US Army Corps
of Engineers
Philadelphia District

PEARCE CREEK CONFINED DISPOSAL AREA MODIFICATION

CECIL COUNTY
MARYLAND

GROUNDWATER MONITORING PLAN NARRATIVE

INITIAL SUBMISSION
JUNE 2014

PEARCE CREEK CONFINED DISPOSAL AREA MODIFICATION
CECIL COUNTY, MARYLAND
GROUNDWATER MONITORING PLAN NARRATIVE
INITIAL SUBMISSION

JUNE 2014

PREPARED BY:

UNITED STATES ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT
WANAMAKER BUILDING, 100 PENN SQUARE EAST
PHILADELPHIA, PENNSYLVANIA 19107-3390

1.0 INTRODUCTION

This Groundwater Monitoring Plan has been developed to support the design, installation, and operations and maintenance by USACE Philadelphia District of a liner system at the Pearce Creek Confined Disposal Facility (CDF), located in Earleville, Cecil County, MD.

1.1 Objective

The objective of this Groundwater Monitoring Plan is to monitor potential changes in groundwater quality resulting from the installation of an impermeable liner which is designed to mitigate the effects of future and past dredge disposal at the Pearce Creek CDF.

1.2 Previous Similar Applications

USACE Philadelphia District has conducted monitoring projects of this type previously. As an example, the currently ongoing New Jersey CDF Monitoring Program was initiated in 2002 in cooperation with the New Jersey Department of Environmental Protection (NJDEP). The monitoring program was initiated by USACE Philadelphia District and is being conducted voluntarily as a proactive means of monitoring groundwater conditions at several NJ CDFs on a continuing basis. The NJ CDF groundwater monitoring project serves as a suitable template on which to model the Pearce Creek Monitoring Program proposed in this Groundwater Monitoring Plan. Key features of the NJ CDF Groundwater Monitoring Program include:

1. Proactive means of monitoring groundwater quality at several NJ CDFs, with results provided voluntarily to NJDEP on an annual basis.
2. Program started out with a broad range of chemical parameters being analyzed. As it became apparent over time that certain classes of compounds were not of concern or not present, many parameters were eliminated from the sampling program.
3. After several years the frequency of sampling events was eventually reduced, and further reduction is anticipated in the future.

1.3 Assumptions

In designing the Pearce Creek Groundwater Monitoring Plan, several assumptions were made, including:

1. Program includes Magothy, Upper Patapsco Shallow, and Upper Patapsco Deep aquifers
2. Data collected will include groundwater characterization (groundwater analytical samples) and groundwater levels
3. No monitor wells inside the CDF will be included as they will be abandoned in accordance with Maryland Department of the Environment (MDE) requirements
4. Monitor wells and piezometers included in the study are located on government property, in road rights-of-way, and on private properties.
5. Study area consists of Pearce Creek CDF and up to approximately 0.5 mile outside CDF perimeter
6. No residential drinking water samples will be tested
7. No river/creek/surface water samples will be tested

8. Total duration of monitoring program is 10 years
9. Site performance standard is Federal MCL/SMCL and MDE drinking water values.

2.0 SITE DESCRIPTION AND HYDROGEOLOGY

This section provides a brief physical description of the Pearce Creek CDF. The site hydrogeology is summarized, especially as it relates to, and influences, the well installation and well sampling activities.

2.1 Site Description

The Pearce Creek CDF is located in Cecil County, Maryland, immediately south of Pearce Creek and the eastern shore of the Elk River, a major tributary of the Chesapeake Bay. The CDF encompasses 260 acres, and is defined by a dike that encircles the facility and has a perimeter length of approximately 2.5 miles. A secondary baffle dike extends approximately 1,800 feet from the northeastern leg of the perimeter dike towards the southwest. The CDF is bounded by residential properties to the west, by residential, agricultural, and undeveloped properties to the south and east, and by Pearce Creek and the Elk River to the north. The interior of the CDF is generally covered with phragmites and other hydrophilic plants (Kleinfelder, 2013).

2.2 Site Hydrogeology

The Pearce Creek CDF is located in the Atlantic Coastal Plain physiographic province, which consists of a largely unconsolidated, thick wedge of continental, coastal, and marine sediments of Cretaceous to Recent age. The sediments in the Atlantic Coastal Plain are underlain unconformably by Precambrian and lower Paleozoic crystalline rock. The coastal plain sediments in the vicinity of Pearce Creek are estimated to be approximately 900 feet thick (USGS, 2012).

The United States Geological Survey (USGS) (2012) has interpreted an alternating series of aquifers and confining units underlying the site. In stratigraphic order from the ground surface downward, the youngest units in general consist of anthropogenic (fill and dredged material) material that intermix with the surficial Matawan Formation (composed of clay and silty clay) to form a surficial confining unit that is approximately 20 to 40 feet thick. Because the new well locations are located outside of the CDF, it is unlikely that the fill and spoils will be encountered.

The Magothy Aquifer underlies the Matawan Formation, is predominantly composed of coarse sand and gravel, and is the shallowest water-bearing unit beneath the site. The Magothy Aquifer generally ranges in thickness from 40 to 50 feet, except west of the CDF where it thins to less than 20 feet in the vicinity of the Elk River.

A confining unit underlies the Magothy Aquifer. It is generally present within the project area and is composed of clays and silty clays, and ranges in thickness from about 10 to 50 feet.

The Upper Patapsco Shallow Aquifer underlies the confining unit, and is the principle water-bearing zone for the majority of the residential wells in the area. This aquifer unit is encountered at a subsurface depth of approximately 40 feet beneath the ground surface, and is approximately 60 feet in thickness. The Upper Patapsco Shallow Aquifer is composed predominantly of fine sands and thin beds of gravel, although clay and silt stringers ranging from 5 to 10 feet in thickness are common.

Another confining unit underlies the shallow aquifer and separates the Upper Patapsco Shallow Aquifer from the Upper Patapsco Deep Aquifer. The confining unit is approximately 80 feet thick beneath the West View Shores residential community, and consists predominantly of clay and silty clay.

The Upper Patapsco Deep Aquifer is the deepest hydrogeologic unit beneath the project area. Based on the USGS (2012) interpretation, the Upper Patapsco Deep Aquifer in this area should be encountered between the depths of approximately 190 to 235 feet.

The USGS (2012) report contains a description and data regarding historical groundwater flows and contours.

3.0 PLAN DESCRIPTION

3.1 Components

The Pearce Creek Groundwater Monitoring Program will include collection of groundwater samples and groundwater level data. Both data types will be collected over the course of the program, both prior to construction of the liner and afterwards.

Groundwater samples will be collected for chemical analysis using the low-flow procedure Final USEPA Region II Low Stress (Low Flow) Ground Water Sampling Standard Operating Procedure, dated December 2003, and submitted for analysis of the following parameters:

1. Total Metals: Aluminum, Arsenic, Beryllium, Cadmium, Calcium, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Sodium, and Zinc
2. General Chemistry Parameters: Alkalinity, Total Dissolved Solids, Total Suspended Solids, Fluoride, Chloride, Bromide, Sulfate, Nitrogen (nitrite and nitrate), Nitrogen (nitrate), and Nitrogen (nitrite)
3. Radiologic Parameters: Gross Alpha and Gross Beta

Groundwater samples will be analyzed using approved USEPA methods of analysis, and will be performed by a laboratory having related certifications by MDE.

Groundwater level data will be collected four times per year in order to develop groundwater contour maps over the study area and take into account seasonal variations. These contour maps will be used to determine groundwater flow direction and assess the effects on the groundwater table resulting from the liner construction.

3.2 Monitor Wells and Piezometers in Study

The monitoring program will include existing monitor wells and require installation of several new monitor wells and piezometers. Both the existing and new monitor wells and piezometers will be screened in the Magothy, Upper Patapsco Shallow, and Upper Patapsco Deep aquifers that underlie the site.

Table 1 contains a list of the existing and proposed monitor wells and piezometers to be included in the monitoring plan (a total of 34 monitor wells and piezometers). These wells and piezometers are located on government property as well as on private properties. USACE anticipates that the proposed new monitor wells will be installed prior to initiation of the liner work.

No monitor wells inside the CDF will be included in the Monitoring Plan as they will be abandoned prior to the liner construction work. USACE has determined that interior monitor wells represent a potential for leakage into aquifers beneath the CDF. These interior monitor wells will be abandoned in accordance with MDE requirements. Well abandonment details are provided in a separate Well Abandonment submittal.

Table 1 - Monitor Wells to be Included in Monitoring Plan

Existing/Proposed	Designation	Monitor Well/ Piezometer	Aquifer	Government/ Private Property
Existing	CSW-5	Monitor Well	Magothy	Private
	CSW-7		Up Pat Shallow	Private
	CSW-9		Up Pat Shallow	Government
	CSW-10		Up Pat Shallow	Government
	CSW-13		Magothy	Government
	7A		Magothy	Private
	7B		Up Pat Deep	Private
	8A		Up Pat Shallow	Private
	8B		Magothy	Private
	11A		Up Pat Deep	Government
	11C		Magothy	Government
	11R		Up Pat Shallow	Government
	12R		Magothy	Government
	13A		Up Pat Shallow	Government
	14R		Up Pat Shallow	Government
	16A		Magothy	Government
	18B		Up Pat Shallow	Government
	21S		Magothy	Government
	21D		Up Pat Shallow	Government
Proposed	CSW-27		Magothy	Government
	CSW-28		Up Pat Shallow	Government
	CSW-29		Magothy	Government
	CSW-30		Magothy	Government
	CSW-31		Up Pat Shallow	Government
	CSW-32		Magothy	Government
	CSW-33		Up Pat Shallow	Government
	CSW-34		Up Pat Deep	Government
	CSW-35		Up Pat Deep	Government
	CSW-36		Up Pat Deep	Government
	PZ-1	Piezometer	Magothy	Government
	PZ-2		Magothy	Government

	PZ-3		Magothy	Government
	PZ-4		Magothy	Government
	PZ-5		Magothy	Government
	Total = 34			

Figure 1 shows the Magothy formation monitor wells and piezometers to be used in the monitoring plan. Figure 2 shows the Upper Patapsco Shallow formation monitor wells to be used in the monitoring plan. Figure 3 shows the Upper Patapsco Deep formation monitor wells to be used in the monitoring plan.

Descriptions of placement and installation of the proposed monitor wells and piezometers are below:

3.2.1 Magothy Aquifer

1. Piezometers PZ-1 through PZ-3 are located along the eastern perimeter of the CDF, while PZ-4 and PZ-5 continue along the southeast edge of the CDF.
2. Monitor wells CSW-30 and CSW-32 are located along the eastern perimeter of the CDF. CSW-30 is located midway between monitor well 11C and piezometer PZ-2. CSW-32 is located midway between PZ-2 and PZ-3.
3. Monitor well CSW-27 is located approximately midway along the southwest edge of the CDF, which is aligned parallel with Pond Neck Rd. It is approximately midway between monitor wells 16A and 12R.
4. Monitor well CSW-29 is located along the west edge of the CDF approximately 900 feet to the north of monitor well 16A.

3.2.2 Upper Patapsco Shallow Aquifer

1. Monitor wells CSW-31 and CSW-33 are paired up with CSW-30 and CSW-32 respectively, along the east edge of the CDF.
2. Monitor well CSW-28 is located approximately midway along the southwest edge of the CDF, which is aligned parallel with Pond Neck Rd. It is approximately midway between monitor wells CSW-10 and 14R.

3.2.3 Upper Patapsco Deep Aquifer

1. Monitor well CSW-34 is located approximately midway along the southwest edge of the CDF, which is aligned parallel with Pond Neck Rd.
2. Monitor well CSW-35 is located near the front entrance to the CDF.
3. Monitor well CSW-36 is located near the southeast corner of the CDF.

4.0 METHODOLOGY

4.1 Monitor Well/Piezometer Installation

A Maryland-licensed driller will install the proposed monitor wells and piezometers in accordance with USACE, MDE, and Cecil County Health Dept. regulations and guidance. The monitor wells

and piezometers will be constructed of 4-inch and 2-inch diameter PVC, respectively. Due to the required depths and local geology, they will likely be installed using mud-rotary drilling equipment. A 5-foot or 10-foot long well screen will be installed, whichever is appropriate. All proposed new monitor wells and piezometers are located on government property and will be stickup wells. Table 2 contains a summary of the proposed monitor wells to be installed. For comparison purposes, Table 3 contains a summary of the existing monitor wells included in the Groundwater Monitoring Plan.

Prior to installing any wells, the driller will place one pilot borehole at each proposed single well location or multiple well location. The purpose of the pilot boreholes is to establish the stratigraphy and locate the desired aquifer and screening interval. The pilot borehole will be drilled and sampled from the surface level for each well, and be utilized for the well installation.

Split-spoon soil sampling will be performed using either the Standard Penetration Test method or down-hole hammer. The soil borings will be logged by a qualified geologist. Split spoon sampling will be performed while installing the pilot boring. While drilling the pilot borehole, one 2-foot split spoon sample will be collected every 5 feet until a depth is reached approximately 20 feet above the top of the expected screening range of the monitor well to be installed. At this point continuous split-spoon sampling will be done to confirm the well screening and well bottom depths.

Several of the wells will be installed as pairs or 3-well groupings consisting of a shallower well and one or two deeper wells. These well pairs or groupings will be drilled and installed within approximately 10 (horizontal) feet of each other. The pilot boring for the deeper monitor well in the pair or grouping will be drilled, sampled, and logged first. The pilot boring depth will be equal to the depth of the deep well in the associated well pair. The data obtained from logging this boring will be used to select the depth and screen interval of the shallower well. The borehole for the shallower well will be blind drilled to within approximately 10 feet of the appropriate depth selected for this well, based on logging of the pilot borehole. At this point, continuous split spoon sampling will be done to confirm the well screening and well bottom depths. At all new monitor well locations, when the target depth range is reached, the boring will be terminated once a sufficient length of screenable material is encountered (i.e., ten-foot length of screenable sand).

4.2 Groundwater Sampling

Prior to construction of the liner system, a groundwater sampling event will be performed to establish baseline conditions. Samples will be collected from all of the monitor wells and piezometers in the monitoring program (see Table 1). A total of 34 monitor wells and piezometers will be sampled in the monitoring program. A complete synoptic round of groundwater level readings for all of these monitor wells and piezometers will also be recorded during the sampling event. A second synoptic round of pre-construction groundwater levels will also be collected at a later time.

After initiation of construction of the liner system, two analytical groundwater sampling events will be conducted each year for the first two years. During the third through the fifth year following initiation of liner construction, a single yearly analytical groundwater sampling event will be performed. Beginning in the sixth year following initiation of the liner construction, one analytical groundwater sampling event will be performed every other year, until the completion of the monitoring program.

Synoptic rounds of groundwater level readings will be obtained four times per year for the first five

years after initiation of the liner construction. Beginning in the sixth year after initiation of liner construction, two synoptic rounds of groundwater level readings will be obtained per year, until the completion of the monitoring program.

Transducers will be installed in four monitor wells located around the perimeter of the Pearce Creek CDF. Each of these four monitor wells will be set in the Magothy aquifer. The transducers will be used to collect groundwater elevation data for a period of one month prior to the beginning of a dredging cycle, during the dredging cycle, and for one month after the completion of the dredging cycle. Local precipitation data will be used to adjust and correct water level changes during the data collection period. These data will allow evaluation and comparison of groundwater flow patterns before, during, and after dredging operations.

4.2.1 Method of Analytical Sampling

Sampling will require that the Contractor follow the Final USEPA Region II Low Stress (Low Flow) Ground Water Sampling Standard Operating Procedure, dated December 2003. The following field parameters will be real-time monitored as per the low flow procedure using a groundwater quality meter to determine when the purged groundwater has stabilized prior to sampling:

- specific conductance
- pH
- temperature
- oxidation-reduction potential
- turbidity
- dissolved oxygen

Depth to water shall also be monitored to track drawdown rates during purging. A Grundfos 2-inch adjustable speed submersible pump/controller, or approved similar equipment, will be used for all groundwater sample collection in combination with a continuous flow-through cell suitable for taking water quality measurements using the groundwater quality meter. The groundwater quality meter must be calibrated for all measured parameters on a daily basis, and must be documented in the field notebook. The same sampling method will be used for all sample locations in the monitoring program. Bailers and other sampling methods will not be used in this sampling program unless specifically approved by USACE and MDE. If insufficient groundwater is available to use the low flow sampling technique, no groundwater sample will be collected. If the water level in the well approaches the low flow drawdown limit and/or the well turbidity exceeds 20 NTUs, the USACE will make a determination as to whether a groundwater sample will be collected.

All sampling equipment, including pumps and cells, etc. shall be decontaminated prior to each sample location according to the standard USEPA Low Flow groundwater sampling procedure referenced above. Pumps shall be subjected to daily and between-well decontamination procedures, as discussed in the procedure.

Preservation, sample bottles, and holding times for samples collected for chemical and radiological analysis shall be in accordance with the associated methods. The sampling crew will ship the samples the same day of sample collection via laboratory courier or overnight delivery service for either same day or next day delivery to the laboratory. Field quality control (QC) samples, including blind field duplicates, rinsate blanks, laboratory duplicates, and matrix spike/matrix spike duplicate

samples will be collected at frequencies consistent with EPA protocols.

5.0 DATA ANALYSIS AND REPORTING

The following data will be generated from the monitoring plan.

Soil boring logs and well construction logs from new monitor well installation will be developed for each of the three underlying aquifers and added to the site database to further clarify the Pearce Creek site conceptual model. Water level data will be used to generate groundwater flow contours. This will be done on a continuing basis to identify whether any changes in groundwater flow take place over time. When sufficient groundwater level data has been collected USACE will evaluate differences in groundwater levels relative to pre-construction data. Noticeable differences may provide an indication as to whether groundwater levels in one area are substantially different compared to those in other areas. Transducer data will be used to generate graphs of groundwater elevation vs. time. This will allow evaluation and comparison of groundwater levels in the Magothy aquifer before, during, and after a dredging operation.

Laboratory results will be reported in a legally defensible Contract Laboratory Program (CLP)-type data package, including raw data, that can be validated by an external third party. Data shall be maintained in an electronic format that can be imported to an Access database to permit rapid selection and mathematical manipulation of data. Electronic Data Deliverables (EDDs) compliant with the USACE's Automated Data Review (ADR) specification will also be obtained from the laboratory. These deliverables will allow the project data review chemist to complete an automated review of the laboratory data through the ADR process, and apply data validation qualifiers for QC outliers based on results for selected laboratory and field QC samples. The ADR output files with the reviewed and qualified results will then be uploaded into the Environmental Data Management System (EDMS) database file for the project. These validated results will be utilized in the generation of project reports, and will incorporate a comparison with the Federal MCLs and SMCLs and MDE drinking water criteria.

6.0 SUBMITTALS

USACE will provide MDE with a project summary report on an annual basis over the duration of the site monitoring activities. This report will describe all work performed during the past year. It will include boring logs, well construction diagrams, laboratory analysis results from groundwater samples, water level readings, groundwater contour maps, site figures showing monitor well and piezometer locations, and other data or figures that are appropriate for the work completed during the year. The reports will include recommendations for future actions, including recommended modifications to the monitoring plan as more groundwater data is collected.

7.0 REFERENCES

U.S. Geological Survey, 2012. Hydrologic Framework, Hydrology, and Water Quality in the Pearce Creek Dredge Material Containment Area and Vicinity, Cecil County, Maryland, 2010-11.

Kleinfelder, 2013. Subsurface Exploration Report, Pearce Creek Confined Disposal Facility,

Earleveille, Cecil County, MD

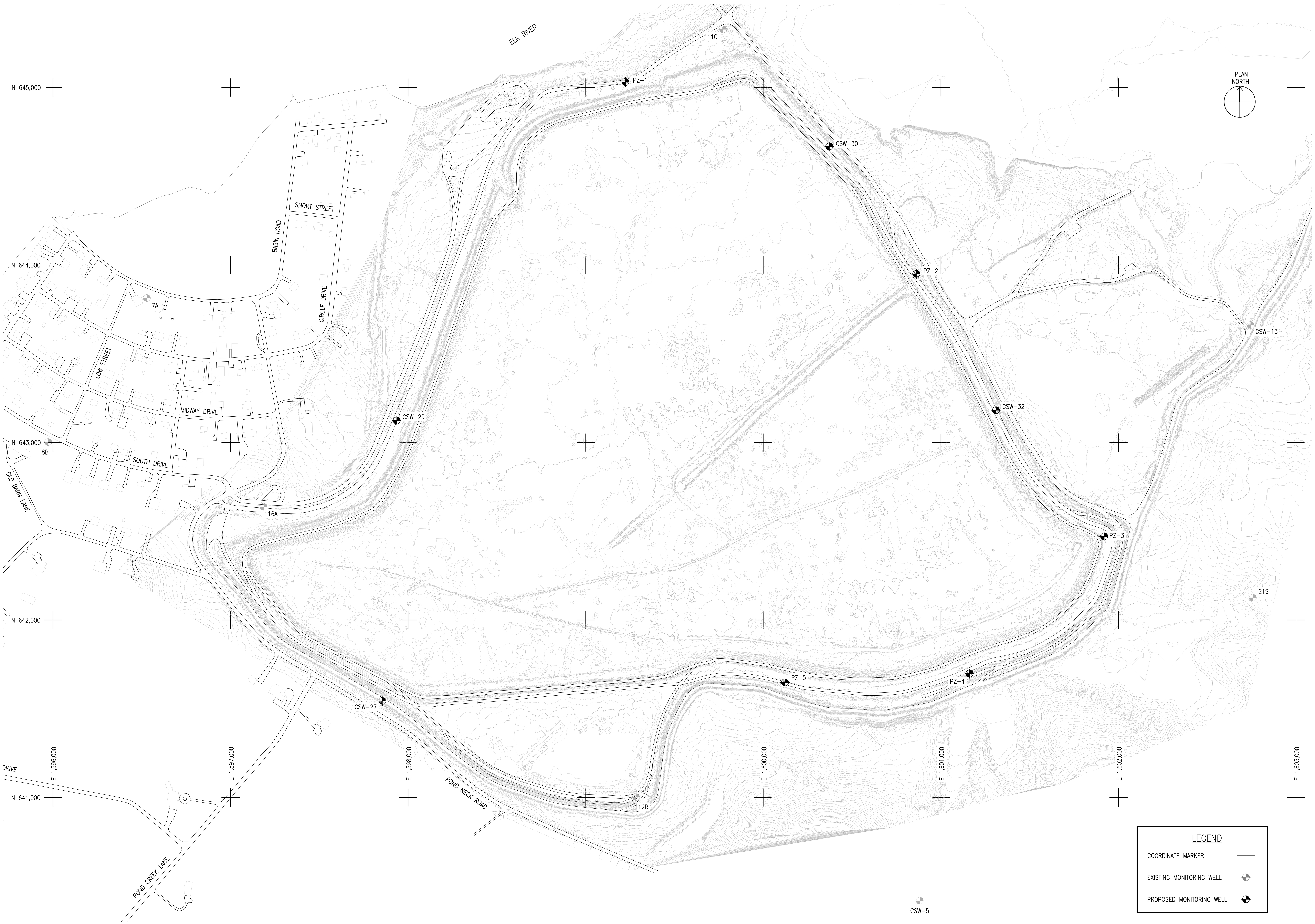
Table 2
Summary of Proposed New Monitor Wells at Pearce Creek
Pearce Creek Confined Disposal Facility
Cecil County, MD
6/16/2014

No.	Well Desig	Description/ Location	Diameter (inches)	Latitude/ Longitude		Approx Depth Range (ft bgs)*	Aquifer
1	CSW-27	SW perimeter of CDF adjacent to Pond Neck Rd	4	39 deg 25'25.89"	75 deg 59'21.43"	35 to 65	Magothy
2	CSW-28	SW perimeter of CDF adjacent to Pond Neck Rd	4	39 deg 25'25.89"	75 deg 59'21.43"	40 to 120	Up Pat Shallow
3	CSW-29	W perimeter of CDF adjacent to Stemmers Run	4	39 deg 25'41.49"	75 deg 59'20.19"	30 to 50	Magothy
4	CSW-30	East perimeter of CDF	4	39 deg 25'56.48"	75 deg 58'48.93"	20 to 40	Magothy
5	CSW-31	East perimeter of CDF	4	39 deg 25'56.48"	75 deg 58'48.93"	100 to 150	Up Pat Shallow
6	CSW-32	East perimeter of CDF	4	39 deg 25'41.69"	75 deg 58'37.18"	50 to 80	Magothy
7	CSW-33	East perimeter of CDF	4	39 deg 25'41.69"	75 deg 58'37.18"	65 to 150	Up Pat Shallow
8	CSW-34	SW perimeter of CDF adjacent to Pond Neck Rd	4	39 deg 25'25.89"	75 deg 59'21.43"	200 to 220	Up Pat Deep
9	CSW-35	W perimeter of CDF by front gate	4	39 deg 25'36.78"	75 deg 59'28.82"	200 to 270	Up Pat Deep
10	CSW-36	SE perimeter of CDF	4	39 deg 25'27.48"	75 deg 58'37.61"	200 to 220	Up Pat Deep
11	PZ-1	North perimeter of CDF adjacent to Elk River	2	39 deg 26'0.19"	75 deg 59'3.51"	20 to 40	Magothy
12	PZ-2	East perimeter of CDF	2	39 deg 25'49.33"	75 deg 58'42.79"	55 to 80	Magothy
13	PZ-3	East perimeter of CDF	2	39 deg 25'34.60"	75 deg 58'29.52"	70 to 95	Magothy
14	PZ-4	South perimeter of CDF	2	39 deg 25'27.05"	75 deg 58'39.3"	35 to 85	Magothy
15	PZ-5	South perimeter of CDF	2	39 deg 25'26.67"	75 deg 58'52.55"	50 to 90	Magothy

* Approximate depth ranges determined using data from nearby monitor wells in same aquifer

Table 3
Summary of Proposed Existing Monitor Wells at Pearce Creek
Pearce Creek Confined Disposal Facility
Cecil County, MD
6/17/2014

No.	Well Desig	Diameter (inches)	Screen Length (ft)	Well Screen Depth (ft bgs)	Aquifer
1	CSW-5	4	10	80 to 90	Magothy
2	CSW-7	4	10	81 to 91	Up Pat Shallow
3	CSW-9	4	10	115 to 125	Up Pat Shallow
4	CSW-10	2	15	100 to 115	Up Pat Shallow
5	CSW-13	4	5	48 to 53	Magothy
6	7A	4	5	11 to 16	Magothy
7	7B	4	5	217 to 222	Up Pat Deep
8	8A	4	10	79 to 89	Up Pat Shallow
9	8B	4	5	39 to 44	Magothy
10	11A	4	10	188 to 198	Up Pat Deep
11	11C	4	10	20 to 30	Magothy
12	11R	4	10	118.5 to 128.5	Up Pat Shallow
13	12R	4	5	35 to 40	Magothy
14	13A	4	10	135 to 145	Up Pat Shallow
15	14R	4	10	108 to 118	Up Pat Shallow
16	16A	4	10	30 to 40	Magothy
17	18B	4	10	77 to 87	Up Pat Shallow
18	21S	4	10	57 to 67	Magothy
19	21D	4	10	145 to 150	Up Pat Shallow



LEGEND

- COORDINATE MARKER
- EXISTING MONITORING WELL
- PROPOSED MONITORING WELL

1 PLAN - MAGOTHY MONITORING
SCALE = 1" = 200'

0 100 200 400
SCALE IN FEET

NOTES:

1. TOPO SHOWN WAS DEVELOPED USING LIDAR DATA FROM 2014.

US Army Corps of Engineers
Philadelphia District

MARK	ACTION	DESCRIPTION	DATE	BY
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PHILADELPHIA DISTRICT
PHILADELPHIA, PA 19107-3390
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DWN BY: SJP	DESIGNED BY: MFM	ISSUE/RELEASE DATE: 90% 30 JUN 14
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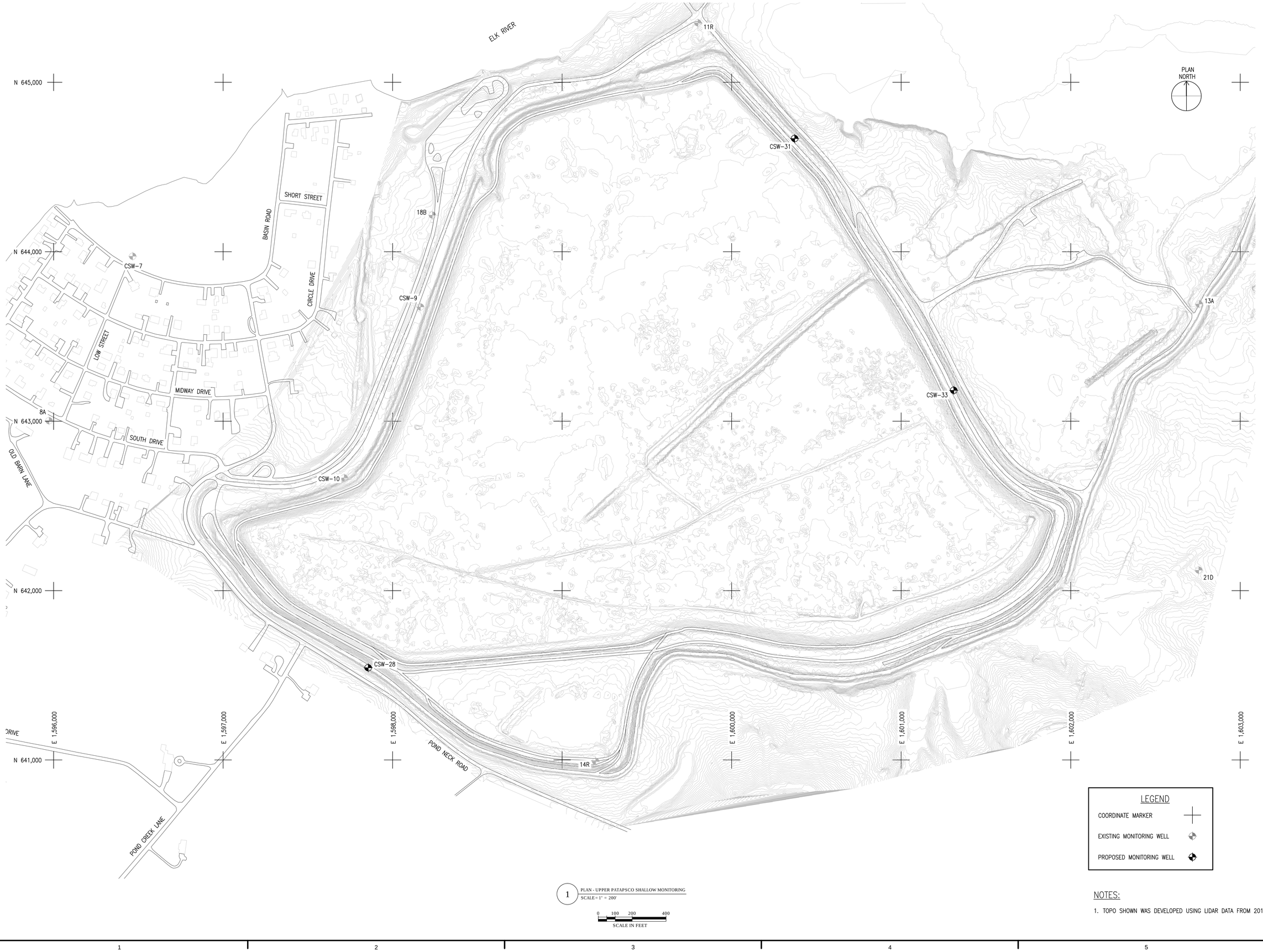
		SOLICITATION NUMBER: IFB W912BU-1X-XXXX
DWG SCALE: 1"=200'		CONTRACT NUMBER: -
DWG. SIZE: 30"x42" Arch E1	FILE NAME: 1 PLAN - MAGOTHY MONITORING.dwg	

DELAWARE RIVER TO CHESAPEAKE BAY
DELAWARE AND MARYLAND
PEARCE CREEK CONFINED DISPOSAL AREA
MODIFICATIONS

PLAN - MAGOTHY MONITORING

SHEET NUMBER
1



LEGEND

- COORDINATE MARKER
- EXISTING MONITORING WELL
- PROPOSED MONITORING WELL

NOTES:

1. TOPO SHOWN WAS DEVELOPED USING LIDAR DATA FROM 2014.

1 PLAN - UPPER PATAPSCO SHALLOW MONITORING
SCALE = 1" = 200'

0 100 200 400
SCALE IN FEET

US Army Corps of Engineers
Philadelphia District

MARK	ACTION	DESCRIPTION	DATE	BY
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DELAWARE RIVER TO CHESAPEAKE BAY
DELAWARE AND MARYLAND
PEARCE CREEK CONFINED DISPOSAL AREA
MODIFICATIONS
PLAN - UPPER PATAPSCO SHALLOW MONITORING

SHEET NUMBER
2

1 PLAN - UPPER PATAPSCO DEEP MONITORING
SCALE = 1" = 200'

0 100 200 400
SCALE IN FEET

NOTES:

1. TOPO SHOWN WAS DEVELOPED USING LIDAR DATA FROM 2014.

US Army Corps of Engineers
Philadelphia District

MARK	ACTION	DESCRIPTION	DATE	BY

DWN BY: SJP	DESIGNED BY: MTM
CAD BY:	REVIEWED BY:
DWG SCALE: 1"=200'	ISSUE/RELEASE DATE: 9DS 30JUN14
DWG. SIZE: 30"x42" ANSI D	PROJ. NUMBER:
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MODIFICATIONS
PLAN - UPPER PATAPSCO DEEP MONITORING

SHEET NUMBER
3