

FRESHWATER MUSSEL (UNIONIDAE) SITE ASSESSMENTS AND SURVEYS FOR THE PROPOSED MOUNTAIN VALLEY PIPELINE IN VIRGINIA

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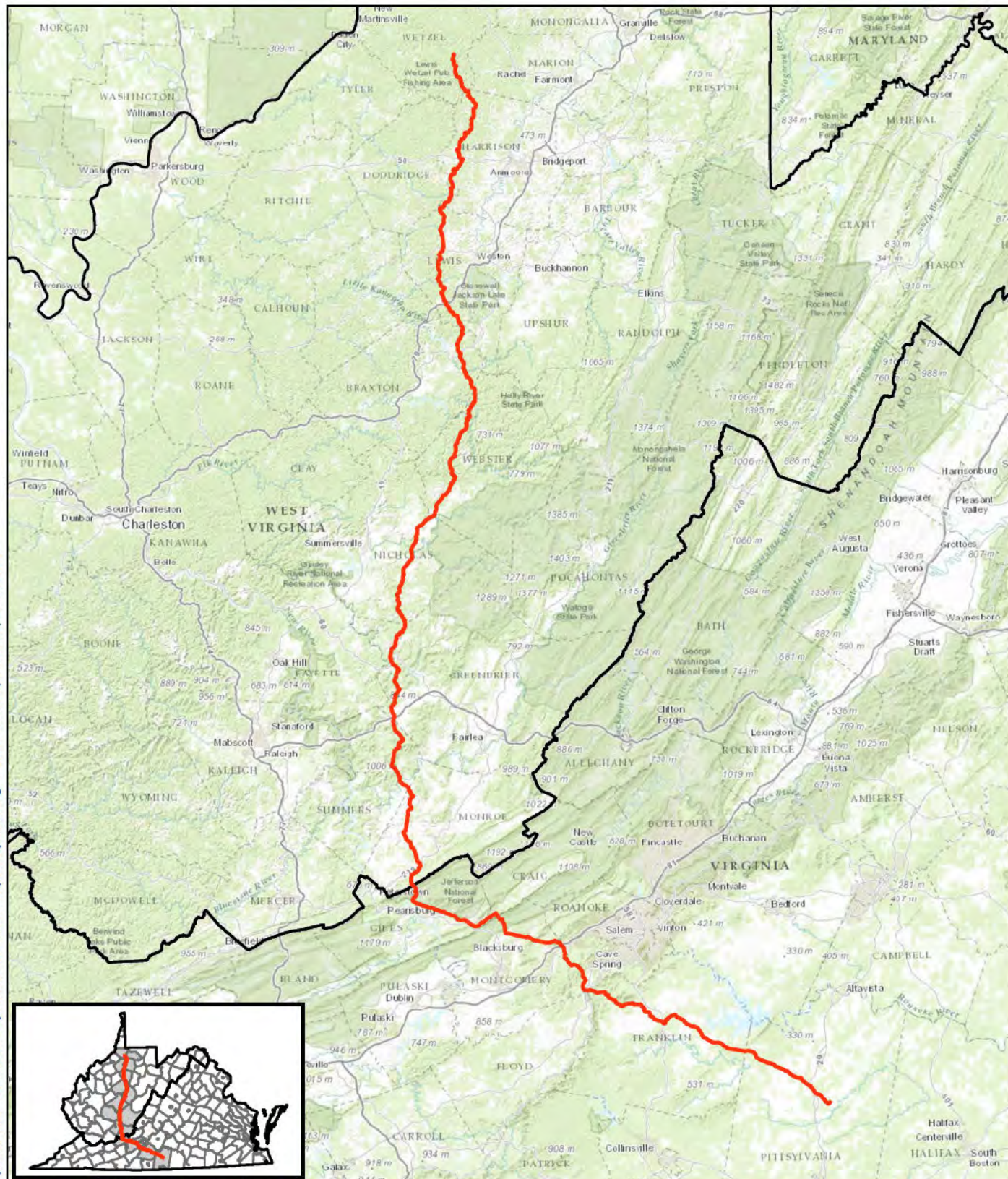
1.0 Introduction and Project Description

Mountain Valley Pipeline, LLC (MVP), a joint venture of EQT Midstream Partners, LP, a subsidiary of NextEra Energy, Inc., WGL Holdings, Inc., Vega Energy Partners, Ltd., and RGC Midstream, LLC, plans to construct the Mountain Valley Pipeline (Project), an approximate 301-mile, 42-inch diameter natural gas pipeline, to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region. The Project will extend from the existing Equitrans, L.P. transmission system near Mobley in Wetzel County, West Virginia, to Transcontinental Gas Pipe Line Company, LLC's Zone 5 compressor station 165 in Pittsylvania County, Virginia (Figure 1). In West Virginia, approximately 195.5 miles of the pipeline is expected to cross Braxton, Doddridge, Fayette, Greenbrier, Harrison, Lewis, Monroe, Nicholas, Summers, Webster, and Wetzel counties. In Virginia, approximately 105.5 miles of the pipeline is expected to cross Craig, Franklin, Giles, Montgomery, Pittsylvania, and Roanoke counties. In addition, more than 53 miles of supporting access roads are proposed to be utilized or constructed along the Project in Virginia.

Several alternate routes were originally proposed for the Project in Virginia and West Virginia. The current route as proposed includes a permanent right-of-way (ROW) of 50 feet. This encompasses a total of 1,378.02 acres in West Virginia and 713.64 acres in Virginia. The width of the construction ROW is 125 feet which will temporarily impact an additional 2,861.21 acres in West Virginia and 1,344.66 acres in Virginia.

This document comprises studies completed along the currently proposed Project alignment; field investigations along eliminated alignments are not reported with the exception of those providing value for evaluation of areas restricted by land access.

The proposed Project traverses numerous watersheds that harbor native freshwater mussels including both state and federally listed aquatic species. Environmental Solutions & Innovations, Inc. (ESI) was contracted on behalf of MVP to assist with a determination of the impacts to aquatic resources by the Project in Virginia. This document contains results of the desktop analysis and field survey efforts to address Project stream crossings that support freshwater mussels in Craig, Franklin, Giles, Montgomery, Pittsylvania, and Roanoke counties, Virginia.



— Proposed MVP Alignment

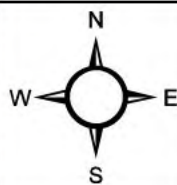


Figure 1. Location of the proposed Mountain Valley Pipeline Project in Virginia and West Virginia.

Project No.
593.11

20 0 20 40 Kilometers



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2.0 Regulatory Setting

2.1 Endangered Species Act

The Federal Endangered Species Act (ESA) [16 U.S.C. 1531 et seq.] was codified into law in 1973. This law provides for the listing, conservation, and recovery of endangered and threatened species of plants and wildlife. Under the ESA, the U.S. Fish and Wildlife Service (USFWS) is mandated to monitor and protect listed species.

Section 9 of the ESA prohibits the take of listed species unless otherwise specifically authorized by regulation. Take is defined by the ESA as, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" [16 U.S.C. 1532(19)]. USFWS further defines harm to include significant habitat modification or degradation [50 CFR §17.3] to the point where it actually kills or injures an individual or significantly impairs essential behavioral patterns, including feeding, breeding, and sheltering. Harassment is an intentional or negligent act or omission that creates the likelihood of injury by annoying an individual to such an extent as to significantly disrupt formal behavior patterns, which include but are not limited to breeding, foraging, and sheltering. Harassment does not cover habitat disturbing activities.

Section 7(a)(2) of the ESA states that each federal agency shall insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of designated critical habitat. Federal actions include (1) expenditure of federal funds for roads, buildings, or other construction projects, and (2) approval of a permit or license, and the activities resulting from such permit or license. Compliance is required regardless of whether involvement is apparent, such as issuance of a federal permit, or less direct, such as federal oversight of a state-operated program. Actions of federal agencies that do not result in jeopardy or adverse modification, but that could result in a take, must also be addressed under Section 7. Take by a federal agency can be authorized through the Section 7 consultation process, culminating in an Incidental Take Statement (ITS) by the USFWS. The take must be incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

In 1982 amendments to the ESA, Congress established a provision in Section 10(a)(1)(B) that authorizes incidental take by nonfederal entities. To obtain an Incidental Take Permit (ITP), an applicant must submit a conservation plan specifying impacts that result in take and measures to minimize and mitigate those impacts.

Regardless of whether incidental take might be covered under Section 7 or Section 10, it is the obligation of the project proponent to avoid and minimize impacts to listed

species. If, through this process, take is avoided, then an ITS or ITP is not required. The initial step in avoidance and minimization is to determine whether suitable habitat and listed species are present.

2.2 Virginia Endangered Species Act

The Virginia Endangered Species Act (29.1-563 - 29.1-570) provides that VDGIF is the state regulatory authority over federally or state listed endangered or threatened fish and wildlife in the Commonwealth, defining fish or wildlife as “. . . any member of the animal kingdom, vertebrate or invertebrate, except for the class Insecta, and includes any part, products, egg, or the dead body or parts thereof.” It prohibits the taking, transportation, processing, sale, or offer for sale within the Commonwealth of any fish or wildlife listed as a federally endangered or threatened species, except as permitted by the Board of Game and Inland Fisheries for zoological, educational, scientific, or captive propagation for preservation purposes. State-listed species are provided the same protection per VDGIF Regulation 4 VAC 15-20-130.

The law further authorizes the Board of the VDGIF to adopt the federal list of endangered and threatened species, to declare by regulation that species not listed by the federal government are endangered or threatened in Virginia, and to prohibit by regulation the taking, transportation, processing, sale, or offer for sale of those species. Implementing regulations pursuant to this authority (4 VAC 15-20-130 through 140) further define “take” and other terms similarly to the federal ESA.

2.3 Initial Project Review

On 13 October 2014, MVP submitted letters introducing the Project to the USFWS Gloucester Field Office (USFWS GFO) and Virginia Department of Game and Inland Fish (VDGIF). Correspondence with USFWS GFO (3 April 2015) and Virginia Department of Conservation and Recreation (VCNR) (6 April 2015) provided formal comments to ESI regarding the Project’s potential to impact federally listed species in the Project Area. The Project traverses streams within the Upper James River drainage known to harbor federally endangered James spiny mussel (*Pleurobema collina*). USFWS and VDGIF recommended site assessments and presence-absence surveys, respectively at stream crossings in Craig Creek and its watershed (excluding Little Oregon and Dicks Creek). In addition, on 25 November 2014, Mr. Brian Watson (VDGIF) through personal communication with ESI recommended using a 12.9-square kilometer (5-mi²) drainage threshold for ensuring all potential mussel streams are addressed; similar to the threshold used by the Virginia Marine Resource Commission’s (VMRC) subaqueous activity guidelines (Regulation 4 VAC 20-120-10 ET SEQ) to define non-tidal, perennial streams. Agency correspondence is provided in Appendix A.

2.4 Regional Occurrence of Listed Mussels

The Project is within the range of the federally endangered James spiny mussel, and state-endangered Atlantic pigtoe (*Fusconaia masoni*), and state threatened green floater (*Lasmigona subviridis*).

2.4.1 James Spiny mussel (*Pleurobema collina*)

James spiny mussel was historically widespread in the James River drainage; however, it has been extirpated from approximately 90 percent of its historical range, with survival documented only in a few creeks and small rivers in the upper James River drainage. Recent records show the species is currently known from a dozen small tributaries of the James River in Virginia and West Virginia. The Craig Creek subbasin is known to support populations of James spiny mussel and the Project proposes to traverse Craig Creek in Montgomery County.

2.4.2 Atlantic Pigtoe (*Fusconaia masoni*)

Atlantic pigtoe is known to occur in upper James River and Roanoke River basins; however, waterbodies traversed by the Project are not likely to harbor the species.

2.4.3 Green Floater (*Lasmigona subviridis*)

Green floater is known to occur in the upper New River basin including the New River in Giles County, Virginia. Project stream crossings in direct tributaries proximal to the New River such as Little Stony Creek and Stony Creek may support populations of green floater in Giles County.

2.5 Study Plan

A study plan outlining methods for site assessments and potential mussel surveys was approved by the USFWS GFO Office and VDGIF on 29 May 2015. Field surveys are carried out under ESI's current USFWS Federal Fish and Wildlife Permit (#TE02373A-9), Virginia Scientific Collection Permit (#050667), and Virginia Threatened/Endangered Species Permit (#050669).

3.0 Methods

Site assessments, abbreviated surveys, and future relocations follow the USFWS and VDGIF DRAFT Freshwater Mussel Survey Guidelines for Virginia (dated 4 September 2013). Mussel site assessments can be performed any time of the year assuming stream conditions are favorable to adequately assess mussel habitat. Abbreviated mussel surveys and relocation efforts are completed within the permissible mussel survey field season: 15 April to 30 October.

3.1 Desktop Analysis

Prior to field efforts, a detailed desktop analysis using geographical information system (GIS – Esri ArcMap 10.3) is completed to identify freshwater mussel concerns along Project route (including access roads). All waterbodies traversed by the Project are identified and preliminarily assessed for their potential to support freshwater mussels including stream type (i.e., ephemeral, intermittent, or perennial), watershed size (e.g. stream order, upstream drainage area), and existing available mussel distribution data. Stream order is calculated using the 1:24,000 high resolution National Hydrography Dataset, and upstream drainage area is calculated using a 30-m resolution digital elevation model from the National Elevation Dataset. These remotely sensed metrics are then used to identify areas possibly supporting federally listed species, state listed species, and/or native mussels.

3.2 Site Assessments

Site assessments are completed throughout a survey reach extending 20 meters (65.6 ft) upstream and 80 meters (262 ft) downstream of the proposed Project footprint. Site assessments are conducted to aid in determining whether a stream segment has the ability to support freshwater mussels and includes site photographs and mapping of all habitats. Habitat maps are georeferenced and delineated by stream morphology (i.e., pools, riffles, and runs) based on water depth, velocity, and substrate. When suitable habitat is present, an abbreviated survey is completed as recommended by the VDGIF or USFWS. Upon completion of the site assessments, results are provided to VDGIF and USFWS for review to determine whether further surveys and subsequent relocations are necessary. Mussel site assessments can be performed any time of the year assuming stream conditions are favorable to adequately assess mussel habitat.

3.3 Abbreviated Mussel Surveys

Abbreviated mussel surveys are completed at streams identified during site assessments that contain mussels and/or suitable habitat as well as those streams known to harbor RTE species (Tables 1). Qualitative survey efforts extend a minimum of 100 meters (328 ft) upstream and 400 meters (1,312 ft) downstream of the Project footprint at each crossing (where possible).

Depending on water depth, snorkeling (<1 meter [3.28 ft] deep) or scuba/surface supply air (>1 meter [3.28 ft] deep) are used to survey for mussels. Surveyors use their hands and fingertips to fan the top level of substrate and rake loose sediments to search for embedded mussels. Surveyors overturn large flat rocks and search beneath them where mussels could reside. Location, species counts, survey method (i.e. snorkel, scuba, surface supply), and search efforts are recorded. Abbreviated survey efforts are within the permissible Virginia mussel survey field season: 15 April to 30 October.

3.4 Relocations

Relocation efforts and locations are determined based on results of the site assessments, abbreviated surveys, and coordination with the USFWS and VDGIF.

Implementation of standard mussel relocation protocols is anticipated for the Project as outlined below:

- The first relocation survey will occur within 30 to 45 days of in-stream construction activities and at least 7 days prior to the second relocation survey.
- The second relocation survey will occur within 30 days of in-stream construction activities and at least 7 days after the first relocation survey.
- All relocation surveys will include a minimum of two passes with a target relocation of 80 percent of the initial number of mussels collected. If on the second pass, more than 20 percent of the initial number of mussels is collected, additional passes will be completed until no more than 20 percent of the initial number of mussels is collected.
- If a state-listed species is found, continual passes will be conducted until no listed species are found on the final pass. If repeated passes result in continual collection of state-listed species, survey techniques will be modified based on recommendations from VDGIF.

The location of all relocated mussels will be documented with GPS coordinates, and all state-listed species will be tagged in the event future monitoring activities are warranted.

4.0 Results

4.1 Desktop Analysis

The proposed Project traverses three major watersheds including the New River, James River, and the Roanoke River. Twenty-nine perennial stream crossings were identified in Virginia with drainage areas greater than 12.9 square kilometers (5 mi²) and potential to support freshwater mussels (Table 1). Of these, seven crossings are within streams identified as potentially harboring rare, threatened, and endangered (RTE) mussels. The federally endangered James spinymussel (*Pleurobema collina*) and state-threatened Atlantic pigtoe (*Fusconaia masoni*) are known to occur in Craig Creek (and several tributaries). Four crossings of Craig Creek are proposed. The yellow lampmussel (*Lampsilis cariosa*), federal species of concern is known to occur

in the Pigg River and Mill Creek. The state-threatened green floater (*Lasmigona subviridis*) occurs downstream of Stony Creek beyond the confluence with the New River. VDGIF requested assumed presence of freshwater mussels in the Roanoke River mainstem with mussel relocations prior to construction (Appendix A), therefore no surveys were conducted here. Mussel concerns were dismissed in streams with upstream drainage areas less than VMRC's 5-square mile watershed threshold. The remaining 21 stream crossings in Virginia with upstream drainage areas greater than 5-square miles were assessed for mussels via site assessments and/or subsequent mussel surveys.

Table 1. Streams crossed by the Mountain Valley Pipeline Project with drainage areas greater than 12.9 square kilometers (5 mi²) upstream of the crossing location or potential for RTE species occurrences in Virginia.

County	Stream Name ¹	Mile Post	Crossing Type ²	Support RTE Mussels ³	Drainage Area (mi ²)	Strahler Stream Order	Field Assessment ⁴
Giles	Stony Creek		Pipeline	Yes	47.5	4	Survey
Giles	Little Stony Creek		Pipeline	No	19.7	4	SA
Giles	Sinking Creek ²		Pipeline	No	66.2	4	SA
Craig	Sinking Creek AR		AR	No	42.6	4	SA
Montgomery	Craig Creek ¹		Pipeline	Yes	5.1	3	Survey
Montgomery	Craig Creek AR		AR	Yes	5.3	3	Survey
Montgomery	Craig Creek ²		Pipeline	Yes	5.8	3	Survey
Montgomery	Craig Creek ³		Pipeline	Yes	5.8	3	Survey
Montgomery	Mill Creek ¹		Pipeline	No	5.1	3	SA
Montgomery	North Fork Roanoke River ¹		Pipeline	No	23.8	4	SA
Montgomery	North Fork Roanoke River AR ¹		AR	No	23.7	4	SA
Montgomery	Bradshaw Creek ¹		Pipeline	No	17.5	4	SA
Montgomery	Bradshaw Creek AR		AR	No	13.5	4	SA
Montgomery	North Fork Roanoke River AR ²		AR	No	112.2	5	SA
Roanoke	Roanoke River		Pipeline	No	256.5	6	Relocations
Roanoke	Mill Creek ²		Pipeline	Yes	5.8	3	Survey
Franklin	North Fork Blackwater River		Pipeline	No	5.9	3	SA
Franklin	Teels Creek ²		Pipeline	No	5.1	3	SA
Franklin	Teels Creek ³		Pipeline	No	5.5	3	SA
Franklin	Teels Creek ⁴		Pipeline	No	22.6	3	SA
Franklin	Little Creek ^{1,5}		Pipeline	No	22.6	4	SA
Franklin	Little Creek ²		Pipeline	No	25.1	4	SA
Franklin	Blackwater River ¹		Pipeline	No	107.6	5	SA
Franklin	Blackwater River ²		Pipeline	No	109.9	5	SA
Franklin	Maggodee Creek ¹		Pipeline	No	45.4	5	SA
Franklin	Blackwater River ³		Pipeline	No	165.4	6	SA
Pittsylvania	Pigg River		Pipeline	Yes	340.1	6	Survey
Pittsylvania	Harpen Creek ¹		Pipeline	No	7.8	3	SA
Pittsylvania	Little Cherrystone Creek ³		Pipeline	No	5.0	3	SA

¹UNT – Unnamed tributary

²AR = Access Road

³RTE = Rare, Threatened, Endangered species

⁴SA = Site Assessment; Survey = Abbreviated Survey

4.2 Site Assessments and Abbreviated Mussel Surveys

During April to October 2015, 19 proposed stream crossings along the currently proposed MVP alignment and access roads in Giles, Montgomery, Roanoke, Franklin, and Pittsylvania counties were assessed for suitable mussel habitat or surveyed for mussels (Table 2). Site assessments were completed at eight stream crossings. Nine stream crossings were not assessed due to land access restrictions and the Roanoke River was not assessed because VDGIF recommended relocation efforts prior to construction. One stream (Little Cherrystone Creek) was not assessed at its proposed crossing location due to land access restrictions; however, two assessments completed upstream provided valuable, surrogate information regarding habitat features and representative characteristics of the stream. Abbreviated mussel surveys were performed at 11 stream crossings including Craig Creek. Presence of James spinymussel is assumed at the stream crossing locations on Craig Creek. Maps depicting the locations of mussel site assessments and surveys along the Project in Virginia are provided in Appendix B, and representative photographs are presented in Appendix C. Field notes and datasheets can be provided upon request.

Table 2. Stream crossings warranting mussel site assessments and/or surveys along the proposed Mountain Valley Pipeline Project in Virginia.

County	Stream Name ¹	Mile Post	Crossing Type ²	HA Completed ³	Drainage Area (mi ²)	Mussels Present ⁴
Giles	Stony Creek	199.0	Pipeline	Survey	47.5	No
Giles	Little Stony Creek	202.9	Pipeline	SA	19.7	No
Giles	Sinking Creek2	209.9	Pipeline	SA	66.2	No
Craig	Sinking Creek AR	216.6	AR	Not Assessed	42.6	TBD
Montgomery	Craig Creek1	218.2	Pipeline	Survey	5.1	No
Montgomery	Craig Creek AR	218.4	AR	Survey	5.3	No
Montgomery	Craig Creek2	218.5	Pipeline	Survey	5.8	No
Montgomery	Craig Creek3	218.6	Pipeline	Survey	5.8	No
Montgomery	Mill Creek1	223.9	Pipeline	SA	5.1	No
Montgomery	North Fork Roanoke River1	█	Pipeline	Survey	23.8	Yes
Montgomery	North Fork Roanoke River AR1	█	AR	Survey	23.7	Yes
Montgomery	Bradshaw Creek1	229.2	Pipeline	Survey	17.5	No
Montgomery	Bradshaw Creek AR	230.0	AR	Not Assessed	13.5	TBD
Montgomery	North Fork Roanoke River AR2	230.0	AR	Not Assessed	112.2	NA
Roanoke	Roanoke River	█	Pipeline	Not Assessed	256.5	Yes
Roanoke	Mill Creek2	243.0	Pipeline	Not Assessed	5.8	TBD
Franklin	North Fork Blackwater River	247.3	Pipeline	SA	5.9	No

County	Stream Name ¹	Mile Post	Crossing Type ²	HA Completed ³	Drainage Area (mi ²)	Mussels Present ⁴
Franklin	Teels Creek2	258.5	Pipeline	SA	5.1	No
Franklin	Teels Creek3	259.3	Pipeline	SA	5.5	No
Franklin	Teels Creek4	259.9	Pipeline	Not Assessed	22.6	TBD
Franklin	Little Creek1.5	260.1	Pipeline	Not Assessed	22.6	TBD
Franklin	Little Creek2	260.8	Pipeline	Not Assessed	25.1	TBD
Franklin	Blackwater River1	262.8	Pipeline	Not Assessed	107.6	TBD
Franklin	Blackwater River2	█	Pipeline	SA	109.9	Yes ⁴
Franklin	Maggodee Creek1	266.6	Pipeline	Survey	45.4	No
Franklin	Blackwater River3	█	Pipeline	Survey	165.4	Yes ⁴
Pittsylvania	Pigg River	█	Pipeline	Survey	340.1	Yes
Pittsylvania	Harpen Creek1	287.1	Pipeline	SA	7.8	No
Pittsylvania	Little Cherrystone Creek3	300.3	Pipeline	Not Assessed ⁵	5.0	No ⁶

¹ UNT = Unnamed tributary

² AR = supporting access road

³ SA = Mussel Site Assessment; Not Assessed = land access restriction; Survey = Abbreviated Survey; Progress as of 3 November 2015.

⁴TBD = To Be Determined

⁵ mussels likely present in vicinity of stream crossing as deadshell mussels were recovered

⁶ site-specific field visit not completed however stream assessments performed upstream serve as a surrogate assessment

4.3 Giles County

The proposed Project traverses the entirety of Giles County in a southeasterly direction. MVP traverses three streams with potential to support freshwater mussels including Stony Creek, Little Stony Creek, and Sinking Creek 2. Mussel site assessments were completed at two crossings and an abbreviated mussel survey was completed at Stony Creek. Each stream empties into the New River.

4.3.1 Stony Creek

Stony Creek is a fourth order stream with an upstream drainage area of 123.1 square kilometers (47.5 mi²). It is known to support freshwater mussels therefore an abbreviated mussel survey was completed on 19 October 2015. Ten hours of search time was expended along 348 meters (1,142 ft) of stream reach at the Project crossing. Despite all efforts to locate mussels, no signs of mussels (live or deadshell) were observed.

The survey reach was composed of a 40-meter (131 ft) Area of Direct Impact (ADI). Survey buffers were applied to the outer limits of the ADI and included a 100-meter upstream (US) buffer and a 207-meter downstream (DS) buffer. Land access prohibited completion of surveys in the downstream reaches of the DS buffer. The Stony Creek crossing is downstream of the APG Lime Corp Kimballton Plant. The stream meanders parallel to a railroad along the left descending bank (LDB). Upstream of the centerline, the rip-rapped apron of the railroad extends to the water

line. An existing powerline (ROW) traverses the stream immediately downstream of the centerline. The riparian buffer is intact along the entire right descending bank (RDB) and flanked by natural forest.

Stony Creek is characterized as a perennial, mountainous, trout stream with an average bankfull width averaging 15 meters (49 ft) and wetted width averaging 7 meters (23 ft) at the time of assessment. It is a high gradient stream and substrates are a coarse mixture of 20 percent boulder, 50 percent cobble, and 30 percent gravel. Gravel is interspersed among rounded boulder and cobble substrates, predominantly covered with an algal film. Overall stream morphology is characterized as 90 percent riffle, 5 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.5 meters (4.9 ft), respectively. Maximum depth occurs in a scoured plunge pool downstream of a small logjam. The stream exhibits little to no embeddedness or siltation. Although no sign of unionid mussels were observed, aquatic fauna such as macroinvertebrates, crayfish, and fish are present.

4.3.2 Little Stony Creek

A mussel site assessment was completed at Little Stony Creek on 20 October 2015. It is a fourth-order stream with an upstream drainage area of 51.1 square kilometers (19.7 mi²) at the Project crossing. The stream is characterized as a small perennial trout stream with an average bankfull width of 12 meters (39 ft) and wetted width of 5 meters (16 ft) at the time of assessment. It is a high gradient stream and substrates are a coarse mixture of 15 percent boulder, 70 percent cobble, and 15 percent gravel. Stream morphology is characterized as 100 percent riffle habitat. Average and maximum depths measure 0.35 meter (1.1 ft) and 1.0 meter (3.3 ft), respectively. The stream exhibits exhibit little to no embeddedness nor siltation. A deciduous forest floodplain borders the stream along the RDB and a residential lawn flanks a narrow riparian buffer along the LDB. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. No live or deadshell mussels were observed. The stream was considered unlikely to support freshwater mussels.

4.3.3 Sinking Creek 2

Sinking Creek 2 is a direct tributary to the New River and was assessed on 27 September 2015. It is a fourth-order stream with an upstream drainage area of 171.5 square kilometers (66.2 mi²) at the Project crossing. The stream is characterized as a small perennial trout stream with average bankfull width of 22 meters (72 ft) and wetted width of 15 meters (49 ft) at the time of assessment. It is a moderately high gradient stream and substrates are a heterogeneous mix composed of 10 percent boulder, 50 percent cobble, 20 percent gravel, and 20 percent sand. Stream morphology is characterized as 80 percent riffle and 20 percent glide habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 1.0 meter (3.3 ft), respectively. The stream exhibits exhibit little to no embeddedness nor siltation. A

narrow riparian buffer is present along both banks in the survey reach. The riparian buffer is flanked by Zells Mill Road along the RDB and a residential lawn on the LDB. The Project traverses Sinking Creek between two bridges. Mountain Lake Road Bridge and Covered Bridge Lane Bridge traverse the stream approximately 50 meters (164 ft) upstream and 30 meters (98 ft) downstream, respectively, of the proposed alignment. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. No live or deadshell mussels were observed. The stream was considered unlikely to support freshwater mussels.

4.4 Craig County

The proposed Project traverses the extreme southwestern portion of Craig County. One stream, Sinking Creek, is traversed by an existing agricultural ford access road and warrants a mussel site assessment. Sinking Creek is a tributary to the New River. A mussel site assessment was not completed at Sinking Creek in Craig County due to land access restrictions. Once access is granted, an assessment will be completed and an amended report will be submitted to the agencies.

4.5 Montgomery County

The proposed Project traverses the northern portion of Montgomery County in an easterly direction. Two watersheds, the James River and Roanoke River, are traversed by the Project in Montgomery County. Craig Creek is within the upper James River system. Abbreviated mussel surveys were completed at four Project crossings of Craig Creek. In the Roanoke River system, the Project traverses three streams at five crossing locations. North Fork Roanoke River and Bradshaw Creek are each crossed at two locations. Mussel site assessments were completed at all Project crossings except Bradshaw Creek 2. These streams are within the North Fork Roanoke River drainage prior to entering into the Roanoke River.

4.5.1 Craig Creek – Four Crossings

The Project proposes to traverse Craig Creek at four locations on the current alignment consisting of three pipeline crossings and a single access road crossing. All crossings occur within approximately 800 meters (2,624 ft) of stream reach. Craig Creek is a third order stream at all crossings and the upstream drainage areas range from 13.2 to 14.9 square kilometers (5.1 to 5.8 mi²). Recent occurrence records of James spiny mussel and Atlantic pigtoe are known downstream of the Project crossings therefore abbreviated mussel surveys are warranted.

An abbreviated mussel survey was completed on 20 October 2015 and encompassed both Project crossing locations. Fourteen hours and 20 minutes of search time was expended along 1,553 meters (5,095 ft) of stream reach at the Project crossing. Despite all efforts to locate mussels, no signs of mussels (live or deadshell) were observed.

The survey reach is composed of an 846-meter ADI that encompassed all four crossings and includes 20 meters upstream of the upstream-most crossing and 20 meters downstream of the downstream-most crossing. Survey buffers were applied to the outer limits of the ADI and included 171-meter US buffer and a 536-meter DS buffer. The stream is characterized as a small perennial stream with an average bankfull width that ranged from 8 to 25 meters (26 - 82 ft) and wetted width ranging from 1 to 8 meters (3.3 - 26 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a heterogeneous mix composed of 15 percent cobble, 25 percent gravel, 5 percent sand, and 55 percent bedrock. The majority of the stream bottom consists of uplifted or underlying bedrock. Coarse substrates are present on top of or in the seams of bedrock.

Overall stream morphology is characterized as 60 percent riffle, 25 percent run, and 15 percent pool habitats. Average and maximum depths measure 15 centimeters (5.9 in) and 150 centimeters (59.1 in), respectively. Maximum depth occurs just upstream of a massive logjam that has created a dam. Two white pine trees have fallen across the stream and the subsequent collection of foliage and woody debris has dammed the stream. The dam is approximately 1.2 meters tall (3.9 ft) and creates a pool habitat along 210 meters (689 ft) of stream reach. The stream exhibits little to no embeddedness or siltation; however, a very fine layer of detrital material is present on all substrates, particularly in areas of reduced water velocities.

Craig Creek exhibits a meandering water course that parallels Craig Creek Road. Craig Creek Road traverses the stream in the DS buffer via a bridge. Approximately 200 meters (656 ft) of stream reach was assessed downstream of the bridge. A naturally forested hillside flanks a fully intact riparian buffer along the LDB. A narrow riparian buffer is flanked by a residential lawn along the RDB. Upstream of the bridge and throughout the ADI, the RDB is a wooded hillside and the LDB is mostly a wooded floodplain. Craig Creek meanders parallel to an existing powerline corridor.

The Craig Creek access road crossing is at an existing ford crossing that appears to receive irregular use. Upstream of the access road ford crossing, the stream passes within 4 meters (13 ft) of Craig Creek Road and the stream bank is highly eroded. The immediate land use flanking the riparian buffer changes upstream of the access road ford crossing. A hayfield and fallow, overgrown field flank the RDB and LDB, respectively. Although no sign of unionid mussels were observed, aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e., adult southern two-lined salamander [*Eurycea cirrigera*]), and fish are present.

4.5.2 Mill Creek 1

Mill Creek 1 is a direct tributary to the North Fork Roanoke River and was assessed on 14 July 2015. It is a third-order stream with an upstream drainage area of 13.1 square kilometers (5.1 mi²) at the Project crossing. The stream is characterized as a

perennial headwater stream with an average bankfull width of 8 meters (26.2 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a high gradient stream and substrates are a heterogeneous mix of 85 percent cobble, 10 percent gravel, and 5 percent sand. Stream morphology is characterized as 30 percent riffle and 70 percent run habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit little to no embeddedness nor siltation. Natural forest, with approximately 60 percent closed canopy cover, predominates land use in the vicinity of the stream. A narrow riparian buffer is intact along the entirety of the Project crossing. A trout farm is present at the Mill Creek crossing. The stream provides water used by the trout farm and two impoundments occur on the property. The impoundments are approximately 200 meters (656 ft) downstream of the Project crossing and likely impede the upstream movement of host fishes and mussels. Aquatic fauna such as macroinvertebrates, snails, crayfish, amphibians (i.e., frogs, tadpoles), and fish are present. No live or deadshell mussels were observed. The stream was considered unlikely to support freshwater mussels.

4.5.3 North Fork Roanoke River – MVP and Access Road

The Project proposes to traverse North Fork Roanoke River at two locations including a pipeline crossing and an access ford crossing approximately 120 meters (394 ft) upstream of the proposed pipeline crossing. MVP proposes to use the existing agricultural ford crossing to transport equipment associated with construction operations. A site assessment was completed at the proposed Project crossing on 24 April 2015, yielded presence of numerous deadshells, and thereby warranted a subsequent mussel survey.

An abbreviated mussel survey was completed on 20 October 2015 and encompassed both Project crossing locations. Thirteen hours and 30 minutes of search time were expended along a 655-meter (2,149-ft) stream reach at the Project crossing and resulted in collection of two live notched rainbow mussels (*Villosa constricta*) and five deadshell. Live individuals were observed in the DS and US buffers and separated by approximately 370 meters (1,214 ft) of stream reach. Both individuals were found in similar micro-habitat (i.e., depositional pocket of sand downstream of a boulder) and meso-habitat (i.e., deep riffle habitat). The mussel population is sparse in this section of the North Fork Roanoke River.

North Fork Roanoke River is a fourth order stream at both crossings and have upstream drainage areas of 61.5 and 61.8 square kilometers (23.7 and 23.8 mi²). The survey reach is composed of a 155-meter (509 ft) ADI that encompasses both crossings and include 20 meters upstream of the access road crossing and 20 meters downstream of the pipeline crossing. Survey buffers were applied to the outer limits of the ADI and included a 100-meter (328 ft) US buffer and a 400-meter (1312 ft) DS buffer. The stream is characterized as a small perennial stream with an

average bankfull width averaging 14 meters (46 ft) and wetted width averaging 6 meters (20 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a heterogeneous mix composed of 20 percent cobble, 60 percent gravel, 5 percent sand, and 15 percent bedrock. Gravel deposits are relatively pervasive throughout the stream reach and appear to be freshly deposited and prone to shifting.

Overall stream morphology is characterized as 60 percent riffle, 30 percent run, and 10 percent pool habitats. Average and maximum depths measure 0.2 meter (0.7 ft) and 1.75 centimeters (5.7 ft), respectively. The stream exhibits little to no embeddedness or siltation.

Along the RDB, a narrow riparian buffer is flanked primarily by hay fields and pastures. In the DS buffer, livestock have direct access to the stream. A riparian buffer is present along the entirety of the LDB but the adjacent land use changes longitudinally. The predominant adjacent land use is hay field, fallow field, and natural forest in the US buffer, ADI, and DS buffer, respectively. The North Fork Roanoke River access road crossing is at an existing agriculture ford crossing that appears to receive regular use. An additional active, agriculture ford crossing is present at the upstream limits of the survey reach.

4.5.4 Bradshaw Creek

Bradshaw Creek is a direct tributary to the North Fork Roanoke River. Two crossings are proposed to traverse Bradshaw Creek including an MVP crossing (Bradshaw Creek 1) and an access road crossing (Bradshaw Creek 2). Bradshaw Creek 2 is an existing private crossing that passes through culverts beneath the road and was not visited because of land access restrictions. A site assessment was completed on 14 July 2015. No live or deadshell mussels were observed during the assessment however suitable mussel habitat was present, thereby warranting an abbreviated mussel survey.

An abbreviated mussel survey was completed on 21 October 2015. Eleven hours and 30 minutes of search time were expended along a 647-meter (2123-ft) stream reach at the Project crossing. Timed searches yielded no live individuals or deadshell within the survey area. Despite no signs of unionid mussels, other aquatic fauna such as macroinvertebrates, crayfish, and fish were observed.

Bradshaw Creek is a fourth-order stream with an upstream drainage area of 45.4 square kilometers (17.5 mi²) at the proposed pipeline crossing. The survey reach consists of a 40-meter (131 ft) ADI, 104-meter (341 ft) US buffer, and a 503-meter (1,650 ft) DS buffer. The stream is characterized as a small perennial stream with an average bankfull width of 12 meters (39 ft) and wetted width of 6 meters (16 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a

heterogeneous mix composed of 35 percent cobble, 25 percent gravel, 10 percent sand, and 30 percent bedrock. The majority of the stream bottom consists of uplifted (exposed) or underlying bedrock. Coarse substrates are present on top of bedrock. In several areas, gravel-sized, shale-like fragments have accumulated and are in a tightly 'stacked' pattern. This pattern acts as an impervious substrate for which mussels can embed. Stream morphology is characterized as 20 percent riffle, 40 percent run and 40 percent pool habitats. Average and maximum depths measure 0.25 meter (1.6 ft) and 1.6 meters (5.2 ft), respectively. Riffles are narrow and shallow and exhibit light embeddedness and no siltation.

The stream is crossed by Bradshaw Road Bridge approximately 25 meters (82 ft) downstream of the proposed centerline. Riparian vegetation is intact upstream of the Bradshaw Road Bridge. Residential lawns flank a narrow riparian buffer along each stream bank along the majority of the survey reach. In the DS buffer, the stream takes a southerly course at a bend in the stream. Maximum water depth occurs in a bedrock-laden pool at the base of a 15-meter (49 ft) high exposed cliff along the LDB. A hayfield is adjacent the RDB riparian buffer and an active railroad parallels the stream along the LDB.

4.6 Roanoke County

The proposed Project traverses the southwestern corner of Roanoke County in a southeasterly direction and traverses two waterbodies including Roanoke River and Mill Creek 2. A mussel site assessment was not completed at Mill Creek 2 due to land access restrictions. Roanoke River does not warrant site assessments nor surveys per VDGIF recommendations; however, mussel relocation efforts are scheduled prior to construction.

4.7 Franklin County

The proposed Project traverses Franklin County in an easterly direction. Five different streams, North Fork Blackwater River, Teels Creek, Little Creek, Blackwater River, and Maggodee Creek are proposed for crossing by the Project at ten locations that warrant site assessments. Three streams include multiple crossings (Teels Creek, $n=3$; Little Creek, $n=2$; Blackwater River, $n=3$). All streams are within the Blackwater River basin.

4.7.1 North Fork Blackwater River

North Fork Blackwater River is a tributary to the Blackwater River and was assessed on 15 July 2015. It is a third-order stream with an upstream drainage area of 15.3 square kilometers (5.9 mi²) at the Project crossing. The stream is characterized as a perennial stream with an average bankfull width of 5 meters (16.4 ft) and wetted width of 3 meters (9.8 ft) at the time of assessment. It is a moderately high gradient stream and substrates are a heterogeneous mix of 75 percent cobble, 20 percent gravel, and 5 percent sand. Stream morphology is characterized as 25 percent riffle

and 75 percent run habitats. Average and maximum depths measure 0.2 meter (0.7 ft) and 0.5 meter (1.6 ft), respectively. Riffles are narrow and shallow and exhibit little embeddedness. A pasture with no riparian buffer and less than 10 percent closed canopy cover comprises land use immediately surrounding the stream. Cattle have direct access to the stream. The stream is crossed by Adney Gap Road Bridge, approximately 30 meters (98 ft) downstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present. No live or deadshell mussels were observed. The stream is considered unlikely to support freshwater mussels.

4.7.2 Teels Creek – Three stream crossings

Teels Creek is a tributary to Little Creek which empties into the Blackwater River. Three stream crossing locations warrant mussel site assessments. Site assessments were completed at two crossings (Teels Creek 2 and 3) and the remaining (Teels Creek 1) was not assessed due to land access restrictions.

4.7.2.1 Teels Creek 2

Teels Creek 2 was assessed on 22 April 2015. It is a third-order stream with an upstream drainage area of 13.1 square kilometers (5.1 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 14 meters (46 ft) and wetted width of 4.3 meters (14 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent boulder, 10 percent cobble, 20 percent gravel, 60 percent sand, and 5 percent bedrock. Stream morphology is characterized as 20 percent riffle, 75 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.4 meter (1.3 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit high embeddedness and siltation. Agricultural practices and natural forest and, with approximately 40 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A riparian buffer is along the majority of the Project crossing and is flanked primarily by hay fields and natural forest. Aquatic fauna such as macroinvertebrates, Asiatic clam, snails, crayfish, and fish are present. No live or deadshell mussels were observed. The stream is considered unlikely to support freshwater mussels.

4.7.2.2 Teels Creek 3

Teels Creek 3 was assessed on 22 April 2015. It is a third-order stream with an upstream drainage area of 14.3 square kilometers (5.5 mi²) at the Project crossing. The stream is characterized as a perennial headwater stream with an average bankfull width of 12.5 meters (41 ft) and wetted width of 8 meters (26 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 5 percent boulder, 10 percent cobble, 25 percent gravel, 50 percent sand, and 10 percent bedrock. Stream morphology is characterized as 35 percent riffle, 60 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.3 meter

(1.0 ft) and 1.0 meter (3.3 ft), respectively. Riffles are shallow and exhibit high embeddedness and siltation. Agricultural practices and natural forest and, with approximately 40 percent closed canopy cover, predominate land use in the vicinity of the stream crossing. A riparian buffer is intact along the majority of the Project crossing with the exception of a utility line corridor crossing of Teels Creek downstream of the proposed centerline. Aquatic fauna such as macroinvertebrates, Asiatic clam, snails, crayfish, and fish are present. No live or deadshell mussels were observed. The stream is considered unlikely to support freshwater mussels.

4.7.3 Little Creek

Little Creek is a tributary to the Blackwater River and is proposed to be traversed by the alignment at two locations (Little Creek 1.5 and Little Creek 2). Little Creek is a fourth-order stream at both locations and are within 3.9 stream kilometers (2.4 mi) of one another. The upstream drainage area at Little Creek 1.5 is 58.6 square kilometers (22.6 mi²) and the upstream drainage area at Little Creek 2 is 65.0 square kilometers (25.1 mi²) at the proposed pipeline crossing. Site assessments were not completed at either stream crossing due to restricted land access.

4.7.4 Blackwater River

Blackwater River is a direct tributary to the Roanoke River. Three crossings (Blackwater River 1, 2, 3) are proposed to be traversed by the Project. Site assessments were completed at Blackwater River 2 and 3. Suitable mussel habitat was identified at both crossing locations and thereby warranted a subsequent mussel survey. An abbreviated mussel survey was not completed at Blackwater River 2. Neither an abbreviated mussel survey nor site assessment were completed at Blackwater River 1, due to land access restrictions. An abbreviated mussel survey was completed at Blackwater 3.

4.7.4.1 Blackwater River 2

Blackwater River 2 was assessed for mussel habitat on 11 August 2015. It is a fifth-order stream with an upstream drainage area of 284.6 square kilometers (109.9 mi²) at the proposed Project crossing. The stream is characterized as a small river with an average bankfull width of 45 meters (148 ft) and wetted width of 35 meters (15 ft) at the time of assessment. It is a low gradient stream and substrates are a mixture of 30 percent gravel, 50 percent sand, and 20 percent silt. Stream morphology is characterized as 80 percent glide and 20 percent pool habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 1.2 meters (3.9 ft), respectively. The stream reach is highly embedded (90%) by sandy substrates which are unstable and prone to shift. A fine layer of silt covers the stream bottom with the exception of a few isolated areas where flow is diverted around a large substrate (e.g., bedrock exposure, woody debris). Silt aggregates in areas of reduced stream flow (e.g., depressions in the substrates, along the stream margins). The overall stream reach is void of functional interstitial spaces. Natural forest, with approximately 10 percent

closed canopy cover surrounds the stream. An existing powerline ROW is approximately 15 meters upstream of the proposed centerline. Riparian vegetation is intact along the entire stream reach. Aquatic fauna such as macroinvertebrates, amphibians (i.e., tadpoles), snails, Asian clam, and fish are present. No live or deadshell mussels were observed. Despite the highly embedded and shifting substrates, the stream crossing may support freshwater mussels in microhabitats along the stream margins in the vicinity of the Project crossing. An abbreviated survey was not completed at Blackwater River 2 due to land access restrictions in the required survey buffers.

4.7.4.2 Blackwater River 3

An abbreviated mussel survey was completed on 22 October 2015. Twelve hours and 20 minutes of search time were expended along a 584-meter (1916-ft) stream reach at the Project crossing. Timed searches yielded no live mussels; however, two deadshell mussels of two species, eastern elliptio (*Elliptio complanata*) and creeper (*Strophitus undulatus*) were recovered within the survey area. Other aquatic fauna such as macroinvertebrates, snails, Asian clam, crayfish, and fish were observed in the survey extent.

Blackwater River 3 is a sixth-order stream with an upstream drainage area of 428.3 square kilometers (165.4 mi²) at the proposed Project crossing. The survey reach was composed of a 40-meter (131 ft) ADI, 132-meter (433 ft) US, and a 412-meter (1,352 ft) DS buffer. The stream is characterized as a small river with an average bankfull width of 25 meters (82 ft) and wetted width of 22 meters (72 ft) at the time of assessment. It is a moderately low gradient stream and substrates are a mixture of 15 percent bedrock, 10 percent cobble, 25 percent gravel, and 50 percent sand. Stream morphology is characterized as 30 percent riffle, 50 percent run, and 20 percent pool habitats. Average and maximum depths measure 0.7 meter (2.3 ft) and 1.4 meters (4.6 ft), respectively. In areas of reduced stream velocities (i.e., run and pool habitats), the stream reach is highly embedded (90%) by sandy substrates which are unstable and prone to shift. These areas are void of functional interstitial spaces. Despite the abundance of sand substrates, silt comprises a negligible amount of substrate. In areas of elevated stream velocities (i.e., riffles, flow-diverting substrates such as boulders and bedrock exposures), gravel substrates are relatively clean-swept and less embedded (20% embeddedness).

Maggodee Creek empties into the Blackwater River at the upstream survey extent. A hayfield flanks of a narrow riparian buffer along the majority of the LDB. A sharp bend in the river occurs in the downstream-most reaches of the DS buffer and is characterized as a pool habitat. Maximum depth occurs in this pool and a wooded hillside runs along the LDB. A riparian vegetation buffer is intact along the entirety of the RDB and is flanked by natural forest.

4.7.5 Maggodee Creek1

A mussel site assessment was completed on 16 July 2015, identified potentially suitable mussel habitat, and thereby warranted a subsequent mussel survey. An abbreviated mussel survey was completed on 22 October 2015. Nine hours of search time were expended along a 516-meter (1,693-ft) stream reach at the Project crossing. Timed searches yielded no live individuals or deadshell within the survey area. Despite no signs of unionid mussels, other aquatic fauna such as macroinvertebrates, snails, Asian clam, and fish were observed.

Maggodee Creek 1 is a direct tributary to the Blackwater River. It is a fifth-order stream with an upstream drainage area of 117.6 square kilometers (45.4 mi²) at the proposed pipeline crossing. The survey reach consists of a 40-meter (131-ft) ADI, 66-meter (217-ft) US buffer, and a 410-meter (1,345-ft) DS buffer. The stream is characterized as a moderate-sized stream with an average bankfull width of 24 meters (79 ft) and wetted width of 14 meters (46 ft) at the time of assessment. It is a low gradient stream and substrates are a heterogeneous mix of 20 percent cobble, 20 percent gravel, 55 percent sand, and 5 percent bedrock. Stream morphology is characterized as 20 percent riffle, 60 percent run and 20 percent pool habitats. Average and maximum depths measure 0.5 meter (1.6 ft) and 1.0 meter (3.3 ft), respectively. In areas of reduced stream velocities (i.e., run and pool habitats), the stream reach is highly embedded (75%) by sandy substrates which are unstable and prone to shift. These areas are void of functional interstitial spaces. Despite the abundance of sand substrates, silt comprises a negligible amount of substrate. In areas of elevated stream velocities (i.e., riffles, flow-diverting substrates such as boulders and bedrock exposures), gravel substrates are relatively clean-swept and lightly embedded (25% embeddedness).

The stream is impounded by a large dam, a legacy of a former mill operation, approximately 86 meters (282 ft) upstream of the Project crossing. The mussel survey reach did not extend upstream of the dam. The base of the dam is almost entirely composed of bedrock and the maximum depth occurs in the pool below the dam. Stream flow is diverted around an instream depositional island immediately downstream of the pool habitat. The wetted stream channel merges downstream of the island and continues a course toward the confluence with the Blackwater River. Land use immediately surrounding the stream bank comprises a hayfield along the LDB and natural forest along the RDB.

4.8 Pittsylvania County

The proposed Project traverses western half Pittsylvania County in an easterly direction. Three different streams, Pigg River, Harpen Creek, and Little Cherrystone Creek are proposed for crossing at three locations that warrant site assessments. Pigg River and Harpen Creek are within the Pigg River basin and Little Cherrystone Creek is in the Dan River basin.

4.8.1 Pigg River

A mussel site assessment was completed on 17 July 2015, identified potentially suitable mussel habitat, and thereby warranted a subsequent mussel survey. An abbreviated mussel survey was completed on 23 October 2015. Fifteen hours and 45 minutes of search time were expended along a 592-meter (1942-ft) stream reach and resulted in collection of 14 live individuals of three species including eastern elliptio, creeper, and yellow lampmussel (*Lampsilis cariosa*) within the survey extent (Table 3). All live individuals were encountered along the stream margins (within approximately 5 meters [16 ft] of each streambank) near woody debris or cobble substrates. The thalweg was void of mussels. Three discrete areas yielded the presence of live mussels including the LDB and RDB in the vicinity of the ADI and along the RDB in the downstream reaches of the DS buffer. Yellow lampmussel is listed as a Virginia state species of concern and was collected approximately 60 meters (197 ft) downstream of the proposed centerline. One single weathered deadshell eastern elliptio was recovered from the survey extent. Based on the mussel survey results, the mussel population is sparse in this section of the Pigg River. In addition to live mussels, aquatic fauna such as macroinvertebrates, snails, Asian clam, crayfish, amphibians (i.e., salamanders) and fish are present.

Table 3. Live mussels collected at the Mountain Valley Pipeline Project crossing of the Pigg River in Pittsylvania County, Virginia.

Area ¹	Mussel Species		Length (mm)	Width (mm)	Depth (mm)
	Scientific Name	Common Name			
Area1_RDB	<i>Elliptio complanata</i>	eastern elliptio	77.2		
Area1_RDB	<i>Elliptio complanata</i>	eastern elliptio	90.8		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	91.3		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	87.6		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	91.1		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	88.0		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	87.9		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	80.0		
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	89.6		
Area2_LDB	<i>Strophitus undulatus</i>	creeper	47.6		
Area2_LDB	<i>Lampsilis cariosa</i>	yellow lampmussel	65.1	48.7	29.4
Area2_LDB	<i>Elliptio complanata</i>	eastern elliptio	63.7		
Area3_RDB	<i>Elliptio complanata</i>	eastern elliptio	103.0		
Area3_RDB	<i>Elliptio complanata</i>	eastern elliptio	105.2		

¹ RDB = Right Descending Bank; LDB = Left Descending Bank

Pigg River is a sixth-order with an upstream drainage area of 880.9 square kilometers (340.1 mi²) at the proposed crossing location. The survey reach consists of a 40-meter (131-ft) ADI, 147-meter (482-ft) US buffer, and a 405-meter (1,329-ft) DS buffer. The Pigg River is characterized as a small river with an average bankfull width of 40 meters (131 ft) and wetted width of 30 meters (98 ft) at the time of survey.

It is a moderately low gradient stream and substrates are a heterogeneous mixture of 15 percent bedrock, 5 percent boulder, 5 percent cobble, 30 percent gravel, and 45 percent sand. Stream morphology is characterized as 15 percent riffle, 80 percent run, and 5 percent pool habitats. Average and maximum depths measure 0.7 meter (2.3 ft) and 2.5 meters (8.2 ft), respectively. In areas of reduced stream velocities (i.e., run and pool habitats), the stream reach is highly embedded (90%) by sandy substrates which are unstable and prone to shift. These areas are void of functional interstitial spaces. Despite the abundance of sand substrates, silt comprises a negligible amount of substrate. In areas of elevated stream velocities (i.e., riffles, flow-diverting substrates such as boulders and bedrock exposures), gravel substrates are relatively clean-swept and less embedded (20% embeddedness).

Natural forest immediately surrounds the Pigg River and logging practices are common in the vicinity of the crossing.

4.8.2 Harpen Creek 1

Harpen Creek 1 is a direct tributary to the Pigg River and was assessed on 19 July 2015. It is a third-order stream with an upstream drainage area of 20.1 square kilometers (7.8 mi²) at the Project crossing. The stream is characterized as a perennial stream with an average bankfull width of 25 meters (82 ft) and wetted width of 5 meters (16.4 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 10 percent gravel, 50 percent sand and 40 percent silt. Stream morphology is characterized as 30 percent riffle, 30 percent run, 20 percent pool, and 20 percent glide habitats. Average and maximum depths measure 0.3 meter (1.0 ft) and 0.8 meter (2.6 ft), respectively. Riffles are shallow and exhibit heavy embeddedness and siltation. Natural forest and pastureland, with approximately 90 percent closed canopy cover, predominates land use in the vicinity of the stream crossing. A large-scale livestock farm is adjacent the stream. The pasture is almost completely void of vegetation facilitating considerable erosion that contributes run-off to the stream. A narrow riparian buffer is intact along the majority of the assessment reach. Aquatic fauna such as macroinvertebrates, Asiatic clam, and fish are present. No live or deadshell mussels were observed. The stream is considered unlikely to support freshwater mussels.

4.8.3 Little Cherrystone Creek

Little Cherrystone Creek is a tributary to Cherrystone Creek which empties into the Banister River. A single crossing of Little Cherrystone Creek is proposed along the current alignment at Little Cherrystone Creek 3. A site assessment has not been completed at Little Cherrystone Creek 3 due to land access restrictions; however, two crossings (Little Cherrystone Creek 1 and 2) on the stream were assessed as part of previously eliminated alternative alignments on 18 July 2015. The assessments of Little Cherrystone Creek 1 and 2 act as surrogate assessments for Little Cherrystone

Creek 3. Little Cherrystone Creek 3 is a third-order stream with an upstream drainage area of 13.0 square kilometers (5.0 mi²) at the Project crossing.

Little Cherrystone Creek 1 is approximately 1.2 kilometers (0.7 mi) upstream of Little Cherrystone Creek 3. The stream is characterized as a perennial headwater stream with an average bankfull width of 15 meters (49 ft) and wetted width of 3.5 meters (11.5 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 10 percent boulder, 10 percent cobble, 5 percent gravel, 70 percent sand, and 5 percent silt. Stream morphology is characterized as 10 percent riffle, 60 percent run, 10 percent pool, and 20 percent glide habitats. Average and maximum depths measure 12 centimeters (4.7 in) and 50 centimeters (19.7 in), respectively. Riffles are shallow and substrates are highly embedded. Aquatic fauna such as macroinvertebrates, crayfish, and fish are present.

Little Cherrystone Creek 2 is approximately 3 kilometers (1.9 mi) upstream of Little Cherrystone Creek 3. The stream is characterized as a perennial headwater stream with an average bankfull width of 6 meters (19.7 ft) and wetted width of 1.5 meters (4.9 ft) at the time of assessment. It is a low gradient stream and substrates are a relatively heterogeneous mix of 10 percent gravel, 80 percent sand, and 10 percent silt. Stream morphology is characterized as 30 percent riffle, 50 percent run, and 20 percent pool habitats. Average and maximum depths measure 18 centimeters (7.1 in) and 50 centimeters (19.7 in), respectively. Riffles are shallow and substrates are highly embedded. The majority of substrates are covered in a fine layer of silt. Aquatic fauna such as macroinvertebrates, crayfish, amphibians (i.e. frogs), and fish are present.

Little Cherrystone Creek 3 is a third-order stream with an upstream drainage area of 13.0 square kilometers (5.0 mi²) at the Project crossing. No tributaries enter between the evaluated sites and the currently proposed location therefore no variation of habitat features are likely to occur. Overall, the stream is small, highly embedded and dominated by sandy substrates. The stream is unlikely to support freshwater mussels.

5.0 Discussion

The Project proposes to traverse all streams in Virginia via an open-trench construction method (i.e., wet cut, dam and flume, etc.). Of the 29 stream crossings identified during the desktop analysis and traversed by the project, three crossings (North Fork Roanoke River¹, North Fork Roanoke River AR1, and Pigg River) yielded

live mussels and an additional crossing (Blackwater River³) yielded deadshell mussels only. Ten identified crossings were not evaluated due to restricted access and habitat assessments are anticipated to occur upon receipt of landowner permission to access. An amended report will be submitted upon completion. The 14 remaining streams assessed or surveyed did not yield live mussels or exhibit suitable habitat. No additional work is proposed at these locations

Despite adequate search efforts at four crossings in Craig Creek, no sign of unionid mussels were present. The drainage area ranges between 13.2 and 14.9 square kilometers (5.1 to 5.8 mi²) and is in the headwaters of the watershed. Substrates are predominantly bedrock. The crossings occur within a portion of the watershed that provides limited habitats and resources to support freshwater mussels. No evidence of James spinymussels was observed during surveys.

To date, mussel relocation efforts are necessary at four Project crossings including North Fork Roanoke River¹, North Fork Roanoke River AR¹, Roanoke River, and Pigg River. Additional mussel relocation efforts may be warranted at other Project crossings that have yet to be assessed or at the recommendation of VDGIF. Standard relocation efforts (See Section 4.3) will be expended at all stream crossings where live mussels are encountered. Coordination with VDGIF will occur in relation to site-specific crossings and schedules.

MVP will implement and strictly adhere to applicable state and local erosion and sediment control/storm water management laws and regulations in watersheds; especially those that harbor threatened and endangered species. To further minimize adverse impacts to mussels, MVP intends to adhere to the TOYR standards recommended by VDGIF to the maximum extent practicable. Construction within waterbodies potentially harboring short-term brooding mussels is not permitted from 15 May through 31 July and this restriction applies to Craig Creek. Construction within waterbodies potentially harboring long-term brooding mussels is not permitted from 15 April through 15 June (due to release of glochidia) and 15 August through 30 September (due to spawning) and this restriction applies to Stony Creek. Coordination with VDGIF will occur if any deviation or modification from the TOYR standards is anticipated. Construction is scheduled to commence in 2016 therefore mussel relocation efforts will occur in accordance with the instream construction schedules that will likely occur in 2018

Where site assessments have been completed and suitable habitat is not present, ESI respectfully requests concurrence that the methods, results, and overall approach described herein are adequate to address potential Project-related disturbances to James spinymussel and other freshwater mussels in Virginia.

APPENDIX A
AGENCY CORRESPONDENCE



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061



April 3, 2015

Ms. Valerie Clarkston
Environmental Solutions & Innovations, Inc.
4525 Este Avenue
Cincinnati, OH 45232

Re: Mountain Valley Pipeline, Virginia
Segments

Dear Ms. Clarkston:

The U.S. Fish and Wildlife Service (Service) has reviewed the project package for the referenced project. Mountain Valley Pipeline plans to construct a 42-inch diameter natural gas pipeline to allow producers and end-users a direct route to transport new gas supplies. The project will extend from the existing Equitrans transmission system near Mobley in Wetzel County, WV to Transcontinental Gas Pipeline Company's Zone 5 compressor station 165 in Pittsylvania County, VA. In Virginia, the pipeline is expected to cross Craig, Franklin, Giles, Montgomery, Pittsylvania, and Roanoke Counties. The following comments are provided under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended, Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, 54 Stat. 250), as amended, and Migratory Bird Treaty Act of 1940 (16 U.S.C. 703-712, 40 Stat. 755).

Our recommendations are based on the route alignment provided on March 6, 2015. Once the action area of the project is finalized, an additional review that includes all attendant facilities, staging areas, etc. will be necessary. Action area refers to all areas directly or indirectly affected by the proposed action and not only the immediate area involved in the action.

Migratory birds are a Federal trust resource and are protected under the Migratory Bird Treaty Act. The project package did not include information on proposed impacts to migratory birds and their habitats. The Service will provide additional comments upon receipt of a plan that identifies and addresses impacts to migratory birds.

We recommend a detailed habitat assessment be conducted for the federally listed and proposed species below within the specified areas of potential habitat. An approved surveyor can conduct these habitat assessments in the action area to identify suitable habitat and survey for the species

if suitable habitat is identified. Surveys are not needed if the approved surveyor determines that no suitable habitat is present.

A table of optimal survey times for plants can be found on our website at:

http://www.fws.gov/northeast/virginiafield/pdf/endspecies/MISC/20120125_VIRGINIA_survey_time_frame_for_plants.pdf.

A list of qualified surveyors can be found on our website at:

<http://www.fws.gov/northeast/virginiafield/endspecies/surveyors.html>. This list does not include all individuals qualified or authorized to survey for these species. If you select someone not on the pre-approved surveyor list, provide the proposed surveyor's qualifications and proposed survey design to this office for review and approval prior to initiating the survey. Send copies of all habitat assessments and/or survey results to this office.

- James spinymussel (*Pleurobema collina*): federally listed endangered. We have reviewed the study plan entitled, "Freshwater mussel (Unionidae) site assessments, surveys, and relocations for the proposed Mountain Valley Pipeline in Virginia." Because this species has been documented in Craig, Johns, Little Oregon, and Dicks Creeks in Virginia, presence/absence surveys are not necessary in these streams. Habitat assessments are necessary for other perennial streams in the Craig Creek watershed in Craig County. We recommend that alternative routes be developed that avoid this watershed due to its importance to the conservation and recovery of this species. Formal consultation pursuant to the Endangered Species Act between the Service and Federal Energy Regulatory Commission is likely if this route or other routes in this watershed are pursued. Any relocation of federally listed mussels must be authorized by the Service prior to relocation. This species also occurs in South Fork Potts Creek in West Virginia and coordination with Service's West Virginia Field Office is necessary (see contact information below).
- Roanoke logperch (*Percina rex*): federally listed endangered. Because this species has been documented in the Pigg, Roanoke, and North Fork Roanoke Rivers, presence/absence surveys are not necessary in these rivers. Habitat assessments are necessary for other perennial streams in the Roanoke River watershed in Montgomery, Roanoke, Franklin, and Pittsylvania Counties.
- Northeastern bulrush (*Scirpus ancistrochaetus*): federally listed endangered. Potential habitat occurs in Craig and Giles Counties between points -80.237, 37.416 and -80.246, 37.42; -80.284, 37.387 and -80.287, 37.392; and -80.688, 37.392 and -80.693, 37.402.
- Smooth coneflower (*Echinacea laevigata*): federally listed endangered. Potential habitat occurs in Roanoke and Montgomery Counties between points -80.364, 37.275 and -80.329, 37.268; 80.242, 37.319 and -80.243, 37.316; -80.21, 37.246 and -80.202, 37.242; and 80.198, 37.229 and 80.197, 37.227.

- Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*): federally listed endangered. Potential habitat occurs in Franklin and Montgomery Counties.
- Bats
 - Surveys for potential hibernacula including cave openings and cave-like structures (e.g., abandoned or active mines, railroad tunnels) should be conducted following the guidance on page B3 of the Northern Long-Eared Bat Interim Conference and Planning Guidance within the action area of the proposed pipeline route. This guidance is available at:
<http://www.fws.gov/Midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf>.
 - In areas where tree removal will occur, surveys should be conducted by an approved surveyor following the most recent version of the Range-wide Indiana Bat Summer Survey Guidelines (available at:
<http://www.fws.gov/northeast/virginiafield/endangered/about.html>) for the following species in the areas specified below within suitable habitat.
 - Indiana bat (*Myotis sodalis*): federally listed endangered. Potential habitat occurs in Giles, Montgomery, Roanoke, and Craig Counties.
 - Northern long-eared bat (*Myotis septentrionalis*) (NLEB): federally proposed endangered (effective May 2, 2015 this species will be federally listed threatened with an interim 4(d) rule). Potential habitat occurs in Franklin, Giles, Montgomery, Pittsylvania, Roanoke, and Craig Counties.
 - The proposed route intersects with Tawneys Cave in Giles County, a known hibernaculum for Indiana and Northern long-eared bats. We recommend a minimum 5 mile buffer from the known hibernaculum opening and any mapped passages.
- Specific comments on the revised study plan dated March 6, 2015:
 - Page 4 – Per page B5 of the NLEB Interim Conference and Planning Guidance, revise the description as follows, “a field survey, where access can be obtained, of all land within one-half mile of the edge of the project footprint and documentation (i.e., literature search) of all known caves and abandoned mine portals within 3 miles of the outside edge of the project footprint should be conducted.”
 - Page 5 – Per page B6 of the NLEB Interim Conference and Planning Guidance, if you plan to conduct spring portal/cave surveys they must be conducted between April 1 and April 21 and prior to any tree clearing. A minimum of three nights of sampling per week for three weeks (i.e., 9

nights of sampling) is required at each suitable entrance as determined by the Phase 1 Habitat Assessment. Your study plan proposes two evenings of sampling. Fall portal/cave surveys can be conducted rather than spring surveys. Per page B5 of the NLEB Guidance, surveys must be conducted between September 1 and October 31 and prior to any tree clearing. A minimum of two nights of sampling is required at each suitable entrance as determined by the Phase 1 Habitat Assessment.

- Page 5 - Per page B6 of the NLEB Interim Conference and Planning Guidance, harp traps and/or mist nets should be monitored for captured bats on 10-minute intervals. Your study plan states “traps are checked at least once per hour or continuously if the catch rate is greater than 25 bats per hour.” Change your plan to reflect the NLEB Interim Guidance.
- Address and incorporate comments the Service provided on November 26, 2014 on the study plan dated November 3, 2014. Specifically comments: SH10, SH11, SH12, and SH13.

To assist us in analyzing effects to federally listed and proposed species from the proposed action, provide the following information to this office:

- For proposed stream crossings where federally listed species are present, provide us an analysis that outlines all alternatives considered for that crossing, how the determination was made that the selected alternative was the least environmentally damaging, an analysis of effects to the stream anticipated due to the pipeline approaches to each side of the stream, and the proposed schedule/timing of the crossing. If boring or drilling is proposed, provide a best professional opinion on the likelihood that drilling fluids will escape through the bedrock to the stream.

To avoid and minimize impacts to federally listed and proposed species, incorporate the following conservation measures into the proposed project:

- To address impacts to summer bat habitat (see Appendix D of the NLEB Interim Conference and Planning Guidance): leave dead or dying trees standing (if not a safety hazard), maintain or improve forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches, clearly demarcate trees to be protected vs. cut to help ensure contractors do not accidentally remove more trees than anticipated, avoid/minimize tree clearing that fragments large forested areas or tree lined corridors (e.g., route linear features along the edge of a woodlot instead of through the middle).

We recommend that you contact Liz Stout (West Virginia Field Office) at 304-636-6586 or elizabeth_stout@fws.gov to coordinate the portions of the project in West Virginia.

Once the action area of the project is finalized, an additional review that includes all attendant facilities, staging areas, etc. will be necessary. If habitat assessments and/or surveys determine that suitable habitat for listed or proposed species are present, this office will work with you to ensure that the project avoids or minimizes adverse impact to listed species and their habitats.

If you have any questions, please contact Kim Smith at (804) 824-2410 or via email at kimberly_smith@fws.gov.

Sincerely,

Cindy Schulz
Field Supervisor
Virginia Ecological Services

cc: FERC, Washington, D.C. (Attn: Paul Friedman)
Service, Elkins, WV (Attn: Liz Stout)
VDCR-DNH, Richmond, VA (Attn: Rene Hypes)
VDGIF, Richmond, VA (Attn: Amy Ewing)



TELEPHONE / PERSONAL CONVERSATION REPORT

PROJECT NAME:	Mountain Valley Pipeline Project
MVP TEAM CALLER:	Mr. Casey Swecker – Senior Project Manager/Malacologist
CONVERSATION WITH:	Mr. Brian Watson - Aquatic Resources Biologist/Malacologist
AGENCY:	Virginia Department of Game and Inland Fisheries
EMAIL ADDRESS:	brian.watson@dgif.virginia.gov
PHONE NUMBER:	434.525.7522, Ext 114
SUBJECT:	Mussel Surveys and Review
DATE AND TIME:	25 November 2014

SUMMARY OF CONVERSATION:

Mr. Swecker called Mr. Watson regarding freshwater mussel review, surveys, and assessments along linear projects. Several topics were covered as outlined below:

- Mr. Watson explained that many projects especially large projects choose to conduct mussel site assessments. The results of the site assessments can aid in the review process in narrowing down the list of streams that will require subsequent surveys. Photographs should be taken at all streams to aid in the determination. .
- Site assessments can be completed outside of the mussel survey window.
- Mussel relocations may be recommended at non-listed streams where significant mussel resources (species diversity or dense population) are located even without the presence of a state or federally listed species. The reason behind this is that the optimal site may have the potential to support a rare species where it is not currently known to occur. Also, due to the qualitative nature of surveys, a rare species could be overlooked during the original surveys. Generally this type of situation only warrants a single relocation effort prior to construction (instead of the two separate relocation efforts required following VDGIF's mussel guidelines)
- Mr. Watson indicated that a 5 square mile drainage may be more suitable in Virginia than the currently proposed 10 square mile drainage threshold for evaluating the project for all potential mussel streams. He cited the 5 square miles from a permitting aspect related to the Virginia Marine Conservation Commission (VMRC).

The following supporting information was taken from the VMRC's subaqueous guidelines:
http://www.mrc.virginia.gov/regulations/subaqueous_guidelines.shtm

In a May 3, 1982 opinion, the Attorney General advised the Commission to assume jurisdiction on non-tidal streams that were determined to be "navigable-in-fact" unless the landowner could



show clear title to the riparian land acquired by grant prior to July 4, 1776. Where the stream was determined to be "non-navigable-in-fact", the Commission was advised to assume jurisdiction unless the landowner could show a grant prior to 1792 in that part of the State draining to the Atlantic Ocean, or prior to 1802 in that part of the State draining toward the Gulf of Mexico.

The question of navigability is a question of fact as to whether a stream is being, or has been historically used as a highway for trade or travel or whether it is capable of such use in its ordinary and natural condition (i.e. disregarding artificial obstructions such as dams which could be abated). The Commission assumes that all perennial streams with a drainage basin of greater than 5 square miles, or a mean annual flow greater than 5 cubic feet per second, are navigable-in-fact until evidence is presented proving non-navigability.

Activities in non-tidal areas

The Virginia Marine Resources Commission, as the custodian of Virginia's submerged lands, has the proprietary authority and responsibility to issue permits for activities that take place over, under, through and on all submerged lands throughout the Commonwealth. This authority is based on the Commonwealth's ownership of submerged lands and was clarified through an opinion by Gerald L. Baliles, Attorney General, on May 3, 1982. This opinion stated, in part, that "(t)he Commission should assume that all streams above some administratively determined minimum size...." are subject to its jurisdiction.

The Commission has defined the minimum size of non-tidal waterways as those perennial streams with a drainage area of 5 square miles or with a mean annual instream flow of 5 cubic feet per second. Activities within waterways with characteristics below these threshold attributes do not require authorization from this agency.

The Commission has determined the extent of jurisdiction within non-tidal waterways to extend no further landward than the ordinary high water mark. While the State of Virginia has not adopted a legal definition of ordinary high water, the Federal definition represents an informative explanation of the term. The Army Corps of Engineers defines ordinary high water in 33 CFR Part 329 "Definition of Navigable Waters of the US" Section 329.11a.1. This regulation states that the "ordinary high water mark" on non-tidal rivers is the line on the shore established by the fluctuations of water and indicated by the physical characteristics such as a clear, natural line impressed on the bank, shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding area."

When evaluating project proposals that fall within the jurisdiction of this agency, Commission staff will normally consult with the Department of Game and Inland Fisheries, the Department of Conservation and Recreation, the Department of Environmental Quality, and local government officials before granting permits for any encroachments into State-owned submerged lands.



This coordination may result in specific permit conditions such as limits on the time of year when instream construction activities can take place (e.g. construction should be performed only during low-flow conditions.) Specific construction methodologies may be required, such as the use of cofferdams constructed of non-erodible materials and placement of cofferdams in such a manner that no more than half the width of the waterway shall be obstructed at any point in time. In all cases, the cofferdams and any excess material will be required to be removed to an approved upland area upon completion of construction, and the streambed will be required to be restored to its pre-existing contours and conditions.

It should be noted that the Virginia Erosion and Sediment Control Handbook (3rd Edition, 1992 or subsequent edition) should be followed throughout construction. If blasting to create a trench is necessary, the Department of Game and Inland Fisheries shall be notified a week prior to the blasting to permit representatives of that agency to observe the operation.

A handwritten signature in blue ink, appearing to read "Casey Smith", written over a horizontal line.

Contact Signature: _____

From: ProjectReview (DGIF) [<mailto:ProjectReview@dgif.virginia.gov>]
Sent: Monday, March 16, 2015 4:11 PM
To: Casey Swecker; Watson, Brian (DGIF)
Cc: ProjectReview (DGIF); Cason, Gladys (DGIF)
Subject: Follow-up re: ESSLog 35246; Freshwater Mussel Study Plan for proposed Mountain Valley Pipeline
Importance: High



Casey Swecker

Senior Project Manager / Malacologist

Environmental Solutions & Innovations, Inc.

4525 Este Avenue | Cincinnati, Ohio 45232 | USA

t: 513.451.1777 f: 513.451.3321 c: 304.633.5808

cswecker@envsi.com | www.envsi.com

Hello!

We have reviewed the draft proposed mussel study plan for the above-referenced project. In general, we support the mussel survey plan, as proposed.

However, we have the following preliminary recommendations, questions, and concerns:

- **Please explain how the need for a mussel survey was ruled-out:** (e.g., was yes/no based on the 5-square mile watershed threshold that VMRC uses?). If not, please clarify what information was considered to determine whether a mussel survey was/was not required.
- **Photos of each stream crossing:** We recommend providing representative photos of all stream crossing sites (showing general stream conditions, substrate, gradient, surrounding riparian conditions, etc.) for our review, prior to survey work. Clearly labeled photos of stream crossings need to be accompanied by a map and stream crossing table. We will recommend whether the site may require a habitat assessment or potential survey, after reviewing the photos showing site conditions and proposed stream crossing method.
- **Surveys not recommended** for sites where presence of federal Endangered state Endangered (FESE) James spiny mussel known: According to our records, this species is known from Little Oregon Creek and Dicks Creek, downstream from proposed crossings. We typically recommend assuming presence at these locations (e.g., we do not recommend surveys for these sites).
- **Surveys are recommended** where presence of federal Endangered state Endangered (FESE) James spiny mussel is less certain (e.g., Johns Creek and Craig Creek).

Please note that, these waters (Little Oregon Creek, Dicks Creek, Johns Creek, and Craig Creek) contain what is considered to be the most significant population of the FESE James spiny mussel throughout its entire range. We remain concerned that despite strict adherence to our customary protective recommendations for aquatic species known from these stream crossings (during the actual instream work), surrounding land-clearing-disturbance during construction within riparian or upland areas could result in stream degradation (e.g., caused by Erosion and Sediment (E&S) control failures, etc.), if a route in this region is selected. Based on our preliminary review of existing information, we recommend protecting these aquatic resources by avoiding potential routes crossing- or along these waters, in favor of alternative route/s that do not.

We appreciate the opportunity to review and provide preliminary comments in response to this draft mussel study plan. We recommend continued coordination with us as additional information becomes available. We will review and provide updated comments, as appropriate.

Again, we recommended coordination be routed through me (cc: me on direct coordination with DGIF species experts) to help ensure all parties are kept in the loop. Thanks.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
P.O. Box 11104
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov

Casey Swecker

From: Casey Swecker
Sent: Friday, May 29, 2015 3:10 PM
To: Ernie.Aschenbach@dgif.virginia.gov; Watson, Brian (DGIF)
Cc: Taina Pankiewicz; Daniel Judy
Subject: Mountain Valley Pipeline Mussel Study Plan Response Letter
Attachments: VDGIF Response Letter 20 May 2015.pdf

Hi Ernie and Brian,

Please find the attached response letter based on comments received 6 March 2015 regarding the Freshwater Mussel Study Plan for the Mountain Valley Pipeline (MVP) in Virginia.

A hard copy is being mailed at Ernie's attention for your records.

If you have any questions, please don't hesitate to contact me.

Thanks again for the study plan review, Casey



Casey Swecker

Senior Project Manager / Malacologist
Environmental Solutions & Innovations, Inc.
4525 Este Avenue | Cincinnati, Ohio 45232 | USA
office: 513.451.1777 **direct:** 513.591.4324
fax: 513.451.3321 **cell:** 304.633.5808
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ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

4525 Este Avenue
Cincinnati, OH 45232
Phone: (513) 451-1777; Fax: (513) 451-3321

Pesi 593

20 May 2015

Virginia Dept. of Game and Inland Fisheries
Attn: Mr. Ernie Aschenbach & Mr. Brian Watson
P.O. Box 11104
4010 West Broad Street
Richmond, VA 23230

RE: ESS LOG 35246; Freshwater Mussel Study Plan for proposed Mountain Valley Pipeline

Dear Aschenbach and Mr. Watson:

Environmental Solutions & Innovations, Inc. (ESI) appreciates your timely review of the draft study plan entitled: *Freshwater Mussel (Unionidae) Site Assessments, Surveys, and Relocations for the Proposed Mountain Valley Pipeline in West Virginia* (dated 6 March 2015).

The following section answers each question or comment relevant to the study plan.

“Please explain how the need for a mussel survey was ruled-out: (e.g., was yes/no based on the 5-square mile watershed threshold that VMRC uses?). If not, please clarify what information was considered to determine whether a mussel survey was/was not required.”

- Mussel surveys in VA were ruled out only when the upstream drainage area from the proposed crossing was less than VMRC’s 5-square mile watershed threshold. All other streams in VA with upstream drainage areas greater than 5-square miles are being assessed for mussels via Site Assessments and/or mussel surveys.

“Photos of each stream crossing: We recommend providing representative photos of all stream crossing sites (showing general stream conditions, substrate, gradient, surrounding riparian conditions, etc.) for our review, prior to survey work. Clearly labeled photos of stream crossings need to be accompanied by a map and stream crossing table. We will recommend whether the site may require a habitat assessment or potential

survey, after reviewing the photos showing site conditions and proposed stream crossing method.”

- To facilitate Project planning, ESI is planning to conduct a Site Assessment at all stream crossings in Virginia with upstream drainage areas greater than 5-square miles. This effort will document and record all of the above-requested items (i.e., photos) including a detailed mussel Site Assessment following Virginia’s Draft Mussel Survey Protocol which extends 20 meters upstream and 80 meters downstream of the proposed Project footprint. Site Assessments are conducted to determine if a stream segment has the ability to support freshwater mussels and includes mapping all habitats. Habitat maps are georeferenced and delineated by stream morphology (i.e., pools, riffles, and runs) based on water depth, velocity, and substrate.

Surveys not recommended for sites where presence of federal Endangered state Endangered (FESE) James spynymussel known: According to our records, this species is known from Little Oregon Creek and Dicks Creek, downstream from proposed crossings. We typically recommend assuming presence at these locations (e.g., we do not recommend surveys for these sites).

- ESI acknowledges VDGIF’s request to forego mussel survey efforts within Little Oregon Creek and Dicks Creek and the recommendation to assume presence of James spynymussel within these streams. Therefore, ESI does not anticipate performing mussel surveys at these Project crossing locations.

Surveys are recommended where presence of federal Endangered state Endangered (FESE) James spynymussel is less certain (e.g., Johns Creek and Craig Creek).

- ESI plans to complete a Site Assessment at both Johns Creek and Craig Creek. The results of the Site Assessments will aid in determining the level of effort and mussel resource that exists at these Project crossings. The results of these assessments will be provided to VDGIF for review prior to initiating mussel surveys (i.e., abbreviated or full), if necessary, following Virginia’s Draft Mussel Survey Protocol.

“Please note that, these waters (Little Oregon Creek, Dicks Creek, Johns Creek, and Craig Creek) contain what is considered to be the most significant population of the FESE James spynymussel throughout its entire range. We remain concerned that despite strict adherence to our customary protective recommendations for aquatic species known from these stream crossings (during the actual instream work), surrounding land-clearing-disturbance during construction within riparian or upland areas could result in stream degradation (e.g., caused by Erosion and Sediment (E&S) control failures, etc.), if a route in this region is selected. Based on our preliminary review of existing information, we recommend protecting these aquatic resources by avoiding potential routes crossing- or along these waters, in favor of alternative route/s that do not.”

- ESI acknowledges VDGIF’s recommendation to avoid crossing the watersheds of Little Oregon Creek and Dicks Creek in favor of those potential alternative

routes that do not traverse these watersheds. ESI will relay the aforementioned VDGIF recommendation to Mountain Valley Pipeline.

We appreciate the opportunity to answer any questions in response to this draft mussel study plan. We will continue to coordinate with VDGIF as additional information becomes available. We look forward to your continual support and review to provide updated comments, as appropriate.

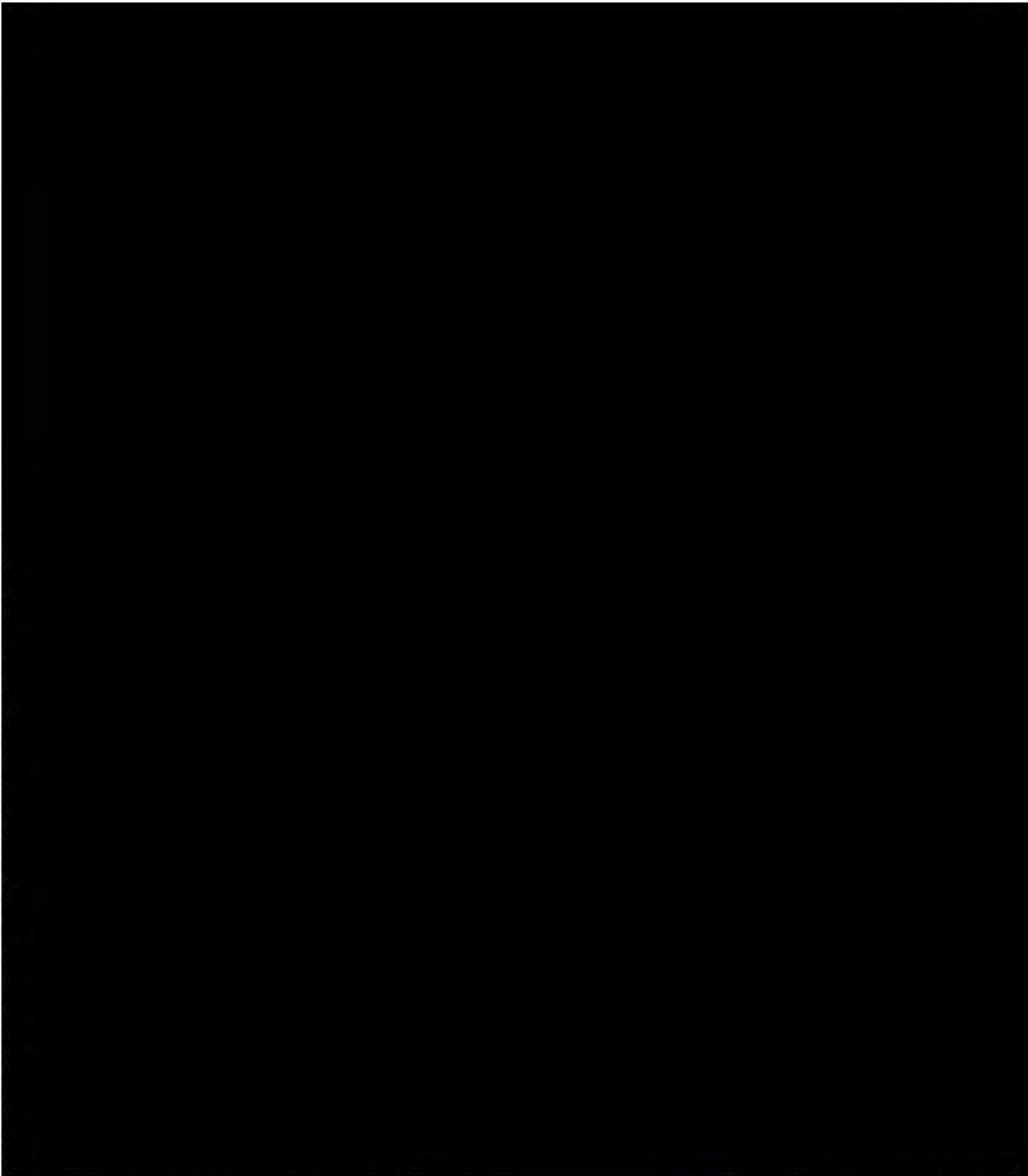
Sincerely,

A handwritten signature in blue ink, appearing to read 'Casey Swecker', with a stylized flourish at the end.

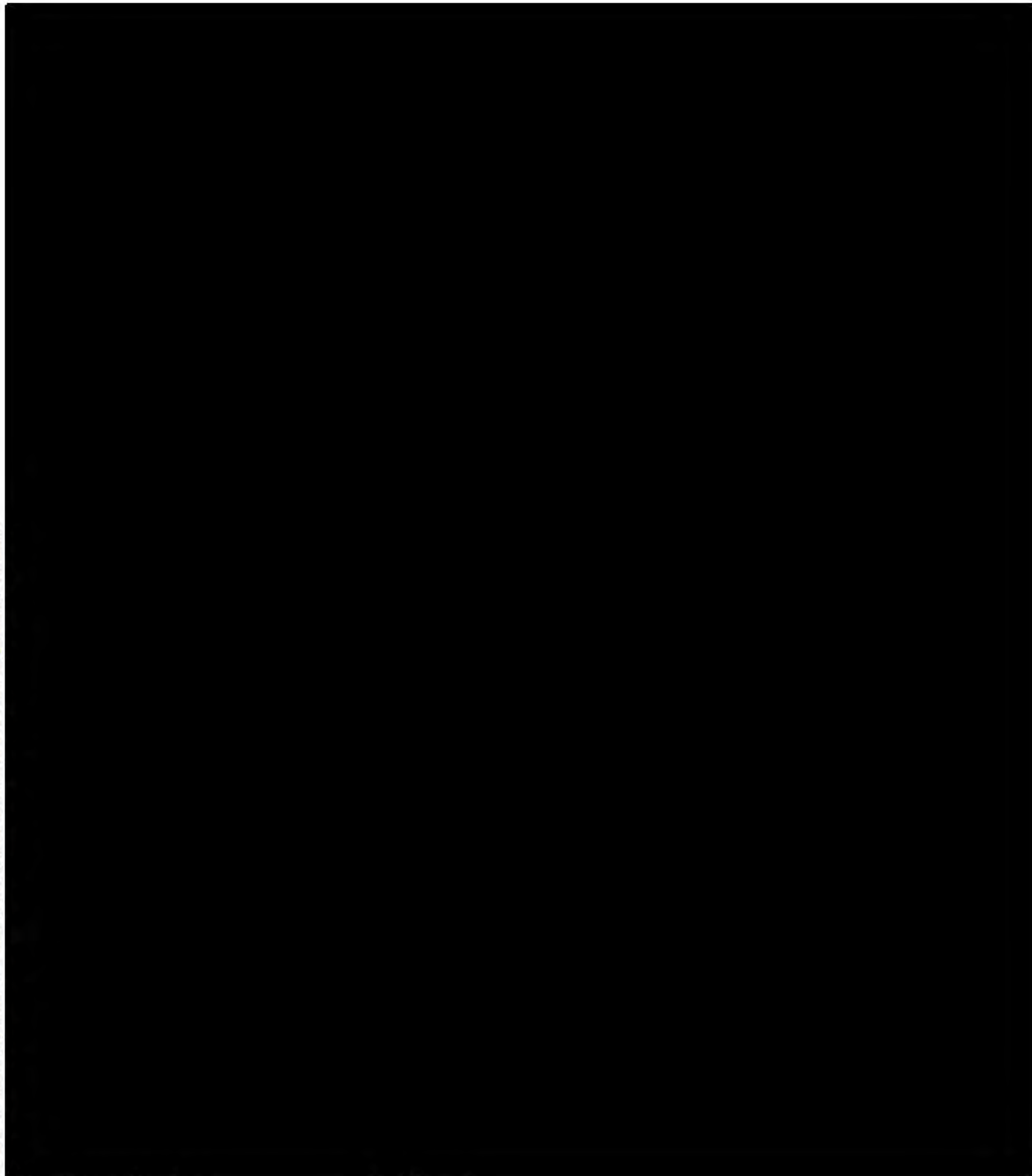
Casey Swecker
ESI, Project Manager / Malacologist
cswecker@envsi.com

**APPENDIX B
STREAM CROSSING MAPS**

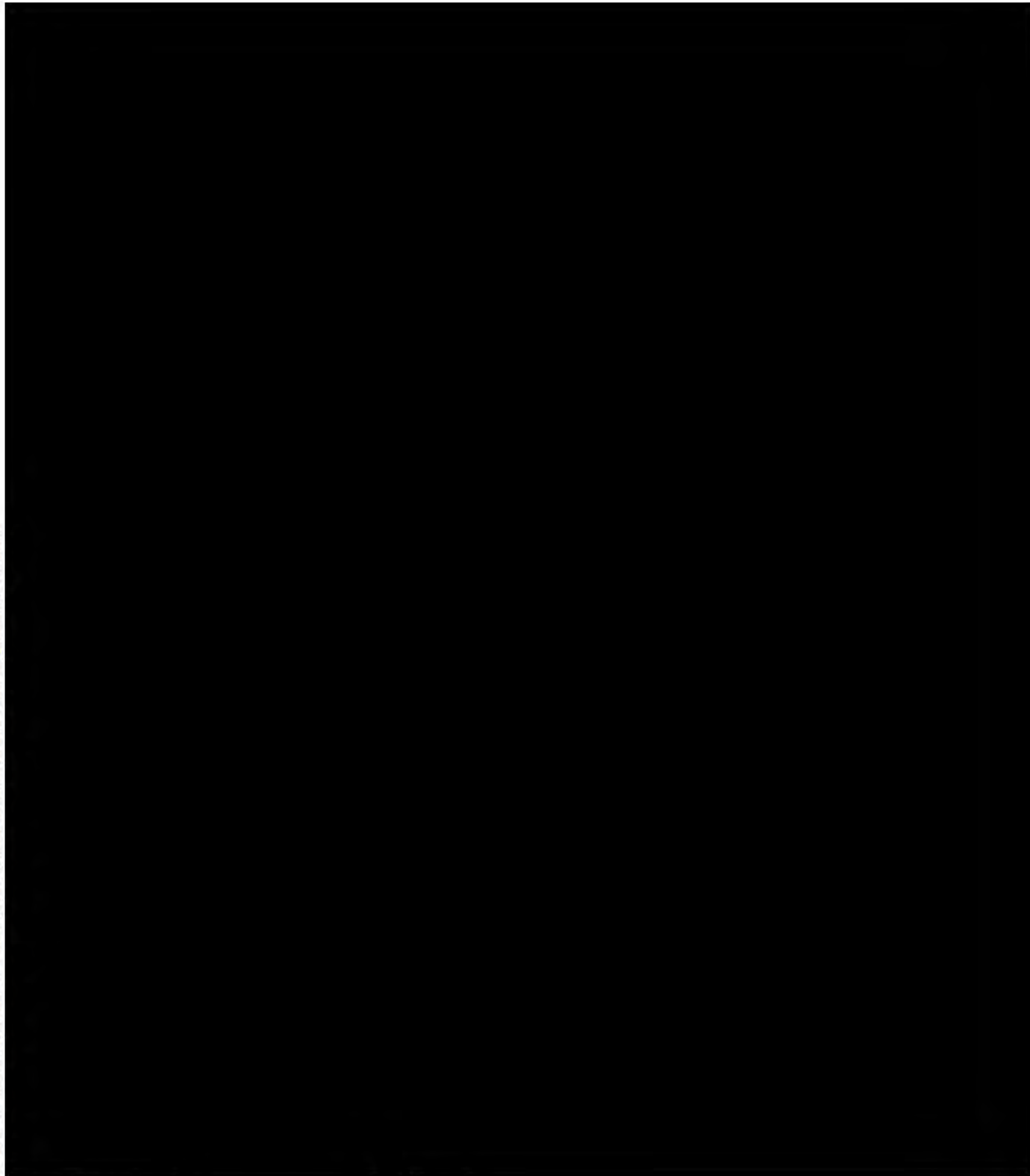




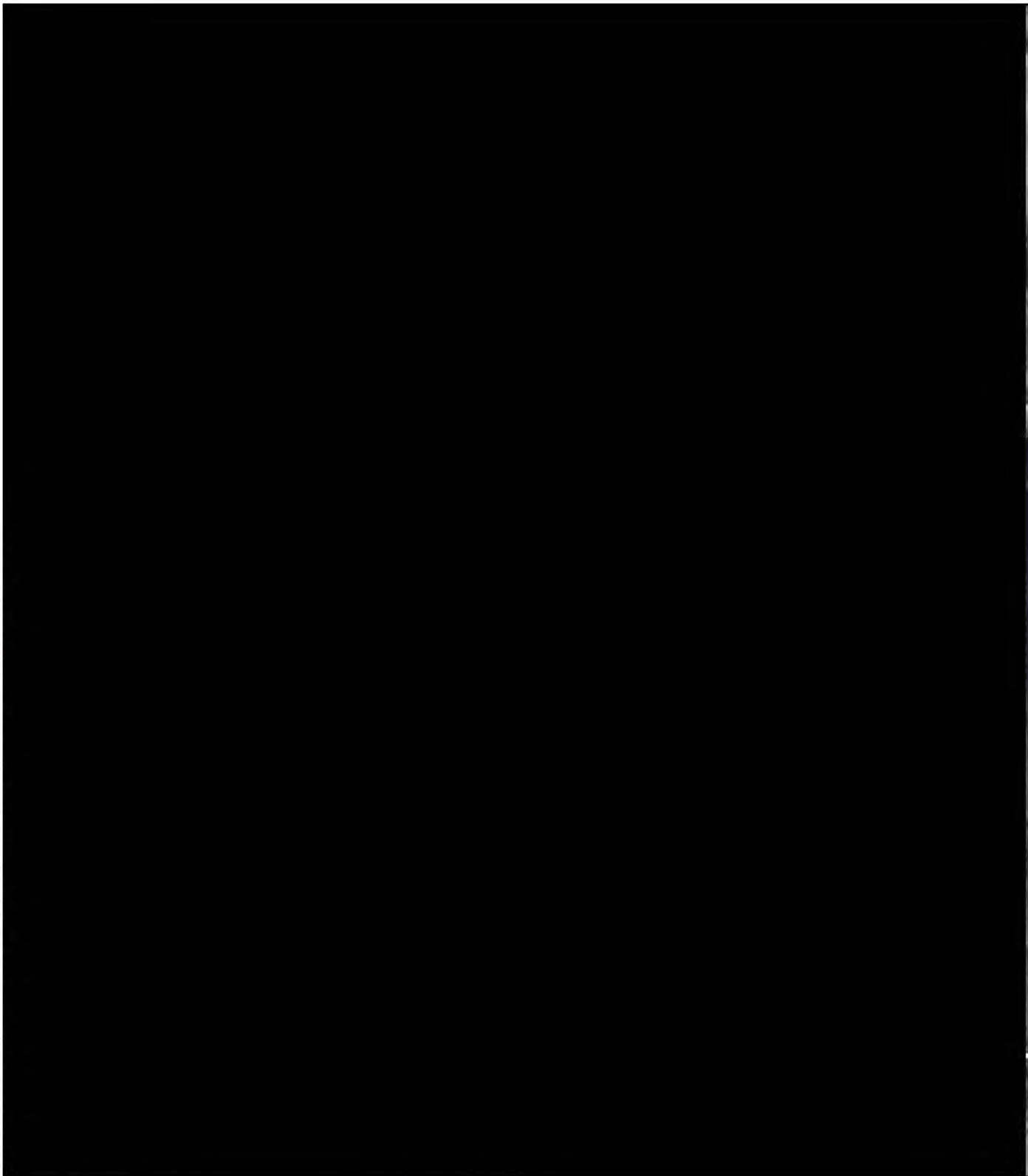
Mussel Survey Location Mussel Survey Completed		Milepost Proposed MVP Alignment Access Road		Area of Direct Impact (ADI) Upstream (US) and Downstream (DS) Survey Buffer	
		Mussel survey efforts at the Mountain Valley Pipeline crossing of Stony Creek in Giles County, Virginia.			
Project No. 593.11		50 0 50 100 Meters		ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	
				Map 1 of 23	



Mussel Survey Location ● Milepost ▲ Mussel Habitat Assessment Completed — Proposed MVP Alignment — Thawleg	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Little Stony Creek in Giles County, Virginia.
Project No. 593.11	50 0 50 100 Meters
	ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
Map 2 of 23	



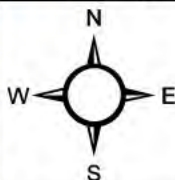
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Sinking Creek2 in Giles County, Virginia.		Map 3 of 23
	Project No. 593.11		



Mussel Survey Location ■ ■ Access Road

■ No Mussel Habitat Assessment Completed

— Thawleg



Mussel survey efforts at the Mountain Valley Pipeline crossing of Sinking Creek AR in Giles County, Virginia.

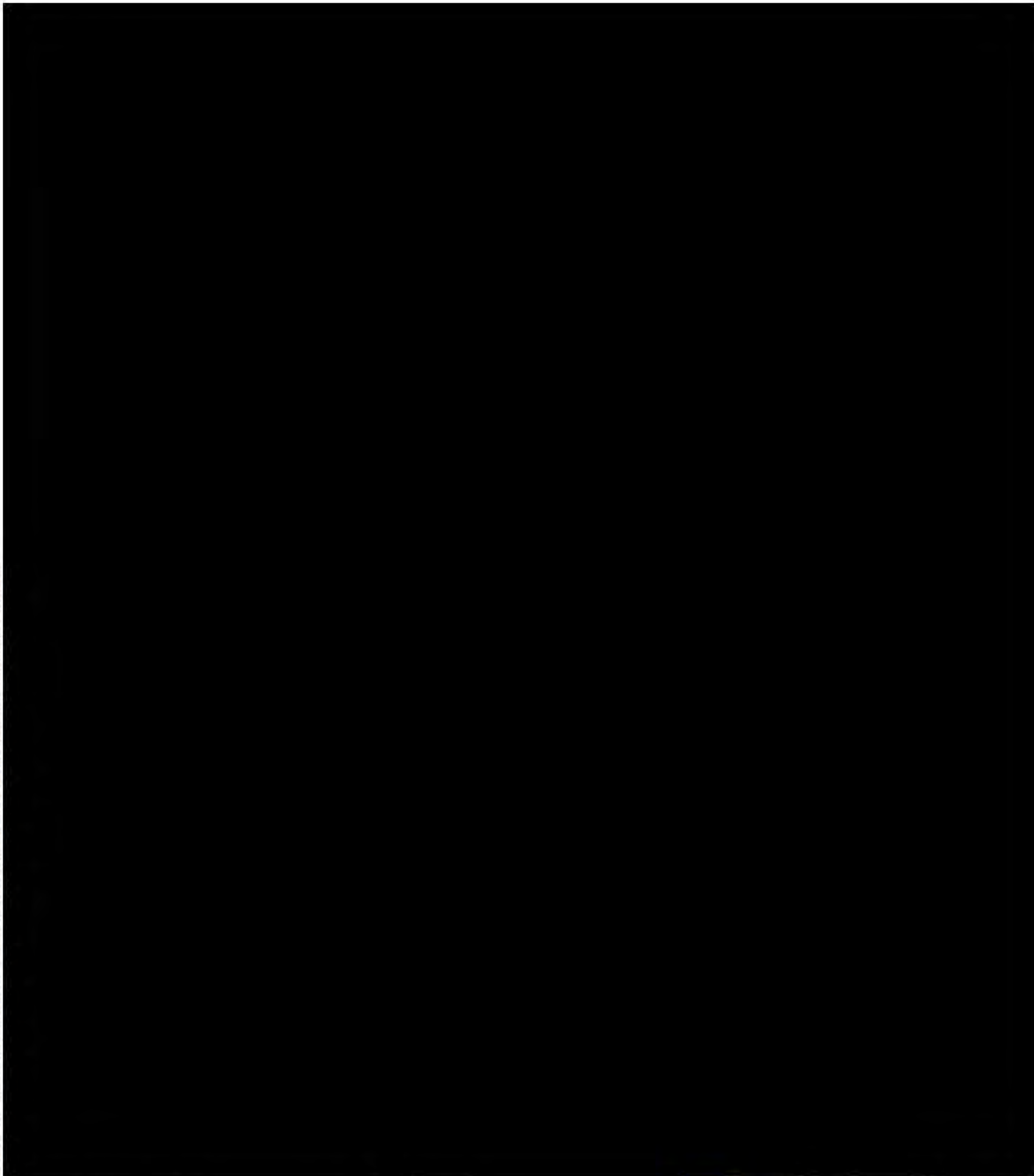
Map 4 of 23

Project No.
593.11

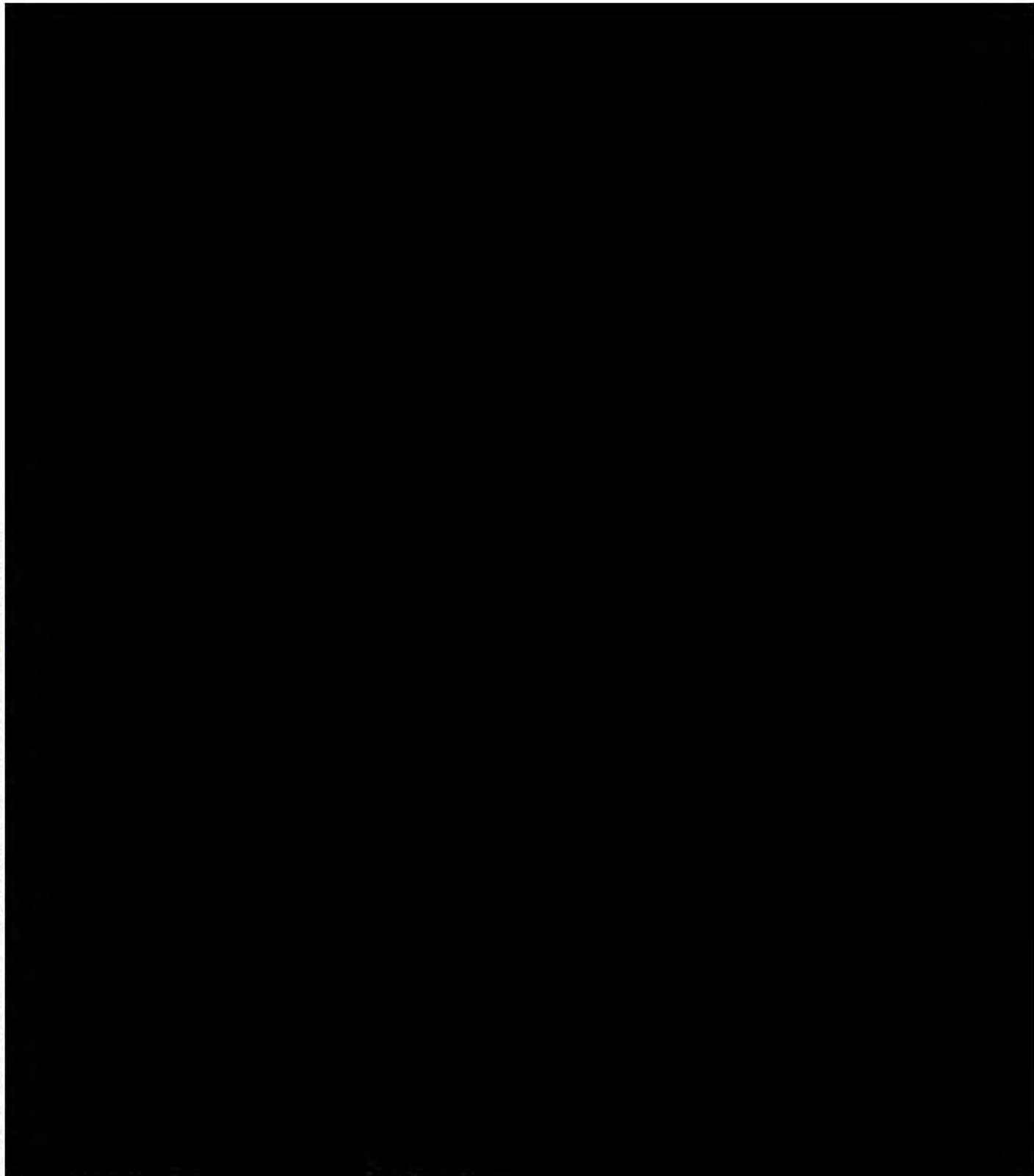
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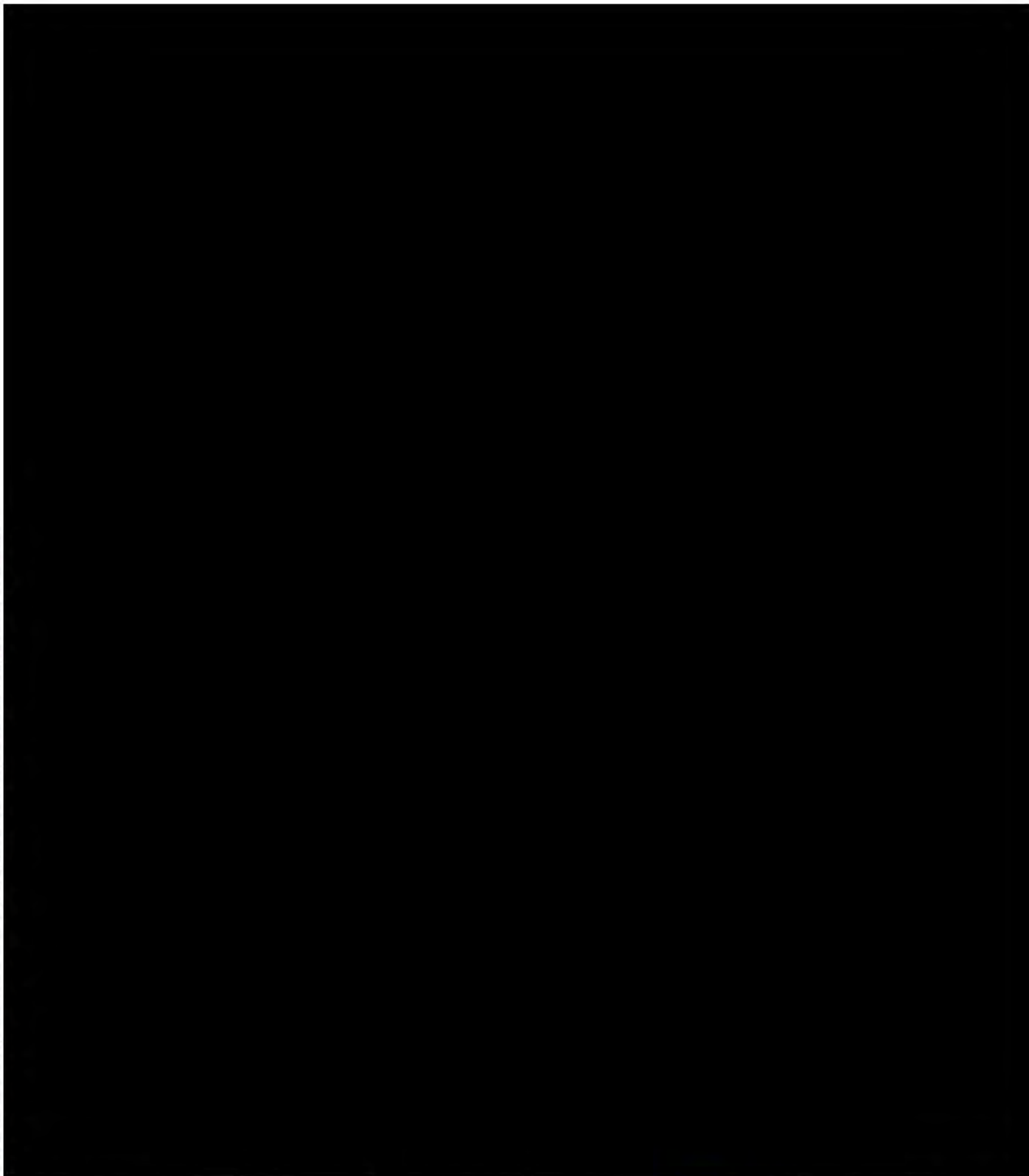
ENVIRONMENTAL SOLUTIONS
& INNOVATIONS, INC.



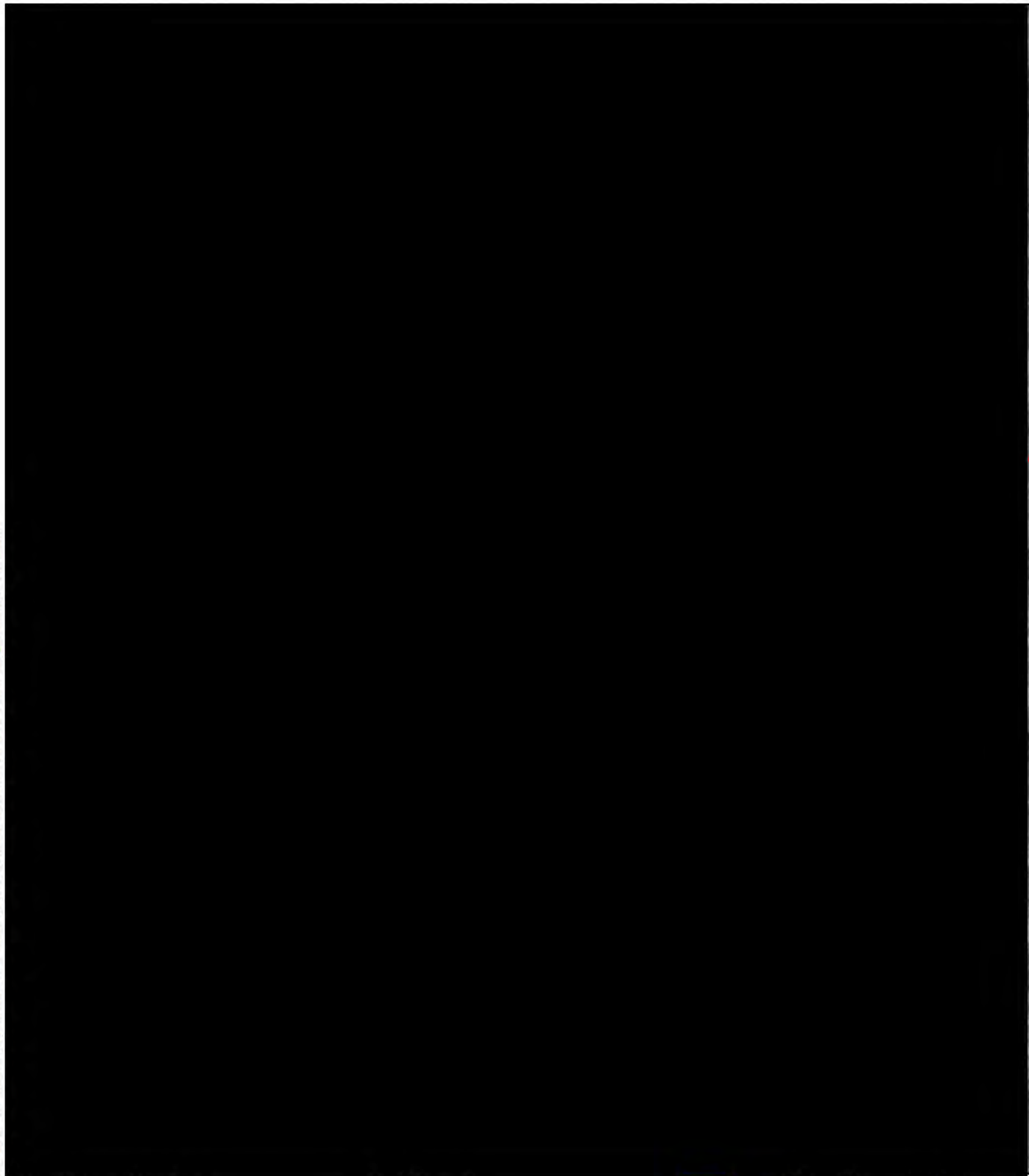
Mussel Survey Location Mussel Survey Completed		Milepost - Milepost - Proposed MVP Alignment - Access Road		Area of Direct Impact (ADI) - Area of Direct Impact (ADI) - Upstream (US) and Downstream (DS) Survey Buffer	
Mussel survey efforts at the Mountain Valley Pipeline crossing of Craig Creek AR, Craig Creek1, Craig Creek2, and Craig Creek3 in Montgomery County, Virginia.					
		Project No. 593.11		100 0 100 200 Meters	
				ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	



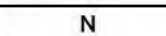
Mussel Survey Location ● Milepost ▲ Mussel Habitat Assessment Completed — Proposed MVP Alignment — Access Road — Thawleg	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Mill Creek1 in Montgomery County, Virginia.
Project No. 593.11	50 0 50 100 Meters
ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	
Map 6 of 23	

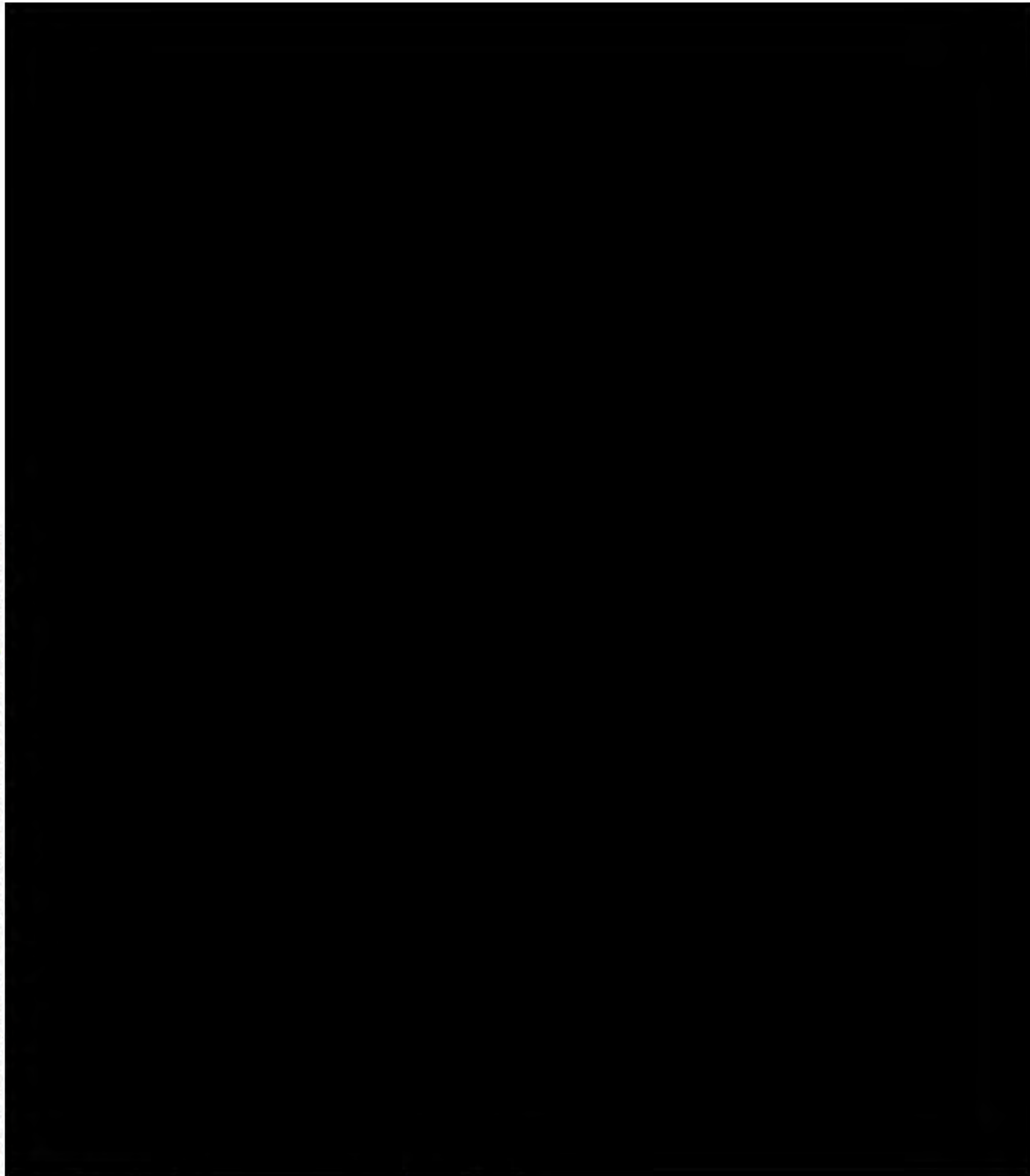


Mussel Survey Location Mussel Survey Completed		Milepost Proposed MVP Alignment Access Road		Area of Direct Impact (ADI) Upstream (US) and Downstream (DS) Survey Buffer	
		Mussel survey efforts at the Mountain Valley Pipeline crossing of North Fork Roanoke River AR1 and North Fork Roanoke River 1 in Montgomery County, Virginia			
Project No. 593.11		50 0 50 100 Meters		ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	

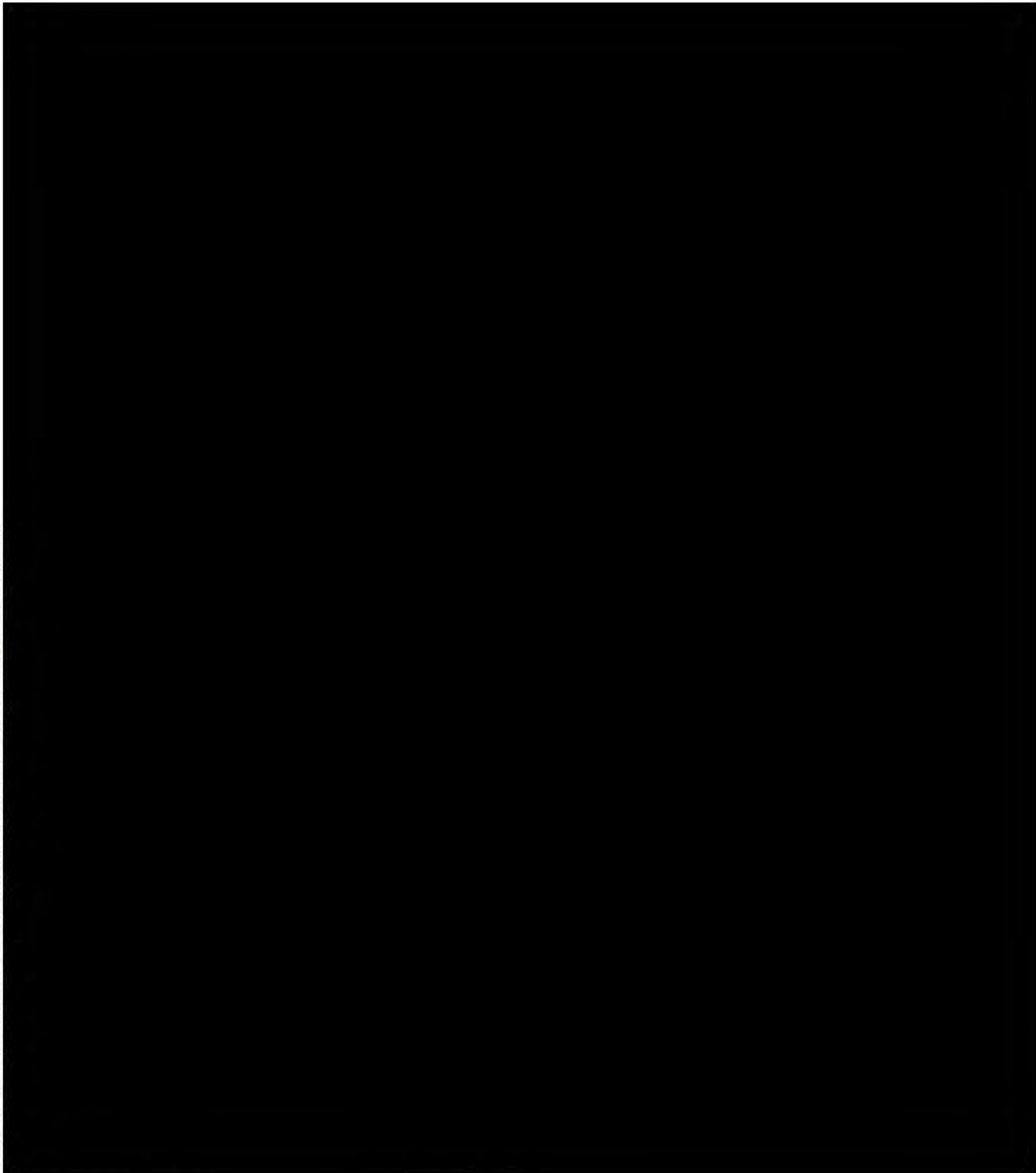


Mussel Survey Location	● Milepost	Area of Direct Impact (ADI)
● Mussel Survey Completed	Proposed MVP Alignment	Upstream (US) and Downstream (DS) Survey Buffer
	Access Road	

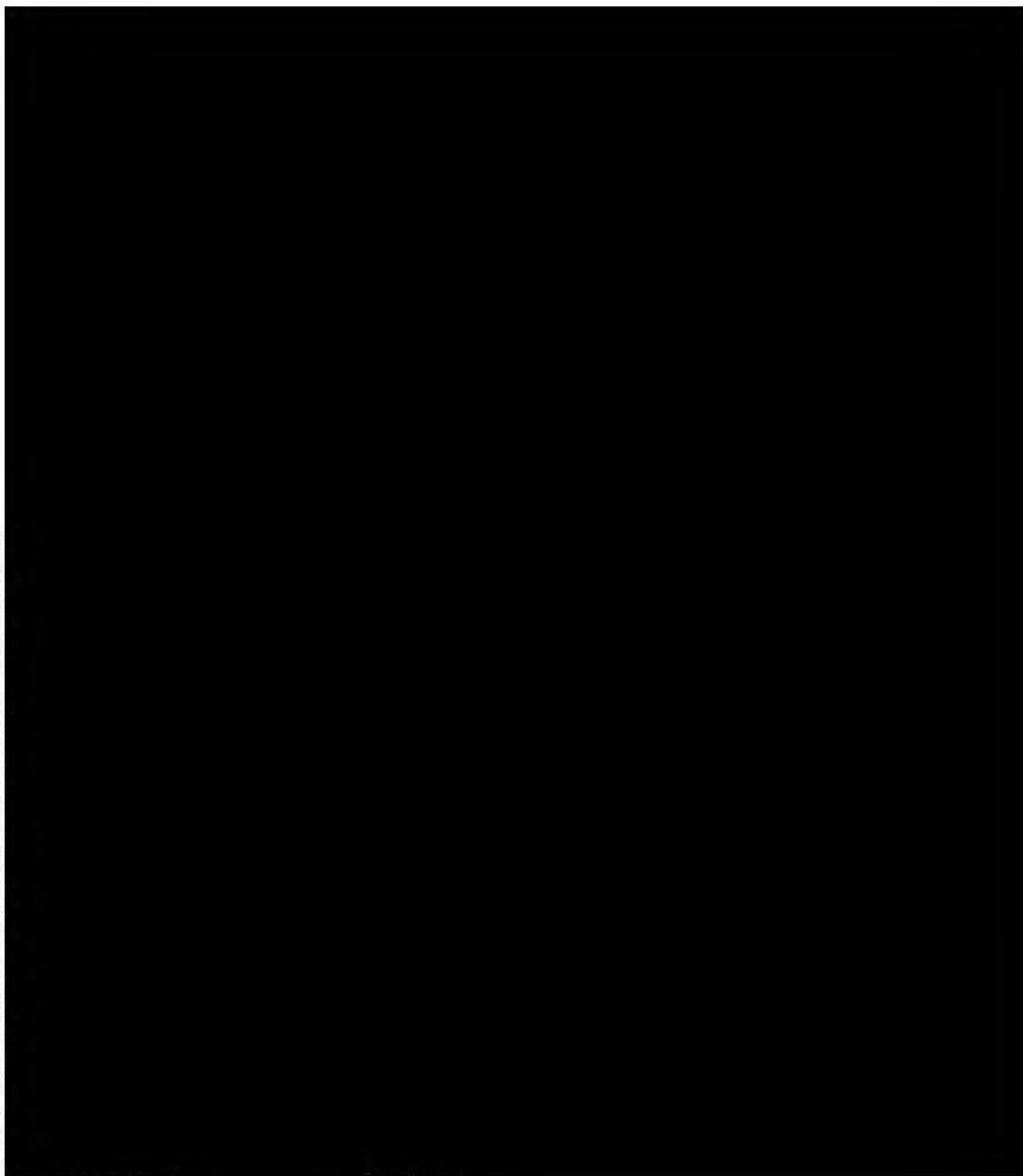
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Bradshaw Creek1 in Montgomery County, Virginia.			Map 8 of 23
	Project No. 593.11	 50 0 50 100 Meters	 ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	



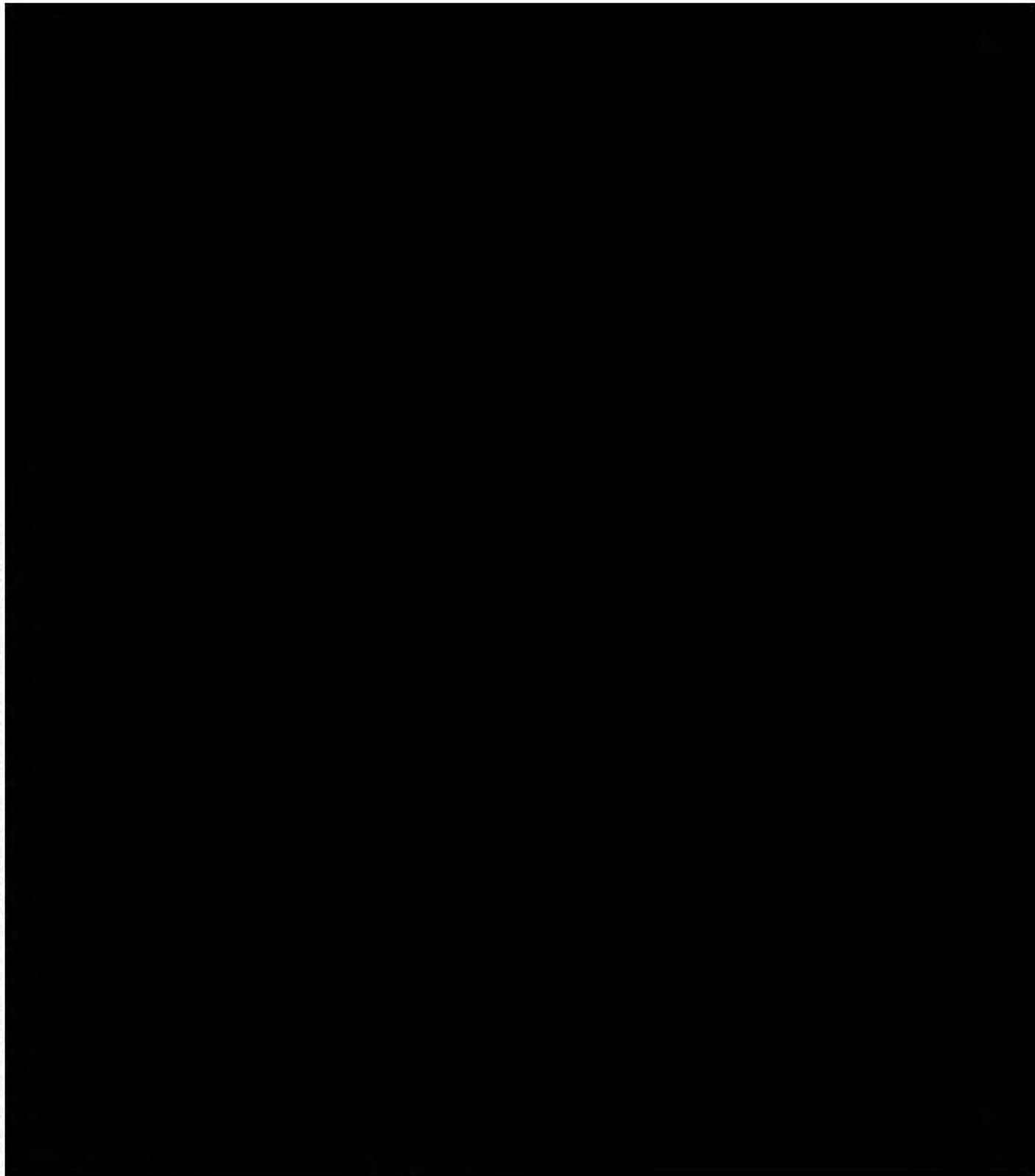
Mussel Survey Location  No Mussel Habitat Assessment Completed  Thawleg		 Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Bradshaw Creek AR in Montgomery County, Virginia.		
	Project No. 593.11	50 0 50 100 Meters	 ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



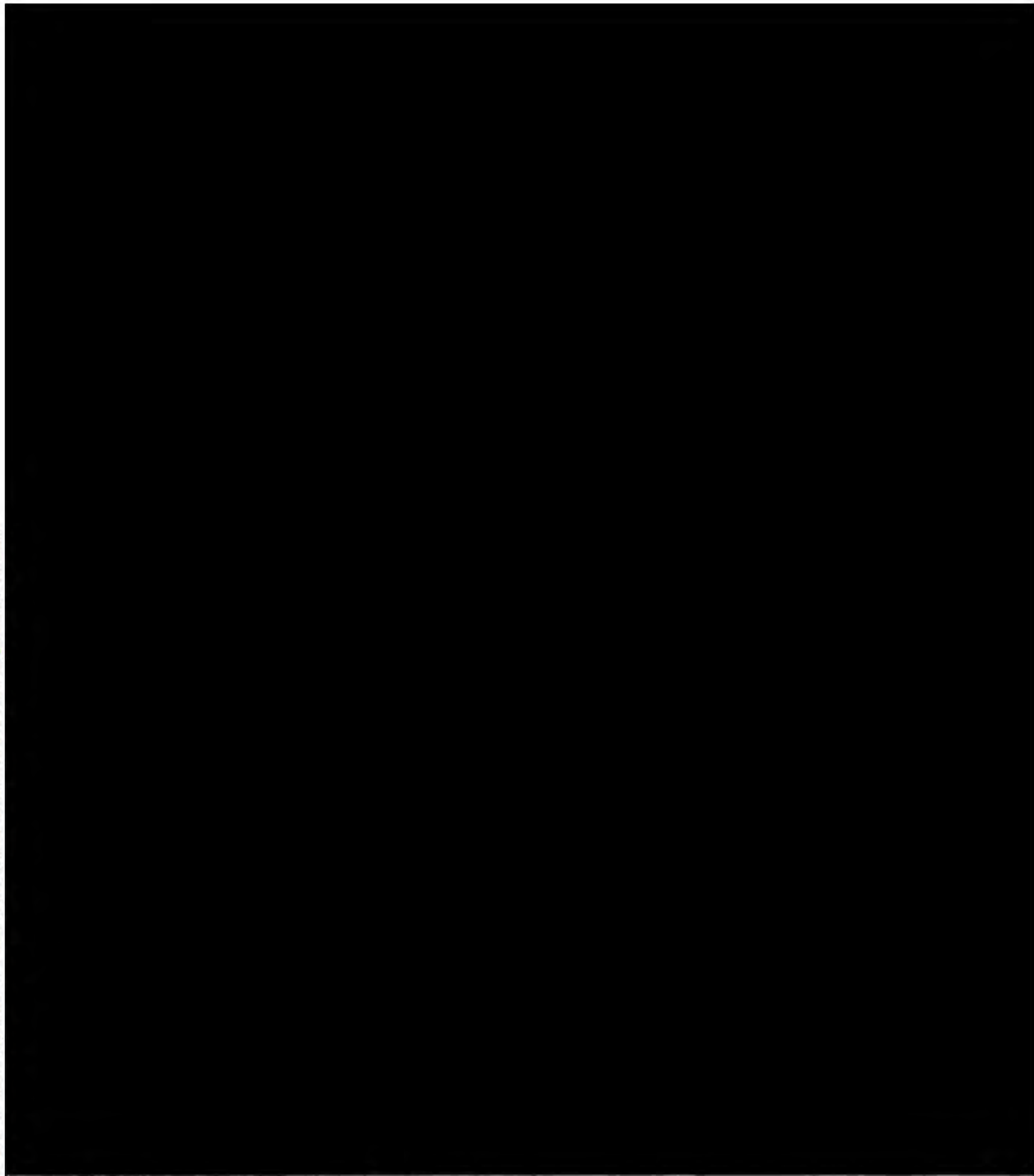
Mussel Survey Location ■■■ Access Road ■ No Mussel Habitat Assessment Completed — Thawleg	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of North Fork Roanoke River AR2 in Montgomery County, Virginia.
Project No. 593.11	50 0 50 100 Meters
	ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

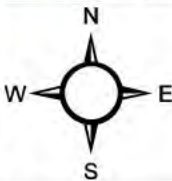


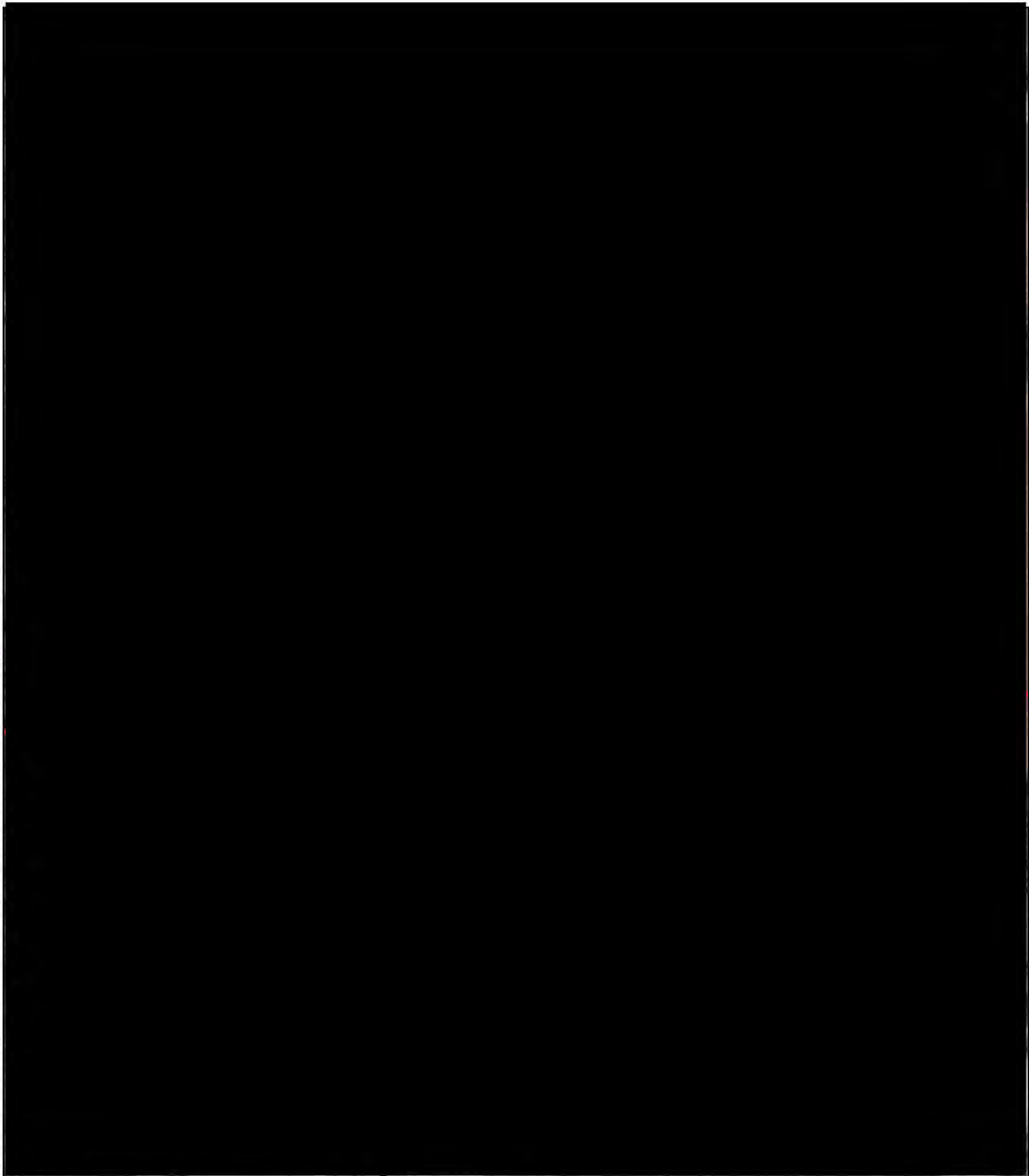
Mussel Survey Location No Mussel Habitat Assessment Completed Thawleg		Milepost Proposed MVP Alignment Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Roanoke River in Montgomery County, Virginia.		
	Project No. 593.11	50 0 50 100 Meters	ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

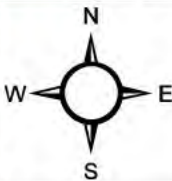


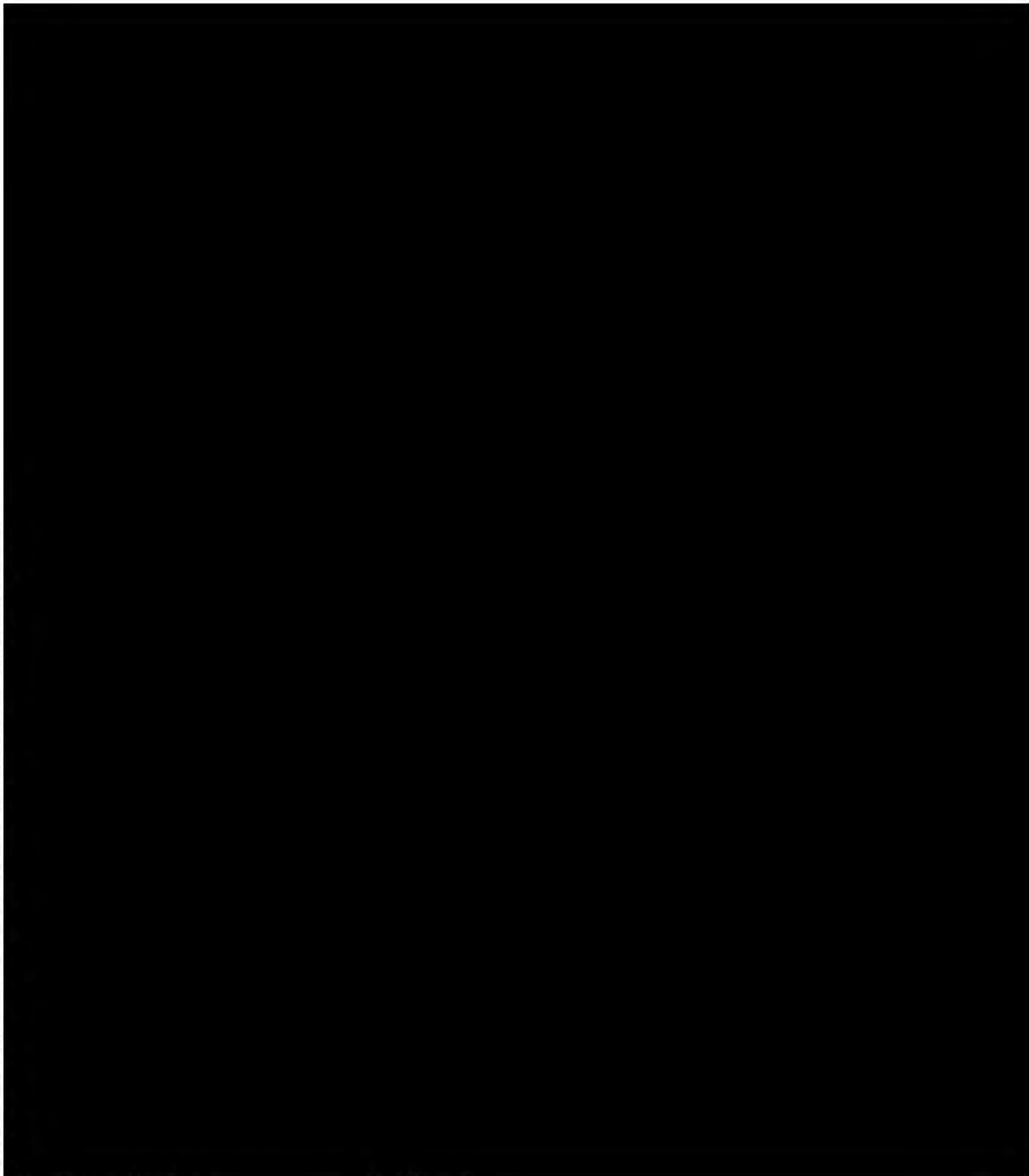
Mussel Survey Location  No Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment		
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Mill Creek2 in Roanoke County, Virginia.			Map 12 of 23
	Project No. 593.11	50 0 50 100 Meters		

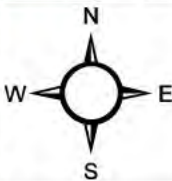


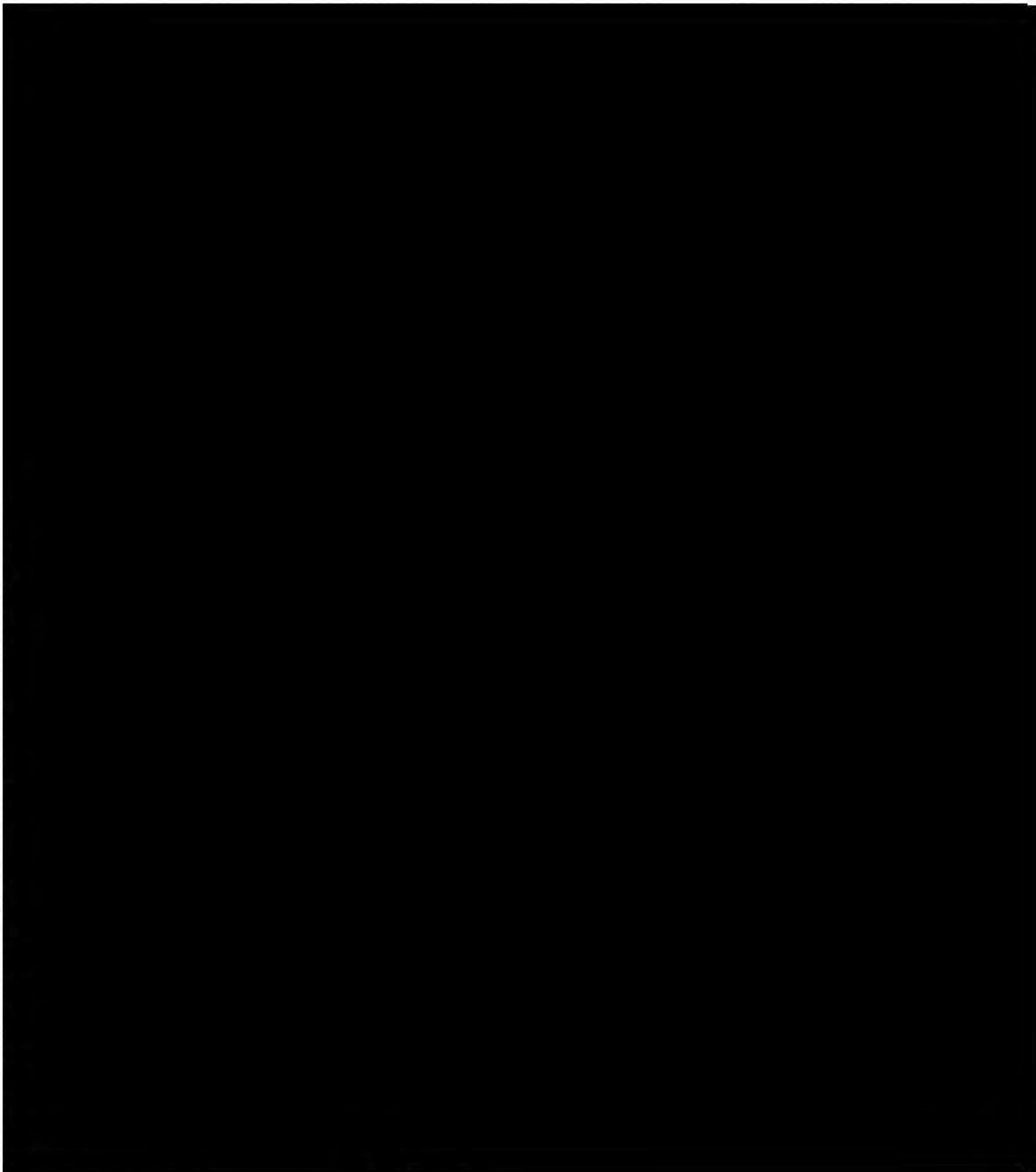
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of North Fork Blackwater River in Franklin County, Virginia.		
	Project No. 593.11	50 0 50 100 Meters	 ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



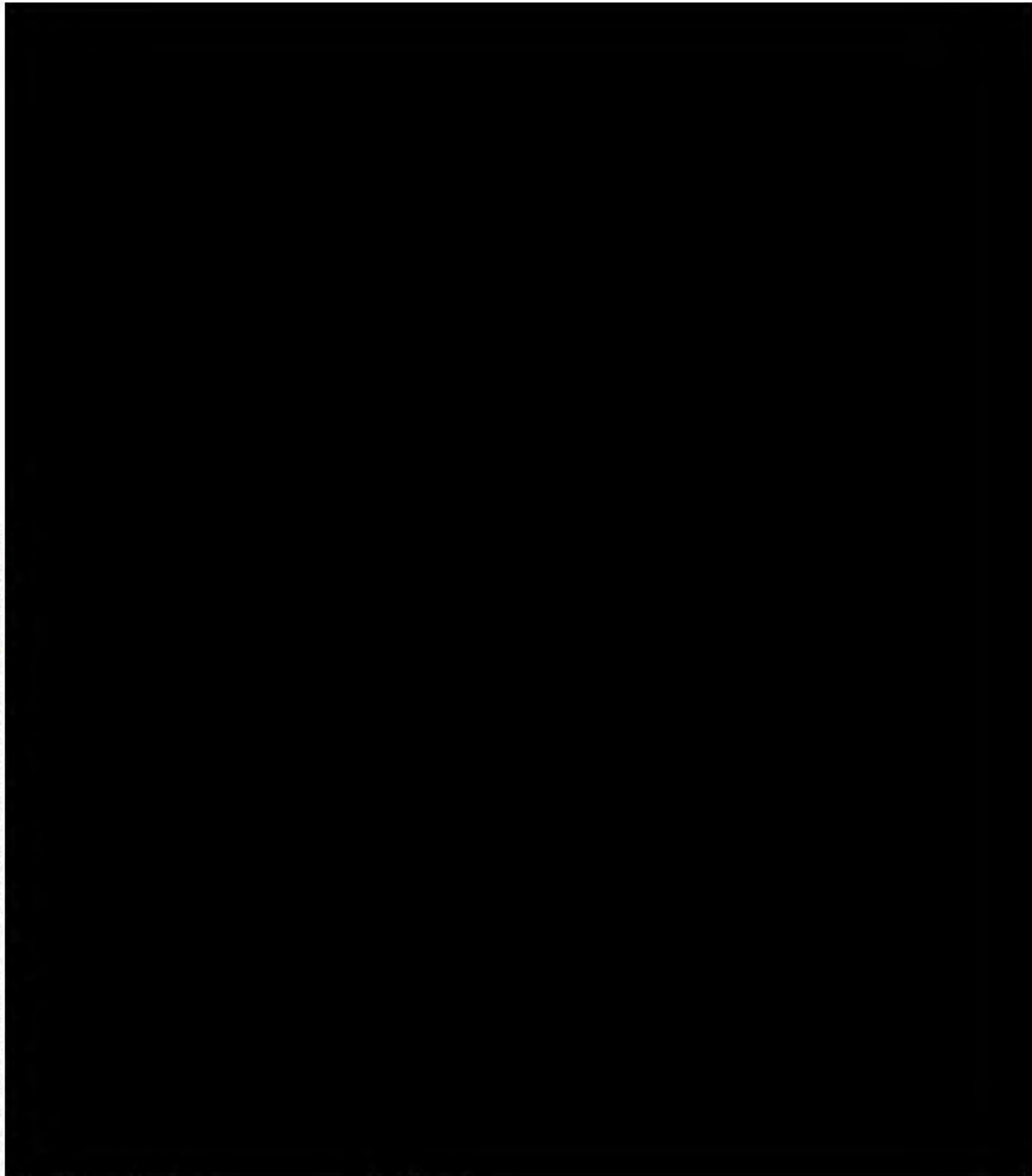
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Teels Creek2 in Franklin County, Virginia.		Map 14 of 23
	Project No. 593.11		



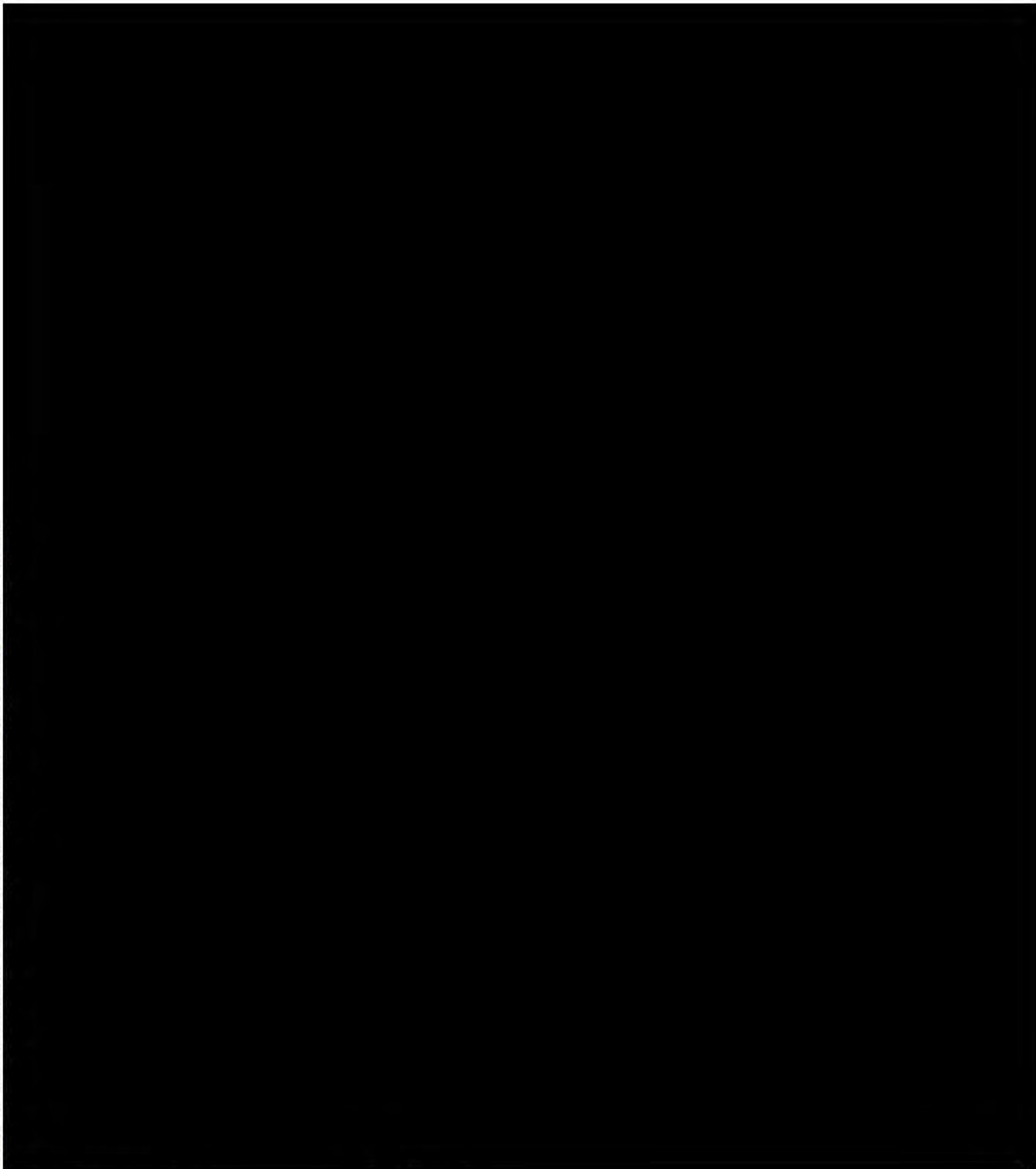
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Teels Creek³ in Franklin County, Virginia.		Map 15 of 23
	Project No. 593.11	50 0 50 100 Meters	 ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



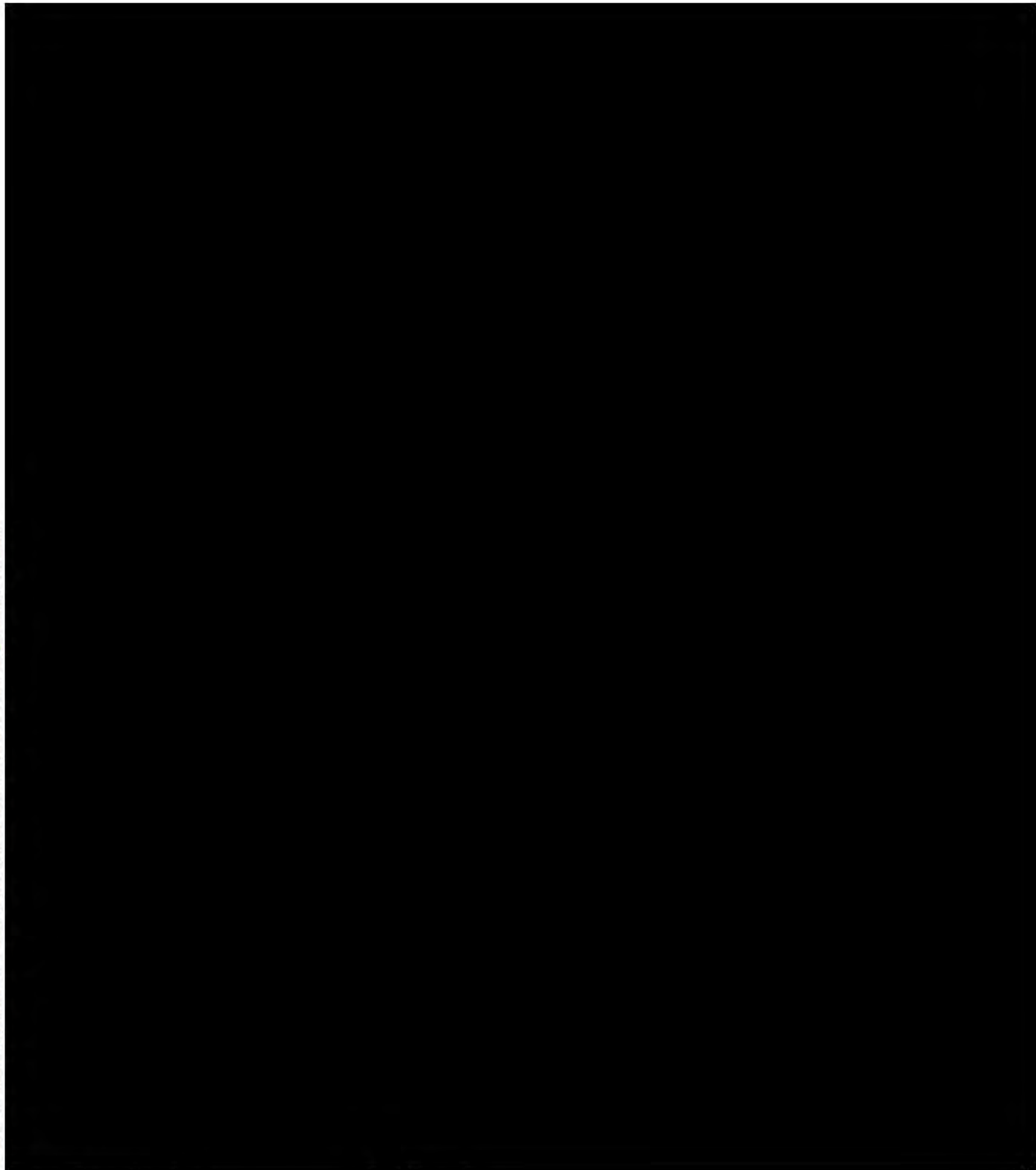
Mussel Survey Location  No Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Teels Creek⁴ and Little Creek^{1.5} in Franklin County, Virginia.		
	Project No. 593.11	50 0 50 100  Meters	 ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



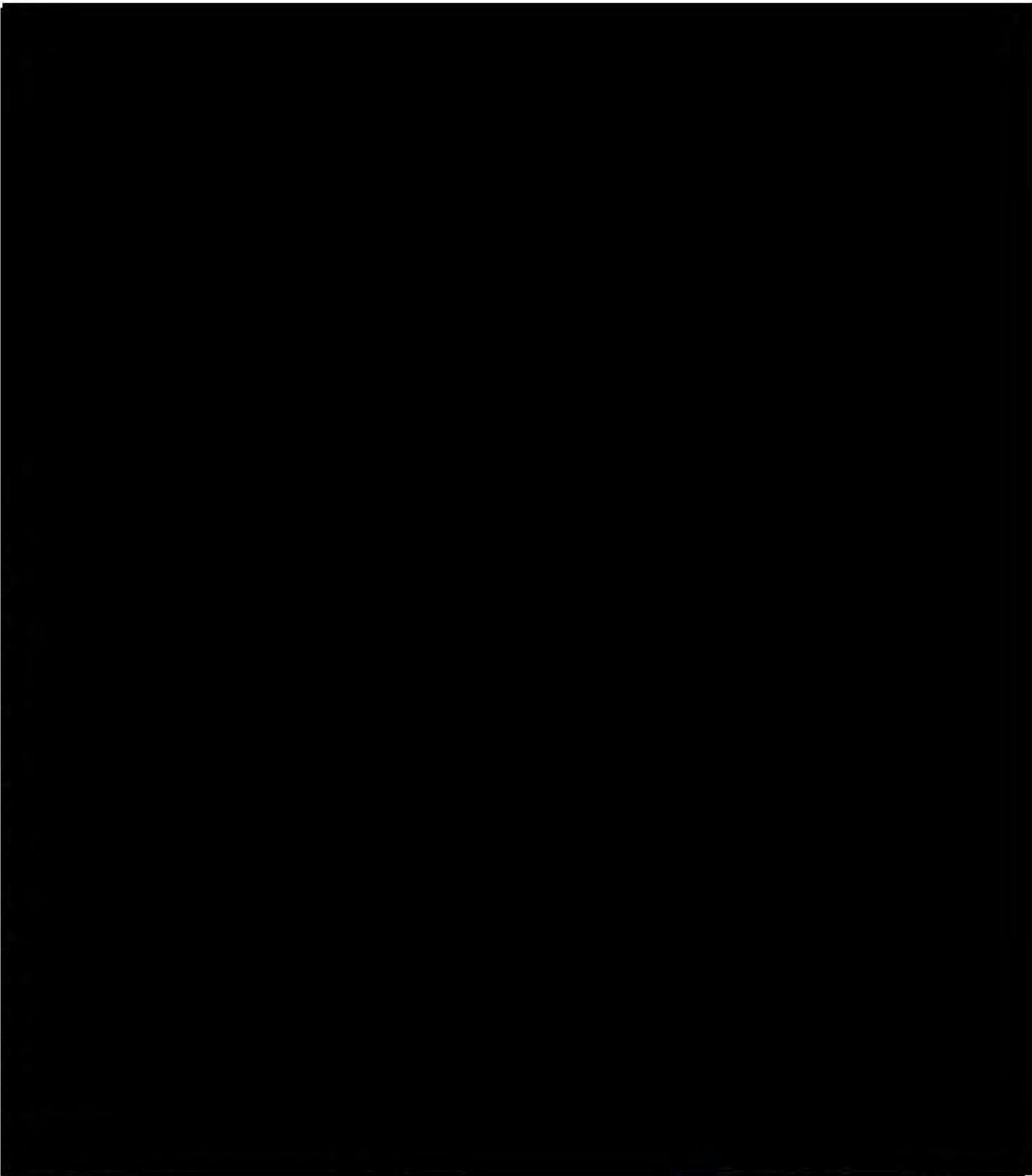
Mussel Survey Location  No Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment		
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Little Creek2 in Franklin County, Virginia.			Map 17 of 23
	Project No. 593.11			



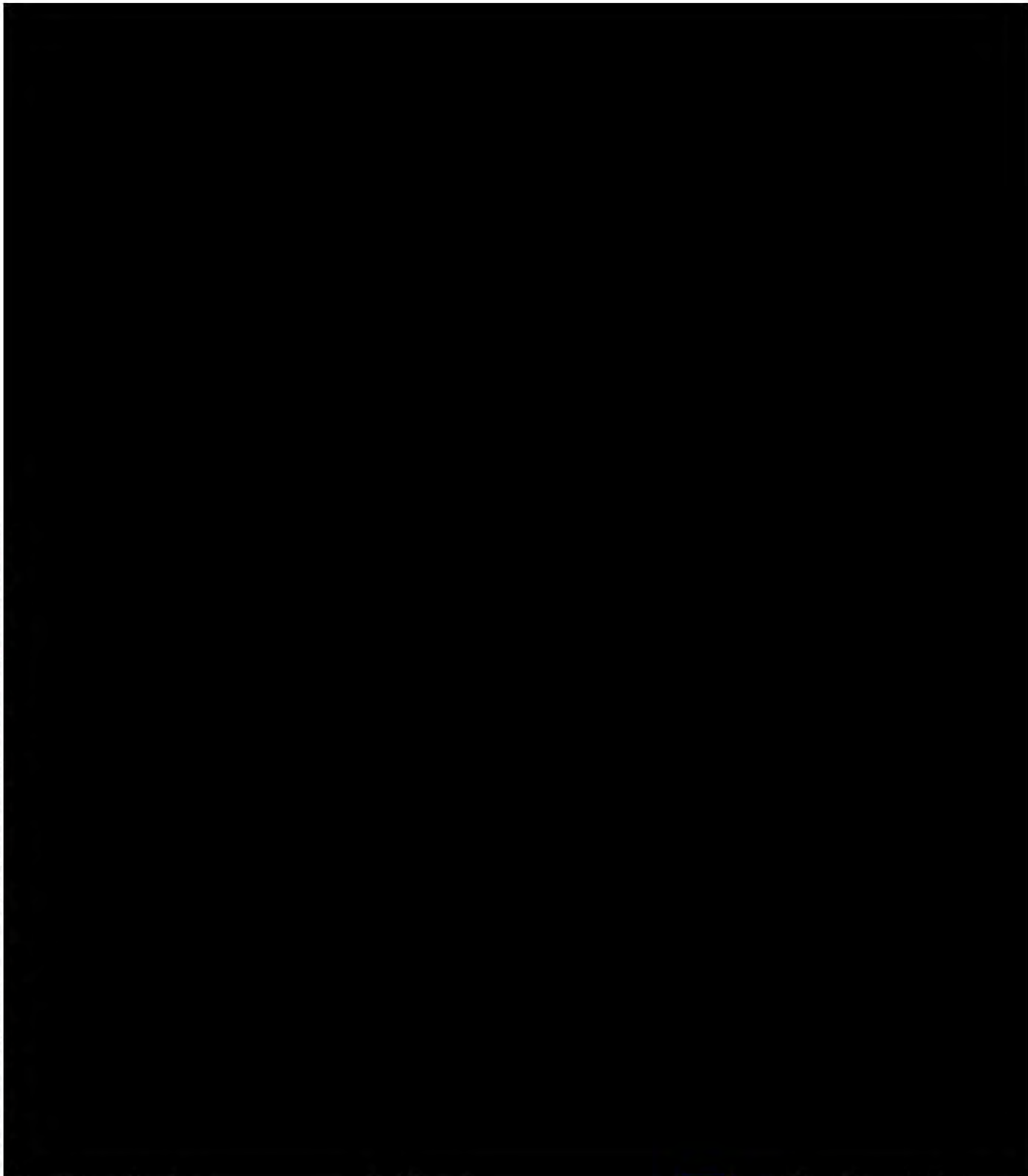
Mussel Survey Location  No Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road		
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Blackwater River1 in Franklin County, Virginia.			Map 18 of 23
	Project No. 593.11	50 0 50 100 Meters		



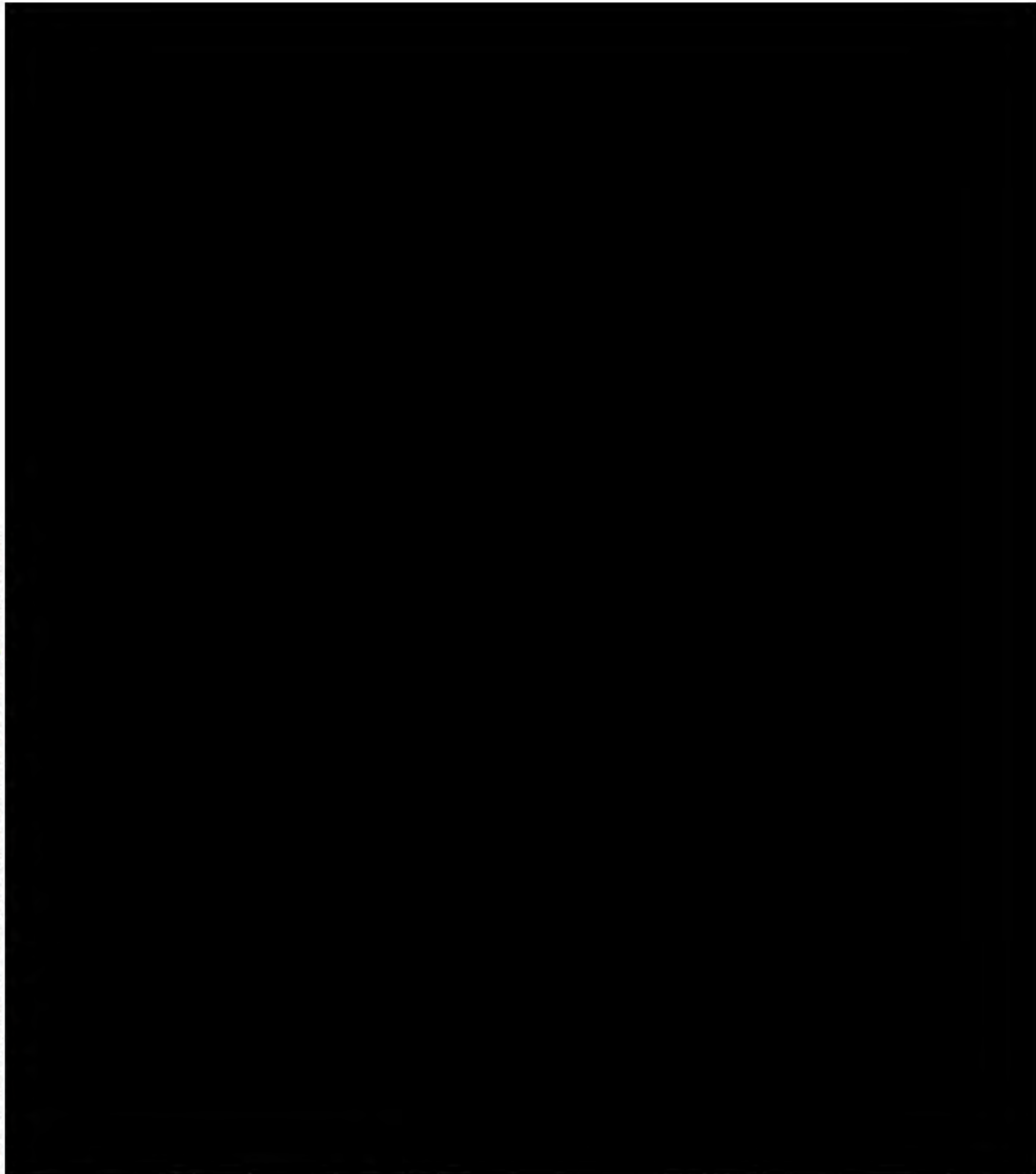
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment  Access Road	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Blackwater River2 in Franklin County, Virginia.		Map 19 of 23
	Project No. 593.11	50 0 50 100 Meters	

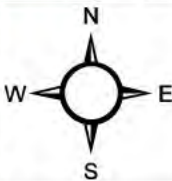
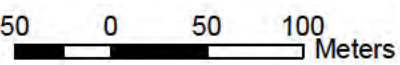


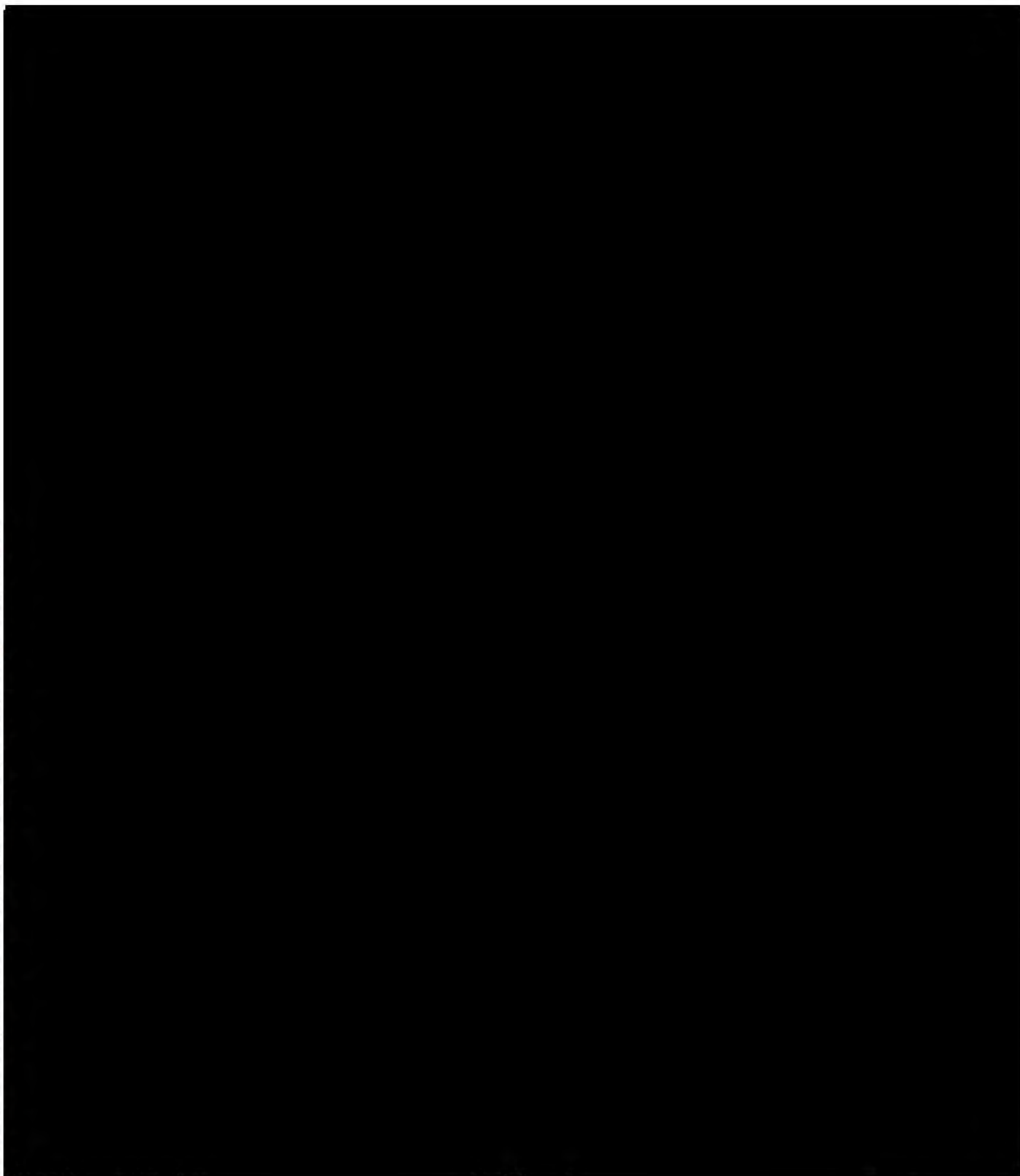
Mussel Survey Location Mussel Survey Completed		Milepost Proposed MVP Alignment Access Road		Area of Direct Impact (ADI) Upstream (US) and Downstream (DS) Survey Buffer	
		Mussel survey efforts at the Mountain Valley Pipeline crossing of Magoddee Creek¹ and Blackwater River³ in Franklin County, Virginia.			
Project No. 593.11		50 0 50 100 Meters			
		Map 20 of 23			



Mussel Survey Location Mussel Survey Completed		Milepost Proposed MVP Alignment Access Road		Area of Direct Impact (ADI) Upstream (US) and Downstream (DS) Survey Buffer	
		Mussel survey efforts at the Mountain Valley Pipeline crossing of Pigg River in Pittsylvania County, Virginia.			
Project No. 593.11		50 0 50 100 Meters		ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.	
					Map 21 of 23



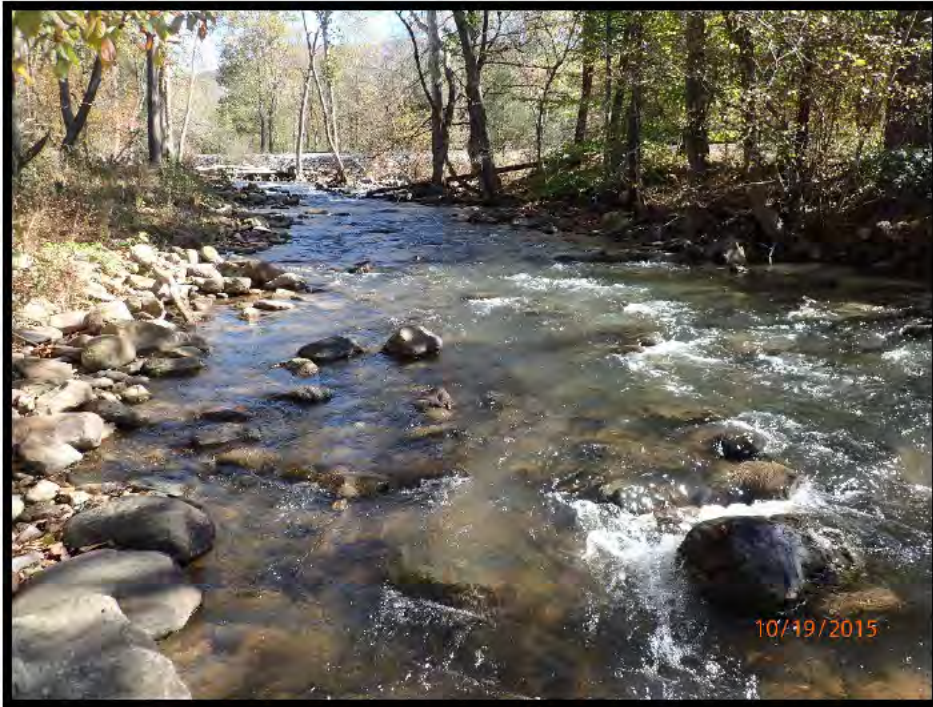
Mussel Survey Location  Mussel Habitat Assessment Completed  Thawleg		 Milepost  Proposed MVP Alignment	
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Harpen Creek ¹ in Pittsylvania County, Virginia.		
	Project No. 593.11		
			ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.



Mussel Survey Location - No Mussel Habitat Assessment Completed - Stream Eliminated by Desktop Review - Milepost - Proposed MVP Alignment - Access Road - Thawleg		
	Mussel survey efforts at the Mountain Valley Pipeline crossing of Little Cherrystone Creek1, Little Cherrystone Creek2, and Little Cherrystone Creek3 in Pittsylvania County, Virginia.	
Project No. 593		

APPENDIX C
REPRESENTATIVE PHOTOGRAPHS

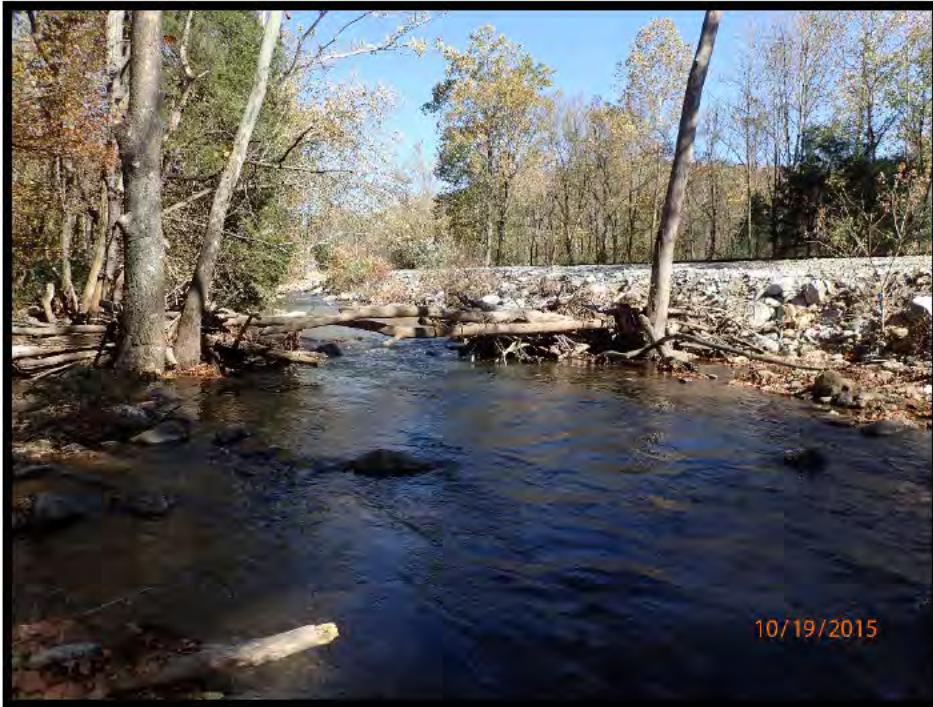




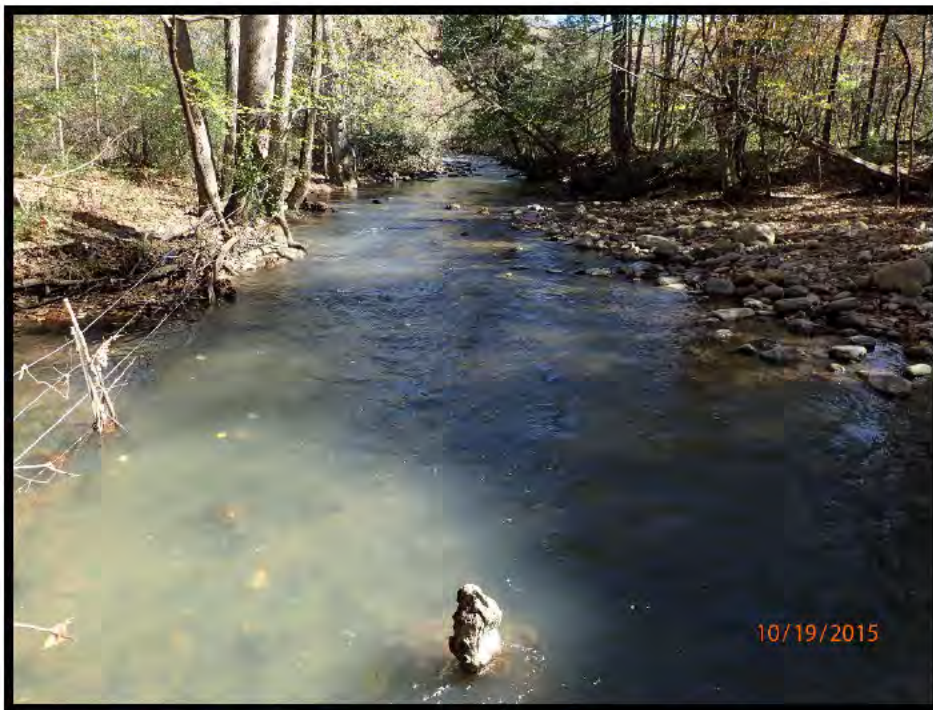
Stony Creek – looking upstream



Stony Creek – looking downstream



Stony Creek – looking upstream



Stony Creek – looking upstream



Little Stony Creek– looking upstream



Little Stony Creek– looking downstream



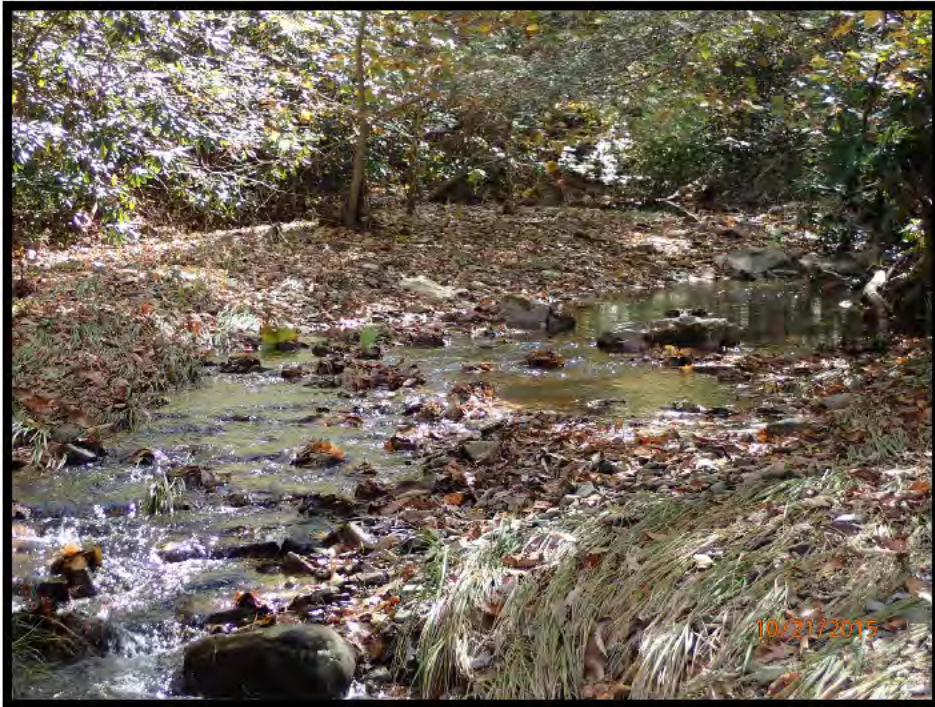
Sinking Creek 2 - looking downstream



Craig Creek – looking upstream



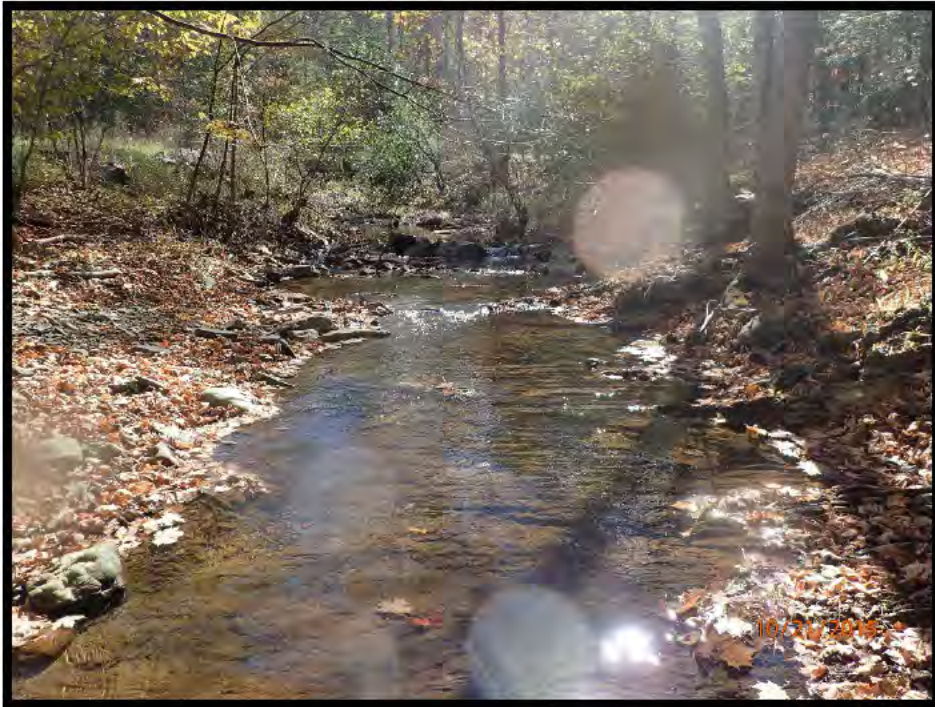
Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream - logjam



Craig Creek – looking downstream – dammed pool habitat



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream – existing ford crossing



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Craig Creek – looking upstream



Mill Creek 1 - looking upstream



Mill Creek 1 - looking upstream



North Fork Roanoke River1 – looking downstream



North Fork Roanoke River1 – looking downstream



North Fork Roanoke River 1 – looking downstream



North Fork Roanoke River 1 – looking upstream



North Fork Roanoke River AR1 – looking upstream



North Fork Roanoke River AR1 – looking upstream



Notched rainbow (*Villosa constricta*) - live



Notched rainbow (*Villosa constricta*) - live



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



Bradshaw Creek 1 - looking upstream



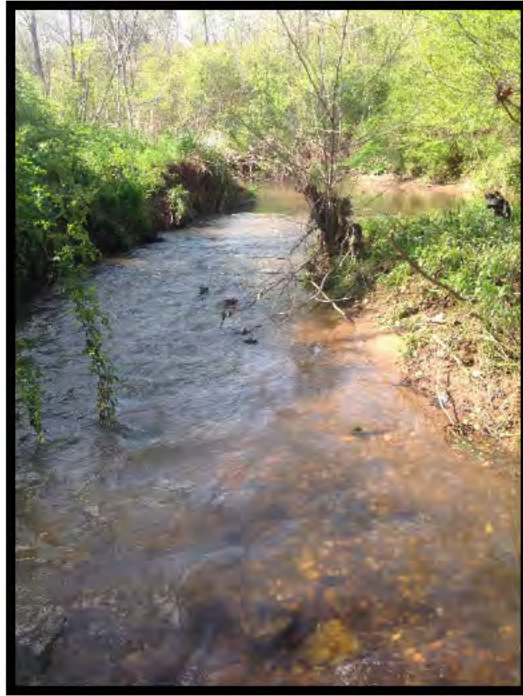
Bradshaw Creek 1 - looking upstream



North Fork Blackwater River - looking upstream



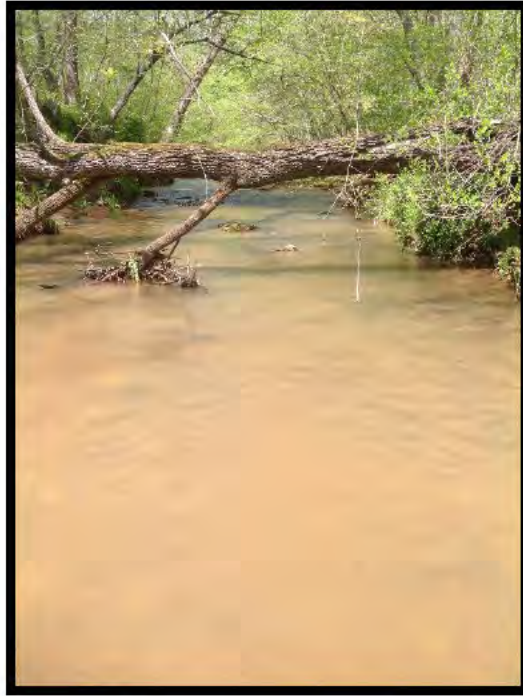
North Fork Blackwater River - looking downstream



Teels Creek 2 - looking upstream



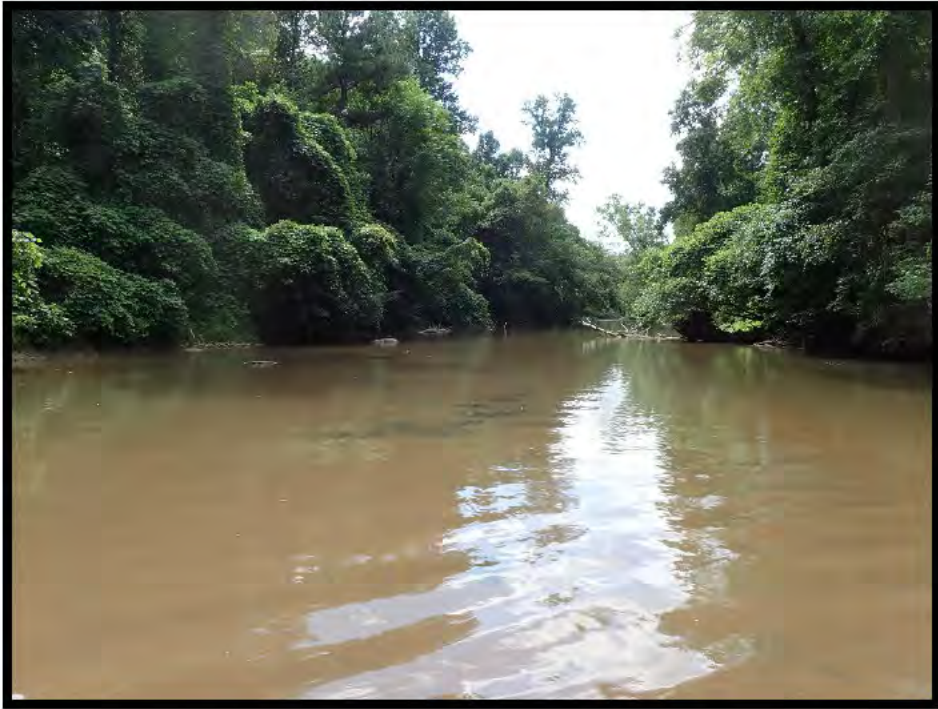
Teels Creek 2 - looking upstream



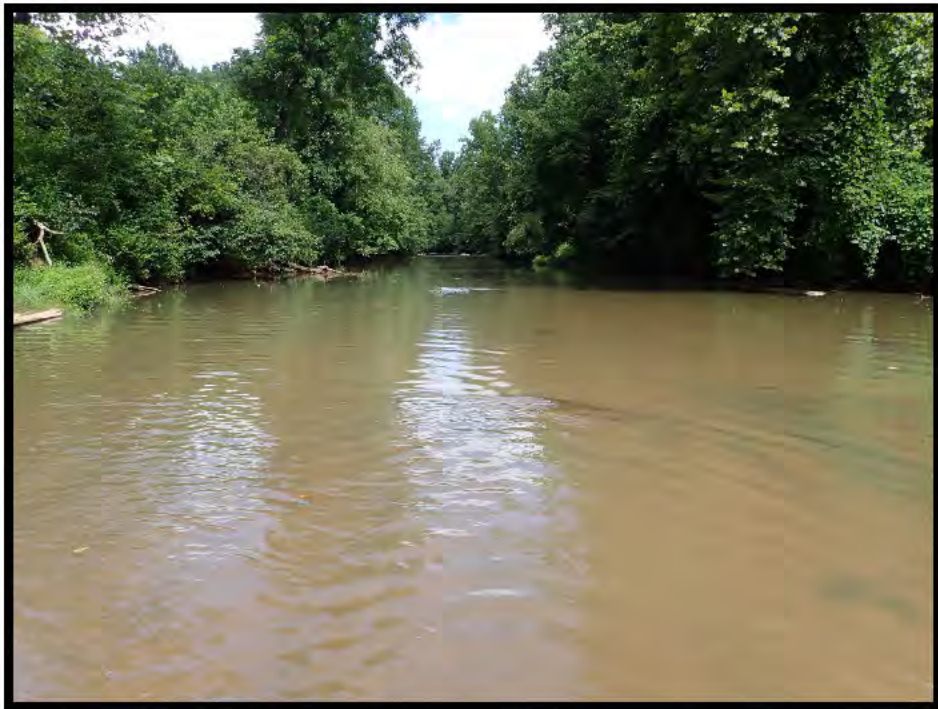
Teels Creek 3 - looking upstream



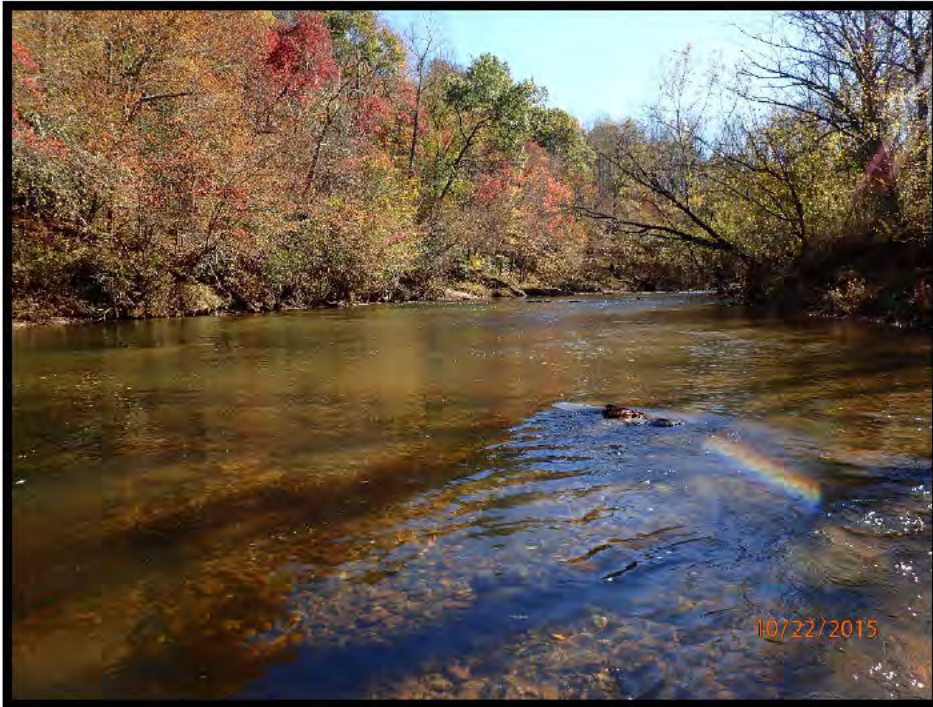
Teels Creek 3 - looking downstream



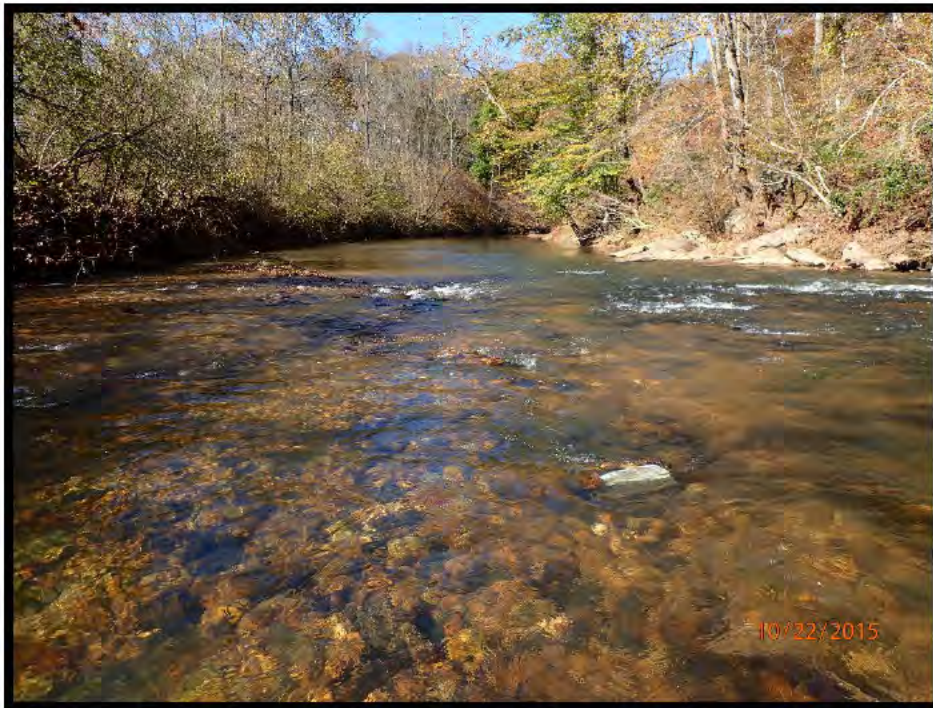
North Fork Blackwater River 2 – Looking downstream



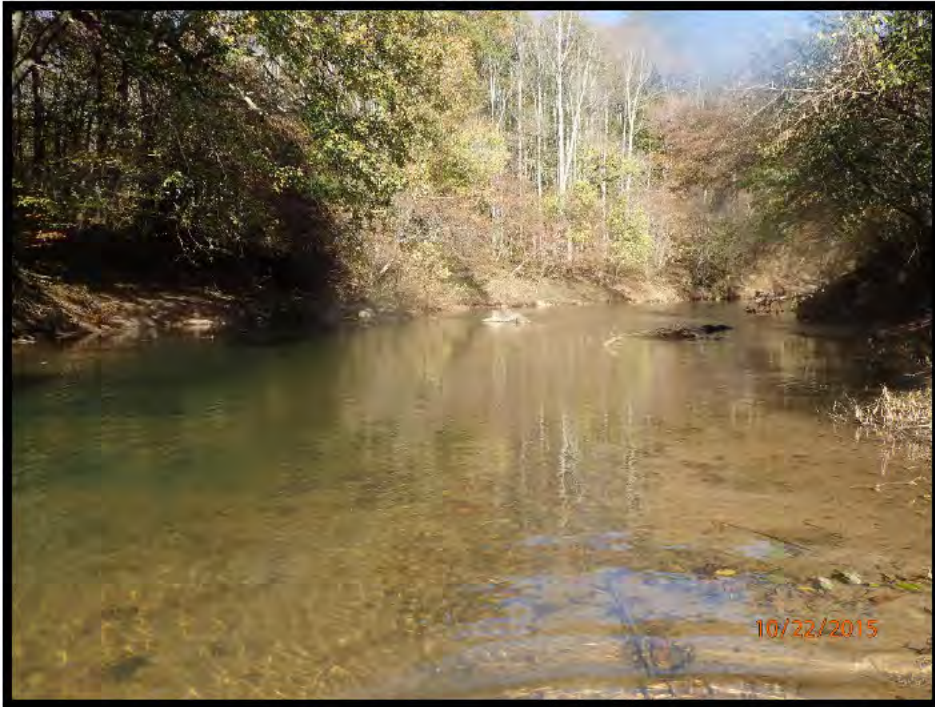
North Fork Blackwater River 2 – Looking upstream



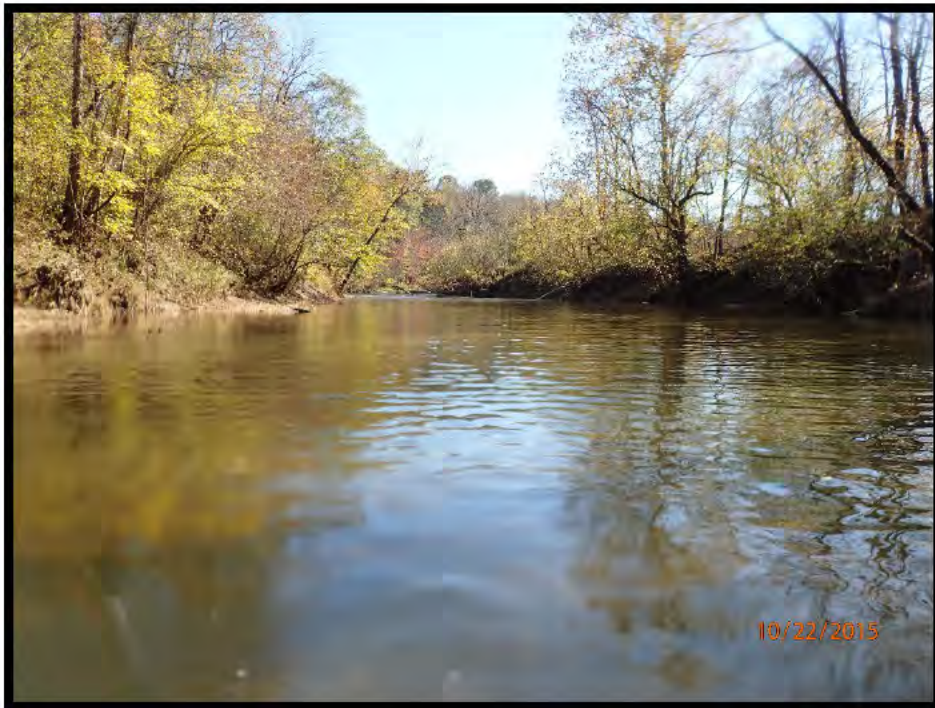
Blackwater River 3 - looking upstream



Blackwater River 3 - looking downstream



Blackwater River 3 - looking upstream



Blackwater River 3 - looking downstream



Creeper (*Strophitus undulatus*) – weathered dead



Eastern elliptio (*Elliptio complanata*) – weathered dead



Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - looking downstream



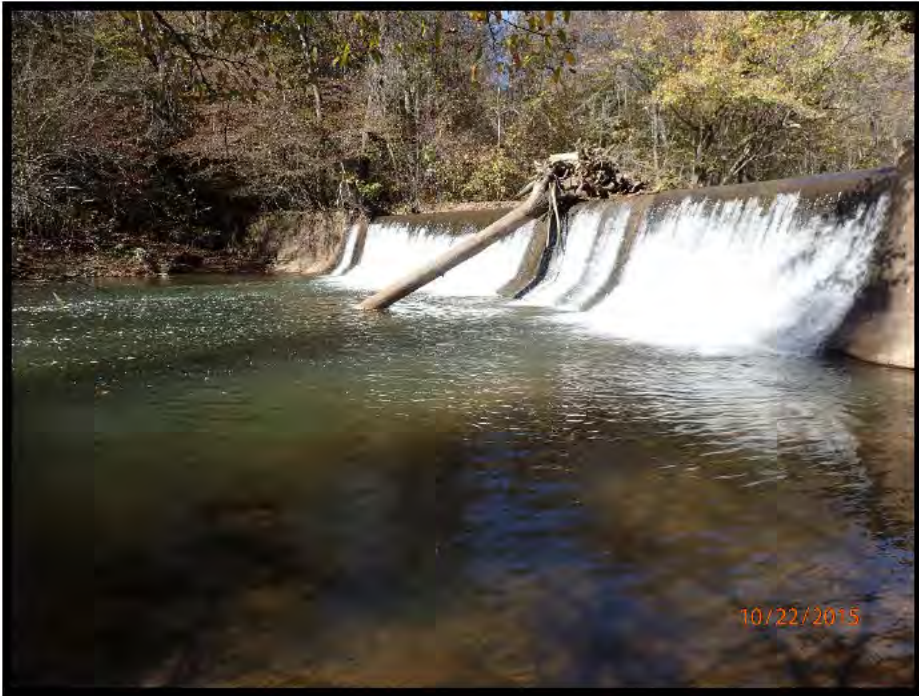
Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



Maggodee Creek - looking upstream



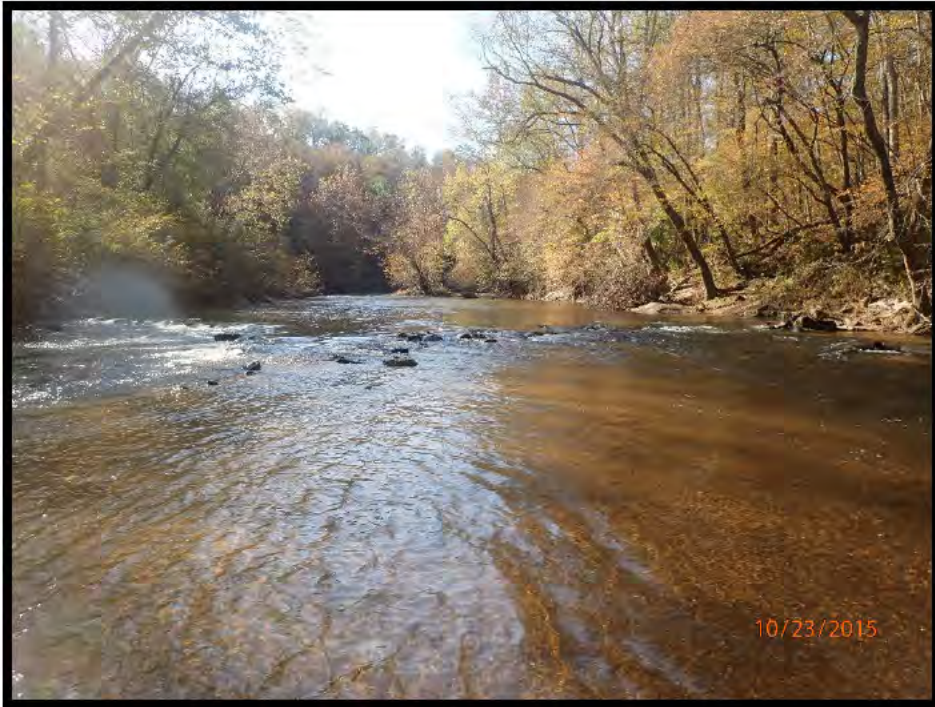
Maggodee Creek - upstream dam



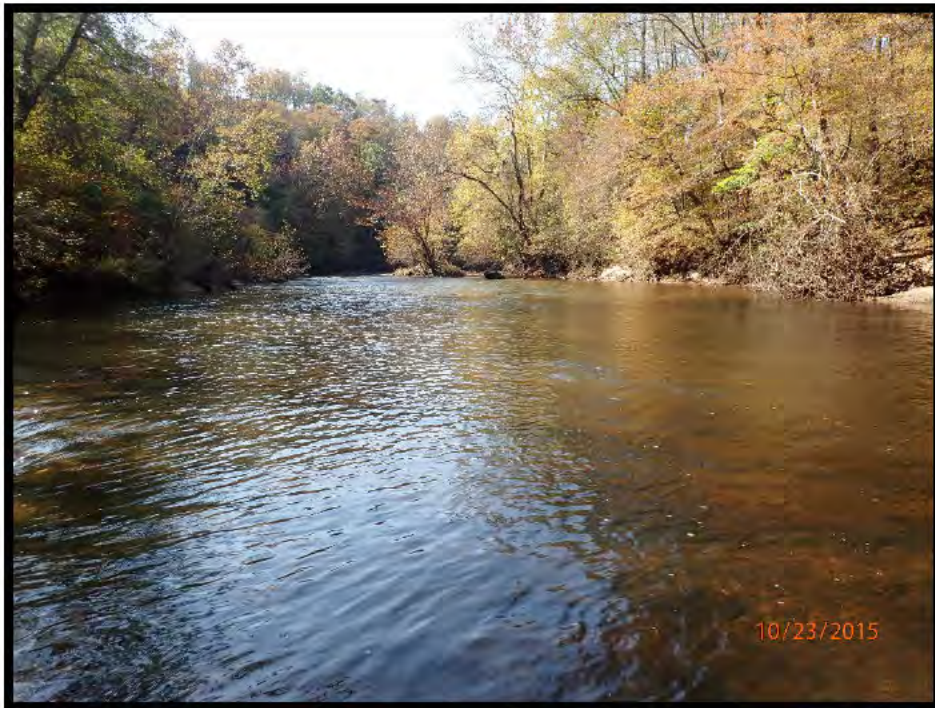
Pigg River – looking upstream



Pigg River – looking upstream



Pigg River – looking upstream



Pigg River – looking upstream



Yellow lampmussel (*Lampsilis cariosa*) - live



Creeper (*Strophitus undulatus*) - live



Eastern elliptio (*Elliptio complanata*) - live



Harpen Creek 1 - looking upstream



Little Cherrystone Creek 1 - looking upstream



Little Cherrystone Creek 1 - looking downstream



Little Cherrystone Creek 2 - looking upstream



Little Cherrystone Creek 2 - looking downstream