

NOTES

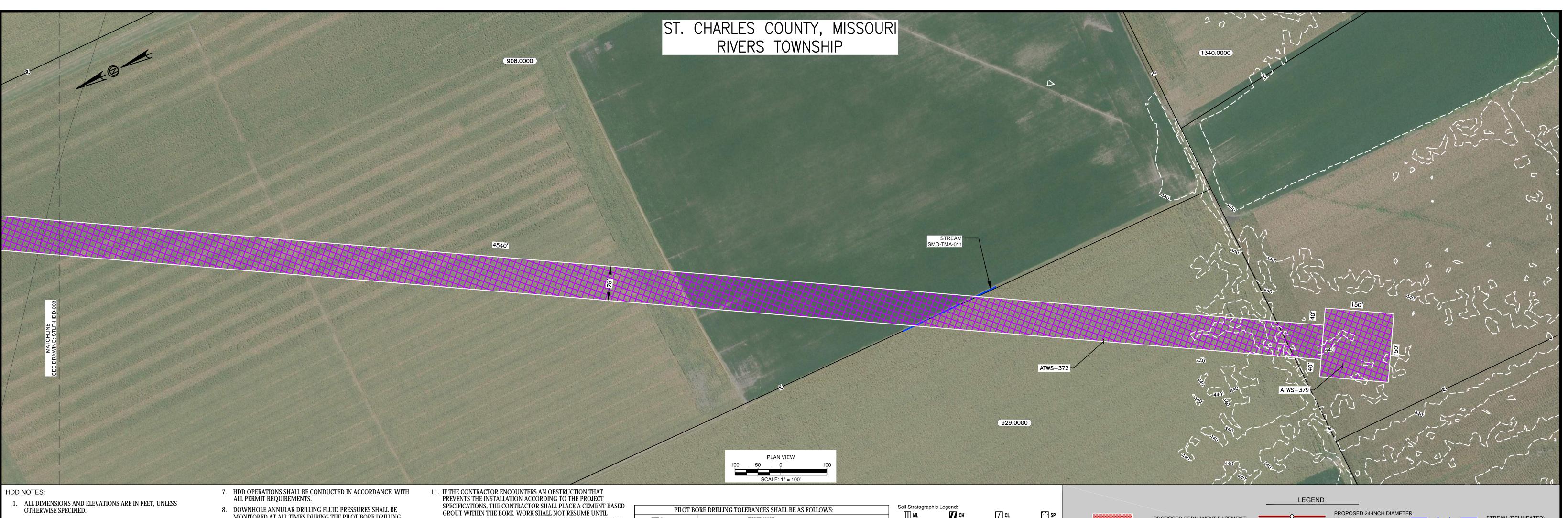
NOTES: 1. THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM

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.

SPIRE STL PIPELINE PROJECT REFERENCE DRAWINGS REFERENCE DRAWINGS REVISIONS **APPROVALS** HDD PROFILE OVERVIEW DWG. NO. TITLE DWG. NO. TITLE NO. REVISIONS DATE DRAWN CK APPR NO. REVISIONS DATE DRAWN CK APPR (MOTT M) D.R.G. 01/2017 D.G.G. 07/2017 01/2017 RJR EB RJP STLP-A-053 STLP-HDD-004 HDD PROFILE OVERVIEW ISSUE FOR FERC ALIGNMENT SHEET MISSISSIPPI RIVER MAINLINE 04/2017 RJR EB RJP 07/2017 RJR EB RJR STLP-AR-006 ACCESS ROAD SITE PLAN - PAR-018 AMENDMENT TO FERC STLP-HDD-003 MACDONALD ST. CHARLES COUNTY, MISSOURI M.A.P. 07/2017 J.E.W. 07/2017 FERC SUPPLEMENTAL FILING STLP-HDD-002

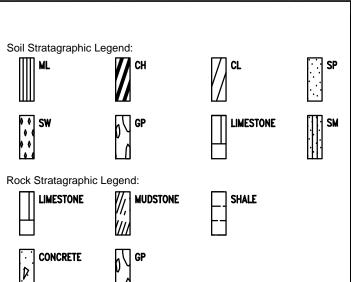


- 2. ALL CHAINAGES ARE HORIZONTAL.
- CONTRACTOR SHALL DETERMINE FINAL LOCATIONS AND DIMENSIONS OF ALL PITS NECESSARY TO ACCOMMODATE THEIR
- 4. CONTRACTOR SHALL DETERMINE DIAMETER, GRADE, WALL THICKNESS AND ADDITIONAL LENGTH OF TEMPORARY CONDUCTOR CASINGS THAN THOSE SHOWN ON THE DRAWINGS. ANY INSTALLED 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.
- MONITORED AT ALL TIMES DURING THE PILOT BORE DRILLING PROCESS, LOCATION OF MONITORING SHALL BE AS CLOSE TO THE
- 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.

- 12. CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.
- 13. THE PILOT BORE WILL BE EITHER 10.625" OR 12.25" IN DIAMETER THE NUMBER OF REAMING PASSES WILL BE DETERMINED BY THE
- CONTRACTOR SELECTED FOR THE WORK. 14. CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT.

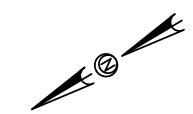
PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:				
ITEM	TOLERANCE			
PILOT ENTRY ANGLE	INCREASE ANGLE UP TO 1 (STEEPER), BUT NO DECREASE IN ANGLE ALLOWED.			
PILOT ENTRY LOCATION	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL			
PILOT EXIT ANGLE)-#k-°o·°V80 yhiu\``70 uu-k "yuV\'@V#k-°o·o'®V'-0®a°V80 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.			



PROPOSED PERMANENT EASEMENT STREAM (DELINEATED) EXISTING PERMANENT EASEMENT STREAM (DESKTOP) X X X X-.0000 TEMPORARY WORKSPACE WETLAND (DESKTOP) EXISTING GAS PIPELINE XXXXX —— EXISTING FOREIGN PIPELINE PROPOSED STAGING AREA ——— OH ———— EXISTING OVERHEAD LINE ——— ROAD CENTERLINE ACCESS ROAD ____ USACE EASEMENT

- THE IMAGERY SHOWN WAS PROVIDED BY AERIAL DATA SERVICES, 2016. ADDITIONAL IMAGERY SUPPLEMENTED FROM
- USFWS-NWI AND USGS. EXISTING FEATURES SHOWN WERE SURVEYED BY MOTT MACDONALD AND DIGITIZED FROM IMAGERY. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR.
- PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA.
- 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.

SPIRE STL PIPELINE PROJECT REFERENCE DRAWINGS REVISIONS **APPROVALS** HDD PROFILE OVERVIEW DATE DRAWN CK APPR DWG. NO. TITLE DWG. NO. TITLE NO. REVISIONS DATE DRAWN CK APPR REVISIONS I MOTT M 1 D.R.G. 01/2017 D.G.G. 01/2017 01/2017 RJR EB RJP STLP-A-053 ISSUE FOR FERC ALIGNMENT SHEET MISSISSIPPI RIVER MAINLINE 04/2017 RJR EB RJP AMENDMENT TO FERC STLP-HDD-003 HDD PROFILE OVERVIEW STLP-HDD-004 MACDONALD 01/2017 01/2017 ST. CHARLES COUNTY, MISSOURI E.B. J.E.W. ACCESS ROAD SITE PLAN - PAR-018 STLP-AR-006





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.
- 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
- 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.
- 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
- 14. CONTRACTOR SHALL USE A GYROSCOPIC GUIDANCE SYSTEM TO COMPLETE THE PILOT BORE INSTALLATION.

CONTRACTOR SELECTED FOR THE WORK.

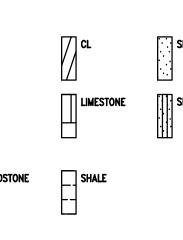
15. CONTRACTOR SHALL MONITOR PRECIPITATION AND RIVER LEVEL ELEVATIONS AND BE PREPARED TO REMOVE EQUIPMENT PRIOR TO A FORECASTED FLOOD EVENT

MISSOURI RIVER HDD PLAN VIEW

Rock Stratagraphic Legend:

LIMESTONE

		WISSOURI RIVER	<u> </u>	
	PILOT BORE DRILLING TOLERANCES SHALL BE AS FOLLOWS:			
			ı	
	ITEM	TOLERANCE	ı	
	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	AS STAKED BY OWNER. NO CHANGES WITHOUT OWNER APPROVAL.		
	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.		



PROPOSED PERMANENT EASEMENT EXISTING PERMANENT EASEMENT TEMPORARY WORKSPACE XXXXXX ADDITIONAL TEMPORARY WORKSPACE PROPOSED STAGING AREA ACCESS ROAD ____

USACE EASEMENT

LEGEND PROPOSED 24-INCH DIAMETER STREAM (DELINEATED) PROPERTY LINE STREAM (DESKTOP) X X X X-.0000 MMID WETLAND (DESKTOP) EXISTING GAS PIPELINE WETLAND (DELINEATED) —— EXISTING FOREIGN PIPELINE ----- ROAD CENTERLINE

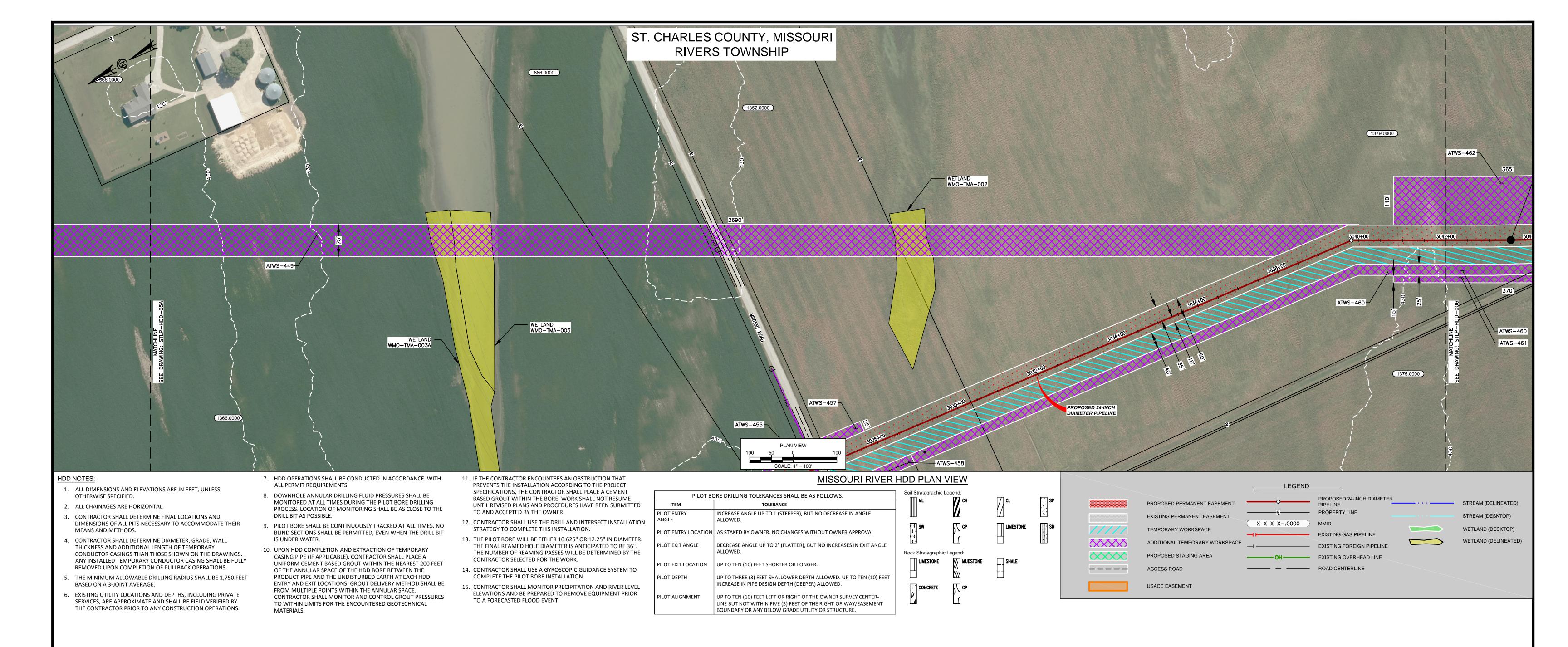
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PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA.

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.

SPIRE STL PIPELINE PROJECT REFERENCE DRAWINGS **APPROVALS** HDD PROFILE OVERVIEW DWG. NO. TITLE DWG. NO. REVISIONS DATE DRAWN CK APPR REVISIONS DATE DRAWN CK APPR R.J.P. 07/2017 D.G.G. 07/2017 STLP-A-066 FERC SUPPLEMENTAL FILING 07/2017 RJP EB RJP ALIGNMENT SHEET MISSOURI RIVER MAINLINE STLP-A-067 ALIGNMENT SHEET STLP-HDD-005A MACDONALD ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI 07/2017 07/2017



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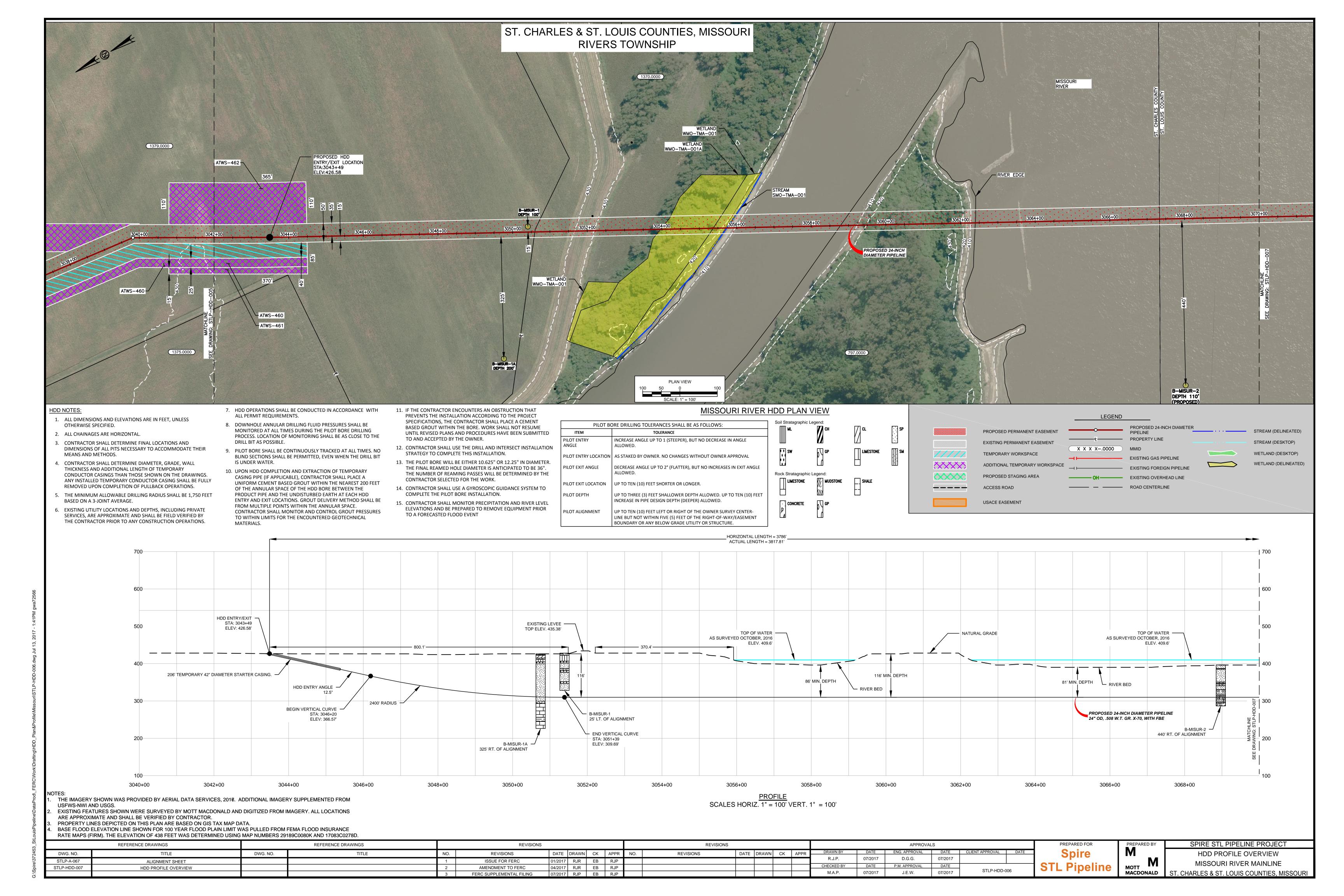
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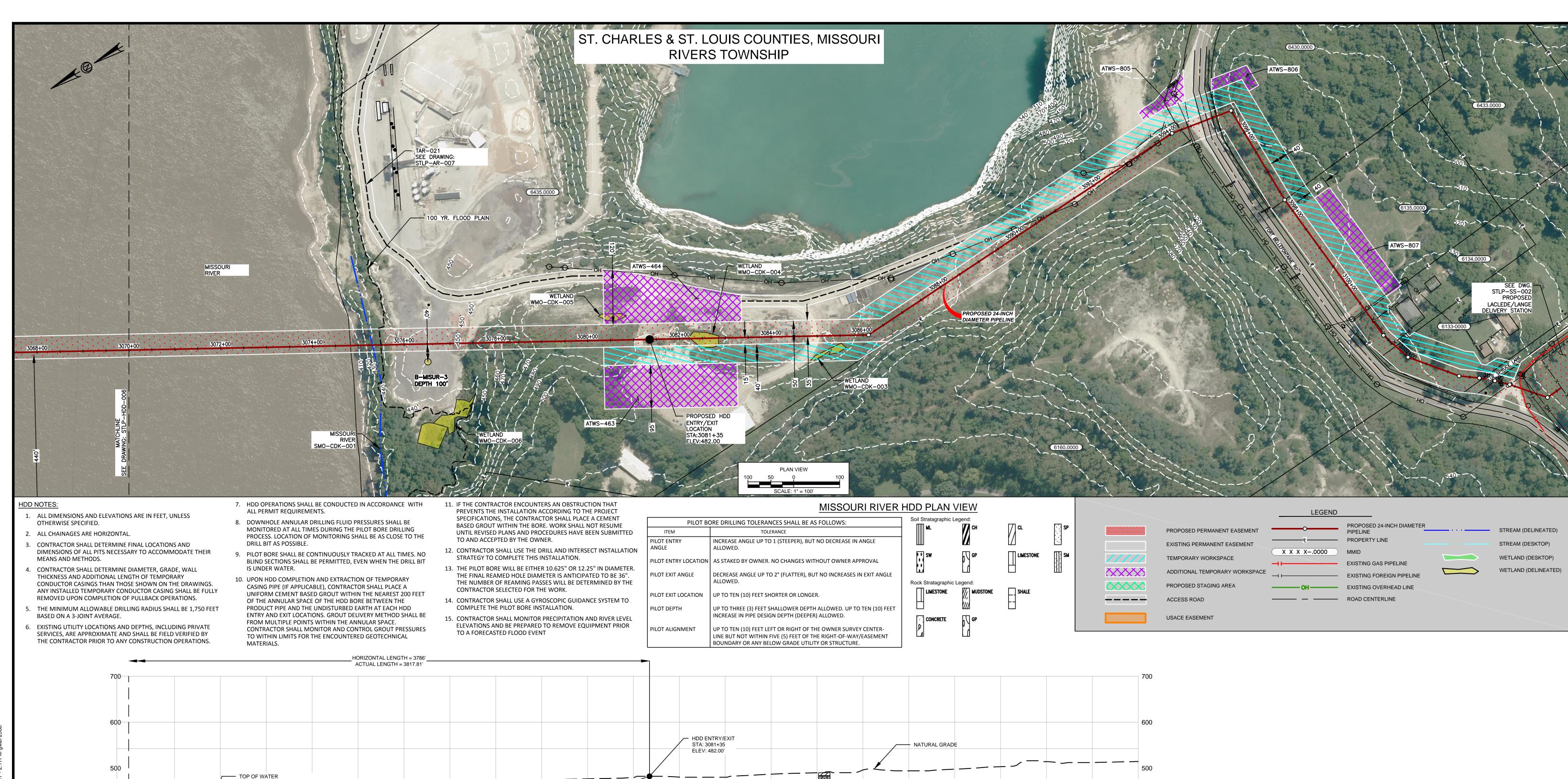
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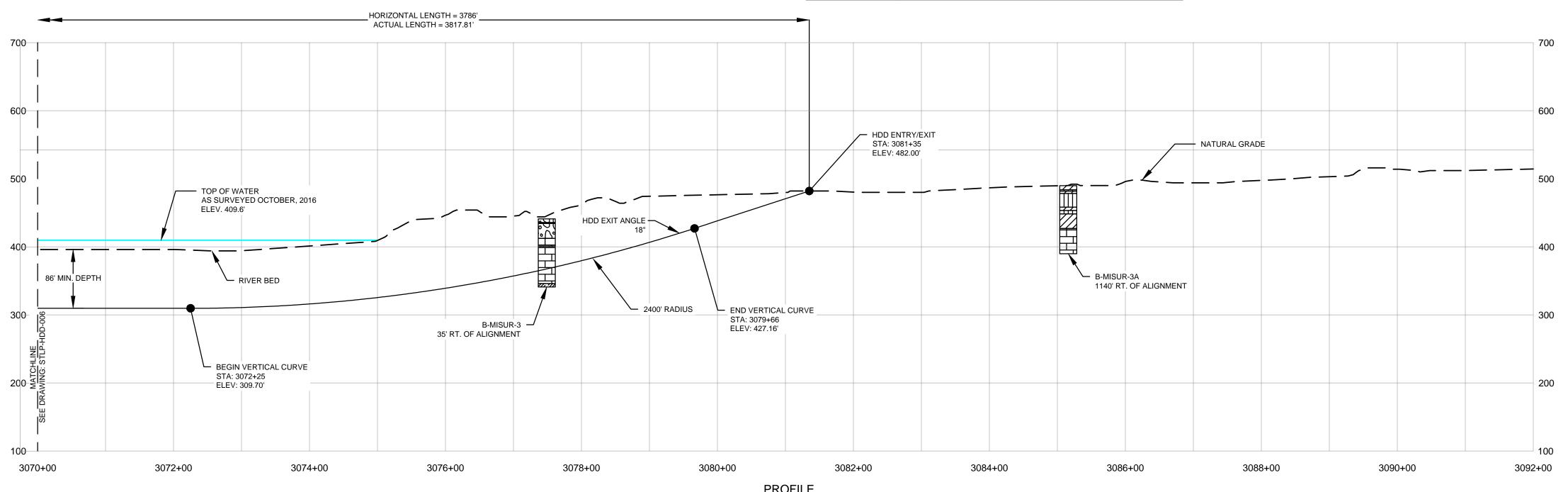
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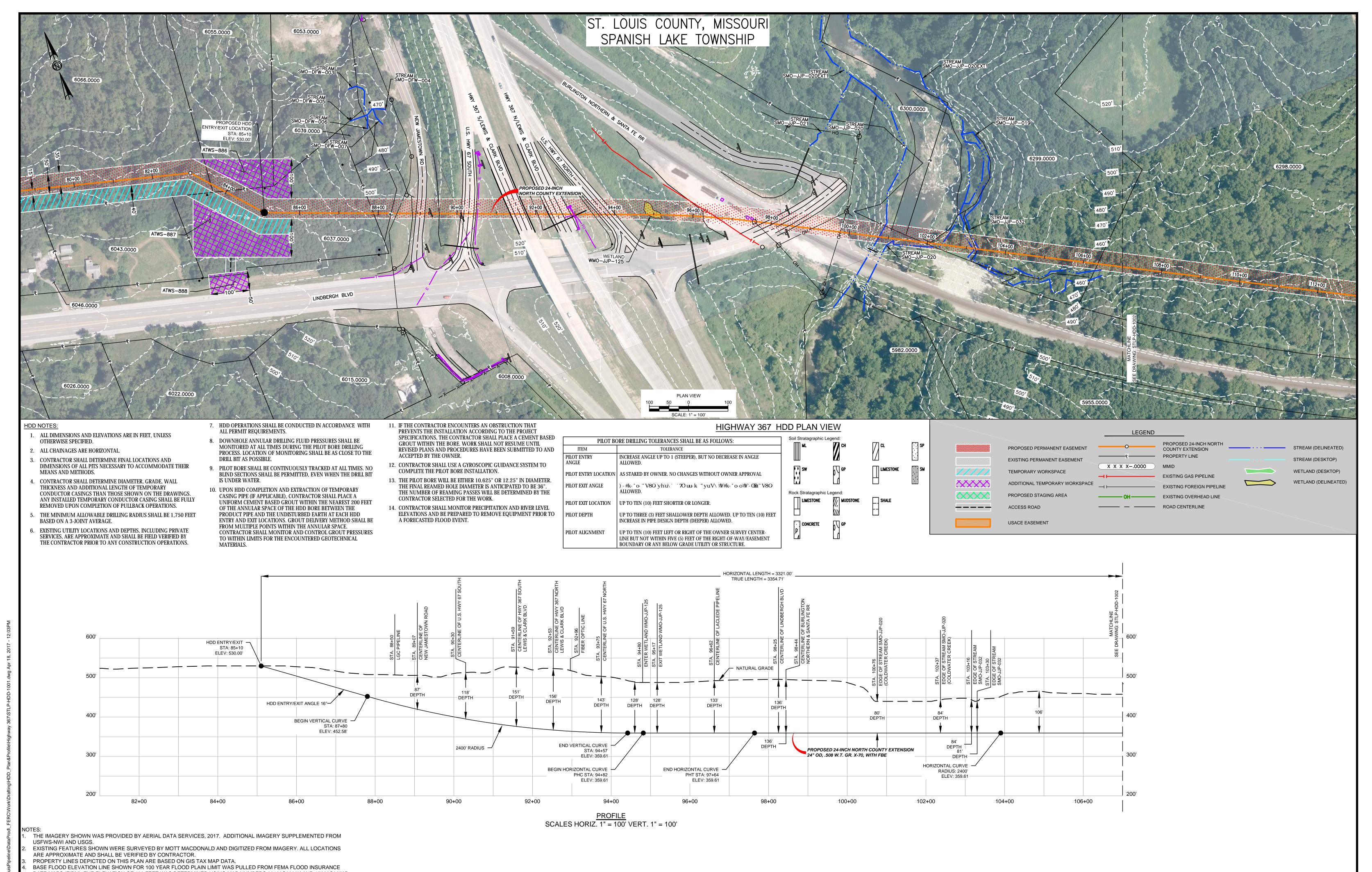
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SPIRE STL PIPELINE PROJECT HDD PROFILE OVERVIEW MISSOURI RIVER MAINLINE MACDONALD ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

04/2017 RJR EB RJP 07/2017 RJP EB RJP ACCESS ROAD SITE PLAN - TAR-021 AMENDMENT TO FERC STLP-HDD-007 07/2017 07/2017 LACLEDE/LANGE DELIVERY STATION SITE LAYOUT - STLP-SS-002 FERC SUPPLEMENTAL FILING

SCALES HORIZ. 1" = 100' VERT. 1" = 100'



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APPROVALS

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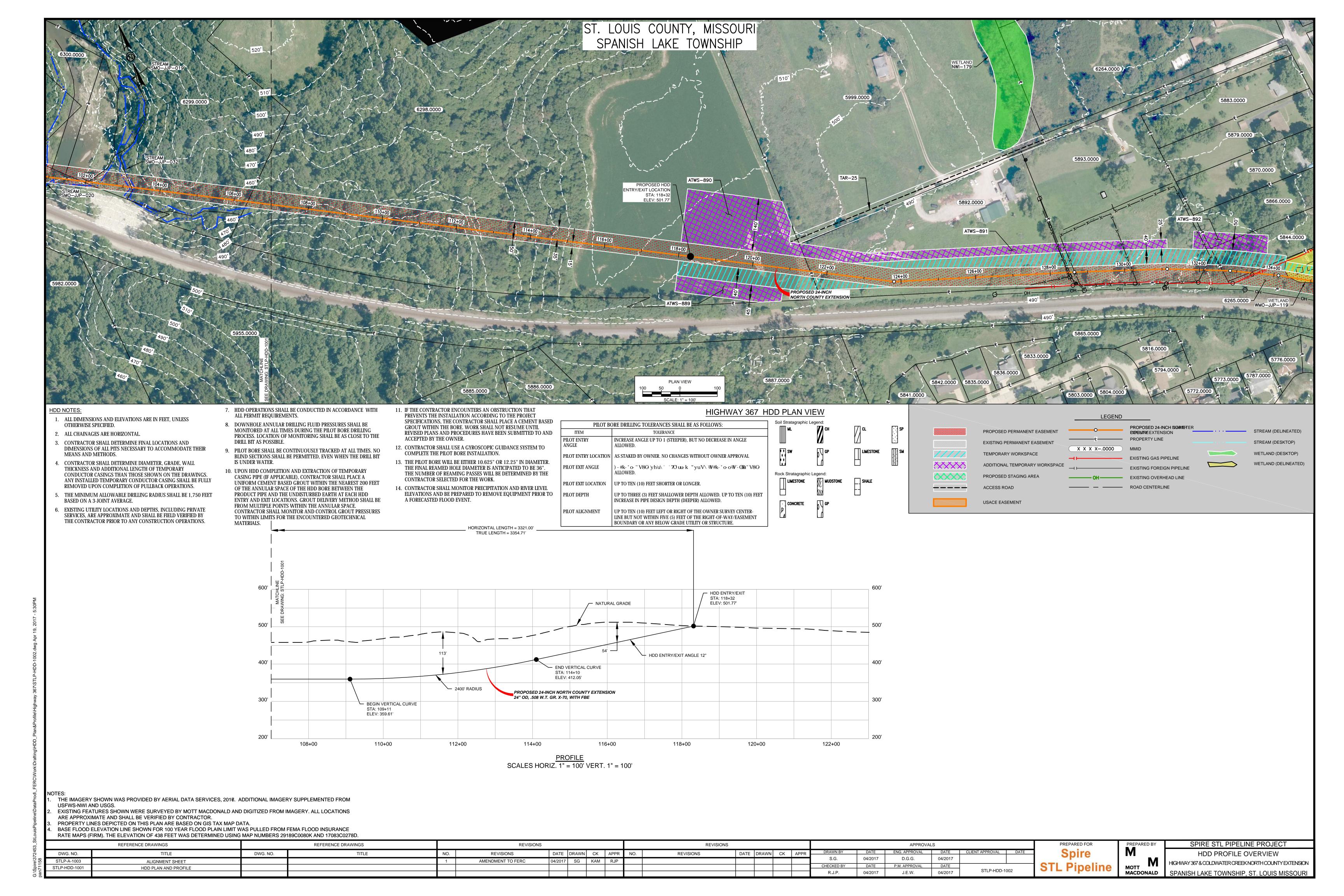
STLP-HDD-1001

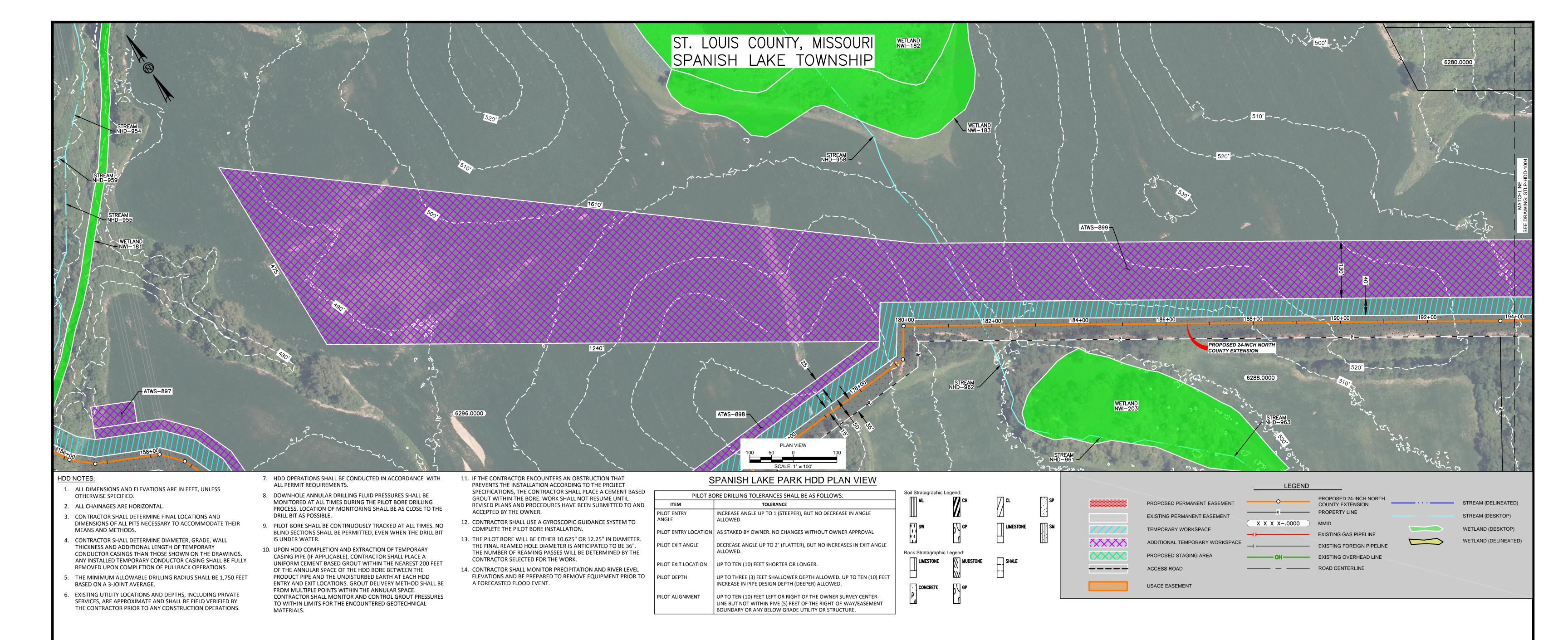
SPIRE STL PIPELINE PROJECT

HDD PROFILE OVERVIEW

HIGHWAY 367 & COLDWATER CREEK NORTH COUNTY EXTENSION

SPANISH LAKE TOWNSHIP, ST. LOUIS, MISSOURI





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