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PSEG Nuclear, LLC

Well AA-V Installation Report

PSEG Salem Generating Station
Hancocks Bridge, New Jersey

March 2014

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PSEG Salem Generation Station

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Acronyms and Abbreviations

ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
DRBC	Delaware River Basin Commission
GPR	ground penetrating radar
GRS	groundwater recovery system
HCGS	Hope Creek Generating Station
M1	first moving averages
M2	second moving averages
mg/L	milligrams per liter
N.J.A.C.	New Jersey Administrative Code
NJ DCED	New Jersey Department of Conservation and Economic Development
NJDEP	New Jersey Department of Environmental Protection
pCi/L	picocuries per liter
PRM	Potomac-Raritan-Magothy
PSEG	PSEG Nuclear, LLC
PVC	polyvinyl chloride
SFP	Spent Fuel Pool
SGS	Salem Generating Station
the Station	SGS and HCGS
T	transmissivity
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

1. Introduction

This Well AA-V Installation Report presents and discusses the results of recent well network upgrades and investigation activities at the PSEG Nuclear, LLC (PSEG) Salem Generation Station (SGS), located in Hancocks Bridge, New Jersey. The purpose of this report is to document:

- Installation of a monitoring well in the Vincentown Formation (Well AA-V);
- Retrofitting and repair of several monitoring wells;
- Abandonment of monitoring Well CB;
- An extended purge performed at Well AA-V;
- A mean hydraulic gradient study;
- A potable well search.

1.1 Objective

The objectives of the activities recently conducted at the SGS are to:

- Reduce the potential for storm and surface water infiltration directly into the monitoring well;
- Abandon a damaged monitoring well;
- Evaluate groundwater quality with respect to tritium in the Vincentown Formation downgradient of SGS Unit 1;
- Identify potential off-site groundwater receptors; and,
- Recommend future activities.

1.2 Report Organization

The introduction of this report is presented above. Section 2 provides a description of SGS and Hope Creek Generating Station (HCGS; collectively referred to as "the Station") history and background. Section 3 presents a technical overview of field activities and presentation of the results. Section 4 provides an interpretation of the findings and provides a logical path forward for investigation activities based on the information presented in Section 3. Section 5 provides a list of references used to develop this report.

2. Station History and Background

This section describes the Station and its history and discusses local geologic and hydrologic conditions.

2.1 Background

PSEG operates the Station located on Artificial Island, in Salem County, New Jersey. A site plan of the Station is provided on **Figure 1**. SGS comprises two pressurized water reactors (Unit 1 and Unit 2). Each unit has a plant vent located on top of the Containment Building. There are additional permitted release points on the Turbine and Auxiliary Buildings for secondary effluents. An oval-shaped cofferdam was built during the construction of SGS and surrounds both Unit 1 and Unit 2. In 2002, Salem Unit 1 identified a water leak from the Spent Fuel Pool (SFP), resulting in a release of tritiated water to the environment. Tritium is a radioactive isotope of hydrogen that reacts identically to any other hydrogen atom or ion. There are both naturally occurring and anthropogenic sources of tritium. Tritium is produced in nuclear power plants by activation and fission. In the form of a water molecule, it can be released as part of permitted gaseous and liquid effluents.

2.2 Environmental Setting

The SGS is located on a portion of Artificial Island that borders the Delaware Estuary which, in the location of the SGS, is a tidal, brackish river, located in an area designated as Zone 5 by the Delaware River Basin Commission (DRBC). The entire area of Artificial Island is within the Delaware River's estuarine zone and is defined by the DRBC as a "tidally influenced interface between fresh water and salt water" (DRBC 2008). The salinity line, as tracked by DRBC and presented in the 2008 *State of the Basin Report* (DRBC) hovers around the Pennsylvania-Delaware state line.

2.3 Geology and Hydrogeology

The Station is located on the southern tip of what was once a natural sand bar or shoal in the Delaware River Estuary. Beginning in the early twentieth century, the USACE designated the area as a dredge spoil collection area. The so-called Artificial Island was created by depositing hydraulic dredge spoils from the shipping channel in the Delaware River Estuary into a diked area established around a natural sand bar. The Station is located on that portion of Artificial Island that borders the Delaware River Estuary. The northern portion of the island continues to be used by USACE as a staging and management station for dredge spoils. Prior to construction of the SGS, the property was vacant, undeveloped, low-lying land.

2.3.1 Regional Geology

The SGS is located in the Atlantic Coastal Plain Physiographic Province. This area is characterized by relatively flat to gently undulating terrain, underlain by unconsolidated sediments that increase in thickness to the southeast. These sediments range in age from Holocene to Cretaceous (0 to 146 million years old); primarily comprise clay, silt, sand, and gravel; and are generally classified as continental, coastal, or marine in nature. Published geologic mapping indicates that the basement bedrock beneath these sediments (in the area of the SGS) is metamorphic schist of the Wissahickon Formation, which is Pre-Cambrian in age (570 to 900 million years old). The Station's Physiographic Province is characterized by a southeasterly dipping wedge of unconsolidated sediments consisting of clays, silts, sands, and gravels that thicken toward the sea. **Figure 2** depicts a regional cross section for the Delaware Bay and southern New Jersey Region. The Cretaceous and Tertiary age sediments that overlie the bedrock strike northeast-southwest and dip gently to the southeast between 10 and 60 feet per mile (NJ DCED 1969).

The engineered fill, tidal marsh deposits, and riverbed deposits combine to form the shallow, water-bearing unit. The geologic formations beneath the shallow, water-bearing unit, in order of increasing depth, are as follows: the Kirkwood Formation; the Vincentown Formation; the Hornerstown-Navesink Aquitard; the Mount Laurel-Wenonah Formations; the Matawan Formation; the Magothy Formation; the Raritan Confining Unit and Aquifer; the Potomac Group; and, the Wissahickon Formation.

2.3.2 Station Geology and Hydrogeology

The geologic composition at the Station is shown on the cross section on **Figure 3**. The construction of the generating facilities and supporting structures required that significant changes be made to the environment. This figure shows some detail as to the degree of anthropogenic influence present in the upper hydrostratigraphic units at the SGS.

The shallow overburden at the SGS consists of approximately 25 to 35 feet of dredge spoils (hydraulic fill), engineered fill material, tidal marsh deposits, and riverbed deposits. Structural (engineered) fill material was placed on Artificial Island to provide a more stable base than the dredge spoil material to enable construction of the site. Two deeper units of environmental significance at the Station are the Kirkwood basal sands and the Vincentown Formation. The results of aquifer tests conducted previously have shown the riverbed deposits to have a hydraulic conductivity on the order of 0.01 to 1 ft/day (Dames & Moore 1988, 1974).

2.3.2.1 Kirkwood Formation

The thick, dense clay of the Kirkwood Formation provides a competent confining unit for the Vincentown Formation (Dames & Moore 1988). Direct push soil borings advanced during pre-facility construction proved that, in the immediate vicinity of the Station, the Kirkwood Formation consists of dark gray to brown clay with some silt and layers of fine-grained micaceous quartz sand. The Kirkwood basal sand is a reddish brown fine to medium sand coarsening with depth. The sand is variable in thickness at the Station and has been misidentified as the deeper aquifer in previous investigations (Dames & Moore 1974). Pumping tests conducted in the Kirkwood basal sand and Vincentown Formation have shown the units to have a hydraulic conductivity on the order of $1x10^{-3}$ cm/s and a storativity with a magnitude on the order of $1x10^{-4}$ to $1x10^{-3}$ (Dames & Moore 1974).

2.3.2.2 Vincentown Formation

The Vincentown Formation is an aquifer of minor importance in some areas. In the vicinity of the Site, the Vincentown Formation has chloride concentrations in the range of 1,800 to 4,300 milligrams per liter (mg/L), preventing the aquifer from being used as a potable water source (Dames & Moore 1988). The Vincentown Formation outcrops over a small area of central Salem County, trends northeast to southwest, and dips to the east-southeast. The Vincentown Formation is composed of sands to silty sand characterized by a glauconitic quality. Confined by the overlying Kirkwood Formation, the Vincentown Formation extends southeast from Keasby Creek to Stow Creek, with the greatest thickness (approximately 60 feet) coinciding with Alloways Creek (USGS 1999). The Vincentown Formation thins and narrows to the northeast, reaching a minimum thickness between Glassboro and Berlin before again increasing in thickness and lateral extent. The results of aquifer and laboratory tests have shown the Vincentown Formation to have a hydraulic conductivity on the order of 1 to 10 ft/day (USGS 1999; Dames & Moore 1988).

2.4 Groundwater Use

Several geologic formations beneath Artificial Island contain transmissive units and are capable of supplying a useable quantity of water. The shallow and manmade geologic units beneath the Station are marginally transmissive, and groundwater within the shallow zone is not used for potable or non-potable purposes. The Vincentown Formation supplies potable water to domestic wells located upgradient in eastern Salem County, where groundwater in the aquifer is moderately hard with high iron content. Saltwater intrusion into the aquifer occurs along the Delaware River Estuary in western Salem County, thus rendering water quality brackish and non-potable (USGS 1999). In general, groundwater in the Vincentown Formation beneath the site has relatively high concentrations of chloride and therefore is not adequate for use as a potable water supply.

The Mount Laurel-Wenonah aquifer occurs from approximately 170 to 270 feet below ground surface (bgs). SGS has emergency fire-water supply wells screened in this formation.

The deepest of the water-bearing formations near SGS is the Potomac-Raritan-Magothy (PRM) Aquifer System, which is bounded by the Merchantville Formation above and by the Wissahickon Schist basement rock below. The crystalline basement bedrock of the Wissahickon Schist is not considered an aquifer because it transmits water only locally due to secondary porosity (i.e., fractures and faults). In Salem County, the PRM Formation occurs at depths in excess of 500 feet bgs. This is the primary water-producing aquifer for southern New Jersey. As detailed below, site water supply wells are screened in the PRM at depths ranging from 800 to 1,100 feet bgs.

3. Technical Overview

This section describes the monitoring well retrofitting, repair, abandonment, installation, and development conducted from May 13, 2013 through June 6, 2013 and groundwater sample collection and analyses from Well AA-V completed from June 2013 through October 2013. **Figure 1** shows the location of the retrofitted, abandoned and new monitoring wells.

Before intrusive field activities began, underground commodities were marked out using ground penetrating radar (GPR) and electromagnetic techniques. PSEG personnel compared each of the work locations to as-built maps and used historical knowledge of the Station to clear locations. Uni-Tech Drilling Company, Inc., a licensed New Jersey driller, performed the well retrofitting, repair, abandonment and installation activities. ARCADIS U.S., Inc. (ARCADIS) collaborated with PSEG and Sargent & Lundy, LLC to acquire appropriate excavation permits and design change package documentation prior to site mobilization. Following the retrofitting, abandonment and installation activities, Stires Associates P.A., a New Jersey-licensed land surveyor, surveyed the location and elevation of each of the modified or new wells. Horizontal locations were identified with respect to NAD 1983, and elevations (ground surface and top of inner casing) were identified with respect to the North American Vertical Datum of 1988. **Table 1** presents a summary of well construction details. Form B documentation for each new monitoring well is presented in **Appendix A**.

3.1 Retrofit and Repair of Existing Monitoring Wells

PSEG retrofitted eight existing wells (Wells BB, BF, BG, BW, BX, CA, U, and V) by converting flush-mount and vault surface completions to stick-up protective casings. To minimize storm water overland flow from entering the well, casings were extended approximately 3 feet above ground surface and fitted with a water tight cap. Following utility location activities, vacuum excavation tools were used to remove the soil surrounding the flush-mount protective casings and to create boreholes for securing protective bollards. Well vaults were kept in place and filled with concrete to ground surface. A total of thirty bollards were installed to protect the stick-up protective casings using vacuum excavation to advance the boreholes. Following retrofitting activities, ARCADIS modified dedicated submersible pump tubing (air and discharge) so that pumps remain at their current depth.

Field inspections identified the surface completions for Wells DA and W allowed excessive storm water to enter; however, these wells are not located in an area which is conducive for the placement of a stick-up casing. To minimize the potential for storm water infiltration into the well casing, a flush-mount was installed and was backfilled with concrete in the vault containing Well W. The flush mount for Well DA was repaired by adding grout to improve the seal and inhibit infiltration.

3.2 Well CB Abandonment

Well CB was observed to be damaged following the March/April 2008 outage. PSEG attempted to repair the well in mid-2010; however, the repairs were apparently not successful based on historical groundwater quality data for the well. Well CB, screened in the Vincentown Formation, was tremie grouted to the surface and the vault was filled with concrete in accordance with New Jersey Department of Environmental Protection (NJDEP) well construction, maintenance, and sealing requirements (New Jersey Administrative Code [N.J.A.C.] 7:9D). The outer 16-inch diameter PVC casing was removed by pulling it out of the ground. The middle casing was over-drilled by advancing hollow-stem augers to approximately 30 feet bgs, at which point the middle casing sheared. Additional overdrilling was not attempted, and the borehole was tremie grouted to the surface. The Well Decommissioning Report is provided in **Appendix B**.

Soil cuttings were transferred into a powered wheel barrel for transport to a PSEG-approved soil staging area. ARCADIS contained the water generated during abandonment activities in PSEG-supplied 55-gallon drums. After suspended solids settled, water was screened for disposal and decanted into the non-radiological liquid waste basin for release through the PSEG permitted liquid effluent outfall.

3.3 Well AA-V Installation

PSEG installed monitoring well AA-V to characterize groundwater within the Vincentown Formation downgradient of the historical investigation area. The location was selected based on existing data indicating groundwater flow direction in the Vincentown Formation, its proximity to the baseline plume and constraints associated with Station operations (i.e., surface and subsurface infrastructure). The well was installed at a location approximately 320 feet south of the SGS Unit 1 Reactor Building in the vicinity of existing well AA(**Figure 1**).

In accordance with N.J.A.C. 7:9D, Well AA-V was constructed with a 6-inch diameter outer steel casing installed to approximately 50 feet bgs. The outer casing was grouted in place using a tremie pipe. A borehole was then advanced through the bottom of the outer casing to approximately 85 feet bgs. Continuous soil samples were collected during borehole advancement using a 2-inch diameter, 2-foot long, split-spoon sampling device in accordance with ASTM International Standard D-1586 (1984). A geologist logged the description of each split-spoon sample according to the Unified Soil Classification System. The monitoring well was constructed using 2-inch diameter, flush-jointed, threaded Schedule 40 polyvinyl chloride (PVC) screen installed from 75- to 85-feet bgs. The well was completed with a stick-up protective surface casing and four protective bollards. **Figure 3** shows a cross section through the plume investigation area, including Well AA-V. The boring logs and well construction details for Well AA-V are included in **Appendix C**.

After the installation, Well AA-V was developed using a submersible pump until purge water was visually turbid free. Dry to damp soil cuttings were transferred into a powered wheel barrel for transport to a PSEG-approved soil staging area. Mud generated during installation activities was drummed and staged for disposal by PSEG. ARCADIS contained water generated during development activities in PSEG-supplied 55-gallon drums. After suspended solids settled, water was screened for disposal and decanted into the non-radiological liquid waste basin for permitted release through the PSEG permitted liquid effluent outfall.

3.4 Groundwater Sampling

This section presents the groundwater sampling activities completed at Well AA-V from June 2013 through October 2013.

3.4.1 Low-Flow Sampling

Groundwater samples were collected in accordance with the NJDEP *Field Sampling Procedures Manual* (2005), using low-flow sampling techniques. **Table 2** presents the results from groundwater samples collected from Well AA-V, and previously existing monitoring wells (CB, K, L, P, Q and V) and Early Site Permit monitoring wells installed within the Vincentown Formation. **Figure 4** shows the distribution of tritium detected in the Vincentown Formation since 2012. Details regarding the groundwater sampling methodology can be found in the *Remedial Action Progress Report, Second Quarter 2013* (ARCADIS 2013). The following summarizes the results from tritium sample analysis:

- Tritium was detected in samples collected from Well AA-V ranging in concentration from 7,620 picocuries per liter (July 2013; pCi/L) to 12,800 pCi/L (October 2013);

- Since 2012, tritium was not detected in four (K, L, P and Q) of seven monitoring wells installed within the Vincentown Formation closest to the SGS Containment Buildings;

- Since 2012, tritium was detected at peak concentrations of 12,800 pCi/L, 4,020 pCi/L and 1,080 pCi/L in groundwater samples from Wells AA-V, CB and V, respectively;

- Tritium was not detected during the 2012 groundwater sampling event in samples collected from the 13 Early Site Permit monitoring wells installed within the Vincentown Formation.

3.4.2 Extended Purge

From September 26, 2013 through October 4, 2013, PSEG performed an extended purge on Well AA-V removing approximately 5,000 gallons of groundwater from the well. Groundwater was extracted from the well using a submersible pump and transferred directly to a 700-gallon holding tank. Prior to daily discharge, a composite sample was collected for screening prior to transfer to the non-radiological liquid waste basin for permitted release through the PSEG permitted liquid effluent outfall. The Chemistry screening results from the samples collected from the tank are presented in **Table 3**. The average concentration of tritium detected in composite samples collected during the extended purge was 1.38 x 10^4 pCi/L.

During two days of purging activities, drawdown and recharge were measured using a pressure transducer in Wells AA-V and L to evaluate the specific capacity of the Vincentown Formation. The data gathered were evaluated with AQTESOLV software to estimate hydraulic conductivity using the Theiss equation. The curve fitting chart and transmissivity (T) estimates are included in **Appendix D**. Using this information, an average hydraulic conductivity of 4.67 feet per day was calculated for the screened interval of Well AA-V.

3.5 Mean Hydraulic Gradient Study

PSEG performed a mean hydraulic gradient study, in accordance with Serfes (1991) to evaluate the effects of tidal fluctuations on groundwater elevations and hydraulic gradient within the Vincentown Formation. This evaluation was performed using the six monitoring wells (K, L, P, Q, V and AA-V) by deploying pressure transducers into these wells for a period of five days (August 26, 2013 through August 30, 2013) and assessing the data.

As requested by NJDEP, an analysis of the effect of tidal fluctuations on groundwater depth within the confined Vincentown formation aquifer was performed. This study was divided into two parts, data collection and data evaluation.

3.5.1 Data Collection

On August 26, 2013, Solinst™ pressure transducers with data logging capabilities were deployed at a depth of 30 feet from the top of the inner well casing. Additionally, a pressure transducer (i.e., baro-logger) was also deployed near Well Q. On August 30, 2013, the transducers were retrieved from each well. Groundwater level measurements were collected before the deployment of the transducers and after retrieval, to correlate the pressure transducer data. Surface water elevation measurements from the Delaware River were collected during the same time period from a gauge maintained by the HCGS were included in the analysis.

3.5.2 Data Evaluation

The water-level elevations for each well were estimated in two steps. First, the water-level reading measured by the transducer, which reflects the height of water column above the transducer, was compensated for atmospheric pressure by subtracting the barometric pressure measured from the baro-logger. A barometric efficiency factor of 0.83 was estimated using the data from Well Q and was multiplied to the baro-logger measurement to compensate for the capillary effects of the soil on the wells screened in the Vincentown Formation. In the second step, the water-level elevation was calculated with respect to the mean sea level and a correction factor for each well was estimated by taking the difference of the water levels collected manually and the first and last measurable readings from the transducer measurements. This correction factor was added to the transducer water levels to estimate the actual water levels. The water-level data collected from the pressure transducers, the deployment and retrieval measurements and charts showing the groundwater and surface water elevations for the period of study are included in **Appendix E.**

These water levels were used to calculate the average water level for each well in two different ways: 1) arithmetic mean; and 2) moving average. Simple arithmetic mean was calculated by adding the transducer readings and dividing it by the number of readings. The moving average was calculated using the method described in Serfes

(1991) which is designed to remove all diurnal and semidiurnal lunar and solar harmonics from water-level data. This calculation is performed by taking an average for a 24-hour period, to be presented as one data point, to create the series for first moving averages (M1). Similarly, a second set of moving averages (M2) for the next 24-hour period is then calculated. These averages were calculated for readings up to 71 hours. The median value for Serfes method is taken from the M2 value at the 36th hour of the study.

3.5.3 Results Summary

The mean water elevation calculated using the Serfes method from the six Vincentown Formation monitoring and the Delaware River, as well as the maximum and minimum elevations observed for the study period, are shown on **Figure 5**. **Table 4** presents the mean water levels calculated using both methods (Serfes and arithmetic mean) and the maximum and minimum values during the study period. The tidal study data indicate that the Delaware River had a fluctuation in water level of approximately 5 feet during the study period. The fluctuations observed in the Delaware River were in sync with the groundwater level fluctuations observed in the Vincentown Formation wells, and there is little time delay between tidal fluctuations in the Delaware River and monitoring wells. Wells AA-V, P, and L showed the greatest fluctuation in groundwater (approximately 3 feet) which is expected since Wells AA-V, P, and L are located closer to the Delaware River compared to Wells K, Q and V. Wells K and V are located farthest from the Delaware River and had moderate fluctuations of approximately 1 foot. Well Q showed virtually no influence from tidal fluctuation, suggesting that this well may be hydrogeologically isolated. **Figure 5** includes potentiometric groundwater level contours for the study area and shows an overall groundwater flow gradient is southwest toward the Delaware River.

3.6 Potable Well Search

A comprehensive online search was performed using NJDEP data miner to locate potable wells within Lower Alloways Creek, Elsinboro, and Greenwich Townships (**Appendix F**). In addition, individual well searches were performed through NJDEP to obtain available potable well permit information from properties closest to the Station. The permit and well construction details for select potable wells located at and closest to the Station are presented in **Table 5.** To further evaluate the potable well locations and depth information provided by NJDEP with respect to the Vincentown Formation, the Vincentown Formation outcrop, including strike, dip and downdip limit information, are shown on **Figure 6**.

PSEG owns eight on-site production/potable wells (HC-1, HC-2, LDC-1, PC-1, PW-2, PW-3, PW-5 and PW-6) at the Station. These wells range in depth from 260 feet bgs (PC-1) to 1,800 feet bgs (PW-6). These wells are installed in deeper formations, isolated by confining units, beneath the Vincentown Formation.

Well permit records obtained through the NJDEP well search indicate the closest offsite potable wells (Permit numbers 3400002697, 3400002698 and 3400002699) are located approximately one mile northeast from the Station; however, the coordinates provided indicate that these wells as located in a wetland area that is not known or anticipated to be occupied. As such, PSEG does not expect these wells are actually located at the coordinates provided in the permit. Additionally, the wells are mapped to an area where the Vincentown Formation is expected to be between 50 and 120 feet bgs. The permitted depth of these wells are from 345 to 349 feet bgs, indicating they are screened below the Vincentown Formation. The closest offsite potable well which potentially is installed in the Vincentown Formation (Permit number 3400002389) is shown to be located approximately 4 miles north of the Station and upgradient to groundwater flow. As part of the Radiological Environmental Monitoring Program, PSEG collects samples from a well located approximately 3.8 miles from the Station. **Figure 6** shows the location of the well (3E1 – FARM WELL). NJDEP could not provide permit information for this well; however, tritium has not been detected in this well.

4. Evaluation of Results and Proposed Activities

Tritium is present in Well AA-V at a concentration greater than previously detected in groundwater samples from existing Vincentown Formation monitoring wells. Based on the concentration detected in Well AA-V, the source of the tritium is likely associated with Salem Unit 1 and possibly the spent fuel pool release.

Data presented in Section 3.5 demonstrate that groundwater in the Vincentown Formation flows toward the Delaware River. Based on the interpretation of the groundwater elevation data, Well AA-V is located downgradient of the fuel handling building/seismic gap. Groundwater sample results collected from the Early Site Permit wells confirms tritium has not been detected in groundwater upgradient of the Station.

The low-flow sampling technique is a groundwater sampling method designed to minimally stress the aquifer, in comparison the extended purge was designed to stress the aquifer. During the extended purge, groundwater from an approximately 15-foot radius surrounding Well AA-V was purged from the well. Samples collected during the extended purge represent an average concentration of the surrounding area. During the extended purge, the concentration of tritium detected in Well AA-V increased, compared to previous samples collected using the low-flow sampling technique. The tritium data collected during the extended purge indicate that concentrations of tritium in the vicinity of Well AA-V are greater than those detected prior to the extended purge (i.e., nominally 8,150 pCi/L). As groundwater flow returns to normal conditions, the influence of the extended purge will reduce and concentrations in Well AA-V will likely return to the range detected prior the extended purge.

Based on the above, it is recommended a work plan is developed, in collaboration with NJDEP, to investigate tritium in groundwater beneath the Kirkwood Formation confining unit. Additionally, the work plan should include activities to supplement the groundwater recovery system (GRS) by performing spot remediation at Well AC. The work plan will be submitted to NJDEP for approval; however, initiation of project planning activities may begin prior to receiving approval.

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Tables

Figures

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Appendix A

Monitoring Well Certification Form B

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Appendix B

Boring Logs and Construction Details for Well AA-V

Appendix C

Specific Capacity Test for Well AA-V

Appendix D

Tidal Study Raw Data

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Appendix E

Groundwater and Delaware River Tidal Study Charts

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Appendix F

NJDEP Online Township Based Well Search Results