Assessment of Corrective Measures Report

Possum Point Power Station - Pond D
Dumfries, Virginia

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Executive Summary

Golder Associates Inc. (Golder) prepared this *Assessment of Corrective Measures (ACM) Report* on behalf of Virginia Electric and Power Company, doing business as Dominion Energy Virginia (Dominion Energy) for Pond D at the Possum Point Power Station (Facility) in Dumfries, Virginia. Dominion Energy maintains a groundwater monitoring program for Pond D at the Possum Point Power Station in Prince William County, Virginia, consistent with the requirements in Title 40 Code of Federal Regulations (CFR) Part 257.50 *et seq.* of the Federal Disposal of Coal Combustion Residuals from Electric Utilities Rule (CCR Rule) as well as the Commonwealth of Virginia adoption of 40 CFR Part 257 Subpart D by reference [Title 9 Virginia Administrative Code (VAC) Agency 20, Chapter 81-800 *et seq.* (9VAC20-81-800)]. Evaluation of analytical data collected during the first semi-annual compliance monitoring event in 2018 resulted in the identification of Virginia Groundwater Protection Standard (GWPS) exceedances for cobalt (ED-1605) and lithium (ED-9R2 and SD-1603). Similar exceedances of the Virginia (ED-1605, ED-1D, and ED-1606) and the federal (ED-1605) GWPS were observed for cobalt during the second semi-annual 2018 event. In response to these exceedances, consistent with the CCR Rule, Dominion Energy initiated an ACM on January 29, 2019.

A field investigation was completed for the Possum Point Power Station Pond D between January 2019 and March 2019 to support the ACM consistent with the requirements in 40 CFR Part 257.95 and 257.96 of the CCR Rule. A report summarizing the results of the field investigation is provided under separate cover (*ACM Field Investigation Report,* June 2019). This ACM Report summarizes the results of the assessment of remedial alternatives for addressing the reported GWPS exceedances based on the results of the field investigation, the site conceptual model, a Risk Assessment, and Commonwealth of Virginia statutory requirements promulgated during the 2019 General Assembly for CCR source removal from unlined impoundments. The requirement for source removal (pending codification) is detailed in Chapter 651 of the 2019 Acts of Assembly (Senate Bill 1355) as signed by the Virginia Governor on March 20, 2019, hereafter referred to as The Act.

Prior to promulgation of The Act, Dominion Energy was evaluating numerous industry-accepted remedial alternatives for remediation of groundwater downgradient from Pond D, most of which were based on a closure in-place scenario for the CCR material. However, subsequent to the requirements of The Act (effective date of July 1, 2019), a closure in-place scenario is no longer an option; rather Dominion Energy will be required to remove the CCR materials accumulated in Pond D. This requirement, in consideration of the existing groundwater impact extending over 30 years of Pond D operation, indicates that source removal will significantly expedite the remediation of documented groundwater impacts. This finding, coupled with the actual limited impacts associated with the delineated groundwater impacts (limited to Dominion Energy property), implies that no significant additional remedial progress or benefit would be realized with the implementation of additional active remedial measures. Specifically, existing data indicates that source removal and natural recovery of the groundwater system is sufficient to meet the regulatory requirements in a timely manner. Therefore, this ACM considers the following remedial alternatives:

- Excavation with On-Site Disposal and Natural Recovery
- Excavation with Off-Site Disposal and Natural Recovery

These two remedial alternatives were evaluated consistent with the requirements of the CCR Rule (40 CFR Part 257.96 and 257.97). To assist with this evaluation, Golder developed a robust analytical model for the probabilistic ranking of the remedial options using the remedial options evaluation criteria set forth in the CCR Rule

Executive Summary - Continued

for the ACM. The model evaluated the remedial options against the CCR Rule ACM criteria, with a higher probability of success assigned for criteria that the remedy could meet and *vice-versa*. Ideally a higher overall probability implies that the remedy would be more likely to be successful in meeting the CCR Rule remedial action goals. As stated in the CCR Rule, these goals are:

1) To prevent further releases,
2) To remediate any existing releases, and
3) To restore the affected area to original conditions.

The probabilistic model was used to account for the relative uncertainty associated with the evaluation criteria under each remedial option. The uncertainty related to probability of success is attributed to a variety of reasons, including but not limited to data gaps associated with known site conditions, hydrogeologic information, operating and permitting conditions, regulatory feedback, and community acceptance. After building and compiling the model for each remedial option, the model for each remedial option was evaluated 1,000 times over the estimated remedial option timeframe [estimated at 22 years for on-site disposal (12 years for removal and 10 years of natural recovery monitoring) and 25 years for off-site disposal (15 years for removal and 10 years of natural recovery monitoring)], using the GoldSim® Monte Carlo Modeling (GoldSim®) software. The modeling output was then used to develop remedy-specific probabilistic distributions describing the probability of success for each remedy. The modeling results suggest that excavation with off-site disposal has a slightly higher mean probability of success (3.2% higher) which is within the expected margin of error for the evaluation.

The CCR Rule currently does not include provisions for evaluating potential remedial options based on remedy implementation or operational costs; however, other factors, such as costs, are critical for the evaluation. Specifically, costs are important for viability assessment and planning purposes. Therefore, as with the ACM evaluation criteria, Golder developed probabilistic cost estimates (AACE International [formerly the Association for Advancement of Cost Engineering] Class IV type – study/feasibility level) for each viable remedial option over the expected remedial timeframe. These cost estimates include costs associated with the design and permitting, construction, operations, post-construction monitoring for natural recovery, and termination of the remedy once the remedial action goals are achieved. The probabilistic cost estimates were then evaluated using 1,000 simulations of the remedy-specific analytical cost model with the GoldSim® software to generate probabilistic ranges for the remedy costs. The evaluations indicated that upper 95% future value costs for the two source removal alternatives considered, based on an average inflation rate of 2.5% over the estimated remedial timeframes, could range from approximately $450 million USD (on-site disposal over 22 years) to approximately $1,360 million USD (off-site disposal over 25 years).

Using the estimated costs for remediation, the alternatives from the probability-of-success evaluation were normalized for costs to generate a relative method for comparing the cost-benefit of the remedial options. The evaluation was completed by dividing the mean probability of success for each remedial option by the mean cost estimate (in $1,000's of million USD) for the remedy. That evaluation indicates that the highest cost-benefit is obtained with excavation and on-site disposal (184.7% relative cost-benefit factor) versus a relative cost-benefit factor of 64.8% for excavation and off-site disposal.

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) prepared this *Assessment of Corrective Measures* (ACM) *Report* on behalf of Virginia Electric and Power Company, doing business as Dominion Energy Virginia (Dominion Energy), to evaluate remedial alternatives to address impacted groundwater identified in the vicinity of Pond D at the Possum Point Power Station (Facility) in Dumfries, Virginia (Drawing 1).

The ACM is required for Pond D due to exceedances of Virginia and federal Groundwater Protection Standards (GWPS) for cobalt and lithium during the first and second semi-annual compliance sampling events in 2018. During the first semi-annual event of 2018 lithium was identified as exceeding the Virginia GWPS at two Pond D assessment monitoring program wells (ED-9R2 and SD-1603) and cobalt was identified as exceeding the Virginia GWPS at one Pond D compliance well (ED-1605). Similar exceedances of the Virginia GWPS for cobalt were documented at three wells (ED-1605, ED-1D, and ED-1606) and the federal GWPS for cobalt at one well (ED-1605) during the second semi-annual 2018 event. The exceedances were documented using a direct value-to-standard comparison method for the evaluation.

In response to the GWPS, Dominion Energy completed a field investigation to support the ACM. The field investigation was conducted between January 2019 and March 2019 pursuant to the requirements in Title 40 of the Code of Federal Regulations (CFR) Section 257.96 (40 CFR Part 257.96) of the Federal Disposal of Coal Combustion Residuals from Electric Utilities Rule (CCR Rule). A report summarizing the results of the field investigation is provided under separate cover (Golder*,* June 2019).

This ACM Report summarizes the results of the assessment of remedial alternatives for addressing the reported GWPS exceedances based on the results of the field investigation. This ACM Report has been prepared in accordance with CCR Rule requirements consistent with Virginia Department of Environmental Quality (DEQ) guidance for assessing potential remedial actions at solid waste sites as outlined in the Division of Land Protection and Revitalization Guidance Memo LPR-SW-SI-16.

In addition to the above referenced regulatory requirements and DEQ guidance, the ACM was completed in the context of recent legislation promulgated during the 2019 Virginia Assembly that requires certain activities for management of CCR materials in unlined impoundments, including Pond D. Specifically, Commonwealth of Virginia statutory requirements promulgated during the 2019 General Assembly (pending codification) as detailed in Chapter 651 of the 2019 Acts of Assembly (Senate Bill 1355) and signed by the Virginia Governor on March 20, 2019, hereafter referred to as The Act, requires the removal of CCR material from unlined impoundments. The recovered materials are to be beneficially reused or disposed of in a lined landfill. This requirement for source removal eliminated various remedial options based on a “closure in-place scenario” that were being considered for Pond D. Furthermore, in consideration of the limited nature of the documented groundwater impacts that have developed over 30 years of Pond D operation, it is Golder’s opinion that source removal will significantly expedite the remediation of any groundwater impacts beneath and downgradient from the Pond D. Therefore, no significant additional remedial progress or benefit is expected to be realized with the implementation of additional active remedial measures beyond source removal. The remedial evaluations presented herein are based on this finding.

2.0 SITE INFORMATION SUMMARY

2.1 Site Setting and Background

As shown on Drawing 1, a portion of the United States Geological Survey USGS 7½ minute topographic map of Quantico, Virginia, the site vicinity has moderately steep topography in the Facility's pond area. Both intermittent and perennial streams characterize surface flow in the vicinity of Pond D, with broad ridges and hilltops serving as topographical highs (maximum elevations of roughly 200 feet above mean sea level [AMSL] to the north of the Pond D). Pond D is located northwest of the power block in an upland area outside of the floodplain.

As presented on Drawing 2, the Station property is used for industrial purposes, and the surrounding properties are generally undeveloped or consist of private residential development. Undeveloped areas primarily consist of predominantly hardwoods and deciduous wooded uplands with wetlands present in low lying areas adjacent to stream channels. The impoundment areas are bordered to the south by Quantico Creek and public roadways (Possum Point Road and Cockpit Point Road). Land use surrounding Pond D is classified as both "M-1 Heavy Industrial" and "A-1 Agricultural". There are known water supply wells on some of the adjoining properties to the Facility; however, none of the known wells are located hydraulically downgradient from Pond D.

Historically groundwater beneath Pond D has been monitored under a Virginia Pollutant Discharge Elimination System (VPDES) Permit (Permit No. VA0002071) that was initially issued in 1985. Based on monitoring results, a Site Characterization Report (SCR) was submitted to the DEQ for the Facility in September 2004. The SCR concluded that observed groundwater conditions downgradient from Pond D (and the former adjoining Pond E) did not pose a risk to identified offsite human health or environmental receptors. The VPDES permit was most recently reissued in April 2013 and monitoring and reporting activities under the VPDES permit are conducted on a semi-annual basis. Solid Waste Permit (SWP No. 617) was issued on June 13, 2019, for the closure of Ponds ABC and E and to incorporate CCR rule provisions into the state permit for the CCR surface impoundments, including groundwater monitoring. From this date forward Pond D groundwater monitoring will be conducted under the requirements outlined in SWP No. 617.

Groundwater monitoring under the CCR Rule began in November 2016 at Pond D. The background sampling activities for Pond D were completed in August 2017 and the Groundwater Monitoring Certification, Groundwater Monitoring Plan, and Statistical Method Certification were placed in the operating record by October 17, 2017. The compliance monitoring well locations are shown on Drawing 2. The initial Detection Monitoring Program event for Pond D was completed in September 2017 and identified statistically significant increases (SSIs) over background levels in one or more downgradient wells. Within 90 days of identifying the SSIs, the Assessment Monitoring Program was established at Pond D by sampling groundwater in all CCR well network wells for all constituents listed in Appendix IV of the CCR Rule in March 2018 following placement of the statistically significant increase notification in the operating record on February 4, 2018. The initial semi-annual sampling event for Pond D was completed in June 2018 and the second semi-annual event was conducted in September 2018.

As discussed previously, a Virginia GWPS exceedance for cobalt was documented on November 13, 2018 for Pond D assessment monitoring well ED-1605 with additional Virginia GWPS exceedances for lithium documented in samples collected from ED-9R2 and SD-1603. The locations of the CCR compliance wells with GWPS exceedances are shown on Drawing 3. Once a GWPS exceedance has been documented for an Appendix IV constituent, such as lithium or cobalt, the CCR Rule requires the initiation of an ACM within 90 days of documenting the GWPS exceedance unless a successful Alternative Source Demonstration (ASD) is completed. Consistent with the CCR Rule, Dominion Energy has an additional 90 days to complete the ACM unless a demonstration for additional time based on a Facility-specific condition or circumstances is completed. Pursuant to Part 257.96(a) of the CCR Rule, a demonstration of need for a 60-day extension was certified by a professional engineer and placed in the Facility's operating record on April 22, 2019. A copy of the extension request will be included in the Facility's annual groundwater monitoring and corrective action report.

2.2 Groundwater Monitoring Network

As presented in Table 1 below, the CCR Rule Pond D compliance monitoring network includes two upgradient wells and six downgradient wells that are screened within the uppermost aquifer beneath Pond D.

Table 1: Pond D Monitoring Network

Upgradient CCR Compliance Monitoring Wells		
ED-24R	ED-1612	
Downgradient CCR Compliance Monitoring Wells		
ED-1D	ED-9R2	SD-1603
SD-1604	ED-1605	ED-1606

In addition to the CCR compliance monitoring wells, the ACM evaluation was supported by data obtained from observation wells and VPDES wells that were previously installed in the vicinity of Pond D, along with eight observation wells installed during this investigation. The eight observation wells constructed during this investigation were installed to further assist with the vertical and horizontal delineation of groundwater impacts downgradient of ED-9R2 and SD-1603, where lithium exceedances were reported, and ED-1605, ED-1D, and ED-1606, where a cobalt exceedance was reported. Additional wells to evaluate the extent of lithium downgradient of ED-9R2 (proposed monitoring wells MW-2S and MW-2D) could not be installed due to the time of year restriction for bald eagles and the presence of a nest in the area (restriction timeframe extends through July 1st). Based on the results of the ACM field investigation, Golder does not believe that these formerly proposed wells need to be installed for delineation purposes. Table 2 below summarizes the additional wells evaluated during the ACM field investigation. The locations of groundwater wells are presented in Drawing 3.

Table 2: Pond D Area ACM Investigation Observation Wells and Soil Boring

Existing Observation Well		
SD-1611D		
Existing VPDES Wells		
ED-1	ED-17	ED-33

New ACM Investigation Wells and Soil Boring Downgradient Boundary Wells		
MW-1S	MW-1D	MW-3S
MW-3D	MW-4	MW-4S
MW-5S	MW-6S	SB-1 (soil boring only)

2.3 Purpose and Report Structure

Consistent with the CCR Rule, the purpose of the Pond D ACM is to assess corrective measures to prevent future releases, to remediate any releases, and to restore affected areas to original conditions. The evaluation of remedial options should take into consideration the nature and extent of the groundwater impacts.

As previously stated, a comprehensive summary of the field investigation completed to address the nature and extent of groundwater impacts [*i.e.,* to delineate the horizontal and vertical extent of cobalt and lithium GWPS exceedances in the vicinity of the Pond D] is provided under separate cover in the *ACM Field Investigation Report* (June 2019). A summary of the work completed, and the key results of the field investigation, is provided in Section 3.0. An assessment of select remedial options to address the requirements of the ACM per the CCR Rule is presented in Section 4.0. Cost estimates associated with the evaluated remedial options are presented in Section 5.0, limitations for the remedial alternative assessment are presented in Section 6.0, and conclusions are presented in Section 7.0.

3.0 ACM FIELD INVESTIGATION SUMMARY

The following sections summarize the findings from the *ACM Field Investigation Report* (Golder, 2019) completed to support this ACM Report. The field investigation focused on understanding the nature and extent of cobalt and lithium in site soils, groundwater, and the Pond D pore water based on the documented GWPS exceedances for these two constituents in Pond D compliance wells.

3.1 Constituent of Concern Lithium

As discussed in the *ACM Field Investigation Report* (Golder, 2019) lithium is an alkali metal found naturally in the Earth's crust. Lithium in nature occurs predominantly in silicate minerals, and is a common accessory element in feldspar, biotite mica, amphibole, and clay minerals (Reeder, 2006). The abundance of lithium in soil can vary considerably; lithium content of a soil is influenced more by the conditions under which the soil was formed than by the content of the original parent rock (Yalamanchali, 2012). Lithium is used in batteries, glass and ceramic production, in lubricants used in high-temperature environments, and in pharmaceuticals (Yalamanchali, 2012).

Under natural groundwater and surface water conditions (pH of 4 to 9 Standard Units and Eh of -0.1 to 0.4 volts) found in Virginia, lithium is found almost exclusively in its univalent free ionic form in the natural environment. When not dissolved in the water column, it is considered relatively immobile because its fluoride, carbonate, and phosphate compounds (*i.e.*, minerals) generally have low solubilities. Chemical and physical weathering of these minerals from igneous rocks and from secondary clay minerals, especially at low pH levels (Lyons and Welsh, 1997) will release the lithium ion into solution. As a result, lithium is found naturally occurring in groundwater (VDH, 2011) and in soil.

Limited soil sampling activities for lithium identified naturally occurring concentrations of lithium in site soils. The reported concentrations are consistent with concentrations reported as being naturally occurring in Virginia by the United States Geological Survey. Evaluation of the reported concentrations using expected soil-water partitioning evaluations indicates that the reported soil concentrations are generally sufficient in concentration to account for the low concentrations of lithium observed in site groundwater when land use practices are considered. These results suggest that the observed lithium concentrations in groundwater may in part, or fully, be associated with naturally occurring sources.

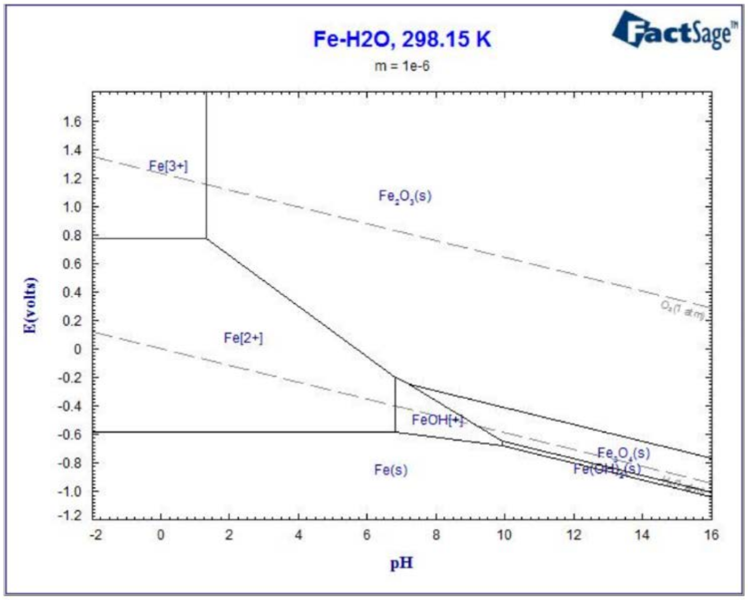
Supporting these limited findings are limited isotopes analyses completed during the ACM field investigation. Specifically, the Pond D pore water isotope composition falls within expected isotope ratio ranges for CCR pore water based on published literature. However, the isotope analyses completed for the groundwater compliance wells during this investigation indicates that the lithium isotope ratios for these two wells are dissimilar to the Pond D pore water ranges. Specifically, the isotope ratios are similar to the lithium isotope ranges observed other unimpacted downgradient wells at the Facility. These results suggest that the observed lithium concentrations in groundwater are more likely to be associated with naturally occurring sources than a release from Pond D.

3.2 Constituent of Concern Cobalt

As discussed in the *ACM Field Investigation Report* (Golder, 2019) cobalt is a naturally occurring metal found in soil and rock. Cobalt is commonly associated with minerals and ores that contain copper and nickel. Cobalt is used in the preparation of magnetic, wear-resistant, and high-strength alloys. Smalt (cobalt silicate glass) and cobalt blue [cobalt (II) aluminate, $CoAl_2O_4$] gives a distinctive deep blue color to glass, ceramics, inks, paints, and varnishes. Cobalt-60 is commercially important radioisotope, used as a tracer in the production of gamma rays for industrial use. Cobalt is an essential trace element for all multicellular organisms as the active center of coenzymes called cobalamins. These include vitamin B-12 which is essential for mammals. Cobalt is also an active nutrient for bacteria, algae, and fungi, and may be a necessary nutrient for all life.

Limited soil sampling activities for cobalt identified naturally occurring concentrations of cobalt in site soils. The reported concentrations are consistent with concentrations reported as being naturally occurring in Virginia by the United States Geological Survey. Evaluation of the reported concentrations using expected soil-water partitioning evaluations indicates that the reported soil concentrations are generally sufficient in concentration to account for the low concentrations of cobalt observed in site groundwater when land use practices are considered. These results suggest that the observed cobalt concentrations in groundwater may in part, or fully, be associated with naturally occurring sources.

Under natural groundwater and surface water conditions (pH of 4 to 9 Standard Units and Eh of -0.1 to 0.4 volts) found in Virginia, cobalt is typically found almost exclusively in its divalent free ionic form in the natural environment. However, cobalt, as well as other divalent metals, is known to strongly absorb to iron oxyhydroxide minerals that are naturally present in sedimentary aquifers, such as the uppermost aquifer beneath Pond D. As illustrated in the inset Eh-pH diagram from FactSage^{TM} for iron, groundwater in central Virginia typically is located near the Ferrous and Ferric iron transition boundary such that *de minimis* changes in groundwater quality (pH and Eh) can result in the dissolution or precipitation of iron oxyhydroxide minerals which will release cobalt and any other absorbed metals to the groundwater.



At this Facility, the pH at the affected compliance wells (ED-1605, ED-1606, and ED-1D) is slightly acidic in the 4 to 5 Standard Unit range and the ORP is positive in the 300 millivolt (mV) range (based on the silver-iodide reference probe used for the ORP meter, the corrected Eh range is approximately 500 mV). Thus, as expected, the groundwater Eh-pH conditions at these wells are conducive to transitional precipitation/dissolution of iron oxyhydroxide minerals, and this phenomena may be the source of the observed cobalt concentrations in the compliance wells. In support of this natural source hypothesis is the very low concentration of cobalt that is observed in the Pond D pore water relative to the concentrations observed in the groundwater downgradient from Pond D. These results collectively suggest that the observed cobalt concentrations in groundwater are more likely to be associated with naturally occurring sources than a release from Pond D.

3.3 Summary of Field Program

To fulfill the requirement in 40 CFR Part 257.95 of the CCR Rule, a field investigation was conducted to characterize the nature and extent of the release in the vicinity of Pond D and to identify site conditions that could affect the remedy. To meet these requirements Golder completed a field investigation that included the following tasks:

- Eight boundary wells were installed downgradient of ED-9R2, SD-1603, and ED-1605. Hydraulic testing and groundwater sampling of seven of the new boundary wells was completed following installation.
- Eleven existing site wells in the vicinity of the Pond D were sampled, including CCR compliance wells, sentinel wells, and VPDES wells.
- Sampling of interstitial water from two piezometers installed in Pond D CCR material (PZ-1 and PZ-2).
- Isotopic analysis of three metals (lithium, boron, and strontium) in groundwater at select monitoring wells in the vicinity of Pond D, as well as interstitial water collected from the piezometers installed in the CCR material.
- A limited soil sampling program to assess for background sources of cobalt and lithium associated with the local geologic conditions.

Detailed descriptions of sampling methods, analytical parameters, and analysis methodology are provided in the *ACM Field Investigation Report* (Golder, 2019).

3.4 Summary of Results

Based on review of the March 2019 ACM field investigation sampling results, the sampling results confirmed the initially limited impacts to the uppermost aquifer beneath Pond D. Only cobalt continued to exceed the federal GWPS [6.0 micrograms per liter (ug/l)] at compliance monitoring locations ED-1605 (6.2 ug/l) and MW-5S (6.2 ug/l). Evaluation of analytical results for cobalt in samples collected from compliance and observation wells sampled to delineate the cobalt impacts exceeding the Virginia GWPS (1.0 ug/l) indicates that the following Virginia GWPS exceedances for cobalt are present: ES-1 (5.4 ug/l); MW-6S (4.7 ug/l); ED-1D (3.5 ug/l); ED-1606 (2.0 ug/l); MW-5S (6.2 ug/l); ED-1605 (6.2 ug/l); MW-3S (1.4 ug/l); and ED-17 (2.9 ug/l). The data do not indicate any off-site cobalt impacts associated with the horizontally and vertically delineated on-site cobalt groundwater concentrations.

The lithium impacts are generally localized around the two CCR compliance monitoring wells ED-9R2 and SD-1603. Results from this ACM confirmed the initially limited impacts to the uppermost aquifer beneath Pond D with no sample results documented that exceed the Virginia GWPS (25 ug/l) or federal GWPS (40 ug/l). Lithium was reported in a sample collected MW-1D, which is screened in a confined aquifer underlying the uppermost aquifer, at a concentration (29.4 ug/l). Based on the confined nature of the lower aquifer and the lateral continuity of the confining layer, available information indicates that this lithium is not likely to be associated with a release from Pond D. Within the uppermost aquifer, the data do not indicate any off-site lithium impacts associated with the horizontally and vertically delineated on-site lithium groundwater concentrations.

4.0 REMEDIAL ALTERNATIVES ASSESSMENT

In accordance with the CCR Rule, the owner/operator of a CCR impoundment with GWPS exceedances must complete an assessment of potential corrective measures that could be implemented to remediate impacted groundwater. The ACM must include an analysis of the effectiveness of potential corrective measures in meeting the requirements of §257.97, including performance, reliability, ease of implementation, potential remedy impacts, residual contamination controls, time required to initiate and complete the remedy, and the institutional controls that may be required that could impact the remedy implementation. The evaluation criteria in §257.97 are comprised of some 37 "evaluation elements" that Golder has grouped into seven "evaluation categories" as follows:

- Remedy Constructability
- Remedy Institutional Controls
- Remedy Performance
- Remedy Timeframes
- Remedy Concerns
- Remedy Operations and Maintenance
- Remedy Risks

The evaluation elements in each category are summarized in Table 3 along with the relevant CCR Rule citation. Within each category, the evaluation elements were assigned a mean probability of success. These mean values were assigned based on Golder's experience with similar remediation and construction activities and the following site-specific conditions, remedial option considerations, and regulatory requirements:

- Site Conceptual Model (Geology/Hydrogeology)
- CCR Impoundment Design
- Site Geometry
- Site Geographic Location
- Contaminant Risk (Human and Environmental)
- Source Removal Regulatory Requirement
- Aquifer Geochemistry
- Constituents of Concern (Contaminants)
- Contaminant Fate and Transport Considerations
- Treatment Technology Efficacy
- Site-Specific Data Gaps

To minimize bias for one remedial option versus another, the mean probability of success for each element was limited to one of four success probability options (20%, 40%, 60%, or 80%) with each option assigned a 15% standard deviation. In general, the higher the probability of success, the more likely the remedy is to satisfy the individual ACM evaluation criterion in the CCR Rule. Some of the ACM evaluation criteria are ranked in an inverse manner (*e.g.*, the potential need for remedy replacement: a lower probability for this element correlates with a higher probability of success) and the assigned probabilities for these criteria have been accounted for in the model. Similarly, timeframe criteria are evaluated in terms of years, with short timeframes generally considered more successful. The timeframes are translated in the model to probability of success using linear regression.

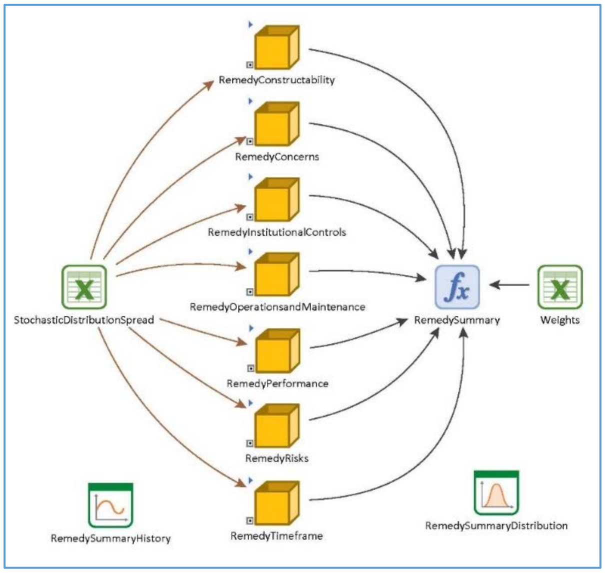
To account for expected bias in the extreme tails of the assigned probability, a beta distribution was assumed for each evaluation element (with exception of the Occupational Safety and Health Administration [OSHA] compliance criterion, which was assigned a uniform distribution that assumed 100% compliance for every remedy). The beta distribution follows a normal distribution for a 50% rating with an increasingly positive skewness for mean success ratings that exceed 50% and an increasingly negative skewness for mean success ratings that are less than 50%. Table 3 summarizes the assigned success probabilities for the 37 ACM evaluation elements for each potential remedial option evaluated.

The ACM evaluation elements within each category were weighted evenly such that the maximum success probability for any one category was 80%, with the minimum being 20%. The ACM categories (collections of evaluation elements) were weighted based on Golder's interpreted significance as presented in the CCR Rule, the CCR Rule Preamble, and our experience with working on similar solid waste remediation projects. The assigned category weightings used for this evaluation are presented in Table 4 below.

Table 4: Remedy Evaluation – Model Categories and Weights

Category	Weighting
Remedy Constructability	10%
Remedy Concerns	10%
Remedy Institutional Controls	5%
Remedy Operations and Maintenance	5%
Remedy Performance	20%
Remedy Risk	30%
Remedy Timeframe	20%
Sum of Weights:	**100%**

As presented in Table 4, the category weightings sum to 100%, such that a remedial option with an 80% probability of success in all seven categories would yield an average weighted overall probability of success score of 80%.



The assigned groupings, probabilities, distributions, and weightings for the ACM evaluation categories and evaluation elements were subsequently evaluated using an analytical model constructed within the commercially-available GoldSim® Monte Carlo simulation software that is managed and maintained by the GoldSim Technology Group LLC.

After constructing the model (see inset illustration) and assigning the probabilities and distributions to the model elements within each category, the GoldSim® software was used to simulate the probability of success for each remedial option using 1,000 simulations over the expected remedial option-specific timeframe.

As discussed previously herein, prior to promulgation of The Act, Dominion Energy was evaluating numerous industry-accepted remedial alternatives for remediation of groundwater downgradient from the Pond D, most of which were based on a "closure in-place scenario" for the CCR material. However, subsequent to the requirements of The Act (effective date of July 1, 2019), a closure in-place scenario is no longer an option; rather Dominion Energy will be required to remove the CCR materials that have been accumulated in the unlined Pond D. This requirement in consideration of the existing groundwater impact extent over 30 years of Pond D operation indicates that source removal will significantly expedite the remediation of documented groundwater impacts. This finding, coupled with the limited risk associated with the delineated groundwater impacts (limited to Dominion Energy property), implies that no significant additional remedial progress or benefit would be realized with the implementation of additional active remedial measures. Specifically, existing data indicates that source removal and monitoring of natural recovery via natural diffusion and dispersion-controlled mechanisms, sorption, and mineralization is sufficient to meet the regulatory requirements in a timely manner. Therefore, this ACM considered the following remedial alternatives:

- Excavation with Off-Site Disposal and Natural Recovery (Option 1)
- Excavation with On-Site Disposal and Natural Recovery (Option 2)

A summary of the two remedial alternatives evaluated as part of the ACM is presented in the following sections. Details regarding the consideration of the 37 evaluation elements in the CCR rule for each potential remedy are presented in Table 3. As noted above, each of these alternatives assumes that Pond D will be excavated, with either disposal of the ash at an off-site third-party permitted municipal solid waste or industrial facility, or disposal of the ash in a new Dominion-owned landfill to be sited, permitted, and constructed in the immediate vicinity of the Possum Point Power Station. As part of the excavation activities, it is assumed that the operation of the dewatering system and the wastewater treatment system will continue until the ash has been removed.

4.1 Natural Recovery

Options 1 and 2 are comprised of excavation of the Pond D (with on- or off-site disposal) followed by natural recovery of the groundwater system. Specifically, based on available data, Golder believes that natural hydrogeological processes based on diffusion, dispersion, sorption, and mineralization (potential carbonate and iron oxyhydroxide mineralization) will attenuate the concentrations of lithium and cobalt to concentrations that are less than their applicable GWPS within approximately 10 years following removal of the CCR materials, if not sooner (*e.g.*, lithium may already be trending long-term towards concentrations that are lower than the Virginia and federal GWPS). Option 1 is expected to require 15 years to complete the CCR removal activities and Option 2 is expected to require 12 years to complete the removal activities, including the front-loaded permitting timeframe. Future studies prior to formal remedy selection may be necessary to validate natural recovery mechanisms and timeframes.

5.0 COST ESTIMATES

The CCR Rule does not currently include provisions for evaluating potential remedial options based on remedy implementation costs or operational costs. However, these costs are important for viability assessment and planning purposes. As with the ACM evaluation criteria, Golder developed probabilistic cost estimates (AACE International [formerly the Association for Advancement of Cost Engineering] Class IV type – study/feasibility level) for each viable remedial option over the remedy's expected remedial timeframe. These costs estimates include costs associated with the design and permitting, construction, operations, post-construction monitoring, and termination of the remedy once the remedial action goals are achieved. The probabilistic costs estimates were then evaluated using 1,000 simulations of the remedy-specific analytical cost model with the GoldSim® software to generate probabilistic ranges for the remedy costs. The evaluations indicated that the upper 95% probable future value costs for the alternatives considered, based on an average inflation rate of 2.5% over the estimated remedial timeframe could range from $450 million USD for Option 2 to $1,400 million USD for Option 1.

Using the estimated costs for remediation, the alternatives from the probability-of-success evaluation were normalized for costs to generate a relative method for comparing the cost-benefit of the remedial options. The evaluation was completed by dividing the upper 95% probability of success for each remedial option by the mean cost estimate (in $1,000's of million USD) for the remedy. Table 5 below summarizes estimated remedial timeframes, mean probabilities of success, future remedy costs, and the relative cost-benefit factor for each remedial option. The evaluation indicates that the highest cost-benefit is obtained with Option 2.

Table 5: Summary of Cost Evaluation

Remedial Option		Estimated Remedial Timeframe (years)	Upper 95% Probability of Success Score (%)	Mean Future Value Remedy Cost (1,000,000,000's USD)	Relative Cost Benefit Factor (% per USD)
1	Excavation with off-site disposal and Natural Recovery	25	73.0%	$1.13	64.8
2	Excavation with on-site disposal and Natural Recovery	22	69.9%	$0.38	184.7

6.0 LIMITATIONS

The assessment and evaluation activities presented here were performed based on limited data, the impacts of which could have a substantial bearing on the evaluation outcomes presented herein. These limitations include the following assumptions and data gaps:

- Limited understanding of the nature and extent of the existing groundwater plume that will remain following CCR material removal;
- Current groundwater monitoring data from existing site monitoring wells accurately reflects the nature and extent of GWPS exceedances in the study area;
- Normal and expected construction costs for routine construction activities have been assumed for the cost estimates;
- High level estimates of non-routine specialty construction costs; and
- Source removal over a 15-year or less time frame.

7.0 CONCLUSIONS

Consistent with the CCR Rule and based on the results presented in the *ACM Field Investigation Report* (Golder, 2019), Golder identified two potential remedial options to address the GWPS exceedance of cobalt and lithium in the vicinity of Pond D. Each of these alternatives assumes that Pond D will be excavated, with either disposal of the ash at an off-site third-party permitted municipal solid waste or industrial facility, or disposal of the ash in a new Dominion-owned landfill to be sited, permitted, and constructed in the immediate vicinity of the Possum Point Power Station, consistent with closure by removal requirements.

Using a robust analytical model Golder evaluated the remedial options against the CCR Rule to develop a probabilistic ranking of remedial options. Additionally, although the CCR Rule does not currently include provisions for evaluating potential remedial options based on remedy implementation costs or operational costs, Golder developed probabilistic cost estimates for each of the remedial options over the remedy's expected remedial timeframe. These cost estimates include costs associated with design and permitting, construction, operations, post-construction monitoring, and termination of the remedy once the remedial action goals are achieved.

The success probabilities (probabilistic rankings) for each remedial option considered were normalized with the remedy-specific mean cost estimates to provide an overall scaled relative efficacy/cost evaluation of the remedial options. These evaluations suggest that excavation with on-site disposal followed by 10 years of natural recovery monitoring would prove to be the most effective remedy options under the CCR Rule ACM evaluation criteria for mitigating the currently observed groundwater impacts when the statutory requirements of The Act as promulgated by the 2019 Virginia Assembly are considered. Future studies prior to formal remedy selection may be necessary to validate natural recovery mechanisms and timeframes.

8.0 REFERENCES

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9.0 SIGNATURE PAGE

This document was prepared by qualified groundwater scientists and engineers who have received baccalaureate and/or post-graduate degrees in the natural sciences or engineering and who have sufficient training and experience in groundwater hydrology, engineering, and related fields as demonstrated by state professional registrations and completion of an accredited university program that enables sound professional judgments consistent with the industry standard of care for groundwater monitoring, contaminant fate and transport, environmental corrective actions, and cost estimate development.

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TABLES

Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Performance	1	§257.96(c)(1); §257.97(c)(1); §257.97(c)(2)(i)	0% = minimal; 100% = substantial longterm effectiveness	Long-Term Effectiveness of Remedy (%)	60	Source removal coupled with limited sorption and dilution. Considering current groundwater impacts, should be effective in controlling the release	60	Source removal coupled with limited sorption and dilution. Considering current groundwater impacts, should be effective in controlling the release
	2	§257.96(c)(1); §257.97(c)(1); §257.97(c)(1)(vii); §257.97(c)(3)(ii)	0% = minimal; 100% = substantial longterm reliability	Long-Term Reliability of Remedy (%)	60	Source removal, Natural Recovery based on sorption and dilution for COCs	60	Source removal, Natural Recovery based on sorption and dilution for COCs
	3	§257.97(c)(2)(ii)	0% = lot of tech use; 100% = no tech use	Treatment Tech Use Extent (%)	80	No tech required, just physical controls, sorption, and dilution	80	No tech required, just physical controls, sorption, and dilution
	4	§257.96(c)(1)	0% = minimal; 100% = substantial shortterm effectiveness	Short-Term Effectiveness (%)	20	May require up to 15 years for complete source removal and full remedy effectiveness	20	May require up to 15 years for complete source removal and full remedy effectiveness
	5	§257.97(b)(2)	0% = low; 100% = high ability to obtain GPS at POC	Ability to Obtain the GPS at Point of Compliance (%)	60	With time, soprtion and dilution will attain goal	60	With time, soprtion and dilution will attain goal
	6	§257.96(c)(1); §257.97(b)(3)	0% = minimal reduction; 100% = elimination of further releases	Source Control to Reduce or Eliminate Further App IV Releases (%)	80	Source removal coupled with gradient reduction and Natural Recovery for contaminated water.	80	Source removal coupled with gradient reduction and Natural Recovery for contaminated water.
	7	§257.96(c)(1); §257.97(b)(4)	0% = minimal recovery; 100% = full recovery, or none required	Fugitive Material Recovery (%)	80	Fugitive materials recovered under parallel program	80	Fugitive materials recovered under parallel program
	8	§257.97(c)(1)(ii)	0% = low potential for preventing; 100% = high potential for preventing future	Potential for Future Material Releases (%)	80	Source Removal over 15 years	80	Source Removal over 15 years
	9	§257.96(c)(1); §257.97(c)(1)(viii)	0% = low; 100% = high remedy replacement potential	Potential Need for Remedy Replacement (%)	20	May not be sufficent as a stand alone remedy to prevent off-site impacts above risk-based concentrations due to property line proximity	20	May not be sufficent as a stand alone remedy to prevent off-site impacts above risk-based concentrations due to property line proximity

Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Constructability (Ease of Implementation)	10	§257.96(c)(1)	0% = hard to build; 100% = easy to build	Constructability (%)	80	normal exercise of excavation	80	normal exercise of excavation
	11	§257.97(c)(3)(i)	0% = not available; 100% = available	Technology Availability (%)	80	relatively available for this scale and type of work	80	relatively available for this scale and type of work
	12	§257.97(c)(3)(iv)	0% = not available; 100% = available	Resource & Knowledge Availability (%)	80	experience gained every day by active providers	80	experience gained every day by active providers
	13	§257.97(c)(3)(v)	0% = not available; 100% = available	Available Treatment, Storage, and Disposal Resources (%)	60	Need space in existing Municipal Solid Waste or Industrial Landfill or new Industrial landfill	60	Need space in existing Municipal Solid Waste or Industrial Landfill or new Industrial landfill
Remedy Concerns	14	§257.96(c)(1)	0% = high potential safety impact; 100% = low safety impacts	Potential Safety Impacts (%)	60	heavy equipment, source removal via over the road or rail traffic	80	heavy equipment, source removal via on-site haul roads
	15	§257.96(c)(1)	0% = high cross media impact; 100% = low cross media impacts	Potential Cross-Media Impacts (%)	60	Potential exist, 15-year removal effort, contaminated groundwater could discharge to surface water. Contaminated groundwater flux reduces after source removal.	60	Potential exist, 12-year removal effort, contaminated groundwater could discharge to surface water. Contaminated groundwater flux reduces after source removal.
	16	§257.96(c)(1)	0% = no residual contamination control; 100% = control	Residual Contamination Exposure Control (%)	60	Source removal, contaminated groundwater. Potential for exposure at groundwater-surface water interface.	60	Source removal, contaminated groundwater. Potential for exposure at groundwater-surface water interface.
	17	§257.97(c)(4)	0% = does not address; 100% = addresses all concerns	Community Concerns (%)	60	Source removal to off-site location, no active groundwater treatment	40	Source removal to an on-site location, no active groundwater treatment

Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Institutional Controls	21	§257.96(c)(3); §257.97(c)(3)(iii)	0% = Hard to get Fed Permit Required; 100% = No Fed Permit Required	Federal Permit Need (%)	80	None	20	May require 404 Wetland permitting
	22	§257.96(c)(3); §257.97(c)(3)(iii)	0% = Hard to get State Permit Required; 100% = No State Permit Required	State Permit Need (%)	40	Solid Waste permit for closure via removal	20	Solid Waste permit for closure via removal and may require 401 wetland permitting; Solid Waste Permit for new landfill
	23	§257.96(c)(3); §257.97(c)(3)(iii)	0% = Hard to get Local Permit Required; 100% = No Local Permit Required	Local Permit Need (%)	80	no local permit known	60	Conditional Use Permit may be required
	24	§257.97(a)	0% = Out of Compliance; 100% = in compliance	Compliance With OSHA Standards - 100% Compliance Assumed (%)	100	In compliance	100	In compliance
	25	§257.97(b)(5)	0% = not in compliance; 100% = always in compliance	Waste Management Compliance (257.98(d)) (%)	80	low risk for out of compliance conditions	80	low risk for out of compliance conditions
	26	§257.96(c)(3); §257.97(c)(3)(iii)	0% = Deed Restriction Required; 100% = Not Required	Deed Restrictions (%)	80	Waste Removed, no deed restriction required for waste.	80	Waste Removed, no deed restriction required for waste.
	27	§257.96(c)(1); §257.97(c)(1)(vii)	0% = Not reliable; 100% = always reliable	Long Term Reliability of Controls (%)	60	Once constructed, at steady state Natural Recovery is reliable after source removal	60	Once constructed, at steady state Natural Recovery is reliable after source removal

Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Risks	28	§257.97(c)(1)(iv)	0% = significant community risks; 100% = no community risk	Community Implementation Risks (transporation & disposal) (%)	40	Significant over the road or rail transport for construction of remedy	40	Assumes little to no public transportation corridor transport
	29	§257.97(c)(1)(iv)	0% = significant Eco risks; 100% = no Eco risk	Ecological Implementation Risks	60	Wetland impacts unlikely, potential for surface water impacts during construction.	20	Wetland impacts likely, potential for surface water impacts during construction.
	30	§257.97(b)(1); §257.97(c)(1)(vi)	0% = less protective; 100% = most protective	Remedy Human Health Protectiveness & Waste Exposure	60	With source removal steady state remedy is protective provided no media transfer to surface water	60	With source removal steady state remedy is protective provided no media transfer to surface water
	31	§257.97(b)(1); §257.97(c)(1)(vi)	0% = less protective; 100% = most protective	Remedy Environment Protectiveness & Waste Exposure	60	With source removal steady state remedy is protective provided no media transfer to surface water	60	With source removal steady state remedy is protective provided no media transfer to surface water
	32	§257.97(c)(1)(i)	0% = little to no risk reduction; 100% = major risk reduction	Magnitude of Existing Health Risk Reduction	80	With source removal should ultimately achieve GPS, health risk reduction is goal	80	With source removal should ultimately achieve GPS, health risk reduction is goal
	33	§257.97(c)(1)(ii)	0% = little to no risk reduction; 100% = major risk reduction	Magnitude of Residual Risk for Further Releases	80	Source removal	80	Source removal

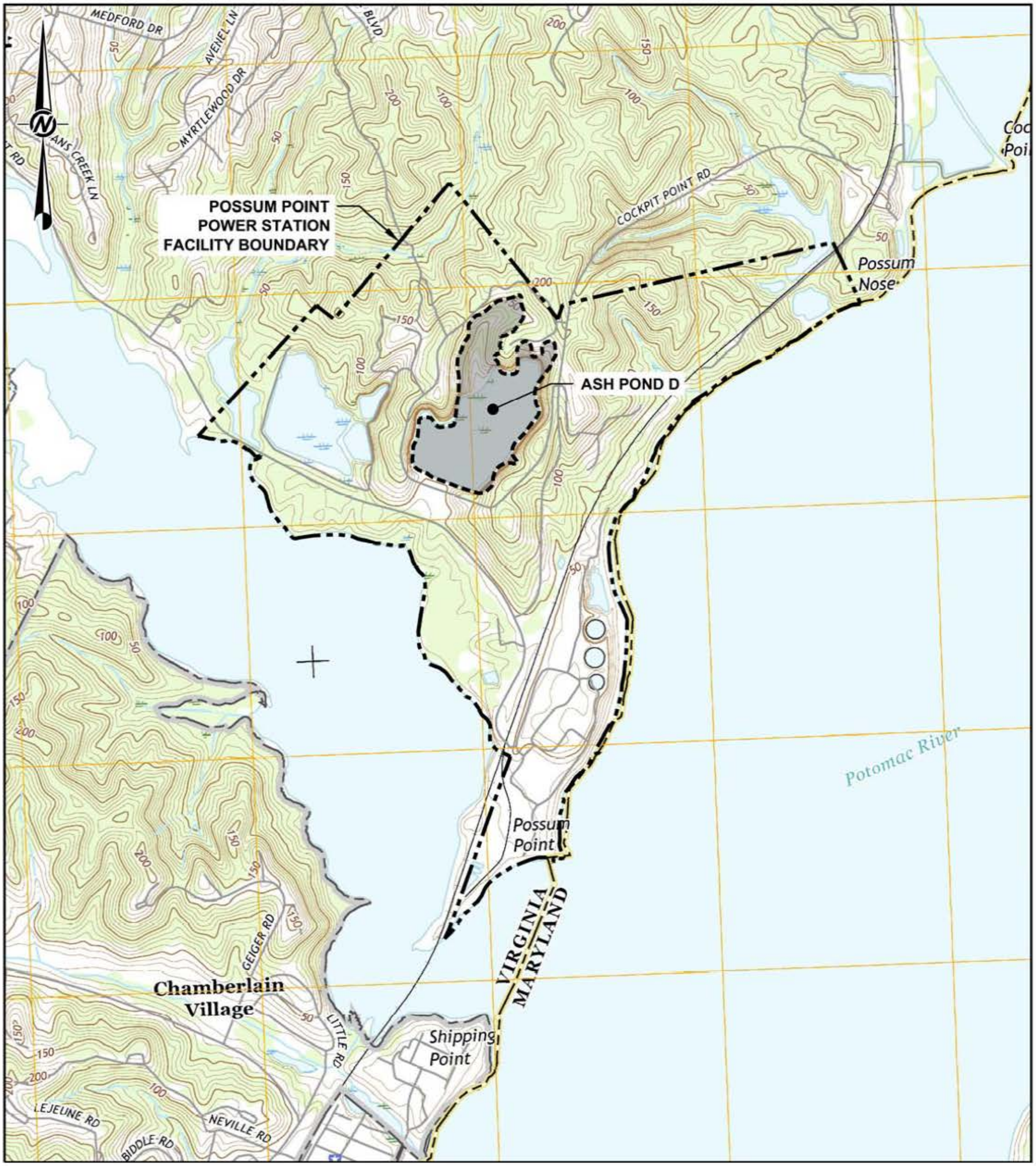
Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Operations and Maintenance	34	§257.97(c)(1)(iii)	0% = High Management; 100% = Low Management	Relative Management Requirement (%)	60	Intensive management during construction, passive management after construction	60	Intensive management during construction, passive management after construction
	35	§257.97(c)(1)(iii)	0% = High Monitoring; 100% = Low Monitoring	Relative Monitoring Requirement (%)	40	High level of monitoring during construction and moderate level of monitoring after construction is complete	40	High level of monitoring during construction and moderate level of monitoring after construction is complete
	36	§257.97(c)(1)(iii)	0% = High Operational; 100% = Low Operational	Relative Operational Requirements (%)	80	High during construction, low after construction	80	High during construction, low after construction
	37	§257.97(c)(1)(iii)	0% = High Maintenance; 100% = Low Maintenance	Relative Maintenance Requirements (%)	80	Minimal after construction is complete	80	Minimal after construction is complete
Remedy Timeframes	18	§257.96(c)(2)	Enter Years	Time Required to Initiate Remedy (yrs)	1	Award contract and start hauling	4	Permitting for new facility, construction, then move materials
	19	§257.96(c)(2)	Enter Years	Time Required to Complete Remedy Construction (yrs)	14	waste removal	6	waste removal
	20	§257.96(c)(2); §257.97(c)(1)(v)	Enter Years	Time to Full Protection (less than GPS at Point of Compliance; yrs)	25	estimate based on groundwater flow velocity, pore space flushing, and remedy construction timeframe	25	estimate based on groundwater flow velocity, pore space flushing, and remedy construction timeframe

Table 3
Assessment of Corrective Measures Evaluation Criteria
Possum Point Power Station, Pond D

Class	Model Element	Regulatory Citation	Percent Success	Criteria	Excavation with Off-Site Disposal and Post-Removal Monitoring		Excavation with On-Site Disposal and Post-Removal Monitoring	
					Mean	Assignment Notes (Relative evaluation across crierion)	Mean	Assignment Notes (Relative evaluation across crierion)
Remedy Cost	**38**	--	**Enter Costs**	**Engineering/Design Cost (USD)**	$ 5,400,000		$ 15,000,000	
	40	--	**Enter Costs**	**Construction Cost & Construction Period O&M (USD)**	$ 897,309,000		$ 313,201,000	
	41	--	**Enter Costs**	**Annual Post-Construction O&M Cost (USD)**	$ 275,000		$ 275,000	

DRAWINGS



REFERENCE

BASE MAP CONSISTS OF USGS TOPOGRAPHIC QUADRANGLE
QUANTICO, VIRGINIA DATED 2016.

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SCALE FEET

CLIENT
DOMINION ENERGY

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES REPORT
POSSUM POINT POWER STATION
PRINCE WILLIAM COUNTY, VIRGINIA

CONSULTANT

GOLDER

YYYY-MM-DD	2019-05-14
DESIGNED	AK
PREPARED	SIB
REVIEWED	JK
APPROVED	MGW

TITLE
SITE LOCATION MAP

PROJECT NO.	REV.	DRAWING
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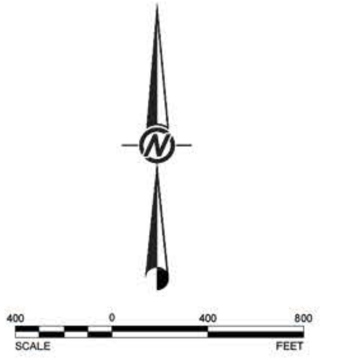
LEGEND

——— — — ———	PROPERTY BOUNDARY
ED-1606	EX. GROUNDWATER MONITORING WELL (POND D CCR)
▚ ED-1	EX. GROUNDWATER OBSERVATION WELL LOCATION AND IDENTIFICATION
○ SB-1	SOIL BORING
⊕ PZ-1	INTERSTITIAL WATER WELL



CLIENT
DOMINION ENERGY
POSSUM POINT POWER STATION
PRINCE WILLIAM COUNTY, VIRGINIA

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES REPORT
POSSUM POINT POWER STATION
PRINCE WILLIAM COUNTY, VIRGINIA

TITLE
ASSESSMENT OF CORRECTIVE MEASURES SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2019-06-11
DESIGNED	AK
PREPARED	SIB
REVIEWED	JK
APPROVED	MGW

PROJECT NO.	REV.	DRAWING
1662150	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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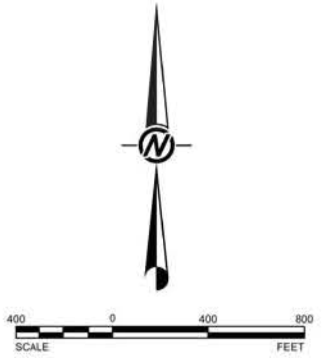
LEGEND

— — - - — —	PROPERTY BOUNDARY
ED-1606	EX. GROUNDWATER MONITORING WELL (POND D CCR)
ED-1	EX. GROUNDWATER OBSERVATION WELL LOCATION AND IDENTIFICATION
SB-1	SOIL BORING
PZ-1	INTERSTITIAL WATER WELL
- - - - - - - - -	SLURRY WALL
50 — — — —	GROUNDWATER SURFACE CONTOUR (FEET AMSL)
→	APPROXIMATE GROUNDWATER FLOW PATHWAY USED TO CALCULATE HYDRAULIC GRADIENT
i gw = 3,711'	GROUNDWATER PATH LENGTH (FEET)

NOTES

1. GROUNDWATER CONTOURS BASED ON LINEAR INTERPOLATION BETWEEN AND EXTRAPOLATION FROM KNOWN DATA, TOPOGRAPHIC CONTOURS, AND KNOWN FIELD CONDITIONS. THEREFORE, GROUNDWATER CONTOURS MAY NOT REFLECT ACTUAL GROUNDWATER CONDITIONS.
2. GROUNDWATER CONTOUR LINES SHOW THE WATER TABLE SHAPE AND ELEVATION. THESE CONTOURS ARE INFERRED LINES FOLLOWING THE GROUNDWATER SURFACE AT A CONSTANT ELEVATION ABOVE SEA LEVEL. THE GROUNDWATER FLOW DIRECTION IS GENERALLY PERPENDICULAR TO THE GROUNDWATER SURFACE CONTOURS, SIMILAR TO THE RELATIONSHIP BETWEEN SURFACE WATER FLOW AND TOPOGRAPHIC CONTOURS.
3. STATIC WATER LEVELS MEASURED ON MARCH 11, 2019 - MARCH 15, 2019.



CLIENT
DOMINION ENERGY

PROJECT
ASSESSMENT OF CORRECTIVE MEASURES REPORT
POSSUM POINT POWER STATION
PRINCE WILLIAM COUNTY, VIRGINIA

TITLE
GROUNDWATER POTENTIOMETRIC SURFACE PLAN
MARCH 11-15, 2019

CONSULTANT
GOLDER

YYYY-MM-DD	2019-05-14
DESIGNED	AK
PREPARED	SIB
REVIEWED	JK
APPROVED	MGW

PROJECT NO.
16-62150

REV.
0

DRAWING
3

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