ROVER PIPELINE
An ENERGY TRANSFER Company

ROVER PIPELINE LLC

Rover Pipeline Project

RESOURCE REPORT 2
Water Use and Quality

FERC Docket No. CP15-___-000

February 2015

TABLE OF CONTENTS

Section **Page**

2.0 WATER USE AND QUALITY 2-1
2.1 GROUNDWATER RESOURCES 2-2
2.1.1 Regional Aquifers 2-2
2.1.1.1 West Virginia 2-2
2.1.1.2 Pennsylvania 2-3
2.1.1.3 Ohio 2-3
2.1.1.4 Michigan 2-5
2.1.2 Sole Source Aquifers 2-6
2.1.3 State-Designated Aquifers 2-6
2.1.4 Contaminated Groundwater 2-6
2.1.5 Public and Private Water Supply Wells and Springs 2-6
2.1.6 Wellhead Protection Areas 2-7
2.1.6.1 West Virginia 2-7
2.1.6.2 Pennsylvania 2-7
2.1.6.3 Ohio 2-8
2.1.6.4 Michigan 2-8
2.1.7 Groundwater Impacts and Mitigation 2-9
2.2 SURFACE WATER RESOURCES 2-11
2.2.1 Watersheds Crossed by the Project 2-11
2.2.2 Waterbodies Affected by the Project 2-11
2.2.2.1 Waterbodies Crossed within Karst-Prone Areas 2-12
2.2.2.2 Traditional Navigable Waters 2-13
2.2.2.3 Water Quality Classification 2-13
2.2.3 Sensitive Surface Waters 2-14
2.2.3.1 Impaired Waterbodies and Contaminated Sediments 2-15
2.2.3.2 Threatened and Endangered Species or Critical Habitat 2-15
2.2.3.3 Federally and State Designated Waterbodies 2-15
2.2.3.4 Surface Water Intakes 2-16
2.2.3.5 Surface Water Protection Areas 2-16
2.2.3.6 Flood Zones 2-18
2.2.4 Waterbody Crossing Methods 2-18
2.2.5 Waterbody Construction Impacts, Mitigation, and Restoration 2-19
2.2.6 Hydrostatic Test Water Withdrawal and Discharge 2-21
2.3 WETLANDS 2-22
2.3.1 Classification of Wetlands Crossed By the Project 2-22
2.3.1.1 Palustrine Emergent Wetlands 2-22
2.3.1.2 Palustrine Scrub-Shrub Wetlands 2-23
2.3.1.3 Palustrine Forested Wetlands 2-24
2.3.2 Wetland Crossings 2-24
2.3.3 Wetland Construction Methods 2-26

2.3.4 Wetland Impacts and Mitigation 2-26
2.3.4.1 Wetland Impacts 2-26
2.3.4.2 Wetland Mitigation 2-27
2.3.5 Compensatory Mitigation 2-28
2.3.5.1 West Virginia 2-28
2.3.5.2 Pennsylvania 2-28
2.3.5.3 Ohio 2-29
2.3.5.4 Michigan 2-29
2.4 REFERENCES 2-30

LIST OF TABLES

TABLE 2.2-1 Summary of Waterbodies Crossed by the Rover Pipelines by Flow Type 2-12
TABLE 2.3-1 Summary of Wetlands Affected 2-25

LIST OF APPENDICES

APPENDIX 2A Supplemental Tables
Table 2A-1 Aquifers Crossed by the Rover Pipeline Project
Table 2A-2 Public and Private Water Supply Wells and Springs within 150 Feet
Table 2A-3 Wellhead Protection Areas Crossed by the Rover PipelineProject
Table 2A-4 Watersheds Crossed by the Rover Pipeline Project
Table 2A-5 Waterbodies Crossed by the Rover Pipeline Project
Table 2A-6 Drainages Crossed by the Rover Pipeline Project
Table 2A-7 Sensitive Surface Waters Crossed by the Rover Pipeline Project
Table 2A-8 Surface Water Intakes within Three Miles Downstream of Waterbodies Crossed by the Rover Pipeline Project
Table 2A-9 Surface Water Protection Areas Crossed by the Rover Pipeline Project
Table 2A-10 FEMA Flood Hazard Zones Crossed by the Rover Pipeline Project
Table 2A-11 Wetlands Crossed by the Rover Pipeline Project

APPENDIX 2B Figures
Figure 2B-1 Wellhead Protection Areas crossed by the Rover Pipeline

VOLUME II-B

ATTACHMENT 2A Wetland Delineation Reports

ATTACHMENT 2B U.S. Army Corps of Engineer Applications
Pittsburgh District
Huntington District
Buffalo District

ATTACHMENT 2C Michigan Department of Environmental Quality Applications

LIST OF ACRONYMS

ATWS	additional temporary workspace
CAZ	Critical Assessment Zone
CGT	Columbia Gas Transmission
CWA	Clean Water Act
CWF	coldwater fishery
EFH	essential fish habitat
EV	Exceptional Value
FEMA	Federal Emergency Management Agency
FERC or Commission	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
GIS	geographic information system
HDD	horizontal directional drill
hp	horsepower
HQ	High Quality
HUC	Hydrologic Unit Code
ILF	In-lieu fee
IRT	Interagency Review Team
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MP	milepost
NPS	National Park Service
NRCS	Natural Resources Conservation Service
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PEM	Palustrine Emergent
PFBC	Pennsylvania Fish and Boat Commission
PFO	Palustrine Forested
PGC	Pennsylvania Game Commission
PIESCES	Pennsylvania Integrated Ecological Services Enhancement and Support
Rover Plan	*Rover's Upland Erosion Control, Revegetation, and Maintenance Plan*
Project	Rover Pipeline Project
PSS	Palustrine Scrub-Shrub
PWRP	Pennsylvania Wetland Replacement Project
Rover	Rover Pipeline LLC
Rover Procedures	Rover's *Waterbody and Wetland Construction and Mitigation Procedures*
RTE	Rare, threatened, and endangered
SDWA	Safe Drinking Water Act
SFHA	Special Flood Hazard Areas

SPR Procedures	Spill Prevention and Response Procedures
SSA	Sole Source Aquifer
SWAP	Source Water Assessment and Protection
TNW	Traditional Navigable Waters
TSF	trout stocking
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WHPA	wellhead protection area
WHPP	Wellhead Protection Program
WVBPH	West Virginia Department of Health and Human Resources, Bureau for Public Health
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Department of Natural Resources
WWF	warmwater fishery
ZCC	Zone of Critical Concern

RESOURCE REPORT 2 -- WATER USE AND QUALITY	
Filing Requirement	**Location in Environmental Report**
• Identify and describe by milepost perennial waterbodies and municipal water supply or watershed areas, specially designated surface water protection areas and sensitive waterbodies, and wetlands that would be crossed. For each waterbody crossing, identify the approximate width, state water quality classifications, any known potential pollutants present in the water or sediments, and any potable water intake sources within 3 miles downstream. (§ 380.12 (d) (1))	Sections 2.1 and 2.2 and Tables 2A-2 through 2A-8 in Appendix 2A
• Compare proposed mitigation measures with the staff's current "Wetland and Waterbody Construction and Mitigation Procedures," which are available from the Commission Internet home page or the Commission staff, describe what proposed alternative mitigation would provide equivalent or greater protection to the environment, and provide a description of site-specific construction techniques that would be used at each major waterbody crossing. (§ 380.12 (d) (2))	Section 2.2.4; Section 2.2.5; and Section 2.3.4
• Describe typical staging area requirements at waterbody and wetland crossings. Also, identify and describe waterbodies and wetlands where staging areas are likely to be more extensive. (§ 380.12 (d) (3))	Sections 2.2.4 and 2.3.4
• Include National Wetland Inventory (NWI) maps. If NWI maps are not available, provide the appropriate state wetland maps. Identify for each crossing, the milepost, the wetland classification specified by the U.S. Fish and Wildlife Service, and the length of the crossing. Include two copies of the NWI maps (or the substitutes, if NWI maps are not available) clearly showing the proposed route and mileposts directed to the environmental staff. Describe by milepost, wetland crossings as determined by field delineations using the current Federal methodology. (§ 380.12 (d) (4))	Section 2.3.2 NWI maps and/or site-specific maps from field surveys to be provided in January 2015
• Identify aquifers within excavation depth in the project area, including the depth of the aquifer, current and projected use, water quality and average yield, and known or suspected contamination problems. (§ 380.12 (d) (5))	Section 2.1.1
• Describe specific locations, the quantity required, and the method and rate of withdrawal and discharge of hydrostatic test water. Describe suspended or dissolved material likely to be present in the water as a result of contact with the pipeline, particularly if an existing pipeline is being retested. Describe chemical or physical treatment of the pipeline or hydrostatic test water. Discuss waste products generated and disposal methods. (§ 380.12 (d) (6))	Section 2.2.6 Resource Report 1, Hydrostatic test water source/discharge locations to be provided in January 2015
• If underground storage of natural gas is proposed: (§ 380.12 (d) (7)) (i) Identify how water produced from the storage field will be disposed of, and (ii) For salt caverns, identify the source locations, the quantity required, and the method and rate of withdrawal of water for creating salt cavern(s), as well as the means of disposal of brine resulting from cavern leaching.	Not Applicable No underground storage proposed

RESOURCE REPORT 2 -- WATER USE AND QUALITY	
Filing Requirement	**Location in Environmental Report**
• Discuss proposed mitigation measures to reduce the potential for adverse impacts to surface water, wetlands, or groundwater quality to the extent they are not described in response to paragraph (d)(2) of this section. Discuss the potential for blasting to affect water wells, springs, and wetlands, and measures to be taken to detect and remedy such effects. (§ 380.12 (d) (8))	Section 2.1.6; Section 2.2.5; and Section 2.3.4
• Identify the location of known public and private groundwater supply wells or springs within 150 feet of proposed construction areas. Identify locations of EPA or state-designated sole-source aquifers and wellhead protection areas crossed by the proposed pipeline facilities. (§ 380.12 (d) (9))	Section 2.1.2; Section 2.1.4; Section 2.1.5 and Tables 2A-2 and 2A-3 in Appendix 2A

2.0 WATER USE AND QUALITY

Rover Pipeline LLC (Rover) is seeking authorization from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act to construct, own, and operate the proposed Rover Pipeline Project (Project). The Rover Pipeline Project is a new natural gas pipeline system that will consist of approximately 711.2 miles of Supply Laterals and Mainlines, 10 compressor stations, and associated meter stations and other aboveground facilities that will be located in parts of West Virginia, Pennsylvania, Ohio, and Michigan. The Project will include approximately 509.1 miles of proposed right-of-way, extending from the vicinity of New Milton, Doddridge County, West Virginia to the vicinity of Howell, Livingston County, Michigan, and will include approximately 202.1 miles of dual pipelines.

The Project will consist of the following components and facilities:

- Supply Laterals:
  - eight supply laterals consisting of approximately 199.7 miles of 24-, 30-, 36-, and 42-inch-diameter pipeline in West Virginia, Pennsylvania, and Ohio,
  - two parallel supply laterals, each consisting of approximately 18.8 miles (for a total of approximately 37.6 miles) of 42-inch-diameter pipeline (Supply Connector Lateral Line A and Line B) in Ohio,
  - approximately 72,645 horsepower (hp) at six new compressor stations to be located in Doddridge and Marshall counties, West Virginia; Washington County, Pennsylvania; and Noble, Monroe, and Harrison counties, Ohio, and
  - two new delivery, 11 new receipt, and two bidirectional meter stations on the Supply Laterals.

- Mainlines A and B:
  - approximately 190.6 miles of 42-inch-diameter pipeline (Mainline A) in Ohio,
  - approximately 183.3 miles of parallel 42-inch-diameter pipeline (Mainline B) in Ohio,
  - approximately 114,945 hp at three new compressor stations to be located in Carroll, Wayne, and Crawford counties, Ohio, and
  - two new delivery meter stations in Defiance County, Ohio.

- Market Segment:
  - approximately 100.0 miles of 42-inch diameter pipeline in Ohio and Michigan,
  - approximately 25,830 hp at one new compressor station to be located in Defiance County, Ohio, and
  - two new delivery meter stations in Washtenaw and Livingston counties, Michigan.

Resource Report 2 addresses water use and quality, which includes, but is not limited to, existing "waters of the U.S., including wetlands" pursuant to Section 404 of the Clean Water Act (CWA), drinking water supplies, and groundwater resources that may be affected by the construction and operation of the Project.

This Resource Report 2 also describes the expected impact of the Project on water quality and use, and the mitigative and protective measures proposed to minimize impacts on those resources. Copies of relevant correspondence are provided in Volume II-B, Resource Report 1, Attachment 1F.

To minimize impacts during construction and operation of the Project on water and wetland resources, Rover will implement the *Rover's Upland Erosion Control, Revegetation, and Maintenance Plan* (Rover Plan) and Project-specific *Rover's Wetland and Waterbody Construction and Mitigation Procedures* (Rover Procedures) to address site-specific conditions encountered along the pipelines. In addition, Rover will implement the measures contained in its *Spill Prevention and Response Procedures* (SPR Procedures) to minimize the risk of spills of hazardous materials during construction. The Rover Plan, Rover Procedures and the SPR Procedures are also included in Appendix 1B in Resource Report 1.

The Wetland Delineation Report for surveys completed through October 2014 is provided in Volume II-B, Attachment 2A. Permit applications for the U.S. Army Corps (USACE) Districts, Ohio Environmental Protection Agency (OEPA), and Michigan Department of Environmental Quality (MDEQ) will be provided in February 2015.

2.1 GROUNDWATER RESOURCES

This section describes the existing groundwater resources including groundwater use and quality in the Project areas. This section also discusses the potential impacts to groundwater resources from construction and operation of the Project, and methods to avoid, minimize and mitigate those potential impacts.

2.1.1 Regional Aquifers

Physiographic or geomorphic regions are broad-scale subdivisions of the landscape based on surface terrain, lithology, and geologic structure and history. Certain characteristics of the underlying physiographic regions determine the depth and yield of an aquifer. Information about the regional aquifers crossed by the individual components of the Project is discussed below by state and provided in Table 2A-1.

2.1.1.1 West Virginia

The Sherwood, Columbia Gas Transmission (CGT), Burgettstown, and Majorsville Laterals overlie the Pennsylvanian and Permian sedimentary aquifers of the Appalachian Plateau Province in West Virginia. The consolidated rocks of the Appalachian Plateaus Province are almost flat-lying to gently folded; the regional dip of the beds rarely exceeds 25 feet per mile. Consolidated sedimentary rocks in the Pennsylvanian and Permian aquifers consist of cyclic sequences of sandstone, shale, limestone, and coal. Sandstone members are most common and most productive with well yields ranging from 5 to 400 gallons per minute (Trapp and Horn, 1997).

Since the unglaciated portion of the Appalachian Plateaus is highly dissected and sloping, much of the precipitation that falls on the area rapidly runs off the slopes. A small amount of the precipitation, however, infiltrates the earth's surface and moves downward through the unsaturated zone to infiltrate weathered bedrock and shallow fractures in unweathered bedrock. The general movement of groundwater is from areas of high hydraulic head to areas of low hydraulic head. In the Appalachian Plateaus, extensive, almost flat-lying confining units of shale, siltstone, clay, and dense limestone effectively impede the vertical movement of water through porous bedrock at the confining layer. This is especially true of the sedimentary rocks, which cover a large part of the area (Trapp and Horn, 1997).

Fresh groundwater generally circulates only to shallow depths in the Appalachian Plateaus Province. In much of the area, saline water or brine is not far below the land surface with only a thin transition zone between the freshwater and saltwater. The origin of the brine that feeds the springs is uncertain, but one possible explanation is that salt has been leached from deposits of salt and other evaporates (Trapp and Horn, 1997).

The chemical quality of water in the freshwater parts of the bedrock aquifers of the Appalachian Plateaus Province is somewhat variable but is generally satisfactory for municipal supplies and other purposes. Most of the water in the upper parts of the aquifers is not greatly mineralized and is suitable, or can be treated, for most uses (Trapp and Horn, 1997).

2.1.1.2 Pennsylvania

Groundwater in Pennsylvania is primarily used for domestic drinking water supplies (The Pennsylvania State University, 2007). In addition, groundwater contributes about 74 percent of water used by agriculture and 84 percent of water used for mining. It is also a significant source for industrial and commercial uses (Pennsylvania Department of Conservation and Natural Resources [PADCNR], 1999).

Similar to Project facilities in West Virginia, the Burgettstown Lateral in Pennsylvania is located within the Appalachian Plateaus physiographic province (PADCNR, 2000). Specifically, the Burgettstown Lateral is located within the Pittsburgh Low Plateau which is characterized by underlying sedimentary rocks of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age (PADCNR, 2000; Berg et al., 1980). Please refer to the previous section for a discussion of the Pennsylvanian and Permian aquifers of the Appalachian Plateaus Province.

2.1.1.3 Ohio

In general, Ohio has abundant surface and groundwater resources. Average rainfall ranges between 30 to 44 inches per year, and a small portion of this rainfall (3 to 16 inches) contributes directly to underlying aquifers. Aquifers in the state can be divided into three major types, including sand and gravel valley aquifers or "buried valleys," sandstone aquifers, and carbonate aquifers (OEPA, 2010). Project facilities in Ohio overlie three major aquifer types. The Supply Laterals in Ohio and the eastern half of Mainlines A and B overlie sand and gravel valley aquifers and sandstone aquifers of the Appalachian Plateaus physiographic province. The western portion of Mainlines A and B and the portion of the Market

Segment in Ohio primarily overlie carbonate aquifers, in addition to sand and gravel valley aquifers, in the Central Lowland physiographic province. Each major aquifer type is discussed below in more detail.

The unconsolidated sand and gravel units, typically associated with buried valley aquifer systems, are highly permeable, easily recharged, and yield more water than any other aquifer in Ohio or the Appalachian Plateaus Province (Lloyd and Lyke, 1995). These valleys were cut into the bedrock by pre-glacial and glacial streams and subsequently the valleys were back-filled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. Buried valley aquifers are found beneath and adjacent to the Ohio River, its major tributaries, and other pre-glacial stream channels. In the northwest corner of the state, sand and gravel deposits occur between sheets of glacial till. Present day stream processes deposit alluvial sand and gravel deposits that also serve as aquifers (OEPA, 2010). Water production from the coarser grained and thicker sand and gravel deposits ranges from 500 to 1,000 gallons per minute. Lower yields from sand and gravel aquifers are more common (OEPA, 2010). Due to their rapid recharge rates, the OEPA considers sand and gravel valley aquifers to be the most sensitive and the most likely to be impacted by land use activities (OEPA, 2007).

Mississippian and Pennsylvanian sandstone units are the dominant bedrock aquifers in the eastern half of Ohio. Upper Paleozoic siltstone, sandstone, and conglomerate formations (Mississippian to Permian age) in eastern Ohio occur as numerous layers of siltstone and sandstone of variable thickness and areal extent separated by layers of shale and minor amounts of limestone, clay and coal. Some of the thicker sandstones and conglomerates are capable of yielding 50 to 100 gallons per minute (OEPA, 2010). In southeastern Ohio, Upper Pennsylvanian and Permian stratigraphic sections include low yielding aquifers. The bedrock consists of varied sequences of thin-bedded shales, limestones, sandstones, clays, and coals of the Pennsylvania, Conemaugh and, Monongahela Groups and the Permian Dunkard Group. The Conemaugh and Monongahela Groups average approximately 1,000 feet in thickness, and thicken toward the southeast, reaching 1,500 feet in thickness along the Ohio River in Belmont, Monroe, and Washington counties, Ohio (Lloyd and Lyke, 1995). Yields below 5 gallons per minute are common in these areas (OEPA, 2010).

Carbonate bedrock, consisting of limestone and dolomite of Silurian and Devonian age, is the dominant aquifer in the western part of Ohio in the Central Lowland Province (OEPA, 2010; Lloyd and Lyke, 1995). The majority of the freshwater portion of the Silurian-Devonian aquifer is directly overlain by unconsolidated deposits of Quaternary age that compose the surficial aquifer system. The thickness of the Quaternary deposits, and depth to the top of the Silurian-Devonian aquifer, range from less than 100 feet to more than 400 feet below land surface. The Silurian-Devonian aquifer is recharged from the overlying surficial aquifer system in areas where water levels in the surficial aquifer system are higher than those in the Silurian-Devonian aquifer. Locally, where the water-level differences are reversed, water discharges to the surficial aquifer system from the Silurian-Devonian aquifer (Lloyd and Lyke, 1995). Middle Devonian and Silurian limestone and dolomite reach a total thickness of 300 to 600 feet, and are capable of yielding from 100 to over 500 gallons of water per minute (OEPA, 2010). The chemical quality of water from the freshwater parts of the Silurian-Devonian aquifer generally is adequate or can be treated and made adequate, for most purposes (Lloyd and Lyke, 1995).

Karst is a landscape formed by the dissolution of soluble rocks such as limestone, dolomite, and gypsum by groundwater. Karst features that outcrop at or near the earth's surface may not provide adequate filtration of recharge prior to entering drinking water supplies (U.S. Geological Survey [USGS], 1998). Karst areas are present in the vicinity of the Project in Ohio between approximate Mainline mileposts (MPs) 124.0 and 209.4 and Market Segment MPs 0.0 and 4.0. Additional discussion of karst topography is provided in Resource Report 6.

2.1.1.4 Michigan

Groundwater is used for drinking water by nearly half of Michigan's population. In addition, groundwater is used for irrigation and industrial purposes (MDEQ, 2006).

The Market Segment in Michigan overlies the Mississippian and Pennsylvanian aquifers. Within the Pennsylvanian aquifer system, the Grand River-Saginaw aquifer is present and consists primarily of sandstone with some interbedded shale, and is the principal bedrock aquifer in the Lower Peninsula of Michigan. This aquifer is productive and forms a major source of water for municipal, industrial, and domestic supply (Olcott, 1992). The aquifer is underlain by a confining unit that mainly consists of Pennsylvanian and Mississippian age limestone and shale. In places, the aquifer is overlain and confined by red shale of Jurassic age that is up to 300 feet thick. The aquifer is most productive where it is overlain by and hydrologically connected to the surficial aquifer system that consists of permeable, sorted and stratified sand and gravel deposits of glacial origin that are commonly interbedded within less permeable till. Recharge to the sandstone aquifer is from water that percolates downward through the surficial aquifer system. Once in the sandstone aquifer, water movement is primarily horizontal. Estimated potential well yields range from less than 50 to 900 gallons per minute, depending on thickness, fracturing, and degree of interconnection with the overlying surficial aquifer system (Olcott, 1992).

The Mississippian aquifer system, which underlies much of the Lower Peninsula of Michigan, contains one of the most productive aquifers in the state. Mississippian age rocks dip and thicken in a radial pattern toward the center of the Michigan Basin, and generally consist of sandstone, some shale, limestone and coal, and range in thickness from a featheredge to approximately 1,000 feet (Olcott, 1992). The aquifer is overlain by either Pennsylvanian age rocks or gravel deposits (i.e., the surficial aquifer system). Although much of the aquifer is confined or semiconfined, unconfined conditions occur locally in the area where the aquifer forms the bedrock surface. Recharge to the aquifer is principally where the aquifer forms the bedrock surface and is directly overlain by and hydraulically connected with the surficial aquifer system to the north and the south of overlying Pennsylvanian rocks. Wells located in these unconfined areas yield approximately 900 to 1,000 gallons per minute. Because of the minimal aquifer transmissivity and the occurrence of dense brine in the central part of the aquifer, little groundwater movement probably occurs. The principal movement of water in the aquifer, therefore, is probably largely restricted to peripheral areas of the aquifer (Olcott, 1992).

As such, karst areas or "sensitive bedrock aquifer areas" are of special concern in Michigan. In the Lower Peninsula, carbonate rocks are buried deeply beneath glacial deposits and do not support karst terrain

(Lusch, 2012). According to mapping produced by Western Michigan University, the Market Segment does not cross any karst areas or sensitive bedrock aquifer areas in Michigan (Lusch, 2012).

2.1.2 Sole Source Aquifers

An aquifer that is the sole or principal source providing 50 percent or more of the drinking water for a given area, and for which there are no other reasonable alternative sources should that specific aquifer be contaminated, is designated as a Sole Source Aquifer (SSA) by the United States Environmental Protection Agency (USEPA), pursuant to Section 1424(e) of the Safe Drinking Water Act (SDWA) of 1974. According to the USEPA's designated SSA maps for Regions 3 and 5 (USEPA, 2009; USEPA, 2014a), there are no designated SSAs crossed by or located near the Rover Pipeline Project facilities.

2.1.3 State-Designated Aquifers

In addition to the USEPA designated SSA program, individual states may enact regulations protecting significant aquifer recharge areas used for public water supplies. Based on consultation with the appropriate state agencies and review of publicly available information, none of the states crossed by Project facilities designated aquifers for protection at the state level (Merideth et al, 2001; OEPA, 2015a; PADCNR, 1999; PADCNR, 2015. MDEQ, 2015a; WVDEP, 2015a). Agency correspondence and a list of sources searched is provided in Volume IIB, Attachment 1D.

2.1.4 Contaminated Groundwater

Based on a review of available data, Rover did not identify any known hazardous waste sites, including National Priority List sites, that could be impacted or provide a groundwater contamination concern for construction and operation of the proposed Project facilities (MDEQ, 2003; Pennsylvania Department of Environmental Protection [PADEP], 2004; USEPA, 2014b; USEPA, 2014c; USEPA, 2014d; USEPA, 2014e; USEPA, 2014f; USEPA, 2014g). Additional information on hazardous waste sites is included in Resource Report 8.

2.1.5 Public and Private Water Supply Wells and Springs

Civil surveyors field-identified public and private water supply wells and springs within a 250 to 400-foot wide survey corridor along the centerline of the pipelines. In order to ensure all public and private water supply wells were identified, publicly available geospatial data, including online databases and geographic information system (GIS) shapefiles, were used to supplement the information collected by the civil surveyors.

To summarize, 40 public and private water supply wells are located within 150 feet of the Supply Laterals, 11 are within 150 feet of Mainlines A and B, and 32 are within 150 feet of the Market Segment. Based on a review of available data for Washington County and the results of the civil survey, there are no public water supply wells located within 150 feet of the Burgettstown Lateral in Pennsylvania (PADEP, 2004; Pennsylvania Geological Survey, 2014). Rover contacted the West Virginia Source Water

Assessment and Wellhead Protection Programs (SWAP and WHPP) staff to determine if additional public and private wells are located within 150 feet of the Sherwood, Majorsville, or Burgettstown Laterals in West Virginia. Based on correspondence with the SWAP and WHPP, the West Virginia state code prohibits the release of locational data for public water wells (WVDHHR, 2015). Table 2A-2 in Appendix 2A provides a list of all known public and private supply wells and springs within 150 feet of the construction work areas, and indicates whether they were identified through civil survey or publicly available geospatial data. In addition, any wells located within a karst area are identified in Table 2A-2 with a superscript plus sign ($^{+}$) next to the MP.

2.1.6 Wellhead Protection Areas

Under a 1986 amendment to the SDWA, each state was required to develop and implement a wellhead protection program in order to identify the land and recharge areas contributing to public supply wells, and prevent the contamination of drinking water supplies. The SDWA was later updated in 1996 with an amendment requiring the development of a broader-based SWAP, which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. This program is responsible for the delineation of Source Water Protection Areas for public water supply withdrawals from groundwater and surface water sources. The following sections discuss the wellhead protection program of each state crossed by the Project facilities, and Table 2A-3 in Appendix 2A provides list of wellhead protection areas (WHPA) crossed by each Project segment. See Section 2.2.3.5 for surface water protection information.

2.1.6.1 West Virginia

The West Virginia WHPP, approved by the USEPA in 1991, was established to protect public groundwater sources from contamination and forms the cornerstone of the SWAP Program (West Virginia Department of Health and Human Resources, Bureau for Public Health [WVBPH], 2008). Wellhead protection requires: (1) the delineation of a wellhead area or the area from which water could flow to the source within a five-year time of travel; (2) a survey of past and present activities performed on all properties present within the wellhead area to identify potential sources of contaminations; and (3) development and implementation of long- and short-term drinking water supply replacement strategies and plans to reduce or eliminate potential threats (WVBPH, 2014a; WVBPH, 2014b). Rover contacted the West Virginia SWAP and WHPP staff to determine if any WHPAs are crossed (WVDHHR, 2015). One WHPA is crossed by the Burgettown Lateral in Hancock County, and one is crossed by the Majorsville Lateral in Marshall County (see Table 2A-3 in Appendix 2A).

2.1.6.2 Pennsylvania

The Pennsylvania WHPP, approved by the USEPA in 1999, is the foundation of the PADEP's SWAP Program as a proactive effort designed to apply proper management techniques and various preventive measures to protect groundwater supplies (PADEP, 2002). WHPAs in Pennsylvania are the protected surface and subsurface area surrounding a public water supply well, wellfield, spring or infiltration gallery through which contaminants are reasonably likely to move toward and reach the water source.

WHPAs are identified in 25 Pennsylvania Code Chapter 109.1 as having three zones: Zone I is the immediate area surrounding the source and may range from a radius of 100 to 400 feet depending upon the site-specific source and aquifer characteristics; Zone II is a radius of a 0.5 mile surrounding the source, unless a more detailed delineation is established to identify the surface area overlying the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery and has been approved by the PADEP (PA Bureau of Watershed Management, 2014); and Zone III is the area which contributes surface water or groundwater to Zone II and may be significant to protecting the source (PADEP, 2002).

Rover was advised by the PADEP in 2014 to contact any Public Water Supplier within the Project area for information regarding their source water protection areas including WHPAs. Using Pennsylvania's eMAP Application one Public Water Supplier, (PA American Water Company PGH District) was identified. Rover contacted the PA American Water Company, but did not receive a response regarding any delineated and approved source water protection areas. Therefore, Rover has assumed a Zone II radius of a 0.5 mile around the source.

Since no public wells appear to be located within a 0.5 mile radius of the Project based on the results of the civil survey to date and a review of Pennsylvania's eMAP Application, Rover believes no Zone I or Zone II WHPAs are crossed by the Burgettstown Lateral in Pennsylvania. However, one public well is located aproximately 7.7 miles southeast of the Burgettstown Lateral within the same HUC-12 watershed. Therefore, Rover conservatively assumes a portion of Burgettstown Lateral (MP 0 to 4.2) is located within a Zone III WHPA (see Table 2A-3 in Appendix 2A). Given the distance of the well to the Burgettstown Lateral, it is unlikely that surface water or groundwater in the Project area contribute to this source.

2.1.6.3 Ohio

The OEPA developed a WHPP to protect the health of people utilizing public drinking water by providing a focus zone around streams, lakes, and aquifers (public wells or wellfields) to assess and protect drinking water. For aquifer sources, this objective is met through the delineation of WHPAs, identification and management of potential pollution sources, groundwater monitoring plans, contingency plans, public vigilance, and public participation and education efforts. WHPAs are defined by the OEPA as the surface and subsurface areas supplying water to public wells or wellfields through which contaminants are likely to move toward and reach such wells or wellfields (OEPA, 1992). WHPAs are delineated using numerical groundwater flow models.

In Ohio, no WHPAs are crossed by the Supply Laterals or Market Segment, and seven are crossed by Mainlines A and B (see Table 2A-3 in Appendix 2A) (OEPA, 2014a).

2.1.6.4 Michigan

The MDEQ developed a WHPP to minimize the potential for contamination by identifying and protecting the area that contributes water to municipal water supply wells. The MDEQ identifies the contributing

area or WHPA through hydrogeological studies assuming a groundwater time of travel of 10 years (MDEQ, 2012). Based on available geospatial data, seven WHPAs are crossed by the Market Segment in Michigan (see Table 2A-3 in Appendix 2A) (MDEQ, 2012).

2.1.7 Groundwater Impacts and Mitigation

Potential impacts to groundwater resources from construction activities will be avoided or minimized by the use of both standard and specialized construction techniques. Shallow aquifers could sustain temporary minor impacts from changes in overland water flow and recharge caused by clearing and grading of the construction work areas. In forested areas, water infiltration may be enhanced by the presence of dense vegetation that retards runoff and promotes retention in the root zone. It is possible, therefore, that surface runoff will increase and infiltration of rainfall will be commensurately reduced, at least temporarily, until the original extent and density of vegetative cover is fully reestablished. In addition, near-surface soil compaction caused by heavy construction vehicles could reduce the soil's ability to transmit water to the shallow aquifer. These minor impacts will be temporary and will not significantly affect groundwater resources.

Groundwater will likely be encountered during trenching associated with the pipelines in wetlands, where groundwater occurs at or near the surface during most of the growing season, and in shallow water table areas. If required, Rover will conduct trench dewatering in accordance with the Rover Plan and the Rover Procedures, all applicable local, state, and federal permits, and any site-specific field conditions that are identified during wetland delineations that may warrant special impact avoidance, minimization, or mitigation procedures.

No significant impacts are expected to occur to groundwater resources from construction and operation of the Project. Potential impacts to groundwater resources will be avoided or minimized by the use of both standard and specialized pipeline construction techniques. Dewatering of the pipeline trench, the only activity requiring pumping of groundwater, may be necessary in areas where there is a high water table. However, pipeline construction activities within a particular location are typically completed within several days, and any lowering of localized groundwater is expected to be temporary. To recharge the aquifer and prevent silt-laden waters from flowing into streams and wetlands, Rover proposes to discharge all water from dewatering activities into well-vegetated upland areas, or into settling or filtering structures if vegetation is insufficient. Implementation of these procedures and use of dewatering structures at stream crossings should minimize potential groundwater impacts during dewatering operations. Rover will conduct construction activities in accordance with the Rover Plan and Rover Procedures to minimize potential impacts to groundwater in the vicinity of the Project.

Construction of the pipelines will require trenching and backfilling to a depth of approximately seven to 15 feet below ground surface. Trenching and backfilling could potentially cause minor localized fluctuations in groundwater levels, and/or increase turbidity within the zone of shallow groundwater adjacent to the trench. Any shallow groundwater disturbance would be localized and temporary to the immediate area of the trenching and backfilling activity and will not affect the overall quality of groundwater in the Project area.

Construction of the aboveground facilities (compressor stations, meter stations, etc.) will require vegetation clearing, grading, and the installation of paved/graveled surfaces, buildings, and concrete pads. Post-construction stormwater management measures will be installed to handle the difference in stormwater runoff volume from pre- to post-construction conditions for the design storm event in accordance with federal and state requirements. New facilities will result in a minor increase in impervious surfaces in the Project area, and the presence of these facilities is not anticipated to affect the recharge of groundwater at the local level.

During construction of the facilities, Rover will comply with its SPR Procedures, which contain provisions to ensure that potential impacts to groundwater resources are prevented and minimized to the extent possible (see Resource Report 1, Appendix 1B). In addition, Rover will adhere to federal and state water quality standards (e.g., CWA, Sections 401, 402, and 404, and the SDWA) to ensure that there will be no significant adverse effects on the quality of groundwater resources.

In karst-prone areas, Rover will implement its Karst Mitigation Plan (see Resource Report 1, Appendix 1B). As required in this plan, Rover will offer each landowner pre- and post-construction testing of wells within 150 feet of the pipeline construction work areas and within 2,000 feet of horizontal directional drill (HDD) locations. For any significant differences in the well yield between pre- and post-construction sampling that cannot be attributed to naturally occurring conditions, such as seasonal groundwater level fluctuations, Rover will compensate the landowner for the installation of a new well or otherwise arrange for provision of suitable water supplies.

Spills or leaks of hazardous liquids have the potential for long-term impacts on groundwater resources, especially in areas where there is a high susceptibility to surface contamination. Factors in determining groundwater susceptibility to contamination are the type of underlying bedrock, depth to bedrock, depth to the water table, and characteristics of soils and surficial deposits. Of these, soil and surficial deposit characteristics are considered the most important factors in determining how susceptible an area is to groundwater contamination. Areas with sand and gravel are considered more susceptible to groundwater contamination than those areas consisting of silt and clay, mainly due to the permeability of the material.

Spill-related impacts from the construction of the Project would mainly be associated with fuel storage, equipment refueling, and equipment maintenance. These potential impacts will be avoided or greatly reduced by regulating fuel storage and refueling activities, and by requiring immediate cleanup should a spill or leak occur. Rover's SPR Procedures describe the preventative measures to avoid spills and leaks, as well as the mitigative measures utilized to minimize potential impacts should a spill or leak occur. These measures include restrictions on the locations for refueling areas; spill response procedures, spill response materials, and training; mitigative measures/response; and hazardous liquids quantities, storage, and disposal. The SPR Procedures will prohibit fuel storage, equipment refueling, and equipment maintenance activities within WHPAs during construction unless approved by the appropriate regulatory authority. By following the SPR Procedures during construction, the potential impacts on soils, groundwater, and water wells due to spills or leaks will be minimized. If it is determined that construction of the Project impacts a water well used for drinking water, Rover will provide water to the landowner until the well can be repaired or replaced.

2.2 SURFACE WATER RESOURCES

2.2.1 Watersheds Crossed by the Project

Watersheds or "hydrologic units" in the U.S. are delineated by the USGS using a national standard hierarchal system based on surface hydrologic features. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, non-contributing, and diversions to form a drainage area with single or multiple outlet points. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification: 2-digit HUC first-level (region), 4-digit HUC second-level (subregion), 6-digit HUC third-level (accounting unit), 8-digit HUC fourth-level (cataloguing unit or subbasin), 10-digit HUC fifth-level (watershed), and 12-digit HUC sixth-level (subwatershed) (Natural Resources Conservation Service [NRCS], 2007).

Project facilities are located within 13 watersheds as defined by the USGS at the 8-digit HUC or subbasin level. Table 2A-4 in Appendix 2A provides information on the subbasins crossed by each Project pipeline in West Virginia, Pennsylvania, Ohio, and Michigan.

2.2.2 Waterbodies Affected by the Project

Waterbodies are defined in the Rover Procedures as "any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes." Waterbodies are defined as being minor if they are less than or equal to 10 feet wide at the crossing location, intermediate if they are greater than 10 feet wide but less than or equal to 100 feet wide, and major if they are greater than 100 feet wide at the crossing location. The USACE has jurisdiction over "waters of the U.S., including wetlands", pursuant to Section 404 of the federal CWA, for all states in the Project area except in Michigan where the USACE has delegated that authority to the MDEQ. Waterbodies include streams with perennial, intermittent, or ephemeral flow. Perennial streams flow year-round. Typically, intermittent streams will flow continuously during wet seasons, but may be dry for a portion of the year. Ephemeral streams flow only for a short period following major rainfall events. Intermittent and ephemeral streams may be dry at the time of construction, depending on the time of year and rainfall conditions.

The term "waterbody" as it is used in this Resource Report is inclusive of all "waters of the U.S.," other than wetlands, that are potentially jurisdictional to the USACE and MDEQ, and all waterbodies as defined by FERC. Potential surface water resources within the Project areas were initially identified using USGS 7.5-minute topographic maps. They were then field-verified during waterbody and wetland delineation surveys conducted between June and October 2014.
As stated in the Rover Procedures, "ditches" are primarily man-made drainage features that include agricultural ditches and canals in fields and pastures and roadside drainage ditches. Ditches are not considered part of stream systems mapped in the USGS hydrographic database and are not intermittent or perennial stream systems or channelized portions of these stream systems. As such, they typically do not fall under the jurisdiction of the U.S. Army Corps of Engineers (COE). Ditches are temporary in nature

and are typically used to facilitate agriculture practices. Ditches or "drainages" were field-identified in addition to waterbodies during waterbody and wetland delineation surveys performed between June and October 2014.

Table 2.2-1 provides a summary of the waterbodies, according to flow type, crossed by the Project to date based on field delineation surveys conducted through October 2014 on approximately 84 percent of the pipeline routes. The Wetland Delineation Report for these surveys is attached as Volume II-B, Attachment 2A. Field surveys are ongoing and data collected after October 2014 will be provided in an addendum report to be submitted when complete or by the 3rd Quarter 2015. Table 2A-5 in Appendix 2A lists each waterbody crossed by MP, and provides information on crossing width, fishery classification, and state water quality classification. USGS National Hydrography Dataset (NHD) and USGS topography mapping was used to supplement field-identified surface water resources to capture perennial waterbodies crossed by the Project. In addition, Table 2A-6 provides a list of drainages crossed by the MP, and provides information on the drainage type, flow type, and crossing width. A total of 105 drainages are crossed by the Rover Pipeline Project.

TABLE 2.2-1
Summary of Waterbodies Crossed by the Rover Pipelines by Flow Type

Waterbodies by Crossing Width	Perennial Streams	Intermittent Streams	Ephemeral Streams	Lakes and Ponds
Major (over 100 feet wide)	11	0	0	3
Intermediate (10 to 100 feet wide)	145	21	0	3
Minor (less than 10 feet wide)	194	265	160	0
Total	**350**	**286**	**160**	**6**

Note:
Waterbodies in the workspace but not crossed by the pipeline are not included in this table as crossings. This table reflects all waterbody crossings surveyed to date or identified using USGS topographic mapping, including occurrences where a waterbody is crossed by the pipeline more than once.

2.2.2.1 Waterbodies Crossed within Karst-Prone Areas

As stated in Section 2.1.1.4, karst is a landscape formed by the dissolution of soluble bedrock. Karst regions within the Project area extend along Mainlines A and B from MP 124.0 to 209.4, and the Market Segment from MP 0 to 4.0 (see Resource Report 6, Figure 6B-7 in Appendix 6B). A detailed discussion of karst, including the Bellevue-Castalia Karst Plain, which is not crossed by the Rover pipelines in Ohio, is provided in Section 6.4.5 of Resource Report 6.

Waterbodies crossed within karst regions are denoted on Table 2A-5 in Appendix 2A with a superscript plus sign ($^{+}$) next to the waterbody name. HDD is proposed at three waterbody crossings within karst regions. Proposed mitigation measures within karst regions are discussed in Section 2.2.5.

2.2.2.2 Traditional Navigable Waters

The USACE regulates construction in traditional navigable waters (TNW) of the U.S. under Section 10 of the Rivers and Harbors Act of 1899. Navigable waters are defined as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

One TNW, the Ohio River, is crossed by the Project in three separate locations by the Burgettstown Lateral (MP 15.51), Majorsville Lateral (MP 12.32), and Sherwood Lateral (MP 34.44) (World Canals, 2005). Rover proposes to install the pipeline via HDD at these locations. In addition, construction and restoration of these crossings will be conducted in accordance with the Rover Plan and Rover Procedures.

2.2.2.3 Water Quality Classification

Water quality standards are the foundation of the water quality-based pollution control program mandated by the CWA, and define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions such as antidegradation policies to protect waterbodies from pollutants. States are mandated to adopt and review water quality standards under Section 303(c) of the CWA.

<u>West Virginia</u>
The water quality standards for West Virginia are found in the *Requirements Governing Water Quality Standards Rule - Title 47 CRS2*. General water use categories for the state include public water supply (Category A), propagation and maintenance of fish (Category B), water contact recreation (Category C), agriculture and wildlife use (Category D), and industrial water supply (Category E). Unless otherwise designated by these rules, at a minimum all state waters are designated Categories B and C consistent with Federal Act goals. All waters are assigned to specific tiers depending upon the level of protection necessary to maintain high quality and/or existing uses. The higher the tier, the more stringent the requirements are for protection. West Virginia categorizes waters into the following tiers: Tier 1 protection mandates that existing water uses and levels of water quality necessary to protect the existing uses are maintained and protected. Tier 2 protection maintains and protects “high quality” waters - water bodies where the level of water quality exceeds levels necessary to support recreation and wildlife and the propagation and maintenance of fish and other aquatic life. Tier 2 is also the default assignment for a waterbody not listed as impaired on the state’s 303(d) list. Tier 3 waters are outstanding national resource waters and are protected, maintained, and improved when necessary. These include waters in Federal Wilderness Areas, specifically designated federal waters, and high quality waters or naturally reproducing trout streams in state parks, national parks, and national forests. No Tier 3 waters are crossed by the Rover pipelines. Designated uses for waters crossed by the Project are provided in Table 2A-5 in Appendix 2A (WVDEP, 2014a).

<u>Pennsylvania</u>
Under Title 25, Pennsylvania Code, Chapter 93 – Water Quality Standards, the limits for chemical, physical and biological parameters that affect the suitability of Pennsylvania's surface waters in sustaining life, health, and human activities are listed. All surface waters have designated uses which determine the

standards for water quality to be met for that body of water. Protected uses group into several broad categories, such as Aquatic Life, Water Supply, Recreation and Fish Consumption, and Special Protection. Within each category are specific uses: Aquatic Life includes Warm Water Fishes (WWF), Cold Water Fishes (CWF), Migratory Fishes, and Trout Stocking (TSF); and Recreation and Fish Consumption includes Boating, Fishing, Water Contact Sports, and Esthetics.

Special Protection waters in Pennsylvania are designated as either High Quality (HQ) or Exceptional Value (EV), with EV being the higher standard. A HQ water is defined as a stream or watershed that has excellent quality or other features that require special water quality protection; EV waters are defined as a waterbody that constitutes an "outstanding" resource, such as waters of public parks or forests, waters used as potable water supply or waters of wildlife refuges, State Game lands, or waters that have been characterized by the the Pennsylvania Fish and Boat Commission (PFBC) as Wilderness Trout Streams. Other types of waterway classifications include CWF, WWF, and TSF. A discussion of fishery resources is provided in Section 3.1 of Resource Report 3. The water quality classification for waters crossed by the Project in Pennsylvania are provided in Table 2A-5 in Appendix 2A (PADEP, 2005) .

Ohio

In Ohio, stream use designations are listed in Ohio rule 3745-I-07 and 3745-1-05 of the Administrative Code, and include those for the protection of aquatic life uses (e.g., coldwater habitat, warmwater habitat, exceptional warmwater habitat, etc.), those for the protection of recreational activities (i.e., bathing waters, primary contact recreation, and secondary contact recreation) and those for the protection of water supplies (i.e., public, agricultural, or industrial water supply). The OEPA recommends avoidance of streams designated as coldwater habitat or exceptional warmwater habitat. Designated uses for streams crossed in Ohio are provided in Table 2A-5 in Appendix 2A (OEPA, 2014b). .

Michigan

The State of Michigan's Part 4 Rules (of Part 31, Water Resources Protection, of Act 451 of 1994) specify water quality standards which shall be met in all state waters. The rules require that all designated uses of the receiving water be protected. Designated uses include: agriculture, navigation, industrial water supply, public water supply at the point of water intake, warmwater or coldwater fish and other indigenous aquatic life and wildlife, partial body contact recreation, and total body contact recreation from May 1 to October 31. Designated uses for streams crossed in Michigan are provided in Table 2A-5 in Appendix 2A (MDEQ, 2014d).

2.2.3 Sensitive Surface Waters

FERC considers sensitive surface waters to include: 1) surface waters with impaired water quality; 2) waters containing federally or state listed threatened or endangered species or critical habitat; 3) any waters afforded special national, regional, or state status designations for a variety of other reasons; and 4) waterbodies crossed less than three miles upstream of a potable water intake. All sensitive waterbodies in the Project area were identified based on a review of publicly available resources and contacts with various state and federal agencies. Sensitive waterbodies crossed by Project facilities are listed in Table 2A-7 in Appendix 2A and discussed in the following sections.

2.2.3.1 Impaired Waterbodies and Contaminated Sediments

States are mandated to adopt and review water quality standards under the Section 303(c) of the CWA. Water quality standards define the beneficial designated uses that are protected for each waterbody and the associated water quality criteria that must be met to protect those uses. Water quality classifications are based on the designated uses set under the water quality standards. A waterbody that does not achieve water quality criteria for one or more of its designated uses is considered impaired. Information on streams crossed by the Project that are listed on each state's respective 303(d) List of Impaired Waters is provided in Table 2A-7 in Appendix 2A.

Best management practices will be implemented during construction to control soil erosion and sedimentation of downgradient areas as described in Section 2.2.5. With the implementation of these measures, no additional impairment to designated streams in the Project area is anticipated.

2.2.3.2 Threatened and Endangered Species or Critical Habitat

Rover consulted with federal and state resource agencies to determine if any federally or state listed endangered or threatened species (including federal and state species of special concern) or their designated critical habitats occur within the Project route. Agencies contacted by Rover include the West Virginia Department of Natural Resources (WVDNR), Ohio Department of Natural Resources (ODNR), PADCNR, PFBC, Pennsylvania Game Commission (PGC), Michigan Department of Natural Resources (MDNR), United States Fish and Wildlife Service (USFWS) Midwest Region 3, Columbus, Ohio and East Lansing, Michigan offices and the USFWS Northeast Region 5, State College, Pennsylvania office and Elkins, West Virginia office. Based on initial consultation, 17 federally listed rare, threatened or endangered (RTE) species and 51 state listed rare, candidate, threatened or endangered species, including those that use aquatic habitats, have been identified as potentially occurring in the vicinity of Project facilities. A detailed discussion of federal and state listed RTE species is included in Resource Report 3. No essential fish habitat (EFH) was identified in the Project area, based on a review of the National Marine Fisheries Service's EFH Online Mapper. Refer to Section 3.1 in Resource Report 3 for more information regarding EFH.

2.2.3.3 Federally and State Designated Waterbodies

A detailed discussion of federally and state-designated scenic waterbodies is provided in Section 8.4.3 of Resource Report 8. In summary, none of the waterbodies crossed by Project facilities is designated as National Wild and Scenic Rivers (National Wild and Scenic Rivers Council, 2014). However, Mainlines A and B cross a river listed on the Nationwide Rivers Inventory (Tuscarawas River), and two Ohio Scenic Rivers: the Maumee River and Sandusky River (see Table 2A-7 in Appendix 2A) (National Park Service [NPS], 2011).

2.2.3.4 Surface Water Intakes

Based on publicly available geospatial data, a total of six surface water intakes are located within three miles downstream of waterbodies crossed by the Project facilities. Four of these are located in the vicinity of the Supply Laterals and two are located in the vicinity of Mainlines A and B in Ohio. There are no surface water intakes within three miles downstream of waterbodies crossed by the Burgettsville Lateral in Pennsylvania (PADEP, 2004). Rover contacted the West Virginia SWAP and WHPP staff to determine if any surface water intakes are located within three miles downstream of Project facilities in West Virginia. Based on correspondence with the SWAP and WHPP, the West Virginia state code prohibits the release of locational data for surface water intakes (WVDHHR, 2015). Table 2A-8 in Appendix 2A provides the location, source, associated public water system, and distance of the surface water intake from the nearest pipeline centerline.

2.2.3.5 Surface Water Protection Areas

As discussed in Section 2.1.5, states delineate boundaries of areas providing source waters for public water systems and identify (to the extent practicable) the origins of certain contaminants in the delineated area to determine the susceptibility of public water systems to those contaminants under the provisions of the 1996 SDWA reauthorization. The following sections provide information on the surface water protection program of each state crossed by Project facilities, and Table 2A-9 in Appendix 2A provides a list of surface water protection areas crossed by each Project proponent.

<u>West Virginia</u>
As part of its SWAP Program, West Virginia delineates surface water protection areas in two ways. The first type of delineation includes watershed delineation which includes the entire watershed upstream of the intake up to the boundary of the West Virginia state border or topographic boundary (WVBPH, 2003 and WVDEP 2014a). The second type of delineation is the Zone of Critical Concern (ZCC) based on a modeled five-hour time of travel with a 1,000 foot buffer on the main stem and a 500-foot buffer on tributaries (WVBPH, 2011). Rover contacted the West Virginia SWAP and WHPP staff to determine if any WHPAs are crossed (WVDHHR, 2015). One ZCC is crossed by the Burgettstown Lateral, one is crossed by the Majorsville Lateral, and two are crossed by the Sherwood Lateral in West Virginia (see Table 2A-9).

<u>Pennsylvania</u>
Pennsylvania's SWAP Program identifies surface water protection areas as having three zones around rivers and streams that have a surface water intake. Zone A is an area 0.25-mile-wide on either side of the river or stream. Zone B is a 2-mile-wide area on either side of the river or stream. Zone C is the remainder of the watershed, but can be refined by consideration of river hydraulics to determine channeled flow and critical contributing tributaries. Critical contributing tributaries are tributaries that contribute significant flow to the surface water intake, and therefore, have the potential to contribute significant contaminant loads. For watersheds with an area less than 100 square miles, a Zone A is delineated; the remainder of the watershed is inventoried as a Zone B (Pennsylvania Source Water Protection, 2012).

One surface water intake associated with Raccoon Creek is located approximately 1.25 miles upstream of the Burgettstown Lateral crossing in Pennsylvania. Therefore, based on Pennsylvania's method of delineating surface water protection areas, the Project is located within the Zones A, B and C associated with this intake due to its proximity to Raccoon Creek (see Table 2A-9).

Ohio

Under Ohio's SWAP Program, SWAP areas for surface water public water supplies are delineated through a watershed approach (OEPA, 1999). Once SWAP area boundaries are determined, an emergency management zone and corridor management zone are delineated. The emergency management zone is defined as an area in the immediate vicinity of the surface water intake in which the public water supply owner-operator has little or no time to respond to a spill. Several criteria are used in determining the emergency management zone, including upstream hydrology/topography such as permeability of soils and gradient of slopes, type of system, speed in which the intake can be closed and the length of time the system can supply its daily demand while the intake is shut off, and the number and types of potential significant contaminant sources within an established critical distance from the intake. (OEPA, 1999). The corridor management zone is an area along streams within SWAP areas that warrants delineation, inventory, and management because of its proximity to the source water. Corridor management zones are delineated based on the following criteria: 1) 1,000 feet on each bank of the principal stream and 500 feet on each bank of tributaries draining into the principal streams, and 2) 10 miles upstream of the intake, including the principal stream and all tributaries that drain into it (OEPA, 1999).

In addition to the emergency and corridor management zones discussed above, the OEPA developed a separate tiered delineation system for surface water intakes within the Ohio River. Zone I, or the ZCC, is the area directly adjacent to the Ohio River from 0.25 mile downstream of the intake to a distance of 25 miles upstream or 0.25 mile below the next upstream intake. Zone II, or the Zone of High Concern, is all 14-digit HUC watersheds adjacent to the Ohio River from a distance of 0.25 mile downstream of the intake up to a distance of 0.25 mile below the next upstream intake, and all 14-digit HUC watersheds adjacent to the major Ohio River tributaries a distance of 25 miles upstream or to the next upstream intake. Zone III, or the source water area, is the entire portion of the Ohio River basin upstream of the surface water intake (OEPA, 1999).

Based on geospatial data provided through the OEPA's SWAP Program website, no emergency management zones are crossed by Project facilities. One corridor management zone is crossed by the Seneca Lateral, one is crossed by the Supply Connectors, four are crossed by Mainlines A and B, and one is crossed by the Market Segment in Ohio (OEPA, 2014a). The Burgettstown Lateral crosses two areas designated as Zone I and two designated as Zone II. In addition, entire or portions of the Supply Laterals are located within three areas designated as Zone III. See Table 2A-9 in Appendix 2A for a complete list of corridor management zones and Ohio River Zones I, II, and III crossed by the Project in Ohio.

Michigan

Surface water protection areas in Michigan are determined by identifying the watershed, or portion thereof, that discharges towards the known surface-water intake. After delineating a watershed, a critical assessment zone (CAZ) is delineated for each intake. A susceptibility rating is applied to a CAZ based on the vulnerability of the public water supply to potential contaminants. The CAZ for river intakes ranges from a 1,000 to 3,000-foot radius upstream from the center of the intake (MDEQ, 2014a; Sweat et al., 2002). Rover determined no CAZs are crossed by the Market Segment, based on correspondence with the MDEQ.

2.2.3.6 Flood Zones

Flood zones are geographic areas that the Federal Emergency Management Agency (FEMA) has defined according to varying levels of flood risk. Each zone reflects the severity or type of flooding in the area and is categorized as minimal, moderate, or high risk. These zones or Special Flood Hazard Areas (SFHAs) are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary map. SFHAs are defined as the area that will be inundated by a 1-percent-annual-chance flood (also referred as the base or 100-year flood). High risk zones include Zones A, AO, AH, A1-A30, AE, A99, AR, AR/AE, AR/AO, AR/A1-A30, AR/A, V, VE, and V1-V30; moderate risk zones include Zones B and X (shaded on FIRMs), and minimal risk zones include Zones C and X (unshaded on FIRMs) (FEMA, 2014).

As listed on Table 2A-10 in Appendix 2A, the Project crosses SFHAs, Zones A and AE. Both Zones A and AE represent areas subject to inundation by the 1-percent-annual-chance flood; however, Base Flood Elevations have been determined for Zone AE areas.

2.2.4 Waterbody Crossing Methods

To date, Rover has determined that a total of 802 waterbodies will be affected by the Project, 518 by the Supply Laterals, 207 by Mainlines A and B, 6 by only Mainline A, 6 by only Mainline B, and 65 by the Market Segment. Section 1.6.1.3 of Resource Report 1 provides a detailed discussion of the waterbody construction techniques proposed by Rover for construction of the Project. Waterbody crossings will be constructed in conformance with the Rover Procedures, using the in-stream construction methods and restoration procedures described therein. Construction activities will be scheduled so that the pipeline trench is excavated as close in schedule to pipe laying activities as possible. In accordance with the Rover Procedures and where the pipeline will not be installed using HDD, the duration of construction across perennial waterbodies will be limited to 48 hours (24 hours to cross the waterbody and 24 hours for restoration) across minor waterbodies (10 feet wide or less) and intermediate waterbodies (between 10 and 100 feet wide). Drainages will be completed as part of mainline construction. Banks will be returned to as near to pre-construction conditions as possible within 24 hours of completion of each open-cut crossing. Any deviations in timing that would result in extended crossing durations will be identified in advance by Rover and notification made to FERC with site-specific justification. Major waterbodies (those greater than 100 feet wide), navigable waters, or sensitive waterbodies identified by federal and

state agencies, will be crossed using HDD. Those waterbodies that will be crossed using an HDD are marked with an asterisk (*) in Table 2A-5 in Appendix 2A.

In general, additional temporary workspace (ATWS) is typically required on both sides of a waterbody crossing to store materials and trench spoil. These work areas will be located at least 50 feet away from the waterbody edge, topographic and other site specific conditions permitting, and are typically 50 feet by 50 to 100 feet in size. In some situations, conditions do not permit a 50-foot setback. Therefore, Rover has requested deviations within the Rover Procedures as required (see Appendix 1B in Resource Report 1).

2.2.5 Waterbody Construction Impacts, Mitigation, and Restoration

Construction activities associated with the Project that have the potential to affect surface waters include clearing activities, open-cut crossings of waterbodies for pipeline installation, HDD, especially in karst regions, hydrostatic test discharges, potential spills or leaks of hazardous liquids from the refueling of construction vehicles or storage of fuel, oil, and other fluids, and temporary access road crossings. Periodic maintenance of the right-of-way also has the potential to impact bank and riparian areas adjacent to waterbodies.

Pipeline construction across rivers and streams or adjacent to surface waters can result in temporary and long-term adverse environmental impacts if not properly completed. However, proper construction techniques and timing can ensure that any such effects are both temporary and minor. The primary effect associated with in-stream trenching is a temporary increase in turbidity and the resulting sedimentation that may occur downstream. Surface runoff and erosion from the cleared right-of-way can also increase in-stream sedimentation during construction. Mobile organisms, such as fish, are expected to avoid localized areas that are temporarily impacted by construction, but less mobile or sessile aquatic organisms may be adversely affected by changes in water quality.

Long-term effects on water quality can result from alteration of stream banks and removal of riparian vegetation. If not stabilized and revegetated properly, soil erosion associated with surface runoff and stream bank sloughing can result in the deposition of large quantities of sediment into the waterbody. Increased turbidity from soil erosion and increased water temperature from vegetation removal can reduce the suitability of habitat for fisheries. Potential effects on fisheries resources from the Project and proposed mitigation are discussed further in Section 3.1 of Resource Report 3.

Effects may also result from accidental releases of hazardous materials during refueling/maintenance of the construction equipment, equipment failure in or near a waterbody, or inappropriate storage of fuel in or near a waterbody. Minor long-term effects associated with pipeline operations and maintenance will largely be restricted to periodic clearing of vegetation within the permanent right-of-way at waterbody crossings. These maintenance activities will be consistent with the Rover Procedures (see Appendix 1B of Resource Report 1).

To minimize impacts from soil disturbance due to construction, Rover will install temporary and permanent erosion controls (e.g., silt fence, hay bales, compost socks, slope breakers, trench plugs, etc.) to manage stormwater runoff in accordance with the Rover Plan and Rover Procedures, and any other applicable federal or state permit requirements. Typical best management practices that will be implemented during construction to control soil erosion and sedimentation of downgradient areas include:

- erosion controls will be placed at drainage swale outlets as appropriate, on steep slopes, and adjacent to roads and waterbodies;
- trench spoil that is excavated from streambeds and banks will be placed in the ATWS at least 10 feet from the top of the waterbody bank;
- waterbody crossing methods included in the Rover Procedures will be implemented to minimize direct stream channel disturbance, prevent hydric soil rutting and compaction, and contain temporary trench spoil piles;
- surface contours and drainage patterns along the pipeline rights-of-way will be returned as nearly as possible to original conditions;
- all disturbed ground will be seeded and mulched to encourage revegetation; and
- post construction monitoring will be conducted to identify areas in need of remedial soil stabilization and vegetation re-establishment.

Because construction will proceed quickly (within 24 to 48 hours) at each waterbody crossing, disturbances will be limited and long-term impacts on water quality or aquatic organisms are not anticipated. Water quality and other stream attributes should return to pre-construction conditions within a short period after restoration of stream bed and banks.

Additionally, major waterbody crossings and crossings of federal and state-designated waterbodies are proposed to be crossed utilizing HDD where practicable to avoid in-stream disturbance.

Rover has sited the proposed Project adjacent to existing, maintained utility rights-of-way at waterbody crossings to the extent practicable to minimize impacts on riparian buffers along stream corridors. Where pre-construction baseline stream surveys are conducted, post-construction surveys will be conducted and compared to the baseline surveys. If significant changes from pre-construction conditions are detected, Rover will coordinate with the applicable regulatory authorities to return the site to as near to pre-construction conditions as possible.

To reduce the likelihood of a spill, any hazardous materials, chemicals, lubricating oils, solvents, or fuels used during construction generally will be stored in upland areas at least 100 feet from wetlands and waterbodies and in accordance with the Rover Procedures (see Resource Report 1, Appendix 1B). All such materials and spills (if any) will be handled in accordance with Rover's SPR Procedures. Except where absolutely necessary, or required to otherwise minimize overall effects to the environment, there will be no refueling or lubricating of vehicles or equipment within 100 feet of a waterbody. Under no circumstances will refuse be discarded in waterbodies, trenches, or along the construction corridor. In accordance with the SPR Procedures, Rover will conduct routine inspections of tanks and storage areas to

help reduce the potential for spills of hazardous materials. Rover will consult with federal and state agencies regarding the potential to encounter contaminated sediments along the Project. In the event that contaminated sediment areas are confirmed, Rover will work with federal and state agencies to develop appropriate mitigation.

2.2.6 Hydrostatic Test Water Withdrawal and Discharge

The piping associated with all Project pipeline facilities will be hydrostatically tested for structural integrity prior to being placed in service. Hydrostatic test withdrawal and discharge locations are provided in Table 1A-6 in Resource Report 1, Appendix 1A. Testing will be completed by capping installed pipe facilities with test manifolds, filling these segments with water, and maintaining a test pressure in excess of normal operating pressures for a specified period of time (typically 8 hours). Hydrostatic testing will be conducted on this Project in a manner that meets or exceeds the United States Department of Transportation "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" (49 Code of Federal Regulations Part 192).

Rover will employ several measures designed to reduce the likelihood of entrainment or impingement of juvenile and adult fishes during hydrostatic test water withdrawal operations. Rover will attempt to avoid withdrawals during low-flow conditions to limit any potential effect on downstream aquatic resources. Hydrostatic test water intake structures (typically a box design) will be floated so they are not laying on the streambed and will be screened with wire to prevent larger fish from entering the intake structure. The screen around the intake will be fabricated to provide an adequate surface area of fine meshed screen designed to reduce the approach velocity to prevent impingement or entrainment of small fish and/or macroinvertebrates. Upon completion of the hydrostatic test, environmental effects from the discharge of hydrostatic test water will be minimized by using the measures prescribed below. Rover will:

- locate hydrostatic test manifolds outside of wetlands and riparian areas to the extent practicable;
- discharge into dewatering structures located in upland areas within the construction work area;
- comply with all appropriate permit requirements;
- not discharge into state-designated special waters, waterbodies that provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless the relevant federal, state, and local permitting agencies grant written permission;
- regulate the discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent sedimentation and streambed scour;
- reuse hydrostatic test water to the extent practicable; and
- avoid interbasin transfers of source water in compliance with state and federal discharge requirements once testing is complete.

Pumps used for hydrostatic testing located within 100 feet of any surface water will be operated and refueled in accordance with the SPR Procedures. Rover will also coordinate with the applicable state regulatory agencies regarding the source of hydrostatic test water and discharge locations. Rover does not anticipate using chemicals for testing or for drying the pipeline following hydrostatic testing.

2.3 WETLANDS

This section describes wetlands crossed by the Project, potential impacts to wetlands from construction and operation of the Project, and procedures that will be implemented to minimize and mitigate potential impacts. Wetlands are defined as areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Typical wetlands include swamps, marshes, wet meadows, and similar areas. In addition, vernal pools are small isolated wetlands that do not contain a permanent inlet or outlet and experience cyclic periods of water inundation and drying. Based on consultation and a review of publicly available information, each state crossed by Project facilities protects vernal pools under their wetland regulations (MDEQ, 2015b; OEPA, 2015b; PNHP, 2015; WVDEP, 2015b). There are no other regulations protecting vernal pools. Documentation of correspondence is provided in Volume II, Attachment 1D.

Jurisdictional wetlands have been field-delineated along approximately 84 percent of the pipeline route between mid-June and the end of October 2014, in accordance with the USACE's Wetlands Delineation Manual (USACE, 1987), and the following Regional Supplements to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0) (USACE, 2012a), Eastern Mountains and Piedmont Region (Version 2.0) (USACE, 2012b), and Midwest Region (Version 2.0) (USACE, 2010). The Wetland Delineation Report for these surveys is included in Volume II-B, Attachment 2A. Field surveys are ongoing and data collected after October 2014 will be provided in an addendum report to be submitted when complete or by the 3rd Quarter 2015.

2.3.1 Classification of Wetlands Crossed By the Project

The USFWS wetland classification system described by Cowardin et al. (1979) was used to classify the wetlands that will be affected by the Project. The wetlands in the Project area were delineated as palustrine forested (PFO), palustrine scrub-shrub (PSS), palustrine emergent (PEM), palustrine open water, or a combination of these four cover types. Palustrine systems include all non-tidal wetlands that are dominated by trees, shrubs, persistent emergent, and emergent mosses or lichens, and all wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. The palustrine system was developed to group vegetated wetlands, commonly referred to as marshes, swamps, bogs, and prairies. This system includes ponds and may be situated shoreward of lakes, river channels, estuaries, and river floodplains or in isolated catchments or on slopes (Cowardin et al., 1979). All of the resource areas identified along the Project route are classified as palustrine systems.

2.3.1.1 Palustrine Emergent Wetlands

The PEM wetland cover type is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al., 1979). Emergent wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough. PEM wetlands along the Project route are generally classified as marshes and wet meadows, which typically occur along lakes, ponds, shallow slow flowing rivers, and in isolated depressions. Marshes typically occur on mineral soils that are seasonally flooded or

permanently or seasonally saturated, while wet meadows typically occur on seasonally saturated mineral or organic soils that may be associated with high water tables and/or surface water inputs. The hydrology of PEM wetlands ranges from saturated only to inundated with several feet of water. Shallow PEM wetlands are seasonal in that shallow inundation during the first part of the growing season may draw down to saturated soils by late in the growing season. Deep PEM wetlands are typically semi-permanent, drying out only during drought years. Vegetation typically consists of a variety of submergent, emergent and other rooted herbaceous species, including cattails, sedges, rushes, and grasses.

Dominant species and vegetative diversity varied within the delineated wetlands, depending on position in the landscape, duration and type of hydrology, and anthropogenic disturbances. Common dominant herbaceous species identified in delineated wetlands include reed canarygrass (*Phalaris arundinacea*), lamp rush (*Juncus effusus*), rice cutgrass (*Leersia oryzoides*), cattail species (*Typha* sp.), sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*), late goldenrod (*Solidago gigantea*), spotted trumpetweed (*Eutrochium maculatum*), common boneset (*Eupatorium perfoliatum*), black bent (*Agrostis gigantea*), cottongrass bulrush or woolgrass (*Scirpus cyperinus*), dark-green bulrush (*Scirpus atrovirens*), large barnyard grass (*Echinochloa crus-galli*), skunk cabbage (*Symplocarpus foetidus*), arrow-leaf tearthumb (*Persicaria sagittata*), swamp smartweed (*Persicaria hydropiperoides*), and various sedges, including hop sedge (*Carex lupulina*), lakebank sedge (*Carex lacustris*), uptight sedge (*Carex stricta*), shallow sedge (*Carex lurida*), and fox sedge (*Carex vulpinoidea*).

2.3.1.2 Palustrine Scrub-Shrub Wetlands

Scrub-shrub wetlands include areas dominated by woody vegetation less than six meters tall (Cowardin et al., 1979). Woody vegetation found in this type of wetland includes true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Scrub-shrub wetlands may represent a successional stage leading to a forested wetland or a relatively stable climax community. Vegetation composition is strongly influenced by the hydrologic regime and location, such as within existing rights-of-way, and by local vegetation maintenance practices. Most scrub-shrub communities are seasonally flooded and the soil is often saturated to the surface. The ground layer can be composed of a diversity of ferns, sedges, rushes, and forbs, such as those in wet meadows. The ground layer in disturbed, deciduous shrub swamps may be composed of reed canarygrass or other invasive species.

Common dominant shrub species identified in delineated wetlands include willow species such as black willow (*Salix nigra*), sandbar willow (*Salix interior*), and Bebb's or gray willow (*Salix bebbiana*); dogwood species such as silky dogwood (*Cornus amomum*), gray dogwood (*Cornus racemosa*), stiff dogwood (*Cornus foemina*), alternate-leaf dogwood (*Cornus alternifolia*), and red-osier dogwood (*Cornus alba*); smooth arrowwood (*Viburnum recognitum*) and southern arrowwood (*Viburnum dentatum*); Morrow's honeysuckle (*Lonicera morrowii*) and twinsisters (*Lonicera tatarica*); and common buttonbush (*Cephalanthus occidentalis*), and white meadowsweet (*Spiraea alba*), as well as young trees such as slippery elm (*Ulmus rubra*) and American elm (*Ulmus Americana*), Eastern cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*). Typical dominant herbaceous species identified in PSS wetlands include reed canarygrass, goldenrod species (*Solidago* sp.), aster species (*Symphyotrichum*

sp.), spotted touch-me-not, beggarticks (*Bidens* sp.), rice cutgrass, sensitive fern, stinging nettle (*Urtica dioica*), arrow-leaf tearthumb, and the sedges (*Carex* sp.) identified in Section 2.3.1.1.

2.3.1.3 Palustrine Forested Wetlands

Forested wetlands are characterized by woody vegetation that grows six meters (20 feet) tall or taller (Cowardin et al., 1979). Forested wetlands normally include an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer. Within the Project area, PFO wetlands are generally characterized as deciduous, which are common throughout much of the region in depressions, on floodplains, on flats on glacial lake plains, and along lake shores. Floodplain forests occupy lowlands adjacent to the larger rivers in the region. Wet flatwoods occur on broad, glacial lake plains, such as those along Lake Ontario. These wetlands are dominated by typical swamp species, but are not flooded as long as most swamps. Instead, they have seasonally high or perched water tables that may persist from winter to early summer.

Common dominant tree species identified in delineated wetlands include silver maple (*Acer saccharinum*) and red maple (*Acer rubrum*); American elm, green ash and black ash (*Fraxinus nigra*); shellbark hickory (*Carya laciniosa*), black willow, pin oak (*Quercus palustris*) and swamp white oak (*Quercus bicolor*); and Eastern cottonwood. The understory within the delineated PFO wetlands was typically dominated by Northern spicebush (*Lindera benzoin*), American elm, common buttonbush, American hornbeam (*Carpinus caroliniana*), green ash, red maple, arrowwood (*Viburnum* sp.), and dogwood species (*Cornus* sp.). Dominant herbaceous vegetation within the PFO wetlands include Japanese stilt grass (*Microstegium vimineum*), Canadian clearweed (*Pilea pumila*), aster species, spotted touch-me-not, rice cutgrass, various sedge species, sensitive fern, and goldenrod species.

2.3.2 Wetland Crossings

The Project will cross a total of 528 wetlands, for a combined crossing length of approximately 11.14 miles, based on field delineations surveys conducted through October 2014 on approximately 88 percent of the pipeline routes (see Volume II-B, Attachment 2A). Field surveys are ongoing and data collected after October 2014 will be provided in an addendum report to be submitted when available or by the 3rd Quarter 2015.

Table 2.3-1 provides a summary of the total length and acres of each wetland type affected by the Project based on field surveys through October 2014. A complete list of the wetlands crossed by Project facilities, including the length of the crossing and total impact to each wetland is provided in Table 2A-11 in Appendix 2A. In addition, Table 2A-11 provides the total permanent conversion of forested wetlands to PEM/PSS wetlands.

TABLE 2.3-1
Summary of Wetlands Affected

Facility	Wetland Type	Crossing Length (miles)	Acres Affected			
			Temporary [1]	Permanent	Total	Total PFO Conversion [2]
Supply Laterals						
Aboveground Facilities - Compressor Stations, Receipt and Delivery Stations, Contractor Yards						
Burgettstown Tie-In	PEM	0.00	0.00	0.10	0.10	0.00
Clarington Compressor Station	PEM	0.00	0.00	0.03	0.03	0.00
Seneca Compressory Station	PEM	0.00	0.00	0.20	0.20	0.00
Sherwood Contractor Yard	PEM	0.00	0.00	0.03	0.03	0.00
Subtotal		*0.00*	*0.00*	*0.36*	*0.36*	*0.00*
Pipeline Facilities						
Berne Lateral	PEM	0.03	0.17	0.25	0.42	0.00
Subtotal		*0.03*	*0.17*	*0.25*	*0.42*	*0.00*
Burgettstown Lateral	PEM	0.27	1.74	1.54	3.28	0.04
	PFO	0.01	0.03	0.07	0.10	
	PSS	0.57	4.97	3.45	8.42	
Subtotal		*0.85*	*6.74*	*5.06*	*11.80*	*0.04*
CGT Lateral Total		0.00	0.00	0.00	0.00	0.00
Clarington Lateral	PEM	10.20	1.10	1.08	2.18	0.13
	PFO	0.03	0.13	0.21	0.34	
	PSS	0.03	0.28	0.15	0.43	
Subtotal		*0.26*	*1.51*	*1.44*	*2.95*	*0.13*
Majorsville Lateral	PEM	0.06	0.21	0.26	0.47	0.00
Subtotal		*0.06*	*0.21*	*0.26*	*0.47*	*0.00*
Seneca Lateral	PEM	0.18	1.17	1.11	2.28	0.01
	PFO	0.00	0.02	0.03	0.05	
	PSS	0.00	0.06	0.01	0.07	
Subttotal		*0.18*	*1.25*	*1.15*	*2.40*	*0.01*
Sherwood Lateralt	PEM	0.12	1.37	0.71	2.08	0.18
	PFO	0.05	0.22	0.30	0.52	
	PSS	0.02	0.07	0.11	0.18	
Subtotal		*0.19*	*1.66*	*1.12*	*2.78*	*0.18*
Supply Connector Lines A and B	PEM	0.36	2.69	2.43	5.12	0.27
	PFO	0.04	0.16	0.31	0.47	
	PSS	0.03	0.18	0.24	0.42	
Subotal		*0.43*	*3.03*	*2.98*	*6.01*	*0.27*
Supply Laterals Pipeline Facilities Subtotal:		**2.00**	**14.57**	**12.26**	**26.83**	**0.63**
Mainlines						
Aboveground Facilities - Compressor Stations, Receipt and Delivery Stations, Contractor Yards						
Mainline Compressor Station 1	PEM	0.00	0.00	0.49	0.49	0.00
Mainlines Aboveground Facilities Subtotal:		*0.00*	*0.00*	*0.49*	*0.49*	*0.00*
Pipeline Facilities						
Mainlines A and B	PEM	2.47	16.43	16.37	32.80	10.79
	PFO	1.78	6.21	12.89	19.10	
	PSS	0.12	0.94	0.83	1.77	

TABLE 2.3-1
Summary of Wetlands Affected

Facility	Wetland Type	Crossing Length (miles)	Acres Affected			
			Temporary [1]	Permanent	Total	Total PFO Conversion [2]
Subotal		*4.37*	*23.58*	*30.09*	*53.67*	*10.79*
Mainline A	PFO	0.14	0.44	0.86	1.30	0.51
Subtotal		*0.14*	*0.44*	*0.86*	*1.30*	*0.51*
Market Segment	PEM	2.58	18.32	15.06	33.38	5.51
	PFO	1.50	5.11	9.19	14.30	
	PSS	0.56	3.18	3.43	6.61	
Subtotal		*4.64*	*26.61*	*27.68*	*54.29*	*5.51*
Mainline Pipeline Facilities Total:		**9.15**	**50.63**	**58.63**	**109.26**	**16.81**
TOTAL		**11.15**	**65.20**	**71.74**	**136.94**	**17.44**

[1] The temporary area affected by construction of the Project includes temporary impacts associated with ATWS.
[2] PFO conversion includes the 30-foot operational right-of-way that will be permanently converted from PFO to PEM/PSS.

2.3.3 Wetland Construction Methods

The wetland construction procedures are presented in Section 1.6.1.2 of Resource Report 1. Jurisdictional wetland crossings will be conducted in accordance with the Rover Procedures (see Appendix 1B of Resource Report 1) and federal and state permits/approvals. The method of construction and required construction right-of-way width depend largely on soil stability and related conditions in the wetland, but Rover anticipates that the open-cut trenching method will likely be used for most of the non-flooded wetland crossings along the Project route. Additional information on wetland crossing techniques is presented in Resource Report 1. Wetlands crossed using an HDD are identified with an asterisk (*) next to the wetland ID in Table 2A-11 in Appendix 2A. A detailed discussion of the HDD crossing method is provided in Section 1.6.1.4 of Resource Report 1.

ATWS will be required in locations where it is not possible to place spoil and pipe sections immediately adjacent to the pipe. This could be due to additional volumes of spoil in areas with a reduced right-of-way (e.g., at wetland crossings) or where specialized construction operations, such as an HDD, will be performed. Table 1A-3 in Resource Report 1, Appendix 1A identifies each ATWS that is less than 50 feet from the wetland edge. Site-specific justification for each ATWS is included in in the Rover Procedures.

2.3.4 Wetland Impacts and Mitigation

2.3.4.1 Wetland Impacts

Based on completed field surveys, approximately 52.88 acres of temporary and 47.88 of permanent impacts to PEM and PSS wetlands, and 12.32 acres of temporary and 23.86 acres of permanent impacts to PFO have been identified. Table 2.3-1 provides a summary of wetlands based on surveys conducted

through October 2014 within the currently proposed construction workspace. Temporary and permanent impacts to each wetland by pipeline facility is provided in Table 2A-11 in Appendix 2A.

Temporary effects on wetlands may include soil disturbance, temporary alteration of hydrology, and loss of vegetation. These changes could affect the reinstatement of natural re-growth of wetland vegetation if not restored properly. Permanent impacts include conversion of PFO to non-forested cover types within the permanently maintained right-of-way. No permanent filling of wetlands is proposed or anticipated for the Project.

There is the potential for increased sedimentation caused by erosion and sediment-laden stormwater runoff entering wetlands from disturbed areas or spoil piles in the immediately adjacent uplands. Rover will implement the Rover Procedures to minimize impacts from erosion and stormwater runoff during construction, including the installation of best management practices to minimize off-right-of-way sedimentation.

There is also the potential for an accidental release of hazardous materials during refueling/maintaining of the construction equipment and equipment failure in or near a wetland. As discussed in Section 1.6.1.2 of Resource Report 1, fuel will not be stored within 100 feet of a wetland or waterbody unless otherwise approved by FERC or the Environmental Inspector. Rover will implement its SPR Procedures in response to a spill as discussed in Section 2.1.7.

In addition, there has been some concern regarding impacts to the Great Black Swamp as a result of the Project. The Great Black Swamp historically covered approximately 1,500 square miles in northwestern Ohio and northeastern Indiana. When the Wisconsin Glacier retreated about 20,000 years ago, it left a flattened surface covered with impermeable clay. Areas of the swamp were covered in dense forests and and as the fallen leaves decomposed, the water turned black. In the 1830's, settlers that moved to the area began to clear and drain the Great Black Swamp. Today, few wetlands are present in this area due to the installation of drain tiles and conversion of the land to agriculture (Sauder Village, 2014). Field surveys verified the majority of this area consists of row crops. However, construction within any remnant wetlands would be conducted in accordance with the Rover Procedures and all applicable regulations as with any other wetland along the Project. Therefore, the Project will have minimal to no effect on the Great Black Swamp or remnants thereof.

2.3.4.2 Wetland Mitigation

Rover will minimize potential adverse effects to wetlands through implementation of its Procedures (see Appendix 1B of Resource Report 1). Rover proposes to use a construction right-of-way width of 75 feet in all wetlands where a single 24-inch pipeline will be installed (Berne, CGT, and Majorsville Laterals) and in forested wetlands where a single 30-, 36-, or 42-inch pipeline will be installed; 120 feet in non-forested wetlands where dual 42-inch pipelines will be installed (Supply Connector Lines A and B, and Mainlines A and B); 100 feet in non-forested wetlands where a single 30-, 36-, or 42-inch pipeline will be installed; and 95 feet in forested wetlands where the dual 42-inch pipelines will be installed. During construction, the following measures will be implemented to minimize impacts to wetlands:

- minimization of riparian clearing to the extent feasible while ensuring safe construction conditions;
- confinement of stump removal and grading over the trench to minimize soil disturbance (unless safety or access conditions require stump removal elsewhere) to facilitate the regrowth of woody vegetation;
- expedited construction in and around wetlands;
- return of wetland contours and drainage patterns to their original configurations to the extent possible;
- permanent stabilization of upland areas near wetlands as soon as practicable after trench backfilling to reduce sediment run-off;
- segregation of topsoil in unsaturated wetlands within the area disturbed by trenching to preserve the native seed source (which will facilitate natural regrowth of herbaceous vegetation once pipeline installation is complete); and
- periodic inspection of the construction corridor during and after construction.

In accordance with the Rover Procedures, post-construction monitoring of affected wetlands will be performed to assess the condition of vegetation and the success of restoration. To assist with periodic surveillance and monitoring efforts, a 10-foot-wide corridor centered on the pipeline will be routinely cleared and maintained in an herbaceous state for a single pipeline and a 30-foot-wide corridor will be routinely maintained for the dual pipelines.

2.3.5 Compensatory Mitigation

USACE Districts and states have specific compensatory mitigation requirements, programs and methods, as discussed in the following paragraphs.

2.3.5.1 West Virginia

In West Virginia, the Project is located within the Huntington and Pittsburg USACE Districts. The West Virginia Department of Environmental Protection (WVDEP) has established an in-lieu fee (ILF) program to offset unavoidable impacts to Waters of the U.S. and state waters, including wetlands, streams and associated buffers. This program was established to provide compensatory mitigation when no mitigation banks are available to the permittee (WVDEP, 2014b). At this time, no mitigation banks currently service the HUC-8 watersheds crossed by the Project in West Virginia. Correspondence with the WVDEP regarding available mitigation options is included in Volume II-B, Resource Report 1, Attachment 1D. Therefore, Rover proposes to pay into the West Virginia ILF program to offset unavoidable permanent impacts as a result of construction of the Project in West Virginia.

2.3.5.2 Pennsylvania

The portion of the Project in Pennsylvania is located solely within the USACE Pittsburgh District. There are currently three methods to compensate for unavoidable impacts to Waters of the U.S. and state waters

within the State of Pennsylvania. These methods include: permittee responsible mitigation, purchasing credits from an approved mitigation bank, and making a payment into the Pennsylvania Wetland Replacement Project (PWRP). Pennsylvania is currently drafting regulations that would replace the PWRP with a new ILF program called the Pennsylvania Integrated Ecological Services Enhancement and Support (PIESCES) ILF program. However, the PIESCES ILF program may not be operational at the time the Project is permitted with federal, state, and local agencies (USACE, 2014a; PADEP, 1996).

Currently, Rover plans to either purchase mitigation credits from an approved mitigation bank or make a payment into the current Pennsylvania ILF program. At this time, Enlow Fork Mitigation Bank appears to be the only mitigation bank with potential to provide sufficient compensatory mitigation credits to offset unavoidable permanent conversion of forested wetlands as a result of construction of the Project in Pennsylvania (USACE, 2014b). It is anticipated that the Enlow Fork Mitigation Bank will be approved and have credits available for purchase at the time the Project is permitted with the applicable federal, state and local agencies. Following submittal of its application to the USACE and PADEP, Rover will continue consultations in the development of an appropriate mitigation plan.

2.3.5.3 Ohio

In Ohio, the Project is located within the Huntington, Pittsburgh and Buffalo USACE Districts. An Interagency Review Team (IRT) composed of representatives from the each of these districts, USEPA Region 5, USFWS, NRCS, OEPA and ODNR was established to develop guidelines for mitigation banking and ILF programs within the State of Ohio. These guidelines ensure that unavoidable permanent impacts to Waters of the U.S. and state waters are successfully compensated for (IRT, 2011; IRT, 2014).

Numerous approved mitigation banks and ILF programs are currently available within the HUC 8-watersheds of Ohio to supply compensatory mitigation credits to offset unavoidable impacts to emergent and forested wetlands. The approved mitigation banks and ILF programs with potential to provide mitigation credit to Rover include: Ben's Acres and Reservoir Road Mitigation Bank, Sugar Creek-Brewster Site ILF Program, Little Stillwater ILF Program, Ohio Wetlands Foundation ILF Program, The Nature Conservancy ILF Program, and Crystal Springs Mitigation Bank. Rover proposes to either purchase credits from an approve mitigation bank, make a payment into an approved ILF program, or incorporate a combination of both approved options to offset impacts caused by the construction of the Project in Ohio. Following submittal of its application to the USACE Pittsburgh, Huntington and Buffalo Districts, Rover will continue consultations in the development of an appropriate mitigation plan.

2.3.5.4 Michigan

In Michigan, the Project is located within two MDEQ districts. An ILF program to compensate for impacts to waters of the U.S. and state waters does not currently exist in the State of Michigan. Sixteen mitigation banks, approved by the MDEQ, have been established. However, these were either created for public entities or specific projects, or are not located in any of the HUC 8-watersheds traversed by the Project. According to the MDEQ, new mitigation banks are expected to come online in late 2015 or early 2016, but these proposed banks are still in the planning stages. Permittee-responsible mitigation will be

required in HUC 8 watersheds that do not contain agency approved mitigation banks with available credits (MDEQ, 2014c).

Purchasing mitigation credits from an approved mitigation bank is Rover's preferred option to compensate for unavoidable permanent impacts to Waters of the U.S. and state waters as a result of the Project. However, if approved banks are not available to compensate for impacts along the Project at the time the Project is permitted, Rover will develop a Project specific wetland mitigation plan that will include the purchase of mitigation credits from agency approved wetland mitigation banks and possibly permittee-responsible mitigation. If necessary, Rover will prepare a permittee-responsible mitigation plan in 2015 and provide the FERC with a copy upon its completion. The plan would identify the location and amount of each type of wetlands to be created. Following submittal of its applications to the MDEQ, Rover will continue consultations in the development of an appropriate mitigation plan.

2.4 REFERENCES

Berg, T. M., Edmunds, W. E., Geyer, A. R., compilers. 1980. Geologic map of Pennsylvania (2nd ed.): Pennsylvania Geological Survey, 4th ser., Map 1, scale 1:250,000, 3 sheets [web release]. Accessed online in October 20, 2014 at: http://www.dcnr.state.pa.us/topogeo/publications/pgspub/map/map1/index.htm

Cowardin, Lewis M., Carter, Virginia, Golet, Francis C., LaRow, Edward T. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Accessed online October 11, 2014 at: http://www.charttiff.com/pub/WetlandMaps/Cowardin.pdf

FEMA, 2014. Definitions of FEMA Flood Zone Designations. Accessed online October 29, 2014 at: https://msc.fema.gov/portal.

IRT, Guidelines for Wetland Mitigation Banking in Ohio. Accessed online October 22, 2014 at: http://www.lrh.usace.army.mil/Portals/38/docs/Guidelines_for_Wetland_Mitigation_Bakingn_Ohio_2011.pdf

IRT, 2014. Draft Guidelines for Stream Mitigation Banking and In -Lieu Fee Programs in Ohio. Accessed online October 22, 2014 at: http://www.lrb.usace.army.mil/Portals/45/docs/regulatory/publicnotices/2014April/DraftGuielines_OH_Document.pdf

Lusch, D. P. 2012. Groundwater in Michigan. Accessed online October 21, 2014 at: file:///C:/Users/jwalker/Downloads/Groundwater_Fundamentals_MDARD_Jan2012%22).pdf

Lloyd, O. B., and Lyke, W.L. 1995. Groundwater Atlas of the United States: Illinois, Indiana, Kentucky, Ohio, and Tennessee, HA 730-K. Accessed online October 6, 2014 at: http://pubs.usgs.gov/ha/ha730/ch_k/index.html

Merideth, Robert, Joy R. Drohan, Charles W. Abdalla, Joan R. Jessen, and Edith D. Stevens, 2001.Groundwater Protection and Management in Pennsylvania: An Introductory Guide for

Local Citizens. Accessed online February 9, 2015 at: http://wren.palwv.org/wren/download/groundwaterbook.pdf

MDEQ, 2003. Water Well Viewer. Accessed online October 9, 2014 at: http://wellviewer.rsgis.msu.edu/viewer.htm

MDEQ, 2006. The Michigan Wellhead Protection Program Guide. Accessed online October 8, 2014 at: http://www.michigan.gov/documents/deq/deq-wb-dwehs swpuwhpguidebook_256483_7.pdf

MDEQ, 2012. An Overview of Michigan's Wellhead Protection Program. Accessed online October 8, 2014 at: http://www.michigan.gov/documents/deq/deq-dwrpd-gwswpuWHPPOverview_256490_7.pdf

MDEQ, 2013. Michigan Wellhead Protection Areas. Accessed online October 8, 2014 at: http://www.mcgi.state.mi.us/mgdl/?rel=thext&action=thmname&cid=19&cat=WellheadProtection+Areas

MDEQ, Office of Drinking Water and Municipal Assistance, 2014a. Correspondence with Jason Berndt regarding surface water intakes and critical assessment zones

MDEQ, 2014b. Correspondence with Michael Pennington regarding approved mitigation options (see Appendix 2D).

MDEQ, 2014c. Wetland Mitigation Banking. Acessed online October 27, 2014 at: http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10426--,00.html

MDEQ, 2014d. Water Quality and Pollution Control in Michigan 2014 Sections 303(d), 305(b), and 314 Integrated Report. Accessed online October 2014 at: http://www.michigan.gov/deqwater

MDEQ, 2015a. Correspondence with Brant Fisher regarding state-designated aquifers.

MDEQ, 2015b. Correspondence with Amy Berry regarding vernal pool regulations.

NPS, 2011. Nationwide Rivers Inventory. Accessed online October 21, 2014 at: http://www.nps.gov/ncrc/programs/rtca/nri/

National Wild and Scenic Rivers Council. 2014. National Wild and Scenic Rivers. Accessed online in October 21, 2014 at: http://www.rivers.gov/.

NRCS, 2007. Watersheds, Hydrologic Units, Hydrologic Unit Codes, Watershed Approach, and Rapid Watershed Assessments. Accessed online October 22, 2014 at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1042207.pdf

Office of Environmental Health Services, Environmental Engineering Division – Public Water Supply Program. 2011. West Virginia Source Water Protection Program for Public Water Supplies and Private Wells. Accessed online October 23, 2014 at: http://anr.ext.wvu.edu/r/download/116656

OEPA, 1992. Ohio Wellhead Protection Program. Accessed online October 7, 2014 at: http://www.epa.state.oh.us/portals/28/documents/swap/whpprogram.pdf

OEPA, 1999. State of Ohio Source Water Assessment and Protection Program. Accessed online October 23, 2014 at: http://www.epa.state.oh.us/portals/28/documents/swap/swapdoc.pdf

OEPA, 2007. Sensitive Aquifers in Ohio – Relationship to Highly Susceptible Public Water Systems. Accessed online October 21, 2014 at: http://pubs.usgs.gov/of/2007/1285/pdf/Kenah.pdf

OEPA, 2010. 2010 Ohio Integrated Water Quality Monitoring and Assessment Report. Accessed online October 10, 2014 at: http://www.epa.state.oh.us/dsw/tmdl/2010IntReport/index.aspx

OEPA, 2014a. Source Water Assessment and Protection Program, Drinking Water Source Assessments, Maps, and GIS Data. Accessed onlineOctober 8, 2014 at: http://www.epa.state.oh.us/ddagw/swap.aspx#114912860-reportsmaps-gisbr-datarequests

OEPA, 2014b. State of Ohio Water Quality Standards

Chapter 3745-1 of the Adminstrative Code. Accessed online at: http://www.epa.state.oh.us/dsw/wqs/index.aspx

OEPA, 2015a. Correspondence with Chris Kenah regarding state-designated aquifers.

OEPA, 2015b. Correspondence with Joni Lung regarding vernal pool regulations.

Olcott, P. 1992. Groundwater Atlas of the United States: Iowa, Michigan, Minnesota, Wisconsin, HA 730J. Accessed online October 21, 2014 at: http://pubs.usgs.gov/ha/ha730/ch_j/index.html

Pennsylvania Association of Conservation Districts, Inc. 2009. PA Watersheds. Accessed online August 28, 2014 at: http://pacd.org/education/pa-watersheds/

PADEP, 1996. Public Notice, 25 Pa. Code Chapter 105, Pennsylvania Wetland Replacement Project. Accessed online October 17, 2014 at: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/wwec/general/wetlands/ELFD1.htm

PADEP, 2002. The Wellhead Protection Program in Pennsylvania, an Overview. Accessed online October 1, 2014 at: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/srceprot/source/whppover.tm

PADEP, 2004. eMapPA. Accessed online in October 8, 2014 at: http://www.emappa.dep.state.pa.us/emappa/viewer.htm

PADEP, 2005. Title 25, Pennsylvania Code, Chapter 93 – Water Quality Standards. Accessed online at: http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

PADEP. 2014. Correspondence with Thomas McCaffrey regarding source water protection areas and well/springs.

PADCNR, 1999. PennsylvaniaDepartment of Conservation and Natural Resources. The Geology of Pennsylvania's Groundwater. DCNR Educational Series 3. Pennsylvania Geological Survey, Fourth Series:Harrisburg, PA. Accessed online in October 10, 2014 at: http://www.dcnr.state.pa.us/topogeo/education/es3.pdf

PADCNR, 2000.PennsylvaniaDepartment of Conservation and Natural Resources. PhysiographicProvinces of Pennsylvania[Map]. DCNR Map 13. Accessed online in October 10, 2014 at: http://www.dcnr.state.pa.us/topogeo/map13/map13.aspx

PADCNR, 2015. PennsylvaniaDepartment of Conservation and Natural Resources. Groundwater. Accessed online February 9, 2015 at: http://www.dcnr.state.pa.us/topogeo/groundwater/index.htm.

Pennsylvania Geological Survey. 2014. Pennsylvania Groundwater Information System (PaGWIS): Pennsylvania Geological Survey, 4th ser., SQL database. Accessed online October 8, 2014 at: http://www.dcnr.state.pa.us/topogeo/groundwater/pagwis/index.htm

Pennsylvania Source Water Protection. 2012. Protection Zones: Map/Delineate Protection Zones.

Accessed online October 29, 2014 at: http://www.sourcewaterpa.org/?page_id=9

PNHP, 2015. Vernal Pools. Accessed online February 9, 2015 at: http://www.naturalheritage.state.pa.us/VernalPool_Regulation.aspx.

Sauder Village. 2014. The Great Black Swamp. Accessed online October 30, 2014 at: https://www.saudervillage.org/history/BlackSwamp.asp

Sweat, M.J., Brogren, B.B., Jodoin, R.S., Rossi, T.A., and Loerop, M.W. 2002. Michigan's Source Water Assessment Program – Surface Water Assessments Leading to ProtectionInitiatives. Accessed online October 23, 2014 at:http://mi.water.usgs.gov/pubs/MISC/RTSMI0121/pdf/WTO222b.pdf

The Pennsylvania State University. 2007. A Quick Guide to Groundwater in Pennsylvania. Produced by Ag Communications and Marketing. Accessed online in October 10, 2014 at: http://pubs.cas.psu.edu/freepubs/pdfs/uh183.pdf

Trapp, H. and M. A. Horn. 1997. Groundwater Atlas of the United States: Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia, USGS HA 730-L.Accessed online in October 10, 2014 at: http://pubs.usgs.gov/ha/ha730/ch_l/index.html

USACE, 1987. Corps of Engineers Wetland DelineationManual. Technical Report U 87-1. Waterways Experiment Station, Vicksburg, MS.

USACE, 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0). U.S. Army Engineer Research and Development Center, Vicksburg, MS.

USACE, 2012a. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountain and Piedmont Region (Version 2.0). U.S. Army Engineer Research and Development Center, Vicksburg, MS.

USACE, 2012b. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North Central and Northeast Region (Version2.0). U.S. Army Engineer Research and Development Center, Vicksburg, MS.

USACE, 2014a. Public Notice: CENAB-OP-RPA 2014 00371 (Pennsylvania Integrated Ecological Services Capacity Enhancement and Support). Accessed online October 17, 2014 at: http://www.nab.usace.army.mil/Portals/63/docs/Regulatory/SPN1424.pdf

USACE, 2014b. Regulatory In-Lieu Fee and Bank InformationTracking System. Accessed online October 22, 2014 at: http://geo.usace.army.mil/ribits/index.html

USEPA, 2009. Sole Source Aquifers: Region 3. Accessed online August 28, 2014 at: http://www.epa.gov/safewater/sourcewater/pubs/qrg_ssamap_reg3.pdf

USEPA, 2014a. Designated Sole Source Aquifers in Region 5. Accessed online August 28, 2014 at: http://www.epa.gov/Region5/water/gwdw/solesourceaquifer/index.htm

USEPA, 2014b. Mid-Atlantic Superfund Sites. Accessed online October 2, 2014 at: http://www.epa.gov/reg3hwmd/super/allnpl.htm

USEPA, 2014c. Region 5 Superfund, NPL Fact Sheets for Ohio. Accessed online October 2, 2014 at: http://www.epa.gov/region5/superfund/npl/ohio/index.html

USEPA, 2014d. Region 5 Superfund, NPL Fact Sheets for Michigan. Accessed online October 2, 2014 at: http://www.epa.gov/region5/superfund/npl/michigan/index.html

USEPA, 2014e. Mid-Atlantic Superfund, West Virginia Superfund Sites. Accessed online October 9, 2014 at: http://www.epa.gov/reg3hwmd/super/wv.htm

USEPA, 2014f. Mid-Atlantic Superfund, Pennsylvania Superfund Sites. Accessed online October 9, 2014 at: http://www.epa.gov/reg3hwmd/super/pa.htm

USEPA, 2014g. Cleanup sites in Region 5. Accessed online October 9, 2014 at: http://www.epa.gov/region5/cleanup/index.htm#OH

USGS, 1998. Michigan Source Water Assessment: Groundwater in Karst Areas. Accessed online October 21, 2014 at: http://mi.water.usgs.gov/pdf/poster.pdf

USGS. 2014. Mineral Resources On-line Spatial Data. Accessed online January 19, 2015 at: http://mrdata.usgs.gov/.

WVDEP, 2014a. West Virginia Watersheds. Accessed online August 27, 2014 at: http://www.dep.wv.gov/WWE/getinvolved/sos/Pages/Watersheds.aspx.

WVDEP, 2014b. In-Lieu Fee and Wetland Mitigation Program. Accessed online October 17, 2014 at: www.dep.wv.gov/WWE/Programs/Pages?In-lieu-fee.aspx

WVDEP, 2015a. Groundwater/UIC Program. Accessed February 9, 2015 at: http://www.dep.wv.gov/WWE/Programs/gw/Pages/gwhome.aspx

WVDEP, 2015b. Correspondence with Wilma Reip regarding vernal pool regulations.

WVBPH, 2003. State of West Virginia Source Water Assessment and Protection Program, Source WaterAssessment Report – West Union Municipal Water, Doddridge County, PWSID: WV3300901. Accessed online October 23, 2014 at: http://www.wvdhhr.org/oehs/eed/swap/get.cfm?id=3300901

WVBPH, 2008. Fact Sheet: Source Water Assessment and Protection (SWAP) Program, West Virginia Department of Health and Human Resources Bureau for Public Health. Accessed online August27, 2014 at: http://www.wvdhhr.org/oehs/eed/swap/swapfactsheet.pdf

WVBPH, 2014a. West Virginia Source Water Assessment and Wellhead Protection Programs. Accessed online August 27, 2014 at: http://www.wvdhhr.org/oehs/eed/swap/

WVBPH, 2014b. Wellhead Protection Program. Accessed online October 1, 2014 at: http://www.wvdhhr.org/oehs/eed/SWAP/whppknowledge.asp

WVDEP, 2014a. West Virginia Watersheds. Accessed online August 27, 2014 at: http://www.dep.wv.gov/WWE/getinvolved/sos/Pages/Watersheds.aspx.

WVDEP, 2014b. 47CRS2 - Requirements Governing Water Quality Standards. Accessed online at: http://www.dep.wv.gov/WWE/Programs/wqs/Pages/default.aspx

WVDHHR. 2015. Correspondence with William Toomey and James Mitchell regarding source water protection areas and well/springs.

World Canals. 2005. Ports and Navigable Waterways of the United States. Accessed online October 21, 2014 at: http://www.worldcanals.com/english/ntham.html