Appendix C

Photographs

Photo 1 – Cushaw Dam

Photo 2 – Snowden Dam

Photo 3 – Big Island Dam

Photo 4 – Coleman Falls Dam

Photo 5 – Holcomb Rock Dam

Photo 6 – Reusens Dam

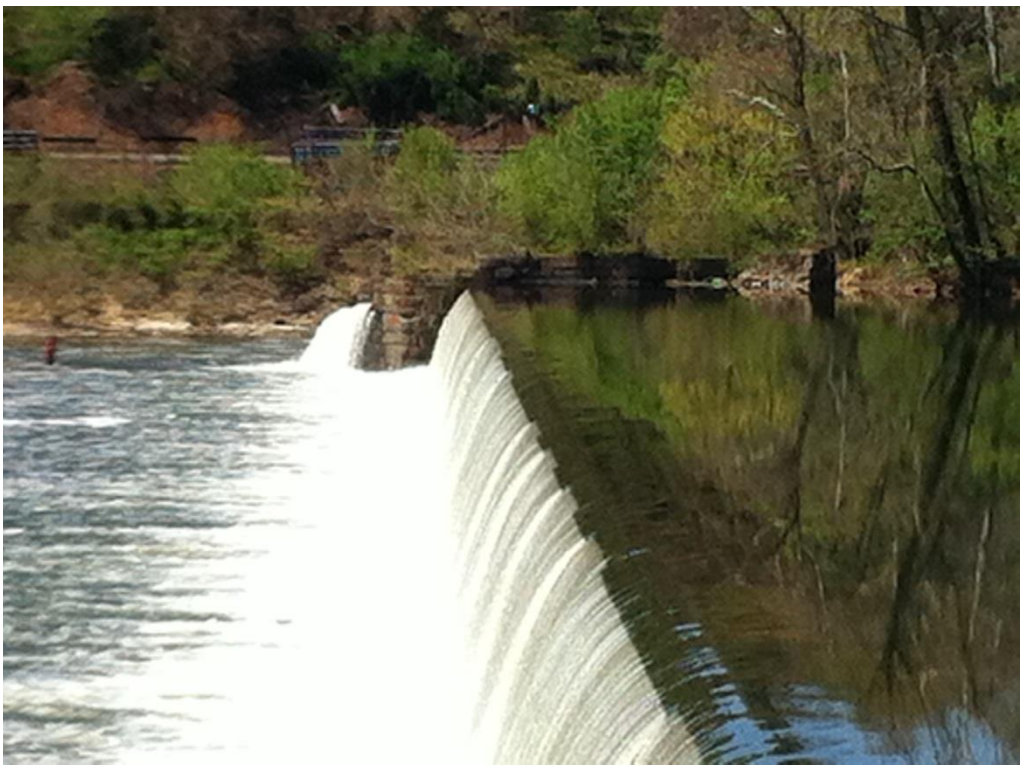

Photo 7 – Scott's Mill Dam April 2016 – 1,800 cfs

Photo 8 – Scott's Mill Dam September 12, 2016 – Low Flow about 800 cfs

Photo 9 – Scott's Mill Dam November 14, 2017 – Flow 1,500 cfs – Note Flow Over Arch Section and Old Fishway

Photo 10 – Scott's mill Dam May 5, 2017 – High Flow about 25,000 cfs

Photo 11 – Scott's Mill Dam May 5, 2017 – Note Turbulent Flow and Reduced Head

Photo 12 – Scott's Mill Dam July 7, 2017 – Flow 1,400 cfs

Photo 13 – Scott's Mill Dam February 2, 2017 – Average Flow 3,200 cfs

Photo 14 – 1,400 cfs Flow Over Sill at Riveredge Park

Photo 15 – 800 cfs Flow at Riveredge Park Sill

Photo 16 – July 7, 2017 Vegetation Screening the James River Immediately Downstream of Scott's Mill

Photo 17 – July 7, 2017 Slight View of River from River Road Downstream from Scott's mill Dam

Photo 18 – November 28, 2016 Scott's mill Dam from River Road in Defoliated Season

Photo 19 – April 18, 2016 Scott's Mill Dam as viewed from 5th Street Bridge

Photo 20 – April 20, 2016 Scott's Mill dam Viewed from North Side of Norwood Street (Note Pipe Storage Area)

Photo 21 – April 20, 2016 Scott's Mill Dam from Norwood Street

Photo 22 – November 14, 2017 Views of Homes on Norwood Street with Views of Scott's Mill Dam (Note Downstream Island in Foreground)

Photo 23 – November 28, 2016 View of Scott's Mill Grist Foundation (Left Abutment) Showing Grist Mill Discharge Location

Appendix D

Virginia Water Quality Standards

Part I
Surface Water Standards with General, Statewide Application

9VAC25-260-5. Definitions.

The following words and terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"Algicides" means chemical substances, most commonly copper-based, used as a treatment method to control algae growths.

"Board" means State Water Control Board.

"Chesapeake Bay and its tidal tributaries" means all tidally influenced waters of the Chesapeake Bay; western and eastern coastal embayments and tributaries; James, York, Rappahannock and Potomac Rivers and all their tidal tributaries to the end of tidal waters in each tributary (in larger rivers this is the fall line); and includes subdivisions 1, 2, 3, 4, 5, and 6 of 9VAC25-260-390, subdivisions 1, 1b, 1d, 1f and 1o of 9VAC25-260-410, subdivisions 5 and 5a of 9VAC25-260-415, subdivisions 1 and 1a of 9VAC25-260-440, subdivisions 2, 3, 3a, 3b and 3e of 9VAC25-260-520, and subdivision 1 of 9VAC25-260-530. This definition does not include free flowing sections of these waters.

"Criteria" means elements of the board's water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.

"Designated uses" means those uses specified in water quality standards for each water body or segment whether or not they are being attained.

"Drifting organisms" means planktonic organisms that are dependent on the current of the water for movement.

"Epilimnion" means the upper layer of nearly uniform temperature in a thermally stratified man-made lake or reservoir listed in 9VAC25-260-187 B.

"Existing uses" means those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.

"Lacustrine" means the zone within a lake or reservoir that corresponds to nonflowing lake-like conditions such as those near the dam. The other two zones within a reservoir are riverine (flowing, river-like conditions) and transitional (transition from river to lake conditions).

"Man-made lake or reservoir" means a constructed impoundment.

"Mixing zone" means a limited area or volume of water where initial dilution of a discharge takes place and where numeric water quality criteria can be exceeded but designated uses in the water body on the whole are maintained and lethality is prevented.

"Natural lake" means an impoundment that is natural in origin. There are two natural lakes in Virginia: Mountain Lake in Giles County and Lake Drummond located within the boundaries of Chesapeake and Suffolk in the Great Dismal Swamp.

"Passing organisms" means free swimming organisms that move with a mean velocity at least equal to the ambient current in any direction.

"Primary contact recreation" means any water-based form of recreation, the practice of which has a high probability for total body immersion or ingestion of water (examples include but are not limited to swimming, water skiing, canoeing and kayaking).

"Pycnocline" means the portion of the water column where density changes rapidly because of salinity and/or temperature. In an estuary the pycnocline is the zone separating deep, cooler more saline waters from the less saline, warmer surface waters. The upper and lower boundaries of a pycnocline are measured as a change in density per unit of depth that is greater than twice the change of the overall average for the total water column.

"Secondary contact recreation" means a water-based form of recreation, the practice of which has a low probability for total body immersion or ingestion of waters (examples include but are not limited to wading, boating and fishing).

"Swamp waters" means waters with naturally occurring low pH and low dissolved oxygen caused by: (i) low flow velocity that prevents mixing and reaeration of stagnant, shallow waters and (ii) decomposition of vegetation that lowers dissolved oxygen concentrations and causes tannic acids to color the water and lower the pH.

"Use attainability analysis" means a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in 9VAC25-260-10 H.

"Water quality standards" means provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (§ 62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC § 1251 et seq.).

<u>"Wetlands" means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.</u>

9VAC25-260-50. Numerical criteria for dissolved oxygen, pH, and maximum temperature.***

CLASS	DESCRIPTION OF WATERS	DISSOLVED OXYGEN (mg/l)****		pH****	Max. Temp. (°C)
		Min.	Daily Avg.		
I	Open Ocean	5.0	--	6.0-9.0	--
II	Estuarine Waters (Tidal Water-Coastal Zone to Fall Line)	4.0	5.0	6.0-9.0	--
III	Nontidal Waters (Coastal and Piedmont Zones)	4.0	5.0	6.0-9.0	32
IV	Mountainous Zones Waters	4.0	5.0	6.0-9.0	31
V	Stockable Trout Waters	5.0	6.0	6.0-9.0	21
VI	Natural Trout Waters	6.0	7.0	6.0-9.0	20
VII	Swamp Waters	*	*	3.7-8.0*	**

*This classification recognizes that the natural quality of these waters may fluctuate outside of the values for D.O. and pH set forth above as water quality criteria in Class I through VI waters. The natural quality of these waters is the water quality found or expected in the absence of human-induced pollution. Water quality standards will not be considered violated when conditions are determined by the board to be natural and not due to human-induced sources. The board may develop site specific criteria for Class VII waters that reflect the natural quality of the waterbody when the evidence is sufficient to demonstrate that the site specific criteria rather than narrative criterion will fully protect aquatic life uses. Virginia Pollutant Discharge Elimination System limitations in Class VII waters shall not cause significant changes to the naturally occurring dissolved oxygen and pH fluctuations in these waters.

**Maximum temperature will be the same as that for Classes I through VI waters as appropriate.

***The water quality criteria in this section do not apply below the lowest flow averaged (arithmetic mean) over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years (a climatic year begins April 1 and ends March 31). See 9VAC25-260-310 and 9VAC25-260-380 through 9VAC25-260-540 for site specific adjustments to these criteria.

****For a thermally stratified man-made lake or reservoir in Class III, IV, V or VI waters that are listed in 9VAC25-260-187, these dissolved oxygen and pH criteria apply only to the epilimnion of the water body. When these waters are not stratified, the dissolved oxygen and pH criteria apply throughout the water column.

9VAC25-260-140. Criteria for surface water.

A. Instream water quality conditions shall not be acutely[1] or chronically[2] toxic except as allowed in 9VAC25-260-20 B (mixing zones). The following are definitions of acute and chronic toxicity conditions:

"Acute toxicity" means an adverse effect that usually occurs shortly after exposure to a pollutant. Lethality to an organism is the usual measure of acute toxicity. Where death is not easily detected, immobilization is considered equivalent to death.

"Chronic toxicity" means an adverse effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a pollutant. This includes low level, long-term effects such as reduction in growth or reproduction.

B. The following table is a list of numerical water quality criteria for specific parameters.

Table of Parameters [6, 7]

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply[3]	All Other Surface Waters[4]
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]		
Acenapthene (µg/l) 83329					670	990
Acrolein (µg/l) 107028	3.0	3.0			6.1	9.3
Acrylonitrile (µg/l) 107131 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.					0.51	2.5
Aldrin (µg/l) 309002 Known or suspected carcinogen; human health criteria at risk level 10^{-5}.	3.0		1.3		0.00049	0.00050
Ammonia (µg/l) 766-41-7 Chronic criterion is a 30-day average concentration not to be exceeded more than once every three (3) years on the average.(see 9VAC25-260-155)						
Anthracene (µg/l) 120127					8,300	40,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply[3]	All Other Surface Waters[4]
	Acute[1]	Chronic[2]	Acute[1]	Chronic[2]		
Copper (µg/l)[5] 7440508 Freshwater values are a function of total hardness as calcium carbonate $CaCO_3$ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion (µg/l) WER [$e^{\{0.9422[\ln(\text{hardness})]-1.700\}}$] ($CF_a$) Freshwater chronic criterion (µg/l) WER [$e^{\{0.8545[\ln(\text{hardness})]-1.702\}}$] ($CF_c$) WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F. e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF_a = 0.960 CF_c = 0.960 <u>Alternate Copper Criteria in Freshwater: The freshwater criteria for copper can also be calculated using the EPA 2007 Biotic Ligand Model (See 9VAC 25-260-140.G)</u> Acute saltwater criterion is a 24-hour average not to be exceeded more than once every three years on the average.	13 $CaCO_3$ = 100	9.0 $CaCO_3$ = 100	9.3 X WER	6.0 X WER	1,300	
Cyanide, Free (µg/l) 57125	22	5.2	1.0	1.0	~~140~~ <u>4.2</u>	~~16,000~~ <u>480</u>

[4]Criteria have been calculated to protect human health from toxic effects through fish consumption, unless otherwise noted and apply in all other surface waters not designated as PWS in 9VAC25-260-390-540.

[5]Acute and chronic saltwater and freshwater aquatic life criteria apply to the biologically available form of the metal and apply as a function of the pollutant's water effect ratio (WER) as defined in 9VAC25-260-140 F (WER X criterion). Metals measured as dissolved shall be considered to be biologically available, or, because local receiving water characteristics may otherwise affect the biological availability of the metal, the biologically available equivalent measurement of the metal can be further defined by determining a Water Effect Ratio (WER) and multiplying the numerical value shown in 9VAC25-260-140 B by the WER. Refer to 9VAC25-260-140 F. Values displayed above in the table are examples and correspond to a WER of 1.0. Metals criteria have been adjusted to convert the total recoverable fraction to dissolved fraction using a conversion factor. Criteria that change with hardness have the conversion factor listed in the table above.

[6]The flows listed below are default design flows for calculating steady state waste load allocations unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

Aquatic Life:

Acute criteria	1Q10
Chronic criteria	7Q10
Chronic criteria (ammonia)	30Q10
Human Health:	
Noncarcinogens	30Q5
Carcinogens	Harmonic mean

The following are defined for this section:

"1Q10" means the lowest flow averaged over a period of one day which on a statistical basis can be expected to occur once every 10 climatic years.

"7Q10" means the lowest flow averaged over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years.

"30Q5" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every five climatic years.

"30Q10" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every 10 climatic years.

"Averaged" means an arithmetic mean.

"Climatic year" means a year beginning on April 1 and ending on March 31.

[7]The criteria listed in this table are two significant digits. For other criteria that are referenced to other sections of this regulation in this table, all numbers listed as criteria values are significant.

[8]The fish tissue criterion for methylmercury applies to a concentration of 0.30 mg/kg as wet weight in edible tissue for species of fish and/or shellfish resident in a waterbody that are commonly eaten in the area and have commercial, recreational, or subsistence value.

C. Application of freshwater and saltwater numerical criteria. The numerical water quality criteria listed in subsection B of this section (excluding dissolved oxygen, pH, temperature) shall

be applied according to the following classes of waters (see 9VAC25-260-50) and boundary designations:

CLASS OF WATERS	NUMERICAL CRITERIA
I and II (Estuarine Waters)	Saltwater criteria apply
II (Transition Zone)	More stringent of either the freshwater or saltwater criteria apply
II (Tidal Freshwater), III, IV, V, VI and VII	Freshwater criteria apply

The following describes the boundary designations for Class II, (estuarine, transition zone and tidal freshwater waters) by river basin:

1. Rappahannock Basin. Tidal freshwater is from the fall line of the Rappahannock River to the upstream boundary of the transition zone including all tidal tributaries that enter the tidal freshwater Rappahannock River.

Transition zone upstream boundary – 38° 4' 56.59"/-76° 58' 47.93" (430 feet east of Hutchinson Swamp) to 38° 5' 23.33"/-76° 58' 24.39" (0.7 miles upstream of Peedee Creek).

Transition zone downstream boundary - 37° 58' 45.80"/-76° 55' 28.75" (1,000 feet downstream of Jenkins Landing) to 37° 59' 20.07/ -76° 53' 45.09" (0.33 miles upstream of Mulberry Point). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream boundary of the transition zone to the mouth of the Rappahannock River (Buoy 6), including all tidal tributaries that enter the estuarine waters of the Rappahannock River.

2. York Basin. Tidal freshwater is from the fall line of the Mattaponi River at N37° 47' 20.03"/W77° 6' 15.16" (800 feet upstream of the Route 360 bridge in Aylett) to the upstream boundary of the Mattaponi River transition zone, and from the fall line of the Pamunkey River at N37° 41' 22.64" /W77° 12' 50.83" (2,000 feet upstream of Totopotomy Creek) to the upstream boundary of the Pamunkey River transition zone, including all tidal tributaries that enter the tidal freshwaters of the Mattaponi and Pamunkey Rivers.

Mattaponni River transition zone upstream boundary – N37° 39' 29.65"/W76° 52' 53.29" (1,000 feet upstream of Mitchell Hill Creek) to N37° 39' 24.20"/W76° 52' 55.87" (across from Courthouse Landing). Mattaponi River transition zone downstream boundary – N37° 32' 19.76"/W76° 47' 29.41" (old Lord Delaware Bridge, west side) to N37° 32' 13.25"/W76° 47' 10.30" (old Lord Delaware Bridge, east side).

Pamunkey River transition zone upstream boundary – N37° 32' 36.63"/W76° 58' 29.88" (Cohoke Marsh, 0.9 miles upstream of Turkey Creek) to N37° 32' 36.51"/W76° 58' 36.48" (0.75 miles upstream of creek at Cook Landing). Pamunkey River transition zone downstream boundary – N37° 31' 57.90"/ 76° 48' 38.22" (old Eltham Bridge, west side) to N37° 32' 6.25"/W76 48' 18.82" (old Eltham Bridge, east side).

All tidal tributaries that enter the transition zones of the Mattaponi and Pamunkey Rivers are themselves in the transition zone.

Estuarine waters are from the downstream boundary of the transition zones of the Mattaponi and Pamunkey Rivers to the mouth of the York River (Tue Marsh Light) including all tidal tributaries that enter the estuarine waters of the York River.

3. James Basin. Tidal Freshwater is from the fall line of the James River in the City of Richmond upstream of Mayo Bridge to the upstream boundary of the transition zone, including all tidal tributaries that enter the tidal freshwater James River.

James River transition zone upstream boundary – N37° 14' 28.25"/W76° 56' 44.47" (at Tettington) to N37° 13' 38.56"/W76° 56' 47.13" 0.3 miles downstream of Sloop Point.

Chickahominy River transition zone upstream boundary – N37° 25' 44.79"/W77° 1' 41.76" (Holly Landing).

Transition zone downstream boundary – N37° 12' 7.23/W76° 37' 34.70" (near Carters Grove Home, 1.25 miles downstream of Grove Creek) to N37° 9' 17.23/W76° 40' 13.45" (0.7 miles upstream of Hunnicutt Creek). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream transition zone boundary to the mouth of the James River (Buoy 25) including all tidal tributaries that enter the estuarine waters of the James River.

4. Potomac Basin. Tidal Freshwater includes all tidal tributaries that enter the Potomac River from its fall line at the Chain Bridge (N38° 55' 46.28"/W77° 6' 59.23") to the upstream transition zone boundary near Quantico, Virginia.

Transition zone includes all tidal tributaries that enter the Potomac River from N38° 31' 27.05"/W77° 17' 7.06" (midway between Shipping Point and Quantico Pier) to N38° 23' 22.78"/W77° 1' 45.50" (one mile southeast of Mathias Point).

Estuarine waters includes all tidal tributaries that enter the Potomac River from the downstream transition zone boundary to the mouth of the Potomac River (Buoy 44B).

5. Chesapeake Bay, Atlantic Ocean, and small coastal basins. Estuarine waters include the Atlantic Ocean tidal tributaries, and the Chesapeake Bay and its small coastal basins from the Virginia state line to the mouth of the bay (a line from Cape Henry drawn through Buoys 3 and 8 to Fishermans Island), and its tidal tributaries, excluding the Potomac tributaries and those tributaries listed above.

6. Chowan River Basin. Tidal freshwater includes the Northwest River and its tidal tributaries from the Virginia-North Carolina state line to the free flowing portion, the Blackwater River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately state route 611 at river mile 20.90, the Nottoway River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately Route 674, and the North Landing River and its tidal tributaries from the Virginia-North Carolina state line to the Great Bridge Lock.

Transition zone includes Back Bay and its tributaries in the City of Virginia Beach to the Virginia-North Carolina state line.

D. Site-specific modifications to numerical water quality criteria.

1. The board may consider site-specific modifications to numerical water quality criteria in subsection B of this section where the applicant or permittee demonstrates that the alternate numerical water quality criteria are sufficient to protect all designated uses (see 9VAC25-260-10) of that particular surface water segment or body.

2. Any demonstration for site-specific human health criteria shall be restricted to a reevaluation of the bioconcentration or bioaccumulation properties of the pollutant. The

exceptions to this restriction are for site-specific criteria for taste, odor, and aesthetic compounds noted by double asterisks in subsection B of this section and nitrates.

3. Procedures for promulgation and review of site-specific modifications to numerical water quality criteria resulting from subdivisions 1 and 2 of this subsection.

a. Proposals describing the details of the site-specific study shall be submitted to the board's staff for approval prior to commencing the study.

b. Any site-specific modification shall be promulgated as a regulation in accordance with the Administrative Process Act. All site-specific modifications shall be listed in 9VAC25-260-310 (Special standards and requirements).

E. Variances to water quality standards.

1. A variance from numeric criteria may be granted to a discharger if it can be demonstrated that one or more of the conditions in 9VAC25-260-10 H limit the attainment of one or more specific designated uses.

a. Variances shall apply only to the discharger to whom they are granted and shall be reevaluated and either continued, modified or revoked at the time of permit issuance. At that time the permittee shall make a showing that the conditions for granting the variance still apply.

b. Variances shall be described in the public notice published for the permit. The decision to approve a variance shall be subject to the public participation requirements of the Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation, 9VAC25-31 (Permit Regulation).

c. Variances shall not prevent the maintenance and protection of existing uses or exempt the discharger or regulated activity from compliance with other appropriate technology or water quality-based limits or best management practices.

d. Variances granted under this section shall not apply to new discharges.

e. Variances shall be submitted by the department's Division of Scientific Research or its successors to the Environmental Protection Agency for review and approval/disapproval.

f. A list of variances granted shall be maintained by the department's Division of Scientific Research or its successors.

2. None of the variances in this subsection shall apply to the halogen ban section (9VAC25-260-110) or temperature criteria in 9VAC25-260-50 if superseded by § 316(a) of the Clean Water Act requirements. No variances in this subsection shall apply to the criteria that are designed to protect human health from carcinogenic and noncarcinogenic toxic effects (subsection B of this section) with the exception of the metals, and the taste, odor, and aesthetic compounds noted by double asterisks and nitrates, listed in subsection B of this section.

F. Water effect ratio.

1. A water effects ratio (WER) shall be determined by measuring the effect of receiving water (as it is or will be affected by any discharges) on the bioavailability or toxicity of a metal by using standard test organisms and a metal to conduct toxicity tests simultaneously in receiving water and laboratory water. The ratio of toxicities of the metal(s) in the two waters is the WER (toxicity in receiving water divided by toxicity in laboratory water = WER). Once an acceptable WER for a metal is established, the numerical value for the metal in subsection B of this section is multiplied by the WER to

produce an instream concentration that will protect designated uses. This instream concentration shall be utilized in permitting decisions.

2. The WER shall be assigned a value of 1.0 unless the applicant or permittee demonstrates to the department's satisfaction in a permit proceeding that another value is appropriate, or unless available data allow the department to compute a WER for the receiving waters. The applicant or permittee is responsible for proposing and conducting the study to develop a WER. The study may require multiple testing over several seasons. The applicant or permittee shall obtain the department's Division of Scientific Research or its successor approval of the study protocol and the final WER.

3. The Permit Regulation at 9VAC25-31-230 C requires that permit limits for metals be expressed as total recoverable measurements. To that end, the study used to establish the WER may be based on total recoverable measurements of the metals.

4. ~~The Environmental Protection Agency views the WER in any particular case as a site-specific criterion. Therefore, the department's Division of Scientific Research or its successor shall submit the results of the study to the Environmental Protection Agency for review and approval/disapproval within 30 days of the receipt of certification from the state's Office of the Attorney General. Nonetheless, the~~ The WER is established in a permit proceeding, shall be described in the public notice associated with the permit proceeding, and applies only to the applicant or permittee in that proceeding. The department's action to approve or disapprove a WER is a case decision, not an amendment to the present regulation.

The decision to approve or disapprove a WER shall be subject to the public participation requirements of the Permit Regulation, 9VAC25-31-260 et seq. A list of final WERs will be maintained by the department's Division of Scientific Research or its successor.

5. A WER shall not be used for the freshwater and saltwater chronic mercury criteria or the freshwater acute and chronic selenium criteria.

G. Biotic Ligand Model (BLM) for copper.

1. On a case by case basis, EPA's 2007 copper criteria (EPA-822-F-07-001) biotic ligand model (BLM) for copper may be used to determine alternate copper criteria for freshwater sites. The BLM is a bioavailability model that uses receiving water characteristics to develop site-specific criteria. Site-specific data for ten parameters are needed to use the BLM. These parameters are; temperature, pH, dissolved organic carbon, calcium, magnesium, sodium, potassium, sulfate, chloride and alkalinity. If sufficient data for these parameters are available, the BLM can be used to calculate alternate criteria values for the copper criteria. The BLM would be used instead of the hardness based criteria and a takes the place of the hardness adjustment and the WER. A WER will not be applicable with the BLM.

[2]The default design flow for calculating steady state waste load allocations for the chronic ammonia criterion for freshwater is the 30Q10 (see 9VAC25-260-140 B footnote 10) unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

exception to this requirement is in measuring attainment of the SAV and water clarity acres, which are compared directly to the criteria.

9VAC25-260-187. Criteria for man-made lakes and reservoirs to protect aquatic life and recreational designated uses from the impacts of nutrients.

A. The criteria in subsection B of this section apply to the man-made lakes and reservoirs listed in this section. Additional man-made lakes and reservoirs may be added as new reservoirs are constructed or monitoring data become available from outside groups or future agency monitoring.

B. Whether or not algicide treatments are used, the chlorophyll a criteria apply to all waters on the list. The total phosphorus criteria apply only if a specific man-made lake or reservoir received algicide treatment during the monitoring and assessment period of April 1 through October 31.

The 90th percentile of the chlorophyll a data collected at one meter or less within the lacustrine portion of the man-made lake or reservoir between April 1 and October 31 shall not exceed the chlorophyll a criterion for that water body in each of the two most recent monitoring years that chlorophyll a data are available. For a water body that received algicide treatment, the median of the total phosphorus data collected at one meter or less within the lacustrine portion of the man-made lake or reservoir between April 1 and October 31 shall not exceed the total phosphorus criterion in each of the two most recent monitoring years that total phosphorus data are available.

Monitoring data used for assessment shall be from sampling location(s) within the lacustrine portion where observations are evenly distributed over the seven months from April 1 through October 31 and are in locations that are representative, either individually or collectively, of the condition of the man-made lake or reservoir.

Man-made Lake or Reservoir Name	Location	Chlorophyll a (µg/L)	Total Phosphorus (µg/L)
~~Able~~ Abel Lake	Stafford County	35	40
Airfield Pond	Sussex County	35	40
Amelia Lake	Amelia County	35	40
Aquia Reservoir (Smith Lake)	Stafford County	35	40
Bark Camp Lake (Corder Bottom Lake, Lee/Scott/Wise Lake)	Scott County	35	40
Beaver Creek Reservoir	Albemarle County	35	40
Beaverdam Creek Reservoir (Beaverdam Reservoir)	Bedford County	35	40
Beaverdam Reservoir	Loudoun County	35	40
Bedford Reservoir (Stony Creek Reservoir)	Bedford County	35	40
Big Cherry Lake	Wise County	35	40
Breckenridge Reservoir	Prince William County	35	40
Briery Creek Lake	Prince Edward County	35	40
Brunswick Lake (County Pond)	Brunswick County	35	40

Burke Lake	Fairfax County	60	40
Carvin Cove Reservoir	Botetourt County	35	40
Cherrystone Reservoir	Pittsylvania County	35	40
Chickahominy Lake	Charles City County	35	40
Chris Green Lake	Albemarle County	35	40
Claytor Lake	Pulaski County	25	20
Clifton Forge Reservoir (Smith Creek Reservoir)	Alleghany County	35	20
Coles Run Reservoir	Augusta County	10	10
Curtis Lake	Stafford County	60	40
Diascund Creek Reservoir	New Kent County	35	40
Douthat Lake	Bath County	25	20
Elkhorn Lake	Augusta County	10	10
Emporia Lake (Meherrin Reservoir)	Greensville County	35	40
Fairystone Lake	Henry County	35	40
Falling Creek Reservoir	Chesterfield County	35	40
Fluvanna Ruritan Lake	Fluvanna County	60	40
Fort Pickett Reservoir	Nottoway/ Brunswick County	35	40
Gatewood Reservoir	Pulaski County	35	40
Georges Creek Reservoir	Pittsylvania County	35	40
Goose Creek Reservoir	Loudoun County	35	40
Graham Creek Reservoir	Amherst County	35	40
Great Creek Reservoir	Lawrenceville	35	40
Harrison Lake	Charles City County	35	40
Harwood Mills Reservoir	York County	60	40
Hidden Valley Lake	Washington County	35	40
Hogan Lake	Pulaski County	35	40
Holiday Lake	Appomattox County	35	40
Hungry Mother Lake	Smyth County	35	40
Hunting Run Reservoir	Spotsylvania County	35	40
J. W. Flannagan Reservoir	Dickenson County	25	20

Kerr Reservoir, Virginia portion (Buggs Island Lake)	Halifax County	25	30
Keysville Reservoir	Charlotte County	35	40
Lake Albemarle	Albemarle County	35	40
Lake Anna	Louisa County	25	30
Lake Arrowhead	Page County	35	40
Lake Burnt Mills	Isle of Wight County	60	40
Lake Chesdin	Chesterfield County	35	40
Lake Cohoon	Suffolk City	60	40
Lake Conner	Halifax County	35	40
Lake Frederick	Frederick County	35	40
Lake Gaston, (Virginia portion)	Brunswick County	25	30
Lake Gordon	Mecklenburg County	35	40
Lake Keokee	Lee County	35	40
Lake Kilby	Suffolk City	60	40
Lake Lawson	Virginia Beach City	60	40
Lake Manassas	Prince William County	35	40
Lake Meade	Suffolk City	60	40
Lake Moomaw	Bath County	10	10
Lake Nelson	Nelson County	60	40
Lake Nottoway (Lee Lake, Nottoway Lake)	Nottoway County	35	40
Lake Orange	Orange County	60	40
Lake Pelham	Culpeper County	35	40
Lake Prince	Suffolk City	60	40
Lake Robertson	Rockbridge County	35	40
Lake Smith	Virginia Beach City	60	40
Lake Whitehurst	Norfolk City	60	40
Lake Wright	Norfolk City	60	40
Lakeview Reservoir	Chesterfield County	35	40
Laurel Bed Lake	Russell County	35	40
Lee Hall Reservoir (Newport News	Newport News City	60	40

Reservoir)			
Leesville Reservoir	Bedford County	25	30
Little Creek Reservoir	Virginia Beach City	60	40
Little Creek Reservoir	James City County	25	30
Little River Reservoir	Montgomery County	35	40
Lone Star Lake F (Crystal Lake)	Suffolk City	60	40
Lone Star Lake G (Crane Lake)	Suffolk City	60	40
Lone Star Lake I (Butler Lake)	Suffolk City	60	40
Lunga Reservoir	Prince William County	35	40
Lunenburg Beach Lake (Victoria Lake)	Town of Victoria	35	40
Martinsville Reservoir (Beaver Creek Reservoir)	Henry County	35	40
Mill Creek Reservoir	Amherst County	35	40
Modest Creek Reservoir	Town of Victoria	35	40
Motts Run Reservoir	Spotsylvania County	25	30
Mount Jackson Reservoir	Shenandoah County	35	40
Mountain Run Lake	Culpeper County	35	40
Ni Reservoir	Spotsylvania County	35	40
North Fork Pound Reservoir	Wise County	35	40
Northeast Creek Reservoir	Louisa County	35	40
Occoquan Reservoir	Fairfax County	35	40
Pedlar Lake	Amherst County	25	20
Philpott Reservoir	Henry County	25	30
Phelps Creek Reservoir (Brookneal Reservoir)	Campbell County	35	40
Powhatan Lakes (Upper and Lower)	Powhatan County	35	40
Ragged Mountain Reservoir	Albemarle County	35	40
Rivanna Reservoir (South Fork Rivanna Reservoir)	Albemarle County	35	40
Roaring Fork	Pittsylvania County	35	40

Rural Retreat Lake	Wythe County	35	40
Sandy River Reservoir	Prince Edward County	35	40
Shenandoah Lake	Rockingham County	35	40
Silver Lake	Rockingham County	35	40
Smith Mountain Lake	Bedford County	25	30
South Holston Reservoir	Washington County	25	20
Speights Run Lake	Suffolk City	60	40
Spring Hollow Reservoir	Roanoke County	25	20
Staunton Dam Lake	Augusta County	35	40
Stonehouse Creek Reservoir	Amherst County	60	40
Strasburg Reservoir	Shenandoah County	35	40
Stumpy Lake	Virginia Beach	60	40
Sugar Hollow Reservoir	Albemarle County	25	20
Swift Creek Lake	Chesterfield County	35	40
Swift Creek Reservoir	Chesterfield County	35	40
Switzer Lake	Rockingham County	10	10
Talbott Reservoir	Patrick County	35	40
Thrashers Creek Reservoir	Amherst County	35	40
Totier Creek Reservoir	Albemarle County	35	40
Townes Reservoir	Patrick County	25	20
Troublesome Creek Reservoir	Bucking-ham County	35	40
Waller Mill Reservoir	York County	25	30
Western Branch Reservoir	Suffolk City	25	20
Wise Reservoir	Wise County	25	20

C. When the board determines that the applicable criteria in subsection B of this section for a specific man-made lake or reservoir are exceeded, the board shall consult with the Department of Game and Inland Fisheries regarding the status of the fishery in determining whether or not the designated use for that water body is being attained. If the designated use of the subject water body is not being attained, the board shall assess the water body as impaired in accordance with § 62.1-44.19:5 of the Code of Virginia. If the designated use is being attained, the board shall assess

the water body as impaired in accordance with § 62.1-44.19:5 of the Code of Virginia until site-specific criteria are adopted and become effective for that water body.

D. If the nutrient criteria specified for a man-made lake or reservoir in subsection B of this section do not provide for the attainment and maintenance of the water quality standards of downstream waters as required in 9VAC25-260-10 C, the nutrient criteria herein may be modified on a site-specific basis to protect the water quality standards of downstream waters.

9VAC25-260-310. Special standards and requirements.

The special standards are shown in small letters to correspond to lettering in the basin tables. The special standards are as follows:

a. Shellfish waters. In all open ocean or estuarine waters capable of propagating shellfish or in specific areas where public or leased private shellfish beds are present, including those waters on which condemnation classifications are established by the State Department of Health, the following criteria for fecal coliform bacteria will apply:

The geometric mean fecal coliform value for a sampling station shall not exceed an MPN (most probable number) or MF (membrane filtration using mTEC culture media) of 14 per 100 milliliters (ml) of sample and the estimated 90th percentile shall not exceed an MPN of 43 per 100 ml for a 5-tube decimal dilution test or an MPN of 49 per 100 ml for a 3-tube decimal dilution test or MF test of 31 CFU (colony forming units) per 100 ml.

The shellfish area is not to be so contaminated by radionuclides, pesticides, herbicides, or fecal material that the consumption of shellfish might be hazardous.

b. Policy for the Potomac Embayments. At its meeting on September 12, 1996, the board adopted a policy (9VAC25-415. Policy for the Potomac Embayments) to control point source discharges of conventional pollutants into the Virginia embayment waters of the Potomac River, and their tributaries, from the fall line at Chain Bridge in Arlington County to the Route 301 bridge in King George County. The policy sets effluent limits for BOD_5, total suspended solids, phosphorus, and ammonia, to protect the water quality of these high profile waterbodies.

c. Cancelled.

d. Cancelled.

e. Cancelled.

f. Cancelled.

g. Occoquan watershed policy. At its meeting on July 26, 1971 (Minute 10), the board adopted a comprehensive pollution abatement and water quality management policy for the Occoquan watershed. The policy set stringent treatment and discharge requirements in order to improve and protect water quality, particularly since the waters are an important water supply for Northern Virginia. Following a public hearing on November 20, 1980, the board, at its December 10-12, 1980 meeting, adopted as of February 1, 1981, revisions to this policy (Minute 20). These revisions became effective March 4, 1981. Additional amendments were made following a public hearing on August 22, 1990, and adopted by the board at its September 24, 1990, meeting (Minute 24) and became effective on December 5, 1990. Copies are available upon request from the Department of Environmental Quality.

h. Cancelled.

i. Cancelled.

j. Cancelled.

k. Cancelled.

l. Cancelled.

m. The following effluent limitations apply to wastewater treatment facilities <u>treating an organic nutrient source</u> in the entire Chickahominy watershed above Walker's Dam (this excludes

discharges consisting solely of stormwater):

CONSTITUENT	CONCENTRATION
1. Biochemical Oxygen demand 5-day	6 mg/l monthly average, with not more than 5% of individual samples to exceed 8 mg/l
2. Settleable Solids	Not to exceed 0.1 ml/l monthly average
3. Suspended Solids	5.0 mg/l monthly average, with not more than 5% of individual samples to exceed 7.5 mg/l
4. Ammonia Nitrogen	Not to exceed 2.0 mg/l monthly average as N
5. Total Phosphorus	Not to exceed 0.10 mg/l monthly average for all discharges with the exception of Tyson Foods, Inc. which shall meet 0.30 mg/l monthly average and 0.50 mg/l daily maximum.
6. Other Physical and Chemical Constituents	Other physical or chemical constituents not specifically mentioned will be covered by additional specifications as conditions detrimental to the stream arise. The specific mention of items 1 through 5 does not necessarily mean that the addition of other physical or chemical constituents will be condoned.

n. No sewage discharges, regardless of degree of treatment, should be allowed into the James River between Bosher and Williams Island Dams.

o. The concentration and total amount of impurities in Tuckahoe Creek and its tributaries of sewage origin shall be limited to those amounts from sewage, industrial wastes, and other wastes which are now present in the stream from natural sources and from existing discharges in the watershed.

p. Cancelled.

q. Cancelled.

r. Cancelled.

s. Cancelled.

t. Cancelled.

u. Maximum temperature for the New River Basin from West Virginia state line upstream to the Giles-Montgomery County line:

The maximum temperature shall be 27°C (81°F) unless caused by natural conditions; the maximum rise above natural temperatures shall not exceed 2.8°C (5°F).

This maximum temperature limit of 81°F was established in the 1970 water quality standards amendments so that Virginia temperature criteria for the New River would be consistent with those of West Virginia, since the stream flows into that state.

Appendix E

Scott's Mill Dissolved Oxygen Sampling

JAMES RIVER DO SAMPLING:

Riverbank DO sampling, 9/9/16, sunny, 90 degrees F, no rain within 4 days									
	Site	**DO (%)**	**DO (mg/L)**	**Temp (°C)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Location/Notes**	**Latitude**	**Longitude**
Upstream	001	130.4	9.63	31.5	752.8	0.6	10m u/s of Reusen's Dam (SW side)	37 27 47.6 N	-79 11 13.5 W
	002	96.0	7.58	27.5	753.6	0.5	100m d/s of Reusen's Dam, 5,900m u/s of Scotts Mill Dam (SW side)	37 27 43.9 N	-79 11 12.0 W
	003	84.2	6.43	29.3	753.3	0.3	1,500m u/s of Scott's Mill Dam (NE side)	37 26 10.2 N	-79 08 53.8 W
	004	104.1	7.97	29.2	753.3	0.3	1,100m u/s of Scott's Mill Dam, at Red and Dot's boat ramp (NE side)	37 26 02.1 N	-79 08 42.3 W
	005	99.7	7.58	29.7	753.1	0.3	300m u/s of Scott's Mill Dam (NE side)	37 25 37.2 N	-79 08 26.4 W
	006	94.9	7.37	29.5	752.8	0.3	5m u/s of Scott's Mill Dam straight section (NE side)	37 25 29.4 N	-79 08 23.6 W
	011	*96.9*	*7.51*	*28.7*	*752.6*	*0.3*	*50m u/s of Scott's Mill Dam arch section (SW side)*	*37 25 27.7 N*	*-79 08 35.0 W*
	007	98.2	7.69	28.0	753.4	0.3	15m d/s of Scott's Mill Dam straight section (NE side)	37 25 28.5 N	-79 08 23.4 W
	008	102.9	8.06	27.9	753.3	0.3	390m d/s of Scott's Mill Dam, across from Griffin Pipe (NE side)	37 25 15.8 N	-79 08 19.9 W
	009	103.6	8.11	28.0	753.2	0.3	990m d/s of Scott's Mill Dam, at Riverside Park boat ramp (NE side, d/s of Blackwater Creek)	37 24 57.9 N	-79 08 12.8 W
Downstream	010	102.8	8.06	27.9	753.1	0.3	670m d/s of Scotts Mill Dam, Griffin Pipe boat ramp (SW side, u/s of Blackwater Creek)	37 25 06.2 N	-79 08 22.2 W

Deployed DO Meter 50m u/s of Scott's Mill Dam Arch Section, 9/9/16-9/10/16, site 012, Beginning at 16:24pm, No Rain Within 4 days							
Meter Time	**Actual Time**	**DO (%)**	**DO (mg/L)**	**Temp (°C)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
0:37	17:01	100.9	7.91	27.9	753.1	0.3	16:24
1:37	18:01	99.6	7.81	27.9	752.9	0.3	6pm, 9/9/16
2:37	19:01	99.0	7.76	27.9	752.9	0.3	
3:37	20:01	96.5	7.58	27.8	752.8	0.3	8pm
4:37	21:01	95.1	7.47	27.8	753.2	0.3	
5:37	22:01	94.1	7.40	27.7	753.2	0.3	10pm
6:37	23:01	92.0	7.24	27.7	753.9	0.3	
7:37	0:01	89.8	7.08	27.6	754.3	0.3	12 midnight, 9/9/16
8:37	1:01	88.7	6.99	27.6	754.9	0.3	
9:37	2:01	86.0	6.78	27.6	755.5	0.3	2am, 9/10/16
10:37	3:01	**83.9**	**6.63**	27.5	755.9	0.3	
11:37	4:01	89.8	7.08	27.6	756.2	0.3	4am
12:37	5:01	91.8	7.22	27.8	756.1	0.3	
13:37	6:01	95.8	7.51	27.9	755.8	0.3	6am
14:37	7:01	97.5	7.63	28.0	755.6	0.3	
15:37	8:01	108.0	8.43	28.2	755.4	0.3	8am
16:37	9:01	**114.9**	**8.96**	28.2	755.0	0.3	
17:37	10:01	113.2	8.81	28.3	754.9	0.3	10am
18:37	11:01	109.2	8.53	28.1	755.2	0.3	
19:37	12:01	102.2	8.00	28.0	755.9	0.3	12 noon, 9/10/16
20:37	13:01	98.8	7.75	27.9	756.8	0.3	
21:37	14:01	95.3	7.49	27.8	757.3	0.3	2pm
Average		97.4	7.64	27.9	754.9		

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Cross-Section 1	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
Left Riverbank (Amherst/NE side)	96.4	7.69	26.9	757.9	1	1m of cable deployed, 50m u/s of bouys, 10s logging interval
↓	91.0	7.27	26.9	757.9	1	
	100.4	7.91	27.6	757.9	1	
	107.2	8.35	28.3	757.9	1	
	107.1	8.34	28.3	758.0	1	
	106.8	8.32	28.3	758.0	1	
	106.7	8.31	28.3	758.0	1	
	106.7	8.30	28.4	758.0	1	
	107.1	8.32	28.4	757.9	1	
	107.2	8.34	28.4	758.0	1	
	107.2	8.33	28.4	758.0	1	
	107.7	8.37	28.4	757.9	1	
	108.0	8.40	28.4	758.0	1	
	108.0	8.40	28.4	758.0	1	
	107.6	8.38	28.3	758.0	1	
	107.9	8.40	28.3	758.0	1	
Daniel Island	108.4	8.46	28.2	757.9	1	
Average	105.4	8.23	28.1	758.0		

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Cross-Section 2	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
Left Riverbank (Amherst/NE side)	94.3	7.56	26.7	758.0	2	2m of cable deployed, 50m u/s of bouys, 10s logging interval
	94.4	7.51	27.1	757.9	2	
	91.7	7.31	27.0	758.0	2	
	85.8	6.87	26.7	758.0	2	
	98.5	7.84	27.1	758.0	2	
	101.8	8.08	27.2	757.9	2	
	99.7	7.93	27.1	758.0	2	
	102.4	8.10	27.4	758.0	2	
	105.1	8.28	27.6	758.0	2	
	107.4	8.46	27.7	758.0	2	
	106.3	8.37	27.7	757.9	2	
	106.4	8.39	27.6	757.9	2	
	106.2	8.34	27.6	757.9	2	
	106.1	8.29	28.1	757.9	2	
	105.8	8.26	28.2	758.0	2	
	106.0	8.27	28.2	757.9	2	
	108.4	8.46	28.2	757.9	2	
	106.0	8.27	28.2	757.9	2	
	106.2	8.29	28.2	757.9	2	
Daniel Island	106.8	8.31	28.3	757.9	2	
Average	102.3	8.06	27.6	757.9		

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Cross-Section 3a	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
Left Riverbank (Amherst/NE side)	96.5	7.83	26.0	757.6	3	3m of cable deployed, 50m u/s of bouys, 10s logging interval
↓	91.7	7.40	26.3	757.6	3	
	99.8	7.95	27.0	757.7	3	
	106.4	8.39	27.6	757.7	3	
	107.2	8.47	27.5	757.6	3	
	103.0	8.18	27.2	757.6	3	
	102.9	8.17	27.2	757.7	3	
	103.2	8.17	27.3	757.7	3	
	105.1	8.18	27.5	757.6	3	
	107.8	8.30	27.6	757.6	3	
	108.4	8.51	27.8	757.6	3	
	109.3	8.59	27.8	757.7	3	
	109.1	8.54	28.0	757.7	3	
Daniel Island	109.5	8.55	28.1	757.6	3	
Average	104.3	8.23	27.4	757.6		

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Cross-Section 3b	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
Left Riverbank (Amherst/NE side)	91.8	7.37	26.6	757.6	3	3m of cable deployed, 50m u/s of bouys, 10s logging interval
↓	91.8	7.37	26.6	757.6	3	
	94.2	7.55	26.7	757.7	3	
	100.0	7.95	27.1	757.7	3	
	105.0	8.28	27.6	757.6	3	
	108.6	8.51	27.9	757.6	3	
	109.6	8.56	28.1	757.6	3	
	109.7	8.54	28.3	757.6	3	
	109.7	8.56	28.2	757.6	3	
	109.5	8.52	28.3	757.6	3	
Daniel Island	109.4	8.50	28.4	757.6	3	
Average	103.6	8.16	27.6	757.6		

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Vertical Profile 1	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
	108.4	8.44	28.3	757.8	0	8m of cable deployed gradually, 50m u/s of bouys, 1s logging interval
	108.4	8.43	28.3	757.7		
	108.4	8.44	28.3	757.8		
	108.4	8.43	28.4	757.8		
	108.5	8.43	28.4	757.8		
	108.5	8.43	28.4	757.7		
	108.4	8.44	28.3	757.8		
	108.2	8.44	28.2	757.7		
	107.8	8.41	28.2	757.7		
	107.5	8.40	28.1	757.7		
	107.2	8.39	28.0	757.8	2	
	106.9	8.38	27.9	757.8		
	106.5	8.37	27.8	757.8		
	106.1	8.35	27.7	757.9		
	105.5	8.32	27.6	757.8		
	104.6	8.26	27.5	757.8		
	103.9	8.22	27.4	757.7		
	103.1	8.17	27.3	757.8		
	102.7	8.14	27.3	757.8		
	102.5	8.14	27.2	757.8		
	101.7	8.09	27.1	757.7		
	101.4	8.06	27.1	757.8	4	
	100.4	8.00	27.0	757.8		
	99.3	7.93	26.9	757.8		
	98.4	7.86	26.9	757.8		
	97.4	7.79	26.8	757.8		
	95.9	7.67	26.8	757.8		
	94.8	7.59	26.7	757.8		
	93.2	7.47	26.7	757.8		
	92.2	7.38	26.7	757.8		
	91.2	7.32	26.6	757.8		
	90.0	7.22	26.6	757.8		
	89.2	7.16	26.6	757.8	6	
	88.6	7.11	26.6	757.8		
	87.6	7.04	26.5	757.8		

	87.2	7.02	26.5	757.8	
	86.6	6.96	26.5	757.8	
	85.9	6.91	26.5	757.8	
	85.6	6.89	26.5	757.8	
	85.2	6.85	26.5	757.7	
	84.9	6.82	26.5	757.8	
	84.7	6.81	26.5	757.7	
	84.5	6.79	26.5	757.8	
	84.1	6.78	26.4	757.7	8
Minimum	84.1	6.78	26.4	757.7	
Maximum	108.5	8.44	28.4	757.9	
Average	98.2	7.79	27.2	757.8	

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Vertical Profile 2	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
	108.1	8.42	28.3	757.8	0	8m of cable deployed gradually, 50m u/s of bouys, 1s logging interval
	108.1	8.42	28.3	757.8		
	108.1	8.42	28.3	757.8		
	108.1	8.41	28.4	757.8		
	108.2	8.41	28.4	757.8		
	108.3	8.42	28.4	757.8		
	108.3	8.42	28.4	757.8		
	108.3	8.42	28.4	757.8		
	108.1	8.42	28.3	757.8		
	107.3	8.37	28.2	757.8	2	
	106.9	8.37	28.0	757.8		
	106.0	8.32	27.9	757.8		
	105.2	8.28	27.7	757.8		
	104.8	8.25	27.7	757.8		
	104.4	8.23	27.6	757.9		
	104.0	8.21	27.5	757.9		
	103.7	8.20	27.4	757.8		
	103.3	8.19	27.3	757.9		
	102.8	8.15	27.3	757.8	4	
	102.2	8.12	27.2	757.9		
	100.8	8.02	27.1	757.9		
	99.8	7.95	27.0	757.8		
	98.7	7.86	27.0	757.8		
	97.5	7.79	26.9	757.8		
	96.1	7.67	26.9	757.9		
	95.1	7.60	26.8	757.8		
	93.8	7.50	26.8	757.8		
	92.9	7.45	26.7	757.8	6	
	92.1	7.38	26.7	757.8		
	91.0	7.29	26.7	757.8		
	90.2	7.24	26.6	757.8		
	89.2	7.16	26.6	757.8		
	88.6	7.11	26.6	757.8		
	87.8	7.05	26.6	757.8		
	87.1	7.00	26.5	757.8		

	86.7	6.97	26.5	757.8	
	86.3	6.94	26.5	757.8	
	85.7	6.89	26.5	757.8	8
Minimum	85.7	6.89	26.5	757.8	
Maximum	108.3	8.42	28.4	757.9	
Average	99.6	7.88	27.4	757.8	

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Vertical Profile 3	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
	107.7	8.56	27.1	757.7	0	10m of cable deployed gradually, 50m u/s of bouys, 1s logging interval, main channel?
	108.0	8.54	27.4	757.7		
	108.1	8.52	27.6	757.7		
	108.3	8.52	27.7	757.7		
	108.4	8.51	27.8	757.8		
	108.4	8.50	27.9	757.8		
	108.4	8.50	27.9	757.8		
	108.1	8.49	27.8	757.8		
	107.6	8.45	27.8	757.8	2	
	107.1	8.43	27.7	757.8		
	106.6	8.37	27.6	757.8		
	105.9	8.32	27.5	757.7		
	105.2	8.28	27.4	757.8		
	104.5	8.29	27.3	757.8		
	103.6	8.23	27.2	757.7		
	102.9	8.19	27.1	757.7		
	102.2	8.15	27.0	757.7		
	101.4	8.10	26.9	757.7	4	
	100.1	7.99	26.9	757.8		
	98.7	7.90	26.8	757.7		
	97.7	7.81	26.8	757.8		
	96.3	7.71	26.7	757.7		
	95.5	7.66	26.7	757.8		
	94.6	7.60	26.6	757.8		
	93.9	7.54	26.6	757.8		
	93.1	7.47	26.6	757.7		
	92.3	7.42	26.5	757.7	6	
	91.2	7.34	26.5	757.7		
	90.2	7.25	26.5	757.7		
	89.4	7.19	26.5	757.7		
	88.6	7.14	26.4	757.7		
	87.8	7.07	26.4	757.7		
	87.1	7.01	26.4	757.7		
	86.3	6.95	26.4	757.7		

	85.7	6.90	26.4	757.7	
	85.3	6.88	26.4	757.7	8
	85.1	6.86	26.4	757.7	
	84.6	6.82	26.4	757.7	
	84.3	6.80	26.3	757.7	
	83.9	6.77	26.3	757.7	
	83.7	6.75	26.3	757.7	
	83.1	6.70	26.3	757.7	
	82.6	6.67	26.3	757.8	
	82.5	6.66	26.3	757.8	10
Minimum	82.5	6.66	26.3	757.7	
Maximum	108.4	8.51	27.9	757.8	
Average	96.3	7.68	26.9	757.7	

Scott's Mill Dam Impoundment Sampling, 9/12/16, 85 degrees F, No Rain Within 5 Days						
Vertical Profile 4	**DO (%)**	**DO (mg/L)**	**Temp (ºC)**	**Pressure (mm Hg)**	**Approx. Depth (m)**	**Notes**
	103.6	8.20	27.4	757.6	0	8m of cable deployed gradually, 50m u/s of bouys, 1s logging interval, near island
	103.8	8.20	27.5	757.7		
	104.1	8.21	27.6	757.6		
	105.2	8.28	27.7	757.6		
	106.1	8.35	27.7	757.6		
	107.0	8.41	27.8	757.6		
	107.3	8.45	27.7	757.6		
	107.1	8.44	27.6	757.6	2	
	106.4	8.39	27.6	757.6		
	105.1	8.30	27.5	757.7		
	103.9	8.22	27.4	757.6		
	102.6	8.14	27.3	757.7		
	102.0	8.10	27.2	757.6		
	101.6	8.08	27.1	757.7		
	100.6	8.01	27.1	757.7		
	99.9	7.96	27.0	757.6	4	
	99.0	7.91	26.9	757.6		
	97.5	7.78	26.9	757.7		
	96.0	7.68	26.8	757.7		
	93.9	7.51	26.8	757.7		
	91.9	7.36	26.7	757.7		
	90.6	7.26	26.7	757.6		
	89.2	7.16	26.6	757.6	6	
	88.4	7.09	26.6	757.6		
	87.8	7.03	26.6	757.7		
	87.2	7.00	26.6	757.6		
	87.0	6.98	26.6	757.7		
	86.8	6.96	26.6	757.7		
	86.5	6.95	26.6	757.7		
	86.5	6.94	26.6	757.7	8	
Minimum	86.5	6.94	26.6	757.6		
Maximum	107.3	8.45	27.8	757.7		
Average	97.8	7.78	27.1	757.6		

Appendix F

PCB Soil/Sediment Sampling Analysis

January 9, 2017

Mr. Mark Fendig
Luminaire Technologies
9932 Wilson Highway
Mouth of Wilson, VA 24363

HURT & PROFFITT INCORPORATED

Subject: Scott's Mill Dam Hydropower Project
PCB Soil/Sediment Sampling Analysis
H&P Project 20150824

Dear Mark:

We have completed the sediment/soil analysis effort for the proposed Scott's Mill Dam Hydropower Project. The purpose of this study was to collect soil/sediment samples from the James River substrate and Daniel's Island, then have these samples analyzed for the potential presence of polychlorinated biphenyls (PCB's). We understand that some substrate/soil dredging and excavation may be necessary in the study area as part of the proposed project. We also understand that the data provided by this sampling and analysis will be provided to the Virginia Department of Environmental Quality (VDEQ), to help answer agency comments and questions regarding the project.

Study Area / Background

For this effort, soil/sediment samples were collected on November 11, 2016 at two locations: Station "Daniel Island 001" was located approximately 250' upstream of the dam (on Daniel's Island). Station "James River 002" was located approximately 160' upstream of the dam (in the main channel of the James River itself). Samples were collected using a hand auger and extensions, from the soil/sediment surface to a depth of approximately three feet. Samples were composited (mixed) in the field, and were then sent to the Cape Fear Analytical laboratory (in Wilmington, NC) for PCB analysis using US Environmental Protection Agency (USEPA) Method 1668A (low-level PCB / 209 congener analysis).

<u>Sampling locations:</u>
Station "Daniel Island 001" location: 37.425502 N, -79.142365 W
Station "James River 002" location: 37.424936 N, -79.140754 W

Results

For the Daniel's Island sample (001), PCB concentrations ranged from approximately 9 to 422 pg/g (or parts per trillion [ppt]). This is equivalent to approximately 0.000009-0.000422 parts per million (ppm). For the James River sample (002), the PCB concentrations ranged from approximately 9 to 75 pg/g (or ppt). This is equivalent to 0.000009-0.000075 ppm. For comparison, typical remediation projects (e.g., chemical spill/leak clean-up or treatment efforts) require that PCB levels be below 1.0 ppm for the site to be considered clean/complete.

Conclusions

Based on these data, it appears that the sampled sediment/soil would not likely be a significant source of elevated PCB concentrations from soil re-suspension. Please contact us with any questions you may have. We can be reached at 434.847.7796 or via email at bll@handp.com.

Sincerely,
HURT & PROFFITT, INC.

Ben Leatherland, PWD, PWS, CPESC
Sr. Environmental Scientist

Attachments: CFA Lab Data

CFA | Cape Fear Analytical LLC
an affiliate of The GEL Group INC

3306 Kitty Hawk Road, Suite 120 Wilmington, NC 28405
P 910.795.0421
www.capefearanalytical.com

December 08, 2016

Mr. Ben Leatherland
Hurt & Proffitt Engineering
2524 Langhorne Road
Lynchburg, Virginia 24501

Re: VA DEQ PCB's
Work Order: 10095
SDG: Scotts_Mill_Dam

Dear Mr. Leatherland:

Cape Fear Analytical LLC (CFA) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 16, 2016. This original data report has been prepared and reviewed in accordance with CFA's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at 910-795-0421.

Sincerely,

Cynde Larkins

Cynde Larkins
Project Manager

Enclosures

Page: _____ of _____
Project #:
CFA Quote #: _____
COC Number (1): _____
PO Number:

Cape Fear Analytical, LLC
Chain of Custody and Analytical Request

CFA Work Order Number: 10095

Cape Fear Analytical, LLC
3306 Kitty Hawk Rd. Suite 120
Wilmington, NC 28405
Phone: (910) 795-0421

Client Name: Hurt & Proffitt (Ben Leatherland) Phone #:

Project/Site Name: Scotts Mill Dam Fax #:

Address: 2524 Langhorne Rd, Lynchburg, VA 24501

Collected by: BL Send Results To: bll@handp.com (Ben L)

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Total number of containers	Low-level PCB	<-- Preservative Type (6)
Daniel Island (001)	11/11/16	11:05	N	N	SW	1	1	
James River (002)	11/11/16	11:30	N	N	SW	1	1	

Comments
Note: extra sample is required for sample specific QC

TAT Requested: Normal: X Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: Yes / (No)

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*
No known hazards. Please email and mail results/data. Please return cooler to us.

Sample Collection Time Zone
(Eastern) Pacific
Central Other _____
Mountain

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	[signature]	11/15/16	13:14	[signature]	16 NOV 2016	11:40
2						
3						

Sample Shipping and Delivery Details

CFA PM:
Method of Shipment: UPS Next Day Date Shipped: 11/15/16
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a- Y - for yes the sample was field filtered or- N - for sample was not field filtered.
4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e.*8290B*, **1668B**) and number of containers provided for each (i.e.*8290B* - 3, **1668B** - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: 2.8 C

WHITE = LABORATORY **YELLOW = FILE** **PINK = CLIENT**

PCB Congeners Analysis

Case Narrative

PCBC Case Narrative
Hurt & Proffitt Engineering (HPEN)
SDG Scotts_Mill_Dam
Work Order 10095

Method/Analysis Information

Product:	**PCB Congeners by EPA Method 1668A in Solids**
Analytical Method:	EPA Method 1668A
Extraction Method:	SW846 3540C
Analytical Batch Number:	33410
Clean Up Batch Number:	33409
Extraction Batch Number:	33408

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA Method 1668A:

Sample ID	Client ID
10095001	Daniel Island (001)
10095002	James River (002)
12017426	Method Blank (MB)
12017427	Laboratory Control Sample (LCS)
12017428	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on a "dry weight" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by Cape Fear Analytical LLC (CFA) as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with CF-OA-E-003 REV# 6.

Raw data reports are processed and reviewed by the analyst using the TargetLynx software package.

Calibration Information

Initial Calibration

All initial calibration requirements have been met for this sample delivery group (SDG).

Continuing Calibration Verification (CCV) Requirements

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

Quality Control (QC) Information

Certification Statement
The test results presented in this document are certified to meet all requirements of the 2009 TNI Standard.

Method Blank (MB) Statement
The MB(s) analyzed with this SDG met the acceptance criteria.

Surrogate Recoveries
All surrogate recoveries were within the established acceptance criteria for this SDG.

Laboratory Control Sample (LCS) Recovery
The LCS spike recoveries met the acceptance limits.

Laboratory Control Sample Duplicate (LCSD) Recovery
The LCSD spike recoveries met the acceptance limits.

LCS/LCSD Relative Percent Difference (RPD) Statement
The RPD(s) between the LCS and LCSD met the acceptance limits.

QC Sample Designation
A matrix spike and matrix spike duplicate analysis was not required for this SDG.

Technical Information

Holding Time Specifications
CFA assigns holding times based on the associated methodology, which assigns the date and time from sample collection. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples in this SDG met the specified holding time.

Preparation/Analytical Method Verification
All procedures were performed as stated in the SOP.

Sample Dilutions
Samples 10095001 (Daniel Island (001)) and 10095002 (James River (002)) were diluted due to the presence of non-target interferences.

Sample Re-extraction/Re-analysis
Re-extractions or re-analyses were not required in this SDG.

Miscellaneous Information

Nonconformance (NCR) Documentation
A NCR was not required for this SDG.

Manual Integrations
Manual integrations were required for data files in this SDG. Certain standards and QC samples required manual integrations to correctly position the baseline as set in the calibration standard injections. Where manual integrations were performed, copies of all manual integration peak profiles are included in the raw data section of this fraction.

System Configuration
This analysis was performed on the following instrument configuration:

Instrument ID	Instrument	System Configuration	Column ID	Column Description
HRP875_1	PCB Analysis	PCB Analysis	SPB-Octyl	30m x 0.25mm, 0.25um

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted: Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Sample Data Summary

Cape Fear Analytical, LLC
3306 Kitty Hawk Road Suite 120, Wilmington, NC 28405 - (910) 795-0421 - www.capefearanalytical.com

Qualifier Definition Report
for

HPEN001 Hurt & Proffitt Engineering

Client SDG: Scotts_Mill_Dam CFA Work Order: 10095

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a surrogate compound

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

DL Indicates that sample is diluted.
RA Indicates that sample is re-analyzed without re-extraction.
RE Indicates that sample is re-extracted.

Review/Validation

Cape Fear Analytical requires all analytical data to be verified by a qualified data reviewer.

The following data validator verified the information presented in this case narrative:

Signature:  **Name: Heather Patterson**

Date: 08 DEC 2016 **Title: Group Leader**

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
2051-60-7	1-MoCB		17.9	pg/g	8.86
2051-61-8	2-MoCB	U	8.86	pg/g	8.86
2051-62-9	3-MoCB		68.4	pg/g	8.86
13029-08-8	4-DiCB	U	8.86	pg/g	8.86
16605-91-7	5-DiCB	U	8.86	pg/g	8.86
25569-80-6	6-DiCB	U	8.86	pg/g	8.86
33284-50-3	7-DiCB	U	8.86	pg/g	8.86
34883-43-7	8-DiCB		34.9	pg/g	8.86
34883-39-1	9-DiCB	U	8.86	pg/g	8.86
33146-45-1	10-DiCB	U	8.86	pg/g	8.86
2050-67-1	11-DiCB	U	88.6	pg/g	88.6
2974-92-7	12-DiCB	CU	17.7	pg/g	17.7
2974-90-5	13-DiCB	C12			
34883-41-5	14-DiCB	U	8.86	pg/g	8.86
2050-68-2	15-DiCB		128	pg/g	8.86
38444-78-9	16-TrCB		12.6	pg/g	8.86
37680-66-3	17-TrCB		12.9	pg/g	8.86
37680-65-2	18-TrCB	C	25.7	pg/g	17.7
38444-73-4	19-TrCB	U	8.86	pg/g	8.86
38444-84-7	20-TrCB	C	105	pg/g	17.7
55702-46-0	21-TrCB	C	48.4	pg/g	17.7
38444-85-8	22-TrCB		32.5	pg/g	8.86
55720-44-0	23-TrCB	U	8.86	pg/g	8.86
55702-45-9	24-TrCB	U	8.86	pg/g	8.86
55712-37-3	25-TrCB	U	8.86	pg/g	8.86
38444-81-4	26-TrCB	CU	17.7	pg/g	17.7
38444-76-7	27-TrCB	U	8.86	pg/g	8.86
7012-37-5	28-TrCB	C20			
15862-07-4	29-TrCB	C26			
35693-92-6	30-TrCB	C18			
16606-02-3	31-TrCB		82.1	pg/g	8.86
38444-77-8	32-TrCB		10.1	pg/g	8.86

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
38444-86-9	33-TrCB	C21			
37680-68-5	34-TrCB	U	8.86	pg/g	8.86
37680-69-6	35-TrCB	U	8.86	pg/g	8.86
38444-87-0	36-TrCB	U	8.86	pg/g	8.86
38444-90-5	37-TrCB		102	pg/g	8.86
53555-66-1	38-TrCB	U	8.86	pg/g	8.86
38444-88-1	39-TrCB	U	8.86	pg/g	8.86
38444-93-8	40-TeCB	CU	17.7	pg/g	17.7
52663-59-9	41-TeCB	U	8.86	pg/g	8.86
36559-22-5	42-TeCB		12.1	pg/g	8.86
70362-46-8	43-TeCB	U	8.86	pg/g	8.86
41464-39-5	44-TeCB	C	38.3	pg/g	26.6
70362-45-7	45-TeCB	CU	17.7	pg/g	17.7
41464-47-5	46-TeCB	U	8.86	pg/g	8.86
2437-79-8	47-TeCB	C44			
70362-47-9	48-TeCB	U	8.86	pg/g	8.86
41464-40-8	49-TeCB	C	41.8	pg/g	17.7
62796-65-0	50-TeCB	CU	17.7	pg/g	17.7
68194-04-7	51-TeCB	C45			
35693-99-3	52-TeCB		51.1	pg/g	8.86
41464-41-9	53-TeCB	C50			
15968-05-5	54-TeCB	U	8.86	pg/g	8.86
74338-24-2	55-TeCB	U	8.86	pg/g	8.86
41464-43-1	56-TeCB		51.6	pg/g	8.86
70424-67-8	57-TeCB	U	8.86	pg/g	8.86
41464-49-7	58-TeCB	U	8.86	pg/g	8.86
74472-33-6	59-TeCB	CU	26.6	pg/g	26.6
33025-41-1	60-TeCB		42.4	pg/g	8.86
33284-53-6	61-TeCB	C	224	pg/g	35.4
54230-22-7	62-TeCB	C59			
74472-34-7	63-TeCB	U	8.86	pg/g	8.86
52663-58-8	64-TeCB		82.4	pg/g	8.86

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
33284-54-7	65-TeCB	C44			
32598-10-0	66-TeCB		114	pg/g	8.86
73575-53-8	67-TeCB	U	8.86	pg/g	8.86
73575-52-7	68-TeCB	U	8.86	pg/g	8.86
60233-24-1	69-TeCB	C49			
32598-11-1	70-TeCB	C61			
41464-46-4	71-TeCB	C40			
41464-42-0	72-TeCB	U	8.86	pg/g	8.86
74338-23-1	73-TeCB	U	8.86	pg/g	8.86
32690-93-0	74-TeCB	C61			
32598-12-2	75-TeCB	C59			
70362-48-0	76-TeCB	C61			
32598-13-3	77-TeCB		37.2	pg/g	8.86
70362-49-1	78-TeCB	U	8.86	pg/g	8.86
41464-48-6	79-TeCB	U	8.86	pg/g	8.86
33284-52-5	80-TeCB	U	8.86	pg/g	8.86
70362-50-4	81-TeCB	U	8.86	pg/g	8.86
52663-62-4	82-PeCB	U	8.86	pg/g	8.86
60145-20-2	83-PeCB	U	8.86	pg/g	8.86
52663-60-2	84-PeCB	U	8.86	pg/g	8.86
65510-45-4	85-PeCB	C	62.6	pg/g	26.6
55312-69-1	86-PeCB	C	55.2	pg/g	53.1
38380-02-8	87-PeCB	C86			
55215-17-3	88-PeCB	CU	17.7	pg/g	17.7
73575-57-2	89-PeCB	U	8.86	pg/g	8.86
68194-07-0	90-PeCB	C	98.8	pg/g	26.6
68194-05-8	91-PeCB	C88			
52663-61-3	92-PeCB		18.1	pg/g	8.86
73575-56-1	93-PeCB	CU	17.7	pg/g	17.7
73575-55-0	94-PeCB	U	8.86	pg/g	8.86
38379-99-6	95-PeCB		28.0	pg/g	8.86
73575-54-9	96-PeCB	U	8.86	pg/g	8.86

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
41464-51-1	97-PeCB	C86			
60233-25-2	98-PeCB	CU	17.7	pg/g	17.7
38380-01-7	99-PeCB		59.1	pg/g	8.86
39485-83-1	100-PeCB	C93			
37680-73-2	101-PeCB	C90			
68194-06-9	102-PeCB	C98			
60145-21-3	103-PeCB	U	8.86	pg/g	8.86
56558-16-8	104-PeCB	U	8.86	pg/g	8.86
32598-14-4	105-PeCB		142	pg/g	8.86
70424-69-0	106-PeCB	U	8.86	pg/g	8.86
70424-68-9	107-PeCB		23.3	pg/g	8.86
70362-41-3	108-PeCB	CU	17.7	pg/g	17.7
74472-35-8	109-PeCB	C86			
38380-03-9	110-PeCB	C	185	pg/g	17.7
39635-32-0	111-PeCB	U	8.86	pg/g	8.86
74472-36-9	112-PeCB	U	8.86	pg/g	8.86
68194-10-5	113-PeCB	C90			
74472-37-0	114-PeCB	U	8.86	pg/g	8.86
74472-38-1	115-PeCB	C110			
18259-05-7	116-PeCB	C85			
68194-11-6	117-PeCB	C85			
31508-00-6	118-PeCB		241	pg/g	8.86
56558-17-9	119-PeCB	C86			
68194-12-7	120-PeCB	U	8.86	pg/g	8.86
56558-18-0	121-PeCB	U	8.86	pg/g	8.86
76842-07-4	122-PeCB	U	8.86	pg/g	8.86
65510-44-3	123-PeCB	U	8.86	pg/g	8.86
70424-70-3	124-PeCB	C108			
74472-39-2	125-PeCB	C86			
57465-28-8	126-PeCB	U	8.86	pg/g	8.86
39635-33-1	127-PeCB	U	8.86	pg/g	8.86
38380-07-3	128-HxCB	C	97.8	pg/g	17.7

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
55215-18-4	129-HxCB	C	634	pg/g	26.6
52663-66-8	130-HxCB		25.7	pg/g	8.86
61798-70-7	131-HxCB	U	8.86	pg/g	8.86
38380-05-1	132-HxCB		38.4	pg/g	8.86
35694-04-3	133-HxCB	U	8.86	pg/g	8.86
52704-70-8	134-HxCB	U	8.86	pg/g	8.86
52744-13-5	135-HxCB	C	80.0	pg/g	17.7
38411-22-2	136-HxCB	U	8.86	pg/g	8.86
35694-06-5	137-HxCB		28.6	pg/g	8.86
35065-28-2	138-HxCB	C129			
56030-56-9	139-HxCB	CU	17.7	pg/g	17.7
59291-64-4	140-HxCB	C139			
52712-04-6	141-HxCB		63.6	pg/g	8.86
41411-61-4	142-HxCB	U	8.86	pg/g	8.86
68194-15-0	143-HxCB	U	8.86	pg/g	8.86
68194-14-9	144-HxCB	U	8.86	pg/g	8.86
74472-40-5	145-HxCB	U	8.86	pg/g	8.86
51908-16-8	146-HxCB		73.4	pg/g	8.86
68194-13-8	147-HxCB	C	146	pg/g	17.7
74472-41-6	148-HxCB	U	8.86	pg/g	8.86
38380-04-0	149-HxCB	C147			
68194-08-1	150-HxCB	U	8.86	pg/g	8.86
52663-63-5	151-HxCB	C135			
68194-09-2	152-HxCB	U	8.86	pg/g	8.86
35065-27-1	153-HxCB	C	533	pg/g	17.7
60145-22-4	154-HxCB	U	8.86	pg/g	8.86
33979-03-2	155-HxCB	U	8.86	pg/g	8.86
38380-08-4	156-HxCB	C	73.1	pg/g	17.7
69782-90-7	157-HxCB	C156			
74472-42-7	158-HxCB		58.6	pg/g	8.86
39635-35-3	159-HxCB	U	8.86	pg/g	8.86
41411-62-5	160-HxCB	U	8.86	pg/g	8.86

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
74472-43-8	161-HxCB	U	8.86	pg/g	8.86
39635-34-2	162-HxCB	U	8.86	pg/g	8.86
74472-44-9	163-HxCB	C129			
74472-45-0	164-HxCB		33.9	pg/g	8.86
74472-46-1	165-HxCB	U	8.86	pg/g	8.86
41411-63-6	166-HxCB	C128			
52663-72-6	167-HxCB		27.5	pg/g	8.86
59291-65-5	168-HxCB	C153			
32774-16-6	169-HxCB	U	8.86	pg/g	8.86
35065-30-6	170-HpCB		185	pg/g	8.86
52663-71-5	171-HpCB	C	55.5	pg/g	17.7
52663-74-8	172-HpCB		39.7	pg/g	8.86
68194-16-1	173-HpCB	C171			
38411-25-5	174-HpCB		176	pg/g	8.86
40186-70-7	175-HpCB	U	8.86	pg/g	8.86
52663-65-7	176-HpCB		14.1	pg/g	8.86
52663-70-4	177-HpCB		123	pg/g	8.86
52663-67-9	178-HpCB		65.9	pg/g	8.86
52663-64-6	179-HpCB		86.4	pg/g	8.86
35065-29-3	180-HpCB	C	553	pg/g	17.7
74472-47-2	181-HpCB	U	8.86	pg/g	8.86
60145-23-5	182-HpCB	U	8.86	pg/g	8.86
52663-69-1	183-HpCB	C	147	pg/g	17.7
74472-48-3	184-HpCB	U	8.86	pg/g	8.86
52712-05-7	185-HpCB	C183			
74472-49-4	186-HpCB	U	8.86	pg/g	8.86
52663-68-0	187-HpCB		422	pg/g	8.86
74487-85-7	188-HpCB	U	8.86	pg/g	8.86
39635-31-9	189-HpCB	U	8.86	pg/g	8.86
41411-64-7	190-HpCB		46.9	pg/g	8.86
74472-50-7	191-HpCB	U	8.86	pg/g	8.86
74472-51-8	192-HpCB	U	8.86	pg/g	8.86

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
69782-91-8	193-HpCB	C180			
35694-08-7	194-OcCB		218	pg/g	8.86
52663-78-2	195-OcCB		71.5	pg/g	8.86
42740-50-1	196-OcCB		101	pg/g	8.86
33091-17-7	197-OcCB	C	39.8	pg/g	17.7
68194-17-2	198-OcCB	C	421	pg/g	17.7
52663-75-9	199-OcCB	C198			
52663-73-7	200-OcCB	C197			
40186-71-8	201-OcCB		34.9	pg/g	8.86
2136-99-4	202-OcCB		108	pg/g	8.86
52663-76-0	203-OcCB		253	pg/g	8.86
74472-52-9	204-OcCB	U	8.86	pg/g	8.86
74472-53-0	205-OcCB		10.3	pg/g	8.86
40186-72-9	206-NoCB		413	pg/g	8.86
52663-79-3	207-NoCB		37.2	pg/g	8.86
52663-77-1	208-NoCB		175	pg/g	8.86
2051-24-3	209-DeCB		366	pg/g	8.86
1336-36-3	Total PCB Congeners		8370	pg/g	8.86

Surrogate/Tracer recovery	Qual	Result	Nominal	Units	Recovery%	Acceptable Limits
13C-1-MoCB		96.0	177	pg/g	54.2	(15%-150%)
13C-3-MoCB		103	177	pg/g	58.4	(15%-150%)
13C-4-DiCB		110	177	pg/g	62.4	(25%-150%)
13C-15-DiCB		148	177	pg/g	83.5	(25%-150%)
13C-19-TrCB		126	177	pg/g	70.9	(25%-150%)
13C-37-TrCB		158	177	pg/g	89.2	(25%-150%)
13C-54-TeCB		137	177	pg/g	77.2	(25%-150%)
13C-77-TeCB		195	177	pg/g	110	(25%-150%)
13C-81-TeCB		196	177	pg/g	111	(25%-150%)
13C-104-PeCB		134	177	pg/g	75.5	(25%-150%)
13C-105-PeCB		177	177	pg/g	99.8	(25%-150%)
13C-114-PeCB		175	177	pg/g	99.0	(25%-150%)
13C-118-PeCB		172	177	pg/g	97.3	(25%-150%)
13C-123-PeCB		180	177	pg/g	101	(25%-150%)
13C-126-PeCB		181	177	pg/g	102	(25%-150%)
13C-155-HxCB		151	177	pg/g	85.5	(25%-150%)
13C-156-HxCB	C	339	354	pg/g	95.6	(25%-150%)
13C-157-HxCB	C156L					
13C-167-HxCB		173	177	pg/g	97.5	(25%-150%)
13C-169-HxCB		175	177	pg/g	99.0	(25%-150%)
13C-188-HpCB		141	177	pg/g	79.6	(25%-150%)
13C-189-HpCB		165	177	pg/g	93.0	(25%-150%)

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095001**	**Date Collected:**	**11/11/2016 11:05**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**22.1**
Client ID:	**Daniel Island (001)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 20:34**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-7**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.5 g**		

CAS No.	Parmname	Qual	Result	Units	PQL

Surrogate/Tracer recovery	Qual	Result	Nominal	Units	Recovery%	Acceptable Limits
13C-202-OcCB		141	177	pg/g	79.8	(25%-150%)
13C-205-OcCB		165	177	pg/g	93.2	(25%-150%)
13C-206-NoCB		146	177	pg/g	82.4	(25%-150%)
13C-208-NoCB		139	177	pg/g	78.2	(25%-150%)
13C-209-DeCB		166	177	pg/g	94.0	(25%-150%)
13C-111-PeCB		159	177	pg/g	89.8	(30%-135%)
13C-28-TrCB		145	177	pg/g	82.1	(30%-135%)
13C-178-HpCB		170	177	pg/g	96.2	(30%-135%)

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
2051-60-7	1-MoCB	U	9.39	pg/g	9.39
2051-61-8	2-MoCB	U	9.39	pg/g	9.39
2051-62-9	3-MoCB	U	9.39	pg/g	9.39
13029-08-8	4-DiCB	U	9.39	pg/g	9.39
16605-91-7	5-DiCB	U	9.39	pg/g	9.39
25569-80-6	6-DiCB	U	9.39	pg/g	9.39
33284-50-3	7-DiCB	U	9.39	pg/g	9.39
34883-43-7	8-DiCB	U	9.39	pg/g	9.39
34883-39-1	9-DiCB	U	9.39	pg/g	9.39
33146-45-1	10-DiCB	U	9.39	pg/g	9.39
2050-67-1	11-DiCB	U	93.9	pg/g	93.9
2974-92-7	12-DiCB	CU	18.8	pg/g	18.8
2974-90-5	13-DiCB	C12			
34883-41-5	14-DiCB	U	9.39	pg/g	9.39
2050-68-2	15-DiCB	U	9.39	pg/g	9.39
38444-78-9	16-TrCB	U	9.39	pg/g	9.39
37680-66-3	17-TrCB	U	9.39	pg/g	9.39
37680-65-2	18-TrCB	CU	18.8	pg/g	18.8
38444-73-4	19-TrCB	U	9.39	pg/g	9.39
38444-84-7	20-TrCB	CU	18.8	pg/g	18.8
55702-46-0	21-TrCB	CU	18.8	pg/g	18.8
38444-85-8	22-TrCB	U	9.39	pg/g	9.39
55720-44-0	23-TrCB	U	9.39	pg/g	9.39
55702-45-9	24-TrCB	U	9.39	pg/g	9.39
55712-37-3	25-TrCB	U	9.39	pg/g	9.39
38444-81-4	26-TrCB	CU	18.8	pg/g	18.8
38444-76-7	27-TrCB	U	9.39	pg/g	9.39
7012-37-5	28-TrCB	C20			
15862-07-4	29-TrCB	C26			
35693-92-6	30-TrCB	C18			
16606-02-3	31-TrCB	U	9.39	pg/g	9.39
38444-77-8	32-TrCB	U	9.39	pg/g	9.39

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
38444-86-9	33-TrCB	C21			
37680-68-5	34-TrCB	U	9.39	pg/g	9.39
37680-69-6	35-TrCB	U	9.39	pg/g	9.39
38444-87-0	36-TrCB	U	9.39	pg/g	9.39
38444-90-5	37-TrCB	U	9.39	pg/g	9.39
53555-66-1	38-TrCB	U	9.39	pg/g	9.39
38444-88-1	39-TrCB	U	9.39	pg/g	9.39
38444-93-8	40-TeCB	CU	18.8	pg/g	18.8
52663-59-9	41-TeCB	U	9.39	pg/g	9.39
36559-22-5	42-TeCB	U	9.39	pg/g	9.39
70362-46-8	43-TeCB	U	9.39	pg/g	9.39
41464-39-5	44-TeCB	CU	28.2	pg/g	28.2
70362-45-7	45-TeCB	CU	18.8	pg/g	18.8
41464-47-5	46-TeCB	U	9.39	pg/g	9.39
2437-79-8	47-TeCB	C44			
70362-47-9	48-TeCB	U	9.39	pg/g	9.39
41464-40-8	49-TeCB	CU	18.8	pg/g	18.8
62796-65-0	50-TeCB	CU	18.8	pg/g	18.8
68194-04-7	51-TeCB	C45			
35693-99-3	52-TeCB	U	9.39	pg/g	9.39
41464-41-9	53-TeCB	C50			
15968-05-5	54-TeCB	U	9.39	pg/g	9.39
74338-24-2	55-TeCB	U	9.39	pg/g	9.39
41464-43-1	56-TeCB	U	9.39	pg/g	9.39
70424-67-8	57-TeCB	U	9.39	pg/g	9.39
41464-49-7	58-TeCB	U	9.39	pg/g	9.39
74472-33-6	59-TeCB	CU	28.2	pg/g	28.2
33025-41-1	60-TeCB	U	9.39	pg/g	9.39
33284-53-6	61-TeCB	CU	37.6	pg/g	37.6
54230-22-7	62-TeCB	C59			
74472-34-7	63-TeCB	U	9.39	pg/g	9.39
52663-58-8	64-TeCB	U	9.39	pg/g	9.39

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
33284-54-7	65-TeCB	C44			
32598-10-0	66-TeCB	U	9.39	pg/g	9.39
73575-53-8	67-TeCB	U	9.39	pg/g	9.39
73575-52-7	68-TeCB	U	9.39	pg/g	9.39
60233-24-1	69-TeCB	C49			
32598-11-1	70-TeCB	C61			
41464-46-4	71-TeCB	C40			
41464-42-0	72-TeCB	U	9.39	pg/g	9.39
74338-23-1	73-TeCB	U	9.39	pg/g	9.39
32690-93-0	74-TeCB	C61			
32598-12-2	75-TeCB	C59			
70362-48-0	76-TeCB	C61			
32598-13-3	77-TeCB	U	9.39	pg/g	9.39
70362-49-1	78-TeCB	U	9.39	pg/g	9.39
41464-48-6	79-TeCB	U	9.39	pg/g	9.39
33284-52-5	80-TeCB	U	9.39	pg/g	9.39
70362-50-4	81-TeCB	U	9.39	pg/g	9.39
52663-62-4	82-PeCB	U	9.39	pg/g	9.39
60145-20-2	83-PeCB	U	9.39	pg/g	9.39
52663-60-2	84-PeCB	U	9.39	pg/g	9.39
65510-45-4	85-PeCB	CU	28.2	pg/g	28.2
55312-69-1	86-PeCB	CU	56.3	pg/g	56.3
38380-02-8	87-PeCB	C86			
55215-17-3	88-PeCB	CU	18.8	pg/g	18.8
73575-57-2	89-PeCB	U	9.39	pg/g	9.39
68194-07-0	90-PeCB	CU	28.2	pg/g	28.2
68194-05-8	91-PeCB	C88			
52663-61-3	92-PeCB	U	9.39	pg/g	9.39
73575-56-1	93-PeCB	CU	18.8	pg/g	18.8
73575-55-0	94-PeCB	U	9.39	pg/g	9.39
38379-99-6	95-PeCB	U	9.39	pg/g	9.39
73575-54-9	96-PeCB	U	9.39	pg/g	9.39

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

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PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
41464-51-1	97-PeCB	C86			
60233-25-2	98-PeCB	CU	18.8	pg/g	18.8
38380-01-7	99-PeCB	U	9.39	pg/g	9.39
39485-83-1	100-PeCB	C93			
37680-73-2	101-PeCB	C90			
68194-06-9	102-PeCB	C98			
60145-21-3	103-PeCB	U	9.39	pg/g	9.39
56558-16-8	104-PeCB	U	9.39	pg/g	9.39
32598-14-4	105-PeCB	U	9.39	pg/g	9.39
70424-69-0	106-PeCB	U	9.39	pg/g	9.39
70424-68-9	107-PeCB	U	9.39	pg/g	9.39
70362-41-3	108-PeCB	CU	18.8	pg/g	18.8
74472-35-8	109-PeCB	C86			
38380-03-9	110-PeCB	CU	18.8	pg/g	18.8
39635-32-0	111-PeCB	U	9.39	pg/g	9.39
74472-36-9	112-PeCB	U	9.39	pg/g	9.39
68194-10-5	113-PeCB	C90			
74472-37-0	114-PeCB	U	9.39	pg/g	9.39
74472-38-1	115-PeCB	C110			
18259-05-7	116-PeCB	C85			
68194-11-6	117-PeCB	C85			
31508-00-6	118-PeCB	U	9.39	pg/g	9.39
56558-17-9	119-PeCB	C86			
68194-12-7	120-PeCB	U	9.39	pg/g	9.39
56558-18-0	121-PeCB	U	9.39	pg/g	9.39
76842-07-4	122-PeCB	U	9.39	pg/g	9.39
65510-44-3	123-PeCB	U	9.39	pg/g	9.39
70424-70-3	124-PeCB	C108			
74472-39-2	125-PeCB	C86			
57465-28-8	126-PeCB	U	9.39	pg/g	9.39
39635-33-1	127-PeCB	U	9.39	pg/g	9.39
38380-07-3	128-HxCB	CU	18.8	pg/g	18.8

Comments:

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PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
55215-18-4	129-HxCB	CU	28.2	pg/g	28.2
52663-66-8	130-HxCB	U	9.39	pg/g	9.39
61798-70-7	131-HxCB	U	9.39	pg/g	9.39
38380-05-1	132-HxCB		9.72	pg/g	9.39
35694-04-3	133-HxCB	U	9.39	pg/g	9.39
52704-70-8	134-HxCB	U	9.39	pg/g	9.39
52744-13-5	135-HxCB	CU	18.8	pg/g	18.8
38411-22-2	136-HxCB	U	9.39	pg/g	9.39
35694-06-5	137-HxCB	U	9.39	pg/g	9.39
35065-28-2	138-HxCB	C129			
56030-56-9	139-HxCB	CU	18.8	pg/g	18.8
59291-64-4	140-HxCB	C139			
52712-04-6	141-HxCB	U	9.39	pg/g	9.39
41411-61-4	142-HxCB	U	9.39	pg/g	9.39
68194-15-0	143-HxCB	U	9.39	pg/g	9.39
68194-14-9	144-HxCB	U	9.39	pg/g	9.39
74472-40-5	145-HxCB	U	9.39	pg/g	9.39
51908-16-8	146-HxCB	U	9.39	pg/g	9.39
68194-13-8	147-HxCB	C	22.8	pg/g	18.8
74472-41-6	148-HxCB	U	9.39	pg/g	9.39
38380-04-0	149-HxCB	C147			
68194-08-1	150-HxCB	U	9.39	pg/g	9.39
52663-63-5	151-HxCB	C135			
68194-09-2	152-HxCB	U	9.39	pg/g	9.39
35065-27-1	153-HxCB	CU	18.8	pg/g	18.8
60145-22-4	154-HxCB	U	9.39	pg/g	9.39
33979-03-2	155-HxCB	U	9.39	pg/g	9.39
38380-08-4	156-HxCB	CU	18.8	pg/g	18.8
69782-90-7	157-HxCB	C156			
74472-42-7	158-HxCB	U	9.39	pg/g	9.39
39635-35-3	159-HxCB	U	9.39	pg/g	9.39
41411-62-5	160-HxCB	U	9.39	pg/g	9.39

Comments:

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PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
74472-43-8	161-HxCB	U	9.39	pg/g	9.39
39635-34-2	162-HxCB	U	9.39	pg/g	9.39
74472-44-9	163-HxCB	C129			
74472-45-0	164-HxCB	U	9.39	pg/g	9.39
74472-46-1	165-HxCB	U	9.39	pg/g	9.39
41411-63-6	166-HxCB	C128			
52663-72-6	167-HxCB	U	9.39	pg/g	9.39
59291-65-5	168-HxCB	C153			
32774-16-6	169-HxCB	U	9.39	pg/g	9.39
35065-30-6	170-HpCB		9.48	pg/g	9.39
52663-71-5	171-HpCB	CU	18.8	pg/g	18.8
52663-74-8	172-HpCB	U	9.39	pg/g	9.39
68194-16-1	173-HpCB	C171			
38411-25-5	174-HpCB		11.4	pg/g	9.39
40186-70-7	175-HpCB	U	9.39	pg/g	9.39
52663-65-7	176-HpCB	U	9.39	pg/g	9.39
52663-70-4	177-HpCB	U	9.39	pg/g	9.39
52663-67-9	178-HpCB	U	9.39	pg/g	9.39
52663-64-6	179-HpCB	U	9.39	pg/g	9.39
35065-29-3	180-HpCB	C	24.2	pg/g	18.8
74472-47-2	181-HpCB	U	9.39	pg/g	9.39
60145-23-5	182-HpCB	U	9.39	pg/g	9.39
52663-69-1	183-HpCB	CU	18.8	pg/g	18.8
74472-48-3	184-HpCB	U	9.39	pg/g	9.39
52712-05-7	185-HpCB	C183			
74472-49-4	186-HpCB	U	9.39	pg/g	9.39
52663-68-0	187-HpCB		15.5	pg/g	9.39
74487-85-7	188-HpCB	U	9.39	pg/g	9.39
39635-31-9	189-HpCB	U	9.39	pg/g	9.39
41411-64-7	190-HpCB	U	9.39	pg/g	9.39
74472-50-7	191-HpCB	U	9.39	pg/g	9.39
74472-51-8	192-HpCB	U	9.39	pg/g	9.39

Comments:

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U Analyte was analyzed for, but not detected above the specified detection limit.

PCB Congeners
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Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL
69782-91-8	193-HpCB	C180			
35694-08-7	194-OcCB	U	9.39	pg/g	9.39
52663-78-2	195-OcCB	U	9.39	pg/g	9.39
42740-50-1	196-OcCB	U	9.39	pg/g	9.39
33091-17-7	197-OcCB	CU	18.8	pg/g	18.8
68194-17-2	198-OcCB	CU	18.8	pg/g	18.8
52663-75-9	199-OcCB	C198			
52663-73-7	200-OcCB	C197			
40186-71-8	201-OcCB	U	9.39	pg/g	9.39
2136-99-4	202-OcCB	U	9.39	pg/g	9.39
52663-76-0	203-OcCB	U	9.39	pg/g	9.39
74472-52-9	204-OcCB	U	9.39	pg/g	9.39
74472-53-0	205-OcCB	U	9.39	pg/g	9.39
40186-72-9	206-NoCB		40.1	pg/g	9.39
52663-79-3	207-NoCB	U	9.39	pg/g	9.39
52663-77-1	208-NoCB		19.7	pg/g	9.39
2051-24-3	209-DeCB		75.4	pg/g	9.39
1336-36-3	Total PCB Congeners		228	pg/g	9.39

Surrogate/Tracer recovery	Qual	Result	Nominal	Units	Recovery%	Acceptable Limits
13C-1-MoCB		59.9	188	pg/g	31.9	(15%-150%)
13C-3-MoCB		76.5	188	pg/g	40.7	(15%-150%)
13C-4-DiCB		74.1	188	pg/g	39.5	(25%-150%)
13C-15-DiCB		122	188	pg/g	65.0	(25%-150%)
13C-19-TrCB		88.7	188	pg/g	47.2	(25%-150%)
13C-37-TrCB		157	188	pg/g	83.6	(25%-150%)
13C-54-TeCB		116	188	pg/g	61.6	(25%-150%)
13C-77-TeCB		195	188	pg/g	104	(25%-150%)
13C-81-TeCB		194	188	pg/g	103	(25%-150%)
13C-104-PeCB		122	188	pg/g	65.0	(25%-150%)
13C-105-PeCB		171	188	pg/g	91.2	(25%-150%)
13C-114-PeCB		167	188	pg/g	89.2	(25%-150%)
13C-118-PeCB		168	188	pg/g	89.6	(25%-150%)
13C-123-PeCB		175	188	pg/g	93.3	(25%-150%)
13C-126-PeCB		172	188	pg/g	91.7	(25%-150%)
13C-155-HxCB		150	188	pg/g	80.0	(25%-150%)
13C-156-HxCB	C	340	376	pg/g	90.6	(25%-150%)
13C-157-HxCB	C156L					
13C-167-HxCB		173	188	pg/g	92.3	(25%-150%)
13C-169-HxCB		175	188	pg/g	93.4	(25%-150%)
13C-188-HpCB		146	188	pg/g	77.9	(25%-150%)
13C-189-HpCB		170	188	pg/g	90.3	(25%-150%)

PCB Congeners
Certificate of Analysis
Sample Summary

SDG Number:	**Scotts_Mill_Dam**	**Client:**	**HPEN001**	**Project:**	**HPEN00112**
Lab Sample ID:	**10095002**	**Date Collected:**	**11/11/2016 11:30**	**Matrix:**	**SOIL**
Client Sample:	**1668A Soil**	**Date Received:**	**11/16/2016 11:40**	**%Moisture:**	**25.6**
Client ID:	**James River (002)**			**Prep Basis:**	**Dry Weight**
Batch ID:	**33410**	**Method:**	**EPA Method 1668A**		
Run Date:	**12/01/2016 21:40**	**Analyst:**	**MJC**	**Instrument:**	**HRP875**
Data File:	**d01dec16b-8**			**Dilution:**	**5**
Prep Batch:	**33408**	**Prep Method:**	**SW846 3540C**	**Prep SOP Ref:**	**CF-OA-E-001**
Prep Date:	**28-NOV-16**	**Prep Aliquot:**	**14.31 g**		

CAS No.	Parmname	Qual	Result	Units	PQL

Surrogate/Tracer recovery	Qual	Result	Nominal	Units	Recovery%	Acceptable Limits
13C-202-OcCB		150	188	pg/g	79.7	(25%-150%)
13C-205-OcCB		174	188	pg/g	92.5	(25%-150%)
13C-206-NoCB		152	188	pg/g	81.1	(25%-150%)
13C-208-NoCB		147	188	pg/g	78.5	(25%-150%)
13C-209-DeCB		179	188	pg/g	95.4	(25%-150%)
13C-111-PeCB		179	188	pg/g	95.6	(30%-135%)
13C-28-TrCB		164	188	pg/g	87.5	(30%-135%)
13C-178-HpCB		194	188	pg/g	103	(30%-135%)

Comments:

C Congener has coeluters. When Cxxx, refer to congener number xxx for data

U Analyte was analyzed for, but not detected above the specified detection limit.

Appendix G

Terrestrial Habitat Assessment

December 27, 2016

Mr. Mark Fendig
Luminaire Technologies
9932 Wilson Highway
Mouth of Wilson, VA 24363

HURT & PROFFITT INCORPORATED

Subject: Scott's Mill Dam Hydropower Project
Terrestrial Habitat Assessment
H&P Project 20150824

Dear Mark:

We have completed the terrestrial habitat assessment effort for the proposed Scott's Mill Dam Hydropower Project. The study area for this effort extended approximately 2.8 miles upstream from the existing Scott's Mill Dam, from the water surface to an elevation approximately 10 feet above the water surface. The study area includes existing terrestrial habitat that would be affected by the proposed project (with or without three-foot flashboards. In general, no unique or high-quality habitat areas were noted, though a variety of wildlife species were observed.

Study Area / Background

The study area extent was determined by estimating the maximum extent of upstream inundation/impoundment associated with the proposed hydropower project, if three-foot (3') flashboards were installed along the crest of the existing dam. Flood Insurance Rate Map (FIRM) data from Federal Emergency Management Agency (FEMA) and topographic mapping from the City of Lynchburg, Amherst County and the US Geological Survey (USGS) were used in this effort. Based on these data, the addition of three-foot flashboards at Scott's Mill Dam would likely increase inundation/impoundment depths approximately 2.1 miles upstream (to the midpoint of Woodruff Island). It is worth noting that the increased inundation would 'taper' upstream, such that only 1.5' of increased inundation would be present halfway through the study area, and at the upstream end of the study area there would likely be less than 0.1' difference in average water depths. The riverbanks in this affected portion of the James River are both steep (generally greater than 2:1 slopes) and high (six to ten feet, on average). The eroded shorelines of some islands here are as generally as steep and high as these riverbanks, though gravel bars and low-gradient slopes are present in isolated areas of lower-velocity water flow. Because of these factors, terrestrial habitat that may be affected by the proposed project will likely be limited largely to the actual riverbanks and island shorelines themselves.

Field Assessment

Following background data collection, mapping, and protected species database review efforts, H&P staff conducted a field assessment of the affected riverbank habitat areas on November 11, 2016. Access was from generally the river itself, by canoe/kayak (in order to avoid potential private property trespass issues). Observed wildlife species were noted, and habitat resources were documented/photographed.

Observations

This portion of the James River has been highly affected by human activities and land use changes during the past 200 years. The majority of the southwestern riverbank is currently 'armored' with riprap/rock placement (to protect the two adjacent railroad tracks by minimizing soil erosion), while over 60% of the northeastern riverbank has been developed as single-family detached residential properties (along River Road/State Route 685). The remaining 40% of the northeastern riverbank is too narrow to permit development (approximately 30-50' between River Road and the riverbank itself). One railroad track currently crosses Woodruff Island, while only the stone piers and abutments of another previous railroad track crossing of Daniel's Island remain. Decades ago, a large portion of Treasure Island was in use as athletic fields, and structures/buildings are still present (and visible) on the island now. Anecdotal information indicates that a small airstrip may have even been in use at one time on Treasure Island. Prior to that time, it appears that all three major islands (Daniel's Island, Treasure Island, and Woodruff Island) were previously used for agricultural (crop) production. The two parallel railroad tracks present along the southwestern riverbank are located on the route of a previous canal system present here in the 1800's (whose stone structures are still visible in some areas). Prior to the canal system, records indicate that batteaux (narrow cargo boats) likely passed regularly through this portion of the James River (carrying agricultural products between Buchanan [upstream] and Richmond [downstream]).

Vegetation

Riparian vegetation along the southwestern riverbank is primarily limited to a narrow area between the railroad tracks and the edge of water (typically 15'-25' in width). Approximately 60-70% of this riverbank through the study area has been stabilized with hard armor (riprap/rock), and there is evidence that trees and vegetation closest to the railroad tracks may be regularly cut. In some of these areas, tree stumps were visible, but no living trees/shrubs with diameters greater than 3" were present. The riprap and active maintenance here have largely favored the establishment of pioneer species.

The northeastern riverbank has more mature trees, and a more diverse assemblage of species than the southwestern riverbank. However, significant portions of the riparian area along this riverbank are currently in use as residential lawns. Multiple piers, boat docks, and floating wooden platforms are also present along the riverbank here. At many residential properties, significant vegetation has been cleared (except for scattered mature trees) along the riverbank, to increase visibility of the river.

The greatest abundance and diversity of vegetative species was observed on the islands themselves. This is likely due to the relative absence of land use activities here. The three primary islands (Daniel's Island, Treasure Island, and Woodruff Island) are predominately forested at this point. However, along the actual shorelines of the islands, there is significant erosion. In these eroded areas, there is very little vegetation present. The erosion is likely due to periodic floodwater flows and the alluvial soils of the islands themselves.

Table 1: Vegetative Species Observed *(on riverbanks and islands)*

Trees:
River birch (*Betula nigra*)
Tuliptree (*Liriodendron tulipifera*)
Sycamore (*Platanus occidentalis*)
Red maple (*Acer rubrum*)
Tree-of-Heaven (*Ailanthus altissima*)
Black locust (*Robinia pseudoacacia*)
Flowering dogwood (*Cornus florida*)
Shagbark hickory (*Carya ovata*)
American beech (*Fagus grandifolia*)
Chestnut oak (*Quercus prinus*)
Northern red oak (*Quercus rubra*)
Sweetgum (*Liquidambar styraciflua*)
Green ash (*Fraxinus pennsylvanica*)

Shrubs:
Hazel alder (*Alnus serrulata*)
Boxedler (*Acer negundo*)
Chinese privet (*Ligustrum sinense*)
Sweetbay (*Magnolia virginiana*)
And saplings of the tree species above

Herbaceous/Woody Vines:
Wild grape (*Vitis* spp.)
Poson ivy (*Toxicodendron radicans*)
Blackberry (*Rubus* spp.)
Greenbrier (*Smilax* spp.)
Soft rush (*Juncus effusus*)

Wildlife

Wildlife observations for this terrestrial habitat assessment effort were largely limited to mammals and birds. The fieldwork was scheduled during autumn, in order to help improve visibility. However, this schedule also resulted in few insect observations. Since this study's purpose was to assess terrestrial habitat that would be affected by hydropower operations, no aquatic species assessment was conducted.

Table 2: Avian (Bird) Species Observed

Carolina Wren (*Thryothorus ludovicianus*)
Northern Cardinal (*Cardinalis cardinalis*)
Bald Eagle (*Haliaeetus leucocephalus*)
American Crow (*Corvus brachyrhyncos*)
Blue Jay (*Cyanocitta cristata*)
Black Cap Chickadee (*Poecile atricapillus*)
Tufted Titmouse (*Baeolophus bicolor*)
Eastern Bluebird (*Sialia sialis*)
Song Sparrow (*Melospiza melodia*)
Slate Junco (*Junco hyemalis*)
Redtailed Hawk (*Buteo jamaicensis*)
Northern Flicker (*Colaptes auratus*)
Double-Crested Cormorant (*Phalacrocorax auritus*)
Red-Bellied Woodpecker (*Melanerpes carolinus*)
Canada Goose (*Branta canadensis*)
Black Vulture (*Coragyps atratus*)
Turkey Vulture (*Cathartes aura*)
Belted Kingfisher (*Megaceryle alcyon*)
Pileated Woodpecker (*Dryocopus pileatus*)
Great Blue Heron (*Ardea Herodias*)
Rock Dove (*Columba livia*)
American Goldfinch (*Spinus tristis*)

Table 3: Mammalian Species Observed *(or inferred by observed tracks/sign/scat)*

Virginia Opossum *(Didelphis virginiana)*
Raccoon *(Procyon lotor)*
Whitetail Deer *(Odocoileus virginianus)*
Gray Fox (*Urocyon cinereoargentus*)
Gray Squirrel (*Sciurus carolinensis*)
Muskrat *(Ondatra zibethicus)*
River Otter *(Lontra Canadensis)*

Protected Species

Protected species (federal and state-listed Threatened and/or Endangered Species) records from the US Fish and Wildlife Service (USFWS), the Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Department of Conservation and Recreation (VDCR) Natural Heritage (NH), and Virginia Department of Agriculture and Consumer Services (VDCAS) records were reviewed as part of this terrestrial habitat assessment. USFWS records indicate northern long-eared bat (Myotis septentrionalis, Federal Threatened) as potentially present in proximity to the project area. A previous USFWS review also included James spinymussel (*Pleurobema collina*, a freshwater aquatic mussel, Federal Endangered) as potentially present nearby. VDGIF records suggest that the following protected species may be present within approximately two miles of the study area:

Table 3: Protected Species

James River spinymussel (*Pleurobema collina*, FESE)
Northern long-eared bat (*Myotis septentrionalis*, FTST)
Little brown bat (*Myotis lucifugus lucifugus*, SE)
Tri-colored bat (*Perimyotis subflavus*, SE)
Peregrine falcon (*Falco peregrinus*, ST)
Loggerhead shrike (*Lanius ludovicianus*, ST)
Atlantic pigtoe (*Fusconaia masoni*, ST)
Green floater (*Lasmigona subviridis*, ST)
Migrant loggerhead shrike (*Lanius ludovicianus migrans*, ST)

FE – Federally Endangered, FT – Federally Threatened, SE – State Endangered, ST – State Threatened

Conclusions

Based on background research and field observations, it appears that the proposed hydropower project should not significantly affect unique or high-quality terrestrial habitats. Increased inundation would likely be noticeable from the Scott's Mill Dam to a point approximately 2.1 miles upstream. Within this area, flashboards would increase water depths by an estimated one to three feet. However, the majority of suitable terrestrial habitat present along these riverbanks and islands exists at least four to six feet higher the James River baseflow elevation. Within the area to be most affected by increased inundation, many sections of riverbank are already stabilized with hard armoring (riprap, stone, tires, or concrete fragments)). In contrast, much of the comparable island shorelines are significantly eroded (since they have not been artificially stabilized in a similar manner). Hard armoring and eroded shorelines provide only very limited opportunities for vegetative growth and wildlife use.

Approximately 60-70% of the riverbank areas that will experience increased inundation as a result of flashboard installation and hydropower operations have already been modified by placement of hard armoring materials, along with constructed piers, wooden stairs, and boat docks. Approximately half of the remaining 30-40% of riverbank length is maintained as residential lawn. On the islands themselves, an estimated 50-60% of the shorelines are eroded or severely eroded, with cut-banks frequently in excess of eight feet. The remaining 40-50% of island shorelines are lower-gradient and vegetated by herbaceous species (particularly those that are also underlain by gravel bars). Two railroad tracks parallel the southwestern riverbank, while River Road and adjacent houses line the northeastern riverbank.

In summary, previous development and land uses along this portion of the James River have significantly affected terrestrial habitat resources within the study area. The islands themselves appear to provide higher quality habitat than the riverbanks, though these too were previously developed decades ago. Since the devastating flood of 1985 destroyed pedestrian/vehicle access to Treasure Island, the island is now becoming more naturalized. The proposed inundation change of one to three feet is unlikely to affect more than the lower 30% of the eight to ten-foot high riverbanks and island shorelines within the study area.

Please contact us with any questions you may have. We can be reached at 434.847.7796 or via email at bll@handp.com.

Sincerely,
HURT & PROFFITT, INC.

Ben Leatherland, PWD, PWS, CPESC
Sr. Environmental Scientist

Attachments: Site maps
Site photographs

Photograph 1 – Southwestern shoreline of Daniel's Island (note erosion), view N

Photograph 2 – River between Daniel's Island (to R) and railroad track (to L), view NW

Photograph 3 – Typical southwestern riverbank (note railroad riprap), view SW

Photograph 4 – Shallow water area between Daniel's Island and Treasure Island (view E)

Photograph 5 – Relic structure on Treasure Island (note 6-8’ high shoreline), view NE

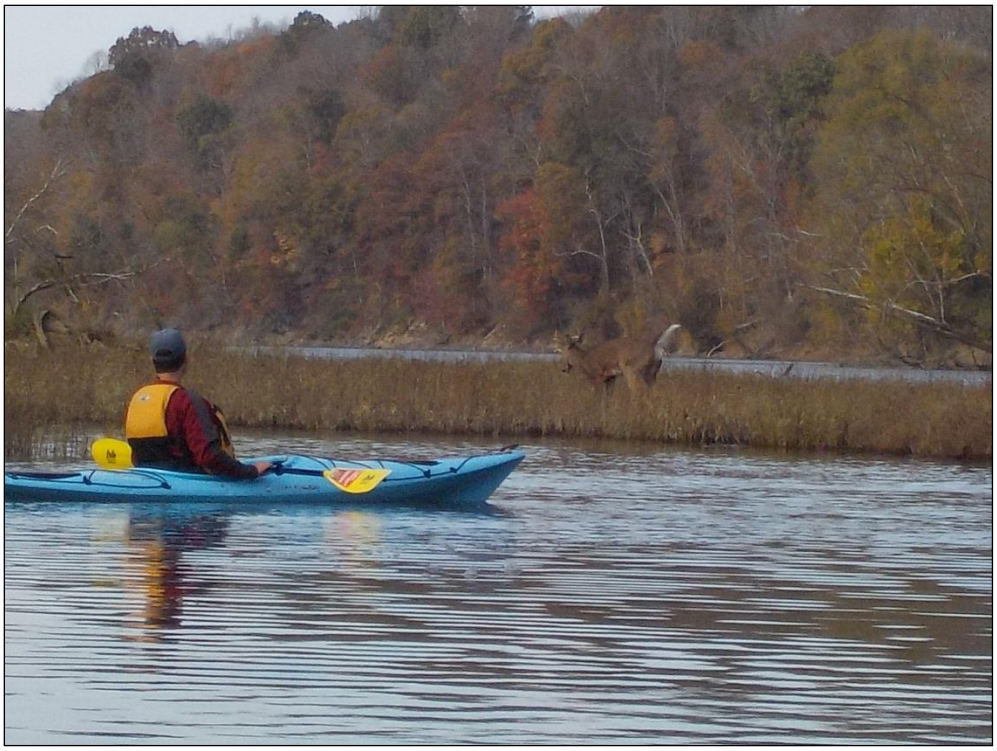
Photograph 6 – Relic bridge abutment on SW riverbank (view NW)

Photograph 7 – Bridge abutment (?) / structure on Treasure Island, view E

Photograph 8 – Relic stone railroad bridge pier, view SW

Photograph 9 – Existing railroad bridge across Woodruff Island, view NW

Photograph 10 – Typical SW riverbank, with railroad and >10’ high riprap stabilization (view W)



Photograph 11 – Whitetail deer at upstream end of Woodruff Island, view N

Photograph 12 – Low gradient Woodruff Island upstream shoreline (view NW)

Photograph 13 – Typical NE riverbank development and boat dock, view N

Photograph 14 – Typical NE riverbank land use/development (note rock/riprap), view N

Photograph 15 – Typical NE riverbank pier/dock (note 10’ riverbank), view N

Photograph 16 – Typical NE riverbank (undeveloped section), view NE

Photograph 17 – Typical NE riverbank land use/development, view NE

Photograph 18 – Typical NE riverbank land use, view E

Photograph 19 – Roadway along NE riverbank (note >8’ riverbank height), view NE

Photograph 20 – NE riverbank stabilization using waste tires, view NE

Appendix H

James River Freshwater Mussel Survey Report

James River Freshwater Mussel Survey Report

Scott's Mill Hydropower Project (FERC No. 144525)

Lynchburg City and Amherst Counties, Virginia

James River below Scott's Mill Dam

Prepared For:

Liberty University &

Dyok Consulting

Prepared by:

Three Oaks Engineering

November 23, 2016

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1.0 INTRODUCTION

The Scott's Mill Hydro Project (FERC No. 14425, the Project) is a proposed 3.8 megawatt hydropower project being undertaken by Liberty University (LU) and partners. The Project proposes modification of the existing 875-foot-long by 15-foot-high Scott's Mill dam that creates an approximately 3.5-mile-long, 316 acre run of the river impoundment on the James River in Lynchburg City and Amherst Counties.

The Federal Energy Regulatory Commission (FERC) license application for the project includes participation of stakeholders such as the state and federal resource agencies. In their review of the Project, the Virginia Department of Game and Inland Fisheries (VDGIF) requested updated survey data for freshwater mussels within the pool above Scott's Mill Dam and the mainstem James River downstream to the vicinity of its confluence with Blackwater Creek (project boundary). Previous survey efforts within the project boundary near John Lynch Bridge documented the presence of three species of freshwater mussel including the state Threatened Green Floater (*Lasmigona subviridis*) in 2002.

Three Oaks Engineering (Three Oaks) was retained to conduct this mussel study, with the objective of characterizing mussel presence/absence and relative abundance within the project boundary.

2.0 TARGET SPECIES DESCRIPTION

As the Green Floater is known from the project area, a brief description of the species characteristics, biology and distribution is provided below.

2.1 Lasmigona subvirdis (Green Floater) *Conrad 1835*

2.1.1 Characteristics

The Green Floater, described by Conrad (1835) from the Schuylkill River in Lancaster County, Pennsylvania, is relatively small with a thin, slightly inflated, sub ovate shell that is narrower in front, and broader behind. The dorsal margin forms a blunt angle with the posterior margin. The shell is dull yellow or tan to brownish green, usually with concentrations of dark green rays.

2.1.2 Distribution and Habitat Requirements

The Green Floater occurs along the Atlantic Slope from the Savannah River in Georgia north to the Hudson River in New York, as well as in the "interior" basins New, Kanawha, and Watauga (of the Tennessee River) basins. Ortmann (1919) observed that the Green Floater is "adverse to very strong current, and prefers more quiet parts, pools or eddies with gravelly and sandy bottoms, and it also goes into canals, where it seems to flourish." Clarke (1985) agreed with this assessment, adding that it seemed to have a preference for streams as opposed to rivers and that it is not consistently found but when located, it is often abundant. These observations are consistent with where Green Floater has been recently observed, with the species showing a preference for stable, relatively low energy habitats, most often being found along shallow

stream margins that often have a component of silt and or clay (T. Dickinson, personal observations). A silt/detritus component has also been shown to be important in propagation efforts, where survival of juveniles grown in hatcheries increases where it is provided (B. Watson, personal communication). The Green Floater has experienced major declines throughout its entire range.

2.1.3 Threats to Species

The cumulative effects of several factors, including sedimentation, point and non-point discharge, stream modification (e.g., impoundment, channelization) are believed to have contributed to the decline of this species throughout its range. When mussel populations are reduced to a small number of individuals and are restricted to short reaches of isolated streams, they are extremely vulnerable to extirpation from a single catastrophic event or activity (Strayer et al. 1996). Catastrophic events may consist of natural events such as flooding or drought, as well as human influenced events, such as toxic spills.

Siltation resulting from improper erosion control of various land usage, including agriculture, silviculture, and development activities, has been recognized as a major contributing factor to degradation of mussel populations (USFWS 1996). Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing potential exposure to other pollutants, and by directly smothering mussels (Ellis 1936, Marking and Bills 1979). Sediment accumulations of less than 1 inch have been shown to cause high mortality in most mussel species (Ellis 1936).

Sewage treatment effluent has been documented to significantly affect the diversity and abundance of mussel fauna (Goudreau et al. 1988). Goudreau et al. (1988) found that recovery of mussel populations might not occur for up to two miles below points of chlorinated sewage effluent. Clarke and Neves (1984) suggested that sewage and industrial pollution might have contributed to the extirpation of the James Spinymussel from the North River in Virginia. The impact of impoundments on freshwater mussels has been well-documented (USFWS 1992, Neves 1993). Construction of dams transforms lotic habitats into lentic habitats, which results in changes with aquatic community composition. These changes associated with inundation adversely affect both adult and juvenile mussels as well as fish community structure, which could eliminate possible fish hosts for glochidia (Fuller 1974).

The introduction of exotic species, such as the Asian Clam (*Corbicula fluminea*) and Zebra Mussel (*Dreissena polymorpha*), has also been shown to pose significant threats to native freshwater mussels. The Asian Clam is now established in most of the major river systems in the United States (Fuller and Powell 1973) including those streams still supporting surviving populations of the green floater. Concern has been raised over competitive interactions for space, food, and oxygen between this species and native mussels, possibly at the juvenile stages (Neves and Widlak 1987, Alderman 1997). The Asian clam is common to abundant within the James River. The zebra mussel, native to the drainage basins of the Black, Caspian, and Aral Seas, is an exotic freshwater mussel that was introduced into the Great Lakes in the 1980s and has rapidly expanded its range into the surrounding river basins, including those of the South Atlantic Slope (O'Neill and MacNeill 1991). This species competes for food resources and

space with native mussels, and is expected to contribute to the extinction of at least 20 freshwater mussel species if it becomes established throughout most of the eastern United States (USFWS 1992). This species has not been recorded in the James River Basin in Virginia, but has been recorded in a quarry in Prince William County VA, within the Potomac River Basin.

The Green Floater is listed as Threatened in Virginia. The species is listed by Williams et al. (1993) as threatened throughout its range. The most recent status assessment and conservation strategy for this species was completed in 2014 (VDGIF 2014).

3.0 SURVEY EFFORTS

To provide current data on the freshwater mussel fauna with regards to species composition, distribution, and relative abundance within the project boundary, mussel surveys were conducted at seven locations in the reservoir pool between Scott's Mill dam and Reusens dam, and in the James River tailrace below the dam downstream to the vicinity of its confluence with Blackwater Creek (Appendix A, Figures 1 & 2).

3.1 Mussel Surveys for this Project

Surveys were conducted by Three Oaks personnel Tom Dickinson, Chris Sheats, and Evan Morgan on October 6-7, 2016, with assistance from VDGIF State Malacologist Brian Watson on October 6th.

3.2 Methodology

Survey sites were selected after initial habitat evaluations were performed, with special preference given to areas with appropriate habitat for rare target mussel species. Impoundment sites were accessed via powerboat and the James River below the dam was accessed on foot from available public access points. Visual and tactile surveys were performed using mask/snorkel, glass bottom view buckets (bathyscopes), and/or SCUBA, depending on the habitat type and depth. Shoreline surveys utilized mask/snorkel and bathyscopes. SCUBA was used at depths over 3 feet during transect surveys and deeper sites in the impoundment. Timed searches were employed at all the survey sites to provide Catch Per Unit Effort (CPUE) data for each species found.

All areas of appropriate habitat were searched within a site. All freshwater mollusks were recorded and returned to the substrate. Representative photographs of each species were taken. Timed survey efforts provided Catch Per Unit Effort (CPUE) data for each species found. Relative abundance estimates for freshwater snails and freshwater clam species were developed using the following criteria:

- (VA) Very abundant > 30 per square meter
- (A) Abundant 16-30 per square meter
- (C) Common 6-15 per square meter
- (U) Uncommon 3-5 per square meter
- (R) Rare 1-2 per square meter
- (P-) Ancillary adjective "Patchy" indicates an uneven distribution of the species within the sampled site.

4.0 RESULTS

The survey sites/reaches conducted for the Project are depicted in Appendix A Figures, with select photographs in Appendix B. The survey results for each survey site are presented as follows.

4.1 Scott's Mill Tailrace

This reach included the James River tailrace below Scott's Mill from the vicinity of the Blackwater Creek confluence to the dam. The main channel is greater than 90 meters wide with mostly boulder/cobble lined banks; a large amount of metal debris was present in the river adjacent to the Griffin Pipe factory. Several cobble/gravel bars were present near the Blackwater Creek confluence and a large sandbar/island was present just below the dam. American water-willow (*Justicia americana*) stabilized the bars and banks where it was present. Most the reach consisted of deeper run habitat, with a riffle complex near the downstream extent of the survey and occasional slackwater areas along banks and behind bars. Substrates consisted of a variable mix of sand, gravel, and cobble, with silt and sand accumulations in lower flow and depositional areas. Surveys were concentrated along the river margins of the main channel and surveys were to depths of approximately 3 feet for a total of 11.67 person hours, during which two species of freshwater mussel, the Eastern Ellipito (*Elliptio complanata*) and Northern Lance (*Elliptio fisheriana*), were found (Table 1). Mussels were found in relative low densities, with most located below John Lynch Bridge. Other mollusks located included the invasive exotic Asian Clam (*Corbicula fluminea*), which was very abundant, with shells comprising a large portion of the substrate in areas, as well as the aquatic snails Pointed Campeloma (*Campeloma decisum*), Piedmont Elimia (*Elimia virginica*), and Crested Mudalia (*Leptoxis carinata*). The Pointed Campeloma was only represented by a few individuals, while the Piedmont Elmia and Crested Mudalia were abundant and often found in concentrations on rocks and other stable substrates, particularly in areas of steady flow.

Table 1. Scotts Mill Tailrace Shoreline Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio complanata	Eastern Elliptio	235	20.14/hr
Elliptio fisheriana	Northern Lance	4	0.34/hr
Freshwater Snails and Clams			**Relative Abundance**
Campeloma decisum	Pointed Campeloma	~	R
Corbicula fluminea	Asian Clam	~	VA

Elimia virginica	Piedmont Elimia	~	A
Leptoxis carinata	Crested Mudalia	~	A

In order to characterize habitat and relative abundance of mussels across the river, three cross river transects were surveyed utilizing SCUBA at the locations shown in figure 1. Surveyors covered an approximately one meter wide swath during each pass. The results for each are summarized below.

4.1.1 Transect 1

This transect was surveyed by three divers for a total of 1.9 person hours. Substrate consisted of a mix of sand, gravel, cobble, and boulder, with areas of bedrock. The majority of mussels were found on the left descending side of the channel, but were consistently found throughout the transect. A total of 102 Eastern Elliptio (53.7/hr) and 3 Northern Lance (1.6/hr) were located.

4.1.2 Transect 2

This transect was surveyed by two divers for a total of 0.9 person hours. Substrate consisted of a mix of sand, gravel, cobble, boulder, and bedrock; bedrock was the dominant substrate along the left descending half of the channel. As such, the right descending side was most productive. A total of 22 Eastern Elliptio (24.4/hr) were found

4.1.3 Transect 3

This transect was located just downriver of the mill dam turbulence for 0.4 person hours. Substrate consisted of a shifting sand, gravel, and shell mix. No live mussels were found, however, a shell of the Eastern Floater (*Pyganadon cataracta*) was located.

4.2 Site 1

This most downriver impoundment site was surveyed from the right descending river bank to the middle of the channel. The maximum depth was approximately 5 meters. Substrate ranged from the silt/mud shoreline and slope with abundant woody debris to unconsolidated sand along the river bottom. One live Northern Lance was found in the river bank shallows; no other mussel evidence was located in 1.25 person hours of search.

Table 2. Site 1 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio fisheriana	Northern Lance	1	0.8/hr
Freshwater Snails and Clams			**Relative Abundance**
Campeloma decisum	Pointed Campeloma	~	R
Corbicula fluminea	Asian Clam	~	C
Elimia virginica	Piedmont Elimia	~	U

4.3 Site 2

This shallow interisland site consisted of several smaller channels with some flow. Substrate was dominated by gravel mixed with sand, mollusk (Corbicula and snail) shell, and silt. American water-willow lined the island margins. Surveys were conducted for 1.25 person hours. While the habitat presented as high quality, only a few Eastern Elliptio were located.

Table 3. Site 2 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio complanata	Eastern Elliptio	5	4.0/hr
Freshwater Snails and Clams			**Relative Abundance**
Corbicula fluminea	Asian Clam	~	A
Elimia virginica	Piedmont Elimia	~	U

4.4 Site 3

This site consisted of a gradual sloping silt shoreline to the river bottom with a maximum depth of approximately 4 meters. Substrate was dominated by sand with patches of gravel and boulder. Surveys were conducted for 1.17 person hours. A single Northern Lance shell comprised the only mussel evidence found.

Table 4. Site 3 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio fisheriana	Northern Lance	Shell	~
Freshwater Snails and Clams			**Relative Abundance**
Corbicula fluminea	Asian Clam	~	C
Elimia virginica	Piedmont Elimia	~	U

4.5 Site 4

This shallow site consisted of a channel lined with American water-willow between islands. Substrate was dominated by silt, sand, and mollusk shell; however, no freshwater mussel evidence was found in 1.2 person hours of search.

4.6 Site 5

This site was surveyed from the left descending river bank near a rail road trestle. Surveys were conducted along the shoreline and to the center channel to a maximum depth of 3 meters. Substrate consisted of boulder and debris with patches of silt, sand, and gravel in-between. Surveys were conducted for 1.0 person hour during which two Eastern Ellitpio were found.

Table 5. Site 5 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio complanata	Eastern Elliptio	2	2.0/hr
Freshwater Snails and Clams			**Relative Abundance**
Corbicula fluminea	Asian Clam	~	C
Elimia virginica	Piedmont Elimia	~	C

4.7 Site 6

This site was surveyed from a bar covered in dense American water-willow to the head of the next island downriver. Substrates consisted of sand, gravel, cobble, and shell covered in a layer of silt. Surveys were conducted to a maximum depth of approximately 2 meters. No live mussels were found in 1.5 person hours of search, however shell evidence of the Eastern Elliptio and Northern Lance were present.

Table 6. Site 6 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio complanata	Eastern Elliptio	Shell	~
Elliptio fisheriana	Northern Lance	Shell	~
Freshwater Snails and Clams			**Relative Abundance**
Corbicula fluminea	Asian Clam	~	C
Elimia virginica	Piedmont Elimia	~	C
Leptoxis carinata	Crested Mudalia	~	C

4.8 Site 7

This most upriver site was conducted within sight of Reusens dam from a dense water-willow bar. Habitat consisted of run with mixed cobble, gravel, and sand substrate. A few older Eastern Elliptio were located in 2.0 person hours of search.

Table 7. Site 7 Results

Scientific Name	Common Name	Number	CPUE (#/hr)
Freshwater Mussels			
Elliptio complanata	Eastern Elliptio	2	1.0/hr
Freshwater Snails and Clams			**Relative Abundance**
Corbicula fluminea	Asian Clam	~	C
Elimia virginica	Piedmont Elimia	~	C
Leptoxis carinata	Crested Mudalia	~	C

5.0 CONCLUSIONS

This report provides current freshwater mussel survey data for the Scott's Mill Hydro Project. The target Green Floater was not found during these efforts, however, appropriate habitat conditions coupled with the known record from 2002 suggest this and other rare species may be present, but were not detected during these one-time efforts.

These surveys documented the presence of three freshwater mussel species; the Eastern Elliptio, Northern Lance, and Eastern Floater. The highest quality habitats and greatest relative abundances were observed in the lower tailrace reach, below John Lynch bridge. The impoundment results suggest that the Scott's Mill dam pool supports a very low density mussel fauna for the available habitat observed.

6.0 LITERATURE CITED

Alderman, J.M. 1997. Monitoring the Swift Creek freshwater mussel community. Pages 98-107 in K.S. Cummings, A.C. Buchanan, C.A. Mayer, and T.J. Naimo, eds. 1997. Conservation and Management of Freshwater Mussels II Initiatives for the future. Proceedings of a UMRCC symposium, 16-18 October 1995, St. Louis, Missouri. Upper Mississippi River Conservation Committee, Rock Island Ilinois. 293 pp.

Clarke, A.H. (1985). The tribe Alasmidontini (Unionidae: Anodontinae), Part II: Lasmigona and Simpsonaias. Smithsonian Contributions to Zoology, 399: 75.

Clarke, A. H. and R. J. Neves. 1984. Status survey of the James River spinymussel *Cathyria collina*, in the James River, Virginia. A report for Region 5 of the U.S. Fish and Wildlife Service. 32pp.

Conrad, T. A. 1835. Monography of the family Unionidae, No. 1:1-12, pls. 1-5, or naiads of Lamarck (freshwater bivalve shells) of North America, illustrated by figures drawn on stone from nature. J. Dobson, 108 Chestnut Street, Philadelphia, Pennsylvania.

Ellis, M.M. 1936. Erosion silt as a factor in aquatic environments. Ecology. 17:29-42.

Fuller, S. L. H. 1974. Clams and mussels (Mollusca: Bivalva). Pp. 215-273, *In:* C. W. Hart, Jr., and S. L. H. Fuller, editors. *Pollution Ecology of Freshwater Invertebrates.* Academic Press, New York. 389pp

Goudreau, S.E., R.J. Neves, and R.J. Sheehan. 1988. Effects of sewage treatment effluents on mollusks and fish of the Clinch River in Tazewell County, Virginia. Final Rep., U.S. Fish and Wildl. Serv. 128 pp.

Marking, L.L., and T.D. Bills. 1979. Acute effects of silt and sand sedimentation on freshwater mussels. Pp. 204-211 in J.L. Rasmussen, ed. Proc. of the UMRCC symposium on the Upper Mississippi River bivalve mollusks. UMRCC. Rock Island IL. 270 pp.

Neves, R.J. 1993. A state of the Unionids address. Pp. 1-10 in K.S. Cummings, A.C. Buchanan, and L.M. Kooch, eds. Proc. of the UMRCC symposium on the Conservation and Management of Freshwater Mussels. UMRCC. Rock Island IL.189 pp.

Neves, R.J., and J.C. Widlak. 1987. Habitat ecology of juvenile freshwater mussels (Bivalvia: Unionidae) in a headwater stream in Virginia. Amer. Malacol. Bull. 1(5):1-7.

O'Neill, C.R., Jr., and D.B. MacNeill. 1991. The zebra mussel (*Dreissena polymorpha*): an unwelcome North American invader. Sea Grant, Coastal Resources Fact Sheet. New York Sea Grant Extension. 12 pp.

Ortmann, A.E. 1919. A monograph of the naiades of Pennsylvania. Part III: Systematic account of the genera and species. Memoirs of the Carnegie Museum 8(1):xvi–384, 21 pls.

Parmalee P.W. and Bogan A.E. 1998. *The Freshwater Mussels of Tennessee*. University of Tennessee Press, Knoxville Tennessee.

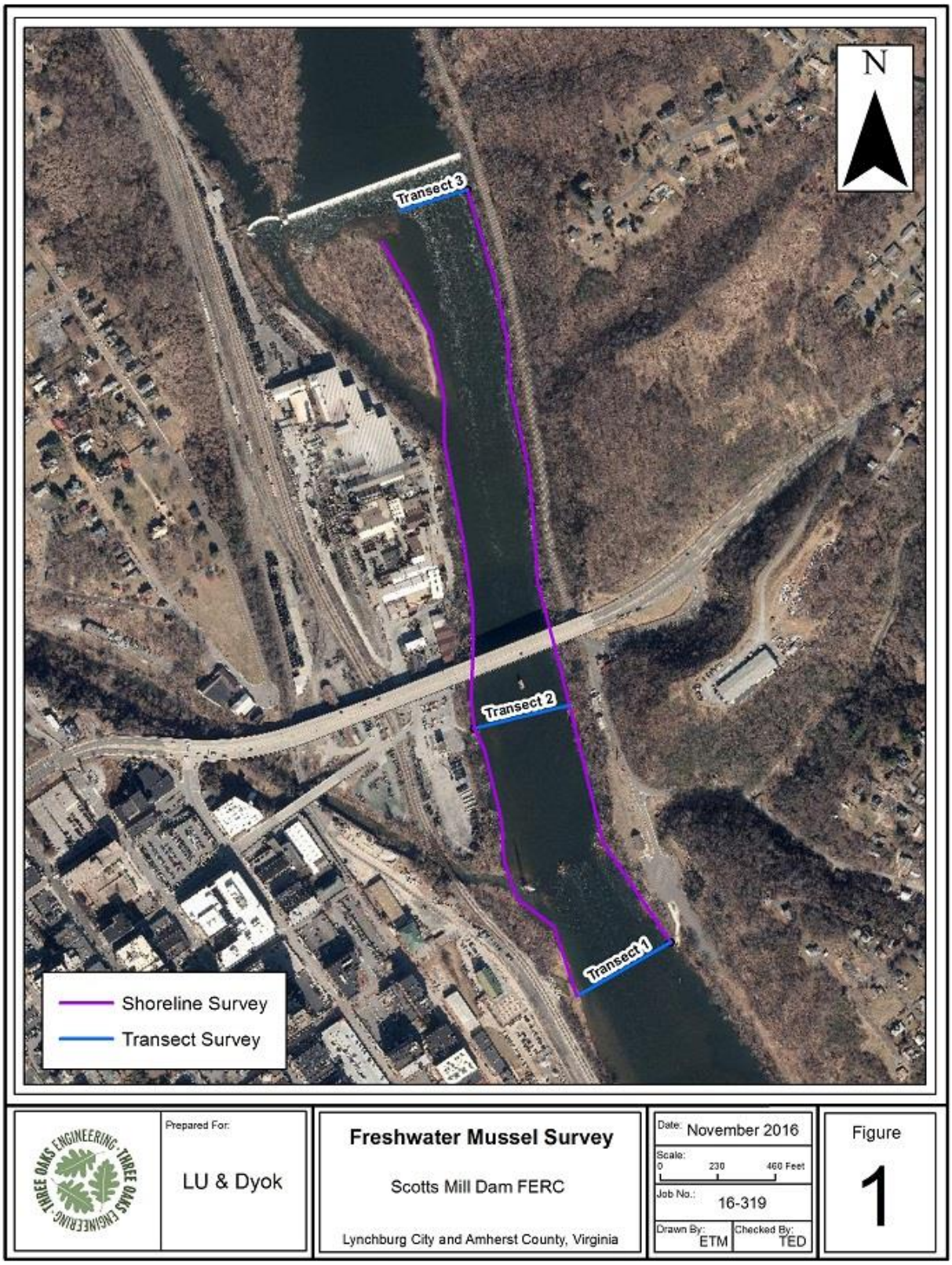
U.S. Fish and Wildlife Service. 1996. Revised Technical/Agency Draft Carolina Heelsplitter Recovery Plan. Atlanta GA. 47 pp.

U.S. Fish and Wildlife Service. 1992. Endangered and Threatened species of the southeast United States (The red book). Prepared by Ecological Services, Div. of Endangered Species, Southeast Region. Government Printing Office, Wash. D.C. 1,070 pp.

Virginia Department of Game and Inland Fisheries. 2014. Green Floater Conservation Plan. Bureau of Wildlife Resources. VDGIF, Richmond, VA.

Williams, J.D., M.L. Warren Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation status of the freshwater mussels of the United States and Canada. *Fisheries* 18(9):6-22.

APPENDIX A: Figures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Transect 2
Transect 1
Shoreline Survey
Transect Survey
Prepared For:
LU & Dyok
Freshwater Mussel Survey
Scotts Mill Dam FERC
Lynchburg City and Amherst County, Virginia
Date: November 2016
Scale:
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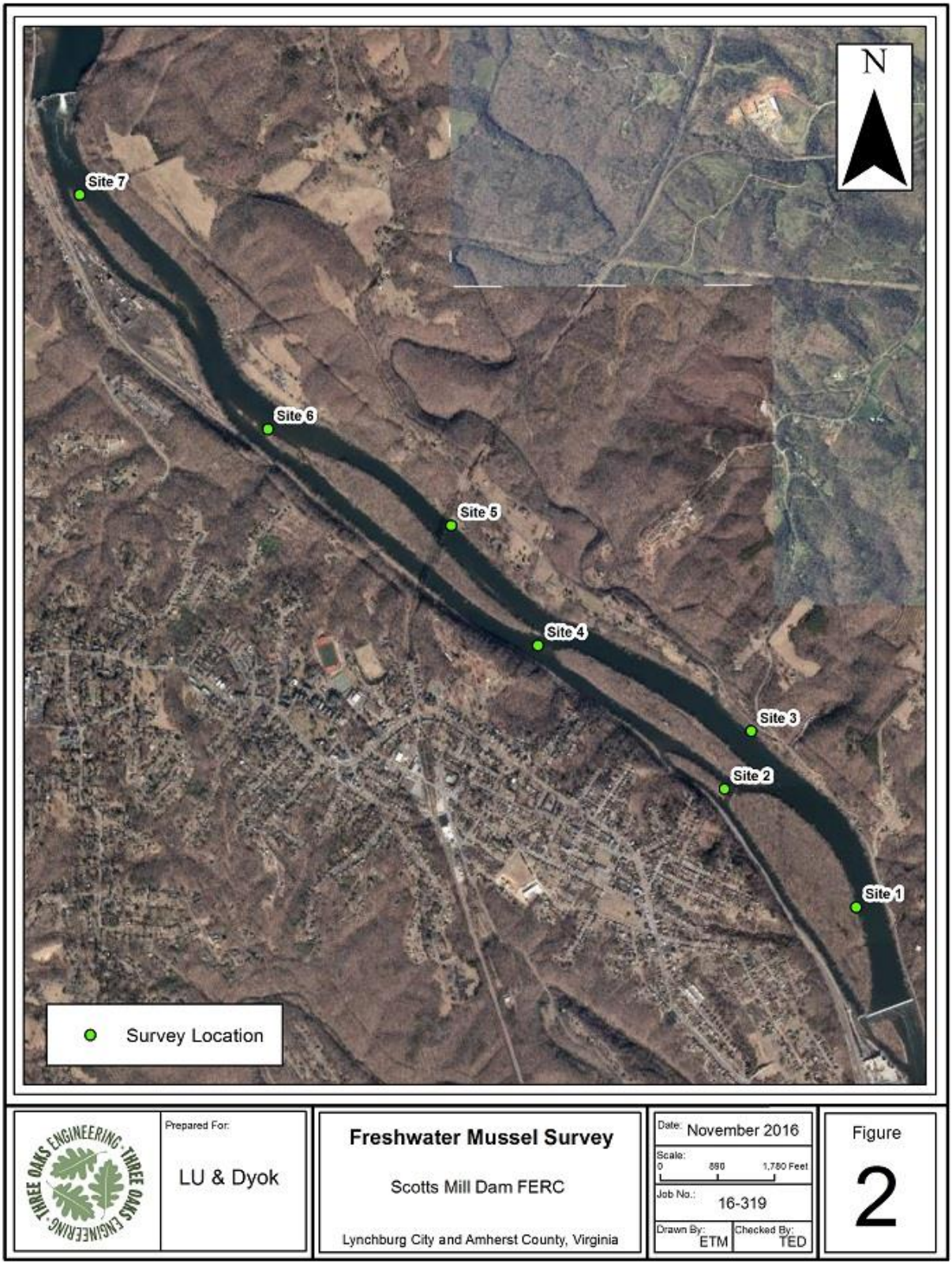
460 Feet
Job No.: 16-319
Drawn By: ETM
Checked By: TED
Figure
1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Site 7
Site 6
Site 5
Site 4
Site 3
Site 2
Site 1
Survey Location
Prepared For:
LU & Dyok
Freshwater Mussel Survey
Scotts Mill Dam FERC
Lynchburg City and Amherst County, Virginia
Date: November 2016
Scale:
0
880
1,760 Feet
Job No.: 16-319
Drawn By: ETM
Checked By: TED
Figure
2

APPENDIX B: Select Photographs

Tailrace Reach Riffle Habitat in vicinity of Blackwater Creek

Tailrace Reach Eastern Elliptio (top and right) and Northern Lance (left and bottom)

Juvenile Eastern Elliptio and Pointed Campeloma-tailrace reach

Boulder lined shoreline tailrace reach

Snorkeling run habitat under John Lynch Bridge-tailrace reach

Lower impoundment shoreline habitat

Interisland impoundment habitat

Water-willow margin below Reusens Dam

Eastern Elliptio located at Impoundment Site 7

Appendix I

Phase II Architectural Survey of Water Works Dam and Canal

THIS APPENDIX CONTAINS PRIVILEGED INFORMATION AND IS EXCLUED FROM THIS DOCUMENT