TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

APPENDIX A

NEW JERSEY ALTERNATIVES ANALYSIS

NORTHEAST SUPPLY ENHANCEMENT PROJECT

JANUARY 2020

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LIST OF ACRONYMS

CO_2	carbon dioxide
CP	cathodic protection
Dth/d	dekatherms per day
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
Harbor Ops Energy Subcommittee	Harbor Safety, Navigation and Operations Committee of the Port of New York and New Jersey
HDD	horizontal directional drill
hp	horsepower
ISO	International Organization for Standardization
LNYBL	Lower New York Bay Lateral
LOI	Letter of Interpretation
M&R	metering and regulating
MAOP	maximum allowable operating pressure
mm	millimeters
MP	milepost
N.J.A.C	New Jersey Administrative Code
National Grid	Brooklyn Union Gas Company (d/b/a [doing business as] National Grid NY) and KeySpan Gas East Corporation (d/b/a National Grid)
NESE	Northeast Supply Enhancement Project
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NO_X	oxides of nitrogen
NPL	National Priorities List
NRHP	National Register of Historic Places
NYSDEC	New York State Department of Environmental Conservation
PJM	PJM Interconnection LLC
Project	Northeast Supply Enhancement Project
QPX	quahog parasite unknown
RDL	Rockaway Delivery Lateral
ROW	right-of-way
SO_2	sulfur dioxide
Transco	Transcontinental Gas Pipe Line Company, LLC

USACE	U.S. Army Corps of Engineers
Williams	Williams Partners L.P.

1 INTRODUCTION

The New Jersey Alternatives Analysis describes the alternatives that have been considered or are under consideration for the proposed Northeast Supply Enhancement (NESE) Project (Project). This report discusses alternatives Transco evaluated in relation to its own system; Raritan Bay Loop alternatives; compressor station and compressor station site alternatives; and compression alternatives. The information contained in this report was obtained from field surveys, desktop reviews of available literature, stakeholder input, and publicly available information regarding existing pipeline infrastructure. The following sections provide analyses and discussions commensurate with the scale of individual Project components and their overall environmental impact, as required by N.J.A.C. 7:7A-16.2(b)

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of Williams Partners L.P. (Williams), prepared this report to support its applications for the New Jersey Flood Hazard Area Individual Permit, Freshwater Wetlands Individual Permit, and Waterfront Development Individual Permit. The Project supports National Grid's long-term growth, reliability, and flexibility beginning in the 2021 heating season. Transco is proposing to expand its existing interstate natural gas pipeline system in Pennsylvania and New Jersey and its existing offshore natural gas pipeline system in New Jersey and New York waters. The Project capacity is fully subscribed by two entities of National Grid: Brooklyn Union Gas Company (d/b/a [doing business as] National Grid NY) and KeySpan Gas East Corporation (d/b/a National Grid), collectively referred to herein as “National Grid.”

To provide the incremental 400,000 dekatherms per day (Dth/d) of capacity, Transco plans to expand portions of its system from the existing Compressor Station 195 in York County, Pennsylvania, to the Rockaway Transfer Point in New York State waters. As defined in executed precedent agreements with National Grid, the Rockaway Transfer Point is the interconnection point between Transco’s existing Lower New York Bay Lateral (LNYBL) and existing offshore Rockaway Delivery Lateral (RDL). Table 1.1-1 lists the pipeline facilities associated with the Project. This report focuses on the Project components within New Jersey.

Table 1.1-1
Summary of Pipeline Facilities

Facility	Size	Onshore/ Offshore	State	County	Length (miles)
Quarryville Loop	42-inch-diameter pipeline	Onshore	Pennsylvania	Lancaster County	10.17
Madison Loop	26-inch-diameter pipeline	Onshore	New Jersey	Middlesex County	3.43
Raritan Bay Loop	26-inch-diameter pipeline	Onshore	New Jersey	Middlesex County	0.16
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New Jersey	Middlesex County	1.86
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New Jersey	Monmouth County	4.09
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New York	Queens County	6.44
Raritan Bay Loop	26-inch-diameter pipeline	Offshore	New York	Richmond County	10.94

A description of the Project facilities is provided below. Note that the mileposts (MPs) provided below for the onshore pipeline facilities correspond to the existing Transco Mainline and Lower New York Bay Lateral.[1] The offshore pipeline facility MPs are unique to the Raritan Bay Loop. The starting MP for the Raritan Bay Loop corresponds to MP12.00 of the Lower New York Bay Lateral, and the end MP corresponds to the Rockaway Transfer Point.

Onshore Pipeline Facilities

Quarryville Loop

- 10.17 miles of 42-inch-diameter pipeline from MP1681.00 near Compressor Station 195 to MP1691.17 co-located with the Transco Mainline in Drumore, East Drumore, and Eden Townships, Lancaster County, Pennsylvania. Once in service, the Quarryville Loop will be referred to as Mainline D.

Madison Loop

- 3.43 miles of 26-inch-diameter pipeline from Compressor Station 207 at MP8.57 to MP12.00 southwest of the Morgan meter and regulating (M&R) Station on the Lower New York Bay Lateral in Old Bridge Township and the Borough of Sayreville, Middlesex County, New Jersey. Once in service, the Madison Loop will be referred to as Lower New York Bay Lateral Loop F.

[1] Also referred to as Lower Bay Loop C.

Raritan Bay Loop

- 0.16-mile of 26-inch-diameter pipeline from MP12.00 west-southwest of the Morgan M&R Station to the Sayreville shoreline at MP12.16. Additionally, a cathodic protection (CP) power cable will be installed from a rectifier located at the existing Transco Morgan M&R Station near MP12.10 and extending to a connecting point on the proposed 26-inch-diameter pipeline at MP12.00. The approximately 545-foot-long power cable will be installed by horizontal directional drill (HDD).

Offshore Pipeline Facilities

Raritan Bay Loop

- 23.33 miles of 26-inch-diameter pipeline from MP12.16 at the Sayreville shoreline in Middlesex County, New Jersey, to MP35.49 at the Rockaway Transfer Point in the Lower New York Bay, New York, south of the Rockaway Peninsula in Queens County, New York. Additionally, a 1,831-foot-long CP power cable will be installed via HDD from a rectifier at the existing Transco Morgan M&R Station near MP12.10 to an offshore anode sled located approximately 1,200 feet north of MP12.32. Once in service, the Raritan Bay Loop will be referred to as Lower New York Bay Lateral Loop F.

Aboveground Facilities

New Compressor Station 206

- Construction of a new 32,000 ISO (International Organization for Standardization) horsepower (hp) compressor station and related ancillary equipment in Franklin Township, Somerset County, New Jersey, with two Solar Mars® 100 (or equivalent) natural-gas-fired, turbine-driven compressors.

Modifications to Existing Compressor Station 200

- Addition of one electric motor-driven compressor (21,902 hp) and related ancillary equipment to Transco's existing Compressor Station 200 in East Whiteland Township, Chester County, Pennsylvania.

Modifications to Existing Mainline Valve Facilities

- **Existing Valve Site 195-5** – Installation of a new mainline valve, launcher/ receiver, and tie-in facilities at the start of the Quarryville Loop in Pennsylvania (MP1681.00).
- **Existing Valve Site 195-10** – Installation of a new mainline valve, launcher/ receiver, and tie-in facilities at the end of the Quarryville Loop in Pennsylvania (MP1691.17).
- **Existing Valve Site 200F55** – Installation of a new mainline valve, launcher/ receiver, and tie-in facilities at the start of the Madison Loop in New Jersey (MP8.57).

New Mainline Valve Facilities

- **Proposed Valve Site 195-8** – Installation of a new intermediate mainline valve for the Quarryville Loop in Pennsylvania (MP1687.86).
- **Proposed Valve Site 200F59** – Installation of a new mainline (isolation) valve for the Madison Loop in New Jersey (MP11.90).

If Transco obtains the applicable permits and authorizations, Transco anticipates that construction of the Project will begin in the fourth quarter of 2020 to meet an in-service date in the fourth quarter of 2021.

2 TRANSCO SYSTEM DESIGN ANALYSIS AND ALTERNATIVES

The subsections below describe Transco's existing system and hydraulic constraints that form the basis for the design of the proposed Project and the operational requirements on the Transco system when considering a project in a given area. Transco system alternatives incorporate the results of the hydraulic analysis and the design requirements.

Transco System Design

Transco's system is designed and operated to meet the coincidental maximum day firm quantities of its customers. This design is based on customers' Delivery Point Entitlements as recorded in the Compliance Filing, CP89-484 as amended. Because firm contractual demands, natural gas temperatures, and ambient temperatures vary by month and season, multiple design scenarios are applicable to the existing Transco system.

For design purposes, the Transco system is divided into three main areas: the Production Area, Southern Market Area, and Northern Market Area. The Project path spans portions of the Southern Market Area and the Northern Market Area; therefore, models for both of these areas were used in designing the Project facilities.

The Southern Market Area begins at the suction side of Compressor Station 65 in Louisiana and continues to the discharge side of Compressor Station 200 in Pennsylvania. The Southern Market Area is designed with the following three scenarios: a summer scenario, a winter average scenario, and a winter peak scenario. The summer scenario is defined as the highest monthly load for each customer during the summer period (April through October). The winter average scenario is defined as the highest monthly load for each customer during the winter shoulder months (November or March). The winter peak scenario is defined as the highest monthly load for each customer during the winter months (December through February).

The Northern Market Area for the Transco system consists of two major components, the Transco Mainline and the Leidy line. The Transco Mainline begins at the suction side of Compressor Station 180 in Virginia and continues through Compressor Station 200. The natural gas flow continues to Compressor Station 205, where a portion of the flow supplies the Trenton Woodbury Lateral and the remainder supplies the New Jersey/New York area. The Leidy line starts at the Leidy storage area in Pennsylvania and continues eastward through the Centerville regulator station where the natural gas stream splits; a portion flows to New York through Caldwell lines, and the remainder flows to Compressor Station 205. The major laterals that are included in the Northern Market Area include the Marcus-Hook Lateral, Trenton-Woodbury Lateral, LNYBL, Long Island Extension, and Paterson Lateral. Part of the Northern Market Area model overlaps with the Southern Market Area model from Compressor Station 180 to Compressor Station 200.

The design of the Northern Market Area is based on a winter peak scenario that takes into account two delivery shifts, recognizing that the customers have the right to move the natural gas within the limits of their Delivery Point Entitlements. The Northeast Shift assumes that each shipper's firm contract volume is moved to the most downstream northeastern point on Transco's system within the limits of the shipper's Delivery Point Entitlements. The Southeast Shift assumes that each shipper holding capacity on the Trenton-Woodbury Mainline loop around Philadelphia, Pennsylvania, is loaded to its maximum volume within the limits of the shipper’s Delivery Point Entitlements. Furthermore, the design is based on contract flows that alternate between six-hour intervals during which firm customers are taking 120% of their full contractual entitlements and 80% of their full contractual entitlements.

Control Points

Control points are set points along a pipeline route that normally include the start and end points for the pipeline. These points dictate the routing options of a pipeline. Engineering of the Project design requires considering a number of system constraints, including temperatures, pressures, volumes, geography, and environmental conditions throughout the transport of natural gas along the pipeline.

Transco’s gas delivery points into New York City include facilities at 72nd Street in Manhattan, 134th Street in Manhattan, and the Narrows M&R Facility on Staten Island. Transco’s facilities in Manhattan provide service to Consolidated Edison but do not connect to, or service, National Grid directly. The Narrows M&R Facility is a delivery point to National Grid, and the recent New York Bay Expansion Project has brought the Long Island Extension pipeline from Staten Island to Brooklyn up to National Grid’s capacity. In addition, the Brooklyn Regulating Facility, which interconnects with National Grid at Shore Road in Brooklyn, does not provide natural gas to the areas needed. Further, the existing National Grid system design does not support transfer of gas from this area of Brooklyn to the customers serviced by gas delivered at the Rockaway Transfer Point to the extent necessary. None of these delivery points would meet the Project’s requirement of delivering natural gas to National Grid at the Rockaway Transfer Point. These conditions eliminate the two Manhattan, the Staten Island, and the Brooklyn delivery points described above from consideration as control points for the Project.

Using hydraulic modeling to identify control points ensures pipeline integrity and efficiency by allowing for the maintenance of pipeline flows and pressures as natural gas is transferred and received between several points on the system. The control points for the Project were established based on hydraulic modeling to determine the system constraints along the existing Transco Mainline and the modifications necessary to transport the 400,000 Dth/d required by the Project.

To be a viable system alternative to the proposed Project, any potential system alternative must meet the following criteria:

- Capable of transporting up to 400,000 Dth/d of natural gas to the Rockaway Transfer Point, as required by National Grid, without negatively impacting service to existing customers;
- Capable of being constructed in time to meet the peak demand projected for the 2021 heating season; and
- Able to meet the criteria above with an environmentally superior alternative relative to the Project.

The Precedent Agreements with National Grid require Transco to provide the requested incremental capacity from Compressor Station 195. Based on hydraulic modeling, Transco identified three distinct segments on its system that will require upgrades to achieve the Project purpose and need:

- Compressor Station 195 to Compressor Station 205
- Compressor Station 205 to Northern Market Area
- Compressor Station 207 to Rockaway Transfer Point

The segment from Compressor Station 195 to Compressor Station 205 is fulfilled by the Project components proposed in Pennsylvania (Quarryville Loop and Compressor Station 200) and not discussed further.

2.1 Compressor Station 205 to Market Area Segment

Hydraulic modeling indicated that to provide 400,000 Dth/d of natural gas to the Rockaway Transfer Point, as required by National Grid, additional Project facilities are needed in the Market Area north of Compressor Station 205. The segment of the Transco system downstream of Compressor Station 205 is primarily designed to facilitate the transmission of natural gas from Compressor Station 205 and the Leidy Line to delivery points in the Market Area north of Compressor Station 205. In order to be considered feasible facility alternatives, proposed Project facilities in this segment must be capable of transporting the incremental 400,000 Dth/d Project capacity in addition to the existing volumes without resulting in materially degrading the transportation service at existing delivery points. Transco has proposed the construction of Compressor Station 206 to meet these requirements.

System alternatives considered for the segment from Compressor Station 205 to the Market Area include a looping only alternative (see Section 2.1.1) and increasing compression at existing Compressor Station 205 and/or Compressor Station 207 (see Section 2.1.2). In addition, Transco evaluated the use of electric motors for Compressor Station 206 rather than gas turbines (see Section 2.1.3).

2.1.1 Looping-Intensive Alternative

Transco considered a pipeline looping-intensive alternative to achieve the facility upgrade requirements in the Compressor Station 205 to the Market Area segment that would eliminate the need to install Compressor Station 206. A pipeline looping-intensive alternative for this segment would require 15.31 miles of 42-inch pipeline from Compressor Station 205 to approximately MP1788.20 in Middlesex County, New Jersey (see Figure 1).

For purposes of this comparison, Transco assumed the additional pipeline length would be co-located with its existing right-of-way (ROW). Transco assumed that 50 feet of permanent ROW and 100 feet of temporary ROW would be required based on Transco's standard requirements for temporary (construction) and permanent (operational) ROW requirements. Typically, a pipeline loop is sited to accommodate a 25-foot offset between the centerline of the loop and existing pipeline. As such, Transco has assumed that the Looping-Intensive Alternative would overlap Transco's adjacent existing maintained ROW by 25-feet. If the Looping-Intensive Alternative were pursued, Transco would overlap and use 83.86 acres within its existing maintained ROW (i.e., previously disturbed) as temporary workspace. Transco would need to acquire an additional 25-feet of permanent ROW for the permanent (operational) ROW totaling 41.04 acres for the construction and operation of the pipeline. Additionally, Transco would need to acquire 25-feet of new temporary workspace to accommodate construction needs for a total of 41.76 acres. A total of 32.68 acres of vegetated lands (inclusive of forested lands, PFO wetlands, scrub-shrub, agricultural lands, utility land, and PEM wetlands) would be cleared within the new permanent (operational) ROW; however, a portion of these lands (agricultural lands, utility lands, PEM wetlands) would be restored within 6 months and therefore would not be permanently impacted.

Land use in the area of this loop is highly urbanized and contains several dense, residential neighborhoods. The MPs provided in the description below are approximate. This alternative passes through an existing business complex parking lot at MP1774.48 and a large subdivision between MP1775.00 and MP1775.41. Based on a review of existing resources, Transco anticipates that an HDD would be required from MP1775.00 to MP1776.50 to avoid a densely populated subdivision, open trenching a waterbody (Stony Brook) three separate times, and open trenching associated floodways.

New Jersey Department of Environmental Protection (NJDEP) mapped wetlands would be crossed from MP1776.73 to MP1777.66. The pipeline would traverse another residential area from MP1777.66 to MP1778.08. The pipeline would then traverse directly through an apartment complex from MP1778.55 to MP1778.75. In order to avoid the apartment complex, the pipeline would have to be routed away from the existing ROW. Mapped wetlands would be crossed from MP1780.19 to MP1781.11, and from MP1782.01 to MP1783.11. The pipeline would then traverse multiple subdivisions within Kendall Park and be within 50 feet of residences and backyards from MP1783.18 to MP1786.14. At MP1787.90, due to 25-foot offset requirements and land requirements for construction and operation, the pipeline would be installed approximately 15 feet from eight multi-family apartment buildings within an apartment complex.

Table 2.1-1 below provides a comparison of the environmental impacts of Compressor Station 206 and the Looping-Intensive Alternative, including temporary and permanent impacts to palustrine forested wetlands (PFO), palustrine scrub-shrub wetlands (PSS), and palustrine emergent wetlands (PEM). The Looping-Intensive Alternative would result in 9.01 acres of temporary PEM wetland impacts, 0.0 acres of permanent PEM wetland impacts, 0.0 acres of temporary and permanent PSS wetland impacts, 0.0 acres of temporary PFO wetland impacts, and 8.78 acres of permanent PFO wetland impacts. Comparatively, Compressor Station 206 would result in 0.15 acres of temporary PEM wetland impacts, 0.31 acres of permanent PEM wetland impacts, 0.0 acres of temporary or permanent PSS wetland impacts, 0.0 acres of temporary PFO wetland impacts, and 0.54 acres of permanent PFO wetland impacts.

Table 2.1-1
Comparison of the Environmental Impacts of Compressor Station 206 and the Looping-Intensive Alternative

Factor	Unit	Compressor Station 206	Looping-Intensive Alternative
Length of pipeline	Miles	N/A	15.31
Temporary ROW not within existing maintained ROW [a]	Acres	2.51	41.76
Permanent ROW not within existing maintained ROW [b]	Acres	18.95	41.04
Existing Maintained ROW (i.e. previously disturbed areas)[c]	Acres	N/A	83.86
Temporary impacts on waters not within existing maintained ROW	Acres	0.00	0.20
Temporary impacts on waters within existing maintained ROW	Acres	0.00	0.18
Temporary impacts on PEM wetlands not within existing maintained ROW [e, f]	Acres	0.15	9.01
Permanent Impacts on PEM wetlands not within existing maintained ROW [e, f]	Acres	0.31	0.00
Temporary impacts on PEM wetlands within existing maintained ROW [e]	Acres	N/A	11.60
Temporary impacts on PSS wetlands not within existing maintained ROW [e]	Acres	0.0	0.00
Permanent Impacts on PSS wetlands not within existing maintained ROW [e]	Acres	0.0	0.00
Temporary impacts on PSS wetlands within existing maintained ROW [e]	Acres	N/A	0.00
Permanent impacts on PFO wetlands not within existing maintained ROW [d, e, g]	Acres	0.54	8.78
Permanent impacts on PFO wetlands within existing maintained ROW [d, e, g]	Acres	N/A	1.67
Number of waterbody crossings (NHD)	Count	0	0
Number of stream crossings (NHD)	Count	0	19
Number of residences within 50 feet of temporary workspace	Count	0	112
Number of any local, state, or federal lands, parklands, or recreational lands crossed	Count	0	30
Local, state, or federal lands, parklands, or recreational lands crossed by temporary ROW	Acres	0	43.77
Local, state, or federal lands, parklands, or recreational lands crossed by permanent ROW	Acres	0	14.51

Sources: NJDEP 2012; USFWS 2016; USGS 2016; Ecolsciences 2016a; E & E 2019; Sources for Federal, State, and Local Lands and Recreation Lands are provided in Resource Report 8 of Transco's March 27, 2017, Certificate Application.

Table 2.1-1
Comparison of the Environmental Impacts of Compressor Station 206 and the Looping-Intensive Alternative

Factor	Unit	Compressor Station 206	Looping-Intensive Alternative

[a] The temporary ROW not within the existing maintained ROW includes a 25-foot wide corridor adjacent to the new permanent ROW that would need to be acquired for the Looping Intensive Pipeline centerline. Transco would use the temporary ROW during construction of the Looping-Intensive Alternative.

[b] The permanent ROW not within the existing maintained ROW includes a 25-foot wide corridor adjacent to the Looping Intensive Pipeline centerline that would need to be acquired and maintained as new operational ROW.

[c] Existing maintained ROW includes a 50-foot wide corridor that is currently maintained as Transco's operational ROW for the existing pipeline.

[d] In accordance with NJDEP regulations, Transco assumes restoration would not be complete within 6 months. Therefore, Transco assumes all forested impacts to be permanent regardless of whether they overlap temporary workspaces or the existing maintained ROW.

[e] Wetland delineation data used for Compressor Station 206. NJDEP 2012 wetland data layer used for Looping-Intensive Alternative.

[f] Includes all PEM wetlands within the permanent and temporary ROW (and Compressor Station temporary workspaces) not within the existing maintained ROW.

[g] Includes all PFO wetlands within the permanent and temporary ROW (and Compressor Station temporary and permanent workspaces) not within the existing maintained ROW as Transco assumes restoration would not be complete within 6 months.

Key:
N/A = not applicable
NHD = National Hydrographic Database
NJDEP = New Jersey Department of Environmental Protection
ROW = right-of-way

The primary environmental benefit of implementing a looping-intensive alternative would be the elimination of potential long-term air and noise impacts, if any, that will be associated with operation of Compressor Station 206. However, through proper design, the proposed Compressor Station 206 alternative results in far fewer environmental impacts than would be anticipated with a Looping-Intensive Alternative. The majority of noise-generating equipment at Compressor Station 206 will be enclosed within a building (i.e., the building that houses the compressor station turbines and compressors) and the compressor station building will be acoustically designed to ensure that noise levels at the fence line of the compressor station do not exceed established noise thresholds.

Transco conducted an air quality analysis to quantify effects of the proposed Compressor Station 206 and will implement best available control technologies to reduce emissions. Transco has acquired an Air Pollution Control Preconstruction Permit and Certificate to Operate Construction of a New Source on September 7, 2017 (PCP170001).

The Looping-Intensive Alternative would result in significantly greater construction and operational impacts to wetlands when compared to Compressor Station 206. Accordingly, the Looping-Intensive Alternative would not be a practicable alternative that would have lesser impacts on freshwater wetlands or State Open Waters when compared to Transco's proposed construction of Compressor Station 206. See N.J.A.C. 7:7A-10.2(b)1.

2.1.2 Expansion of Existing Compressor Station Facilities

As alternatives to constructing a new compressor station, Transco considered the expansion of existing Compressor Station 205; the expansion of existing Compressor Station 207; and a combination of modifications to both Compressor Station 205 and Compressor Station 207 as discussed below.

Compression Addition at Compressor Station 205

The purpose of adding compression at an existing compressor station is to offset the pressure drop associated with transporting the additional volume of natural gas flowing through the pipeline because of an expansion project. Discharging at the maximum allowable operating pressure (MAOP) helps to minimize the negative impact of pressure loss that occurs as natural gas travels to downstream facilities and delivery points. To maintain a maximum discharge pressure at Compressor Station 205, the installation of an additional 45,000 hp of compression would be required. Although this alternative would allow the compressor station to discharge at the MAOP of the downstream pipeline, pressure drop associated with the incremental Project capacity would still result in the material degradation of delivery pressures downstream of Compressor Station 205; hence, simply adding compression at Compressor Station 205 is not a viable alternative. In order to mitigate the incremental pressure drop, an additional 6.8 miles of 42-inch-diameter of pipeline looping would also be required, beginning at Compressor Station 205 (MP1773.40) and ending at approximately MP1780.2, resulting in greater environmental disturbance and landowner impacts. For these reasons, adding compression solely at Compressor Station 205 was eliminated from further consideration.

Compression Addition at Compressor Station 207

Adding an additional 25,000 hp of compression at existing Compressor Station 207 would be sufficient to overcome the reduced suction pressure that Compressor Station 207 would experience as a result of delivering the additional natural gas for this Project. This would allow for existing and new deliveries to be made downstream of Compressor Station 207 on the Lower

Bay Loop C. However, the addition of the incremental 400,000 Dth/d of capacity to the system would cause significant pressure degradation upstream of Compressor Station 207 on the LNYBL and on Transco's Mainline downstream of Compressor Station 205 at delivery meters connected to lines A and E, which are not compressed by Compressor Station 207. Compressor Station 207 currently provides compression only for volumes on the Lower Bay Loop C and the LNYBL downstream of the facility; therefore, the addition of compression, of any amount, at Compressor Station 207 alone would be insufficient to counteract the pressure degradation upstream of the facility. For these reasons, adding compression solely at Compressor Station 207 was eliminated from further consideration.

Compression Addition at Both Compressor Station 205 and Compressor Station 207

In addition to evaluating adding compression capacity at Compressor Station 205 and Compressor Station 207 individually, Transco also evaluated an alternative in which compression would be added at both compressor stations. Adding additional compression at both Compressor Station 205 and Compressor Station 207 is not a viable alternative to the construction of Compressor Station 206 because no combination of compression at Compressor Station 205 and Compressor Station 207 alone would be sufficient to meet the hydraulic requirements of the Project. As described above, even if horsepower were added at Compressor Station 205 to allow the compressor station to discharge at the MAOP of the downstream pipeline, downstream delivery pressures would be significantly degraded due to the increased pressure drop associated with the incremental Project volumes. The increased pressure drop associated with the incremental Project volumes would occur downstream of Compressor Station 205 on Transco Mainlines A, C, and E. Additional horsepower at Compressor Station 207 could be used to mitigate the pressure degradation on Lower Bay Loop C but could not mitigate the increased pressure drop on Mainlines A and E because Compressor Station 207 does not compress Transco Mainlines A and E. For these reasons, adding compression at Compressor Station 205 and Compressor Station 207 was eliminated from further consideration.

2.1.3 Electric Motor-Driven Compression at Compressor Station 206

Transco evaluated the feasibility and related environmental impacts of using electric motor-driven compression at Compressor Station 206, as an alternative to gas-driven compression at Compressor Station 206.

Electric utility providers undergo a regulatory process, not unlike the process that natural gas pipelines go through, when they propose to expand their system. Transco engaged with the local electric utility provider to discuss the feasibility of bringing in electric power capable of running electric compressor units in the proposed compressor site. The results of these discussions showed that in order to supply utility power capable of supporting electric-powered compression the electric utility would have to overcome numerous regulatory hurdles, including running additional lines through a historic borough, crossing the Delaware and Raritan Canal, and impacts to landowners as a result of running several miles of additional lines. These factors were communicated as part of phone conversations with representatives of the electric utility and were not provided in written format.

Regardless of the availability of electric power capable of running electric compressors, this additional electrical infrastructure would significantly increase the environmental footprint associated with Compressor Station 206. Therefore, electric motor-driven compression alternative would not be a practicable alternative that would have lesser environmental impacts on freshwater wetlands when compared to Transco's proposed use of natural gas turbine-driven compression at Compressor Station 206. See N.J.A.C. 7:7A-10.2(b)1.

2.2 Compressor Station 207 to Rockaway Transfer Point Segment

The segment of the Transco system downstream of Compressor Station 207 is primarily designed to facilitate the transmission of natural gas from south of Compressor Station 207 to delivery points downstream of Compressor Station 207 and on the LNYBL. For the segment between Compressor Station 207 and the Rockaway Transfer Point, Transco evaluated multiple system alternatives that would provide the incremental Project capacity. To be considered a feasible facility alternative, the Project facilities in this segment must be capable of transporting the incremental 400,000 Dth/d Project capacity in addition to meeting existing firm shipper entitlements without causing material degradation of delivery pressures at existing delivery points.

Transco has proposed the Madison Loop and Raritan Bay Loop to meet the hydraulic requirements of the Project.

System alternatives considered for the segment from Compressor Station 207 to the Rockaway Transfer Point include combining the Lockwood Marina HDD and the Morgan Shore Approach HDD (see Section 2.2.1), and a compression-intensive alternative (see Section 2.2.2). Specific pipeline alternatives considered for the Raritan Bay Loop are discussed in Section 3.2.

2.2.1 Combined HDD Alternative

Transco evaluated an alternative pipeline configuration to combine the easternmost HDD on the Madison Loop (e.g., the Lockwood Marina HDD) and the Morgan Shore Approach HDD. Transco does not consider this a viable alternative for three reasons: (1) Transco plans to place a mainline valve as close as possible to the shoreline as an additional safety measure for the existing Class 3 and high consequence area (HCA) locations (the term HCA is used to identify an area where pipeline releases could have greater consequences to health and safety of the environment – see Attachment 2 for more information). A mainline valve must be installed where the pipeline is near to the surface and not in a deep HDD portion. This location has been identified near the junction of the Madison Loop and Raritan Bay Loop. Combining the Morgan Shore Approach HDD with the Lockwood Marina HDD would require the valve to be located near the entry point for the Lockwood Marina HDD, which would result in permanent wetland impacts. (2) Transco is currently proposing to integrate CP for the Raritan Bay Loop by installing a power cable and anode sled, which would also be installed via HDD from the start of the Raritan Bay Loop. Moving the valve site to the west would increase the load to that CP system by an additional 0.5 mile of 26-inch pipe, plus 0.5 mile of 42-inch pipe, therefore providing less available protective current for the offshore pipe. (3) While the conceptual length of approximately 1 mile of the combined HDD may be technically feasible in the expected soil conditions, numerous factors lead Transco to pursue the two separate HDDs. In particular, Transco identified increased risks associated with the added duration of offshore assets as under the combined HDD alternative the entire length of pipe for the Lockwood Marina and Morgan Shore Approach would need to be strung offshore and pulled from the offshore entry pit to the Lockwood Marina exit pit, thereby increasing the amount and duration of offshore and in-water construction activities. In contrast, under the preferred alternative, the Lockwood Marina HDD pipe string will be strung on land with no added in-water work requirements. Transco also identified increased workspaces and logistical issues needed for the increased length of pullback string offshore. The pre-trench length and length of pipe that would be laid in the water would be approximately 0.5 miles longer, which would increase the offshore equipment needs and associated air impacts and sediment disturbances. Increasing the length of the pullback string and length of HDD would have a cascading effect on the offshore construction schedule which has been optimized to the maximum extent practicable to reduce the duration of in-water work and in consideration of protected species time-of-year restrictions. Additionally, the combined HDD alternative would increase the offshore pit volume excavation and associated increased drilling fluid volume offshore and increased horizontal curvature into the HDD alignment to maneuver the pipeline between the entry and exit pits.

2.2.2 Compression-Intensive Alternative

Transco considered two compression-intensive alternatives to the Madison and Raritan Bay Loops. First, Transco considered whether adding additional compression at Compressor Station 207 alone would be an alternative to the construction of the Madison and Raritan Bay Loops and found that it is not a feasible hydraulic design alternative. Adding additional horsepower at Compressor Station 207 alone is not a feasible alternative because, even if Compressor Station 207 discharges at the MAOP of the pipeline, the increased pressure drop caused by the Project volumes would not allow for the existing and incremental Project volumes to be delivered without additional compression downstream of Compressor Station 207.

While upgrading Compressor Station 207 alone is not an option, the Project objectives could be met by a compression-intensive alternative including a new compressor station downstream of Compressor Station 207. This alternative would consist of increasing the horsepower at Compressor Station 207 from 26,400 hp to 52,900 hp in combination with the construction of a new offshore compressor station platform in Lower New York Bay at MP35.49, just upstream of the Rockaway Transfer Point.

Transco's modeling determined that an offshore compressor station in the Lower New York Bay would require approximately 180,000 ISO hp of compression, which could be provided by six Solar Titan 250 compressor units (30,000 ISO hp each) or an equivalent amount of electrical compression. Constructing a large offshore compressor station in the offshore environment would result in permanent impacts on marine traffic, conflicts with commerce, the construction of a large permanent offshore structure, and greater long-term impact to existing offshore natural resources. Due to the amount of horsepower required, operating the offshore compression alternative would also result in significantly greater air emissions than the proposed looping.

In addition to the increased impacts, an offshore compressor station would also be less reliable than the proposed loops because it would be vulnerable to outages due to storms, marine accidents, or third-party damage. Furthermore, an outage on the Lower Bay Loop C or LNYBL downstream of Compressor Station 207 would result in complete disruption of deliveries to the Rockaway Transfer Point, whereas the operation of the proposed Raritan Bay Loop and the LNYBL would allow natural gas to be delivered in case of an outage on the adjacent line. For the reasons listed above, Transco has rejected the compression-intensive alternative as a viable alternative to the Project and construction of the pipeline facilities.

2.3 Transco System Alternatives Conclusion

Using hydraulic modeling, Transco was able to evaluate where additional compression and looping would be required to provide 400,000 Dth/d of natural gas to the Rockaway Delivery Point, as required by National Grid. Transco evaluated alternatives for compression-intensive or looping-intensive for three segments: Compressor Station 195 to Compressor Station 205; Compressor Station 205 to Market Area; and Compressor Station 207 to Rockaway Transfer Point. Based on the analysis provided, these alternatives to the proposed Project would not meet the Project purpose and/or result in more environmental impacts.

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3 PIPELINE ROUTE ALTERNATIVES

Transco also considered various route alternatives for both the onshore and offshore pipeline facilities, presented in Section 3.1 and 3.2, respectively. A route alternative is considered a linear segment of pipeline that follows an alignment separate from the proposed pipeline alignment. Transco evaluated alternatives to determine if the Project's purpose and need could be met while avoiding or minimizing potential adverse environmental impacts to the greatest extent practicable, and be consistent with the FERC guidelines as set forth in 18 Code of Federal Regulations 380.15.

3.1 Onshore Pipeline Route Alternatives

When identifying routing alternatives for the onshore pipeline facilities, Transco attempted to co-locate the Project facilities with existing utility corridors and ROWs. The use of co-location as a principal design element, which is consistent with the FERC guidelines, stresses the corridor concept and complements the existing land use characteristics in the Project area. Siting pipeline facilities along existing corridors reduces the need to establish new corridors in previously undisturbed areas and for onshore pipelines, minimizes the number of affected landowners.

Transco defines co-locating as siting a pipeline ROW within an existing ROW or easement or that abuts an existing ROW or easement. Typically, deviations from these corridors result in additional construction impacts, additional installation costs, and additional operating procedures (e.g., two separate ROWs to maintain instead of one). Pipeline loops are usually shorter and more efficient hydraulically than deviations because of their placement adjacent to the existing pipeline. The proposed routes of the Quarryville and Madison Loops are co-located with existing Transco pipeline ROWs.

At this time, Transco has not identified any factors that would necessitate alternative routing on the Quarryville and Madison Loops and, as such, no route alternatives have been considered.

3.2 Offshore Pipeline Route Alternatives

Transco considered a number of route alternatives for the offshore segment of the Raritan Bay Loop within the area that would connect the tie-in at MP12.00 of the LNYBL, downstream of Compressor Station 207, and to the Rockaway Transfer Point. Transco identified eight routing alternatives, including seven offshore and one predominately onshore alternatives.

As shown on Figure 2, each alternative was developed to either take advantage of existing infrastructure, avoid specific environmental resources or engineering constraints either identified by Transco or resource agencies, or optimize crossings of existing navigation channels. These considerations were also used to evaluate the alternatives, and determine the route that minimizes logistical and engineering, and environmental constraints, and also minimizes conflicts with other marine uses/users.

Criteria used to evaluate the alternatives are described in more detail in Sections 3.2.2 (Logistical and Engineering Constraints), 3.2.3 (Environmental Constraints), and 3.2.4 (Marine Uses/Users Conflicts). A discussion of each of the siting alternatives is presented in Section 3.2.5. Tables 3.2-1 through 3.2-7 present a summary comparison of the siting alternatives.

3.2.1 Control Points

The overriding consideration in the siting, permitting, construction, operation, and maintenance of the Raritan Bay Loop is ensuring protection of public health, safety, and the environment. Other considerations, including regulatory compliance, environmental factors, engineering design feasibility, and construction feasibility are critical in identifying and evaluating alternatives. Siting requires balancing a variety of considerations. Some factors are constraints that prevent the siting of a pipeline in a specific area offshore within Raritan and Lower New York Bay, while other factors influence route selection and require the application of best professional judgment.

Before applying siting criteria, Transco first defined a siting envelope as defined by two control points within which alternatives to the proposed Raritan Bay Loop could be identified. The siting envelope was built based on National Grid’s need for an additional 400,000 Dth/d of incremental firm transportation capacity delivered to the Rockaway Transfer Point. The Rockaway Transfer Point therefore, served as the primary control point for the Raritan Bay Loop. Based on the design of Transco’s existing pipeline infrastructure, a tie-in to the Transco system at existing MP12.00 of the LNBYL, downstream of Compressor Station 207, was identified as the only practicable control point to define the siting envelope (see Section 2.0, above, for a discussion of Transco’s system).

While any number of routing alignments could be created between the two control points for the offshore portion of the project, Transco identified eight unique routing alternatives (described below) between the tie-in at existing MP12.00 and the Rockaway Transfer Point that present the range of potential alignments considered available to Transco (see Figure 2).

Following preliminary screening of siting alternatives, Transco identified two feasible alternatives: Alternatives 6 and 8. A secondary screening process was conducted to evaluate these two alternatives, as discussed in Section 3.2.5. Ultimately, Transco selected Alternative 6 as the preferred route for the Raritan Bay Loop.

3.2.2 Siting Criteria: Logistical and Engineering Constraints

A number of user logistical and engineering constraints exist within Raritan Bay and the Lower New York Bay that directly affect the design of the Project. Transco considered the following criteria, which reflect constraints that would be problematic for construction of a pipeline, and result in increased time and associated impacts for in-water construction.

Anchorage Areas

Anchorage areas are areas designated for anchorage of deep-draft vessels. Transco consulted with the U.S. Coast Guard Harbor Safety Navigation and Operations Committee Energy Subcommittee (Harbor Ops Energy Subcommittee), and the U.S. Army Corps of Engineers (USACE) regarding user conflicts and regulatory requirements within designated anchorage areas to better understand the logistical and engineering constraints.

According to Harbor Ops Energy Subcommittee and the USACE, the presence of the pipeline in anchorage areas should be avoided to the extent possible, but, if necessary, a pipeline sited in these areas would be required to be buried at greater depths below the seafloor to limit the potential for an anchor and pipeline interaction. The requirements for deeper pipeline burial restricts the number of options for the construction vessel and pipeline lowering method that may be used. USACE would require that the minimum depth of cover be 7 feet over the pipeline in designated anchorage areas, while outside of designated anchorage areas, a minimum depth of cover of 4 feet would be required from the top of the pipeline.

Due to the greater trench width and increased volume of dredged material and associated water quality impacts generated in the excavation of a deeper trench, the impacts on the marine environment will increase as the depth of cover requirements increase. In addition, with deeper excavation depths, construction duration is expected to increase, resulting in increased offshore vessel emissions during construction and a longer duration of marine user conflicts during construction. Since both construction and environmental impacts would increase with presence in an anchorage area and the need for a deeper trench, Transco considered siting alternatives that would minimize the pipeline crossing length in anchorage areas to the extent possible. Figure 3 shows the constraints described above.

Submarine Cable/Utilities

The presence of cables, pipelines, or other linear utilities present seabed obstructions that impose installation risks during pipelay, pre-trenching, and post-burial operations. Crossings of these facilities increase both construction and environmental impacts as additional workspace and/or excavation is required to ensure the integrity of existing infrastructure. The presence of buried utilities also place high demands on the accuracy and positioning of construction equipment, including HDD equipment, and operations.

In addition, routing alternatives were considered in terms of the crossing angle of the submarine cables and utilities. Ideal utility crossing angles are as close to perpendicular as possible, which reduces the overall distance of the crossing and minimizes disturbance of the existing utility. The crossing angle facilitates a reduction in crossing length and allows reduced construction times, which in turn minimizes potential conflict within the active navigation area and reduces the potential for affecting active utilities. Figure 3 shows the constraints described above.

Navigation Channels

The presence and orientation of active navigation channels creates greater logistical coordination during construction and also creates conflict with active use of the channel. Transco considered siting alternatives that would minimize the impact on navigation channels to the extent practicable. Routing alternatives were considered in terms of the crossing angle of the navigation channel. Ideal navigation channel crossing angles are as close to perpendicular as possible, which reduces the overall distance of the crossing and minimizes the duration of construction within the channel. Figure 3 shows the constraints described above.

3.2.3 Siting Criteria: Environmental Constraints

In addition to the logistical and engineering constraints, a number of environmental constraints exist within Raritan Bay and the Lower New York Bay, as identified through literature review, agency outreach, and Transco's experience operating the LNYBL. Transco considered the following constraints when selecting a preferred alternative for the Raritan Bay Loop.

Metocean Conditions

Prevailing meteorological and oceanic conditions, including subsea currents that could cause erosion and/or depositional processes, can affect the seafloor near the pipeline. Of particular concern is the Sandy Hook dynamic shoreline. The National Oceanic and Atmospheric Administration (NOAA)-designated Sandy Hook dynamic shoreline introduces constructability and technical issues associated with pipeline installation in the environment around Sandy Hook. Sandy Hook is a sand spit approximately 10 miles long and is growing northward via littoral drift (Caldwell 1966). Sandy Hook's primary recreational beach spit has eroded at rates of 10 meters per year since 1953 and 23 meters per year in the 1970s (Allen 1981; NPS n.d.). Sediment sinks along the longshore sediment transport result when sediment is diverted from the longshore current either onshore causing shoreline accretion or when diverted offshore creating shoreline erosion. Allen (1981) used aerial photographs taken from 1953 to 1976 to track shoreline accretion, compared those estimates to dredging records of the shipping channel and conducted nearshore field measurements of sediment movement, in addition to utilizing sediment transport computer models to confirm the longshore transport rates. This showed a beach growth of approximately 139,000 cubic meters per year and suggested an offshore transport of 167,000 cubic meters per year. However, the growth of the spit is slowed by the dredging of the Sandy Hook Channel, located immediately north and east of Sandy Hook. Figure 3 shows the constraints described above.

Sand waves in this vicinity suggest a dynamic environment, and the strong bottom currents in this area and changing sediment deposition pattern could lead to pipeline exposure and spanning. As such, avoiding Sandy Hook would minimize construction challenges and enhances the long-term integrity of the pipeline related to maintaining adequate cover during backfilling activities and operation.

Geological Hazards and Mapped Obstructions

Other geological hazards that can be problematic for construction of the pipeline include seafloor gradients, varying water depth, and the presence of glacial drift, which can include boulders (outcropping rocks) and/or rocky substrates. Seafloor gradients (resulting from the presence of borrow pits as well as related to existing natural seafloor contours) can introduce spans to pipelines, raise concerns about pipeline instability, and can be a contributing factor for instability of the sediments on the slope itself. The presence of boulders and rocky substrates from glacial drift can also cause spans, reduce pipe embedment, reduce pipeline slope stability, reduce or prevent trenching and burial, and damage pipeline coatings.

Transco also identified the presence of shipwrecks, National Register of Historic Places mapped resources, and other marine obstructions; however, these factors did not differentiate between Transco's identified alternatives. Figure 3 shows the constraints described above.

Shellfish Beds

Based on review of available data and state agency communications (see Resource Report 3 of Transco's Certificate Application), shellfish beds are prevalent throughout much of Raritan Bay, Lower New York Bay, and the Atlantic Ocean near the Rockaway Peninsula. Current and/or future harvest of these shellfish resources is conditionally permitted in several areas within both New York and New Jersey waters. While it is not possible to avoid these resources, Transco looked to minimize impacts to the extent practicable.

In addition, Transco identified sport fishing grounds crossed by the routes. However, as Transco will coordinate with maritime and fishing community, the presence of these fishing grounds did not differentiate between Transco's identified route alternatives. Figure 3 shows the constraints described above.

3.2.4 Siting Criteria: Marine Uses/User Conflict

To further understand the marine uses and user concerns within Raritan and Lower New York Bays, Transco consulted with several permitting agencies and stakeholders. Initially, Transco consulted with the USACE (New York District), U.S. Coast Guard and Harbor Ops Energy Subcommittee, New York State Department of Environmental Conservation (NYSDEC), NJDEP, Port Authority of New York and New Jersey, NOAA Fisheries Services, New York State Department of State, NY/NJ Baykeeper, Clean Ocean Action, the Natural Resources Defense Council, and Bayshore Watershed to introduce the Project, discuss design goals, and gain insight to agencies, stakeholders, and nongovernmental organizations that may have an interest in the Project. See Transco's Certificate Application).

As the Project design evolved, Transco routinely consulted with the USACE and Harbor Ops Energy Subcommittee to discuss the conditions associated with alternatives to traversing anchorage areas. Transco also regularly consulted with NYSDEC's Marine Resources Group to discuss impacts on shellfish resources. Alternative 8 was specifically identified and presented by NYSDEC with the intent of reducing impacts on shellfish areas of concern.

3.2.5 Preliminary Siting Alternatives

Transco considered the logistical and engineering constraints, environmental constraints, and marine uses and user conflicts described above when evaluating alternatives for the offshore segment of the Raritan Bay Loop. The potential impacts associated with each alternative are discussed below and summarized in Tables 3.2-1 through 3.2-7.

Six of the eight routes were eliminated due to a combination of engineering, environmental, and marine user conflict constraints. These six are discussed in this section. Further analysis was required to differentiate the two remaining alternatives (Alternative 6 and Alternative 8), and these are discussed in Section 3.2.6.

Alternative 1

Alternative 1 (see Table 3.2-1 and Figure 4) is sited parallel to, or nearly so, to the existing 26-inch Transco LNYBL pipeline to optimize co-location of existing Transco facilities. Consistent with the current LNYBL alignment, Alternative 1 was configured to cross the intersection of the Raritan Bay, Chapel Hill, and Sandy Hook channels (via HDD) to minimize individual channel crossings and impacts on navigation in Raritan Bay. Alternative 1 also is located south of and outside of designated anchorage areas and avoids the need to cross the Neptune Cable, a buried high-voltage direct current electric cable line that runs between New Jersey and New York. This cable generally follows the alignment of Transco's existing LNYBL system. Alternative 1 passes just north of the NOAA-designated Sandy Hook dynamic shoreline. Transco anticipates that construction of the route would require a total of three HDDs, two of which would be water-to-water HDDs.

Transco did not select this alternative because the currents north of Sandy Hook are actively eroding the Sandy Hook channel northwards and could result in complications related to the installation and maintenance of the pipeline. Furthermore, Transco did not select this alternative for the following additional reasons:

- The need for two water-to-water HDDs increases construction duration and risk.

- The need for an HDD at the intersection of the Sandy Hook, Chapel Hill, and Raritan Bay channels increases the time needed for in-water construction; the HDD staging areas would be subject to more dynamic sea conditions north of Sandy Hook; and the increased length of the HDD introduces additional construction risks.
- The route's proximity to the existing LNYBL pipeline and Neptune Cable introduced engineering constraints, and increases the risks associated with construction and safety. Transco's LNYBL is a primary source of natural gas in National Grid's distribution system, and disruption of the existing service would have significant consequences for National Grid's ability to maintain its base service load.

Table 3.2-1
Comparison of Alternative Routes 6 (Preferred Alternative) and 1 for the Raritan Bay Loop

Factor	Unit	Alternative 6 (Preferred)		Alternative 1	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	17.85	4.20
Offshore Length	Miles	5.95	17.38	17.69	4.20
Mileposts Range where Routes Diverge	MPs	12.98–35.49			
Number of HDDs	Count	2		3	
Total HDD Length	Feet	7,293		12,767	
Anchorage Zones Crossed	Miles	0	0.76	0	0
Offshore Trenching in Anchorage Zones	Miles	0	0.76	0	0
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	15.43	4.20
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	456,704	65,690
Submarine Cable/Utility Crossings[b]	No.	1	1	4	0
Navigation Channels Crossed	No.	1	2	3	0
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	3	0
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	1	0
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	4	1
NJDEP Hard Clam Relative Abundance - Low	Miles	0.0	-	1.56	-
NJDEP Hard Clam Relative Abundance - Moderate	Miles	0.0	-	0.19	-
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	11.25	-
NJDEP Surf Clam Relative Abundance	Miles	0.00	-	2.59	-

Table 3.2-1
Comparison of Alternative Routes 6 (Preferred Alternative) and 1 for the Raritan Bay Loop

Factor	Unit	Alternative 6 (Preferred)		Alternative 1	
		NJ	NY	NJ	NY
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	3.09
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	1.62	0.62

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009.

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).

[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.

[c] Obstructions/wrecks were taken from the AWOIS database.

[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.

[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.

[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
AWOIS = Automated Wreck and Obstruction Information System
ENC = Electronic Navigation Chart
HDD = horizontal directional drill
NJ = New Jersey
NJDEP = New Jersey Department of Environmental Protection
NRHP = National Register of Historic Places
NY = New York
NYSDEC = New York State Department of Environmental Conservation

Alternative 2

Alternative 2 (see Table 3.2-2 and Figure 5) was developed to reduce construction risk by (1) reducing immediate proximity to the existing LNYBL; (2) proposing two trenched channel crossings of the Raritan and Chapel Hill navigation channels instead of a long HDD at the convergence of three channels; and (3) avoiding the area north of Sandy Hook, which is a dynamic environment and subject to scour. This route was developed in response to analysis, which indicated co-locating with the existing LNYBL would result in engineering constraints and construction risks that could otherwise be avoided. Alternative 2 is sited north of the LNYBL and is not co-located with the existing pipeline; instead, the offset of Alternative 2 ranges from approximately 232 to 6,889 feet north of the LNYBL. By proposing two open-cut navigation channel crossings, Alternative 2 would require only one water-to-water HDD and one land-to-water HDD.

Alternative 2 crosses designated anchorage areas for 5.45 miles, which was the primary reason the route was not selected as the preferred alternative. During preliminary meetings, the

USACE noted that a cover depth of 7 feet is required for burial of the pipeline in anchorage areas. To achieve burial depth of 7 feet, Transco would need to excavate trench depth to approximately 10.5 feet, resulting in an estimated 185% increase in area and volume relative to the standard 4-foot cover depth. Additionally, in-water construction time would almost double as depth of cover increased from 4 feet to 7 feet. Given the increases in dredged materials volume and in-water construction duration, the impacts on water quality, sediment disturbance, emissions, and the potential to impact navigation and commerce would greatly increase.

Furthermore, Transco did not select this alternative because it crosses the Raritan Bay and Ambrose Channel, as well as the Neptune Cable, at angles that are not ideal and could result in greater long-term impacts on navigational traffic and subsea cables.

Table 3.2-2
Comparison of Alternative Routes 6 and 2 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 2	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	14.12	7.81
Offshore Length	Miles	5.95	17.38	13.96	7.81
Mileposts where Routes Diverge	MPs	14.06–35.49			
Total HDD Length	Feet	7,293		7,750	
Anchorage Zones Crossed	Miles	0	0.76	5.45	0
Offshore Trenching in Anchorage Zones	Miles	0	0.76	5.45	0
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	7.20	7.81
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	861,093	226,003
Submarine Cable/Utility Crossings[b]	No.	1	1	3	0
Navigation Channels Crossed	No.	1	2	3	0
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	3	1
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	0	1
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	3	1
NJDEP Hard Clam Relative Abundance - Moderate	Miles	0.0	-	2.02	-
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	7.29	-
NJDEP Surf Clam Relative Abundance	Miles	0.00	-	2.28	-

Table 3.2-2
Comparison of Alternative Routes 6 and 2 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 2	
		NJ	NY	NJ	NY
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	6.73
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	1.40	0.62

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015; Barnes 2016; Platt 2009.

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).
[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.
[c] Obstructions/wrecks were taken from the AWOIS database.
[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.
[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.
[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
AWOIS = Automated Wreck and Obstruction Information System
ENC = Electronic Navigation Chart
HDD = horizontal directional drill
NJ = New Jersey
NJDEP = New Jersey Department of Environmental Protection
NRHP = National Register of Historic Places
NY = New York
NYSDEC = New York State Department of Environmental Conservation

Alternative 3

Alternative 3 (see Table 3.2-3 and Figure 6) was developed to reduce risk near existing infrastructure by shifting the proposed line farther away from the Neptune cable from north of Sandy Hook to near the Rockaway Transfer Point. In addition to increasing separation, Alternative 3 avoids the need to simultaneously HDD the Ambrose Channel and Neptune Cable.

Alternative 3 crosses designated anchorage areas for 5.45 miles, which was the primary reason that this alternative was not selected. As stated previously, deeper burial would be required in these areas, and water quality impacts, sediment disturbance, emissions, and long-term impacts on navigation and commerce would increase. Furthermore, Transco did not select this alternative because Alternative 3 also crosses the Raritan Bay Channel, Ambrose Channel, and the Neptune Cable at angles that are not ideal and could result in greater impacts on navigational traffic and subsea cables.

Table 3.2-3
Comparison of Alternative Routes 6 and 3 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 3	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	13.76	8.26
Offshore Length	Miles	5.95	17.38	13.60	8.26
Mileposts where Routes Diverge	MPs	14.06 – 35.49			
Total HDD Length	Feet	7,293		7,392	
Anchorage Zones Crossed	Miles	0	0.76	5.45	0
Offshore Trenching in Anchorage Zones	Miles	0	0.76	5.45	0
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	6.91	8.26
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	859,095	234,258
Submarine Cable/Utility Crossings[b]	No.	1	1	3	0
Navigation Channels Crossed	No.	1	2	3	0
Areas of outcropping Rocks within 1,000 feet of Pipeline	No.	3		2	
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	3	1
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	0	1
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	2	1
NJDEP Hard Clam Relative Abundance - Moderate	Miles	0.0	-	2.02	-
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	7.29	-
NJDEP Surf Clam Relative Abundance	Miles	0.00	-	2.26	-
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	6.91
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	1.10	0.88

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).
[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.
[c] Obstructions/wrecks were taken from the AWOIS database.
[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.
[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.
[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
AWOIS = Automated Wreck and Obstruction Information System
ENC = Electronic Navigation Chart
HDD = horizontal directional drill
NJ = New Jersey
NJDEP = New Jersey Department of Environmental Protection
NRHP = National Register of Historic Places
NY = New York
NYSDEC = New York State Department of Environmental Conservation

Alternative 4

Alternative 4 (see Table 3.2-4 and Figure 7) was designed to reduce conflicts with, and crossings of, anchorage areas. Alternative 4 is 22.36 miles in length. The route includes two HDD installations and two open-cut crossings of navigation channels. The presence of the sloping seafloor gradients (i.e., borrow pit) on the east side of Ambrose Channel would require an extension of the length of the HDD to allow for a stable working area. Placement of the pipeline in proximity to borrow pits could also contribute to both construction and operational safety concerns related to vessel traffic accessing the borrow sites.

Alternative 4 was not selected as the preferred alternative largely based on the engineering difficulties associated with the crossings of the Ambrose Channel. Furthermore, Transco did not select this alternative because of the following additional reasons:

- The crossing of the Raritan Bay Channel is not at an ideal angle.
- East of the Ambrose Channel bottom topography is more sloping (between MP25.85 and MP27.12 the seafloor elevation varies as much as 9 feet), introducing constructability and engineering challenges.
- East of the Ambrose Channel, the pipeline route has a greater potential to intersect areas of glacial drift, which would introduce rocky substrates that are not conducive to Transco's preferred installation methods.

Table 3.2-4
Comparison of Alternative Routes 6 and 4 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 4	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	1.94	20.42
Offshore Length	Miles	5.95	17.38	1.82	20.42
Mileposts where Routes Diverge	MPs	12.00 – 35.49			
Total HDD Length	Feet	7,293		7,042	
Anchorage Zones Crossed	Miles	0	0.76	0	0.77
Offshore Trenching in Anchorage Zones	Miles	0	0.76	0	0.77
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	1.94	18.32
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	76,309	725,058
Submarine Cable/Utility Crossings[b]	No.	1	1	1	2
Navigation Channels Crossed	No.	1	2	0	3

Table 3.2-4
Comparison of Alternative Routes 6 and 4 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 4	
		NJ	NY	NJ	NY
Areas of outcropping Rocks within 1,000 feet of Pipeline	No.	3		0	
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	0	5
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	0	2
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	0	13
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	1.86	-
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	9.51
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	1.10	0.88

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).
[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.
[c] Obstructions/wrecks were taken from the AWOIS database.
[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.
[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.
[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

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NYSDEC = New York State Department of Environmental Conservation

Alternative 5

Alternative 5 (see Table 3.2-5 and Figure 8) was developed as an alternative to reduce navigation conflicts and entirely avoid anchorage areas. This alternative is 25.46 miles long and includes two HDD installations but would require only a single open-cut of a navigation channel. Alternative 5 would require a much longer water-to-water HDD, with platforms located at the edge of a borrow pit (i.e., sloping seafloor gradient) at the convergence of a high-volume vessel-traffic area, on the west side of the Chapel Hill Channel and east side of the Ambrose Channel. The need for HDD platforms in the vicinity of the borrow pits would result in increased construction risks due to the high volume of vessel traffic in the surrounding area as well as site stability concerns related to the depth of the borrow pit in relation to the surrounding seafloor, an approximate difference of 20 feet. In addition to construction risks, the difference in seafloor elevations could lead to operational concerns such as the introduction of pipeline spans and stress on the pipeline.

Alternative 5 is in the vicinity of seven areas of outcropping rocks located within 1,000 feet of the route. The presence of outcropping rocks within the immediate vicinity of Alternative 5 poses engineering and constructability challenges for the reasons discussed in Section 3.2.2.

Alternative 5 was not selected as the preferred option for the reasons described above and had no clear advantages over any of the other alternatives. Furthermore, Transco did not select this alternative because of the following additional constraints:

- Vessel traffic at the Narrows and the upper portion of Lower New York Bay is extremely high.
- Proximity to the Narrows will introduce greater currents, which could increase construction risk.
- The pipeline is approximately 2 miles longer than most of the presented alternatives, increasing the duration of construction and associated impacts.

Table 3.2-5
Comparison of Alternative Routes 6 and 5 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 5	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	1.94	23.52
Offshore Length	Miles	5.95	17.38	1.82	23.52
Onshore Length[a]	Miles	0.16	0.0	0.16	0.0
Mileposts where Routes Diverge	MP	12.00 – 35.49			
Total HDD Length	Feet	7,293		6,876	
Anchorage Zones Crossed	Miles	0	0.76	0	0
Offshore Trenching in Anchorage Zones	Miles	0	0.76	0	0
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	1.94	22.22
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	76,309	692,841
Submarine Cable/Utility Crossings[b]	No.	1	1	1	2
Navigation Channels Crossed	No.	1	2	0	3
Areas of outcropping Rocks within 1,000 feet of Pipeline	No.	3		7	
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	0	4
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	0	1
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	0	11
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	1.86	-

Table 3.2-5
Comparison of Alternative Routes 6 and 5 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 5	
		NJ	NY	NJ	NY
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	8.98
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	0.0	0.44

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009.

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).
[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.
[c] Obstructions/wrecks were taken from the AWOIS database.
[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.
[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.
[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
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NYSDEC = New York State Department of Environmental Conservation

Alternative 7

Alternative 7 (see Table 3.2-6 and Figure 9) was developed to reduce the length of in-water pipeline. Alternative 7 is 30.55 miles long, but, unlike Alternatives 1 through 6, and Alternative 8, this alternative would establish a new onshore ROW and would be co-located with New Jersey Route 35 for 17.37 miles, from the Morgan M&R Station to the Atlantic shoreline of New Jersey. The installation of the onshore portion of Alternative 7 would necessitate crossing areas of significant residential and commercial development and would affect many residents, including 937 residences within 250 feet of the preferred route. Alternative 7 would also include a shore-to-water HDD to avoid impacts on the Highlands Reach, Sandy Hook, and the Gateway National Recreation Area. Once offshore, Alternative 7 would cross approximately 3.15 miles of designated anchorage area, then curve north, avoiding National Park Service waters to the east and a Historic Area Remediation Site. Alternative would cross the Ambrose Channel via HDD.

Alternative 7, which was developed as an alternative to crossing the Raritan Bay, was not selected as the preferred alternative for multiple reasons, including the significant increase in impacts on urbanized land associated with the need for more than 17 miles of additional onshore pipeline, and the crossing of 3.15 miles of designated anchorage areas. As stated previously, deeper burial would be required in these areas, and water quality impacts, sediment disturbance, emissions, and long-term impacts on navigation and commerce would increase.

Furthermore, Transco did not select this alternative because of the following additional constraints:

- Alternative 7 would disrupt traffic patterns throughout the duration of onshore construction, which would likely extend over multiple years.
- Alternative 7 includes 186 road crossings.
- Substantive increases in noise impacts would occur because of the proximity of the route to local residences and businesses.
- Alternative 7 is approximately 5 to 8 miles longer than all other presented alternatives, increasing the duration of construction and associated impacts.

Table 3.2-6
Comparison of Alternative Routes 6 and 7 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 7	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	26.80	3.61
Offshore Length	Miles	5.95	17.38	9.68	3.61
Onshore Length[a]	Miles	0.16	0.0	17.13	0.00
Mileposts where Routes Diverge	MP	12.00–35.49			
Total HDD Length	Feet	7,293		13,549	
Roadways Crossed	No.	3	-	172	-
Residences within 50 feet of the Proposed ROW	No.	15	0	159	0
Anchorage Zones Crossed	Miles	0	0.76	4.36	0
Offshore Trenching in Anchorage Zones	Miles	0	0.76	4.36	0
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	19.87	3.61
Sediment Disturbed by Trenching	Cubic Yards	178,170	599,879[f]	396,125	57,312
Submarine Cable/Utility Crossings[b]	No.	1	1	8	0
Navigation Channels Crossed	No.	1	2	1	0
Areas of outcropping Rocks within 1,000 feet of Pipeline	No.	3		2	
Wrecks within 0.5 mile of Pipeline[c]	No.	1	2	5	1
Cultural Resources (NRHP) within 1 mile of Pipeline	No.	1	2	21	~~0~~ 1
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	5	1

Table 3.2-6
Comparison of Alternative Routes 6 and 7 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 7	
		NJ	NY	NJ	NY
NJDEP Hard Clam Relative Abundance - Moderate	Miles	0.0	-	0.22	-
NJDEP Hard Clam Relative Abundance - High	Miles	1.92	-	0.0	-
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	3.00
NJ and NY Sport Fishing Areas[d]	Miles	0.99	0.82	6.98	0.36

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).
[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.
[c] Obstructions/wrecks were taken from the AWOIS database.
[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.
[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.
[f] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
AWOIS = Automated Wreck and Obstruction Information System
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3.2.6 Final Route Selection

The two remaining alternatives, Alternative 6 (see Table 3.2-7 and Figure 10) and Alternative 8 (see Figure 11) minimize the length of the route crossing designated anchorage areas while (1) providing preferable crossing angles for both the Neptune cable and the Raritan Bay and Chapel Hill navigation channels, and (2) avoiding constructability challenges near Ambrose Channel. These two routes are similar, with only slight differences in the length of the pipeline crossing in Raritan Bay. As such, Alternatives 6 and 8 were determined to be suitable from an engineering constraints standpoint. Table 3.2-7 presents a final comparison of these two alternatives.

Table 3.2-7
Comparison of Alternative Routes 6 and 8 for the Raritan Bay Loop

Factor	Unit	Alternative 6		Alternative 8	
		NJ	NY	NJ	NY
Total Length	Miles	6.11	17.38	6.02	17.40
Offshore Length	Miles	5.95	17.38	5.86	17.40
Mileposts where Routes Diverge[f]	MP	14.31–21.55 25.17–29.33 30.42–33.79			
Anchorage Zones Crossed	Miles	0	0.76	0	1.70
Offshore Trenching in Anchorage Zones	Miles	0	0.76	0	1.70
Offshore Trenching outside of Anchorage Zones	Miles	4.73	16.62	4.64	15.70
Sediment Excavated by Trenching	Cubic Yards	178,170	599,879[g]	185,074	717,607
Navigation Channels Crossed	No.	1	2	0	3
AWOIS and ENC Offshore Obstructions within 0.5 mile of Pipeline[c]	No.	2	3	2	5
NYSDEC-Designated Shellfish Area[e]	Miles	-	8.89	-	9.10

Source: U.S. Department of Commerce 2014; NJDEP 2000; 2003; NOAA 2001; O'Dwyer 2014; NYSDEC 2012, 2015b; Barnes 2016; Platt 2009

[a] Pipeline length includes 0.16 mile onshore (HDD entry point to the shoreline).

[b] Existing linear infrastructure crossed includes Neptune Cable and Long Island Power Authority transmission lines. Other active or inactive cables may be crossed by the above routes. Evaluation currently ongoing.

[c] Obstructions/wrecks were taken from the AWOIS database.

[d] Data layer is taken from NJ metadata but includes areas in NY that have been included in this table. Length reported reflects distance crossed by the alternative route centerlines and not the Project workspaces.

[e] NYSDEC-Designated Shellfish Area includes areas where some shellfish harvest is allowed and includes Certified Shellfish Harvest Areas, New York Special Permit Transplantation Areas, and New York Special Permit Bait Only Areas.

[f] Alternatives 6 and 8 were originally designed to only vary from MP14.31 to MP21.55 to account for areas of shellfish beds as requested by NYSDEC, however, the alternatives now vary along other portions of the routes due to minor construction related routing adjustments of Alternative 6.

[g] The volume of sediment disturbed by trenching in NY waters reflects the volume proposed at the time the Alternatives Analysis was initially conducted and prior to Transco's adoption of the 15-foot burial requirement at the navigation channels.

Key:
AWOIS = Automated Wreck and Obstruction Information System
ENC = Electronic Navigation Chart
HDD = horizontal directional drill
MP = Milepost
NJ = New Jersey
NJDEP = New Jersey Department of Environmental Protection
NRHP = National Register of Historic Places
NY = New York
NYSDEC = New York State Department of Environmental Conservation

While Alternative 6 traverses less anchorage area, NYSDEC indicated that Alternative 6 crosses sections of a NYSDEC hard clam transplantation program harvest area that is reported to be especially productive, compared with the sections of the harvest area crossed by Alternative 8 (see Transco's Certificate Application, Volume 3, Agency Consultation). However, the latest available data on hard clam density and abundance for areas in New York crossed by Alternatives 6 and 8 are limited to anecdotal shellfish harvester reports and grab sampling at limited locations associated with hard clam quahog parasite unknown (QPX) disease-monitoring surveys. Therefore, per NYSDEC recommendations in a letter dated October 5, 2016, Transco conducted offshore sediment sampling in late 2016 along both of these alternative routes to characterize the sediment chemistry (especially contaminant levels), benthic communities, and geotechnical properties for the two routes. The results were compared to more clearly assess the potential for Project-related impacts on shellfish resources along the two route alternatives. See the Environmental Sampling Report submitted to the NJDEP as an attachment to Transco's Waterfront Development Individual Permit application.

Transco conducted an initial statistical analysis of hard clam (*Mercenaria mercenaria*) counts found during the benthic sampling within the NYSDEC transplantation program area (MP14.00 to MP21.00) in order to determine if hard clam densities along Alternative 8 would be significantly different than densities along Alternative 6. As discussed below, the results indicate that the hard clam densities along these two route alternatives are not statistically different. In addition, a larger average number of hard clams were collected at sampling sites along Alternative 8.

Tables 3.2-8 and 3.2-9 below present the results for hard clams identified at the selected stations collected along Alternative 6 and Alternative 8. Hard clams were partitioned into two length groups: less than 25 millimeters (mm) and greater than 25 mm. Of the 213 clams collected along Alternative 6, 158 (74%) were less than 25 mm, and 64 (26%) were greater than 25 mm. Along Alternative 8, 488 total individuals were collected, with 423 (86%) being less than 25 mm and 65 (14%) being greater than 25 mm. Table 3.2-8 presents summary statistics for the sample pool from each route alternative.

Transco applied a Kruskal-Wallis statistical test of total counts to determine whether the median hard clam populations from the two alternatives were statistically different from each other within the transplant program area. A two-sample t-test was also applied to evaluate the potential difference in sampled population means for the two route alternatives.[2] The results of these tests show no statistical difference (alpha=0.5) in medians (kilowatt test) or means (two sample t-test) of the hard clam populations along Alternative 6 and Alternative 8.

Table 3.2-8
Hard Clam Counts – Alternative 6 Stations

Station	<25 mm	>25 mm	Total
7	0	0	0
8	32	0	32
9	0	0	0
10	21.3	3	24.3
11	7.1	1	8.1
12	0	8	8
13	10.9	9	19.9
14	0	2	2
15	16	3	19
16	0	0	0
17	0	0	0
18	0	8	8
19	0	7	7
20	0	3	3
21	0	3	3
22	64	2	66
23	6.4	0	6.4
24	0	1	1
25	0	1	1
26	0	1	1
27	0	1	1
28	0	2	2
Total	**157.7**	**55**	**212.7**
Percent of Total	**74%**	**26%**	

Key:
< = less than
> = greater than
mm = millimeters

[2] The t-test assumes a normal population distribution, while the Kruskal-Wallis test assumes a non-normal distribution. Based on a Kolmogorov-Smirnov test, the sample sets exhibited non-normal distributions, so the Kruskal-Wallis test is considered more appropriate than the t-test in this case.

Table 3.2-9
Hard Clam Counts - Alternative 8 Stations

Station	<25 mm	>25 mm	Total
70	0	0	0
71	25.6	3	28.6
72	128	1	129
73Alt	114.7	3	117.7
74	81.6	1	82.6
75	0	8	8
76	8	6	14
77	31.5	11	42.5
78	6.4	4	10.4
79Alt	0	4	4
80	0	0	0
81	0	1	1
82	16	13	29
83Alt	0	0	0
84Alt	0	1	1
85	3.6	1	4.6
86Alt	0	2	2
87	7.6	6	13.6
Total	**423**	**65**	**488**
Percent of Total	**86%**	**14%**	

Key:
< = less than
> = greater than
mm = millimeters

Transco also considered the percentages of silt/clay in the surface grab samples and contaminant levels in the upper 3 feet of shallow core samples collected along Alternative 6 and Alternative 8 within the NYSDEC hard clam transplant program harvest area. A representative summary of these characteristics for the two route alternatives is presented in Appendix 1D of Resource Report 1 of Transco's Certificate Application. These results indicate that a greater average percentage of fine sediment and higher average levels of contaminants are present along Alternative 8 compared to Alternative 6. This suggests that installation of the pipeline along Alternative 8 would cause larger sediment plumes with higher levels of re-suspended contaminants than installation along Alternative 6 assuming equal areas of disturbance. The potential impacts associated with the two alternatives are summarized in Tables 3.2-7, 3.2-8, 3.2-9, and 3.2-10. A discussion of the two route alternatives is provided below.

Alternative 6

The Raritan Bay Loop Alternative 6 reflects 16 months of stakeholder input and siting work and is Transco's preferred alternative. Alternative 6 is 23.49 miles long and is sited to avoid significant long-term conflicts with commercial vessel traffic, allow for a secure crossing at the Ambrose Channel, and minimize impacts with anchoring in Raritan Bay. The route includes two HDD installations and two open-cut crossings of navigation channels at nearly perpendicular angles.

Alternative 6 crosses approximately 0.76 mile of designated anchorage areas in New York. As previously stated, the USACE indicated that a minimum depth of cover of 7 feet over the pipeline in designated anchorage areas will be required, while outside of designated anchorage areas the minimum depth of cover is 4 feet over the pipeline. Impacts on the marine environment increase as the depth of cover requirements increase. Although the Alternative 6 route is slightly longer than Alternative 8, the pipeline crossing length in anchorage areas is less.

The results of the benthic grab survey show no statistical difference in hard clam density (95% confidence) between Alternative 6 and Alternative 8 within the NYSDEC transplantation program harvest area (see the Environmental Sampling Report submitted to the NJDEP as an attachment to Transco's Waterfront Development Individual Permit application). As Alternative 8 crosses an 0.94 additional mile of the designated anchorage area, and the additional burial depth requirement associated with traversing anchorage areas results in increased water quality impacts (due to greater sediment disturbance, higher percentage of silt/clay, and higher concentrations of contaminants), Alternative 6 was selected as the preferred alternative.

Alternative 8

As described above, Alternative 8 was developed in response to NYSDEC concerns specific to areas believed to contain high abundances and densities of hard clam. This alternative is 23.42 miles long and is similar to the preferred Alternative 6. Alternative 8 minimizes the crossing length of areas considered by NYSDEC to be valuable based on qualitative data, including historic reports from clam harvesters. Like Alternative 6, this route crosses a NYSDEC hard clam transplantation program harvest area. Although this area is not currently harvested, NYSDEC has indicated that harvest may resume in the future.

As described above, the benthic grab survey show no statistical difference in shellfish density (95% confidence) in hard clam density between Alternative 6 and Alternative 8 (see Table 3.2-10). However, as Alternative 8 crosses designated anchorage areas for 1.70 miles, approximately 0.94 mile longer than the preferred alternative, Alternative 8 would require a greater depth of cover over a longer portion of the pipeline, which would result in greater water quality impacts (due to greater sediment disturbance, higher percentage of silt/clay, and higher concentrations of contaminants), more vessel emissions, and an increased potential for long-term impacts on navigation and commerce. Therefore, Alternative 8 was not selected as the preferred alternative.

Table 3.2-10
Descriptive Statistics for Hard Clam Counts for Alternatives 6 and 8

Route	Total	N	Mean	Std Dev.	Size Ratio [a]
8	488	18	27.1	40.7	6.5:1
6	212.7	22	9.7	15.4	2.8:1

Note:
[a] Ratio of individuals <25 mm to >25 mm

Key:
Std. Dev. = standard deviation

4 ABOVEGROUND FACILITY ALTERNATIVES

Transco conducted a detailed hydraulic analysis, as discussed above in Section 2, to determine the need for additional compression to meet the Project's purpose of supplying 400,000 Dth/d of capacity to the Rockaway Transfer Point. Based on the results of the hydraulic analysis, Transco identified the need for additional compression at one existing compressor station in Pennsylvania (Compressor Station 200) and for one new compressor station in New Jersey (Compressor Station 206). The following sections include a description of the various alternatives Transco has evaluated with respect to Compressor Station 206. Compressor Station 200 is located in Pennsylvania and therefore, is not discussed further here.

4.1 Compressor Station 206 Alternatives

Transco used a multi-tiered approach to identify the most suitable site for Compressor Station 206. The siting criteria of engineering constraints, site availability, and natural resources, feed into the tiers outlined below. Recognizing that Compressor Station 206 must be sited in a more urban location based on the results of the system alternatives analyzed, Transco undertook an exhaustive study to identify and evaluate potential compressor station locations.

Siting Envelope

Transco first defined a siting envelope for the location of the compressor station that consisted of two principal steps: (1) identifying through the hydraulic analysis that portion of the existing pipeline system and range of MPs where compression is required, and, (2) finding a suitable property within approximately 0.5 mile of the existing Transco Mainline that could feasibly accommodate a 32,000 ISO hp compressor station (see Figure 12).

The hydraulic analysis that Transco conducted identified the segment of its mainline in New Jersey where the new 32,000 ISO hp Compressor Station 206 needed to be sited to optimize Transco's ability to transport the incremental 400,000 Dth/d Project capacity, in addition to the existing firm shipper entitlements, without resulting in material degradation of delivery pressures at existing delivery points. The results of this analysis confirmed that in order to meet these objectives, the new Compressor Station 206 must be located between MP1780.00 and the Milltown regulator station at MP1790.84.

The hydraulic analysis concluded that locating Compressor Station 206 upstream of MP1780.00 would result in material pressure degradation at existing downstream delivery points. Further, any compressor station location upstream of MP1780.00 would be too close to existing Compressor Station 205, making it difficult to coordinate the operation of the two compressor stations.

The location of Compressor Station 206 cannot be sited farther downstream of the Milltown regulator station at MP1790.84 because this is a system intersection point: It is the location where the Transco Mainline C line diverges from Transco Mainlines A and E and extends to Compressor Station 207 and the LNYBL. If Compressor Station 206 were to be sited downstream of the Milltown regulator station, Transco Mainline C could not be compressed, resulting in material degradation of delivery pressures at meter stations on Transco Mainline C between the Milltown regulator and Compressor Station 207. Further, additional horsepower would be required at Compressor Station 207 to maintain delivery pressures downstream of the compressor station.

Connecting the new compressor station to the existing system will require suction and discharge piping. Operation of this piping would require an approximately 80-foot-wide permanent ROW. Therefore, Transco searched for sites within 0.5 mile of the existing mainline in order to reduce the length of piping, thereby minimizing the amount of associated construction and operational workspace and associated impacts.

Additionally, as pipelines greater than 1,000 feet in length require pigging with internal inspection devices, siting the compressor station more than 1,000 feet from the mainline would require Transco to construct a new pig launcher and pig receiver with a valve setting at the location where the piping intersects the mainline and at the compressor station site. Installing a pig launcher and receiver would require an additional 1 acre of temporary and permanent workspace at the interconnection point with the mainline.

Transco searched for potential sites between MP1780.00 and MP1790.84 that are within 0.5 mile of the existing Transco Mainline and are at least 10 acres in area, the minimum area needed to construct a 32,000 ISO hp compressor station and related ancillary equipment. Based on these factors, Transco identified 39 potential sites, which were then evaluated against the Tier 1 siting criteria described below (see Figure 12 for the sites initially identified by Transco).

Siting Criteria - Tier 1

After defining the siting envelope that would preclude construction of a compressor station, Transco applied Tier 1 siting criteria to the 39 sites depicted in Figure 12:

- **Parcel availability.** Transco researched these parcels to determine if they were available for purchase. In order to search as broadly as possible, Transco's initial list of potential sites included parcels encumbered by Green Acres or owned by the New Jersey Department of Transportation. However, Transco eliminated these parcels as they are either actively committed to an alternative use or are preserved, and therefore would not be readily available for acquisition. Transco also eliminated parcels containing existing structures. Owners of sites with on-site structures were not pursued due to the potential for additional community impacts associated with buying local residences and removing them and their current use for purposes of this Project. (See Figures 13, 14, and 15).
- **Parcel configuration.** The parcel needs to be configured such that it could accommodate an approximate 600-foot by 700-foot footprint, the minimum size required to accommodate a 32,000 ISO hp compressor station and related ancillary equipment (see Figure 16).

After applying the Tier 1 siting criteria, Transco determined that 17 of the 39 sites would not be suitable for development of a compressor station due to lack of availability or issues related to parcel configuration such as size and shape. As such, a total of 22 sites were analyzed further under Tier 2. Figure 17 details the sites remaining within the siting envelope that met the Tier 1 siting criteria.

Siting Criteria - Tier 2

After defining the siting envelope and applying Tier 1 constraints, Transco applied the following Tier 2 siting criteria to 22 remaining parcels:

- **NJDEP Wetlands and Transition Areas.** Transco evaluated these sites to avoid or minimize impacts on NJDEP-mapped wetlands and NJDEP-mapped wetland transition areas/buffers. Figure 18 shows the required 600-foot by 700-foot compressor station footprint and NJDEP mapped wetlands.

Transco considered the presence of wetlands on these sites and sought to reduce impacts to wetlands and waterbodies to the extent practicable and in consideration of the New Jersey Freshwater Wetland Protection Act Rules (New Jersey Administrative Code [N.J.A.C.] 7:7A). Based on this analysis, five parcels with the least potential impact on wetlands based on a review of NJDEP wetland mapping were carried forward. Figure 19 details the sites remaining within the siting envelope that were not eliminated through the Tier 1 and Tier 2 siting analysis identified above. The following section presents Transco's evaluation of these five potential sites to compare the environmental impacts associated with each alternative. See Table 4.1-1, below.

4.1.1 Compressor Station 206 Site Alternatives

Potential Sites

Five potential sites remained after application of the compressor station siting criteria described above (see Tables 4.1-1 and 4.1-2 and Figures 20 through 24). In response to previous consultations with the NJDEP regarding the proposed Project, Transco analyzed the Compressor Station 206 alternative site workspaces to provide an equivalent comparison between the proposed site (Site 3) and the other four potential site alternatives. To enable a more direct comparison between each site, Transco applied the temporary and permanent workspace requirements dictated by the design of Compressor Station 206 at Transco's proposed site, Site 3, to each of the remaining alternative sites. Site 3 has been fully engineered and includes workspaces that present realistic, buildable conditions for a compressor station of this type. Transco used the following additional considerations to further refine the workspace requirements for each of the remaining four sites:

- **Operation workspaces** – Each site alternative required approximately 14 acres of operation workspace, and the workspaces were roughly sited within each parcel to avoid open water and wetland features. Note that the 14-acre operation workspace does not account for the workspace needed for suction and discharge piping, the tie-in to the Transco Mainline, or access roads.
- **Construction workspace** – Each site alternative required approximately 4 additional acres of construction workspace.
- **Access Road** – Access roads for each site alternative were roughly 120 feet wide and extended from the facility itself to the nearest public road, if the site was not immediately adjacent to a public road. It should be noted, that the Site 3 access road workspaces reflects the currently proposed access road incorporating detailed engineering design.
- **Suction and discharge piping** – Suction and discharge piping required an 80-foot-wide permanent ROW from the operation footprint to the existing Transco Mainline. The length varied for each site based on the site alternative's distance from the Transco Mainline.

- **Tie-in to the Transco Mainline** – Approximately 1 acre of land is typically needed at the tie-in location to accommodate the aboveground valve setting that connects the suction and discharge piping with the Transco Mainline. However, additional temporary workspace is required at the tie-in location at Sites 8 and 27 because this tie-in location is adjacent to a bend on the Transco Mainline. Tie-ins can only be installed within straight segments of pipe. This additional temporary workspace (approximately 100 by 80 feet of additional workspace at the tie-in location) is needed to safely accommodate the additional excavation and installation requirements.
- **Pig Launcher and Receiver** – A pig launcher and receiver would be needed at any site alternative where the suction and discharge piping is greater than 1,000 feet in length. The need for pig launcher and receiver facilities increases the temporary and permanent workspace needed by 1 acre, and 0.25 acre, respectively. These additional workspace requirements were applied to Site 8, as this is the only site where the suction and discharge piping length exceeded 1,000 feet.

Also in response to previous consultations with the NJDEP regarding the proposed Project, Transco revised its alternatives analysis to reflect the use of the best available wetland data at each of the five remaining sites. When available, wetland and waterbody delineation data were used first to describe on-site wetland and waterbody impacts, followed by wetland approximation data, and finally, remote sensing data were used where on-site visits were not conducted. The various data sources used and the sites to which each source was applied are described below. See Tables 4.1-1 and 4.1-2, below.

- **Wetland delineation data** – Field biologists conducted wetland surveys in spring–summer 2016 and spring 2019. During field investigations, vegetation, soils, and hydrology were examined for evidence of wetland characteristics in accordance with the methodologies outlined in the USACE Wetlands Delineation Manual (Environmental Laboratory 1987); the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0) (Regional Supplement) (USACE 2010), and the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee on Wetland Delineation 1989), depending on the location. A wetland delineation was conducted within the limits of disturbance (LOD) at Site 3 and within the parcel boundary of Site 2. However, the workspace that would be required for the suction and discharge piping tie-in to Transco's mainline at Site 2 was outside of the originally surveyed area. For this reason, Transco used remote sensing to estimate the potential on-site wetland impacts in this tie-in area associated with Site 2 (see the discussion of remote sensing, below).

- **Letter of Interpretation Data** – On November 3, 2017, Transco filed an Open Public Records Act Record Request for the Full Letter of Interpretation (LOI) for NJDEP Wetlands L.O.I. File No. 1808-05-0002.1 FWW050001, No. 1808-05-0002.2, and No. 1808-05-0002.2 FWW060005TW1, as well as mapping and spatial data to describe the extent of the LOI and/or the survey area boundary and any mapped features. Transco used NJDEP Wetlands LOI issued November 15, 2007, to identify the presence of wetlands and waterbodies at Site 8.
- **Wetland Approximation Data** – An on-site wetland approximation survey was conducted within the parcel boundary of Site 1 to roughly determine the presence, and approximate extent, of wetlands on the site utilizing procedures detailed in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation 1989) as mandated within the New Jersey Freshwater Wetlands Protection Act rules (N.J.A.C 7:7A). This task was designed to "approximate" the location and presence of on-site wetlands. However, the workspace that would be required for the suction and discharge piping tie-in to Transco's mainline was outside of the originally surveyed area. For this reason, Transco used remote sensing to estimate the potential on-site wetland impacts in this tie-in area associated with Site 1 (see the discussion of remote sensing below).
- **Remote Sensing Data** – Transco used the results of its remote sensing exercise (see Attachment 1 for Transco's remote sensing methodology) to identify the presence of wetlands and waterbodies at Site 27. As described above, Transco also used the results of its remote sensing exercise to identify wetlands and waterbodies in previously unsurveyed portions of the Site 1 and 2 workspaces. NJDEP accepted Transco's use of remote sensing methodology in a meeting pertaining to February 27, 2018 meeting with NJDEP, Transco, E & E, and Amy Greene Environmental.

Site 1

Site 1 is a 69.74-acre lot in Franklin Township in Somerset County, New Jersey (see Figure 201). It is located approximately 0.5 mile east of the Trap Rock Quarry and just west of New Jersey Route 27. Site 1 is zoned for agricultural use but is entirely forested.

Transco used wetland approximation data, supplemented by remote sensing data at the suction and discharge piping and valve setting location, to evaluate the approximate wetland impacts associated with construction of the compressor station at Site 1. Based on this evaluation, it was determined that the construction of Compressor Station 206 at Site 1 would result in 9.43 more acres of permanent wetland impacts than construction of the compressor station at Site 3. See Tables 4.1-1 and 4.1-2, below, and Figure 20 for a comparison of impacts at Sites 1 and 3.

Site 2

Site 2 is a 37.93-acre undeveloped lot located in Franklin Township in Somerset County, New Jersey (see Figure 21). The site is located less than 0.5 mile east of the Trap Rock Quarry, abutting New Jersey Route 27 to the east. Site 2 is zoned for agricultural uses but is entirely forested.

Transco used wetland delineation data, supplemented by remote sensing data at the suction and discharge piping and valve setting location, to evaluate the approximate potential wetland impacts associated with construction of the compressor station at Site 2. Based on this evaluation, it was determined that the construction of Compressor Station 206 at Site 2 would result in 4.13 more acres of permanent wetland impacts than construction of the compressor station at the Site 3.

Further, due to the size and configuration of the property, the compressor station facilities (permanent facility footprint) at Site 2 would need to be constructed within open water features, which are presumed to be jurisdictional under the Flood Hazard Area Control Act. Wherever possible, Transco avoids siting aboveground facilities, including compressor stations, in open water features to avoid ongoing operational challenges associated with stormwater and flooding. Furthermore, open water impacts are regulated under the Freshwater Wetlands Protection Act and separately under the Flood Hazard Area Control Act. Filling a regulated water feature under the Flood Hazard Area Control Act is unlikely to be permitted. N.J.A.C. 7:13-11.1 and 7:13-12.1. See Tables 4.1-1 and 4.1-2, and Figure 21 for a comparison of impacts at Sites 2 and 3.

Site 3

Site 3 is a 52.34-acre, largely undeveloped lot located in Franklin Township in Somerset County, New Jersey (see Figure 22). It is zoned for rural residential use but is largely forested.

Transco evaluated the potential impacts to sensitive resources and receptors as outlined in Table 4.1-1 and 4.1-2, below. Transco used wetland delineation data to evaluate the wetland impacts associated with Site 3. Through an iterative, detailed engineering process in response to comments by the NJDEP DLUR, Transco initially minimized the impacts to the maximum extent practicable such that the compressor station facility footprint will not impact wetlands or wetland transition areas. In response to NJDEP's November 27, 2019 letter outlining regulatory deficiencies associated with Transco's June 2019 application for a Freshwater Wetlands (FWW) Individual Permit (IP), Transco is proposing an access road on an adjacent parcel to eliminate impacts on wetlands and waterways associated with the previously proposed access road included in Transco's June 12, 2019 FWW IP application (see below and Section 4.2.1 for the access road alternatives analysis). Transco has thereby reduced the impacts associated with Site 3 to 0.85 acre of permanent wetland impacts and 0.15 acres of temporary wetland impacts. All impacts to wetlands and transition areas are now a result of the suction and discharge piping and tie-in to the Transco Mainline in this area. See Figure 22 for impacts on Site 3.

Transco's previous application for a FWW IP, dated June 2019, detailed a number of challenges that would preclude Transco's use of the Higgins Farm access road to access the compressor station site including: (1) a deed of easement restricting the development of non-agricultural land uses on the property; (2) EPA concerns regarding Transco's use of the Higgins Farm access road as a permanent means of access to the compressor station; (3) potential issues associated with contamination related to the Higgins Farm Superfund Site, as described below; and (4) uncertainty whether Transco would be able obtain authorization from FERC to use the Higgins Farm access road. However, as described above, in response to NJDEP's November 27, 2019 letter, Transco is now proposing to use and extend the existing Higgins Farm access road on the Higgins Farm Superfund site for the Project (see Figure 22). Transco is seeking authorization from FERC to use the Higgins Farm access road and actively consulting with the EPA.

Site 3, inclusive of the Higgins Farm access road, was previously identified as having potential groundwater contamination on a small portion of the site. A Phase I Environmental Site Assessment of Site 3 was conducted in June 2016 (EcolSciences 2016a). The report indicated that one National Priorities List (NPL) site, Higgins Farm Superfund site, is located immediately adjacent (west) to the property and is impacting the groundwater on the northwestern edge of Site 3 and the parcel on which the Higgins Farm access road is located.

The Phase I Environmental Site Assessment of Site 3 included details from the most recent (March 11, 2016) monitoring report, Semi-Annual Groundwater Monitoring Report, Quarters 3 and 4, 2015, Higgins Farm Superfund site, Franklin Township, New Jersey, which indicated that the groundwater contamination is more than 50 feet below ground surface, within the diabase aquifer of the early Mesozoic rock basins of the Piedmont Physiographic Province possibly contaminating surrounding soils (Herman et al. 1998).

Higgins Farm Superfund site has an active groundwater extraction and treatment system with several groundwater extraction wells installed around its perimeter, and four additional groundwater monitoring wells are located on Site 3. The groundwater treatment system limits further migration of contaminated groundwater, while actively reducing contaminant levels. The Phase I report indicates that the groundwater is actively managed and therefore soil contamination potential is reduced (EcolSciences 2016a).

Transco conducted a Phase II Investigation in Fall 2016. The Phase II included a geophysical survey to locate potential underground storage tanks and other buried features and collection of soil and groundwater samples to evaluate subsurface conditions. The geophysical survey did not reveal any targets of interest. Data obtained from soil and groundwater samples did not indicate the presence of contamination that may pose a risk or impact the Project (EcolSciences 2016b and 2016c).

The Higgins Farm Superfund site is not likely to pose a concern for the development of the compressor station facility and suction and discharge piping at Site 3, given that the extent of groundwater contamination is known, being actively monitored, collected, and treated; monitoring by the EPA is ongoing; the depth of contamination is deeper than would be required by proposed facilities, and the location that the pipeline and compressor station would tie into is at the southern tip of the property, which is outside the contaminated groundwater plume. Construction and operational workspaces are also outside the contaminated groundwater plume.

To prevent the spread of contamination and protect the existing institutional controls associated with the Higgins Farm Superfund Site during construction and expansion of the Higgins Farm access road, Transco will follow their Unanticipated Discovery of Contamination Plan which outlines practices Transco will employ in the event of an unanticipated discovery of contamination in soil, groundwater, or sediment when excavating during construction and/or maintenance activities. Additionally, Transco will conduct soil sampling during mobilization for construction efforts associated with the Higgins Farm access road to the anticipated depths of excavation in order to characterize onsite soils and identify and delineate contaminated soils, if present. Based on the results of the soil sampling, Transco will dispose of excavated soils in accordance with all applicable regulatory requirements and will backfill excavated areas with clean fill material. Site sampling and disturbance of soils found to contain contaminants will be performed by workers equipped and/or certified with the appropriate level of Occupational Safety and Health Administration (OSHA) training (e.g., Hazardous Waste Operations and Emergency Response program certification). Transco will develop and implement a site-specific Health and Safety Plan including worker exposure monitoring provisions during construction. In the event that contaminated soils are uncovered, Transco will coordinate with NJDEP and EPA regarding site remediation and soil disposal activities.

In summary, Site 3 allows for the construction of the compressor station and ancillary equipment while minimizing impacts on regulated and sensitive environmental resource areas as well as on residential areas. As such, Site 3 is Transco's proposed site for Compressor Station 206. As described above, since site selection, Transco has refined the placement for the compressor station footprint and workspaces within the site and has identified the location for the access road and tie-in facilities that are required for development of the compressor station and connection with the Transco Mainline system. The impacts presented in Transco's Application for a Freshwater Wetlands Individual Permit and Flood Hazard Area Individual Permit and Verification describe those associated with this refined compressor station footprint and requirements.

Site 8

Site 8 is a 41.02-acre lot located in Township of South Brunswick in Middlesex County, New Jersey (see Figure 23). As described above, Transco used NJDEP Wetlands LOI (file number 1808-05-0002.1 FWW05001) data on a property boundary plat indicating the presence of wetlands, transition areas, and open water features, which are presumed to be jurisdictional under the Flood Hazard Area Control Act. Transco supplemented these data with remote sensing data at the suction and discharge piping and valve setting location, to evaluate the approximate potential wetland impacts associated with construction of the compressor station at Site 8. Based on this evaluation, it was determined that the construction of Compressor Station 206 at Site 8 would result in 0.42 more acres of permanent wetland impacts than Site 3.

However, similar to Site 2, due to the size and configuration of the property, the compressor station facilities (permanent facility footprint) at Site 8 would need to be constructed within open water features, which are presumed to be jurisdictional under the Flood Hazard Area Control Act. As described above for Site 2, Transco has sought to avoid siting the compressor station facilities within a regulated open water feature to reduce potential stormwater management issues and because of potential permitting challenges under the Flood Hazard Area Control Act. See Tables 4.1-1 and 4.1-2, below, and Figure 23 for a comparison of impacts at Sites 8 and 3.

In addition, Site 8 would result in substantially greater impacts to wetland transition areas when compared with Site 3. Specifically, Site 8 would permanently impact 11.53 acres of wetland transition areas, whereas Site 3 would only impact 0.48 acres. Similarly, Site 8 would result in over 2 acres of temporary impacts to transition areas, whereas Site 3 would only impact 0.45 acres.

Further, Site 8 is not contiguous with Transco's existing mainline, and would require a minimum of 2,000 feet of suction and discharge piping to tie into the mainline. As discussed above, pigging equipment is required on piping more than 1,000 feet long (see Table 4.1-1, below). Due to the location of Site 8 relative to the mainline, increased impacts associated with the launch/receiver facility to forested wetlands and/or residential areas would occur. As such, Site 8 was not carried forward for consideration.

Site 27

Site 27 is a 25.96-acre lot located in the township of Franklin Township in Somerset County, New Jersey (see Figure 24). Transco used remote sensing data to evaluate the approximate potential wetland impacts associated with Site 27. Based on this evaluation, it was determined that the construction of Compressor Station 206 at Site 27 would result in 4.90 more acres of permanent wetland impacts than Site 3. See Tables 4.1-1 and 4.1-2, below, and Figure 24 for a comparison of impacts at Sites 27 and 3.

Additionally, 21 residences are within 0.25 mile of the site. Transco would also need to route suction and discharge piping on the parcel directly south of Site 27. Due to the location of Site 27 relative to the mainline, increased impacts associated with the launch/receiver facility to forested wetlands and their wetland transition areas and/or residential areas would occur. The valve setting would be located less than 0.10 mile from an existing residence. As such, Site 27 was not carried forward for consideration.

Table 4.1-1
Primary Distinguishing Factors for Compressor Station 206 Site Alternative Comparison

Criteria	Unit	Site Alternative[a]				
		1	2	3	8	27
Total Temporary Impacts Wetlands[a,c]	acres	-	-	0.15	0.11	0.11
PEM	acres	-	-	0.15	0.11	0.11
PSS	acres	-	-	-	-	-
PFO	acres	-	-	-	-	-
Total Permanent Impacts Wetlands[a,c]	acres	10.28	4.98	0.85	1.27	5.75
PEM	acres	0.07	-	0.31	0.93	0.61
PSS	acres	-	-	-	-	-
PFO	acres	10.22	4.98	0.54	0.34	5.14
Temporary Impacts Wetland Transition Area (150-foot) [a, b]	acres	-	2.77	0.45	2.08	1.16
Permanent Impacts Wetland Transition Area (150-foot) [a, b]	acres	-	6.36	0.48	11.53	7.90
Temporary Impacts Wetland Transition Area (50-foot) [a, b, c]	acres	-	-	-	-	-
Permanent Impacts Wetland Transition Area (50-foot) [a, b, c]	acres	5.27	-	-	-	-
Temporary Impacts Waterways[a]	acres	-	0.15	-	-	-
Permanent Impacts Waterways[a]	acres	0.04	0.16	-	-	-
Temporary Impacts Waterbodies[a]	acres	-	-	-	-	-
Permanent Impacts Waterbodies[a]	acres	0.01	-	-	0.06	-
Number of Residences within 0.25 Mile of Site center	count	0	0	0	18	19
Number of Residences within 0.25 Mile of all Workspaces	count	88	58	12	56	47
Distance to Nearest Noise Sensitive Area (Residence)	feet	1,479	1,533	2,319	431	584
Direction to Nearest Noise Sensitive Area (Residence)	-	ESE	ESE	NNW	SSE	SSE

[a] Utilized the best available waters/wetland data. Site 1 utilized waters/wetland approximation data (Ecolsciences 2016d). Site 2 and Site 3 utilized waters/wetland jurisdictional delineation data (Ecolsciences 2016e and 2016a). Site 8 utilized LOI and remote sensed wetland data. Site 27 utilized remote sensed data.

[b] Assumed the maximum potential buffer for the State of New Jersey of 150 feet.

[c] Totals may not sum precisely due to rounding errors

Key:
- ESE = east-southeast
- LOI = Letter of Interpretation
- NNW = north-northwest
- PEM = palustrine emergent
- PFO = palustrine forested
- PSS = palustrine scrub/shrub
- SSE = south-southeast

Table 4.1-2
Compressor Station 206 Site Alternative Comparison

Criteria	Unit	Site Alternative[a]				
		1	2	3	8	27
Parcel Size	acres	69.78	37.95	52.37	41.04	25.98
Parcel Availability	-	Vacant	Vacant	Vacant	Vacant	Vacant
Construction Workspace	acres	4.02	4.06	2.51	5.45	4.32
Operation Workspace	acres	19.65	15.45	18.95	20.05	16.46
Approximate Tie-In Pipe Length	feet	629	199	445	1,802	769
Length of Access Road	feet	1,347	55	3,032	490	88
Temporary Impacts Forested Land	acres	0.00	0.00	0.00	0.00	0.00
Permanent Impacts Forested Land	acres	22.04	19.48	13.29	22.96	18.34
Total Temporary Impacts Wetlands[a, f]	acres	-	-	0.15	0.11	0.11
PEM	acres	-	-	0.15	0.11	0.11
PSS	acres	-	-	-	-	-
PFO	acres	-	-	-	-	-
Total Permanent Impacts Wetlands[a, f]	acres	10.28	4.98	0.85	1.27	5.75
PEM	acres	0.07	-	0.31	0.93	0.61
PSS	acres	-	-	-	-	-
PFO	acres	10.22	4.98	0.54	0.34	5.14
Temporary Impacts Waterways[a]	acres	-	0.15	-	-	-
Permanent Impacts Waterways[a]	acres	0.04	0.16	-	-	-
Temporary Impacts Waterbodies[a]	acres	-	-	-	-	-
Permanent Impacts Waterbodies[a]	acres	0.01	-	-	0.06	-
Temporary Impacts Waterway/Waterbodies Riparian Buffer (50-foot)[a]	acres	-	1.48	-	-	-
Permanent Impacts Waterway/Waterbodies Riparian Buffer (50-foot)[a]	acres	0.89	1.43	-	0.29	-
Temporary Impacts Wetland Transition Area (150-foot)[a, b]	acres	-	2.77	0.45	2.08	1.16
Permanent Impacts Wetland Transition Area (150-foot)[a, b]	acres	-	6.36	0.48	11.53	7.90
Temporary Impacts Wetland Transition Area (50-foot)[a, b, c]	acres	-	-	-	-	-

Table 4.1-2
Compressor Station 206 Site Alternative Comparison

Criteria	Unit	Site Alternative[a]				
		1	2	3	8	27
Permanent Impacts Wetland Transition Area (50-foot) [a, b, c]	acres	5.27	-	-	-	-
Temporary Impacts NHD Waterbody	acres	-	-	-	-	-
Permanent Impacts NHD Waterbody	acres	-	-	-	0.08	-
Temporary Impacts NHD Stream	feet	-	-	-	-	-
Permanent Impacts NHD Stream	feet	81	-	-	-	-
Temporary potential NJDEP Vernal pool habitat [d]	acres	-	-	-	5.08	1.11
Permanent potential NJDEP Vernal pool habitat [d]	acres	0.20	0.86	-	15.92	-
Temporary Impacts FEMA Flood Hazard Area	acres	-	-	-	-	-
Permanent Impacts FEMA Flood Hazard Area	acres	0.27	-	-	-	-
Temporary Impacts FEMA Flood Hazard Area Buffer (100-foot)	acres	0.01	0.04	-	-	-
Permanent Impacts FEMA Flood Hazard Area Buffer (100-foot)	acres	0.76	-	-	-	-
Temporary Impacts NJDEP Landscape Project Rank 1 Habitat[c]	acres	4.02	4.06	2.07	5.09	3.96
Permanent Impacts NJDEP Landscape Project Rank 1 Habitat [c]	acres	17.77	15.41	13.80	16.08	14.85
Temporary Impacts NJDEP Landscape Project Rank 2 Habitat [c]	acres	-	-	-	-	-
Permanent Impacts NJDEP Landscape Project Rank 2 Habitat [c]	acres	-	-	-	0.08	-
Temporary Impacts Prime Farmland [e]	acres	4.02	-	2.03	4.88	4.29
Permanent Impacts Prime Farmland [e]	acres	6.12	-	18.37	20.01	16.43
Impacts to Local, State, or Federal Lands and Parks and Recreation areas	acres	-	-	-	-	-
Impacts to Conservation Easements and Green Acres	acres	0.00	0.00	0.00	1.74	0.00
Number of Residences within 0.25 Mile of Site Center	count	2	25	0	32	38
Number of Residences within 0.25 Mile of all Workspaces	count	88	58	12	56	47

Table 4.1-2
Compressor Station 206 Site Alternative Comparison

Criteria	Unit	Site Alternative[a]				
		1	2	3	8	27
Distance to Nearest Noise Sensitive Area (Residence)	feet	1,479	1,533	2,319	431	584
Direction to Nearest Noise Sensitive Area (Residence)	-	ESE	ESE	NNW	SSE	SSE

[a] Utilized the best available waters/wetland data. Site 1 utilized waters/wetland approximation data (EcolSciences 2016d). Site 2 and Site 3 utilized waters/wetland jurisdictional delineation data (EcolSciences 2016e and 2016a). Site 8 utilized LOI data. Site 27 utilized remote sensed data.

[b] Assumed the maximum potential buffer for the State of New Jersey of 150 feet for alternatives 2, 3, 8 and 27 per note c below and a 50 foot buffer for Site 1.

[c] No critical habitat for state or federally listed threatened or endangered species is present on any of the five sites. The following layers were examined using the NJ-GeoWeb: Landscape Project Version 3.3 – Species Based Habitat (SBH) – Piedmont Plains; Natural Heritage Priority Sites; and Natural Heritage Grid Map. However, an accepted report in May of 2019 of the state-threatened barred owl at Site 3 has resulted in the classification of the PFO wetlands at Site 3 as "exceptional resource value". Transco applied the methodology used by New Jersey Landscape Project to identify the area of potentially suitable habitat. When the barred owl sighting is added to the Landscape Project, Transco expects NJDEP will apply the same methodology to identify suitable foraging habitat in this area. In Appendix V of the New Jersey Landscape Project, Version 3.3, 20 different Land Use / Land Classification types have been identified as potentially suitable habitat for the barred owl. Additionally, the appendix notes that the patches should be contiguous as barred owls tend to reside in larger forest patches. The Landscape Project also identifies upland forest types as potentially suitable habitat. Using these methods, Transco determined that the total contiguous area of potentially suitable barred owl habitat surrounding the Compressor Station 206 site is more than 800 acres. Compressor Station 206 alternative Sites 2, 8, and 27 also occur within the contiguous habitat area, and as such constitute suitable barred owl foraging habitat and for the purposes of this evaluation are considered "exceptional resource value". Per N.J.A.C. 7:7A-3.2, exceptional resource value wetlands warrant a transition area of 150 feet. Site 1 is outside of the defined contiguous habitat is was therefore assigned a 50-foot transition area.

[d] Data from NJDEP recognizes the mapped area as "potential vernal habitat area." This does not necessarily suggest that these areas are or contain vernal pools. Data from NJDEP indicate that 14.40 acres of NJDEP mapped potential vernal habitat would be permanently impacted by operation of Site 3 and 2.51 acres of NJDEP mapped potential vernal habitat would be temporarily impacted by construction of Site 3. However, during field surveys at Site 3, vernal pools were identified adjacent to Compressor Station 206 Site 3 survey corridor, but none were identified within the proposed Limits of Disturbance/footprint.

[e] Prime farmland acreages are based on soil survey geographic database (SSURGO) mapping and potentially do not reflect the current land use conditions.

[f] Totals may not sum precisely due to rounding.

Key:

ESE = east-southeast
FEMA = Federal Emergency Management Agency
LOI = Letter of Interpretation
NHD = National Hydrography Dataset
NJDEP = New Jersey Department of Environmental Protection
NNW = north-northwest
PEM = palustrine emergent
PFO = palustrine forested
PSS = palustrine scrub/shrub
SSE = south-southeast

4.1.2 Conclusion

The regulations implementing the Freshwater Wetlands Protection Act provide, in relevant part, that "[t]he Department shall issue an individual freshwater wetlands or open water fill permit only if the regulated activity...[h]as no practicable alternative which would…have a less adverse impact on the aquatic ecosystem or would not involve a freshwater wetland or State open water; and [t]he alternative would not have other significant adverse consequences, that is, it shall not merely substitute other significant environmental consequences for those attendant to the original proposal" (N.J.A.C. 7:7A-10.2(b)). Based on the workspaces and impact calculations described in Table 4.1-1 and 4.1-2, above, the construction of Compressor Station 206 at Sites 1, 2, 8, or 27 would result in more permanent impacts to wetlands than at Site 3. Further, construction of Compressor Station 206 at Site 2 or 8 would require constructing aboveground facilities in an open water feature, thereby resulting in the permanent filling of an open water feature, which is unlikely to be permitted under the Flood Hazard Area Control Act. N.J.A.C 7:13–11.1 and 7:13–12.1. Both Site 2 and 8 would also involve substantially greater impacts (permanent and temporary) to wetland transition areas when compared to Site 3. For these reasons, Transco has selected Site 3 as its proposed site for Compressor Station 206, as there is no practicable alternative that would have lesser impacts on freshwater wetlands or State open waters.

4.2 Compressor Station 206 Ancillary Facilities

4.2.1 Access Road Siting Alternatives

Transco considered three permanent access road alternatives for Compressor Station 206. The proposed access road (Higgins Farm access road) would run along (and beyond) the existing EPA Superfund access road off Highway 518 located in the Township of Franklin, designated as Block 5.02, Lot 26.01 on the official Tax Map of the Township of Franklin. The Trap Rock access road alternative ("Trap Rock access road") is located on the Trap Rock property and would also be connected to Georgetown Franklin Turnpike. The third access road would utilize an existing ROW (the "Trap Rock ROW").

4.2.1.1 Trap Rock Access Road

The Trap Rock access road was Transco's preferred access road alternative due to the legal constraints associated with the Higgins Farm access road presented in its previous applications to NJDEP for a Freshwater Wetlands Individual Permit. However, in light of NJDEP's November 27, 2019 letter outlining regulatory deficiencies associated with Transco's June 12, 2019 applications, Transco is now seeking authorization from FERC to use the Higgins Farm access road. If authorization from FERC is received, Transco will need to obtain the necessary rights to the Higgins Farm access road. Given the Deed of Easement held by the Township of Franklin, Transco will likely need to file a condemnation action to acquire the necessary access road easement. The Trap Rock access road would result in greater freshwater wetland, transition area, and open water impacts relative to the Higgins Farm access road (see Table 4.2-1 below). As such, the Trap Rock access road is no longer the preferred access road. However, if the FERC denies Transco's request to use the Higgins Farm access road, or if Transco is unable to obtain the necessary access road easement through condemnation, then the Trap Rock access road would be the only practicable alternative with the least impacts to freshwater wetlands. Should this occur, Transco has provided an Abbreviated Environmental Report for NJDEP FWW IP and FHA IP describing impacts to regulated features associated with the Trap Rock access road in Attachment 3 and 4, respectively.

4.2.1.2 Trap Rock ROW Access Road

Transco considered its existing ROW (the "Trap Rock ROW") as an access road alternative and assessed the practicability of this access with respect to wetland and waterbody impacts, engineering considerations, construction and operational logistics, and the ability to accomplish the overall project purpose per N.J.A.C. 7:7A-10.2 and 7:7A-10.3. See Figure 27 for a depiction of this alternative. Transco did not consider access along the adjacent Sunoco ROW as it is unlikely that Sunoco would allow permanent access to Transco's facility utilizing their ROW. After assessing the alternative access road footprint with respect to the location of the proposed tie-in facility, the location of existing mapped wetlands and state open waters, the additional engineering considerations to construct the alternative access road situated on top of and adjacent to existing pipelines, Transco determined that the alternative access road was not a practicable alternative. Furthermore, Transco has made reasonable attempts to identify, remove, and accommodate these constraints associated with the alternative access road as summarized below.

Upon further review, the alternate access road would have to be routed around the tie-in facility, increasing overall wetland impacts to approximately 6.75 acres. The 6.75 acres of wetland impact along the alternate access road is a conservative impact estimate based on a minimum 85-foot wide corridor and assumes utilities could be placed under the road. The current proposed access road will result in no impacts to wetlands. (Table 4.2-1).

Additional detailed engineering design could result in some areas of impact reduction within that 85-foot wide corridor, and would likely result in areas of greater impact due to site-specific conditions. As previously mentioned, Transco determined that the alternate access road would have to be routed around the tie-in facility to reach the compressor station, further increasing wetland impacts by approximately 0.70 acres.

Transco identified a limited milepost range along Mainlines A and C where the tie-in facility could be sited. The tie-in assembly can only be installed into straight segments of pipe; therefore siting the tie-in assembly upstream (northeast) of where currently proposed is not possible due to the presence of bends in Mainlines A and C. Siting the tie-in assembly downstream (southwest) would increase the length of suction and discharge piping and associated wetland impacts and would not eliminate the need for the alternate access road to be routed around the tie-in facility.

Additional site-specific conditions that would impact the width of the alternate access road include the presence Transco's Mainlines A and C, over which the alternate access road would have to be constructed. Additionally, a Sunoco pipeline is located adjacent to the Transco ROW. The presence of these large-diameter utilities presents a constructability consideration that would likely result in additional workspace needs beyond the assumed 85-foot corridor. Specific constructability considerations include the following:

- Underground utilities likely could not be placed under the road due to the presence of existing infrastructure (existing pipelines).
- An access road situated on top of existing large-diameter pipelines would require a larger corridor to construct a stable base between the existing pipelines and the access road, especially in wetlands.
- An access road situated on top of existing pipelines impedes access to the pipeline for routine maintenance activities such as anomaly digs or replacements. Large excavations are required for inspection of large-diameter pipeline, thus interrupting access to the facility.
- The 85-foot corridor assumption does not account for infrastructure required to meet stormwater requirements, which would be a challenge to install in this area due to the presence of wetlands. Additionally, the topography in the area slopes toward the Sunoco pipeline right-of-way and it is unlikely that Sunoco would allow stormwater controls within their ROW.

Each of these engineering and constructability considerations would expand the road corridor outside of the existing, disturbed ROW, thus increasing overall forested impacts, including forested wetland impacts.

Based on the site-specific conditions described above, field data collected along the Trap Rock ROW demonstrating much of the ROW corridor is wetland, and the additional length of the alternate access road (over 1,100 feet), Transco did not further pursue detailed engineering since the impacts to wetlands would be significantly greater when compared to the proposed access road and the basic project purpose cannot reasonably be accomplished if there is a reduction in the size, scope, or configuration of the alternative access road. In accordance with N.J.A.C 7:7A, Transco has eliminated wetland impacts along the proposed access road for Compressor Station 206. Based on these impact eliminations and an analysis of the alternative access road wetland impacts and construction/operational constraints, Transco has determined that the Trap Rock ROW access road is not a practicable alternative that meets the requirements of N.J.A.C 7:7A-10.2 (b)1 i and ii.

Table 4.2-1
Access Road Alternatives Wetland Impacts

Criteria		Unit	Access Road Alternative[a]		
			Higgins Farm Access Road	Trap Rock Access Road	Trap Rock ROW Access Road
Total Permanent Impacts Wetlands[a,c]		acres	0.00	2.86	6.75
	PEM	acres	0.00	0.47	2.09
	PSS	acres	0.00	0.31	2.97
	PFO	acres	0.00	2.09	1.69

[a] Utilized wetland delineation data

[b] Assumed the maximum potential buffer for the State of New Jersey of 150 feet based on an accepted report in May of 2019 of the state-threatened barred owl at Site 3 which has resulted in the classification of the PFO wetlands at Site 3 as "exceptional resource value". As the alternative access roads occur within the contiguous habitat area, PFO wetlands constitute suitable barred owl foraging habitat and for the purposes of this evaluation are considered "exceptional resource value".

[c] Totals may not sum precisely due to rounding errors

Key:
PEM = palustrine emergent
PFO = palustrine forested
PSS = palustrine scrub/shrub

4.2.1.3 Conclusion

As set forth above, there are no practicable alternatives to the Higgins Farm access road that would have no impacts on freshwater wetlands, as such Transco has selected the proposed access road as its preferred alternative. However, as noted above, if the FERC denies Transco's request to use the Higgins Farm access road, or if Transco is unable to obtain the necessary access road easement through condemnation, then the Trap Rock access road would be the only practicable alternative with the least impacts to freshwater wetlands.

4.2.1.4 Proposed Access Road Avoidance and Minimization Measures

In response to NJDEP Division of Fish and Wildlife (DFW) Endangered Species and Nongame (ENSP) Program's acceptance of a report of the barred owl (*Strix varia*), which resulted in the reclassification of PFO wetlands as exceptional resource value wetlands, Transco undertook an additional detailed engineering analysis to eliminate the impacts to the exceptional value forested wetland transition areas for construction of Compressor Station 206. As such, Transco has reduced the LOD along the Higgins Farm access road to the maximum extent practicable to eliminate impacts to PFO wetlands by utilizing aboveground power and an alternative water source for Compressor Station 206, eliminating the need for additional underground utilities.

4.2.2 Compressor Station 206 Tie-In Alternatives

Compressor Station 206 is needed to offset the pressure drop associated with transporting the additional volume of natural gas flowing through the pipeline as a result of the Project without negatively impacting service to existing customers. Compressor Station 206 contains suction piping that pulls gas from a natural gas transmission line into the station, where it is compressed, and discharge piping that discharges the compressed gas back into the transmission line. Utility Crossing D (as indicated on the permit plans included as part of Transco's Freshwater Wetlands Individual Permit Application) encompasses the suction and discharge piping and the location where the suction and discharge piping will tie into Transco's existing Mainlines A and C.

Because Transco's Mainlines A and C already exist at this location, the point where suction and discharge piping can be tied in is limited to the existing ROW for these mainlines. Transco determined the potential locations along the Transco Mainline where the tie-in could be sited based on the need to site the tie-in as close to the compressor station facility as possible. Transco identified a limited milepost range (MP1782.50 to MP1782.67) along Mainlines A and C where the suction and discharge piping tie-in could be made (see Figure 25 and 26). This milepost range is dictated by suction and discharge piping length, discussed below, and the presence of a bends in Mainlines A and C upstream (northeast) of MP1782.67. As previously noted, the tie-in assembly can only be installed into straight segments of pipe. Additionally, Mainlines A and C intersect a foreign pipeline at MP1782.72; a tie-in upstream (northeast) of the intersection would require extra workspace, discussed below.

Based on incidental field observations, Transco's field survey crews indicate that much of the ROW where the tie-in would result in suction and discharge piping less than 1,000 feet in length is wetland. As such, the impacts associated with the proposed tie-in location have been limited to the maximum extent practicable, given that the areas around the proposed suction and discharge facilities are also wetland.

As a result of NJDEP's review of Transco's initial permit application for the Project, Transco considered siting the Compressor Station 206 tie-in along Mainlines A and C to the northeast (upstream) of the proposed tie-in location. As discussed above, Mainlines A and C intersect a foreign pipeline at MP1782.72; due to bends in the pipe for this crossing, the closest that Transco would be able to site the tie-in to the compressor station would be near MP1782.77. Because of requirements associated with crossing a foreign pipeline, including installation of the suction and discharge piping below the foreign pipeline to meet minimum depth of cover, additional workspace would be required to construct the tie-in in this location. Based on the results of a remote sensing exercise, Transco anticipates that siting the tie-in at this location would permanently impact 2.43 acres of forested wetlands and 0.48 acre of emergent wetlands (see Figure 26).

In addition to evaluating alternative tie-in locations, Transco has limited the overall wetland impacts associated with the suction and discharge piping and tie-in, to the maximum extent practicable. Typically, the ROW width to install suction and discharge piping ranges from 100 to 120 feet. At Compressor Station 206, Transco has reduced the construction ROW width for "Utility Crossing D" to 80 feet. Additionally, in response to previous consultation with NJDEP, Transco has reduced the impacts of Utility Crossing D by redesigning the suction and discharge piping workspaces to reduce the length from approximately 700 to 550 feet. As described above, locating the tie-in outside of wetlands is infeasible due to the proximity requirements of the tie-in to the compressor station and MP range where the tie-in must be sited. However, although the tie-in was sited within a wetland, the associated workspace was sited in an adjacent upland area, to the maximum extent practicable. Table 4.3-1 presents the wetland impacts between the original design for the proposed "Utility Crossing D," the currently proposed "Utility Crossing D" described in Transco's Freshwater Wetlands Individual Permit Application, and the alternative suction/discharge tie-in.

Table 4.3-1
Wetland Impacts for Compressor Station 206 Tie-in Location

Wetland Impact	Previously Proposed Utility Crossing "D"	Proposed Utility Crossing "D"	Alternative Suction/Discharge Tie-in
Total Temporary Impacts Wetlands (acres)	0.46	0.15	0.18
PEM	0.46	0.15	0.18
PSS	-	-	-
PFO	-	-	-
Total Permanent Impacts Wetlands (acres)	0.78	0.85	2.91
PEM	-	0.31	0.48
PSS	-	-	-
PFO	0.78	0.54	2.43
Total Impacts Wetlands (acres)	**1.24**	**1.00**	**3.09**

Key:
PEM = palustrine emergent
PFO = palustrine forested
PSS = palustrine scrub/shrub

4.2.3 Compressor Station 206 Infiltration Basin Siting

Transco sited the proposed infiltration basin for Compressor Station 206 in accordance with N.J.A.C. 7:8-5.3 and taking into account the existing hydrology of the site in evaluating practicable alternatives. The topography and drainage patterns at the site are such that the majority of the stormwater runoff from the site flows east towards Carters Brook thereby limiting the potential locations where the basin could be sited to the eastern portion of the site. Groundwater sampling of the site indicated that the northeastern portion of the site has a high water table which will not facilitate infiltration. Additionally, Transco's wetland delineation identified the presence of wetlands in the northeastern portion of the site. As such, the potential location for the basin was limited to the general area where it is currently planned. The proposed basin location minimizes direct impacts to wetlands and associated transition areas while accommodating the anticipated volume of stormwater runoff that may be generated by the Project without the need for significant grading and additional impacts that would be necessary if the basin were sited elsewhere within the site.

Additionally, to reduce impacts to exceptional resource value wetland transition areas, Transco undertook additional detailed engineering to further reduce the impacts associated with the siting of the stormwater infiltration basin. Specifically, basing calculations on field-verified soil types and modifying the impervious surfaces within Compressor Station 206 allowed the footprint of the infiltration basin to be further reduced, resulting in no impacts to exceptional value wetland transition areas by the infiltration basin footprint.

4.2.4 Compressor Station 206 Ancillary Facilities Conclusion

Impacts to regulated features associated with the Compressor Station 206 site will occur because of construction and operation of the tie-in of the facility to the existing Transco pipeline in this area. As stated above, no impacts result from the construction and operation of the facility or the access road and Transco has undertaken a number of refinements to eliminate or reduce impacts to regulated features located in areas of the ancillary facilities within the Compressor Station 206 footprint.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

NEW JERSEY ALTERNATIVES ANALYSIS

FIGURES

NORTHEAST SUPPLY ENHANCEMENT PROJECT

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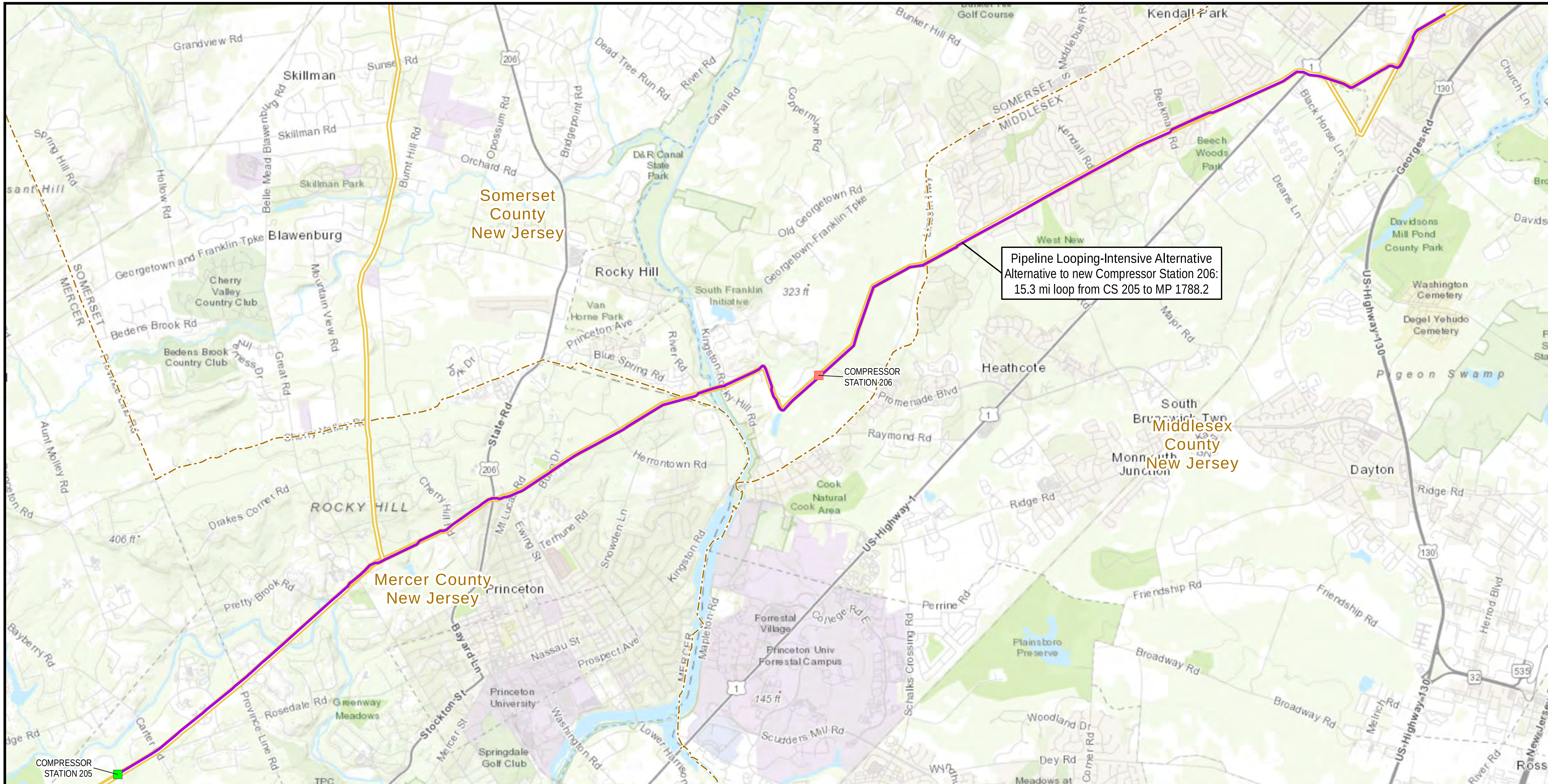

Legend

- Existing Compressor Station
- Proposed Compressor Station
- Pipeline Looping-Intensive Alternative
- Existing Transco Pipeline
- County Boundary

N

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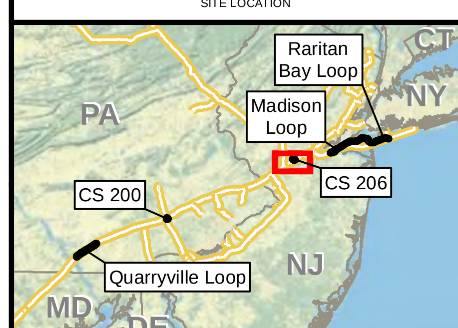
Miles

SITE LOCATION



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B	5/24/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
PIPELINE LOOPING-INTENSIVE ALTERNATIVE
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams.

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:57,404
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 1	SHEET 1 OF 1
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Data Sources: Williams 2018; E&E 2018; ESRI 2012, 2018

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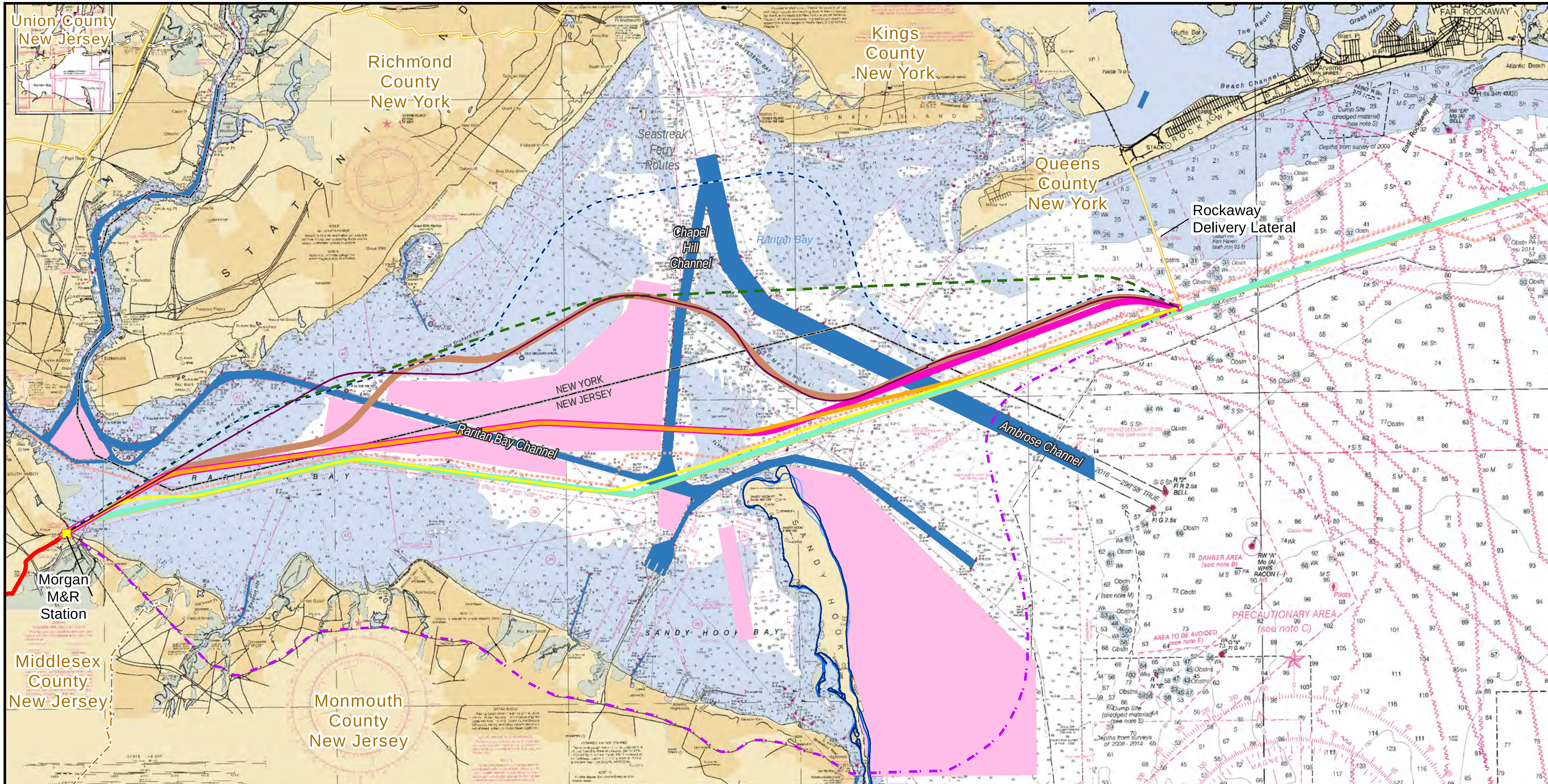

Legend

- Existing Meter & Regulating Station

Raritan Bay Alternatives

- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5
- Alternative 7
- Alternative 8
- Alternative 6 (Preferred Raritan Bay Loop)
- Proposed Pipeline: Madison Loop
- Lower NY Bay Lateral line (LNYBL)
- Neptune Cable
- Existing Transco Pipeline
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Sandy Hook Coastline - 2012
- Sandy Hook Coastline - 2007
- Sandy Hook Coastline - 2002
- Maintained Navigation Channel
- Anchorage Areas

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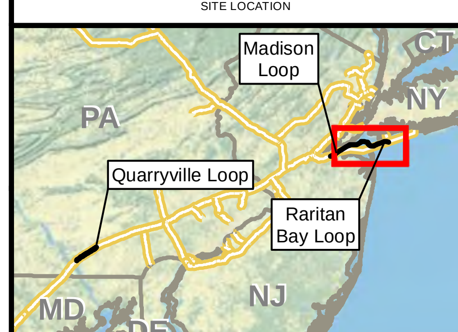
Miles

SITE LOCATION



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C	5/25/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
D	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVES
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

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WO: 1000891		3:15 PM	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NJDEP 2002, 2007, 2012.

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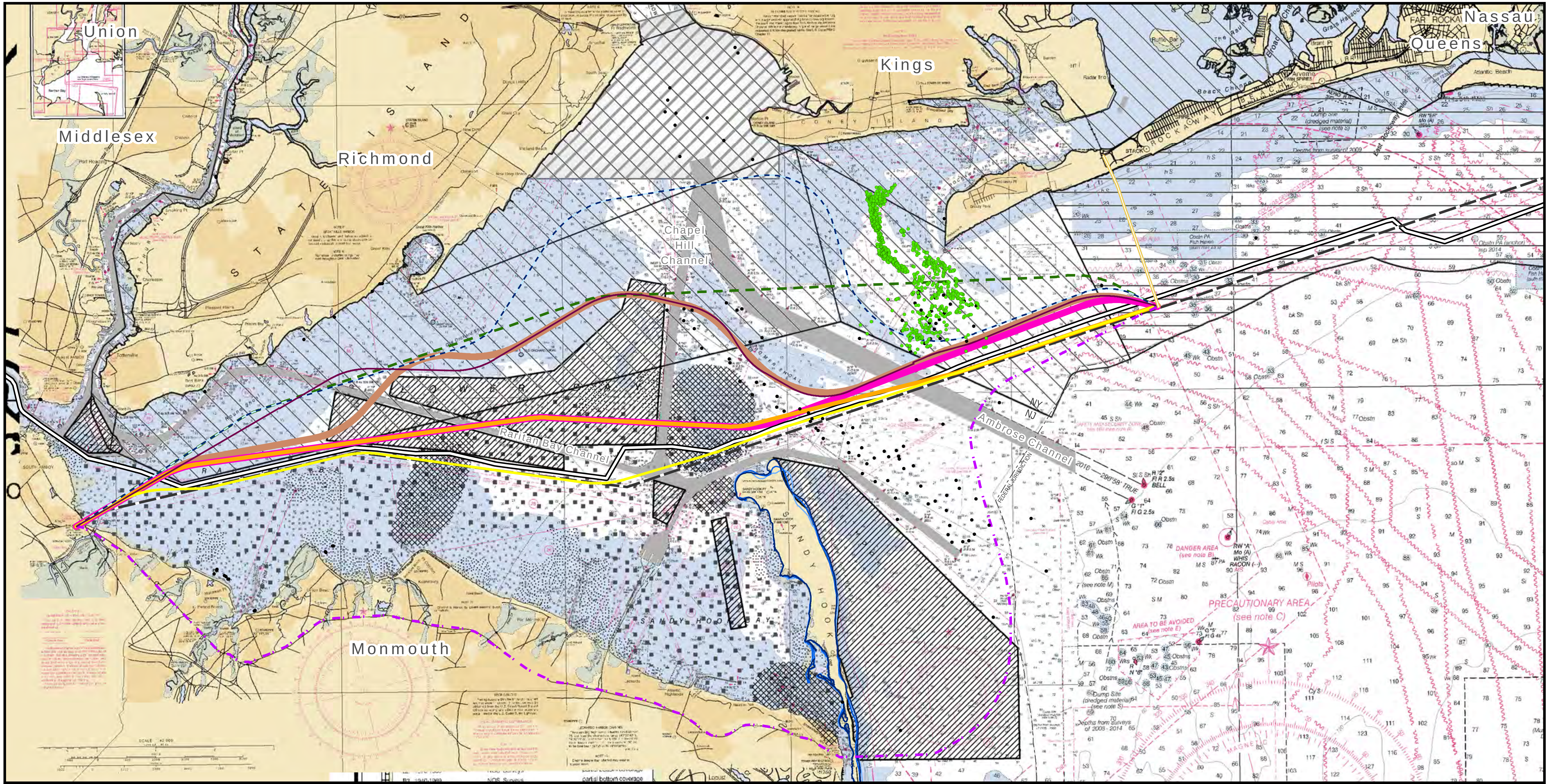


Legend

- Outcropping Rocks
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

Raritan Bay Alternatives

- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4
- Alternative 5
- Alternative 7
- Alternative 8
- Alternative 6 (Preferred Raritan Bay Loop)
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)
- Sandy Hook Coastline - 2002
- Sandy Hook Coastline - 2007
- Sandy Hook Coastline - 2012
- Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)

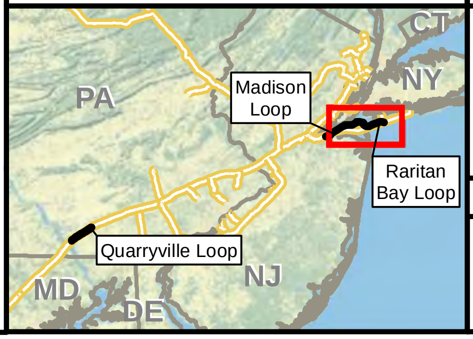
NJ DEP Hard Clam Relative Abundance (2014)

- High
- Moderate
- Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line

0 1 2
Miles

N

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-6

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP CONSTRAINTS
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

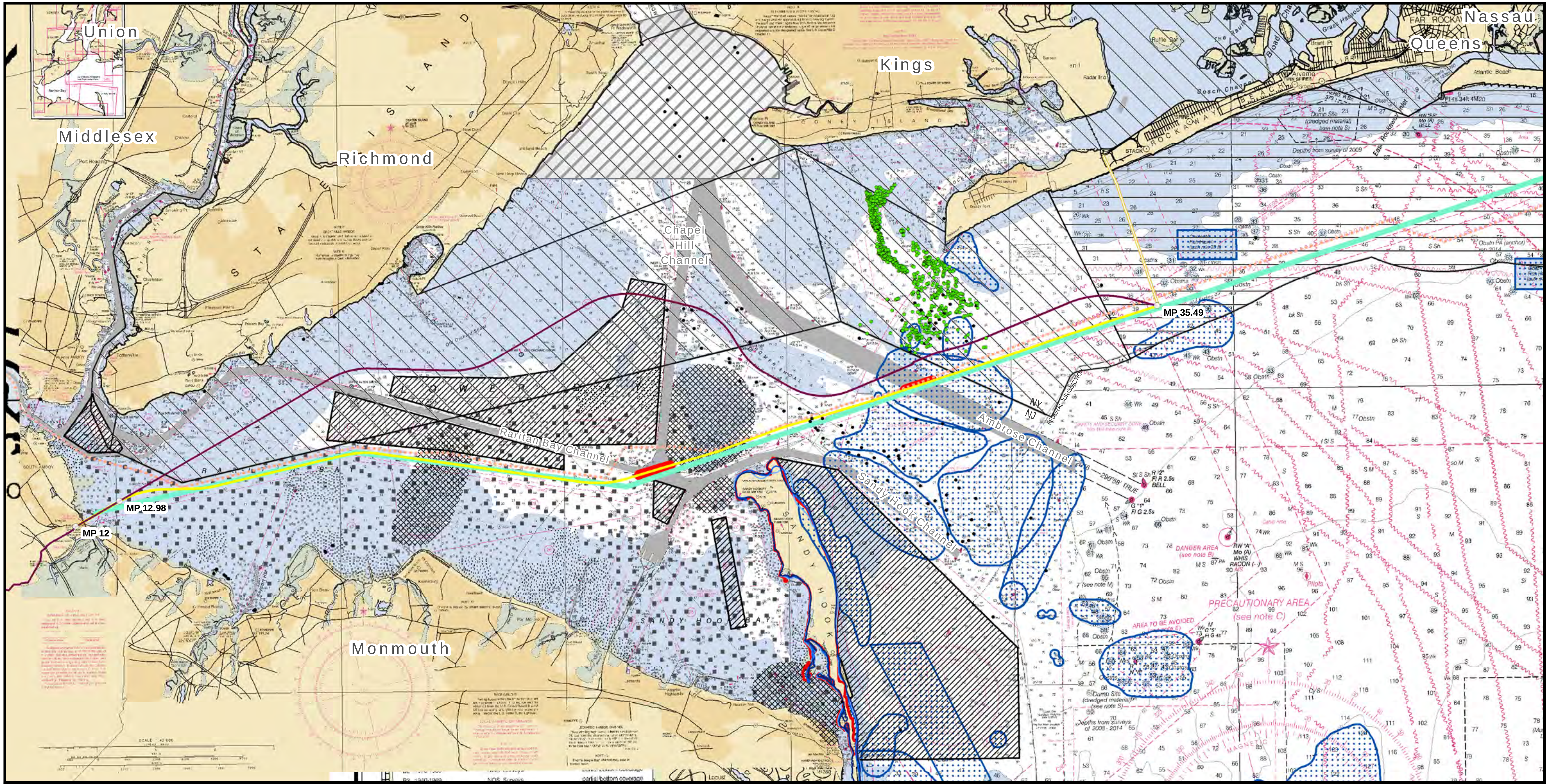
Williams.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:119,468
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 3	SHEET 1 OF 1
WO: 1000891		3:17 PM 1/3/2020	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2002, 2007, 2012, 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NYS DEC 2015

L:\Buffalo\Williams_NYRE\Map\MXDs\Permit_Request\2020_01_03_NJDEP_Resubmission_AltsAnalysis\3_RaritanBayLoop_Constraints.mxd



Legend

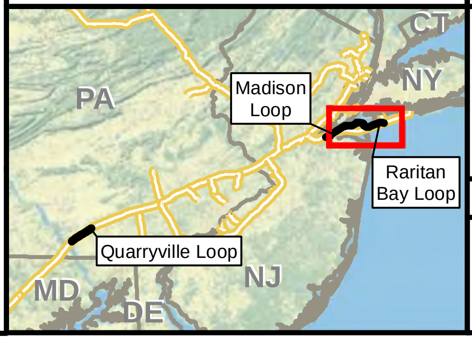
- Milepost
- Preferred Raritan Bay Loop Route
- Alternative 1
- Lower NY Bay Lateral line (LNYBL)
- Neptune Cable
- Navigation Channel Crossings
- Sandy Hook Coastline - 2002
- Sandy Hook Coastline - 2007
- Sandy Hook Coastline - 2012
- Rockaway Delivery Lateral
- Sandy Hook
- Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
  - High
  - Moderate
  - Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Outcropping Rocks
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

N

0 1 2
Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-7

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 1
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:119,487
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 4	SHEET 1 OF 1
WO: 1000891		3:21 PM 1/3/2020	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2002, 2007, 2012, 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NYS DEC 2015

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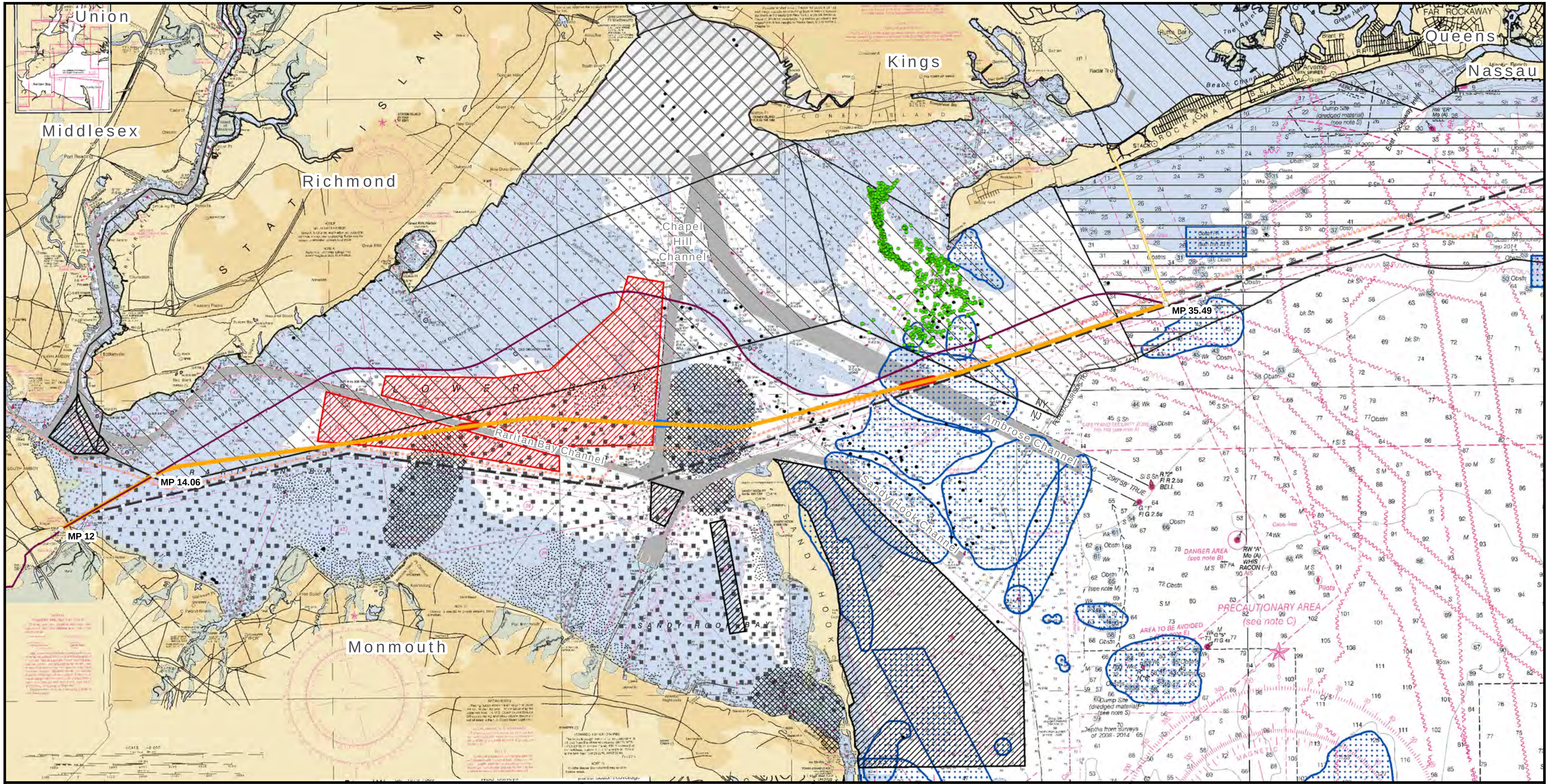


Legend

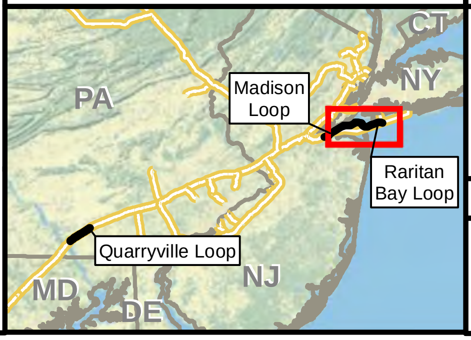
- Milepost
- Preferred Raritan Bay Loop Route
- Alternative 2
- Neptune Cable
- Navigation Channel Crossings
- Chapel Hill Crossing
- Rockaway Delivery Lateral
- Lower NY Bay Lateral line (LNYBL)
- Anchorage Areas Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
  - High
  - Moderate
  - Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Outcropping Rocks
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

N

0 1 2
Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-8

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 2
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 5 3:34 PM 1/3/2020	SHEET 1 OF 1
WO: 1000891			

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NYS DEC 2015

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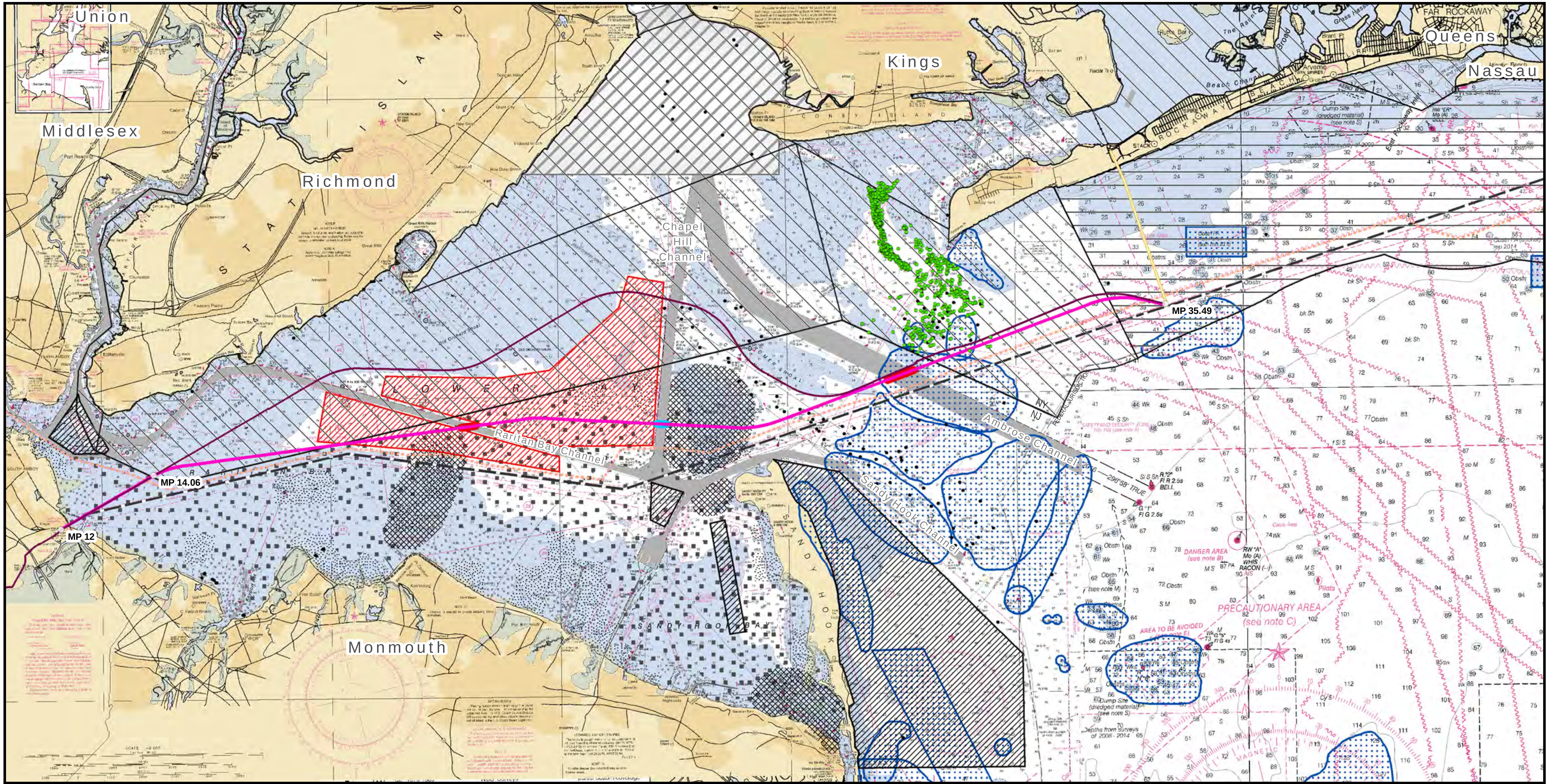


Legend

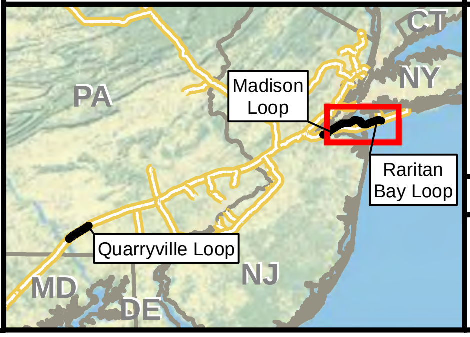
- Milepost
- Outcropping Rocks
- Preferred Raritan Bay Loop Route
- Alternative 3
- Neptune Cable
- Navigation Channel Crossings
- Chapel Hill Crossing
- Rockaway Delivery Lateral
- Lower NY Bay Lateral line (LNYBL)
- Anchorage Areas Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
- High
- Moderate
- Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

Features identified in red highlight constraints.

N

0 1 2
Miles

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-9

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 3
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000	
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20	
APPROVED BY:	DATE:	DRAWING NUMBER: 3:36 PM 1/3/2020	FIGURE 6	SHEET 1 OF 1
WO: 1000891				

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NYS DEC 2015

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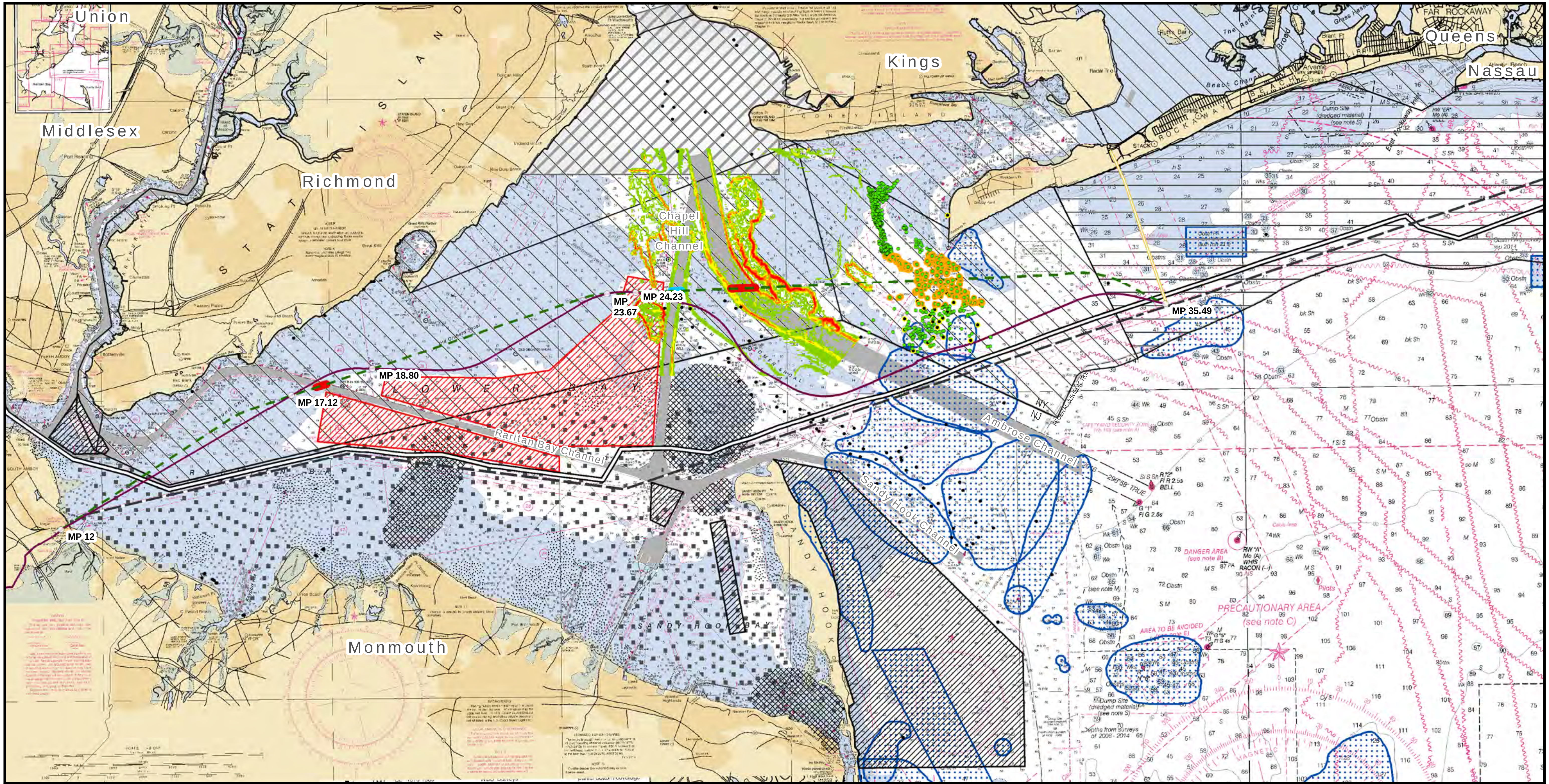


Legend

- Milepost
- Preferred Raritan Bay Loop Route
- Alternative 4
- Navigation Channel Crossings
- Chapel Hill Crossing
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)

Slope (Degrees)

- 0.7 - 2
- 2.1 - 3
- 3.1 - 5
- 5.1 - 11.6
- Anchorage Areas Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)

NJ DEP Hard Clam Relative Abundance (2014)

- High
- Moderate
- Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds

- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Nearby Outcropping Rocks
- Outcropping Rocks

NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

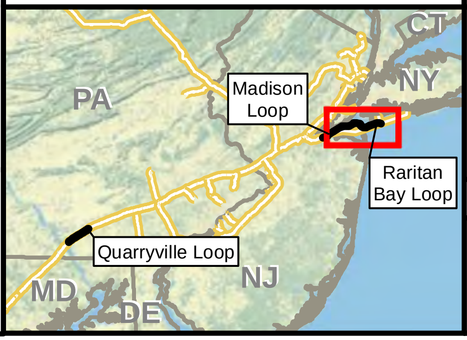
- All Potential Rocks and Outcops
- within 1/2 mile of Alternative 4

N

0 1 2
Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-10

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 4
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 7	SHEET 1 OF 1
WO: 1000891		3:44 PM 1/3/2020	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016; NOAA NOS SP 1997; NYS DEC 2015

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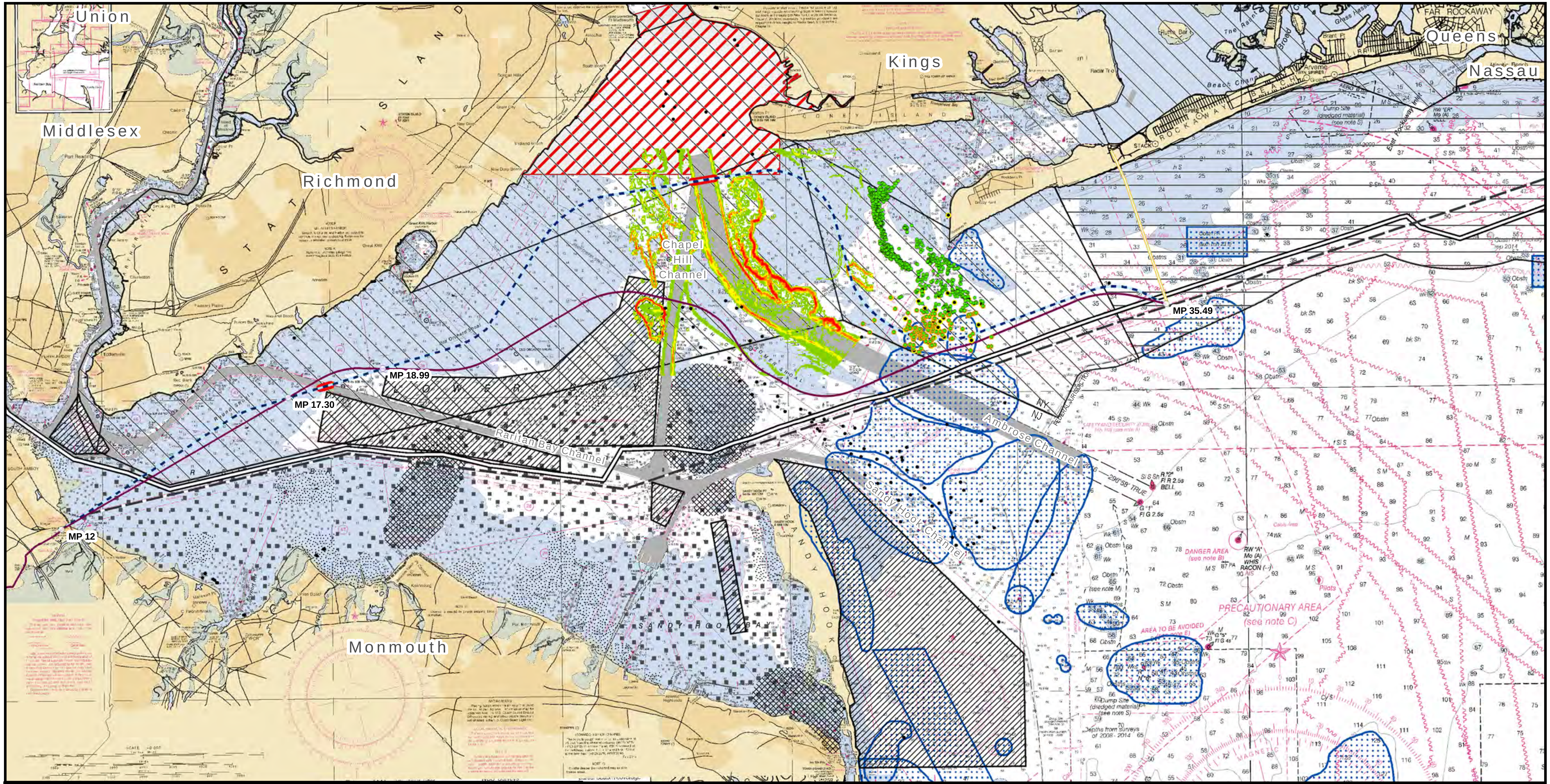


Legend

- Milepost
- Preferred Raritan Bay Loop Route
- Alternative 5
- Navigation Channel Crossings
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)

Slope (Degrees)

- 0.7 - 2
- 2.1 - 3
- 3.1 - 5
- 5.1 - 11.6
- Mouth of the Hudson River
- Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)

NJ DEP Hard Clam Relative Abundance (2014)

- High
- Moderate
- Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds

- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Nearby Outcropping Rocks
- Outcropping Rocks

NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

- All Potential Rocks and Outcops
- within 1/2 mile of Alternative 5

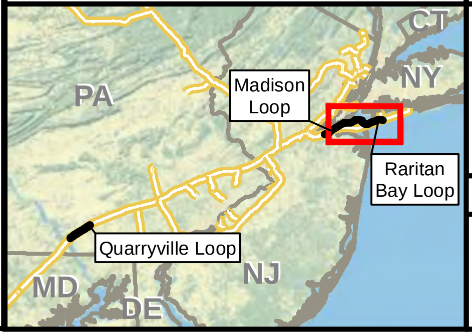
N

0 1 2

Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-11

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 5
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 8	SHEET 1 OF 1
WO: 1000891		3:45 PM 1/3/2020	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016, NOAA NOS SP 1997; NYS DEC 2015

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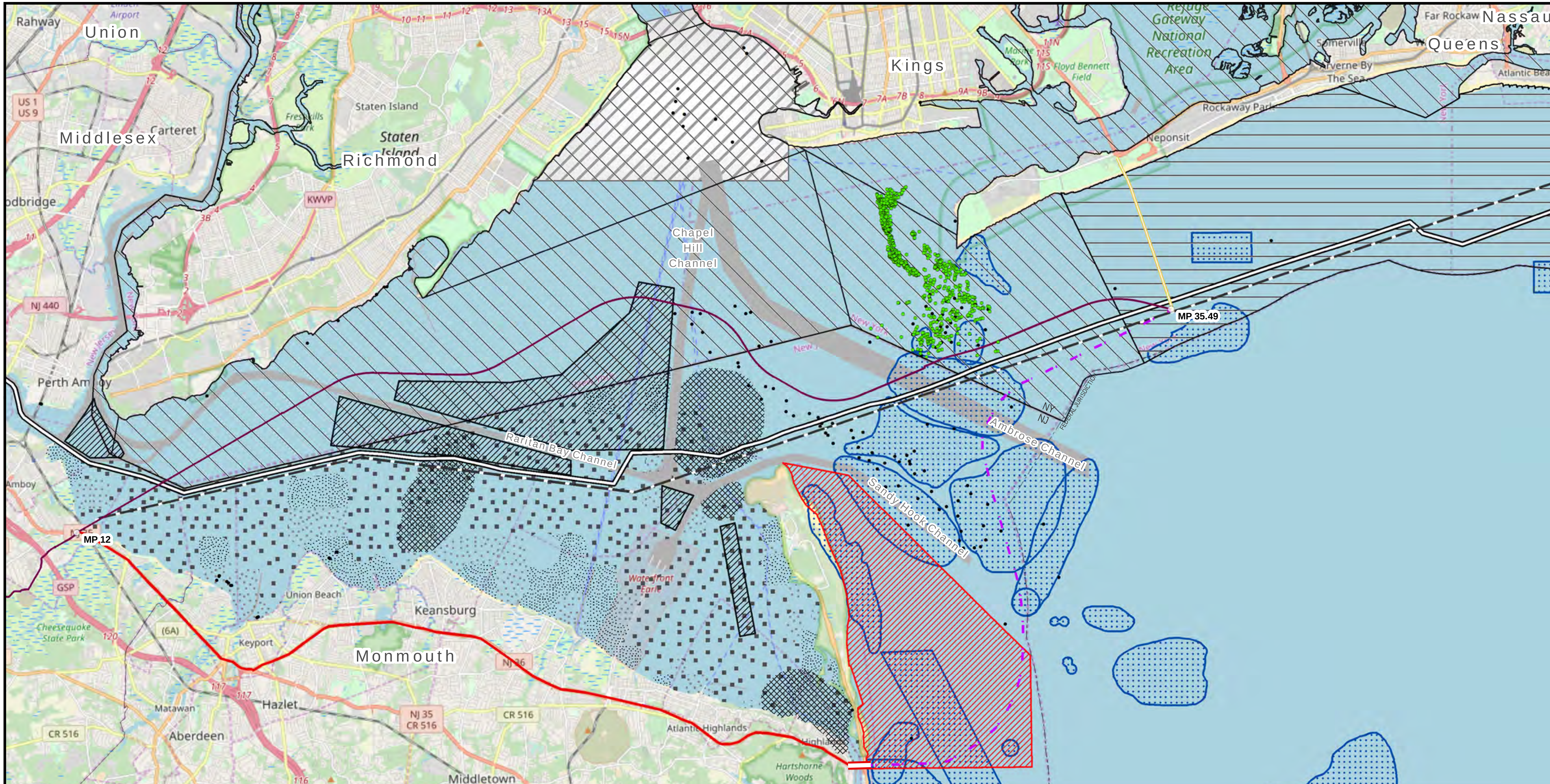


Legend

- Milepost
- Preferred Raritan Bay Loop Route
- HDD
- Alternative 7 - Onshore
- Alternative 7 - Offshore
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)
- Anchorage Area Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
  - High
  - Moderate
  - Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Outcropping Rocks

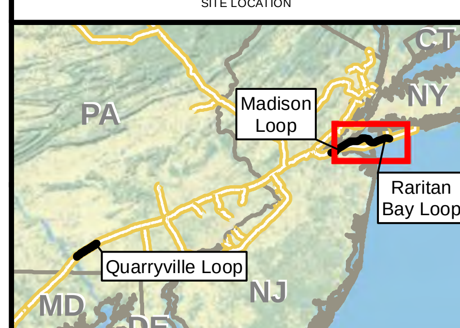
NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

- All Potential Rocks and Outcops

0 1 2
Miles
N

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-12

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 7
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams.

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:119,492
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 9 (3:49 PM 1/3/2020)	SHEET 1 OF 1
WO: 1000891			

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016, NYS DEC 2015

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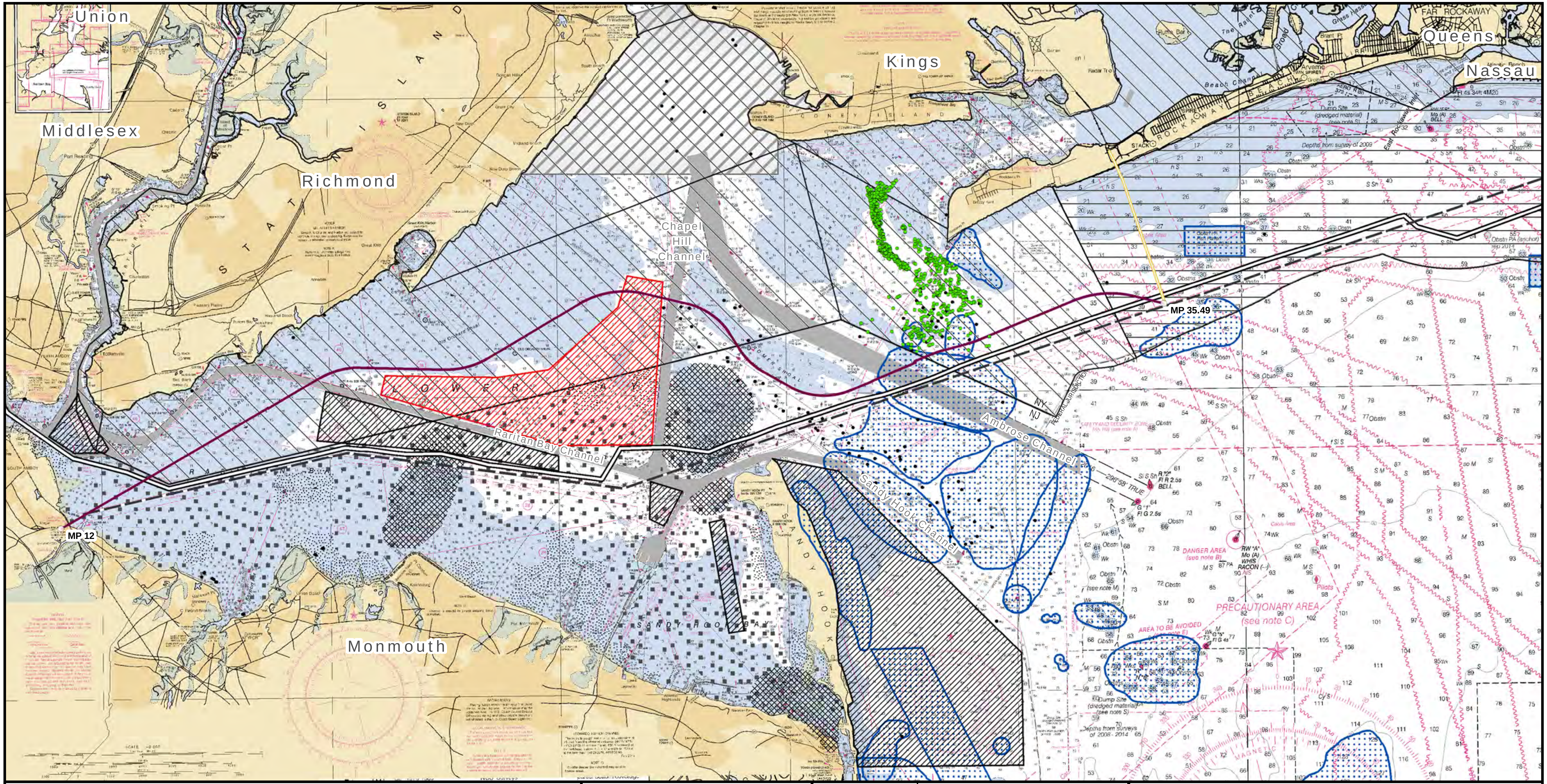


Legend

- Milepost
- Alternative 6 (Preferred Raritan Bay Loop)
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)
- Anchorage Area Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
  - High
  - Moderate
  - Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Maintained Navigation Channel
- Mouth of the Hudson River
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Outcropping Rocks
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

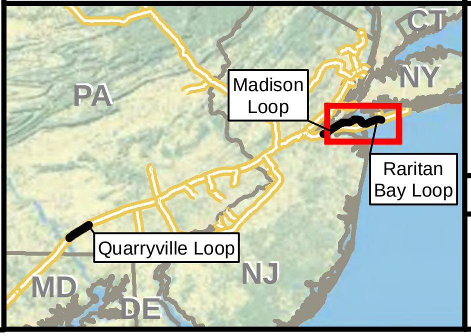
N

0 1 2

Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-13

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 6
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 10	SHEET 1 OF 1
WO: 1000891		3:51 PM 1/3/2020	

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016, NYS DEC 2015

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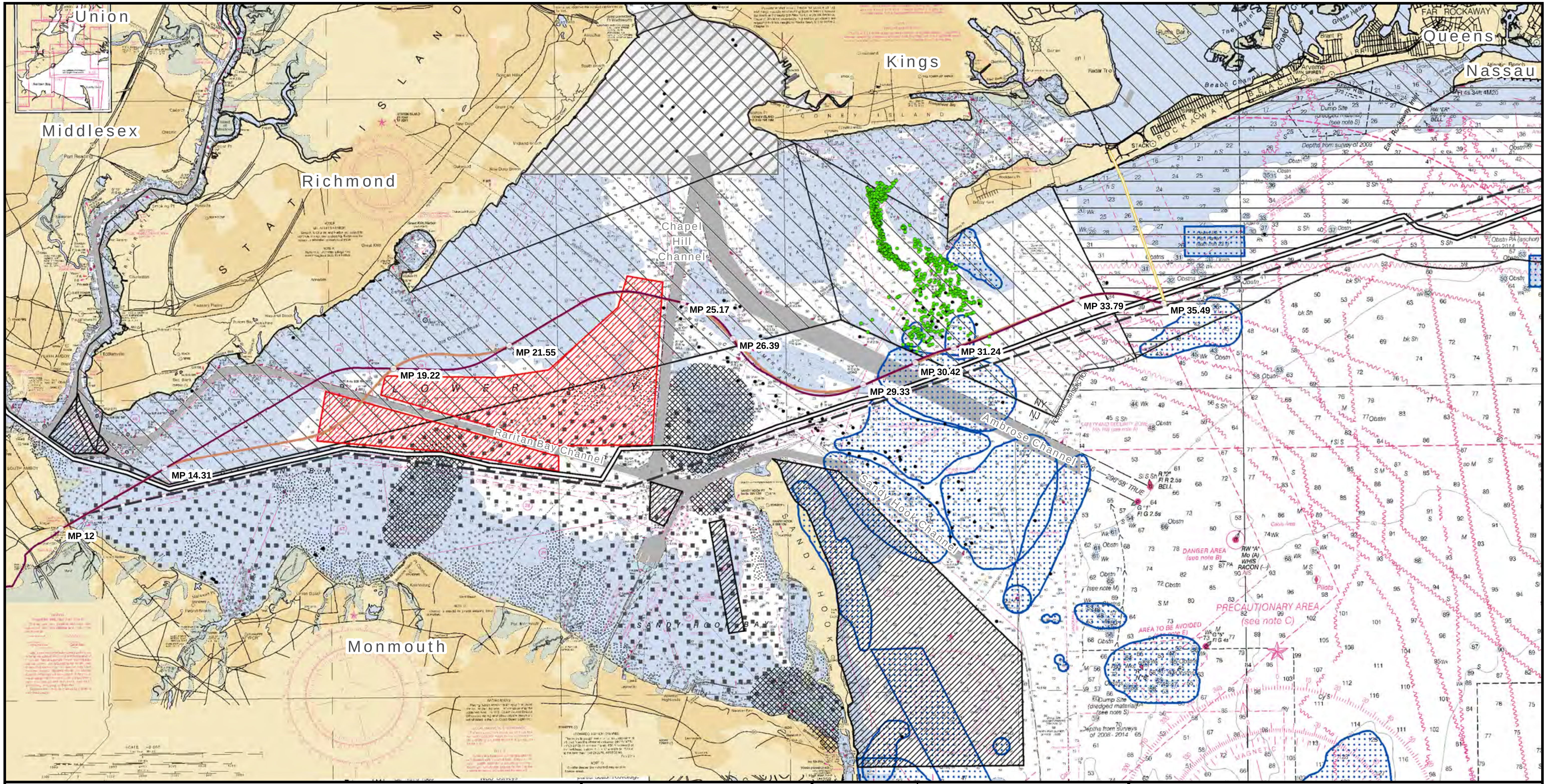


Legend

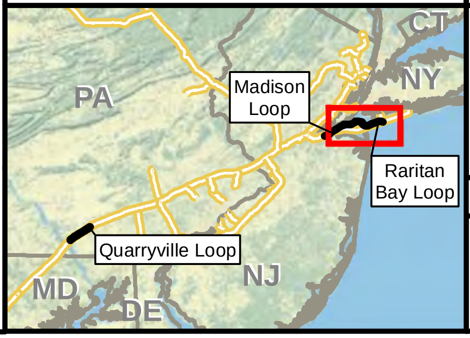
- Milepost
- Preferred Raritan Bay Loop Route
- Alternative 8
- Rockaway Delivery Lateral
- Neptune Cable
- Lower NY Bay Lateral line (LNYBL)
- Anchorage Areas Crossed
- Other Anchorage Areas
- NJ DEP Surf Clam Relative Abundance (2014)
- NJ DEP Hard Clam Relative Abundance (2014)
  - High
  - Moderate
  - Low
- NYS DEC Shellfish - Uncertified
- NYS DEC Shellfish - Certified
- NJDEP Sport Ocean Fishing Grounds
- Mouth of the Hudson River
- Maintained Navigation Channel
- County Boundary
- NY/NJ Boundary
- State/Federal Offshore Line
- Outcropping Rocks
- NOAA Hydrographic Survey - Potential Rocks and Rock Outcrops

N

0 1 2
Miles

Features identified in red highlight constraints.

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-14

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/17/2017	CE	ISSUED FOR FERC FILING	1000891	MK	
B	5/30/2017	CE	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	MK	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
RARITAN BAY LOOP ALTERNATIVE 8
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY AND NEW YORK

Williams

DRAWN BY: CE	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:117,000
CHECKED BY: MK	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 11	SHEET 1 OF 1
WO: 1000891	3:54 PM 1/3/2020		

Data Sources: Williams 2018; E&E 2018; ESRI 2012; NJDEP 2014; NOAA ENC 2013 (Chart # 12327 and # 12326) Seamless Web Service; NOAA ENC Direct 2016, NYS DEC 2015

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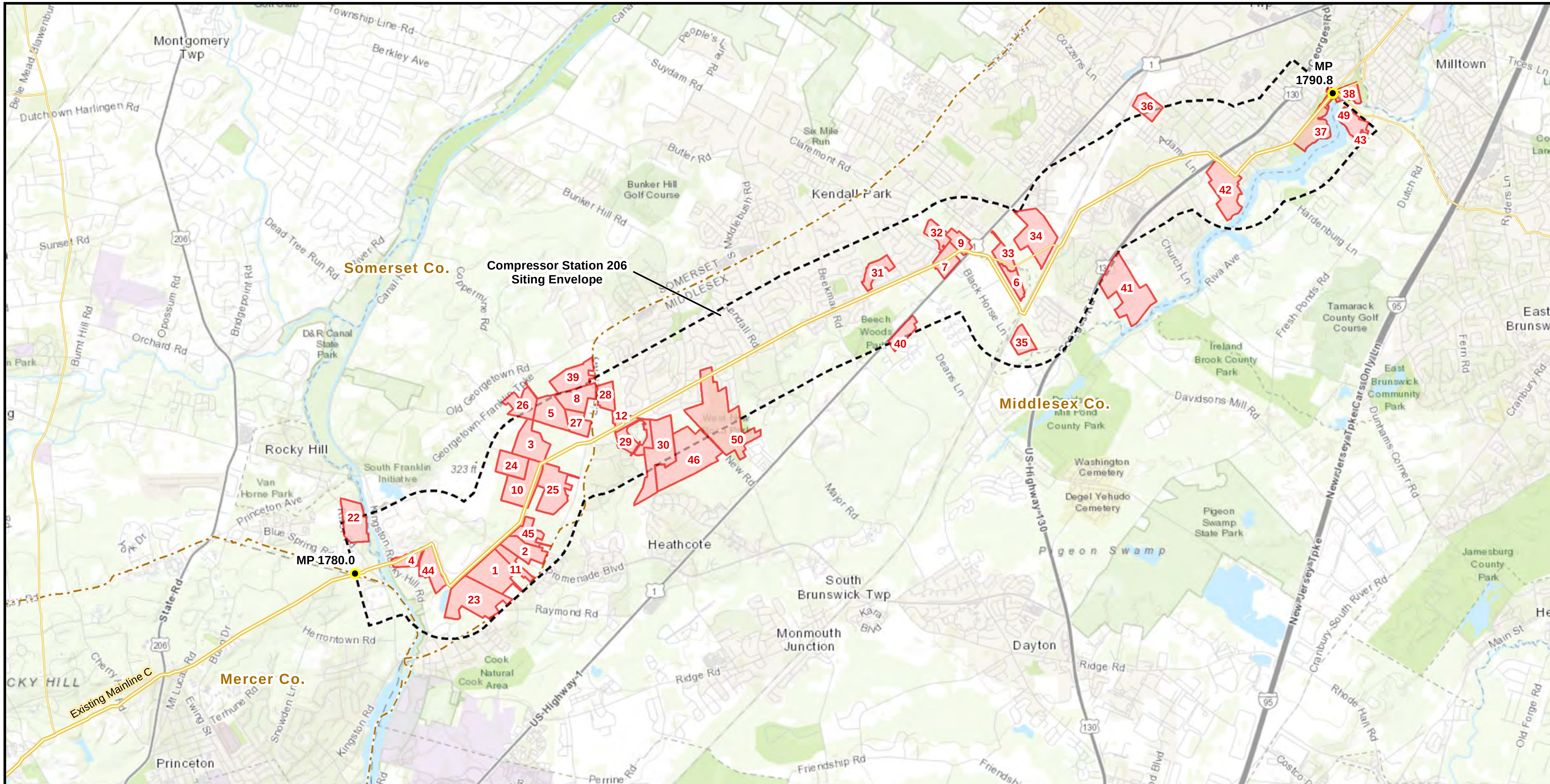


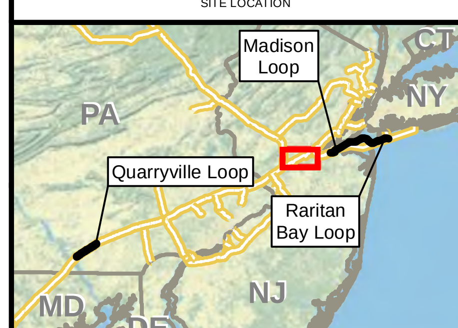
Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Parcels Meeting Intial Siting Criteria
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)

N

0 0.5 1
Miles

SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	10A-15

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

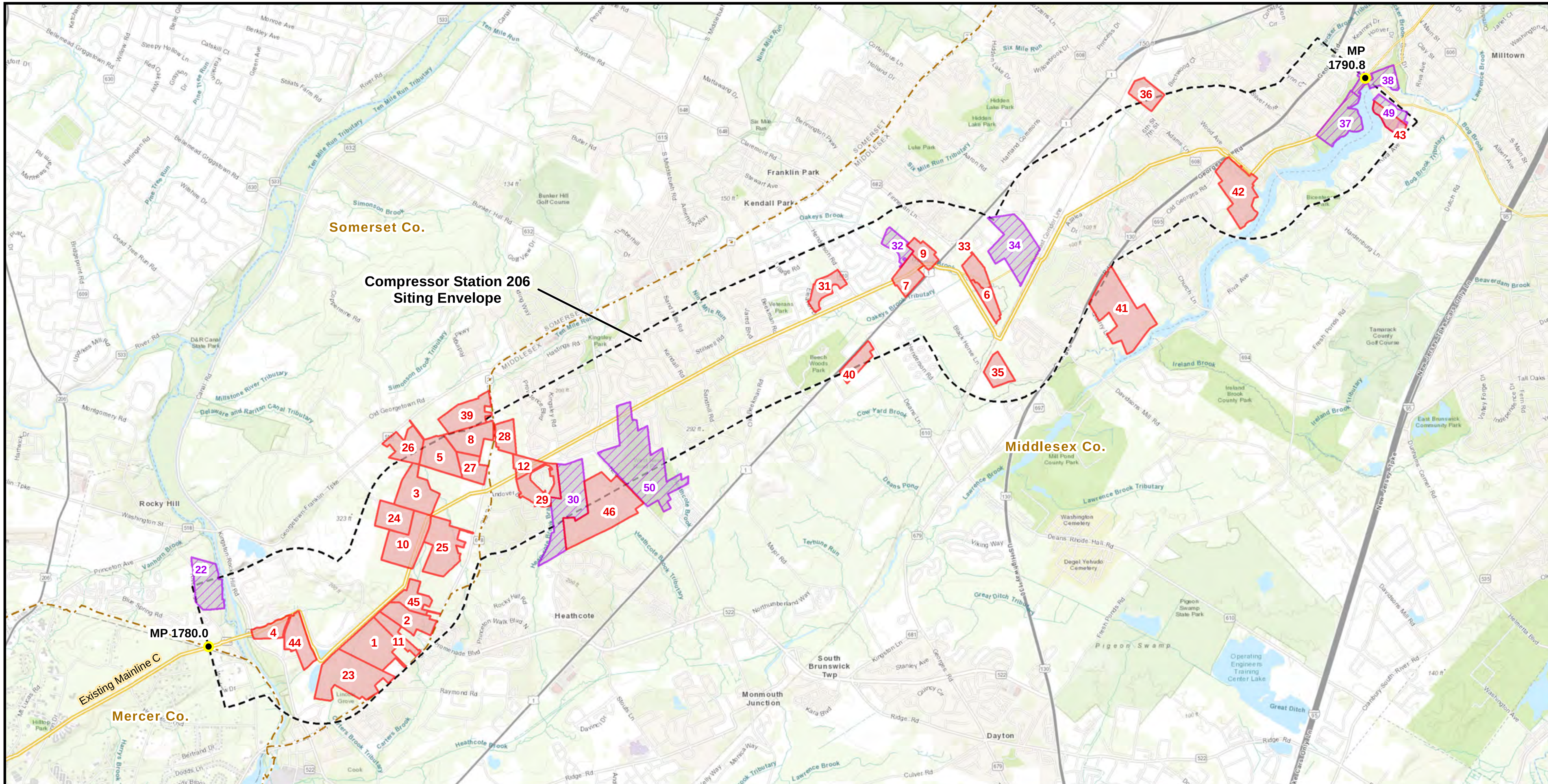
TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 SITING ENVELOPE
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:58,000
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 12	SHEET 1 OF 1
WO: 1000891		3:55 PM 1/3/2020	

Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018

L:\Buffalo\Williams_NYRE\Map\MXDs\Permit_Request\2020_01_03_NJDEP_Resubmission_AltsAnalysis\12_CS206_SitingEnvelope_11x17.mxd



Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Sites Meeting Tier 1 Green Acres Parcel Criteria
- Tier 1 Criteria - Green Acres Parcel

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-16

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TIER 1 CRITERIA - GREEN ACRES PARCELS
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:49,000
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 3:57 PM 1/3/2020	FIGURE 13 — SHEET 1 OF 1
WO: 1000891			

Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018

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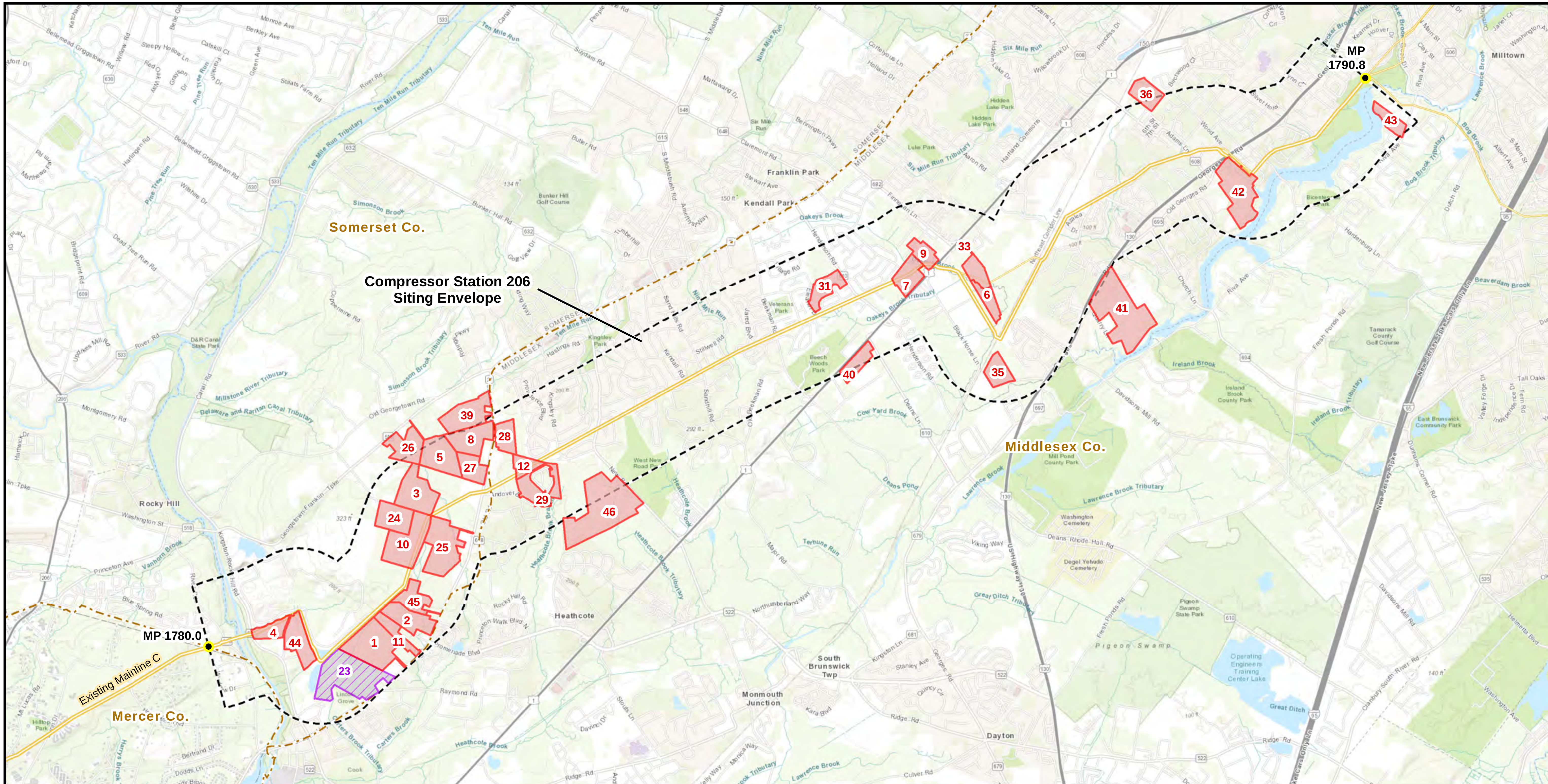

Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Sites Meeting Tier 1 NJ DOT Parcel Criteria
- Tier 1 Criteria - NJ DOT Owned Parcel

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-17

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TIER 1 CRITERIA - PARCELS OWNED BY NJDOT
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:49,000
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 14	SHEET 1 OF 1
WO: 1000891		3:58 PM 1/3/2020	

Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018

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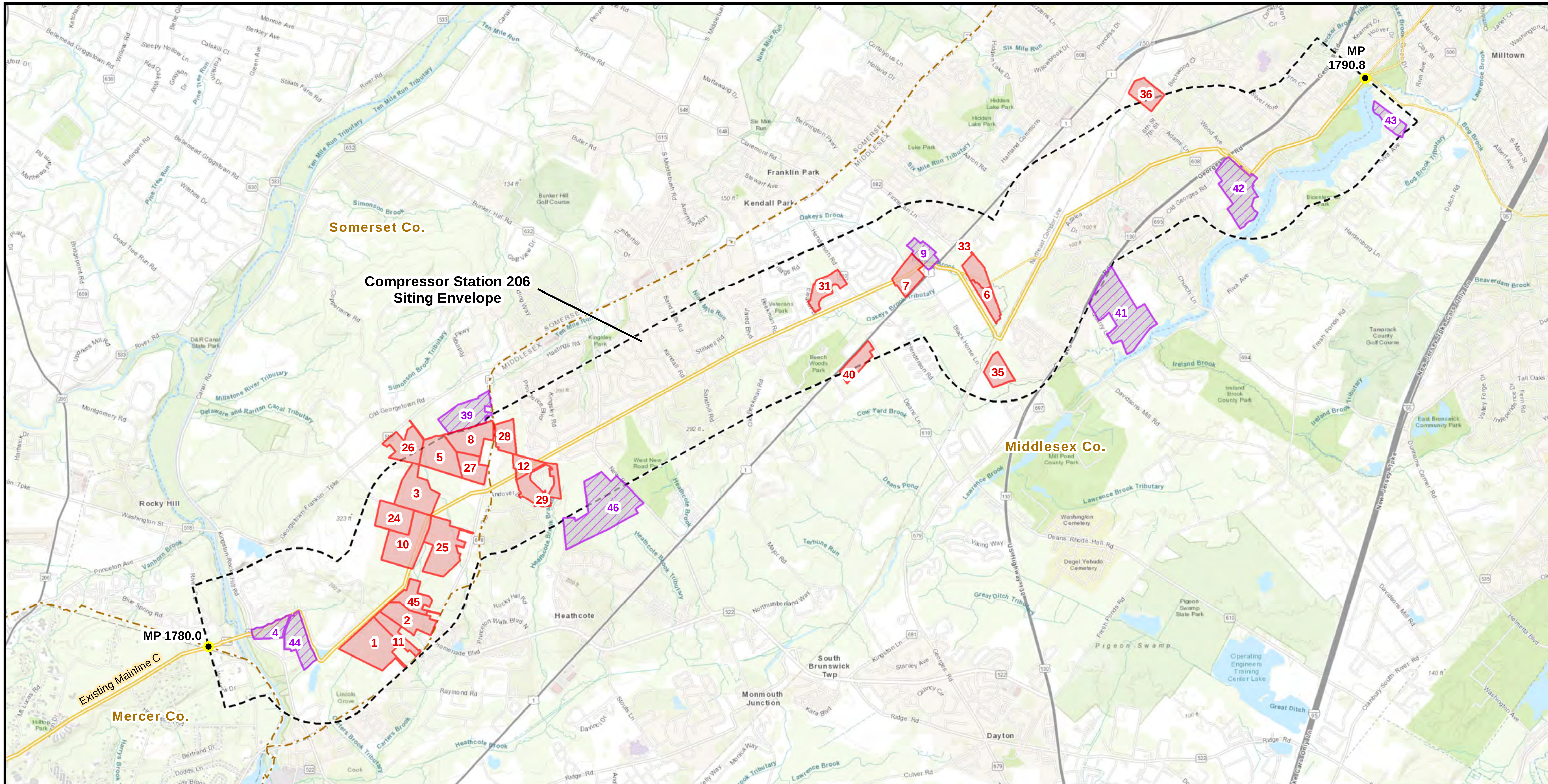

Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Sites Meeting Tier 1 Structure Criteria
- Tier 1 Criteria - Structure/Building on Parcel

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-18

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TIER 1 CRITERIA - PARCELS WITH STRUCTURES/BUILDINGS
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams.

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:49,000
AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 4:03 PM 1/3/2020 FIGURE 15	SHEET 1 OF 1
WO: 1000891			

Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018

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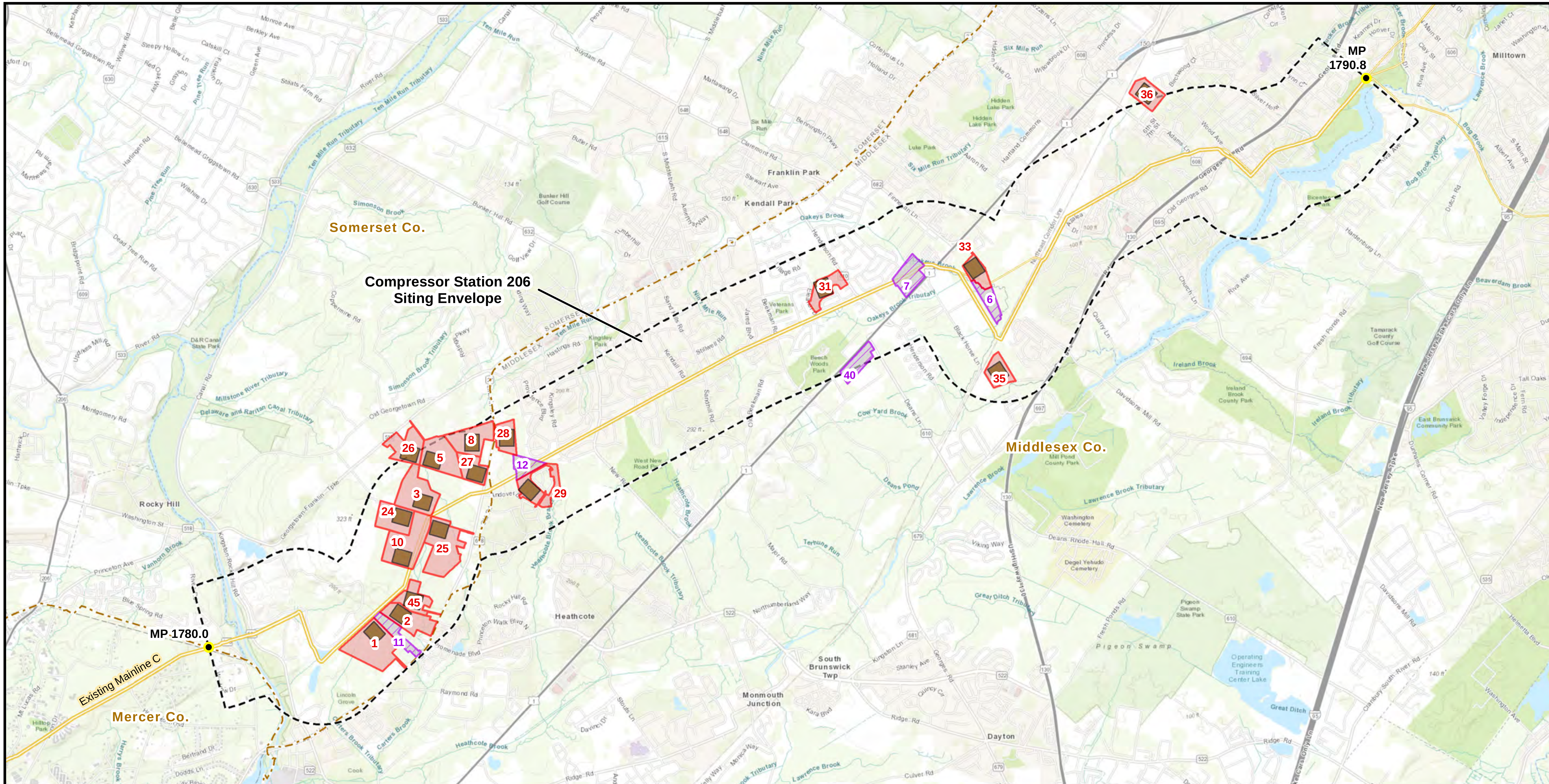

Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Representative Compressor Station Footprint (600 ft x 700 ft)
- Sites Meeting Tier 1 Facility Footprint Criteria
- Tier 1 Criteria - Cannot Fit Facility Footprint

N

0 0.5 1 Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-19

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TIER 1 CRITERIA - SITE CONFIGURATION
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:49,000
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 16	SHEET 1 OF 1
WO: 1000891		4:04 PM 1/3/2020	

Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018

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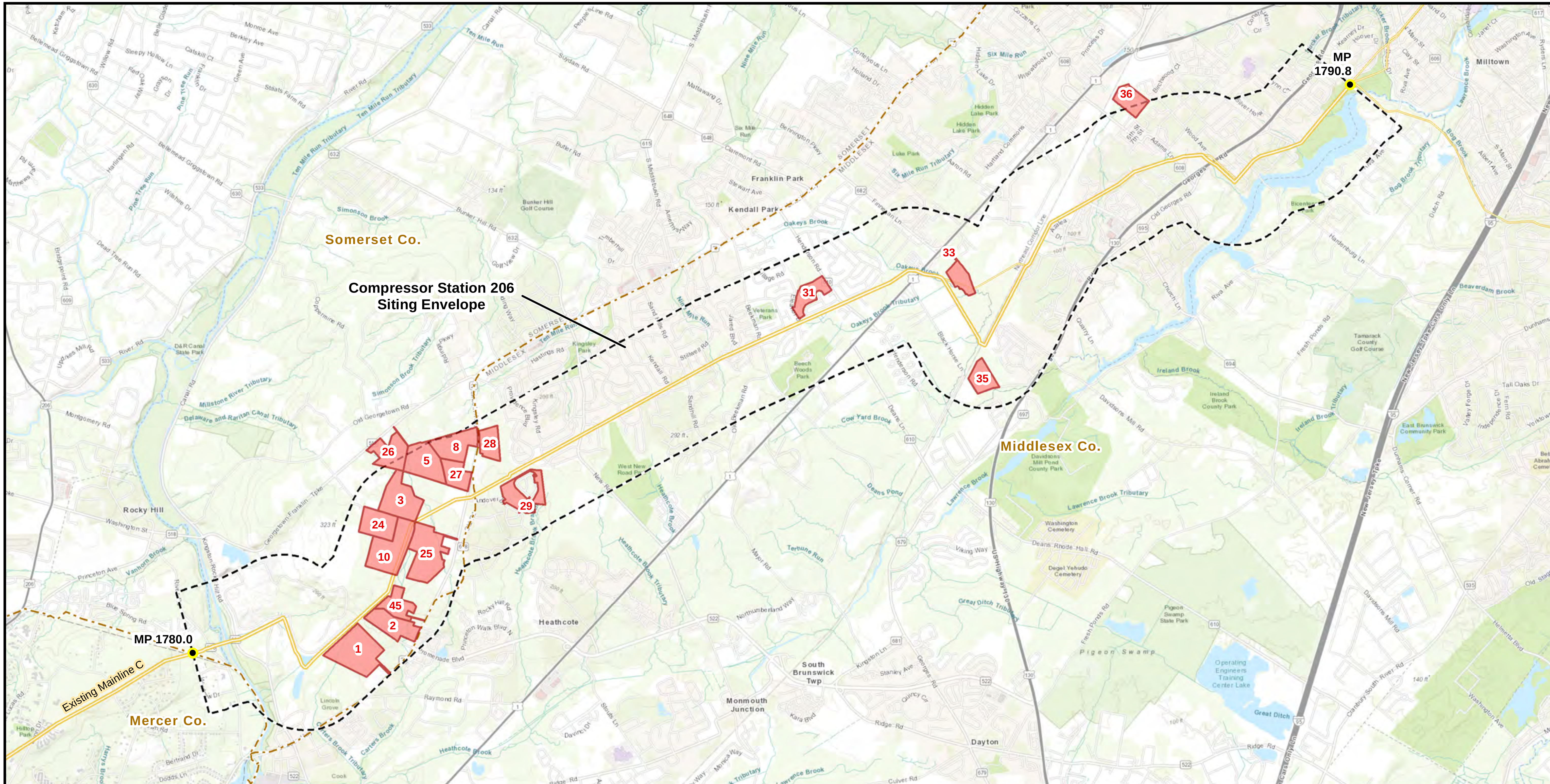

Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Sites Meeting Tier 1 Criteria

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-20

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/20/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SITES MEETING TIER 1 SITING CRITERIA
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:49,000
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 4:06 PM 1/3/2020	FIGURE 17 SHEET 1 OF 1
WO: 1000891			

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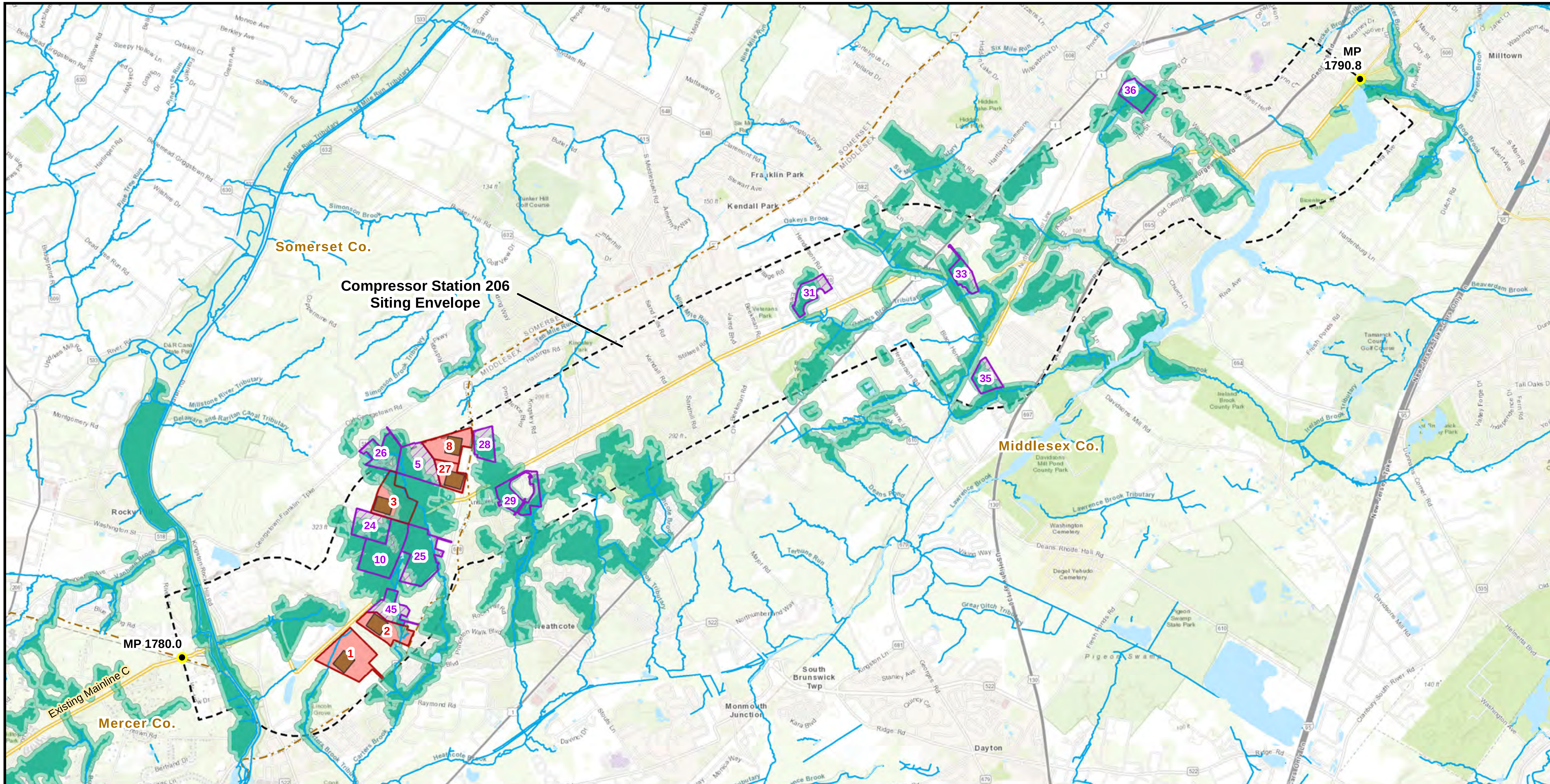
Data Sources: NJDEP 2017; Williams 2018; E&E 2018; ESRI 2012, 2018



Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Representative Compressor Station Footprint (600 ft x 700 ft)
- Sites Meeting Tier 2 Facility Footprint With Wetland Buffer Criteria
- Tier 2 Criteria - Facility Footprint With Wetland Buffer
- County Boundary
- Stream (NHD)
- Waterbody (NHD)
- NJDEP Wetlands (2012)
- NJDEP Wetlands buffer (150-ft)

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.

REFERENCE TITLE

10A-21

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TIER 2 CRITERIA - NJDEP WETLANDS
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:48,144
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 18	SHEET 1 OF 1
WO: 1000891		4:09 PM 1/3/2020	

Data Sources: NJDEP 2012; USGS-NHD 2016; Williams 2018; E&E 2018; ESRI 2012, 2018

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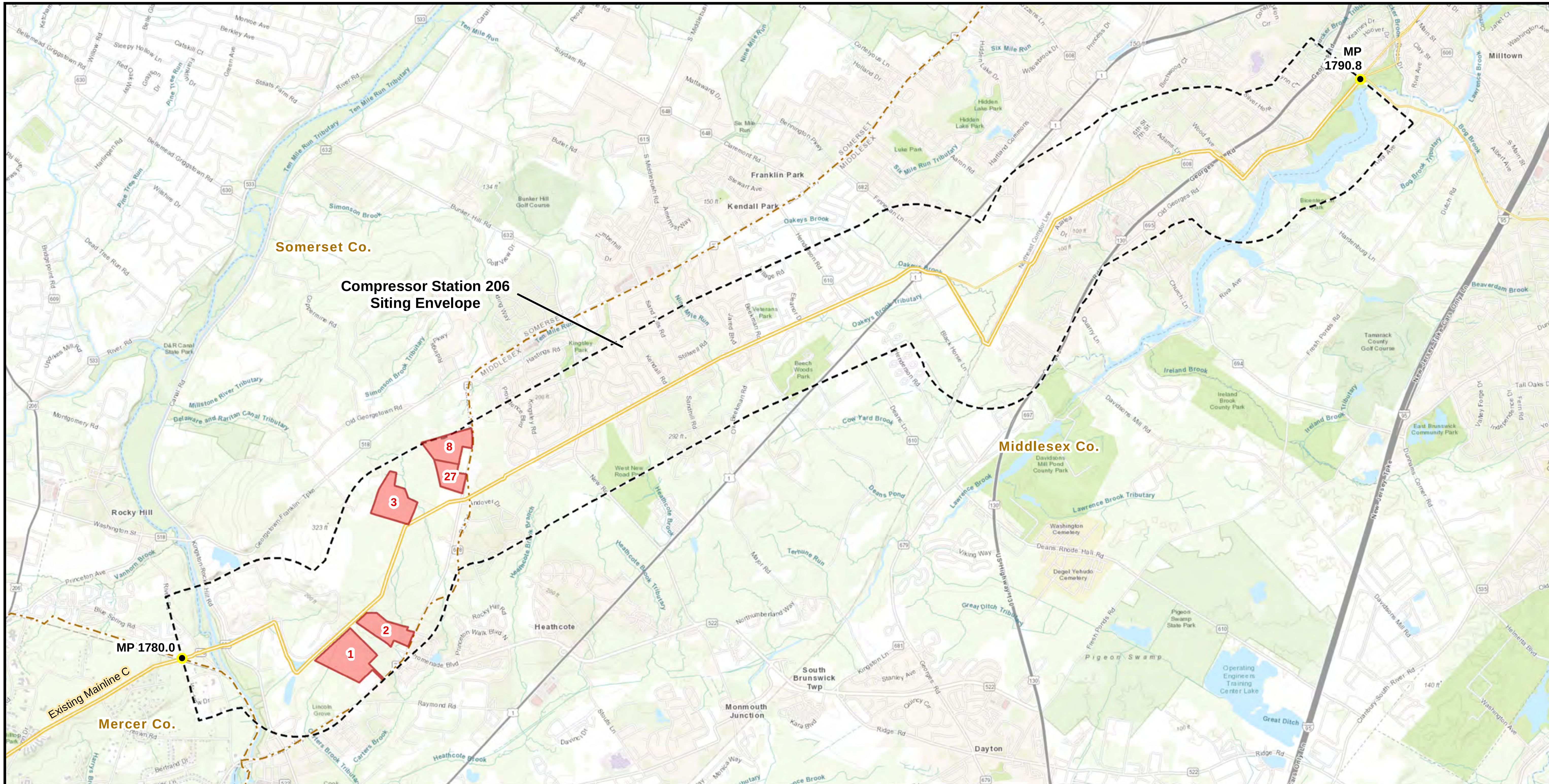

Legend

- Milepost
- Existing Transco Mainline-C
- Other Existing Transco Pipeline
- County Boundary
- Compressor Station 206 Siting Envelope (0.5-Mile From Existing Mainline C)
- Sites Meeting Tier 2 Criteria

N

0 0.5 1
Miles

SITE LOCATION

DRAWING NO.	REFERENCE TITLE
	10A-22

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	5/25/2017	MK	ISSUED FOR FERC SUPPLEMENTAL FILING	1000891	AL	
C	1/3/2020	CE	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	MK	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SITES MEETING TIER 2 SITING CRITERIA
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE: 1:48,144
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 4:13 PM 1/3/2020 FIGURE 19	SHEET 1 OF 1
WO: 1000891			

Data Sources: NJDEP 2012; USGS-NHD 2016; Williams 2018; E&E 2018; ESRI 2012, 2018

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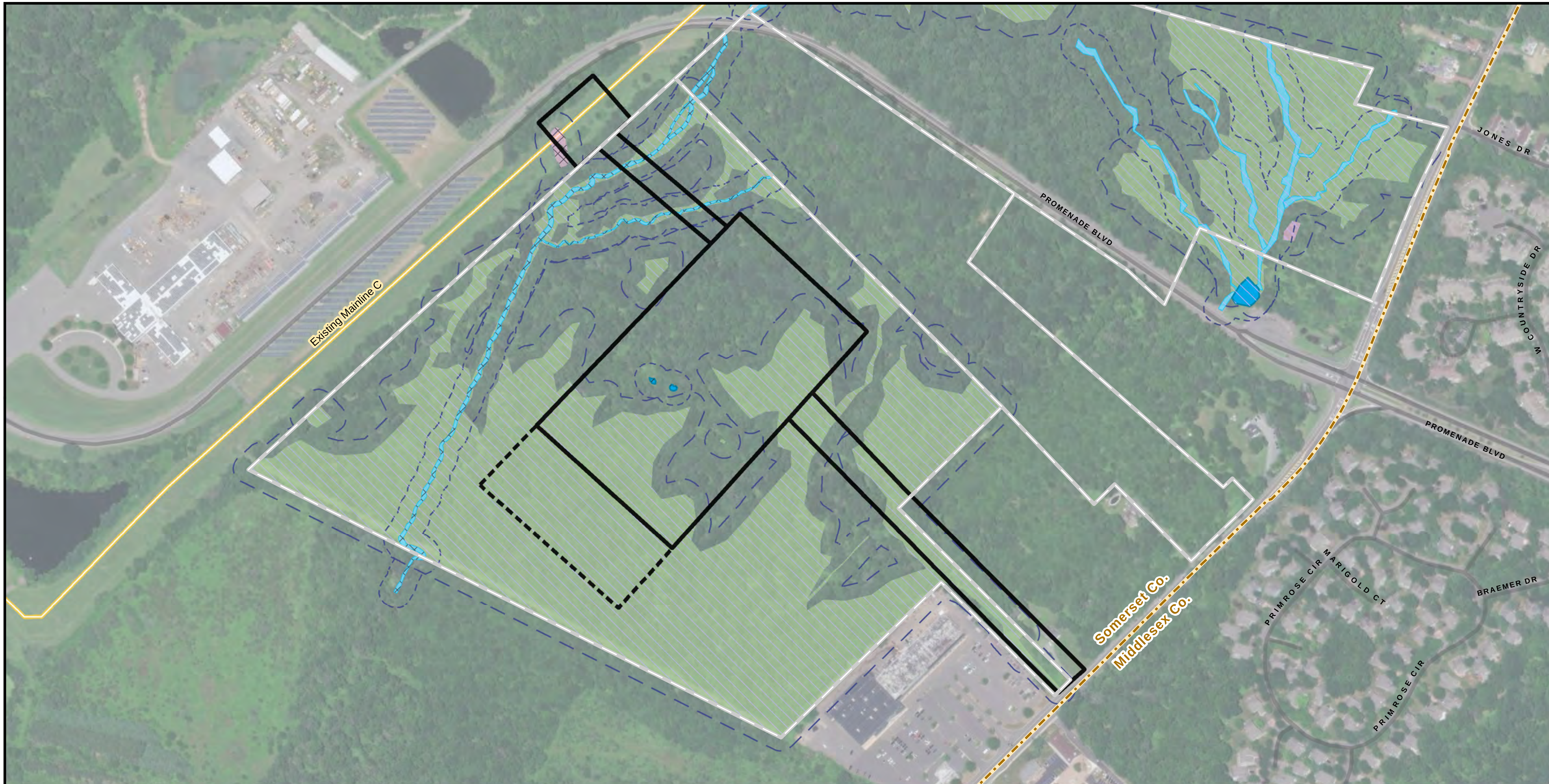

Legend

- Existing Transco Mainline-C
- County Boundary

CS 206 Alternative 1 Workspace

- Permanent Workspace
- Temporary Workspace
- Parcel Boundary
- Waterway/Waterbody Buffer
- Wetland Buffer
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland

Data Source

- Field Surveyed
- Remotely Sensed
- NJDEP Letter of Interpretation/ Line Verification Data

N

0 250

Feet

SITE LOCATION

DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	1/11/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
C	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	AL	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 – SITE 1
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams.

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 20	SHEET 1 OF 1
WO: 1000891		4:15 PM 1/3/2020	

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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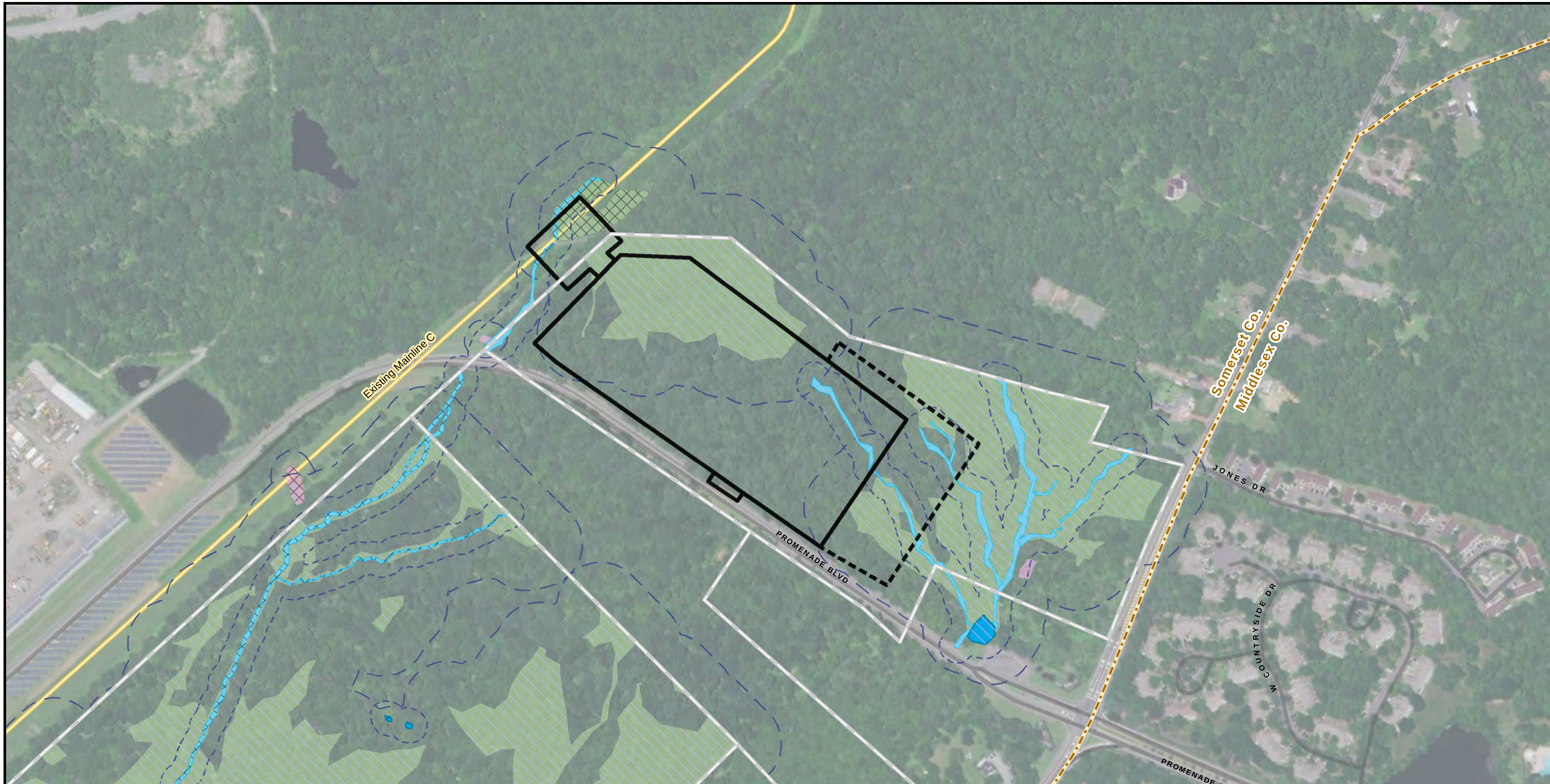

Legend

- Existing Transco Mainline-C
- County Boundary

CS 206 Alternative 2 Workspace

- Permanent Workspace
- Temporary Workspace
- Parcel Boundary
- Waterway/Waterbody Buffer
- Wetland Buffer
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland

Data Source

- Field Surveyed
- Remotely Sensed
- NJDEP Letter of Interpretation/ Line Verification Data

N

0 250

Feet

SITE LOCATION

DRAWING NO.

REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	1/11/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
C	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	AL	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 – SITE 2
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams.

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 4:17 PM 1/3/2020 FIGURE 21	SHEET 1 OF 1
WO: 1000891			

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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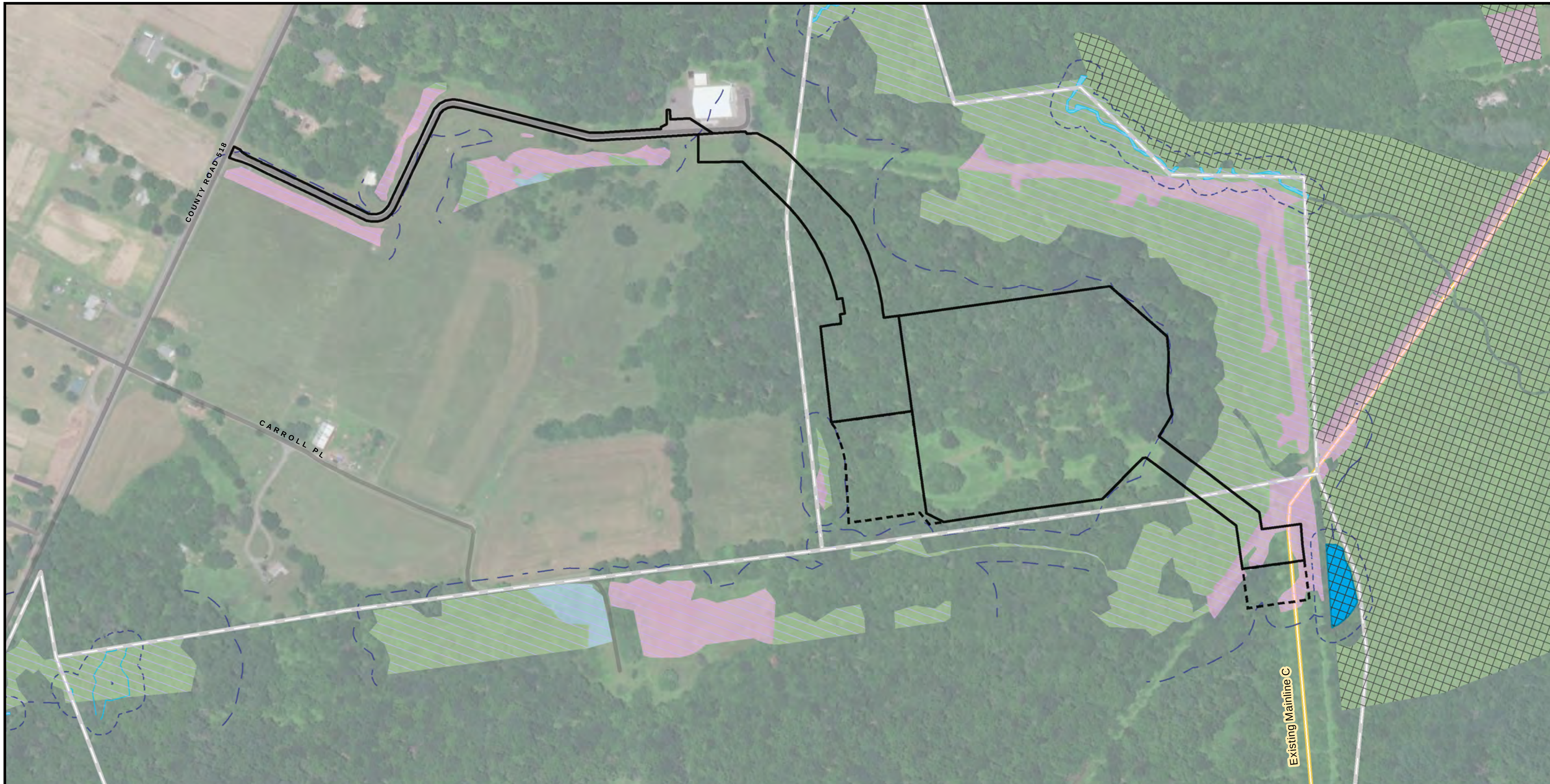


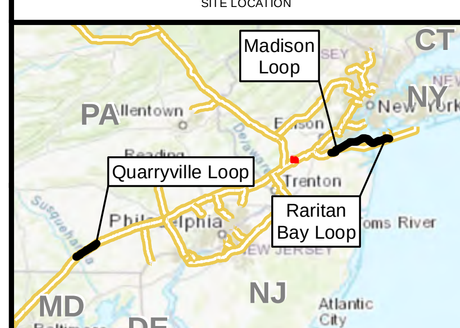
Legend

- Existing Transco Mainline-C
- CS 206 Alternative 3 Workspace
- Permanent Workspace
- Temporary Workspace
- Parcel Boundary
- Waterway/Waterbody Buffer
- Wetland Buffer
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland
- PSS Wetland

Data Source
- Field Surveyed
- Remotely Sensed
- NJDEP Letter of Interpretation/ Line Verification Data

0 250
Feet

SITE LOCATION



DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	1/11/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
C	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	CE	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 – SITE 3
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: CE	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver24b
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 22	SHEET 1 OF 1
WO: 1000891		1/3/2020	

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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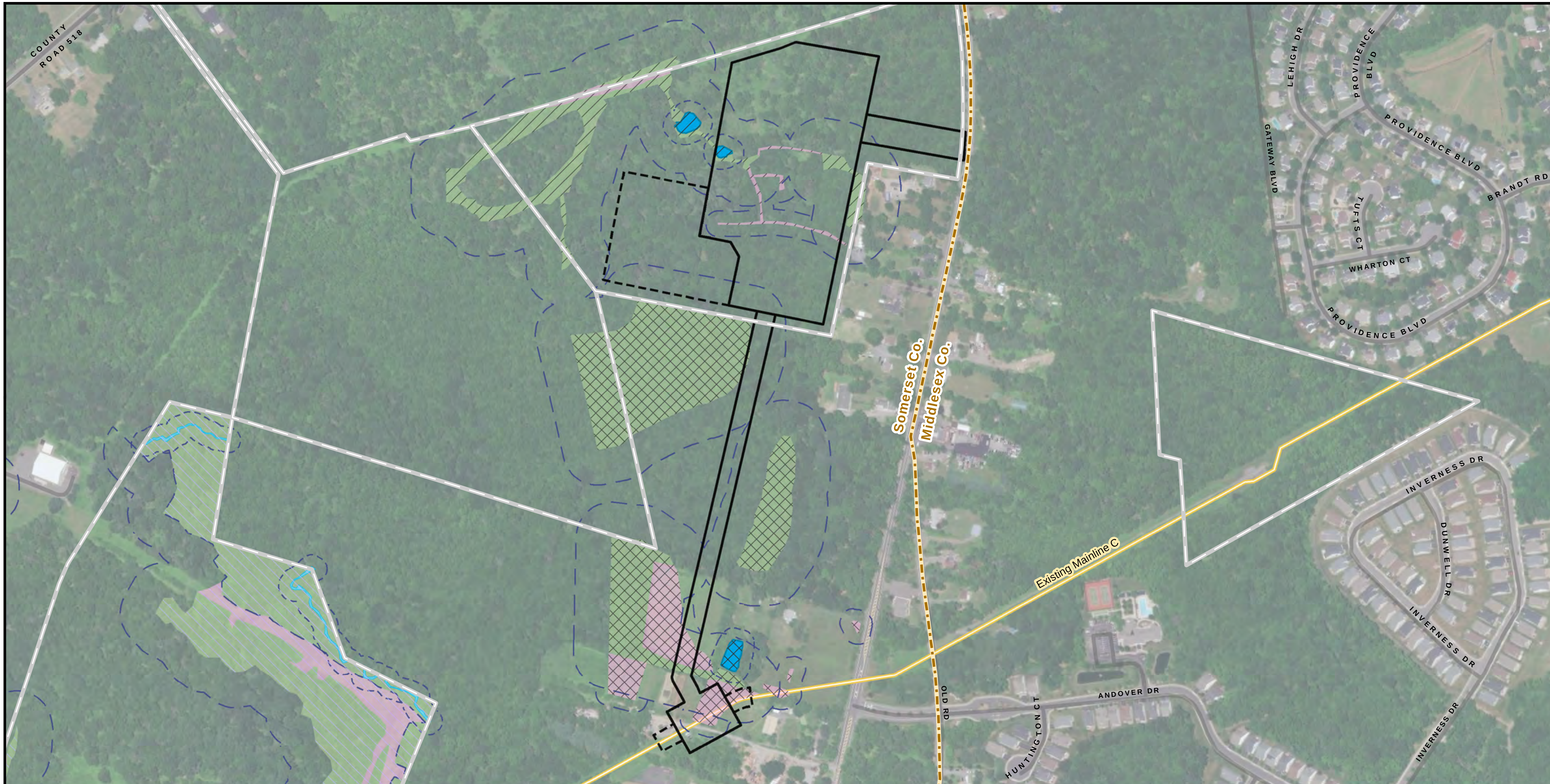

Legend

- Existing Transco Mainline-C
- County Boundary

CS 206 Alternative 8 Workspace
- Permanent Workspace
- Temporary Workspace
- Parcel Boundary
- Waterway/Waterbody Buffer
- Wetland Buffer
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland

Data Source
- Field Surveyed
- Remotely Sensed
- NJDEP Letter of Interpretation/ Line Verification Data

N

0 500 Feet

SITE LOCATION

DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	1/11/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
C	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	AL	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 – SITE 8
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: 4:21 PM 1/3/2020 FIGURE 23	SHEET 1 OF 1
WO: 1000891			

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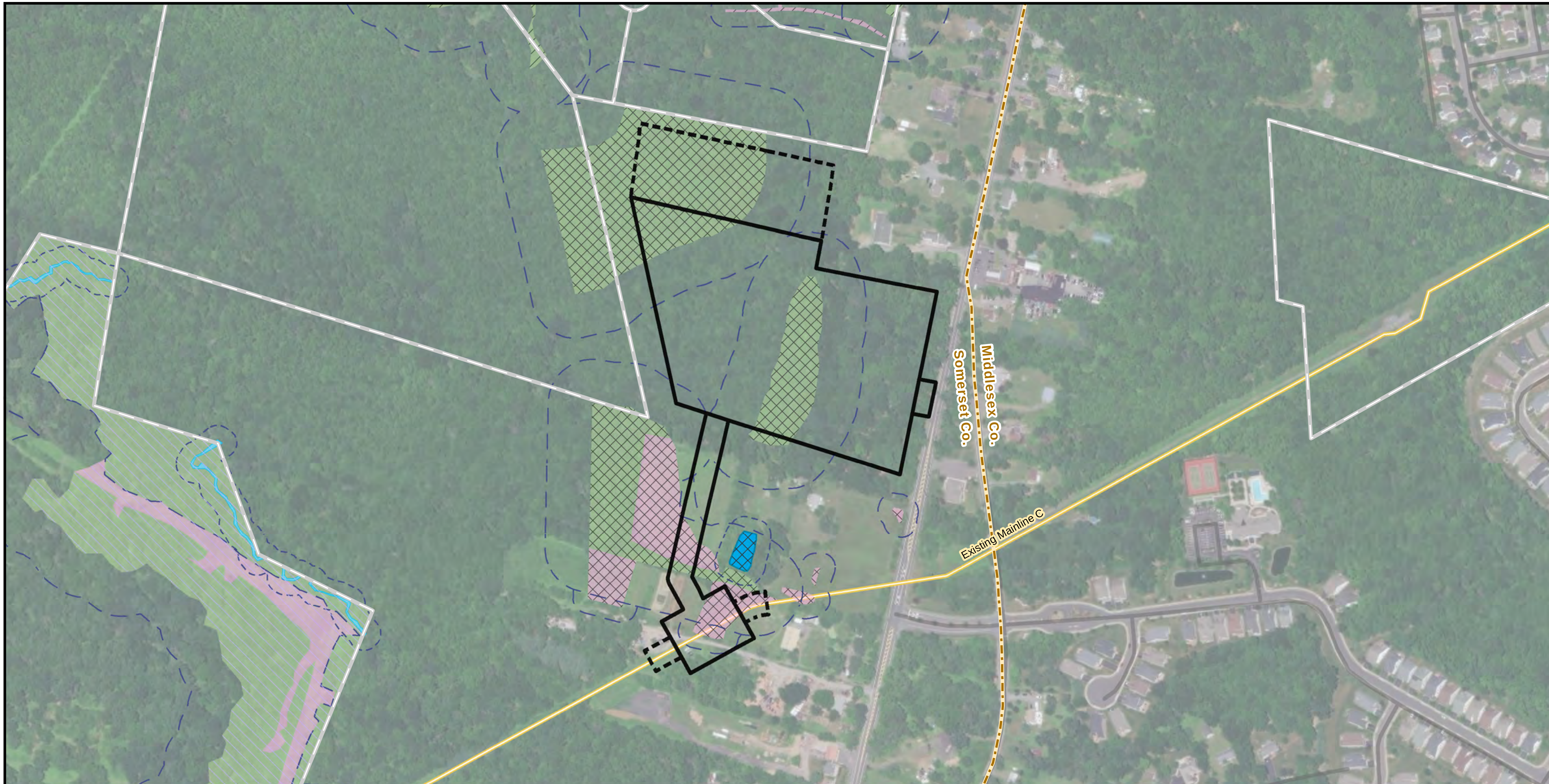
Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.



Legend

- Existing Transco Mainline-C
- County Boundary
- CS 206 Alternative 27 Workspace
  - Permanent Workspace
  - Temporary Workspace
- Parcel Boundary
- Waterway/Waterbody Buffer
- Wetland Buffer
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland
- Data Source
  - Field Surveyed
  - Remotely Sensed
  - NJDEP Letter of Interpretation/ Line Verification Data

N

0 250
Feet

SITE LOCATION

DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	3/21/2017	MK	ISSUED FOR FERC FILING	1000891	AL	SM
B	1/11/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
C	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	AL	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
COMPRESSOR STATION 206 – SITE 27
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: AL	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver20
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 24	SHEET 1 OF 1
WO: 1000891		4:23 PM 1/3/2020	

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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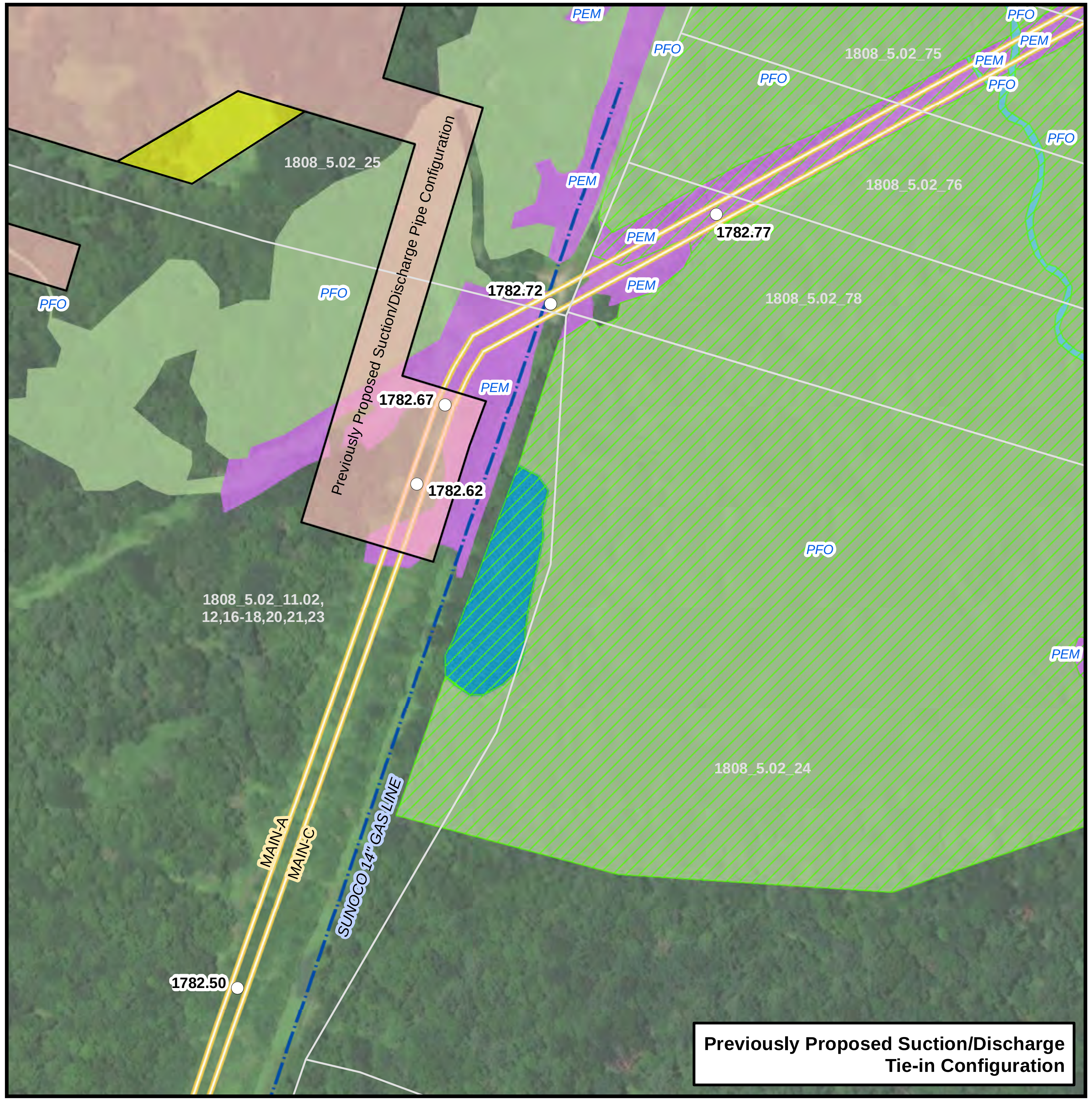

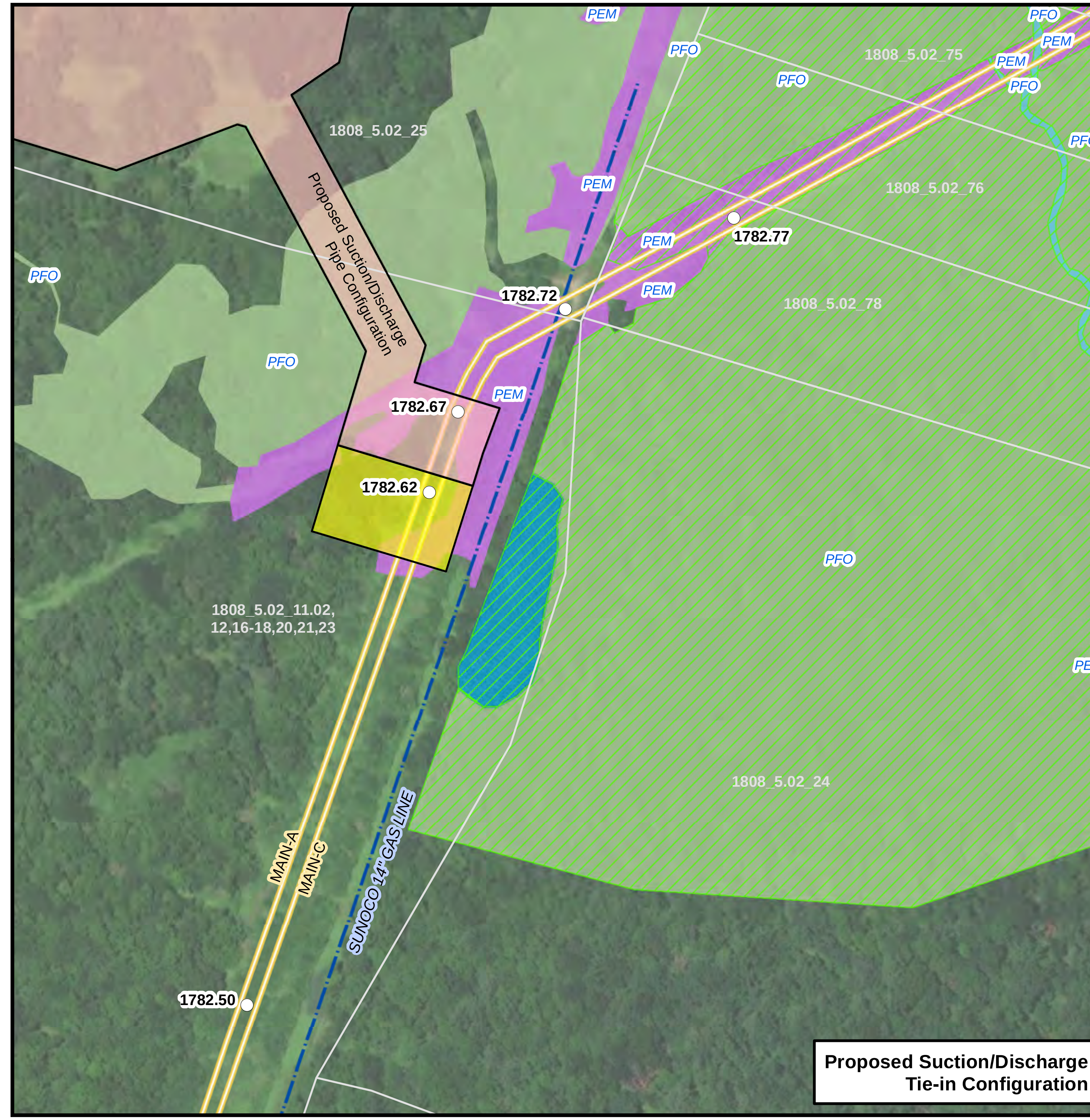

Table 1

Wetland Impact	Previously Proposed Utility Crossing "D"	Proposed Utility Crossing "D"
Total Temporary Impacts Wetlands (acres)	0.46	0.15
PEM	0.46	0.15
PSS	-	-
PFO	-	-
Total Permanent Impacts Wetlands (acres)	0.78	0.85
PEM	-	0.31
PSS	-	-
PFO	0.78	0.54
Total Impacts Wetlands (acres)	**1.24**	**1.00**

Data Sources: NJDEP 2012; Williams 2019; E&E 2019; ESRI 2012, 2017.

Legend

- Mainline Mileposts
- Existing Transco Mainline
- Existing Sunoco 14" Gas Line
- Parcel Boundary
- Permanent Workspace
- Temporary Workspace
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland
- Remotely Sensed Feature

0 250
Feet
N

SITE LOCATION

DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	1/10/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
B	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	BS	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
PROPOSED SUCTION AND DISCHARGE TIE-IN
COMPRESSOR STATION 206 – SITE 3
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: BS	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver22
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 25 1/3/2020	SHEET 1 OF 1
WO: 1000891			

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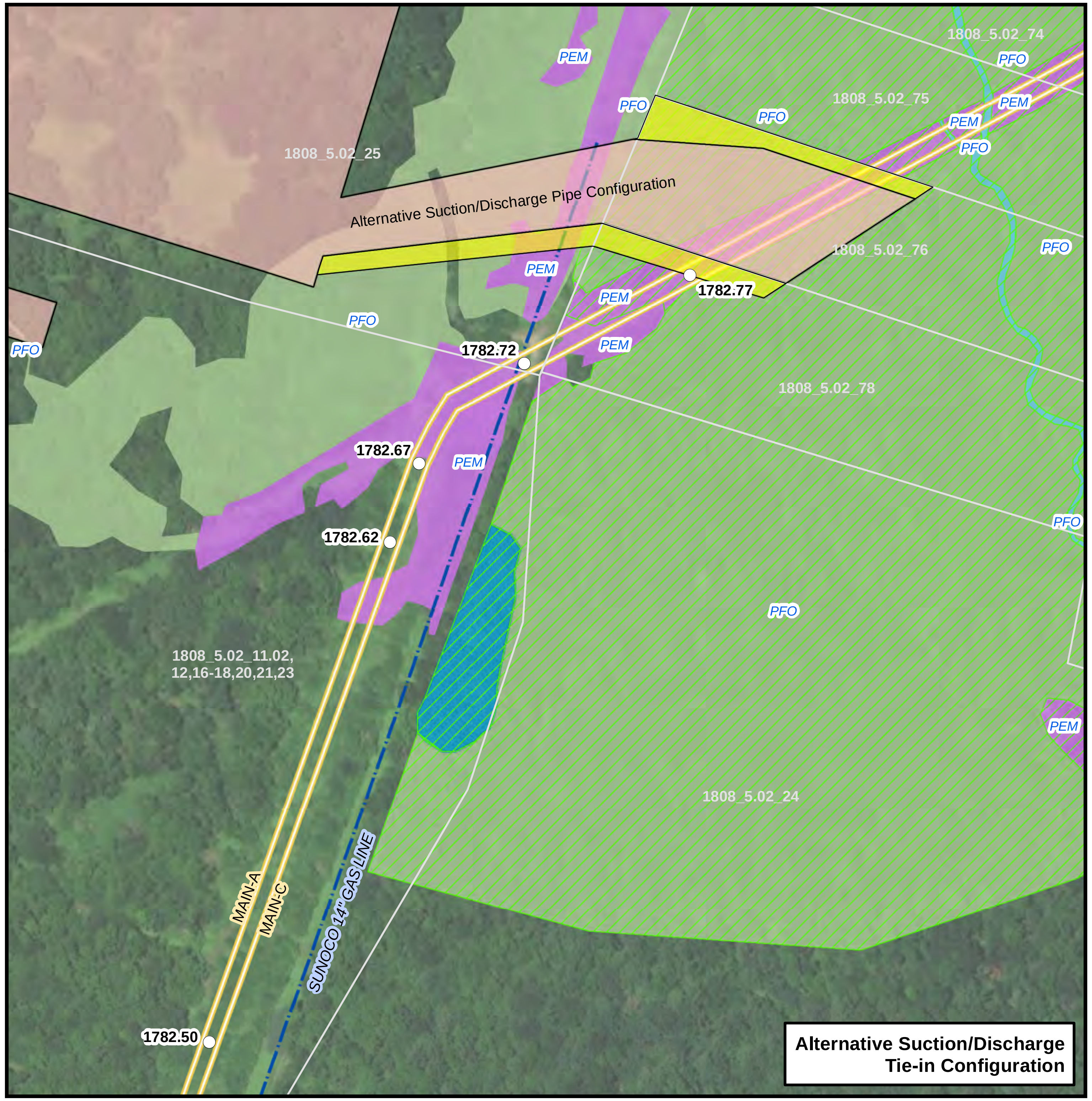


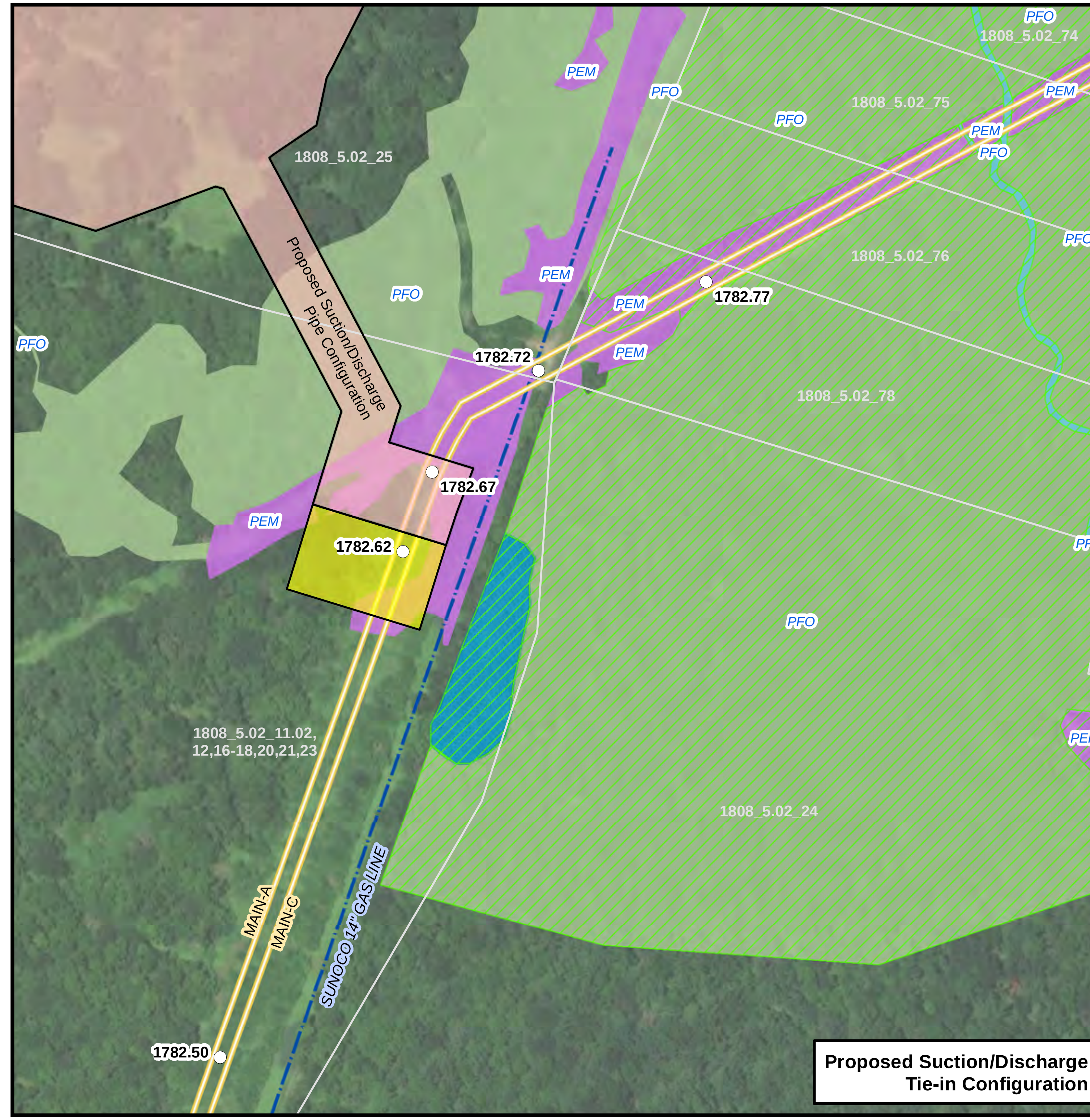


Table 2

Wetland Impact	Proposed Utility Crossing "D"	Alternative Suction/Discharge Tie-in
Total Temporary Impacts Wetlands (acres)	0.15	0.18
PEM	0.15	0.18
PSS	-	-
PFO	-	-
Total Permanent Impacts Wetlands (acres)	0.85	2.91
PEM	0.31	0.48
PSS	-	-
PFO	0.54	2.43
Total Impacts Wetlands (acres)	**1.00**	**3.09**

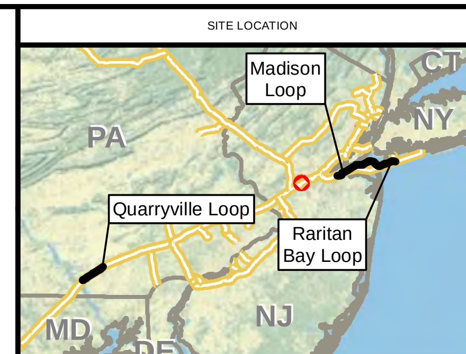
Legend

- Mainline Mileposts
- Existing Transco Mainline
- Existing Sunoco 14" Gas Line
- Parcel Boundary
- Permanent Workspace
- Temporary Workspace
- Waterbody Polygon
- Waterway Polygon
- PEM Wetland
- PFO Wetland
- Remotely Sensed Feature

0 250
Feet

N

SITE LOCATION



DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	1/10/2018	MK	ISSUED FOR NJDEP FILING	1000891	AL	
B	1/3/2020	MK	ISSUED FOR NJDEP PERMIT APPLICATION	1000891	BS	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
ALTERNATIVE SUCTION AND DISCHARGE TIE-IN
COMPRESSOR STATION 206 – SITE 3
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: BS	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver22
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 26 1/3/2020	SHEET 1 OF 1
WO: 1000891			

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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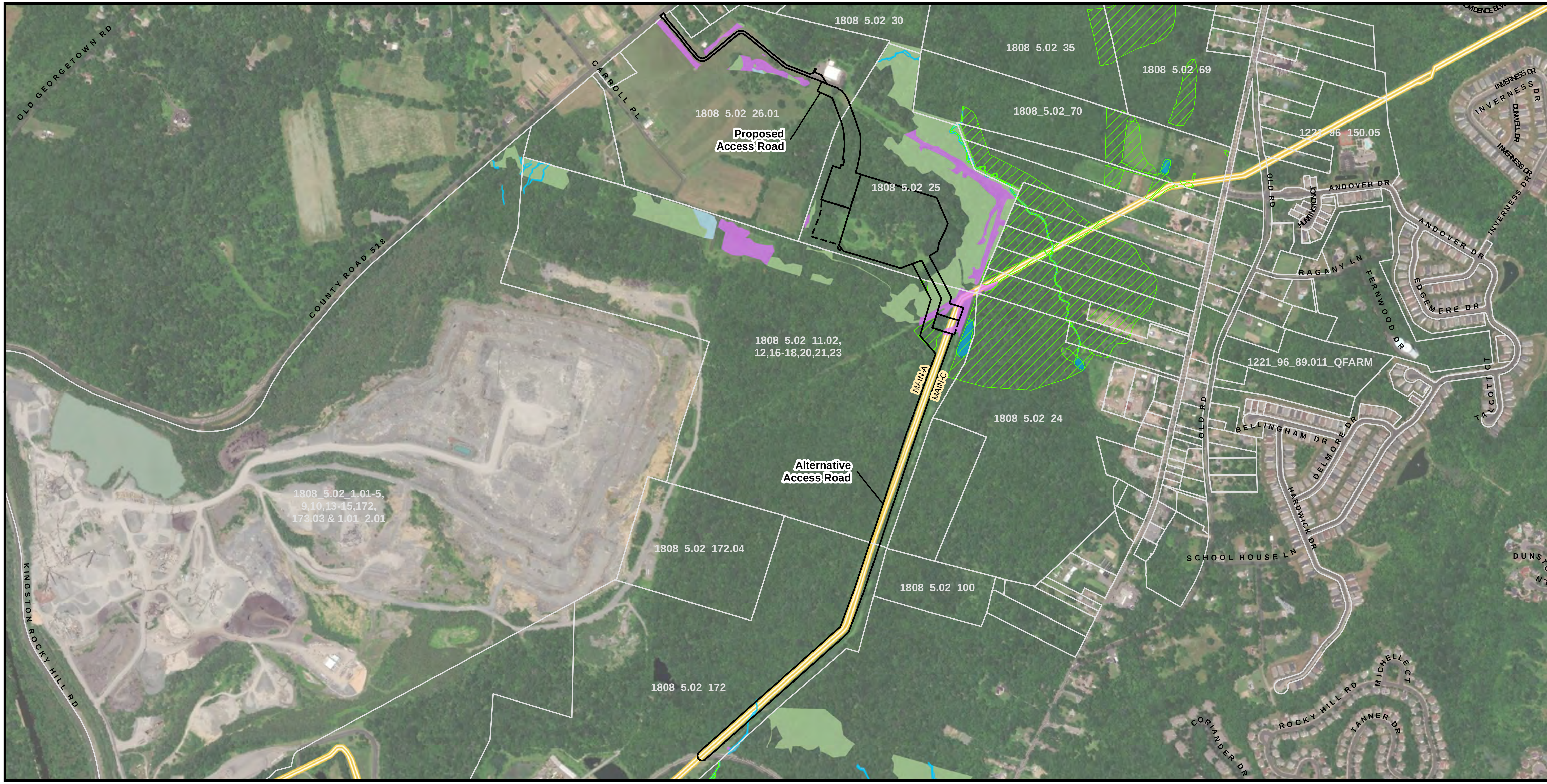


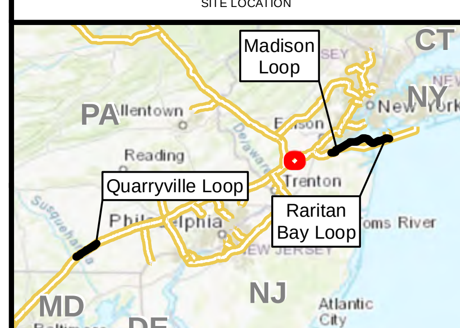
Legend

- Existing Transco Mainline
- Parcel Boundary
- Alternative and Proposed Access Road
- Permanent Workspace
- Temporary Workspace
- Remotely Sensed Feature
- PEM Wetland
- PFO Wetland
- PSS Wetland
- Waterway
- Waterbody

N

0 200 400 600 800 1,000
Feet

SITE LOCATION



DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	1/3/2020	MK	ISSUED FOR PERMITTING REFERENCE	1000891	CE	

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
ALTERNATIVE ACCESS ROAD
COMPRESSOR STATION 206 – SITE 3
NORTHEAST SUPPLY ENHANCEMENT PROJECT
NEW JERSEY

Williams

DRAWN BY: MK	DATE: 1/3/2020	ISSUE FOR BID: N/A	SCALE:
CHECKED BY: CE	DATE: 1/3/2020	ISSUE FOR CONSTRUCTION: N/A	Project features ver24b
APPROVED BY:	DATE:	DRAWING NUMBER: FIGURE 27	SHEET 1 OF 1
WO: 1000891		4:31 PM 1/3/2020	

Data Sources: NJDEP 2012; Williams 2017; E&E 2017; ESRI 2012, 2017.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

ATTACHMENT 1

REMOTE SENSING METHODOLOGY

NORTHEAST SUPPLY ENHANCEMENT PROJECT

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TABLE OF CONTENTS

LIST OF TABLES

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1.0 Remote Sensing for WOTUS Delineation

Remote-sensing methodologies for mapping streams and wetlands have been in existence since the publication of the 1987 Corps of Engineers Wetlands Delineation Manual, which recognizes the use of remote sensing, maps, and other approaches in helping to determine the jurisdictional extent of Waters of the U.S. (WOTUS). Transco developed a remote-sensing methodology that generates a delineation of streams and wetlands in areas not field-surveyed. The remotely sensed WOTUS data assist with avoiding and minimizing impacts, developing and refining Project facilities and workspaces, and assessing the potential for buffers/transitional areas of features located immediately adjacent to the survey corridor to extend back into the Project's limit of disturbance (LOD). Finally, the remotely sensed WOTUS data, used in conjunction with the jurisdictional data collected by the field teams, assist with the permitting process by providing a valid estimate of the water and wetland resources at proposed facility alternatives and potential cumulative impacts and possible mitigation requirements for the proposed Project.

1.1 Remote Sensing Analysts' Experience

Two remote-sensing analysts, both certified Professional Wetland Scientists (PWS) with 60 years of combined experience identifying jurisdictional WOTUS in the field and on aerial photography and satellite imagery, conducted the remote sensing and mapping work for the NESE Project, supporting their analyses by ground-truthing, which is critical to refining the skills needed to interpret and correlate signatures and characteristics of the imagery/ancillary data sources with waters/wetland conditions on the ground. They have used their experience in remote-sensing and ground-truthing in portions of all 50 states, several U.S. territories, and a number of foreign countries. The team conducted a similar remote sensing effort on a larger scale for Transco's Atlantic Sunrise Project (ASR), a proposed 19-mile natural gas pipeline project in Pennsylvania that originally developed the basis for the remote sensing methods and approaches described below.

1.2 High-Resolution Imagery and Elevation Data

High-resolution four-band (red, green, blue, near infra-red) aerial photographic imagery, at a 6-inch resolution per image pixel, was collected for the Project in December 2015. The imagery was collected within a 2,500-foot swath over the proposed pipeline centerline during leaf-off winter conditions, thus allowing greater visual representation of the earth's surface beneath the vegetation, especially in wetter areas. Typically, ponded water, areas of higher surface soil moisture, and emergent vegetation consistent with wetland signatures are more readily identified using the near infrared band within multi-spectral imagery. This high-resolution imagery was used as the mapping base for the remotely sensed delineation of WOTUS features for the NESE project.

In addition, elevation data at a resolution of 1-foot per pixel were generated using photogrammetric techniques for the proposed pipeline routes from the same aerial imagery collected for the Project. The elevation data were developed into a digital elevation model (DEM) of the earth’s surface, and a number of additional topographic datasets (i.e., contours, slope, and concavity) were then derived from this DEM as needed for further interpretation. These datasets included pixel representations of the local slope and topographic curvature (i.e., the relative convexity or concavity of the land’s surface) at every point in the DEM, for the entire Project area. In addition, 1-foot and 5-foot contour datasets were also created for the proposed pipeline routes.

The 6-inch resolution imagery, the 1-foot resolution DEM, and the elevation derivatives were the primary data sources used for the remote sensing-based delineation of WOTUS for the NESE Project.

1.3 Ancillary Data Sources

In addition to the aforementioned four-band imagery and elevation data, a variety of ancillary data sources were reviewed in ArcGIS 10.3 to provide additional information and a base of reference for use in the remotely sensed delineation of WOTUS boundaries on the high resolution imagery. These ancillary data sources are summarized in Table 1-1 below.

Table 1-1
Ancillary Data Sources Used During the Remote Sensing-Based Delineation of Waters of the U.S. (WOTUS) on the Northeast Supply Enhancement Project

Data Source	Data Spatial Resolution	Data Attributes	Data Source
World Imagery in ArcView 10.4	Variable	High-Resolution Satellite Imagery Served Online via ArcGIS – Primarily National Agricultural Imagery Program (NAIP) imagery. True-color and Color Infra-Red Imagery.	ESRI/NAIP
Google Earth Imagery and Historic Imagery	Variable	High-Resolution Aerial Imagery High Resolution Historic Aerial Imagery 1995-2016 (variable seasons and leaf-on/leaf-off conditions)	Google Earth, Inc.
Bing Birds Eye View Imagery	Variable – Oblique Imagery	High Resolution Oblique “Birds-Eye View” Imagery – March to May 2012 and Aerial Imagery sources	Microsoft, Inc. Bing Imagery
NWI	Vector data	Wetlands/Waterbodies/Cowardin Class	USFWS

Table 1-1
Ancillary Data Sources Used During the Remote Sensing-Based Delineation of Waters of the U.S. (WOTUS) on the Northeast Supply Enhancement Project

Data Source	Data Spatial Resolution	Data Attributes	Data Source
NHD	Vector data	Streams and Waterbodies, Hydrologic Context and Connectivity	USGS
SSURGO Hydric Soils	Vector data	Hydric Soils and Drainage Classes	USDA-NRCS
FEMA 100-year Floodplain/Floodway	Vector data	Spatial Extent of the 100-year Floodplain/Floodway and Flood Elevations	FEMA
E & E WOTUS Field Data on Adjacent Land Parcels	Sub-meter GPS collection	Wetland and water points, polylines, and polygons	Williams/Transco and E & E

Key:

E & E = Ecology and Environment, Inc.
ESRI = Environmental Systems Research Institute, Inc.
FEMA = Federal Emergency Management Agency
GPS = Global positioning system
NAIP = National Agricultural Imagery Program
NHD = National Hydrography Dataset
NWI = National Wetlands Inventory
NRCS = Natural Resources Conservation Service
SSURGO = Soil Survey Geographic Database
USDA = U.S. Department of Agriculture
USFWS = U.S. Fish and Wildlife Service
USGS = U.S. Geological Survey

1.4 Imagery and Data Interpretation

Datasets and analyses were prepared using ArcGIS 10.3. Mapping scales chosen for image and data interpretation by the analysts were 1:1,200, 1:600, and 1:300 in order to maintain mapping consistency and minimize errors related to differences in scale across the mapped areas. Water and wetland boundaries were all mapped (i.e., heads-up digitizing [HUD]) at a 1:600 scale. Analysts then used a 1:300 scale in certain areas to map finer details of waterbodies and/or wetland edges. Once detailed mapping at 1:300 was completed, the analysts returned to HUD at 1:600 scale to complete the boundary mapping. The 1:1,200 scale provided context from the surrounding area and was used to ensure mapped features were hydrologically connected properly either to an existing water/wetland on the same parcel or to existing field-collected data on adjacent parcels where field surveys were completed.

Image elements such as tone, texture, pattern, shape, context, and association were used to identify potential WOTUS features within the high-resolution Project imagery and other ancillary imagery sources that were available at each location. The process also included assessing the relative landscape position/landform (e.g., valley bottoms, floodplains, tributary junctions, pond margins, etc.) and hydrodynamics (e.g., potential water sources and sinks) to locate potential stream and wetland features. In addition, field survey data on adjacent parcels (e.g., field-delineated WOTUS data) provided a basis for continuing the delineation of features into the areas not field-surveyed. Of the approximately 118 total delineated features (i.e., wetland boundaries, stream centerlines, and ordinary high water mark/top of bank OHWM/TOB polygons) identified as jurisdictional through the remote sensing process, 56 of the 118 (47.5%) were extensions of existing field data that had been collected by teams on the ground, and 62 of the 118 (52.5%) were newly identified. The vast majority—55 of the 62 newly identified features (88.7%)—were delineated on three of the five proposed sites considered in the Compressor Station 206 alternatives analysis, where no prior field data existed.

Digital hydric soils and drainage class data from the Soil Survey Geographic (SSURGO) digital soils dataset were examined to identify areas where potential features were mapped as 'hydric' with poor to very poor drainage classes, which provided additional data to either substantiate or invalidate the feature's presence/absence and relative boundary. National Wetland Inventory (NWI) data, the USGS National Hydrography Dataset (NHD), and Federal Emergency Management Agency (FEMA) ancillary data tended to be less useful for a first-cut analysis of waters/wetlands presence or absence and were generally used in conjunction with the aforementioned data sources to help corroborate or refute the boundary of a remotely sensed WOTUS feature.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

ATTACHMENT 2

HIGH CONSEQUENCE AREA (HCA) DEFINITION

NORTHEAST SUPPLY ENHANCEMENT PROJECT

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High Consequence Area is defined by 49 CFR 192.903 as follows:

(1) An area defined as-

(i) A Class 3 location under §192.5; or

(ii) A Class 4 location under §192.5; or

(iii) Any area in a Class 1 or Class 2 location where the potential impact radius is greater than 660 feet (200 meters), and the area within a potential impact circle contains 20 or more buildings intended for human occupancy; or

(iv) Any area in a Class 1 or Class 2 location where the potential impact circle contains an identified site.

(2) The area within a potential impact circle containing-

(i) 20 or more buildings intended for human occupancy, unless the exception in paragraph (4) applies; or

(ii) An identified site.

(3) Where a potential impact circle is calculated under either method (1) or (2) to establish a high consequence area, the length of the high consequence area extends axially along the length of the pipeline from the outermost edge of the first potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy to the outermost edge of the last contiguous potential impact circle that contains either an identified site or 20 or more buildings intended for human occupancy.

(4) If in identifying a high consequence area under paragraph (1)(iii) of this definition or paragraph (2)(i) of this definition, the radius of the potential impact circle is greater than 660 feet (200 meters), the operator may identify a high consequence area based on a prorated number of buildings intended for human occupancy with a distance of 660 feet (200 meters) from the centerline of the pipeline until December 17, 2006. If an operator chooses this approach, the operator must prorate the number of buildings intended for human occupancy based on the ratio of an area with a radius of 660 feet (200 meters) to the area of the potential impact circle (i.e., the prorated number of buildings intended for human occupancy is equal to 20 x (660 feet) [or 200 meters]/potential impact radius in feet [or meters]).

Identified site means each of the following areas:

(a) An outside area or open structure that is occupied by twenty (20) or more persons on at least 50 days in any twelve (12)-month period. (The days need not be consecutive.) Examples include but are not limited to, beaches, playgrounds, recreational facilities,

camping grounds, outdoor theaters, stadiums, recreational areas near a body of water, or areas outside a rural building such as a religious facility; or

(b) *A building that is occupied by twenty (20) or more persons on at least five (5) days a week for ten (10) weeks in any twelve (12)-month period. (The days and weeks need not be consecutive.) Examples include, but are not limited to, religious facilities, office buildings, community centers, general stores, 4-H facilities, or roller skating rinks; or*

(c) *A facility occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate. Examples include but are not limited to hospitals, prisons, schools, day-care facilities, retirement facilities or assisted-living facilities.*