers. The supplemental NOI was sent to known and potential stakeholders in the vicinity of the alternative under consideration. These notices also established scoping periods and requested that the public provide written comments on specific concerns about the Project or issues that should be considered during preparation of the EA.

We conducted three scoping sessions to receive verbal scoping comments on the Project. Scoping sessions were held on November 14, 2016, in North St. Louis, Missouri; November 15, 2016, in Dow, Illinois; and November 16, 2016, in Carrollton, Illinois. We received a total of 12 verbal comments at these scoping sessions. During that period, FERC staff also participated in an interagency meeting with the USACE.

The Commission received 50 comment letters on the Project: 15 letters during the scoping periods established by the NOIs and 35 letters outside of the designated scoping periods. Consulting agencies who submitted comment letters include the U.S. Environmental Protection Agency (USEPA), Missouri Department of Natural Resources (MDNR), Illinois State Historic Preservation Office (SHPO), and Missouri Department of Conservation.

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[4] 81 Federal Register 31922.

The transcripts of the public scoping sessions and written scoping comments are part of the public record for the Project and are available for viewing on the FERC Internet website (http://www.ferc.gov).[5] The environmental comments received are summarized below and addressed, as applicable, in relevant sections of this EA, as shown in table A-1.[6]

Table A-1
Issues Identified During Public Scoping

Issue	EA Section Addressing Issue
Air quality, GHGs, and climate change	section B.8.1
Alternatives, including pipeline routing alternatives	section C
Alternative crossing of New Piasa Chautauqua	section C.4
Contamination	section B.1.2
Cultural resources	section B.7
Cumulative impacts	section B.10
Expansion of Route 67	section B.10
Historic trails and native people	sections B.5.3 and B.7.2
Land held in conservation easements / habitat programs	section B.5.3
Land use, recreation, and visual impacts	section B.5
Project purpose and need, including impact on other gas transmission companies	section A.2 and C.1
Safety	section B.9
Socioeconomic impacts, including environmental justice	section B.6
Soils	section B.1.2
Surface water, groundwater, and wetlands	section B.2
Threatened and endangered species	section B.4
Vegetation and wildlife	section B.3
Water supplies	section B.2.2
GHG = greenhouse gas.	

5 Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF16-9); be sure to select an appropriate date range. The pre-fling process concluded on February 6, 2017, following Spire's filing of its formal application and the FERC's issuance of the Notice of Application. The proceedings for the Project are currently being conducted under Docket Nos. CP17-40-000 and CP17-40-001.

6 One commentor expressed opposition to fossil fuels in favor of renewable energy; and raised concerns regarding health risks associated with natural gas sourced from hydraulic fracturing. These topics concern energy policy or are otherwise outside the scope of this EA. As such, we do not discuss them further.

5. Proposed Facilities and Locations

The natural gas facilities proposed for the Spire STL Pipeline Project include the following:

- installation of 59.2 miles of new, 24-inch-diameter pipeline (the Mainline; milepost [MP] 0.0 to MP 58.8[7]);
- installation of 6.0 miles of new, 24-inch-diameter pipeline (designated as the North County Extension [NCE]; NCE MP 0.0 to NCE MP 6.0);
- three new meter and regulator stations (meter stations);
- three new mainline valves (MLVs); and
- installation of three pig[8] launcher/receivers (pigging facilities).

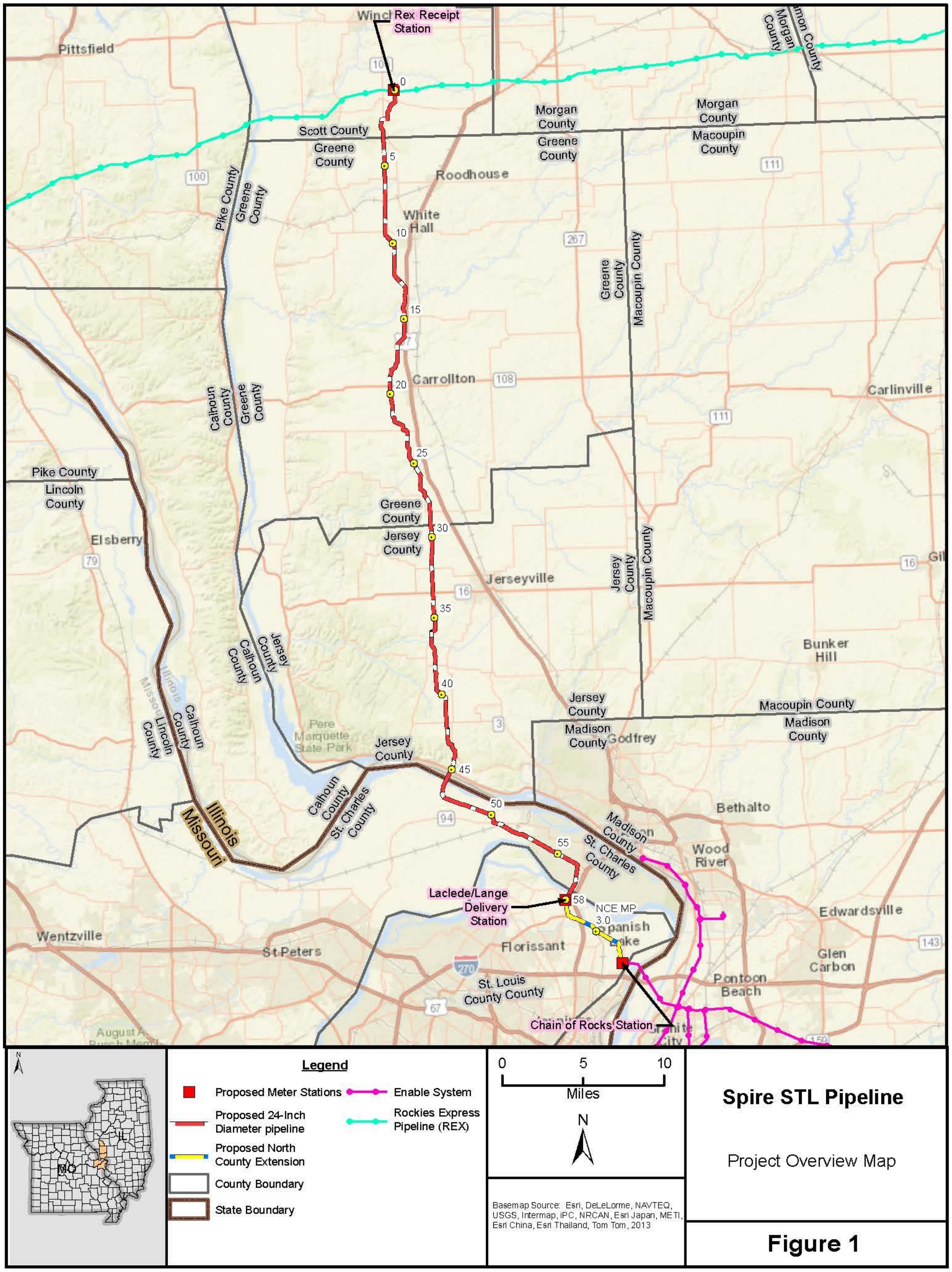
Additionally, Spire has proposed temporary access roads and staging areas for use during Project construction, and permanent access roads for use during both Project construction and operation. Spire would also install permanent cathodic protection groundbeds outside of the permanent right-of-way at 6 locations, and alternating current mitigation zinc ribbons at 46 locations within the permanent right-of-way where the pipeline would be parallel to high-voltage electric transmission lines. The general location of the Project is shown in figure 1, below, and on U.S. Geological Survey (USGS) 7.5-minute quadrangle topographic maps in appendix A.

5.1 Pipeline Facilities

Spire proposes to construct two pipeline segments that would total 65.2 miles of pipe. The Mainline would begin at a tie-in with Rockies Express Pipeline LLC's (REX) existing system (MP 0.0) in Scott County, Illinois and terminate at an interconnect to the Laclede/Lange Delivery Station (MP 58.8) in St. Louis County, Missouri. The North County Extension would originate at the terminus of the Mainline (MP58.8/NCE MP 0.0) and would terminate at the Chain of Rocks Station (NCE MP 6.0). These pipeline facilities (collectively, "the pipeline") would provide transportation capacity of 400,000 Dth/d, with a maximum allowable operating pressure (MAOP) of 1,440 pounds per square inch gauge.

[7] Based on minor adjustments to the route proposed by Spire in its amended application (accession no. 20170421-5167), milepost designations for the Project do not equate to true miles.

[8] A pipeline "pig" is a device to clean or inspect the pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.


Rex Receipt Station
Laclede/Lange Delivery Station
Chain of Rocks Station
NCE MP 3.0
Illinois
Missouri
Legend
Proposed Meter Stations
Proposed 24-Inch Diameter pipeline
Proposed North County Extension
County Boundary
State Boundary
Enable System
Rockies Express Pipeline (REX)
0 5 10
Miles
N
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline
Project Overview Map
Figure 1

The North County Extension would connect to Enable MRT's existing system via a 0.25-mile-long, 24-inch-diameter interconnect between the proposed Chain of Rocks Station and Enable MRT's existing station in St. Louis. About 0.1 mile of the interconnect pipeline would be located entirely with Enable MRT's existing easement.

Spire completed environmental surveys for 92.8 percent of the pipeline route, which represents all areas where landowner survey access was granted. Due to pending landowner permission, survey access is not available for discrete locations totaling about 3.4 miles along the proposed route.

To facilitate movement of natural gas through Spire's proposed tie-in to the REX system, REX would modify a yard and station piping at an existing compressor station in Christian County, Illinois. This work would be completed pursuant to 18 CFR 2.55 (a), as regulated by the FERC as part of REX's ongoing effort to update its existing system to source and deliver gas bi-directionally.

5.2 Aboveground Facilities

Spire has proposed to locate its REX Receipt Station at MP 0.0 in Scott County, Illinois in order to connect Spire's Mainline to REX's existing pipeline. Spire would install a tap into the REX pipeline, a pig launcher, and monitoring systems, most of which would be owned by Spire, but would be operated by REX.

The Laclede/Lange Delivery Station would connect the proposed Mainline to the proposed North County Extension and Laclede's existing facilities at MP 58.8/NCE MP 0.0 in St. Louis County, Missouri. This delivery station would include a pig receiver, a bi-directional pig launcher/receiver, and monitoring systems. Spire would own and operate all equipment at this meter station.

The Chain of Rocks Station would be constructed in St. Louis County, along the North County Extension at MP 6.0. This station would include interconnects with Laclede's and Enable MRT's existing systems, a bi-directional pig launcher/receiver, and monitoring systems. Spire would own and operate all equipment at the new meter station and is working to finalize easements for properties where all aboveground facilities would be located; Spire anticipates these negotiations will be completed by November 2017. In addition, Spire would install three MLVs along the pipeline at MPs 15.7, 34.7, and 46.2.

6. Land Requirements

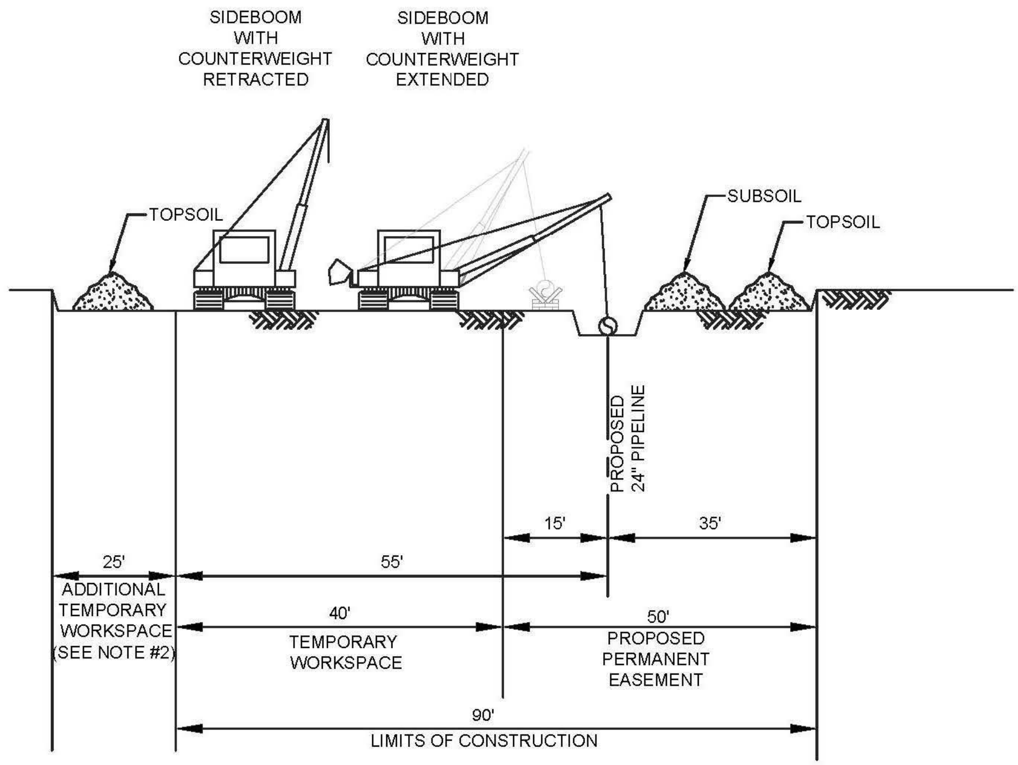
Table A-2 provides acreage requirements for each of the proposed Project facilities.

Table A-2 Summary of Land Requirements for the Spire STL Pipeline Project		
Facility	**Land Affected During Construction (acres)**	**Land Affected During Operation (acres)**
Pipeline Facilities		
Pipeline right-of-way	694.7	394.7
Additional temporary workspace	240.0	0.0
Access roads	17.0	2.4
Staging areas	33.5	0.0
Cathodic protection groundbed	2.4	1.7
Aboveground Facilities		
REX Receipt Station	5.0	5.0
Laclede / Lange Delivery Station	4.0	4.0
Chain of Rocks Station	7.5	7.0
Project Total	**1,004.1**	**414.8**

6.1 Pipeline Facilities

The typical construction right-of-way would be 90 feet wide in upland areas and 75 feet wide at wetland and waterbody crossings. In agricultural land, Spire is proposing a right-of-way width of 115 feet to allow for full right-of-way topsoil segregation as discussed in section A.8.2, below. In some locations, Spire would reduce the pipeline right-of-way width to avoid or minimize impacts on residences.

After construction, Spire's permanent right-of-way would be 50 feet wide, in which the pipeline would be off centered (generally 35 feet on one side and 15 feet on the other side) to aid in future maintenance. Three MLVs at MPs 15.7, 34.7, and 46.2 would be installed within the permanent right-of-way on a 50-foot by 60-foot area covered by gravel and surrounded by a fence. Land requirements for the Project are provided in table A-2 and further discussed in section B.5 of this EA. Figure 2, below, provides a typical construction diagram for the Project. About 9.8 miles (15.0 percent), of the pipeline would be adjacent to existing rights-of-way, as shown in table A-3. An additional 7.8 miles (12.0 percent) of the pipeline route would be parallel to, but offset from, existing rights-of-way at varying distances ranging from 30 to 90 feet.



PROFILE
(NOT TO SCALE)

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 90 FEET WIDE CONSISTING OF 50 FEET OF PROPOSED PERMANENT EASEMENT AND 40 FEET OF TEMPORARY WORKSPACE. ADDITIONAL TEMPORARY WORKSPACE (ATWS) WILL BE NECESSARY AT MAJOR ROADS, RAILROADS, RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.
2. ADD 25 FEET OF ATWS ON WORKING SIDE (TYPICALLY) FOR TOPSOIL STORAGE IN AGRICULTURAL FIELDS, RESIDENTIAL YARDS, AND AS PER LANDOWNER AGREEMENTS.
3. LEAVE GAPS IN SPOIL PILES AT OBVIOUS DRAINAGES. DO NOT PUSH AGRICULTURAL SOILS INTO STREAMS OR WETLANDS. DO NOT USE TOPSOIL FOR PADDING. AVOID SCALPING VEGETATED GROUND SURFACE WHEN BACKFILLING TOPSOIL AND SPOIL PILES.
4. MINIMUM DEPTH OF COVER IN AGRICULTURAL FIELD IS 5 FEET.

Project
Typical Pipeline
Construction Diagram

Figure 2

Table A-3 Summary of Pipeline Locations Adjacent to Existing Rights-of-Way			
Type of Right-of-Way	**Start Milepost**	**End Milepost**	**Width of Existing Right-of-Way (in feet)**
Powerline	5.0	5.7	Unknown
Road	5.7	5.8	40
Powerline / road	5.8	6.5	Unknown / 40
Road	6.5	6.7	40
Powerline	22.7	22.8	Unknown
Road	42.3	42.6	40
Pipeline	43.9	46.2	30
Railroad	52.5	54.5	90
Railroad	54.8	56.4	100 - 140
Powerline	58.5	58.6	10 - 20
Road	58.6	58.8	65
Propane line	NCE 0.0	NCE 0.2	Unknown
Powerline	NCE 0.8	NCE 1.1	Unknown
Powerline / road	NCE 2.2	NCE 3.2	Unknown
Note: Spire's land agents are coordinating with utility owners to obtain information noted as unknown.			

Spire would require additional temporary workspace (ATWS) outside the construction right-of-way for road, wetland, and waterbody crossings; at horizontal directional drill (HDD) entry and exit points; for storage of segregated topsoil; in areas with steep slopes; for storage of construction materials; for equipment movement and turn-arounds; and for other site-specific constraints (see appendix B). The use of ATWS during construction would affect 240.0 acres. Spire would generally locate ATWS a minimum of 50 feet from waterbody and wetland edges, except where a reduced set-back is necessary for site-specific reasons (see appendix C). Although Spire has identified all areas where ATWS would be currently required, additional or alternative areas could be identified in the future because of changes in construction requirements at specific sites. Spire would be required to file information on any of these areas for Commission review and approval prior to use, in accordance with recommendation 5 in section D of this document. Following construction, 589.4 acres would revert to pre-construction conditions and uses. The remaining 414.8 acres, within the permanent pipeline easement and permanent access roads, would be retained for operation of the Project.

6.2 Aboveground Facilities

Construction of three meter stations would affect about 16.5 acres. Operation of these meter stations would require 16.0 acres. One permanent access road affecting 0.1

acre would be required for operation of the REX Receipt Station. The remaining 2.9 acres would be restored and allowed to revegetate. In addition, three stand-alone MLVs would be installed within the permanent right-of-way for the pipeline.

6.3 Staging Areas

Spire has identified five staging areas that would be used for storage of pipe and contractor materials, staging construction operations, and temporary construction offices; these areas are located off the proposed pipeline right-of-way (see table A-4).

Table A-4
Staging Areas along the Spire STL Pipeline Project

Name	Location (Nearest Milepost)	Size (acres)	Current Land Use
Staging Area 1	0.0	27.8	Agricultural
Staging Area 2	43.9	2.5	Open land
Staging Area 3	43.9	0.4	Open land
Staging Area 4	46.6	1.4	Agricultural
Staging Area 5	57.3	1.4	Agricultural
Total	--	**33.5**	--

6.4 Access Roads

Existing public and private roads would be used to the extent feasible to access the pipeline right-of-way and aboveground facilities. Spire has proposed to use 20 access roads, including 17 temporary access roads for use during construction and 3 permanent roads for use during construction and operation (see table A-5). Spire does not anticipate the need to install new culverts along existing access roads, although culverts may be installed where an access road crosses a drainage ditch.

Table A-5
Access Roads Proposed for Use on the Spire STL Pipeline Project

Access Road	Nearest Milepost	Construction Status	Existing or New	Modifications	Length (feet)	Area (acres)[a]
Pipeline						
TAR-003	1.0	Temporary	Existing	Gravel[b]	1,103	0.6
TAR-008	8.6	Temporary	Existing	Gravel[b]	75	0.1
TAR-009	14.4	Temporary	Existing	Gravel[b]	1,015	0.6
TAR-010	15.1	Temporary	Existing	Gravel	496	0.3
TAR-012	24.9	Temporary	Existing	Gravel	2,717	1.6
TAR-013	25.8	Temporary	Existing	Gravel	1,615	0.9

Table A-5 (continued) Access Roads Proposed for Use on the Spire STL Pipeline Project						
Access Road	**Nearest Milepost**	**Construction Status**	**Existing or New**	**Modifications**	**Length (feet)**	**Area (acres)[a]**
TAR-014	26.1	Temporary	Existing	Gravel	1,353	0.8
PAR-024	34.7	Permanent	New	Gravel and grade	78	<0.1
TAR-015	36.6	Temporary	Existing	Gravel[b]	697	0.4
TAR-016	40.8	Temporary	Existing	Gravel[b]	2,090	1.2
TAR-017	44.7	Temporary	Existing	Gravel	5,035	2.9
PAR-018	46.1	Permanent	Existing / new	Clear trees and Gravel[c]	4,117	2.3
TAR-022	51.1	Temporary	New	Gravel	728	0.4
TAR-019	52.3	Temporary	Existing	Gravel	618	0.4
TAR-021	58.5	Temporary	Existing	Gravel	3,720	2.1
TAR-023	NCE 1.6	Temporary	New	Clear trees, grade, gravel	39	<0.1
TAR-025	NCE 2.3	Temporary	Existing	Gravel	733	0.4
TAR-026	NCE 4.5	Temporary	Existing	None	3,266	1.9
TAR-027	NCE 4.8	Temporary	Existing	None	79	<0.1
REX Receipt Station						
PAR-001	0.0	Permanent	Existing	Gravel	182	0.1

TAR = temporary access road; PAR = permanent access road.

[a] Impacts for access roads proposed to be used during operations are presented in table B-9.

[b] Following construction, gravel would be removed.

[c] Spire plans to relocate a portion of this road to an existing roadway, pending landowner negotiations.

7. Construction Schedule and Workforce

Spire anticipates that construction of the Project would commence in January, 2018, pending the Commission's approval and receipt of all other necessary permits and regulatory approvals. As discussed in sections B.3.3 and B.4, Spire plans to complete all tree-clearing activities in accordance with agency recommended timing windows to minimize potential impacts on nesting migratory birds and federally and state listed bats. Spire is proposing to complete Project construction using two construction "spreads" (spreads are construction areas with separate crews) for the pipeline. Spread one would consist of 292 workers to construct the Mainline, and spread two would consist of 77 workers to construct the North County Extension. Smaller work crews would sequentially construct the meter stations and MLV's, respectively. The peak construction workforce would be about 410 people; 5 permanent workers would be required for operation of the Project. Spire's projected in-service date is November 2018.

8. Construction, Operations, and Maintenance Procedures

The Project would be designed, constructed, operated, and maintained in accordance with applicable requirements defined by U.S. Department of Transportation (DOT) regulations in 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*; the Commission's Siting and Maintenance Requirements with 18 CFR 380.15; and other applicable federal and state safety regulations. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Generally, the pipeline would be installed using conventional overland pipeline construction techniques, where the construction spreads proceed along the pipeline right-of-way in one continuous operation, with the entire process coordinated to minimize the total time a tract of land is disturbed. Spire adopted and committed to implement, with specific deviations, the FERC guidelines as outlined in our *Upland Erosion Control, Revegetation, and Maintenance Plan*[9] (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures*[10] (Procedures). The Plan and Procedures are a set of baseline construction and mitigation measures developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. Spire has requested certain deviations from our Procedures, including reducing ATWS setback requirements from certain wetlands and waterbodies (see appendix C); we have reviewed these alternate measures and find them acceptable. With our approval of these alternative measures, Spire would implement its Procedures during construction of the Project.

Spire would also implement additional construction, restoration, and mitigation plans prepared for the Project, including its Spill Prevention, Control, and Countermeasures Plan (SPCC Plan); Unanticipated Discovery of Contamination Plan; Horizontal Directional Drill Contingency Plan (HDD Plan); Unanticipated Discoveries Plans for Cultural Resources in Missouri and Illinois; Winter Construction Plan; Karst Mitigation Plan; Blasting Plan; and Fugitive Dust Control Plan. These plans are available for review on the FERC website (eLibrary under Docket Nos. CP17-40-000 and CP17-40-001). Also, Spire has worked with the IDOA to develop a Project-specific AIMA for construction in Illinois agricultural land. The AIMA (which is included as appendix D of this EA) establishes best management practices for construction and restoration on agricultural land and was provided to all affected landowners in Illinois. We have reviewed these construction and mitigation plans and in conjunction with our recommendations in section B, we find them acceptable.

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9 A copy of the FERC Plan is available at www.ferc.gov/industries/gas/enviro/plan.pdf.

10 A copy of the FERC Procedures is available at www.ferc.gov/industries/gas/enviro/procedures.pdf.

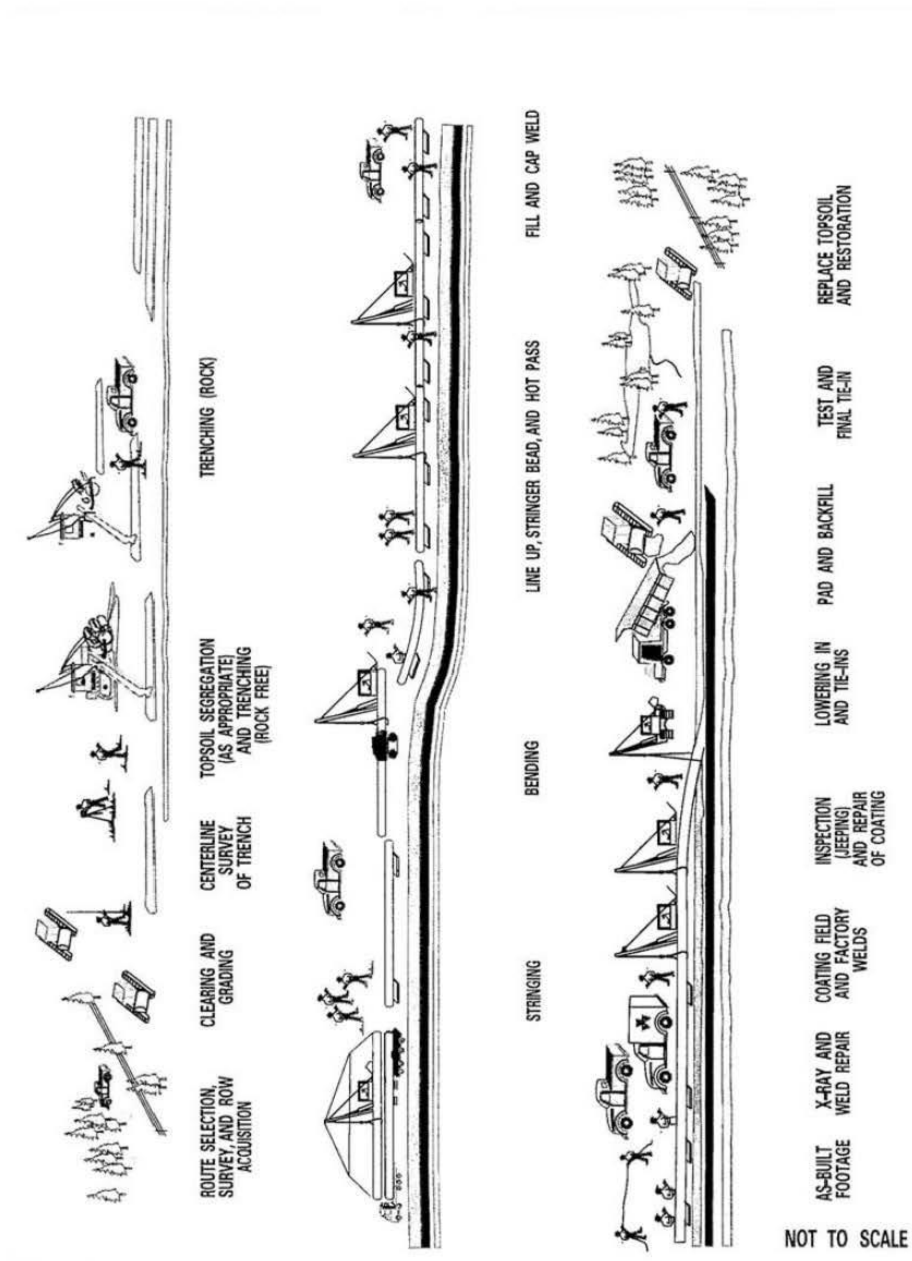
8.1 General Pipeline Construction Procedures

Figure 3 depicts the typical pipeline construction sequence that would be used to construct the pipeline. Prior to construction, Spire's survey crews would stake the pipeline centerline and limits of the construction right-of-way, ATWS, road and railroad crossings, and access roads. Spire would also mark wetland boundaries and other environmentally sensitive areas. Spire would contact the Illinois and Missouri One-Call systems to identify and mark existing underground utilities within the construction workspace to minimize the potential for accidental damage during pipeline construction.

After marking the construction areas, clearing crews would clear workspaces of vegetation and obstructions, including trees, rocks, and logs. Cleared vegetation and stumps would be stacked adjacent to the right-of-way (except in wetlands), or otherwise handled per individual landowner agreements and applicable regulations and ordinances. In wetlands, most vegetation would be cut to grade to maintain the integrity of the root systems.

In agricultural areas, Spire would segregate topsoil across the entire right-of-way, including HDD pull string areas. The full depth of topsoil, up to 12 inches in Missouri and 36 inches in Illinois per the Project's AIMA, would be segregated and stored separately from subsoil. Temporary soil erosion and sediment control devices would be installed as needed in accordance with the Plan and Procedures. The erosion and sediment controls would be inspected and maintained throughout construction and restoration of the Project. Following clearing, the construction right-of-way and ATWS areas would be graded where necessary to provide a level work surface.

Spire would excavate the pipeline trench with a track-mounted backhoe or similar equipment. Large stones or bedrock would be broken using conventional rock-trenching methods; blasting is not currently proposed. However, blasting may be necessary in areas where bedrock is encountered at depths that interfere with conventional rock-trenching methods, as discussed below. Spire would stockpile excavated soils along the right-of-way, typically on the side of the trench away from the construction traffic and pipe assembly areas (on the "spoil side"). In agricultural, residential, and non-saturated wetland areas, subsoil would be stored separately from topsoil piles. The pipeline trench would be excavated at least 12 inches wider than the diameter of the pipe and to a sufficient depth to allow a minimum of 3 feet of soil cover between the top of the pipe and the final graded land surface after construction. Pipeline cover may be greater than 3 feet at road, railroad, stream, wetland, and agricultural land crossings. As discussed further in section A.8.2, Spire would bury the pipe at depths ranging between 5 and 7 feet in certain areas to mitigate buoyancy and where special construction procedures necessitate (e.g., bore, HDD). In compliance with 49 CFR 192, the depth of cover would be a minimum of 2 feet in areas of consolidated bedrock.



Spire STL Pipeline Project
Typical Pipeline
Construction Sequence

Figure 3

Individual sections of pipe would be trucked to the construction right-of-way and strung along the trenchline in a single, continuous line. Typically, a track-mounted, hydraulic pipe-bending machine would tailor the shape of the pipe to conform to the contours of the terrain. The pipe segments would then be placed on temporary supports and welded together into long 'strings.' Spire would weld its pipeline in compliance with 49 CFR 192 *(Transportation of Natural and Other Gas by Pipeline Minimum Federal Safety Standards*), American Petroleum Institute Standard 1104 (*Welding of Pipelines and Related Facilities),* and Spire's specifications. Completed welds would be coated to prevent corrosion, and the coating would be inspected for defects and repaired, if necessary, prior to lowering the pipe into the trench.

Prior to lowering in the pipe, Spire would inspect the trench to ensure it is free of rocks and other debris that could damage the pipe or its protective coating. The pipe would then be lifted from the temporary supports and lowered into the trench using sideboom tractors. In rocky areas, a layer of soil or sand would be placed on the bottom of the trench to protect the pipe. Once the pipe has been lowered in, the trench would be backfilled with previously excavated materials. If excavated materials are not suitable (too rocky), the pipeline would be covered with more suitable fill or protected with a rock shield (padding placed around the pipe). Topsoil would not be used to provide padding around the pipe. Excess soil may be spread evenly within upland areas in the right-of-way, and in accordance with landowner and agency requirements.

After backfilling, Spire would hydrostatically test pipeline segments to ensure the pipeline segments are free from leaks and meet safety requirements at operating pressures. Refer to section B.2.2 for additional information on hydrostatic testing.

Final cleanup would begin after backfilling and as soon as weather and site conditions permit. In accordance with the Plan, weather and season permitting, Spire would complete final cleanup (including removal of construction debris, replacement of topsoil where applicable, final grading, and installation of permanent erosion control devices) within 20 days after the trench is backfilled. In residential areas, cleanup and restoration would occur within 10 days of backfilling. If final cleanup is prevented by winter snowfall, Spire would implement its Winter Construction Plan, which includes measures to temporarily stabilize the right-of-way and avoid erosion until spring thaw conditions (see section A.8.2).

Spire would complete restoration in accordance with the Plan and Procedures and applicable permit requirements. Areas disturbed by construction would be graded to match original contours and surrounding drainage patterns, except at those locations where permanent changes in drainage would be required to prevent scour, erosion, or potential exposure of the pipeline. A slight crown on top of the trench may be left to allow for settling of soil air pockets. Temporary and permanent erosion and sediment control measures, including silt fencing, water bars, and vegetation would be installed. Fences, gates, driveways, and roads disturbed by pipeline construction would be restored to pre-construction conditions or better, as practicable. Markers showing the location of the pipeline would be installed at fence and road crossings to identify Spire as the owner and convey emergency information in accordance with applicable government regulations, including DOT safety requirements.

In most upland locations, Spire would revegetate areas disturbed by construction with a grass seed mixture and application of a hydro-straw mulch as appropriate to avoid erosion. Spire developed its seed mixture in consultation with Natural Resources Conservation Service (NRCS). At the landowner's request, actively cultivated cropland may be left unseeded.

8.2 Special Pipeline Construction Procedures

Waterbody Crossings

Spire proposes to cross streams using dry-ditch flume and HDD crossing methods (see appendix E). During construction, Spire would implement the measures specified in the Plan and Procedures and any additional requirements that may be specified in federal or state waterbody crossing permits. In addition, Spire has stated that it would develop a Project-specific Erosion and Sediment Control Plan prior to construction.

Dry-ditch Flume Crossing Method

A dry-ditch flume crossing diverts or isolates flow during pipe installation through the use of flumes to maintain water flow and fish passage during pipeline construction. During a typical dry-ditch flume crossing, water is diverted across the trench area through one or more flume pipes of suitable diameter to convey the maximum water flow. Temporary sandbags, bladders, or other impervious materials are used to support and seal the ends of the flume and to direct stream flow into the flume and over the construction area. These temporary dams at both the upstream and downstream sections of the flume pipe create a containment area where turbid water is confined. If the pipeline trench requires dewatering during construction of the Project, the water would be pumped out through upland dewatering structures to create a dry work area for trench excavation and pipe installation. Immediately after backfilling, bottom recontouring, and restoration of stream banks, the flume pipes and temporary dams would be removed and flow through the construction work areas would be restored.

Horizontal Directional Drill Method

Spire proposes to use the HDD method of construction at four locations along the pipeline route (see table A-6). The HDD method involves drilling a pilot borehole under the targeted feature (i.e., waterbody), then enlarging that borehole through successive reaming passes until the borehole is large enough to accommodate the pipe. For a 24-inch-diameter pipeline, the borehole diameter is typically about 36 inches.

Table A-6 Summary of Horizontal Directional Drill Locations for the Spire STL Pipeline Project				
HDD	**Begin (Entry) Milepost**	**End (Exit) Milepost**	**Length (feet)**	**Primary Features Avoided**
HDD 1	45.0	46.2	5,900	Mississippi River, The Meeting of the Great River Scenic Byway (Illinois Route 100), Sam Vadalabene Great River Road Bike Trail, Upper Mississippi River Conservation Area, Luesse Lake
HDD 2	57.7	58.4	3,302	Missouri River, Consolidated North County Levee
HDD 3	NCE 1.6	NCE 2.2	3,321	Coldwater Creek, US 67 / Missouri State Road 367 (Lewis and Clark Blvd.)
HDD 4	NCE 3.8	NCE 4.5	3,568	Spanish Lake Park, Fort Bellefontaine Park, Emerald Greens Golf Course, Sunfish Lake

Throughout the process of drilling and enlarging the borehole, drilling mud (made of a naturally occurring, non-toxic bentonite clay material and water) would be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and stabilize the borehole during reaming and placement of the pipeline. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area and then pulled through the borehole. This crossing method typically requires ATWS for the HDD entry and exit points, with a drill rig located at the entry pit.

Based on site-specific conditions at the proposed crossing of the Mississippi River and Missouri River, Spire plans to complete the crossing using an intersect HDD. This method involves using a drill rig at each of the HDD pits such that the pilot holes are drilled from each side of the waterbody crossing and the intersection of the boreholes occurs at a predetermined point.

Each of the HDD methods generally avoids impacts on the feature being crossed. In addition, because Spire would use a gyroscopic guidance system, no clearing of vegetation between the entry and exit pits would be required. However, HDD personnel would walk the path of the drill to monitor for any inadvertent return of drilling mud to the surface.

Spire has provided an HDD Plan[11] that addresses the prevention, detection, notifications, and response to inadvertent returns in upland areas, wetlands, and waterbodies. In response to inadvertent returns of drilling mud to the surface, on-site personnel would assess the volume and discharge location to inform appropriate containment and response measures. In the event an inadvertent release enters a flowing waterbody, Spire would work to stop the flow and isolate the release, and would develop

[11] Available on the FERC Docket via https://www.ferc.gov/docs-filing/elibrary.asp, in accession no. 20170421-5167.

a cleanup plan based on site-specific conditions, in consultation with appropriate agencies.

Wetlands

Spire would delineate and mark wetland boundaries in the field prior to construction activities. Wetlands would be crossed via HDD or open-cut methods (see appendix F for wetlands proposed to be crossed by HDD). HDD crossing methods would be similar to those described above for waterbody crossings. At open-cut wetland crossings, woody vegetation within the construction right-of-way would be cut off at ground level and removed from the wetlands, generally leaving the root systems intact; the pulling of tree stumps and grading activities would be limited to the area directly over the trenchline unless it is determined that safety-related construction constraints require otherwise. Spire would install temporary sediment control devices prior to grading near wetlands and, as necessary, after initial disturbance of wetlands or adjacent upland areas to prevent sediment flow into wetlands in accordance with the Procedures. Spire would maintain these devices until revegetation of the wetlands is complete. Construction equipment operating in wetland areas would be limited to that needed to clear the right-of-way, dig the trenches, install the pipeline, backfill the trenches, and restore the right-of-way. In addition, Spire would use timber mats (or similar measures) in saturated wetlands or other wetland areas where rutting could occur.

Spire would determine the method of pipeline construction within each wetland based on soil stability and saturation at the time of construction. Where soils are stable and are not saturated at the time of crossing, the pipeline would be installed using methods similar to those in upland areas. Other methods identified in the Procedures could be used where wetland soils are saturated and/or inundated, if applicable. Stringing and welding of the pipe would be conducted prior to trenching in wetlands, per the Procedures.

Some ATWS may be required adjacent to wetlands for staging the crossing and for the assembly and fabrication of the pipeline. These ATWS would be at least 50 feet from the edge of the wetland except in cases where this is not feasible (for example, near HDD entry and exit locations and road crossings). In these cases, Spire has requested alternative measures from our Procedures that would allow a setback less than 50 feet from wetlands. Appendix C identifies the location and rationale for changes in setback distances at wetland crossings. We have reviewed these ATWS locations, and Spire's justifications for them, and have found them acceptable. See section B.2.3 for further information on wetlands.

Road and Railroad Crossings

Spire would generally cross local, state, federal, and private roads using the open cut or conventional bore methods. Of the 71 proposed road crossings, 6 would be open cut (i.e., typical upland construction methods), and 57 would be bored. The conventional boring method avoids direct impacts on the road surface and associated transportation. The conventional bore crossings typically consist of excavating a pit on each side of the feature being crossed, placing boring equipment within the pits, boring a hole under the feature, and pulling a section of pipe through the hole. Dewatering the bore pits may be necessary and would be similar to dewatering the trench as described above. For long crossings, pipe sections could be welded into a pipe string before being pushed through the borehole.

The remaining eight roads would be crossed by HDD, including the Meeting of the Great River Scenic Byway (Illinois Route 100) and the adjacent Sam Vadalabene Great River Road Bike Trail, as part of the Mississippi River crossing. Two railroads would be crossed three times by a trenchless method (i.e., bore or HDD). See appendix G for each road and railroad crossed by the Project and the proposed crossing method.

Agricultural Areas

Construction in agricultural areas would be conducted in a manner similar to conventional pipeline construction; however, Spire would protect the topsoil from the movement of equipment and construction activities through removal of topsoil. Spire would store segregated topsoil and subsoil in separate windrows. Spire would use a construction right-of-way up to 115 feet wide in agricultural areas to allow for topsoil stockpiling. During backfill operations, subsoil would be used to initially backfill the trench, and then the topsoil would be reapplied to the top of the trench and the graded right-of-way.

Spire consulted with the Missouri Department of Agriculture on the need for an AIMA and any special construction techniques the state may require. Missouri does not require an AIMA, therefore construction and restoration on agricultural land in Missouri would be done in accordance with the Plan. Mitigation measures include requirements regarding minimum depth of pipeline cover, topsoil segregation, and post-construction monitoring and revegetation. Topsoil would be segregated to the full depth, up to 12 inches, and stored separately from subsoil.

In agricultural land in Illinois, Spire would implement measures in the Plan and Procedures, in conjunction with the Project's AIMA (see appendix D). Spire would segregate the topsoil to the full depth, up to 36 inches. If parent material[12] is evacuated from the trenchline, it would be stored separate from top or subsoils and disposed of at an approved facility, per the terms of the landowner easement. The Project's AIMA describes mitigation measures, specific to the types of soils and conditions in Illinois, which Spire must implement. Certain aspects of the Project's AIMA deviated from the

[12] The unconsolidated mineral or organic material from which the true soil develops. Parent material is located below the subsoil strata and is not a rooting or growing medium.

measures described in the Plan, however, the measures in the Project's AIMA are generally more protective. Key differences between these Plans include the following:

- retaining an agricultural inspector for each spread;
- employing a forester with local expertise to assess the value of any timber to be cut, with 100 percent compensation to the landowner;
- providing drawings of and Global Positioning System coordinates for all tile lines crossed during construction to IDOA and the respective landowner;
- removing rock greater than 3 inches from upper 42 inches of soil (including topsoil and exposed subsoil); and
- implementing all mitigation actions within 45 days following construction, or as specified within the AIMA.

Additional discussion of the Project's AIMA is provided in EA sections B.1.2 and B.5.

Residential Areas

Spire has identified all residences and associated structures within 50 feet of any construction workspace and would implement mitigation measures, in accordance with the Plan, to minimize impacts on these houses and the residents, including topsoil segregation. After construction, final grading would be would be conducted within 10 days of backfilling the trench. All turf, ornamental shrubs, and specialized landscaping would be restored in accordance with landowner easement. See section B.5.2 for further information on residential areas.

Foreign Utility Crossing

The pipeline would cross 168 foreign utilities or pipelines, 93 of which are existing overhead electric utilities (see appendix H). Prior to construction, Spire would utilize the respective states' One-Call system to locate known utilities, and would identify the precise location of each foreign line prior to excavation using probes or handheld devices. Spire would also scan the right-of-way with electronic locating equipment to identify unknown foreign pipelines prior to grading. Spire would give each operator adequate notice so that they could be present during construction around their utility lines. If foreign utilities are accidentally damaged during construction, Spire would stop work and evacuate the immediate area. To aid in immediate response in the event of accidental damage, Spire would coordinate with the utility company on the timing of construction so that the utility company could have a representative on site during excavation.

Steep Slope and Side Slope Construction

The majority of the Project (83.7 percent) would be located on agricultural land, which generally consists of relatively flat land or gentle rolling hills. However, steep slopes are present along the bluffs near the proposed crossing of the Mississippi River. These areas can be susceptible to landslides, or slips, during construction following trench backfill (see section B.1.1). In these areas, Spire would use the two-tone construction technique, which involves grading activities to remove the upslope side of the construction right-of-way to then be used to fill the downslope side of the construction right-of-way to create a safe and level surface for travel lanes and equipment operation. Potential impacts associated with steep slopes and rugged terrain, as well as associated mitigation measures, are further discussed in section B.1.1.

Winter Construction

Based on Spire's anticipated schedule, construction of the Project would overlap the 2018 winter season. Therefore, Spire has developed its Winter Construction Plan which includes specialized methods and procedures to protect resources during the winter season in accordance with the Plan and Procedures. These measures would include methods of snow handling and removal; snow removal would be limited to construction work areas. Spire would establish gaps in topsoil piles to facilitate drainage of melting snow across the right-of-way. If inclement weather prohibits replacement of topsoil immediately following construction, Spire would stabilize topsoil piles (e.g., mulching and erosion controls) until weather conditions improve. As discussed in section B.1.2, when final cleanup would be prevented by winter snowfall, Spire would implement measures to temporarily stabilize the right-of-way and avoid erosion until spring thaw conditions. In addition, Spire has stated that it would also develop a Project-specific Stormwater Pollution Prevention Plan prior to construction.

8.3 Aboveground Facility Construction Procedures

Aboveground facilities would be constructed in accordance with the Plan and Procedures, as well as federal and state approvals, as applicable. Generally, construction of new aboveground facilities would begin with clearing and grading of the construction workspace, and excavation would be conducted where necessary to accommodate new foundations. Subsequent activities would include preparing foundations, installing underground piping, installing aboveground piping and machinery, testing the piping and control equipment, and cleaning and stabilizing the work area. Aboveground facilities would be fenced, and for areas in and around buildings, meters, piping, and associated equipment would be covered with crushed rock or similar material. Any areas not covered with rock or paving would be seeded with a grass seed mixture and would be maintained as herbaceous cover. The short segments of buried piping between the pigging facilities and the corresponding meter stations would be constructed and restored in the same way as described for the pipeline.

8.4 Environmental Compliance Inspection and Monitoring

Prior to construction, Spire would conduct environmental training for construction personnel. Construction contractors typically receive environmental training applicable to their job duties and construction management and the environmental inspectors (EI) receive all Project-specific information. The training program would focus on the Plan and Procedures; Project-specific Certificate and other permit conditions; regulatory requirements, such as those pertaining to endangered species, cultural resources, or wetlands; and other Project-specific mitigation plans such as the Project's AIMA.

During construction Spire would employ a Chief Construction Inspector, Craft Inspectors, and at least one EI per spread. The EI would report directly to the Chief Construction Inspector; EI responsibilities would include monitoring compliance with environmental measures required by the Project-specific Certificate and other permit conditions; documenting compliance with environmental requirements; and identifying and overseeing corrective actions where necessary. The EI would have the authority to stop activities that violate the Project's environmental conditions and to order appropriate corrective action.

According to the terms of the Project's AIMA, Spire would hire an agricultural inspector for each construction spread in Illinois. The agricultural inspector would work with the other on-site staff, including the EI, and train staff on the terms of the Project's AIMA. The inspector would also serve as a liaison between landowners and Spire to address site-specific issues that may arise during construction. See sections B.1.2 and B.5.1 of this EA for additional detail on the role of the agricultural inspector and the Project's AIMA.

Spire would conduct post-construction monitoring to document restoration and revegetation of the right-of-way and other disturbed areas. Spire would monitor wetlands annually until revegetation is successful in accordance with the Procedures. Spire would monitor upland areas after the first and second growing seasons following restoration or until revegetation is successful in accordance with the Plan. Spire would also file quarterly monitoring reports with the FERC to document the status of revegetation in disturbed areas. These reports would describe the results of post-construction inspections, any problem areas, and corrective actions taken. Monitoring would cease if an area meets performance standards at the end of the second year (or in any subsequent year). Within 3 years of construction, Spire would file with a FERC a wetland revegetation monitoring report. Spire would continue to file wetland revegetation monitoring reports on an annual basis thereafter until revegetation efforts are considered successful.

In addition, the FERC staff would inspect the Project throughout construction to independently verify compliance with the Commission's order. The FERC staff would continue to monitor and inspect the vegetation along the Project route until restoration and revegetation are deemed successful.

8.5 Operations and Maintenance

Spire would operate and maintain the new pipeline and aboveground facilities in accordance with all applicable federal and state regulations, including 49 CFR 192. Spire would periodically inspect the pipeline from the air and/or ground, in accordance with applicable regulatory requirements, to identify potential concerns that may affect the safety and operation of the pipeline. If pipeline patrols or vegetation maintenance identify areas on the right-of-way where erosion is occurring, Spire would repair existing erosion control devices or install additional devices as necessary (including vegetation) to stabilize the area and prevent future erosion, throughout the life of the Project.

To maintain accessibility to the right-of-way and accommodate pipeline integrity surveys, vegetation along the permanent pipeline right-of-way would be cleared periodically, using mechanical mowing or cutting where necessary, and in accordance with the Plan. Spire would not conduct routine vegetation maintenance in upland areas more frequently than every 3 years, with the exception of a 10-foot-wide corridor centered on the pipeline that Spire would maintain in an herbaceous state to allow for periodic corrosion and leak surveys. In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year to minimize potential impacts on migratory birds during operation of the pipeline facilities. Routine maintenance would not be conducted between HDD entry and exit points.

Active cropland would be allowed to revert to pre-construction use for the full width of the right-of-way. In non-cultivated upland areas, routine vegetation maintenance clearing would be done in accordance with the Plan. In wetlands, a 10-foot-wide corridor centered over the pipeline could be maintained in an herbaceous state, and trees within 15 feet of the pipeline with roots that may compromise the pipeline integrity may be selectively cut and removed from the right-of-way.

Spire would also perform regular operation and maintenance activities on equipment at the pigging facilities and meter stations. These activities would include calibration, inspection, and scheduled routine maintenance. Operational testing would be performed on safety equipment to ensure proper functioning, and problems would be corrected.

9. Non-jurisdictional Facilities

Under Section 7 of the NGA and as part of its decision regarding whether or not to approve the facilities under its jurisdiction, the Commission is required to consider all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the FERC. These non-jurisdictional facilities may be integral to a project (for instance, a natural gas-fueled power plant at the end of a jurisdictional pipeline) or they may be minor, non-integral components of the jurisdictional facilities that would be constructed and operated because of a project.

Although no non-jurisdictional facilities have been identified for the proposed Project, Spire anticipates that the REX Receipt Station and Laclede/Lange Delivery Station would require a transformer, power pole(s), and a meter base from the respective electric company(ies). These new facilities would be similar to the existing structures located adjacent to the station sites and would be small, requiring less than 0.5 acre.

10. Permits and Approvals

Table A-7 provides a list of the major federal and state permits related to construction and operation of the Project. Spire would also apply for county and local permits associated with road, railroad, utility, and driveway crossings, as well as floodplain, building, and zoning permits. Spire would seek to obtain all applicable permits and approvals prior to construction and operation of the Project, regardless of whether they appear in the table.

Table A-7
Environmental Permits, Approvals, and Consultations for the Spire STL Pipeline Project

Administering Agency	Permit / Approval / Consultation	Status
Federal		
FERC	Certificate of Public Convenience and Necessity	Application submitted January 2017; Amended application submitted April 2017
USACE – St. Louis District	CWA, Section 404, Section 10, Nationwide Permit (NWP) 12	Application submitted January 2017; Addendums submitted April and July 2017
	Real Estate Agreement	Submitted January 2017
USACE – Kansas City District	Section 408	Application submitted January 2017
USFWS – Rock Island Field Office	The Endangered Species Act (ESA) of 1973, Section 7 Consultation Migratory Bird Treaty Act (MBTA) Consultation Bald and Golden Eagle Protection Act Consultation	Initial consultation submitted June 2016
USFWS – Columbia Field Office	The ESA of 1973, Section 7 Consultation MBTA Consultation Bald and Golden Eagle Protection Act Consultation	Rock Island Field Office is taking the lead

Table A-7 (continued) Environmental Permits, Approvals, and Consultations for the Spire STL Pipeline Project		
Administering Agency	**Permit / Approval / Consultation**	**Status**
U.S. Department of Agriculture	Conservation Reserve Program	Initial consultation occurred in August 2016
State		
Illinois		
IDOA	Project-specific AIMA	Fully Executed Project AIMA, April 2017
IL Department of Natural Resources	Statewide Permit #6 State Species Consultation Incidental Take Authorization	Consultation initiated June 2016; Initial consultation submitted June 2016; Anticipated submittal November 2017
IL Environmental Protection Agency	401 Water Quality Certification State Operating Permit for Wastewater Discharges National Pollutant Discharge Elimination System Permit Sections 404 and 10; automatic authorization under NWP-12	Application submitted January 2017; Anticipated submitted first quarter 2018; Consultation initiated August 2016 Submitted April 2017 and July 2017
IL Historic Preservation Agency – State Historic Preservation Office (SHPO)	Section 106 of the National Historic Preservation Act (NHPA) Consultation	Initial consultation submitted to SHPO June 2016; Initial Phase I Survey Report submitted January 2017; Addendum reports submitted April and July 2017; Phase II reports submitted July 2017
Missouri		
MO Department of Natural Resources	401 Water Quality Certification Hydrostatic Discharge Permit / Water Withdrawal Registration	Submitted April 2017; Anticipated submitted October 2017
MO Department of Conservation	State Listed Species Consultation Special Use Permit	Submitted June 2016; Anticipated October 2017
MO SHPO	Section 106 of the NHPA Consultation	Initial consultation submitted to SHPO June 2016; Initial Phase I Survey Reports submitted in January 2017; Addendum reports submitted April and July 2017; Phase II report submitted April 2017
Consolidated North County Levee District	Letter of Endorsement	Anticipated endorsement January 2018

B. ENVIRONMENTAL ANALYSIS

Construction and operation of the Spire STL Pipeline Project would have temporary, short-term, long-term, and permanent impacts. As discussed throughout this EA, temporary impacts are defined as occurring only during the construction phase. Short-term impacts are defined as lasting up to 3 years. Long-term impacts would eventually recover, but require more than 3 years. Permanent impacts are defined as lasting throughout the life of the Project.

1. Geology and Soils

1.1 Geology

Physiographic Setting and Geologic Conditions

The Project facilities would be located in the Central Lowland Province, Till Plains, and Dissected Till Plains Sections (U.S. Department of the Interior-National Parks Service [USDOI-NPS] 2017). The Central Lowland Province extends from western New York to North Dakota and south to Texas. The province is bounded by higher relief, with elevations around 2,000 feet or less and is characterized by flat land with geomorphic remnants of glaciation (USDOI-NPS 2017).

Areas of the proposed Project in Illinois are within the Till Plains Section of the Central Lowland Province, which is characterized by level to gently rolling till plain with broad bottomland and associated terraces and is overlain by a series of low, undulating ridges (glacial end moraines). Elevation in this section ranges from 600 to 1,000 feet, with local relief dominantly between 3 and 100 feet (U.S. Department of Agriculture-Forest Service [USDA-FS] 2017). The section is covered by Pleistocene till and stratified drift up to 400 feet thick overlying bedrock composed of lower Mississippian limestones, shales, and sandstones. Bedrock in this section is well exposed on upland areas between the lower Illinois River and Mississippi's floodplain, and in the bluffs overlooking the rivers. Farther north, Silurian and Devonian carbonates crop out along the floodplain margins, and Mississippian and Pennsylvanian limestones, siltstones, and sandstones are exposed in erosional windows through the till along the Wabash and its major tributaries (USDA-FS 2017).

Areas of the proposed Project from the Mississippi River into Missouri are within the Dissected Till Plains section of the Central Lowland Province, which is characterized by moderately dissected, glaciated, flat to rolling plains that slope gently toward the Missouri and Mississippi River valleys (USDA-FS 2017). Local relief in this section is 20 to 165 feet with elevations ranging from 600 to 1,500 feet. Quaternary loess, up to 25 feet thick, mantles most upland areas and is underlain by Pleistocene till and stratified drift up to 300 feet deep. Up to 150 feet of unconsolidated Tertiary and Quaternary alluvium (gravel, sand, silt, and clay) overlie bedrock in the Mississippi and Missouri floodplains. Pennsylvanian shale, limestone, and minor coal underlie most of the Dissected Till Plains with Mississippian, Devonian, and Ordovician shale. Carbonate bedrock underlies the areas to the east and south. Bedrock is exposed locally along deeper drainages and in erosional windows in unconsolidated surficial material (USDA-FS 2017).

Geotechnical investigations in the Project area around the Mississippi and Missouri Rivers indicate that general lithology in these areas consists of fine-grained silts and clays underlain by poorly-graded sands overlying limestone and mudstone bedrock with minor components of sandstone, shale, and siltstone throughout. The top of bedrock depth ranges from 24 to 133 feet below ground surface.

Paleontological Resources

Paleontological resources are the fossilized remains of prehistoric plants and animals, as well as the impressions remaining in rock or other materials. The proposed Project in Illinois is atop the Lower and Middle Valmeyeran Series and the Carbondale Formation, which consist primarily of sedimentary rock form the Carboniferous Period (USGS 2017a). Although the proposed Project's crossing of Mississippian and Pennsylvanian epoch rock would have the potential to encounter paleontological resources in the form of prehistoric aquatic organisms; there are no known paleontological sites crossed by the Project (Illinois State Geology Survey [ISGS] 2017a; The Paleontology Portal 2017a). Approximately 1 mile east of the Project, a woolly mammoth fossil was discovered on the campus of Principia College (Principia News 2013). The section of the Project in Missouri is topped with Holocene alluvium deposits, and underlain by the Meramecian Series, and the Cherokee Group, which are geologic formations that consist primarily of sedimentary rock from the Carboniferous Period (USGS 2017a).

In Missouri, the Project would have the potential to encounter paleontological resources in the form of brachiopods, bryozoans, and trilobite parts, near the portions of the Project in St. Louis County (The Paleontology Portal 2017b). In the event of a potential paleontological find, Spire would follow applicable regulations and coordinate with the appropriate state agencies and the landowner. Therefore, we conclude the Project would not adversely affect paleontological resources.

Mineral Resources

Sand, gravel, and limestone are the principal mineral resources mined in the Project area. The Project would not cross any active surface mines or quarries. According to the MDNR, the nearest active aggregate mines are located 100 feet southeast of MP 58.4 and 0.5 mile southeast of MP 58.5 (MDNR 2017a). An abandoned clay mine was identified within the proposed construction work area at MP 0.0. Based on review of aerial photography, remnants of the clay mine at MP 0.0 are not apparent, while operations at the mines located near MPs 58.4 and 58.5 are still active with a large apparent settling pond located east of the Project. Construction and operation of the Project would limit access to aggregate resources within the permanent right-of-way; however, Spire has consulted with representatives of Central Stone (operators of the quarry near MPs 58.4 and 58.5), and reports that the quarry has no plans to expand in the foreseeable future.

The primary minerals produced in Illinois include coal reserves and crude oil (U.S. Energy Information Administration [USEIA] 2016a). No planned mines or mine expansions are in the vicinity of the Project. The narrow construction footprint and shallow excavation for the Project would have minimal impacts on oil and/or gas recovery. Therefore, we conclude the Project would have permanent but minimal effect on present and/or future extraction of nearby mineral resources.

Coal Resources

Information regarding coal mining activities and locations in the Project area was obtained from the ISGS and MDNR. The Project would not affect any known active or inactive coal resources. Coal underlies two-thirds of the state of Illinois and is the most important mined product in the state, accounting for 5 percent of U.S. coal production (USEIA 2016a). Coal production in Missouri only equals about 1 percent of the coal consumed in the state (USEIA 2016b). No active coal mines or mine permits were identified along the Project and no inactive/abandoned coal mines were identified within 0.25 mile of the Project in Missouri (ISGS 2017a; MDNR 2014a-c). An abandoned coal slope (886 feet northeast of MP 0.0) in Illinois and a coal strip mine (1,035 feet northwest MP 0.0) in Missouri were identified within 0.25 mile of the Project (ISGS 2017b and c; 2014a-c).

Oil and Natural Gas Resources

The Project would have minimal effects on active or inactive oil and/or natural gas resources. Based on data from MDNR and ISGS's Geographic Information Systems Mapping Services, four active oil and/or gas wells were identified within 0.25 mile of the Project (MDNR 2014d). Two of the four are 1,080 and 1,091 feet west of the proposed pipeline near MP 57.1, the third is 196 feet south of MP 58.3, and the fourth is 534 feet northwest of MP 58.8. A total of 23 additional wells were identified within 0.25 mile of the Project with an unknown or plugged/abandoned status. No resources were identified within the areas of the REX Receipt Station, Laclede/Lange Delivery Station, or the Chain of Rocks Station. No new wells are under construction in the Missouri counties crossed by the Project, and the last recorded active wells in St. Charles and St. Louis Counties were drilled in 1975 and 2012, respectively (MDNR 2017b). Oil production is prominent in the Illinois Basin, which covers portions of Illinois, Indiana, and Kentucky with approximately 800 drilling permits issued each year (ISGS 2017d; Illinois Department of Natural Resources [IDNR] 2017a). Spire would field verify the location of all existing wells prior to construction and would coordinate with well operators and landowners to avoid impacts on wells within the Project workspace. In the event an orphan well is discovered during construction, Spire would have the well pre-inspected by a professional and complete a post-construction inspection to verify no damage occurred to the well. Also, Spire would minimize traffic and vibrations in the area of an orphan well to minimize disturbance of the well, as needed.

Illinois has 28 natural gas storage fields within the state and is second in the United States in total natural gas storage capacity (USEIA 2016a). According to USEIA field level storage data, one natural gas storage facility was identified in St. Louis County. The storage facility is owned by Laclede Gas Company (Laclede) and is used to store off-season gas supplies for use during peak-season demand. No facilities were identified in the counties crossed by the Project in Illinois (USEIA 2015). The narrow construction footprint and shallow excavation for the Project would have minimal impacts on oil and/or gas recovery and storage.

Geologic Hazards and Impact Mitigation

Geologic hazards are natural physical conditions that, when active, can result in damage to land and structures, or injury to people. Potential geologic hazards can be related to seismic activities, such as earthquakes and fault rupture. Other potential geologic hazards may include soil liquefaction, landslides, and subsidence. The Project pipeline alignments were evaluated with respect to those geologic processes that have a potential for occurrence in the Project area.

Seismicity, Ground Rupture, and Soil Liquefaction

The Spire STL Pipeline Project would be constructed within a region of relatively low historical earthquake activity. A review of earthquakes over the last 50 years identified one event within 50 miles of the Project. This event registered a magnitude of 1.5 on the Mercalli Intensity Scale. An event of that size is typically not felt or rarely felt (USGS 2017b and c). According to the ground shaking intensity maps from the USGS, the Project would be in an area ranging from IV (light, felt indoors by many, outdoors by few) to V (moderate, felt indoors by most, outdoors by many) in Modified Mercalli Intensity (USGS 2017d).

The horizontal force a structure must withstand during an earthquake is related to ground acceleration, and seismic hazards can be assessed based on peak ground acceleration (PGA). PGA is the maximum acceleration experienced by a particle during an earthquake. The USGS produces ground motion hazard maps at a given level of probability to exceed PGA values. PGA values are represented as a factor of "g." The factor "g" is equal to the acceleration of a falling object due to gravity. For buried pipelines, the design operational earthquake is considered to be the PGA associated with a 10 percent probability of exceedance in 50 years; and for aboveground structures, it is considered to be the PGA associated with a 2 percent probability of exceedance in 50 years. A review of the Project area on the USGS's Seismic Hazard Maps (USGS 2014a) indicates that there would be a 2 percent probability of a 10 to 30 percent "g" exceedance in 50 years; and that there is a 10 percent probability of a 3 to 10 percent "g" exceedance in 50 years. A 10 to 30 percent PGA is characterized as moderate to very strong ground shaking with very light to moderate potential for damage; a 3 to 10 percent PGA is associated with light to moderate ground shaking with no to very light potential for damage (USGS 2017e).

In addition, according to the USGS Quaternary Fold and Fault database, no Quaternary-Period faults would be crossed or encountered by the Project (USGS 2014b). These data show that the Project would not be considered at risk from active seismicity or surficial ground rupture. Soil liquefaction occurs when loose (low density or uncompacted) sandy, water-saturated soils temporarily lose their strength and liquefy by strong ground-shaking due to earthquakes or other rapid loading. Based on a study conducted in 2008 concluding that liquefaction potential at 2 percent probability of exceedance in 50 years is sufficient to anticipate liquefaction, Project facilities located between the Mississippi River, Missouri River, Coldwater Creek, and other tributary crossings would be susceptible to liquefaction (Pearce *et al.* 2008). Spire would design and construct the pipeline and associated facilities to withstand seismic events and ground shaking should they occur. All proposed pipeline facilities would be constructed to meet or exceed federal standards including DOT regulations (49 CFR 192), and would be constructed in accordance with International Building Code 2012 (Chapter 16 and Section 1613) and American Society of Civil Engineers 7-10, Minimum Design Loads for Buildings and Other Structures.

Landslides

Landslides involve the downslope mass movement of soil, rock, or a combination of materials on an unstable slope. The proposed Project would be within an area consisting primarily of relatively flat or gently rolling topography. Landslide incidence and susceptibility mapping compiled by the USGS of the Project area show that landslide incidence for the majority of the pipeline is considered low. Along the proposed pipeline route, one area (between MPs 40.0 and 45.1) was identified as high susceptibility with low to moderate incidence and another area (between MPs 46.0 and NCE 6.0) was identified as moderate susceptibility with low incidence. In areas with steep slopes, soils may be unstable and present erosion management problems when disturbed, often requiring various erosion and sediment control measures during pipeline construction and operation. Landslide incidences may be more frequent in these areas of steep slopes. Steep slopes may be encountered during construction in Illinois at the bluffs near the Mississippi River, and stream valley slopes in Scott County, Illinois.

Where possible, Spire has routed the pipeline to avoid steep slopes, and would follow special procedures for slope construction in areas of steep slope with a risk of landslide. At the bluffs near the Mississippi River, Spire would install the pipeline in a southwest direction, opposite to the steep slope, and install temporary conductor casing at the HDD pit at MP 45.0 to support the soils and stabilize the borehole. Side-slope construction would be minimized in these areas, and temporary erosion control measures may be installed closer together with more frequent maintenance until permanent erosion controls are established. In addition, Spire would conduct routine inspections of slopes in areas with high susceptibility for landslide to identify signs of distress and development of head scarps. Mitigation measures such as diverting water by installing swales or water bars could be used in areas of observed distress. Additional mitigation could include relieving drainage with the installation of drainage materials or re-grading, if necessary. Spire has committed to develop a site-specific plan to address steep slope construction and landslide hazards associated with the bluffs near the Mississippi River. Since this plan has not yet been finalized, **we recommend that:**

- **<u>Prior to construction</u>, Spire should file with the Secretary of the Commission (Secretary), for review and written approval of the Director of the Office of Energy Projects (OEP), its site-specific steep slope and landslide hazard assessment plan for the bluffs near the Mississippi River crossing.**

Following construction, slopes would be returned to their original contours and vegetation would be reestablished in accordance with the Plan and Procedures. Therefore, we conclude that the Project would not increase the risk of landslides.

Land Subsidence and Karst Terrain

Ground subsidence is a lowering of the land surface elevation that results from changes that take place underground. Subsidence can range from small, localized areas of collapse to a broad, regional lowering of the ground surface. Common causes of land subsidence include the dissolution of limestone in areas of karst terrain and the collapse of underground mines. Subsidence could also be caused by the pumping of water, oil, and gas from underground reservoirs.

Karst

Karst features such as sinkholes, caves, and caverns form as a result of long-term dissolution of soluble bedrock such as carbonate rocks including limestone, dolomite, and gypsum, creating a potential for pipelines constructed through karst terrain to become unsupported. Sinkholes may develop from the raveling of soils over the carbonate bedrock into solution channels within the bedrock mass (Smith and Sinn 2013). Raveling is the process by which water transports soil particles downward into cavities in the underlying bedrock. According to the USGS, the Project area is underlain by soluble rock with the potential for development of karst or pseudokarst. The Middle and Lower Valmeyeran Series, located in the Project area, are identified as carbonate rock buried under less than 50 feet of glacially derived insoluble sediments in a humid climate (USGS 2014c). Sixteen karst features and/or sink areas were identified within 1,500 feet of the Project. To date, field surveys conducted by Spire have confirmed the two sink areas at NCE MP 1.6 (about 1.3 feet north of the Project) and NCE MP 2.0 (proposed to be crossed by HDD). Additional karst features identified between MPs 43.9 and 44.1 will be field verified by Spire once landowner permissions have been obtained.

Spire would implement its Karst Mitigation Plan to ensure appropriate measures are taken for construction in karst formations. As part of the plan, Spire would conduct route surveillance during construction and operation of the facilities to monitor for indicators of sinkhole formation. In the event an unanticipated karst feature is discovered during construction activities, work would be stopped immediately and the discovery communicated to Spire and contractor supervisors. Erosion and sediment controls would be modified to minimize the potential for surface water runoff intrusion into the karst feature until the designated geotechnical engineer can develop specific design and mitigation measures depending on the conditions and nature of the karst feature. If karst mitigation is required, Spire would notify and coordinate with applicable agencies as mentioned in its plan to ensure agency reviews or approvals are acquired. In addition, the Class 1 pipe specified for the pipeline is capable of spanning a 25-foot-wide void with continued safe operation. In the event a karst feature is encountered that is greater than 25 feet wide, Spire would consider engineering options and/or adjust the route within 300 feet of the study corridor to an area where the void could be spanned safely by the pipeline. Any such adjustments would be subject to FERC review and approval.

Crossing karst terrain using the HDD method poses a risk for the loss of drilling fluids into nearby waterbodies. Due to the identification of karst terrain along the Project route, Spire conducted a subsurface investigation to determine feasibility of the Mississippi and Missouri Rivers and Coldwater Creek crossings by HDD. The investigations included exploratory soil borings and material laboratory testing to gather geotechnical information to determine the subsurface lithology at the HDD crossings and to characterize the depth of the bedrock along the proposed HDD bore paths.

The results of the Mississippi and Missouri River investigations determined that HDD construction is feasible, with minimum chance for a release of drilling fluids. The subsurface material is generally fine-grained silts and clays underlain by poorly-graded sands overlaying limestone and mudstone bedrock with minor sandstone, shale and siltstones throughout. Overall the rock material was described as fresh to moderately weathered with weak to medium strong properties. Depth to bedrock at these crossings ranged from 24 to 133 feet below ground surface.

The results of the Coldwater Creek investigation determined that the subsurface material was generally silts and clays overlaying limestone and mudstone bedrock. A desktop review of karst in the area identified two mapped sinkholes near the location of the Coldwater Creek HDD crossing. Limestone bedrock was encountered at 38.5 and 52 feet below ground surface with voids noted from 0.3 to 8 feet in size during drilling. Voids encountered during drilling could indicate karst conditions in the area of the proposed Coldwater Creek and Spanish Lake Park HDD crossings and may increase the potential for inadvertent release of drilling fluid. The geotechnical investigations provided by Spire indicate the results may not be representative of the subsurface conditions in this area. Due to the fact that the extent of karst features is not fully characterized in this area, **we recommend that:**

- **<u>Prior to construction</u> Spire should file with the Secretary, for review and written approval of the Director of OEP, additional geotechnical investigations at the Coldwater Creek and Spanish Lake Park HDD crossings to determine the presence and extent of potential karst features and whether an HDD is expected to be successful.**

In the event of an inadvertent release of drilling fluid, Spire would implement measures in its HDD Plan which details how drilling mud would be contained and cleaned up. Potential impacts on groundwater and further mitigation measures are described in section B.2.1.

Although there is potential for karst features to be discovered within the Project area, the occurrence of subsidence in the Project area due to karst features would be minimized by the implementation of mitigation measures identified in Spire's Karst Mitigation Plan.

Mines

As discussed above, no active coal mines were identified along the Project and no inactive/abandoned coal mines were identified within 0.25 mile of the Project in Missouri. An abandoned coal slope (886 feet northeast of MP 0.0) and coal strip mine (1,035 feet northwest of MP 0.0) were identified within 0.25 mile of the Project in Illinois (ISGS 2017a and b; 2014a-c). According to the MDNR, the lack of former mining districts suggests that collapse potential is unlikely in the Project area. Based on the distance of these abandoned mines from the Project and the lack of former mining districts in the area, there is minimal potential for land subsidence to mine collapse in the Project area.

Flash Flooding

Bank erosion and/or scour from flash flooding could result in exposure of the pipeline or cause the pipeline to become unsupported. All pipeline facilities are required to be constructed in accordance with 49 CFR 192. Portions of the Mainline would be constructed within the 100-year Federal Emergency Management Agency (FEMA) floodplain of Apple Creek, Macoupin Creek, Mississippi River, Missouri River, and tributaries of the Missouri River; however, construction would not result in any permanent fill in the floodplains. Portions of the North County Extension would be installed within the Coldwater Creek 100-year FEMA floodplain but would not result in any permanent fill of the floodplain.

To prevent bank erosion and/or scour, Spire would install a minimum depth of cover of 5 feet (2 feet in areas on consolidated rock), and 7 feet within in the floodplains of the Mississippi and Missouri Rivers. At a minimum, Spire would implement erosion and sediment control techniques in accordance with the Plan. Temporary slope breakers, trench plugs, sediment, and/or mulch would be used during construction to minimize erosion impacts. Following construction, temporary erosion controls would be maintained or reinstated until permanent erosion control devices are established or restoration is completed. In addition, MLV 3 and Project facilities to be installed at Enable MRT's existing facility in St. Louis County would be constructed within a 100-year FEMA floodplain. A small area (less than 0.1 acre) of the floodplain within Chain of Rocks Station would be fenced and permanently graveled within the Laclede right-of-way. Spire would design the facilities to minimize impacts from high velocity flows. The potential for scour at waterbodies that would be crossed using open-cut methods and the impact on designated floodways are discussed in section B.2.2.

Blasting

Blasting is sometimes required for pipeline projects in areas with shallow bedrock. Since shallow bedrock is not anticipated to be encountered along the Project route, blasting is currently not proposed for the Project. Spire plans break apart large stones or bedrock using mechanical rock trenching methods such as excavation with a backhoe, pneumatic rock hammering, or ripping. In the event that blasting becomes necessary, Spire would implement its Project-specific Blasting Plan to minimize the effects of blasting and mitigate any impact caused by blasting. Spire has developed its plan because site-specific conditions at certain locations may interfere with conventional rock-trenching methods. These areas include the Limestone-Lacrescent Complex in Jersey County, Illinois (MP 44.9 to 45.0) and an area of a rock quarry in St. Louis County, Missouri (MP 58.3 to 58.6). Any blasting activities that may be required during construction would comply with applicable federal, state, and local requirements.

In the unlikely event that blasting is required, Spire would implement mitigation measures identified in its Blasting Plan. We have reviewed the Blasting Plan and find it acceptable.

We conclude that Project impacts by blasting on nearby resources would be minor and temporary; and, given the conditions in the Project area, impacts on geologic resources are not anticipated.

1.2 Soils and Designated Farmland

Soil information and tables for the proposed Project were developed using the USDA's NRCS Soil Survey Geographic Database (USDA-NRCS 2015a and b). The proposed Project is within the Central Mississippi Valley Wooded Slopes, Northern and Western Part Major Land Resource Area. This area consists mainly of loess covered hills bordering the floodplains of the Mississippi and Missouri Rivers and several loess mantled karst plains. The dominant soil orders in this area are comprised of Alfisols, Entisols, Inceptisols, and Mollisols. These soil types are very shallow to very deep, poorly drained to excessively drained, and loamy, silty, or clayey (USDA-NRCS 2006). Soils in the Project area are formed in loess on upland areas, till or paleosols along streams and upland drainage ways, bedrock residuum, and colluvium on upland areas, Cretaceous deposits, and alluvium on floodplains. Potential impacts on soils from the Project are generally associated with soil limitations and certain soil characteristics, as described below.

<u>Soil Limitations</u>

Soils were grouped and evaluated according to the characteristics that could affect construction or increase the potential for soil impacts during construction. These characteristics include prime farmland, compaction prone and hydric soils, highly erodible soils, and the presence of stones and shallow bedrock. Additional soil-related issues considered in the analysis include revegetation and soil contamination (see table B-1).

Prime Farmland and Farmland of Statewide Importance

The USDA-NRCS defines prime farmland as land that has the best combination of physical and chemical characteristics for growing food, feed, forage, fiber, and oilseed crops (USDA-NRCS 2015a and b). This designation includes cultivated land, pasture, woodland, or other land that is either used for food or fiber crops, or is available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating) (USDA-NRCS 2015c). About 63.7 percent of land potentially affected by the Project is classified as prime, unique, or locally important farmland (see table B-1).

Table B-1
Soil Characteristics and Limitations for the Spire STL Pipeline Project (acres)[a]

Facility	Prime Farmland or Farmland of Statewide Importance[b]	High Compaction Potential / Hydric Soils[c,d]	Highly Water Erodible[e]	Low Revegetation Potential[f]
Pipeline and additional temporary workspace[g]	588.9	202.4	94.7	249.7
Aboveground facilities[h]	14.0	5.1	3.8	7.8
Cathodic protection groundbed	2.2	0.0	0.0	0.4
Staging areas	27.1	2.9	14.7	14.9
Access roads[i]	7.8	2.6	0.6	6.3
Percent of Project area[j]	63.7	21.2	11.3	27.8

a Total acreage does not equal the total impact acreage for the Project as not all soils are classified with limitations and certain soils are classified as having multiple limitations.

b Prime farmland includes soils designated by the USDA-NRCS if drained and / or reclaimed of excess salts and sodium.

c Soils categorized as compaction prone include soils with clay loam or finer texture and a drainage class of poor, somewhat poor, and very poor. All soils represented in this category are hydric, but may not have a high compaction potential.

d Hydric soils included soils classified by the USDA-NRCS as being partially hydric and hydric.

e Water erodible soils included soils with a K factor of "High".

f Soils with low revegetation potential included soils with a capability class of three or greater, a low water capacity, and a slope greater than 8 percent.

g Totals include permanent and temporary impacts associated with the Project (ATWS, temporary workspace, and permanent easement). While no ground disturbance would be required between HDD entry and exit points, the area within the proposed 50-foot-wide permanent right-of-way is included in these acreage totals.

h Totals include the aboveground facilities for the Project (including the REX Receipt Station, Laclede / Lange Delivery Station, and Chain of Rocks Station).

i Totals include all temporary and permanent access roads for the Project.

j Totals do not equal 100 percent as not all soils are classified with limitations and certain soils are classified as having multiple limitations.

About 13.4 acres of prime farmland and farmland of statewide importance would be permanently converted to non-agricultural use for construction and operation of the REX Receipt Station, Laclede/Lange Delivery Station, and Chain of Rocks Station. In addition, access roads in Scott County would permanently impact 0.1 acre of prime farmland and farmland of statewide importance. Staging areas, temporary workspace, and temporary access roads would temporarily impact 193.5 acres of prime farmland and farmland of statewide importance with no permanent impacts. Spire would compensate landowners for land that would be permanently converted to non-agricultural use. Construction and operation impacts on active agricultural land are further discussed in section B.5.1.

To minimize potential impacts on farmland from construction of the Project, Spire would implement measures outlined in the Plan and the Project's AIMA (in Illinois). Spire consulted with the Missouri Department of Agriculture and determined no agricultural mitigation agreements or special crossing procedures are required for agricultural land in Missouri. Topsoil would be segregated from subsoil in active cropland across the pipeline right-of-way and ATWS. Topsoil would be replaced in the proper order during backfilling and final grading to help ensure post-construction revegetation success. Spire would ensure a minimum of 5 feet of cover in cropland to allow for sufficient depth for landowners to continue farming. Spire would remove excess rock or stone in at least the top 12 inches of soil on agricultural land in Missouri, in addition, all rock greater than 3 inches in diameter would be removed within the upper 42 inches of soil on agricultural land in Illinois (including topsoil and exposed subsoil) such that the size, density, and distribution of remaining rock on the construction work area is similar to adjacent non-disturbed areas. Soil compaction in agricultural areas during construction would be minimized or remediated as discussed below.

Soil Compaction and Hydric Soils

Soil compaction modifies the structure of soil and, as a result, alters its strength and drainage properties. Soil compaction decreases pore space and water-retention capacity, which restricts the transport of air and water to plant roots. As a result, soil productivity and plant growth rates may be reduced, soils may become more susceptible to erosion, and natural drainage patterns may be altered. Consequently, soil compaction is of particular concern in agricultural areas and in areas of hydric soils. The susceptibility of soils to compaction varies based on moisture content, composition, grain size, and density of the soil. Soils that form under conditions of extended saturation, flooding, or ponding during the growing season may develop anaerobic conditions in the upper horizon, and are considered to be hydric (59 FR 16835). Due to extended periods of saturation, hydric soils can be prone to compaction and rutting.

To minimize compaction, Spire would limit off-road traffic to those areas required for construction. Spire would use timber mats within saturated wetlands to minimize compaction and would avoid construction activities during periods of heavy rainfall and snow melt. In addition, Spire would segregate and stockpile topsoil and subsoils during construction, including within HDD pullback workspaces that are actively cultivated. After construction, areas of heavy compaction would be tilled as necessary, and affected areas would be graded and restored to original contours prior to final revegetation. In agricultural and residential areas, decompaction would be conducted with deep tillage to a depth of 18 to 22 inches. Spire would remove any large stones unearthed during decompaction prior to replace topsoil, and care would be taken not to mix topsoil and subsoil during the process.

Soil Erosion

Soil erosion potential is affected by soil characteristics such as texture, grain size, organic content, moisture content, slope of the land, and the type and density of vegetation cover. Soils most susceptible to erosion by water typically have bare or sparse vegetation cover, non-cohesive soil particles (such as silt loam soils in the Project area), low infiltration rates, and are located on moderate to steep slopes. About 11.3 percent of the soils that would be affected by construction of the Project are considered to be highly susceptible to erosion by water (see table B-1); none of the soils are considered to be highly susceptible to erosion by wind. At a minimum, Spire would implement the erosion and sediment control techniques in accordance with the Plan. In accordance with the Project's AIMA (in Illinois), Spire would work with landowners to prevent excessive erosion and determine agreed-upon methods of erosion control along the pipeline right-of-way. Temporary slope breakers, trench plugs, sediment, and/or mulch would be used during construction to minimize erosion impacts. Following construction, temporary erosion and sediment controls would be maintained or reinstated until permanent erosion control devices are established or restoration is completed. In addition, should construction and restoration occur during winter months, Spire's Winter Construction Plan includes guidelines for erosion and sediment controls, such as temporary water bars, additional mulch on slopes (excluding active cropland), sediment barriers, and temporary seeding to areas where topsoil has not yet been replaced.

The USDA's Farm Service Agency administers Highly Erodible Land Conservation provisions aimed at reducing soil loss on land that are prone to erosion. Two such identified parcels would be crossed at MP 22.6 and MP 43.5 in Illinois. Spire is corresponding with the landowners to determine specific vegetation and seeding requirements to prevent soil erosion in these areas.

Shallow Depth to Bedrock

Construction through soils with shallow bedrock (bedrock less than 5 feet from the surface) could result in the incorporation of bedrock fragments into surface soils. Because shallow bedrock is not anticipated to be encountered along the Project route, blasting is not currently anticipated. A contingency for blasting is discussed in section B.1.1, above.

Low Revegetation Potential

Revegetating areas affected by construction of the Project may be more difficult in areas with poor drainage, shallow depth to bedrock, or steep slopes. Additionally, construction activities could affect soil fertility and facilitate the dispersal and establishment of invasive weeds. As shown in table B-1, 27.8 percent of soils that would be affected by Project construction have a low revegetation potential. Soils disturbed by the Project would be revegetated using seed mixes based on site-specific conditions such as soil types, topography, native plant communities, and land use or seed mixes specified by landowners and permitting agencies. In addition to agricultural land, the proposed pipeline route crosses forested upland areas, forested lowland, and non-agricultural meadowland, for which Spire has developed recommended native grass seed mixes in accordance with regional USDA-NRCS technical guidelines. Spire has also developed pollinator seed mixes to be incorporated into native grass seed mixes and an optional cover crop seed mix to be utilized on agricultural land restored between May and August, where requested by the landowner.

Spire would implement the Plan and Procedures and the Project's AIMA, as appropriate, to minimize impacts on soils with revegetation concerns. In accordance with USDA-NRCS guidelines and the Project's AIMA, Spire would apply soil amendments, fertilization, mulching, or other facilitating practices for plant growth to ensure revegetation success. With the exception of agricultural land, seed mixes would be applied at a time that best ensures growth. To minimize the spread of noxious and invasive weeds, Spire would implement its Noxious Weed/Invasive Plant Control and Mitigation Plan (appendix I). The final seed mixes should germinate quickly, effectively control erosion, and provide an environmentally beneficial vegetation cover. In agricultural land and elsewhere, where applicable, segregated topsoil would be replaced after the subsoil to ensure post-construction revegetation success, and soils would be decompacted as described above and as described in the Project's AIMA. In the event that winter construction prevents completion of restoration activities, Spire would implement its Winter Construction Plan, which outlines stabilization and winterization practices for the site prior to spring restoration. Procedures may include disking or tilling the right-of-way to create a seed bed for germination and restoring topsoil after stockpiled topsoil and subsoil have thawed and the ground has dried.

Inadvertent Spills or Discovery of Contaminants

Other potential soil impacts during construction include the accidental release of petroleum hydrocarbons or other hazardous materials, as well as the discovery of existing contaminated soils during trench excavation and grading activities. Soil contamination during construction could result from material spills or trench excavation through pre-existing contaminated areas. Spire researched the Project area to identify potentially contaminated and/or hazardous sites. Current sampling efforts by the USACE's Formerly Utilized Sites Remedial Action Program indicated that sources of contaminants have been removed upstream from the Coldwater Creek crossing. The closest National Priority List Superfund Site identified by the USEPA is the Chemetco Superfund Site about 8.5 miles southeast of MP 58.5. In addition, the West Lake Landfill Superfund Site consisting of several inactive landfills is also approximately 11.5 miles southwest of MP 58.8.

As described in section A.8, prior to construction Spire would implement its SPCC Plan that specifies the spill response and cleanup procedures to be implemented in the event of an inadvertent leak or spill. If contaminated or suspect soils (such as those that are oil stained) are identified during trenching operations, Spire would implement its Unanticipated Discovery of Contamination Plan. Work in the area would be halted until an appropriate plan of action is determined based on the type and extent of contamination and in accordance with local, state, and federal regulations.

Soil Impacts and Mitigation

Spire would implement its Project-specific Plans (e.g., SPCC Plan, Unanticipated Discovery of Contamination Plan, Blasting Plan, Noxious Weed/Invasive Plant Control and Mitigation Plan, AIMA, and Winter Construction Plan), as well as the Plan and Procedures to minimize impacts on soils associated with the Project. Measures to segregate topsoil from subsoil would contribute to post-construction revegetation success, and minimize the loss of crop productivity and the potential for long-term erosion problems. Measures to minimize erosion and reduce or mitigate for soil compaction by Spire would also minimize impacts and contribute to successful restoration of affected soils. We conclude that Spire's adherence to guidance by the IDOA in the Project's AIMA and the Plan and Procedures during construction and restoration would adequately minimize impacts on soils for the proposed Project.

Construction and operation of the aboveground facilities would permanently convert soils to an industrial use. The Project would result in the loss of 13.6 acres of prime farmland and farmland of statewide importance that would be permanently converted to non-agricultural use for aboveground facilities and access roads. Therefore, we conclude that impacts on soils from aboveground facilities and access roads would be permanent, but minor.

2. Water Resources and Wetlands

2.1 Groundwater Resources

Existing Groundwater Resources

Bedrock aquifers that underlie the Project area in Illinois include the Pennsylvanian, Mississippian, Silurian-Devonian, and Cambrian-Ordovician Aquifer Systems (Illinois State Water Survey 2017). Wells completed in the first three of these aquifers yield an average of 10 gallons of water per minute (Lloyd and Lyke 1995). Groundwater withdrawal from the Cambrian-Ordovician Aquifer system is limited to northern Illinois outside of the Project area (Lloyd and Lyke 1995). A system of shallow (surficial) sand and gravel aquifers exists within the unconsolidated geologic materials overlying the bedrock. The total potential yield of sand and gravel aquifers in Illinois is estimated to be 4.8 billion gallons per day (Illinois State Water Survey 2017); the majority of this potential yield is in alluvial deposits that lie directly adjacent to major rivers such as the Illinois, Mississippi, Ohio, and Wabash (Illinois State Water Survey

2017). The most prevalent groundwater quality concern in Illinois is related to the use of fertilizer for agricultural activities (Lloyd and Lyke 1995; Voelker and Clarke 1987).

Bedrock aquifers that underlie the Project area in Missouri include the Mississippian and Ozark Plateau Aquifer Systems (Miller and Appel 1997). These bedrock aquifers mainly contain slightly saline to saline water in northern Missouri, with well yields varying from 10 to more than 1,000 gallons per minute (MDNR 2017c). A system of shallow (surficial) sand and gravel aquifers of glacial and alluvial origin exist within the unconsolidated geologic materials overlying the bedrock. The potential yield of sand and gravel aquifers in Missouri is estimated to be from 500 to more than 2,000 gallons per minute (MDNR 2017d). These surficial aquifers provide the main source of fresh groundwater in the Project area (Miller and Appel 1997). The use of fertilizer and pesticides for agricultural activities is the most prevalent groundwater concern in the Project area; local traces of nutrients and pesticides have been reported in groundwater as a result of the downward migration of irrigation water from agricultural fields (Miller and Appel 1997).

Surficial aquifer systems with groundwater that is locally unconfined, semi-confined, or confined in locations are present at the proposed HDD crossing of the Mississippi and Missouri Rivers. Surficial features at the other HDD locations (Coldwater Creek and Spanish Lake Park) are not expected to act as a productive aquifer as it consists of loess, a fine-grained composition. Below these features, the Mississippian aquifer is confined by a Pennsylvanian shale unit on top and a Pennsylvanian shale unit below (Miller and Appel 1997). Surficial aquifer systems in Illinois are generally less than 100 feet in thickness, and sand and gravel aquifers are typically formed of glacial and alluvial deposits along major rivers (Wehrmann *et al.* 2003). In Missouri, stream-valley aquifer systems range from 90 to 160 feet in thickness, and glacial drift aquifers have depths between 200 and 300 feet.

Designated Sole Source Aquifers

The USEPA defines a sole source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer where there are no reasonably available alternative drinking water sources should the aquifer become contaminated. No sole source aquifers are in the Project area (USEPA 2017a).

Source Water Protection Areas

A Source Water Protection Area (SWPA) is defined as the drainage area around the point where a public water system withdraws water. The proposed Project does not cross any SWPAs or groundwater protection planning regions in Illinois (Illinois Environmental Protection Agency [IEPA] 2017). In Missouri, the, pipeline would cross the 0.5-mile buffer of the Portage Des Sioux Water Plant, which includes a public drinking water supply well. The public well is about 2.5 miles downstream of the proposed HDD crossing of the Mississippi River and approximately 0.2 mile north of ATWS-764 at MP 49.0 of the proposed pipeline. No proposed permanent aboveground facilities are within a SWPA.

Public Water Supply

Spire identified eight private groundwater wells and two wells with unknown use within 150 feet of the Project (see table B-2).

Table B-2
Water Supply Wells Within 150 Feet of Project Construction Work Areas[a]

Approximate Milepost	Water Supply Type	Distance from Construction Work Area (feet)
Pipeline		
9.0	Private well[b]	0.0
9.0	Private well[b]	0.0
13.9	Private well	117
28.7	Private well	123
29.4	Private well	68
36.5	Unknown	126
38.6	Private well	104
NCE 0.0	Unknown	85
NCE 4.0	Private well	45
Access Roads		
24.9	Private well	144

[a] No water supply wells, springs, or seeps were identified within 150 feet of the aboveground facilities.
[b] Based on coordination with the landowner, only one of the wells is in use.

Groundwater Impacts and Mitigation

Construction of the pipeline would generally require the excavation of a trench to allow a minimum of 3 feet of soil cover, but would be between 5 and 7 feet in depth at certain locations, as condition warrant. In areas where the water table is near the surface, groundwater could sustain minor impacts from temporary changes in overland water flow and recharge from trenching, backfilling, and clearing and grading of the right-of-way. Such impacts could include increases in turbidity to the affected groundwater, fluctuations in groundwater levels, and change of flow paths.

Soil compaction from construction could reduce the ability of the soil to absorb water, thereby reducing groundwater recharge. Depth to groundwater at the proposed

HDD locations range from 20-30 feet below ground surface at the Mississippi River (MP 45.0 to 46.2) to 50-70 feet below ground surface at the Missouri River (MP 57.7 to 58.4). While the trenchless HDD crossings are likely to encounter groundwater aquifers, impacts on overall groundwater quality are not anticipated based the small diameter of the borehole and short duration of this construction technique. Additionally, any impacts on groundwater from HDD drilling operations would be minimized by the use of an additive of non-toxic bentonite clay in the drilling fluids, which can act to seal the walls of the borehole and would minimize the amount of drilling fluid released into the surrounding geologic formations and potentially reaching the ground surface.

The presence of karst features near proposed HDD locations could have the potential to affect specific groundwater receptors. Based on the results of geotechnical surveys conducted by Spire identifying karst features, additional effort should be made to verify groundwater is not impacted by the HDD operation. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Spire should file with the Secretary, for review and written approval of the Director of OEP, a Water Resource Identification and Testing Plan for each HDD through karst terrain (for the North County Extension from MP 1.6 to MP 2.2 and MP 3.8 to 4.5). The Water Resource Identification and Testing Plan should include:**

  a. the results of a fracture trace/lineament analysis coupled with the results of existing dye trace studies, if any, showing potential groundwater flow direction from source (drill alignment) to receptors (wells, springs, and waterbodies); and

  b. identification of all water supply wells, springs, and surface water intakes within 1,000 feet down-gradient of each HDD that crosses karst terrain (for the North County Extension from MP 1.6 to MP 2.2 and MP 3.8 to 4.5) and provide the following for each water source identified;

  i) written verification of Spire's offer to conduct, with the landowner's permission, pre- and post-construction water quality and yield monitoring of all karst area water supply wells and springs. Water quality monitoring should consist of the following parameters: oils and greases, volatile organic compounds, turbidity, total and fecal coliform bacteria, total suspended solids; and

  ii) confirmation that Spire will restore or replace all affected karst area water supplies to pre-construction conditions with respect to both quality and yield.

With implementation of the Plan and Procedures and our recommendation, construction, operation, and maintenance of the facilities would not be expected to have significant or long-term impacts on groundwater resources.

An accidental spill of fuel or hazardous materials during refueling or maintenance of construction equipment could also affect groundwater if not cleaned up appropriately. Soils impacted from spills could continue to leach contaminants to groundwater long after the spill has occurred. To minimize the risk of potential fuel or hazardous materials spills, Spire would implement its SPCC Plan, which includes spill prevention measures, reporting protocols, mitigation measures, and cleanup methods to reduce potential impacts should a spill occur. If Spire encounters contaminated soil or groundwater during construction, it would implement the measures in its Unanticipated Discovery of Contamination Plan. Spire would stop work, identify the type and extent of contamination, and develop a response action in adherence to applicable regulations.

Field surveys identified seven private water supply wells and two wells of unknown use within 150 feet of the proposed pipeline and one well within 150 feet of an access road. Two wells were identified at MP 9.0; however, only one is active (the landowner is unsure which one). To date, no water supply wells, seeps, or springs have been identified within 150 feet of the proposed workspace for the meter stations.

Spire would implement its SPCC Plan, which prohibits refueling and storage of hazardous materials within 200 feet of identified active private water wells and 400 feet of public water supply wells. Spire would also offer to conduct pre-construction evaluations of all active wells within 150 feet of work areas and would document which wells were tested, so post-construction tests could be performed as requested by the landowner. In the event that impacts on private wells occur as a result of construction, Spire would provide an alternative water source, repair any permanent damage, or otherwise compensate landowners. Since the landowner of the wells at MP 9.0 does not know which well is active, it is unclear how pre- and post-construction evaluations would be conducted. Further, Spire has not completed identifying water wells and springs within 150 feet of construction workspaces in Illinois and Missouri due to lack of survey access (3.4 miles). Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Spire should file with the Secretary:**

  a. the location of all wells and springs within 150 feet of proposed work areas;

  b. an update on pre-construction testing for the wells at MP 9.0, or documentation that the landowner has opted not to have pre-construction testing;

c. **a description of protective measures of how the wells within the work area would be protected during construction;**

d. **verification that both pre- and post-construction testing has been offered to all landowners with wells within 150 feet of work areas; and**

e. **updated alignment sheets depicting the 200- and 400-foot no refueling areas for applicable wells.**

As discussed in section B.1.1, Spire does not anticipate that blasting would be required in the vicinity of wells, seeps, or springs during construction; however, if shallow bedrock is encountered and is not rippable, drilling and blasting could be used. In consultation with landowners, Spire would conduct pre- and post- blast surveys for water yield and quality of groundwater wells within 200 feet of blasting to identify changes in conditions, and any damages that directly result from blasting would be repaired or replaced.

With implementation of the mitigation measures described above and our recommendation, we conclude that the Project would not result in significant long-term or permanent impacts on groundwater resources in the Project area.

2.2 Surface Water Resources

Existing Surface Water Resources

The Spire STL Pipeline Project is within 16 hydrologic unit code (HUC) subwatersheds (see table B-3). Spire conducted field surveys of the Project area in 2016 and 2017 to identify wetlands and waterbodies crossed by the Project. The Project would cross a total of 112 rivers/streams, (40 perennial, 29 intermittent, and 43 ephemeral); as well as 3 ponds and 2 lakes. Information on each waterbody crossing for the Project, including name, water quality classification, flow regime, crossing width, and crossing method is provided in appendix E.

Perennial waterbodies flow or contain standing water year-round and are typically capable of supporting populations of fish and macroinvertebrates. Intermittent waterbodies contain water seasonally, and are typically dry for part of the year. Ephemeral waterbodies generally contain water only in response to surface runoff and rising water tables following precipitation or spring snowmelt. Maps depicting the waterbody crossings are provided in appendix A.

Table B-3 Watersheds Crossed by the Spire STL Pipeline Project		
Subwatershed (HUC 12)	**Drainage Area (acres)**	**Facilities**
Illinois		
North Little Sandy Creek	14,060	Pipeline; REX Receipt Station
Little Sandy Creek	18,275	Pipeline
Hurricane Creek	15,544	Pipeline
Whitaker Creek-Apple Creek	30,453	Pipeline
Coates Creek-Apple Creek	19,623	Pipeline, MLV-1
Link Branch-Lower Macoupin Creek	24,105	Pipeline
Wine Branch-Lower Macoupin Creek	23,859	Pipeline
De Arcy Branch-Phils Creek	21,726	Pipeline
Sandy Creek-Otter Creek	25,796	Pipeline; MLV-2
Shilow-Hollow-South Fork Otter Creek	15,444	Pipeline
Lower Piasa Creek	20,970	Pipeline
Marais Temps Clair-Mississippi River	46,147	Pipeline; MLV-3
Missouri		
Outlet Missouri River	34,659	Pipeline; Laclede / Lange Delivery Station
City of Alton-Mississippi River	22,927	Pipeline
Coldwater Creek	11,826	Pipeline
Maline Creek-Mississippi River	60,447	Pipeline

Of the 117 total proposed waterbody crossings and waterbodies in Project workspaces, 87 crossings are classified as minor (less than 10 feet wide), 20 are classified as intermediate (10 to 100 feet wide), and 5, including the Mississippi River, the Missouri River, an oxbow of the Missouri River, Macoupin Creek, and Coldwater Creek, are classified as major (100 feet wide or greater). The five remaining crossings are of lakes or ponds. Portions of the pipeline would also cross 100-year floodplains and may be prone to flash flooding.

Sensitive Waterbody Crossings

The Spire STL Pipeline Project would not cross designated High Quality or Exceptional Value waterbodies, or state or federal wild and scenic rivers. Section 303(d) of the CWA requires that each state review, establish, and revise water quality standards for the surface waters within the state. States develop monitoring and mitigation programs to ensure that water standards are attained as designated. Waters that fail to meet their designated beneficial use(s) are considered impaired and are listed under a state's 303(d) list of impaired waters.

The Macoupin Watershed (HUC 07130012) is an area of probable concern for sediment contamination (USEPA 2004). The Macoupin stream segment that would be crossed by the Project, however, is not impaired for suspended solids in the current 303(d) list, and no restrictions are anticipated (IEPA 2016a). The Project would cross five waterbodies designated as impaired, including Apple Creek (MP 13.9), Otter Creek (MP 36.6), the Mississippi River (MP 45.3), the Missouri River (MP 58.2), and Coldwater Creek (NCE MP 1.9) (IEPA 2016b; MDNR 2016). Apple Creek is impaired for dissolved oxygen and fecal coliform and Otter Creek is impaired for dissolved oxygen. No other waterbodies crossed by the proposed Project are listed as containing areas of probable concern for sediment contamination (USEPA 2004). Spire would cross all six of these waterbodies using the dry-ditch flume method to minimize turbidity (see appendix J).

The Mississippi River is impaired for metals and fecal coliform, and the Missouri River is impaired for fecal coliform. Both rivers are designated as federally navigable waterbodies by the USACE, and both support state and federally listed threatened and endangered species. Impacts on threatened and endangered species are discussed in section B.4. The Mississippi and Missouri Rivers would be crossed via the HDD method to minimize impacts.

Coldwater Creek is impaired for chloride and fecal coliform, and is also a designated metropolitan no-discharge stream (MDNR 2014e), a designation that requires an individual water quality certification from the MDNR before construction. Coldwater Creek is also included in the USACE Formerly Utilized Sites Remedial Action Program. The USACE determined that the sources of contaminants have been removed upstream and that there would be no contamination at the proposed crossing location. Spire has consulted with and received applicable permits for crossing Coldwater Creek (see table A-7), which would also be accomplished by the HDD method to minimize impacts.

Surface Water Intakes and Source Water Protection Areas

Both the Mississippi and Missouri Rivers are designated public water supply waterbodies (IEPA 2016b; MDNR 2016) and would be crossed via the HDD method. No known potable surface water intakes are within 3 miles downstream of the proposed crossing of the rivers in Missouri or in Illinois. The pipeline would cross the Mississippi River Water Supply Intake Protection Area from MP 44.8 to MP 45.9; however, the public drinking water intake is located about 9.0 miles downstream of the crossing. Given there would be no construction within the river and the implementation of Spire's HDD Plan, which contains procedures for prevention, monitoring, and response to inadvertent releases, no impacts would be expected on surface water supplies.

Floodplains

The Project would cross the FEMA 100-year floodplain at the locations shown in table B-4. According to FEMA, these floodplains have a 1 percent annual chance of a flood event (FEMA 2017a). Per the requirements of Executive Order (EO) 11988 on Floodplain Management, we analyzed the total permanent (operational) footprint of the Spire STL Pipeline Project relative to the total acres of the impacted floodplains - 135 acres, or about 13.5 percent. Since the pipeline would buried, operation of this Project component would not permanently impact floodplain storage areas. Alternatively, a small area (less than 0.1 acre) to accommodate MLV 3 and Project facilities to be installed at Enable MRT's existing facility would be fenced and permanently graveled, therefore we conclude that there would be an insignificant permanent loss of floodplain storage due to operation of the Project. Construction workspaces would be revegetated following Project construction and topographic contours would be restored.

Table B-4
100-Year Floodplains Crossed by the Spire STL Pipeline Project

Waterbody Associated with 100-Year Floodplain	Begin Milepost	End Milepost	Length (miles)
Pipeline Facilities			
Apple Creek	13.8	14.4	0.6
Unnamed Tributary to Macoupin Creek	25.0	25.1	0.1
Macoupin Creek	25.2	25.6	0.4
Otter Creek	36.5	36.7	0.1
Mississippi River[a,b]	45.0	47.1	2.1
Mississippi and Missouri Rivers	47.4	57.8	10.4[c]
Missouri River[b]	57.8	58.3	0.5
Coldwater Creek[b]	NCE 1.9	NCE 2.0	0.1
Aboveground Facilities			
Chain of Rocks Station			
Mississippi River	N/A	N/A	N/A[d]

Source: FEMA 2017b.

a Includes a MLV within the permanent right-of-way of the pipeline at MP 46.2.

b Regulated floodway also crossed.

c Milepost range provided for floodplain between the two rivers.

d The station is not a linear feature; as such, an area less than 0.1 acre would be within the flood zone.

Project facilities associated with the Chain of Rocks Station (to be installed at Enable MRT's existing facility) would be within the 100-year floodplain; however, the station would not be within the regulated floodway. Spire is proposing to fence and gravel the area within the floodplain. No other aboveground facilities would be constructed within the 100-year floodplain.

Portions of the pipeline facilities, including MLVs, would also be constructed within the FEMA 100-year floodplain and regulatory floodways as shown in table B-4. Potential impacts on these floodplains include: removal of vegetation, compaction of soils, stream bank erosion, and temporary cuts or fills. However, Spire would restore construction workspaces to their pre-construction contours, as practicable, resulting in no long-term impacts on floodplains. According to FEMA, a regulatory floodway is the channel of a river and adjacent land areas that must be reserved in order to discharge flood waters without cumulatively increasing the water surface elevation more than a designated height (FEMA 2017b). Spire would obtain a No-Rise Certification from county floodplain managers for regulatory floodway crossings. No aboveground facilities would be constructed within regulatory floodways.

<u>Surface Water Impacts and Mitigation</u>

The proposed Project would cross 117 waterbody crossings. Spire is proposing the HDD crossings of seven waterbodies (including the Mississippi and Missouri Rivers, see appendix E). Installation of the pipeline across other waterbodies, where perceptible flow is present at the time of crossing, would be by the dry-ditch flume method. The crossings of intermittent waterbodies that do not have flowing water at the time of construction may be crossed with upland construction methods. Spire would construct waterbody crossings in accordance with state and federal permits, and the Procedures. Typical waterbody crossing methods are described in section A.8.2. Spire would also minimize waterbody impacts by reducing the right-of-way width at trenched crossing locations to 75 feet.

Spire would install erosion controls in accordance with the Procedures to minimize impacts during construction. Trench spoil would be placed at least 10 feet from the waterbody edge for use as backfill, and temporary erosion controls would be installed to prevent migration of trench spoil into the waterbody.

Spire does not anticipate that blasting would be required within waterbodies during the pipeline construction; however; if shallow bedrock is encountered and is not rippable, drilling and blasting would be used to install the pipeline. Spire anticipates that the Project areas with the greatest potential for blasting include between MPs 44.9 and 45.0 and between MPs 58.3 and 58.6 (near the proposed HDD crossings of the Mississippi and Missouri Rivers). Spire would follow the measures described in its Blasting Plan.

To minimize the potential for impacts on the pipeline from streambed scour, Spire would install the pipeline with a minimum cover of 5 feet between the streambed and the top of the pipeline, except in consolidated rock, where a minimum of 2 feet of cover would be required. The depth of burial at waterbodies crossed by HDD would be considerably deeper (at least 24 feet deep) than the minimum requirement. In addition, the pipeline would be maintained in accordance with DOT pipeline standards in 49 CFR 192, which include requirements for monitoring pipeline conditions.

Pipeline construction could result in temporary impacts on water quality due to increased turbidity from construction in or near flowing surface waters. The highest levels of sediment would be generated by use of the wet open-cut method; however, this crossing method is not proposed for use. Where waterbodies are crossed via HDD, direct impacts on the bed and banks of the waterbody would generally be avoided. As discussed in section B.1.1 of this EA, geotechnical analysis showed that HDD construction for the Mississippi and Missouri River crossings is feasible, with minimum chance for a release of drilling fluids. Alternatively, additional investigation is recommended for the Coldwater Creek and Spanish Lake crossing locations (see section B.1.1 for additional details of the geotechnical analysis). If an inadvertent release of HDD drilling fluid occurs within a waterbody, the resulting turbidity could temporarily affect water quality. Spire would implement the measures in its HDD Plan, which incorporates measures for prevention, detection, agency notifications, and mitigation for inadvertent releases. We have reviewed this plan and found it is generally acceptable. However, in order to ensure adequate protection of surface water resources, **we recommend that:**

- **<u>Prior to construction</u>, Spire should file with the Secretary a revised HDD Plan, for review and written approval by the Director of OEP, that includes additional monitoring requirements, including but not limited to, a commitment to monitor the entire path of each HDD for evidence of an inadvertent return daily during active drilling activities.**

In addition, Spire has provided site-specific crossing plans for Macoupin Creek, the Mississippi River, and the Missouri River (see appendix J). We have reviewed these plans and find them to be acceptable. Finally, Spire would adhere to the Procedures, including locating hazardous material storage and equipment refueling activities at least 100 feet from waterbodies and implement its site-specific SPCC Plan, which would reduce the potential for hazardous materials to enter waterbodies.

After installation of the pipeline, Spire would replace the excavated spoil in the trench and restore the streambed and banks as close as practicable to their pre-construction contours. During final restoration, Spire would seed stream banks and riparian areas with conservation grasses and legumes or native plant species in accordance with applicable agency requirements and the Procedures. Where flow conditions or waterbody bank conditions do not allow for stabilization via revegetation, Spire would implement additional measures, such as the use of riprap from the construction work area to stabilize waterbody banks, in consultation with USACE and state agencies.

ATWS would be sited in accordance with the requirements of the Procedures unless otherwise requested by Spire and approved in advance by the FERC. Spire has requested a deviation from our Procedures regarding the location of ATWS within 50 feet of waterbodies as identified in appendix C. Spire would install sediment and erosion controls according to the Procedures to minimize the potential for impacts on the waterbody. At HDD crossings, Spire would designate at least one EI to monitor HDD activities and to be present where ATWS is within 50 feet of a waterbody. We have reviewed the justifications for these deviations and find them acceptable.

Where an existing access road crosses a waterbody (MPs 24.9, 26.1, and 36.4), existing culverts would be used to maintain waterbody flow, and temporary mats would be used if necessary. Spire would restore temporary access roads to pre-construction conditions. Where the workspace associated with the egress to access roads would cross waterbodies (TAR-12, TAR-14, TAR-015, TAR-18, and PAR-018), Spire would implement erosion control measures to avoid sediment entering the waterbodies. With implementation of the Procedures as well as applicable permit conditions, we conclude Spire would minimize and mitigate impacts on surface waters, and these impacts would not be significant.

Hydrostatic Testing

In accordance with DOT regulations, Spire would conduct hydrostatic testing of the pipeline prior to placing it into service. Hydrostatic testing is a method by which water is introduced to segments of pipe and then pressurized to verify the integrity of the pipeline. In addition, aboveground facilities would be hydrostatically tested to ensure structural integrity before being put into service. Spire would use municipal hydrants, totaling about 12,730,000 gallons for both hydrostatic testing (about 8,190,000) and HDD activity (about 4,540,000 gallons) to avoid impacts on surface waters (see table B-5). No chemicals would be added to the test water prior to use. The water in the pipe segments would be pressurized and held for a minimum of 8 hours in accordance with 49 CFR 192. Spire would repair any leaks detected and retest the pipe segment. Upon completion of hydrostatic testing, the water may be pumped to the next segment for re-use or would be discharged through an energy dissipation device to a well vegetated upland, and in accordance with federal and state permit requirements.

Test water for the new pipe, stations, and for the additional aboveground facilities would be discharged offsite or to a well-vegetated upland area along the pipeline route at the locations shown in table B-5 through an energy-dissipating device to prevent erosion. Environmental impacts from the discharge of test water would be minimized by implementing measures outlined in the Procedures, such as regulating the discharge rate and installing sediment barriers. Therefore, we conclude impacts from discharge of hydrostatic test water would not be significant.

Table B-5 Total Water Use for Construction of the Spire STL Pipeline Project				
Facility / Activity	**Estimated Uptake / Discharge Volume (gallons)**	**Activity Start Milepost**	**Activity Discharge Milepost**	**Water Source**
Pipeline Facilities				
Mainline hydrostatic test	1,100,000	0.0	9.1	Municipal hydrant
Mainline hydrostatic test	1,300,000	9.1	19.6	Municipal hydrant
Mainline hydrostatic test	1,800,000	19.6	34.2	Municipal hydrant
Mainline hydrostatic test	3,000,000	34.2	58.8	Municipal hydrant
Mainline Mississippi River HDD operations	2,800,000	45.0	Offsite	Municipal water
Mainline Missouri River HDD operations	1,600,000	57.7	Offsite	Municipal water
North County Extension hydrostatic test	900,000	0.0	6.0	Municipal hydrant
North County Extension Coldwater Creek HDD operations	70,000	NCE 1.6	Offsite	Municipal water
North County Extension Spanish Lake Park HDD operations	70,000	NCE 3.8	Offsite	Municipal water
Aboveground Facilities				
REX Receipt Station hydrostatic test	30,000	0.0	0.0	Municipal hydrant
Laclede / Lange Delivery Station hydrostatic test	30,000	58.8	58.8	Municipal hydrant
Chain of Rocks Station hydrostatic test	30,000	NCE 6.0	NCE 6.0	Municipal hydrant
Total	12,730,000			
Note: HDD drilling mud would be disposed of at an approved licensed facility.				

2.3 Wetlands

The USACE and USEPA jointly define wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation adapted for life in saturated soil conditions (USACE 1987). We define a wetland as any area that is not actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology presented in the USACE's Wetland Delineation Manual (1987), and the associated regional supplement (USACE 2012) for identifying and delineating wetlands.

<u>Existing Wetland Resources</u>

Wetlands crossed by the Project were field delineated by Spire in 2016 and 2017 following the USACE's Wetlands Delineation Manual and the Midwest Region (version 2.0) Regional Supplement (USACE 1987; 2012). Biological surveys were completed on about 94.8 percent of the Project area; survey access is not available for the remainder of the Project. Within the areas where survey permission has not been granted, available National Wetlands Inventory (NWI) data were used to identify wetlands.

A total of 79 wetlands would be affected by the Project (see appendix F). Wetland types were assigned using the NWI classification system (Cowardin *et al.* 1979). Palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO) wetlands were documented in the Project area, as were palustrine and lacustrine unconsolidated bottom (PUB and LUB, respectively). PEM wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens; PSS wetlands contain emergent vegetation with woody vegetation less than 20 feet tall; PFO wetlands are dominated by hydrophytic tree species at least 20 feet tall; and PUB wetlands are open water areas with vegetation cover less than 30 percent, and 25 percent coverage of particles (bottom substrate) less than 6 to 7 centimeters. LUB wetlands, are also open water areas with less than 30 percent cover, and are generally characterized as lakes.

Wetland Impacts and Mitigation

Construction of the Project would impact approximately 12.2 acres of wetlands, including about 1.0 acre of PFO wetland, less than 0.1 acre of PSS wetland, 10.2 acres of PEM wetland, and 1.0 acre of PUB wetland; one LUB wetland would be avoided by HDD. Table B-6 summarizes impacts of the proposed Project on wetlands. Detailed information regarding each wetland that would be crossed by the Project is included in appendix F. All wetland impacts would occur within the pipeline right-of-way and associated ATWS (i.e., wetlands would not be filled for aboveground facilities). Four of the 12 PFO wetlands would be crossed using HDD methods; therefore, impacts on these wetlands would be minimized or avoided. No direct wetland impacts would result from the construction of permanent aboveground facilities, access roads, or staging areas.

Wetlands within the 50-foot-wide Project permanent right-of-way are discussed in sections B.3.1 and B.5.1. Operational maintenance would not result in impacts across the full permanent right-of-way because Spire would only maintain a 10-foot-wide corridor directly over the pipeline centerline, with removal of trees within 15 feet of the centerline. However, right-of-way maintenance would result in the permanent conversion of 0.2 acre of PFO to PEM or PSS wetlands, and less than 0.1 acre of PSS to PEM within the 10-foot maintenance corridor. Table B-6 summarizes the Project impacts on wetlands; detailed information regarding each wetland that would be crossed is included in appendix F.

Table B-6
Wetland Impact Summary of the Project

NWI Classification	Wetland Area Affected During Construction (acres)[a]	Wetland Area Affected During Operation (acres)[a,b]
PFO	1.0	0.2
PSS	<0.1	<0.1
PEM	10.2	0.0
PUB	1.0	0.0
Total	**12.2**	**0.2**

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends. Acreages exclude wetlands avoided by the HDD crossing method.

[b] Operational impacts include only the maintained portion of the permanent right-of-way. PFO wetlands within 15 feet of the pipeline would be converted to PEM / PSS, and PSS wetlands within a 10-foot-wide corridor over the pipeline would be converted to PEM wetlands. Spire does not anticipate the need for routine maintenance in PEM, PUB, or LUB wetlands.

The primary impact of Project construction on wetlands would be the potential alteration of wetland vegetation due to clearing excavation, rutting, compaction, and mixing of topsoil and subsoil. Construction could also affect water quality within wetlands due to sediment loading or inadvertent spills of fuel or chemicals. Temporary impacts of construction on wetlands could include the loss of vegetation; soil disturbance associated with grading, trenching, and stump removal; and changes in the hydrological profile.

Impacts on wetlands would be greatest during and immediately following construction. The majority of these effects would be short-term in nature and would cease upon, or shortly following, wetland restoration and revegetation. Following revegetation, the wetland would eventually transition back into a community with functionality similar to that of the pre-construction condition.

In PEM wetlands, the herbaceous vegetation would regenerate quickly (within 1 to 3 years); woody vegetation in PSS wetlands would take longer to re-establish, and woody vegetation would be precluded from re-establishing over the pipeline centerline. Impacts on PFO wetlands would include long-term or permanent conversion to PEM and/or PSS wetland types through tree removal. In the case of conversion of wetland vegetation type, no permanent loss of wetlands would occur; however, functional changes to the wetland community would result.

Spire would cross wetlands in accordance with state and federal permits and the Procedures. The wetland crossing method would depend upon site-specific conditions present during construction. In general, the right-of-way width in wetlands would be reduced to 75 feet, and other measures as discussed below. Spire's Procedures contain several measures that differ from the FERC Procedures. As discussed in section A.8.2, we have reviewed these measures and find them acceptable.

As described in appendix C, Spire has identified five locations where reduction of the construction right-of-way through wetlands would not be feasible. Two of the five locations would be required to accommodate an HDD crossing (NCE MPs 2.4 and 3.8). This method would avoid impacts on sensitive resources including several waterbodies, US 67, Missouri State Road 367, two parks and a golf course (see table A-6) and would result in a smaller construction footprint overall. The remaining locations would be where wetlands are within active agricultural fields and associated with soil segregation. Spire would not place soils within the wetlands. In addition, Spire has committed to developing a Project-specific Erosion and Sediment Control Plan.

Spire plans to avoid direct impacts on certain wetlands (totaling about 1,025 feet) by using HDD construction methods (see appendix F). However, if an inadvertent release of HDD drilling fluid occurs within a wetland, temporary impacts on the wetland vegetation and hydrology would result. Spire would implement measures in its HDD Plan, which address prevention, detection, required notifications, and mitigation for inadvertent releases as discussed in section B.2.2.

Where soils are stable and not saturated at the time of crossing, the pipeline would be installed using methods similar to those in upland areas. Tree stumps and root systems would be removed from areas directly over the trenchline. In the absence of safety-related construction constraints, stumps and root systems would be left in place in the remainder of the construction right-of-way. Spire would segregate the topsoil up to one foot in depth over the trenchline in wetlands, where hydrologic conditions permit. Segregated topsoil would be stockpiled separately from the subsoil and would be placed in the trench following subsoil backfilling.

Saturated wetlands include those with standing water or completely saturated soils at the time of construction. Topsoil segregation is generally not practical in saturated wetlands. Otherwise, construction would be similar as described for unsaturated wetlands. Saturated wetlands would be crossed using timber mats to minimize impacts from rutting and compaction.

Spire would minimize wetland impacts by implementing the construction and mitigation measures outlined in the Plan and Procedures and adhering to applicable permit requirements. General construction and mitigation measures would include:

- limiting construction right-of-way width in wetlands to 75 feet wide, except as noted in appendix C;

- limiting construction equipment in wetlands to that needed to clear the right-of-way, excavate the trench, fabricate the pipe, install the pipe, backfill the trench, and restore the right-of-way;

- installing sediment barriers prior to ground disturbing activities near wetlands;

- minimizing the period of time that topsoil is segregated and the trench is open;

- stabilizing the right-of-way with timber mats, prefabricated equipment mats, or terra mats;

- using low ground weight equipment or operating equipment on timber matting, prefabricated equipment mats, or terra mats on saturated soils or where standing water is present;

- installing trenchline barriers and/or sealing the trench bottom as necessary to maintain the original wetland hydrology; and

- limiting vegetation maintenance on the operational right-of-way in wetlands to a 10-foot-wide herbaceous corridor centered over the pipeline and the cutting and removal of trees and shrubs within 15 feet of the pipeline that could impact the pipeline coating.

Spire would restore wetlands in accordance with state and federal permits and the Procedures, including restoring wetland contours and developing Project-specific measures for re-establishing herbaceous and woody species and monitoring the success of revegetation. Spire would develop a Project-specific wetland mitigation plan in consultation with the USACE to mitigate for permanent wetland conversion, which would be completed prior to construction.

The USACE has a goal of "no net loss" of wetlands in the United States. This means that unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation. In order to offset the wetland impacts that would occur as a result of the Project, Spire is developing a Conceptual Mitigation Plan as part of its permit application to the USACE; consultation with the USACE to finalize the plan is ongoing.

We anticipate that, if the USACE issues a Section 404/Section 10 permit for the Project, it would be conditional upon Project-related adverse impacts on waters of the United States being effectively offset by wetland mitigation, such that impacts would be reduced to less than significant levels. Therefore, with implementation of these minimization and mitigation measures, and with adherence to the requirements of all applicable permits, we conclude that wetland impacts associated with construction and operation of the Project would not be significant.

3. Vegetation, Fisheries, and Wildlife

3.1 Vegetation

Existing Vegetation Resources

The Project would traverse the River Hills and Western Dissected Illinoisan Till Plain (USEPA 2017b). These ecoregions are part of the Interior River Lowland ecoregion which is generally described as vast, flat bottomed, terraced valleys containing forested valley walls which are dissected by glacial till plains (Purdue 1999). Construction and operation of the Project would principally affect agricultural land as well as the following general vegetation cover types: open land (including existing rights-of-way, pastures, and land actively maintained as herbaceous or scrub-shrub vegetation), upland forested land, forested wetlands, and non-forested wetlands (see table B-7). Impacts on developed land (including industrial/commercial roadways, railroads, and residential land) are discussed in section B.5.1, and impacts on open waters are discussed in section B.2.2. Acreage impacts on each vegetation classification are included in table B-7.

Agricultural land in the Project area would consist of areas that are routinely cultivated. Crops documented during field surveys included corn, soybeans, and sorghum. Construction of the Project would disturb 840.3 acres of agricultural habitat. Impacts on agricultural land are further discussed in section B.5.1.

Forested habitat associated with the Project consists of deciduous tree species which generally shed their leaves near the end of the frost-free season or during the dry season. Species documented during field surveys include common hackberry, eastern cottonwood, green ash, Shumard's oak, silver maple, trumpet creeper, and black walnut. Construction of the Project would disturb about 64.6 acres of forested upland, 34.9 acres of which would be maintained as permanent right-of-way (see table B-7).

Open land in the Project area consists of areas that are primarily associated with pastureland and existing rights-of-way. Species documented during field surveys include annual ragweed, common milkweed, common morning-glory, white grass, yellow bristlegrass, and fall panic grass. Construction of the Project would disturb about 54.9 acres of open land habitat, 23.2 of which would be maintained as permanent right-of-way (see table B-7).

Table B-7
Acreage of Construction and Operation Impacts on Vegetation[a]

Facility	Agricultural		Forested		Open Land		Forested Wetlands[b]		Non-Forested Wetlands[b]		Total	
	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Pipeline Facilities												
Pipeline[c,d]	577.1	320.2	52.0	31.1	33.6	20.0	0.8	1.4	10.1	6.2	673.6	378.9
Additional temporary workspace	219.1	0.0	7.5	0.0	8.9	0.0	0.2	0.0	1.1	0.0	236.8	0.0
Access roads	3.4	0.5	1.0	0.1	7.3	1.0	0.0	0.0	0.0	0.0	11.7	1.6
Staging areas	30.7	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	33.5	0.0
Cathodic protection groundbeds	1.5	1.0	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0	1.9	1.3
Subtotal	**831.8**	**321.7**	**60.5**	**31.2**	**53.0**	**21.3**	**1.0**	**1.4**	**11.2**	**6.2**	**958.0**	**382.4**
Aboveground Facilities												
REX Receipt Station	5.0	5.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	12.3	6.0
Laclede / Lange Delivery Station	3.6	3.6	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	6.7	3.9
Chain of Rocks Station	0.0	0.0	3.8	3.3	1.9	1.9	0.0	0.0	0.0	0.0	11.1	4.3
Subtotal	**8.6**	**8.6**	**4.1**	**3.6**	**2.0**	**2.0**	**1.0**	**1.4**	**0.0**	**0.0**	**30.1**	**14.2**
Total	**840.3**	**330.3**	**64.6**	**34.9**	**54.9**	**23.2**	**1.0**	**1.4**	**11.2**	**6.2**	**972.1**	**396.0**

Con = Construction; Op = Operation.

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

[b] Non-forested wetlands include PEM and PSS wetlands.

[c] Construction impact acreages are based on a temporary right-of-way width between 75 and 90 feet. While no ground disturbance would be required between HDD entry and exit points, the area within the proposed 50-foot-wide permanent right-of-way is included in these acreage totals.

[d] The operational footprint is based on a 50-foot-wide permanent right-of-way in uplands and wetlands. However, Spire does not intend to maintain the full permanent right-of-way in forested wetlands and would only maintain a 30-foot-wide area (centered over the pipeline) within these wetlands; therefore, actual impacts on wetlands during operation may be less than depicted in the table.

Wetlands in the Project area are classified as forested (PFO) or non-forested (including PSS and PEM) wetlands, as further discussed in section B.2.3. Species documented in wetlands during field surveys include silver maple, southern hackberry, black willow, American sycamore), sedge, valley redstem, rice cut grass, fall panic grass, rough cocklebur, and swamp smartweed. About 1.0 and 11.2 acres of forested and non-forested wetlands would be within the construction footprint, respectively; of that, 1.4[13] and 6.2 acres of forested and non-forested wetlands would be retained as permanent right-of-way. As discussed in section B.2.3, impacts on these wetlands from construction and operation would be limited to 12.2 and 0.2 acres, respectively.

Construction of access roads would affect 3.4 acres of agricultural land, 7.3 acres of open land, and 1.0 acre of forested upland areas; no impacts on wetlands would result from improvement or use of access roads. Use of permanent access roads during operations would result in the conversion of 0.5 acre of agricultural land, 1.0 acre of open land, and 0.1 acre of forested upland to developed land for the life of the Project. Construction of the aboveground facilities would affect 2.0 acres of open land, 8.6 acres of agricultural land, and 4.1 acres of upland forested land; of which, 8.6 acres of agricultural land, 2.0 acres of open land, and 3.6 acres of forested upland would be permanently converted to developed land.

Vegetation Communities of Special Concern

Vegetation communities of special concern may include ecologically important natural communities or other rare or imperiled plants sensitive to disturbance or in need of special protection. Three vegetation areas of special concern have been identified in the Project area. According to Illinois Natural Heritage Inventory data, the Project would cross the Principia Hill Prairies West Illinois Natural Area Inventory Site. In addition, the Missouri Department of Conservation (MDOC) has indicated that the Project is within 0.5 mile of a shrub swamp (within Landgrant 3281) and a wet mesic bottomland forest (within Landgrant 1692). Federal or state listed plants with the potential to occur in the Project area are discussed in section B.4.1.

The Principia Hill Prairies West Illinois Natural Area Inventory Site supports state listed threatened and endangered species by providing a high-quality loess hill community. Loess hill prairies are isolated patches of prairie vegetation surrounded by steep, wooded south and south-west facing slopes. Loess hill prairies occur predominantly along the Illinois and Mississippi Rivers in Illinois and consist of wind-blown loamy soils. Vegetation along loess hill prairies includes herbaceous species such as little bluestem, side-oats grama, and purple prairie clover (Robertson *et al.* 1996). Construction and operation of the Project would impact 2.9 acres of predominantly

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[13] Construction impacts do not include wetlands within the permanent right-of-way between HDD entry and exit points as these features would be avoided.

forested land within the Principia Hill Prairies West Illinois Natural Area Inventory Site, 0.8 acre of which would be within the permanent right-of-way. To reduce impacts on this sensitive resource, Spire plans to place the pipeline adjacent to an existing pipeline right-of-way for the entire crossing length (737 feet).

Landgrant 3281 would be crossed by the Project between MPs 45.4 and 46.2; the MDOC has indicated that a wet-mesic bottomland forest within the landgrant would be within 0.5 mile of the Project corridor. Mesic bottomland forests generally experience long durations of flooding throughout the year and are associated with meandering rivers systems. These areas consist predominately of mature trees intermingled with vine species. Due to long periods of flooding and a full canopy, these areas generally have an open understory. Vegetation species common to wet-mesic bottomland forests generally include bur oak, swamp white oak, American sycamore, green ash, pawpaw, common hackberry, and bitternut hickory (USDA-NRCS 2004).

The entire area of the landgrant would be crossed via HDD, with the exception of the HDD exit pit, which would be located on agricultural land within the landgrant. Impacts on any wet-mesic bottomland forest within the path of the HDD would generally be avoided. In addition, Spire's HDD Plan would be implemented to mitigate for any inadvertent returns, as needed.

Landgrant 1692 would be crossed by the Project between MPs 46.2 and 47.5; the MDOC has indicated that a shrub swamp habitat within the landgrant would be within 0.5 mile of the Project corridor. Shrub swamp habitats are generally found within or on the fringes of wetlands or bottomland forests which experience long periods of flooding throughout the year. Shrub swamp habitat generally consists of small woody species between 1 and 6 meters (about 3.3 and 19.7 feet) in height with a diameter at breast height of less than 6 inches. Vegetation associated with shrub swamp habitat include button bush and other smaller willow species. The Project traverses Landgrant 1692 along areas which are classified as agricultural land; therefore, the Project would not impact the associated shrub swamp habitat.

<u>Noxious and Invasive Weeds</u>

Noxious or invasive plant communities can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. Plant species identified as noxious and invasive by the Illinois Noxious Weed Law and the Missouri Noxious Weed List include, but are not limited to, giant ragweed, marijuana, Columbus grass, purple loosestrife, Scotch thistle, and johnsongrass. Spire conducted baseline noxious weed and invasive plant species surveys and identified common ragweed, Canada thistle, johnsongrass, and giant ragweed within the Project area. High (widespread), moderate (small clusters), or low (individual plant) coverage of noxious and invasive weeds, most notably of the ragweed species, were sporadically identified across the Project area between MPs 0.9 and 36.4 (see appendix I). Spire's proposed mitigation measures are described below.

<u>Vegetation Impacts and Mitigation</u>

The Project would affect 972.1 acres of vegetation during construction; 369.0 acres would be within the operational footprint of the Project. Table B-7 summarizes the temporary construction and permanent operational impacts of the Project on each vegetation community type. Impacts on developed land are discussed in section B.5.1.

Prior to construction, the pipeline right-of-way and workspaces would be cleared of vegetation to the extent necessary to allow for safe working conditions. Cleared timber would be stacked adjacent to the right-of-way, brush and slash would be stacked or chipped, and stumps would be disposed of in accordance with landowner preferences and applicable law. Removal of all construction debris would be done after backfilling and in accordance with the Plan. Following soil disturbance, erosion and sediment controls would be installed according to the Plan and Procedures. In addition, Spire would also develop a Project-specific Erosion and Sediment Control Plan prior to construction.

During construction and operation of the Project, Spire would use existing roads to the maximum extent possible; however, two of the three new access road required for construction and operation of the Project would require tree clearing (see table A-5). Spire would also use ATWS and staging areas to support construction of the Project. Vegetated areas within ATWS, temporary access roads, and staging areas would be allowed to revegetate after construction. Spire's proposed staging areas are previously disturbed agricultural and open land.

During operation, maintenance of the permanent pipeline right-of-way would be necessary to allow for visibility and access for monitoring and maintenance activities. In upland areas, the permanent right-of-way would be 50 feet wide. Routine mowing would not be conducted more frequently than once every 3 years across the entire width of the right-of-way in upland areas; however, a 10-foot-wide corridor centered on the pipeline could be mowed at a frequency necessary to allow for periodic pipeline surveys. In wetlands, as discussed in section B.2.3, vegetation maintenance on the operational right-of-way would be limited to a 10-foot-wide herbaceous corridor centered over the pipeline and the selective removal of trees within 15 feet of the pipeline with roots that could compromise the pipeline integrity.

Community-specific Impacts

Impacts on forest vegetation from construction of the Project would be long-term. Re-growth of trees to pre-construction condition would take 20 to 30 years for many species such as green ash. Hardwood species, such as oaks, could take more than 50 years to reach maturity. Upland forest vegetation in the permanent right-of-way would be removed, and thus that habitat corridor would be maintained in an herbaceous state throughout the operational life of the Project.

The term "edge effect" is commonly used in conjunction with the boundary between natural habitat, particularly forests, and disturbed or developed land, such as pipeline corridors. Edge effects occur where land adjacent to a forest has been cleared, creating an open/forest boundary which allows sunlight and wind to penetrate the forest to a greater extent, resulting in tree destabilization from increased wind shear and drying out of the interior of the forest near the edge. This encourages growth of opportunistic species along the edge, and changes other environmental factors such as air temperature, soil moisture, and light intensity (Murcia 1995). Fragmentation of forested areas can result in changes in vegetation (e.g., invasion of shrubs along the edge). As currently designed, about 15.0 percent of the Project route would be adjacent to existing rights-of-way; thus, new edge habitat would be replacing existing edge habitat adjacent to these existing rights-of-way, minimizing fragmentation impacts from the Project.

For non-forested vegetation types, including agricultural land, open land, and non-forested wetlands, impacts associated with construction of the pipeline would generally be temporary or short-term. Agricultural land generally returns to crop production the season following construction. Herbaceous areas would return to their vegetation cover within 1 to 3 years, and scrub-shrub areas would return within 3 to 5 years following construction. To facilitate revegetation, Spire would re-seed disturbed areas using seed mixes developed in consultation with recommendations from the local soil conservation authorities. Before a permanent vegetation cover is established within the right-of-way, Spire would use a seasonal variety of grass, depending on the time of year, to establish a quick vegetation cover to stabilize disturbed areas.

Mitigation

To minimize direct and indirect impacts on vegetation communities from construction and operation of the Project, Spire would implement the measures in the Plan and Procedures, including:

- minimizing vegetation clearing through placement adjacent to existing rights-of-way where practicable (about 15.0 percent of the proposed route);
- using existing roads for access to the Project where practical;
- installing temporary erosion control measures, such as slope breakers, sediment barriers, and mulch;
- revegetating the right-of-way, where applicable, with seed mixes developed in accordance with the recommendations of local soil conservation district recommendations, landowner consultation, and permit requirements;
- visually inspecting agricultural land to ensure that crop growth and vigor in areas affected by construction is similar to those of adjacent portions of the same field, or as otherwise agreed to by the landowner; and

- monitoring and reporting to the FERC to document the status of revegetation until deemed successful.

Also, Spire has committed to developing a Project-specific Erosion and Sediment Control Plan. After construction is complete, Spire would monitor revegetation success within all construction workspaces. Revegetation would be considered successful if the density and cover of non-nuisance vegetation were similar in density and cover to adjacent undisturbed land, or in accordance with any state or local permitting requirements.

Spire would follow the measures included in the Plan and its Noxious Weeds/Invasive Plant Species Control and Mitigation Plan (appendix I) to control the spread of noxious weeds and invasive plant species. Specific measures in the plan include ensuring that all vehicles, equipment, and materials are inspected and cleaned of any visible vegetation and soil before entering and leaving areas of known infestations; use of certified weed-free straw or hay for erosion control, where necessary and applicable; and monitoring of the right-of-way to observe for new growth of noxious and invasive plant species. In the event that invasive species spread to areas of the right-of-way where they were not present prior to construction, Spire would remove invasive species either by mowing or hand-removal along the pipeline right-of-way. Spire may use herbicides and/or pesticides at aboveground facilities in Illinois, in accordance with the Project's AIMA. Inspections would take place after the first and second growing seasons and continue until the disturbed areas are adequately restored.

Based on the types and amounts of vegetation affected by the Project and Spire's proposed avoidance, minimization, and mitigation measures to limit Project impacts, we conclude that impacts on vegetation from the Project would not be significant.

3.2 Fisheries

The Spire STL Pipeline Project would cross would cross a total of 117 waterbodies, including 40 perennial, 29 intermittent, and 43 ephemeral streams, and 3 ponds and 2 lakes (see appendix E). Perennial waterbodies flow or contain standing water year-round and are typically capable of supporting populations of fish and macroinvertebrates. Intermittent waterbodies contain water seasonally, and are typically dry for part of the year. Ephemeral waterbodies generally contain water only in response to precipitation events or spring snowmelt. Each of the streams crossed by the proposed Project are classified as warmwater fisheries by their respective states for the protection of aquatic life (IEPA 2016c; MDNR 2014f).

Fisheries of Special Concern

Fisheries of concern include those waterbodies that provide habitat for protected species, are assigned special state status for fishery management, support fisheries of exceptional recreational value (such as trout fisheries), or are designated as essential fish habitat. Spire identified two fisheries of concern during agency consultations: the Mississippi River (MP 45.3) and the Missouri River (MP 57.9 and 58.2), both of which contain potentially suitable habitat for federally and state listed species, including the pallid sturgeon, lake sturgeon, flathead chub, and various mussel species. The Mississippi River is also a state-designated fish and wildlife area (see section B.3.3). No coldwater fisheries, which may contain trout, would be crossed by the Project (IEPA 2016d; MDNR 2014f). In addition, no essential fish habitat is within the Project area (National Marine Fisheries Service 2017). Potential impacts on threatened and endangered species are discussed in section B.4.

<u>Fisheries Impacts and Mitigation</u>

Spire would cross all waterbodies with perceptible flow by dry-ditch (flume) or HDD construction methods. While dry-ditch crossing methods would maintain flow and reduce turbidity and downstream sedimentation during construction, minor aquatic habitat alteration could still occur. Temporary impediments, changes to behavior, temporary loss of habitat, and/or the alteration of water quality could increase the stress rates, injury, and/or mortality experienced by fish. Waterbody crossing methods are described in detail in section A.8.2 and listed in appendix E. No coldwater fisheries would be crossed, and the IEPA and MDNR do not impose timing windows on warmwater fisheries; therefore, warmwater fisheries can be crossed during any time of year (IEPA 2016a-c; MDNR 2017e; MDOC 2017a).

Spire's use of the HDD crossing method would avoid direct impacts on fisheries during construction at crossings of seven waterbodies, including the Mississippi and Missouri Rivers (see appendix E). If an inadvertent release of HDD drilling fluid occurs within a waterbody, the resulting turbidity could impact water quality and impede fish movement, potentially increasing the rates of stress, injury, and/or mortality experienced by fishes; however, Spire has conducted geotechnical surveys of the HDD locations and has indicated that there is a high probability of successful completion for the proposed crossings of the Mississippi and Missouri Rivers. Alternatively, as discussed in section B.1.1, additional investigation is recommended for the crossings of Coldwater Creek and Spanish Lake. In addition, water quality could be adversely affected by an accidental spill of hazardous material into a waterbody. Spire's adherence to its HDD Plan and SPCC Plan would minimize the potential for these impacts, as well as the response time for notification and clean-up, should an inadvertent release or spill occur. Specific measures to minimize impacts on waterbodies, which would also protect the fisheries they contain, are discussed in section B.2.2.

During operation, to minimize impacts on waterbodies and fisheries, Spire would maintain a 25-foot-wide riparian strip within the permanent right-of-way adjacent to waterbodies and would limit vegetation maintenance within the riparian area to a 10-foot-wide strip centered over the pipeline with selective tree-clearing within 15 feet of the pipeline. Although Spire does not anticipate the need for blasting, blasting may be necessary in areas where bedrock is encountered at depths that interfere with conventional rock-trenching methods; however, no in-stream blasting is currently proposed (see section B.2.2).

Spire has sited the majority of its aboveground facilities such that no waterbodies, and therefore no aquatic resources, would be within the facility boundaries. The only exception is that one ephemeral waterbody (SMO-DFW-002) is within the proposed workspace of the Laclede/Lange Delivery Station; however, this waterbody would be avoided during operation by facility design. No waterbodies or fisheries would be affected by staging areas.

Use of temporary and permanent access roads would affect six waterbody crossings; four of which would be crossed using existing culverts. Two waterbodies would be affected by the workspace for access roads but would not be directly crossed by an access road (see appendix E); each of these roads is existing and would be improved only through the addition of gravel (see table A-5). Spire's adherence to the Plan and Procedures would mitigate potential impacts from use of access roads crossing or adjacent to waterbodies, including the installation of sediment barriers adjacent to waterbodies, where necessary, to prevent soil or debris from migrating into the waterbody.

In consideration of Spire's proposal to cross waterbodies with perceptible flow using HDD or dry-ditch methods, and Spire's adherence to the Procedures, we conclude that impacts on fisheries and other aquatic resources from the Project would not be significant.

3.3 Wildlife

Wildlife habitat types are based on the vegetation types in the Project area and include agricultural land, open upland areas, upland forests, wetlands (including PFO, PSS, and PEM wetlands), and open water. Vegetation types, including wetlands, are described in detail in section B.3.1.

Agricultural and open land is utilized by many game and non-game species, including white-tailed deer, wild turkey, mourning doves, cottontail rabbits, and various rodents. Forested upland habitat in the Project area provides food, cover, and nesting habitat for a variety of wildlife species, including mammals such as cottontail rabbit and white-tail deer, and a variety of song-birds such as various species of warblers, finches, and field sparrows. Resident and migratory waterbirds, such as ducks, sandhill cranes, egrets, and herons utilize the Mississippi and Missouri River corridors and surrounding cropland for stopovers and breeding. The open waters and associated habitat of the Mississippi and Missouri Rivers may also provide foraging and nesting opportunities for bald eagles.

Migratory Birds

Migratory birds are species that nest in the United States and Canada during the summer and then migrate to and from tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) – 16 U.S Code 703-711, and bald and golden eagles are additionally protected under the Bald and Golden Eagle Protection Act – 16 U.S Code 668-668d. EO 13186 (66 FR 3853) directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the USFWS.

EO 13186 was issued, in part, to ensure that environmental analyses of federal actions assess the impacts of these actions/plans on migratory birds. It also states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and does not authorize the take of migratory birds. On March 30, 2011, the USFWS and the Commission entered into a Memorandum of Understanding (MOU) that focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the Commission and the USFWS. This voluntary MOU does not waive legal requirements under the MBTA, the Endangered Species Act (ESA), the NGA, or any other statute and does not authorize the take of migratory birds. The proposed Project would be within Bird Conservation Region 22 (Eastern Tallgrass Prairie) of the North American Bird Conservation Initiative.

Managed and Sensitive Wildlife Areas

Based on a review of publicly available data sets, no National Parks, National Wild and Scenic Rivers, National Wildlife Refuges, National Wilderness Areas, or state parks would be crossed or within 0.25 mile of the Project (IDNR 2017b; MDNR 2017f; National Parks Service 2017; USFWS 2017). Spire consulted with the USFWS, IDNR, and MDOC to identify managed or sensitive wildlife habitats near the proposed Project. The consultations indicated that four managed or sensitive wildlife areas are present in the Project area, including the Upper Mississippi Conservation Area, the Principia Hill Prairies West Illinois Natural Area Inventory Site (which is a Natural Heritage Landmark), a shrub swamp within Landgrant 1692, and a wet mesic bottomland forest within Landgrant 3281. These managed and sensitive wildlife areas are discussed below.

Upper Mississippi Conservation Area

The Upper Mississippi River is designated as a state fish and wildlife area and an area for conservation where the primary focus is on wetland management and waterfowl. The Upper Mississippi River Restoration Environmental Management Program was authorized by Congress in the 1986 Water Resources Development Act, which was reauthorized in 1999. The Act includes two major parts: the planning and construction of fish and wildlife habitat projects, and a long-term resource monitoring program (Upper

Mississippi River Basin Association 2017). The Upper Mississippi Conservation Area is part of this program and stretches from the Melvin Price Lock and Dam at Alton, Illinois to LaGrange, Missouri. It includes 87 tracts of federal land totaling over 15,000 acres and managed under a cooperative agreement between the USFWS, the USACE, and the MDOC (MDOC 2016a). This property is held in fee title by the USACE St. Louis District.

The Upper Mississippi Conservation Area would be crossed by the pipeline from MP 45.7 to MP 46.1, which would require a right-of-way easement from the USACE. While there are no designated trails, public uses of the Upper Mississippi River Conservation Area include fishing, hunting (waterfowl, deer, squirrel, and turkey), trapping, canoeing, and bird watching. Many aquatic game species utilize this area, including bass, catfish, crappie, and sunfish. Many waterfowl, turkey, and deer also utilize this conservation area (MDOC 2017b). The Project would cross this property as part of an HDD of the Mississippi River; therefore, no tree clearing or earth disturbance would occur as a result of the construction of the Project. Additional information on this property is provided in section B.5.3.

Principia Hill Prairies

In Illinois, the Project would cross the Principia Hill Prairies West Natural Area, which is identified as an Illinois Natural Heritage Landmark (Illinois Natural Heritage Database 2016). The area includes high-quality loess hill natural community, as well as habitat for the state listed ground plum milkvetch and timber rattlesnakes. Forested portions of the property also provide habitat for bat species, including the federally and state listed Indiana and northern long-eared bats. Further discussion on these species is provided in section B.4.

Loess hill prairies are the most abundant type of prairie in Illinois and occur primarily along the Illinois and Mississippi Rivers. They are named for their characteristic wind-blown loam soil, which was deposited as the glaciers receded. The Principia Hill Prairies support native dry prairie species such as little bluestem, Indian grass, leadplant, and purple prairie clover (Robertson *et al.* 1996). Spire proposes to route its pipeline adjacent to an existing pipeline right-of-way through this area, limiting impacts to the extent practicable. Route and construction alternatives that were considered to avoid impacts on the Principia Hill Prairies West Illinois Natural Area Inventory Site are discussed in section C.4; special status species that occur in the vicinity of this site are discussed in section B.4.

Landgrant 3281

As discussed in section B.3.1, Spire, in consultation with the MDOC, identified that the Project would cross Landgrant 3281 between MPs 45.4 and 46.2, which contains a wet mesic bottomland forest that would be within 0.5 mile of the pipeline (MDOC 2016b). Mature bottomland forests are characterized by large trees, vine lattices, and an open understory because of the periodic flooding that occurs. These areas can provide habitat for gray treefrogs, red-shouldered hawks, and northern parula warblers, as well as nesting trees for bald eagles and great blue herons. These forests may also include rare cerulean warblers, barred owls, prothonotary warblers, small-mouthed salamanders, mole salamanders, and wood ducks. Bottomland hardwood forests most often are found in the southeast Missouri lowlands (MDOC 2016c).

The Missouri Natural Heritage Program assigns a conservation status rank for species and ecosystems habitat from S1 to S5 where S1 is critically imperiled, and S5 is common, widespread, and abundant within the state (MDOC 2017c). The wet mesic bottomland forest located on Landgrant 3281 is state ranked as S2, which is considered imperiled because of rarity of some factors making it very vulnerable to extirpation from the state. There are no regulatory requirements associated with this status and no regulatory implications under Missouri law. With the exception of the HDD exit pit on the south side of the Mississippi River, which would be in an agricultural field, impacts on Landgrant 3281 would be avoided via the HDD of the Mississippi River. Therefore, impacts on the wet mesic bottomland forest associated with Landgrant 3281 would be avoided.

Landgrant 1692

The Project would cross Landgrant 1692 between MPs 46.2 and 47.5. Landgrant 1692 contains a shrub swamp habitat within 0.5 mile of the pipeline (MDOC 2016b). Shrub swamps are characterized by thickets of buttonbush and short-statured willows, which provide habitat for yellow warblers and green herons. Shrub swamps often are found in or near marshes, swamps, or bottomland forests. According to the Missouri Natural Heritage Program, the shrub swamp habitat on Landgrant 1692 is also state ranked as S2. However, the Project would cross Landgrant 1692 within agricultural fields and therefore the shrub swamp wetlands associated with Landgrant 1692 would not be affected by construction or operation of the Project.

<u>Wildlife Impacts and Mitigation</u>

Construction and operation of the Project would result in various short- and long-term impacts on wildlife. Impacts would vary depending on the specific habitat requirements of the species in the area and the vegetation and land cover crossed by the pipeline right-of-way and other Project components such as ATWS and access roads. Potential short-term impacts on wildlife include the displacement of individuals from construction areas and adjacent habitats and the direct mortality of smaller, less mobile mammals, reptiles, and amphibians that are unable to leave the construction area. Long-term impacts would include permanent conversion of some forested or scrub-shrub habitat to cleared and maintained right-of-way, and periodic disturbance of wildlife during operation and maintenance. Altered habitat and periodic disturbance could also increase wildlife mortality, injury, and stress.

Fragmentation of forested areas results in changes in vegetation (for example, shrubs inhabiting the forest edge) which may limit the movement of wildlife species between adjacent forest blocks, increase predation, and decrease reproductive success for some species (Rosenberg *et al.* 1999). Where practicable, Spire has routed the proposed pipeline to be adjacent to existing utility rights-of-way to minimize habitat fragmentation (about 15.0 percent of the Project route).

Although individual mortality of some wildlife species could occur because of the proposed Project, the effects of these individual losses on wildlife populations would be temporary and minor. Based on the construction within and/or adjacent to existing right-of-way to the extent possible, the presence of similar habitats adjacent to and in the vicinity of construction activities, and the implementation of impact avoidance and minimization measures, we conclude that construction and operation of the Spire STL Pipeline Project would not have population-level impacts or significantly measurable negative impacts on wildlife.

Migratory Birds

The primary concern for impacts on migratory birds, including bald eagles, is mortality of eggs and/or young as mature birds could avoid active construction. Tree clearing and ground-disturbing activities could cause disturbance during critical breeding and nesting periods, potentially resulting in the loss of nests, eggs, or young. In addition, forest fragmentation could increase predation and competition, and reduce nesting and mating habitat for migratory and ground-nesting birds (Faaborg *et al.* 1995). Spire proposes to minimize impacts on migratory birds by siting 83.7 percent of the Project facilities in agricultural fields and routing the pipeline so that about 15.0 percent of the route is adjacent to existing rights-of-way.

Although multiple bird species occur in the Project area, no federally listed threatened or endangered bird species are known to occur in the area. As discussed with the USFWS during informal consultation, tree-clearing between May 1 and August 1 should be avoided to minimize risks to migratory birds during peak nesting season (Spire 2017); Spire has committed to avoid tree-clearing during this 3-month window, for the protection of migratory birds, and intends to clear all trees between February 1 and May 1, 2018, pending the receipt of all applicable permits and approvals. Should Spire seek a variance to clear trees during peak nesting season, FERC approval and further consultation with USFWS would be necessary.

During operations, and in accordance with the Plan, Spire would prohibit all vegetation maintenance activities between April 15 and August 1 to minimize disturbance during migratory bird critical nesting periods. Spire is continuing to consult with the USFWS regarding impacts on migratory birds.

The Project would be within the range of the bald eagle, which is federally protected under the Bald and Golden Eagle Protection Act. The USFWS Rock Island

Field Office has indicated that the closest known bald eagle nest is 4 miles from the Project (USFWS 2016a), and the MDOC has indicated that there may be an active nest located on Slim Islands, about 0.5 mile from the proposed crossing of the Mississippi River (MDOC 2016d). In February 2017, Spire conducted a bald eagle nest survey to identify any active bald eagle nests within the Project area; no active bald eagle nests were identified within accessible portions of the right-of-way (GAI Consultants, Inc. 2017). Prior to construction, Spire would complete surveys in previously inaccessible habitat, and would consult with the USFWS if any bald eagle nests are identified within 660 feet of construction workspaces. However, Spire has indicated that a survey report would only be submitted to the USFWS if nests were encountered. We believe that an abbreviated survey report would also be warranted if no bald eagles were found, to acknowledge the completed surveys and summarize the results. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Spire should file with the Secretary a copy of its final bald eagle survey report and any correspondence with the USFWS regarding the survey results.**

Based on the characteristics and habitat requirements of migratory birds known to occur in the proposed Project area; the amount of similar habitat adjacent to and in the vicinity of the Project; Spire's implementation of the measures in the Plan and Procedures, including timing restrictions for clearing of vegetation; and our recommendation, we conclude that construction and operation of the Project would not have significant impacts on migratory bird populations.

4. Threatened and Endangered Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Special status species include federally listed species protected under the ESA, species proposed or candidates for listing by the USFWS, and those species that are state listed as threatened, endangered, or otherwise considered sensitive. Section 7(a)(2) of the ESA requires the Commission to ensure that any action it authorizes, funds, or carries out would not jeopardize the continued existence of federally listed or proposed listed species, or result in the adverse modification or destruction of critical habitat for federally listed and proposed species. As the lead federal agency for the Spire STL Pipeline Project, the FERC is responsible for ESA consultation with the USFWS. Species classified as candidates for listing under the ESA do not currently carry regulatory protection but are typically considered during our assessments as they may be listed in the future. Similarly, species protected under state statutes do not carry regulatory protection under the ESA, but impacts are reviewed if the applicable agency indicates its potential presence in the Project area during consultation.

Table B-8 summarizes the federally and state listed species that may occur in the Project area, their preferred habitat, and our determination of effect, as further discussed in appendix K. No designated critical habitat is present in the Project area (USFWS 2016b).

State listed species of concern that have been identified by the state agencies or public comment as having potential habitat in the Project area are listed in table B-8 and discussed in section B.4.2, below; species for which there is no suitable habitat in the Project area are not discussed further.

Informal consultations were initially conducted by Spire, as our non-federal representative, with the USFWS Rock Island Field Office, IDNR, and MDOC to determine whether any federally or state listed threatened or endangered species, species of concern, or designated critical habitats occur in the Project area. During informal consultations, Spire determined that federally listed species have the potential to occur along the proposed Project route in areas where survey access has not yet been granted by the landowner. Further, species-specific field surveys have identified federally listed species (Indiana bats and northern long-eared bats) within the Project corridor.

4.1 Federally Listed Species

Spire prepared a Draft Biological Assessment (BA) for our review and consideration; however, the FERC is responsible for preparing the final BA to submit to the USFWS for ESA Section 7 consultation. Spire's proposed construction schedule overlaps with USFWS' tree-clearing restrictions for the protection of federally listed bats, and field surveys are outstanding for the decurrent false aster. Based on survey results (bat species) or assumed presence due to pending surveys (decurrent false aster), we have determined that the proposed Project *is likely to adversely affect* the Indiana bat, northern long-eared bat, and decurrent false aster (see table B-8). Incidental take of the northern long-eared bat is not prohibited under Section 4(d) of the ESA; therefore, the streamlined consultation framework for the northern long-eared bat would be used to complete consultation for this species.

Based on our findings and determinations, as described below, we are requesting that the USFWS consider this analysis (including table B-8 and appendix K) as our BA and enter into Formal Consultation for the Indiana bat and decurrent false aster. We also request that the USFWS concur with our use of the streamlined consultation framework for the northern long-eared bat as well as our determination of *not likely to adversely affect* for the remaining five federally listed species (i.e., the least tern, piping plover, red knot, gray bat, and pallid sturgeon), as identified in table B-8.

Table B-8
Federal and State Threatened and Endangered Species and Species of Concern Potentially Occurring in the Project Area

Species	Federal Status	State Status	Habitat Description	Effect Determination
Birds				
Least tern (*Sterna antillarum*)	E	Illinois - E Missouri -E	Least terns nest on barren to sparsely vegetated sandbars or open areas along rivers and winter in Central and South America (USFWS 2015a).	*Not likely to adversely affect*. Least terns are likely to nest along the Mississippi and Missouri Rivers within the Project area. Spire anticipates avoiding least tern nesting habitat through HDD of the Mississippi and Missouri Rivers.
Piping plover (*Charadrius melodus*)	E	Illinois - E	Piping plovers utilize wide, flat, open, sandy beaches for habitat and often nest along small creeks or wetlands. Winter along the Gulf Coast or other southern locations (USFWS 2015b).	*Not likely to adversely affect*. Piping plovers are likely to nest along the Mississippi and Missouri Rivers within the Project area. Spire anticipates avoiding piping plover nesting habitat through HDD of the Mississippi and Missouri Rivers.
Red knot (*Calidris canutus rufa*)	T	Illinois - T	Red knots breed in the arctic and winter in parts of the United States and further south; may transit through the Project area during migrations South America. During migration, the birds utilize large waterbodies where they feed on mussels and crustacean eggs (USFWS 2005).	*Not likely to adversely affect*. The species is not likely to breed in the area and may only be present as a transient species seeking out foraging opportunities. Spire anticipates avoiding potential foraging habitat through HDD of the Mississippi and Missouri Rivers.
Mammals				
Indiana bat (*Myotis sodalis*)[a]	E	Illinois - E Missouri - E	Hibernates in caves and abandoned mines during the winter. Roosts in maternity colonies in spring, summer, and fall located under the exfoliating bark of dead trees in riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities. Forages in forested areas, cleared areas adjacent to forests, and over ponded areas that support abundant flying insects (USFWS 2012a).	*Likely to adversely affect*. Mist net surveys caught 7 Indiana bats, and summer maternity and summer non-maternity habitat exists within the Project area. Tree clearing is proposed to occur during periods of Indiana bat occupation. Indiana bats are expected to occupy the area between April 1 and October 15. Project tree clearing may occur between April 1 and April 30, followed by a tree clearing restriction from May 1 to July 31 (for tree-nesting migratory birds), and resume on August 1, if necessary.

Table B-8 (continued)
Federal and State Threatened and Endangered Species and Species of Concern Potentially Occurring in the Project Area

Species	Federal Status	State Status	Habitat Description	Effect Determination
Mammals (continued)				
Northern long-eared bat (*Myotis septentrionalis*)[a]	T	Illinois - T	Hibernates in caves and abandoned mines during the winter. Roosts singly or in colonies underneath exfoliating bark of dead trees, in cavities, or in crevices of both living and dead trees. Occasionally found using structures as roost sites (e.g., barns and sheds). Forages within the understories of forested habitat (USFWS 2015c).	*Likely to adversely affect.* One adult female was captured during mist net surveys, indicating that summer maternity habitat is present in the Project area. No occupied maternity roosts or hibernacula were identified in close proximity to the Project. As discussed for the Indiana bat, tree-clearing could occur during occupation of summer habitat. Incidental take from Project tree clearing is not prohibited because the Project design meets the requirements of the final Section 4(d) rule for the northern long-eared bat. The IDNR does not recognize the federal 4(d) rule; therefore, Spire will develop and submit an application for incidental take to the IDNR.
Gray bat (*Myotis grisescens*)[a]	E	Illinois - E Missouri - E	Gray bats inhabit caves year-round, moving to warmer caves in summer where maternity / nursery colonies form. Summer foraging habitat is strongly correlated with the open water of streams, rivers, lakes, and reservoirs; most foraging locations are within 2.5 miles of maternity colonies, although individuals may travel up to 22 miles for prime foraging habitat. (USFWS 2009)	*Not likely to adversely affect.* To date, no caves or abandoned mines were found during the portal searches and no individuals were captured during mist net surveys. Based on survey results, it is unlikely that the Project would affect any roosting or hibernating habitat for the species. In addition, the Project would have minimal effects on the open water foraging habitat, as the larger rivers would be crossed via HDD.

Table B-8 (continued)
Federal and State Threatened and Endangered Species and Species of Concern Potentially Occurring in the Project Area

Species	Federal Status	State Status	Habitat Description	Effect Determination
Reptiles				
Timber rattlesnake (*Crotalus horridus*)	-	Illinois – T	Timber rattlesnakes are most commonly found in mature forest in rugged, hilly, sometimes rocky terrain, or along rock bluffs and forest surrounding river corridors or riparian areas. Foraging habitat includes upland forests and disturbed habitats including edges of fields where prey is more abundant. Timber rattlesnakes have been documented at bluffs along the Mississippi River in Illinois and locally within the Principia Hills West Property north of the Mississippi River.	*Would not significantly impact.* A qualified biological monitor would survey known habitat during active construction to remove any identified snakes, and would file an approved Conservation Plan prior to construction, as recommended in section B.4.1.
Fish				
Pallid sturgeon (*Scaphirhynchus albus*)	E	Illinois - E Missouri - E	Pallid sturgeons are a bottom-oriented, large, silty river obligate fish inhabiting the Mississippi and Missouri rivers and some tributaries. Preferred habitat has diverse depths and velocities (USFWS 1998).	*Not likely to adversely affect*. Range of the species is scarce in the Mississippi and Missouri Rivers. Spire would avoid pallid sturgeons by utilizing HDD techniques to cross the Mississippi and Missouri Rivers.
Lake sturgeon (*Acipenser fulvescens*)	-	Missouri - E	Lake sturgeons have been known to inhabit the Missouri and Mississippi Rivers and have also been known to occur in the larger tributaries to the river. They prefer rivers with firm, silt-free bottoms of sand, gravel, and rock.	*Would not significantly impact*. Impacts on lake sturgeon habitat would be avoided or minimized due to HDD construction.
Flathead chubs (*Platygobio gracilis*)	-	Missouri - E	Flathead chubs have been known to inhabit the Mississippi and Missouri Rivers and prefer turbid waters where the current is swift. They can also inhabit pools of small creeks with clear water, little current, with coarse gravel and bedrock bottoms.	*Would not significantly impact*. Impacts on flathead chub habitat would be avoided or minimized due to HDD construction.
Mussels				
Higgins Eye pearlymussel (*Lampsilis higginsii*)	E	Missouri - E	Higgins Eye pearlymussel utilize larger rivers where they are usually found in deep water with moderate currents. The historic range of the species extended as far south as St. Louis, but current populations are not known near the Project area (USFWS 2012b).	*No effect*. Species is not known to occur within the immediate Project area.

Table B-8 (continued)
Federal and State Threatened and Endangered Species and Species of Concern Potentially Occurring in the Project Area

Species	Federal Status	State Status	Habitat Description	Effect Determination
Plants				
Decurrent false aster (*Boltonia decurrens*)	T	Illinois - T Missouri - E	Habitat for decurrent false aster includes floodplains bordering big rivers, floodplain wetlands, mudflats, boarders of lakes marshes and sloughs, old fields, levees, roadsides and agricultural fields with full sun exposure. The species is also found in areas that have periodic disturbance such as periodic flooding, scour, mowing, or cultivation to maintain an open environment.	*Likely to adversely affect*. No individuals identified during surveys in Illinois. Surveys in potential habitat in Missouri are being conducted in August / September, 2017; however, the results of these surveys have not been provided to us, therefore we assume that a viable population of decurrent false aster exists within the potential habitat, and direct and indirect effects to decurrent false aster may occur.
Eastern prairie fringed orchid (*Platanthera leucophaea*) x	T	Illinois - E Missouri - E	Habitat for eastern prairie fringed orchid consists of early to mid-successional habitats such as grass and sedge dominated areas including mesic prairies, sedge meadows, bogs, and fens with full sun exposure. The species is also found in areas with very low or no disturbance to the substrate, areas with little or no woody vegetation competition.	*No effect*. Initial surveys identified three potential habitat locations in Illinois that warranted species-specific surveys for eastern prairie fringed orchid. Surveys were conducted in June 2017 in the two locations deemed to have potentially suitable habitat; no eastern prairie fringed orchids were found.
Mead's milkweed (*Asclepias meadii*)	T	Illinois – E Missouri - E	Habitat for Mead's milkweed includes dry-mesic to mesic upland tallgrass prairies, barrens, igneous glades, and railroad rights-of-way with full sun exposure. The species is also found in areas of late-successional prairie habitats, usually found in undisturbed habitats with high diversity of native vegetation.	*No effect*. Initial surveys identified two potential habitat locations in Illinois that warranted species-specific surveys for Mead's milkweed. Surveys were conducted in June 2017. No Mead's milkweed was found

Table B-8 (continued)
Federal and State Threatened and Endangered Species and Species of Concern Potentially Occurring in the Project Area

Species	Federal Status	State Status	Habitat Description	Effect Determination
Plants (continued)				
Ground plum milkvetch (*Astragalus crassicarpus var. trichocalyx*)	--	Illinois - E	Habitat for ground plum milkvetch consists of dry prairies, glades, open woods, and bluff tops with full sun exposure. The species may be found growing within disturbed areas such as roadsides that have a regular occurrence of moderate disturbance such as mowing to maintain an open environment.	*Would not impact*. Surveys conducted in June 2017 identified no individual plants or suitable habitat.

[a] Surveys have not yet been completed along 3.4 miles of the Project, where survey access has not yet been obtained. Of these areas, 3.1 miles would cross agricultural land and 0.3 mile would cross forested land. Spire would complete surveys at these locations upon obtaining access.

We are still consulting with the USFWS regarding federally listed threatened and endangered species that may be present in the Project area. In response to our BA, the USFWS will issue a Biological Opinion as to whether or not the federal action would jeopardize the continued existence of a listed species. Further, while we have determined that the Project *may affect, and is likely to adversely affect* the northern long-eared bat, but any incidental take would not be prohibited by the federal final 4(d) rule, the IDNR does not recognize the federal 4(d) rule; therefore, Spire is coordinating with the IDNR to develop a Conservation Plan to obtain a state Incidental Take Authorization, which would include mitigation identified in coordination with the IDNR. To ensure compliance with our responsibilities under Section 7 of the ESA regarding federally listed species, **we recommend that:**

- **Spire <u>should not begin construction</u> of the Project <u>until</u>:**

  a. the staff receives comments from the USFWS regarding the proposed action;

  b. the FERC staff completes Section 7 consultation with the USFWS; and

  c. Spire has received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of any conservation measures) may begin.

4.2 State Listed Species of Concern

<u>Timber Rattlesnake</u>

The state listed threatened timber rattlesnake was identified during Spire's consultations with the IDNR, as well as in comments provided by the public. Timber rattlesnakes are typically found in mature forests near rocky outcrops and bluffs, and are active during April through October, sunning on rocks and foraging for small mammals in forested areas and adjacent to disturbed land. In the colder months, they hibernate in rocky dens (Illinois Natural History Survey 2017). The IDNR indicated that rattlesnakes could potentially occur in one location crossed by the Project on the north side of the Mississippi River within the vicinity of the Project's crossing of The Principia's West Farm campus north of the Mississippi River. The IDNR has also identified two potential den buffers adjacent to the proposed pipeline right-of-way. As the presence of timber rattlesnakes has been well-documented, Spire does not propose to conduct species-specific surveys in areas of potential habitat, but instead assumes their presence.

Given the known habitat and location of active dens, timber rattlesnakes could potentially occur within construction workspaces, and a take could occur during construction. To minimize the potential for take, Spire would use a qualified biological monitor during construction between MPs 44.0 and 45.1 for the safety of the snakes and construction personnel. Spire would install barriers (e.g., silt fences) around areas of active construction through the potential habitat, conduct surveys each morning to ensure that no snakes are in the active construction area, and avoid construction until additional surveys are conducted if breaches are found in the barrier.

As discussed in section B.1.1, Spire plans to avoid blasting during trenching. However, Spire has identified locations where site-specific conditions may interfere with conventional rock-trenching methods. Based on these locations blasting could be required about 530 feet from a known den. To minimize impacts at this location, Spire would conduct blasting such that flyrock would have a peak ground acceleration of 2 inches per second. Also, Spire is coordinating with the IDNR to develop a Conservation Plan to obtain an Incidental Take Authorization for timber rattlesnakes at this location, which would include mitigation identified in coordination with the IDNR (IDNR 2016); however, as the Conservation Plan has not yet been finalized, **we recommend that:**

- **Prior to construction, Spire should file with the Secretary its Conservation Plan to obtain an Incidental Take Authorization for timber rattlesnakes, as well as results of its consultation with the IDNR on its plan.**

Given Spire's commitment to use of a qualified biological monitor in areas of potential timber rattlesnake habitat, special consideration of the species during blasting activities, and our recommendation to provide the approved Conservation Plan prior to construction, we find that the Project would not significantly impact the timber rattlesnake.

Lake Sturgeon

The state listed endangered lake sturgeon is a large river obligate species and is known in the Project area from the Missouri River. They prefer firm, silt-free river bottoms consisting of sand, gravel, and rock in swift moving currents. Lake sturgeon can live to be 150 years old, and are not mature until they are 15 to 20 years old. Females only spawn every 3 to 5 years with peak spawning in the first half of May. Lake sturgeon are endangered because of alterations to their native habitat and historic overfishing of the species (MDOC 2017d).

The lake sturgeon has the potential to occur in the Project area where the pipeline crosses the Mississippi and Missouri Rivers; Spire plans to avoid direct impacts on these rivers using the HDD construction method. As described in section B.1.1, Spire conducted geotechnical studies to determine the feasibility of the HDDs and determined that they had a high probability of successful completion. However, if an inadvertent release of HDD drilling fluid were to occur during construction, the resulting turbidity could impact water quality. In addition, water quality could be adversely affected by an accidental spill of hazardous material. Spire's adherence to the Plan and Procedures, HDD Plan, and SPCC Plan would minimize or avoid potential impacts on the Mississippi and Missouri Rivers. In the event that an HDD crossing is unsuccessful, Spire would consult with applicable agencies regarding impacts on threatened and endangered species, and would obtain necessary approvals prior to implementing an alternative crossing method. Therefore, we conclude that the Project would not significantly impact the lake sturgeon.

Flathead Chub

The state listed endangered flathead chub occurs in the Project area within the Mississippi and Missouri Rivers and its tributaries. The flathead chub prefers turbid waters with swift current where the bed is composed of sand and fine gravel, but in smaller creeks it can be found in calmer pools of clear water with gravel and bedrock bottoms; no small creeks with suitable habitat were identified during Spire's field surveys. This species is adapted for finding food in muddy waters, but reservoirs upstream of the Project area have altered the flow of the Missouri thereby eliminating most suitable habitat in that River (MDOC 2017e and f). As with the lake sturgeon, with Spire's proposed use of the HDD construction method across the Mississippi and Missouri Rivers, and implementation and its mitigation plans and the Procedures, we conclude that the Project would not significantly affect the flathead chub.

Ground Plum Milkvetch

The ground plum milkvetch, which is state listed as endangered in Illinois, is a broad-leaved herbaceous plant with violet flowers that blooms in April and May. The species prefers full sun on well drained to dry soil. In Illinois, it is found on dry rocky prairie, glades, glacial till, open woods, and blufftops. The ground plum milkvetch was thought to be extirpated from the state but was discovered on a limestone bluff in Jersey County in 1987 (Herkert *et al.* 2002).

Principia College had indicated that a population of ground plum milkvetch is located on its West Farm campus where the Project would traverse its property; however, surveys conducted on this property in early June, 2017 identified neither ground plum milkvetch nor suitable habitat for the species. Therefore, we find that the proposed Project would not impact the ground plum milkvetch.

5. Land Use and Visual Resources

The Spire STL Pipeline Project would cross a variety of land types beginning in Scott County, Illinois and proceeding south through Greene and Jersey Counties, Illinois; St. Charles County, Missouri; and terminating in St. Louis County, Missouri. Most of the land affected by the construction and operation of the Project would be agricultural land (83.7 percent). Other land uses would be open land, forested land, developed land, wetlands, and open water.

The Project would affect 1,004.1 acres of land during construction, including pipeline construction right-of-way, ATWS, and staging areas, access roads, and meter stations. Of that total acreage, 589.3 acres would be restored to pre-construction uses. The remaining 414.8 acres would be maintained for operation of the Project. Table B-9 summarizes the Project's temporary (construction) and permanent (operational) land use impacts. The acreage of estimated construction impacts includes all land disturbed, whereas the acreage of operational impacts represents the land permanently retained for operation. Impacts on open water and wetlands are discussed in sections B.2.2 and B.2.3, respectively.

5.1 Land Use

Agricultural Land

Construction of the Project would affect 840.3 acres of agricultural land (606.9 acres in Illinois and 233.4 acres in Missouri), which includes active hayfields, grazing/pasture land, and active crop production. Crops produced in agricultural land crossed by the proposed Project include corn and soybeans; one community farm would be crossed near MP 43.9; no other areas of specialty crop production are known to be crossed. Some potentially affected landowners filed comments expressing concerns about long-term impacts on their agricultural fields and access during construction. These concerns are addressed below.

Within actively cultivated or rotated cropland, topsoil would be stripped and stockpiled separately from the subsoil, as described in section A.8.2. During construction across lands that are being actively cultivated or used for grazing, Spire would install temporary access (e.g., steel plates or temporary bridges) over the trench to maintain access for landowners, as well as their equipment and livestock. Spire is also coordinating with landowners on the location of drain tiles or irrigation systems within the right-of-way. If drain tiles or irrigation systems are damaged, cut, or removed during construction, Spire would work with the landowner to replace them or repair the damaged portion. Spire anticipates that one growing season would be lost due to construction; landowners would be compensated for these production losses in accordance with the terms of individual landowner agreements.

As described in sections A.8.2 and B.1.2, agricultural land in Illinois would also be subject to the terms of the Project's AIMA (see appendix D). As described in section A.8.2, the Project's AIMA includes construction and restoration issues unique to agricultural areas in Illinois. According to the terms of this agreement, Spire would employ an agricultural inspector to monitor work on each spread for the Project. The agricultural inspector serves as a liaison between the landowners and the company, working in conjunction with the EIs to ensure the terms of the Project's AIMA are met and to address site-specific issues that may arise during construction.

Table B-9
Land Use Affected by Construction and Operation (in Acres) of the Spire STL Pipeline Project[a]

Facility	Agricultural		Upland Forest		Open Land		Developed		Wetlands[b]		Open Water		Total	
	Con[c]	Op[d]	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Pipeline right-of-way	577.1	320.2	52.0	31.1	33.6	20.0	12.9	7.9	10.9	7.6	8.2	7.9	694.7	394.7
Additional temporary workspace	219.1	0.0	7.5	0.0	8.9	0.0	3.2	0.0	1.3	0.0	<0.1	0.0	240.0	0.0
Access roads	3.4	0.5	1.0	0.1	7.3	1.0	5.4	0.8	0.0	0.0	0.0	0.0	17.0	2.4
Staging areas	30.7	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.5	0.0
Cathodic protection groundbed	1.5	1.0	0.0	0.0	0.4	0.3	0.5	0.4	0.0	0.0	0.0	0.0	2.4	1.6
Subtotal	**831.8**	**321.7**	**60.5**	**31.2**	**53.0**	**21.3**	**22.0**	**9.1**	**12.2**	**7.6**	**8.2**	**7.9**	**987.6**	**398.7**
REX Receipt Station	5.0	5.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0
Laclede / Lange Delivery Station	3.6	3.6	0.3	0.3	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	4.0	4.0
Chain of Rocks Station	0.0	0.0	3.8	3.3	1.9	1.9	1.8	1.7	0.0	0.0	0.0	0.0	7.5	7.0
Subtotal	**8.6**	**8.6**	**4.1**	**3.6**	**1.9**	**1.9**	**1.8**	**1.7**	**0.0**	**0.0**	**0.0**	**0.0**	**16.5**	**16.0**
Total	**840.3**	**330.3**	**64.6**	**34.9**	**54.9**	**23.2**	**23.8**	**10.9**	**12.2**	**7.6**	**8.2**	**7.9**	**1,004.1**	**414.8**

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends. Impacts associated with mainline valves, alternating current mitigation zinc ribbons, and pigging facilities are presented with the pipeline impacts or corresponding aboveground facility as applicable.

[b] The wetlands category includes both forested and non-forested wetlands.

[c] Construction impact acreages are based on a nominal temporary right-of-way between 75 and 90 feet. While no ground disturbance would be required between HDD entry and exit points, the approximately 18.5 acres within the proposed 50-foot-wide permanent right-of-way is included in these totals.

[d] The operational footprint is based on a new 50-foot-wide permanent right-of-way.

Spire consulted with the Missouri Department of Agriculture on special construction techniques the state may require. Based on this consultation, construction and restoration on agricultural land in Missouri would be done in accordance with the Plan.

Following construction, Spire would visually inspect agricultural land to ensure that crop vigor in areas affected by construction is similar to adjacent portions of the same field, or as otherwise agreed to by the landowner. Impacts on prime farmland and farmland of statewide importance are discussed in section B.1.2.

Operations would affect 330.3 acres of agricultural land. Of this, 321.2 acres would be within the proposed permanent pipeline right-of-way or cathodic protection groundbeds, which would be restored in accordance with the Plan and the Project's AIMA, as applicable, following construction so that the full right-of-way could be used for crop production the following season. The remaining 9.1 acres would be permanently affected by aboveground facilities or permanent access roads. Spire would mitigate for the permanent loss of agricultural land according to the terms of individual landowner agreements and the Project's AIMA, as applicable. Given Spire's proposed mitigation measures, we find impacts on agricultural land would be temporary and not significant.

Open Land

Project construction would affect 54.9 acres of open land, defined as non-forested upland areas, pastures, and maintained utility rights-of-way (see table B-9). About 31.7 acres of the temporarily disturbed area would be allowed to revert to original condition after construction. During operation of the Project 23.2 acres of open land would be within the maintained pipeline right-of-way. Based on the limited acreage of open land that would be permanently maintained or converted, impacts on open land would be predominantly temporary and not significant.

Forested Land

About 64.6 acres of forested land would be within the construction workspace of the Project, including 1.0 acre of forested wetlands. Portions of a tract owned by Principia College are managed for educational purposes including forest management. Impacts on this parcel are discussed further in section B.5.4. No areas of commercial timber production or sustainably managed forest have been identified along the proposed Project route through Spire's field surveys and contact with landowners. If Spire identifies any such parcels at a later date, it would consult with the landowner and management entity, as appropriate, to mitigate impacts.

After construction, trees and shrubs would be allowed to grow within the temporary construction right-of-way and other temporary workspace areas. In forested wetlands, a 10-foot-wide corridor centered over the pipeline could be maintained in an herbaceous state, and trees within 15 feet of the pipeline with roots that may compromise the pipeline integrity may be selectively cut and removed from the right-of-way. Impacts on forested land would be long-term or permanent, as it would likely take 20 years or more for mature trees to re-establish within the construction areas and the 34.9 acres required for operation would be permanently converted to open land. Additionally, 0.2 acre of forest wetland would be permanently converted to PEM wetland (see table B-6). Impacts on forested vegetation are discussed in detail in section B.3, and visual impacts from clearing forested land are discussed in section B.5.4. We find that the Project would not result in significant impacts on forested land.

Developed Land

Developed land is defined as existing easements, transportation rights-of-way, commercial areas, paved roads, railroads, residential yards, and subdivisions. As presented in table B-9, the Spire STL Pipeline Project would affect a total of 23.8 acres of developed land during construction. Of the 23.8 acres, 10.9 acres would be permanently encumbered by the operational right-of-way, aboveground facilities, or permanent access roads. The remaining 12.9 acres of developed land would be returned to original conditions after construction. Mitigation of impacts on residential land is discussed in section 5.2.

After construction, the pipeline would cross 70 public roads, 1 private road, and 2 railroads (the Burlington Northern & Santa Fe Railroad would be crossed twice, at MP 51.1 and NCE MP 1.9). The majority of the roads and the railroads would be crossed by trenchless methods such as bore or HDD, thereby avoiding direct impacts on these features. However, six roads would be crossed using the open-cut method. These roads would be restored to pre-construction conditions. Transportation impacts are discussed in section B.6.3. The majority of impacts on developed land would be temporary, minor, and not significant.

Open Water

For this Project, open water is defined as lakes, ponds, and waterbodies that are 10 feet wide or greater at the crossing location. Construction of the pipeline would affect approximately 8.2 acres of open water, 7.9 acres of which would be within the new permanent right-of-way as presented in table B-9. Of the 7.9 acres of open water, about 6.1 acres are within the pipeline's permanent right-of-way but would be associated with the HDD crossings, thereby avoiding direct impacts on these features.

Major waterbodies, defined as greater than 100 feet wide, proposed to be crossed by the Project include: the Mississippi River, Missouri River, an oxbow of the Missouri River, and Coldwater Creek. Because Spire is proposing to install the pipeline via HDD, no impacts on these waterbodies are anticipated from construction or operation of the Project. The fourth waterbody, Macoupin Creek, would be crossed using the dry-ditch flume method. Details on this waterbody are provided in section B.2.2. Based on the proposed construction methods and mitigation measures, we find there would be no significant impacts on open water.

5.2 Residential Land and Planned Developments

Based on correspondence with county and town planning and zoning offices in the Project area, no commercial or residential developments were identified within 0.25 mile of the Project. However, 10 residences, 3 commercial buildings, as well as 35 structures (e.g., barns, garages, sheds), and 2 swimming pools (NCE MP 2.6 and NCE MP 5.8) would be within 50 feet of work areas. Temporary construction impacts on residences and businesses in proximity to the construction work areas could include noise and dust; disturbance or removal of lawns, trees, landscaped shrubs, or similar vegetation; potential damage to existing septic systems or wells; and removal of aboveground structures such as fences, sheds, or pools from within the pipeline right-of-way. Spire would minimize construction-related impacts on all residences through landowner notification of approximate timelines of active construction; maintained property access; installation of safety fence around an open ditch; installation of steel plates over the trench across driveways (completed in one day or less), installation of end caps on exposed pipeline at the end of each day; and backfilling and restoration in accordance with the Plan.

A total of 10 residences are within 50 feet of the proposed construction work area as presented in table B-10. For residences within 50 feet of the construction right-of-way, a barricade fence would be installed adjacent to the residence and along the edge of the construction work area for a distance of 100 feet to ensure that equipment and materials remain within the construction workspace. As shown in table B-10, no residences would be within 10 feet of the construction work areas.

Spire has filed site-specific residential construction plans for the 10 residences within 50 feet of construction work areas (see appendix L). Based on our review of the site-specific residential construction plans, and Spire's mitigation measures, we find impacts on residences would be temporary and not significant. With issuance of this EA, we are seeking comments from affected landowners on these site-specific plans.

Table B-10 Residences and Buildings within 50 Feet of Construction Work Areas				
County, State	**Building Type**	**Milepost**	**Distance from Work Area (feet)**	**Site-specific Mitigation Plan**
Pipeline				
Greene, Illinois	Structure	5.6	0	N/A
	Residence	6.2	50	See appendix L
	Structure	14.9	28	N/A
	Structure	14.9	33	N/A
	Structure	24.4	21	N/A
	Barn	24.4	25	N/A
	Barn	24.6	6	N/A
	Barn	24.7	4	N/A
	Barn	24.7	33	N/A
	Barn	24.7	37	N/A
Jersey, Illinois	Barn	29.7	50	N/A
	Barn	29.7	43	N/A
	Barn	30.9	38	N/A
	Structure	36.4	46	N/A
	Structure	37.9	19	N/A
	Structure	37.9	15	N/A
	Structure	37.9	15	N/A
	Structure	37.9	15	N/A
St. Louis, Missouri	Residence	46.4	42	See appendix L
	Barn	46.4	5	N/A
	Residence	46.6	49	See appendix L
	Structure	58.2	31	N/A
	Structure	58.2	29	N/A
	Structure	58.2	7	N/A
	Structure	58.2	14	N/A
	Structure	58.3	28	N/A
	Commercial	58.3	41	N/A
	Garage	58.4	4	N/A
	Residence	58.7	12	See appendix L
	Residence	58.8	50	See appendix L
	Residence	NCE 0.0	15	See appendix L
	Shed	NCE 0.0	7	N/A
	Barn	NCE 0.3	0	N/A
	Shed	NCE 1.1	38	N/A

Table B-10 (continued) Residences and Buildings within 50 Feet of Construction Work Areas				
County, State	**Building Type**	**Milepost**	**Distance from Work Area (feet)**	**Site-specific Mitigation Plan**
St. Louis, Missouri (continued)	Barn	NCE 1.1	20	N/A
	Garage	NCE 1.3	26	N/A
	Residence	NCE 2.4	48	See appendix L
	Shed	NCE 2.6	3	N/A
	Pool	NCE 2.6	0	N/A
	Residence	NCE 2.6	14	See appendix L
	Shed	NCE 2.6	25	N/A
	Structure	NCE 3.0	16	N/A
	Barn	NCE 3.3	26	N/A
	Shed	NCE 5.0	8	N/A
	Pool	NCE 5.8	50	N/A
	Residence	NCE 5.8	46	See appendix L
	Residence	NCE 5.8	45	See appendix L
	Pool	NCE 5.8	50	N/A
Chain of Rocks Station				
St. Louis, Missouri	Commercial	N/A	38	N/A
	Commercial	N/A	41	N/A

5.3 Public Land, Recreation, and Special Interest Areas

The Spire STL Pipeline Project would not cross any National Wild and Scenic Rivers, National Park Service Wildlife Management Areas, state forests, Indian reservations, or land managed by or associated with the U.S. Bureau of Land Management, Wetland Reserve Program, Emergency Conservation Program, or Grassland Reserve Program. The Project is outside of any Coastal Zone Management Act areas; as such, no impacts on coastal resources are expected. However, portions of the Project could affect several other recreation and/or special interest areas that are within 0.25 mile (see table B-11). Further discussion of these areas is included below. The Scenic byway that would be crossed by the Project (MP 45.1) and the Lewis and Clark National Historic Trail are discussed in section B.5.4. Two landgrants in Missouri that are managed and sensitive wildlife areas are discussed in sections B.3.1 and B.3.3.

Table B-11
Public Land and Designated Recreation or Scenic Areas within 0.25 Mile of the Spire STL Pipeline Project

Name of Area	Approximate Milepost	Land Ownership / Land Management	Distance from Project (feet)	Crossing Length (feet)	Area Affected (acres)		Proposed Crossing Method
					Con	Op	
Mainline							
Pleasant Hill Church	2.2	N/A	619	0	0.0	0.0	N/A
West Farm	44.0 and 44.7[a]	Principia College	0	5,609	13.9	6.5	Open cut, dry-ditch flume, temporary access road TAR-017
Elsah Historic District	44.6	National Park Service	935	0	0.0	0.0	N/A
The Meeting of the Great River Scenic Byway (Illinois Route 100)	45.1	Illinois Department of Transportation / National Highway Association	0	69	0.1	0.1	HDD
Sam Vadalabene Great River Road Bike Trail	45.1	Rails to Trails Conservancy	0	10	<0.1	<0.1	HDD
Upper Mississippi Conservation Area	45.6	USFWS and USACE	0	1,737	2.0	2.0	HDD
Portage Des Sioux Baseball Field	49.0	Portage Des Sioux	695	0	0.0	0.0	N/A
Consolidated North Levee	57.8	Consolidated North Levee District and USACE	0	79	0.1	0.1	HDD
Lewis and Clark National Historic Trail / Missouri River Water Trail	58.3[b]	National Park Service	0	1,267	1.5	1.5	HDD

Table B-11 (continued)
Public Land and Designated Recreation or Scenic Areas within 0.25 mile of the Spire STL Pipeline Project

Name of Area	Approximate Milepost	Land Ownership / Land Management	Distance from Project (feet)	Crossing Length (feet)	Area Affected (acres)		Proposed Crossing Method
					Con	Op	
North County Extension							
The Valley Senior Community	1.4	N/A	464	0	0.0	0.0	N/A
Fort Belle Fontaine County Park	2.0	St. Louis County	0.0	448	0.5	0.5	HDD
Arrowpoint Elementary School	2.2	Hazelwood School District	826	0	0.0	0.0	N/A
Spanish Lake Park	4.0	St. Louis County	0	1,479	1.7	1.7	HDD
Emerald Greens Golf Course	4.2 and 4.5[a]	N/A	0	3,068	6.2	3.8	HDD, open cut, temporary access road TAR-026
Mount Moriah Church of Christ	5.3	N/A	630	0	0.0	0.0	N/A
Applied Scholastics International	6.0	N/A	0[c]	1,044	3.0	2.2	Open cut
Grace Baptist Church	6.0	N/A	395	0	0.0	0.0	N/A
Chain of Rocks							
Green Valley Nursing and Rehab	N/A	N/A	260	0	0.0	0.0	N/A

[a] At this location the feature would be in proximity to an access road.

Conservation Reserve Program

The Conservation Reserve Program (CRP) is managed and administered by the USDA's Farm Service Agency and provides eligible farmers and ranchers with technical and financial assistance to conserve and protect water, soil, and related natural resources on their land. Through consultation with Farm Service Agency (in both Illinois and Missouri) and landowners, Spire identified four parcels enrolled in the CRP that would be crossed at MPs 3.1, 10.4, 27.3, and 42.4. We also received two comments from potentially affected landowners concerned about their current or future enrollment in the CRP.

Based on consultation with the Farm Service Agency regarding CRP parcels in Illinois, tree clearing on these parcels is restricted between April 15 and August 1. As discussed in section B.3.3, Spire intends to clear all trees between February 1 and May 1, 2018. If tree clearing were to take place on these parcels between April 15 and May 1, the parcel would be subject to a reassessment and a reduction in program benefits. Spire is coordinating with landowners to identify parcels enrolled in the program and coordinate on the anticipated construction schedule. Any potential reduction in benefits of the CRP program associated with construction of the Project could be negotiated with Spire as part of the landowner's easement.

Similarly, the USDA's Farm Service Agency also administers Highly Erodible Land Conservation provisions aimed at reducing soil loss on land that is prone to erosion. Two such identified parcels would be crossed at MPs 22.6 and 43.5. See section B.1.2 for a discussion of potential impacts on soils. We received comments from a landowner concerned that the Project would prevent property from being enrolled in a quail habitat program administered by the Farm Service Agency in Illinois. Per correspondence with the Farm Service Agency, parcels enrolled in this program are typically agricultural land which would need to be restored to pre-construction conditions following construction and would have specific reseeding requirements. Impacts on agricultural land would largely be temporary and minor, as cropland would be restored and returned to production within 1 year (see section B.5.1). Further, Spire has consulted with the landowner and would reseed the parcel using designated seed mixes, as applicable, and in accordance with the Project's AIMA in Illinois and the Plan in Missouri.

Principia College

The Project would cross a portion of Principia College known as the West Farm (between MPs 44.0 and 45.0). This area is used by the college for educational purposes such as forest management and field research, and includes a community farm focusing on organic farming practices. Spire is proposing to construct the pipeline adjacent to the existing NuStar Pipeline on this parcel. Spire is coordinating with college representatives to obtain access to the parcel for survey purposes. See section B.4 for additional discussion of threatened and endangered species associated with Principia College's land

and section C for our analysis of a minor route alternative associated, in part, with this parcel.

Federal Land and Resources

In addition to the navigable waters of the Missouri and Mississippi Rivers, the Project would cross two USACE resources: a flood control levee along the Missouri River that is maintained by the Consolidated North County Levee District at MP 57.8 and a parcel of the Upper Mississippi Conservation Area at MP 45.6. The levee is about 41 miles and provides protection for about 30 thousand acres of farmland and floodplain areas (St. Charles County 2017). As discussed in section B.3.3, the Upper Mississippi Conservation Area is managed cooperatively by USFWS and USACE. See section B.3.3 for additional details on the Upper Mississippi Conversation Area. Each of these crossings would require 408 permits issued by the USACE, as discussed in section A.10. USACE will ensure that any proposed alteration of these resources will not be injurious to the public interest and will not affect the USACE project's ability to meet its authorized purpose. These resources would all be crossed by the HDD method, thereby mitigating impacts from construction and operation of the Project.

The National Park Service raised concerns for potential visual impacts from the Project on the historic route identified as the Lewis and Clark National Historic Trail. On March 10, 2017, Spire provided the USDOI-NPS with detailed Project plans to construct the pipeline beneath the historic trail using the HDD method. Following its review of the submitted plans, the USDOI-NPS submitted return correspondence on March 13, 2017, citing no further comments regarding potential impacts on the trail.

Other Special Use Areas

Spire has identified parcels in the Project area that allow public and private hunting and would work with the individual landowners and leaseholders to identify restrictions on hunting during active construction periods. Compensation for any interruptions would be established during easement negotiations with individual landowners. Spire would also require workers to wear protective equipment such as safety vests when constructing across parcels where active hunting may occur.

The Meeting of the Great River Scenic Byway (Illinois Route 100) and Sam Vadalabene Great River Road Bike Trail follow the Mississippi River. The proposed HDDs of the Mississippi and Missouri Rivers would mitigate impacts on the byway and trail as well as the special use areas identified in table B-11 between MPs 45.0 and 46.2 and MPs 57.7 and 58.4. Although construction would not directly affect the scenic byway or bike trail, the byway would be used by construction vehicles to transport equipment and personnel to nearby work areas. To minimize impacts on bicyclists, Spire would adhere to safe driving practices during construction and operation of the Project. Also, Spire would install safety fencing, cover open excavations at the end of the work day, and initiate restoration immediately following construction. Further, the proposed crossing at this location would be adjacent to the existing NuStar Pipeline right-of-way.

Three churches, the Elsah Historic District, a nursing and rehabilitation facility, a senior community, and a baseball field would not be directly affected by the Project. However, based on their proximity to construction work areas, as reported in table B-11, potential impacts on these areas could occur from increased noise during construction. Overall these impacts would be minor and temporary, as a buffer of forested habitat would separate construction activities from these areas. Based on the proposed construction methods and mitigation measures, we find there would not be significant impacts on public land, recreation, and special interest areas.

5.4 Visual Resources

The Project could alter existing visual resources in two ways: (1) construction activity and equipment may temporarily alter the viewshed; and (2) lingering impacts along the right-of-way from clearing during construction and operation could alter existing vegetation patterns. The significance of these visual impacts would primarily depend on the quality of the viewshed, the degree of alteration of that view, the sensitivity or concern of potential viewers, and the perspective of the viewer. Impacts would be greatest during construction of the Project because of the increased right-of-way needed for construction, the displaced soil, and the presence of personnel and equipment. After construction, temporary workspaces would be returned to pre-construction conditions by the restoration methods discussed in the Plan and Procedures. Land affected by the Project is dominated by agricultural land, and open land (89.1 percent) would revert to pre-construction conditions within 1 to 3 years after construction. The greatest long-term and permanent visual impacts would occur in areas of forested land where cleared vegetation would be more noticeable (about 5.0 miles). The conversion of forested land to open land has the potential to affect its use as a visual buffer and reduce its aesthetic quality.

In restored areas, regrowth to pre-construction conditions would generally take 20 to 30 years for many species to reach maturity. Hardwood species, such as oaks, could take 50 years to reach maturity. However, the significance of visual impacts would vary based on the viewer's location and the adjacent land use type. When the pipeline is routed adjacent to existing disturbance (e.g., rights-of-way, agricultural fields), the impact of cleared trees may result in a slightly wider cleared area, but would not significantly change the viewshed of the land at these locations. In areas where the pipeline is routed through larger forested plots, the remaining trees would generally screen the right-of-way from view and would not result in visual impacts. However, minor to moderate visual impacts would occur in those areas where views include a newly cleared right-of-way in forested land. In consideration of the amount of forested land proposed for clearing and the routing of the proposed pipeline, we find that the overall impacts of clearing in forested land for the Project would be minor, yet long-term to permanent.

As described above, Spire's use of the HDD method for the crossing of the Mississippi River would minimize any direct impacts on the Meeting of the Great Rivers Scenic Byway and the adjacent Sam Vadalabene Great River Road Bike Trail. Scenic views would be affected during construction, as construction activities would be within view of motorists on the byway and users of the bike trail. Overall visual impacts along this route would be a result of construction activities and equipment, and the disturbance of land used for workspace alongside the highway. However, the existing treeline and bluff would block the view of some construction activities from certain vantage points. Following construction, Spire would restore work areas as near as possible to pre-construction contours and revegetate disturbed areas; therefore, impacts on the viewshed for motorists/cyclists would generally be minor and temporary during active construction. While the creation of a right-of-way through forested land would result in minor permanent impacts within the viewshed, the proposed crossing at this location would be adjacent to the existing NuStar Pipeline right-of-way.

The REX Receipt and Laclede/Lange Delivery Stations would be constructed predominately on agricultural land, while the Chain of Rocks Station would be constructed on a mix of open, developed, and forested land. Each station is sited to connect to nearby, existing natural gas infrastructure; however, the new meter stations proposed at these locations would represent new aboveground facilities, which would permanently change the viewshed for nearby receptors. To minimize visual impacts from these facilities, Spire would utilize color schemes that are consistent with the surrounding environment. In addition, Spire would maintain existing vegetation where feasible. Spire has stated that it would coordinate with Applied Scholastics International, located north of the Chain of Rocks Station, to minimize visual impacts. Through Spire's implementation of the revegetation measures in the Plan, pipeline placement adjacent to existing disturbance where possible, and pipeline routing through predominately non-forested land, we conclude that visual impacts of the entire proposed Project would be appropriately minimized and not significant.

6. Socioeconomics

Socioeconomic impacts resulting from the construction and operation of the proposed pipeline, meter stations, access roads, MLVs, and pigging facilities would affect Scott, Greene, and Jersey Counties in Illinois; and St. Charles and St. Louis Counties in Missouri. Some of these potential effects would be related to the number of construction workers that would work on the Project and their impact on population, public services, and employment during construction. Other potential effects include an increase in local traffic, decreased available housing, and increased tax revenue. We also received comments regarding property values.

6.1 Employment

Based on the U.S. Bureau of Labor Statistics, the 2016 average unemployment rate for Illinois was 5.9 percent, with unemployment rates of 5.6, 5.9, and 5.8 percent in Scott, Greene, and Jersey Counties, respectively. The 2016 average unemployment rate for Missouri was 4.5 percent, with an unemployment rate of 3.5 percent in St. Charles County and 4.2 percent in St. Louis County (U.S. Bureau of Labor Statistics 2017).

Construction of the pipeline, meter stations, and pigging facilities for the Spire STL Pipeline Project would require an estimated peak workforce of 393 workers. Spire anticipates that about 50 percent of the construction workforce would be hired locally. Specialists and supervisory positions may be filled by non-local workers. Local workers would likely be residents of the five counties crossed by the Project and would reside within commuting distance of the Project.

Due to the short duration of construction, it is anticipated that most non-local workers would not be accompanied by their families. The introduction of non-local workers would be temporary and limited to the 11-month period required to complete construction. The increase in employment for local workers would result in a temporary and negligible impact on the affected counties' employment rate and a negligible impact on the population and services of the local municipalities. Spire anticipates five full-time positions would be required for operation of the Project. This would result in a permanent, negligible impact on employment rates in the Project area.

6.2 Housing

As previously indicated, Spire anticipates that about half of the 393 workers required for construction would already reside near the proposed Project area. Non-local workers, however, would relocate to the Project area for the 11-month construction period. The 2015 rental housing vacancy rates in the counties crossed by the proposed Project were 3.6 percent, 4.4 percent, and 4.0 percent, respectively, in Scott, Greene, and Jersey Counties, Illinois; and 5.2 percent and 7.6 percent, respectively, in St. Charles and St. Louis Counties (see table B-12). As of 2015, there were 45,347 vacant housing units in the counties crossed by the Project (U.S. Census Bureau 2017a). In addition, there are about 273 hotels, motels, and bed and breakfasts within the five counties crossed by the Project (HotelMotels 2017). Additionally, there are about 51 recreational vehicle parks and campgrounds in and around the counties crossed by the Project that the workforce could use (HotelMotels 2017; Yellowbook 2017).

Table B-12
Existing Economic Conditions by County / State for the Spire STL Pipeline Project

State / County	Unemployment Rate[a]	Vacant Housing Units[b]	Rental Vacancy Rates[b]	Hotels / Motels[c]	RV Parks and Campgrounds[d]
Illinois	5.9	517,287	6.4	3,325	--
Scott County	5.6	311	3.6	0	5
Greene County	5.9	904	4.4	4	2
Jersey County	5.8	1,149	4.0	14	2
Missouri	4.5	365,174	6.9	2,675	--
St. Charles County	3.5	6,746	5.2	40	18
St. Louis County	4.2	36,237	7.6	215	24

a U.S. Bureau of Labor Statistics 2017.
b U.S. Census Bureau 2017b.
c HotelMotels 2017.
d Yellowbook 2017.

While the bulk of the housing facilities (215 hotels and 42 recreational vehicle parks and campgrounds) are in Missouri, other additional temporary housing facilities such as apartments or seasonal rentals/vacation properties are likely present in Scott, Greene, and Jersey Counties, Illinois (see table B-12). The distance from the housing facilities in Missouri to the Project areas further north in Illinois are within the limits of typical commute distances for these types of projects.

Operation of the Project would require five new full-time workers; therefore, impacts on public housing during operation of the Project would be permanent but negligible. Overall, impacts on housing in the vicinity of the proposed Project area would be negligible and limited to the construction phase.

6.3 Transportation

Construction of the Project may result in minor, temporary impacts on roadways due to construction and the movement of workers and heavy equipment. The Project would require 71 road and 3 railroad crossings, of which 6 would be open cut and 68 would be bored or crossed using the HDD method. The Meeting of the Great River Scenic Byway (Illinois Route 100) and the adjacent Sam Vadalabene Great River Road Bike Trail would be crossed with the HDD crossing of the Mississippi River. Two of the railroad crossings would be by conventional bore (MP 7.2 and MP 51.1) and the third crossing would be within the path of the HDD crossing of Coldwater Creek. While many of the roads proposed to be open cut are paved, crossing by the open-cut method allows for a more expedited crossing with less ATWS.

Two roads (Portage Road near MP 46.6 and Mintert Road near MP 57.3) would be temporarily obstructed during construction to accommodate the pull string area for the HDD crossings of the Mississippi River and Missouri River. Spire estimates that the pull string activities at this location would take place over 3 days with 24-hour operations.

Impacts on users of these roads would be mitigated by Spire's commitment to maintain traffic flow through the establishment of detours, use of temporary bridges, or establishment of bypasses. Spire would establish temporary detours in consultation with transportation authorities. Construction at public road crossings would be done in compliance with applicable permits. Roads that would be bored or crossed by HDD are not expected to experience traffic delays as the road surface would not be disturbed.

A minor increase in traffic would occur during the 11-month construction period from the temporary influx of workers moving throughout the Project area; however, we anticipate that much of this travel would occur outside of peak traffic times. To minimize congestion, specifically in suburban residential areas, Spire would establish parking areas at the staging areas and provide bus transport to the work sites. Minimal traffic delays would also occur during the transportation of construction materials, specifically oversized equipment, on public roadways. Spire would obtain all permits necessary to transport construction materials on public roadways. Overall, we conclude impacts on transportation would be temporary, minor, and not significant.

6.4 Public Services

Based on the nominal workforce anticipated for construction and operation of the Project and the existing inventory of schools, hospitals, fire, and police departments, in the Project area, impacts on public services are not anticipated. Spire would develop an incident planning program as part of its Emergency Response Plan and would post emergency response information at all construction trailers.

6.5 Tax Revenue

Spire estimates that the construction workforce payroll would be 50 million dollars, a portion of which would likely be spent on local amenities such as food, housing, and other living expenses during the 11-month construction period. As such, state taxes would be paid by local and non-local workers on goods and services bought locally with money earned from the Project. In addition, Spire would locally procure some materials needed for construction of the Project. Therefore, during construction, the Project would benefit the economies of the counties crossed.

Based on the limited acreage affected by Spire's proposed aboveground facilities (see table B-9), the Project would not result in a significant, direct increase in property tax revenues.

6.6 Property Values

The potential impact of a pipeline on the value of a property is related to many property-specific variables, including the size, current value of the land, available utilities and services, current land use, and value of adjacent properties. Land values are determined by appraisals that would take into account objective characteristics of the property, such as size, location, and any improvements. While there is recently published literature indicating that there is no identifiable or consistent link between the presence of natural gas pipeline easements and residential property values (Diskin *et al.* 2011; Wilde *et al.* 2012; INGAA Foundation 2016), valuation is subjective and is generally not considered in appraisals. The presence of a pipeline, and the restrictions associated with a pipeline easement, could influence a potential buyer's decision to purchase a property. If a buyer is looking for a property for a specific use that the presence of the pipeline renders infeasible, then the buyer may decide to purchase another property more suitable to their objectives. For example, a buyer wanting to develop the land for a commercial property with sub-surface structures would likely not find the property suitable, but farmers looking for land for grazing or additional cropland could find it suitable for their needs. This would be similar to other buyer-specific preferences that not all homes have, such as close proximity to shopping or access to high quality school districts.

Spire would acquire easements for both the temporary (construction) and permanent right-of-way. Compensation would be paid to landowners for limited use during construction and any construction related damages, per the terms of the individual landowner easement agreements. We conclude the Project would have no significant impact on property values.

6.7 Environmental Justice

In accordance with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, we address the potential for disproportionately high and adverse health or environmental effects of the Project on minority and low-income populations. According to the CEQ environmental justice guidance under NEPA (CEQ 1997a), minorities are those groups that include American Indian or Alaskan Native; Asian or Pacific Island; Black, not of Hispanic origin; or Hispanic. Minority populations are defined where either; (a) the minority population of the affected area exceeds 50 percent or, (b) the minority population of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. The CEQ guidance also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau. In this EA, low-income populations are defined as those individuals with reported income below the poverty level. Table B-13 provides a summary of the minority or low-income percentage of county populations in the Project area.

Table B-13 Minority Populations and Poverty Levels in the Vicinity of the Project		
State / County	**Minority Populations as a Percentage of Total Population**	**Percent of the Population Below Poverty Level**
Illinois	27.7	14.3
Scott County	1.3	14.2
Greene County	2.3	17.1
Jersey County	2.7	7.3
Missouri	17.4	15.6
St. Charles County	9.7	6.3
St. Louis County	30.4	10.9
Source: U.S. Census Bureau 2017a (2011-2015 American Community Survey - Race: B02001; Poverty: S1701).		

According to the U.S. Census Bureau, the portion of minority populations in the counties crossed by the Spire STL Pipeline Project do not exceed 50 percent and the poverty levels in these counties are similar to or lower than the respective state. However, because we received comments expressing concern for impacts on minority and low-income populations, specifically associated with Project facilities in the metropolitan areas of Missouri, we refined our analysis using USEPA's Environmental Justice Screening and Mapping Tool (USEPA 2017c). We assessed the potential for environmental justice areas within 0.25 mile of the North County Extension. According to 2010 U.S. Census data, 75 percent of the population within 0.25 mile of North County Extension is comprised of minority populations who have an average per capita income of $22,356 (USEPA 2017c).

The proposed pipeline has predominately been routed through agricultural land or open land (89.7 percent) with few residences, and only three existing residences are within 25 feet of the proposed pipeline right-of-way. As described in section A.4, the FERC and Spire have made documents and notices about the Project available to the public. The potential impacts of constructing and operating the pipeline facilities on the natural and human environments are identified and discussed throughout section B of this document. Overall the Project would result in negligible to minor negative impacts and minor positive impacts on socioeconomic characteristics and economies in the Project area. As discussed throughout this EA, potentially adverse environmental effects associated with the Project would be minimized or mitigated, as applicable. Although the racial and economic composition in St. Charles and St. Louis Counties in Missouri show some deviations from state-level statistics, there is no evidence that the Project would cause a disproportionate share of adverse environmental or socioeconomic impacts on any racial, ethnic, or socioeconomic group.

7. Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA), as amended, requires the FERC to take into account the effects of its undertakings on properties listed in, or eligible for listing in, the National Register of Historic Places (NRHP), and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Spire, as a non-federal party, is assisting the Commission in meeting its obligations under Section 106, and the implementing regulations, by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

7.1 Cultural Resource Investigations

Between October 5, 2016, and December 10, 2016; and between February 1, 2017, and March 3, 2017, Spire completed cultural resources field survey investigations of all accessible Project areas in Illinois and Missouri. Supplemental surveys were conducted between March 8, 2017, and June 9, 2017. In both states, a 300-foot-wide corridor centered over the pipeline (inclusive of the proposed MLVs and pigging facilities), and a 100-foot-wide corridor along proposed access roads was surveyed for archaeological resources. In addition, the entire facility footprint for each of the meter stations and staging areas, as well as extra workspaces and cathodic protection areas, were included in the archaeological field surveys.

For the historic architectural resources surveys, the Illinois SHPO requested field surveys be conducted within 660 feet of the pipeline. The Missouri SHPO requested surveys for historic architectural resources be conducted within the 300-foot-wide survey corridor.

The surveys to date have covered approximately 1,839 acres in Illinois and 745 acres in Missouri. Approximately 1.9 miles of pipeline corridor in Illinois and 1.6 miles in Missouri remain to be surveyed due to denied access.

In January 2017, Spire provided the reports resulting from these surveys to the FERC and the Illinois and Missouri SHPOs for their respective states. A combined *Phase I Archaeological Survey and Architectural and Historical Resources Reconnaissance Survey* report (Scuoteguazza *et al.* 2017a) was provided for Illinois. A separate *Phase I Archaeological Survey* report (Scuoteguazza *et al.* 2017b) and *Architectural and Historical Resources Reconnaissance Report* (Williams and Baiocchi 2017a) were provided for Missouri. Subsequently, Spire made adjustments to the proposed Project, including the development of a new greenfield route in Missouri in lieu of modifications to the existing Line 880. These changes resulted in a shift of the survey corridor, so in April and July of 2017, Spire provided addendum *Phase I Archaeological Survey* reports for Illinois (Hood and Sabo 2017; Scuoteguazza *et al.* 2017c) and Missouri (Hood 2017; Scuoteguazza *et al.* 2017d), an *Architectural and Historical*

Resources Addendum Reconnaissance Report for Missouri (Williams and Baiocchi 2017b), and *Phase II Archaeological Testing* reports for sites 11JY751 and 11JY765 in Illinois (Munford 2017; Scuoteguazza 2017), and site 23SC2219 in Missouri (Scuoteguazza and Munford 2017). Based on the Project changes proposed by Spire, some resources identified by the initial surveys would not be affected by the proposed Project.

<u>Survey Results</u>

Illinois

In Illinois, Spire reported the results of initial field surveys in January 2017. Supplemental survey results were reported in April and July 2017. The initial field survey efforts resulted in the identification of 170 archaeological resources (113 sites and 57 isolated finds) within the survey corridor. Supplemental surveys conducted in February and March 2017 resulted in the identification of 40 additional resources (34 sites and 6 isolated finds), while supplemental work conducted between March and June 2017 resulted in the discovery of 29 more archaeological resources (28 sites and 1 isolated find). Altogether, Spire identified 239 archaeological resources within the 300-foot-wide survey corridor, 130 of which are within the Project's proposed limits of disturbance. These include:

- 17 resources in Scott County: 14 precontact sites and 3 precontact isolated finds;
- 47 resources in Greene County: 29 precontact sites, 16 precontact isolated finds, 2 historic sites, and 5 multicomponent sites; and
- 66 resources in Jersey County: 47 precontact sites, 9 precontact isolated finds, 1 historic site, and 10 multicomponent sites.

As a result of the initial surveys, 10 sites (11ST613, 11GE757, 11GE758, 11GE773, 11GE789, 11JY661, 11JY680, 11JY698, 11JY699, and 11JY700) of the 170 resources identified were recommended as potentially eligible for the NRHP, and avoidance or Phase II NRHP eligibility testing was recommended. The remainder of the resources were recommended as not eligible for the NRHP. In a letter dated June 22, 2017, the SHPO concurred with these recommendations. We concur also.

As a result of Project modification surveys conducted in February and March 2017, the 10 potentially eligible sites are now outside the Project's limits of disturbance. All of the remaining archaeological resources identified during the initial surveys and supplemental surveys conducted in February and March 2017 within the Project's limits of disturbance were recommended not eligible for the NRHP. Spire has not yet provided the SHPO's comments on the supplemental survey Addendum report.

Of the 29 new resources identified during the supplemental surveys conducted between March and June 2017, sites 11JY751 and 11JY765 were recommended for Phase II NRHP eligibility testing. In addition, site 11JY778 was recommended as potentially eligible for the NRHP. Spire indicated it would avoid impacts on this site through the placement of timber matting. The remaining sites were recommended as not eligible for the NRHP.

Subsequent Phase II NRHP eligibility testing of sites 11JY751 and 11JY765 resulted in recommendations that both sites were not eligible within the Project's limits of disturbance and that no further work be required. On July 14, 2017, an Addendum II report and the Phase II reports for sites 11JY751 and 11JY765 were submitted to the Illinois SHPO. Spire has not yet provided the Illinois SHPO's comments on these reports.

In addition, Spire documented a total of 31 previously unrecorded historic architectural resources during the surveys completed to date in Illinois. These include:

- 3 resources in Scott County: all 3 are circa 1890 farmsteads;

- 15 resources in Greene County: 11 farmsteads, 1 series of barn structures, 1 dwelling of various architectural styles, ranging between circa 1870 and 1960; and 1 cemetery (the Belltown Community Cemetery), dated to circa 1840-present, and 1 circa 1921 railroad; and

- 13 resources in Jersey County: 12 farmsteads, and 1 dwelling of various architectural styles, ranging in age between circa 1850 and 1950.

Two of the 31 identified architectural resources in Illinois were recommended as potentially eligible for the NRHP: a circa 1890 farmstead (ID #GAI-02) in Scott County, and the circa 1921 Gulf, Mobile, and Ohio Railroad (ID #GAI-06) in Greene County. The farmstead is located outside of the proposed construction right-of-way and would not be physically impacted. The Gulf, Mobile, and Ohio Railroad would be avoided by Spire's use of the conventional bore technique. Spire indicated while temporary visual and noise impacts may occur during construction, since the pipeline would be underground there would be no permanent impacts on aboveground historic resources, and recommended that the Project would not adversely impact any NRHP-eligible resources identified to date.

All of the documented farmsteads are within the survey area, but outside of the construction right-of-way. Spire recommended 28 of the 29 farmsteads, outbuilding, and dwelling resources as not eligible for the NRHP and that no further work be required. In addition, Spire recommended the Belltown Community Cemetery as not NRHP-eligible and that no further work be required. The cemetery is east of the Project right-of-way, is bordered by a fence, and would be avoided. During the survey, no evidence that the cemetery extended beyond the existing fence line was found, which was supported by a review of historic maps and aerial images. In its letter of June 22, 2017, the SHPO indicated that "no architectural resources are affected" by the Project.

We received comments from representatives from Principia College raising concerns about the Project's potential to impact Native American archaeological resources on their property. Spire is currently working with representatives from the college to obtain access to the property to conduct surveys.

Missouri

In January 2017, Spire reported the results of the initial field surveys in Missouri. Supplemental field survey results were reported in April and July 2017. The initial field survey efforts resulted in the identification of 27 archaeological resources (8 sites and 19 isolated finds) within the surveyed corridor. Supplemental surveys conducted in February and March 2017 resulted in the identification of 14 additional resources (5 sites and 9 isolated finds), while supplemental work conducted between March and June 2017 did not identify any additional archaeological resources. Altogether, Spire identified 41 archaeological resources within the 300-foot-wide survey corridor, 22 of which are within the Project's proposed limits of disturbance. These include the following:

- 15 resources in St. Charles County: 4 precontact sites, 10 precontact isolated finds, and 1 historic isolated find; and
- 7 resources in St. Louis County: 6 precontact isolated finds and 1 historic site.

As a result of the initial surveys, 4 sites (23SC2215, 23SC2216, 23SC2218, and 23SC2219) of the 27 resources identified were recommended as potentially eligible for the NRHP, and avoidance or Phase II NRHP eligibility testing was recommended. The remaining resources were recommended as not eligible for the NRHP. In a letter dated March 23, 2017, the SHPO requested additional information and a revised report. Following submittal of a revised report, in a letter dated July 28, 2017, the SHPO concurred with these recommendations and requested avoidance plans, or the results of testing, be submitted for the four sites. As a result of the supplemental surveys conducted in February and March 2017, site 23SC2218 was found to be located outside the Project limits of disturbance, and Phase II NRHP eligibility testing was recommended for site 23SC2219. In a letter dated May 23, 2017, the SHPO requested additional information and a revised Addendum report. Spire has not yet provided a revised Addendum report.

Changes to the Project resulted in the recommendation to install temporary fencing in the vicinity of site 23SC2216 to protect the site during construction. In a letter dated July 28, 2017, the SHPO concurred that the site may be eligible, but there would be no adverse effect on the condition the site was fenced and protected during construction. Based on current Project plans, site 23SC2218 is located outside the Project limits of disturbance. Site 23SC2219 was subject to Phase II NRHP eligibility testing. The results were provided in a Phase II report. As a result of testing, the portion of site 23SC2219 within the right-of-way was recommended as not eligible for the NRHP. In a letter dated May 22, 2017, the Missouri SHPO concurred. We concur also. Spire has not yet provided avoidance plans for sites 23SC2215 and 23SC2216.

During the initial architectural resources surveys in Missouri, Spire identified 54 architectural resources. Subsequent reroutes of the pipeline avoided all but four of the initially identified resources. Supplemental surveys identified 12 additional resources. Of these, the property boundaries of six are within the limits of the construction right-of-way. Therefore, a total of 10 previously unrecorded historic architectural resources were identified during surveys completed along the proposed pipeline in Missouri.

These include the following:

- two resources in St. Charles County: one circa 1910 farmstead and one circa 1849 railroad; and

- eight resources in St. Louis County: seven dwellings of early to mid-twentieth century age and one circa 1900 farmstead.

Of these 10, Spire recommended 2 of the historic architectural resources as eligible for the NRHP, including the circa 1940 Villa Gesu Convent (ID #GAI-66) and the Chicago, Burlington, and Quincy Railroad (ID #GAI-02), dated circa 1849. While within the surveyed corridor, the Villa Gesu Convent is outside of the proposed construction right-of-way. Spire indicated that the Project would be located entirely within a cleared field that would be restored to its original condition, and therefore would not affect the viewshed.

Spire would avoid the Chicago, Burlington, and Quincy Railroad using the conventional bore technique. In its letter of March 23, 2017, the SHPO commented on the January architectural report and requested additional information and a revised report. Spire has not yet provided the revised report, or the SHPO's comments on the architectural addendum report.

Spire consulted with the Missouri SHPO and personnel from Missouri State Parks regarding the Project's potential to impact the historic Katy Trail. Missouri State Parks personnel verified that the Katy Trail does not extend within the Project area. The trail is about 0.7 mile southwest of the Project and would be avoided.

7.2 Native American Consultations

Between June and October of 2016, Spire sent correspondence to 31 federally recognized Indian tribes. Table B-14 includes a list of the contacted tribes and a summary of the significant dates of correspondence between Spire and the tribes.

In addition, Spire reviewed the available archival literature to identify the location of the historic Potawatomi Removal Trail in relation to the proposed Project. The records indicate the trail is located between 4 and 8 miles north of the pipeline's northern terminus. Spire provided these results to the Huron Potawatomi Nation on March 28, 2017. A response from the tribe has not been received.

Table B-14
Federally Recognized Tribes Contacted for the Spire STL Pipeline Project

Contacted Tribes	Significant Consultation Dates[a]	Responses Received to Date[a]
Absentee - Shawnee Tribe of Indians of Oklahoma	6/30/2016 – Initial contact. 3/31/2017 – Project update notice.	8/16/2016 – Tribe agreed to be consulting party. 12/19/2016 – meeting held to discuss survey results; Tribe requested to review draft reports.
Cherokee Nation	10/19/2016– initial contact. 3/31/2017 – Project update notice.	04/04/2017 and 05/18/2017 – Tribe submitted comments indicating that the Project was not likely to impact Cherokee cultural resources; requested notification of inadvertent discoveries and significant Project changes.
Citizen Potawatomi Nation	7/1/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Delaware Nation	6/30/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Delaware Tribe of Indians	6/30/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Eastern Shawnee Tribe of Oklahoma	6/30/2016 – initial contact. 3/31/2017 – Project update notice (included updated mapping).	4/4/2017 – Tribe requested Project mapping.
Forest County Potawatomi	7/1/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Ho-Chunk Nation	10/19/2016 – initial contact. 1/31/2016 – Provided copies of the draft survey reports. 3/31/2017 – Project update notice. 4/13/2017 – Provided summary of survey results. 4/21/2017 – Provided copies of the draft survey report addendums.	10/19/2016 – Tribe requested digital copies of the survey reports and a 30-day review period.

Table B-14 (continued) Federally Recognized Tribes Contacted for the Spire STL Pipeline Project		
Contacted Tribes	**Significant Consultation Dates[a]**	**Responses Received to Date[a]**
Huron Potawatomi Nation	10/19/2016 – initial contact. 3/28/2017 – Voicemail message regarding results of archival review of the location of the historic Potawatomi Removal trail and Project's avoidance. 3/31/2017 – Project update notice.	No response to date.
Iowa Tribe of Kansas and Nebraska	6/30/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	7/6/2016 – Tribe is likely to accept invitation to be a consulting party but has not confirmed; requested copies of draft survey reports and notification if human remains or archaeological deposits are found.
Iowa Tribe of Oklahoma	6/30/2016 – initial contact. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	6/30/2016 – Tribe would like to be notified if human remains are discovered
Kaw Indian Nation of Oklahoma	6/30/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/29/2017 – Provide summary of survey results. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	8/16/2016 – Tribe agreed to be consulting party. 12/19/2016 – meeting held to discuss survey results; requested summary of survey results and draft survey reports for review. 4/7/2017 – Tribe requests in-person meeting and may be available in July 2017.
Kickapoo Traditional Tribe of Texas	6/30/2016 – initial contact. 3/31/2017 – Project update notice.	5/10/17 – The Project would not affect any of the Tribe's historic or sacred sites.
Kickapoo Tribe in Kansas	6/30/2016 – initial contact. 3/31/2017 – Project update notice.	05/10/2017 – Tribe indicated that the Project was not within any tribal historic or sacred sites.
Kickapoo Tribe of Oklahoma	6/30/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Match-e-be-nash-she-wish Band of Potawatomi Indians of Michigan	10/19/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Miami Tribe of Oklahoma	6/30/2016 – initial contact. 3/7/2017 – provided a PDF copy of the Missouri draft archaeological survey report. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	8/12/2016 – Tribe agreed to be consulting party. 3/7/2017 – Requested archaeological survey results be submitted in PDF format.

Table B-14 (continued) Federally Recognized Tribes Contacted for the Spire STL Pipeline Project		
Contacted Tribes	**Significant Consultation Dates[a]**	**Responses Received to Date[a]**
Osage Nation	6/30/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice.4/21/2017 – Provided copies of the draft survey report addendums.	8/16/2016 – Tribe agreed to be consulting party. 12/19/2016 – meeting held to discuss survey results; Tribe requested to review draft survey reports.
Peoria Tribe of Indians of Oklahoma	7/1/2016 – initial contact. 3/31/2017 – Project update notice. 4/13/2017 – Provided digital copies on CD of the draft survey reports. 4/21/2017 – Provided copies of the draft survey report addendums.	No response to date.
Pokagon Band of Potawatomi Indians	7/1/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice.	No response to date.
Ponca Tribe of Nebraska	7/1/2016 – initial contact. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	7/1/2016 – Tribe is not likely to participate as a consulting party, but requested to review Project mapping.
Ponca Tribe of Oklahoma	7/1/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Potawatomi Nation - Hannahville Indian Community	7/1/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Prairie Band Potawatomi Nation	7/1/2016 – initial contact. 3/31/2017 – Project update notice.	No response to date.
Quapaw Tribe of Oklahoma	7/1/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	8/24/2016 – Tribe agreed to be a consulting party but is only interested in St. Louis County, MO; requested a copy of the EA.
Sac and Fox Nation of Oklahoma	7/1/2016 – initial contact. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	No response to date.
Sac and Fox Tribe of the Mississippi in Iowa	7/1/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	8/9/2016 – Tribe is likely to accept invitation to be a consulting party but has not confirmed.
Sac and Fox Tribe of the Missouri in Kansas and Nebraska	7/1/2016– initial contact. 3/31/2017 – Project update notice. 4/21/2017 – Provided copies of the draft survey report addendums.	No response to date.

Table B-14 (continued) Federally Recognized Tribes Contacted for the Spire STL Pipeline Project		
Contacted Tribes	**Significant Consultation Dates[a]**	**Responses Received to Date[a]**
Shawnee Tribe	10/19/2016 – initial contact. 3/31/2017 – Project update notice.	05/08/2017 – Tribe indicated no known historic properties would be negatively impacted by the Project; no issues or concerns; requested notification of inadvertent discoveries during construction.
United Keetoowah Band of Cherokee Indians of Oklahoma	10/19/2016 – initial contact. 1/31/2017 – Provided copies of draft survey reports. 3/31/2017 – Project update notice. 4/10/2017 – Follow-up. 4/21/2017 – Provided copies of the draft survey report addendums.	No response to date.
Winnebago Tribe of Nebraska	10/19/2016 – initial contact. 3/31/2017 – Project update notice. 4/10/2017 – Follow-up.	3/21/2017 - Tribe agreed to be a consulting party but has not confirmed and requested notification if human remains or archaeological deposits are found.
[a] This table is intended to highlight key correspondence. It is not intended to be comprehensive.		

On March 31, 2017, Spire sent supplemental letters to each of the tribes outlining various Project updates, including the addition of the North County Extension. Since June of 2016, Spire has also conducted extensive telephone and email follow-up with the tribes, and provided any requested information including the cultural resources survey reports. To date, none of the contacted tribes have objected to the Project or indicated that they are aware of specific sites in the Project area.

We sent our NOI, supplemental NOI, and follow-up letters to the same 31 tribes. We also conducted numerous email contacts with tribes requesting additional information. In response, the Eastern Shawnee Tribe requested Project mapping, which we provided. The Miami Tribe of Oklahoma offered no objection to the Project, but requested to continue as a consulting party and to be consulted on discoveries of human remains or cultural items. The Nottawaseppi Huron Band of the Potawatomi indicated it was interested in consultation on the Project, expressed concern about the tribe's historic Removal Trail, and provided updated contact information. In a subsequent communication, the tribe indicated "no potential impacts," but requested to be notified of inadvertent discoveries of human remains. The Osage requested consulting party status, and expressed interest in a meeting. The United Keetoowah Band of Cherokee Indians in Oklahoma requested copies of the survey reports, which Spire provided. The Winnebago Tribe of Nebraska provided tribal historical information, expressed concern about potential burials and graves, and requested to be notified of discoveries during construction. The Project unanticipated discovery plans (see below) provide for notification of tribes in the event of a discovery. No other responses have been received to date.

7.3 Unanticipated Discoveries Plan

Spire has provided an Unanticipated Discoveries Plan for Cultural Resources for each state that would be implemented in the event that previously unreported archaeological sites or human remains were encountered during construction. These plans provide for the notification of interested parties, including Native American tribes, in the event of any discovery.

We requested revisions to the plans. Revised copies of the plans were provided to the FERC and Illinois and Missouri SHPOs for their respective states. In a letter dated April 21, 2017, the Missouri SHPO provided additional comments on the revised plan. The Illinois SHPO has not yet commented on the revised plan.

7.4 Compliance with the National Historic Preservation Act

Cultural resources surveys and consultation with the Illinois and Missouri SHPOs have not been completed. To ensure that the FERC's responsibilities under the NHPA and implementing regulations are met, **we recommend that:**

- **<u>Spire should not begin construction</u> of facilities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**

  a. Spire files with the Secretary, the Illinois SHPO's comments on the archaeological addenda and Phase II reports provided to date;

  b. Spire files with the Secretary, the Missouri SHPO's comments on the architectural addendum report;

  c. Spire files with the Secretary remaining cultural resources survey reports(s) and revised reports; any required site evaluation report(s) and avoidance/treatment plan(s); and the Missouri and Illinois SHPOs' comments on the reports and plans;

  d. the Advisory Council on Historic Preservation is afforded an opportunity to comment if historic properties would be adversely affected; and

  e. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Spire in writing that treatment plans/mitigation measures (including archaeological

data recovery) may be implemented and/or construction may proceed.

All materials filed with the Commission containing <u>location, character, and ownership information</u> about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: <u>"CUI//PRIV - DO NOT RELEASE"</u>.

8. Air Quality and Noise

8.1 Air Quality

The Project would result in air emissions through short-term construction activities and long-term stationary source emissions. Emissions associated with construction activities include fugitive dust from soil disruption and combustion emissions from construction equipment. Emissions from the stationary sources would be generated through normal operating fugitive losses and episodic events in the form of blowdowns.

<u>Existing Air Quality</u>

Federal and state air quality standards have been designed to protect human health and the environment from airborne pollutants. The USEPA established National Ambient Air Quality Standards (NAAQS) for seven air contaminants designated "criteria air pollutants," which are nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, sulfur dioxide (SO_2), lead, inhalable particulate matter (PM) with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and PM with an aerodynamic diameter less than or equal to 10 microns (PM_{10}). The NAAQS were established under the Clean Air Act (CAA) of 1970, as amended in 1977 and 1990, to protect human health (primary standards) and public welfare (secondary standards). The NAAQS are codified in 40 CFR 50. The NAAQS, as designated by the USEPA,[14] are applicable to all counties where the Project is proposed (USEPA 2017d).

Under the CAA, each state prepares a State Implementation Plan (SIP) to demonstrate the state's air quality management program to attain or maintain the primary and secondary NAAQS. The SIP may also include stricter standards than the NAAQS. Both Illinois and Missouri have adopted the NAAQs as statewide standards. The combustion of gasoline and diesel fuels during construction of the Project would release NO_2, CO, volatile organic compounds (VOC), $PM_{2.5}$, PM_{10}, SO_2, hazardous air pollutants, and greenhouse gases (GHG).

On December 7, 2009, the USEPA added GHG to the definition of pollutant; such GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The GHGs that would be

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14 Available at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

produced by the Project are CO_2, CH_4, and N_2O, but only during operation of construction equipment; hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride would not be emitted. Emissions of GHGs are quantified in terms of carbon dioxide equivalents (CO_{2e}) by multiplying emissions of each GHG by its respective global warming potential (GWP). The GWP is a ratio relative to CO_2 regarding each GHG's ability to absorb solar radiation and its residence time in the atmosphere. Accordingly, CO_2 has a GWP of 1 while CH_4 has a GWP of 25, and N_2O a GWP of 298.

To obtain the CO_{2e} quantity, the mass of the particular chemical is multiplied by the corresponding GWP, the product of which is the CO_{2e} for that chemical. The CO_{2e} value for each of the GHG chemicals is summed to obtain the total CO_{2e} GHG emissions. There are no federal regulations at this time limiting the emissions of CO_2. Also, CO_2 reporting requirements for stationary sources do not apply to construction emissions. However, in compliance with the USEPA's definition of air pollution to include GHGs, we provide estimates of GHG emissions for construction activities below. The USEPA did not establish NAAQS for any listed GHGs, as their impact is on a global basis and not a local/regional basis.

The USEPA has established Air Quality Control Regions in accordance with Section 107 of the CAA, defined as contiguous areas considered to have relatively uniform ambient air quality, and treated as single geographical units for reducing emissions and determining compliance with the NAAQS. Attainment with the NAAQS is determined based on whether or not measured ambient air pollutant concentrations are above or below the NAAQS and/or state Ambient Air Quality Standards. The SIP must include measures identifying how applicable air quality standards are achieved as well as maintained in each region. Areas of the country are designated based on compliance with the NAAQS. Designations fall under three main categories as follows: "attainment" (areas in compliance with the NAAQS); "nonattainment" (areas not in compliance with the NAAQS); or "unclassifiable" (areas lacking data to determine attainment).

Areas formerly designated as nonattainment are considered "maintenance areas." Portions of the Project would be in St. Charles and St. Louis Counties in Missouri, which are within the Metropolitan St. Louis Interstate Air Quality Control Region. This region is currently designated as moderate nonattainment of the 1997 $PM_{2.5}$ standard, as well as marginal nonattainment of the 2008 8-hour ozone standard. A portion of the Project would also fall within Jersey County, Illinois which is designated as maintenance for ozone. All other components of the Project fall within regions that are either designated as in attainment or unclassified. Air quality designations for the counties in the Project area are summarized in table B-15.

<u>Federal Air Quality Requirements</u>

The CAA, 42 U.S.C. 7401 *et seq.*, as amended in 1977 and 1990, and 40 CFR 50 through 99 provide the federal statutes and regulations governing air pollution in the

United States. The provisions of the CAA that are applicable to the Project are discussed below.

Table B-15
National Ambient Air Quality Standards Attainment Status for Project Area Counties

Pollutant	Illinois			Missouri	
	Scott County	Greene County	Jersey County	St. Charles County	St. Louis County
SO_2	Attainment	Attainment	Attainment	Attainment	Attainment
CO	Attainment	Attainment	Attainment	Attainment	Attainment
NO_2	Attainment	Attainment	Attainment	Attainment	Attainment
Ozone (8-hour standard)	Attainment	Attainment	Maintenance	Marginal nonattainment	Marginal nonattainment
PM_{10}	Attainment	Attainment	Attainment	Attainment	Attainment
$PM_{2.5}$	Attainment	Attainment	Attainment	Moderate nonattainment	Moderate nonattainment
Lead	Attainment	Attainment	Attainment	Attainment	Attainment

Air Permitting

New Source Review (NSR) is a pre-construction air permit program designed to protect air quality when air pollutant emissions are increased either through the construction of new stationary sources or modifications to existing stationary sources. In areas with good air quality, NSR ensures that the new emissions do not degrade the air quality, which is achieved through the implementation of the Prevention of Significant Deterioration (PSD) permitting program for major sources or state permit programs for minor sources. In areas with poor air quality, Nonattainment NSR ensures that the new emissions do not inhibit progress toward cleaner air. In addition, NSR ensures that any large, new, or modified industrial source employs appropriate air pollution control technologies. The IEPA and MDNR administer the minor source NSR program and the major Nonattainment NSR and PSD programs in their respective states.

Stationary sources are proposed in St. Louis County, Missouri, with the construction of the line heaters at the Laclede/Lange Delivery Station. Based on the operating emissions discussed below, the planned heaters would not require major source permitting, and operational emissions are not further quantified. Furthermore, based on the emissions estimated from these sources, the proposed heaters would not be required to obtain a Title V major source permit.

New Source Performance Standards

The USEPA promulgates New Source Performance Standards (NSPS) to establish emission limits and fuel, monitoring, notification, reporting, and recordkeeping requirements for stationary source types or categories. These regulations apply to new, modified, or reconstructed sources. NSPS Subpart OOOOa establishes standards for both VOCs and CH_4 that would apply to the continuous bleed natural gas-driven pneumatic controllers that are proposed as part of the natural gas transmission system.

National Emission Standards for Hazardous Air Pollutants

The 1990 CAA amendments established a list of 189 hazardous air pollutants (HAP), resulting in the promulgation of National Emission Standards for Hazardous Air Pollutants. These standards regulate HAP emissions from specific source types located at major or area sources of HAPs by setting emission limits, monitoring, testing, record keeping, and notification requirements. The Project would not be subject to any of these standards.

Greenhouse Gas Mandatory Reporting Rule

The USEPA's Mandatory Reporting of GHG Rule requires reporting of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 tons per year (tpy) of GHG CO_{2e}. Subpart W of the Mandatory Reporting of GHG Rule establishes reporting requirements for natural gas supplier's transmission pipeline systems, and specifically natural gas transmission compression; however, because the Project does not involve compression, the reporting requirements do not apply to the Project. Potential GHG emissions from construction of the Project would nonetheless result in less than 25,000 tpy of GHG CO_{2e}. Tables B-16 and B-17 summarize GHG emissions expected from the proposed Project.

Table B-16
Summary of Estimated Emissions from Construction of the Spire STL Pipeline Project

Source	Total Construction Emissions (TPY)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_{2e}
Construction equipment emissions	273.19	85.6	0.36	19.14	14.86	14.41	15,195.83
Unpaved roads	0	0	0	0	13.8	1.380	0
Material handling / wind erosion	0	0	0	0	1.3	0.7	0
Total	**273.19**	**85.6**	**0.36**	**19.14**	**29.96**	**16.49**	**15,195.83**

Table B-17 Summary of Estimated Emissions from Operation of the Spire STL Pipeline Project							
Source	Total Construction Emissions (TPY)						
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_{2e}
Stationary source emissions	8.45	7.098	--	0.465	0.64	0.64	10,150.68
Pipeline fugitives	--	--	--	--	--	--	1,646.60
Total	**8.45**	**7.098**	**--**	**0.465**	**0.64**	**0.64**	**11,797.28**

Conformity of General Federal Actions

According to Section 176(c)(1) of the CAA (40 CFR 51.853), a federal agency cannot approve or support activity that does not conform to an approved SIP. Therefore, a conformity analysis to determine whether a project would conform to an approved SIP is required when a federal action would generate emissions exceeding conformity threshold levels of pollutants for which an air basin is designated as nonattainment or maintenance. A conformity applicability determination requires that direct and indirect emissions of nonattainment or maintenance pollutants (or precursors) resulting from the federal action be compared with general conformity applicability emissions thresholds. If the thresholds are exceeded, general conformity applies and a conformity determination is required. Portions of the proposed Project are in St. Charles and St. Louis Counties, Missouri, which are classified as both marginal nonattainment for the 2008 ozone standard and moderate nonattainment for the 1997 $PM_{2.5}$ standard. Additionally, the portion of the Project in Jersey County, Illinois is classified as maintenance for the 2008 ozone standard.

The majority of emissions from the Project would result from construction. Ongoing operational emissions from the Project are limited to minor fugitive releases and combustion from line heaters. A summary of construction and operational emissions in comparison with general conformity emission thresholds is presented in table B-18. As shown herein, all construction and operation emissions would fall beneath the general conformity *de minimis* emission thresholds.

State Regulations

Within Title 35 Illinois Administrative Code, the state of Illinois has implemented programs that are relevant to portions of the Project. In addition to the general provisions, permitting requirements, and emission limitations established in Parts 201 and 211-217, the state has provisions established for mobile source emission limitations underneath Part 240. The State of Missouri has air quality regulations covered through Division 10 of the Missouri Code of State Regulations. These regulations impose general requirements for air quality. Restrictions on particulate matter contributions to ambient air that extend beyond the premises of origin are imposed by 10 CSR 10-6.170.

Table B-18
Comparison of Emissions for the Project to General Conformity Thresholds

Air Pollutant	Designated Area	Threshold (tpy)	Pollutant or Precursor	Construction Emissions (tpy)	Ongoing Operational Emissions (tpy)
Ozone	St. Charles / St. Louis, Missouri	100	VOC	6.65	0.47
		100	NO_x	94.66	8.45
	Jersey County, Illinois	100	VOC	4.4	-
		100	NO_x	62.9	-
$PM_{2.5}$	St. Charles / St. Louis, Missouri	100	$PM_{2.5}$	5.66	0.64

Note: General Conformity is only applicable to nonattainment or maintenance areas. Thresholds for each pollutant are based on the severity of the nonattainment areas or maintenance area where the Project is located. Pollutants and counties for which the Project would not require a General Conformity determination are not shown.

Construction Impacts and Mitigation

Emissions associated with construction activities generally include: 1) exhaust emissions from construction equipment, 2) fugitive dust emissions associated with construction vehicle movement on unpaved surfaces, and 3) fugitive dust associated with grading, trenching, backfilling, and other earth-moving activities. The exhaust emissions would depend on the equipment used and the horsepower-hours of operation. Fugitive dust emission levels would vary in relation to moisture content, composition, and volume of soils disrupted during construction. Estimated construction emissions for the Project are presented in table B-16.

Fugitive dust and other emissions from construction activities generally do not result in a significant increase in regional pollutant levels, although local pollutant levels could increase temporarily. Spire would take measures in its Fugitive Dust Control Plan to reduce fugitive emissions through the application of dust suppressants (e.g., water from municipal sources or tackifiers) to disturbed work areas, employing construction equipment on an as needed basis, and by avoiding excessive vehicle speeds on unpaved roads.

Gasoline and diesel engines used during construction would be operated and maintained in a manner consistent with the manufacturers' specifications and operated only on an as-needed basis.

Once construction activities are completed, fugitive dust and construction equipment emissions would return to current levels. Emissions associated with the construction-related activities would be temporary in nature and we conclude they would not cause, or significantly contribute to, a violation of any applicable ambient air quality standard.

Operation Impacts and Mitigation

Spire does not propose any new or modified compressor stations as part of the Project. However, the Project would include stationary sources in the form of the proposed heaters. Minor fugitive natural gas emissions are also expected to occur from valve components during pipeline operations. The Spire STL Pipeline Project and associated facilities would result in minor amounts of fugitive emissions from operations and maintenance.

Though it is not possible to fully determine the amount of future maintenance required, the Project would have the potential for operational emissions of VOC and CO_{2e} from fugitive gas releases associated with the pipeline, meter stations, and pigging facilities. Estimated operational emissions for the Project are summarized in table B-17 above. These emissions would occur for the lifetime of the Project, and would be spread geographically in accordance with the fugitive potential of each pipeline.

Potential impacts on air quality associated with construction and operation of the Project would be minimized by adherence to all applicable federal and state regulations. Based on the analysis presented above, we conclude that construction and operation of the Spire STL Pipeline Project would not have a significant impact on regional air quality.

8.2 Noise and Vibration

The ambient sound level of a region is defined by the total noise generated within the specific environment, over varying land use types, and is usually comprised of natural and artificial sounds. The land use in the Project area varies, and consists primarily of agricultural land, open land, upland forest, and developed land. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions, the effect of seasonal vegetation cover, and human activities.

Ambient sound quality would be affected during construction and operation of the Project, and the magnitude and frequency of sound levels would vary considerably during the day, week, or the seasons, changing weather conditions, vegetation cover, and non-Project sources of noise. Two measures that associate the time-varying quality of sound to its effect on people are the 24-hour equivalent sound level (L_{eq}) and day-night sound level (L_{dn}). The L_{eq} is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The L_{dn} is the L_{eq} plus 10 decibels on the A-weighted scale (dBA), added to account for people's greater sensitivity to nighttime sound (between the hours of 10:00 pm and 7:00 am). The A-weighted scale is used as human hearing is less sensitive to low and high frequencies than mid-range frequencies. The human ear's threshold of perceptible sound level change is considered to be 3 dBA; 6 dBA is clearly noticeable to the human ear, and 9 dBA is perceived as a doubling of sound.

Noise sensitive areas (NSA) within the vicinity of a project may include residences, schools, churches, or any location where people reside or gather and may be affected by noise sources. Construction equipment related to the Project would contribute to ambient sound levels during the specific construction period. Upon completion of construction, sound would return to pre-construction levels, with sound level increases attributed to ongoing operational noise of the three meter stations being imperceptible to the human ear.

<u>Regulatory Noise and Vibration Requirements</u>

In 1974, the USEPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* providing information for state and local regulators to use when developing their own ambient noise standards. The USEPA has determined that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity noise interference. An L_{dn} of 55 dBA is equivalent to a continuous sound level of 48.6 dBA. For comparison, normal speech at a distance of 3 feet averages 60 to 70 dBA L_{eq}. Where site-specific, ambient sound levels are above 55 dBA, sound impacts should be restricted to no more than 10 dBA over background levels. We have adopted this criterion and use it to evaluate the potential noise impact from operation of compressor facilities and certain construction-related activities.

The State of Illinois has an ordinance in place under Chapter 415 of the Illinois Environmental Protection Act, which establishes general regulations that apply to noise that "unreasonably interferes with the enjoyment of life, or with any lawful business, or activity." Similarly, the State of Missouri has a noise ordinance in place under Chapter 574 of the Missouri Revised Statutes, which establishes limitations on excessive or disturbing noise.

St. Charles County, Missouri has county restrictions on noise levels from portable or motor vehicle audio equipment as well as public address systems. St. Louis County, Missouri, where the Laclede/Lange Delivery Station and the Chain of Rocks Station (eastern portion) are located, has general noise ordinances in place that apply to volumes that would disturb the peace. The FERC guideline levels establish more stringent noise requirements than the local ordinances; thus, the impact discussion that follows is based on the FERC standards. No other applicable local noise ordinances were identified in the Project area.

Construction Noise Impacts and Mitigation

Construction of the Project would result in temporary increases in ambient sound levels. Construction sound would be primarily limited to daytime hours, including typical pipeline construction, blasting, and work at meter stations, except during specific activities such as HDD construction, hydrostatic testing, and tie-ins. Night time construction would be limited to about 1 to 3 days at each relevant location. Construction-related sound level increases could be highly variable due to intermittent equipment operation. The type of equipment operating at any location changes with each construction phase. The sound level impacts on NSAs near the Project sites would depend upon the duration of use for each piece of equipment, the number of construction vehicles and equipment used simultaneously, and the distance between the sound source and receptor. The Project would utilize conventional construction techniques and equipment, including graders, clearers, heavy trucks, and similar heavy construction equipment.

Spire proposes to use the HDD construction method at four locations; each of these HDDs is expected to be completed within 15 weeks. Spire would use the intersect HDD method for the crossing for the Mississippi and Missouri Rivers, which requires drill equipment on both sides of the crossing. Therefore NSAs on both sides of the drills could experience noise impacts during active drilling. Although HDD operations often require 24-hour construction during drilling, Spire has indicated that it intends to drill only during daytime hours, with the exception of pull-back activities which may require 24-hour operations for a short period (about 2 to 3 days per HDD). As a conservative measure, Spire conducted its noise analysis assuming that entry-side HDD equipment, which generates the most noise during construction and includes the drill rig, would be present on each side of the HDD. Table B-19 summarizes the sound level impacts on the nearest NSA associated with each side of the HDD. The location of the NSAs and HDD sites are depicted in appendix M-1.

Expected noise level increases at all sites would not exceed the 55 dBA threshold, except at the Spanish Lake Park west HDD location where unmitigated noise at the NSAs could reach 65.0 and 60.4 L_{dn} dBA. To mitigate noise impacts on the NSAs at the Spanish Lake Park west HDD location where noise levels without mitigation would exceed the threshold, Spire would implement noise control measures during drilling at this location that could include the following: installing noise barriers, enclosing the drill rig fully or partially, and/or offering to temporarily relocate affected residents during active drilling operations. Implementation of these noise control measures is expected to reduce noise to the 55 dBA threshold or below at NSAs in the vicinity of the Spanish Lake Park west HDD location (see table B-19, below, which accounts for noise mitigation, where applicable).

Table B-19
Acoustical Survey and Analysis Summary for Horizontal Directional Drills[a]

Closest NSA	Distance and Direction of NSA from HDD Location	Estimated L_{dn} due to Project Construction (dBA)	Existing Ambient L_{dn} (dBA)	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)[a]
Mississippi River North HDD Location (MP 45.0)					
Residence, NSA MS002	1,395 feet southeast	30.5	42.0	42.3	0.3
Mississippi River South HDD Location (MP 46.2)					
Residence, NSA MS001	1,175 feet southeast	44.5	41.7	46.3	4.6
Residence, NSA MS003	2,100 feet south	50.4	53.0	54.9	2.0
Missouri River North HDD Location (MP 57.7)					
Residences, NSA MO002	2,335 feet north	52.4	51.5	55.0	3.5
Missouri River South HDD Location (MP 58.4)					
Residences, NSA MO001	250 feet northwest	48.9	50.7	52.9	2.2
Residences, NSA MO003	1,545 feet northwest	34.3	45.8	46.1	0.3
Residences, NSA MO004	1,790 feet west	34.9	42.5	43.2	0.7
Residences, NSA MO005	1,980 feet southwest	25.8	39.1	39.3	0.2
Residences, NSA MO006	1,235 feet south	36.2	52.5	52.6	0.1
Coldwater Creek East HDD Location (MP NCE 1.6)					
Residences, NSA-MO007	470 feet south	51.4	45.7	52.4	6.7
Residences, NSA-MO008	475 feet east	49.6	41.9	50.3	8.4
Residences, NSA-MO009	610 feet southeast	51.5	44.7	52.3	7.6
School and residences, NSA-MO010	715 feet southwest	35.4	46.9	47.2	0.3
Residences, NSA-MO012	1,780 feet east	42.0	58.3	58.4	0.1
Church and residences, NSA-MO013	1,495 feet south	37.1	50.4	50.6	0.1
Coldwater Creek West HDD Location (MP NCE 2.2)					
Residences, NSA-MO015	430 feet south	45.4	58.7	58.9	0.3

Table B-19 (continued)
Acoustical Survey and Analysis Summary for Horizontal Directional Drills[a]

Closest NSA	Distance and Direction of NSA from HDD Location	Estimated L_{dn} due to Project Construction (dBA) [b]	Existing Ambient L_{dn} (dBA)	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
Residences, NSA-MO018	910 feet south	32.3	48.6	48.7	0.1
Residences, NSA-MO019	1,435 feet south	27.1	43.4	43.5	0.1
Church and residences, NSA-MO020	710 feet north	49.6	48.5	52.1	3.6
Residences, NSA-MO021	1,715 feet northwest	35.3	48.6	48.8	0.2
Spanish Lake Park East HDD Location (MP NCE3.8)					
Residences, NSA MO025	875 feet southeast	51.6	33.9	51.7	17.8
Park and Recreation Area, NSA MO027	1,600 feet west	39.9	31.1	40.4	9.3
Residences, NSA MO028	1,040 feet south	50.8	30.5	50.8	20.3
Residences, NSA MO029	2,150 feet east	37.0	44.6	45.3	0.7
Spanish Lake Park West HDD Location (MP NCE4.5)					
Residences, NSA MO022	300 feet northeast	54.9	36.9	55.0 [c]	18.1
Residences, NSA MO023	1,440 feet southwest	32.0	40.3	40.9 [c]	0.6
Park and Recreation Area, NSA MO024	1,200 feet southwest	40.4	50.6	51.0 [c]	0.4
Residences, NSA MO026	80 feet south	50.4	42.4	51.0 [c]	8.6
Park and Recreation Area, NSA MO027	1,340 feet south	33.3	42.4	42.9 [c]	0.5

[a] Spire anticipates that each HDD would take about 15 weeks to complete. Additional NSAs were identified by Spire in proximity to HDD operations; however, no change in noise level was predicted.

[b] The estimated L_{dn} due to Project construction was determined by subtracting estimated ambient sound from the cumulative sound level due to HDD site operations and existing ambient sound.

[c] Potential increase above ambient (dB) uses the estimated peak noise impact with noise control measures implemented and assuming a 10 dB reduction in sound, where applicable.

Spire has not identified the site-specific mitigation measures that it would implement to reduce noise in the vicinity of the Spanish Lake Park west HDD location. In addition, since the time Spire conducted its noise analysis, the configuration of the HDD entry/exit location at the Spanish Lake Park east HDD location has been modified as a result of geotechnical investigations and has not subsequently reanalyzed for noise impacts.

Because site-specific mitigation has not been identified to minimize noise impacts at the Spanish Lake Park west HDD location, and the available noise impact assessment does not reflect the proposed location of the Spanish Lake Park east HDD location, **we recommend that:**

- **<u>Prior to construction of the Spanish Lake Park HDD</u>, Spire should file with the Secretary, for review and written approval by the Director of OEP, a site-specific noise mitigation plan that identifies measures to reduce the projected noise level attributable to the proposed drilling operations at nearby NSAs. During drilling operations, Spire should implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA or 10 dBA above ambient levels at the NSAs.**

Based on the analyses conducted, the mitigation measures proposed, and our recommendation regarding the Spanish Lake Park HDD, we conclude that construction of the Project would not result in significant noise impacts on local residents and the surrounding communities.

<u>Operation Noise Impacts and Mitigation</u>

The Project would include the construction of the REX Receipt Station, the Laclede/Lange Delivery Station, and the Chain of Rocks Station. These meter stations would produce noise on a continuous basis (i.e., up to 24 hours per day) when operating.

The REX Receipt Station would be located on mostly agricultural land with some open land, and the closest NSA (a residence) is about 589 feet to the east and across a road (local road 1215 E). The Laclede/Lange Delivery Station would be located on mostly agricultural land with some upland forest and developed land, and the closest NSA (a residence) is about 238 feet to the east and across Blue Spruce Lane. The Chain of Rocks Station (western portion) would be located on a mix of upland forested, open, and developed lands about 75 feet east of the nearest NSAs, a residence on the corner of Prigge Road. Existing vegetation between the Laclede/Lange Delivery and Chain of Rocks Stations and the nearest NSAs would aid in buffering the sound from operation of these stations.

Spire conservatively (e.g. "worst case" inputs) modeled noise impacts on NSAs in proximity to each station (see appendix M-2). Based on background noise and distance from the stations, detectible changes in sound at NSAs in the vicinity of the REX Receipt and Laclede/Lange Delivery Stations are not anticipated during operations. However, attributable noise from operation of the Chain of Rocks Station (west station) could be as much as 57.9 dBA L_{dn} at the nearest NSA. To verify the accuracy of Spire's acoustical analyses and ensure sound levels do not exceed our criterion, **we recommend that**:

- **Spire should file noise surveys with the Secretary <u>no later than 60 days after placing the Chain of Rocks Station in service</u>. If a full load condition noise survey is not possible, Spire should provide an interim survey at the maximum possible power load and provide the full power load survey <u>within six months</u>. If the noise attributable to the operation of all the equipment at the facility at interim or full power load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, Spire should file a report on what changes are needed and should install additional noise controls to meet the recommended noise level <u>within one year</u> of the in-service date. Spire should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days after it installs the additional noise controls</u>.**

Because the meter stations are expected to have minimal contribution to the ambient sound levels at NSAs, and based on the analyses conducted, Spire's proposed mitigation measures, and our recommendation, we conclude that operation of the Spire STL Pipeline Project would not result in significant noise impacts on residents or nearby communities.

9. Reliability and Safety

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If inhaled in high concentrations, oxygen deficiency can result in serious injury or death. Methane has an auto-ignition temperature of over 1,000º Fahrenheit and is flammable at concentrations between 5 and 15 percent in air. An unconfined mixture of methane and air is not explosive; however, it may ignite if there is an ignition source present. A flammable concentration within an enclosed space in the presence of an ignition source can explode. Methane is buoyant at atmospheric temperatures and disperses upward rapidly in air.

9.1 Safety Standards

The DOT is mandated to provide pipeline safety under 49 U.S.C. Chapter 601. The DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and require the pipeline operator to use various technologies to achieve safety. PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local levels.

Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adoption and enforcing the federal standards, while Section 5(b) permits a state agency that does not qualify under Section 5(a) to perform certain inspection and monitoring functions. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement actions. The Illinois Commerce Commission's Natural Gas Pipeline Safety Section and the State of Missouri are authorized by PHMSA under Section 5(a) to assume all aspects of the safety program intrastate, but not interstate, facilities to ensure compliance with all Federal and State safety rules and regulations in regards to design, construction, operation, and maintenance (Illinois Commerce Commission 2017; PHMSA 2017a). In addition, the Illinois Commerce Commission also investigates injuries requiring hospitalization, facility or property damage in excess of $50,000 for jurisdictional natural gas facilities. Missouri shares pipeline safety regulatory responsibilities with PHMSA's Office of Pipeline Safety.

The DOT pipeline standards are published in 49 CFR Parts 190--199. Part 192 specifically addresses natural gas pipeline safety issues. Under a MOU on Natural Gas Transportation Facilities, dated January 15, 1993, between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.12(a)(9)(vi) of the FERC regulations require that an applicant certify that it would design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection. Alternatively, an applicant must certify that is has been granted a waiver of the requirements of the safety standards by the DOT in accordance with Section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards. If the FERC becomes aware of an existing or potential safety problem, there is a provision within the MOU to promptly alert the DOT. The MOU also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the FERC's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Spire STL Pipeline Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification, minimum design requirements; and protection from internal, external, and atmospheric corrosion. Spire would design, construct, operate, and maintain the pipeline and aboveground facilities in accordance the safety standards published in 49 CFR 192.

The DOT also defines area classifications, based on population density near the pipeline and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

- Class 1: Location with 10 or fewer buildings intended for human occupancy;
- Class 2: Location with more than 10, but less than 46 buildings intended for human occupancy;
- Class 3: Location with 46 or more buildings intended for human occupancy, or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks during any 12-month period; and
- Class 4: Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For instance, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 18 inches in consolidated rock and 30 inches in normal soil. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Spire would install the pipeline with a minimum depth of cover of 36 inches in normal soil and consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; MAOP; inspection and testing of welds; and the frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Spire would adhere to the DOT Minimum Federal Safety Standards in 49 CFR 192.

The Project would be constructed through Class 1, Class 2, and Class 3 areas. Throughout the life of the pipeline, Spire would monitor new development to identify changes in class location or high consequence areas (HCA) in accordance with 49 CFR 192, subpart L (Section 192.609 and 192.611) to determine whether the pipeline would require upgrades to meet changes in population.

The Pipeline Safety Improvement Act of 2002 requires operators to develop and follow a written integrity management program that contains all the elements described in 49 CFR 192.911 and addresses the risks on each transmission pipeline segment. More specifically, the law establishes an integrity management program that applies to all HCAs.

The DOT has published rules that define HCAs as areas where a gas pipeline accident could considerably harm people and their property and that require an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for the DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 locations where the potential impact radius[15] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[16] or
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site (as described below).

An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days per week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

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15 The potential impact radius is calculated as the product of 0.69 and the square root of: the MAOP of the pipeline in pounds per square inch gauge multiplied by the square of the pipeline diameter in inches.

16 The potential impact circle is a circle of radius equal to the potential impact radius.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Table B-20 below lists the HCAs by milepost that would be crossed by the Project pipeline. Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its integrity management program to those segments of pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan in Section 192.91.

The Spire STL Pipeline Project would cross three HCAs along the North County Extension. Spire would implement all elements of its integrity management plan for the pipeline HCAs. Key elements include data gathering, risk assessments, integrity assessments, response and remediation, and continual evaluation and assessment. The pipeline integrity management rule for HCAs requires inspection of pipeline HCAs at a rate of once every 7 years. Spire would be subject to criteria specified by the DOT to identify additional HCAs if conditions change along the pipeline.

Table B-20
Location of High Consequence Areas for the Project[a]

Facility	Town / County	Begin Milepost	End Milepost	Approximate Length (feet)
Pipeline	Spanish Lake / St. Louis	NCE 2.3	NCE 2.7	2,112
	St. Ferdinand / St. Louis	NCE 4.8	NCE 5.0	1,056
	St. Ferdinand / St. Louis	NCE 5.7	NCE 6.0	1,584

[a] High consequence areas are designated locations along the pipeline that are near either densely populated areas, facilities that would be difficult to evacuate (such as hospitals or schools), or locations where people congregate (such as churches, offices, or parks).

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of natural gas pipeline emergency. Spire would develop operations and maintenance procedures in addition to its Emergency Response Plan as required under Subpart L of 49 CFR 192. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;

- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency system shutdown and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Under 49 CFR 192.615, each pipeline operator must also establish an Emergency Plan that provides written procedures to minimize hazards from a natural gas pipeline emergency. The DOT requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

Spire has initiated and would continue to maintain an ongoing liaison with the appropriate fire, police, and public officials to coordinate mutual assistance during emergencies. In compliance with DOT regulations, Spire would implement procedures in its Emergency Response Plan to enable the public and officials to recognize and report a natural gas emergency. In addition, Spire would establish a written continuing education program to enable the public, emergency officials, local officials, and excavators to recognize a natural gas pipeline emergency, reporting to appropriate officials and company, and actions to take and avoid until operator responds.

9.2 Pipeline Accidents

The DOT requires that all operators of natural gas transmission pipelines notify the DOT of any significant incident and submit an incident report within 20 days. Significant incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involved property damage of more than $50,000 (1984 dollars).[17]

During the 20-year period from 1997 through 2016, a total of 1,038 significant incidents were reported on more than 299,000 total miles of natural gas transmission pipelines nationwide (PHMSA 2017b). Additional insight into the nature of service may

[17] $50,000 in 1984 is approximately $115,000 as of November 2015 (Bureau of Labor Statistics 2015).

be found by examining the primary factors that caused the failures. Table B-21 provides a distribution of the causal factors as well as the number of each incident by cause.

Table B-21
Natural Gas Transmission Pipeline Significant Incidents by Cause 1997-2016

Cause	Number of Incidents[a]	Percentage[b]
Corrosion	184	17.7
Excavation[c]	193	18.6
Pipeline material, weld, or equipment failure	341	32.9
Natural force damage	86	8.3
Outside forces[d]	62	6.0
Incorrect operation	42	4.0
All other causes[e]	130	12.5
Total	**1,038**	**--**

Source: PHMSA 2017b.

a Number of incidents reported for onshore natural gas transmission pipelines; offshore pipeline incident not included.

b Due to rounding, column does not total 100 percent.

c Includes third party damage.

d Fire, explosion, vehicle damage, previous damage, intentional damage, electrical arcing from other equipment / facilities, fishing or maritime activity, maritime equipment, or vessel adrift, and unspecified or other outside force damage.

e Miscellaneous causes or unknown causes.

The dominant causes of pipeline incidents are pipeline material and weld or equipment failure, excavation and corrosion constituting 69 percent of all significant incidents. The pipelines included in the dataset in table B-21 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of the pipeline. The frequency of significant incidents is strongly dependent upon pipeline age. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time-dependent process. The use of both an external protective coating and a cathodic protection system[18] required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

Outside forces, excavation, and natural forces are the cause of about 33 percent of significant pipeline incidents. These result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; and weather effects such as winds, storms, and thermal strains and willful damage.

Older pipelines have a higher frequency of outside forces incidents, partly because their location may be less well known and less well marked as compared to newer

18 Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline through the use of an induced current or a sacrificial anode (like zinc or manganese) that corrodes at a faster rate to reduce corrosion.

pipelines. In addition, the older pipelines contain a disproportionate number of smaller-diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movement. Table B-22 provides a breakdown of outside force incidents by cause.

Since 1982, operators have been required to participate in "One-Call" public utility programs in populated areas to minimize unauthorized excavation activities near pipelines. The "One-Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines, cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

Table B-22
Outside Forces Incidents by Cause[a] 1997-2016

Cause	Number of Incidents[b,d]	Percent of Outside Force Incidents[c]
Third party excavation damage	154	45.0
Vehicle not engaged in excavation	34	9.9
Earth movement	28	8.2
Heavy rains / floods	25	7.3
Lightning / temperature / high winds	24	7.0
Operator/contractor excavation damage	24	7.0
Unspecified excavation damage / previous excavation damage	15	4.4
Unspecified / other outside force damage	9	2.6
Fire / explosion as primary cause	9	2.6
Unspecified / other natural force damage	9	2.6
Previous mechanical damage	5	1.5
Maritime equipment or vessel adrift	2	0.6
Electrical arcing from other equipment / facility	1	0.3
Fishing or maritime activity	1	0.3
Intentional damage	1	0.3
Total	**341**	**-**

Source: PHMSA 2017b.

[a] Excavation, Outside Force, and Natural Force from table B-21.
[b] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.
[c] Due to rounding, column does not total 100 percent.
[d] Number of incidents reported for onshore natural gas transmission pipelines; offshore pipeline incidents not included.

Spire would participate in the Illinois and Missouri One-Call Systems. In addition, damage-prevention personnel employed by Spire would be present onsite to monitor, inspect, and assess all third-party activities near the Project area.

9.3 Impacts on Public Safety

As stated in section B.9.1, Spire would comply with all applicable DOT pipeline safety standards as well as regular monitoring and testing of the pipeline. While pipeline failures are rare, the potential for pipeline systems to rupture and the risk to nearby residents is discussed below.

The service incidents data summarized in table B-21 above, included pipeline failures of all magnitudes with widely varying consequences. Table B-23 below presents the average annual injuries and fatalities that occurred on natural gas transmission pipelines in the 5-year period between 2012 and 2016.

The majority of fatalities from pipelines are due to incidents with local distribution pipelines not regulated by the FERC. These are natural gas pipelines that distribute natural gas to homes and businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes and/or plastic pipes, which are more susceptible to damage. Local distribution systems do not have large rights-of-way and pipeline markers common to FERC-regulated natural gas transmission pipelines.

Table B-23
Injuries and Fatalities – Natural Gas Transmission Pipelines

Year	Injuries[a]	Fatalities
2012	7	0
2013	2	0
2014	1	1
2015	14	6
2016	3	3

Source: PHMSA 2017b.
[a] Number of incidents reported for onshore natural gas transmission pipelines; offshore pipeline incidents not included.

The nationwide totals of accident fatalities from various anthropogenic and natural hazards are listed in table B-24 to provide a relative measure of industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. The data nonetheless indicate a low risk of death due to incidents involving natural gas transmission pipelines compared to other hazard categories. Furthermore, the fatality rate associated with natural gas distribution lines is lower than the fatalities from natural hazards such as lightning, tornadoes, or floods.

Table B-24 Nationwide Accidental Deaths[a]	
Type of Accident	**Annual No. of Deaths**
All accidents	123,706
Motor vehicle	46,844
Poisoning	29,846
Falls	22,631
Injury at work	4,551
Drowning	3,443
Fire, smoke inhalation, burns	3,286
Floods	113
Lightning	29
Tornadoes[b]	18
Natural gas distribution pipelines[c]	11
Natural gas transmission pipelines[c]	3

a All data, unless otherwise noted, reflect 2007, 2009, or 2010 statistics from the U.S. Census Bureau 2012.
b Data are sourced from National Oceanic and Atmospheric Administration 2016.
c Data are sourced from PHMSA 2017b. Data presented for 2016, onshore pipelines.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1997 to 2016, there were an average of 52 significant incidents, 9 injuries, and 2 fatalities per year (PHMSA 2017b). The operation of the Project would represent a slight increase in risk to the nearby public; however, the number of significant incidents over more than 299,000 miles of natural gas transmission lines indicates that the risk is low for an incident at any given location.

10. Cumulative Impacts

In accordance with NEPA and FERC policy, we evaluated the potential for cumulative impacts of the Project on the environment. Cumulative impacts are considered as impacts that result from the incremental effects of the Project when added to other past, present, or reasonably foreseeable future actions, regardless of the agency or party undertaking such actions. Cumulative effects generally refer to impacts that are additive or synergistic in nature and result from the construction of multiple projects in the same vicinity and time frame. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time. In general, small-scale projects with minimal impacts of short duration do not significantly contribute to cumulative impacts.

Our cumulative impact analysis for the Project generally follows the methodology set forth in relevant guidance (CEQ 2005; USEPA 1999). Under these guidelines, inclusion of other projects in the analysis is based on identification of impacts on environmental resources from other projects that would directly or indirectly result in similar effects as the proposed Project. The cumulative impacts analysis includes those past, present, and reasonably foreseeable projects meeting the following three criteria:

- impact a resource area potentially affected by the Project;
- cause this impact within all, or part of, the Project area; and
- cause this impact within all, or part of, the timespan for the potential impact for the Project.

The Spire STL Pipeline Project would affect a confined corridor for pipeline construction and operation within Scott, Greene, and Jersey Counties in Illinois and St. Charles and St. Louis Counties in Missouri. In this cumulative impact analysis, we considered past, present, and reasonably foreseeable actions expected to affect similar resources during similar timeframes with the Project. Information on past, present, and relatively foreseeable future projects in the geographic scope were identified through Spire's consultation with local authorities and through our own scoping and research. A geographic scope was identified for each specific environmental resource that would be affected by the Project (table B-25).

Spire consulted public sources to obtain information on planned future developments. To date, no planned commercial, residential, or other developments have been identified within 0.25 mile of the proposed Project facilities (see section B.5.2). The closest existing residential development, the New Town at St. Charles, is about 8 miles southwest of the Project.

We have focused our review by including other projects we believe have the potential to contribute to cumulative impacts based on the size of the other project or proximity to the Spire STL Pipeline Project. Numerous other projects are certainly present in the counties crossed by the proposed Project (e.g., various roadway reconstructions, residential and commercial developments, gravel mining), but we determined they are either outside of the geographic scope for impacts, or the types of impacts can be considered negligible, given the local setting typical of ongoing urban/metropolitan development. Examples include county-wide impacts on tax revenue, employment, and traffic; and other *de minimis* impacts, such as a commercial development impacting an intermittent stream 3 miles from the Spire STL Pipeline Project in suburban St. Charles County. Such impacts do not require further assessment.

Based on the above considerations, we identified 14 current, proposed, or reasonably foreseeable future actions within the Project area that are within our defined geographic scope for at least one resource area and have the potential to contribute to cumulative impacts (see table B-26). These include seven energy- or utility-related projects (either linear projects or facility/site upgrades or expansions), one major road project, four industrial/commercial projects, and one residential project.

Table B-25
Geographic Scope for Cumulative Impact Analysis

Environmental Resource	Geographic Scope and Justification
Soils and Geology	Construction workspaces – impacts on geological resources and soils would be highly localized and primarily limited to the respective project footprints during active construction
Groundwater, Wetlands, Vegetation, Wildlife	HUC 12 watershed – impacts on water resources, including wetlands, are traditionally assessed on a watershed level. The watershed can also serve as a geographic proxy for impacts to vegetation and wildlife, and provides a natural boundary, as recommended by the CEQ.
Surface Water Resources	HUC 12 watershed – to include potential overlapping impacts from sedimentation, turbidity, and general water quality impacts
Cultural Resources	Overlapping impacts within the APE – direct impacts on cultural resources are highly localized, cumulative impacts would only occur if other projects are constructed in the same place or impact the same historic properties impacted by the proposed Project
Land Use	1-mile radius – to encompass any large areas with specialized or recreational uses
Visual	0.25 mile and existing visual access points (e.g., road crossings) – to include the surrounding area from where a new facility could be visible
Noise - Operations	Overlapping NSAs up to 0.5 mile from the meter stations – to include the maximum distance for noise assessments that are traditionally required for aboveground facilities
Noise - Construction	0.25 mile from pipeline or aboveground facilities due to the localized effects of construction activities. 0.5 mile from horizontal direction drill or direct pipe installation – due to the longer duration of sustained noise from this type of construction activity
Air Quality – Operation	Not analyzed further as operational emissions from the Project are negligible.
Air Quality – Construction	0.25 mile from pipeline or aboveground facilities – construction emissions are highly localized
Socioeconomics	Affected counties and municipalities – due to the projects' limited regional scope and relative short construction duration
Environmental Justice	Not analyzed further as no impacts from the Project are anticipated

In order to understand the contribution of past actions to the cumulative impacts of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. In this analysis, we generally consider the impacts of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline), which was described under the specific resources discussed throughout section B.

Table B-26
Recently Constructed or Proposed Projects with Potential Cumulative Impacts in the Geographic Scope

Project and Proponent	Status	Closest Known Distance and Direction to Project	Description	Resource Potentially Affected
FERC-regulated Projects				
None				
Non-FERC-regulated Utility Projects				
Dakota Access Pipeline (Energy Transfer Partners, L.P.; Dakota Access, LLC)	Recently constructed	6 miles northeast in Scott County, Illinois	The project includes a 30-inch diameter 1,172-mile-long pipeline that will transport domestically produced light sweet crude oil from the Bakken and Three Forks productions areas in North Dakota to terminal facilities in Patoka, Illinois.	Socioeconomics
Grain Belt Express Clean Line (Clean Line Energy Partners)	Proposed to begin early in 2018.	intersects pipeline at MP 2.8 in Scott County, Illinois	A 780-mile-long overhead, direct current transmission line that will deliver wind energy from western Kansas to utilities and customers in Missouri, Illinois, Indiana, and neighboring states. Construction of the transmission line would require a 200-foot right-of-way.	All resources
NuStar Pipeline Modifications	Scheduled to be constructed in the summer of 2017.	adjacent to pipeline from MP 43.9 and 46.2 in Jersey County, Illinois	The project involves replacement of a segment along an existing ammonia pipeline.	All resources
Illinois Rivers Project (Ameren Illinois)	Recently constructed	6 miles north in Scott County, Illinois	A 330-mile-long overhead electric transmission line from Palmyra, Missouri, to Sugar Creek, Indiana for reliability improvements, meeting growing demands for electricity, access to renewable energy, and enhancement of market efficiency.	Socioeconomics

Table B-26 (continued)
Existing or Proposed Projects with Potential Cumulative Impacts in the Geographic Scope

Project and Proponent	Status	Closest Known Distance and Direction to Project	Description	Resource Potentially Affected
Non-FERC-regulated Utility Projects (continued)				
Oil / gas well	In operation	1,080 feet west of MP 57.1 in St. Charles County, Missouri	An active oil / gas well.	All but geology and soils
Oil / gas well	In operation	1,091 feet west of MP 57.1 in St. Charles County, Missouri	An active oil / gas well.	All but geology and soils
Oil / gas well	In operation	196 feet south of MP 58.3 in St. Louis County, Missouri	An active oil / gas well.	All but geology and soils
Oil / gas well	In operation	534 feet northwest of MP 58.8 in St. Louis County, Missouri	An active oil / gas well.	All but geology and soils
Transportation Projects				
U.S. Highway 67	Various, with some still in the planning stage	0.1 - 6.0 miles east in Greene and Scott County, Illinois	Construction of one new expressway (Delhi, Illinois), three new bypasses (Jerseyville, Carrollton, and White Hall / Roadhouse, Illinois), and improvements to existing two and four lane corridors at four locations along U.S. 67 in Jersey and Greene Counties in Illinois. The project in total would be 41.5 miles.	Water Resources, Vegetation, Fisheries, Wildlife, T&E Species, Land Use and Visual Resources, Socioeconomics, Air Quality, and Noise
Industrial / Commercial Projects				
Limestone Quarry (Central Stone)	In operation	crossed by the pipeline between MP 58.3 and 58.6 in St. Louis County, Missouri	An existing, active, limestone quarry.	All resources

Table B-26 (continued)
Existing or Proposed Projects with Potential Cumulative Impacts in the Geographic Scope

Project and Proponent	Status	Closest Known Distance and Direction to Project	Description	Resource Potentially Affected
Industrial / Commercial Projects (continued)				
Wentzville Logistics Center (North Point Development)	In operation	26 miles west in St. Charles County, Missouri	Development of a new industrial park on a 132-acre lot.	Socioeconomics
Smartt Field Airport (Smartt Field Airport)	Unknown	2 miles west in St. Charles County, Missouri	Construction of a new hanger on a 12-acre lot.	Water Resources, Vegetation, Fisheries, Wildlife, T&E, and Socioeconomics
St. Peters' Highway 370 Development (Duke Realty and Gundaker Commercial)	In operation	12 miles southwest in St. Charles County, Missouri	Construction of a business park with commercial sites on a 688-acre lot located south and north of Highway 370.	Socioeconomics
Residential Projects				
New Town at St. Charles (Whittaker Builders, Inc.)	Unknown	8 miles southwest in St. Charles County, Missouri	Expansion of an existing mixed-use neighborhood within a residential community on 700 acres.	Water Resources, Vegetation, Fisheries, Wildlife, T&E, and Socioeconomics

Potential impacts most likely to be cumulative with the Project's impacts are related to geology and soils, water resources and wetlands, vegetation and wildlife (including federally and state listed endangered and threatened species), land use and visual resources, air quality, and noise. The proposed Project facilities could contribute to these cumulative impacts; however, Spire would minimize adverse Project impacts by implementing mitigation measures identified in section B of this EA, and would locate the proposed pipeline adjacent to existing rights-of-way to the extent practicable.

10.1 Geology and Soils

The general geologic setting of the Project poses a limited potential for erosion and landslide hazards as a result of steep slopes. However, where construction of the proposed Project would occur in close proximity to other projects and have ground disturbance, an increased potential for erosion and landslide hazards may occur. The direct effects of geologic hazards would be highly localized and limited primarily to the period of construction; therefore, cumulative impacts from geologic hazard impacts would only occur if other projects are constructed at the same time and place as the proposed facilities.

Three projects have been identified as having the same construction footprint of the proposed Project: Grain Belt Express Clean Line, NuStar Pipeline, and Central Stone Limestone Quarry. Central Stone operates a limestone quarry in St. Louis County, Missouri. The Project would cross Central Stone's property between MPs 58.4 and 58.5; however, no active mining occurs at the proposed crossing location.

The Grain Belt Express Clean Line (Clean Line) project would be crossed by the Project at MP 2.7 in Scott County, Illinois. As discussed, the geologic setting of the Project poses minimal geologic hazards. The Clean Line project would limit ground and soil disturbance to the locations where the transmission towers would be installed.

Finally, the NuStar Pipeline modifications would be adjacent to the Project between MPs 43.9 and 46.2. The construction footprints for the NuStar Pipeline and proposed Project would overlap in an area identified as high susceptibility with low to moderate incidence of landslides; however, modifications to the NuStar Pipeline are expected to precede construction of the Spire STL Pipeline. In section B.1.1 of this EA, we recommend Spire develop a site-specific plan to minimize and mitigate landslide risk. Such a plan would be developed based on field conditions and in consultation with FERC staff geologists, and would thus address cumulative risks with the NuStar Pipeline modifications.

Based on the minimal overlap with other projects and our recommendations, we conclude that the Project would not significantly contribute to cumulative impacts on geology and soils.

10.2 Water Resources and Wetlands

HUCs define the source area that contributes surface water to a specified outlet point, and are delineated based on surface water flow along natural topographic and hydrologic breaks. HUC-12 subwatersheds typically define the drainage area upstream of tributaries to major rivers, and range from 10,000 to 40,000 acres in size. The Project would cross 16 subwatersheds (see table B-3). Impacts on surface waters and wetlands within a HUC can result in downstream contamination or turbidity.

We identified 11 projects within the water resources and wetlands geographic scope for the Spire STL Pipeline Project: expansion of U.S. Highway 67 in most of the HUC in Illinois (see table B-3); construction of Grain Belt Express Clean Line in Little Sandy Creek in Illinois; modification of the NuStar Pipeline in Marais Temps Clair-Mississippi River in Illinois; a limestone quarry and the active oil/gas wells in Outlet Missouri River in Missouri; and finally two development projects in Marais Temps Clair-Mississippi River, in Missouri (the Smartt Field Airport expansion and the Whittaker Builders New Town Development).

Spire STL Pipeline Project impacts on surface waters and, for the most part, on wetlands would be temporary, including sedimentation from construction. The proposed Project, in addition to these other 11 projects, therefore, may have the following temporary cumulative impacts: changes in groundwater recharge; impacts on surface and groundwater quality; sedimentation and increased turbidity due to erosion or construction within surface waters; inadvertent returns in or near the Mississippi River, and temporary impacts on wetlands. Because the proposed Project and the other projects would be required to comply with mitigation requirements and conditions in CWA Section 404 and 401 permits for any permanent wetland impacts, and the incremental impacts of the Spire STL Pipeline Project would be temporary and minor, we conclude that cumulative impacts would not be significant.

10.3 Vegetation, Fisheries, Wildlife, Threatened and Endangered Species

Construction activities associated with the Project would result in temporary and permanent impacts on vegetation and wildlife and temporary impacts on fisheries. The geographic scope for analyzing a cumulative impact on vegetation and wildlife is the HUC-12 subwatersheds that would be crossed by the Project.

Of the eight projects identified in table B-26 as being within the same subwatersheds that would be crossed by the Spire STL Pipeline Project, only the Clean Line project could be under construction at the same time as the Spire STL Pipeline Project, based on known construction timeframes. Clean Line Energy Partners estimates that the maximum right-of-way width for that project would be 200 feet (Clean Line Energy Partners 2017). Based on the portion of the projects that would be in the Little Sandy Creek subwatershed, we estimate that about 250 acres of a mix of forest and open land, considered to be quality habitat, would be temporarily affected during construction. Following construction this land would be totally restored, except where the physical structures of the transmission towers are installed.

The U.S. Highway 67 projects range from minor improvements to existing segments, to construction of new, 2- to 4-lane segments, the longest being 9 miles. Construction impacts associated with this project would be similar to the Spire STL Pipeline Project, resulting in temporary ground disturbances; however, unlike the proposed Project, a larger amount of the land affected during construction would be permanently converted to developed land. Vegetated habitat adjacent to existing infrastructure that would not be quality habitat, alternatively, about 19 miles of new roadway would be constructed and could occur on land considered to be quality habitat.

The limestone quarry (in St. Louis County, Missouri), the active oil/gas wells (two each in St. Charles and St. Louis Counties in Missouri) Smartt Field Airport and New Town residential community (both in St. Charles County, Missouri) are (partially or wholly) in areas of developed land, thus would have a negligible effect on the natural vegetation communities or wildlife habitat.

Cumulative impacts, such as those on vegetation cover types and wildlife habitat, are additive. Many wildlife species depend on mature contiguous tracts of forest to sustain their migratory and reproduction cycles. These species include songbirds and terrestrial mammals that require large tracts of forest to support their home ranges. Similar habitats are adjacent to and near construction activities that are expected to be sufficient to support wildlife displaced during construction. Spire would minimize impacts on vegetation and wildlife habitat by locating the Project adjacent to existing rights-of-way where practicable and by implementing the measures in its Plan and Procedures.

Cumulative impacts on federally and state listed threatened and endangered species and federal species of concern could occur if other projects were to affect the same habitats as the Project. However, the ESA consultation process includes consideration of the current status of affected species and cumulative impacts would be minimized. We conclude that the cumulative impacts on vegetation and wildlife resources, including threatened and endangered species, would not be significant based on the addition of the Project's impacts on these resources.

10.4 Land Use and Visual Resources

Construction and operation of projects in the immediate surrounding areas as the proposed facilities could result in temporary and permanent cumulative impacts on land use. Therefore, the geographic scope for assessing potential cumulative impacts on land use was 1 mile from the Project footprint.

Of the projects identified in table B-26, eight are within a 1-mile radius: the Clean Line project, the modification of the NuStar Pipeline, the limestone quarry, the four active oil/gas wells, and the expansion and upgrades to U.S. Highway 67.

While many of the impacts of the Spire STL Pipeline Project would be temporary, construction of the proposed facilities would result in some permanent land use changes, including forest conversion to maintained right-of-way and conversion of agricultural land and upland forest for aboveground facilities and access roads to developed land.

As discussed in section B.10.3, two development projects, the limestone quarry, and the four active oil/gas wells within the area of geographic scope are in areas of developed land and would not likely result in noticeable changes in land use. Construction of the Grain Belt Express Clean Line, NuStar Pipeline modification, and U.S. Highway 67 projects would have similar temporary and permanent impacts as the Project, affecting primarily agricultural and open land in Illinois. Overall these projects would have nominal impacts on forested land. Additionally, the NuStar Pipeline and U.S. Highway 67 projects would involve work within their existing rights-of-way. Following construction, the NuStar Pipeline would be buried, and most land uses could resume. Alternatively, Grain Belt Express Clean Line and U.S. Highway 67 projects would also result in permanent impacts on land use through the conversion from existing land use types to developed land. Although for the Grain Belt Express Clean Line this conversion would be limited to the locations of the poles/towers supporting the transmission line within the 780-mile maintained right-of-way. Overall the Spire STL Pipeline Project would result in nominal impacts on forest land, temporary (i.e., one season) impacts on agricultural land, including land enrolled in conservation easements.

Spire would minimize impacts on land use by implementing the Plan and Procedures, and by locating the pipeline adjacent to existing rights-of-way where practicable to minimize forest fragmentation and reduce the visual impacts associated with a new corridor. However, we recognize that adjacent utility corridors may, in some cases, also have negative consequences to individual, privately held properties such as the Principia College property where the Project would be adjacent to the NuStar Pipeline. While locating a new right-of-way adjacent to an existing right-of-way may reduce cumulative impacts overall, the cumulative impacts of two or more rights-of-way on individual properties or managed sites may be magnified.

Visual impacts from the proposed Project would be greatest in areas of forest conversion where the changes in vegetation cover would be more noticeable from a greater distance. In addition, the conversion of land for aboveground facilities to developed, industrial land would permanently change the viewshed for nearby receptors. Spire has sited the three proposed meter stations near existing natural gas infrastructure, would utilize color schemes that are consistent with the surrounding environment, and would maintain existing vegetation where feasible to minimize visual impacts from these facilities.

The Clean Line project would cross Spire's proposed Project at MP 2.7 just west of State Route 106 (see table B-26). The presence of forest land along Route 106 in this area would serve as a natural buffer, thereby minimizing the visibility of construction and operation of the projects for motorists and other nearby visual receptors. The maintained right-of-way, transmission lines, and associated towers adjacent to Route 106 would represent a permanent change in the existing viewshed. The proposed right-of-way would be adjacent to U.S. Highway 67 at varying distances (0.1 to 6 miles) between MPs 10.3 and 28.7. Minor long-term and permanent cumulative impacts on visual resources could result from the clearing of forested land for construction and maintenance of the permanent right-of-way for the proposed Project and other projects. While the permanent changes in the existing viewsheds may be locally noticed, roadways and transmission lines are a common type of infrastructure, thus are generally not inconsistent with the existing visual character of the area. Further, none of the other projects would be in proximity to the proposed Project meter stations, and thus would not contribute to cumulative impacts on visual receptors at these locations.

We conclude that cumulative impacts on land use would not be significant. We acknowledge there may be cumulative impacts from consecutive construction on Principia College Property; however, the proposed Project's contribution to cumulative land use impacts would not be significant.

10.5 Socioeconomics

All of the projects in table B-26 are located in part or in whole within the same counties crossed by the Spire STL Pipeline Project. The greatest potential for cumulative impacts on population, employment, and local services would be where the other projects are under construction at the same time as the Spire STL Pipeline Project. These counties would likely see a temporary increase in population from non-local workers relocating to these areas during the construction of the Project as well as any concurrently constructed projects.

Construction of the proposed Project, along with other projects in these counties, would result in cumulative socioeconomic impacts including increases in population from non-local workers relocating to these areas, employment opportunities, and tax revenues. Local workers employed by the projects would likely live in the vicinity to the projects; outside workers would be expected to stay in the counties crossed by the Project to be near their worksites. Local communities would benefit from increased spending by construction crews at restaurants, hotels, and retailers. Additionally, taxes are paid to affected counties during construction. Construction-related impacts from the proposed Project on employment and tax revenues would generally be temporary and minor; the other projects identified in in table B-26 would likely have economic impacts during construction, including those projects typical of ongoing urban/metropolitan development, but to a smaller degree. As discussed in section B.6, the Spire STL Pipeline Project would have negligible socioeconomic impacts during operation and therefore would not contribute to cumulative impacts on population, employment, and local services.

Construction of the proposed Project could result in minor, temporary impacts on some roads due to construction within the roadway and the movement of heavy equipment and personnel. Because Spire would implement mitigation measures to ensure traffic safety and would implement measures to maintain traffic flow, minimal disruption of traffic would be expected (see section B.6.3). Concurrent construction of the proposed Project and other projects in the vicinity could result in a temporary and minor cumulative impact on transportation due to increased use of roadways.

10.6 Cultural Resources

The proposed Project would not permanently impact historic properties listed on or considered eligible for listing on the NRHP. Therefore, any potential incremental increase in cumulative impacts on cultural resources from the other projects in consideration with the Project would be negligible.

10.7 Air Quality

Construction of both the Spire STL Pipeline Project and other projects would involve the use of heavy equipment that would generate temporary emissions of air contaminants and fugitive dust during construction. Construction of the Clean Line project, some of the expansions of and upgrades to U.S. Highway 67, the modification of the NuStar Pipeline, the operation of the limestone quarry, and the operation of the active oil/gas wells are expected to overlap or be constructed within 0.25 mile of the Spire STL Pipeline Project within the same general timeframe. Apart from the continued operations of the limestone quarry and the oil/gas wells, only the construction of the Clean Line project is expected to be concurrent. Should construction of any of these projects be concurrent, cumulative air impacts from these temporary emissions would be additive. Any potential cumulative impacts would be limited to the duration of the construction period, and would be temporary and minor. Each project in table B-26 would also be required to meet applicable state and federal air quality standards to avoid significant impacts on air quality. Therefore, we conclude that the Project would not result in significant cumulative impacts on regional air quality.

10.8 Noise

No reasonably foreseeable projects that produce operational noise were identified within a 0.5 mile of the proposed Project meter stations; however, noise impacts would occur during construction of the Project. The impact of noise is temporary, highly localized, and attenuates quickly as the distance from the noise source increases; therefore, the Project could contribute to a cumulative noise impact on NSAs affected by the Spire STL Pipeline Project within 0.25 mile along the proposed pipeline route.

Concurrent construction within 0.25 mile is possible for three projects: the Clean Line project, upgrades to U.S. Highway 67, and modification of the NuStar Pipeline. In addition, the limestone quarry and the active oil/gas wells are expected to continue to operate. Due to the linear nature of the Project, however, construction-related noise impacts would be of a short duration in a given area. During construction, noise would be generally limited to daylight hours except for limited 24-hour HDD operations during pull-back of the pipeline string. Of the three projects, only modification of the NuStar Pipeline would have any overlapping NSAs with Spire's proposed HDDs; however, both the proposed schedules and confines of the workspace indicate that HDD construction would not be concurrent.

The Spire STL Pipeline Project, together with the other projects listed in table B-26, would all produce noise during construction; however, this noise would be temporary in the vicinity of each of the proposed projects. For this reason and the reasons presented above, we conclude that the Project would not result in significant cumulative noise impacts. During operations, noise would be limited to the aboveground facilities, and, because the meter stations are expected to have minimal contribution to the ambient sound levels at NSAs, cumulative noise impacts are not anticipated.

10.9 Climate Change

Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change.

Climate changes are driven by accumulation of GHG in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests. These impacts have accelerated throughout the end 20th and into the 21st century. Although climate change is a global concern, for this analysis, we will focus on the potential cumulative impacts in the Spire Project area.

The following observations of environmental impacts with a high or very high level of confidence are attributed to climate change in the Midwest Region (USGCRP 2014):

- average temperatures have risen more than 1.5° Fahrenheit between 1900 and 2010 and are projected to increase another 4 to 5° Fahrenheit over the next several decades;

- an increase in health risks due to projected additional heat stress and poor air quality;

- the agricultural crop growing season has lengthened since 1950 and is projected to continue lengthening due to the earlier occurrence of the late spring freeze, potentially increasing crop production in the short-term;

- increased temperatures stress, wetter springs, and the continued occurrence of springtime cold air outbreaks may reduce crop yields overall in the long-term (particularly corn and soybeans);

- a change in range and/or elevation is projected for many tree species with potential declines in paper birch, quaking aspen, balsam fir, and black spruce; and increases in oaks and pines;

- population dispersal may be hindered in flat terrain given the long distances needed to reach temperatures suitable for the species, resulting in some potential decline in forests;

- increased insect outbreaks, forest fire, and drought may result in increased tree mortality and the reduction in beneficial carbon sinks;

- annual precipitation has increased by about 20 percent over the past century, particularly from increased high intensity rainfall events, and this trend is projected to continue;

- surface water temperatures in the Great Lakes have increased several degrees between 1968 and 2002, and are projected to increase by about 7 to 12º Fahrenheit by the end of the century; and

- increased surface water temperatures, increased precipitation, and longer growing seasons are projected to result in an increase in blue-green and toxic algae in the Great Lakes, harming fish and reducing water quality.

Our analysis presents the direct and indirect GHG emissions associated with construction and operation of the projects and the potential impacts of GHG emissions in relation to climate change, to the extent practicable.

The GHG emissions associated with construction and operation of the Spire STL Pipeline Project are discussed in section B.8.1. Furthermore, we recognize the availability of a reasonable, USEPA-developed, methodology to estimate the downstream GHG emissions, assuming all of the gas to be transported is eventually combusted. As such, we estimated the GHG emissions from the end-use combustion of the natural gas to be transported by the Project. The Project would deliver up to 400,000 Dth/d of natural gas volumes, which can produce 7.7 million metric tons of CO_2 per year from end-use combustion (USEPA 2017d). However, as described in Section A.2 (Purpose and Need), this Project was not developed to serve new demand. Thus, the majority of the natural gas provided by the Spire STL Pipeline Project would be replacing, not adding to, other fuel sources that are currently contributing GHGs to the atmosphere. Therefore, we do not anticipate that the end-use would represent new GHG emissions.

10.10 Conclusions on Cumulative Impacts

We conclude that impacts associated with the Spire STL Pipeline Project would be relatively minor, and we are recommending additional measures to further reduce the environmental impacts associated with the Project. We anticipate that the Project would contribute to a negligible to minor cumulative impact when the effects of the Project are added to past, present, and reasonably foreseeable projects in the geographic scope, and would not be significant.

C. ALTERNATIVES

In accordance with NEPA and Commission policy, we evaluated alternatives to the Project to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives included the no-action alternative, system alternatives, major pipeline route alternatives, and minor route variations. Spire is not proposing any major aboveground facilities such as compressor stations, and we did not receive any comments regarding the proposed meter station sites; therefore, we did not evaluate aboveground facility site alternatives.[19]

The evaluation criteria used for developing and reviewing alternatives were:

- ability to meet the Project's stated objective;
- technical and economic feasibility and practicality; and
- significant environmental advantage over the proposed action.

With regard to the first criteria and for the purposes of NEPA, Spire's stated objectives for the Project are to provide about 400,000 Dth/d of year-round transportation service of natural gas to markets in the St. Louis metropolitan area, eastern Missouri, and southwest Illinois; and to enhance reliability. Of the total proposed capacity, about 350,000 Dth/d is subscribed. Spire is currently negotiating with prospective shippers on agreements for the remaining 50,000 Dth/d. The Project would link the greater St. Louis Region to a new supply of gas, which would be the only supply source to the area that does not cross the New Madrid Seismic Zone, thereby enhancing infrastructure reliability and diversity.

It is important to note that not all conceivable alternatives are technically feasible or practical. Some alternatives may be limited by the extent of existing technologies or by system capacities, while others may not be practical because sites are unavailable or cannot be developed for the proposed use. Also it is important to consider the environmental advantages and disadvantages of the proposed action, as some alternatives may reduce impacts on resources that are not of particular sensitivity or concern, while others may reduce impacts on one resource but increase impacts on others.

Information we used to evaluate alternatives to the proposed Project included review of area maps, comments, and suggestions from regulatory agencies, comments from the public, data provided by Spire in its application and filings, and our independent research. Unless otherwise noted, we used similar sources of information to standardize

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[19] It should be noted that during project development, Spire worked with the landowner to adjust the siting of the proposed REX Receipt Station, and adjusted the location of the Chain of Rocks Station to avoid siting it in a floodplain. We find the resulting proposed sites acceptable and having minimal impact; as such, there is no need to investigate alternatives to these locations.

comparisons between the Project and the corresponding alternative. Therefore, data presented in our analysis of alternatives may differ from those presented elsewhere in this EA, which included Project-specific data collected during field surveys and based on engineer drawings.

It should be recognized that the currently proposed route already reflects modifications to Spire's originally planned route. Spire incorporated such modifications during the pre-filing process, with the goal of addressing landowner and other stakeholder concerns, avoiding or minimizing impacts on sensitive resources, reducing or eliminating engineering and constructability concerns, and/or avoiding or minimizing conflicts with existing land uses. Similar Project modifications continued after the formal application was filed (one of which necessitated the amended application). For example, Spire's landowner consultations have resulted in Spire incorporating 20 landowner-requested variations into the proposed route. In all, based on input from landowners, land managing and permitting agencies, Project engineers, and FERC staff, over 40 route variations were incorporated into the proposed Project. As such, their associated environmental consequences are included in our environmental analysis in section B, above.

In addition to these adopted route variations, minor alignment shifts may be required prior to and during construction to accommodate currently unforeseeable site-specific constraints related to engineering, landowner, and environmental concerns. All such alignment shifts that occur outside of the permanent right-of-way would be subject to review and approval by the FERC.

1. No-action Alternative

If the Commission were to deny Spire's application, the Project would not be built and the environmental impacts identified in this EA would not occur. Under this alternative, Spire would not provide an additional source of natural gas supply to the St. Louis market, and the purpose of the Project would not be met. The current market demand would continue to be met by systems already in place and serving the area. The Enable MRT system currently serves the St. Louis area and has a total capacity of 1.9 billion cubic feet per day (Enable Midstream Partners, LP 2015), supplying about 87 percent of the St. Louis natural gas supply from southern supply basins.

Commentors on this Project have protested the stated purpose and need of the Project and raised concerns regarding potential economic harm to existing pipelines in the area and their customers. We acknowledge that this Project was not developed to serve new demand. Rather, Spire states that it was developed to increase its diversity of supply sources and transportation paths in order to lower delivered gas costs, improve security and reliability of supply, and achieve an operationally superior peak-shaving strategy. Further, Spire (through its affiliate, Laclede) has stated that, while some system alternatives may satisfy some of the stated benefits of the Project, no alternative achieves all of the intended benefits. The concerns expressed by commenters about the Project purpose are beyond the scope of this environmental document. However, the Commission may consider these issues in making its determination of public need.

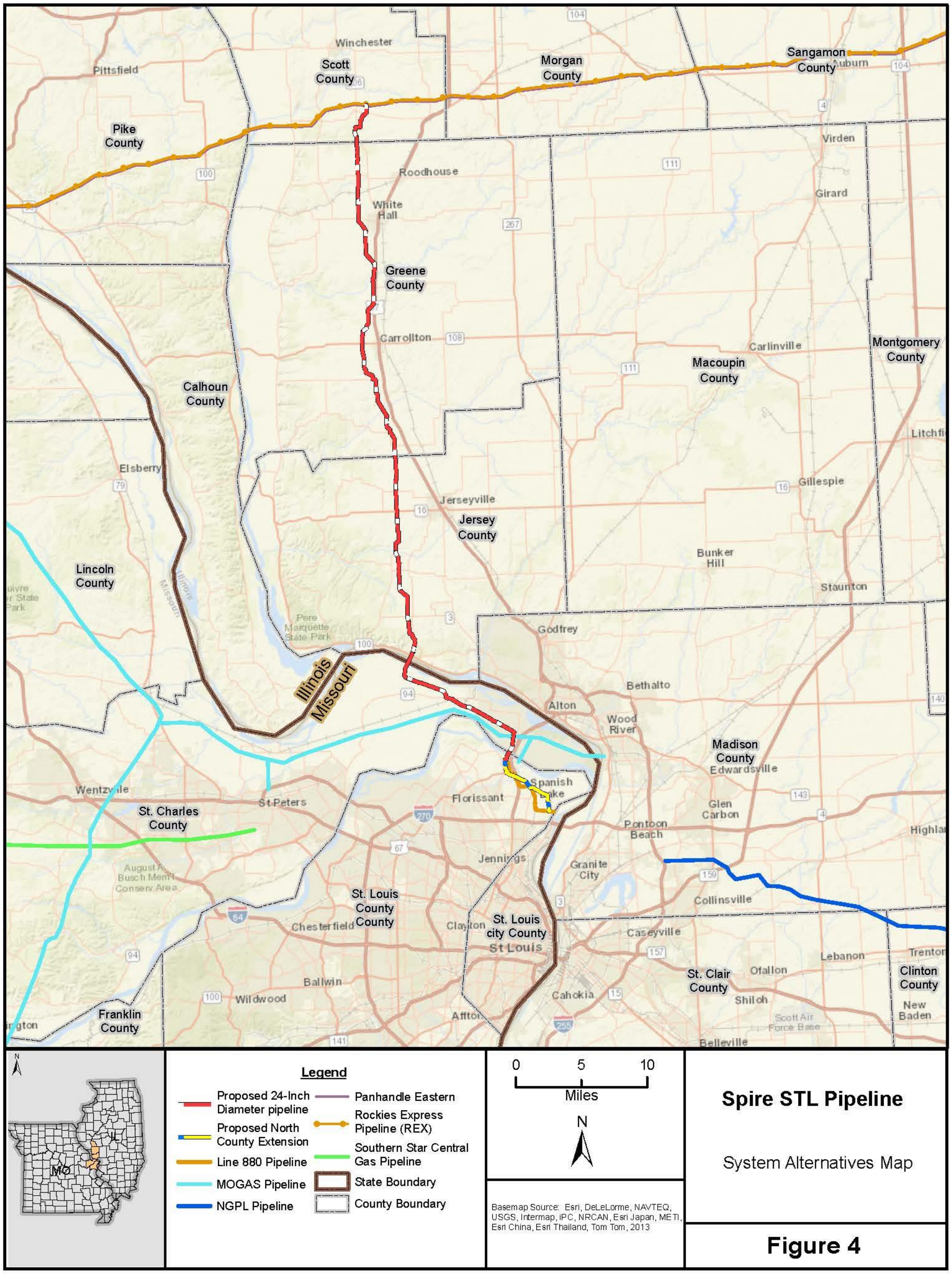
Under the no-action alternative, other natural gas transmission companies could propose to construct other facilities with the intent to increase reliability of service in the St. Louis market area. Such actions could result in impacts similar to or greater than the proposed Project, and would not meet the Project's objectives within the proposed time frames. Therefore, we have concluded that the no-action alternative would not satisfy the stated Project objectives, and we do not recommend it.

2. System Alternatives

System alternatives would use existing, modified, or proposed pipeline systems to meet the purpose and need of the Spire STL Pipeline Project. In general, implementation of a favorable system alternative may deem it unnecessary to construct all or part of a proposed project. However, modifications or additions to other systems are typically necessary to make the alternative viable and able to meet the objective of a proposed project. Such modifications or additions could result in environmental impacts that are less than, similar to, or greater than those associated with construction and operation of a proposed project.

With that in mind, we identified and evaluated three system alternatives to the Spire STL Pipeline Project determine whether the environmental impacts associated with construction and operation of the Project could be avoided or reduced while still meeting the objectives of the Project.[20] These three system alternatives are: the Natural Gas Pipeline Company of America, LLC (NGPL) system; the MoGas Pipeline, LLC (MoGas) system; and Laclede's Line 880. These are depicted in figure 4. No other existing pipeline systems are present in the Project vicinity that would be able to meet the Project objectives.

[20] Notwithstanding Spire's contention that no system alternative would satisfy all intended Project benefits, the three alternatives analyzed could, at least, replace the volume of gas proposed to be delivered to greater St. Louis market.


Winchester
Scott County
Morgan County
Sangamon County
Auburn
Pittsfield
Pike County
Virden
Roodhouse
Girard
White Hall
Greene County
Carrollton
Carlinville
Montgomery County
Macoupin County
Calhoun County
Litchfi
Elsberry
Gillespie
Jerseyville
Jersey County
Lincoln County
Bunker Hill
Staunton
Pere Marquette State Park
Godfrey
Illinois
Missouri
Bethalto
Alton
Wood River
Madison County
Edwardsville
Spanish Lake
Wentzville
St. Charles County
St Peters
Florissant
Glen Carbon
Pontoon Beach
Highlan
August A Busch Mem'l Conserv Area
Jennings
Granite City
Collinsville
St. Louis County
St. Louis city County
St Louis
Chesterfield
Clayton
Caseyville
Trenton
Lebanon
St. Clair County
O'fallon
Clinton County
Ballwin
Wildwood
Cahokia
Shiloh
New Baden
Franklin County
Afton
Scott Air Force Base
Belleville
Legend
Proposed 24-Inch Diameter pipeline
Proposed North County Extension
Line 880 Pipeline
MOGAS Pipeline
NGPL Pipeline
Panhandle Eastern
Rockies Express Pipeline (REX)
Southern Star Central Gas Pipeline
State Boundary
County Boundary
0
5
10
Miles
N
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline
System Alternatives Map
Figure 4

The NGPL natural gas distribution pipeline system includes a lateral line that runs east-to-west towards St. Louis and terminates near Glen Carbon, Illinois, about 11 miles east of the terminus of the proposed alignment. In order to make the desired interconnect with the Enable MRT System, NGPL would first have to expand the existing east-west pipeline about 11 miles. Also, because NGPL's system does not currently have 350,000 Dth/d of available capacity, additional system upgrades would be required, including additional compression, which would increase air emissions when compared to the proposed Project. Finally, based on anticipated rates along NGPL's currently proposed southbound expansion, Spire has indicated that use of the NGPL system would not be an economically viable option (NGPL 2016). In consideration of the required upgrades, additional air impacts, and economic factors, we do not consider the NGPL system to be a viable system alternative to the Spire STL Pipeline Project, and do not recommend it.

The MoGas system includes about 263 miles of interstate natural gas pipeline in Missouri and Illinois, with a mainline passing just north of St. Louis County and crossing the proposed Project around MP 57. While the MoGas pipeline already connects St. Louis to the REX system with an approximately 81-mile-long pipeline, the total capacity of the current system is only about 100,000 Dth/day. To serve as an alternative to the proposed Mainline, the MoGas pipeline would require significant modifications such as looping and compression or new pipeline construction to transport an additional 400,000 Dth/day. Furthermore, the MoGas pipeline would have to be extended by about 1 mile to reach the proposed Laclede/Lange Delivery Station and either the North County Extension or a reasonable alternative would still need to be constructed to reach the desired interconnect to Enable MRT's existing system. Such a buildup of the MoGas pipeline has not been proposed and may have a similar, if not larger, impact on the environment as the proposed Project. Therefore, we do not consider the MoGas system to be an advantageous system alternative to the Spire STL Pipeline Project, and we do not recommend it.

Laclede's Line 880 currently serves as a distribution line to the St. Louis area. As described in section A.1, Spire, in its initial FERC application, proposed to acquire and update Line 880. Here, we evaluate whether the original proposal to acquire Line 880 would be a preferred alternative to the proposed new, greenfield route (the North County Extension).

Acquisition of Line 880 would require multiple upgrades to the existing system and temporary removal of the active line from service during construction. Specifically, Line 880 would require, in addition to the Laclede/Lange Delivery Station and the Chain of Rocks Station, modifications at Laclede's Redman Station, a substantial number of excavations to test the integrity of the 50-year-old pipeline, and hydrostatic testing at higher operating pressures than the system has previously experienced. Acquisition of Line 880 would also require comparatively more work in residential areas (within 50 feet of 21 occupied residences, compared to 5 along the North County Extension, and could require temporary relocation of residents during hydrostatic testing. Because Line 880 has a current service base, it would also need to be taken out of service during summer months and placed back into service by October 1 to avoid supply concerns during colder months; any scheduling delays would create reliability risk for Laclede.

Finally, Spire has indicated that the acquisition of Line 880 is contingent on the approval of the Missouri Public Service Commission. Such an approval appears to be questionable, as the Missouri Public Service Commission filed a conditional protest to the Spire's original application, questioning the Project's stated purpose and need.

Upgrading the existing Line 880 would result in fewer greenfield impacts, and therefore fewer impacts on many (but not all) environmental resources. We conclude that acquisition of Line 880 would result in higher impacts on the communities immediately surrounding Line 880 and would potentially interrupt service to the local St. Louis population currently receive natural gas service on Line 880. Plus, the approval of the Missouri Public Service Commission for Spire to re-purpose the use of Line 880 remains uncertain. For these reasons, we do not find acquisition and upgrade of Line 880 to be a viable system alternative to the Spire STL Pipeline Project, and do not recommend it.

3. Major Route Alternatives

A major route alternative deviates from a relatively large segment of a proposed pipeline alignment for a substantial length and distance in an effort to reduce overall environmental impacts. While a major route alternative should connect the supplier and the corresponding recipient of the natural gas to be transported by a proposed Project, the alternatives could follow routes significantly different from the proposed pipeline. Major route alternatives would not modify or make use of an existing pipeline system as would a system alternative.

Spire's proposed Spire STL Pipeline Project route was selected to connect markets in the greater St. Louis Region to a new supply of gas via the REX pipeline in Scott County, Illinois while minimizing the amount of new pipeline and following existing rights-of-way, where feasible. Locating a new pipeline adjacent to existing rights-of-way serves to reduce construction and operational impacts and is generally preferable to constructing a new pipeline routed entirely through undisturbed areas.

Two major route alternatives for the Spire STL Pipeline Project were identified and analyzed. These route alternatives were developed with the goal of avoiding or minimizing impacts on land managed by the USACE. Specifically, these route alternatives would avoid crossings of the Upper Mississippi Conservation Area, Mississippi River, Missouri River, and/or the Consolidated North Levee. Figure 5 shows the proposed Mainline, as well as Illinois State Route Alternative and the Missouri State Route Alternative; table C-1 provides a comparison of environmental impacts of the proposed route and the two alternatives.

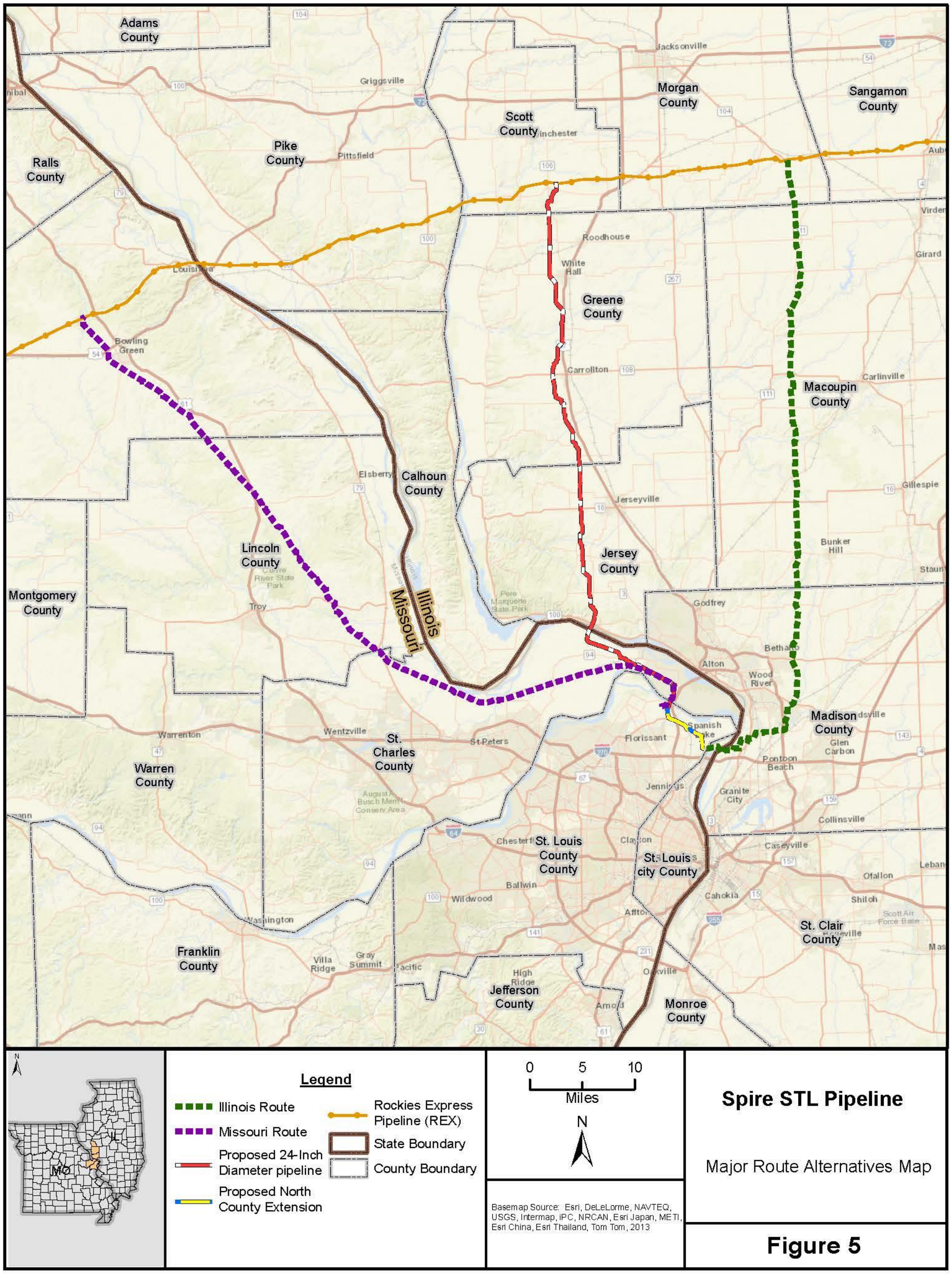

Adams County
Morgan County
Sangamon County
Scott County
Pike County
Ralls County
Greene County
Macoupin County
Calhoun County
Lincoln County
Jersey County
Montgomery County
Illinois
Missouri
Madison County
St. Charles County
Warren County
St. Louis County County
St. Louis city County
St. Clair County
Franklin County
Jefferson County
Monroe County
Legend
Illinois Route
Missouri Route
Proposed 24-Inch Diameter pipeline
Proposed North County Extension
Rockies Express Pipeline (REX)
State Boundary
County Boundary
0 5 10
Miles
N
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline
Major Route Alternatives Map
Figure 5

Table C-1 Major Route Alternatives to the Project			
Resource	**Proposed Route[a]**	**Illinois State Route**	**Missouri State Route**
Pipeline length (miles)	65	72	84
Operation acres[b]	396.8	435.9	510.4
Construction acres[c]	697.8	778.1	912.2
Length of adjacent right-of-way (miles)	20.5	22.4	34.8
Compression required	No	Yes	Yes
Compression acres required (operation / construction)	0.0 / 0.0	10.0-15.0	20.0-30.0
Conservation easements / managed land (miles)	0.5	0.0	4.6
USACE-owned land (miles)	0.3	1.3	0.0
Residential structures within 50 feet of the construction right-of-way	11	26	47
Acres of wetland impacted (construction)	7.0	9.7	32.9
Acres of forested wetlands impacted (construction / operation)[b, c]	3.6 / 2.4	6.4 / 4.2	14.5 / 9.7
Acres of forested upland impacted (construction / operation)[b, c]	53.5 / 29.7	76.4 / 42.4	125.5 / 69.7
Acres of agricultural land impacted (construction / operation)[b, c]	568.4 / 315.8	588.0 / 326.7	687.3 / 381.8
Number of waterbodies crossed (perennial / major / lakes or ponds)	9 / 5 / 5	14 / 2 / 4	7 / 4 / 19

a The data provided for the proposed route is based on desktop data to allow for consistent comparison of data types between the proposed route and alternatives.

b Operation acres estimated based on an assumed 50-foot-wide permanent easement.

c Construction acres estimated based on an assumed 90-foot-wide construction corridor in uplands and a 75-foot-wide corridor in wetlands.

The Illinois State Route Alternative would originate at an interconnect with the REX pipeline in Morgan County, Illinois heading south through Macoupin and Madison Counties before crossing the Mississippi River between river miles 192 and 193 and terminating at Enable MRT's Chain of Rocks facility in St. Louis County, Missouri. The Illinois State Route Alternative would avoid crossings of the Upper Mississippi Conservation Area, Missouri River, and Consolidated North Levee; however, it would require crossings of other USACE-owned land on the east side of the Mississippi River and a shipping canal associated with the Mississippi River. Due to the combined crossing length of these features, one HDD may not be technically feasible. Further, this route alternative would likely require new compression, which would require about 15.0

additional acres of land, as well as result in air emissions beyond those associated with the Spire STL Pipeline Project, as proposed.

The Missouri State Route Alternative would originate at an interconnect with the REX pipeline in Pike County, Missouri generally following a southeast route in parallel to the MoGas Pipeline through Lincoln County and into St. Charles County, where the route would move easterly/southeasterly into St. Louis County where it would terminate at the proposed Laclede/Lange Delivery Station. The Missouri State Route Alternative would avoid crossings of the Upper Mississippi Conservation Area and Mississippi River. Further, this route alternative would require new compression, which would require 30.0 additional acres of land, as well as result in air emissions beyond those associated with the proposed Spire STL Pipeline Project.

While these two alternatives would avoid some of the resources crossed by the proposed Route, impacts associated with the alternative routes in many cases would be greater. Each route alterative would be longer than the proposed route, and would require compression, thereby resulting in greater construction and operational impacts. Further, both alternatives would result in greater impacts on managed and/or federally owned lands and wetlands, and would be in proximity to more residences than the proposed route. Based on these factors, neither the Illinois nor Missouri State Alternatives are found to provide an environmental advantage to the proposed route; therefore, they were not further considered.

4. Route Variations

Route variations were identified to reduce construction impacts on localized, specific resources such as waterbodies, wetlands, cultural resource sites, and residences; route variations are also identified to address specific landowner concerns. While route variations may be a few miles in length, most would be relatively short and in close proximity to the proposed route.

As the proposed route approaches the Mississippi River crossing location it would cross a parcel owned by Principia College. We received comments from college representatives concerned about impacts on areas the college uses to support field curricula, special status species that may be present, forest fragmentation, and visual impacts, as well as construction across the steep terrain of the parcel.

In developing the route in the area of the Mississippi River, Spire conducted a siting reviewing based on desktop data and field surveys. To accommodate an HDD of the river, Spire would need a relatively flat area (about 200 feet by 200 feet) to support drilling operations, a pull-string area the length of the crossing, access for heavy equipment, and limited elevation differences between the work areas on either side of the Mississippi River. Given these considerations and the desire to minimize impacts on sensitive resources, to maximize the distance from work areas to residences, and to minimize the overall crossing length, Spire identified the area between Grafton and Melville, Illinois that met all these parameters for the crossing site. Within this 15-mile range, two crossing locations were identified: the proposed route and a “Mississippi River Route Variation,” which would not cross Principia College. Here, we evaluate that variation.

The Mississippi River Route Variation and the corresponding portion of the proposed route would be about the same length and would involve an HDD of the Mississippi River, though in different locations (see figures 6a and 6b). As discussed above, each of the crossing locations meets acceptable parameters; however, the route progressing from the proposed crossing location would be adjacent to the NuStar Pipeline for about 2.8 miles, or 70 percent, of the corresponding segment, compared to the route progressing from the Mississippi River Route Variation crossing location, which would be entirely greenfield. Additionally, the route variation would cross New Piasa Chautauqua Historic District and an adjacent Ducks Unlimited conservation easement, which is managed for hunting and other uses. We also received comments from residents of New Piasa Chautauqua in opposition to the route variation, based on concern for impacts on wildlife, forest land, increased flooding and runoff as result of construction and operation of the Project, as well as potential for future development within the community.

The Mississippi River Route Variation would be similar to the proposed route in length; however, it would result in a larger construction footprint (6.8 acres) and would have greater impacts on wetlands and forested land (see table C-2). The variation would also require crossings of USACE-owned land and a flowage easement (see figure 6a). Further, the proposed route is adjacent to NuStar’s existing right-of-way between MPs 43.9 and 46.2, while the variation would be entirely greenfield (see figure 6b). Therefore, we conclude that the Mississippi River Route Variation does not provide an environmental advantage to the proposed route, and we do not recommend it.

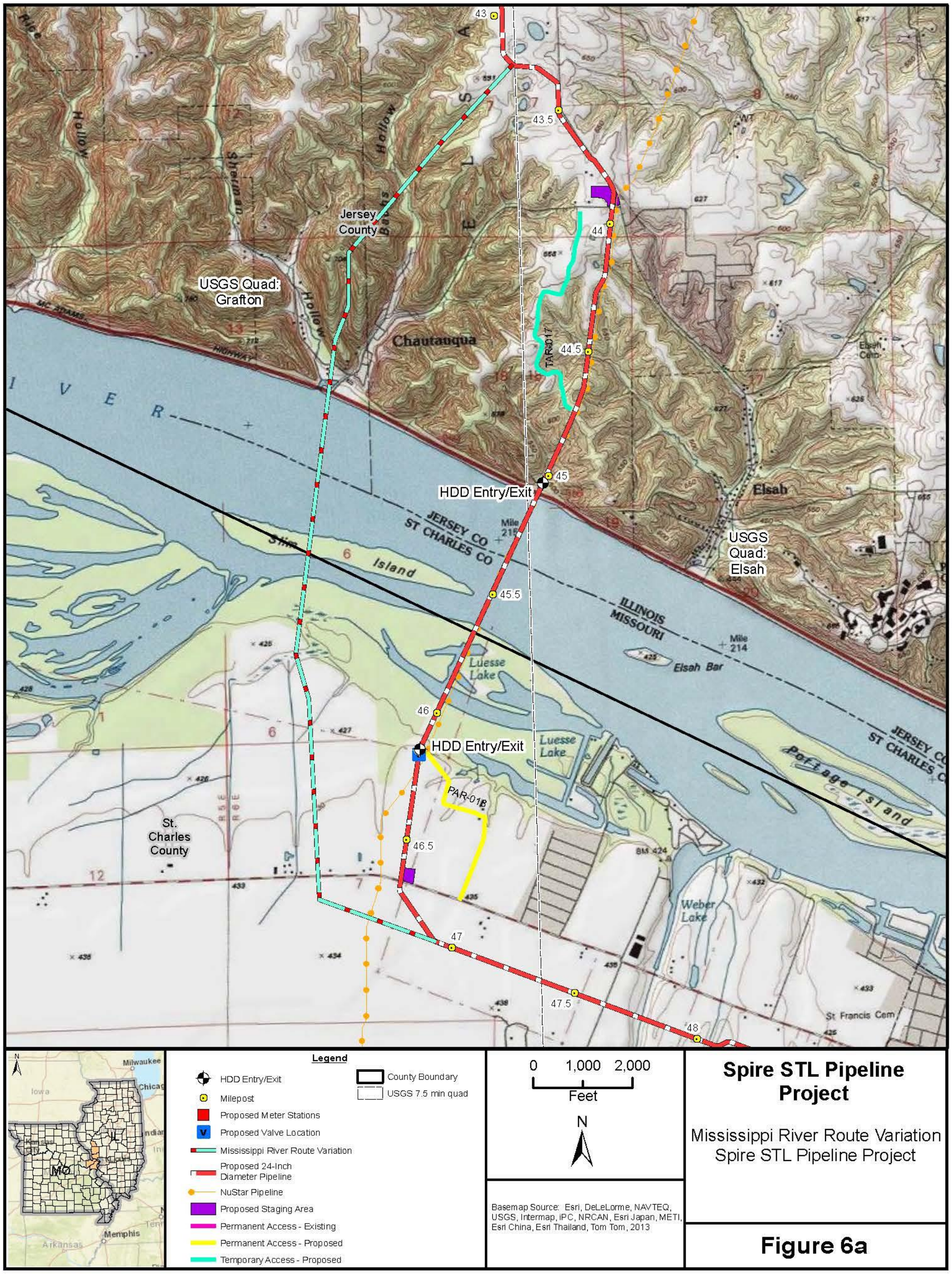
We investigated another route alternative in the same general Mississippi River crossing area to see if impacts on forested land north of the river could be reduced (figure 7a). Accordingly, we requested that Spire assess the feasibility of moving or adjusting the HDD site north of the Mississippi River into a less forested area. In response to our request, Spire considered the feasibility of using the existing HDD entry pit for the Mississippi River HDD (MP 45.1) and incorporating a northbound drill that would exit in an agricultural field near MP 43.9, rather than in the currently proposed forested area (figure 7b). Although Spire indicates that such a drill is possible, the length of the HDD and the difference in elevation between the HDD entry and exit pit would result in additional impacts and risks related to larger workspaces for the required volumes of drilling fluid and pull-string, and higher pressures of drilling fluid, which would increase the risk of inadvertent returns along and adjacent to the path of the HDD. We reviewed Spire’s technical assessment and concur that HDD crossing methods would not be preferable to the proposed open cut crossing, which, while in a forested area, is located adjacent to an existing pipeline right-of-way for the entire length of the segment, about 1.2 miles.

Table C-2
Mississippi River Route Variation

Resource	Proposed Route (MP 43.1 to 47.0)	Mississippi River Route Variation
Pipeline Facilities		
Pipeline length (miles)	3.9	4.0
Operation acres[a]	23.4	24.3
Construction acres[b]	36.9	43.7
Length of adjacent right-of-way (miles)	3.1	0.0
Acres of forested land impacted (construction / operation)	9.8 / 5.5	14.2 / 7.8
Acres of agricultural land impacted (construction / operation)	16.4 / 9.1	17.5 / 9.7
Acres of wetlands impacted (construction / operation)	1.6 / 1.1	2.4 / 1.6
Cultural resource sites (number)	0	1
Residences within 50 feet (number)	2	2
Conservation easements / managed land (miles)[c]	0.5	0.5

[a] Operation acres estimated based on an assumed 50-foot-wide permanent easement.
[b] Construction acres estimated based on an assumed 90-foot-wide construction corridor in uplands and a 75-foot-wide corridor in wetlands.
[c] Includes USACE-owned land and flowage easements.

In summary, we have determined that the proposed Project, as modified by our recommended environmental conditions in section D of this EA, is the preferred alternative than can meet the Project objectives.



Jersey County
USGS Quad: Grafton
Chautauqua
TAR-017
HDD Entry/Exit
JERSEY CO
ST CHARLES CO
Slim Island
Luesse Lake
ILLINOIS
MISSOURI
Elsah Bar
USGS Quad: Elsah
Elsah
PAR-018
St. Charles County
Portage Island
Weber Lake
St Francis Cem
43
43.5
44
44.5
45
45.5
46
46.5
47
47.5
48
Legend
HDD Entry/Exit
Milepost
Proposed Meter Stations
Proposed Valve Location
Mississippi River Route Variation
Proposed 24-Inch Diameter Pipeline
NuStar Pipeline
Proposed Staging Area
Permanent Access - Existing
Permanent Access - Proposed
Temporary Access - Proposed
County Boundary
USGS 7.5 min quad
0 1,000 2,000
Feet
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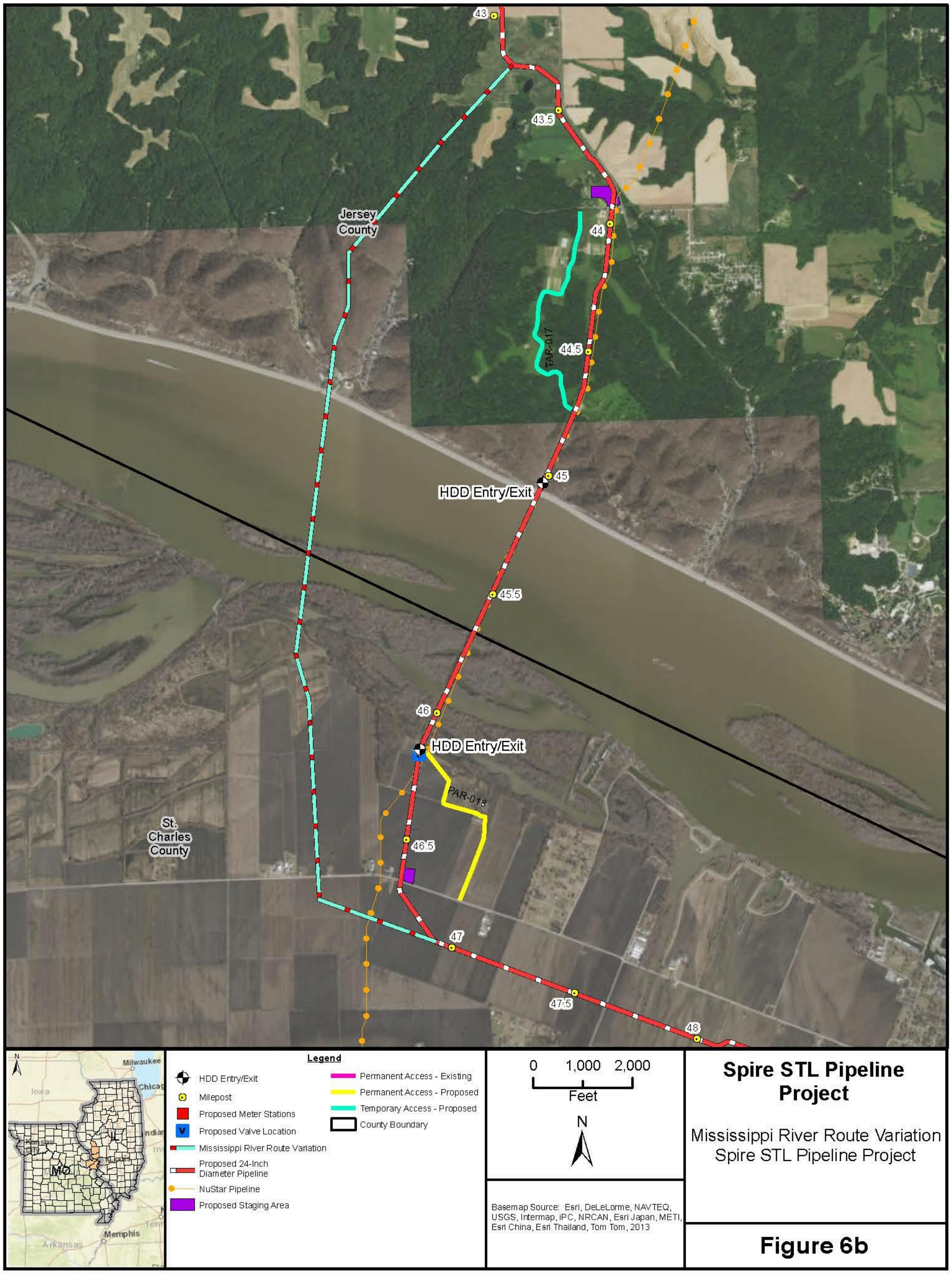
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline Project
Mississippi River Route Variation
Spire STL Pipeline Project
Figure 6a



43
43.5
44
44.5
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45.5
46
46.5
47
47.5
48
Jersey County
St. Charles County
HDD Entry/Exit
HDD Entry/Exit
TAR-017
PAR-018
Legend
HDD Entry/Exit
Milepost
Proposed Meter Stations
Proposed Valve Location
Mississippi River Route Variation
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Permanent Access - Existing
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Temporary Access - Proposed
County Boundary
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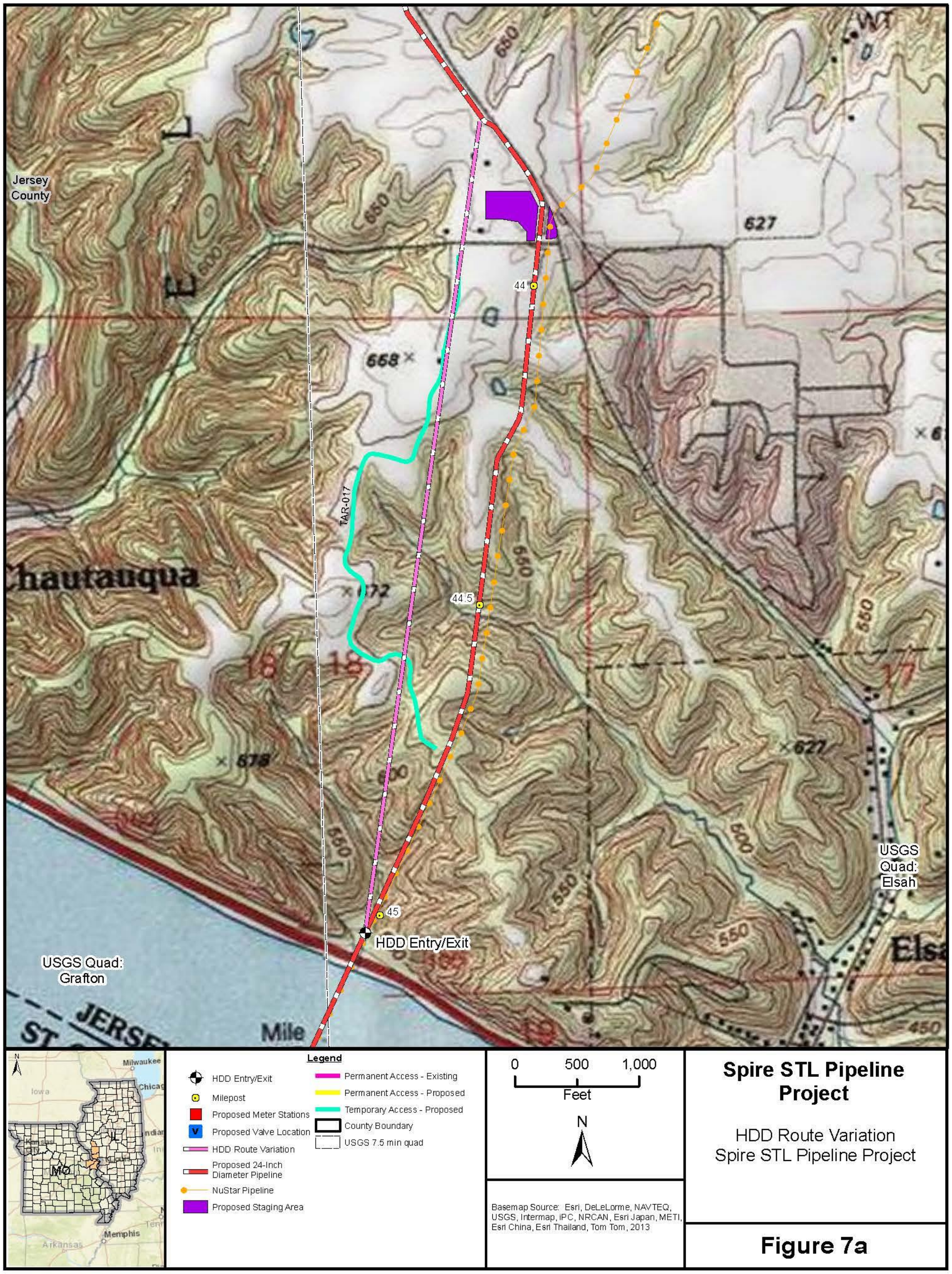
Basemap Source: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline Project
Mississippi River Route Variation
Spire STL Pipeline Project
Figure 6b


Jersey County
Chautauqua
TAR-017
44
44.5
45
HDD Entry/Exit
USGS Quad: Grafton
USGS Quad: Elsah
Mile
Legend
HDD Entry/Exit
Milepost
Proposed Meter Stations
Proposed Valve Location
HDD Route Variation
Proposed 24-Inch Diameter Pipeline
NuStar Pipeline
Proposed Staging Area
Permanent Access - Existing
Permanent Access - Proposed
Temporary Access - Proposed
County Boundary
USGS 7.5 min quad
0 500 1,000
Feet
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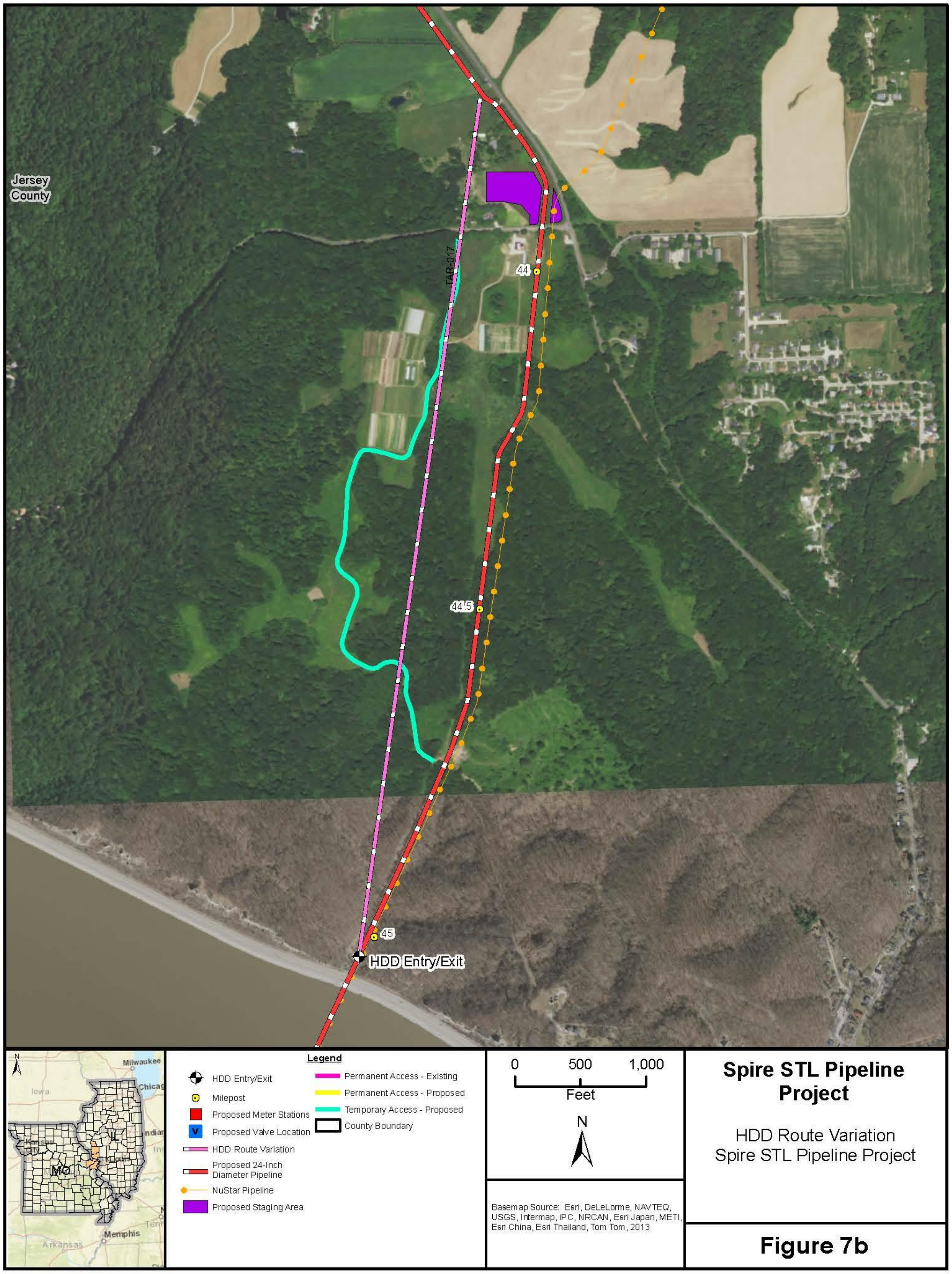
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline Project
HDD Route Variation
Spire STL Pipeline Project
Figure 7a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44.5
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HDD Entry/Exit
Legend
HDD Entry/Exit
Milepost
Proposed Meter Stations
Proposed Valve Location
HDD Route Variation
Proposed 24-Inch Diameter Pipeline
NuStar Pipeline
Proposed Staging Area
Permanent Access - Existing
Permanent Access - Proposed
Temporary Access - Proposed
County Boundary
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Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline Project
HDD Route Variation
Spire STL Pipeline Project
Figure 7b

D. STAFF CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained within this EA, we have determined that if Spire constructs and operates the proposed facilities in accordance with its application and supplements and our recommended mitigation measures, approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment. We recommend that the Commission Order contain a finding of no significant impact and include the following mitigation measures listed below as conditions to any Certificate the Commission may issue.

1. Spire shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EA, unless modified by the Order. Spire must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

    b. justify each modification relative to site-specific conditions;

    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

    d. receive approval in writing from the Director of OEP **before using that modification**.

2. The Director of OEP, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Project, which shall include:

    a. the authority to modify conditions of the Order;

    b. stop work authority; and

    c. the imposition of any additional measures deemed necessary to assure continued compliance with the intent of the environmental conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from Project construction and operation.

3. **Prior to any construction,** Spire shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel would be informed of the EIs' authority and have been or would be trained on the implementation of the environmental mitigation measures

appropriate to their jobs **before** becoming involved with construction and restoration activities.

4. The authorized facility locations shall be as shown in the EA, as supplemented by filed alignment sheets. **As soon as they are available, and before the start of construction,** Spire shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   Spire's exercise of eminent domain authority granted under NGA Section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. Spire's right of eminent domain granted under NGA Section 7(h) does not authorize it to increase the size of its natural gas pipelines or aboveground facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

5. Spire shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the FERC Plan, and/or minor field realignments per landowner needs and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern species mitigation measures;

   c. recommendations by state regulatory authorities; and

d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **Within 60 days of the acceptance of the Certificate and before construction begins**, Spire shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. Spire must file revisions to the plan as schedules change. The plan shall identify:

a. how Spire will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;

b. how Spire will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;

c. the number of EIs assigned, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;

e. the location and dates of the environmental compliance training and instructions Spire will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change);

f. the company personnel and specific portion of Spire's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Spire will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

(1) completion of all required surveys and reports;

(2) the environmental compliance training of onsite personnel;

(3) the start of construction; and

(4) the start and completion of restoration.

7. Spire shall employ at least one EI per construction spread. The EIs shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see Condition 6 above) and any other authorizing document;

c. empowered to order the correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of that Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

8. Beginning with the filing of its Implementation Plan, Spire shall file updated status reports with the Secretary on a **weekly basis until all construction and restoration activities are complete.** On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a. an update on Spire's efforts to obtain the necessary federal authorizations;

b. the construction status of the Project, work planned for the following reporting period, and any schedule changes for stream crossings and forested area clearing, or work in other environmentally sensitive areas;

c. a listing of all problems encountered and each instance of noncompliance observed by the EI during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

e. the effectiveness of all corrective actions implemented;

f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Spire from other federal, state, or local permitting agencies concerning instances of noncompliance, and Spire's response.

9. **Spire must receive written authorization from the Director of OEP before commencing construction of any Project facilities. To obtain such authorization,** Spire must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

10. Spire must receive **written authorization from the Director of OEP before placing the Project into service**. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the Project are proceeding satisfactorily.

11. **Within 30 days of placing the authorized facilities in service,** Spire shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed and installed in compliance with all applicable conditions, and that continuing activities would be consistent with all applicable conditions; or

    b. identifying which of the conditions in the Order Spire has complied with or will comply with. This statement shall also identify any areas affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

12. **Prior to construction**, Spire shall file with the Secretary, for review and written approval of the Director of OEP, its site-specific steep slope and landslide hazard assessment plan for the bluffs near the Mississippi River crossing.

13. **Prior to construction**, Spire shall file with the Secretary, for review and written approval of the Director of OEP, additional geotechnical investigations at the Coldwater Creek and Spanish Lake Park HDD crossings to determine the presence and extent of potential karst features and whether an HDD is expected to be successful.

14. **Prior to construction**, Spire shall file with the Secretary, for review and written approval of the Director of OEP, a Water Resource Identification and Testing Plan for each HDD through karst terrain (for the North County Extension from MP 1.6 to MP 2.2 and MP 3.8 to 4.5). The Water Resource Identification and Testing Plan shall include:

a. the results of a fracture trace/lineament analysis coupled with the results of existing dye trace studies, if any, showing potential groundwater flow direction from source (drill alignment) to receptors (wells, springs, and waterbodies); and

b. identification of all water supply wells, springs, and surface water intakes within 1,000 feet down-gradient of each HDD that crosses karst terrain (for the North County Extension from MP 1.6 to MP 2.2 and MP 3.8 to 4.5) and provide the following for each water source identified;

(1) written verification of Spire's offer to conduct, with the landowner's permission, pre- and post-construction water quality and yield monitoring of all karst area water supply wells and springs. Water quality monitoring shall consist of the following parameters: oils and greases, volatile organic compounds, turbidity, total and fecal coliform bacteria, total suspended solids; and

(2) confirmation that Spire will restore or replace all affected karst area water supplies to pre-construction conditions with respect to both quality and yield.

15. **Prior to construction**, Spire shall file with the Secretary:

a. the location of all wells and springs within 150 feet of proposed work areas;

b. an update on pre-construction testing for the wells at MP 9.0, or documentation that the landowner has opted not to have pre-construction testing;

c. a description of protective measures of how the wells within the work area would be protected during construction;

d. verification that both pre- and post-construction testing has been offered to all landowners with wells within 150 feet of work areas; and

e. updated alignment sheets depicting the 200- and 400-foot no refueling areas for applicable wells.

16. **Prior to construction**, Spire shall file with the Secretary a revised HDD Plan, for review and written approval by the Director of OEP, that includes additional monitoring requirements, including but not limited to, a commitment to monitor the entire path of each HDD for evidence of an inadvertent return daily during active drilling activities.

17. **Prior to construction**, Spire shall file with the Secretary a copy of its final bald eagle survey report and any correspondence with the USFWS regarding the survey results.

18. Spire **shall not begin construction** of the Project **until**:

    a. the staff receives comments from the USFWS regarding the proposed action;

    b. the FERC staff completes Section 7 consultation with the USFWS; and

    c. Spire has received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of any conservation measures) may begin.

19. **Prior to construction**, Spire shall file with the Secretary its Conservation Plan to obtain an Incidental Take Authorization for timber rattlesnakes, as well as results of its consultation with the IDNR on its plan.

20. **Spire shall not begin construction** of facilities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads **until**:

    a. Spire files with the Secretary, the Illinois SHPO's comments on the archaeological addenda and Phase II reports provided to date;

    b. Spire files with the Secretary, the Missouri SHPO's comments on the architectural addendum report;

    c. Spire files with the Secretary remaining cultural resources survey reports(s) and revised reports; any required site evaluation report(s) and avoidance/treatment plan(s); and the Missouri and Illinois SHPOs' comments on the reports and plans;

    d. the Advisory Council on Historic Preservation is afforded an opportunity to comment if historic properties would be adversely affected; and

    e. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Spire in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

    All materials filed with the Commission containing **location, character, and ownership information** about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: **"CUI//PRIV - DO NOT RELEASE"**.

21. **Prior to construction of the Spanish Lake Park HDD**, Spire shall file with the Secretary, for review and written approval by the Director of OEP, a site-specific noise mitigation plan that identifies measures to reduce the projected noise level attributable to the proposed drilling operations at nearby NSAs. During drilling operations, Spire shall implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA or 10 dBA above ambient levels at the NSAs.

22. Spire shall file noise surveys with the Secretary **no later than 60 days after placing the Chain of Rocks Station in service**. If a full load condition noise survey is not possible, Spire shall provide an interim survey at the maximum possible power load and provide the full power load survey **within six months**. If the noise attributable to the operation of all the equipment at the facility at interim or full power load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, Spire shall file a report on what changes are needed and shall install additional noise controls to meet the recommended noise level **within one year** of the in-service date. Spire shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days after it installs the additional noise controls**.

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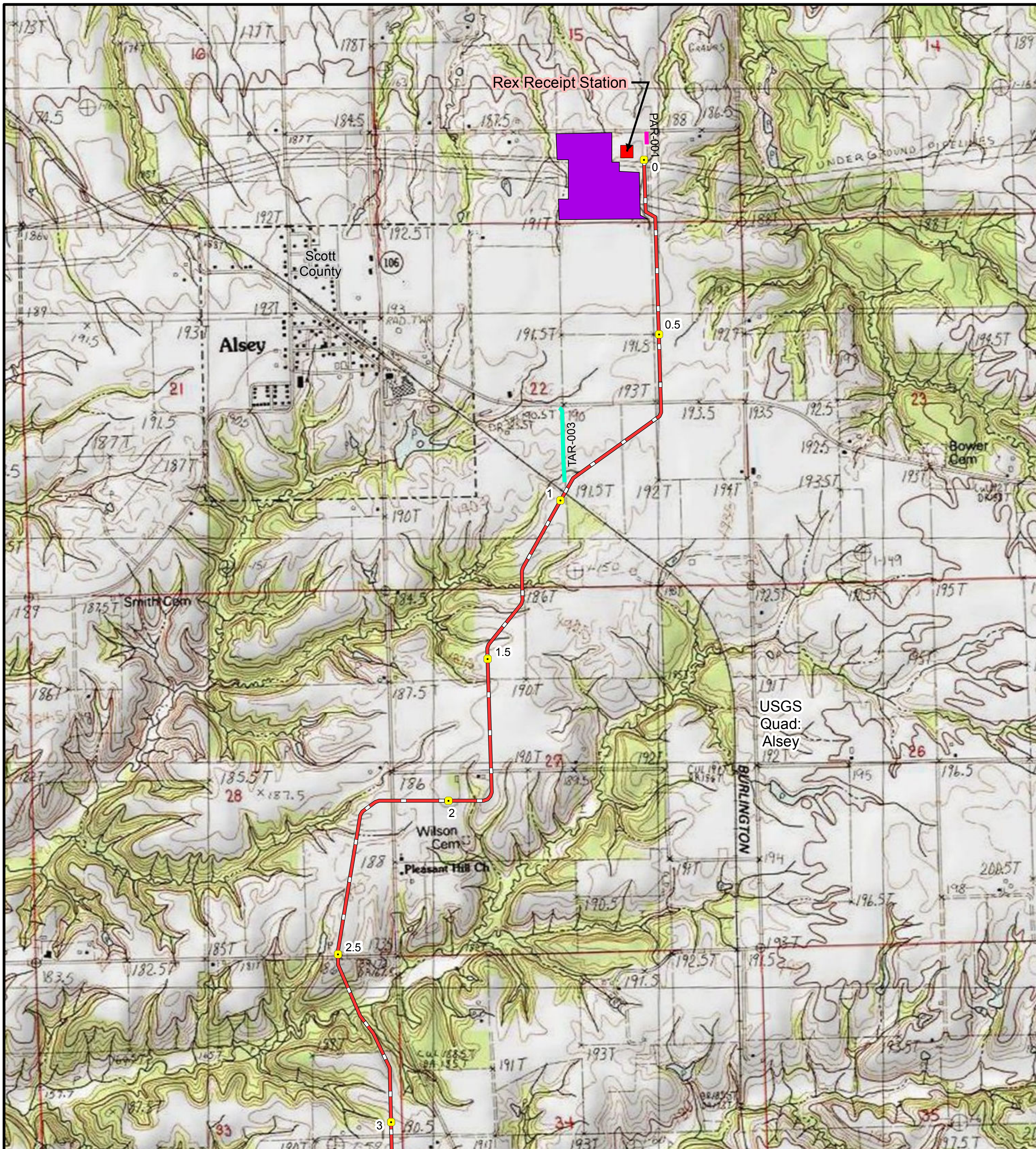
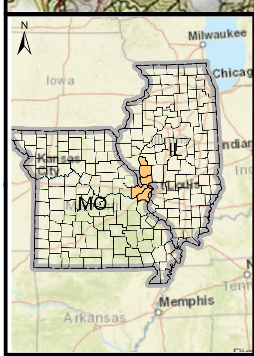
Edge Engineering and Science, LLC is a third party contractor assisting the Commission staff in reviewing the environmental aspects of the project application and preparing the environmental documents required by NEPA. Third party contractors are selected by Commission staff and funded by project applicants. Per the procedures in 40 CFR 1506.5(c), third party contractors execute a disclosure statement specifying that they have no financial or other conflicting interest in the outcome of the project. Third party contractors are required to self-report any changes in financial situation and to refresh their disclosure statements annually. The Commission staff solely directs the scope, content, quality, and schedule of the contractor's work. The Commission staff independently evaluates the results of the third party contractor's work and the Commission, through its staff, bears ultimate responsibility for full compliance with the requirements of NEPA.

APPENDIX A
TOPOGRAPHIC MAPS





Legend

- HDD Entry/Exit
- Milepost
- Proposed Meter Stations
- Proposed Valve Location
- Proposed 24-Inch Diameter Pipeline
- Proposed Staging Area
- Permanent Access - Existing
- Permanent Access - Proposed
- Temporary Access - Proposed
- County Boundary
- USGS 7.5 min quad

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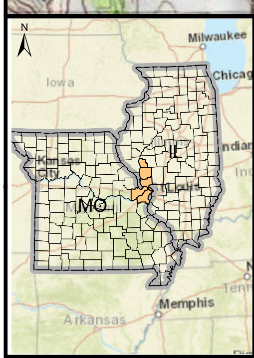
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013

Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 1 of 22

Appendix A



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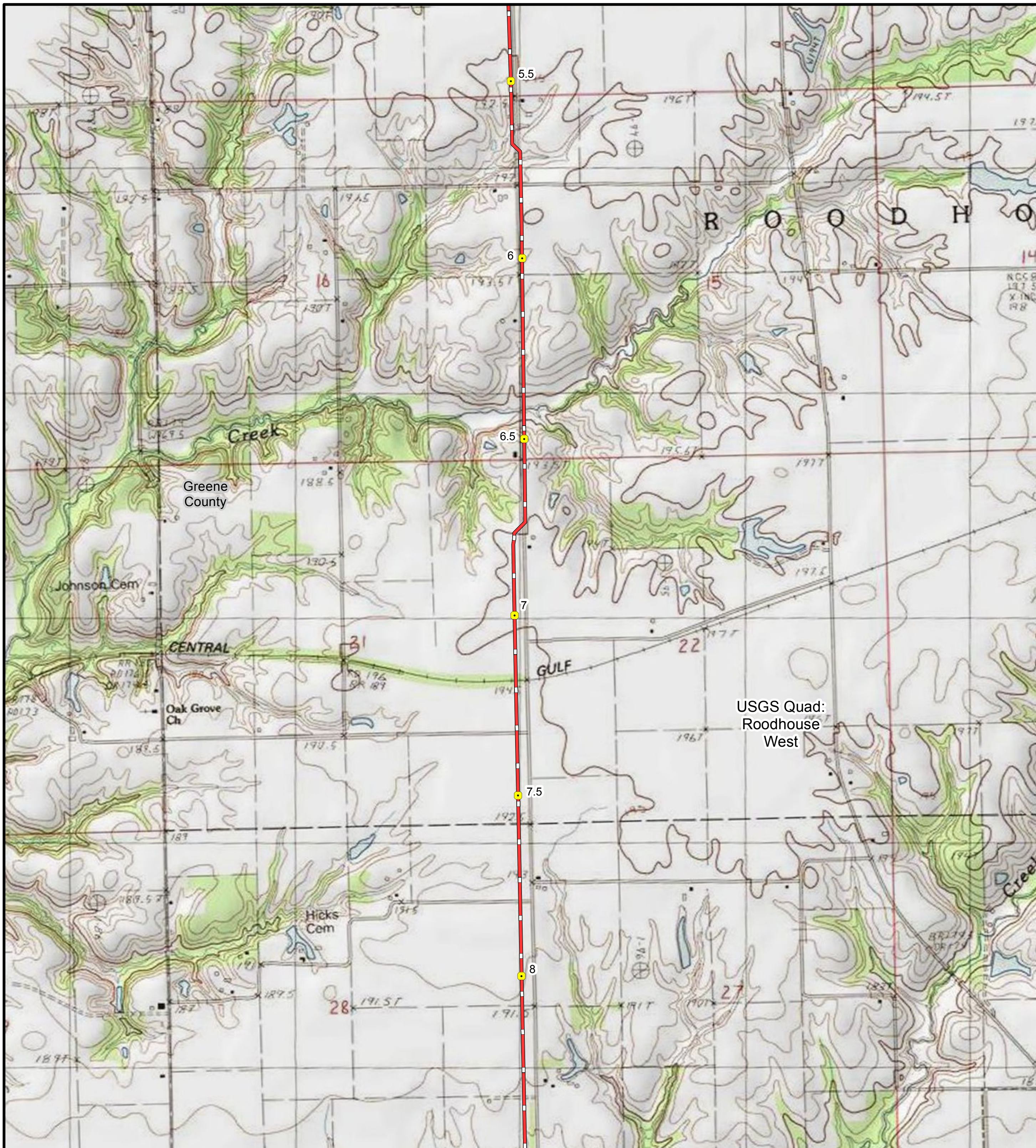
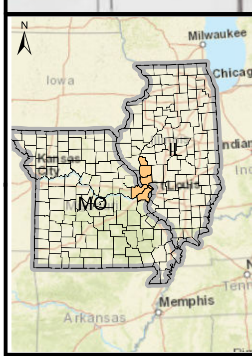
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 2 of 22

Appendix A





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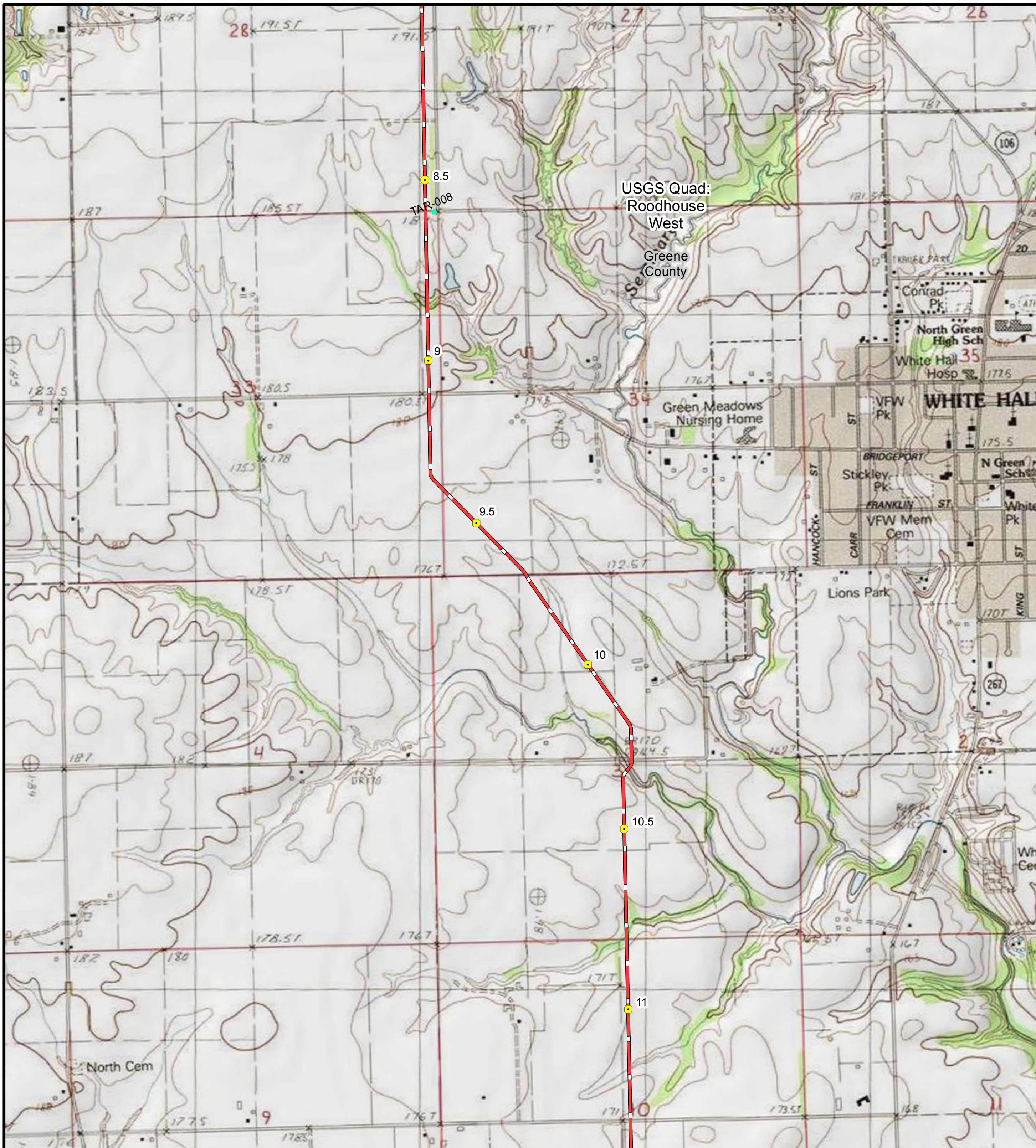
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 3 of 22

Appendix A



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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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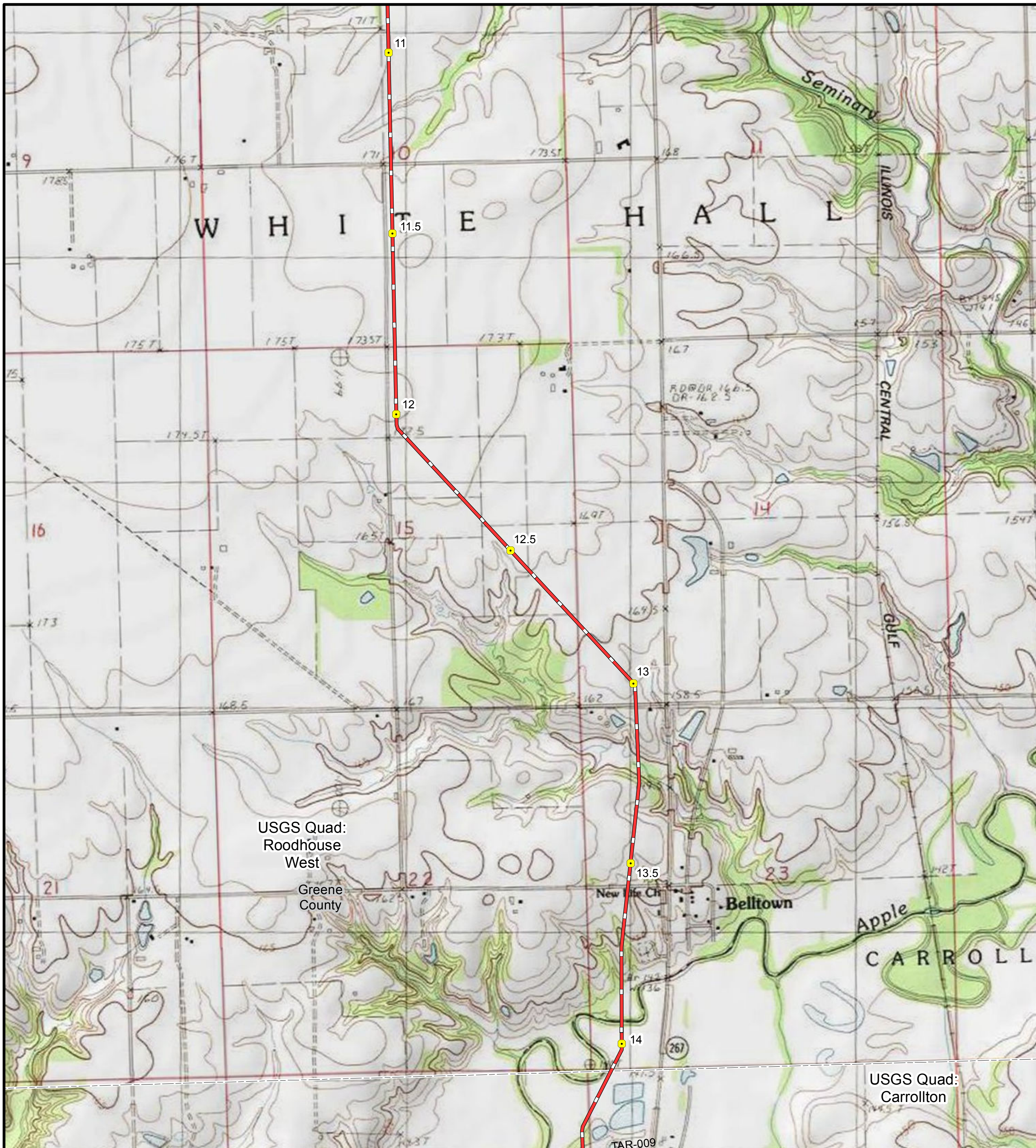
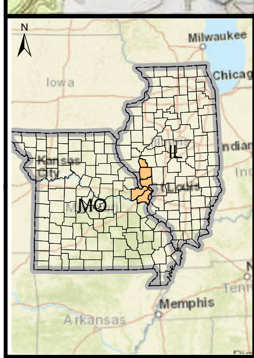
Appendix A





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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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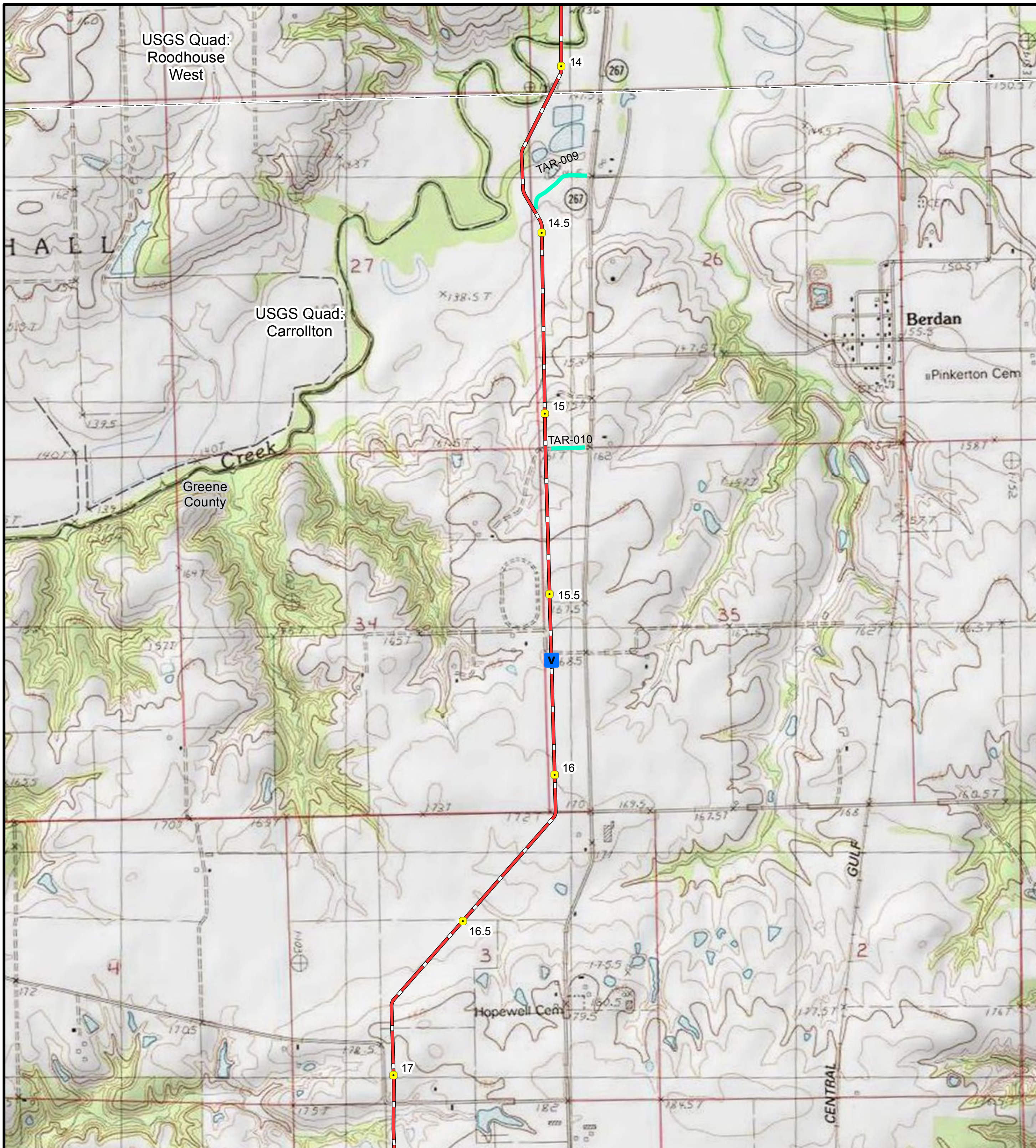
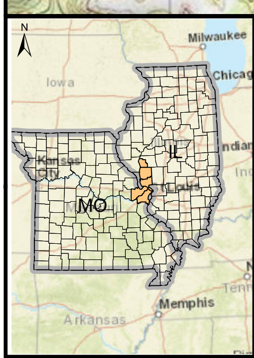
Appendix A





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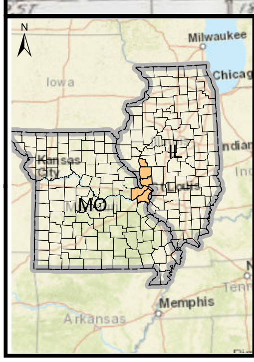
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 6 of 22

Appendix A



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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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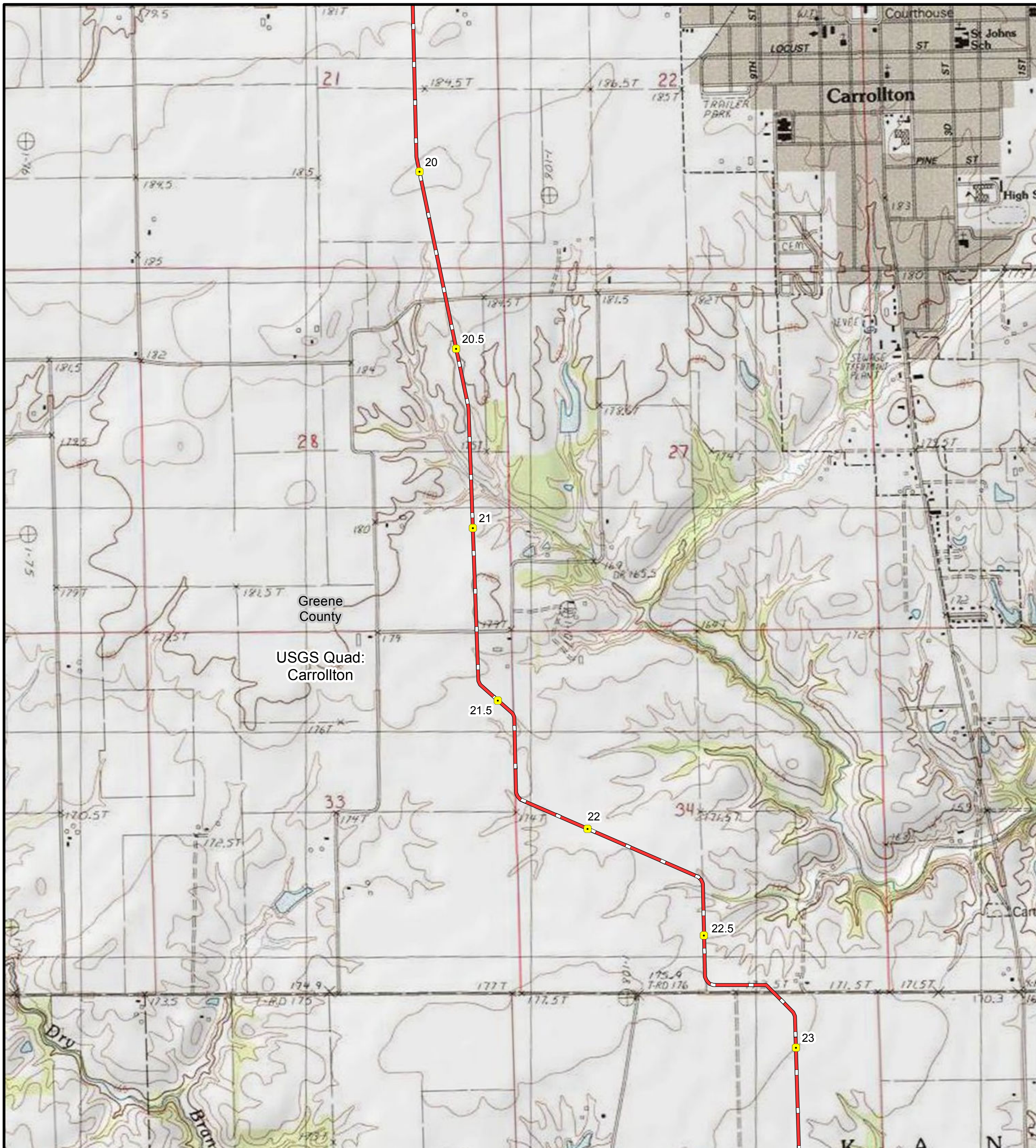
Appendix A



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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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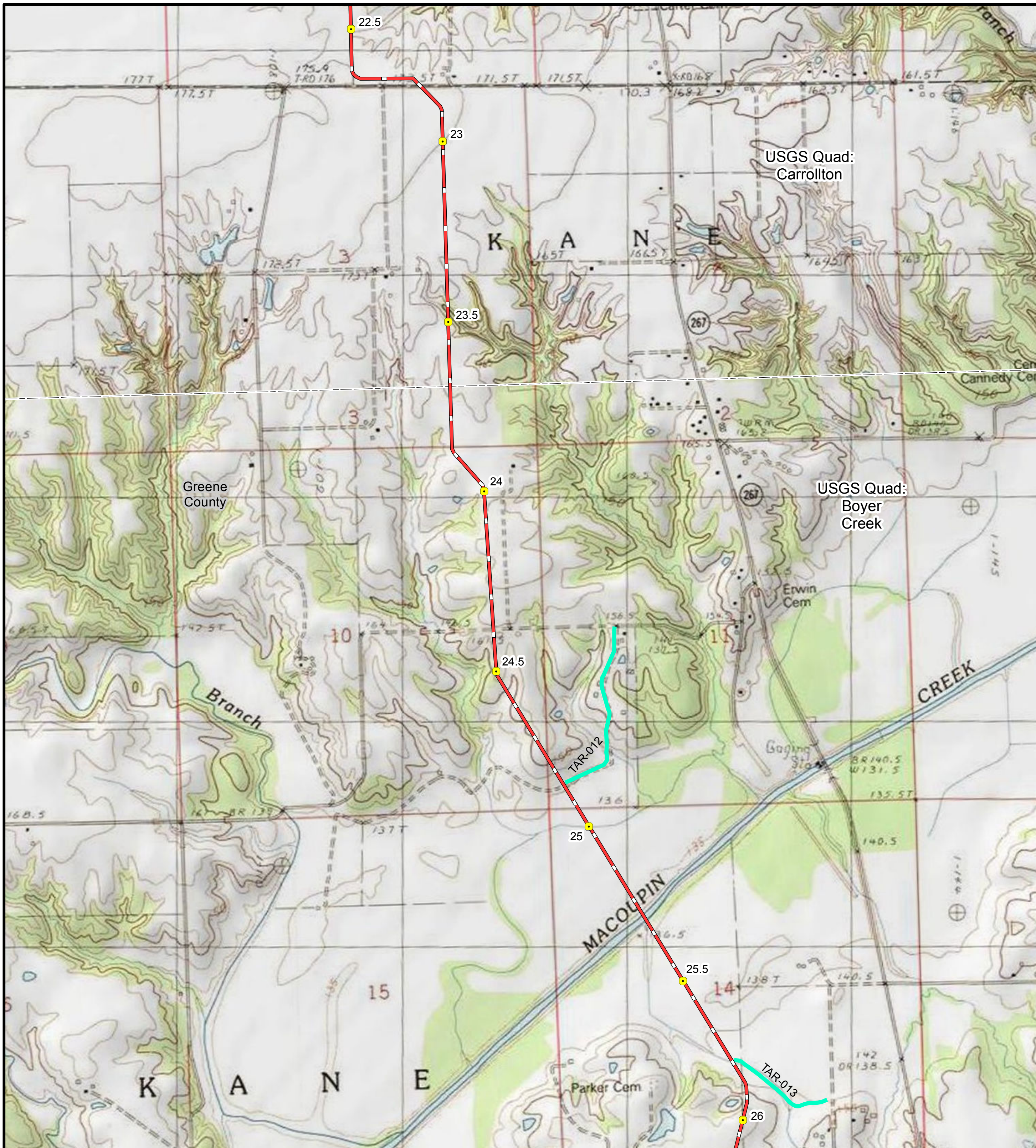
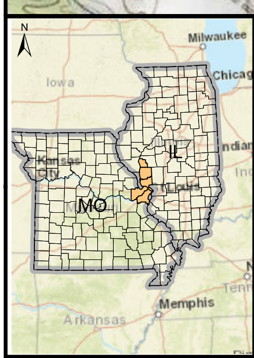
Appendix A





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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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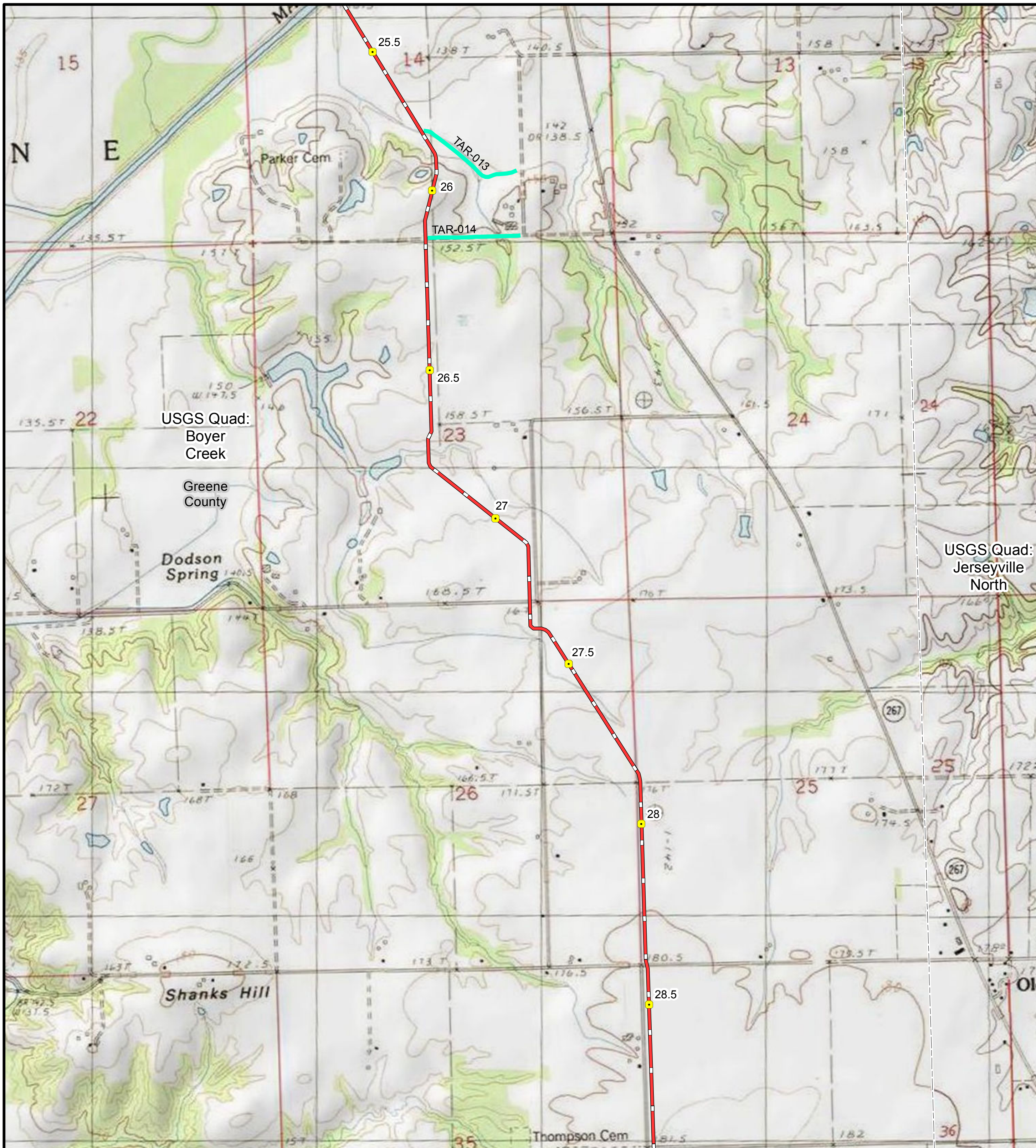
Appendix A



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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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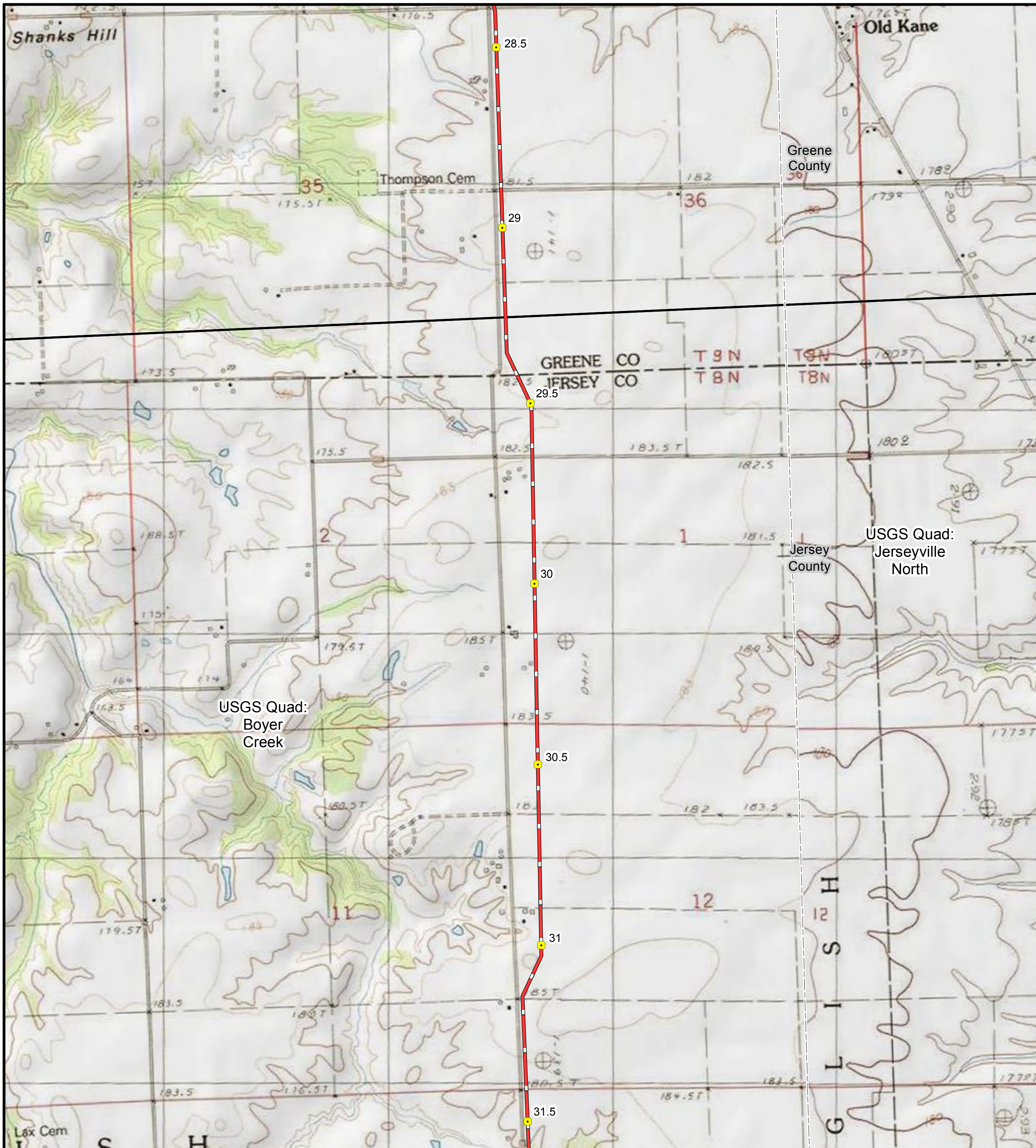
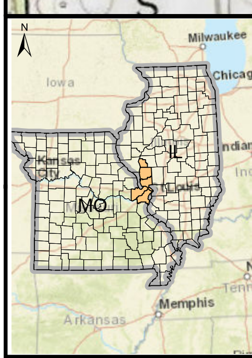
Appendix A





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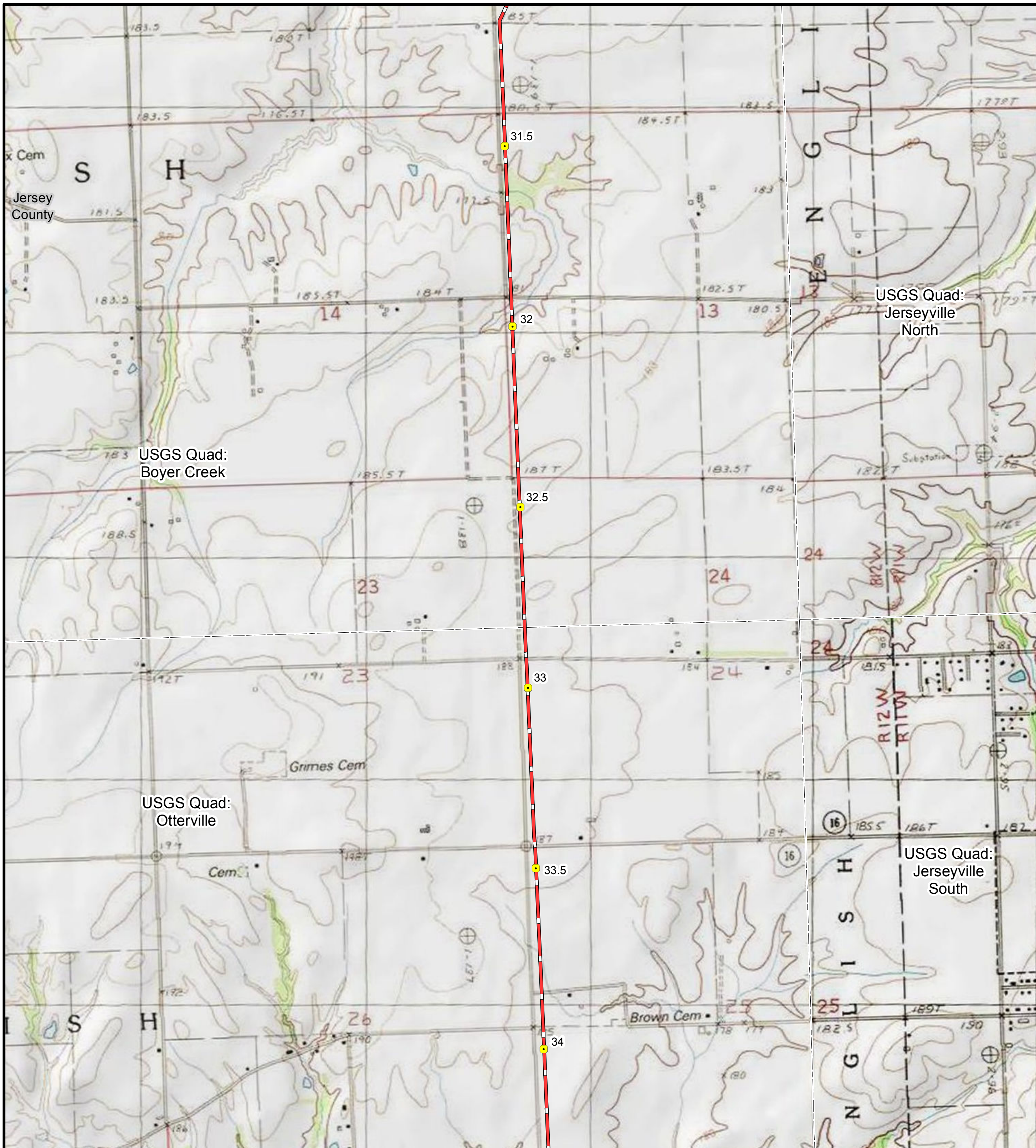
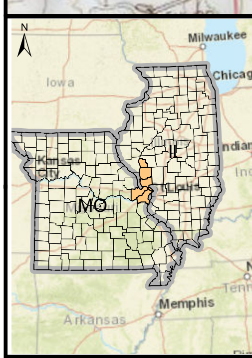
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 11 of 22

Appendix A





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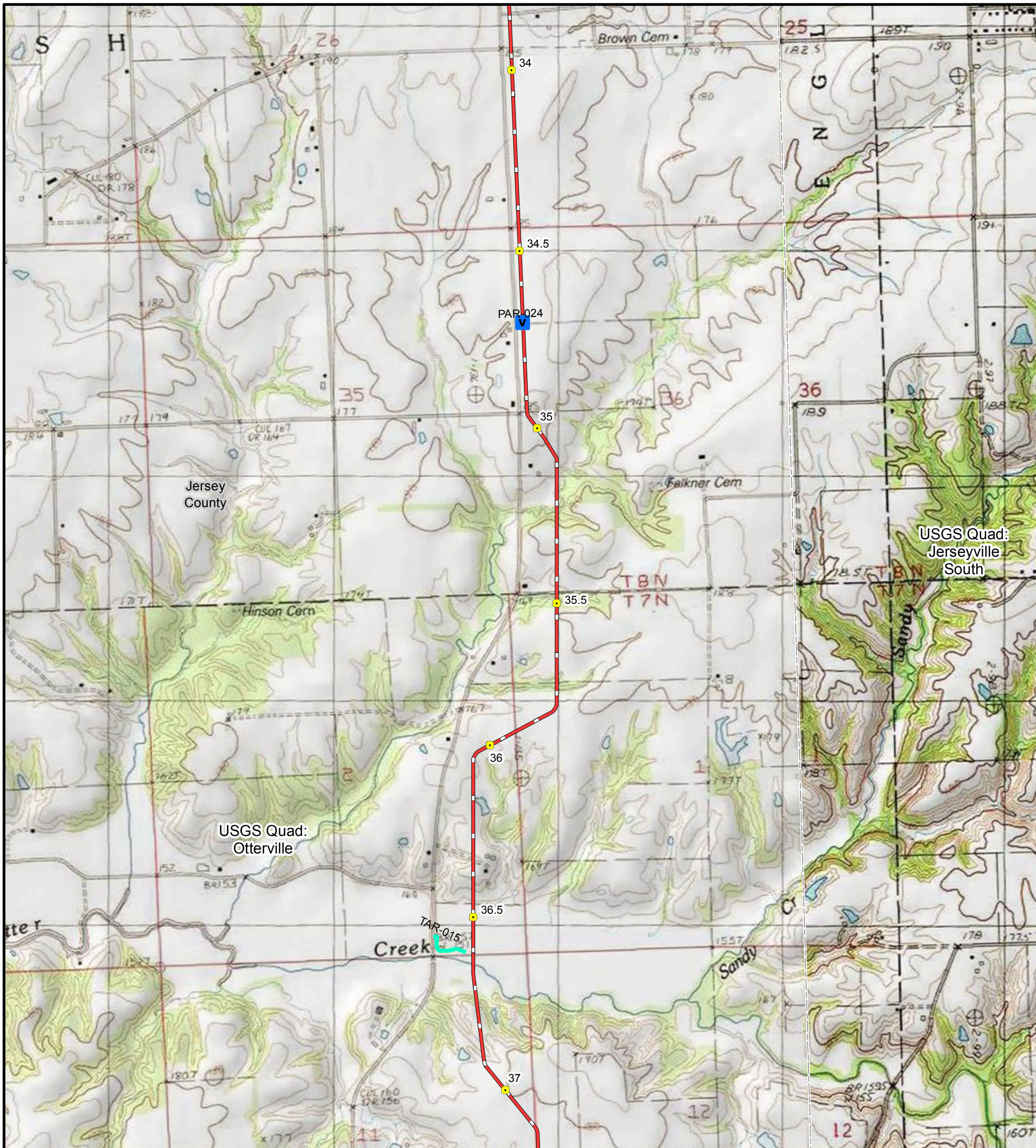
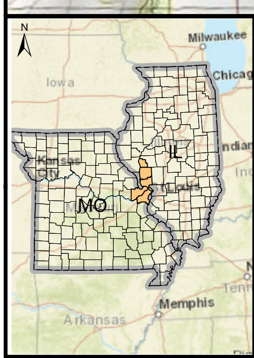
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 12 of 22

Appendix A





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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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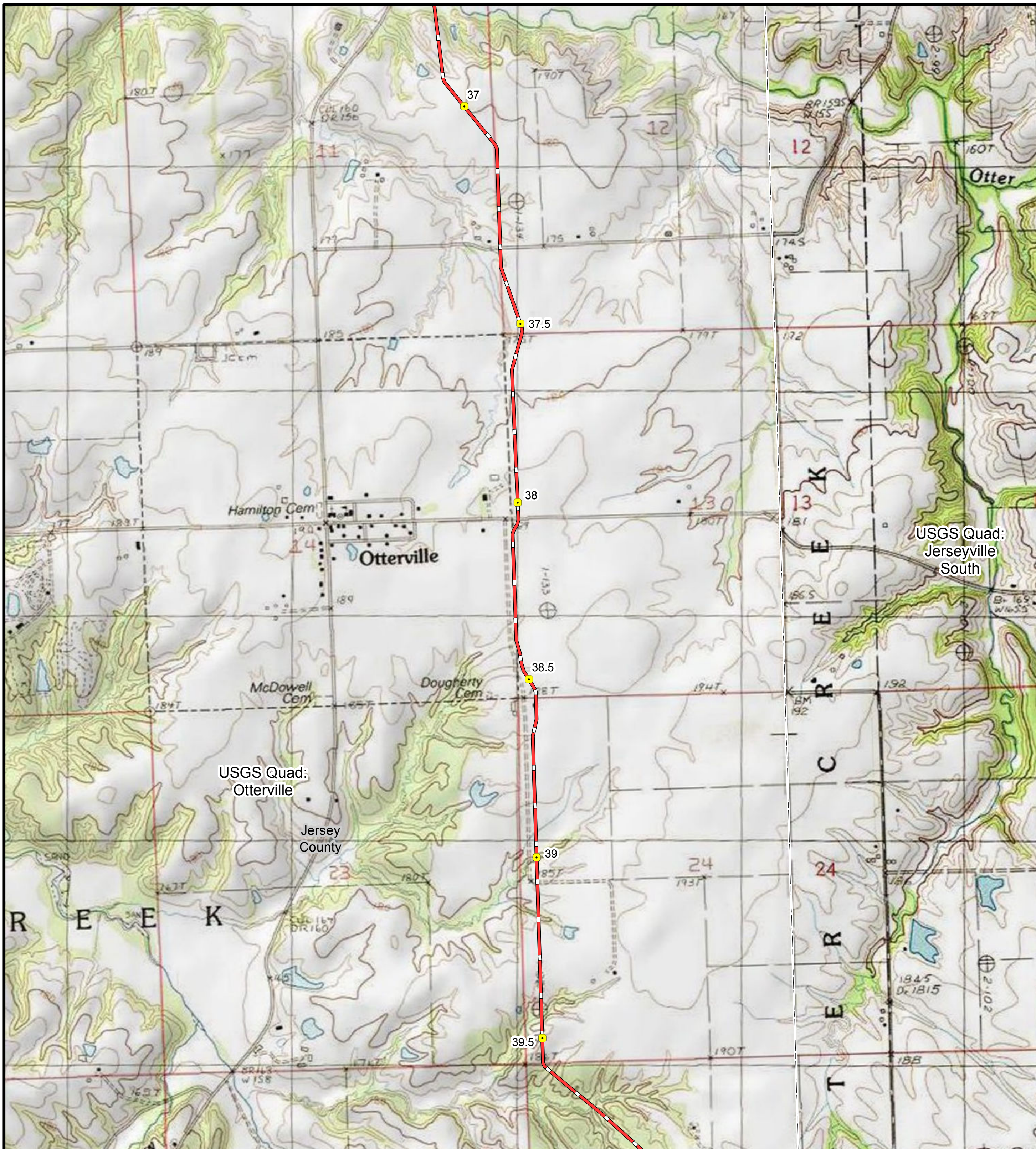
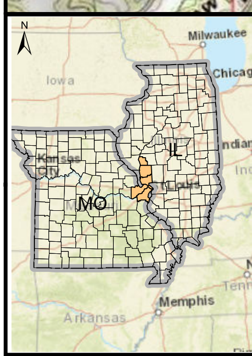
Appendix A





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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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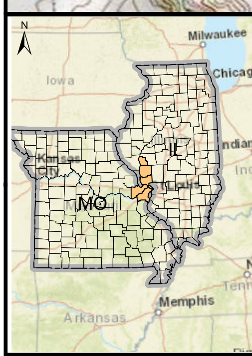
Appendix A



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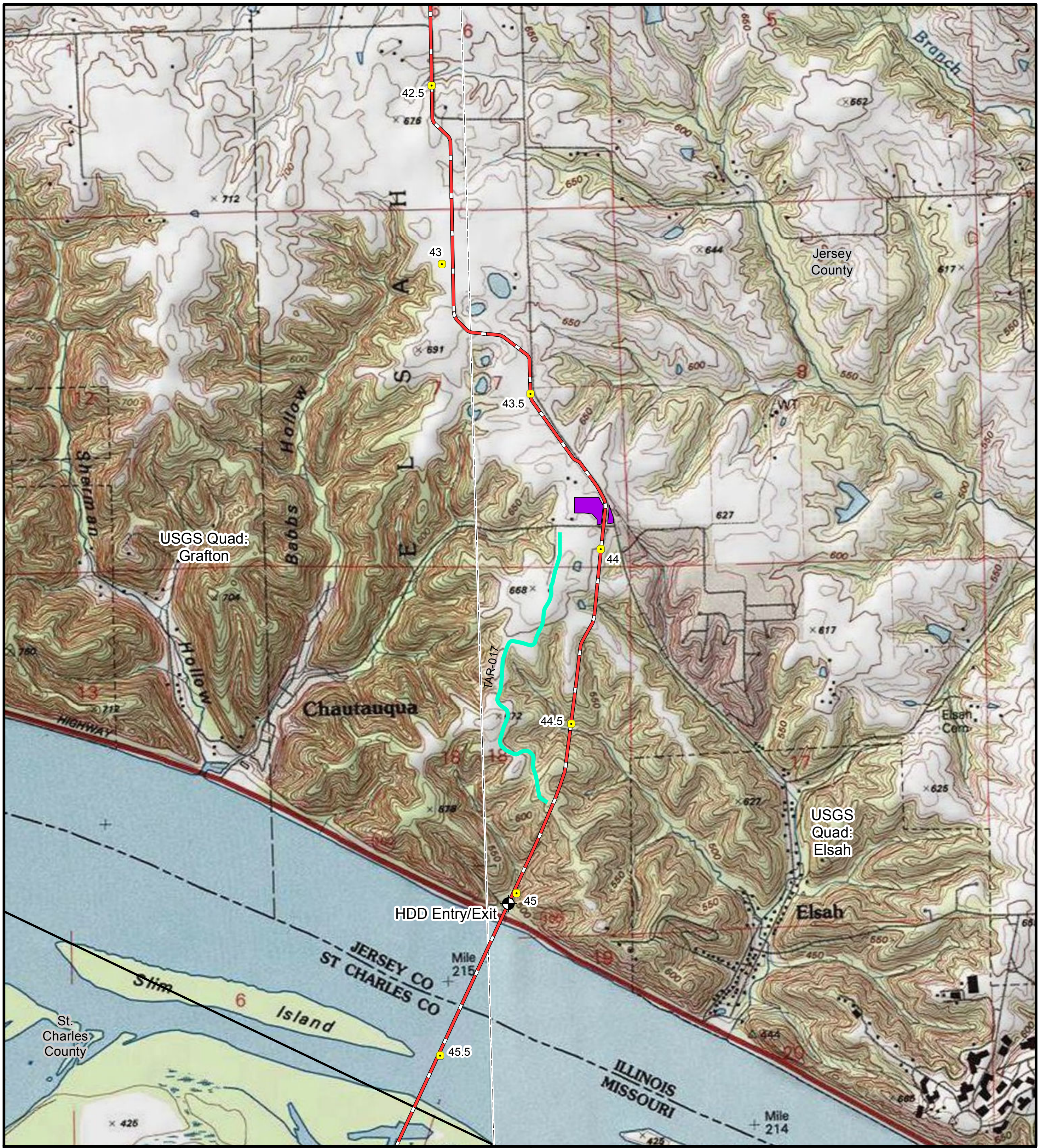
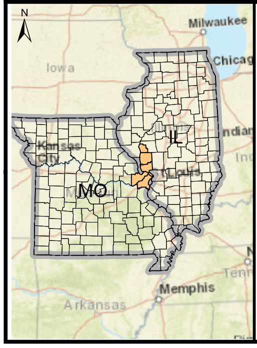
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 15 of 22

Appendix A





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Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

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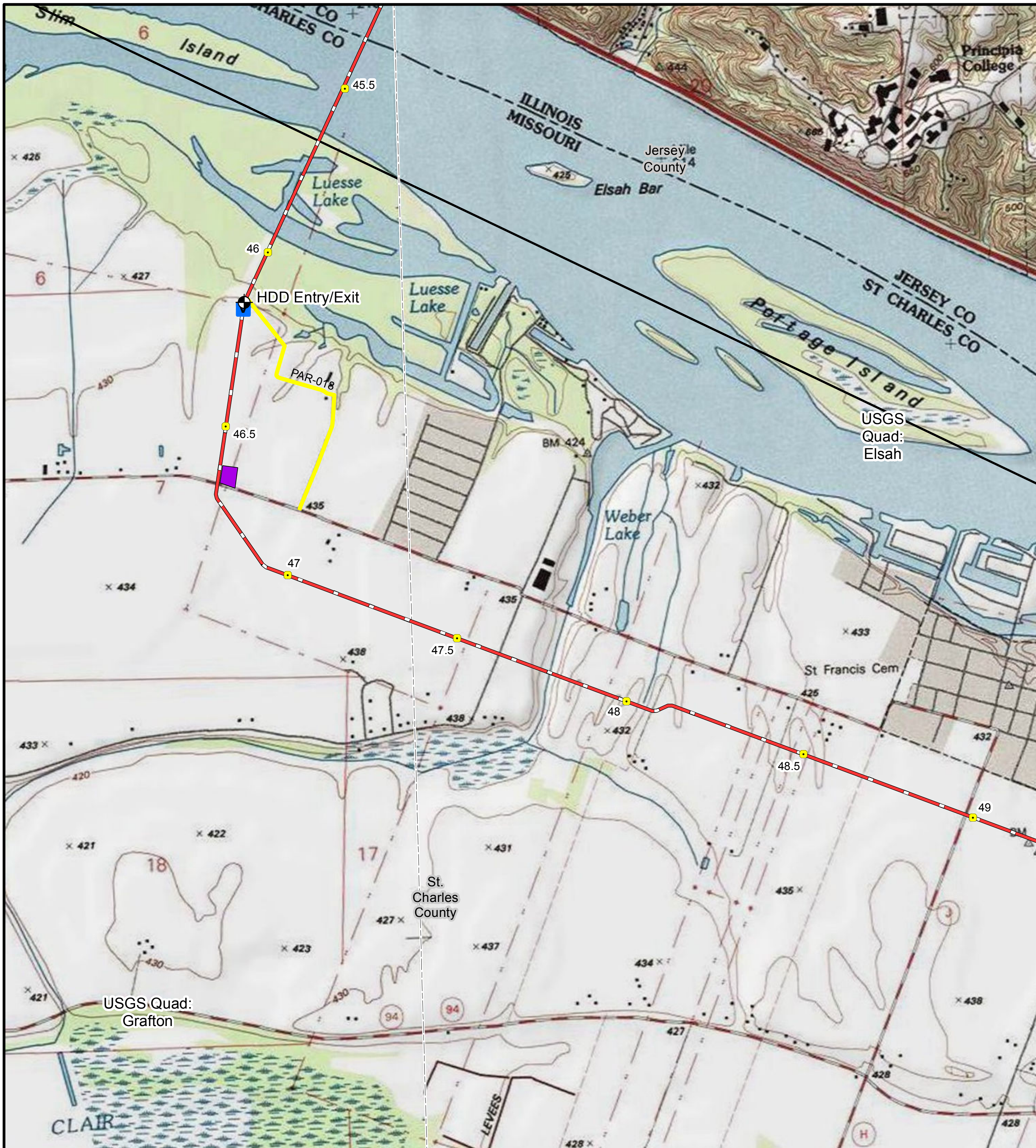
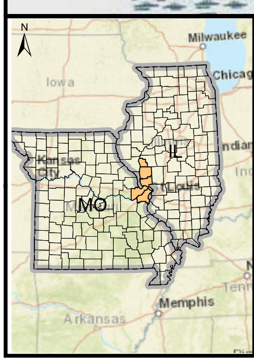
Appendix A





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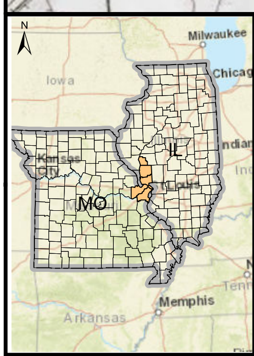
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 17 of 22

Appendix A



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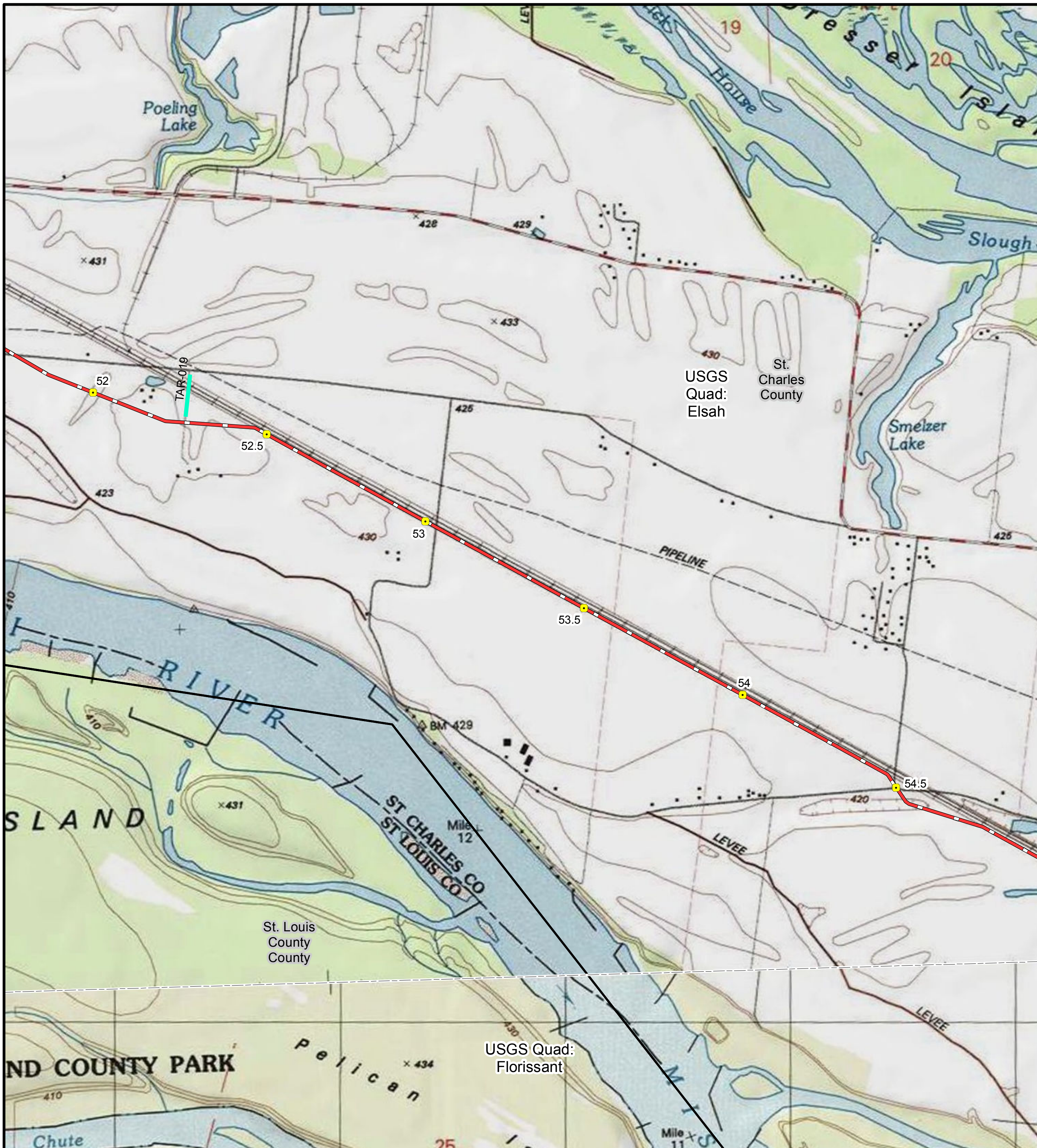
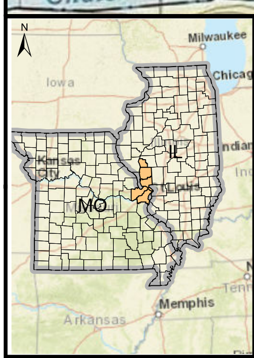
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 18 of 22

Appendix A





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- HDD Entry/Exit
- Milepost
- Proposed Meter Stations
- Proposed Valve Location
- Proposed 24-Inch Diameter Pipeline
- Proposed Staging Area
- Permanent Access - Existing
- Permanent Access - Proposed
- Temporary Access - Proposed
- County Boundary
- USGS 7.5 min quad

0 1,000 2,000
Feet

N

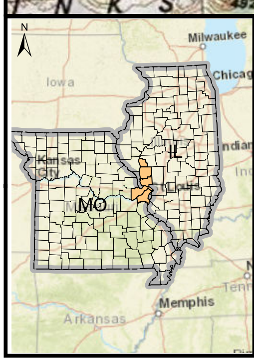
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013

Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 19 of 22

Appendix A



Legend

- HDD Entry/Exit
- Milepost
- Proposed Meter Stations
- Proposed Valve Location
- Proposed 24-Inch Diameter Pipeline
- Proposed Staging Area
- Permanent Access - Existing
- Permanent Access - Proposed
- Temporary Access - Proposed
- County Boundary
- USGS 7.5 min quad

0 1,000 2,000
Feet

N

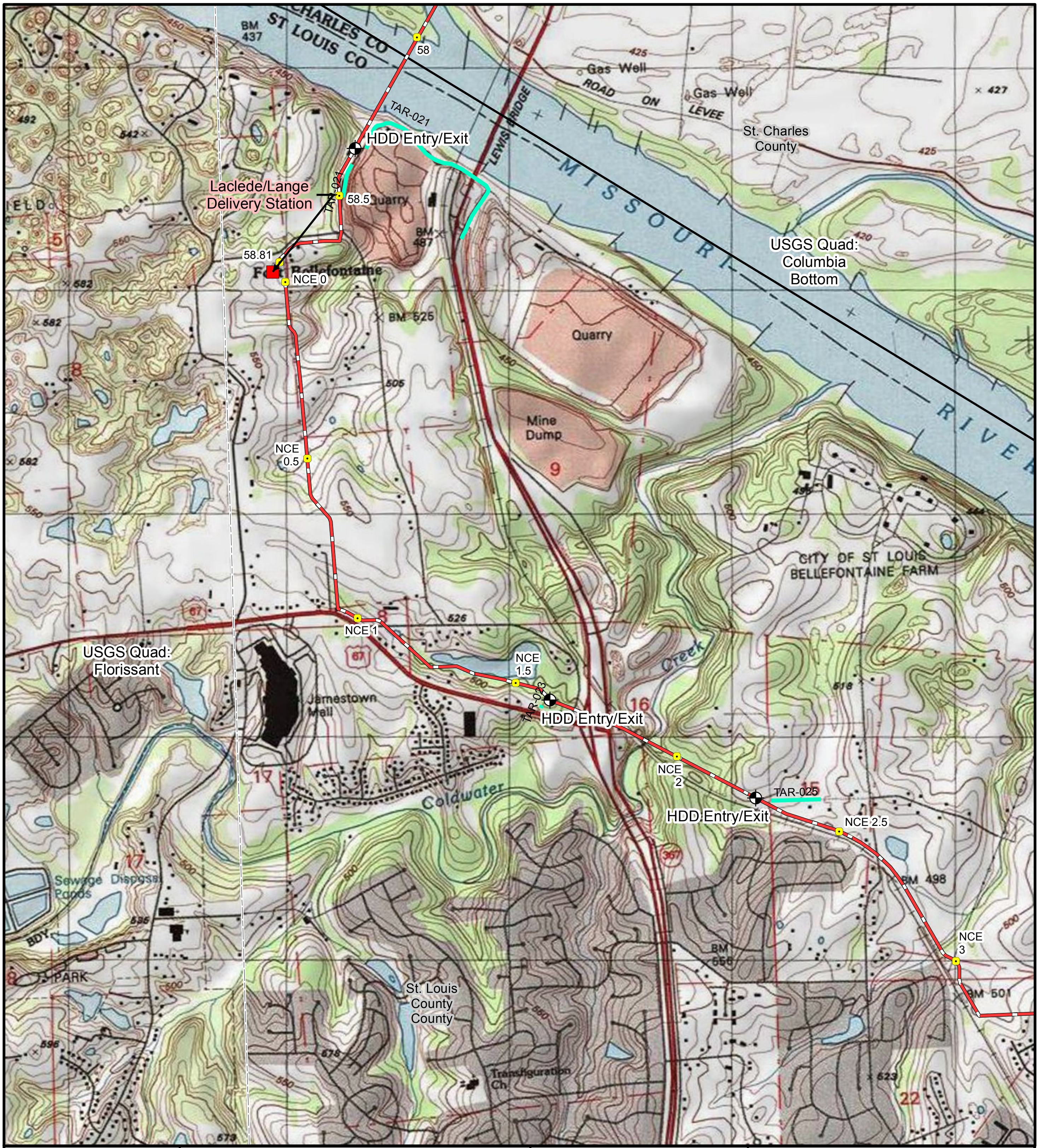
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013

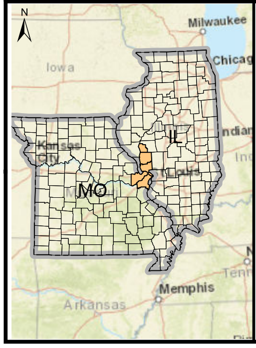
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 20 of 22

Appendix A





Legend

- HDD Entry/Exit
- Milepost
- Proposed Meter Stations
- Proposed Valve Location
- Proposed 24-Inch Diameter Pipeline
- Proposed Staging Area
- Permanent Access - Existing
- Permanent Access - Proposed
- Temporary Access - Proposed
- County Boundary
- USGS 7.5 min quad

0 1,000 2,000
Feet

N

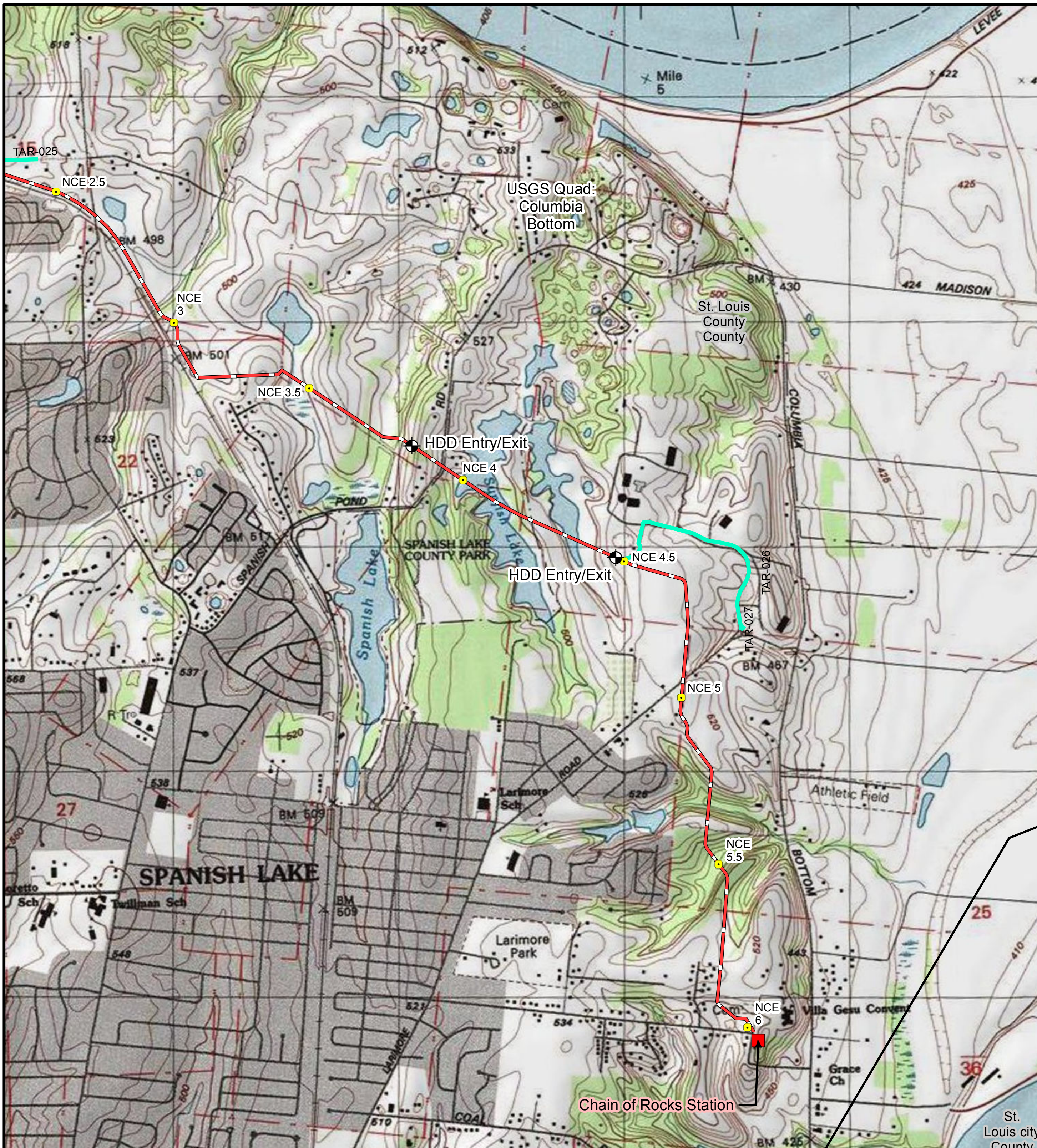
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013

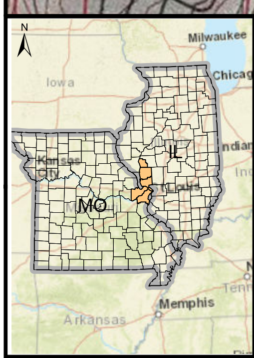
Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 21 of 22

Appendix A





Legend

- HDD Entry/Exit
- Milepost
- Proposed Meter Stations
- Proposed Valve Location
- Proposed 24-Inch Diameter Pipeline
- Proposed Staging Area
- Permanent Access - Existing
- Permanent Access - Proposed
- Temporary Access - Proposed
- County Boundary
- USGS 7.5 min quad

0 1,000 2,000
Feet

N

Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013

Spire STL Pipeline Project

Topographic Maps for the Spire STL Pipeline Project

Map 22 of 22

Appendix A

APPENDIX B

LOCATION OF ADDITIONAL TEMPORARY WORKSPACES

Appendix B
Location of Additional Temporary Workspaces for the Project

ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
Mainline					
Scott County, Illinois					
ATWS-001	0.0	50 x 40	0.0	Agricultural	Access road entrance / equipment
ATWS-001	0.0	50 x 40	0.0	Open land	Access road entrance / equipment
ATWS-814	0.0	130 x 335	1.0	Agricultural	Construction of REX Receipt Station / installation of tap to REX line
ATWS-003	0.2	3,430 x 25	0.0	Developed	Topsoil segregation
ATWS-003	0.2	3,430 x 25	0.0	Open land	Topsoil segregation
ATWS-003	0.5	3,430 x 25	1.9	Agricultural	Topsoil segregation
ATWS-005	0.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-007	0.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-009	0.7	125 x 25	0.1	Agricultural	Road crossing
ATWS-010	0.8	100 x 50	0.0	Agricultural	Access road entrance/equipment
ATWS-010	0.8	100 x 50	0.1	Open land	Access road entrance/equipment
ATWS-008	1.0	3,410 x 25	0.1	Open land	Topsoil segregation
ATWS-008	1.0	3,410 x 25	0.0	Developed	Topsoil segregation
ATWS-008	1.2	3,410 x 25	1.8	Agricultural	Topsoil segregation
ATWS-008	1.2	3,410 x 25	0.1	Forest	Topsoil segregation
ATWS-468	1.2	115 x 25	0.1	Agricultural	Waterbody crossing
ATWS-012	1.3	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-012	1.3	100 x 25	0.0	Forest	Waterbody crossing
ATWS-012	1.3	100 x 25	0.0	Open land	Waterbody crossing
ATWS-013	1.3	2,800 x 25	1.6	Agricultural	Topsoil segregation
ATWS-014	1.3	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-816	1.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-817	1.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-818	1.8	100 x 50	0.1	Agricultural	Road crossing
ATWS-819	1.9	100 x 25	0.1	Forest	Waterbody crossing
ATWS-820	1.9	100 x 25	0.1	Forest	Waterbody crossing
ATWS-479	2.0	840 x 25	0.5	Agricultural	Topsoil segregation
ATWS-821	2.0	100 x 25	0.0	Developed	Waterbody crossing
ATWS-821	2.0	100 x 25	0.0	Forest	Waterbody crossing
ATWS-822	2.0	100 x 25	0.1	Developed	Waterbody crossing
ATWS-822	2.0	100 x 25	0.0	Forest	Waterbody crossing
ATWS-484	2.1	755 x 25	0.4	Agricultural	Topsoil segregation
ATWS-485	2.1	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-486	2.1	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-480	2.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-481	2.1	100 x 25	0.1	Agricultural	Road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-487	2.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-488	2.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-482	2.2	100 x 25	0.1	Agricultural	Road crossing
ATWS-483	2.2	100 x 25	0.1	Agricultural	Road crossing
ATWS-489	2.3	685 x 25	0.4	Agricultural	Topsoil segregation
ATWS-490	2.4	890 x 25	0.5	Agricultural	Topsoil segregation
ATWS-491	2.5	105 x 25	0.1	Agricultural	Road crossing
ATWS-492	2.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-493	2.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-493	2.5	100 x 25	0.0	Forest	Road crossing
ATWS-494	2.5	120 x 25	0.1	Agricultural	Road crossing
ATWS-494	2.5	120 x 25	0.0	Forest	Road crossing
ATWS-494	2.5	120 x 25	0.0	Open land	Road crossing
ATWS-495	2.5	261 x 25	0.1	Agricultural	Topsoil segregation
ATWS-495	2.5	261 x 25	0.0	Forest	Topsoil segregation
ATWS-496	2.6	100 x 25	0.1	Forest	Waterbody crossing
ATWS-497	2.6	100 x 25	0.1	Forest	Waterbody crossing
ATWS-498	2.7	100 x 25	0.1	Forest	Waterbody crossing
ATWS-499	2.7	100 x 25	0.1	Forest	Waterbody crossing
ATWS-047	2.9	925 x 25	0.5	Agricultural	Topsoil segregation
ATWS-048	3.0	100 x 50	0.1	Agricultural	Road crossing/topsoil segregation
ATWS-049	3.0	100 x 25	0.1	Open land	Road crossing
ATWS-500	3.0	100 x 25	0.1	Open land	Road crossing
ATWS-050	3.1	1,589 x 25	0.8	Open land	Topsoil segregation
ATWS-050	3.3	1,589 x 25	0.2	Agricultural	Topsoil segregation
ATWS-051	3.4	95 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-052	3.4	159 x 25	0.1	Agricultural	Topsoil segregation
ATWS-052	3.4	159 x 25	0.0	Open land	Topsoil segregation
ATWS-053	3.4	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-501	3.4	100 x 25	0.1	Forest	Waterbody and wetland crossing
ATWS-502	3.4	100 x 25	0.1	Forest	Waterbody and wetland crossing
ATWS-503	3.5	100 x 25	0.1	Forest	Waterbody crossing
ATWS-504	3.5	100 x 25	0.1	Forest	Waterbody crossing
Greene County, Illinois					
ATWS-505	3.5	125 x 25	0.0	Forest	Waterbody crossing
ATWS-506	3.5	100 x 25	0.0	Forest	Waterbody crossing
ATWS-505	3.5	125 x 25	0.1	Forest	Waterbody crossing
ATWS-506	3.5	100 x 25	0.1	Forest	Waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-507	3.6	750 x 25	0.0	Forest	Topsoil segregation
ATWS-507	3.7	750 x 25	0.4	Open land	Topsoil segregation
ATWS-508	3.7	100 x 25	0.0	Forest	Waterbody crossing
ATWS-508	3.7	100 x 25	0.1	Open land	Waterbody crossing
ATWS-509	3.8	100 x 25	0.0	Forest	Waterbody crossing
ATWS-509	3.8	100 x 25	0.0	Open land	Waterbody crossing
ATWS-510	3.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-511	3.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-511	3.8	100 x 25	0.0	Forest	Waterbody crossing
ATWS-060	3.9	785 x 25	0.5	Agricultural	Topsoil segregation
ATWS-512	3.9	150 x 25	0.1	Agricultural	Waterbody crossing
ATWS-513	3.9	150 x 25	0.1	Agricultural	Waterbody crossing
ATWS-514	4.1	478 x 25	0.3	Agricultural	Topsoil segregation
ATWS-514	4.2	478 x 25	0.0	Forest	Topsoil segregation
ATWS-515	4.2	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-515	4.2	100 x 25	0.0	Forest	Waterbody crossing
ATWS-516	4.2	100 x 25	0.1	Forest	Waterbody crossing
ATWS-517	4.3	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-517	4.3	100 x 25	0.0	Open land	Waterbody crossing
ATWS-518	4.3	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-518	4.3	100 x 25	0.0	Forest	Waterbody crossing
ATWS-519	4.3	322 x 25	0.0	Forest	Topsoil segregation
ATWS-519	4.4	322 x 25	0.2	Agricultural	Topsoil segregation
ATWS-070	4.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-071	4.5	100 x 25	0.1	Open land	Road crossing
ATWS-072	4.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-074	4.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-520	4.5	325 x 25	0.2	Open land	Topsoil segregation
ATWS-521	4.6	345 x 25	0.2	Agricultural	Topsoil segregation
ATWS-522	5.0	2,645 x 25	1.5	Agricultural	Topsoil segregation
ATWS-522	5.0	2,645 x 25	0.0	Open land	Topsoil segregation
ATWS-523	5.2	25 x 20	0.0	Agricultural	Access road entrance/equipment
ATWS-524	5.4	2,500 x 25	1.4	Agricultural	Topsoil segregation
ATWS-084	5.7	170 x 25	0.1	Agricultural	Topsoil segregation
ATWS-085	5.7	112 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-525	5.7	289 x 25	0.2	Agricultural	Waterbody and wetland crossing/road crossing
ATWS-526	5.7	243 x 25	0.1	Agricultural	Waterbody and wetland crossing/road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-527	5.7	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-528	5.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-529	5.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-530	5.8	3,520 x 25	0.0	Developed	Topsoil segregation
ATWS-530	6.4	3,520 x 25	2.0	Agricultural	Topsoil segregation
ATWS-531	6.4	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-532	6.5	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-533	6.5	1,665 x 25	1.0	Agricultural	Topsoil segregation
ATWS-534	6.8	110 x 25	0.1	Agricultural	Road crossing
ATWS-535	6.8	129 x 25	0.1	Agricultural	Road crossing
ATWS-097	7.0	2,209 x 25	1.3	Agricultural	Topsoil segregation
ATWS-097	7.2	2,209 x 25	0.0	Developed	Topsoil segregation
ATWS-097	7.2	2,209 x 25	0.0	Open land	Topsoil segregation
ATWS-099	7.2	119 x 75	0.2	Agricultural	Road and railroad bored crossing
ATWS-099	7.2	119 x 75	0.0	Developed	Road and railroad bored crossing
ATWS-099	7.2	119 x 75	0.0	Open land	Road and railroad bored crossing
ATWS-100	7.2	122 x 25	0.1	Agricultural	Road and railroad bored crossing
ATWS-100	7.2	122 x 25	0.0	Developed	Road and railroad bored crossing
ATWS-100	7.2	122 x 25	0.0	Open land	Road and railroad bored crossing
ATWS-101	7.2	93 x 80	0.2	Agricultural	Road and railroad bored crossing
ATWS-101	7.2	93 x 80	0.0	Developed	Road and railroad bored crossing
ATWS-102	7.2	90 x 25	0.1	Agricultural	Road and railroad bored crossing
ATWS-103	7.3	705 x 25	0.4	Agricultural	Topsoil segregation
ATWS-104	7.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-105	7.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-106	7.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-107	7.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-108	7.7	2,400 x 25	1.4	Agricultural	Topsoil segregation
ATWS-109	7.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-110	7.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-112	7.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-113	7.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-113	7.8	100 x 25	0.0	Developed	Road crossing
ATWS-114	8.6	100 x 50	0.1	Agricultural	Access road transition to workspace
ATWS-114	8.6	100 x 50	0.0	Forest	Access road transition to workspace
ATWS-114	8.6	100 x 50	0.0	Open land	Access road transition to workspace
ATWS-111	8.6	5,402 x 25	0.0	Forest	Topsoil segregation
ATWS-111	8.8	5,402 x 25	3.1	Agricultural	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-115	8.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-115	8.8	100 x 25	0.0	Forest	Waterbody crossing
ATWS-116	8.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-116	8.8	100 x 25	0.0	Forest	Waterbody crossing
ATWS-117	8.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-117	8.9	100 x 25	0.0	Forest	Waterbody crossing
ATWS-118	8.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-118	8.9	100 x 25	0.0	Forest	Waterbody crossing
ATWS-119	8.9	1,162 x 25	0.7	Agricultural	Topsoil segregation
ATWS-119	8.9	1,162 x 25	0.0	Forest	Topsoil segregation
ATWS-120	9.1	100 x 50	0.1	Agricultural	Road crossing
ATWS-121	9.1	600 x 200	2.8	Agricultural	Road crossing/hydrostatic testing
ATWS-122	9.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-123	9.7	6,285 x 25	3.6	Agricultural	Topsoil segregation
ATWS-123	10.1	6,285 x 25	0.0	Developed	Topsoil segregation
ATWS-125	10.3	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-127	10.3	110 x 25	0.1	Agricultural	Waterbody crossing
ATWS-536	10.3	100 x 50	0.1	Agricultural	Road crossing
ATWS-537	10.3	110 x 25	0.1	Agricultural	Road crossing
ATWS-538	10.3	150 x 25	0.1	Agricultural	Topsoil segregation
ATWS-539	10.4	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-539	10.4	100 x 25	0.0	Forest	Waterbody crossing
ATWS-126	10.6	2,367 x 25	0.0	Forest	Topsoil segregation
ATWS-126	10.7	2,367 x 25	1.3	Agricultural	Topsoil segregation
ATWS-128	10.7	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-129	10.8	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-130	10.8	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-132	10.8	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-131	10.9	2,460 x 25	1.4	Agricultural	Topsoil segregation
ATWS-133	11.3	100 x 25	0.1	Agricultural	Waterbody/road crossing
ATWS-134	11.3	100 x 25	0.1	Agricultural	Waterbody/road crossing
ATWS-136	11.3	100 x 25	0.1	Agricultural	Waterbody/road crossing
ATWS-137	11.3	100 x 25	0.1	Agricultural	Waterbody/road crossing
ATWS-135	11.4	9,139 x 25	5.2	Agricultural	Topsoil segregation
ATWS-135	12.0	9,139 x 25	0.0	Forest	Topsoil segregation
ATWS-139	13.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-140	13.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-141	13.1	236 x 25	0.1	Agricultural	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-141	13.1	236 x 25	0.0	Open land	Topsoil segregation
ATWS-142	13.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-143	13.1	799 x 25	0.5	Agricultural	Waterbody crossing/road crossing/topsoil segregation
ATWS-143	13.1	799 x 25	0.0	Open land	Waterbody crossing/road crossing/topsoil segregation
ATWS-145	13.2	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-145	13.2	100 x 25	0.0	Forest	Waterbody crossing
ATWS-540	13.2	50 x 25	0.0	Agricultural	Waterbody crossing
ATWS-146	13.3	265 x 25	0.2	Agricultural	Topsoil segregation
ATWS-541	13.3	70 x 25	0.0	Forest	Waterbody crossing
ATWS-147	13.4	929 x 25	0.5	Agricultural	Topsoil segregation
ATWS-148	13.5	105 x 25	0.1	Agricultural	Road crossing
ATWS-149	13.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-150	13.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-151	13.6	537 x 25	0.3	Agricultural	Topsoil segregation
ATWS-151	13.6	537 x 25	0.0	Open land	Topsoil segregation
ATWS-152	13.6	102 x 25	0.1	Agricultural	Road crossing
ATWS-152	13.6	102 x 25	0.0	Open land	Road crossing
ATWS-542	13.7	570 x 25	0.3	Open land	Topsoil segregation
ATWS-542	13.8	570 x 25	0.0	Forest	Topsoil segregation
ATWS-543	13.9	100 x 50	0.1	Agricultural	Waterbody and wetland crossing
ATWS-154	14.0	335 x 25	0.2	Open land	Topsoil segregation
ATWS-155	14.0	100 x 25	0.1	Open land	Waterbody and wetland crossing
ATWS-156	14.0	100 x 25	0.1	Open land	Waterbody and wetland crossing
ATWS-544	14.1	100 x 25	0.1	Open land	Wetland crossing
ATWS-157	14.2	690 x 25	0.4	Open land	Wetland crossing/topsoil segregation
ATWS-545	14.2	100 x 25	0.1	Open land	Wetland crossing
ATWS-546	14.2	100 x 25	0.1	Open land	Waterbody and wetland crossing
ATWS-158	14.3	90 x 25	0.1	Open land	Wetland crossing
ATWS-159	14.4	100 x 50	0.1	Developed	Access road entrance/equipment
ATWS-547	14.4	172 x 35	0.1	Agricultural	Access road transition to workspace
ATWS-162	15.1	100 x 50	0.1	Agricultural	Access road transition to workspace
ATWS-162	15.1	100 x 50	0.0	Open land	Access road transition to workspace
ATWS-163	15.1	100 x 50	0.1	Agricultural	Access road entrance/equipment
ATWS-163	15.1	100 x 50	0.1	Open land	Access road entrance/equipment
ATWS-548	15.5	5,981 x 25	3.2	Agricultural	Topsoil segregation
ATWS-548	15.3	5,981 x 25	0.0	Forest	Topsoil segregation
ATWS-548	15.1	5,981 x 25	0.2	Open land	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-549	15.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-550	15.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-164	15.7	7,397 x 25	0.0	Open land	Topsoil segregation
ATWS-164	17.0	7,397 x 25	4.2	Agricultural	Topsoil segregation
ATWS-165	17.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-166	17.1	55 x 25	0.0	Agricultural	Road crossing/wetland crossing
ATWS-167	17.1	85 x 25	0.1	Agricultural	Road crossing/wetland crossing
ATWS-168	17.1	95 x 25	0.1	Agricultural	Wetland crossing
ATWS-169	17.1	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-169	17.1	100 x 25	0.0	Developed	Wetland crossing
ATWS-170	17.2	2,480 x 25	1.4	Agricultural	Topsoil segregation
ATWS-171	17.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-172	17.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-173	17.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-173	17.6	100 x 25	0.0	Developed	Waterbody crossing
ATWS-551	17.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-551	17.6	100 x 25	0.0	Developed	Waterbody crossing
ATWS-176	17.7	440 x 25	0.3	Agricultural	Topsoil segregation
ATWS-175	17.8	1,955 x 25	0.0	Developed	Topsoil segregation
ATWS-175	18.0	1,955 x 25	1.1	Agricultural	Topsoil segregation
ATWS-177	18.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-178	18.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-179	18.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-181	18.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-182	18.7	100 x 50	0.1	Agricultural	Waterbody crossing
ATWS-183	18.7	95 x 25	0.1	Agricultural	Waterbody crossing
ATWS-552	18.7	3,180 x 25	1.8	Agricultural	Topsoil segregation
ATWS-184	18.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-553	18.9	1,685 x 25	1.0	Agricultural	Topsoil segregation
ATWS-187	19.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-188	19.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-554	19.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-555	19.1	2,202 x 25	0.0	Forest	Topsoil segregation
ATWS-555	19.2	2,202 x 25	1.3	Agricultural	Topsoil segregation
ATWS-191	19.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-191	19.5	100 x 25	0.0	Developed	Road crossing
ATWS-192	19.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-194	19.6	600 x 200	2.8	Agricultural	Road crossing/hydrostatic testing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-195	20.3	105 x 25	0.1	Agricultural	Road crossing
ATWS-196	20.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-196	20.4	100 x 25	0.0	Developed	Road crossing
ATWS-556	20.3	4,330 x 25	2.5	Agricultural	Topsoil segregation
ATWS-197	20.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-199	20.4	105 x 25	0.1	Agricultural	Road crossing
ATWS-557	20.7	2,395 x 25	1.3	Agricultural	Topsoil segregation
ATWS-557	20.8	2,395 x 25	0.0	Forest	Topsoil segregation
ATWS-557	20.8	2,395 x 25	0.1	Open land	Topsoil segregation
ATWS-200	20.8	100 x 25	0.1	Open land	Waterbody crossing
ATWS-558	20.8	100 x 25	0.1	Open land	Waterbody crossing
ATWS-559	20.9	150 x 25	0.1	Open land	Topsoil segregation
ATWS-560	20.9	100 x 25	0.1	Open land	Waterbody crossing
ATWS-561	20.9	100 x 25	0.1	Open land	Waterbody crossing
ATWS-562	20.9	1,902 x 25	0.1	Open land	Topsoil segregation
ATWS-562	21.0	1,902 x 25	1.0	Agricultural	Topsoil segregation
ATWS-203	21.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-203	21.3	100 x 25	0.0	Open land	Road crossing
ATWS-204	21.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-204	21.3	100 x 25	0.0	Open land	Road crossing
ATWS-205	21.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-207	21.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-563	22.3	5,705 x 25	3.3	Agricultural	Topsoil segregation
ATWS-564	22.3	114 x 25	0.1	Agricultural	Waterbody crossing
ATWS-565	22.4	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-566	22.6	1,475 x 27	0.9	Agricultural	Topsoil segregation
ATWS-566	22.6	1,475 x 27	0.1	Open land	Topsoil segregation
ATWS-567	22.8	1,033 x 25	0.6	Agricultural	Topsoil segregation
ATWS-568	22.8	100 x 30	0.1	Agricultural	Road crossing
ATWS-569	22.8	100 x 30	0.1	Agricultural	Road crossing
ATWS-569	22.8	100 x 30	0.0	Open land	Road crossing
ATWS-570	22.8	88 x 25	0.1	Agricultural	Road crossing
ATWS-571	22.8	3,295 x 25	0.0	Open land	Topsoil segregation
ATWS-571	23.3	3,295 x 25	1.9	Agricultural	Topsoil segregation
ATWS-571	23.4	3,295 x 25	0.0	Forest	Topsoil segregation
ATWS-572	23.5	100 x 25	0.1	Forest	Waterbody crossing
ATWS-573	23.5	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-573	23.5	100 x 25	0.0	Forest	Waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-574	23.5	1,520 x 25	0.0	Forest	Topsoil segregation
ATWS-574	23.7	1,520 x 25	0.8	Agricultural	Topsoil segregation
ATWS-575	23.8	185 x 25	0.1	Agricultural	Topsoil segregation
ATWS-576	23.8	115 x 25	0.1	Agricultural	Topsoil segregation
ATWS-577	23.9	610 x 25	0.4	Agricultural	Topsoil segregation
ATWS-216	24.0	441 x 25	0.0	Forest	Topsoil segregation
ATWS-216	24.0	441 x 25	0.0	Open land	Topsoil segregation
ATWS-216	24.1	441 x 25	0.2	Agricultural	Topsoil segregation
ATWS-578	24.2	890 x 25	0.5	Agricultural	Topsoil segregation
ATWS-578	24.2	890 x 25	0.0	Forest	Topsoil segregation
ATWS-217	24.3	290 x 25	0.2	Agricultural	Topsoil segregation
ATWS-218	24.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-219	24.4	95 x 25	0.1	Agricultural	Road crossing
ATWS-220	24.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-221	24.4	90 x 25	0.1	Agricultural	Road crossing
ATWS-222	24.4	100 x 25	0.0	Agricultural	Access road entrance / equipment
ATWS-222	24.4	100 x 25	0.0	Developed	Access road entrance / equipment
ATWS-222	24.4	100 x 25	0.0	Open land	Access road entrance / equipment
ATWS-579	24.5	1,015 x 25	0.6	Agricultural	Topsoil segregation
ATWS-824	24.5	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-825	24.6	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-826	24.6	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-827	24.6	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-828	24.9	1,640 x 25	0.9	Agricultural	Topsoil segregation
ATWS-828	24.9	1,640 x 25	0.0	Open land	Topsoil segregation
ATWS-829	24.9	55 x 50	0.1	Agricultural	Access road entrance / equipment
ATWS-830	24.9	50 x 50	0.0	Agricultural	Access road entrance / equipment
ATWS-830	24.9	50 x 50	0.0	Open land	Access road entrance / equipment
ATWS-831	24.9	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-832	24.9	150 x 25	0.1	Agricultural	Wetland crossing
ATWS-833	25.0	200 x 25	0.1	Agricultural	Wetland crossing
ATWS-834	25.1	1,220 x 25	0.7	Agricultural	Topsoil segregation
ATWS-834	25.3	1,220 x 25	0.0	Developed	Topsoil segregation
ATWS-835	25.1	200 x 25	0.1	Agricultural	Wetland crossing
ATWS-836	25.2	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-836	25.3	100 x 25	0.0	Developed	Waterbody crossing
ATWS-837	25.2	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-837	25.2	100 x 25	0.0	Developed	Waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-838	25.4	200 x 25	0.1	Agricultural	Waterbody crossing
ATWS-839	25.4	200 x 25	0.1	Agricultural	Waterbody crossing
ATWS-840	25.6	2,025 x 25	1.2	Agricultural	Topsoil segregation
ATWS-841	25.7	110 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-842	25.7	80 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-234	25.8	135 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-236	25.8	180 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-600	25.8	210 x 25	0.1	Agricultural	Topsoil segregation
ATWS-237	26.0	100 x 50	0.0	Agricultural	Access road entrance / equipment
ATWS-237	26.0	100 x 50	0.1	Open land	Access road entrance / equipment
ATWS-601	26.0	950 x 25	0.6	Agricultural	Topsoil segregation
ATWS-243	26.1	55 x 50	0.0	Forest	Access road entrance/equipment
ATWS-243	26.1	55 x 50	0.1	Open land	Access road entrance/equipment
ATWS-602	26.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-603	26.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-604	26.2	100 x 25	0.1	Agricultural	Road crossing
ATWS-605	26.4	2,890 x 25	0.0	Forest	Topsoil segregation
ATWS-605	26.6	2,890 x 25	1.6	Agricultural	Topsoil segregation
ATWS-606	26.7	90 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-607	26.7	105 x 30	0.1	Agricultural	Waterbody and wetland crossing
ATWS-608	26.7	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-609	26.8	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-610	27.2	2,800 x 25	1.6	Agricultural	Topsoil segregation
ATWS-610	27.3	2,800 x 25	0.0	Open land	Topsoil segregation
ATWS-611	27.3	71 x 25	0.0	Agricultural	Road crossing
ATWS-611	27.3	71 x 25	0.0	Open land	Road crossing
ATWS-612	27.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-612	27.3	100 x 25	0.0	Open land	Road crossing
ATWS-613	27.3	85 x 25	0.1	Open land	Road crossing
ATWS-614	27.3	100 x 25	0.1	Open land	Road crossing
ATWS-615	27.3	430 x 25	0.3	Open land	Topsoil segregation
ATWS-616	27.3	69 x 25	0.0	Open land	Road crossing
ATWS-617	27.4	94 x 25	0.1	Agricultural	Road crossing
ATWS-617	27.4	94 x 25	0.0	Developed	Road crossing
ATWS-618	27.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-619	27.7	5,250 x 25	3.0	Agricultural	Topsoil segregation
ATWS-256	28.4	100 x 20	0.0	Agricultural	Road crossing
ATWS-257	28.4	100 x 25	0.1	Agricultural	Road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-259	28.4	100 x 50	0.1	Agricultural	Road crossing
ATWS-620	28.8	2,605 x 25	1.5	Agricultural	Topsoil segregation
ATWS-620	28.8	2,605 x 25	0.0	Open land	Topsoil segregation
ATWS-621	28.9	100 x 50	0.1	Agricultural	Road crossing
ATWS-622	28.9	100 x 50	0.1	Agricultural	Road crossing
ATWS-623	28.9	3,920 x 25	1.6	Agricultural	Topsoil segregation
ATWS-623	28.9	3,920 x 25	0.0	Open land	Topsoil segregation
Jersey County, Illinois					
ATWS-623	28.9	3,920 x 25	0.7	Agricultural	Topsoil segregation
ATWS-264	29.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-265	29.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-266	29.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-266	29.7	100 x 25	0.0	Open land	Road crossing
ATWS-267	29.7	100 x 25	0.1	Agricultural	Topsoil segregation
ATWS-267	29.7	100 x 25	0.0	Open land	Topsoil segregation
ATWS-624	29.7	100 x 25	0.0	Agricultural	Road crossing
ATWS-624	29.7	100 x 25	0.0	Developed	Road crossing
ATWS-624	29.7	100 x 25	0.0	Open land	Road crossing
ATWS-268	29.8	9,915 x 25	5.4	Agricultural	Topsoil segregation
ATWS-268	31.4	9,915 x 25	0.2	Open land	Topsoil segregation
ATWS-625	31.5	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-625	31.5	100 x 25	0.0	Forest	Waterbody crossing
ATWS-626	31.6	100 x 25	0.1	Forest	Waterbody crossing
ATWS-627	31.7	1,435 x 25	0.5	Agricultural	Topsoil segregation
ATWS-627	31.7	1,435 x 25	0.0	Developed	Topsoil segregation
ATWS-627	31.7	1,435 x 25	0.0	Forest	Topsoil segregation
ATWS-627	31.7	1,435 x 25	0.3	Open land	Topsoil segregation
ATWS-271	31.9	100 x 50	0.1	Agricultural	Road crossing
ATWS-271	31.9	100 x 50	0.0	Developed	Road crossing
ATWS-271	31.9	100 x 50	0.0	Open land	Road crossing
ATWS-272	31.9	110 x 50	0.1	Agricultural	Road crossing/wetland crossing
ATWS-275	32.0	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-276	32.0	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-628	32.2	4,963 x 25	2.8	Agricultural	Topsoil segregation
ATWS-628	32.2	4,963 x 25	0.0	Open land	Topsoil segregation
ATWS-277	32.9	100 x 50	0.1	Agricultural	Road crossing
ATWS-278	32.9	100 x 50	0.1	Agricultural	Road crossing
ATWS-278	32.9	100 x 50	0.0	Open land	Road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-629	33.4	2,625 x 25	1.5	Agricultural	Topsoil segregation
ATWS-629	33.4	2,625 x 25	0.0	Open land	Topsoil segregation
ATWS-283	33.7	100 x 50	0.1	Agricultural	Waterbody crossing
ATWS-630	33.7	1440 x 25	0.8	Agricultural	Topsoil segregation
ATWS-630	33.7	1440 x 25	0.0	Open land	Topsoil segregation
ATWS-631	33.8	535 x 25	0.3	Agricultural	Topsoil segregation
ATWS-284	33.9	200 x 25	0.1	Agricultural	Road crossing
ATWS-632	34.2	600 x 200	2.7	Agricultural	Hydrostatic testing
ATWS-633	34.2	50 x 50	0.1	Agricultural	Hydrostatic testing
ATWS-634	34.3	4,487 x 25	2.5	Agricultural	Topsoil segregation
ATWS-634	34.3	4,487 x 25	0.1	Open land	Topsoil segregation
ATWS-634	34.8	2,665 x 25	1.5	Agricultural	Topsoil segregation
ATWS-288	35.2	100 x 50	0.1	Agricultural	Waterbody and wetland crossing
ATWS-636	35.3	100 x 50	0.1	Forest	Waterbody and wetland crossing
ATWS-849	35.4	835 x 25	0.5	Agricultural	Topsoil segregation
ATWS-850	35.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-851	35.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-852	35.5	100 x 25	0.1	Agricultural	Road and waterbody crossing
ATWS-853	35.5	1,175 x 25	0.7	Agricultural	Topsoil segregation
ATWS-853	35.5	1,175 x 25	0.0	Forest	Topsoil segregation
ATWS-854	35.5	100 x 25	0.0	Agricultural	Road and waterbody crossing
ATWS-854	35.5	100 x 25	0.0	Forest	Road and waterbody crossing
ATWS-855	36.1	2,150 x 25	1.2	Agricultural	Topsoil segregation
ATWS-923	36.3	870 x 25	0.5	Agricultural	Topsoil segregation
ATWS-856	36.5	1,235 x 25	0.7	Agricultural	Topsoil segregation
ATWS-857	36.6	100 x 50	0.1	Agricultural	Access road entrance / equipment
ATWS-869	36.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-858	36.7	200 x 25	0.1	Agricultural	Topsoil segregation
ATWS-858	36.7	200 x 25	0.0	Forest	Topsoil segregation
ATWS-858	36.7	200 x 25	0.0	Open land	Topsoil segregation
ATWS-870	36.7	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-871	36.7	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-672	37.1	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-671	37.1	2,090 x 25	1.2	Agricultural	Topsoil segregation
ATWS-671	37.1	2,090 x 25	0.1	Open land	Topsoil segregation
ATWS-673	37.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-674	37.2	240 x 25	0.1	Agricultural	Topsoil segregation
ATWS-675	37.3	100 x 25	0.1	Agricultural	Road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-676	37.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-677	37.3	1,583 x 25	0.9	Agricultural	Topsoil segregation
ATWS-677	37.3	1,583 x 25	0.0	Open land	Topsoil segregation
ATWS-678	37.6	165 x 25	0.1	Agricultural	Topsoil segregation
ATWS-679	37.7	165 x 25	0.1	Agricultural	Topsoil segregation
ATWS-680	37.9	1,705 x 25	1.0	Agricultural	Topsoil segregation
ATWS-681	38.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-682	38.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-683	38.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-684	38.1	100 x 25	0.1	Agricultural	Road crossing
ATWS-685	38.5	2,685 x 25	1.5	Agricultural	Topsoil segregation
ATWS-686	38.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-687	38.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-688	38.6	100 x 25	0.1	Open land	Road crossing
ATWS-689	38.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-689	38.6	100 x 25	0.0	Open land	Road crossing
ATWS-690	38.6	564 x 25	0.2	Agricultural	Topsoil segregation
ATWS-690	38.6	564 x 25	0.1	Open land	Topsoil segregation
ATWS-691	38.7	1,230 x 25	0.7	Agricultural	Topsoil segregation
ATWS-692	38.9	110 x 25	0.1	Agricultural	Waterbody crossing
ATWS-693	38.9	100 x 15	0.0	Agricultural	Waterbody crossing
ATWS-693	38.9	100 x 15	0.0	Developed	Waterbody crossing
ATWS-694	38.9	175 x 25	0.1	Agricultural	Waterbody crossing
ATWS-695	39.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-696	39.1	195 x 25	0.0	Agricultural	Waterbody crossing
ATWS-696	39.1	195 x 25	0.1	Forest	Waterbody crossing
ATWS-696	39.1	195 x 25	0.0	Open land	Waterbody crossing
ATWS-697	39.1	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-698	39.1	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-699	39.2	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-700	39.2	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-701	39.2	945 x 25	0.5	Agricultural	Topsoil segregation
ATWS-702	39.4	100 x 25	0.1	Forest	Waterbody crossing
ATWS-703	39.4	95 x 25	0.1	Forest	Topsoil segregation
ATWS-704	39.4	85 x 25	0.1	Forest	Waterbody crossing
ATWS-705	39.5	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-705	39.5	100 x 25	0.0	Forest	Waterbody crossing
ATWS-706	39.7	100 x 25	0.1	Forest	Waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-707	39.7	80 x 25	0.1	Forest	Waterbody crossing
ATWS-708	39.7	250 x 25	0.1	Forest	Waterbody crossing
ATWS-710	39.9	1,670 x 25	0.1	Forest	Topsoil segregation
ATWS-710	40.1	1,670 x 25	0.9	Agricultural	Topsoil segregation
ATWS-710	40.1	1,670 x 25	0.0	Open land	Topsoil segregation
ATWS-711	40.2	525 x 25	0.3	Agricultural	Topsoil segregation
ATWS-711	40.2	525 x 25	0.0	Open land	Topsoil segregation
ATWS-322	40.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-712	40.3	95 x 25	0.1	Agricultural	Road crossing
ATWS-713	40.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-714	40.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-715	40.4	2,605 x 25	1.5	Agricultural	Topsoil segregation
ATWS-715	40.4	2,605 x 25	0.0	Open land	Topsoil segregation
ATWS-327	40.8	100 x 50	0.0	Agricultural	Access road entrance/equipment
ATWS-327	40.8	100 x 50	0.1	Open land	Access road entrance/equipment
ATWS-716	40.8	100 x 50	0.1	Agricultural	Access road transition to workspace
ATWS-716	40.8	100 x 50	0.0	Forest	Access road transition to workspace
ATWS-717	40.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-718	40.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-719	40.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-719	40.9	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-935	40.9	325 x 25	0.2	Agricultural	Topsoil segregation
ATWS-721	41.0	475 x 25	0.3	Agricultural	Topsoil segregation
ATWS-722	41.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-723	41.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-724	41.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-725	41.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-725	41.1	100 x 25	0.0	Forest	Waterbody crossing
ATWS-726	41.1	295 x 25	0.2	Agricultural	Topsoil segregation
ATWS-727	41.2	100 x 25	0.1	Agricultural	Topsoil segregation
ATWS-728	41.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-729	41.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-730	41.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-730	41.2	100 x 25	0.0	Open land	Wetland crossing
ATWS-731	41.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-731	41.2	100 x 25	0.0	Open land	Wetland crossing
ATWS-732	41.3	530 x 25	0.3	Agricultural	Topsoil segregation
ATWS-732	41.3	530 x 25	0.0	Open land	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-733	41.3	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-734	41.3	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-735	41.3	100 x 25	0.1	Agricultural	Waterbody and wetland crossing
ATWS-736	41.3	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-737	41.4	620 x 25	0.4	Agricultural	Topsoil segregation
ATWS-329	41.5	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-924	41.5	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-330	41.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-331	41.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-332	41.6	205 x 25	0.1	Agricultural	Topsoil segregation
ATWS-738	41.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-739	41.6	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-740	41.7	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-741	41.7	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-333	41.8	950 x 25	0.5	Agricultural	Topsoil segregation
ATWS-334	41.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-335	41.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-336	41.9	100 x 25	0.1	Agricultural	Road crossing
ATWS-336	41.9	100 x 25	0.0	Developed	Road crossing
ATWS-338	41.9	100 x 25	0.1	Agricultural	Road crossing
ATWS-338	41.9	100 x 25	0.0	Developed	Road crossing
ATWS-337	41.8	895 x 25	0.5	Agricultural	Topsoil segregation
ATWS-337	41.8	895 x 25	0.0	Developed	Topsoil segregation
ATWS-925	42.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-926	42.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-927	42.1	175 x 25	0.1	Agricultural	Waterbody crossing
ATWS-928	42.1	238 x 25	0.1	Agricultural	Topsoil segregation
ATWS-929	42.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-930	42.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-931	42.2	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-342	42.1	1,265 x 25	0.7	Agricultural	Topsoil segregation
ATWS-344	42.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-345	42.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-345	42.3	100 x 25	0.0	Open land	Road crossing
ATWS-346	42.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-348	42.4	6,100 x 25	3.5	Agricultural	Topsoil segregation
ATWS-348	42.4	6,100 x 25	0.1	Open land	Topsoil segregation
ATWS-350	43.5	615 x 25	0.4	Agricultural	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-351	43.7	660 x 25	0.4	Agricultural	Topsoil segregation
ATWS-357	44.0	100 x 25	0.1	Agricultural	Topsoil segregation
ATWS-358	44.0	100 x 50	0.1	Forest	Access road entrance/equipment
ATWS-744	44.0	200 x 50	0.1	Agricultural	Road crossing
ATWS-744	44.0	200 x 50	0.1	Forest	Road crossing
ATWS-361	44.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-745	44.1	340 x 25	0.1	Agricultural	Topsoil segregation
ATWS-745	44.1	340 x 25	0.1	Forest	Topsoil segregation
ATWS-362	44.2	255 x 25	0.1	Forest	Waterbody crossing
ATWS-362	44.2	255 x 25	0.1	Open land	Waterbody crossing
ATWS-365	44.5	100 x 100	0.2	Forest	Waterbody crossing
ATWS-366	44.5	100 x 25	0.1	Forest	Waterbody crossing
ATWS-747	44.7	100 x 50	0.0	Forest	Access road transition to workspace
ATWS-747	44.7	100 x 50	0.1	Open land	Access road transition to workspace
ATWS-932	44.9	100 x 25	0.1	Forest	Waterbody crossing
ATWS-933	44.9	140 x 50	0.2	Forest	Waterbody crossing
ATWS-368	45.0	300 x 90	0.4	Forest	HDD crossing
ATWS-368	45.0	300 x 90	0.0	Water	HDD crossing
ATWS-368	45.0	300 x 90	0.2	Wetland	HDD crossing
ATWS-369	45.0	300 x 135	0.6	Forest	HDD crossing
ATWS-369	45.0	300 x 135	0.3	Open land	HDD crossing
ATWS-934	45.0	100 x 25	0.1	Forest	Waterbody crossing
ATWS-920	45.1	215 x 25	0.0	Developed	HDD crossing
ATWS-920	45.1	215 x 25	0.0	Forest	HDD crossing
ATWS-920	45.1	215 x 25	0.0	Open land	HDD crossing
ATWS-920	45.1	215 x 25	0.0	Water	HDD crossing
ATWS-920	45.1	215 x 25	0.0	Wetland	HDD crossing
St. Charles County, Missouri					
ATWS-371	46.1	301 x 134	0.0	Open land	HDD crossing
ATWS-371	46.1	301 x 134	0.0	Forest	HDD crossing
ATWS-371	46.2	301 x 134	0.9	Agricultural	HDD crossing
ATWS-370	46.2	210 x 90	0.4	Agricultural	HDD crossing
ATWS-372	46.2	5,909 x 75	10.1	Agricultural	HDD crossing
ATWS-372	46.2	5,909 x 75	0.1	Developed	HDD crossing
ATWS-374	46.6	105 x 25	0.1	Agricultural	Road crossing
ATWS-748	46.6	2,290 x 25	1.3	Agricultural	Topsoil segregation
ATWS-376	46.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-749	46.7	1,470 x 25	0.8	Agricultural	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-379	46.8	150 x 150	0.5	Agricultural	HDD crossing
ATWS-378	46.9	50 x 40	0.0	Agricultural	Access road entrance / equipment
ATWS-378	46.9	50 x 40	0.0	Open land	Access road entrance / equipment
ATWS-919	46.9	50 x 40	0.0	Agricultural	Access road entrance / equipment
ATWS-919	46.9	50 x 40	0.0	Open land	Access road entrance / equipment
ATWS-860	47.6	3,405 x 25	2.0	Agricultural	Topsoil segregation
ATWS-861	47.6	550 x 25	0.3	Agricultural	Road crossing
ATWS-862	47.6	555 x 25	0.3	Agricultural	Road crossing
ATWS-863	47.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-865	47.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-864	47.7	190 x 25	0.1	Agricultural	Topsoil segregation
ATWS-866	47.8	380 x 25	0.2	Agricultural	Waterbody crossing
ATWS-868	47.8	380 x 25	0.2	Agricultural	Waterbody crossing
ATWS-761	48.1	4,030 x 25	2.3	Agricultural	Topsoil segregation
ATWS-761	48.1	4,030 x 25	0.0	Open land	Topsoil segregation
ATWS-762	48.9	2,230 x 25	1.3	Agricultural	Topsoil segregation
ATWS-762	48.9	2,230 x 25	0.0	Open land	Topsoil segregation
ATWS-763	49.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-763	49.0	100 x 25	0.0	Open land	Road crossing
ATWS-764	49.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-764	49.0	100 x 25	0.0	Open land	Road crossing
ATWS-765	49.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-766	49.0	100 x 25	0.1	Agricultural	Road crossing
ATWS-767	49.1	1990 x 25	1.1	Agricultural	Topsoil segregation
ATWS-768	49.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-769	49.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-770	49.4	100 x 25	0.1	Agricultural	Road crossing
ATWS-771	49.5	970 x 25	0.6	Agricultural	Topsoil segregation
ATWS-772	49.5	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-773	49.5	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-774	49.7	2,940 x 25	0.5	Wetland	Topsoil segregation
ATWS-774	49.9	2,940 x 25	0.0	Open land	Topsoil segregation
ATWS-774	50.0	2,940 x 25	0.1	Developed	Topsoil segregation
ATWS-774	50.1	2,940 x 25	1.0	Agricultural	Topsoil segregation
ATWS-775	50.4	1,382 x 25	0.8	Agricultural	Topsoil segregation
ATWS-402	50.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-405	50.5	129 x 25	0.1	Agricultural	Road crossing
ATWS-776	50.5	4,030 x 25	0.1	Agricultural	Road crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-777	50.5	100 x 25	0.1	Agricultural	Road crossing
ATWS-403	50.8	3,135 x 25	1.8	Agricultural	Topsoil segregation
ATWS-778	51.0	131 x 25	0.1	Agricultural	Railroad bored crossing
ATWS-408	51.1	108 x 25	0.1	Agricultural	Railroad bored crossing
ATWS-408	51.1	108 x 25	0.0	Forest	Railroad bored crossing
ATWS-410	51.1	126 x 25	0.1	Agricultural	Railroad bored crossing
ATWS-410	51.1	126 x 25	0.0	Forest	Railroad bored crossing
ATWS-779	51.1	100 x 50	0.1	Agricultural	Railroad bored crossing
ATWS-409	51.1	1,105 x 25	0.0	Forest	Topsoil segregation
ATWS-409	51.2	1,105 x 25	0.6	Agricultural	Topsoil segregation
ATWS-409	51.3	1,105 x 25	0.1	Developed	Topsoil segregation
ATWS-780	51.2	100 x 50	0.1	Agricultural	Access road entrance/equipment
ATWS-780	51.2	100 x 50	0.0	Open land	Access road entrance/equipment
ATWS-411	51.3	110 x 25	0.1	Agricultural	Road crossing
ATWS-412	51.3	100 x 25	0.1	Developed	Road crossing
ATWS-413	51.3	100 x 25	0.0	Agricultural	Road crossing
ATWS-413	51.3	100 x 25	0.1	Developed	Road crossing
ATWS-415	51.3	110 x 25	0.0	Agricultural	Road crossing
ATWS-415	51.3	110 x 25	0.0	Developed	Road crossing
ATWS-414	51.3	2,268 x 25	0.1	Developed	Topsoil segregation
ATWS-414	51.4	2,268 x 25	1.2	Agricultural	Topsoil segregation
ATWS-416	51.7	155 x 25	0.1	Agricultural	Road crossing
ATWS-417	51.7	100 x 25	0.1	Agricultural	Road crossing
ATWS-419	51.8	100 x 25	0.1	Agricultural	Road crossing
ATWS-420	51.8	155 x 25	0.1	Agricultural	Road crossing
ATWS-418	51.9	1,268 x 25	0.7	Agricultural	Topsoil segregation
ATWS-781	52.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-782	52.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-783	52.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-784	52.0	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-785	52.1	720 x 25	0.4	Agricultural	Topsoil segregation
ATWS-786	52.1	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-787	52.1	100 x 25	0.1	Agricultural	Road and waterbody crossing
ATWS-788	52.2	100 x 25	0.1	Agricultural	Road and waterbody crossing
ATWS-789	52.2	100 x 25	0.1	Agricultural	Road and waterbody crossing
ATWS-790	52.2	410 x 25	0.2	Agricultural	Topsoil segregation
ATWS-791	52.2	100 x 25	0.1	Agricultural	Waterbody crossing
ATWS-792	52.2	100 x 25	0.1	Agricultural	Waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-421	52.3	100 x 50	0.0	Agricultural	Access road entrance/equipment
ATWS-421	52.3	100 x 50	0.1	Open land	Access road entrance/equipment
ATWS-422	52.3	100 x 50	0.1	Agricultural	Access road transition to workspace
ATWS-422	52.3	100 x 50	0.0	Open land	Access road transition to workspace
ATWS-793	52.3	100 x 25	0.0	Agricultural	Waterbody crossing
ATWS-793	52.3	100 x 25	0.0	Open land	Waterbody crossing
ATWS-794	52.3	4,092 x 25	2.3	Agricultural	Topsoil segregation
ATWS-794	52.3	4,092 x 25	0.0	Open land	Topsoil segregation
ATWS-424	53.0	100 x 50	0.1	Agricultural	Road crossing
ATWS-425	53.1	120 x 50	0.1	Agricultural	Road crossing
ATWS-795	53.1	7,543 x 25	4.3	Agricultural	Topsoil segregation
ATWS-795	53.1	7,543 x 25	0.0	Open land	Topsoil segregation
ATWS-795	53.9	7,543 x 25	0.0	Wetland	Topsoil segregation
ATWS-796	54.5	100 x 25	0.1	Agricultural	Waterbody crossing/road crossing
ATWS-797	54.5	85 x 25	0.1	Agricultural	Waterbody crossing/road crossing
ATWS-798	54.6	100 x 25	0.1	Agricultural	Waterbody crossing/road crossing
ATWS-799	54.6	100 x 25	0.1	Agricultural	Waterbody crossing/road crossing
ATWS-800	54.6	6,065 x 25	3.4	Agricultural	Topsoil segregation
ATWS-800	54.6	6,065 x 25	0.1	Wetland	Topsoil segregation
ATWS-801	55.7	100 x 50	0.1	Agricultural	Wetland crossing
ATWS-802	55.9	100 x 50	0.1	Agricultural	Wetland crossing
ATWS-437	56.5	3,714 x 25	2.1	Agricultural	Topsoil segregation
ATWS-438	56.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-439	56.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-440	56.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-441	56.6	875 x 25	0.5	Agricultural	Topsoil segregation
ATWS-442	56.6	100 x 25	0.1	Agricultural	Road crossing
ATWS-443	56.7	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-444	56.7	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-446	56.8	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-447	56.8	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-445	56.8	1,200 x 25	0.7	Agricultural	Topsoil segregation
ATWS-448	57.0	165 x 135	0.5	Agricultural	HDD crossing
ATWS-803	57.1	920 x 25	0.5	Agricultural	Topsoil segregation
ATWS-450	57.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-451	57.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-452	57.2	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-453	57.3	410 x 25	0.2	Agricultural	Topsoil segregation

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	**Milepost**	**Approximate Dimensions (feet)**	**Acres[a]**	**Land Type**	**Justification**
ATWS-454	57.3	100 x 25	0.1	Agricultural	Wetland crossing
ATWS-455	57.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-457	57.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-458	57.3	175 x 25	0.1	Agricultural	Topsoil segregation
ATWS-804	57.3	100 x 25	0.1	Agricultural	Road crossing
ATWS-449	57.3	3,400 x 75	0.1	Developed	HDD crossing
ATWS-449	57.4	3,400 x 75	0.4	Wetland	HDD crossing
ATWS-449	57.5	3,400 x 75	5.5	Agricultural	HDD crossing
ATWS-460	57.5	1,560 x 25	0.9	Agricultural	Topsoil segregation
ATWS-461	57.6	370 x 20	0.2	Agricultural	HDD crossing
ATWS-462	57.6	370 x 115	1.0	Agricultural	HDD crossing
St. Louis County, Missouri					
ATWS-463	58.3	290 x 95	0.1	Forest	HDD crossing
ATWS-463	58.4	290 x 95	0.6	Developed	HDD crossing
ATWS-464	58.3	300 x 91	0.0	Wetland	HDD crossing
ATWS-464	58.4	300 x 91	0.6	Developed	HDD crossing
ATWS-805	58.6	115 x 35	0.1	Developed	Road crossing
ATWS-805	58.6	115 x 35	0.0	Forest	Road crossing
ATWS-806	58.6	117 x 25	0.1	Forest	Road crossing
ATWS-807	58.7	265 x 40	0.2	Open land	Topsoil segregation
ATWS-809	58.8	365 x 245	2.1	Agricultural	Construction of Laclede/Lange Delivery Station/hydrostatic testing
ATWS-809	58.8	365 x 245	0.0	Developed	Construction of Laclede/Lange Delivery Station/hydrostatic testing
North County Extension					
ATWS-873	0.0	395 x 25	0.2	Agricultural	Topsoil segregation
ATWS-874	0.1	255 x 25	0.2	Agricultural	Topsoil segregation
ATWS-875	0.3	140 x 25	0.1	Agricultural	Topsoil segregation
ATWS-875	0.3	140 x 25	0.0	Forest	Topsoil segregation
ATWS-876	0.3	90 x 25	0.1	Developed	Topsoil segregation
ATWS-876	0.3	90 x 25	0.0	Forest	Topsoil segregation
ATWS-877	0.4	260 x 25	0.2	Agricultural	Topsoil segregation
ATWS-878	0.4	100 x 50	0.1	Agricultural	Wetland crossing
ATWS-878	0.4	100 x 50	0.0	Forest	Wetland crossing
ATWS-879	0.5	100 x 50	0.1	Agricultural	Wetland crossing
ATWS-880	0.5	1,775 x 25	1.0	Agricultural	Topsoil segregation
ATWS-881	0.9	155 x 50	0.1	Agricultural	Topsoil segregation and waterbody crossing
ATWS-881	0.9	155 x 50	0.1	Forest	Topsoil segregation and waterbody crossing

Appendix B (continued) Location of Additional Temporary Workspaces for the Project					
ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-882	0.9	100 x 25	0.1	Forest	Waterbody crossing
ATWS-883	1.0	150 x 60	0.2	Open land	Road crossing
ATWS-884	1.1	95 x 25	0.1	Forest	Waterbody crossing
ATWS-885	1.2	400 x 25	0.2	Forest	Waterbody crossing
ATWS-886	1.6	245 x 65	0.4	Forest	HDD crossing
ATWS-887	1.6	245 x 90	0.5	Forest	HDD crossing
ATWS-888	1.6	100 x 50	0.0	Forest	Access road entrance / equipment
ATWS-888	1.6	100 x 50	0.1	Open land	Access road entrance / equipment
ATWS-889	2.3	275 x 45	0.3	Agricultural	HDD crossing
ATWS-890	2.3	350 x 140	0.9	Agricultural	HDD crossing
ATWS-890	2.3	350 x 140	0.2	Developed	HDD crossing
ATWS-890	2.3	350 x 140	0.0	Forest	HDD crossing
ATWS-891	2.4	750 x 25	0.4	Developed	Topsoil segregation
ATWS-891	2.4	750 x 25	0.0	Forest	Topsoil segregation
ATWS-891	2.4	750 x 25	0.0	Wetland	Topsoil segregation
ATWS-892	2.5	190 x 50	0.2	Forest	Wetland crossing
ATWS-893	2.6	105 x 25	0.1	Developed	Road crossing
ATWS-895	2.7	95 x 25	0.1	Open land	Road crossing
ATWS-894	2.7	1,450 x 25	0.8	Agricultural	Topsoil segregation
ATWS-894	2.7	1,450 x 25	0.1	Open land	Topsoil segregation
ATWS-896	2.9	100 x 50	0.1	Agricultural	Waterbody and wetland crossing
ATWS-897	3.0	100 x 50	0.1	Agricultural	Waterbody and wetland crossing
ATWS-898	3.0	2,175 x 25	0.0	Developed	Topsoil segregation
ATWS-898	3.2	2,175 x 25	1.2	Agricultural	Topsoil segregation
ATWS-899	3.6	3,310 x 215	15.8	Agricultural	HDD crossing
ATWS-899	3.8	3,310 x 215	0.2	Forest	HDD crossing
ATWS-899	3.8	3,310 x 215	0.0	Wetland	HDD crossing
ATWS-900	3.8	215 x 85	0.3	Agricultural	HDD crossing
ATWS-900	3.8	215 x 85	0.2	Forest	HDD crossing
ATWS-901	3.8	220 x 80	0.4	Agricultural	HDD crossing
ATWS-901	3.8	220 x 80	0.0	Forest	HDD crossing
ATWS-902	4.5	280 x 120	0.8	Open land	HDD crossing
ATWS-903	4.5	150 x 40	0.1	Open land	HDD crossing
ATWS-904	4.8	810 x 25	0.5	Agricultural	Topsoil segregation
ATWS-905	4.9	125 x 50	0.1	Agricultural	Road crossing
ATWS-906	5.0	415 x 25	0.2	Agricultural	Topsoil segregation
ATWS-907	5.0	125 x 50	0.1	Agricultural	Road crossing
ATWS-908	5.1	325 x 25	0.2	Agricultural	Topsoil segregation

Appendix B (continued)
Location of Additional Temporary Workspaces for the Project

ATWS Identification Number	Milepost	Approximate Dimensions (feet)	Acres[a]	Land Type	Justification
ATWS-909	5.2	105 x 25	0.1	Agricultural	Topsoil segregation
ATWS-910	5.3	100 x 50	0.1	Forest	Waterbody crossing
ATWS-911	5.3	100 x 25	0.1	Forest	Waterbody crossing
ATWS-912	5.3	100 x 25	0.1	Forest	Waterbody crossing
ATWS-913	5.4	335 x 25	0.2	Forest	Waterbody crossing and steep slope
ATWS-914	5.4	545 x 25	0.3	Forest	Waterbody crossing and steep slope
ATWS-915	5.6	655 x 25	0.4	Forest	Waterbody crossing and steep slope
ATWS-916	5.6	550 x 25	0.3	Forest	Waterbody crossing and steep slope
ATWS-917	5.8	830 x 25	0.5	Agricultural	Topsoil segregation
ATWS-918	6.0	160 x 95	0.4	Agricultural	Wetland crossing

ATWS = additional temporary workspace

[a] Acreage calculated from actual footprint, which may not correspond to the approximate dimensions. The acreages reported in this table have been rounded for presentation purposes.

APPENDIX C

PROPOSED ALTERNATIVE MEASURES TO THE FERC PROCEDURES

Appendix C
Proposed Alternative Measures to the FERC Procedures for the Project

Section of FERC's Procedures	Approximate Milepost[a]	Alternative Measure	Approximate Distance (feet)[b]	ATWS ID	Feature ID (Type)	Justification	Additional Protection Measures
Mainline							
VI.B.1.a	14.1	ATWS within 50 feet of wetland	49	ATWS-544	WIL-TMA-006 (PEM)	Wetland crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	14.5	ATWS within 50 feet of wetland	2	ATWS-548	WIL-TMA-007 (PEM)[c]	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	24.6	ATWS within 50 feet of wetland	50	ATWS-828	WIL-TMA-017 (PEM)	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	25.7	ATWS within 50 feet of wetland	29	ATWS-841	WIL-TMA-021 (PEM)	Wetland crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
V.B.2.a	25.7	ATWS within 50 feet of stream	35	ATWS-841	SIL-JJP-104 (Perennial)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
VI.B.1.a	28.6	ATWS within 50 feet of wetland	5	ATWS-620	WIL-JJP-102 (PEM)	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	35.2	ATWS within 50 feet of wetland	49	ATWS-634	WIL-CDK-007 (PUB)	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
V.B.2.a	35.2	ATWS within 50 feet of stream	49	ATWS-636	SIL-CDK-012 (Perennial)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	Approximate Milepost[a]	Alternative Measure	Approximate Distance (feet)[b]	ATWS ID	Feature ID (Type)	Justification	Additional Protection Measures
V.B.2.a	42.1	ATWS within 50 feet of stream	37	ATWS-928	SIL-WJW-009 (Intermittent)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
V.B.2.a	44.1	ATWS within 50 feet of stream	47	ATWS-745	SIL-WJW-015 (Ephemeral)	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
V.B.2.a	44.5	ATWS within 50 feet of stream	11	ATWS-365	SIL-WJW-014 (Ephemeral)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
V.B.2.a	44.5	ATWS within 50 feet of stream	14	ATWS-366	SIL-WJW-013 (Ephemeral)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
VI.B.1.a	44.7	ATWS within 50 feet of wetland	1	ATWS-747	WIL-WJW-003 (PUB)	Access road entrance/equipment	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	45.0	ATWS within 50 feet of wetland	0	ATWS-368	WIL-JJP-148 (PFO)	HDD entry/exit pit	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
V.B.2.a	45.0	ATWS within 50 feet of stream	42	ATWS-934	SIL-JJP-201 (Intermittent)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
V.B.2.a	45.0	ATWS within 50 feet of stream	0	ATWS-368	SIL-WJW-011 (Perennial)	HDD entry/exit pit	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
V.B.2.a	45.0	ATWS within 50 feet of stream	0	ATWS-369	SIL-JJP-200 (Perennial)	HDD entry/exit pit	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	**Approximate Milepost[a]**	**Alternative Measure**	**Approximate Distance (feet)[b]**	**ATWS ID**	**Feature ID (Type)**	**Justification**	**Additional Protection Measures**
V.B.2.a	45.0	ATWS within 50 feet of stream	0	ATWS-369	SIL-JJP-202 (Ephemeral)	HDD entry/exit pit	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
VI.B.1.a	45.1	ATWS within 50 feet of wetland	0	ATWS-920	WIL-JJP-148 (PFO)	to facilitate HDD crossing	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
V.B.2.a	45.1	ATWS within 50 feet of stream	0	ATWS-920	NHD-916 (N/A)	to facilitate HDD crossing	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
V.B.2.a	45.1	ATWS within 50 feet of stream	0	ATWS-920	SIL-JJP-200 (Perennial)	to facilitate HDD crossing	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
V.B.2.a	45.1	ATWS within 50 feet of stream	0	ATWS-920	SIL-WJW-010 (Perennial)	to facilitate HDD crossing	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
V.B.2.a	46.3	ATWS within 50 feet of stream	0	ATWS-372	SMO-TMA-008 (Ephemeral)	HDD pullback	Sediment barriers will be placed along the construction limits nearest to the waterbody. Timber matting will be placed over the portion of the waterbody that crosses into the construction limits.
V.B.2.a	46.6	ATWS within 50 feet of stream	0	ATWS-372	SMO-JJP-030 (Ephemeral)	HDD pullback	Sediment barriers will be placed along the construction limits nearest to the waterbody. Timber matting will be placed over the portion of the waterbody that crosses into the construction limits.
V.B.2.a	46.7	ATWS within 50 feet of stream	0	ATWS-372	SMO-TMA-011 (Ephemeral)	HDD pullback	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	**Approximate Milepost[a]**	**Alternative Measure**	**Approximate Distance (feet)[b]**	**ATWS ID**	**Feature ID (Type)**	**Justification**	**Additional Protection Measures**
V.B.2.a	46.9	ATWS within 50 feet of stream	0	ATWS-378	SMO-JJP-002 (Ephemeral)	Access road entrance / equipment	Sediment barriers will be placed along the construction limits nearest to the waterbody and will run along the entire length of the access road limits of construction adjacent to the waterbody. Timber matting will be used over the portion of the waterbody near the entrance to the access road to allow for construction equipment to access the construction corridor. Sediment barriers will be used on the edges of the timber mats to reduce runoff and around any portion of the waterbody not covered by timber mats within the construction limits.
V.B.2.a	46.9	ATWS within 50 feet of stream	31	ATWS-919	SMO-JJP-002 (Ephemeral)	Access road entrance / equipment	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
VI.B.1.a	49.6	ATWS within 50 feet of wetland	0	ATWS-774	WMO-JJP-012 (PEM)[c]	Topsoil segregation through active or rotated croplands	Upland soils will not be placed within wetlands identified within workspaces.
VI.A.3	49.7	Construction right-of-way width greater than 75 feet	0	-	WMO-JJP-012 (PEM)[c]	Wetland in an active agricultural field. Space needed for topsoil segregation.	Upland soils will not be placed within wetlands identified within workspaces.
VI.B.1.a	49.9	ATWS within 50 feet of wetland	0	ATWS-774	WMO-TMA-010 (PEM)[c]	Topsoil segregation through active or rotated croplands	Upland soils will not be placed within wetlands identified within workspaces.
VI.B.1.a	53.9	ATWS within 50 feet of wetland	0	ATWS-795	WMO-JJP-007 (PEM)[c]	Topsoil segregation through active or rotated croplands	Upland soils will not be placed within wetlands identified within workspaces.
VI.A.3	53.9	Construction right-of-way width greater than 75 feet	0	-	WMO-JJP-007 (PEM)[c]	Wetland in an active agricultural field. Space needed for topsoil segregation.	Upland soils will not be placed within wetlands identified within workspaces.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	**Approximate Milepost[a]**	**Alternative Measure**	**Approximate Distance (feet)[b]**	**ATWS ID**	**Feature ID (Type)**	**Justification**	**Additional Protection Measures**
VI.B.1.a	54.8	ATWS within 50 feet of wetland	0	ATWS-800	WMO-TMA-006 (PEM)[c]	Topsoil segregation through active or rotated croplands	Upland soils will not be placed within wetlands identified within workspaces.
VI.A.3	54.8	Construction right-of-way width greater than 75 feet	0	-	WMO-TMA-006 (PEM)[c]	Wetland in an active agricultural field. Space needed for topsoil segregation.	Upland soils will not be placed within wetlands identified within workspaces.
VI.B.1.a	57.2	ATWS within 50 feet of wetland	0	ATWS-449	WMO-TMA-003A (PEM)[c]	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	57.2	ATWS within 50 feet of wetland	0	ATWS-449	WMO-TMA-003 (PUB)[c]	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	57.4	ATWS within 50 feet of wetland	0	ATWS-449	WMO-TMA-002 (PEM)[c]	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	58.3	ATWS within 50 feet of wetland	36	ATWS-463	WMO-CDK-004 (PEM)	HDD entry/exit pit	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	58.3	ATWS within 50 feet of wetland	0	ATWS-464	WMO-CDK-005 (PEM)[c]	HDD entry/exit pit	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	58.3	ATWS within 50 feet of wetland	19	ATWS-464	WMO-CDK-004 (PEM)	HDD entry/exit pit	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
North County Extension							
V.B.2.a	1.2	ATWS within 50 feet of stream	40	ATWS-885	SMO-JJP-022 (Perennial)	Waterbody crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
VI.B.1.a	2.4	ATWS within 50 feet of wetland	0	ATWS-891	WMO-JJP-126 (PEM)	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	**Approximate Milepost[a]**	**Alternative Measure**	**Approximate Distance (feet)[b]**	**ATWS ID**	**Feature ID (Type)**	**Justification**	**Additional Protection Measures**
VI.A.3	2.4	Construction right-of-way width greater than 75 feet	0	-	WMO-JJP-126 (PEM)	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	2.4	ATWS within 50 feet of wetland	32	ATWS-891	WMO-JJP-127 (PEM)	HDD pullback	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	2.5	ATWS within 50 feet of wetland	2	ATWS-892	WMO-JJP-119 EXT 1 (PEM)	to facilitate HDD crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
VI.B.1.a	2.6	ATWS within 50 feet of wetland	44	ATWS-895	WMO-JJP-124 (PFO)	Road crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.
V.B.2.a	2.7	ATWS within 50 feet of stream	13	ATWS-894	NHD-959 (Intermittent)	Topsoil segregation	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into waterbodies.
V.B.2.a	3.4	ATWS within 50 feet of stream	0	ATWS-899	NHD-962 (Intermittent)	HDD pullback	Sediment barriers will be utilized to prevent the flow of spoil or silt-laden water into any waterbody.
VI.A.3	3.8	Construction right-of-way width greater than 75 feet	-	-	NWI-204 (PFO1C)	HDD pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	3.8	ATWS within 50 feet of wetland	0	ATWS-899	NWI-204 (PFO1C)	HDD Pullback	Spire will utilize timber mats for the protection of the wetland and the crossing of construction equipment.
VI.B.1.a	3.8	ATWS within 50 feet of wetland	2	ATWS-900	NWI-204 (PFO1C)	HDD entry/exit pit	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.

Appendix C (continued) Proposed Alternative Measures to the FERC Procedures for the Project							
Section of FERC's Procedures	**Approximate Milepost[a]**	**Alternative Measure**	**Approximate Distance (feet)[b]**	**ATWS ID**	**Feature ID (Type)**	**Justification**	**Additional Protection Measures**
VI.B.1.a	6.0	ATWS within 50 feet of wetland	48	ATWS-918	WMO-DFW-007 (PEM)	Road crossing	Sediment barriers will contain spoil within the construction right-of-way and prevent sediment flow into wetlands.

ATWS = additional temporary workspace

[a] Milepost based on nearest point between ATWS and pipeline where encroachment within 50-foot buffer or construction right-of-way occurs.

[b] Approximate distance rounded to nearest foot. ATWS within 50 feet approximate distance fall between 49.5 feet and 49.9 feet and are intended to maintain the 50-foot buffer from an environmental feature.

[c] Wetland crossed by ATWS or greater than 75-foot-wide construction right-of-way width is within areas consisting of cultivated or rotated cropland.

APPENDIX D

AGRICULTURAL IMPACT MITIGATION AGREEMENT

AMENDMENT #1 TO

AGRICULTURAL IMPACT MITIGATION AGREEMENT
between
SPIRE STL PIPELINE LLC
and the
ILLINOIS DEPARTMENT OF AGRICULTURE
Pertaining to the Construction of the
SPIRE STL PIPELINE PROJECT
A NATURAL GAS PIPELINE AND RELATED APPURTENANCES
in
SCOTT, GREENE and JERSEY COUNTIES, ILLINOIS

The Agricultural Impact Mitigation Agreement entered into between the above parties on March 15, 2017 is amended as follows:

1. The following language, which is the second paragraph of the agreement and relates to the description of the project, is struck:

   Spire is proposing to build, operate, and maintain the Spire STL Pipeline Project (Project). The Project consists of approximately 59 miles of new 24-inch-diameter natural gas pipeline commencing in Scott County, Illinois at an interconnect with the existing Rockies Express Pipeline LLC (REX) and traversing south through Greene and Jersey Counties, Illinois and into St. Charles and St. Louis Counties, Missouri. The 24-inch-diameter pipeline will tie into an existing 20-inch diameter pipeline in St. Louis County, Missouri that is currently owned and operated by Laclede Gas Company (LGC). As part of the Project, Spire also intends on modifying portions of this approximate 7.0-mile existing 20-inch-diameter pipeline to make it interstate serviceable. The Project will also include the construction of four new metering and regulating (M&R) facilities (one M&R facility in Scott County, Illinois and three M&R facilities in St. Louis County, Missouri), access roads and other minor aboveground appurtenant facilities. Construction is anticipated to commence in the first quarter of 2018.

2. The following language shall replace the language deleted above:

   Spire is proposing to build, operate, and maintain the Spire STL Pipeline Project (Project). The proposed Project will consist of approximately 65 miles of new, greenfield, 24-inch-diameter steel pipeline in two segments. The first segment (referred to as the "24-inch pipeline" portion of the Project) will originate at a new interconnect with the Rockies Express Pipeline LLC (REX) pipeline in Scott County, Illinois and extend approximately 59 miles through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east through St. Charles County, Missouri. The 24-inch pipeline then crosses the Missouri River into St. Louis County, Missouri, and terminates at a new interconnect with Laclede Gas Company (LGC). The second segment of new, greenfield pipeline (referred to as the "North County Extension"), will consist of a 24-inch-diameter steel pipeline which will extend approximately six miles from the LGC interconnect through the northern portion of St. Louis County and terminate at a new interconnect with Enable Mississippi River Transmission, LLC (Enable MRT) and LGC. The total length of the Project pipeline will be approximately 65 miles. The overall design capacity of the Project pipeline is expected to be 400,000 dekatherms per day (Dth/d). No compression will be required. The Project also includes the construction of three new metering and regulating (M&R) stations that provide interconnects with (1) REX in Illinois, (2) LGC in Missouri, and (3) Enable MRT and LGC in Missouri. Construction is anticipated to commence in the first quarter of 2018.

This Amendment shall be effective upon execution by both parties.

State of Illinois
DEPARTMENT OF AGRICULTURE

Raymond Poe
(signature)

Raymond Poe, Director

Illinois Department of Agriculture
63101 State Fairgrounds
P.O. Box 19281
Springfield, IL 62794-9281

Craig A. Sondgeroth
(signature)

By Craig Sondgeroth, General Counsel

801 E. Sangamon Avenue
Springfield, IL 62702

April 13, 2017

SPIRE STL PIPELINE LLC

Castor Armesto
(signature)

Castor Armesto, General Counsel

700 Market Street
St. Louis, Missouri 63101

April 12, 2017

AGRICULTURAL IMPACT MITIGATION AGREEMENT
between
SPIRE STL PIPELINE LLC
and the
ILLINOIS DEPARTMENT OF AGRICULTURE
Pertaining to the Construction of the
SPIRE STL PIPELINE PROJECT
A NATURAL GAS PIPELINE AND RELATED APPURTENANCES
in
SCOTT, GREENE and JERSEY COUNTIES, ILLINOIS

The Illinois Department of Agriculture (IDOA) and Spire STL Pipeline LLC (Spire) agree to the following measures which Spire will implement as it constructs a natural gas pipeline under agricultural land in Scott, Greene, and Jersey Counties, Illinois, as described in Spire's application to the Federal Energy Regulatory Commission (FERC) under Section 7(c) of the Natural Gas Act for a Certificate of Public Convenience and Necessity (Certificate), FERC Docket No. PF16-9-000, CP17-40-000. The mitigative actions outlined in this Agricultural Impact Mitigation Agreement (AIMA) will serve to minimize the negative impacts that may occur due to pipeline construction. The natural gas pipeline system subject to this AIMA is described below.

Spire is proposing to build, operate, and maintain the Spire STL Pipeline Project (Project). The Project consists of approximately 59 miles of new 24-inch-diameter natural gas pipeline commencing in Scott County, Illinois at an interconnect with the existing Rockies Express Pipeline LLC (REX) and traversing south through Greene and Jersey Counties, Illinois and into St. Charles and St. Louis Counties, Missouri. The 24-inch-diameter pipeline will tie into an existing 20-inch diameter pipeline in St. Louis County, Missouri that is currently owned and operated by Laclede Gas Company (LGC). As part of the Project, Spire also intends on modifying portions of this approximate 7.0-mile existing 20-inch-diameter pipeline to make it interstate serviceable. The Project will also include the construction of four new metering and regulating (M&R) facilities (one M&R facility in Scott County, Illinois and three M&R facilities in St. Louis County, Missouri), access roads and other minor aboveground appurtenant facilities. Construction is anticipated to commence in the first quarter of 2018.

In non-agricultural areas, the Project will require 50 feet of permanent easement and 40 feet of temporary workspace (which will revert to the Landowner upon completion of construction activities), a total of 90 feet of construction right-of-way. In agricultural areas, Spire will require 50 feet of permanent easement, 40 feet of temporary workspace and 25 feet of additional temporary workspace; a total of 115 feet of construction right-of-way.

If construction does not commence within two years from the issuance of the FERC's Certificate of Public Convenience and Necessity, the AIMA will be revised, with Spire's input, to reflect the IDOA's most current Pipeline Construction Standards and Policies. This AIMA, and any updated AIMA, will be filed with the FERC by Spire.

The construction standards and policies described below apply to construction activities occurring partially or wholly on privately owned agricultural land. With the exception of Item No. 3, they are not intended to apply to construction activities occurring entirely on public right-of-way, railroad right-of-way, publicly owned land, or privately owned land that is not agricultural land. Spire will, however, adhere to the construction standards relating to the repair of drain tile when drain tiles are encountered on public highways right-of-way, railroad right-of-way and publicly or privately owned land.

Introduction

Spire will retain qualified professionals on each construction phase of the Project. The qualified professionals may be engineers, soil scientists, agronomists and/or construction and environmental inspectors as appropriate during each phase of the Project. This shall include initial AIMA development, construction, initial restoration, and post-construction monitoring and follow-up restoration. The qualified professionals shall act to ensure that the provisions set forth in this document or in any separate agreement, will be adhered to in good faith by the Spire and by the Project construction contractor(s), and that all agreements protect the resources of both the Landowner and Spire.

The qualified professionals shall assist with the collection and analyzing of site-specific agricultural information gathered for the AIMA development by Spire. This information will be obtained through field review as well as direct contact with affected Landowners and farm operators, local County Soil and Water Conservation Districts (SWCDs), Agricultural Extension Agents and others. Spire shall provide a courtesy copy of the site-specific information to the appropriate local County SWCD(s) any time an AIMA modification is submitted.

Spire shall also retain Agricultural Inspectors that will work with the appropriate onsite Spire Project Inspectors and Project Contractors throughout the construction phase and through other phases as needed. Prior to such selection, the IDOA and Spire shall agree on the bidding process (including compensation). The Agricultural Inspectors will also maintain contact with the affected Landowners and farm Tenants in conjunction with Spire rights-of-way agents, as well as local SWCD personnel concerning farm resources and management matters pertinent to the agricultural operations and the site-specific implementation of the Agreement.

Spire will pay for the cost of the work performed by the Agricultural Inspectors that are, at a minimum, thoroughly familiar with the following:

This Agreement;
FERC's Plan and Procedures;
Pipeline Construction Sequences and Process;
Aspects of production agriculture, Illinois soils, soil and water conservation, and Farm operations.

The Agricultural Inspector will possess:

Good oral and written communication skills, and the ability to work closely with the Landowner, Tenants, Spire and Project contractor(s).

Spire agrees that a minimum of one Agricultural Inspector will be assigned per construction (installation) spread.

The Agricultural Inspector(s) shall train all pipeline contractors on the terms of this Agreement and provide a copy of the Agreement to them.

When permitted by law and contract, Spire shall encourage its pipeline contractor(s) to use, where and if available, local drain tile contractors to redesign, reconstruct, and/or repair any subsurface drain tile lines that are affected by the pipeline installation. Often, the local contractors have installed the Landowner's drain tile system and can have valuable knowledge as to the location, depth of cover, appurtenances, and any other factors affecting the tile operation. The drain tile contractor(s) shall follow the attached construction specifications (Refer to 3.D.).

Unless the easement or other agreement between the Landowner and Spire provides to the contrary, the actions specified in the pipeline standards and construction specifications contained in this AIMA will be implemented in accordance with the conditions listed below.

Conditions of the AIMA

The mitigative actions specified in the construction standards and policies set forth in this document below will be implemented in accordance with the conditions listed below:

A. All mitigative actions are subject to modification through negotiation by the Landowner and a representative of Spire, provided such changes are negotiated in advance of any construction, maintenance, or repairs.

B. Spire may negotiate with the Landowner to carry out the mitigative actions that Landowners wish to perform themselves.

C. All mitigative actions employed by Spire, unless otherwise specified in these construction standards and policies or in an easement negotiated with an individual Landowner, will be implemented within 45 days of completion of the pipeline facilities on any affected property, weather and Landowner permitting. Temporary repairs will be made by Spire during the construction process as needed to minimize the risk of additional property damage that may result from an extended construction time period. If weather delays the completion of any mitigative action beyond the 45 day period, Spire will provide the affected Landowner(s) with a written estimate of the time needed for completion of the mitigative action.

D. All mitigative actions will extend to associated future construction, maintenance and repairs by Spire.

E. Spire will provide the IDOA with one set of mailing labels of Landowners and known Tenants on agricultural land, on a county-by-county basis, who are crossed by the proposed pipeline. As the list of affected Landowners and Tenants is updated, Spire will notify the IDOA of any additions or deletions. All labels will be sent to the IDOA upon execution of this AIMA. The IDOA will use the labels for mailing this AIMA to each Landowner and Tenant. Spire shall provide postage reimbursement to the IDOA for mailing to all Landowners.

   The IDOA will also provide this AIMA to the County Farm Bureau and SWCDs offices in the affected counties for the purpose of holding Landowner informational meetings.

F. Every effort will be made by Spire to determine affected Landowners and Tenants along the route of the pipeline. Spire will endeavor to keep the Landowners and Tenants informed of the Project's status, meetings and other factors that may have an impact upon their farming operations.

G. After construction, Spire will provide the IDOA with "as built" drawings (strip maps) showing the location of all tile lines by survey station encountered in the construction of the pipeline. The drawings and GPS tile line repair coordinates will be provided on a county-by-county basis for distribution by the IDOA to the respective County SWCDs for the purpose of assisting Landowners with future drainage needs.

H. In addition, after all construction is complete, affected Landowners on agricultural land will receive a copy of the drainage tile repairs location map with GPS coordinates identified as the Project crosses their property.

I. Prior to the construction of the pipeline, Spire shall provide each Landowner or Landowner's Designate and Tenant with a telephone number and address which can be used to contact Spire, both during and following the completion of construction, regarding the work that was performed on their property or any other construction-related matter. Spire shall respond promptly to Landowner or Landowner's Designate and/or Tenant's telephone calls and correspondence.

J. Spire agrees to include this AIMA as part of its submissions to the FERC.

K. Spire will request that FERC includes a statement affirming Spire's adherence to the construction standards and policies in any environmental assessment and/or environmental impact statement that may be prepared on the Project.

L. Spire will implement all mitigative actions contained in this AIMA to the extent that they do not conflict with the requirements of applicable federal, state and local rules and regulations and other permits and approvals that are obtained by Spire for the Project.

M. Each mitigative action contained in this AIMA will be implemented to the extent that such mitigative action is not determined to be unenforceable by reason of the mitigative actions approved by, or other requirements of, the FERC Certificate issued for the Project or other State/Federal agency with permitting authority over the Project.

N. A forester with local expertise shall be hired by Spire to appraise the merchantable value of any timber to be cut for construction of the pipeline. The Landowner shall be compensated 100 percent of the value.

O. Spire will use good faith efforts to consult with both Landowners and Tenants of a given property in accordance with the terms of this AIMA.

P. Spire will incorporate by reference, the terms of this AIMA, in easement agreements executed with Landowners on Agricultural Land in Illinois. However, in the event of a conflict between this AIMA and an easement agreement, the easement agreement will control.

Definitions

Agricultural Impact Mitigation Agreement (AIMA)	The Agreement between Spire and the Illinois Department of Agriculture described herein.
Agricultural Land	Land used for cropland, hayland, pasture land, managed woodlands, truck gardens, farmsteads, commercial ag-related facilities, feedlots, livestock confinement systems, land on which farm buildings are located, and land in government set-aside programs.
Best Efforts	Diligent and commercially reasonable efforts to achieve a given objective or obligation.
Best Management Practices (BMPs)	Any structural, vegetative or managerial practice used to treat, prevent or reduce soil erosion. Such practices may include, but are not limited to, temporary seeding of exposed soils, construction of retention basins for storm water control and scheduling the implementation of all BMPs to maximize their effectiveness.
Cropland	Land used for growing row crops, small grains, or hay; includes land which was formerly used as cropland, but is currently in a government set-aside program and pastureland comprised of prime farmland.
Drainage Tile/Drain Tile	Artificial subsurface drainage system including, but not limited to, clay and concrete tile, vitrified sewer tile, corrugated plastic tubing, and stone drains.
U.S. Dept. of Energy, Federal Energy Regulatory Commission (FERC)	Federal agency that regulates the transmission and wholesale sale of electricity and natural gas in interstate commerce, and regulates the transportation of oil by pipeline in interstate commerce. FERC also reviews the siting of interstate natural gas pipelines, natural gas storage projects, and liquefied natural gas (LNG) terminals. FERC's scientific, legal, and economic experts evaluate the environmental, cultural, geological, land use, and socioeconomic aspects of the Project. As part of this review, FERC seeks written comments from the public and holds public scoping meetings (when required).
Landowner	Person(s) holding legal title to property on the pipeline route from whom Spire is seeking, or has obtained, a temporary or permanent easement, or any person(s) legally authorized by a Landowner to make decisions regarding the mitigation or restoration of agricultural impacts to such Landowner's property.

Landowner's Designate	Any person(s) legally authorized by a Landowner to make decisions regarding the mitigation or restoration of agricultural impacts to such Landowner's property.
Non-agricultural Land	Any land that is not "Agricultural Land" as defined above.
Parent Material	The unconsolidated mineral or organic material from which the true soil develops. Parent material is located below the subsoil strata and is not a rooting or growing medium. It will be removed from the right-of-way.
Pipeline	The 24-inch diameter natural gas pipeline, related aboveground facilities and appurtenances located in Scott, Greene and Jersey Counties in Illinois, as described in Spire's application to FERC for a Certificate of Public Convenience and Necessity.
Prime Farmland	Agricultural land comprised of soils that are defined by the USDA Natural Resources Conservation Service as being "prime" soils (generally considered the most productive soils with the least input of nutrients and management).
Right-of-way	The permanent easement and temporary workspace Spire acquires and utilizes for the purpose of constructing and operating the pipeline.
Spire	Spire STL Pipeline LLC and any contractor or sub-contractor in the employ of Spire for the purpose of completing construction of the pipeline or any mitigative actions covered by this Agreement.
Spread	Each major segment of project right-of-way where pipeline construction will occur. Spread length for a particular project may vary from a few miles up to ±60 miles.
Surface Drains	Any surface drainage system such as shallow surface field drains, grassed waterways, open ditches, or any other conveyance of surface water.
Tenant	Any person lawfully residing on or leasing/renting of the land.
Topsoil	The uppermost layer of the soil that has the darkest color or the highest content of organic matter, more specifically defined as the "A" horizon. The surface layer of the soil has the darkest color or the highest content of organic matter (as defined in the USDA County Soil Survey and verified with samples as stipulated under 2.A below).

Construction Standards and Policies

1. Pipeline depth

A. Except for aboveground piping facilities, such as mainline block valves, tap valves, meter stations, etc., the pipeline will be buried with:

1. A minimum of 5 feet of top cover where it crosses cropland.
2. A minimum of 5 feet of topcover where it crosses pasture land or other agricultural land comprised of soils that are classified by the USDA as being prime soils.
3. A minimum of 3 feet of top cover where it crosses pasture land and other agricultural land not comprised of prime soils.
4. A minimum of 3 feet of top cover where it crosses wooded/brushy land.
5. Essentially the same topcover as an existing parallel pipeline, but not less than 5 feet, where the route parallels an existing pipeline within a 100 foot perpendicular offset.

B. Notwithstanding the foregoing, in those areas where (i) rock in its natural formation and/or (ii) a continuous strata of gravel exceeding 200 feet in length are encountered, the minimum top cover will be 30 inches.

C. When the pipeline requires weights to keep it from floating, the pipeline will be buried deep enough to maintain the depth of topcover above the weights as specified in 1.A. above.

D. On agricultural land subject to erosion, Spire will patrol the pipeline right-of-way with reasonable frequency to detect areas of erosion of the top cover. In no instance will Spire knowingly allow the amount of top cover to be less than 36 inches as a result of natural erosion, except as stated in 1.B. above.

2. Topsoil Replacement

A. The topsoil depth shall be determined by a properly qualified soil scientist or soil technician (or qualified Agricultural Inspector) who will set stakes or flags every 200 feet along the right-of-way identifying the depth of topsoil to be removed.

B. The actual depth of the topsoil, not to exceed 36 inches, will first be stripped from the area to be excavated above the pipeline and from the adjacent subsoil storage area. The topsoil will be stored in a windrow parallel to the pipeline trench in such a manner that it will not become intermixed with subsoil materials.

C. All subsoil material that is removed from the trench will be placed in a second windrow parallel to the pipeline trench that is separate from the topsoil windrow.

D. Parent material is not rooting material and should never be spread over the right-of way. Any parent material encountered with excavation shall be separated and hauled off the right-of-way and disposed of as agreed by Spire and the Landowner.

E. In backfilling the trench, the stockpiled subsoil material will be placed back into the trench before replacing the topsoil.

F. Refer to Items No. 5.A. through 5.D. for procedures pertaining to rock removal from the subsoil and topsoil.

G. Refer to Items No. 7.A. through 7.F. for procedures pertaining to the alleviation of compaction of the topsoil.

H. The topsoil must be replaced so that after settling occurs, the topsoil's original depth and contour (with an allowance for settling) will be restored. The same shall apply where excavations are made for road, stream, drainage ditch, or other crossings. In no instance will the topsoil materials be used for any other purpose.

3. Repair of Damaged Tile Lines

If underground drainage tile is damaged by the pipeline's construction, it will be repaired in a manner that assures the tile line's proper operation at the point of repair. The following standards and policies shall apply to the tile line repair:

A. Spire will endeavor to locate all tile lines within the right-of-way prior to the pipeline's installation so repairs can be made if necessary. Spire will contact affected Landowners/ Tenants for their knowledge of tile line locations prior to the pipeline's installation. All identified tile lines will be staked or flagged prior to construction to alert construction crews to the possible need for tile line repairs. If previously unidentified, tile lines that are encountered and cut during grading or trenching activities will be flagged at that time.

B. All tile lines that are damaged, cut, or removed shall be staked or flagged with the stakes or flags placed in such a manner they will remain visible until the permanent repairs are completed.

C. If water is flowing through any damaged tile line, the tile line will be immediately and temporarily repaired until such time that permanent repairs can be made. If the tile lines are dry and water is not flowing, temporary repairs are not required if the permanent repairs can be made within 14 days of the time damage occurred; however, the exposed tile lines will be screened or otherwise protected to prevent the entry of foreign materials, small mammals, etc. into the tile lines.

D. Where tile lines are severed by the pipeline trench, repairs shall be made using the IDOA Tile Line Repair Drawings, Temporary and Permanent, 2015 (see Figures 1 and 2) or the Tile Bridge Permanent Repair.

E. There will be a minimum of one foot of separation (or a separation to be specified by Spire during the time of construction that may exceed, but will not be less than one foot, between the tile line and the pipeline whether the pipeline passes over or under the tile line.

F. The original tile line alignment and gradient shall be maintained. A laser transit shall be used to ensure the proper gradient is maintained. A laser operated tiling machine shall be used to install or replace tiling segments of 100 linear feet or more.

G. Before completing permanent tile repairs, all tile lines will be probed or examined by other suitable means on both sides of the trench for their entire length within any work areas to check for tile that might have been damaged by vehicular traffic or construction equipment. If tile lines are found to be damaged, they must be repaired so they operate as well after construction as before the construction began.

H. All permanent tile line repairs must be made within 14 days of the pipeline being laid in the trench on the Landowner's property, weather and soil conditions permitting.

I. Following completion of the pipeline, Spire will be responsible for correcting all tile line repairs that fail due to pipeline construction, provided those repairs were made by Spire. Spire will not be responsible for tile line repairs that Spire pays the Landowner to perform.

J. Spire will use good faith efforts to consult with both Landowners and Tenants of a given property as appropriate.

4. Installation of Additional Tile Lines

A. Spire shall be responsible for installing such additional drainage tile and other drainage measures as are necessary to properly drain wet areas on the permanent and temporary easements caused by the construction and/or existence of the pipeline.

B. Where the pipeline's route parallels an existing pipeline within a 200-foot perpendicular offset, Spire shall be responsible for installing tile and/or other drainage measures, as necessary, to properly drain the area between the two pipelines to the extent the wet areas between the pipelines are caused by the construction and/or existence of the pipeline.

C. It is presumed that any wet areas located in permanent and temporary easements and/or between the two parallel pipelines are caused by the construction and/or existence of the new pipeline unless Spire can prove that the construction and/or existence of the new pipeline is not the cause of the wet areas.

5. Rock Removal

The following rock removal procedures only pertain to rocks found in the uppermost 42 inches of soil, the common freeze zone in Illinois.

A. Before replacing any topsoil, all rocks greater than 3 inches in any dimension will be removed from the surface of all exposed subsoil and from all subsoil that is replaced back in the trench.

B. As the topsoil is replaced, all rocks greater than 3 inches in any dimension will be removed from the topsoil.

C. If trenching, blasting, or boring operations are required through rocky terrain, suitable precautions will be taken to minimize the potential for oversized rocks to become interspersed with adjacent soil material.

D. Rocks and soil containing rocks removed from the subsoil areas, topsoil, or from any excavations, will be hauled off the Landowner's premises or disposed of on the

Landowner's premises at a location that is mutually acceptable to the Landowner and Spire. Haul off and/or disposal locations cannot conflict with Spire's FERC Certificated workspace allowance.

6. Removal of Construction Debris

All construction-related debris and material that are not an integral part of the Project will be removed from the Landowner's property. Such material to be removed would include litter generated by the construction crews. Litter shall be removed daily.

7. Compaction, Rutting, Fertilization, Liming

A. After the topsoil has been replaced, all areas that were traversed by vehicles and construction equipment will be ripped at least 18 inches deep and all pasture and woodland will be ripped at least 12 inches deep. The existence of tile lines or underground utilities may necessitate less depth. The entire right-of-way will then be disked. Decompaction shall be conducted according to the guideline provided in Appendices A and B.

B. When done correctly with the proper equipment and soil conditions, ripping across any agricultural land <u>should only take one pass</u>. Additional passes should only be conducted if the previous pass did not sufficiently shatter the soil.

C. All ripping and disking will be done at a time when the soil is dry enough for normal tillage operations to occur on undisturbed farmland adjacent to the areas to be ripped.

D. Spire will restore all rutted land within the right-of-way to its original condition.

E. The cost of applying fertilizer, manure, and/or lime will be included in the damages paid to the Landowner, thereby allowing the Landowner to apply the appropriate type and amounts of fertilizer, manure, and/or lime as needed depending on the crops contemplated and the construction schedule.

F. If there is any dispute between the Landowner and Spire as to what areas need to be ripped, the depth at which compacted areas should be ripped, or the necessity or rates of lime and fertilizer application, the appropriate County SWCD's opinion shall be considered by Spire and the Landowner.

8. Land Leveling

A. Following the completion of the pipeline, Spire will restore the right-of-way to its original pre-construction elevation and contour should uneven settling occur or surface drainage problems develop as a result of pipeline construction.

B. Spire will provide the Landowners with a telephone number and address that may be used to alert Spire of the need to perform additional land leveling services.

C. If, in the future, uneven settling occurs or surface drainage problems develop as a result of the pipeline construction, Spire will provide such land leveling services within 45 days of a Landowner's written notice, weather and soil conditions permitting or at a time agreed upon by the Landowner and Spire.

D. If there is any dispute between the Landowner and Spire as to what areas need additional land leveling beyond that which is done at the time of construction, it shall be Spire's responsibility to disprove the Landowner's claim that additional land leveling is warranted.

9. Construction During Wet Weather

Except as provided below, construction activities are not allowed on farmland where normal farming operations, such as plowing, disking, planting or harvesting, cannot take place due to excessively wet soils. Wet weather conditions are to be determined on a field by field basis and not for the project as a whole.

A. Construction activities on prepared surfaces, surfaces where topsoil and subsoil have been removed, heavily compacted in preparation, or otherwise stabilized (e.g. through cement mixing) may occur at the discretion of the Company in wet weather conditions.

B. Construction activities on unprepared surfaces will be done only when work will not result in excessive rutting creating an excessive mixing of subsoil and topsoil. Determination as to the potential of subsoil and topsoil mixing will be in consultation with the underlying Landowner, or, if approved by the Landowner, his/her designated Tenant.

10. Backfill Profile and Trench Crowning

A. In all agricultural land areas, trench crowning shall occur during the trench backfilling operation using subsoil materials over the trench to allow for trench settling, to be followed by topsoil replacement. Due to the increased elevation of the crown compared to the rest of the right-of-way, surface drainage across the trench may be hindered until the crown has settled completely.

B. Surface drainage should not be permanently blocked or hindered in any way. If excess soil is encountered, it will be removed offsite to prevent ridging, unless the Landowner and Spire agree otherwise. Adding additional soil to the crown over the trench in excess of that required for settlement will not be permitted. In areas where minor trench settling occurs after topsoil spreading, land leveling or imported topsoil shall be used to fill each depression. In areas where major trench settling occurs after topsoil spreading, and land leveling cannot be utilized; imported topsoil shall be used to fill each depression of significant depth. Topsoil from the adjacent agricultural land outside of the construction footprint shall not be used to fill the depressions.

C. In agricultural areas where the materials excavated during trenching are insufficient in quantity to meet backfill requirements, the soil from any agricultural land adjacent to the trench and construction zone shall not be used as either backfill or surface cover material.

<u>Under no circumstances</u> shall any topsoil materials be used for pipe padding material or trench backfill. In situations where imported soil materials are employed for backfill on agricultural lands, such material shall be of similar texture and quality to the existing soils on site. Imported soils should be free from noxious weeds and other pests to the extent possible.

D. Parent material consists of the C horizon and may or may not consist of materials similar to those from which the A and B horizons developed. It may be blue clay; it may include rocks or sand. It will not promote or support viable plant growth. Under no circumstances is this material to be placed in the trench above the pipe or spread across the easement as part of the leveling material unless agreed to by the Landowner. Parent material is to be stored separated away from the topsoil and subsoil piles. It will be removed from the right-of-way.

11. Prevention of Soil Erosion

A. Spire will work with Landowners to prevent excessive erosion on right-of-way that has been disturbed by construction. Reasonable methods will be implemented to control erosion. This is not a requirement, however, if the land across which the pipeline is constructed is bare cropland that the Landowner intends to leave bare until the next crop is planted.

B. If the Landowner and Spire cannot agree upon a reasonable method to control erosion on the right-of-way, the recommendations of the appropriate County SWCD shall be considered by Spire and the Landowner.

12. Repair of Damaged Soil Conservation Practices

All soil conservation practices (such as terraces, grassed waterways, etc.), which are damaged by the pipeline's construction, will be restored to reflect at least a substantially similar condition to its pre-construction condition in consultation with the local SWCD. And in accordance with USDA Natural Resources Conservation Service standards.

A. Spire will repair or pay the Landowner to repair any soil conservation practices (such as terraces, grassed waterways, etc.), which are damaged by the pipeline's construction.

B. If Spire is responsible for repairing any damaged soil conservation practices, the repairs will be made in accordance with the specifications of the local SWCD.

C. The work set forth in this section will be done within 45 days, weather and Landowner permitting, after the pipeline has been constructed.

13. Damages to Private Property

A. Spire will reasonably compensate Landowners for any construction-related damages caused by Spire that occur on or off of the established pipeline right-of-way.

B. Compensation for damages to private property caused by Spire shall extend beyond the initial construction of the pipeline, to include those damages caused by Spire during future construction, operation, maintenance, and repairs relating to the pipeline.

C. Spire will reimburse Landowner, on a timely basis, for all agricultural production inputs (fertilizers of all types and kinds) needed to restore crop productivity to the right-of-way, the temporary work space, or any other portion of Landowner's property where crop yields are diminished by reason of the construction, repair, maintenance and inspection activities of Spire. This shall be a continuing obligation of Spire until crop growth and vigor are similar to adjacent undisturbed portions of the same field, in accordance with Spire's crop loss payments as part of each Landowner easement agreement. Also, Spire shall make available to Landowner the name and contact information of a person acting on behalf of Spire with whom the Landowner can communicate information with regard to diminished crop yields, and need for reimbursement of cost of agricultural inputs. That person will have a background related to soil productivity and crop production.

14. Clearing of Trees and Brush from the Easement

A. If trees are to be removed from the right-of-way, Spire will consult with the Landowner to determine if there are trees of commercial or other value to the Landowner.

B. If there are trees of commercial or other value to the Landowner, Spire will allow the Landowner the right to retain ownership of the trees with the disposition of the trees to be negotiated prior to the commencement of land clearing. Spire's ability to transport and/or stockpile trees will be restricted to the confines of the FERC Certificated workspace.

C. Unless otherwise restricted by federal, state or local regulations, Spire will follow the Landowner's desires regarding the removal and disposal of trees, brush, and stumps of no value to the Landowner by burning, burial, etc., or complete removal from any affected property.

15. Interference with Irrigation Systems

A. If the pipeline and/or temporary work areas intersect an operational (or soon to be operational) spray irrigation system, Spire will establish with the Landowner an acceptable amount of time the irrigation system may be out of service.

B. If, as a result of pipeline construction activities, an irrigation system interruption results in crop damages, either on the pipeline right-of-way or off the right-of-way, the Landowner will be reasonably compensated for all such crop damages that are attributed to the system interruption.

C. If it is feasible and mutually acceptable to Spire and the Landowner, temporary measures will be implemented to allow an irrigation system to continue to operate across land on which the pipeline is also being constructed.

16. Ingress and Egress Routes

Prior to the pipeline's installation, Spire and the Landowner will reach a mutually acceptable agreement on the route that will be utilized for entering and leaving the pipeline right-of-way should access to the right-of-way not be practical or feasible from adjacent segments of the pipeline right-of-way or from public highway or railroad right-of-way. Access routes on non-public travel ways will be restricted to the confines of the FERC Certificated workspace.

17. Temporary Roads

A. The location of temporary roads to be used for construction purposes will be negotiated with the Landowner and would be restricted to the confines of the FERC Certificated workspace.

B. The temporary roads will be designed to not impede surface drainage and will be built to minimize soil erosion on or near the temporary roads.

C. Upon abandonment, temporary roads may be left intact through mutual agreement of the Landowner and Spire unless otherwise restricted by federal, state, or local regulations.

D. If the temporary roads are to be removed, the rights-of-way upon which the temporary roads are constructed will be returned to their previous use(s) and restored to equivalent condition(s) as existed prior to their construction. All temporary access roads that are removed shall be ripped to a depth of 18 inches. All ripping will be done consistent with Items 7.A. through 7.F.

18. Weed Control

A. On any right-of-way over which Spire has jurisdiction as to its surface use, (i.e., valve sites, metering stations, etc.), Spire will provide for weed control in a manner that prevents the spread of weeds onto adjacent lands used for agricultural purposes. Spraying will be done by a pesticide applicator that is appropriately licensed for doing such work in the State of Illinois.

B. Spire will be responsible for reimbursing all reasonable costs incurred by owners of land adjacent to surface facilities when the Landowners must control weeds on their land which can be determined to have spread from land accommodating pipeline surface facilities, should Spire fail to do so after being given written notice and a 45-day opportunity to respond.

19. Pumping of Water from Open Trenches

A. In the event it becomes necessary to pump water from open trenches, Spire will pump the water in a manner that will avoid damaging adjacent agricultural land, crops, and/or pasture. Such damages include, but are not limited to, inundation of crops for more than 24 hours, deposition of sediment in ditches and other water courses, and the deposition of subsoil sediment and gravel in fields and pastures.

B. If it is impossible to avoid water-related damages as described in Item 19.A. above, Spire will reasonably compensate the Landowners for the damages or will correct the damages so as to restore the land, crops, pasture, water courses, etc. to their pre-construction condition.

C. All pumping of water shall comply with existing drainage laws, local ordinances relating to such activities, and provisions of the Clean Water Act.

20. Aboveground Facilities

Locations for aboveground facilities shall be selected in a manner so as to be as unobtrusive as reasonably possible to ongoing agricultural activities occurring on the land adjacent to the facilities. First priority shall be made to locating aboveground facilities on right-of-way that is not used as cropland. If this is not feasible, such facilities shall be located so as to incur the least hindrance to the adjacent cropping operations (i.e., located in field corners or areas where at least one side is not used for cropping purposes).

21. Advance Notice of Access to Private Property

A. Spire will provide the Landowner or Tenant with a minimum of 24 hours prior notice before accessing his/her property for the purpose of constructing the pipeline.

B. Prior notice shall first consist of a personal contact or a telephone contact, whereby the Landowner or Tenant is informed of Spire's intent to access the land. If the Landowner or Tenant cannot be reached in person or by telephone, Spire will mail or hand deliver to the Landowner or Tenant's home a dated, written notice of Spire's intent. The Landowner or Tenant need not acknowledge receipt of the written notice before Spire can enter the Landowner's property.

22. Reporting of Inferior Agricultural Impact Mitigation Work

No later than 45 days prior to the commencement of the pipeline construction across a Landowner's property, Spire will provide the Landowner with a toll-free number the Landowner can call to alert Spire should the Landowners observe inferior agricultural impact mitigation work which is being done or has been carried out on his/her property.

23. Indemnification

Spire will indemnify all owners and farm tenants of agricultural land upon which such pipeline is installed, their heirs, successors, legal representatives, assigns (collectively "Indemnitees"), from and against all claims by third parties losses incurred thereby, and reasonable expenses, resulting from or arising out of personal injury, death, injury to property, or other damages or liabilities of any sort related to the design, laying, maintenance, removal, repair, use or existence of such pipeline, whether heretofore or hereafter laid, including damages caused by such pipeline or any of its appurtenances and the leaking of its contents, except where claims, injuries, suits, damages, costs, losses, and expenses are caused by the negligence or intentional acts, or willful omissions of such Indemnitees and/or their invitees, including contractors, provided further that such Indemnitees shall tender any such claim as soon as possible upon receipt of notice thereof to Spire. For activities undertaken by the Indemnitees and/or invitees near the pipeline, failure by such Indemnitees and/or invitees to call the **Illinois 811, *Call Before You Dig*** line shall be deemed negligence if the pipeline is not clearly marked by signs.

24. General Monitoring and Remediation

This Plan establishes construction and restoration guidelines to limit adverse effects to agricultural resources and to return the affected lands to productive agricultural use with a level of production consistent with that of the lands immediately adjacent to the right-of-way. Post construction and restoration situations may occur as a result of the pipeline construction which requires further restoration or corrective activities. These areas potentially requiring further restoration or corrective activities will be brought to Spire's attention through Landowner or Tenant contacts with Spire right-of-way staff or as a result of Spire's monitoring of the pipeline right-of-way in accordance with the FERC Plan and Procedures.

Concurrence of the Parties to this AIMA

The Illinois Department of Agriculture and Spire STL Pipeline LLC concur that this AIMA is the complete instrument governing the mitigation of agricultural impacts that may result from the construction of the natural gas pipeline in Scott, Greene and Jersey Counties within the State of Illinois.

The effective date of this AIMA commences on the date of execution.

State of Illinois
DEPARTMENT OF AGRICULTURE

Raymond Poe
(signature)

Raymond Poe, Director

Illinois Department of Agriculture
63101 State Fairgrounds
P.O. Box 19281
Springfield, IL 62794-9281

Craig J. Sondgeroth
(signature)

By Craig Sondgeroth, General Counsel

801 E. Sangamon Avenue
Springfield, IL 62702

March 15, 2017

SPIRE STL PIPELINE LLC

Castor J. Armesto
(signature)

Castor Armesto, General Counsel

700 Market Street
St. Louis, Missouri 63101

March 3, 2017

Appendix A.

Guidelines for Conducting Proper and Successful Decompaction

1. Decompaction is required when all three conditions apply.
   A. the area has been trafficked or traversed by vehicles or construction equipment, and
   B. the soil penetrometer readings are 300 psi or greater, and
   C. The soil strength (psi) in the right-of-way area is greater than that of the non-trafficked area.

2. An Environmental and/or Agricultural Inspector (AI), with experience and training in the proper identification of compacted soil and operation methods of deep decompaction tools is required to observe the daily operation of the ripper/subsoiler to ensure the conditions are appropriate for decompaction efforts and that the proper equipment is utilized and that equipment is set-up and operated correctly.

3. To achieve the most effective shatter of the compacted soil the following guidelines have been established:
   A. Conduct ripping when the soil is dry. Follow the "Soil Plasticity Test Procedures" detailed in Appendix B to determine if soil conditions are adequately dry to conduct decompaction efforts.
   B. Deep ripping shall be conducted using a ripper or subsoiling tool with a shank length of no less than 18 inches and a shank spacing of approximately the same measurement as the shank length.
   C. Use a ripper with a knife length of no less than 2 inches more than the desired depth of decompaction.
   D. To best promote revegetation and restore crop production, a total depth of 30 or more inches of soil (topsoil plus subsoil) is required.
   E. The minimum depths of decompaction stated above in 3.D. are required where possible. A safe distance from sub-surface structures (tile drains, pipelines, buried utilities, bedrock, etc.) must be maintained at all times. Where such structures exist, a lesser depth of decompaction will be required to prevent damage to equipment and the structures as well as to maintain a safe work environment. The allowable decompaction depth in these instances will be determined on a site by site basis.
   F. When the knives are in the soil to the desired depth, the tongue of the ripper should be parallel to the surface of the ground.
   G. Select a tractor that has enough horsepower to pull the ripper at a speed of 1.5 to 2 mph and whose footprint is of equal or lesser width than the ripper. Tracked equipment is preferred and typically required to achieve this criteria.
   H. The ripper shanks should not create ruts, channels, or mixing of the sub-soil with topsoil. A speed of 1.5 to 2 mph is recommended to minimize the risk of rutting and soil mixing. The ideal operating speed can vary with soil characteristics, tractor and ripping tool used. An excessive travel speed will often increase mixing of soil horizons.
   I. When the equipment is set up and operated correctly, the ripper should create a wave across the surface of the ground as it lifts and drops the soil.

J. Make one ripping pass through the compacted area. Using a penetrometer, the AI will measure the PSI between the ripped knife tracks to determine if the single ripping pass was successful. Additional passes should only be used where needed as they may reduce the effectiveness of the ripping by recompacting the soil shattered in the previous pass.

K. If the first pass does not successfully decompact the soil, additional passes will be needed. Should multiple passes of the ripper be needed to achieve decompaction between the knives tracks of the ripping tool, the subsequent passes should be positioned so the knife tracks from the previous pass are split by the second pass. If three or more passes have been made and sufficient decompaction has not yet been achieved the AI may choose to halt further decompaction efforts in that area until conditions improve or better methods are determined.

L. Following ripping, all stone and rock three or more inches in size which has been lifted to the surface shall be collected and removed from agricultural areas.

M. After ripping has been conducted, do not allow unnecessary traffic on the ripped area.

N. In agricultural lands and croplands that will not be replanted to vegetation by the Company, recommend to landowners to plant a cover crop (cereal rye, clover, alfalfa, tillage radish, turnips, etc.) following decompaction. Reduced compaction created by the ripper pass will not remain over time without subsequent root penetration. Root penetration into the shattered soil is necessary to establish permanent stabilized channels to conduct air and water into the soil profile. Two good sources for landowner cover crop education are http://www.mccc.msu.edu/CCinfo/cropbycrop.html and http://mcccdev.anr.msu.edu/. For local expertise, consult with your county's Soil and Water Conservation District /USDA Natural Resource Conservation Service (NRCS) office for cover crop selection and compliance with NRCS planting deadlines.

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Appendix B.

Soil Plasticity Test Procedures

The Agricultural Inspector will test the consistency of the surface soil to a depth of approximately 4 to 8 inches using the Field Plasticity Test procedure developed from the *Annual Book of ASTM Standards, Plastic Limit of Soils* (ASTM D-4318).

1. Pull a soil plug from the area to be tilled, moved, or trafficked to a depth of 4-8 inches.

2. Roll a portion of the sample between the palms of the hands to form a wire with a diameter of one-eighth inch.

3. The soil consistency is:

   A. Tillable (able to be worked) if the soil wire breaks into segments not exceeding 3/8 of an inch in length.

   B. Plastic (not tillable) if the segments are longer than 3/8 of an inch before breaking.

4. This Procedure is to be used to aid in determining when soil conditions are dry enough for construction activities to proceed.

5. Once the soil consistency has been determined to be of adequate dryness, the plasticity test is not required again until the next precipitation event.

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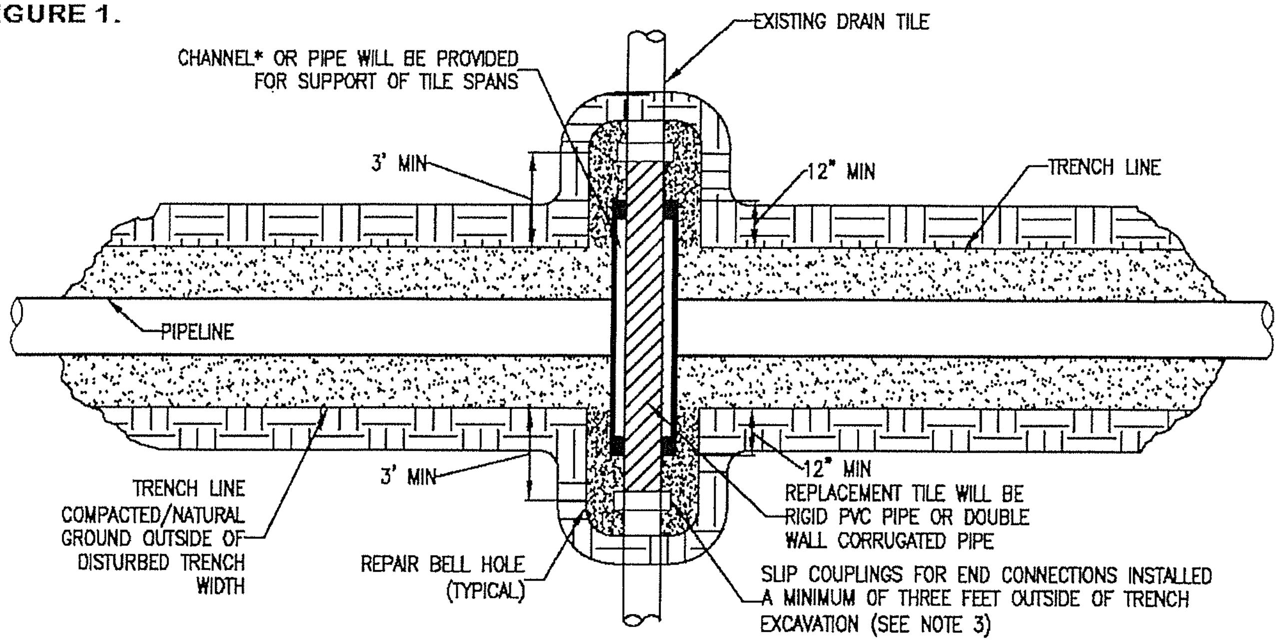
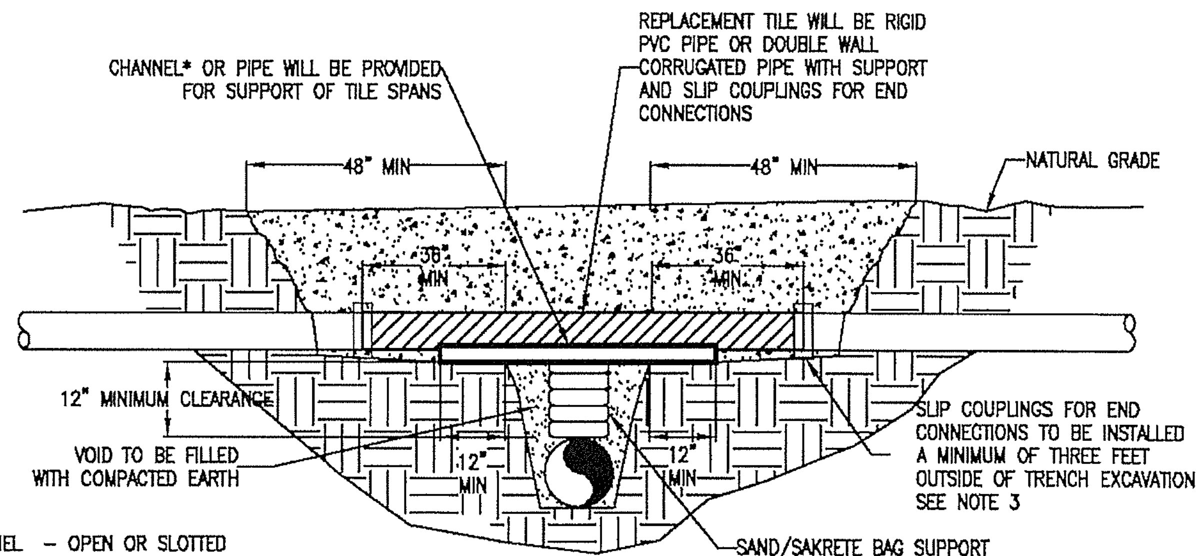
FIGURE 1.



PLAN
N.T.S.



*CHANNEL – OPEN OR SLOTTED CORRUGATED GALVANIZED, PVC OR ALUMINUM CRADLE TO SUPPORT DRAIN TILE.

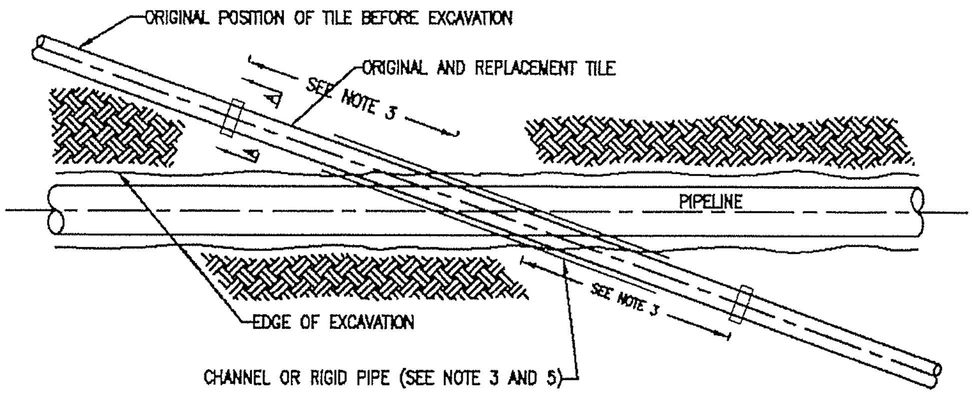
CROSS SECTION
N.T.S.

NOTE:

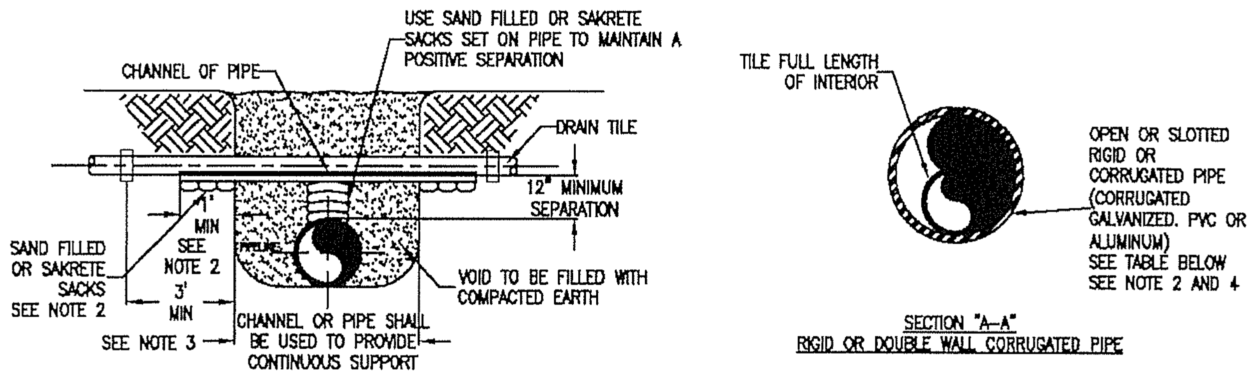
1. IMMEDIATELY REPAIR TILE IF WATER IS FLOWING THROUGH TILE AT TIME OF TRENCHING. IF NO WATER IS FLOWING AND TEMPORARY REPAIR IS DELAYED, OR NOT MADE BY THE END OF THE WORK DAY, A SCREEN OR APPROPRIATE 'NIGHT CAP' SHALL BE PLACED ON OPEN ENDS OF TILE TO PREVENT ENTRAPMENT OF ANIMALS ETC.
2. CHANNEL OR PIPE (OPEN OR SLOTTED) MADE OF CORRUGATED GALVANIZED PIPE, PVC OR ALUMINUM WILL BE USED FOR SUPPORT OF DRAIN TILE SPANS.
3. INDUSTRY STANDARDS SHALL BE FOLLOWED TO ENSURE PROPER SEAL OF REPAIRED DRAIN TILES.

TEMPORARY DRAIN TILE REPAIR

FIGURE 2.



PLAN VIEW



END VIEWS

MINIMUM SUPPORT TABLE				
TILE SIZE	CHANNEL SIZE		PIPE SIZE	
3"	4" @ 5.4	#/ft	4"	STD. WT.
4"-5"	5" @ 6.7	#/ft	6"	STD. WT.
8"-9"	7" @ 9.8	#/ft	9"-10"	STD. WT.
10"	10" @ 15.3	#/ft	12"	STD. WT.

NOTE:

1. TILE REPAIR AND REPLACEMENT SHALL MAINTAIN ORIGINAL ALIGNMENT GRADIENT AND WATER FLOW TO THE GREATEST EXTENT POSSIBLE. IF THE TILE NEEDS TO BE RELOCATED, THE INSTALLATION ANGLE MAY VARY DUE TO SITE SPECIFIC CONDITIONS AND LANDOWNER RECOMMENDATIONS.

2. 1'–0" MINIMUM LENGTH OF CHANNEL OR RIGID PIPE (OPEN OR SLOTTED CORRUGATED GALVANIZED. PVC OR ALUMINUM CRADLE) SHALL BE SUPPORTED BY UNDISTURBED SOIL, OR IF CROSSING IS NOT AT RIGHT ANGLES TO PIPELINE, EQUIVALENT LENGTH PERPENDICULAR TO TRENCH. SHIM WITH SAKRETE, OR SAND BAGS TO UNDISTURBED SOIL FOR SUPPORT AND DRAINAGE GRADIENT MAINTENANCE (TYPICAL BOTH SIDES).

3. DRAIN TILES WILL BE PERMANENTLY CONNECTED TO EXISTING DRAIN TILES A MINIMUM OF THREE FEET OUTSIDE OF EXCAVATED TRENCH LINE USING INDUSTRY STANDARDS TO ENSURE PROPER SEAL OF REPAIRED DRAIN TILES INCLUDING SLIP COUPLINGS.

4. DIAMETER OF RIGID PIPE SHALL BE OF ADEQUATE SIZE TO ALLOW FOR THE INSTALLATION OF THE TILE FOR THE FULL LENGTH OF THE RIGID PIPE.

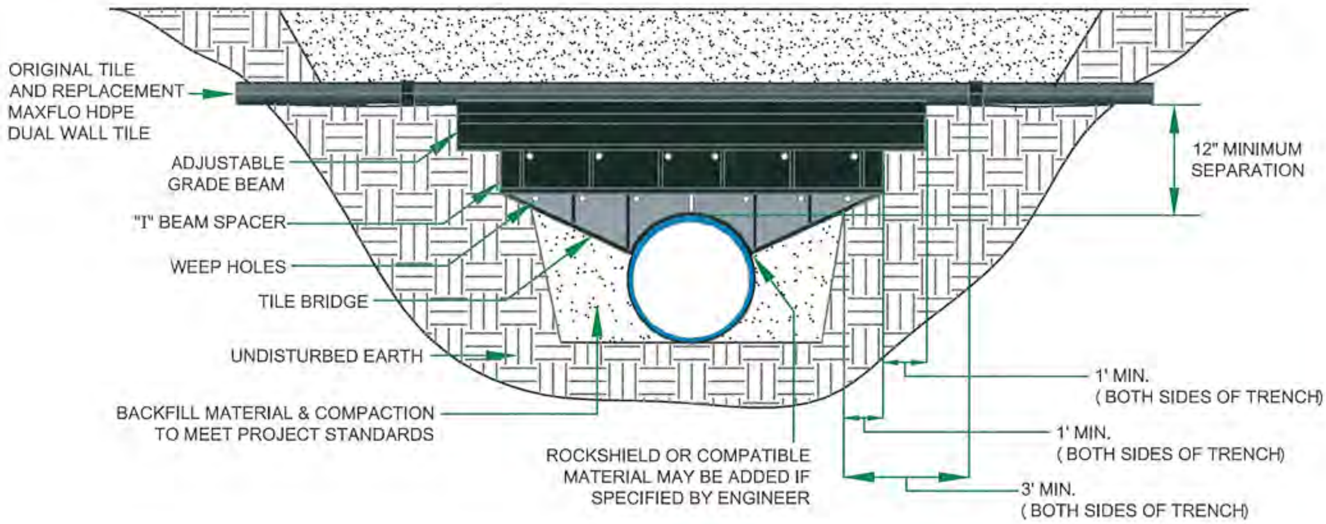
5. OTHER METHODS OF SUPPORTING DRAIN TILE MAY BE USED IF ALTERNATE PROPOSED IS EQUIVALENT IN STRENGTH TO THE CHANNEL/PIPE SECTIONS SHOWN AND IF APPROVED BY COMPANY REPRESENTATIVES AND LANDOWNER IN ADVANCE. SITE SPECIFIC ALTERNATE SUPPORT SYSTEM TO BE DEVELOPED BY COMPANY REPRESENTATIVES AND FURNISHED TO CONTRACTOR FOR SPANS IN EXCESS OF 20', TILE GREATER THEN 10" DIAMETER, AND FOR "HEADER" SYSTEMS.

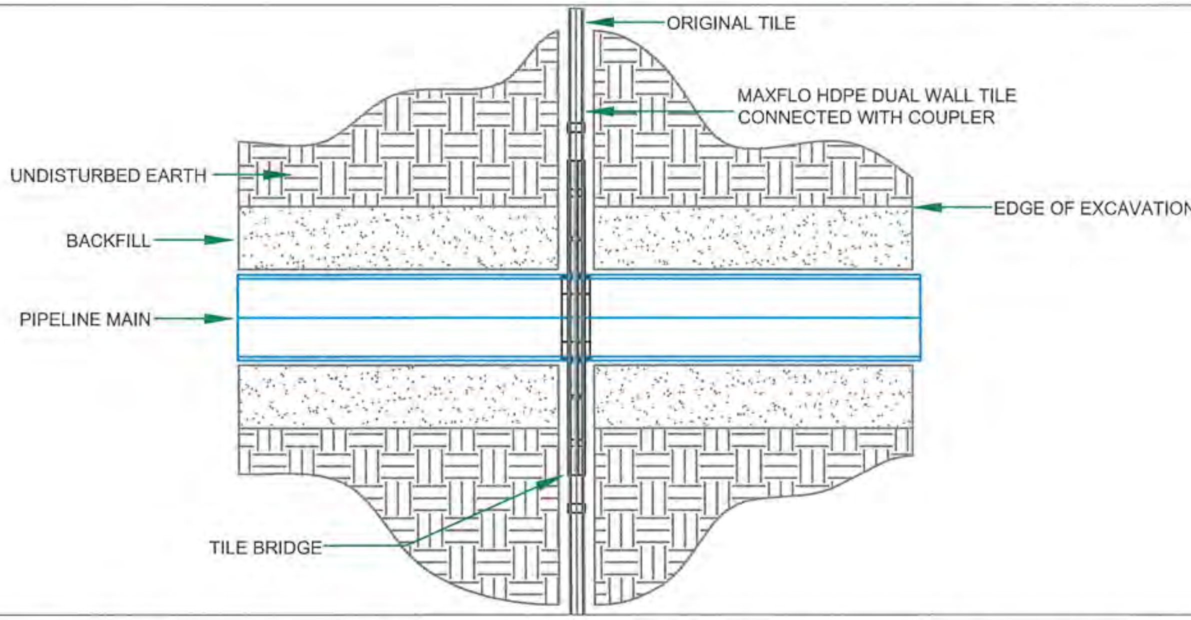
6. ALL MATERIAL TO BE FURNISHED BY CONTRACTOR.

7. PRIOR TO REPAIRING TILE, CONTRACTOR SHALL PROBE LATERALLY INTO THE EXISTING TILE TO FULL WIDTH OF THE RIGHTS OF WAY TO DETERMINE IF ADDITIONAL DAMAGE HAS OCCURRED. ALL DAMAGED/DISTURBED TILE SHALL BE REPAIRED AS NEAR AS PRACTICABLE TO ITS ORIGINAL OR BETTER CONDITION.

PERMANENT DRAIN TILE REPAIR

TILE BRIDGE – PERMANENT TILE REPAIR





NOTES:

1. TILE REPAIR AND REPLACEMENT SHALL CROSS PERPENDICULAR TO THE PIPELINE WHILE MAINTAINING GRADIENT AND FLOW. WATER FLOW MUST BE EQUAL TO OR GREATER THAN ORIGINAL TILE CAPACITY. THE MINIMUM RECEIVING TILE SIZE REQUIRED FOR THE REPAIR SHALL BE 4"DUAL WALL WHEN CONNECTING TO 2", 3" OR 4" SINGLE WALL FIELD TILE AND 6" DUAL WALL WHEN CONNECTING TO 5" AND 6" SINGLE WALL FIELD TILE AND SO ON. ALL RECEIVING TILE SHALL BE DUAL WALL PERFORATED HDPE TUBING AND APPURTENANCES.
2. THE TILE BRIDGE SUPPORTING STRUCTURE SHALL PROVIDE A MINIMUM OF 1 LF SUPPORT INTO UNDISTURBED SOIL IN EACH TRENCH WALL. EACH ADDITIONAL SUPPORTING STRUCTURE SECTION SHALL ALSO PROVIDE A MINIMUM OF 1 LF SUPPORT INTO UNDISTURBED SOIL, INCLUDING ADJUSTABLE GRADE BEAM (WHICH INCLUDES "Y" SUPPORT STRUCTURE FOR PIPE) AND REPLACEMENT HDPE DUAL WALL. IN LOOSER, LESS STRUCTURED SOILS MORE PRONE TO SLOUGHING OFF, THESE SUPPORT DISTANCES MAY NEED TO BE INCREASED. REPLACEMENT HDPE DUAL WALL MAY BE ZIP TIED TO THE "Y" SECTION OF THE ADJUSTABLE GRADE BEAM. THE "Y" SECTION OF ADJUSTABLE GRADE BEAM SHALL SUPPORT HDPE DUAL WALL TO ASTM F449 STANDARDS. SPACER BEAMS MAY BE UTILIZED IF GREATER ELEVATION IS NEEDED BETWEEN THE TILE BRIDGE AND ADJUSTABLE GRADE BEAM TO MAINTAIN PROPER LINE AND GRADE. IF OVER DIGGING INTO THE UNDISTURBED SOIL INTENDED TO SUPPORT THE STRUCTURE OCCURS DURING INSTALLATION OF THE SUPPORTING STRUCTURE, THIS OVER DIG MAY BE FILLED WITH SAND FILLED OR SAKRETE BAGS PROVIDED THEY FIRMLY ABUT ADDITIONAL BAGS AND THE SIDEWALL OF THE TRENCH. IF THE TILE MUST BE RELOCATED, THE INSTALLATION ANGLE SHALL BE PERPENDICULAR TO THE PIPELINE DIRECTION.
3. THE DRAIN TILE REPAIR SECTION WILL BE PERMANENTLY CONNECTED TO THE EXISTING DRAIN TILE A MINIMUM OF 1 LF OUTSIDE OF THE UPPERMOST SUPPORTING STRUCTURE USING INDUSTRY STANDARDS TO ENSURE PROPER SEAL OF REPAIRED DRAIN TILES.
4. OTHER METHODS OF PERMANENT DRAIN TILE REPAIR SUPPORTS MAY BE USED IF THE PROPOSED METHOD IS OF EQUAL OR GREATER STRENGTH THAN DETAILED ABOVE. ANY ALTERNATE METHODS, INCLUDING "TIE IN" AREAS OR OTHER AREAS REQUIRING LONGER SPANS OF SUPPORT, SHALL CONTAIN ADEQUATE AND CONTINUOUS METHODS OF SUPPORT FROM UNDISTURBED TRENCH BOTTOM SOIL VERTICALLY TO THE SUPPORT STRUCTURE AND THROUGHOUT ITS LENGTH. ALTERNATE SUPPORTS SHALL BE APPROVED BY COMPANY REPRESENTATIVES AND LAND OWNERS IN ADVANCE.
5. ALL MATERIALS SHALL BE FURNISHED BY THE PROJECT OWNER AND OR CONTRACTOR.
6. PRIOR TO REPAIRING TILE, CONTRACTOR SHALL PROBE LATERALLY INTO THE EXISTING TILE THE FULL WIDTH OF THE RIGHT OF WAY TO DETERMINE IF ADDITIONAL DAMAGE HAS OCCURRED. USE OF ACCEPTED VIDEO CAMERA EQUIPMENT FOR INTERNAL INSPECTION MAY ALSO BE CONSIDERED. ALL DAMAGED/DISTURBED TILE SHALL BE REPAIRED AS NEAR AS PRACTICABLE TO ITS ORIGINAL OR BETTER CONDITION.

TILE BRIDGE
PERMANENT TILE REPAIR

DRAWN BY	EMH
DATE	2/25/2014
SCALE	NTS
SHEET	1 OF 1

APPENDIX E

WATERBODIES CROSSED BY THE PROJECT

Appendix E
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
Mainline									
Scott County, Illinois									
SIL-JJP-003	1.3	Unnamed Tributary ("UNT") to Little Sandy Creek	IT	10	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-147	1.9	UNT to Little Sandy Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-033	2.7	UNT to Little Sandy Creek	P	9	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-013	3.4	Little Sandy Creek	P	30	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-010	3.5	UNT to Little Sandy Creek	E	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
Greene County, Illinois									
SIL-JJP-017	3.6	UNT to Little Sandy Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-TMA-011	3.8	UNT to Little Sandy Creek	IT	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-018	4.0	UNT to Little Sandy Creek	P	19	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume

Appendix E (continued) Waterbodies Crossed by the Project									
Feature ID	**Approximate Milepost**	**Waterbody Name**	**Flow Type[a]**	**Pipeline or Access Road Crossing Length (feet)[b]**	**Size Classification[c]**	**State Water Quality Classification[d]**	**Fishery Type[a]**	**Impaired Designated Use (Identified Pollutant)**	**Crossing Method**
SIL-TMA-016	4.3	UNT to Little Sandy Creek	IT	0	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-018	4.3	UNT to Little Sandy Creek	P	9	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-054	4.3	UNT to Little Sandy Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-JJP-026	5.6	UNT to Hurricane Creek	IT	2.5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-027	5.7	UNT to Hurricane Creek	IT	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-035	6.3	UNT to Hurricane Creek	IT	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-TMA-020	6.4	Hurricane Creek	P	25	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-026	8.8	UNT to Seminary Creek	IT	7	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-031	10.3	UNT to Seminary Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-TMA-021	10.3	UNT to Seminary Creek	P	28	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume

Appendix E (continued) Waterbodies Crossed by the Project									
Feature ID	**Approximate Milepost**	**Waterbody Name**	**Flow Type[a]**	**Pipeline or Access Road Crossing Length (feet)[b]**	**Size Classification[c]**	**State Water Quality Classification[d]**	**Fishery Type[a]**	**Impaired Designated Use (Identified Pollutant)**	**Crossing Method**
SIL-TMA-022	10.8	UNT to Seminary Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-024	11.3	UNT to Seminary Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-031	13.2	UNT to Apple Creek	P	14	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-033	13.9	Apple Creek	P	67	Intermediate	GEN, PFPWS	WWF	Aquatic Life (Dissolved Oxygen) Primary Contact Recreation (Fecal Coliform)	Dry-ditch flume
SIL-TMA-035	17.1	UNT to Coates Creek	P	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-TMA-036	17.6	UNT to Coates Creek	P	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-143	18.7	Coates Creek	P	13	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-042	19.1	UNT to Coates Creek	P	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-100	19.1	UNT to Coates Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-JJP-110	20.8	UNT to Link Branch	P	7	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-111	20.9	UNT to Link Branch	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-TMA-051	20.9	UNT to Link Branch	IT	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-078	22.4	UNT to Link Branch	IT	2	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-016	23.5	UNT to Macoupin Creek	IT	9	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-148	25.3	Macoupin Creek	P	145	Major	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-141	25.3	UNT to Macoupin Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-104	25.8	UNT to Macoupin Creek	P	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-145	26.7	UNT to Macoupin Creek	P	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
Jersey County, Illinois									
SIL-DFW-002	31.6	UNT to Wines Branch	IT	3.5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume

Appendix E (continued) Waterbodies Crossed by the Project									
Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-DFW-001	31.6	Wines Branch	P	13	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
NHD-761	33.7	UNT to Otter Creek	IT	N/A	Major	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-012	35.2	UNT to Otter Creek	P	34	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-117	35.2	UNT to Otter Creek	E	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-058	35.5	UNT to Otter Creek	P	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-148A	35.7	UNT to Otter Creek	E	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-060	35.7	UNT to Otter Creek	IT	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-052	36.3	UNT to Otter Creek	E	3	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-022	36.6	Otter Creek	P	56	Intermediate	GEN, PFPWS	WWF	Aquatic Life (Dissolved Oxygen)	Dry-ditch flume
SIL-JJP-136	38.9	UNT to South Fork Otter Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-TMA-074	39.0	UNT to South Fork Otter Creek	P	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-073	39.0	UNT to South Fork Otter Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-134	39.2	UNT to South Fork Otter Creek	P	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-131	39.4	UNT to South Fork Otter Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-JJP-132	39.4	UNT to South Fork Otter Creek	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-JJP-130	39.4	UNT to South Fork Otter Creek	P	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-072	39.5	UNT to South Fork Otter Creek	E	3	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-070	39.6	UNT to South Fork Otter Creek	E	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-127	39.7	UNT to South Fork Otter Creek	E	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-TMA-066	39.8	UNT to South Fork Otter Creek	P	13	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-WJW-006	40.9	UNT to South Fork Otter Creek	IT	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-007	41.0	UNT to South Fork Otter Creek	IT	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-001	41.5	UNT to South Fork Otter Creek	P	32	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-002	41.5	UNT to South Fork Otter Creek	IT	4	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-CDK-003	41.6	UNT to South Fork Otter Creek	E	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-008	42.0	UNT to South Fork Otter Creek	IT	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-020	42.0	UNT to South Fork Otter Creek	IT	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-009	42.1	UNT to South Fork Otter Creek	IT	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-016	44.2	UNT to Mississippi River	IT	8	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-014	44.5	UNT to Mississippi River	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-JJP-209	44.5	UNT to Mississippi River	P	17	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-WJW-013	44.5	UNT to Mississippi River	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-JJP-206	44.7	UNT to Mississippi River	E	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-207	44.7	UNT to Mississippi River	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-JJP-203	44.9	UNT to Mississippi River	IT	5	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-201	45.0	UNT to Mississippi River	IT	6	Minor	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-202	45.0	UNT to Mississippi River	E	0	Minor	GEN, PFPWS	WWF	No	Workspace only
SIL-WJW-011	45.0	UNT to Mississippi River	P	176	Intermediate	GEN, PFPWS	WWF	No	Dry-ditch flume
SIL-JJP-200	45.1	UNT to Mississippi River	P	5	Minor	GEN, PFPWS	WWF	No	HDD and workspace only

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SIL-WJW-010	45.3	Mississippi River	P	3,020	Major	Illinois: GEN, PFPWS	WWF	Illinois: Fish Consumption [Polychlorinated Biphenyls (“PCBs”) and Mercury], Primary Contact Recreation (Fecal Coliform)	HDD
St. Charles County, Missouri									
SIL-WJW-010	45.3	Mississippi River	P	3,020	Major	Missouri: LWW, AQL, WBC-Category A, SCR, DWS, IND	WWF	Missouri: Category B (*E. coli*)	HDD
SMO-WJW-001, NHD-924	46.0	Luesse Lake	P	300	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD
SMO-TMA-008	46.3	UNT to Mississippi River	E	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only
SMO-JJP-030	46.5	UNT to Mississippi River	E	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only
SMO-TMA-011	46.7	UNT to Mississippi River	E	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only
SMO-JJP-004	47.0	UNT to Mississippi River	E	2	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SMO-JJP-003	47.7	UNT to Mississippi River	E	4	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-006	47.8	UNT to Mississippi River	P	60	Intermediate	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-001	48.5	UNT to Mississippi River	E	4	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-009	49.6	UNT to Mississippi River	E	6	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-005	52.0	UNT to Missouri River	E	4	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-004	52.1	UNT to Missouri River	E	3	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-003	52.2	UNT to Missouri River	E	2	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-TMA-002	52.3	UNT to Missouri River	E	2	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
PMO-TMA-001	54.5	None	Pond	73	Major	N/A	WWF	No	Dry-ditch flume
SMO-TMA-001	57.9	Missouri River (oxbow)	P	345	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD

Appendix E (continued) Waterbodies Crossed by the Project									
Feature ID	**Approximate Milepost**	**Waterbody Name**	**Flow Type[a]**	**Pipeline or Access Road Crossing Length (feet)[b]**	**Size Classification[c]**	**State Water Quality Classification[d]**	**Fishery Type[a]**	**Impaired Designated Use (Identified Pollutant)**	**Crossing Method**
St. Louis County, Missouri									
SMO-CDK-001	58.2	Missouri River	P	1,320	Major	IRR, LWW, AQL, WBC – Category B, SCR, DWS, IND	WWF	WBC-Category B (*E. coli*)	HDD
North County Extension									
St. Louis County, Missouri									
SMO-JJP-023	0.6	UNT to Missouri River	E	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only
SMO-JJP-022	0.9	UNT to Missouri River	P	6	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-024	1.1	UNT to Missouri River	E	4	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-022	1.1 - 1.2	UNT to Missouri River	P	35	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-026	1.2	UNT to Missouri River	E	6	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-027	1.2	UNT to Missouri River	E	6	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-020	1.9	Coldwater Creek	P	160	Major	LWW, AQL, WBC - Category B, IND	WWF	AQL (Chloride) and WBC-Category B, SCR (*E. coli*)	HDD

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
SMO-JJP-032	2.0	UNT to Coldwater Creek	P	14	Intermediate	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD
NHD-955	2.9	UNT to Coldwater Creek	IT	N/A	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
NHD-962	3.4	UNT to Coldwater Creek	IT	N/A	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
PMO-JJP-001	4.0	Carp Lake	Pond	334	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD
PMO-JJP-001	4.1	Sunfish Lake	Pond	433	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD
PMO-JJP-002	4.3	Emerald Greens Golf Course	Pond	210	Major	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	HDD
SMO-JJP-015	5.3	UNT to Mississippi River	P	14	Intermediate	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-JJP-012	5.5	UNT to Mississippi River	P	40	Intermediate	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Dry-ditch flume
SMO-DFW-015	5.9	UNT to Watkins Creek	P	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only
SMO-JJP-007	5.9	UNT to Watkins Creek	IT	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	Workspace only

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
Laclede/Lange Delivery									
St. Louis County, Missouri									
SMO-DFW-002	-	UNT to Missouri River	E	0	Minor	N/A	WWF	No	Workspace only
Access Roads									
Greene County, Illinois									
SIL-TMA-049	24.8	UNT to Macoupin Creek	IT	5	Minor	GEN, PFPWS	WWF	No	TAR-012 - existing road/stream culverted
SIL-JJP-104	25.8	UNT to Macoupin Creek	P	0	Minor	GEN, PFPWS	WWF	No	TAR-018 - workspace only
SIL-JJP-103	26.1	UNT to Macoupin Creek	IT	4	Minor	GEN, PFPWS	WWF	No	TAR-014 - existing road/stream culverted
SIL-TMA-044	26.1	UNT to Macoupin Creek	IT	7	Minor	GEN, PFPWS	WWF	No	TAR-014 - existing road/stream culverted
Jersey County, Illinois									
SIL-CDK-029	36.6	UNT to Otter Creek	IT	5	Minor	GEN, PFPWS	WWF	No	TAR-015 - existing access/stream culverted

Appendix E (continued)
Waterbodies Crossed by the Project

Feature ID	Approximate Milepost	Waterbody Name	Flow Type[a]	Pipeline or Access Road Crossing Length (feet)[b]	Size Classification[c]	State Water Quality Classification[d]	Fishery Type[a]	Impaired Designated Use (Identified Pollutant)	Crossing Method
St. Charles County, Missouri									
SMO-JJP-002	46.9	UNT to Mississippi River	E	0	Minor	AQL, WBC - Category B, SCR, LWW, IRR	WWF	No	PAR-018 – workspace only

[a] IT = Intermittent; E = Ephemeral; P = Perennial; WWF = warmwater fishery

[b] Crossing width is the bank-to-bank width of stream at the pipeline or access road centerline crossing unless noted otherwise. N/A-Not applicable indicates that these waterbodies are desktop identified and therefore no crossing lengths are currently known.

[c] Minor (<10 feet wide); Intermediate (>10 - <100 feet wide); Major (>100 feet wide).

[d] Water quality standards are contained in 35 IAC Section 302. Water use designation and site-specific water quality standards are contained in 35 IAC Section 303. General Use Waters (GEN) - Except as otherwise specifically provided, all waters of the State (Illinois) must meet the general use standards of Subpart B of Part 302. The General Use standards will protect the State's (Illinois) water for aquatic life (except as provided in Section 302.213), wildlife, agricultural use, secondary contact use and most industrial uses and ensure the aesthetic quality of the State's (Illinois) aquatic environment. Public and Food Processing Water Supplies (PFPWS) - Except as otherwise specifically provided and in addition to the general use standards of Subpart B, Part 302, waters of the State shall meet the public and food processing water supply standards of Subpart C, Part 302, at any point at which water is withdrawn for treatment and distribution as potable supply for food processing. Water quality classifications in Missouri are contained in 10 CSR 20-7.031. IRR - Irrigation, LWW - Livestock & Wildlife Watering, AQL - Protection of Warm Water Aquatic Life and Human Health-Fish Consumption, SCR - Secondary Contact Recreation, DWS - Drinking Water Supply, WBC - Whole Body Contact Recreation, IND - Industrial.

APPENDIX F

WETLANDS CROSSED BY THE PROJECT

Appendix F
Wetlands Crossed by the Project

Facility/ Wetland ID	Milepost	NWI/Cowardin Classification[a]	Crossing Length (feet)[b]	Area Affected by Construction (acres)[c]	Area Affected by ATWS (acres)[d]	Area Affected by Operation (acres)[e]	Area Affected by Permanent Easement (acres)[f]	Crossing Method[g]
Mainline								
Scott County, Illinois								
WIL-JJP-002	1.1	PEM	0	< 0.01	0.00	0.00	< 0.01	Workspace only
WIL-TMA-001	2.2	PEM	84	0.14	0.00	0.00	0.09	Open cut
WIL-TMA-002	3.4	PFO	0	< 0.01	0.00	0.00	< 0.01	Workspace only
WIL-JJP-005	3.4	PFO	39	0.07	0.00	0.03	0.04	Open cut
Greene County, Illinois								
WIL-JJP-009	4.4	PEM	0	< 0.01	0.00	0.00	0.00	Workspace only
WIL-JJP-010	5.1	PEM	0	0.01	0.00	0.00	0.00	Workspace only
WIL-JJP-012A	5.6	PEM	47	0.08	0.00	0.00	0.04	Open cut
WIL-JJP-012	5.6	PFO	4	0.03	0.00	< 0.01	< 0.01	Open cut
WIL-TMA-005	5.7	PEM	11	0.02	0.00	0.00	0.02	Open cut
WIL-JJP-015B	10.8	PEM	6	0.03	0.00	0.00	0.03	Open cut
WIL-JJP-015	10.8	PSS	39	0.05	0.00	0.01	0.04	Open cut
WIL-JJP-015A	10.8	PEM	22	0.05	0.00	0.00	0.03	Open cut
WIL-JJP-107	13.0	PEM	0	0.01	0.00	0.00	0.01	Workspace only
WIL-JJP-101	13.9	PEM	195	0.33	0.00	0.00	0.22	Open cut
WIL-JJP-101A	13.9	PFO	42	0.07	0.00	0.03	0.05	Open cut

Appendix F (continued) Wetlands Crossed by the Project								
Facility/ Wetland ID	Milepost	NWI/Cowardin Classification[a]	Crossing Length (feet)[b]	Area Affected by Construction (acres)[c]	Area Affected by ATWS (acres)[d]	Area Affected by Operation (acres)[e]	Area Affected by Permanent Easement (acres)[f]	Crossing Method[g]
WIL-JJP-001	14.0	PEM	46	0.07	0.00	0.00	0.06	Open cut
WIL-TMA-006	14.1	PEM	72	0.20	0.00	0.00	0.06	Open cut
WIL-TMA-007	14.3	PEM	22	0.04	0.00	0.00	0.03	Open cut
WIL-TMA-008	14.4	PEM	307	0.49	0.00	0.00	0.33	Open cut
WIL-TMA-007	14.4	PEM	29	0.05	0.00	0.00	0.03	Open cut
WIL-TMA-009	17.1	PEM	62	0.11	0.00	0.00	0.07	Open cut
WIL-TMA-017	24.6	PEM	14	0.02	0.00	0.00	0.02	Open cut
WIL-JJP-120	24.9	PEM	41	0.08	0.00	0.00	0.05	Open cut
WIL-TMA-014	25.0	PEM	153	0.26	0.00	0.00	0.18	Open cut
WIL-JJP-121	25.0	PEM	4	0.01	0.00	0.00	0.01	Open cut
WIL-TMA-021	25.8	PEM	56	0.10	0.00	0.00	0.07	Open cut
WIL-TMA-018	26.1	PEM	11	0.02	0.00	0.00	0.01	Open cut
WIL-JJP-122	26.4	PEM	0	< 0.01	0.00	0.00	< 0.01	Workspace only
WIL-JJP-123	26.7	PEM	76	0.13	0.00	0.00	0.09	Open cut
Jersey County, Illinois								
WIL-CDK-010	31.9	PEM	70	0.12	0.00	0.00	0.08	Open cut
WIL-CDK-010	35.2	PUB	35	0.08	0.00	0.00	0.08	Open cut
WIL-CDK-008	35.2	PEM	8	0.01	0.00	0.00	0.01	Open cut
WIL-JJP-109	35.5	PEM	0	< 0.01	0.00	0.00	0.00	Workspace only
WIL-JJP-149	35.5	PEM	0	< 0.01	0.00	0.00	< 0.01	Workspace only

Appendix F (continued)
Wetlands Crossed by the Project

Facility/ Wetland ID	Milepost	NWI/Cowardin Classification[a]	Crossing Length (feet)[b]	Area Affected by Construction (acres)[c]	Area Affected by ATWS (acres)[d]	Area Affected by Operation (acres)[e]	Area Affected by Permanent Easement (acres)[f]	Crossing Method[g]
WIL-CDK-100	36.2	PEM	27	0.03	0.00	0.00	0.03	Open cut
WIL-JJP-151	36.7	PEM	0	0.01	0.00	0.00	0.01	Workspace only
WIL-JJP-115	37.2	PEM	28	0.05	0.00	0.00	0.03	Open cut
WIL-JJP-116	37.2	PEM	9	0.03	0.00	0.00	0.01	Open cut
WIL-JJP-112	39.1	PEM	0	< 0.01	0.00	0.00	0.00	Workspace only
WIL-JJP-114	41.2	PEM	23	0.04	0.00	0.00	0.02	Open cut
WIL-TMA-028	41.3	PEM	22	0.03	0.00	0.00	0.01	Open cut
WIL-DFW-002	43.8	PEM	49	0.08	0.00	0.00	0.03	Open cut
St. Charles County, Missouri								
WIL-JJP-148	45.0	PFO	71	0.38	0.20	0.04	0.05	Open cut
NWI-105	45.7	PFO	388	0.00	0.00	0.00	0.53	HDD
WMO-JJP-001A	46.0	PFO	0	0.00	0.00	0.00	0.02	HDD
WMO-WJW-001	46.1	PFO	331	0.00	0.00	0.00	0.38	HDD
WMO-JJP-012	49.7	PEM	1491	3.38	0.54	0.00	1.72	Open cut
WMO-TMA-010	49.9	PEM	359	0.26	0.01	0.00	0.25	Open cut
WMO-JJP-010	50.2	PEM	67	0.11	0.00	0.00	0.07	Open cut
WMO-JJP-007	53.9	PEM	555	0.80	< 0.01	0.00	0.67	Open cut
WMO-JJP-131	54.5	PEM	0	<0.01	0.00	0.00	0.00	Workspace only
WMO-TMA-006	54.8	PEM	235	0.55	0.12	0.00	0.20	Open cut

Appendix F (continued)
Wetlands Crossed by the Project

Facility/ Wetland ID	Milepost	NWI/Cowardin Classification[a]	Crossing Length (feet)[b]	Area Affected by Construction (acres)[c]	Area Affected by ATWS (acres)[d]	Area Affected by Operation (acres)[e]	Area Affected by Permanent Easement (acres)[f]	Crossing Method[g]
WMO-TMA-005A	55.7	PEM	199	0.37	0.00	0.00	0.24	Open cut
WMO-TMA-005	55.8	PUB	378	0.61	0.00	0.00	0.43	Open cut
WMO-JJP-002	56.0	PEM	0	0.10	0.00	0.00	0.10	Workspace only
WMO-JJP-005	56.8	PEM	62	0.11	0.00	0.00	0.07	Open cut
WMO-TMA-004	57.2	PEM	39	0.07	0.00	0.00	0.05	Open cut
WMO-TMA-003A	57.2	PEM	0	0.09	0.09	0.00	0.00	Workspace only
WMO-TMA-003	57.2	PUB	0	0.15	0.15	0.00	0.00	Workspace only
WMO-TMA-002	57.4	PEM	0	0.13	0.13	0.00	0.00	Workspace only
WMO-TMA-001A	57.9	PFO	140	0.00	0.00	0.00	0.16	HDD
WMO-TMA-001	57.9	PEM	37	0.00	0.00	0.00	0.04	HDD
WMO-CDK-005	58.3	PEM	0	0.01	0.01	0.00	0.00	Workspace only
WMO-CDK-004	58.4	PEM	62	0.04	0.00	0.00	0.03	Open cut
WMO-CDK-003	58.4	PEM	0	0.02	0.00	0.00	0.00	Workspace only
North County Extension								
St. Louis County, Missouri								
WMO-JJP-120	0.4	PEM	0.2	0.01	0.00	0.00	< 0.01	Open cut
WMO-JJP-120	0.4	PFO	22	0.05	0.00	0.02	0.03	Open cut

Appendix F (continued)
Wetlands Crossed by the Project

Facility/ Wetland ID	Milepost	NWI/Cowardin Classification[a]	Crossing Length (feet)[b]	Area Affected by Construction (acres)[c]	Area Affected by ATWS (acres)[d]	Area Affected by Operation (acres)[e]	Area Affected by Permanent Easement (acres)[f]	Crossing Method[g]
WMO-JJP-120	0.5	PEM	131	0.21	0.00	0.00	0.14	Open cut
WMO-JJP-120	0.5	PFO	96	0.17	0.00	0.07	0.12	Open cut
WMO-JJP-122	1.1	PEM	0	0.03	0.00	0.00	0.03	Workspace only
WMO-JJP-123	1.2	PEM	0	0.02	0.00	0.00	0.02	Workspace only
WMO-JJP-125	1.8	PEM	36	0.00	0.00	0.00	0.02	HDD
WMO-JJP-126	2.4	PEM	28	0.06	0.02	0.00	0.03	Open cut
WMO-JJP-119	2.6	PEM	156	0.15	0.00	0.00	0.08	Open cut
WMO-DFW-002	3.2	PEM	0	0.02	0.00	0.00	0.02	Workspace only
NWI-204	3.8	PFO	22	0.05	0.01	0.01	0.02	Open cut
WMO-JJP-132	4.2	PSS	20	0.00	0.00	0.00	0.03	HDD
WMO-JJP-129	4.4	PUB	73	0.00	0.00	0.00	0.10	HDD
WMO-DFW-007	6.0	PEM	28	0.05	0.00	0.00	0.04	Open cut

[a] Wetland classification according to Cowardin *et al.* 1979. PEM = palustrine emergent wetland; PSS = palustrine scrub-shrub wetland; PFO = palustrine forested wetland; and PUB = palustrine unconsolidated bottom wetland.

[b] A crossing length of zero indicates the feature would not be crossed by the centerline of the pipeline but would be within the construction work area.

[c] Construction acreage includes all workspace during construction activities (temporary right-of-way, permanent right-of-way, and additional temporary workspace). Wetland acreage avoided by horizontal directional drill (HDD) construction is excluded.

[d] Acreage represented is a subset of the Area Affected by Construction.

[e] Operational impacts include only the maintained portion of the permanent right-of-way. PFO wetlands within 15 feet of the pipeline would be converted to PEM/PSS, and PSS wetlands within a 10-foot-wide corridor over the pipeline would be converted to PEM wetlands. Spire does not anticipate maintenance in PEM, PUB, or lacustrine unconsolidated bottom wetlands.

[f] Acreage within the permanent easement would be retained by Spire for the life of the Project, but only that subset of acreage identified under Area Affected by Operation would be permanently converted to another wetland type.

[g] No clearing would take place within wetlands in HDD crossing areas without prior approval from FERC and the applicable federal and state regulations.

APPENDIX G

ROADS AND RAILROADS CROSSED BY THE PROJECT

Appendix G
Roads and Railroads Crossed by the Project

Road or Railroad Name	Milepost	Proposed Crossing Method
Mainline		
Scott County, Illinois		
Unknown Road	0.2	Open cut
Unknown Road	0.2	Open cut
County Highway 7 / Manchester Alsey Road	0.7	Bore
Havens Road	1.8	Bore
State Rte 106	2.2	Bore
Gourley Road	2.5	Bore
Roodhouse Springs Road	3.0	Bore
Greene County, Illinois		
Barrow Road	4.5	Bore
1000 E	5.7	Bore
Patterson Road	5.8	Bore
1000 E	6.7	Bore
Unknown Road	7.2	Bore
Kansas City Southern Railway	7.2	Bore
2425 N	7.3	Bore
2375 N	7.8	Bore
County Highway 10	9.1	Bore
Unknown Road	10.3	Open cut
Corsa Lane	11.3	Bore
1900 N	13.1	Bore
Belltown Road	13.6	Bore
1650 N	15.7	Bore
Cemetery Road	17.1	Bore
1400 N	18.1	Bore
State Route 108	19.5	Bore
1175 N	20.4	Bore
1025 E	21.3	Bore
County Highway 20 / Woody Road	22.8	Bore
Unknown Road	24.4	Open cut
Unknown Road	26.1	Open cut
County Road 17	27.3	Bore
County Road 17	27.4	Bore
County Road 17 / Kane Road	28.4	Bore
450 N	28.9	Bore

Appendix G (continued) Roads and Railroads Crossed by the Project		
Road or Railroad Name	**Milepost**	**Proposed Crossing Method**
Jersey County, Illinois		
Allen Lane	29.6	Bore
County Highway 10 / N Centennial Road	31.9	Bore
Hollow Avenue	32.9	Bore
State Highway 16	33.4	Bore
West County Road	33.8	Bore
S Centennial Road	35.5	Bore
Busch Lane	37.3	Bore
County Highway 6 / McClusky Road	38.0	Bore
Daugherty Road	38.6	Bore
Godar Lane	39.1	Bore
Possum Trot Lane	40.3	Bore
State Highway 3	41.8	Bore
Croxford Road	42.3	Bore
County Highway 11 / Chautauqua Road	43.9	Bore
State Route 100	45.1	HDD
St Charles County, Missouri		
Portage Road	46.7	Bore
Weber Lake Road	47.6	Bore
State Highway J	49.0	Bore
Payne Road	49.4	Bore
State Highway 94	50.5	Bore
Burlington Northern & Santa Fe Railroad	51.1	Bore
Dwiggins Road	51.3	Bore
Dwiggins Road	51.8	Bore
Saale Road	53.0	Bore
Saale Road	54.5	Bore
Bradshaw Road	56.6	Bore
Mintert Road	57.3	Bore
St Louis County, Missouri		
Fort Bellefontaine Road	58.6	Bore
Blue Spruce Lane (Private)	58.8	Open cut
North County Extension		
Robbins Mill Road	1.1	Bore
New Jamestown Road	1.7	HDD

Appendix G (continued) Roads and Railroads Crossed by the Project		
Road or Railroad Name	**Milepost**	**Proposed Crossing Method**
US 67 S	1.7	HDD
367S / Lewis & Clark Boulevard	1.7	HDD
367N / Lewis & Clark Boulevard	1.8	HDD
US 67 N	1.8	HDD
Lindbergh Boulevard	1.9	HDD
Burlington Northern & Santa Fe Railroad	1.9	HDD
Bellefontaine Road	2.6	Bore
Spanish Pond Road	3.9	HDD
Larimore Road	4.9	Bore
Riverview Road	N/A	Bore

N/A = The road would be crossed by the interconnect pipe that would connect the Spire STL Pipeline Project to Enable's existing system.

APPENDIX H

FOREIGN UTILITIES CROSSED BY THE PROJECT

Appendix H
Foreign Utilities Crossed by the Project

Nearest Milepost	Utility Type	Owner
Mainline		
0.0	Natural gas pipeline	Tallgrass Energy
0.0	Natural gas pipeline	Panhandle Eastern Pipeline
0.0	Natural gas pipeline	Panhandle Eastern Pipeline
0.1	Natural gas pipeline	Panhandle Eastern Pipeline
0.1	Natural gas pipeline	Panhandle Eastern Pipeline
0.2	Overhead line	Ameren
0.2	Telephone line	Frontier
0.2	Water line	SMG Water
0.2	Overhead line	Ameren
0.7	Water line	SMG Water
0.7	Telephone line	Frontier
1.0	Overhead line	Ameren
1.0	Overhead line	Ameren
1.8	Overhead line	Illinois Elec. Co-Op
2.2	Overhead line	Ameren
2.5	Overhead line	Illinois Elec. Co-Op
3.0	Overhead line	Illinois Elec. Co-Op
4.5	Overhead line	Illinois Elec. Co-Op
5.7	Overhead line	Illinois Elec. Co-Op
5.8	Overhead line	Illinois Elec. Co-Op
6.1	Overhead line	Ameren
6.7	Overhead line	Illinois Elec. Co-Op
7.3	Overhead line	Illinois Elec. Co-Op
7.8	Overhead line	Illinois Elec. Co-Op
9.1	Overhead line	Illinois Elec. Co-Op
9.1	Fiber optic line	General Telephone Company
10.1	Overhead line	Ameren & Illinois Elec. Co-Op
10.3	Overhead line	Illinois Elec. Co-Op
11.3	Overhead line	Ameren
12.8	Overhead lines	Ameren & Illinois Elec. Co-Op
13.0	Overhead line	Illinois Elec. Co-Op
13.6	Overhead line	Illinois Elec. Co-Op
13.8	Overhead line	Illinois Elec. Co-Op
15.0	Overhead line	Ameren & Illinois Elec. Co-Op
15.1	Overhead line	Ameren & Illinois Elec. Co-Op

Appendix H (continued)
Foreign Utilities Crossed by the Project

Nearest Milepost	Utility Type	Owner
15.7	Overhead line	Illinois Elec. Co-Op
15.7	Telephone line	Frontier
16.1	Overhead line	Ameren
17.1	Overhead line	Ameren & Illinois Elec. Co-Op
17.1	Telephone line	Frontier
17.9	Overhead lines	Ameren
18.1	Overhead line	Ameren & Illinois Elec. Co-Op
19.5	Overhead line	Ameren
19.5	Overhead line	Ameren
21.3	Overhead line	Illinois Elec. Co-Op
22.8	Overhead line	Illinois Elec. Co-Op
27.3	Overhead line	Illinois Elec. Co-Op
27.4	Overhead line	Illinois Elec. Co-Op
27.4	Overhead line	Ameren
28.4	Overhead line	Illinois Elec. Co-Op
28.4	Telephone line	Frontier
28.4	Telephone line	Frontier
28.9	Overhead line	Illinois Elec. Co-Op
28.9	Water line	SMG Water
29.6	Water line	Jersey County Rural Water
31.9	Water line	Jersey County Rural Water
31.9	Telephone line	Frontier
31.9	Overhead line	Ameren & Illinois Elec. Co-Op
32.9	Overhead line	Ameren/MJM Elec. Co-Op
33.4	Overhead line	Ameren/MJM Elec. Co-Op
33.9	Overhead line	MJM Elec. Co-Op
35.5	Overhead line	MJM Elec. Co-Op
36.4	Overhead line	MJM Elec. Co-Op
37.3	Overhead line	MJM Elec. Co-Op
38.0	Overhead line	Ameren
40.2	Overhead line	MJM Elec. Co-Op
40.3	Overhead line	MJM Elec. Co-Op
40.3	Fiber optic line	Frontier
41.8	Overhead line	Ameren
42.3	Water line	Illinois American Water
42.3	Fiber optic line	Frontier

Appendix H (continued)
Foreign Utilities Crossed by the Project

Nearest Milepost	Utility Type	Owner
42.4	Overhead line	Ameren
43.8	Overhead line	Ameren
43.9	Ammonia pipeline	Nustar
43.9	Overhead line	Ameren
43.9	Fiber optic line	AT&T
43.9	Fiber optic line	GTI
43.9	Natural gas pipeline	Ameren
45.1	Fiber optic line	AT&T
45.1	Fiber optic line	AT&T
45.1	Fiber optic line	AT&T
45.1	Fiber optic line	AT&T
45.1	Natural gas pipeline	Ameren
46.7	Overhead line	Southwestern Bell
47.6	Overhead line	Ameren
49.0	Overhead line	Ameren
49.4	Water line	Missouri American Water
49.4	Overhead line	Ameren
50.0	Overhead line	Ameren
50.0	Overhead line	Ameren
50.0	Overhead line	Ameren
50.0	Overhead line	Ameren
50.5	Water line	Missouri American Water
50.5	Overhead line	Ameren
50.5	Fiber optic line	AT&T
51.0	Non-highly volatile liquid pipeline	AMOCO
51.0	Natural gas pipeline	MoGas
51.3	Overhead line	Ameren
51.3	Overhead line	Ameren
51.3	Overhead line	Ameren
51.3	Overhead line	Ameren
51.3	Overhead line	Ameren
51.6	Crude oil pipeline	TC Oil
51.6	Crude oil pipeline	Express
51.8	Overhead line	Ameren
52.3	Overhead line	Ameren
53.0	Overhead line	Ameren

Appendix H (continued)
Foreign Utilities Crossed by the Project

Nearest Milepost	Utility Type	Owner
53.0	Overhead line	Ameren
54.0	Oil pipeline	Explorer Pipeline Company
54.0	Oil pipeline	KOCE
54.0	Ammonia pipeline	Nustar
54.5	Overhead line	Ameren
56.6	Overhead line	Ameren
56.7	Crude oil pipeline	Enbridge
57.3	Telephone line	AT&T
57.3	Fiber optic line	AT&T
57.3	Overhead line	Ameren
58.5	Overhead line	Ameren
58.6	Overhead line	Ameren
58.6	Overhead line	Ameren
58.6	Overhead line	Ameren
58.7	Overhead line	Ameren
58.8	Overhead line	Ameren
58.8	Natural gas pipeline	LGC
58.8	Propane pipeline	Laclede Pipeline Company
58.8	Overhead line	Ameren
North County Extension		
0.1	Propane pipeline	Laclede Pipeline Company
0.1	Natural gas pipeline	LGC
0.2	Propane pipeline	Laclede Pipeline Company
0.2	Natural gas pipeline	LGC
1.1	Natural gas pipeline	LGC
1.1	Overhead line	Ameren
1.7	Natural gas pipeline	LGC
1.7	Electric line	Ameren
1.8	Electric line	Ameren
1.8	Fiber optic line	CenturyLink
1.8	Propane pipeline	Laclede Pipeline Company
1.9	Overhead line	Ameren
1.9	Overhead line	Ameren
2.3	Overhead lines	Ameren
2.4	Overhead line	Ameren
2.5	Propane pipeline	Laclede Pipeline Company

Appendix H (continued)
Foreign Utilities Crossed by the Project

Nearest Milepost	Utility Type	Owner
2.6	Overhead line	Ameren
2.6	Overhead line	Ameren
2.6	Propane pipeline	Laclede Pipeline Company
3.0	Overhead lines	Ameren
3.8	Kerosene / jet fuel pipeline	Buckeye Partners, LP
3.8	Jet fuel pipeline	St. Louis Pipeline Operating
3.9	Propane pipeline	Laclede Pipeline Company
3.9	Overhead line	Ameren
4.2	Kerosene / jet fuel pipeline	Buckeye Partners, LP
4.7	Kerosene / jet fuel pipeline	Buckeye Partners, LP
4.9	Sewer line	St. Louis Metropolitan Sewer
4.9	Telephone line	AT&T
4.9	Overhead line	Ameren
4.9	Water line	Missouri American Water
4.9	Natural gas pipeline	LGC
4.9	Telephone line	AT&T
6.0	Telephone line	AT&T
6.0	Fiber optic line	Charter Communications
6.0	Fiber optic line	Charter Communications
6.0	Natural gas pipeline	LGC
6.0	Overhead line	Ameren
6.0	Fiber optic line	Charter Communications
6.0	Fiber optic line	Charter Communications
6.0	Telephone line	AT&T
6.0	Overhead line	Ameren
6.0	Natural gas pipeline	LGC

APPENDIX I

NOXIOUS WEEDS / INVASIVE PLANT SPECIES CONTROL AND MITIGATION PLAN

Spire STL Pipeline Project

Noxious Weeds/Invasive Plant
Species Control and Mitigation Plan

FERC Docket No. CP17-40-_ _ _

April 2017

Public

Table of Contents

Acronyms and Abbreviations

BMP	Best Management Practices
EI	Environmental Inspector
FERC	Federal Energy Regulatory Commission
Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
Project	Spire STL Pipeline Project
Spire	Spire STL Pipeline LLC
USDA	United States Department of Agriculture

spire

Noxious Weeds/Invasive Plant Species Control and Mitigation Plan

This Noxious Weeds/Invasive Plant Species Control and Mitigation Plan describes the general control measures to be implemented by Spire STL Pipeline LLC ("Spire") and its contractors during construction and post-construction activities of the Spire STL Pipeline Project ("Project"). Where deemed appropriate and feasible, measures identified within this plan will be applied to work areas during construction and post-construction activities to avoid and/or minimize the spread of existing noxious weeds or invasive plant species within the Project's permanent easement.

1.1 Noxious Weeds and Invasive Plant Species

Botanists familiar with the vegetative community types and noxious weeds potentially occurring within the Project area developed a list of noxious and invasive species for survey purposes based on the Illinois Noxious Weed Law and the Missouri Noxious Weed List (Illinois Administrative Code 2002; and Missouri Department of Agriculture 2011), In addition, species on the United States Department of Agriculture's ("USDA") Introduced, Invasive and Noxious Plants Federal Noxious Weed List was reviewed for additional species that have the potential to occur in the Project area. A list of potential noxious and invasive species reviewed for the Project area is provide in Attachment A (USDA 2013).

Baseline noxious weed and invasive plant species surveys ("Surveys") were performed concurrently during the biological field surveys by qualified environmental specialists. Surveys were performed by walking the ground within the Project's survey corridor and access roads in a systematic sequence to ensure optimal coverage and identification of invasive plant species as listed on the Noxious Weeds and Invasive Plant Species List. For each distinct occurrence of an invasive plant species observed within the Project corridor, Global Positioning System data points were collected to document the specific location of the invasive plant species occurrence. For each data point collected, the plant species name plus a general identifier for the general level of infestation was recorded. Weed infestation levels were generalized into low (single plants), moderate (small cluster of invasive species), and high categories (widespread infestation). At certain locations, multiple data points were taken if more than one noxious weed species was observed and distributed within distinct areas of close proximity. The locations and extent of noxious weeds identified during baseline surveys is provided in Attachment B.

1.2 Control and Mitigation Plan

During construction, exposed topsoil may provide for the recruitment of invasive species, and the potential exists for equipment to bring in seeds to non-infested areas. In order to counteract the potential for the introduction and/or spread of noxious weeds and invasive plant species listed in Attachment A. Spire, in conjunction with recommendations from the USDA's Conservation Program in Scott, Greene, and Jersey Counties, Illinois, and in St. Charles and St. Louis Counties, Missouri, has developed best management practices ("BMPs") that will be implemented on the Project during construction (Behymer 2016, Fuller 2016, Muenks 2016, Perkins 2016, Wamsley 2016).

1. Prior to the start of Project construction actives, Spire will provide contractors and environmental inspector's ("EIs") maps that depict the location and level of infestation for plant species occurrences identified within the Noxious Weed Surveys.

2. Adhere to erosion control measures in Federal Energy Regulatory Commission's ("FERC") *Upland Erosion Control, Revegetation, and Maintenance Plan* ("Plan") and FERC's *Wetland and Waterbody Construction and Mitigation Procedures* to ensure that sediment movement into newly disturbed soils are minimized to avoid the potential of invasive plant species seed distribution.

3. Use construction techniques along the pipeline route that minimize the time that bare soil is exposed and, therefore, minimize the opportunity for exotic species to become established.

4. Ensure all vehicles, equipment, and materials are inspected and cleaned of any visible vegetation and/or soil before entering or leaving areas of known noxious weed infestations identified within the construction right-of-way.

5. All disturbed areas will be reseeded promptly after final grading, weather and soil conditions permitting, and in consideration of written recommendations from the local soil conservation authorities. Prompt reseeding will ensure that any bare soil within the Project corridor is not available for exotic or invasive species for an extended period of time providing the opportunity for the establishment of plant species listed on the Noxious Weeds and Invasive Plant Species List.

6. As described in the FERC Plan, mulch if available, consisting of a local sources or certified weed-free straw or hay or other erosion-control materials will be used during constructions activities and installation of permanent erosion control measures.

7. During active construction activities and until the Project right-of-way is successfully revegetated as outlined in FERC's Plan, Spire will require all EIs to inspect the Project right-of-way for any new growth of plant species listed on the Noxious Weeds and Invasive Plant Species List. If new areas of growth are observed, Spire will coordinate with landowners and applicable agencies to address concerns.

8. Spire will utilize herbicides and/or pesticides as necessary to provide weed control at aboveground facilities in Illinois which are located adjacent to agricultural lands in accordance with the Project-specific Agricultural Impact Mitigation Agreement for Illinois. Herbicide use will be conducted by an applicator licensed in the state of Illinois. Spire does not propose to utilize herbicides on its pipeline right-of-way. Measures will be taken (as described above) to control the spread of noxious weeds during construction. Spire will monitor the disturbed areas to address the success of revegetation in accordance with FERC's Plan. If species or colonies are found in numbers which are significantly different from the existing nearby off right-of-way locations, Spire will conduct mowing and/or hand cutting/removal of the species in these areas.

It may not be possible to eradicate invasive species in the Project area because of such issues as seed drift or colonization from off-site locations. Therefore, Spire's overall goal is to control the invasive species to the extent that wetlands and uplands are not dominated by the invasive species to the point where the functions and values of the systems/habitats are adversely compromised. Spire has included the use of BMPs to control the transport of invasive species from areas where they may currently occur along the Project route. Measures, such as training personnel in the identification of invasive species, inspecting and cleaning equipment, and practices to encourage rapid stabilization, restoration, and revegetation of disturbed work areas, have been incorporated to minimize adverse impacts resulting from the presence of invasive species.

Spire has provided a copy of this plan as a courtesy to the USDA's Conservation Program representatives in Illinois per request.

1.3 References

Behymer, Bradley. 2016. Phone conversation with USDA-NRCS Greene and Jersey County Field Office District Conservationist and Erin Matthews of GAI on October 3, 2016.

Fuller, Johanna. 2016. Phone conversations with USDA-NRCS Scott County Field Office District Conservationist and Erin Matthews of GAI on September 30, 2016.

Illinois Administrative Code. State of Illinois. 2002. *Illinois noxious weed law*. October 20, 2003.

Missouri Department of Agriculture. 2011. Missouri Revised Statutes and Rules for Noxious Weeds. Available online at http://agriculture.mo.gov/plants/ipm/noxiousweeds.php. Accessed September 2016.

Muenks, Nathan. 2016. Phone conversation with MDOC and Erin Matthews of GAI on September 30, 2016.

Perkins, Charles. 2016. Phone conversation with MDNR Soil and Water Conservation District and Erin Matthews of GAI on September 30, 2016.

United States Department of Agriculture. 2013b. *Introduced, Invasive and Noxious Plants - Federal and State*. Available online at http://plants.usda.gov/java/noxiousDriver#state. Accessed September 2016.

Wamsley, Collin. 2016. Phone conversations with USDA-NRCS St. Louis and St Charles County Field Office District Conservationist and Erin Matthews of GAI on September 30, 2016.

ATTACHMENT A

Noxious Weeds and Invasive Plant Species List

Attachment A. Noxious Weeds and Invasive Plant Species List

Scientific Name	Common Name
Federal Species Known to Occur in Illinois or Missouri	
Heracleum mantegazzianum	Giant Hogweed
Nassella trichotoma	Serrated tussock
Orobanche	Broomrape
Ottelia alismoides	Ducklettuce
Cuscuta	Dodder
Illinois State List	
Ambrosia artemisiifolia	Common ragweed
Ambrosia trifida	Giant ragweed
Cannabis sativa	Marijuana
Carduus nutans	Musk Thistle
Cirsium arvense	Canada thistle
Pueraria montana	Kudzu
Sonchus arvensis	Perennial sowthistle
Sorghum almum	Columbus grass
Sorghum halepense	Johnsongrass
Missouri State List	
Cannabis sativa	Marijuana
Cirsium arvense	Canada thistle
Carduus nutans	Musk thistle
Convolvulus arvensis	Field bindweed
Dipsacus fullonum	Common teasel
Dipsacus laciniatus	Cut-leaved teasel
Lythrum salicaria	Purple loosestrife
Onopordum acanthium	Scotch thistle
Pueraria montana	Kudzu
Rosa multiflora	Multiflora rose
Sorghum halepense	Johnsongrass

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ATTACHMENT B

Noxious Weed Locations

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Attachment B. Noxious Weed Locations

Milepost/ County, State	Feature I.D.	Species	Cover	Within Construction Work Areas (Y/N)	Distance to Construction Work Areas (feet)
24-Inch Pipeline					
Scott County, Illinois					
0.9	NOX-TMA-001	Giant ragweed *(Ambrosia trifida)*	Low	No	13
1.0	NOX-TMA-002	Giant ragweed	Low	Yes	0
1.0	NOX-TMA-003	Giant ragweed	Low	Yes	0
1.0	NOX-TMA-004	Giant ragweed	Low	No	78
2.2R	NOX-TMA-005	Ambrosia spp.	Low	No	410
2.4	NOX-TMA-006	Giant ragweed	Low	No	635
2.4	NOX-TMA-007	Giant ragweed	Low	No	749
2.6	NOX-TMA-008	Common ragweed *(Ambrosia artemisiifolia)*	Low	No	654
2.7	NOX-TMA-009	Sorghum halepense	Low	No	454
3.1	NOX-TMA-010	Common ragweed	Moderate	No	3
3.4	NOX-TMA-012	Johnsongrass	Low	No	111
3.4	NOX-TMA-011	Giant ragweed	Low	No	119
Greene County, Illinois					
3.6	NOX-TMA-013	Common ragweed	Moderate	No	221
3.7	NOX-TMA-014	Ragweed spp.	Moderate	No	93
3.7	NOX-TMA-015	Ragweed spp.	Moderate	No	102
3.8	NOX-TMA-016	Common ragweed	Moderate	Yes	0
4.2	NOX-TMA-017	Common ragweed	Low	Yes	0
4.5	NOX-TMA-019	Ragweed spp.	Moderate	No	29
5.8	NOX-TMA-020	Common ragweed	Low	No	38
5.8	NOX-TMA-021	Ragweed spp.	Low	No	16
6.4	NOX-TMA-022	Ragweed spp.	Low	No	273
8.6	NOX-TMA-025	Giant ragweed	Moderate	Yes	0
11.5	NOX-TMA-024	Giant ragweed	High	No	43
12.0	NOX-TMA-023	Giant ragweed	Low	No	26
14.1	NOX-TMA-026	Giant ragweed	Moderate	No	5
15.0	NOX-TMA-027	Giant ragweed	Low	Yes	0
15.6	NOX-TMA-028	Giant ragweed	Low	No	3

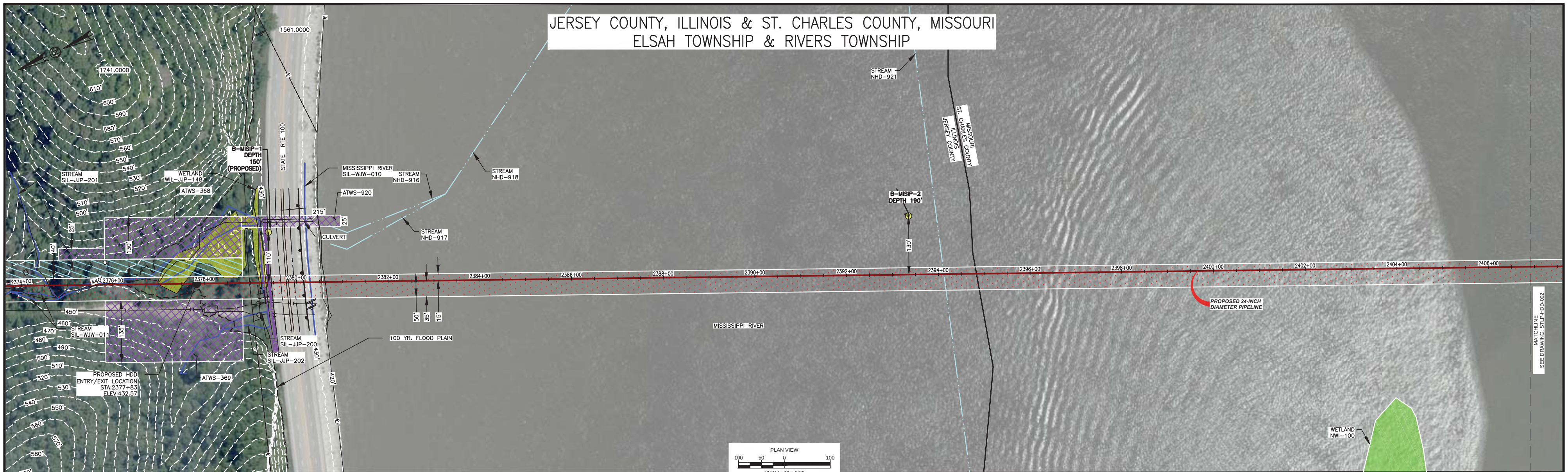
Attachment B. Noxious Weed Locations (Continued)

Milepost/ County, State	Feature I.D.	Species	Cover	Within Construction Work Areas (Y/N)	Distance to Construction Work Areas (feet)
19.5	NOX-TMA-029	Giant ragweed	Moderate	No	4
25.3R	NOX-JJP-004	Giant ragweed	High	Yes	0
25.3R	NOX-TMA-033	Giant ragweed	High	No	810
26.1	NOX-TMA-031	Giant ragweed	High	No	43
26.1	NOX-TMA-032	Giant ragweed	Moderate	No	5
27.6	NOX-TMA-030	Giant ragweed	Moderate	Yes	0
Jersey County, Illinois					
35.5R	NOX-CDK-011	Johnsongrass *(Sorghum halepense)*	Low	No	790
35.8R	NOX-CDK-009	Johnsongrass	High	No	860
36.5R	NOX-CDK-008	*Giant ragweed*	Moderate	No	979
36.5R	NOX-CDK-010	Johnsongrass	Low	No	1,078
58.3 (TAR-021)	NOX-CDK-012	Johnsongrass	Low	No	11
North County Extension					
St. Louis County, Missouri					
5.9	NOX-JJP-003	Johnsongrass	Low	Yes	0
6.0	NOX-JJP-002	Johnsongrass	Low	Yes	0
6.0	NOX-JJP-001 (end)	Giant ragweed	Low	No	24
6.0	NOX-JJP-001 (start)	Giant ragweed	Low	No	31

APPENDIX J

SITE-SPECIFIC WATERBODY CROSSING PLANS

Horizontal Directional Drill 1
The Mississippi River and Luesse Lake



MISSISSIPPI HDD PLAN VIEW

HDD NOTES:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
2. ALL CHAINAGES ARE HORIZONTAL.
3. CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
4. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
5. THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
6. EXISTING UTILITY LOCATIONS AND DEPTHS, INCLUDING PRIVATE SERVICES, ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION OPERATIONS.
7. HDD OPERATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH ALL PERMIT REQUIREMENTS.
8. DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING PROCESS. LOCATION OF MONITORING SHALL BE AS CLOSE TO THE DRILL BIT AS POSSIBLE.
9. PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
10. UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
11. IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL REVISED PLANS AND PROCEDURES HAVE BEEN SUBMITTED TO AND ACCEPTED BY THE OWNER.
12. CONTRACTOR SHALL USE THE DRILL AND INTERSECT INSTALLATION STRATEGY TO COMPLETE THIS INSTALLATION.
13. THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER. THE FINAL REAMED HOLE DIAMETER IS ANTICIPATED TO BE 36". THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE CONTRACTOR SELECTED FOR THE WORK.
14. CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
15. CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT

PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:

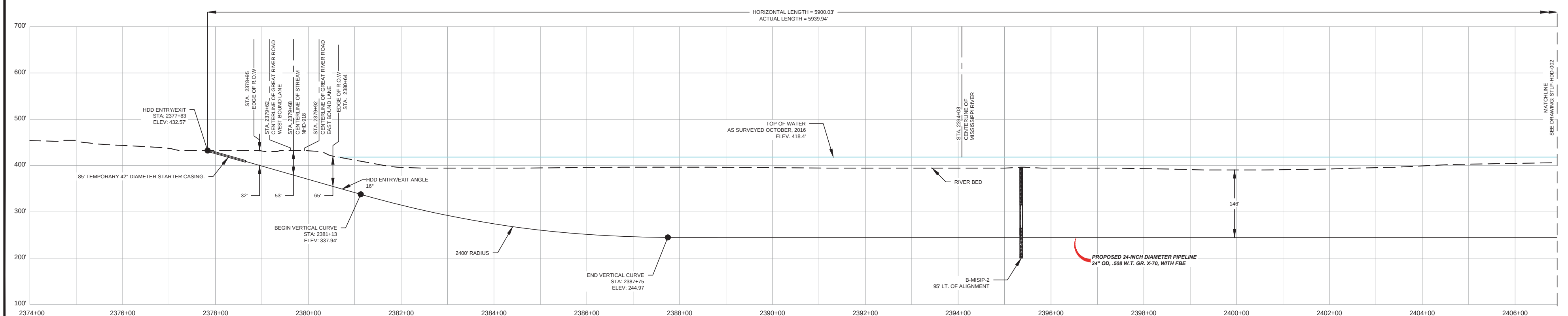
ITEM	TOLERANCE
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1 (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL
PILOT EXIT ANGLE	DECREASE ANGLE UP TO 2° (FLATTER), BUT NO INCREASES IN EXIT ANGLE ALLOWED.
PILOT EXIT LOCATION	UP TO TEN (10) FEET SHORTER OR LONGER.
PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
PILOT ALIGNMENT	UP TO TEN (10) FEET LEFT OR RIGHT OF THE OWNER SURVEY CENTER-LINE BUT NOT WITHIN FIVE (5) FEET OF THE RIGHT-OF-WAY/EASEMENT BOUNDARY OR ANY BELOW GRADE UTILITY OR STRUCTURE.

Soil Stratagraphic Legend: ML, CH, CL, SP, SW, GP, LIMESTONE, SM

Rock Stratagraphic Legend: LIMESTONE, MUDSTONE, SHALE, CONCRETE, GP

LEGEND

PROPOSED PERMANENT EASEMENT
EXISTING PERMANENT EASEMENT
TEMPORARY WORKSPACE
ADDITIONAL TEMPORARY WORKSPACE
PROPOSED STAGING AREA
ACCESS ROAD
USACE EASEMENT
PROPOSED 24-INCH DIAMETER PIPELINE
PROPERTY LINE
X X X X-.0000 MMID
EXISTING GAS PIPELINE
EXISTING FOREIGN PIPELINE
EXISTING OVERHEAD LINE
ROAD CENTERLINE
STREAM (DELINEATED)
STREAM (DESKTOP)
WETLAND (DESKTOP)
WETLAND (DELINEATED)



PROFILE

SCALES HORIZ. 1" = 100' VERT. 1" = 100'

NOTES:
1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.
2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
3. PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA.
4. BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.

REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-052	ALIGNMENT SHEET
STLP-HDD-002	HDD PROFILE OVERVIEW

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP
2	AMENDMENT TO FERC	04/2017	RJR	EB	RJP
3	FERC SUPPLEMENTAL FILING	07/2017	RJP	EB	RJP

APPROVALS

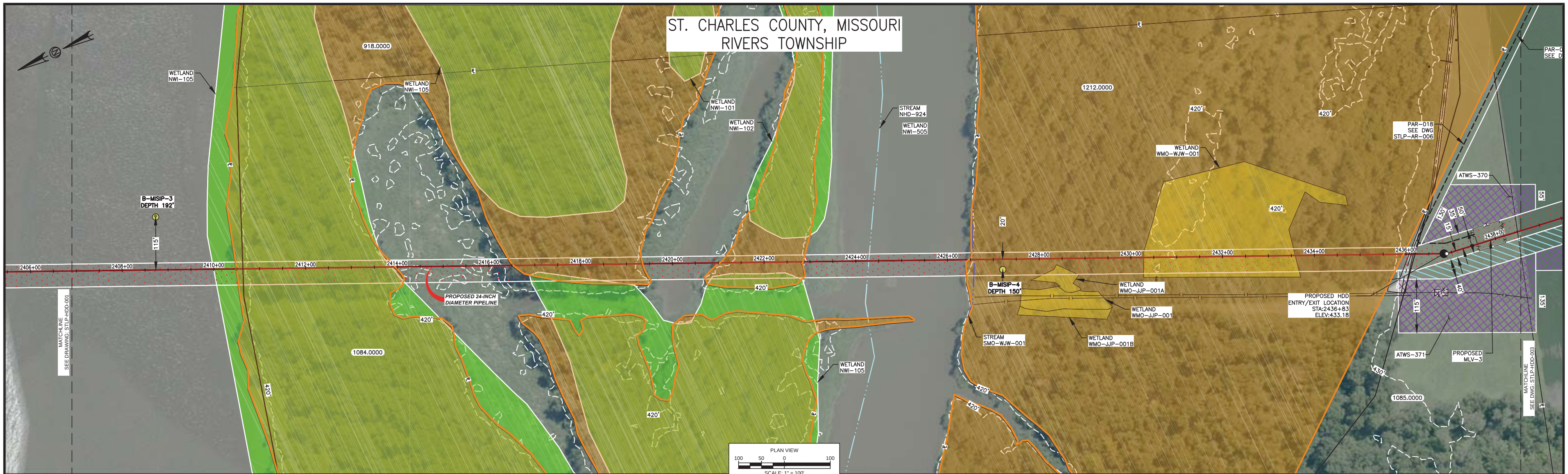
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
M.A.P.	07/2017	J.E.W.	07/2017	STLP-HDD-001	

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSISSIPPI RIVER MAINLINE
JERSEY COUNTY, ILLINOIS & ST. CHARLES COUNTY, MISSOURI

G:\Spire\372453_StLouisPipeline\DataProd_FERC\Work\Drafting\HDD_Plan&Profile\Mississippi\STLP-HDD-001.dwg Jul 10, 2017 - 2:39PM gwa72566



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11. IF THE CONTRACTOR ENCOUNTERS AN OBSTRUCTION THAT PREVENTS THE INSTALLATION ACCORDING TO THE PROJECT SPECIFICATIONS, THE CONTRACTOR SHALL PLACE A CEMENT BASED GROUT WITHIN THE BORE. WORK SHALL NOT RESUME UNTIL REVISED PLANS AND PROCEDURES HAVE BEEN SUBMITTED TO AND ACCEPTED BY THE OWNER.
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MISSISSIPPI HDD PLAN VIEW

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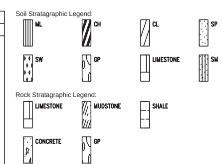

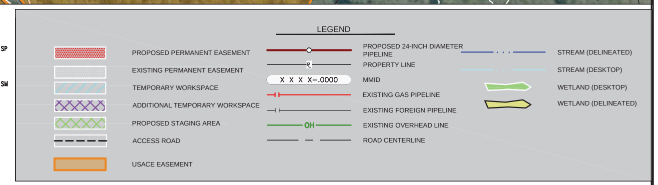

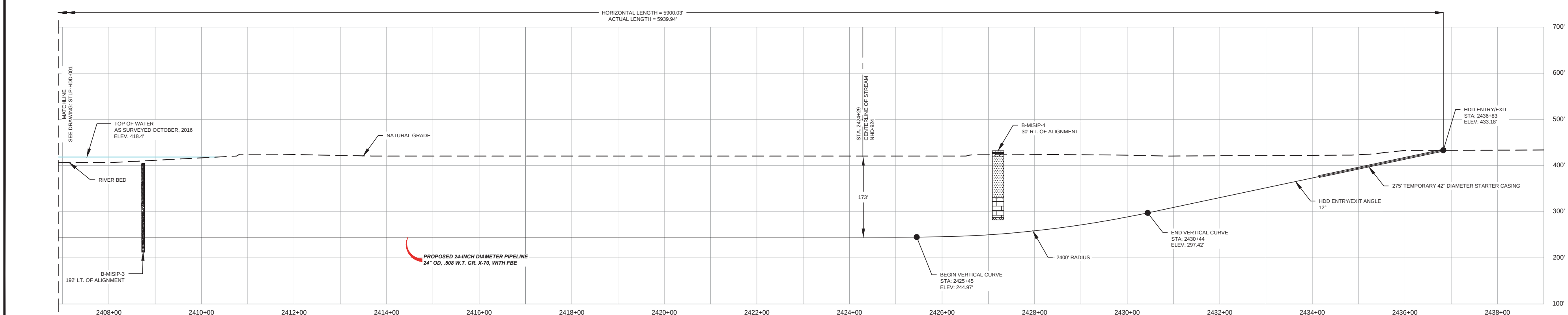

PROFILE
SCALES HORIZ. 1" = 100' VERT. 1" = 100'

NOTES:
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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-052	ALIGNMENT SHEET
STLP-A-053	ALIGNMENT SHEET
STLP-AR-006	ACCESS ROAD SITE PLAN - PAR-018

REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-HDD-001	HDD PROFILE OVERVIEW
STLP-HDD-003	HDD PROFILE OVERVIEW

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP
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3	FERC SUPPLEMENTAL FILING	07/2017	RJP	EB	RJP

REVISIONS

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APPROVALS

DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
D.R.G.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
M.A.P.	07/2017	J.E.W.	07/2017	STLP-HDD-002	

PREPARED FOR
Spire
STL Pipeline

PREPARED BY
MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSISSIPPI RIVER MAINLINE
JERSEY COUNTY, ILLINOIS & ST. CHARLES COUNTY, MISSOURI

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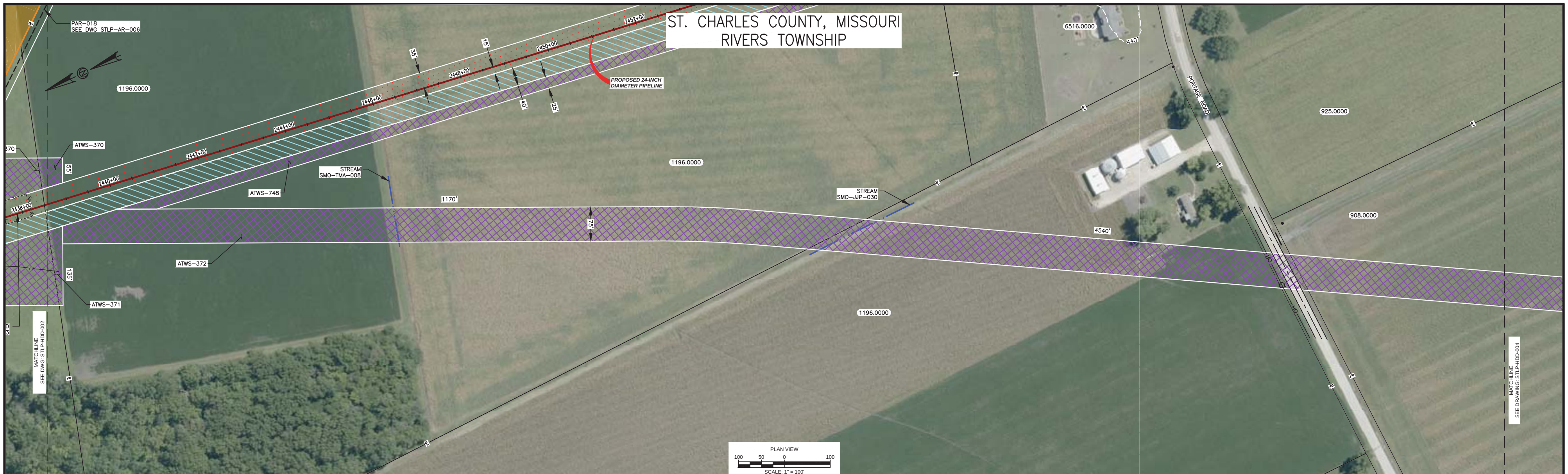

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Soil Stratagraphic Legend:
ML
CH
CL
SP
SW
GP
LIMESTONE
SM

Rock Stratagraphic Legend:
LIMESTONE
MUDSTONE
SHALE
CONCRETE
GP

LEGEND

PROPOSED PERMANENT EASEMENT
EXISTING PERMANENT EASEMENT
TEMPORARY WORKSPACE
ADDITIONAL TEMPORARY WORKSPACE
PROPOSED STAGING AREA
ACCESS ROAD
USACE EASEMENT
PROPOSED 24-INCH DIAMETER PIPELINE
PROPERTY LINE
X X X X-.0000 MMID
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EXISTING FOREIGN PIPELINE
OH EXISTING OVERHEAD LINE
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STREAM (DELINEATED)
STREAM (DESKTOP)
WETLAND (DESKTOP)
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REFERENCE DRAWINGS		REFERENCE DRAWINGS	
DWG. NO.	TITLE	DWG. NO.	TITLE
STLP-A-053	ALIGNMENT SHEET	STLP-HDD-004	HDD PROFILE OVERVIEW
STLP-AR-006	ACCESS ROAD SITE PLAN - PAR-018		
STLP-HDD-002	HDD PROFILE OVERVIEW		

REVISIONS						REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP						
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APPROVALS					
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
D.R.G.	01/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-003	
M.A.P.	07/2017	J.E.W.	07/2017		

PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSISSIPPI RIVER MAINLINE
ST. CHARLES COUNTY, MISSOURI

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Soil Stratagraphic Legend:
ML CH CL SP
SW GP LIMESTONE SM

Rock Stratagraphic Legend:
LIMESTONE MUDSTONE SHALE
CONCRETE GP

LEGEND

PROPOSED PERMANENT EASEMENT
EXISTING PERMANENT EASEMENT
TEMPORARY WORKSPACE
ADDITIONAL TEMPORARY WORKSPACE
PROPOSED STAGING AREA
ACCESS ROAD
USACE EASEMENT
PROPOSED 24-INCH DIAMETER PIPELINE
PROPERTY LINE
X X X X–.0000 MMID
EXISTING GAS PIPELINE
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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-053	ALIGNMENT SHEET
STLP-HDD-003	HDD PROFILE OVERVIEW
STLP-AR-006	ACCESS ROAD SITE PLAN - PAR-018

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP
2	AMENDMENT TO FERC	04/2017	RJR	EB	RJP

APPROVALS

DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
D.R.G.	01/2017	D.G.G.	01/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-004	
E.B.	01/2017	J.E.W.	01/2017		

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSISSIPPI RIVER MAINLINE
ST. CHARLES COUNTY, MISSOURI

Horizontal Directional Drill 2

The Missouri River

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-066	ALIGNMENT SHEET
STLP-A-067	ALIGNMENT SHEET

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
3	FERC SUPPLEMENTAL FILING	07/2017	RJP	EB	RJP

APPROVALS

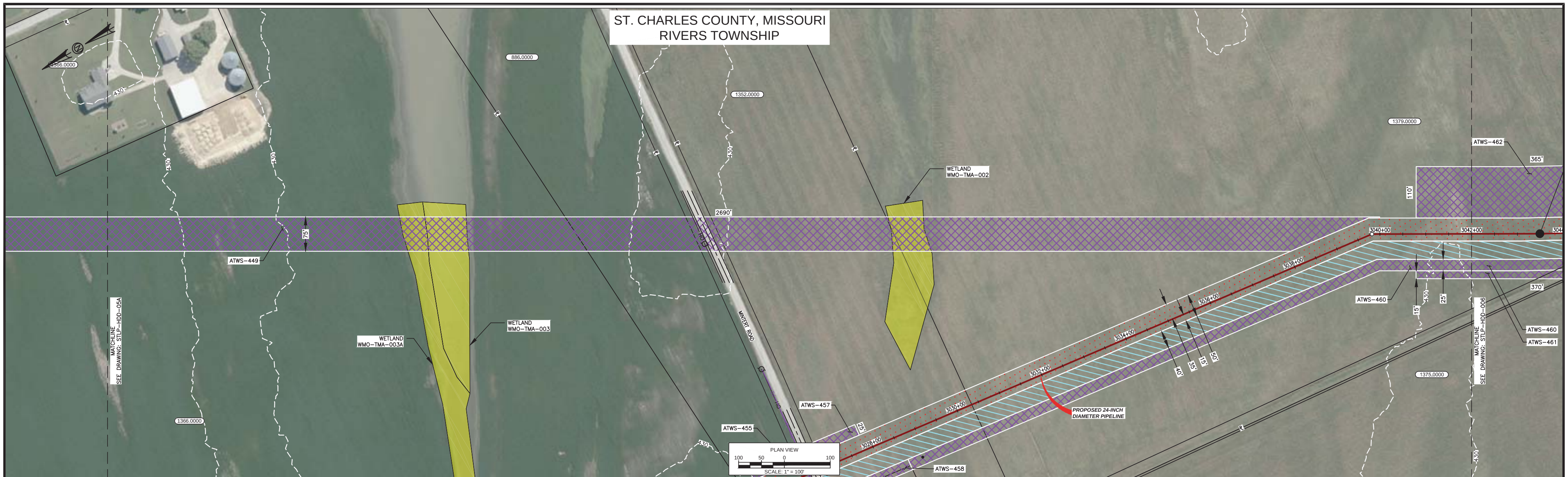
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
M.A.P.	07/2017	J.E.W.	07/2017	STLP-HDD-005A	

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSOURI RIVER MAINLINE
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

G:\Spire\372453_StLouisPipeline\DataProd_FERC\Work\Drafting\HDD_Plan&Profile\Missouri\STLP-HDD-005a.dwg Jul 13, 2017 - 1:22PM gwa72566



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Rock Stratagraphic Legend:
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REFERENCE DRAWINGS		REFERENCE DRAWINGS	
DWG. NO.	TITLE	DWG. NO.	TITLE
STLP-A-066	ALIGNMENT SHEET		
STLP-A-067	ALIGNMENT SHEET		

REVISIONS						REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR	NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP						
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APPROVALS					
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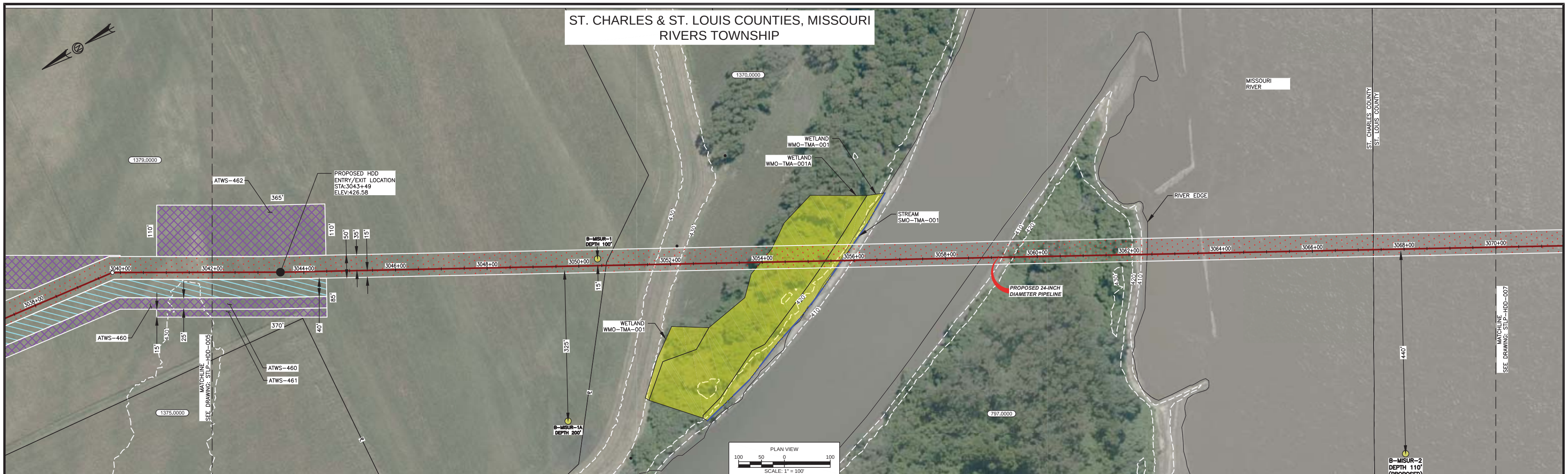
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-005	
M.A.P.	07/2017	J.E.W.	07/2017		

PREPARED FOR
Spire
STL Pipeline

PREPARED BY
MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSOURI RIVER MAINLINE
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI
RIVERS TOWNSHIP



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MISSOURI RIVER HDD PLAN VIEW

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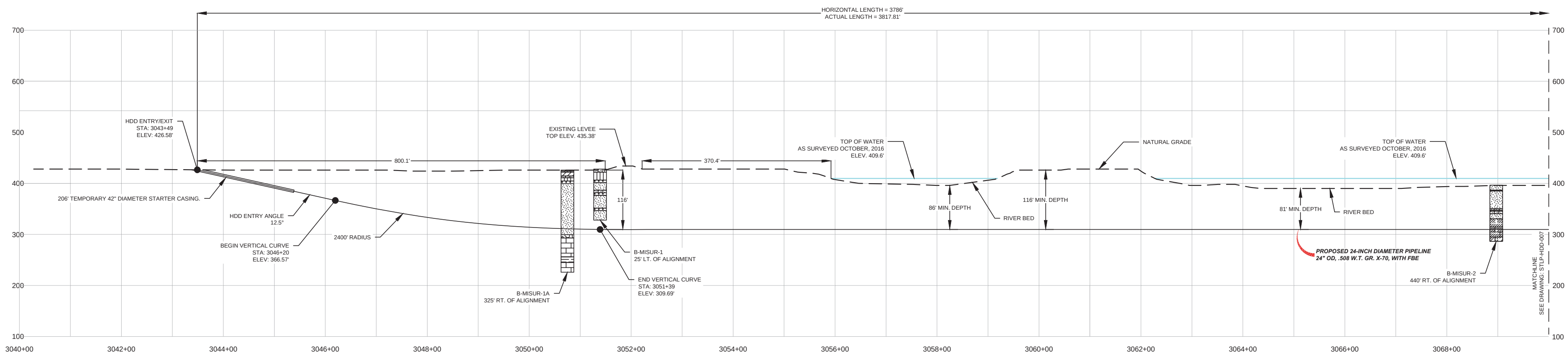

PROFILE
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DWG. NO.	TITLE	DWG. NO.	TITLE
STLP-A-067	ALIGNMENT SHEET		
STLP-HDD-007	HDD PROFILE OVERVIEW		

REVISIONS					
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1	ISSUE FOR FERC	01/2017	RJR	EB	RJP
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REVISIONS					
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APPROVALS					
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-006	
M.A.P.	07/2017	J.E.W.	07/2017		

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSOURI RIVER MAINLINE
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

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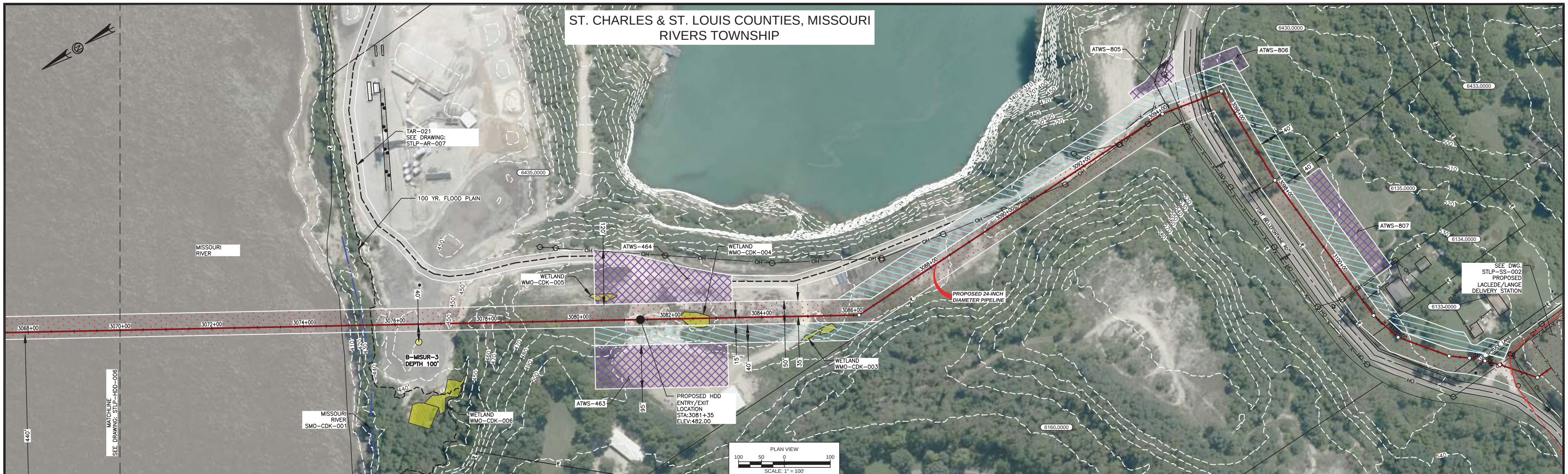

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MISSOURI RIVER HDD PLAN VIEW

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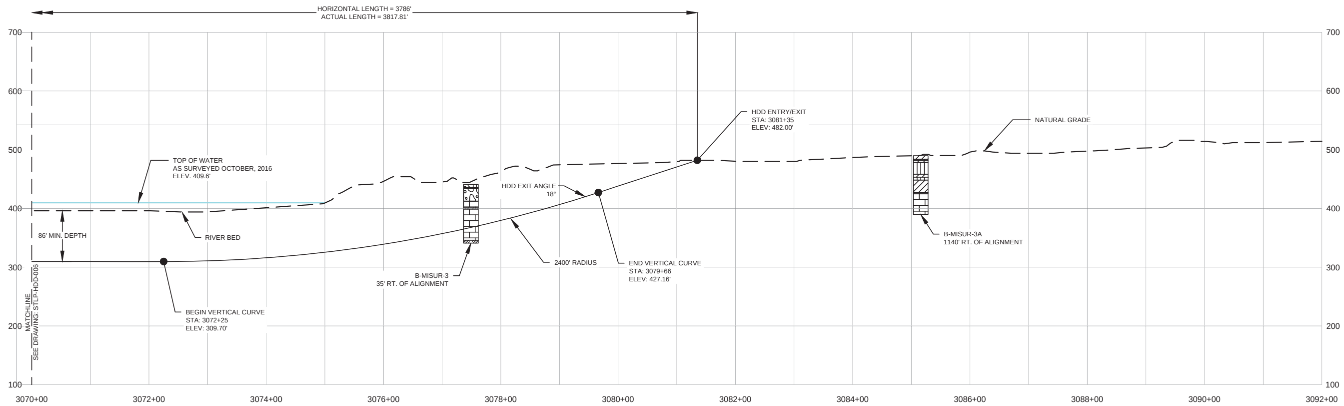

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-068	ALIGNMENT SHEET
STLP-AR-007	ACCESS ROAD SITE PLAN - TAR-021
STLP-SS-002	LACLEDE/LANGE DELIVERY STATION SITE LAYOUT - STLP-SS-002

REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-HDD-006	HDD PROFILE OVERVIEW

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RJR	EB	RJP
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REVISIONS

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APPROVALS

DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-007	
M.A.P.	07/2017	J.E.W.	07/2017		

PREPARED FOR
Spire
STL Pipeline

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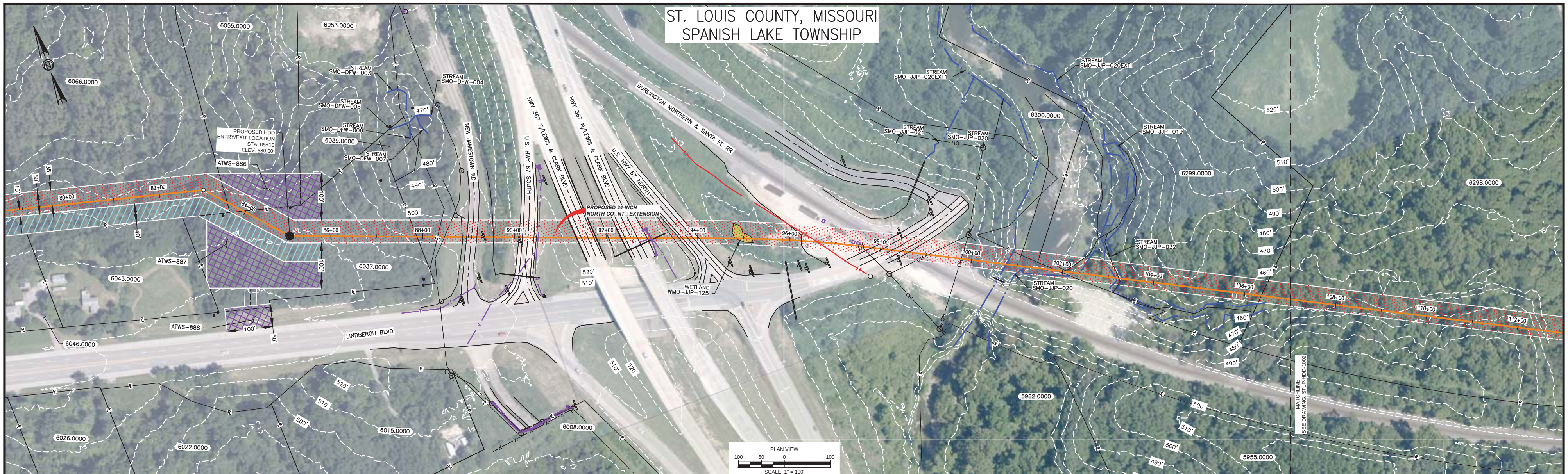
SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
MISSOURI RIVER MAINLINE
ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

Horizontal Directional Drill 3

Coldwater Creek



HIGHWAY 367 HDD PLAN VIEW

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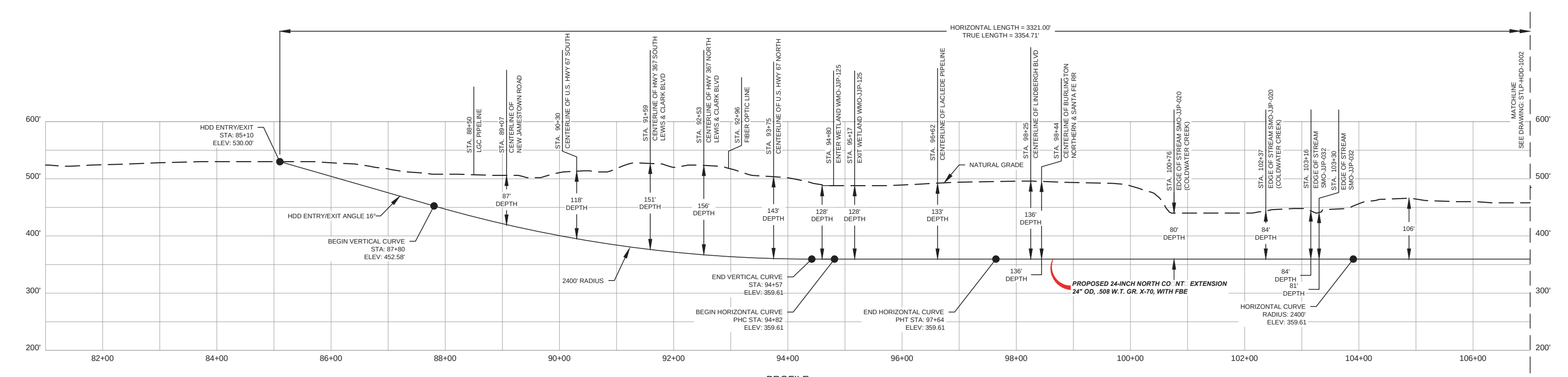

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-1002	ALIGNMENT SHEET
STLP-A-1003	ALIGNMENT SHEET
STLP-HDD-1002	HDD PROFILE OVERVIEW

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	AMENDMENT TO FERC	04/2017	SG	KAM	RJP

APPROVALS

DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
S.G.	04/2017	D.G.G.	04/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
R.J.P.	04/2017	J.E.W.	04/2017	STLP-HDD-1001	

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
HIGHWAY 367 & COLDWATER CREEK NORTH COUNTY EXTENSION
SPANISH LAKE TOWNSHIP, ST. LOUIS, MISSOURI

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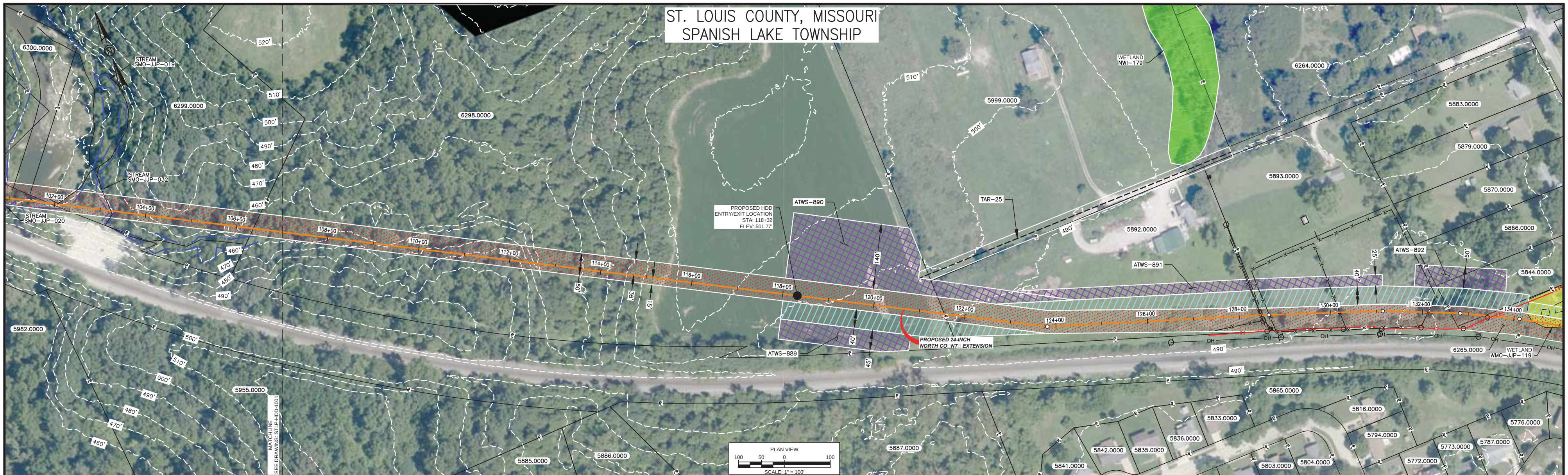

HDD NOTES:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS OTHERWISE SPECIFIED.
2. ALL CHAINAGES ARE HORIZONTAL.
3. CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR MEANS AND METHODS.
4. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED TEMPORARY CONDUCTOR CASING SHALL BE FULLY REMOVED UPON COMPLETION OF PULLBACK OPERATIONS.
5. THE MINIMUM ALLOWABLE DRILLING RADIUS SHALL BE 1,750 FEET BASED ON A 3-JOINT AVERAGE.
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8. DOWNHOLE ANNULAR DRILLING FLUID PRESSURES SHALL BE MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING PROCESS. LOCATION OF MONITORING SHALL BE AS CLOSE TO THE DRILL BIT AS POSSIBLE.
9. PILOT BORE SHALL BE CONTINUOUSLY TRACKED AT ALL TIMES. NO BLIND SECTIONS SHALL BE PERMITTED, EVEN WHEN THE DRILL BIT IS UNDER WATER.
10. UPON HDD COMPLETION AND EXTRACTION OF TEMPORARY CASING PIPE (IF APPLICABLE), CONTRACTOR SHALL PLACE A UNIFORM CEMENT BASED GROUT WITHIN THE NEAREST 200 FEET OF THE ANNULAR SPACE OF THE HDD BORE BETWEEN THE PRODUCT PIPE AND THE UNDISTURBED EARTH AT EACH HDD ENTRY AND EXIT LOCATIONS. GROUT DELIVERY METHOD SHALL BE FROM MULTIPLE POINTS WITHIN THE ANNULAR SPACE. CONTRACTOR SHALL MONITOR AND CONTROL GROUT PRESSURES TO WITHIN LIMITS FOR THE ENCOUNTERED GEOTECHNICAL MATERIALS.
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HIGHWAY 367 HDD PLAN VIEW

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PILOT DEPTH	UP TO THREE (3) FEET SHALLOWER DEPTH ALLOWED. UP TO TEN (10) FEET INCREASE IN PIPE DESIGN DEPTH (DEEPER) ALLOWED.
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Soil Stratagraphic Legend: ML, CH, CL, SP, SW, GP, LIMESTONE, SM

Rock Stratagraphic Legend: LIMESTONE, MUDSTONE, SHALE, CONCRETE, GP

LEGEND

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- EXISTING PERMANENT EASEMENT
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- ADDITIONAL TEMPORARY WORKSPACE
- PROPOSED STAGING AREA
- ACCESS ROAD
- USACE EASEMENT
- PROPOSED 24-INCH DIAMETER COUNTY EXTENSION
- PROPERTY LINE
- X X X X-.0000 MMID
- EXISTING GAS PIPELINE
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- ROAD CENTERLINE
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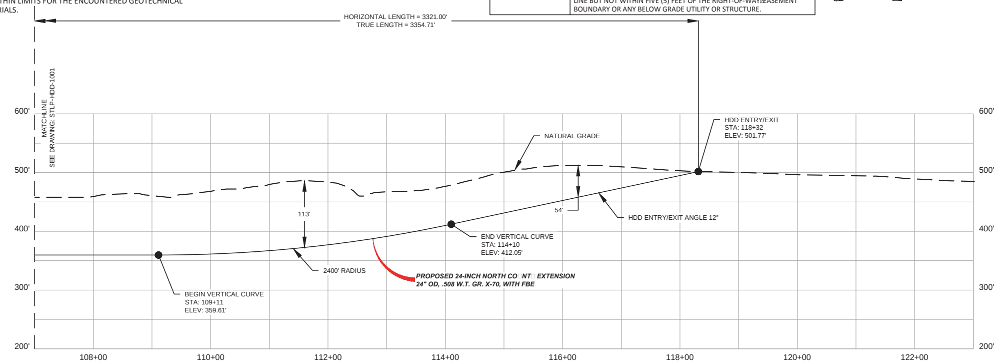

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-1003	ALIGNMENT SHEET
STLP-HDD-1001	HDD PLAN AND PROFILE

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	AMENDMENT TO FERC	04/2017	SG	KAM	RJP

APPROVALS

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S.G.	04/2017	D.G.G.	04/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
R.J.P.	04/2017	J.E.W.	04/2017	STLP-HDD-1002	

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

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SITE-SPECIFIC WATERBODY CROSSING PLAN
HIGHWAY 367 & COLDWATER CREEK NORTH COUNTY EXTENSION
SPANISH LAKE TOWNSHIP, ST. LOUIS MISSOURI

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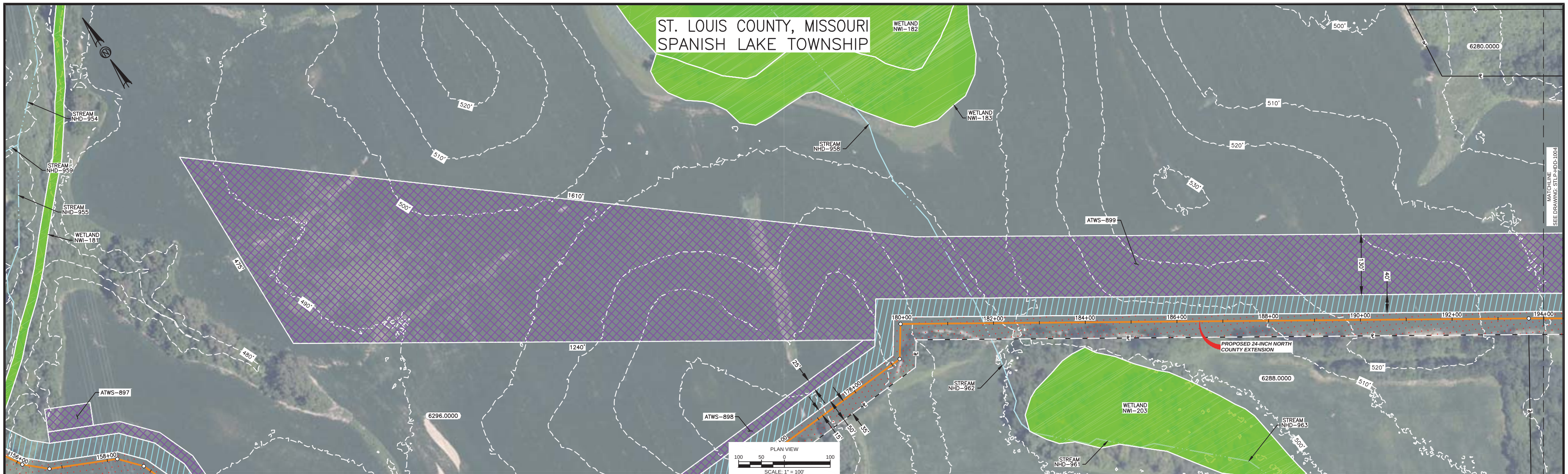
Horizontal Directional Drill 4
Sunfish Lake



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SPANISH LAKE PARK HDD PLAN VIEW

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Soil Stratagraphic Legend:
ML CH CL SP SW GP LIMESTONE SM

Rock Stratagraphic Legend:
LIMESTONE MUDSTONE SHALE CONCRETE GP

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-A-1004	ALIGNMENT SHEET
STLP-HDD-1004	HDD PROFILE OVERVIEW

REVISIONS

NO.	REVISIONS	DATE	DRAWN	CK	APPR
2	AMENDMENT TO FERC	04/2017	AK	KAM	RJP
3	FERC SUPPLEMENTAL FILING	07/2017	RJP	KAM	RJP

APPROVALS

DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE		
M.A.P.	07/2017	J.E.W.	07/2017	STLP-HDD-1003	

PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
SPANISH LAKE PARK NORTH COUNTY EXTENSION
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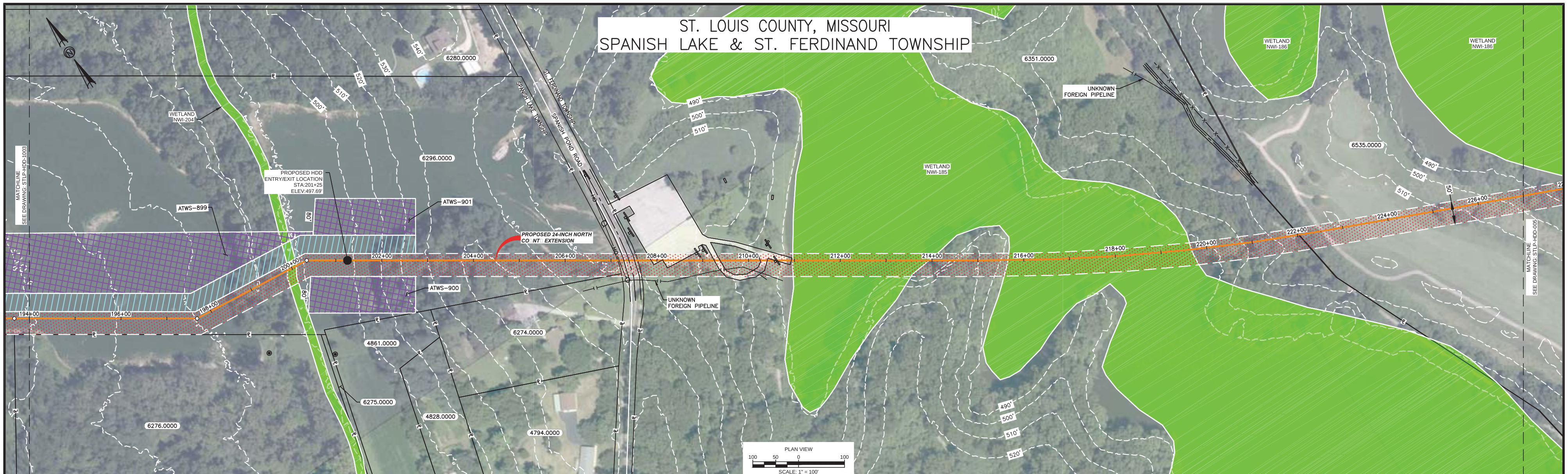

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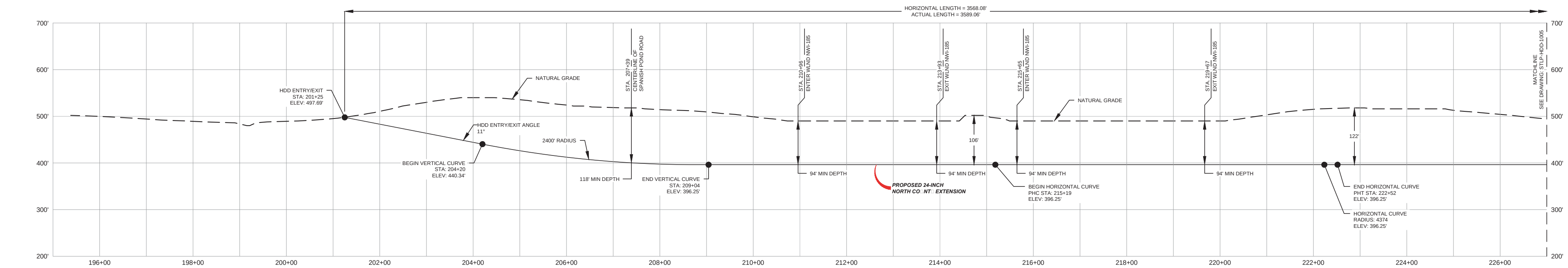

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REFERENCE DRAWINGS

DWG. NO.	TITLE
STLP-HDD-1003	HDD PLAN AND PROFILE
STLP-A-1005	ALIGNMENT SHEET
STLP-HDD-1005	HDD PLAN AND PROFILE

REVISIONS

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A.K.Y.	04/2017				
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-1004	
R.J.P.	04/2017				

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SPANISH LAKE & ST. FERDINAND TOWNSHIPS, ST. LOUIS, MISSOURI

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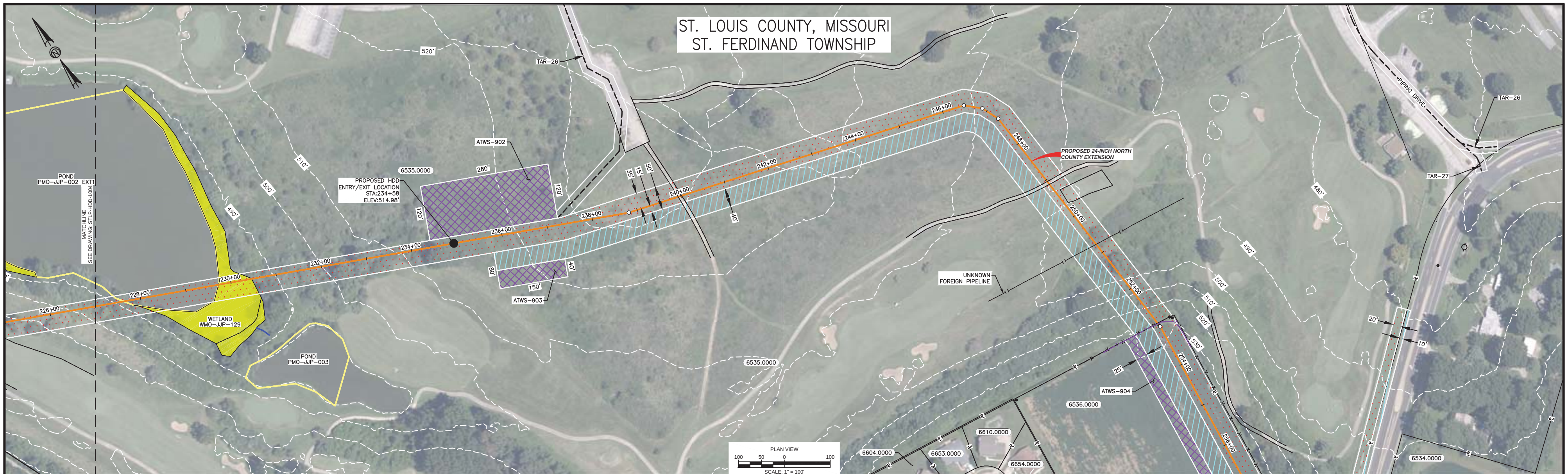

SPANISH LAKE PARK HDD PLAN VIEW

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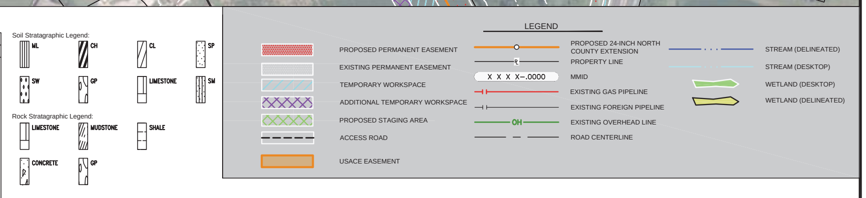

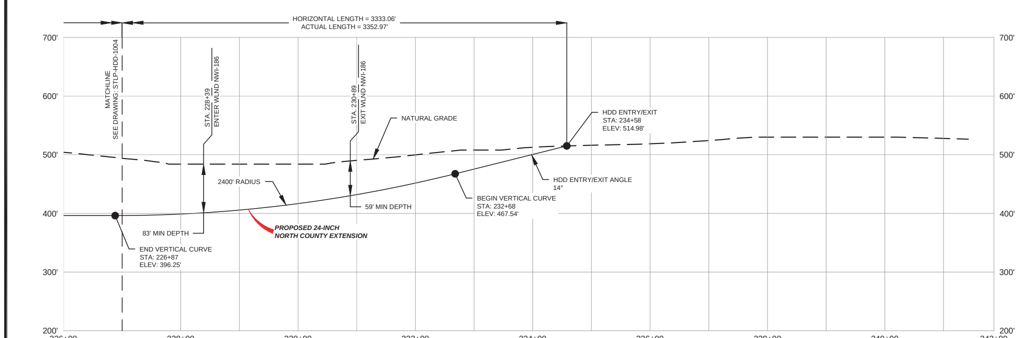

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SCALES HORIZ. 1" = 100' VERT. 1" = 100'

NOTES:
1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2017. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.
2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
3. PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA.
4. BASE FLOOD ELEVATION LINE SHOWN FOR 100 YEAR FLOOD PLAIN LIMIT WAS PULLED FROM FEMA FLOOD INSURANCE RATE MAPS (FIRM). THE ELEVATION OF 438 FEET WAS DETERMINED USING MAP NUMBERS 29189C0080K AND 17083C0278D.

G:\Spire\372453_StLouisPipeline\DataProd_FERC\Work\Drafting\HDD_Plan&Profile\Spanish Lake\STLP-HDD-1005.dwg Jul 10, 2017 - 2:16PM
kwo69681

REFERENCE DRAWINGS		REFERENCE DRAWINGS	
DWG. NO.	TITLE	DWG. NO.	TITLE
STLP-A-1005	ALIGNMENT SHEET		
STLP-A-1006	ALIGNMENT SHEET		
STLP-HDD-1004	HDD PLAN AND PROFILE		

REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR
2	AMENDMENT TO FERC	04/2017	AK	KAM	RJP
3	FERC SUPPLEMENTAL FILING	07/2017	RJP	KAM	RJP

REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR

APPROVALS					
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
R.J.P.	07/2017	D.G.G.	07/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	STLP-HDD-1005	
M.A.P.	07/2017	J.E.W.	07/2017		

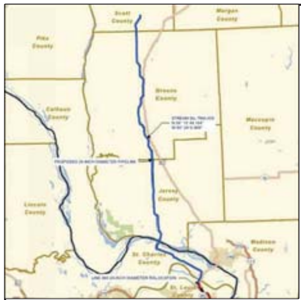
PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

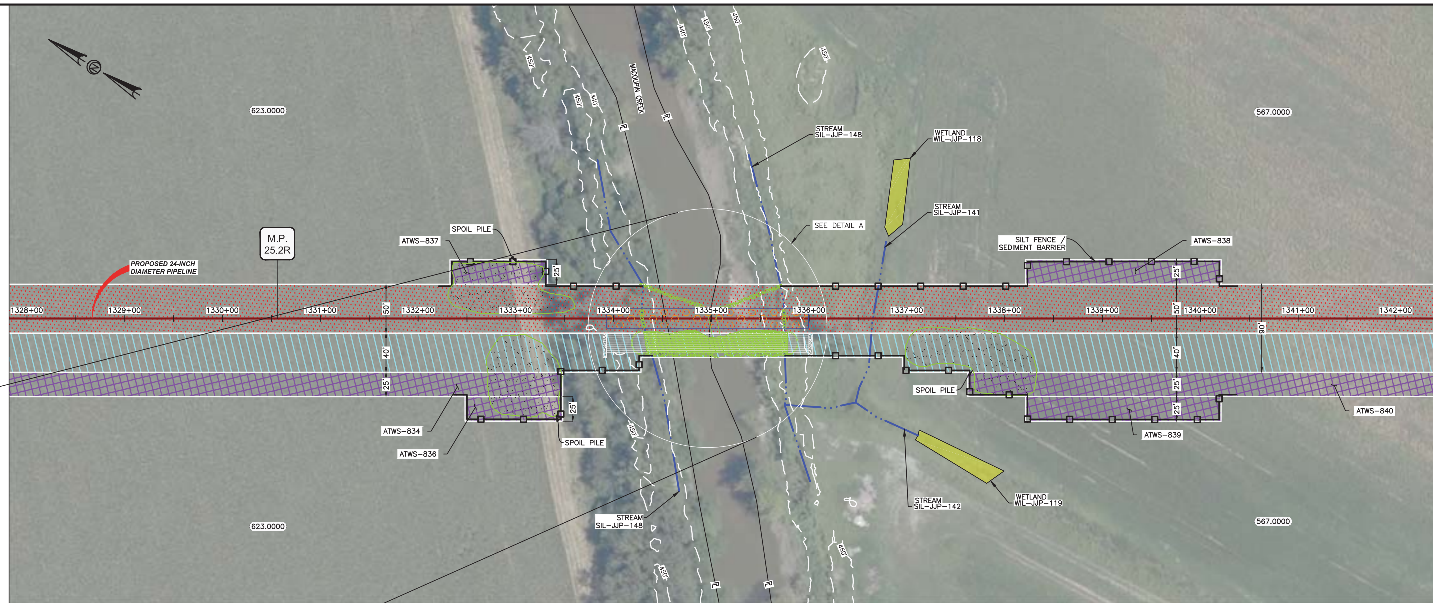
SPIRE STL PIPELINE PROJECT
SITE-SPECIFIC WATERBODY CROSSING PLAN
SPANISH LAKE PARK NORTH COUNTY EXTENSION
ST. FERDINAND TOWNSHIPS, ST. LOUIS MISSOURI

Dry-Ditch Flume

Macoupin Creek

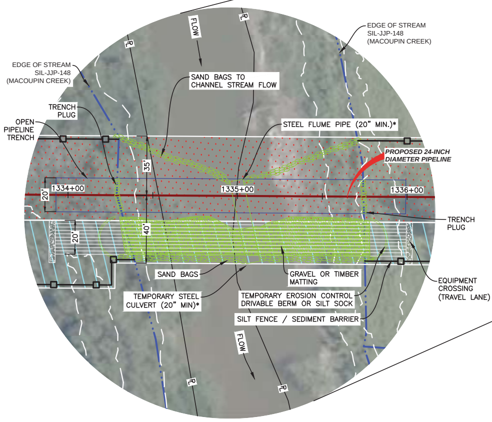


LOCATION MAP
N.T.S



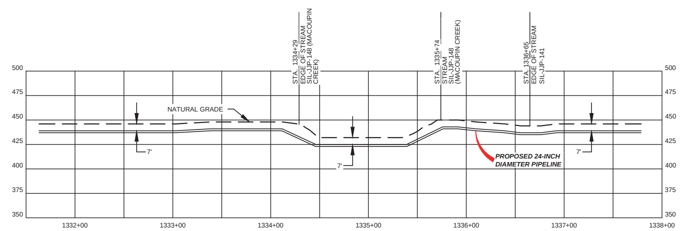
PLAN

GRAPHIC SCALE
60' 30' 0 60'



DETAIL "A"

*ACTUAL NUMBER OF FLUMES/PIPES/CULVERTS REQUIRED TO BE DETERMINED IN THE FIELD BASED ON STREAM FLOWS AT THE TIME OF CONSTRUCTION



PROFILE
SCALES HORIZ. 1" = 60' VERT. 1" = 60'

LEGEND

- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED STAGING AREA
- ACCESS ROAD
- PROPOSED 24-INCH DIAMETER PIPELINE
- EXISTING GAS PIPELINE
- EXISTING FOREIGN PIPELINE
- OVERHEAD POWER LINE
- EXISTING FIBER OPTIC LINE
- 740.000 MMID
- PROPERTY LINE
- MUNICIPAL LINE
- WETLAND (DESKTOP)
- WETLAND (DELINEATED)
- ℄ OF STREAM (DESKTOP)
- ℄ OF STREAM (DELINEATED)
- SILT FENCE / SEDIMENT BARRIER
- FENCE LINE

NOTES:
1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM USFWS-NWI AND USGS.
2. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE, AND SHALL BE VERIFIED BY CONTRACTOR.
3. PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA.
4. THE MAXIMUM FLOW RECORDED DURING 2016 CALENDAR YEAR AT USGS 0558700 MACOUPIN CREEK NEAR KANE, IL WAS 7400 CUBIC FEET PER SECOND ON JULY 3, 2016.

REFERENCE DRAWINGS		REFERENCE DRAWINGS	
DWG. NO.	TITLE	DWG. NO.	TITLE
STLP-A-030	ALIGNMENT SHEET		

REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR
1	ISSUE FOR FERC	01/2017	RMR	EB	DGG
2	AMENDMENT TO FERC	04/2017	DWS	RJP	DGG

REVISIONS					
NO.	REVISIONS	DATE	DRAWN	CK	APPR

APPROVALS					
DRAWN BY	DATE	ENG. APPROVAL	DATE	CLIENT APPROVAL	DATE
GG	03/2017	DGG	04/2017		
CHECKED BY	DATE	P.M. APPROVAL	DATE	SCALE: 1" = 60'	
RJP	04/2017	JEW	04/2017	FILENAME: STLP-MC-001 TYPE:	

PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH DIAMETER PIPELINE
MACOUPIN CREEK CROSSING
GREENE COUNTY, ILLINOIS

APPENDIX K
BIOLOGICAL ASSESSMENT FOR THE SPIRE STL PIPELINE PROJECT

TABLE OF CONTENTS

BIOLOGICAL ASSESSMENT

LIST OF ATTACHMENTS

LIST OF TABLES

LIST OF FIGURES

TECHNICAL ABBREVIATIONS AND ACRONYMS

Action	The issuance of a Notice to Proceed to Spire
AIMA	Agricultural Impact Mitigation Agreement
ATWS	additional temporary workspace
BA	Biological Assessment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Certificate	Certificate of Public Convenience and Necessity
Commission	Federal Energy Regulatory Commission
dBA	decibels on the A-weighted scale
dbh	diameter at breast height
DOT	United States Department of Transportation
EA	Environmental Assessment
ESA	Endangered Species Act
EI	environmental inspector
Enable MRT	Enable Mississippi River Transmission, LLC
FERC	Federal Energy Regulatory Commission
GAI	GAI Consultants, Inc.
HDD	horizontal directional drill
HDD Plan	Horizontal Directional Drill Contingency Plan
HUC	hydrologic unit code
ILCS	Illinois Compiled Statutes
Laclede	Laclede Gas Company
MLV	mainline valve
MP	milepost
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
Project	Spire STL Pipeline Project
REX	Rockies Express Pipeline LLC
RIFO	Rock Island Field Office
RTE	rare, threatened, and endangered
RQD	rock quality designations
Spire	Spire STL Pipeline LLC
USACE	United States Army Corps of Engineers
USC	United States Code

USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WNS	white nose syndrome

A. INTRODUCTION

The purpose of this Biological Assessment (BA) is to review the extent to which the Spire STL Pipeline Project (Project) may affect any rare, threatened, or endangered (RTE) species of plants or wildlife pursuant to the Endangered Species Act [(ESA); 16 United States Code (USC) 1531 et seq.] as a result of the Federal Energy Regulatory Commission (FERC or Commission)'s pending decision to issue a Certificate of Public Convenience and Necessity (Certificate) pursuant to Section 7(c) of the Natural Gas Act [15 USC 717f(c)] which would allow Spire STL Pipeline LLC (Spire) to construct and operate the Project in Scott, Greene, and Jersey Counties, Illinois; and St. Charles and St. Louis Counties, Missouri.

1. Regulatory Background

Section 7(a)(2) of the ESA requires any federal agency that authorizes or approves a project, which may include the issuance of a license, contract, or permit for a non-federal project, to determine whether or not the project may jeopardize the continued existence of federally-protected species or result in the destruction or adverse modification of federally-designated critical habitat for any federally-protected species. Federally-protected species are species currently listed as threatened or endangered under the ESA.

Section 9 of the ESA requires federal actions that may not result in jeopardy or adverse modification of critical habitat for a federally-protected species, but would result in the incidental take of any threatened or endangered species, to obtain authorization for incidental take from the United States Fish and Wildlife Service (USFWS). Incidental take is any take that is otherwise prohibited, as long as such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 Code of Federal Regulations [CFR] 17.3).

Take, as defined in Section 3 of the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is an act that kills or injures wildlife and may include significant habitat modification or degradation that significantly impairs essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass means to perform an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

2. Roles and Responsibilities

For the purposes of this BA, the issuance of a Notice to Proceed to Spire for the construction and operation of the Project is considered a federal action (Action);

therefore, FERC is considered the federal action agency consulting with the USFWS on the potential effects of the Action on federally-protected species and federally-designated critical habitat. Spire is considered a non-federal applicant requiring authorization from FERC prior to construction and operation of the Project. FERC designated Spire as its non-federal representative (50 CFR 402.08) to conduct informal consultation.

This BA was prepared to comply with statutory requirements to use the best scientific and commercial information available to review the potential effects of the Action on federally-protected species and federally-designated critical habitat in accordance with ESA implementing regulations [50 CFR 402; 16 USC 1536 (c)].

3. Consultation History

June 8, 2016 – GAI Consultants, Inc. (GAI) contacted the USFWS' Rock Island Field Office (RIFO) via phone and email to initiate an informal review of the Project in an effort to identify survey needs and RTE species.

June 30, 2016 – GAI sent an email to the USFWS' Two Rivers National Wildlife Refuge requesting information about potential Project effects to migratory birds.

July 8, 2016 – GAI and Spire met with the UFWS' RIFO to discuss the Project and RTE species.

August 2, 2016 – GAI contacted the USFWS' RIFO via phone and email to discuss and transmit information regarding surveys for the decurrent false aster.

August 12, 2016 – GAI sent a letter to the USFWS' RIFO requesting technical assistance on RTE species records and survey requirements for the Indiana bat, northern long-eared bat, gray bat, tree nesting migratory birds and bald eagles (*Haliaeetus leucocephalus*), Higgins eye pearlymussel, Spectaclecase (*Cumberlandia monodonta*), pallid sturgeon, Illinois cave amphipod, decurrent false aster, and running buffalo clover (*Trifolium stoloniferum*).

September 29, 2016 – GAI sent a letter to the USFWS' RIFO requesting additional information and review of initial effects determinations and proposed survey protocol for RTE species. The letter indicated the Project is not likely to adversely affect the least tern, piping plover, Higgins eye pearlymussel, or pallid sturgeon due to the use of horizontal directional drill (HDD) crossing methods for the Mississippi and Missouri Rivers. The letter also indicated the Project is not likely to adversely affect the red knot due to lack of habitat of the species in the Project footprint, and would not affect the Illinois cave amphipod due to the species not being present in counties crossed by the Project. The letter concludes that GAI would conduct habitat and/or species surveys for all remaining previously-identified federal RTE species, and would also include the eastern prairie fringed orchid and Mead's milkweed.

September 30 to November 7, 2016 – GAI and the USFWS' RIFO exchanged emails on the review of the September 29, 2017 letter.

December 8, 2016 – The USFWS' RIFO sent a letter to GAI requesting additional information on HDD methods to support the preliminary not likely to adversely affect determinations for the least tern, piping plover, red knot, Higgins eye pearlymussel, and pallid sturgeon. The letter indicated surveys should be conducted for the following species that may occur in the counties crossed by the Project: decurrent false aster, eastern prairie fringed orchid, Mead's milkweed, running buffalo clover, Indiana bat, northern long-eared bat, gray bat, and bald eagle. The letter also recommended seasonal tree clearing restrictions for migratory birds and the development of a migratory bird habitat impact analysis.

January 4, 2017 – FERC, the USFWS RIFO, Spire, and GAI held a conference call to discuss summer presence/absence bat surveys, RTE species surveys. Parties involved decided that Spire should begin preparation of a draft BA in consultation with USFWS.

January 20, 2017 – GAI sent an email to the USFWS' RIFO providing a schedule for draft BA preparation.

January 25, 2017 – GAI sent a letter to the USFWS' RIFO providing information on HDD methods supporting not likely to adversely affect determinations for the least tern, piping plover, red knot, Higgins eye pearlymussel, and pallid sturgeon. The letter also included additional information and a negative survey result for decurrent false aster. The letter also indicated GAI will conduct habitat and/or species surveys for the eastern prairie fringed orchid, Mead's milkweed, running buffalo clover, Indiana bat, northern long-eared bat, gray bat, and bald eagle. The letter committed to seasonal tree clearing restrictions for migratory birds and included a migratory bird habitat impact analysis.

February 7, 2017 – GAI contacted the USFWS' RIFO via phone and email requesting technical assistance on summer presence/absence bat survey site locations.

February 14, 2017 – The USFWS' RIFO returned the call and discussed the summer presence/absence bat survey and preparation of a draft BA.

March 23, 2017 – The USFWS RIFO, Spire, and GAI held a conference call to discuss preparation of the BA.

April 13, 2017 – Telephone call with GAI Consultants and K. Lundh and T. Crabill of USFWS to discuss decurrent false aster surveys and other RTE surveys.

April 26, 2017 – FERC, the USFWS, and the USACE held a conference call and discussed, among other topics, the agency representatives option to participate as a cooperating agency and schedule of review.

May 25, 2017 – FERC, the USFWS, the Illinois Department of Agriculture, and the USACE held a conference call and discussed, among other topics, the tree clearing window proposed by Spire.

June 29, 2017 – The USFWS RIFO, Spire, and GAI held a meeting to discuss preparation of the BA.

June 30, 2017 – FERC and the USFWS held a conference call to discuss the status of USFWS review of the draft BA.

July 13, 2017 – The USFWS and GAI held a conference call to discuss preparation of the BA.

July 27, 2017 – FERC, the USFWS, the Illinois Department of Agriculture, and the USACE held a conference call and discussed the draft BA and the environmental assessment (EA) review schedule. USFWS confirmed that the running buffalo clover is not present in the Project area as currently proposed.

September 29, 2017 – FERC submits this BA to USFWS.

4. Purpose and Need

According to Spire, the purpose of the Project is to provide about 400,000 dekatherms[1] per day (Dth/d) of year-round transportation service of natural gas to markets in the St. Louis metropolitan area, eastern Missouri, and southwest Illinois. The Project would link the greater St. Louis region to a new supply of gas, which would be the only supply source to the area that does not cross the New Madrid Seismic Zone, thereby enhancing infrastructure reliability and diversity. Also, Spire states that 87

1 A dekatherm is a unit of heating value often used by natural gas companies instead of volume for billing purposes. A dekatherm is equivalent to 10 therms or one million British thermal units. For conceptualization purposes only, a natural gas capacity of 400,000 Dth/d would be sufficient to power roughly 4.0 million homes annually (if it were used solely for residential energy production). This estimate assumes an average household energy consumption of 10,800 kilowatt hours per year (U.S. Energy Information Administration 2017). If the Project is approved, the natural gas could be used in a variety of applications, not solely for residential energy generation.

percent of the current gas supply in this region comes from the existing Enable MRT system; thus, the Spire STL Pipeline Project would enhance infrastructure reliability and diversity.

Under Section 7(c) of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate them. The FERC's Certificate Policy Statement[2] provides guidance as to how the Commission evaluates proposals for new construction, and establishes criteria for determining whether there is a need for a proposed project and whether it would serve the public interest. The Commission bases its decision on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project. The Commission does not direct the development of the gas industry's infrastructure regionally or on a project-by-project basis, or redefine an applicant's stated purpose.

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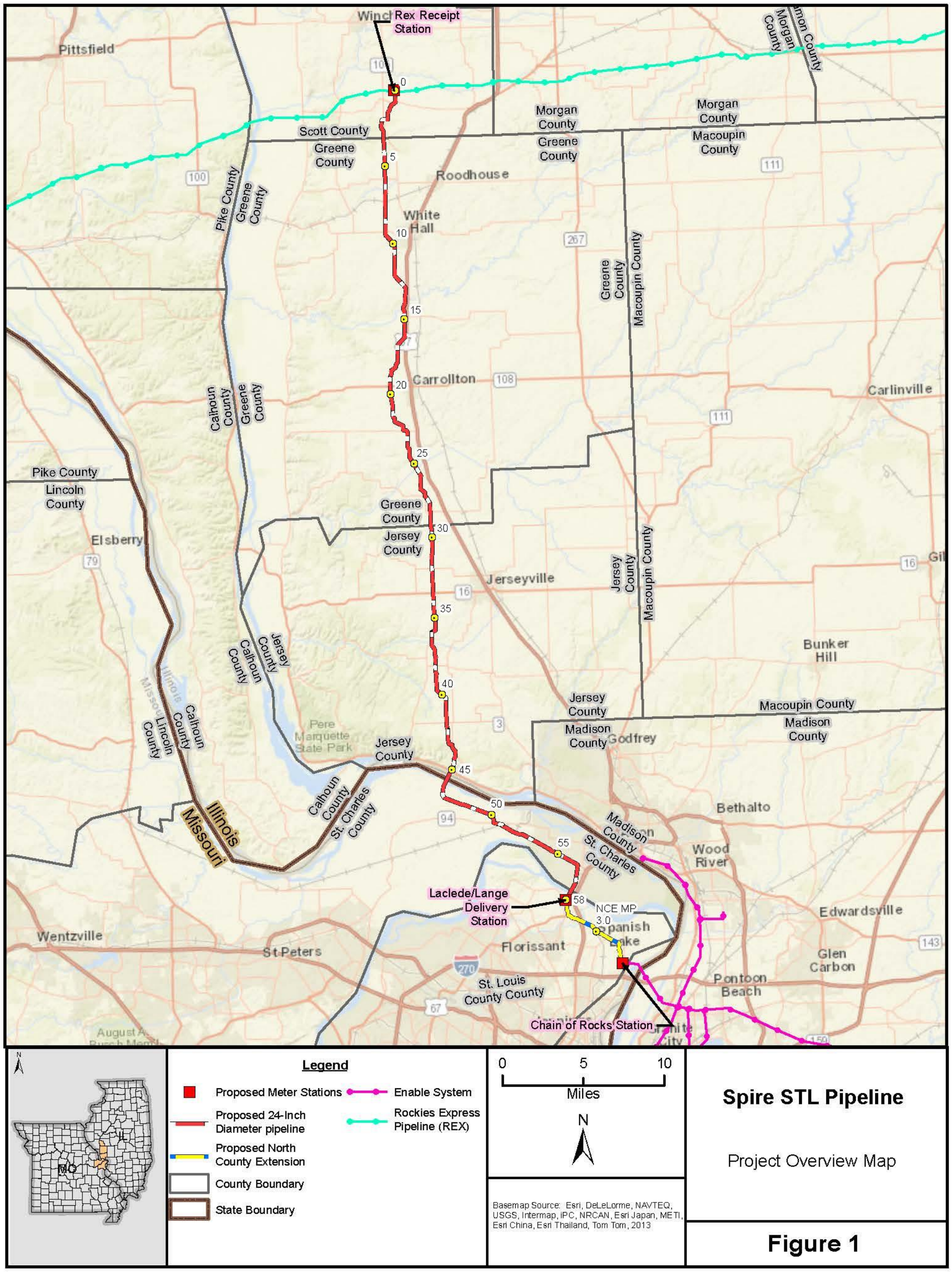
2 The Policy Statement can be found on the FERC website at http://www.ferc.gov/legal/maj-ord-reg/PL99-3-000.pdf. Clarifying statements can be found by replacing "000" in the URL with "001" and "002."

B. DESCRIPTION OF THE ACTION

The Action being evaluated by this BA under ESA Section 7 includes the Action and all interrelated and interdependent actions. Interrelated actions are those that are part of the larger action and depend on the larger action for their justification (50 CFR 402.02). These actions are typically associated with the larger action. Interdependent actions are those that have no independent utility apart from the Action under consideration (50 CFR 402.02). These actions typically occur because the larger action happened first. Therefore, the Action includes construction, operation, and maintenance of the Project.

1. Project Location and Description

The proposed Project would consist of about 65 miles of new, greenfield, 24-inch-diameter pipeline in two segments. The first segment (referred to as the "Mainline" portion of the Project) would originate at a new interconnect with the Rockies Express Pipeline LLC (REX) pipeline in Scott County, Illinois and extend about 59 miles through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east through St. Charles County, Missouri. The Mainline then crosses the Missouri River into St. Louis County, Missouri, and terminates at a new interconnect with Laclede Gas Company (Laclede). The second segment of new, greenfield pipeline (referred to as the North County Extension), would consist of a 24-inch-diameter pipeline which would extend about six miles from the Laclede interconnect through the northern portion of St. Louis County and terminate at a new interconnect with Enable MRT and Laclede. The total length of the Project pipeline would be about 65 miles. The overall design capacity of the Project pipeline is expected to be 400,000 dekatherms per day. No compression would be required. The Project also includes the construction of three new meter stations that provide interconnects with (1) REX in Illinois, (2) Laclede in Missouri, and (3) Enable MRT and Laclede in Missouri. The Project location is shown in figure 1.


Rex Receipt Station
Pittsfield
Scott County
Greene County
Morgan County
Macoupin County
Roodhouse
White Hall
Pike County
Carrollton
Carlinville
Calhoun County
Jersey County
Lincoln County
Elsberry
Jerseyville
Bunker Hill
Pere Marquette State Park
Godfrey
Madison County
Bethalto
St. Charles County
Wood River
Illinois
Missouri
Laclede/Lange Delivery Station
NCE MP 3.0
Spanish Lake
Edwardsville
Wentzville
St Peters
Florissant
St. Louis County County
Glen Carbon
Pontoon Beach
Chain of Rocks Station
Legend
Proposed Meter Stations
Proposed 24-Inch Diameter pipeline
Proposed North County Extension
County Boundary
State Boundary
Enable System
Rockies Express Pipeline (REX)
0 5 10
Miles
N
MO
IL
Basemap Source: Esri, DeLeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China, Esri Thailand, Tom Tom, 2013
Spire STL Pipeline
Project Overview Map
Figure 1

The Project would remove about 59.0 acres of upland forest and 0.8 acre of forested wetland, with about 30.0 acres of upland forest and 0.3 acre of forested wetland as a permanent loss due to maintenance and operation of the Project within the 50-foot-wide permanent right-of-way. However, the maintained corridor in forested wetlands would be reduced to about 30-feet-wide, since Spire would selectively trim trees within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating in accordance with the FERC's Wetland and Waterbody Construction and Mitigation Procedures (Procedures). In addition, this acreage excludes forested areas between Spire's proposed HDD entry and exit locations which would not be cleared during construction or operation. Therefore, this acreage differs from the forested land use acreage reported in our EA by about 6 acres, as those acreages included the forested areas that would be crossed by the HDD and within the proposed 50-foot-wide permanent easement.

1.1 Pipeline Facilities

A summary of the proposed pipeline facilities is presented in table 1.

Table 1
Pipeline Facilities Associated with the Project

Pipeline	Pipeline Diameter (inch) and Type	Milepost[a]	County, State	Approximate Length (in miles)
Mainline	24, New	0.0 - 3.5	Scott, Illinois	3.8
		3.5 - 29.4	Greene, Illinois	25.8
		29.4 – 45.4	Jersey, Illinois	16.1
		45.4 - 58.1	St. Charles, Missouri	12.8
		58.1 – 59.2	St. Louis, Missouri	0.7
			Subtotal[b]	**59.2**
North County Extension	24, New	0.0 - 6.0	St. Louis, Missouri	6.0
			Total[b]	**65.2**

[a] Milepost designations begin at 0.0 for each pipeline facility and are described geographically from north to south for the Mainline and west to east for North County Extension.

[b] May not equal the sum of the column due to rounding.

<u>Pipeline</u>

The proposed Mainline includes about 59.2 miles of 24-inch-diameter pipeline and would deliver gas from the REX pipeline in Scott County, Illinois, to the proposed North County Extension and Laclede's existing facilities in St. Louis County, Missouri. The proposed Mainline would be designed for a maximum allowable operating pressure of 1,440 pounds per square inch gauge. The pipeline generally runs from north to south across the Illinois and Missouri counties shown in table 1. Spire is proposing to cross the Mississippi River and Missouri River via HDD.

The proposed North County Extension includes about six miles of 24-inch-diameter pipeline and would deliver gas from the proposed Mainline to a new meter station and interconnect with Enable MRT and Laclede in St. Louis County, Missouri. The proposed North County Extension would be designed for a maximum allowable operating pressure of 1,440 pounds per square inch gauge. The pipeline generally runs from west to east. Spire is proposing to cross Coldwater Creek and Spanish Lake Park via HDD. The Mainline and North County Extension are collectively referred to as "the pipeline".

Cathodic Protection and Alternating Current Mitigation System

Spire is proposing to install an impressed current cathodic protection system with remote groundbeds along the pipeline route. Based on field investigations, five remote groundbeds would be installed along the Mainline and one remote groundbed would be installed along the North County Extension. Also, Spire is proposing to implement an alternating current mitigation system that would be installed within the permanent pipeline easement or at aboveground facility sites, in areas where the pipeline parallels high-voltage electric transmission lines.

1.2 Aboveground Facilities

No major aboveground facilities are proposed for the Project. Ancillary aboveground facilities on the proposed Project include meter stations, pig launchers/receivers, and mainline valves (MLV), as described below and further detailed in table 2.

Meter Stations

Meter stations typically include a fenced control building and a permanent access road, along with a supply line and a discharge line from the associated pipeline, an emergency bypass line, and communication equipment for supervisory control. The stations proposed to be constructed as part of the Project (see figure 1) include:

- REX Receipt Station: A new meter station would be at milepost (MP) 0.0 in Scott County, Illinois, at the proposed interconnect with the REX pipeline;
- Laclede/Lange Delivery Station: A new meter station would be at MP 58.8 in St. Louis County, Missouri, at an interconnect to Laclede's existing facilities; and

- Chain of Rocks Station: A new meter station would be at MP 6.0 on the proposed North County Extension in St. Louis County, Missouri, and would include interconnects with Enable MRT's existing Chain of Rocks facility and Laclede.

Table 2
Aboveground Facilities Associated with the Project

Facility Name	Approximate MP	County, State	Description
Mainline			
REX Receipt Station	0.0	Scott, Illinois	Construction of a new meter station at the interconnect with the REX pipeline.
MLV 1	15.7	Greene, Illinois	Located within the proposed permanent easement.
MLV 2	34.7	Jersey, Illinois	Located within the proposed permanent easement.
MLV 3	46.2	St. Charles, Missouri	Located within the proposed permanent easement.
Laclede/Lange Delivery Station	59.2	St. Louis, Missouri	Construction of a new meter station at the interconnects between the proposed Mainline, Laclede's existing facilities (for delivery to Laclede), and the North County Extension.
North County Extension			
Chain of Rocks Station	6.0	St. Louis, Missouri	Construction of a new meter station and interconnects with Enable MRT and Laclede.

Mainline Valves

Spire is proposing to construct MLVs at three locations along the pipeline route to meet the requirements of the United States Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA). MLVs allow the associated pipeline to be segmented for safety, operations, and maintenance purposes. They are typically sited away from populated areas to allow for safe and rapid gas evacuation if needed. Permanent access roads for the MLVs on the Mainline would be within the permanent easement. No MLVs are proposed along North County Extension. Proposed MLVs and other aboveground facility locations are provided in table 2.

2. Land Requirements

Land requirements would include both temporary and permanent impacts. Temporarily impacted areas would consist of those areas necessary to facilitate construction including the construction right-of-way, additional temporary workspace (ATWS), staging areas, and temporary access roads. Permanent impact areas would include the new permanent easement associated with the proposed pipeline and cathodic protection, new meter stations, associated ancillary facilities, and new permanent access roads.

The construction right-of-way (including temporary workspaces), permanent easement, ATWS, aboveground facilities, temporary and permanent access roads, and staging areas would total about 1,004.1 acres. Of this, about 414.8 acres would be permanently maintained for operation of the Project facilities. Tables 3 and 4 include a summary of all Project-related land requirements that would be affected by the construction and operation of the Project.

Table 3
Land Requirements for Pipeline Facilities

Facility/County, State	Land Affected During Construction (acres)[a,b]	Land Affected During Operation (acres)
Mainline		
Pipeline		
Scott, Illinois	41.1	22.9
Greene, Illinois	281.1	156.4
Jersey, Illinois	173.9	97.6
St. Charles, Missouri	132.9	77.0
St. Louis, Missouri	6.7	4.5
Subtotals[c]	635.7	358.3
ATWS[d]		
Scott, Illinois	12.5	0.0
Greene, Illinois	87.5	0.0
Jersey, Illinois	49.3	0.0
St. Charles, Missouri	56.1	0.0
St. Louis, Missouri	3.9	0.0
Subtotals[c]	209.3	0.0
Cathodic Protection		
Greene, Illinois	1.1	0.8
Jersey, Illinois	0.4	0.3
St. Charles, Missouri	0.4	0.3
Subtotals[c]	2.0	1.3
Access Roads	0.7	0.1
Scott, Illinois	0.7	0.1
Greene, Illinois	4.2	0.0
Jersey, Illinois	4.5	0.0
St. Charles, Missouri	3.1	2.3
St. Louis, Missouri	2.1	0.0

Table 3 Land Requirements for Pipeline Facilities (continued)		
Facility/County, State	**Land Affected During Construction (acres)[a,b]**	**Land Affected During Operation (acres)**
Subtotals[c]	14.6	2.4
Subtotals for Mainline[c]	862.0	362.4
North County Extension		
Pipeline		
St. Louis, Missouri	59.4	36.5
ATWS[d]		
St. Louis, Missouri	30.3	0.0
Cathodic Protection		
St. Louis, Missouri	0.5	0.3
Access Roads		
St. Louis, Missouri	2.4	0.0
Subtotals for North County Extension[d]	92.5	36.8
Staging Areas		
Scott, Illinois	27.8	0.0
Jersey, Illinois	2.8	0.0
St. Charles, Missouri	2.9	0.0
Subtotals[c]	33.5	0.0
Totals[c]	**987.5**	**398.9**
Acreage Affected in Illinois[c]	686.9	278.1
Acreage Affected in Missouri[c]	300.6	120.8

a Construction workspace through waterbodies and wetlands has been reduced to 75-feet-wide as required and where practicable.

b Land affected during construction is inclusive of operational impacts (permanent). While, no tree clearing would be required between HDD entry and exit points, the area within the proposed 50-foot-wide permanent right-of-way is included.

c May not equal the sum of the column due to rounding.

d ATWS consists of all workspaces denoted as ATWS on the Construction Alignment Sheets, which includes workspaces that would be temporarily utilized during construction of the associated aboveground facilities.

2.1 Pipeline Facilities

Spire is proposing a typical 90-foot-wide temporary construction right-of-way width, which would include a 50-foot-wide permanent easement. An additional 25 feet of ATWS would be required through agricultural areas, and ATWS would be required to facilitate construction in certain areas, such as crossings of roads, railroads, waterbodies, and wetlands. The construction right-of-way would be reduced to 75 feet at waterbodies and wetlands. Spire would not clear land between the HDD entry and exit locations for the proposed crossings of the Mississippi River, Missouri River, Coldwater Creek, and

Spanish Lake Park. A summary of the proposed land requirements for the pipeline facilities is provided in table 3.

Table 4
Land Requirements for Aboveground Facilities

Facility	County, State	Property Size (acres)[a]	Land Affected During Construction (acres)[b,c]	Land Affected During Operation (acres)[b]
Mainline				
REX Receipt Station	Scott, Illinois	39.9	5.0	5.0
MLV 1	Greene, Illinois	N/A	N/A	N/A
MLV 2	Jersey, Illinois	N/A	N/A	N/A
MLV 3	St. Charles, Missouri	N/A	N/A	N/A
Laclede/Lange Delivery Station	St. Louis, Missouri	39.5	3.99	4.0
North County Extension				
Chain of Rocks Station	St. Louis, Missouri	39.0	7.5	7.0
Totals[d]		**118.4**	**16.5**	**16.0**
Acreage Affected in Illinois[d]			5.0	5.0
Acreage Affected in Missouri[d]			11.5	11.0

Notes:
N/A - not applicable.
[a] The land affected during operation is the portion of the tract that would be required for the permanent easement.
[b] MLVs are located within the permanent easement. The construction and operation acreage is accounted for within the operational acreages of the pipeline.
[c] Certain ATWS included in table 3 consist of workspaces that would be temporarily utilized during construction of the associated aboveground facilities. This acreage is not included here to avoid duplication
[d] May not equal the sum of the column due to rounding.

2.2 Additional Temporary Workspace

ATWS areas typically are required at road, railroad, waterbody, and wetland crossing locations and for areas requiring specialized construction techniques, including agricultural land. ATWS to facilitate the hydrostatic tests have also been identified at road crossings closest to potential municipal water sources. The configurations and sizes of ATWS areas are based on site-specific conditions and vary in accordance with the construction methodology, crossing type, and other construction needs. ATWS requirements are summarized in table 3.

2.3 Access Roads

Spire is proposing to use and/or modify existing access roads as well as develop new access roads to access the Project during construction and operation. Public roads would be used to access the right-of-way where possible. Spire has identified about 5.6 miles of access roads for use during construction, with an anticipated width of 25 feet. Of these, about 4.8 miles are proposed for temporary use, and 0.8 mile would be permanently maintained for operation of the Project to provide permanent access to the REX Receipt Station and MLV sites. A summary of the land affected by access roads is included in table 3.

2.4 Staging Areas

Spire does not anticipate the need for additional contractor yards. Spire has identified potential sites to be utilized for staging areas. Staging areas may be utilized for a variety of purposes including equipment and materials staging, parking, and mobilization. These areas would be temporarily utilized during the duration of construction. Locations and acreages of the proposed staging areas are provided in table 3.

2.5 Aboveground Facilities

A summary of estimated land requirements for aboveground facilities is provided in table 4.

2.6 Mainline Valves

Spire would install and operate MLVs within the proposed permanent easement associated with the pipeline at MPs 15.7, 34.7, and 46.2. Each MLV would consist of a 50-foot by 60-foot graveled area and would be fenced within the permanent easement. Spire has located MLVs near existing public roads where permanent access roads to these sites would be constructed.

3. Construction Procedures

The Project would be designed, constructed, and operated in compliance with applicable federal, state, and local regulations and codes. This includes, but is not limited to, the following:

- DOT 49 CFR 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Including All References (6/6/2015) and standards, or portions thereof, incorporated by reference under 49 CFR 192.7 as of 7/7/15;
- Occupational Safety and Health Administration 29 CFR 1926;
- Illinois Commerce Commission - Gas Pipeline Safety Program;

- Illinois Gas Pipeline Safety Act (220 Illinois Compiled Statutes [ILCS] 20);
- Illinois Gas Transmission Facilities Act (220 ILCS 25);
- Missouri Title 4 Code of State Regulations. Division 240, Chapter 40 Public Service Commission - Gas Utilities and Gas Safety Standards; and
- Missouri Department of Transportation Engineering Policy Guide, Section 643.3: Policy, Standards and Regulations pertaining to utility facilities located on or across state highways.

The Project would also be designed, constructed, and operated in accordance with numerous applicable national specifications issued by these organizations: American Association of State Highway and Transportation Officials; American Gas Association; American National Standards Institute; American Petroleum Institute; American Society of Mechanical Engineers; American Society of Testing Materials; National Association of Pipe Coating Applications; and National Fire Protection Association.

Spire would comply with FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*[3] (Plan) and FERC's Procedures[4] in conjunction with the Agricultural Impact Mitigation Agreement (AIMA) for Illinois as a minimum standard during construction. Some ATWS for topsoil segregation in agricultural lands are located within 50 feet of wetlands where the adjacent upland consists of cultivated or rotated cropland as permitted in FERC Procedures. As noted in the EA and described in appendix C, Spire has requested and adequately justified deviations from our Procedures which are necessary for site-specific reasons. Additional construction, restoration, and mitigation plans developed by Spire for the Project are available for review on our website (eLibrary under Docket Nos. CP17-40-000 and CP17-40-001)

Spire would adequately train construction personnel in the environmental restrictions and/or requirements applicable to their particular job duties. Construction management personnel and environmental inspectors (EI) would be provided with the appropriate environmental information/materials specific to the Project. This training would focus on the Plan and Procedures as well as other regulatory requirements such as the AIMA, endangered species, cultural resources, and wetlands.

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[3] A copy of the FERC Plan is available at www.ferc.gov/industries/gas/enviro/plan.pdf

[4] A copy of the FERC Procedures is available at www.ferc.gov/industries/gas/enviro/procedures.pdf

Spire anticipates commencing initial construction activities in January 2018, and expects to place the pipeline and facilities into service November 1, 2018. Anticipated construction dates for each Project facility are included in table 5.

Table 5
Anticipated Construction Dates

Facility	Anticipated Construction Start	Anticipated Construction End
Mainline[a,b]	January 2018	November 2018
North County Extension[b,c]	January 2018	November 2018
REX Receipt Station[c]	May 2018	September 2018
Laclede/Lange Delivery Station[b]	May 2018	September 2018
Chain of Rocks Station[b]	May 2018	September 2018

[a] Construction at the Mississippi River, Missouri River, and federal property crossings are anticipated to begin in April 2018 and continue through September 2018.

[b] Tree clearing would be completed prior to May 1, 2018, in accordance with approvals by applicable agencies.

[c] Construction at the Coldwater Creek and Spanish Lake Park crossings are anticipated to begin in April 2018 and May 2018, respectively, and to continue through September 2018.

Spire plans to employ the construction procedures presented in section A.8 of the EA. Detail for each of the proposed HDD crossings is included below in table 6. Spire has requested certain deviations from our Procedures, as described in appendix C of our EA; however, additional deviations are possible based on actual field conditions or to comply with regulatory requirements as further identified during the consultation and permitting process.

4. Operation and Maintenance

Spire would operate and maintain the newly constructed pipeline facilities in accordance with the requirements of the FERC, DOT’s PHMSA at 49 CFR 192, all other applicable legal requirements, and industry-proven practices and techniques. The facilities would be operated and maintained in a manner such that pipeline integrity is protected to ensure a safe, continuous supply of natural gas reaches its ultimate destination. Maintenance activities would include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks.

Table 6
Summary of Planned HDDs

Facility/ Length of Pipe (feet)	Entry Location		Exit Location		Sensitive Resources to be Avoided			Approximate Duration of Drilling	Proposed Nighttime Drilling
	MP	Town/County, State	MP	Town/County, State	MP	Resource Type	Resource Name		
Mainline									
5,900	45.0	Elsah, Jersey County, Illinois	46.2	Rivers, St. Charles County, Missouri	45.1	Road	Illinois State Route 100	Not to exceed 15 weeks	Estimated 3 shifts of night time work during pullback
					45.1	Special Land Use	Sam Vadalabene Great River Road Bike Trail		
					45.1	Special Land Use	Meeting of the Great Rivers Scenic Route		
					45.1	Waterbody	UNT to Mississippi River (NHD-915)		
					45.3	Waterbody	Mississippi River (NHD-921)		
					45.6	Special Land Use	Upper Mississippi Conservation Area		
					45.7	Wetland	PFO1Ah (NWI-105)		
					45.9	Waterbody	Luesse Lake (NHD-924/NWI-505)		
					46.1	Wetland	PFO (WMO-WJW-001)		
3,302	57.7	Rivers, St. Charles County, Missouri	58.4	Spanish Lake, St. Louis County, Missouri	57.1	Special Land Use	Consolidated North County Levee	Not to exceed 15 weeks	Estimated 2 shifts of night time work during pullback
					57.9	Waterbody	UNT to Missouri River (SMO-TMA-001)		
					57.9	Wetland	PFO/PEM (WMO-TMA-001 and WMO-TMA-001A)		
					58.0	Waterbody	Missouri River (SMO-CDK-001)		
North County Extension									
3,321	1.6	Spanish Lake, St. Louis County, Missouri	2.2	Spanish Lake, St. Louis County, Missouri	1.7	Road	US 67/Missouri State Route 367 (Lewis and Clark Blvd.)	Not to exceed 15 weeks	Estimated 2 shifts of night time work during pullback
					1.8	Wetland	PEM (WMO-JJP-125)		
					1.9	Waterbody	Coldwater Creek (SMO-JJP-020)		
					1.9	Waterbody	UNT to Coldwater Creek (SMO-JJP-032)		

Table 6
Summary of Planned HDDs (continued)

Facility/ Length of Pipe (feet)	Entry Location		Exit Location		Sensitive Resources to be Avoided			Approximate Duration of Drilling	Proposed Nighttime Drilling
	MP	Town/County, State	MP	Town/County, State	MP	Resource Type	Resource Name		
North County Extension (Continued)									
3,568	3.8	Spanish Lake, St. Louis County, Missouri	4.5	St. Ferdinand, St. Louis County, Missouri	2.0	Special Land Use	Fort Bellefontaine County Park	Not to exceed 15 weeks	Estimated 2 shifts of night time work during pullback
					4.0	Special Land Use	Spanish Lake Park		
					4.1	Wetland	Sunfish Lake (NWI-185)		
					4.3	Special Land Use	Emerald Greens Golf Course		
					4.3	Wetland	PUBGh (NWI-186)		

Notes:
UNT = unnamed tributary; PFO = palustrine forested; PEM = palustrine emergent

The latter may include repair or replacement of pipe segments. All fence posts, signs, marker posts, aerial markers, and decals would be maintained to ensure the pipeline locations would be visible from the air and ground. The pipeline and aboveground facilities would be patrolled on a routine basis, and personnel qualified to perform both emergency and routine maintenance on interstate pipeline facilities would handle maintenance.

4.1 Pipeline

Pipeline facilities would be maintained and inspected in accordance with applicable pipeline safety regulations. Operational activity on the pipeline would be limited primarily to maintenance of the rights-of-way and inspection, repair, and cleaning of the pipeline. Vegetation maintenance would be conducted in accordance with the Plan and Procedures. Maintenance functions would include the following:

- periodic seasonal vegetation management of the Project right-of-way in accordance with the timing restrictions outlined in the Plan and Procedures;
- terrace repair, backfill replacement, and drain tile repair as necessary;
- periodic inspection of water crossings; and
- maintenance of a supply of emergency pipe, leak repair clamps, sleeves, and other equipment needed for repair activities.

Erosion problems on the pipeline right-of-way would be reported to the local operations supervisor. These reports may originate from landowners or company personnel performing routine patrols. Corrective measures would be conducted as needed.

4.2 Vegetation Maintenance

A typical post-construction permanent easement width of 50 feet would be maintained for the right-of-way. Maintaining a right-of-way is necessary for the following reasons:

- access for routine pipeline patrols and corrosion surveys;
- avoid pipeline damage from large roots;
- access in the event that emergency repairs of the pipeline are needed;
- visibility during aerial patrols; and

- to serve as a visual indicator to the public of an underground pipeline utility and easement.

Operational vegetation maintenance of Spire's full permanent right-of-way in uplands may be conducted on a frequency of about once every three years (10-foot-wide maintenance can take place as necessary) in accordance with the Plan to maintain an herbaceous to low scrub-shrub cover state. Routine vegetation mowing would be completed outside the migratory bird nesting season, which is April 15 through August 1 in accordance with the recommendations set forth in the Plan.

Within wetlands, Spire would only maintain the 10-foot-wide corridor centered over the pipeline, and removal of trees within 15 feet, allowing the balance of Spire’s permanent easement to revert to its natural, pre-construction vegetated cover state. Spire would not use herbicides or pesticides on its right-of-way unless requested by landowners. Spire would utilize herbicides or pesticides at aboveground facilities that are adjacent to agricultural lands in Illinois in accordance with the AIMA. No herbicides or pesticides would be used within 100 feet of a wetland or waterbody unless otherwise approved by applicable federal, state, and local agencies and directly affected landowners.

Post-construction management of the right-of-way would be conducted in accordance with the Plan and Procedures and Spire’s Noxious Weeds/Invasive Species Control and Mitigation Plan. Vegetation maintenance (with respect to the control of invasive plant species) is detailed in these plans.

Following construction of the pipeline facilities, areas used for temporary workspace and ATWS would be allowed to revert to their pre-construction land use/land cover with no further vegetation maintenance by Spire. Additionally, crop production would be allowed to continue in agricultural areas, immediately following construction or the following growing season.

4.3 Aboveground Facilities

Spire would operate and maintain the proposed aboveground facilities in accordance with standard procedures designed to ensure the integrity of the facilities and to provide its shippers and the general public with a safe and dependable natural gas supply. Responsibilities of Spire would include the following:

- safe operation and maintenance of pipeline and aboveground facilities to provide the required gas flow;
- inspection and maintenance of the pipeline system;
- regular monitoring of the right-of-way;

- development and implementation of an ongoing program of safety and environmental compliance;
- regulatory compliance maintenance inspections;
- administration; and
- landowner relations.

Areas within the permanent easement outside the facility fence line would be maintained through routine vegetation maintenance or allowed to revert to pre-existing conditions.

5. Measures to Avoid and Minimize Adverse Effects

The following descriptions of avoidance and minimization measures are part of the Project design and would be implemented by Spire during construction, operation, and maintenance of the Project:

- Seasonal tree clearing – Spire is proposing to conduct clearing activities within non-cultivated areas prior to April 1, 2018, if regulatory permits are received on schedule and allow for sufficient time to conduct clearing activities within the Project area. Spire is requesting approval to conduct clearing between April 1 and April 30, followed by a clearing restriction from May 1 to July 31 (for tree-nesting migratory birds), and resume on August 1, if necessary. Post-construction operational and routine vegetation mowing or tree clearing in the permanent right-of-way would take place outside the migratory bird nesting season (April 15 through August 1) as prescribed in the Plan.
- Minimize limits of disturbance – The Project has been routed in open areas and was collocated along existing road and pipeline corridors, where practical, to avoid impacts to forests and known and unknown Indiana bat roost trees. About one-third of the Mainline in Illinois would be collocated with existing rights-of-way. Collocating would further reduce effects to the forest or other land uses, including through the contiguous forest north of the Mississippi River, thereby minimizing new fragmentation to other relatively undisturbed tracts of interior forest.
- Avoidance of riparian areas and wetlands wherever practical – The Project area has been generally reduced to 75-feet-wide at streams and wetlands. Stream crossings and impacts would be minimized wherever practical by routing or shifting the Project area to avoid paralleling streams.

- Soil segregation – Topsoil would be segregated during earth disturbance activities in the Project Area in accordance with the Plan, as well as with the AIMA for Illinois. Soil segregation and erosion and sediment controls (described below) are general measures that encourage native plant and animal communities.

- Erosion and sedimentation controls – The Erosion and Sediment Control Plan would reduce the potential for adverse impacts from stormwater runoff during construction. Erosion and sediment control devices would be outlined in erosion and sediment control plans which would incorporate the Plan and state and local regulations.

- Invasive Species Control – Spire has prepared a Noxious Weeds/Invasive Plant Control Mitigation Plan (appendix I of the EA). Implementation of this plan would avoid and/or minimize adverse effects from noxious and invasive plant species.

- HDD Crossings – The trenchless crossings (HDD) of the Mississippi River, Missouri River, Coldwater Creek, and Spanish Lake Park would minimize the potential effects of the Project on shorelines, islands, and aquatic habitat in and along these waterbodies. No in-stream construction or disturbance to the streambed is anticipated at these locations.

- If decurrent false aster is found during surveys, Spire would confer with the USFWS on methods to attempt to avoid and minimize effects on individuals and populations to the greatest extent practicable. Measures would include:

    - topsoil stripping - topsoil would be removed, stockpiled, and re-deposited on disturbed areas such that the seed bed is maintained at the locations where the species is found;

    - construction equipment paths and staging areas would be designed to avoid decurrent false aster to the greatest extent practicable; and

    - operational maintenance (i.e., mowing) in areas where the species is determined to be present would not be conducted during the May through October growing period (Missouri Department of Conservation 2015).

6. Action Area

An action area is the area that may be affected directly or indirectly by a federal action and not merely the immediate area involved in the action (50 CFR 402.02). An action area includes considerations for interrelated and interdependent actions.

An action area includes the limit of measurable or detectable changes in land, air, and water, or other measurable factors that may elicit a response in the species or critical habitat (U.S. Army Corps of Engineers [USACE] 2007). Thus, an action area is not limited to the action, but encompasses the physical, chemical, and biological changes that would take place because of the action. Action areas should consider the action in context of the baseline conditions and the sensitivities and capabilities of the considered species and their habitat.

6.1 Factors Considered

For this Project, the area directly and indirectly affected by the Action is the Project area where all construction, operation, and maintenance activities would take place, and the area outside the Project area that may be affected by stressors that typically extend beyond the Project area, such as fugitive dust, lighting, changes to water quality, and noise:

- Fugitive dust and changes in air quality outside the Project area are expected to be minimal. Spire would implement its Fugitive Dust Control Plan which would implement dust control measures such as water suppression, temporary stabilization of spoil piles, sweeping, and other techniques. The Project is designed to meet the requirements of the Clean Air Act of 1970 (42 USC 7401 et seq.) as well as regulations set by Illinois and Missouri.

- Any increase in ambient lighting outside the Project area is expected to be temporary and/or minimal. Lights may be utilized during early morning and early evening hours in periods of fewer daylight hours (autumn/winter) and may be visible from immediately outside the Project area. Project construction activities would be conducted during daylight hours with the exception of short-term activities such as HDD crossings, critical maintenance, or other Project-mandated activities required to meet schedule or safety requirements. The three minor aboveground facilities (meter stations) would employ ambient security lighting during the operational phase of the Project. The security lighting would be permanent, but is not expected to increase ambient lighting far from the intended purpose of lighting the meter stations within the Project area

- Changes to water quality would be limited to the Project area. The Project, as proposed, would not cause permanent impacts on any surface waterbodies. Construction at waterbodies would be conducted in accordance with applicable state and local regulations and guidance manuals and the Procedures, unless variances are requested by Spire and approved by FERC. Spire is proposing to limit waterbody impacts by generally reducing the construction right-of-way width to 75 feet at the waterbody crossings. A successful HDD crossing would result in no planned impacts to the banks, bed, or water quality of the waterbodies being crossed. Spire would implement its HDD Plan in the unlikely event of inadvertent returns. Hydrostatic test water used for the pipeline would be discharged in compliance with National Pollutant Discharge Elimination System permit conditions and state regulations. No water treatment (chemicals or inhibitors) are necessary during or after the hydrostatic testing.

- Construction noise may extend beyond the Project area. Noise may be generated from construction, operation, and maintenance equipment, and would vary in timing, intensity, and duration.

Overall, noise was identified as the potential stressor likely to extend the farthest distance from the Project area and would include the area of effects generated by any other potential stressors. Noise has been used to determine the action area in recent USFWS Biological Opinions (e.g., USFWS 2015a).

6.2 Determination of the Action Area

Because noise may extend beyond the Project area, the limit to which noise attenuates to ambient levels was used to determine the limits of the Action Area for this BA. Site preparation and construction activities are expected to generate the most noise. The estimate for the limit to which noise attenuates to ambient levels was based on the following[5]:

- Based on the Construction Noise Model, the maximum constant construction noise level is expected to be 110 A-weighted decibels (dBA) at the HDD entry and exit locations. While blasting is not currently proposed, Spire identified two locations, between MPs 44.9 and 45.0 and MPs 58.2 through 58.6, where bedrock could be encountered at depths that may interfere with conventional rock-trenching methods. The instantaneous and short duration of the stressor from blasting was not considered to be the maximum noise level. The maximum noise level for most other construction equipment is assumed to be at or below 95 dBA (Federal Highway Administration 2006).

- Current ambient noise surrounding the Project area averages 53 dBA based on measurements taken at the HDD entry and exit locations and the proposed aboveground facilities.

- Construction equipment noise typically has a drop-off rate of 6 dB per doubling of distance from the source (U.S. Environmental Protection Agency [USEPA] 1971). For acoustically absorptive or soft sites (dirt, grass, crops, snow, or scattered bushes and trees) an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 7.5 dB per doubling of distance from the source (Federal Highway Administration 2009; Washington

[5] Available on the FERC Docket via https://www.ferc.gov/docs-filing/elibrary.asp, in accession no. 20170421-5167

State Department of Transportation 2016; California Department of Transportation 2016).

The following base 10-Log equation (Washington State Department of Transportation 2016; California Department of Transportation 2016) was used to determine the distance at which construction or traffic noise would attenuate to background or ambient sound levels:

$D = Do * 10^{[(\text{construction noise - ambient sound level in dBA})/\alpha]}$

Where:

D = the distance from the noise source

Do = the reference measurement distance (50 feet in this case)

α = 25 for soft ground and 20 for hard ground. For point source noise, a spherical spreading loss model is used. These alpha (α) values assume a 7.5 dBA reduction per doubling distance over soft ground and a 6.0 dBA reduction per doubling distance over hard ground.

$D = 50 * 10^{((110 - 53)/25)}$

$D = 50 * 10^{(57/25)}$

$D = 50 * 10^{(2.3)}$

$D = 50 * 190.5$

D=9,525 feet

In summary, the Action Area was defined as the Project area and all lands within 9,525 feet (1.8 miles) of the Project area that could experience an increase in ambient noise levels. Thus, the Action Area was not defined as the extent of effects on species and habitat; rather, it was determined by the geographical effects of the Action on the species environment. The Action Area for the Project is shown in figure 2.

6.3 Description of the Action Area

Land cover types in the Project area and Action Area were delineated using ArcGIS® (ESRI Corp, Redlands California) and the 2011 National Land Cover Database (NLCD; Homer *et al.* 2015). In an effort to increase the accuracy of estimates of forested land cover in the Project area, the NLCD forest layers were substituted with the Project land use forest layers to provide a more accurate assessment of forest cover within the Project area. Other land cover types remain uncorrected for comparison purposes. Cover types were grouped into the following categories:

Forested – the forested land cover type included four subcategories, including deciduous, evergreen, woody wetland, and mixed forest:

- Deciduous Forest – areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.

- Evergreen Forest – areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

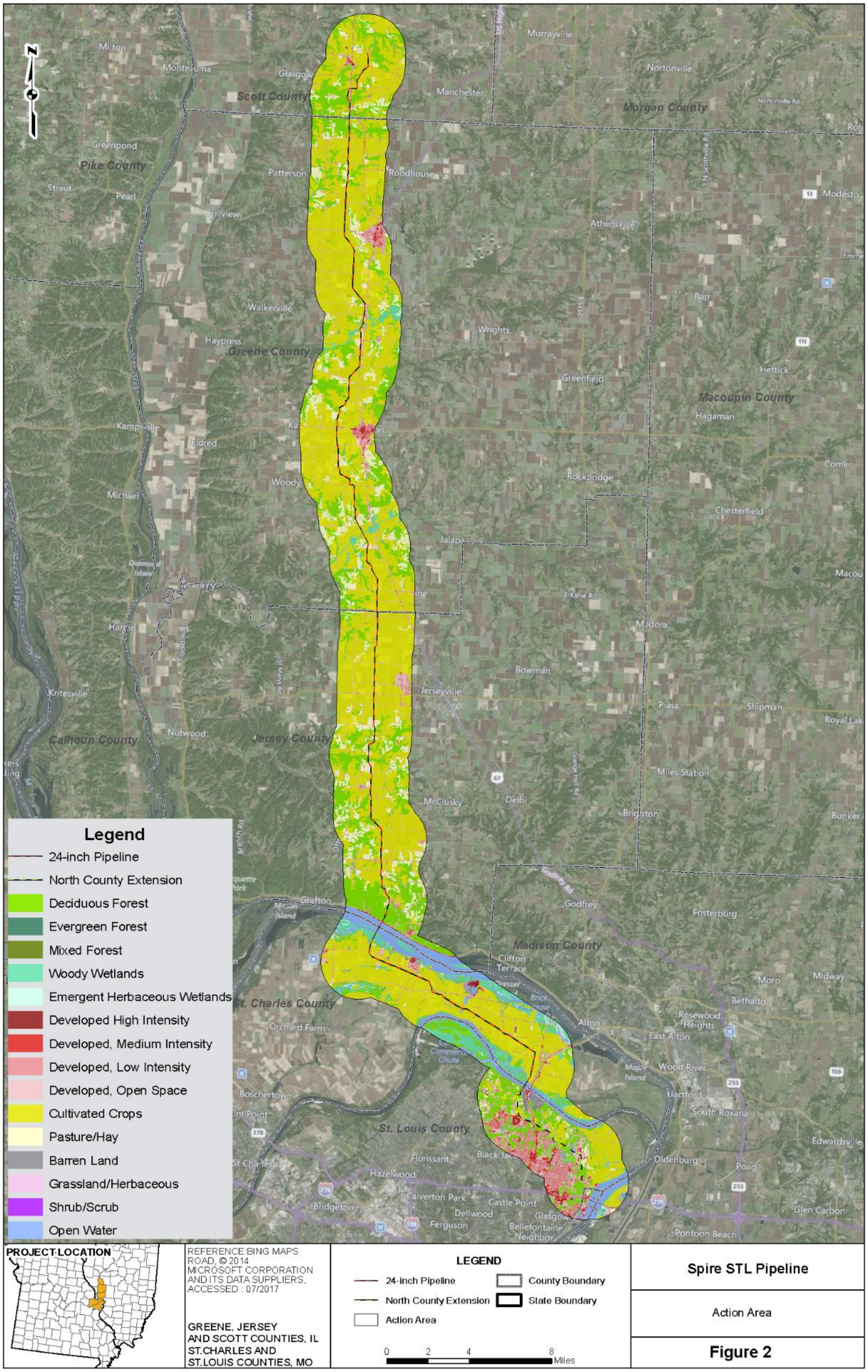
- Woody Wetlands – areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetation cover and the soil or substrate is periodically saturated with or covered with water.

- Mixed Forest – areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

Non-Forested – non-forested land cover type included 11 subcategories:

- Barren Land (Rock/Sand/Clay) – areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.

- Developed, Open Space – areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot, single-family housing units; parks; golf courses; and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.


Legend
24-inch Pipeline
North County Extension
Deciduous Forest
Evergreen Forest
Mixed Forest
Woody Wetlands
Emergent Herbaceous Wetlands
Developed High Intensity
Developed, Medium Intensity
Developed, Low Intensity
Developed, Open Space
Cultivated Crops
Pasture/Hay
Barren Land
Grassland/Herbaceous
Shrub/Scrub
Open Water
Scott County
Morgan County
Pike County
Greene County
Macoupin County
Calhoun County
Jersey County
Madison County
St. Charles County
St. Louis County
PROJECT LOCATION
REFERENCE:BING MAPS ROAD, © 2014 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS, ACCESSED : 07/2017
GREENE, JERSEY AND SCOTT COUNTIES, IL ST.CHARLES AND ST.LOUIS COUNTIES, MO
LEGEND
24-inch Pipeline
North County Extension
Action Area
County Boundary
State Boundary
0 2 4 8 Miles
Spire STL Pipeline
Action Area
Figure 2

- Developed, Low Intensity – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of total cover. These areas most commonly include single-family housing units.

- Developed, Medium Intensity – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 to 79 percent of the total cover. These areas most commonly include single-family housing units.

- Developed, High Intensity – highly developed areas where people reside or work in high numbers. Impervious surfaces account for 80 to 100 percent of the total cover. Examples include apartment complexes, row houses and commercial/industrial

- Open Water – areas of open water, generally with less than 25 percent cover of vegetation or soil.

- Emergent Herbaceous Wetlands – areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetation cover and the soil or substrate is periodically saturated with or covered with water.

- Shrub/Scrub – areas dominated by shrubs; less than five meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.

- Grassland/Herbaceous – areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

- Pasture/Hay – areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

- Cultivated Crops – areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

Acreages of each cover type in the Project area and Action Area are shown in table 7.

Forested land occupies about 23 percent of the Action Area and six percent of the Project area (see table 7). Non-forested cover types in the Action Area that may provide value to traveling or foraging bats, depending on size and juxtaposition on the landscape, include low intensity development (4.1 percent) and open space (4.6 percent), cultivated crops (53.8 percent), grassland/herbaceous (0.1 percent), pasture/hay (7.8 percent), emergent wetlands (0.3 percent), shrub/scrub (0.02 percent), and open water (4.8 percent).

Table 7
Land Cover Types in the Project Area and Action Area[a]

Land Cover Type	Project Area[b] (acres)	Project Area (percent)	Action Area (acres)	Action Area (percent)
Forested[c]				
Deciduous Forest	59.0	6.0	30,075.2	19.0
Evergreen Forest	0.0	0.0	6.5	<0.1
Mixed Forest	0.0	0.0	34.0	<0.1
Woody Wetlands	0.8	<0.1	6,125.8	3.9
Non-Forested				
Developed, High Intensity	0.2	<0.1	471.5	0.3
Developed, Medium Intensity	4.2	0.4	1,486.8	0.9
Developed, Low Intensity	22.2	2.3	6,523.4	4.1
Developed, Open Space	61.5	6.2	7,202.0	4.6
Cultivated Crops	731.6	74.2	85,121.8	53.8
Grasslands/Herbaceous	0.3	<0.1	192.4	0.1
Pasture/Hay	91.2	9.3	12,277.5	7.8
Emergent Wetlands	9.3	0.9	533.4	0.3
Shrub/Scrub	0.1	<0.1	24.7	<0.1
Barren Land	3.8	0.4	592.9	0.4
Open Water	1.5	0.2	7,557.4	4.8
Forested Totals	**59.8**	**6.1**	**36,241.4**	**22.9**
Non-Forested Totals	**925.7**	**93.9**	**121,983.6**	**77.1**
Total	**985.5**	**100.0**	**158,225.1**	**100**

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

[b] Project area acreage reported here is for the area that would have above ground disturbance, which excludes areas between HDD entry/exit locations, where no tree clearing would take place. As such the acreages reported here are not directly comparable to the impacts reported in our EA.

[c] In an effort to increase the accuracy of estimates of forested land cover (deciduous forest and woody wetlands) in the Project area, the NLCD forest layers were substituted with the Project land use forest layers to provide a more accurate assessment of forest cover within the Project area. Other land cover types remain uncorrected for comparison purposes. As such the acreages of forested land reported here are not directly comparable to forested land impacts reported in our EA.

C. SPECIES CONSIDERED

Based on a review of the USFWS Information, Planning, and Conservation System project planning tool, as well as conversations with the USFWS RIFO, Spire identified 11 federally-listed species that may occur in the Action Area (see table 8).

1. Preliminary Determinations

The agency correspondence referenced within this section is available on the FERC Docket via https://www.ferc.gov/docs-filing/elibrary.asp, in accession no. 20170807-5163; see appendix A to Spire's draft version of this assessment.

1.1 No Effect

We determined that the Action would have *no effect* on the Higgins eye pearly mussel based on the species range. The species was included Spire's letter to the USFWS RIFO dated January 25, 2017 as a species not likely to be affected by the Action; however, the determination was later modified given that the range of the species does not overlap the Project area.

We determined that the Action would have *no effect* on the eastern prairie fringed orchid and Mead's milkweed based on the results of negative field surveys for the species and its habitat.

1.2 Not Likely to Adversely Affect

We determined that the Action *may affect, but is not likely to adversely affect* the gray bat based on the results of negative field surveys. The results of the mist net survey are available in the Project mist net survey report (GAI 2017; privileged and confidential).

We determined that the Action *may affect, but is not likely to adversely affect* the following four species based on the minimization of adverse effects through the use of HDD of the Mississippi and Missouri Rivers: least tern, piping plover, red knot, and pallid sturgeon. Information on the HDD crossings is provided in Spire's letter to the USFWS RIFO dated January 25, 2017.

Table 8
Species Considered and Effects Determinations

Common Name (Scientific Name)	Federal Status	Critical Habitat	Determination[1]	Justification for Determination
Least Tern (*Sterna antillarum*)	Endangered	Not Designated	Not likely to adversely affect.	Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake, and reservoir shorelines, and occasionally gravel rooftops. Least terns are likely to nest along the Mississippi and Missouri Rivers within the Project area. Spire anticipates minimizing the potential for adverse effects to least terns through HDD of the Mississippi and Missouri Rivers. Information on HDD is provided in Spire's letter to the USFWS RIFO dated January 25, 2017.
Piping Plover (*Charadrius melodus*)	Threatened	Not in Action Area	Not likely to adversely affect	Piping plovers utilize wide, flat, open, sandy beaches for habitat and often nest along small creeks or wetlands. Piping plovers are likely to nest along the Mississippi and Missouri Rivers within the Project area. Spire anticipates minimizing the potential for adverse effects to piping plovers through the use of the HDD of the Mississippi and Missouri Rivers. Information on HDD is provided in Spire's letter to the USFWS RIFO dated January 25, 2017.
Red Knot (*Calidris canutus*)	Threatened	Not Designated	Not likely to adversely affect	Red knots utilize large waterbodies with gravel and/or sandy edges. The species is not likely to breed in the area and may only be present as a transient species seeking out foraging opportunities. Regardless, Spire anticipates minimizing the potential for adverse effects to red knots through the use of the HDD of the Mississippi and Missouri Rivers. Information on HDD is provided in Spire's letter to the USFWS RIFO dated January 25, 2017.
Higgins Eye Pearlymussel (*Lampsilis higginsii*)	Endangered	Not Designated	No effect	Higgins eye pearlymussels were included Spire's letter to the USFWS RIFO dated January 25, 2017; however, Spire later determined that the species range does not overlap the Project area; we concur.
Pallid Sturgeon (*Scaphirhynchus albus*)	Endangered	Not Designated	Not likely to adversely affect	Pallid sturgeons are a bottom-oriented, large river obligate fish inhabiting the Mississippi and Missouri rivers and some tributaries. Habitat includes floodplains, backwaters, chutes, sloughs, islands, sandbars, main channel waters, and are often associated with sandy and fine bottom materials. The range of the species is scarce in the Mississippi and Missouri Rivers. Regardless, Spire anticipates minimizing the potential for adverse effects to pallid sturgeons by the HDD of the Mississippi and Missouri Rivers. Information on HDD is provided in Spire's letter to the USFWS RIFO dated January 25, 2017.
Indiana bat (*Myotis sodalis*)	Endangered	Not in Action Area	Likely to adversely affect	Adverse effects to the species are anticipated based on an effects analysis included in the following sections of this BA.

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Table 8
Species Considered and Effects Determinations (continued)

Common Name (Scientific Name)	Federal Status	Critical Habitat	Determination[a]	Justification for Determination
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Not Designated	Likely to adversely affect	Adverse effects to the species are anticipated based on an effects analysis included in the following sections of this BA. Any resulting incidental take of the northern long-eared bat is not prohibited by the final 4(d) rule.
Gray bat (*Myotis grisescens*)	Endangered	Not Designated	Not likely to adversely affect	Habitat for gray bat consists of streams, rivers, lakes, and reservoirs, caves, and abandoned mines. Because no caves or abandoned mine portals are known to occur in the Action Area and none were found during the portal searches (where access was obtained), it is unlikely that the Project would affect any roosting or hibernating habitat for the species. In addition, because the Project would minimally affect the other types of habitat utilized by the gray bat, such as for foraging and traveling (i.e., rivers, streams, lakes, and reservoirs), the overall effects of the Project on gray bats are expected to be insignificant and/or discountable. No gray bats were captured during the summer mist net survey (GAI 2017).
Decurrent false aster (*Boltonia decurrens*)	Threatened	Not Designated	Likely to adversely affect	Adverse effects to the species are anticipated based on an effects analysis included in the following sections of this BA.
Eastern prairie fringed orchid (*Platanthera leucophaea*)	Threatened	Not Designated	No effect	Habitat for eastern-prairie fringed orchid consists of early to mid-successional habitats such as grass and sedge dominated areas including mesic prairies, sedge meadows, bogs, and fens with full sun exposure. The species is also found in areas with very low or no disturbance to the substrate and areas with little or no woody vegetation competition. Based on initial biological surveys, Spire originally determined that three potential habitat locations in Illinois warranted species-specific surveys for eastern prairie fringed orchid; however, one location was eliminated in June 2017. Surveys were conducted in June 2017. No eastern prairie fringed orchid was found.
Mead's milkweed (*Asclepias meadii*)	Threatened	Not Designated	No effect	Habitat for Mead's milkweed includes dry-mesic to mesic upland tallgrass prairies, barrens, igneous glades, and railroad rights-of-way with full sun exposure. The species is also found in areas of late-successional prairie habitats, usually found in undisturbed habitats with high diversity of native vegetation. Based on initial biological surveys, Spire determined that two potential habitat locations in Illinois warranted species-specific surveys for Mead's milkweed. Surveys were conducted in June 2017. No Mead's milkweed was found.

[a] Effects Determinations are provided here as a summary. Effects analyses for species likely to experience adverse effects are included in section D. Definitions of Effects Determinations are included in section E.

In order to determine that HDD is a sufficient minimization measure to reach a determination that the Action is not likely to adversely affect these species, a review of the HDD geotechnical borings was completed. Two main aspects of the HDD design indicate that the approach for completing the river crossings via HDD is deemed highly feasible based on the factors noted below.

Geological Features and Construction Methods

Mississippi River

Spire conducted four geotechnical borings at the Mississippi River, including both land-based bores and bores conducted within the river. Soil conditions on the northern drill site include a 23.5-foot-thick layer of soils consisting of soft to medium stiff clayey silt with fine gravel, loose rock fragments and silts. When borings drilled straight down, bedrock was encountered at an approximate elevation of 423.5 feet. Bedrock consisted predominately of limestone and shale, with layers of mudstone, siltstone, and sandstone.

When soft or loose soils are present within the path of an HDD, the required drilling fluid pressures can exceed the strength of the soil, resulting in the formation of hydraulic fracturing. These conditions are present at both sides of the HDD. To mitigate this potential issue, Spire would incorporate temporary conductor casings on the entry and exit locations due to the presence of loose soils near the ground surface. Casings would be installed a minimum length of 85 feet on the north side of the river and 275 feet on the south side of the river. The temporary conductor casings would terminate in favorable soils at depth and would provide an open pathway for drilling fluid to flow back to the HDD entry/exit locations. Once the HDD installation is completed, the temporary conductor casings would be removed from the bore. These casings would be removed and grouted upon the completion of pullback operations.

Bedrock materials are also important for a successful drill. Rock quality designations (RQD) is a technique for determining the quality of rock that is recovered when taking core samples. Heavily weathered, jointed, fractured bedrock with RQDs less than 60 percent present challenges in terms of constructability of an HDD installation. The bedrock recovered from the bores along the HDD alignment presented at RQDs of over 60 percent, indicating that the bedrock is well suited for HDD installation and would have decreased risks associated with bore instability, raveling, and loss of drilling fluids to the overlaying geotechnical materials.

Missouri River

Spire conducted five geotechnical borings at the Missouri River, including both land-based bores and bores conducted within the river. Soil conditions on the northern drill site included a 45-foot-thick layer of soils consisting of very loose to medium dense sand or silt and very soft to medium stiff silts before transitioning to medium dense to very dense sand. When borings drilled straight down, bedrock was encountered at an approximate elevation of 293 feet. Bedrock consisted of mudstone and limestone.

When soft or loose soils are present within the path of an HDD, the required drilling fluid pressures can exceed the strength of the soil, resulting in the formation of hydraulic fracturing. These conditions are present at both sides of the HDD. To mitigate this potential issue, Spire would incorporate temporary conductor casings on the entry and exit locations due to the presence of loose soils near the ground surface. Casings would be installed a minimum length of 200 feet on the north side of the river; while not anticipated, a small length of temporary casing on the south side of the river may also be required. The temporary conductor casings would terminate in favorable soils at depth and would provide an open pathway for drilling fluid to flow back to the HDD entry/exit locations. Once the HDD installation is completed, the temporary conductor casings would be removed from the bore. These casings would be removed and grouted upon the completion of pullback operations.

Bedrock materials are also important for a successful drill. RQDs are a technique for determining the quality of rock that is recovered when taking core samples. Heavily weathered, jointed, fractured bedrock with RQDs less than 60 percent present challenges in terms of constructability of an HDD installation. The bedrock recovered from the bores along the HDD alignment presented at RQDs of over 60 percent for the majority of the crossing, indicating that the bedrock along the alignment of the pipeline is well suited for HDD installation and would have decreased risks associated with bore instability, raveling, and loss of drilling fluids to the overlaying geotechnical materials.

Drilling Fluid Pressure

Spire evaluated the potential for hydraulic fracturing along the proposed HDD crossings of the Mississippi and Missouri Rivers by completing drilling fluid pressure calculations. Spire applied a factor of safety of 2.0 to the cavity expansion calculation, per the recommendations of the USACE. Based on those calculations Spire determined that the required drilling fluid pressure for HDD installation is below the recommended allowable pressure for installation. For the proposed river crossings, the allowable drilling fluid pressure was found to be significantly higher than the drilling fluid pressure required for installation. This indicates that the risk for hydraulic fracturing is greatly reduced because the affected rock type is able to support the HDD and associated mud pressures. As part of standard construction practice, Spire has developed an HDD Plan that would be implemented in the event of an inadvertent release of drilling mud. As part of the plan, drilling pressures would be monitored at all times. In the event of an inadvertent release, Spire would implement the procedures in its plan and coordinate with the USFWS as appropriate.

HDD Summary

No fatal deterrents have been identified with the alignment or the proposed HDD at the Mississippi and Missouri Rivers. Based on the required installation length and diameter, there are 9 successfully completed HDD installations of similar lengths within North America for the Mississippi River crossing and 29 for the Missouri River crossing. The proposed HDD installation has been designed based on the use of the drill and intersect method of construction, where drill rig spreads are established on both sides of the crossing to drill individual pilot bores that meet within a target intersect zone beneath the Mississippi and Missouri Rivers. While not anticipated, if an attempted HDD installation is unsuccessful, the proposed HDD alignment could be modified beneath the Mississippi and/or Missouri Rivers using the same general location to accommodate an additional HDD attempt, depending on the condition/cause contributing to the original HDD failure. Prior to attempting a second HDD crossing, a risk mitigation workshop should be held with all parties to determine the cause of the initial failure and any mitigation measures that could be adopted to reduce the risk(s) during the second HDD attempt.

1.3 Likely to Adversely Affect

We determined that the Action *may affect, and is likely to adversely affect* the following two species based on the results of a positive field survey and subsequent effects analysis included in the following sections of this BA (see sections C.2 and C.3): northern long-eared bat and Indiana bat.

We determined that the Action *may affect, and is likely to adversely affect* the decurrent false aster based on an assumption of presence and subsequent effects analysis included in the following section of this BA (see section C.4).

2. Northern Long-eared Bat

Based on technical assistance provided by the USFWS RIFO, no summer or winter records of northern long-eared bats were previously known from the Action Area. Spire conducted a mist net survey from May 15 to June 1, 2017 and June 13 to June 19, 2017. One adult female northern long-eared bat was captured. The details of the survey, including roost tree and emergence count data, are included in the Project mist net survey report (GAI 2017). The mist net report contains confidential information on the locations of Indiana bats, and therefore is not included as an attachment to this BA. The capture record indicates that northern long-eared bat summer maternity habitat exists within the Action Area, and is assumed to support one maternity colony located within three miles of the capture location (GAI 2017).

Spire is proposing to clear all trees prior to April 1, 2018, to avoid adverse effects to the species, assuming regulatory permits are received on schedule and allow for sufficient time to conduct clearing activities within the Project area. However, Project tree clearing could take place during periods of northern long-eared bat occupation (between April 1 and October 15). Project tree clearing may take place between April 1 and April 30, followed by a tree clearing restriction from May 1 to July 31 (for tree-nesting migratory birds), and resume on August 1, if necessary.

Adverse effects, similar to those described for the Indiana bat in the following sections of this BA, are anticipated as a result of tree clearing activities, if conducted after April 1. These adverse effects would not extend beyond the individuals of the maternity colony determined to be present within the Action Area, and would not affect regional or range-wide populations.

While we have determined that the Project *may affect, and is likely to adversely affect* the northern long-eared bat, incidental take of northern long-eared bats as a result of Project tree clearing is not prohibited under Section 9 of ESA because the Project design meets the conservation requirements of the final rule under Section 4(d) of ESA for the species (81 FR 1900). Specifically, the Project is not within 150 feet of any known, occupied maternity roosts or within 0.25-mile of any known, occupied hibernacula. The streamlined consultation form for the northern long-eared bat is included as attachment A.

3. Indiana Bat

The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in caves and mines, and summers in wooded areas. It was not described as a separate species until 1928 (Miller and Allen) due to its strong resemblance to the little brown bat (*Myotis lucifugus*). The Indiana bat can be best distinguished from similar *Myotis* by its short inconspicuous toe hairs, smaller foot, distinctly keeled calcar, and more uniform dull fur (Barbour and Davis 1974; and Whitaker and Hamilton 1998).

3.1 Status

The Indiana bat was originally listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as endangered under the ESA. At the time of listing, the bat's range-wide population was estimated at 880,000 individuals (Clawson 2002). Causes of historic decline in populations include human land use and alterations to winter habitat, such as saltpeter mining, cave tourism, and entrance modifications that affect airflow (USFWS 2007).

A recovery plan for the species was developed in 1983. The objectives of the recovery plan were to protect hibernacula; maintain, protect, and restore summer maternity habitat; and monitor population trends through winter surveys (USFWS 1983). Agency drafts of a revised recovery plan were developed in 1999 and 2007, but never finalized. The objectives of the 2007 Draft Recovery Plan were to protect hibernacula, maintain a population equal to the 2005 estimate (457,000 individuals), and document a positive growth rate over 10 years (USFWS 2007). The plan listed the Recovery Priority of the Indiana bat at a level of eight, which means the species had a moderate degree of threat and high recovery potential.

The range-wide population increased from 2001 through 2007 and recovery criteria for the species were being met (USFWS 2007; USFWS 2013); however, White Nose Syndrome (WNS) quickly reversed the gain and populations are declining, particularly in the Northeast and Appalachia Recovery Units (Thogmartin *et al.* 2012). The USFWS conducted the most recent 5-year review of the Indiana bat in 2009. Due to the WNS epizootic, the analysis downgraded the recovery potential for the bat and determined the species has a high degree of threat and a low recovery potential, and remains endangered (USFWS 2009) with a Recovery Priority at a level of five. The high degree of threat determination indicates that extinction is almost certain in the immediate future because of rapid population decline or habitat destruction. The USFWS began another five-year review in 2011 (76 FR 44564).

The most recent range-wide estimate of the population was 523,636 bats (USFWS 2015c). The estimate includes 167,000 bats from a new Indiana bat hibernaculum that was discovered in Missouri in 2012. A recent study predicted WNS capable of causing severe reductions in population size and local and regional extirpation of the species (Thogmartin *et al.* 2013).

Given the 2015 range-wide Indiana bat population estimate of 523,636, it can be estimated that there are about 3,273 to 5,236 maternity colonies range-wide, assuming a 50:50 sex ratio (Humphrey *et al.* 1977) and an average maternity colony size of 50 to 80 adult females (USFWS 2007; Whitaker and Brack 2002). The USFWS (2007) listed records of 269 known maternity colonies in 16 states, only 6 to 8 percent of the maternity colonies assumed to be in existence. While it is assumed that additional maternity colonies have been discovered since (USFWS 2007), the locations of the majority of the Indiana bat maternity colonies on the landscape remain unknown.

3.2 Distribution

The Indiana bat's summer range includes most of the eastern woodlands from the central Mississippi Valley, eastern Alabama, and northern Florida to New England, but not along the Atlantic Coast (Barbour and Davis 1974). The majority of the winter population (94 percent) occurs in limestone caves and mines in Indiana, Missouri, Kentucky, and Illinois (USFWS 2015c). Smaller winter populations occur in Arkansas, Oklahoma, Ohio, Tennessee, Alabama, Virginia, Michigan, West Virginia, Pennsylvania, North Carolina, New York, New Jersey, and Vermont.

The Action Area is in the Ozark-Central Recovery Unit, which is near the center of the range for the Indiana bat. The Indiana bat population in the Ozark-Central Recovery Unit (RU) has declined since 1990 (USFWS 2007). Based on biannual population assessments of known Indiana bat hibernacula, between the years of 2013 and 2015 the population in Illinois has declined by 4.7 percent and the population in Missouri has increased by 0.8 percent (USFWS 2015c). However, the discovery of a previously unknown Priority 1 hibernaculum in Missouri has increased the overall baseline size of the population in the Ozark-Central Recovery Unit.

Based on USFWS (2007), there were 48 records of maternity colonies in 39 counties in Illinois and Missouri. In Illinois, there were 28 records of maternity colonies in 20 counties, including Adams (2), Alexander, Bond, Cass, Ford, Henderson, Jackson (3), Jersey, Macoupin, Monroe (4), Pike (2), Pulaski, Randolph, Saline, Schuyler, Scott, St. Clair, Union, Vermilion, and Washington (2; USFWS 2007). The Action Area includes parts of Jersey and Scott Counties. In Missouri, there were 20 records of maternity colonies in 19 counties, including Chariton, Gasconade, Iron, Jefferson, Knox (2), Lewis, Linn, Macon, Madison, Marion, Mercer, Monroe, Nodaway, Pulaski, Scotland, St. Francois, St. Genevieve, Sullivan, and Wayne (USFWS 2007). The Action Area does not pass through any of these Missouri counties.

In 2005, the USFWS developed a new system of classification for Indiana bat hibernacula. The classifications are: Priority 1 (P1), which contain a population of greater than 10,000 bats; Priority 2 (P2), which contain 1,000 to 9,999 bats; Priority 3 (P3), which contain 50 to 999 bats; and Priority 4 (P4), which contain 1 to 49 bats (USFWS 2007). Based on the most recent hibernacula distribution (USFWS 2015c), 27 are P1, 56 are P2, 166 are P3, and 270 are P4 (USFWS 2007).

In 2015, 46.2 percent of the range-wide population (241,748 bats) used hibernacula in Illinois and Missouri. A total of 56,055 Indiana bats, or 10.7 percent of the range-wide population hibernated in Illinois (USFWS 2015c). Illinois has at least 16 known extant hibernacula across 11 counties, including Adams, Alexander, Hardin, Jackson, Jersey, Jo Davies, La Salle, Monroe, Pike, Pope, and Union (USFWS 2007). The closest known Indiana bat hibernaculum to the Action Area in Illinois is a P3 site in Jersey County. A total of 185,693 Indiana bats, or 35.5 percent of the range-wide population hibernated in Missouri (USFWS 2015c). Missouri has at least 40 known extant hibernacula across 18 counties, including Barry, Boone, Camden, Carter, Crawford, Dent, Franklin, Iron, Laclede, Marion, Oregon, Pike, Pulaski, Shannon, St. Louis, Taney, Texas, and Washington (USFWS 2007). The closest known Indiana bat hibernaculum in Missouri is a P3 site in St. Louis County, about 26 miles from the Action Area.

3.3 Critical Habitat

Critical habitat for the Indiana bat was designated on September 24, 1976 and included 11 caves and 2 abandoned mines in 6 states (41 FR 41914, September 24, 1976). Of these hibernacula, one is in Illinois and six are in Missouri. No known critical habitat for the Indiana bat is in the Action Area. The nearest critical habitat for the Indiana bat includes a cave in Washington County, Missouri (about 50 miles from the Action Area), a cave in Franklin County, Missouri (about 60 miles from the Action Area), and a cave in Crawford County, Missouri (about 70 miles from the Action Area).

3.4 Life History

The Indiana bat hibernates in caves and mines in the winter and migrates to summer habitat in the spring. Depending on weather conditions, hibernation for Indiana bats typically lasts from October through April (Hall 1962; LaVal and LaVal 1980), although it may be extended from September to May in northern areas including New York, Vermont, and Michigan (Kurta *et al.* 1997; Hicks 2004). Both males and females return to hibernacula in late summer or early autumn to mate and enter hibernation.

Summering Indiana bats (males and females) roost in trees in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark, which allows the bat to roost between the bark and bole of the tree, and have solar exposure in an open canopy. Tree cavities, hollow portions of tree boles, crevices, and splits from broken tops have been used on a very limited basis, usually by individual Indiana bats. A variety of tree species are used for roosts (3D/Environmental 1995; Kurta 2004; and Britzke *et al.* 2003); however, structure is probably more important than species in determining if a tree is a suitable roost site. Suitable roost trees typically have a large diameter, exfoliating bark, and prolonged solar exposure with no apparent importance in regard to the tree species or whether it is upland or bottomland (Whitaker and Brack 2002; Kurta 2004; Winhold 2007; and Whitaker and Sparks 2008).

Indiana bats arrive at maternity roosts in April and early May in the Midwest, with substantial numbers in mid-May (Humphrey *et al.* 1977). Most documented Indiana bat maternity colonies have 50 to 100 adult bats (USFWS 2007). Indiana bats exhibit strong fidelity to their traditional summer maternity habitat (Kurta *et al.* 2002; Kurta and Murray 2002; Winhold *et al.* 2005; and Whitaker and Sparks 2008). Roost trees are often located on forest edges or openings with open canopy and open understory (USFWS 2007). Most have been found in forest types similar to oak-hickory and elm-ash-cottonwood communities. Important summer roosting and foraging habitat for the Indiana bat is often in floodplain or riparian forests, but may also be in more upland areas.

A variety of suitable roosts are needed within a colony's traditional summer range. Maternity colonies often use multiple roost trees in a season (Kurta *et al.* 1993; Foster and Kurta 1999; Kurta and Murray 2002; and Whitaker and Sparks 2008), and may switch often. Roost longevity is variable because they are often dead and dying trees. Gardner *et al.* (1991a) evaluated 39 roost trees and found that 31 percent were no longer suitable the following summer, and 33 percent of those remaining were unavailable by the second summer.

Indiana bat maternity sites generally consist of one or more primary maternity roost trees that are used repeatedly by large numbers, and varying numbers of alternate roosts that may be used less frequently and by smaller numbers of bats. Trees in excess of 16 inches Diameter at Breast Height (dbh) are considered optimal for maternity colonies (3D/Environmental 1995), but trees in excess of 8.6 inches dbh are used as alternate roosts (USFWS 2002).

Indiana bats may use upland forest for roosting and upland forest and pastures with scattered trees for foraging. Indiana bats prefer forests with old growth characteristics, large trees, scattered canopy gaps, and open understories (USFWS 2007). Instances have been documented of bats using forests altered by grazing, swine feedlots, row-crops, hay fields, residences, clear-cut harvests, and shelterwood cuts (Garner and Gardner 1992; and USFWS 1999).

Females produce one young per year, usually between mid-June and early July. Juveniles begin to fly between early July and early August. Maturity is likely dependent upon weather and the thermal character of the roost (Humphrey *et al.* 1977; and Kurta *et al.* 1996).

Male Indiana bats either disperse throughout the range or stay near hibernacula and roost individually or in small groups, occasionally in hibernacula (Whitaker and Brack 2002). Male Indiana bats have been observed roosting in trees as small as 2.5 inches dbh (Gumbert *et al.* 2002). Because males typically roost individually or in small groups, the average size of their roost trees tends to be smaller than the roost trees used by maternity colonies. Males have shown summer site fidelity and have been recaptured in foraging areas from prior years (USFWS 2007).

Indiana bats feed exclusively on flying aquatic and terrestrial insects. Diet varies seasonally and variations exist among different ages, sexes, and reproductive status (USFWS 2007). It is probable that Indiana bats use a combination of both selective and opportunistic feeding to their advantage (Brack and LaVal 1985). Moths, beetles and midges and flies, caddisflies, and wasps and ants constitute the bulk of the diet (Sparks and Whittaker 2004; Tuttle *et al.* 2006).

Indiana bats forage in and around tree canopy and in openings of floodplain, riparian, and upland forests (USFWS 2007). They often utilize streams, trails, old roads, and fencerows as travel corridors (Brown and Brack 2003; Murray and Kurta 2004). In Illinois, Gardner *et al.* (1991b) found that forested stream corridors and impounded bodies of water were preferred foraging habitats for pregnant and lactating Indiana bats, which typically flew up to 1.5 miles from upland roosts to forage. However, the same study reported the maximum distance that any female Indiana bat flew (regardless of reproductive status) from her daytime roost to her capture site was 2.5 miles. Females typically utilize larger foraging ranges than males (Garner and Gardner 1992). Indiana bats also forage over clearings with successional vegetation, along cropland borders, forest edges, fencerows, and over farm ponds.

Swarming is a critical part of the life cycle when Indiana bats converge at hibernacula, mate, and forage until sufficient fat reserves have been deposited to sustain them through the winter (Hall 1962; Cope and Humphrey 1977; and Laval and Laval 1980). Some males may begin to arrive at hibernacula as early as July. Females typically arrive later, and by September the numbers of males and females are almost equal. Swarming activity in the Midwest peaks in early September (Cope and Humphrey 1977).

In autumn, Indiana bats continue to use multiple roosts, although they are located near hibernacula during this time (Gumbert 2001), which may provide energy advantages during swarming (Brack 2006). However, Indiana bats may leave the swarming area for several days to visit other hibernacula (Gumbert 2001; and Brack 2006). Autumn roosts may be located in canopy gaps created by disturbance (logging, blow down, and prescribed burning) and along edges (Gumbert *et al.* 2002). Roost trees used in autumn are primarily on ridge tops and upper slopes (Kiser and Elliott 1996).

The period after hibernation but prior to spring migration is known as staging. Female Indiana bats emerge first from hibernation in late March or early April, followed by the males. The timing of emergence may vary depending on latitude and weather conditions. Most populations leave their hibernacula by late April.

Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low. As a result, adult mortality may be the highest in late March and April. Females can migrate hundreds of miles from hibernacula (Kurta and Murray 2002; Winhold and Kurta 2006). During spring staging, males have been found almost 10 miles from their hibernacula (Hobson and Holland 1995).

Indiana bats hibernate on cave and mine ceilings and walls in dense clusters of several hundred individuals per square foot. Hibernation lasts from mid-November to mid-April and facilitates survival during harsh winter months when prey is unavailable. Clusters may protect individuals from temperature change and speed arousal due to disturbance. Like other cave bats, the Indiana bat naturally arouses during hibernation (Brack 1979; Brack and Twente 1985; and Twente *et al.* 1985). Limited mating takes place throughout the winter and in early April as Indiana bats emerge (USFWS 2007).

Hibernacula must provide a stable and suitable temperature and humidity microclimate (Brack *et al.* 2009; and USFWS 2007), and only a small percentage of hibernacula meet these requirements. Hibernacula may contain large populations of several species of bats (Stihler and Brack 1992).

3.5 Baseline Conditions/Species Status in the Action Area

Based on technical assistance provided by the USFWS RIFO, no summer or winter records of Indiana bats were previously known from the Action Area. Spire conducted a mist net survey from May 15 to June 1, 2017 and June 13 to June 19, 2017. Seven Indiana bats were captured, including five adult males and two adult females. Five of the Indiana bats, including three adult males and two adult females, were radio-tagged and tracked to eleven diurnal roosts. None of the roosts were within the Project area. The details of the survey, including roost tree and emergence count data, are included in the Project mist net survey report (GAI 2017). The mist net report contains confidential information on the locations of Indiana bats, and therefore is not included as an attachment to this BA.

Portal searches were conducted on all portions of the Project area where landowner access was obtained. No caves, open karst features, abandoned mine portals, or any potential openings to subterranean voids were found. Portal searches were not completed along about 3.4 miles where the Project area crosses two tracts in Jersey County, Illinois and two tracts in St. Louis County, Missouri where landowner access was not obtained, and the recently re-designed Missouri River HDD pullback site in St. Charles County, Missouri. It is assumed that no potentially suitable unknown bat hibernacula exist in the portions of the Project area that cross agricultural lands in these areas (3.1 miles total). It is assumed to be unlikely that potentially suitable unknown bat hibernacula exist in the portion of the Project area that crosses forest land in these areas (0.3 mile total). These areas would be searched for portals when access is obtained. GAI would notify the USFWS if any potentially suitable unknown bat hibernacula are found.

In summary, based on the results of the mist net survey and portal searches, Indiana bats and their summer habitat are considered present in the Action Area. It is assumed that no winter habitat is present in the Action Area.

3.6 Factors Affecting the Species in the Action Area

The Project crosses a variety of land cover types commonly found in rural, agricultural, and forested areas of western Illinois and eastern Missouri; the primary land use within the Project is agriculture. Other dominant landforms crossed include wooded areas and riverine systems. The Project route follows areas of predominately agricultural land use with forested cover typically associated with riparian areas and property lines; therefore, forested areas are currently fragmented throughout the vicinity of the Project. The largest areas of contiguous forest along the Project are located along the north and south sides of the Mississippi River where the forest has been previously fragmented by roads and an existing right-of-way. The Project would be collocated with an existing pipeline corridor north of the Mississippi River; on the south side, forested areas would be bypassed by HDD and therefore not require tree clearing.

Forested land cover along the Project route includes bottomland forest (riparian forested areas bordering waterbodies). Towering trees and vine lattices characterize mature bottomland forests. In the lowlands bordering streams are forests of cottonwood, willow, ash, elm, sycamore, silver maple, and hackberry. Periodic flooding keeps the understory of these riverfront bottomland forests fairly open. In the Midwest, such as southern and central Illinois, maternity colonies are more commonly associated with bottomland, riparian, wetland, or other hydric forest types (Carter 2006).

White Nose Syndrome

Traditionally, loss and degradation of forested lands is often cited as a reason for the decline of Indiana bat populations (USFWS 2007). However, the introduction of WNS has devastated many hibernating bat populations and is now the most significant threat to this species. Prior to the onset of WNS, the range-wide population of Indiana bat appears to have been in a stationary state for at least two decades (Thogmartin *et al.* 2012). Between 2006 and 2009, during the first few years of onset of WNS, the median range-wide population decline for Indiana bats increased by 10.3 percent per year (Thogmartin *et al.* 2012). The presence of WNS was confirmed in Missouri in 2013 and in Illinois in 2014 and is now considered to be state-wide in both states.

Other Actions

We completed a cumulative impact analysis for the Project per relevant guidance by the Council on Environmental Quality (1997) and the USEPA (1999). Under these guidelines, we considered the impact on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Our full assessment of cumulative impacts from the proposed Project is provided in section B.10 of the EA. However, the definition of cumulative effects as it pertains to Section 7 consultation under the ESA is smaller in scope (50 CFR 402.02), requiring assessment of "effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." As defined in section B.6 of this BA, the Action Area for the proposed Project includes a 1.8-mile buffer around the Project. Details and parameters of the cumulative effects analysis for Section 7 consultation are summarized in the following paragraphs as they pertain to Indiana bats.

Using the definition of cumulative effects applicable to Section 7 consultations, three projects, or sets of projects, are reasonably foreseeable to take place in the Action Area, including a new electric transmission line, upgrades to the NuStar pipeline, and upgrades to US 67. An electric transmission action, the Grain Belt Express Clean Line, located within Scott and Greene Counties, Illinois, and modifications to the NuStar pipeline in Jersey, Illinois are proposed to be constructed in the Action Area as early as 2018. These projects would cross the Project at approximate MP 2.6 and be adjacent to the pipeline from MP 43.9 and 46.2, respectively. Based on an evaluation of aerial imagery, some tree clearing would be expected within the same hydrologic unit code (HUC)-12 as the Project. The route is collocated with existing roads where possible. The proponent would work with landowners on vegetation maintenance procedures and has requested input on best practices from local conservation organizations. The proposed route of the Grain Belt Express Clean Line near the Action Area in Scott County, Illinois crosses a primarily agricultural landscape with some areas of forest. The easement would be about 150-to 200-feet-wide. The proponent estimates that less than one percent of the easement would be occupied by structures; existing land use (e.g. farming, grazing, etc.) may continue provided activities do not interfere with operation of the line. It is not known at this time if disturbance could coincide with the Project workspaces. Modifications to the NuStar pipeline would involve work within an existing right-of-way, but may include additional clearing for drilling workspace.

One road infrastructure action was identified as the proposed and potential construction and upgrades of the US 67 corridor. Most of the US 67 corridor improvements are in the preliminary design or planning stage, three of which are included in the Illinois Department of Transportation's programmed projects for 2018-2022. Several sections of the anticipated US 67 corridor improvements are within the Action Area in Illinois, including new bypasses and improvement corridors. New bypasses could be expected to have temporary and permanent impacts. Improvement corridors would entail expansion of the existing roadway, which would minimize impacts to the resources. Detailed analysis of these actions is not publicly available. It is presumed that the loss of some vegetation is likely to take place, though most impacts would be to agricultural lands. The improvement Projects within the Action Area are in varying stages of design, and the construction timeframes are unknown. It is improbable that improvements not yet programmed would be constructed at the same time as the Project.

The Grain Belt Express Clean Line in Scott County, Illinois, improvements to the NuStar pipeline, and the improvements to the US 67 Corridor between Carrollton and White Hall, Greene County, Illinois would involve noise and temporary air quality impacts from heavy vehicles and machinery associated with clearing and construction. These actions would be subject to permit requirements not unlike that of the proposed Project which would further minimize effects to Indiana bats. In addition, the USACE would assess portions of the projects that affect Waters of the U.S.

4. Decurrent False Aster

Decurrent false aster is a perennial herb in the aster (*Asteraceae*) family that grows 3-to 7-feet-tall (Hilty 2017). The species forms either a solitary or a cluster of central stems that branch occasionally to abundantly (Hilty 2017). Central stems are light green with vertical veins that appear glabrous or sometimes glaucous with alternative leaves at regular intervals along the entire length of the stems; leaves become gradually smaller in size as they ascend (Hilty 2017). While the stems are terete (circular in circumference), the bases of leaves extend one to three inches down the stem giving the appearance of winged stems (Hilty 2017). The entire, toothless, oblong-lanceolate shaped leaves of the central stem are up to seven inches in length and one and a half inches across and taper gradually to form narrow acute tips (Hilty 2017). Upper leaf surface is medium to dark green and glabrous, while the lower leaf surface is lighter green and glabrous or glaucous; venation is pinnate, and the central veins are particularly prominent toward their bases (Hilty 2017). Lateral stems have alternative, elliptic or linear-lanceolate shaped leaves up to three inches in length and half an inch across (Hilty 2017).

The blooming period for decurrent false aster is late summer to autumn and lasts one to two months (Hilty 2017). Central stems terminate in large panicles of flowerheads up to two inches long and two inches across, and some robust plants may also have lateral stems terminate in smaller panicles of flowerheads (Hilty 2017). Each flowerhead is three-quarters of an inch to one inch across, daisy-like, consisting of 40 to 60 ray florets that surround a head of 180 or more disk florets. Rays of the flowerheads are linear-oblong in shape and white or rarely lavender or light purple; corollas of the disk florets are yellow and tubular in shape (Hilty 2017).

4.1 Status

Decurrent false aster was listed as federally threatened in 1988 (53 FR 45858, November 14, 1988), and at that time, only 12 populations were known in the states of Illinois and Missouri (USFWS 1988). When the original recovery plan was issued in 1990, the number of known decurrent false aster populations had grown to 20 populations (18 in Illinois and 2 in Missouri), and when the most recent 5-Year Review was issued in 2012, 10 of 19 historically occupied sites (surveyed in 2011) had reestablished decurrent false aster populations (USFWS 1990 and 2012). Populations appear to fluctuate given environmental conditions from year to year, and monitoring has not been sufficiently conducted as floodplain conditions and late-season water tables precluded monitoring on many of the long-term monitoring sites (USFWS 2012).

The natural habitat of decurrent false aster is on moist, sandy, alluvial floodplains, wet prairies, shallow marshes, and shores of open rivers, creeks, and lakes; and although the species is not tolerant to prolonged flooding, it does rely on periodic flooding to scour away other plants that compete for its habitat (USFWS 2000; 2015d; and 2016).

Distribution of decurrent false aster historically ranged from La Salle County, Illinois to St. Louis County, Missouri. In Illinois, extant populations were recorded along the Illinois River in Jersey, Scott, Cass, Morgan, Schuyler, Fulton, Tazewell, and

Marshall Counties and along the Mississippi River in St. Clair County (USFWS 1990). In Missouri, extant populations were recorded in St. Charles County (USFWS 1990).

4.2 Critical Habitat

No critical habitat has been designated for decurrent false aster.

4.3 Life History

Decurrent false aster exhibits morphological adaptations suited for life on the floodplain as it is extremely tolerant to root zone saturation and seed dispersal by river currents (USFWS 2000). The early successional species requires human or natural disturbance to create and maintain suitable habitat, such as periodic flooding or plowing to create open, sunny habitat while reducing other competitive species; germination would not occur in the dark or when achenes are covered with as much as two-tenths of an inch of sediment (Smith and Keevin 1998; USFWS 2000). Due to the structure of decurrent false aster achenes, they are able to float for long distances; and germination and seedling growth is more successful at sandy or silty soils rather than clay (USFWS 2000).

Vegetation production occurs during the fall when one or more basal rosettes form; rosettes bolt in the following spring and flower and set achenes from late August to early October (USFWS 2000). Decurrent false aster produces around 50,000 achenes per individual with an average production of around 40,000 seedlings in optimal conditions (USFWS 2000). Few seedlings are found at established populations due to small achene size, full sun and temperature requirements, and soil texture and microtopography requirements for germination and seedling growth; however, these populations can sustain by basal rosette production (Moss 1997; Smith 1991; USFWS 2000).

Although decurrent false aster is considered stable by some, as of 2000 the species was considered to be at 75 percent recovery; the Recovery Plan requires 12 stable populations in protection through purchase, easement, or other cooperative management agreement (USFWS 2000). Notable populations at that time were the following: Riverlands Environmental Demonstration Area, Spatterdock Bottoms, and Columbia Bottoms in St. Charles County, Missouri; Rice Lake in Fulton County, Illinois; and Worley Lake in Tazewell County, Illinois (Dr. Marian Smith, Southern Illinois University - Edwardsville in litt. to Gerry Bade December 4, 1999; ibid. January 28, 2000, as cited in USFWS 2000).

4.4 Baseline Conditions/Status of the Species in the Action Area

No specific occurrence data was available for Project review other than the population extant and historical collection data provided in USFWS (1990) Recovery Plan. In October 2016, a field survey was conducted for decurrent false aster along the

Otter Creek area (approximate MP 36.6 to 36.8) in Jersey County, Illinois. Neither the species, nor its suitable habitat, were located at the Project area (Thomas 2017).

Based on technical assistance provided by the USFWS Columbia Field Office and RIFO, additional survey areas for decurrent false aster have been proposed in St. Charles County, Missouri, and would be surveyed in August/September 2017 (USFWS 2017a-c). Surveys would be conducted in St. Charles County, Missouri (see section D.2).

While the habitat requirements for decurrent false aster growth are quite specific, much of St. Charles County, Missouri is within large floodplains of the Mississippi and Missouri rivers. Much of the Project area is within heavy agricultural land use, thus, not suitable habitat for the species. However, those lower-lying areas skirting agricultural fields or roadsides with periodic disturbance or forested or open areas adjacent to rivers have potential for the decurrent false aster occurrence.

4.5 Factors Affecting the Species in the Action Area

Population decline of the decurrent false aster has been attributed to the following threats (USFWS 2000 and 2015d):

- modification of the floodplain forest along the Illinois and Mississippi rivers;
- wetland drainage;
- agricultural expansion;
- heavy siltation as a result of extensive row crop cultivation (smoothers seeds and seedlings);
- elimination of wet prairies and marshes;
- building of levees which changed flooding patterns; and
- use of herbicides.

Other actions that take place in the Action Area that could affect the species are similar to those described for the Indiana bat in section C.3.6.

D. EFFECTS OF THE ACTION

Direct effects are immediate effects of an action on listed species or their habitat. Indirect effects are caused by an action and are later in time, but still are reasonably certain. Insignificant effects are related to the relative size of the effects and should never reach the scale where take occurs. Insignificant effects cannot be meaningfully measured, detected, or evaluated. Discountable effects are those effects that are extremely unlikely or not expected to occur (USFWS and National Marine Fisheries Service [NMFS] 1998).

1. Indiana Bat

Direct and indirect effects to Indiana bats from construction, operation, and maintenance of the Project were assessed based on the presence of the species in the Action Area. The following areas were considered occupied habitat when determining the presence of the species in the Action Area:

- within 5 miles of a known, extant hibernaculum;
- within 5 miles of a summer maternity capture without a known roost;
- within 2.5 miles of a known maternity roost; and
- within 2.5 miles of a summer non-maternity record.

Based on the results of the mist net survey, Indiana bat summer maternity and summer non-maternity habitat exists within the Project area (see figure 3). Table 9 provides acres of summer maternity and summer non-maternity habitat (i.e., forest) in the Project area before and after construction.

The following factors were considered while evaluating direct and indirect effects:

Proximity

The Action Area lies near the center of the species overall range. It includes maternity and summer non-maternity habitat. Based on the results of surveys for winter habitat in the Project area, it is assumed no winter habitat is in the Project area. It is unlikely that the Project would affect unknown winter habitat, if present in the Action Area, due to the Project-related effects being primarily isolated to the Project area, with the exception of noise (for which the Action Area was defined), which would be expected to have insignificant and discountable effects to winter habitat.

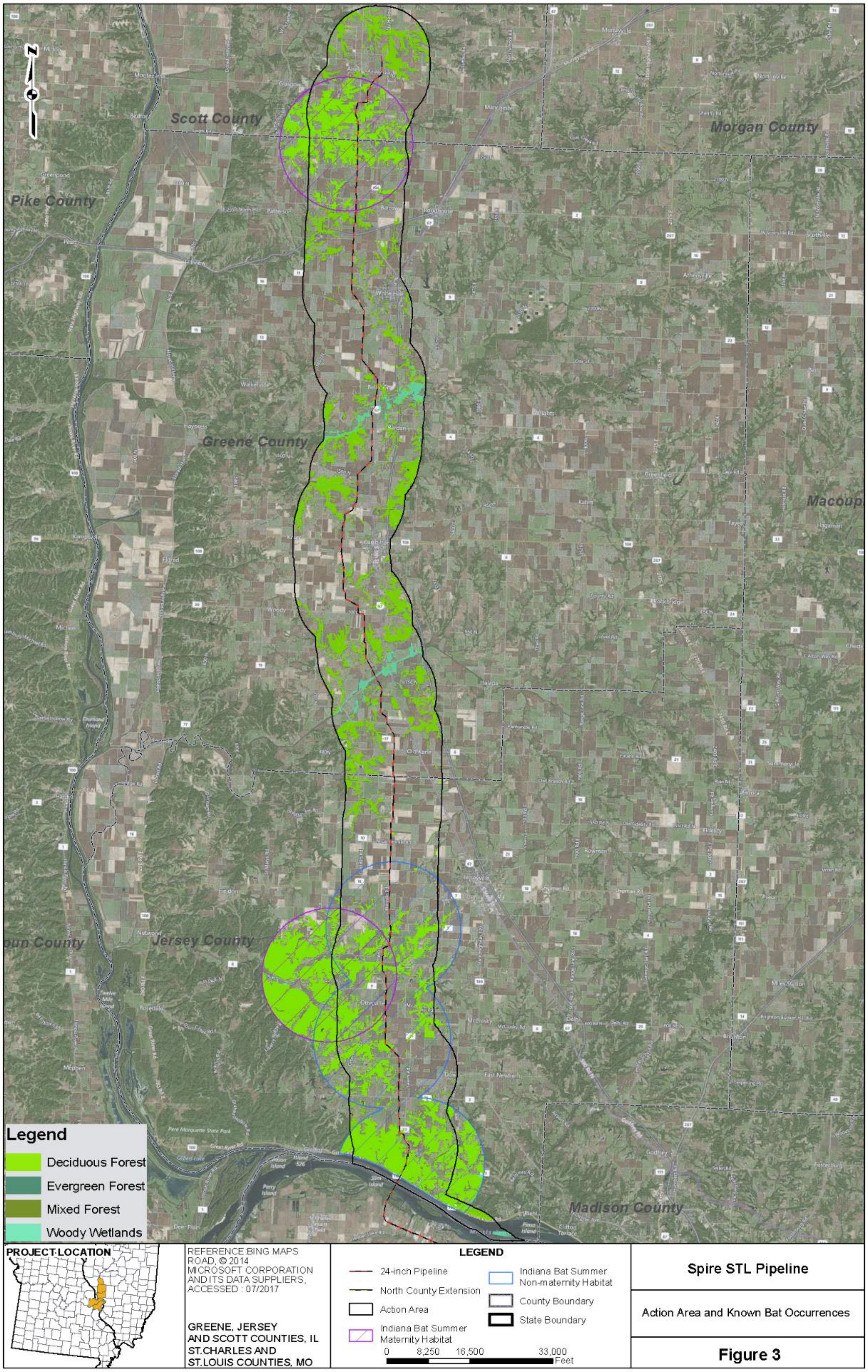
Scott County
Morgan County
Pike County
Greene County
Macoup
Jersey County
oun County
Madison County
Legend
Deciduous Forest
Evergreen Forest
Mixed Forest
Woody Wetlands
PROJECT LOCATION
REFERENCE:BING MAPS ROAD, © 2014 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS, ACCESSED : 07/2017
GREENE, JERSEY AND SCOTT COUNTIES, IL ST.CHARLES AND ST.LOUIS COUNTIES, MO
LEGEND
24-inch Pipeline
North County Extension
Action Area
Indiana Bat Summer Maternity Habitat
Indiana Bat Summer Non-maternity Habitat
County Boundary
State Boundary
0 8,250 16,500 33,000 Feet
Spire STL Pipeline
Action Area and Known Bat Occurrences
Figure 3

Table 9 Forested Lands within Known Indiana Bat Habitat			
Habitat Type	**Total Area (acres)**	**Forested Area (acres)**	**Forested Area (percent)**
All Lands within Known Maternity Habitat[a] (Pre-construction)	25,621.3	11,569.7	45.2
All lands within Known Maternity Habitat[a] (Post-construction)		11,559.1	45.1
Difference		**10.6**	**<0.1**
All Lands within Known Non-maternity Habitat[a] (Pre-construction)	27,599.8	8,779.9	31.8
All lands within Known Non-maternity Habitat[a] (Post-construction)		8,761.6	31.8
Difference		**18.2**	**0.1**
All Lands within Total Known Habitat[b] (Pre-construction)	53,221.0	20,349.6	38.2
All lands within Total Known Habitat[b] (Post-construction)		20,320.7	38.2
Difference		**28.8**	**0.1**

Notes:

[a] Where Known Maternity and Known Non-maternity Habitat overlap (see figure 3), the habitat was considered Known Maternity Habitat.

[b] Total Known Habitat includes Known Maternity Habitat and Known Non-maternity Habitat. Where these two habitat types overlap (see figure 3), habitat was considered Known Maternity Habitat.

Distribution

The effects of the Action would be limited to the Action Area. Effects from construction activities would be primarily limited to specific areas of tree clearing, which lie well within the boundaries of the Action Area. The exception is construction noise, which would decrease as it extends to the edge of the Action Area, and is expected to have discountable effects to Indiana bats and would likely be limited to individual bats and maternity colonies within the Action Area.

Nature

Project tree clearing could: (a) presumably result in a small amount of mortality; (b) remove occupied and potential roosting and foraging habitat (e.g., removal of non-maternity roost trees and foraging and traveling habitat used during summer); (c) alter habitat (e.g., fragmentation of foraging and traveling habitat used during summer); and (d) result in alteration and/or modification of normal Indiana bat behaviors (e.g., effects to reproduction, foraging, and roosting behaviors).

Timing

Spire is proposing to clear all trees prior to April 1, 2018, assuming regulatory permits are received on schedule and allow for sufficient time to conduct clearing activities within the Project area. However, tree clearing could take place during periods of Indiana bat occupation. Indiana bats are expected to occupy the Action Area between April 1 and October 15 (see table 10; USFWS 2015c). Project tree clearing may be conducted between April 1 and April 30, followed by a tree clearing restriction from May 1 to July 31 (for tree-nesting migratory birds), and resume on August 1, if necessary.

Table 4
Indiana Bat Habitat Occupied by Season[a]

Date	April 1 through August 15	August 16 through October 14	October 15[b] through November 14	November 15 through March 31
Habitat Type	Summer	Migration and Swarming	Swarming	Winter

[a] Source: USFWS 2015b provided as an example.
[b] Because no Swarming Habitat is in the Action Area, Indiana bats are not expected to be in the Action Area after October 15.

Effects on Indiana bats, if present, would take place primarily during the summer maternity season. These effects could take place during the early and late portions of the maternity season if tree clearing is conducted during this time (April 1 to April 30, and after August 1). Because tree clearing would not be conducted between May 1 and August 1, (the middle of the maternity season, including then non-volant pup season) few effects would likely occur at this time.

Duration

Any mortality would be limited to the tree-clearing phase of construction, if conducted during the summer maternity season. The loss of roosts (both unknown and potential) and forested land used for foraging and traveling would be considered permanent; however, a portion of the Project area would be allowed to naturally revegetate, lessening these effects. Effects to normal behavioral patterns as a result of those losses are expected to be temporary, and would persist until any bats find new roosts and foraging areas in the surrounding woodlands. Behavioral effects are not expected to persist for more than one summer season.

Disturbance Frequency

The tree clearing phases of the Project would likely cause the highest levels of disturbance to Indiana bats. Due to the Project construction schedule, the majority of these effects would take place during the first part of the summer maternity season (April 1 to April 30) and the last part of the summer maternity season (August 1 to October 15).

Disturbance Intensity

Effects are expected to range from minor disturbance (e.g., short-term nearby noise) to mortality. Effects from Project tree clearing could result in a small amount of mortality of individual Indiana bats, as well as harm and harassment of individual Indiana bats. These effects would mostly impact males and non-maternity habitat due to their closer proximity to the Project area. These effects are also expected to impact the maternity colonies and maternity habitat within the Action Area, but at a reduced rate, and are not expected to result in severe reductions in the numbers of individuals associated with these maternity colonies or the amount of suitable maternity habitat. A suitable amount of maternity habitat is expected to remain on the landscape following Project construction. Both maternity colonies in the Action Area are expected to remain on the landscape following Project construction. Effects are not expected to reach beyond these maternity colonies.

Disturbance Severity

The timeframe in which Project effects may persist and how long it would it take the local or regional population of Indiana bats to recover is expected to be relatively short. Because effects are not expected to persist for more than one summer season, long-term effects to Indiana bat and their habitat are not expected to take place.

1.1 Direct Effects

Tree Clearing in Summer

In most cases, the death of an individual Indiana bat from summer habitat removal would require the bat to be present in the specific tree being removed at the time it is felled. If not struck during the felling, volant Indiana bats would likely have the opportunity to escape the falling tree (Cope et al 1974; Belwood 2002; USFWS 2015b). Although volant Indiana bats could likely fly away from a tree prior to or during felling, females may be less likely to leave if they have non-volant young present (usually between June 1 and July 31). Non-volant young would not be capable of leaving their roost tree and, therefore, the young and the reluctant adult females may be wounded and/or killed.

Project tree clearing could coincide with small portions of the beginning and end of the summer maternity season (and summer non-maternity season for males), when Indiana bats are volant. Combined, these timeframes would be expected to correspond to a low chance of mortality of an individual Indiana bat, if present in a tree being felled. In addition, no known Indiana bat roost trees are within the Project area or proposed for clearing. Despite this, a low amount of mortality is expected to result from felling occupied unknown roosts, primarily occupied by males, based on the proximity of the known male roosts to the Project area. The distances of roost trees from the portions of the Project area proposed for tree clearing are provided in the Project Mist Net Survey Report (GAI 2017) and ranged from 26.9 to 714.6 meters (88 to 2,344 feet) for roosts used by males, and 673.2 to 3,221.6 meters (2,209 to 10,5670 feet) for roosts used by female Indiana bats.

Loss of Roosts

Indiana bats, if displaced from roosts, would be required to find new roosts. Although Indiana bats use multiple roosts during a summer season, and they shift roosts within and between years due to the inherent ephemerality of dead trees, little is known with certainty about the effects of the loss of roost trees, whether occurring during summer or during a time when they are unoccupied (i.e., during off-season tree clearing). One study in Indiana documented the fragmentation of a maternity colony following the natural loss of a primary maternity roost (Sparks *et al.* 2003). Finding replacement roosts may expose bats to a reduction in time spent foraging, increases in energetic demands, exposure to competition, and exposure to predation. Effects may depend on season and type and number of roosts lost. New roosts may be more or less suitable than abandoned roosts (Kurta 2004).

No known roosts would be removed by the Project; however, it is reasonable to assume that removal of unknown roosts prior to April 1, when they are unoccupied, would reduce these effects to an insignificant and discountable level where harm and/or harassment is not expected to take place. However, a low amount of harm and/or harassment would result from Indiana bats fleeing falling roosts and/or roosts in the immediate vicinity of tree clearing activities, and then subsequently having to find new roosts.

1.2 Indirect Effects

Loss of Roosts

As described above, it is reasonable to assume that removal of unknown roosts prior to April 1, when they are unoccupied, would reduce indirect effects to an insignificant and discountable level.

Foraging and Traveling Habitat

The presence of Indiana bats is not correlated with a high amount of forest cover (Gardner and Cook 2002; and Kurta 2004). Within home ranges of Indiana bats at a site in Indiana, the landscape was only 28 percent forested (Sparks *et al.* 2005). In southern Michigan, Indiana bats prospered in areas of 36 percent forest cover (Kurta *et al.* 2002). In an Illinois study, 90 percent of Indiana bat capture sites had 33 percent forest coverage within 0.6 mile (Gardner *et al.* 1991b). Finally, habitat models by BHE (1995) and Farmer *et al.* (2002) indicated that sites with 30 and 31 percent woodland cover within a

0.6-mile area, respectively, could support maternity colonies. Indiana bats are more likely to occur in areas with higher densities of potential roost trees (Miller *et al.* 2002; Farmer *et al.* 2002), and may occur in highly fragmented forests (Carter *et al.* 2002); however, they use the highest quality habitat in those forests.

The Project area would total 1,004.1 acres (see tables 3 and 4), of which, about 59.8 acres are forested (59 acres of upland forest and 0.8 acre of forested wetland as described in section B and table 7). The area considered known maternity habitat is 45.2 percent forested (see figure 3 and table 9). Tree clearing would remove about 10.6 acres of known summer maternity habitat, reducing the amount of forest to 45.1 percent, a change of 0.04 percent. Similarly, the area considered known non-maternity habitat (used by males), is 31.8 percent forested. Tree clearing would remove about 18.2 acres of forest in this area, reducing the amount of forest to 31.8 percent, a change of 0.07 percent. Combined, the area considered known summer Indiana bat habitat is 38.2 percent forested. Tree clearing would remove a total of 28.8 acres, reducing the amount of forest to 38.2 percent, a change of 0.05 percent (note: in areas where maternity and non-maternity habitat overlap were considered maternity habitat only). Tree clearing is not expected to reduce the amount of forest beyond levels commonly used by Indiana bats in the region, and is expected to be an insignificant and discountable change.

Indiana bats are known to follow forested and/or linear landscape features between roosts and foraging areas. Indiana bats travel longer distances between forest parcels in otherwise open landscapes by moving along tree lines (Kurta 2004; Murray and Kurta 2004; Sparks and Whitaker 2004). This behavior has sometimes been interpreted as reluctance to cross open areas; however, Indiana bats in heavily forested areas often travel a similarly long distance to find an open corridor to follow (Brack and Whitaker 2006). Project tree clearing includes a 90-foot-wide temporary easement (75 feet through waterbodies and wetlands) and within a 25-foot-wide easement for some temporary and permanent access roads. After construction, vegetation would be allowed to regenerate outside of the 50-foot-wide permanent easement. In some instances, the removal of forest may result in new future travel corridors for Indiana bats through otherwise forested habitat. In other instances, the removal of forest may cross lines of tree cover, which Indiana bats would utilize to travel across otherwise open land. New forest openings along these tree lines could disrupt travel corridors. Construction activity may also result in a temporary disruption to the utilization of these corridors. Given that the Project would primarily widen existing openings, and the limited width of the permanent openings, it is reasonable to assume that Indiana bats would continue to utilize these linear forested features when construction is complete. Effects to traveling bats from habitat fragmentation by the Project is considered insignificant because habitat connectivity on the landscape surrounding the Project would be maintained.

Winter, Spring, and Autumn Habitat

Based on the results of portal surveys in the Project area, no winter habitat is within the Project area, and is assumed that no unknown winter habitat or associated spring staging or autumn swarming habitat is present in the Action Area. Further, it is unlikely that the Project would affect unknown winter habitat, if present in the Action Area, due to the majority of Project-related effects being limited to the Project area.

Because the Project is in the core of the Indiana bat range, it is reasonable to assume the species could utilize forest cover within the Action Area for migration between summer and winter habitats. Migration pathways may be affected by habitat loss and degradation (USFWS 2007), increasing migratory stress. However, during these stages, Indiana bats may travel hundreds of miles, cross numerous open areas, and use a variety of roosts. Therefore, any effects from loss of forested lands associated with Project development would be extremely unlikely and are expected to be discountable. Migrating Indiana bats may occupy the Action Area during this time; however, occupation would be brief. The Project is not expected to fragment the surrounding landscape to the extent of preventing migratory movement of the species.

Water Quality

The Project would not involve the construction of permanent diversions or dams and, therefore, would be expected to have only short-term temporary effects resulting from surface water quality. Temporary impacts on surface waters include disturbance of stream banks, removal of bank vegetation, sedimentation of the substrate, and, in some instances, modification of flow during dry-crossing construction. The level of temporary effects of the Project on surface waters would depend on precipitation events, sediment loads, stream area/velocity, channel integrity, and bed composition. Runoff from construction activities near waterbodies would be controlled by implementation of erosion and sediment control measures and by compliance with federal, state, and local requirements. BMPs would be utilized throughout the life of the Project to control erosion and sedimentation. Erosion and sediment control devices would localize any temporary reduction in water quality. For certain large waterbody crossings, Spire would implement its HDD Plan and subsequently consult with the USFWS in the event of an inadvertent return. Therefore, the Project would be expected to have minimal temporary effects on water quality. Any effects to bats from changes in water quality are considered insignificant and discountable.

Noise

Although pipeline construction activities would generate unavoidable noise during construction, effects to Indiana bats, if present, would be limited to the relatively short period of active construction. Construction activity and associated noise levels for the pipeline and aboveground facility installation would vary depending on the phase of construction in progress at any given time. These construction phases include site grading, clearing/grubbing, and pipeline and aboveground facility installation. The most prevalent sound source during construction would be the internal combustion engines used to power the construction equipment, particular at the HDD locations. For the meter stations and MLVs associated with the Project, the site construction noise associated with the installation of the new equipment construction would be limited to weekday daytime hours.

Effects to Indiana bats from noise would be limited to the Action Area, primarily during the construction phase. No data exist that indicate construction and operational noise affect roosting Indiana bats, and if they did, a graded response would be expected, based on distance from the source. It is assumed that Indiana bats utilizing roosts immediately adjacent to portions of the Project area actively undergoing timber removal and earthwork would experience the greatest disturbance. Regardless, effects from construction noise on roosting bats are considered insignificant and discountable.

Some nighttime construction is expected within the Project area. If Indiana bats are present, a graded response would again be expected, based on distance from the source. Likewise, noise is unlikely to have any effect on Indiana bats traveling or foraging within but not inhabiting the Project area, as exposure to excessive noise would be brief and generally avoidable.

Fugitive Dust and Lighting

Fugitive dust would result from clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. No data exist that indicate the effect of fugitive dust and lighting on Indiana bats. As previously described, temporary changes to air quality would be expected from heavy vehicles and machinery in use during construction. Heavy equipment would generate emissions of air contaminants and fugitive dust during the construction phase. If present, effects to Indiana bats from fugitive dust and lighting would be primarily limited to the Project area. Because pipeline construction moves through an area quickly, air emissions associated with construction of the pipeline would be intermittent and short term, as well as spatially dispersed. In addition, Spire would implement its Fugitive Dust Control Plan for the Project to control/minimize potential effects.

Any increase in ambient lighting outside the Project area is expected to be temporary and/or minimal. Lights may be utilized during early morning and early evening hours in periods of fewer daylight hours (autumn/winter) and may be visible from immediately outside the Project area. Project construction activities would be conducted during daylight hours with the exception of short-term pull string activities as associated with HDD crossings, critical maintenance, or other Project-mandated activities required to meet schedule or safety requirements. The three aboveground meter stations would employ ambient security lighting during the operational phase of the Project. The security lighting would be permanent, but is not expected to increase ambient lighting far from the intended purpose of lighting the meter stations within the Project area.

Fugitive dust and lighting would be minimal and controlled, and Project effects as they relate to fugitive dust and lighting are expected to be insignificant and discountable.

1.3 Cumulative Effects

Cumulative effects include effects of future non-federal (state, local, or private) actions that are reasonably certain to take place within the Action Area (50 CFR 402.02). Future federal actions that are unrelated to the current proposed Action are not included because they are subject to separate consultation pursuant to Section 7 of ESA. As described in the Baseline Conditions, we completed a cumulative impact analysis for the Project per relevant guidance (Council on Environmental Quality 1997; USEPA 1999), which is presented in section B.10 of the EA. Under these guidelines, consideration was given to the impact on the environment that would result from the incremental impact of the Project, when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

Specific to Section 7 consultation under the ESA, all future actions identified in the Action Area are subject to take provisions of the ESA. Certain portions of these projects may also require individual Section 7 consultation due to a federal nexus with USACE permits. Therefore, no cumulative effects on Indiana bats are expected as a result of non-federal actions.

2. Decurrent False Aster

Direct and indirect effects to decurrent false aster from construction, operation, and maintenance of the Project were assessed based on the assumed presence of the species in the Project area. As previously described, there are no known occurrences of the plant in the Project area. The USFWS (2017a) does report that known locations of decurrent false aster have been found in Missouri; however, this BA is being submitted to the USFWS before the results of August/September's decurrent false aster survey in St. Charles and St. Louis Counties are available. If decurrent false aster is found, Spire would implement the avoidance and minimization measures described in section B.5, as recommended by the USFWS. The factors discussed below were considered while evaluating direct and indirect effects.

Proximity

Project-related direct effects would take place within the Project area, although there are also potential indirect effects that could occur outside of the Project area within the species range. It is assumed that a viable population of decurrent false aster exists within the six potential habitat areas that have yet to be surveyed (see figure 4). Due to the large scale agricultural land use in St. Charles and St. Louis Counties, Missouri, the potential for suitable habitat to exist within the Project area is nominal and the Project is not expected to have significant effects on the species or its suitable habitat outside of the Project area.

Distribution

The effects of the Project would be within the Project area in St. Charles and St. Louis Counties, where decurrent false aster has potential to occur, in addition to the species known range within those counties, given that its achenes are suited for floating to other locations. For the purposes of this analysis, effects from construction activities would be limited to the six proposed study areas for the species in St. Charles and St. Louis Counties, Missouri. These are low-lying areas adjacent to agricultural fields or waters identified by aerial signatures as areas that may be suitable habitat. These study areas total 16.3 acres (see figure 4), of which, 6.4 acres (39.4 percent) are within the Project area.

Nature

Project construction is expected to remove occupied habitat and would result in alteration and/or modification of habitat as soils are disturbed. As the trench and right-of-way are backfilled and graded after pipe installation, the original contours of the land would be restored; thus, the six potential habitat areas would continue to be potentially suitable for decurrent false aster. Effects would likely be limited given that most of the proposed study areas for the species are nominal in size and are in the 100-year flood zone of the two rivers rather than closer to the more active floodway. Achenes have a low probability of reaching the study areas from a flood event and any existing achenes have a low probability of reaching the Mississippi or Missouri River currents to have a significant distribution impact. If decurrent false aster is found, Spire would implement the avoidance and minimization measures described in section B.5, reducing the nature of the effects.

Timing

Project timing is not expected to play a role in the effects to decurrent false aster.

REFERENCE: ORTHOPHOTOGRAPHY, FLOWN 2016. ESRI WORLD IMAGERY, ST. LOUIS ORTHOS, 2015, ACCESSED 07/2017.

LEGEND

- DFA STUDY AREA
- Facility
- ACCESS ROAD
- North County Extension
- 24-inch Pipeline
- STATE BOUNDARY
- COUNTY BOUNDARY

0 1 2 4 Miles

Spire STL Pipeline

Decurrent False Aster Assumed Presence

Figure 4

Duration

Effects to decurrent false aster at the six potential study area locations would be either long-term or permanent, if found. Permanent effects would take place where permanent facilities are being located (i.e., the Chain of Rocks Station). Long-term effects would take place at all other areas where the construction right-of-way is restored to pre-existing contours, as achenes could once again germinate under the right conditions.

Disturbance Frequency

During construction, the decurrent false aster would be removed. As decurrent false aster may migrate back to the Project area, the disturbance frequency changes as the Project shifts to operations and maintenance phases. With the exception of active agricultural fields, full right-of-way clearing and mowing may be conducted no more than once every three years (10-foot-wide maintenance can be conducted as necessary) at uplands in accordance with the Procedures. This periodic disturbance of the right-of-way can create an opportunity for decurrent false aster growth. The species may also benefit as new open areas are created and periodically disturbed (a requirement for the successful germination decurrent false aster achenes).

Disturbance Intensity

Disturbance intensity is the highest during Project construction as land is cleared and decurrent false aster is removed. After construction, if and when decurrent false aster repopulates the Project area, disturbance intensity would change to low as right-of-way clearing and maintenance activities are periodic (as previously explained). As such, the operation and maintenance phases of the Project would be beneficial for the plant as it requires some periodic disturbance. If decurrent false aster is found, Spire would implement the avoidance and minimization measures described in section B.5, reducing the intensity of the effects.

Disturbance Severity

After the removal of decurrent false aster during Project construction, the species has potential to recover quickly if achenes remain near the surface. Assuming recovery would not take place until new achenes are distributed at the Project area, the duration for recovery would be dependent on flooding bringing in new supply. If decurrent false aster is found, Spire would implement the avoidance and minimization measures described in section B.5, reducing the nature of the effects.

2.1 Direct Effects

A majority of the Project area is within heavy agricultural land use not viable to affect decurrent false aster. Periodic disturbed areas (including floodplain forest, open areas with saturated soils, or alongside lake or ponded waters) may be suitable for decurrent false aster plants or seedlings, or its achenes. Direct effects to decurrent false aster are assumed and limited to the Project area at the six proposed study area locations totaling 16.3 acres (see figure 4, table 11), of which, 6.4 acres (39.4 percent) are within the Project area. Under Section 9(a)(2)(B) of the ESA, there are no federal prohibitions for the take of listed plants on non-federal lands unless take of those plants is in violation of state law or federal law. The ESA prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction. Additionally, the ESA prohibits the destruction of endangered plants on non-federal areas in violation of state law or regulation or in the course of any violation of a state criminal trespass law (USFWS 1998). Because there are no take prohibitions, the USFWS may make a jeopardy determination for decurrent false aster.

Table 5
Decurrent False Aster Survey Areas

Survey Area Name	Total Acres	Acres within Project Area	Percent Survey Area within Action Area
DFA HABITAT 001	1.9	1.7	85.1
DFA HABITAT 012	2.8	2.1	77.4
DFA HABITAT 013	6.3	1.2	18.4
DFA HABITAT 014	0.2	0.1	35.4
DFA HABITAT 016	2.3	0.5	21.4
DFA HABITAT 016A	2.8	0.9	32.1
Total	**16.3**	**6.4**	**39.4**

After construction, the Project area would be restored to pre-existing contours, thus, any potential habitat would remain potential habitat following completion of the Project with the exception of permanent facility locations. Permanent facilities would directly impact any existing decurrent false aster plants as they would be permanently removed.

As lands are cleared and soils are trenched and/or sorted during Project construction, any existing decurrent false aster plants, seedlings, or its achenes would be removed from the ground surface. As lands are backfilled at the final stages of Project construction and while contours are restored preconstruction levels, any existing achenes would likely not end up within their near surface requirement for germination (previously mentioned at less than two-tenths of an inch of soil). Alternatively, achenes that were previously silted over, may end up back atop the soil surface and become viable again for germination. Even so, Project activities along the construction right-of-way could result in the direct loss of decurrent false aster within the Project area at the six potential habitat areas in St. Charles and/or St. Louis Counties, Missouri.

2.2 Indirect Effects

Because decurrent false aster plants and achenes may be within the Project area, the loss of those plants and their seed bank would preclude some achene production within the species range. Lost plants and associated achenes may have helped start a new population (or add to an existing population) outside the Project area if those achenes were carried downstream with a river current in a high-water flood event. The overall effect of this loss of contribution to populations outside the Project area is considered insignificant and discountable.

Alternatively, any areas of tree clearing along the Project area may create new open areas viable for decurrent false aster seed germination. Another indirect effect could result from the periodic mowing or clearing of the right-of-way during Project operation and maintenance phases. Right-of-way vegetation maintenance within wetlands and adjacent to perennial waterbodies would be limited and would generally only occur where maintenance clearing of woody vegetation is needed. A 10-foot-wide corridor could be maintained as necessary in uplands in accordance with the Procedures. This could allow for the periodic disturbance suitable for decurrent false aster's growth.

2.3 Cumulative Effects

See section D.1.2 regarding the Project's cumulative impact analysis for the Indiana bat. Specific to Section 7 consultation under the ESA, all future actions identified in the Action Area are subject to applicable provisions of the ESA, which prohibits the take of listed plants on federal lands. Certain portions of these future projects may also require individual Section 7 consultation due to a federal nexus with USACE permits. Further, plants on non-federal lands may be protected by state law. Illinois prohibits the take of state-listed plants without the express written permission of the landowner (520 ILCS 10/3). No future actions have been identified in the Action Area within Missouri. Therefore, no cumulative effects on decurrent false aster are expected as a result of non-federal actions.

E. FINDING OF EFFECTS AND SUMMARY

A **No Effect** finding is the appropriate conclusion when an action would not affect listed species. A **May Affect** finding is the appropriate conclusion when a proposed action may pose any effects on listed species. An **Is Not Likely to Adversely Affect** determination is appropriate when effects on listed species are expected to be insignificant, discountable, or completely beneficial. An **Is Likely to Adversely Affect** finding is the appropriate conclusion if any adverse effect may occur to the listed species as a direct or indirect result of a proposed action or its interrelated or interdependent actions. In the event the overall effect of a proposed action is beneficial to the listed species, but also is likely to cause some adverse effects, then the proposed action is likely to adversely affect the listed species. If incidental take is anticipated as a result of a proposed action, the action is likely to adversely affect listed species. An action that is likely to adversely affect listed species requires the initiation of formal Section 7 consultation (USFWS and NMFS 1998). A **Jeopardy** finding, which would be determined by the USFWS, is the appropriate conclusion when an agency would engage in an action that reasonably would be expected, directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). All of the above definitions include prohibitions on effects to designated critical habitat.

Based on the analysis contained in this BA, and with the implementation of the mitigation/conservation measures proposed by Spire and recommendations included in the EA, we have determined that the Spire STL Pipeline Project:

- would have ***no effect*** on three federally listed species: Higgins eye pearlymussel, eastern prairie fringed orchid, and Mead's milkweed;
- ***may affect, but is not likely to adversely affect***: gray bat, least tern, piping plover, red knot, and pallid sturgeon;
- ***may affect, and is likely to adversely affect*** the Indiana bat, northern long-eared bat, and decurrent false aster; and
- would have ***no effect*** on designated critical habitat for the Indiana bat.

These determinations are based on Spire's informal consultation with the U.S. Fish and Wildlife Service and our own analyses.

We have determined that the Project may affect, and is likely to adversely affect the northern long-eared bat; however, incidental take of northern long-eared bats as a result of Project tree-clearing is not prohibited under Section 9 of ESA because the Project design meets the conservation requirements of the final rule, under Section 4(d) of ESA, for the species (81 FR 1900). We have included the Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form as attachment A to complete consultation for the northern long-eared bat.

We are requesting the USFWS' concurrence with our determination of effect for the gray bat, least tern, piping plover, red knot, and pallid sturgeon and are requesting initiation of formal consultation under Section 7 of the ESA for the Indiana bat and the decurrent false aster.

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ATTACHMENT A

NORTHERN LONG-EARED BAT 4(D) RULE STREAMLINED CONSULTATION FORM

Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form

Federal agencies should use this form for the optional streamlined consultation framework for the northern long-eared bat (NLEB). This framework allows federal agencies to rely upon the U.S. Fish and Wildlife Service's (USFWS) January 5, 2016, intra-Service Programmatic Biological Opinion (BO) on the final 4(d) rule for the NLEB for section 7(a)(2) compliance by: (1) notifying the USFWS that an action agency will use the streamlined framework; (2) describing the project with sufficient detail to support the required determination; and (3) enabling the USFWS to track effects and determine if reinitiation of consultation is required per 50 CFR 402.16.

This form is not necessary if an agency determines that a proposed action will have no effect to the NLEB or if the USFWS has concurred in writing with an agency's determination that a proposed action may affect, but is not likely to adversely affect the NLEB (i.e., the standard informal consultation process). Actions that may cause prohibited incidental take require separate formal consultation. Providing this information does not address section 7(a)(2) compliance for any other listed species.

Information to Determine 4(d) Rule Compliance:	**YES**	**NO**
1. Does the project occur wholly outside of the WNS Zone[1]?	☐	☒
2. Have you contacted the appropriate agency[2] to determine if your project is near known hibernacula or maternity roost trees?	☒	☐
3. Could the project disturb hibernating NLEBs in a known hibernaculum?	☐	☒
4. Could the project alter the entrance or interior environment of a known hibernaculum?	☐	☒
5. Does the project remove any trees within 0.25 miles of a known hibernaculum at any time of year?	☐	☒
6. Would the project cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree from June 1 through July 31.	☐	☒

You are eligible to use this form if you have answered yes to question #1 **or** yes to question #2 **and** no to questions 3, 4, 5 and 6. The remainder of the form will be used by the USFWS to track our assumptions in the BO.

Agency and Applicant[3] (Name, Email, Phone No.):

Christine Mallory, Federal Energy Regulatory Commission, (202) 502-6748, christine.mallory@ferc.gov

Project Name: Spire STL Pipeline Project

Project Location (include coordinates if known): Scott, Green, and Jersey Counties, Illinois; St. Charles County, Missouri

Basic Project Description (provide narrative below or attach additional information):
The proposed Project would consist of about 65 miles of new, greenfield, 24-inch-diameter pipeline beginning in Scott County, Illinois, and terminating in St. Charles County, Missouri. The Project also includes the construction of three new meter stations that provide interconnects and appurtenant facilities.

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[1] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf
[2] See http://www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html
[3] If applicable - only needed for federal actions with applicants (e.g., for a permit, etc.) who are party to the consultation.

See attached Environmental Assessment and Biological Assessment.

General Project Information	YES	NO
Does the project occur within 0.25 miles of a known hibernaculum?	☐	☒
Does the project occur within 150 feet of a known maternity roost tree?	☐	☒
Does the project include forest conversion[4]? (if yes, report acreage below)	☒	☐
Estimated total acres of forest conversion	30.3	
If known, estimated acres[5] of forest conversion from April 1 to October 31	unknown	
If known, estimated acres of forest conversion from June 1 to July 31[6]	0.0	
Does the project include timber harvest? (if yes, report acreage below)	☐	☒
Estimated total acres of timber harvest		
If known, estimated acres of timber harvest from April 1 to October 31		
If known, estimated acres of timber harvest from June 1 to July 31		
Does the project include prescribed fire? (if yes, report acreage below)	☐	☒
Estimated total acres of prescribed fire		
If known, estimated acres of prescribed fire from April 1 to October 31		
If known, estimated acres of prescribed fire from June 1 to July 31		
Does the project install new wind turbines? (if yes, report capacity in MW below)	☐	☒
Estimated wind capacity (MW)		

Agency Determination:

By signing this form, the action agency determines that this project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule.

If the USFWS does not respond within 30 days from submittal of this form, the action agency may presume that its determination is informed by the best available information and that its project responsibilities under 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic BO. The action agency will update this determination annually for multi-year activities.

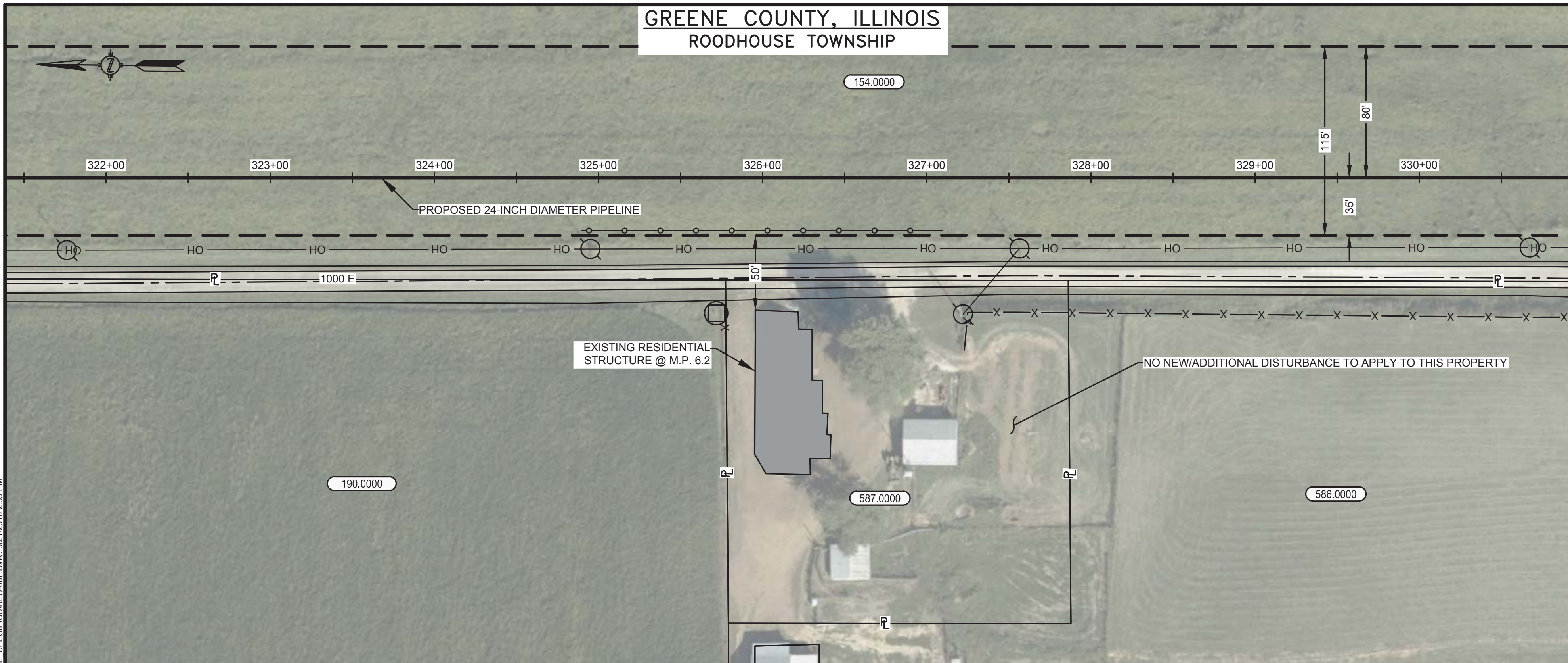
The action agency understands that the USFWS presumes that all activities are implemented as described herein. The action agency will promptly report any departures from the described activities to the appropriate USFWS Field Office. The action agency will provide the appropriate USFWS Field Office with the results of any surveys conducted for the NLEB. Involved parties will promptly notify the appropriate USFWS Field Office upon finding a dead, injured, or sick NLEB.

Signature: Christine Mallory Digitally signed by CHRISTINE MALLORY Date: 2017.08.21 10:18:13 -04'00' Date Submitted: 9/29/2017

[4] Any activity that temporarily or permanently removes suitable forested habitat, including, but not limited to, tree removal from development, energy production and transmission, mining, agriculture, etc. (see page 48 of the BO).
[5] If the project removes less than 10 trees and the acreage is unknown, report the acreage as less than 0.1 acre.
[6] If the activity includes tree clearing in June and July, also include those acreage in April to October.

APPENDIX L

SITE-SPECIFIC PLANS FOR RESIDENCES WITHIN 50 FEET OF PROJECT WORK AREAS



PLAN VIEW
1" = 60'

LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- ####.0000 MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

NOTES:

1. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (L.O.D.) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. AT MINIMUM, FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA.
2. STRUCTURES WITHIN L.O.D. WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.

   THE STRUCTURES ARE BASED ON AERIAL DATA SERVICE IMAGERY FLOWN IN AUGUST AND SEPTEMBER 2016.
3. PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA AND/OR FIELD LOCATED PROPERTY EVIDENCE. THEY SHOULD NOT BE RELIED ON AS AN ACCURATE DEPICTION OF THE ACTUAL PROPERTY LINE LOCATIONS. THEY DO NOT REPRESENT THE RESULTS OF A BOUNDARY SURVEY.
4. AREAS OF PERMANENT EASEMENT WILL BE PERMANENTLY MAINTAINED PER USDOT PHMSA REQUIREMENTS. TEMPORARY WORKSPACES WOULD BE ALLOWED TO REVERT TO PRE-EXISTING USES. FENCES WOULD BE REPAIRED OR REPLACED.
5. SPIRE, DURING LANDOWNER NEGOTIATIONS, IS SEEKING FEEDBACK FROM LANDOWNERS ON THE PROPOSED PIPELINE AND IT'S IMPACTS ON THEIR PROPERTY. IF A LANDOWNER PROVIDES FEEDBACK ABOUT A PARTICULAR FEATURE ON THEIR PROPERTY FOR AVOIDANCE, SPIRE WILL MAKE REASONABLE ACCOMMODATIONS TO TRY TO AVOID THE IMPACT OR PROVIDE THE LANDOWNER COMPENSATION.

GRAPHIC SCALE
60' 30' 0 60'

CONSTRUCTION TECHNIQUES

1. THE STOVE PIPE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. IT IS TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/RESIDENTIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS.
2. THE DRAG SECTION CONSTRUCTION TECHNIQUE, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE STOVE PIPE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	SG	AMENDMENT TO FERC		
1	01/2017	SG	ISSUE FOR FERC		

REVISIONS

Division:		Op. Area:	
State: ILLINOIS		Co./Par.: GREENE COUNTY	
Section:	Township: ROODHOUSE	Range:	
Dft: SG	Date: 03/2017	Scale: 1" = 60'	
Chk: WAH	Date: 03/2017		
Appr:	Date:	Filename: RES-007.DWG	

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH DIAMETER PIPELINE
RESIDENTIAL SITE SPECIFIC
GREENE COUNTY, ILLINOIS

PREPARED FOR Spire STL Pipeline

PREPARED BY MOTT MACDONALD

RES-007 Sheet: 1 of 1 Type: ACAD 2

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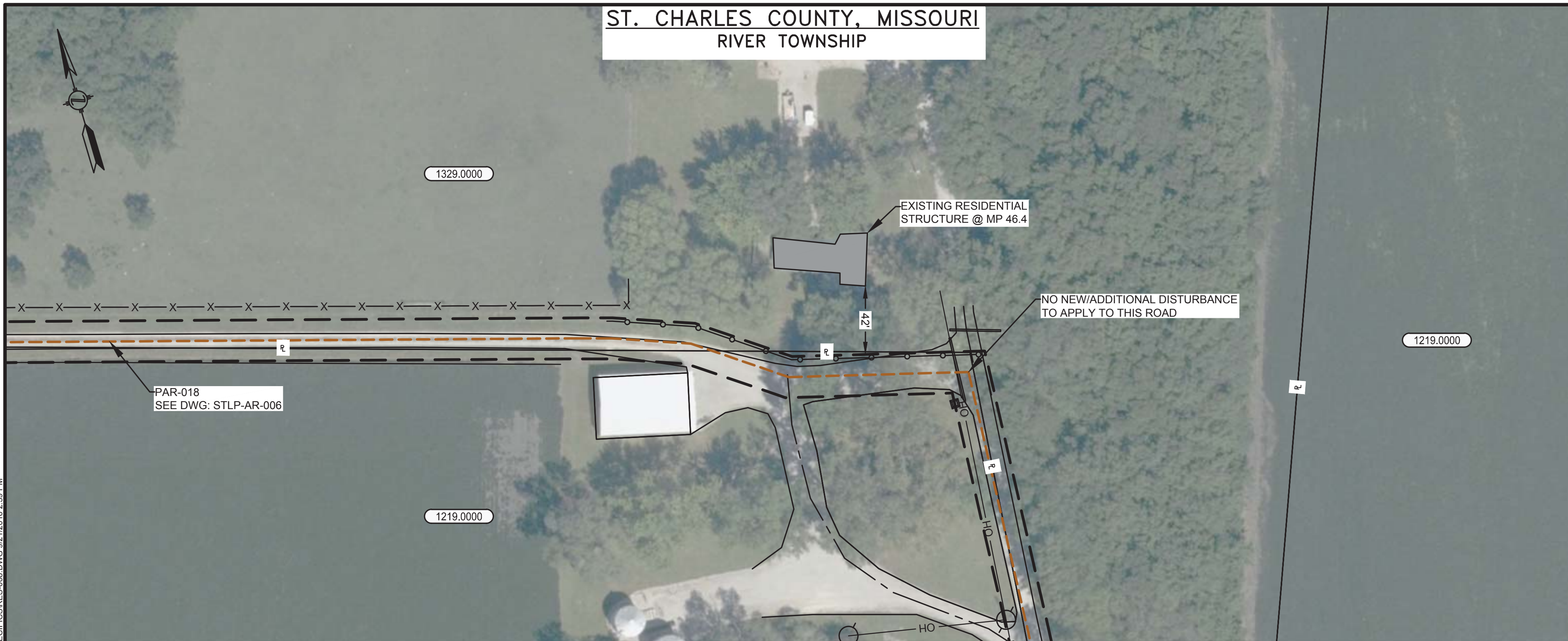

LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES (OH)
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- ####.0000 — MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

NOTES:

1. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (L.O.D.) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. AT MINIMUM, FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA.
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PLAN VIEW

1" = 60'

GRAPHIC SCALE

60' 30' 0 60'

CONSTRUCTION TECHNIQUES

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	AKY	AMENDMENT TO FERC		

REVISIONS

Division:		Op. Area:	
State: MISSOURI		Co./Par.: ST. CHARLES COUNTY	
Section:	Township: RIVER	Range:	
Dft: AYK	Date: 03/2017	Scale: 1" = 60'	
Chk: RJP	Date: 04/2017	Filename: RES-008.DWG	
Appr:	Date:		

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH DIAMETER PIPELINE
RESIDENTIAL SITE SPECIFIC
ST. CHARLES COUNTY, MISSOURI

PREPARED FOR: Spire STL Pipeline

PREPARED BY: MOTT MACDONALD

RES-008 | Sheet: 1 of 1 | Type: ACAD | 2

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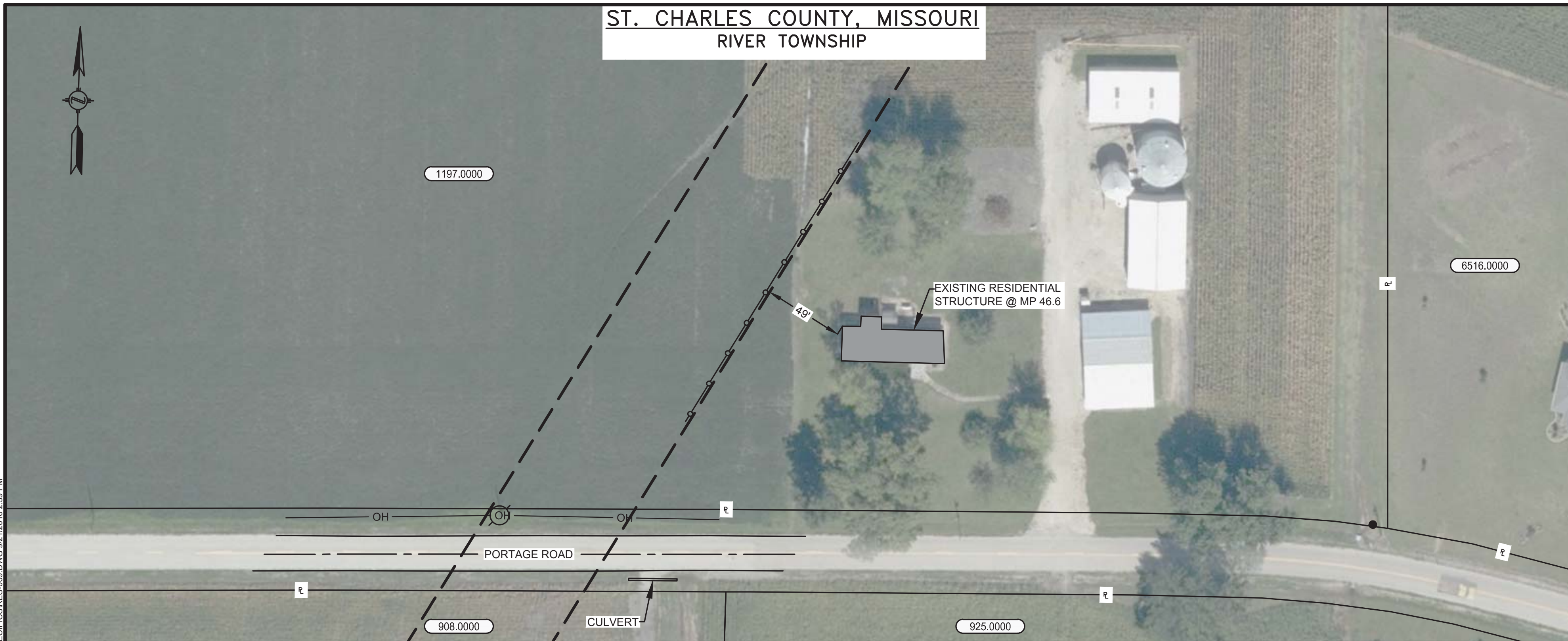
ST. CHARLES COUNTY, MISSOURI
RIVER TOWNSHIP



PLAN VIEW
1" = 60'

GRAPHIC SCALE
60' 30' 0 60'

LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- ####.0000 MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	AKY	AMENDMENT TO FERC		

REVISIONS

Division:		Op. Area:	
State: MISSOURI		Co./Par.: ST. CHARLES COUNTY	
Section:	Township: RIVER	Range:	
Dft: AKY	Date: 03/2017	Scale: 1" = 60'	
Chk: RJP	Date: 04/2017		
Appr:	Date:	Filename: RES-009.DWG	

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH DIAMETER PIPELINE
RESIDENTIAL SITE SPECIFIC
ST. CHARLES COUNTY, MISSOURI

PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

RES-009 | Sheet: 1 of 1 | Type: ACAD | 2

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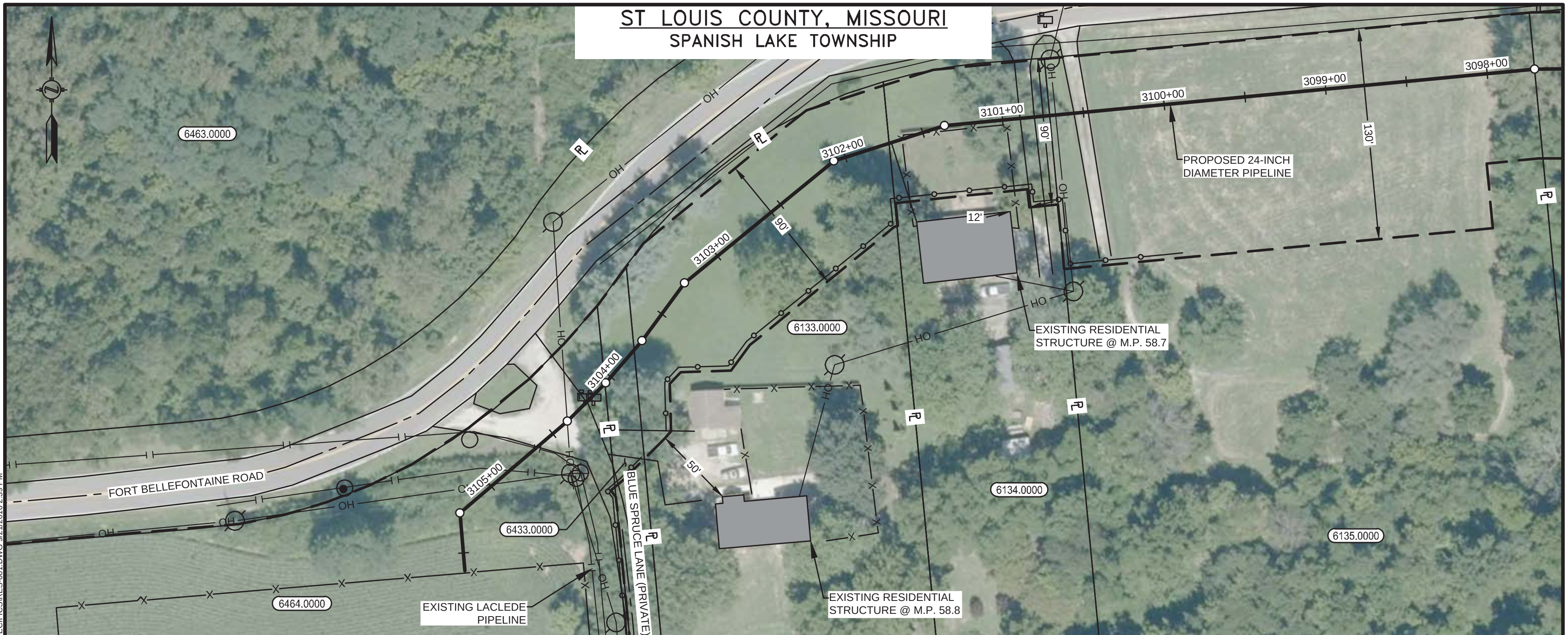
ST LOUIS COUNTY, MISSOURI
SPANISH LAKE TOWNSHIP



LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- ####.0000 MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

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PLAN VIEW
1" = 60'

GRAPHIC SCALE
60' 30' 0 60'

CONSTRUCTION TECHNIQUES

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
3	05/2017	RP	FERC SUPPLEMENTAL		
2	04/2017	SG	AMENDMENT TO FERC		
1	01/2017	DRG	ISSUE FOR FERC		

REVISIONS

Division:		Op. Area:	
State: MISSOURI		Co./Par.: ST LOUIS	
Section:	Township:	Range:	
Dft: DRG	Date: 10/11/16	Scale: 1" = 60'	
Chk: EB	Date: 10/11/16	Filename: RES-001.DWG	
Appr:	Date:		

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH DIAMETER PIPELINE
RESIDENTIAL SITE SPECIFIC
ST LOUIS COUNTY, MISSOURI

PREPARED FOR
Spire
STL Pipeline

PREPARED BY
MOTT MACDONALD

RES-001

Sheet: 1 of 1
Type: ACAD

1

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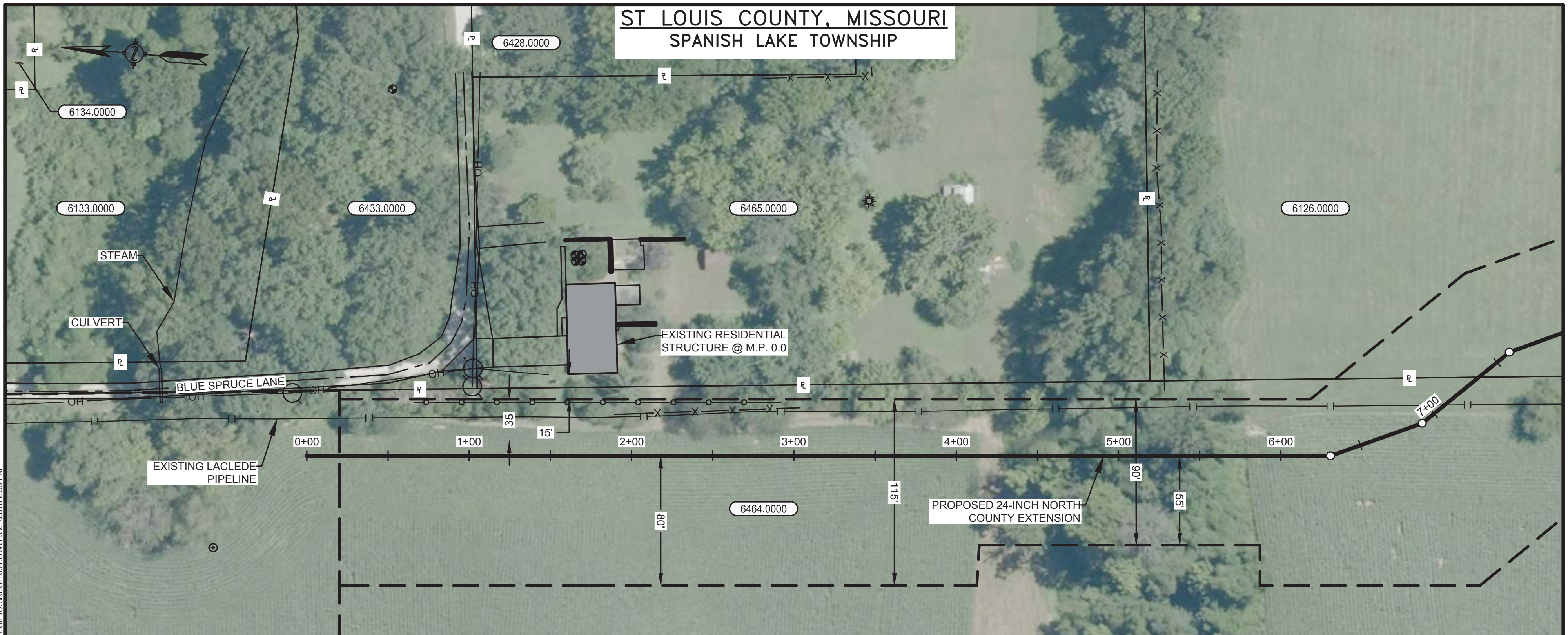

LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE
- PROPOSED ACCESS ROAD
- ####.0000 — MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

PLAN VIEW

1" = 60'

GRAPHIC SCALE

60' 30' 0 60'

NOTES:

1. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (L.O.D.) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. AT MINIMUM, FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA.

2. STRUCTURES WITHIN L.O.D. WILL BE REMOVED, RELOCATED OR PROTECTED PER LAND OWNER AGREEMENT.

   THE STRUCTURES ARE BASED ON AERIAL DATA SERVICE IMAGERY FLOWN IN AUGUST AND SEPTEMBER 2016.

3. PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA AND/OR FIELD LOCATED PROPERTY EVIDENCE. THEY SHOULD NOT BE RELIED ON AS AN ACCURATE DEPICTION OF THE ACTUAL PROPERTY LINE LOCATIONS. THEY DO NOT REPRESENT THE RESULTS OF A BOUNDARY SURVEY.

4. AREAS OF PERMANENT EASEMENT WILL BE PERMANENTLY MAINTAINED PER USDOT PHMSA REQUIREMENTS. TEMPORARY WORKSPACES WOULD BE ALLOWED TO REVERT TO PRE-EXISTING USES. FENCES WOULD BE REPAIRED OR REPLACED.

5. SPIRE, DURING LANDOWNER NEGOTIATIONS, IS SEEKING FEEDBACK FROM LANDOWNERS ON THE PROPOSED PIPELINE AND IT'S IMPACTS ON THEIR PROPERTY. IF A LANDOWNER PROVIDES FEEDBACK ABOUT A PARTICULAR FEATURE ON THEIR PROPERTY FOR AVOIDANCE, SPIRE WILL MAKE REASONABLE ACCOMMODATIONS TO TRY TO AVOID THE IMPACT OR PROVIDE THE LANDOWNER COMPENSATION.

CONSTRUCTION TECHNIQUES

1. THE STOVE PIPE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. IT IS TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/RESIDENTIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS.

2. THE DRAG SECTION CONSTRUCTION TECHNIQUE, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE STOVE PIPE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	AKY	AMENDMENT TO FERC		
1	01/2017	AKY	ISSUED FOR FERC		

REVISIONS

Division:		Op. Area:	
State: MISSOURI		Co./Par.: ST LOUIS COUNTY	
Section:	Township: SPANISH LAKE	Range:	
Dft: AKY	Date: 03/2017	Scale: 1" = 60'	
Chk: WAH	Date: 03/2017	Filename: RES-1001.DWG	
Appr:	Date:		

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH NORTH COUNTY EXTENSION
RESIDENTIAL SITE SPECIFIC
ST LOUIS COUNTY, MISSOURI

PREPARED FOR Spire STL Pipeline

PREPARED BY MOTT MACDONALD

RES-1001 | Sheet: 1 of 1 | Type: ACAD | 2

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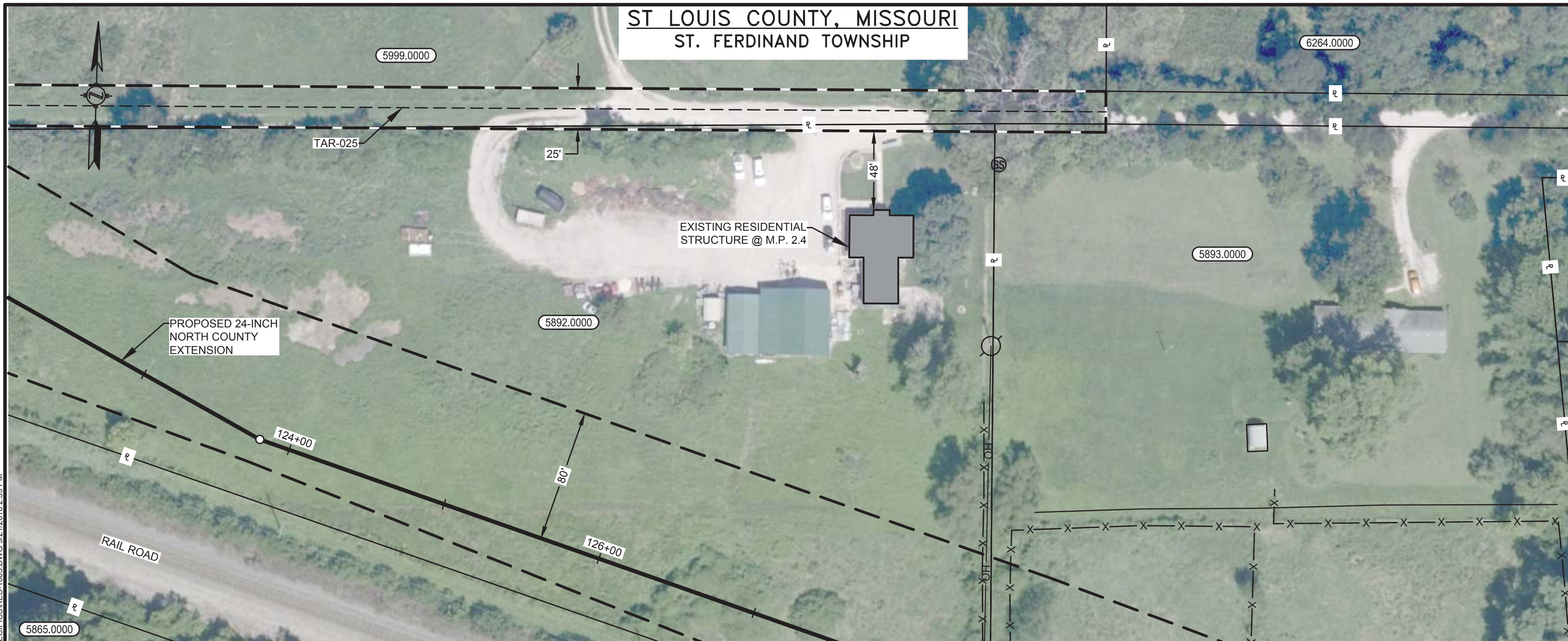

PLAN VIEW
1" = 60'

GRAPHIC SCALE
60' 30' 0 60'

LEGEND

- SAFETY FENCE
- PROPOSED PIPELINE
- OVERHEAD UTILITY LINES (OH)
- EXISTING FOREIGN PIPELINE
- CONSTRUCTION LIMITS
- PROPERTY LINE (℄)
- PROPOSED ACCESS ROAD
- ####.0000 MMID
- RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
- UTILITY POLE

NOTES:

1. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (L.O.D.) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. AT MINIMUM, FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA.

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4. AREAS OF PERMANENT EASEMENT WILL BE PERMANENTLY MAINTAINED PER USDOT PHMSA REQUIREMENTS. TEMPORARY WORKSPACES WOULD BE ALLOWED TO REVERT TO PRE-EXISTING USES. FENCES WOULD BE REPAIRED OR REPLACED.

5. SPIRE, DURING LANDOWNER NEGOTIATIONS, IS SEEKING FEEDBACK FROM LANDOWNERS ON THE PROPOSED PIPELINE AND IT'S IMPACTS ON THEIR PROPERTY. IF A LANDOWNER PROVIDES FEEDBACK ABOUT A PARTICULAR FEATURE ON THEIR PROPERTY FOR AVOIDANCE, SPIRE WILL MAKE REASONABLE ACCOMMODATIONS TO TRY TO AVOID THE IMPACT OR PROVIDE THE LANDOWNER COMPENSATION.

CONSTRUCTION TECHNIQUES

1. THE STOVE PIPE TECHNIQUE IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. IT IS TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/RESIDENTIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS.

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	AKY	AMENDMENT TO FERC		
1	01/2017	AKY	ISSUE FOR FERC		

REVISIONS

Division:	Op. Area:	
State: MISSOURI	Co./Par.: ST LOUIS COUNTY	
Section:	Township: ST. FERDINAND	Range:
Dft: AKY	Date: 03/2017	Scale: 1" = 60'
Chk: RJP	Date: 04/2017	
Appr:	Date:	Filename: RES-1005.DWG

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH NORTH COUNTY EXTENSION
RESIDENTIAL SITE SPECIFIC
ST LOUIS COUNTY, MISSOURI

PREPARED FOR Spire STL Pipeline

PREPARED BY MOTT MACDONALD

RES-1005 | Sheet: 1 of 1 | Type: ACAD | 2

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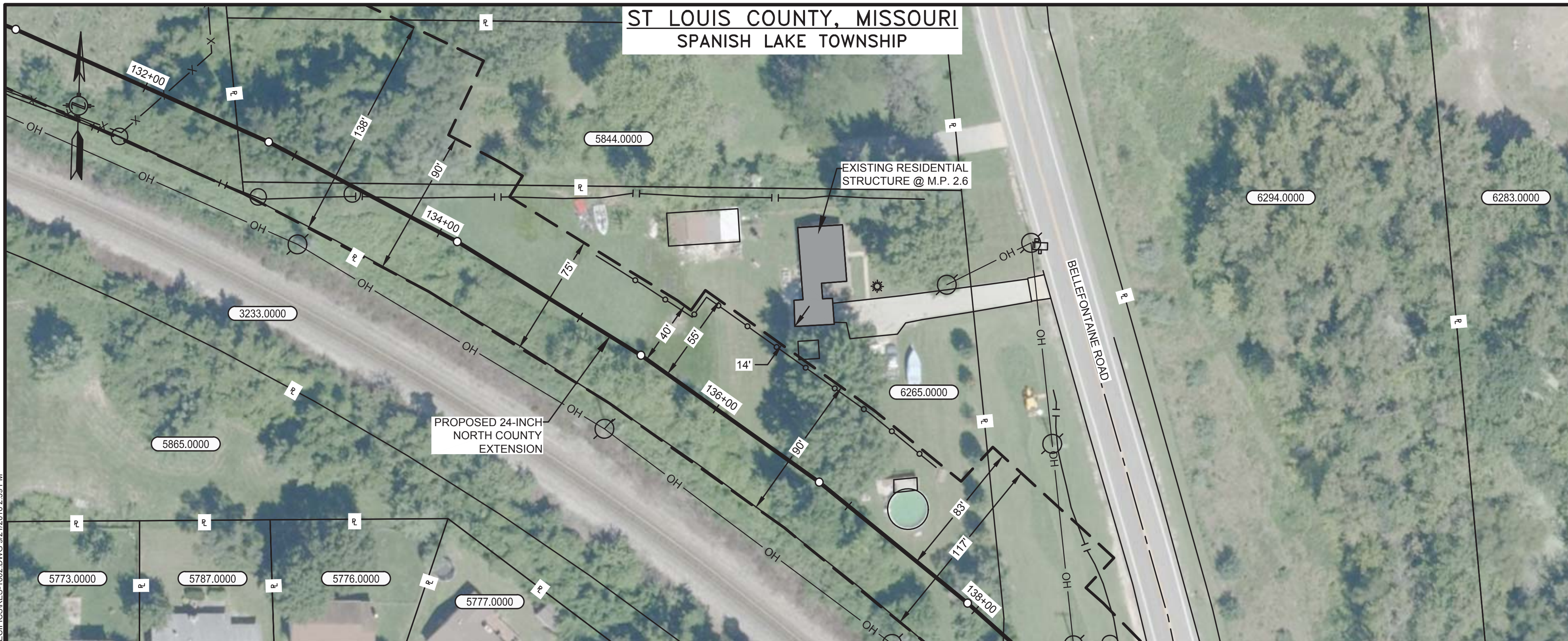

LEGEND

	SAFETY FENCE
	PROPOSED PIPELINE
OH	OVERHEAD UTILITY LINES
	EXISTING FOREIGN PIPELINE
	CONSTRUCTION LIMITS
ℓ	PROPERTY LINE
	PROPOSED ACCESS ROAD
####.0000	MMID
	RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
	UTILITY POLE

PLAN VIEW

1" = 60'

GRAPHIC SCALE

60' 30' 0 60'

NOTES:

1. SAFETY FENCE WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (L.O.D.) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. AT MINIMUM, FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA.
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CONSTRUCTION TECHNIQUES

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	SG	AMENDMENT TO FERC		
1	01/2017	SG	ISSUE FOR FERC		

REVISIONS

Division:		Op. Area:	
State: MISSOURI		Co./Par.: ST LOUIS COUNTY	
Section:	Township: SPANISH LAKE	Range:	
Dft: SG	Date: 03/2017	Scale: 1" = 60'	
Chk: WAH	Date: 03/2017	Filename: RES-1002.DWG	
Appr:	Date:		

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH NORTH COUNTY EXTENSION
RESIDENTIAL SITE SPECIFIC
ST LOUIS COUNTY, MISSOURI

PREPARED FOR
Spire STL Pipeline

PREPARED BY
MOTT MACDONALD

RES-1002 | Sheet: 1 of 1 | Type: ACAD | 2

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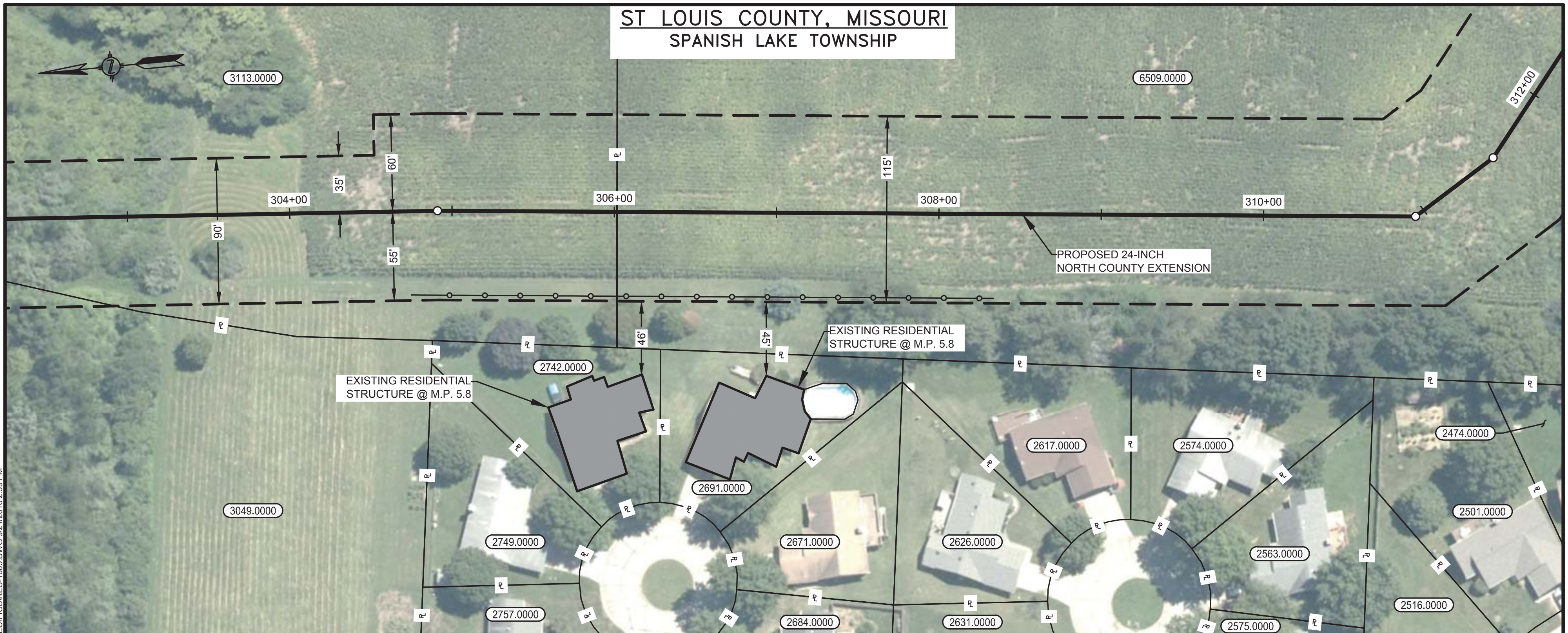

PLAN VIEW
1" = 60'

GRAPHIC SCALE
60' 30' 0 60'

LEGEND

—o—o—	SAFETY FENCE
—O—	PROPOSED PIPELINE
—OH—	OVERHEAD UTILITY LINES
—+—|—	EXISTING FOREIGN PIPELINE
— — —	CONSTRUCTION LIMITS
—℄—	PROPERTY LINE
- - - -	PROPOSED ACCESS ROAD
####.0000	MMID
(shaded box)	RESIDENTIAL OR COMMERCIAL ESTABLISHMENT
Ø	UTILITY POLE

NOTES:

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	04/2017	AKY	AMENDMENT TO FERC		
1	01/2017	AKY	ISSUE FOR FERC		

REVISIONS

Division:	Op. Area:
State: MISSOURI	Co./Par.: ST LOUIS
Section:	Township: SPANISH LAKE / Range:
Dft: AKY / Date: 03/2017	Scale: 1" = 60'
Chk: WAH / Date: 03/2017	Filename: RES-1003.DWG
Appr: / Date:	

SPIRE STL PIPELINE PROJECT
PROPOSED 24-INCH NORTH COUNTY EXTENSION
RESIDENTIAL SITE SPECIFIC
ST LOUIS COUNTY, MISSOURI

PREPARED FOR
Spire
STL Pipeline

PREPARED BY
MOTT MACDONALD

RES-1003 | Sheet: 1 of 1 | Type: ACAD | 2

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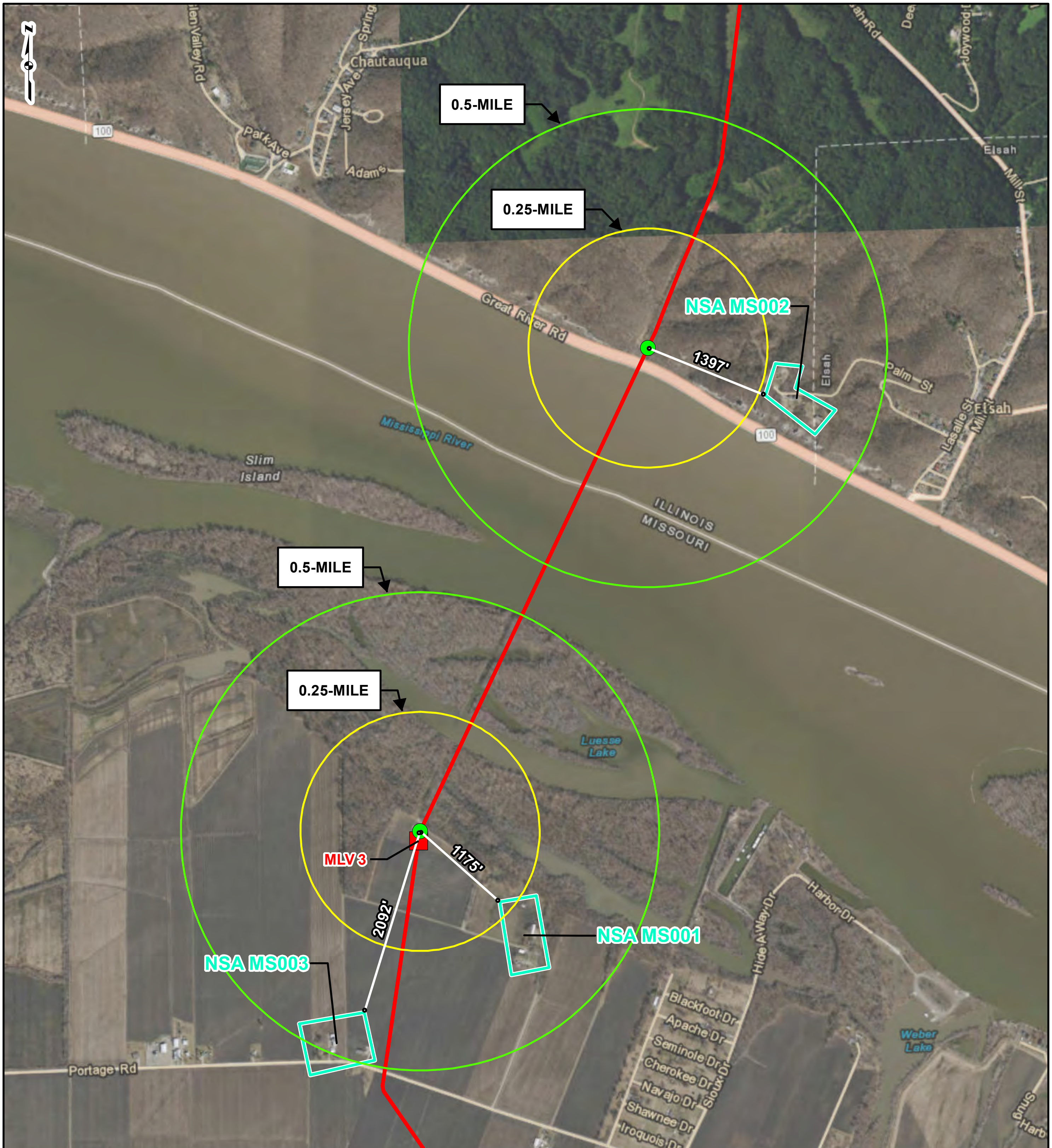
APPENDIX M

NEAREST NOISE SENSITIVE AREAS TO THE PROJECT

APPENDIX M-1

NEAREST NOISE SENSITIVE AREAS
TO THE HORIZONTAL DIRECTIONAL DRILL LOCATIONS



LEGEND

- FACILITY
- HDD LOCATION
- 24-INCH PIPELINE
- NOISE SENSITIVE AREA
- 0.25- MILE HDD RADIUS
- 0.50- MILE HDD RADIUS

0 750 1,500 3,000 Feet

APPENDIX M-1
NOISE SENSITIVE AREAS
MISSISSIPPI RIVER HDD LOCATIONS

SPIRE STL PIPELINE PROJECT

gai consultants

spire

DRAWN BY: PMH DATE: 3/30/2017
CHECKED: EFJ APPROVED: LMF

REFERENCE: ESRI WORLD IMAGERY AND TRANSPORTATION, NAIP, USDA FSA, 2014, ACCESSED 03/2017.

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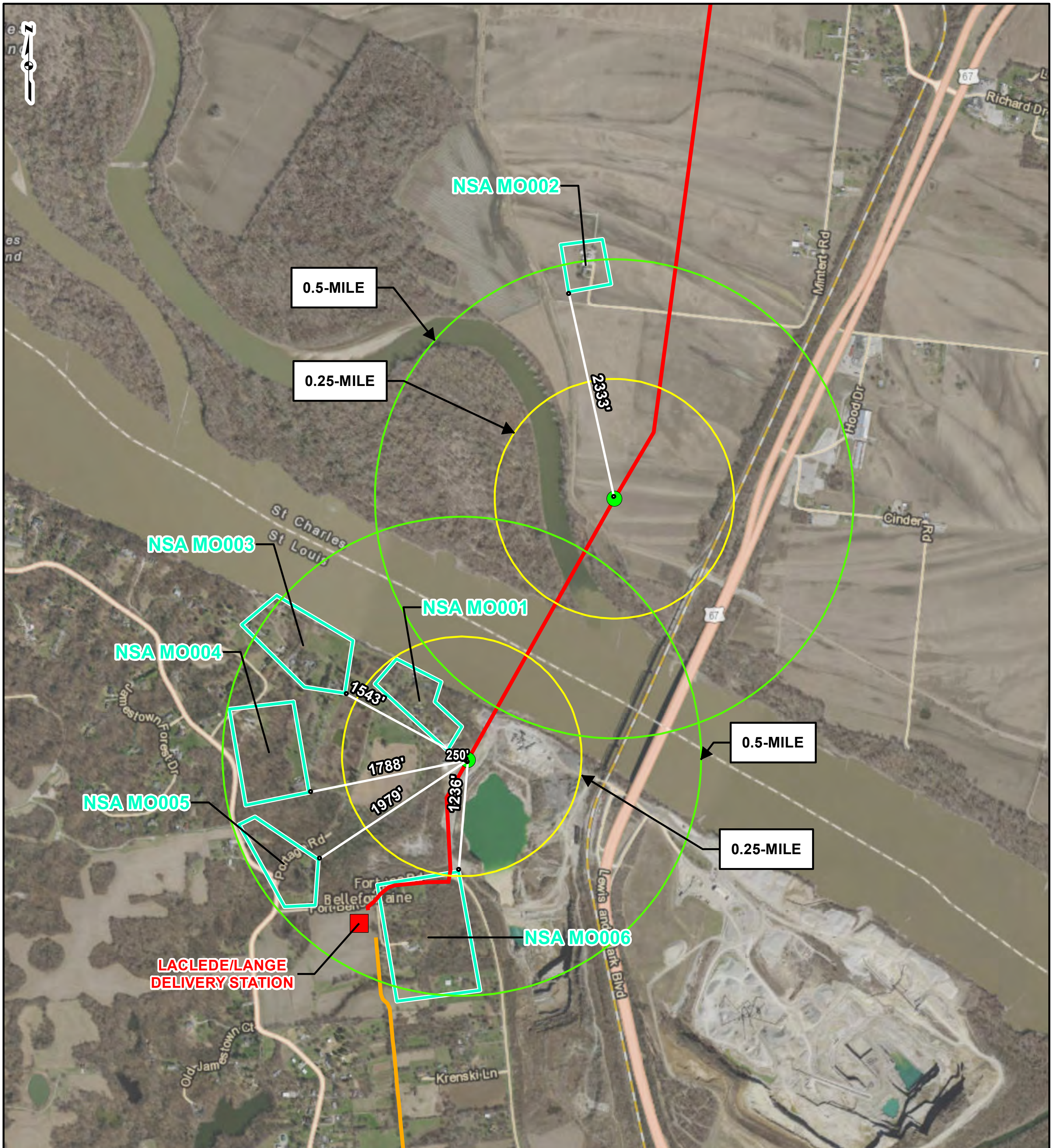

LEGEND

FACILITY	NOISE SENSITIVE AREA
HDD LOCATION	0.25- MILE HDD RADIUS
24-INCH PIPELINE	0.50- MILE HDD RADIUS
NORTH COUNTY EXTENSION	

0 750 1,500 3,000 Feet

APPENDIX M-1
NOISE SENSITIVE AREAS
MISSOURI RIVER HDD LOCATIONS

gai consultants

SPIRE STL
PIPELINE
PROJECT

spire

DRAWN BY: PMH
CHECKED: EFJ
DATE: 3/30/2017
APPROVED: LMF

REFERENCE: ESRI WORLD IMAGERY AND TRANSPORTATION, NAIP, USDA FSA, 2014, ACCESSED 03/2017.

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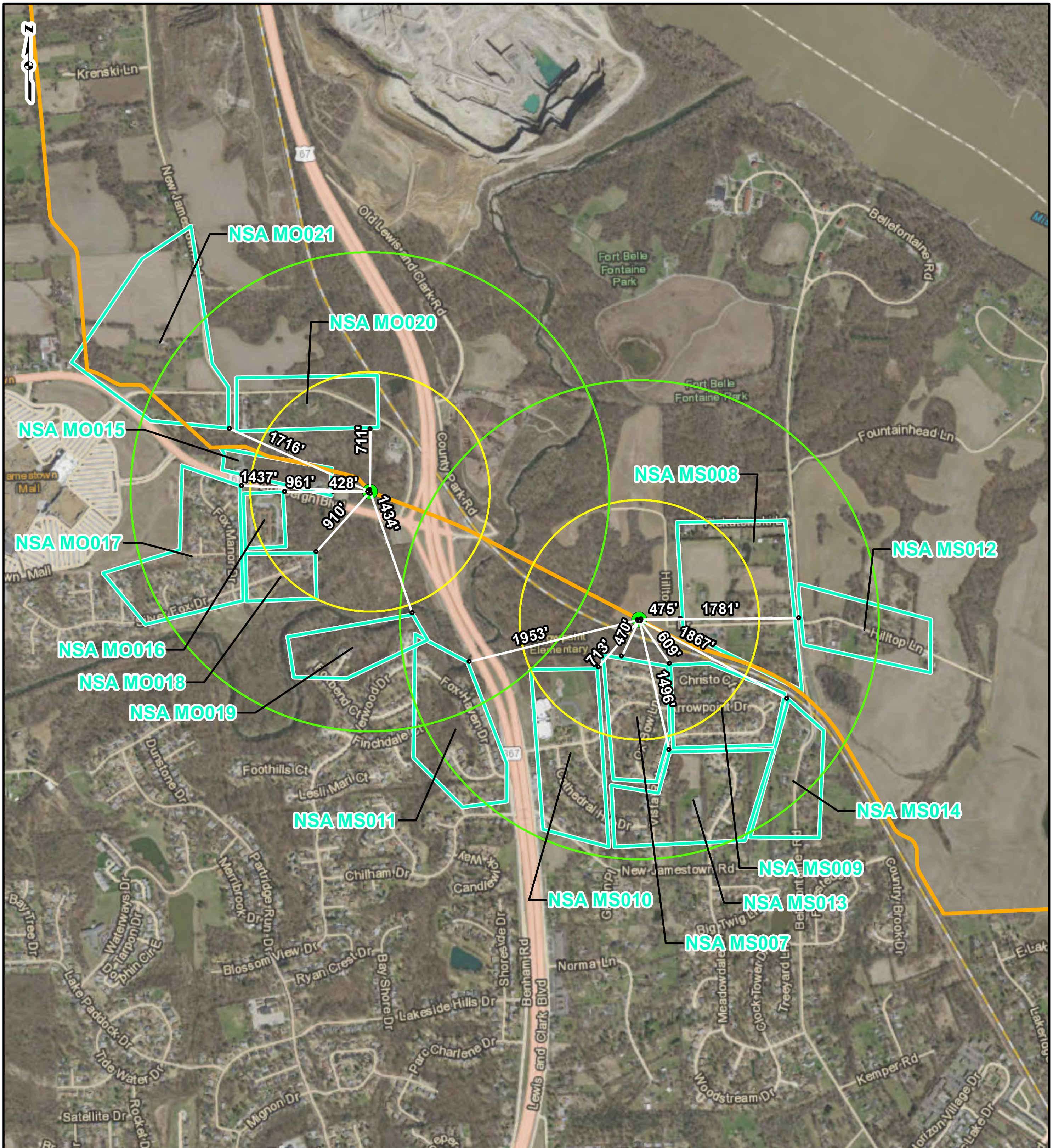

LEGEND

HDD LOCATION

NORTH COUNTY EXTENSION

NOISE SENSITIVE AREA

0.25- MILE HDD RADIUS

0.50- MILE HDD RADIUS

0 750 1,500 3,000 Feet

APPENDIX M-1
NOISE SENSITIVE AREAS
COLDWATER CREEK HDD LOCATIONS

SPIRE STL PIPELINE PROJECT

gai consultants

spire

DRAWN BY: PMH | DATE: 3/30/2017
CHECKED: EFJ | APPROVED: LMF

REFERENCE: ESRI WORLD IMAGERY AND TRANSPORTATION, NAIP, USDA FSA, 2014, ACCESSED 03/2017.

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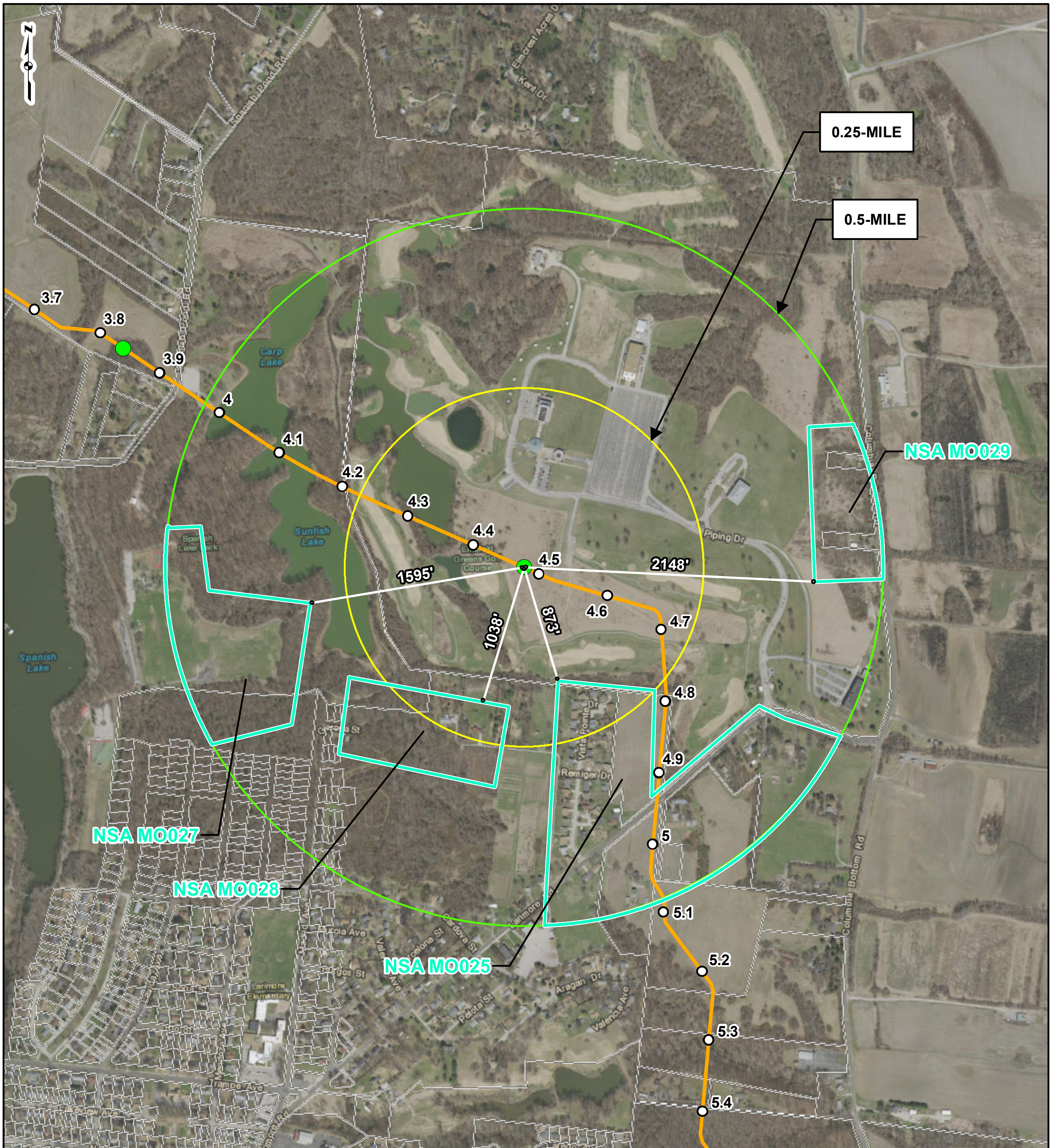
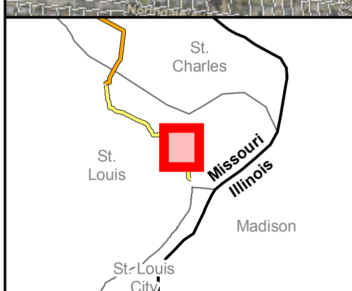




LEGEND

○	MILEPOST		NOISE SENSITIVE AREA
●	HDD LOCATION		0.25- MILE HDD RADIUS
	NORTH COUNTY EXTENSION		0.50- MILE HDD RADIUS
			PARCEL BOUNDARY

0 500 1,000 2,000 Feet

APPENDIX M-1
SPANISH LAKE PARK EAST

gai consultants

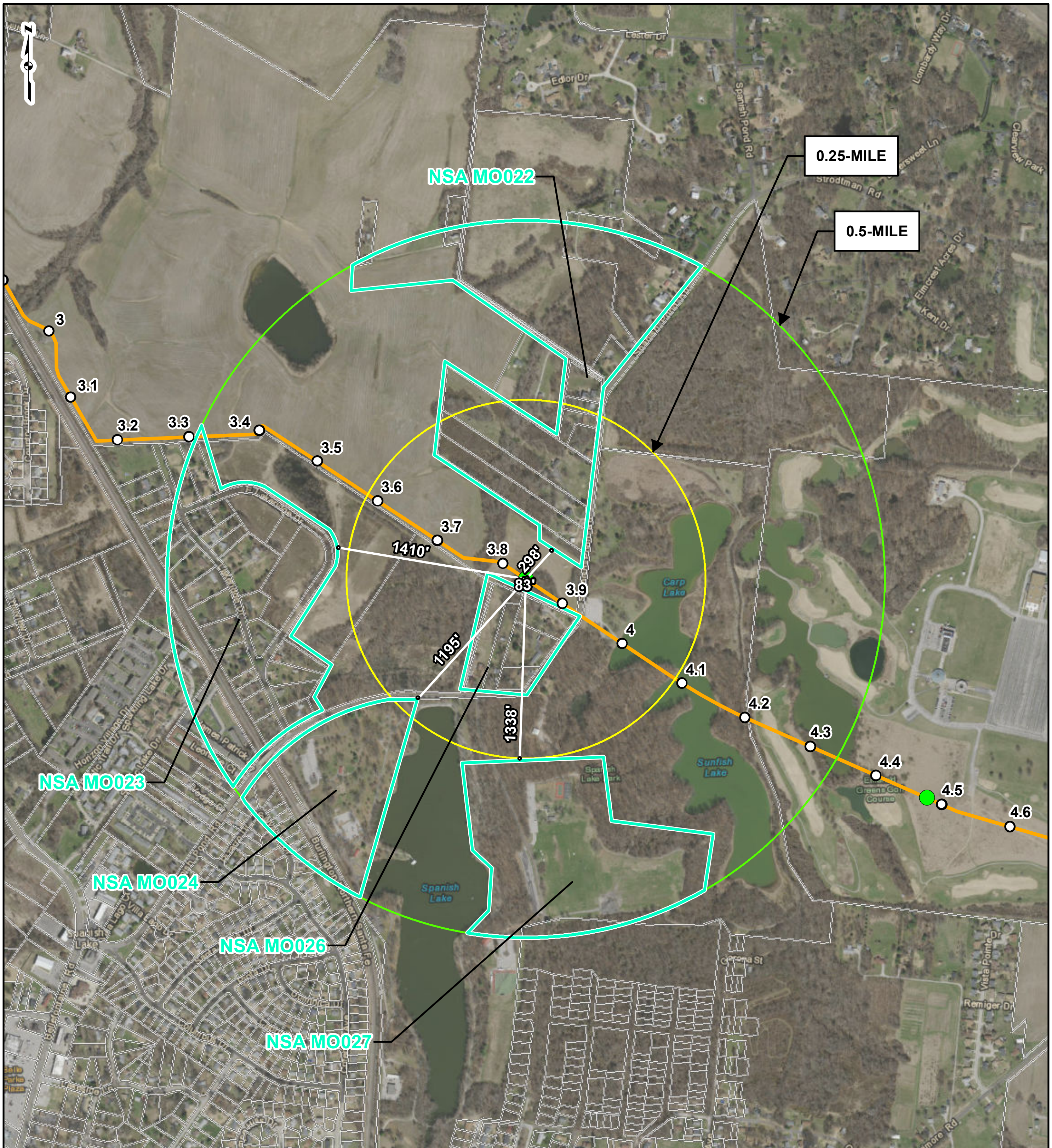
SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PMH DATE: 5/24/2017
CHECKED: APPROVED:

REFERENCE: ESRI WORLD IMAGERY AND TRANSPORTATION, NAIP, USDA FSA, 2014, ACCESSED 05/2017.

Z:\Energy\2016\E160438.00 - Spire - STL Pipeline Proj\GIS\MXD\Resource_Reports\RR_9_Delineated_Noise_Sensitive_Areas_Spanish_Lake_East_2017_05_24.mxd



LEGEND

- MILEPOST
- HDD LOCATION
- NORTH COUNTY EXTENSION
- NOISE SENSITIVE AREA
- 0.25- MILE HDD RADIUS
- 0.50- MILE HDD RADIUS
- PARCEL BOUNDARY

0 500 1,000 2,000 Feet

APPENDIX M-1
SPANISH LAKE PARK WEST

gai consultants

SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PMH
DATE: 5/24/2017
CHECKED:
APPROVED:

REFERENCE: ESRI WORLD IMAGERY AND TRANSPORTATION, NAIP, USDA FSA, 2014, ACCESSED 05/2017.

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APPENDIX M-2
NEAREST NOISE SENSITIVE AREAS
TO THE ABOVEGROUND FACILITIES

gai consultants
transforming ideas into reality®

Legend

- Road
- Building
- M&R Station

Noise level
Ldn
in dB(A)

	<= 40
40 - 50	
50 - 60	
60 - 70	
70 - 80	
80 - 90	
	> 90

APPENDIX M-2
SPIRE Rex Receipt Station Location
38°33'59.14"N 90°25'02.51"W

Prepared By: JJJ
Checked By: MTM
Approved By: ______

Scale 1:400

0 100 200 400 600 800 feet

gai consultants
transforming ideas into reality®

Legend

- Road
- Building
- M&R Station

Noise level
Ldn
in dB(A)

- <= 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- > 90

APPENDIX M-2
SPIRE Laclede/Lange Delivery Station
Location
38°50'13.75"N 90°14'54.22"W

Prepared By: JJJ
Checked By: MTM
Approved By: ______

Scale 1:400

0 100 200 400 600 800 feet

gai consultants
transforming ideas into reality®

Legend

- Road
- Building
- M&R Station

Noise level
Ldn
in dB(A)

Ldn, dB(A)
<= 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
> 90

APPENDIX M-2
SPIRE Chain of Rocks M&R Station Location
38°46'42.82"N 90°11'03.08"W

Prepared By: JJJ
Checked By: MTM
Approved By: JJJ

Scale 1:400

0 100 200 400 600 800 feet