

DETAILED DEVELOPMENT PLAN
WILLS WHARF OFFICE

Baltimore Works Site

Baltimore, Maryland

6 June 2016 (Revised 26 September 2016)

By:
Harbor Point Development LLC
Environmental Resources Management, Inc.
Beatty Harvey Coco Architects, LLP
Mueser Rutledge Consulting Engineers
Morris & Ritchie Associates, Inc.

For:
United States Environmental Protection
Agency - Region III
Maryland Department of the Environment

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Harbor Point Development LLC (HPD) and its consultants have prepared this Detailed Development Plan (DDP) for the Wills Wharf Office Development Project (Project). The Project is planned for a portion of the former AlliedSignal Baltimore Works Site (Site), located in Baltimore, Maryland.

Historical operations at the Site resulted in impacts to soil and groundwater from hexavalent chromium (CrVI). Honeywell International, Inc. (Honeywell), which acquired AlliedSignal, is responsible for operating and maintaining an Environmental Remediation System (ERS) that addresses the chromium impacted soil and groundwater at the Site.

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor in the Fells Point section of Baltimore City. The Site consists of three Areas as described below and presented on drawing EN 100:

1. Area 1 is the principal location of the former AlliedSignal (now Honeywell) Baltimore Works Site, which included chromium processing production and support buildings on an area that covered approximately 14 acres;
2. Areas 2 and 3 were used for various industrial and warehousing operations, including chromate ore storage (Area 2) and brass foundry casting, oil blending and storage, coating/plastics production, lumber storage and foundry (Area 3). Areas 2 and 3 currently include the Thames Street Wharf (TSW) Office Building and its associated parking lots, where construction was completed in 2010 as well as the on-going construction of the Point Street Apartment building. The Project will not disturb the TSW Office Building or Area 3.

The Project is part of HPD's Phase 2 development activities for the Site, and includes a 220,000 square foot office building, a 156 key hotel and 3,000 square feet of ground floor retail. The Project also includes the extension of Wills Street south from the central plaza, a courtyard (open park space), and a promenade along the water. The Project does not include residential land use.

The majority of the planned building construction will occur in the western region of Area 2, south of Point Street (formerly Block Street). The construction of Wills Street will involve a limited area along the southeastern portion of Area 1. The Project also includes non-designated areas that lie outside of Areas 1 and 2 but are within the limits of disturbance (LOD) for the Project. Drawing EN 100 is an Existing Conditions Plan showing the Project and the Site, including the relevant portions of the existing ERS.

The ERS operated and maintained by Honeywell is a requirement of the Consent Decree by and between Honeywell, the U.S. Department of Justice, the United States Environmental Protection Agency (EPA), and the Maryland Department of the Environment (MDE). Honeywell retains responsibility for operating the ERS and monitoring environmental media to demonstrate continued attainment of Consent Decree performance criteria.

The Consent Decree stipulates that development of the Site must not interfere with Honeywell's ability to comply with the performance standards defined in the Consent Decree, or Honeywell's Groundwater Gradient Monitoring Plan, Surface Water Monitoring Plan, and Environmental Media Monitoring Plan. This DDP describes the Project improvements, and the means and methods that will be implemented to meet the requirements established in the Consent Decree and its appendices, as amended, as well as the Owner/Developer covenants.

2.0

PROJECT TEAM/ROLES

The individual stakeholders responsible for the preparation, review and approval of this DDP are identified below:

U.S. Environmental Protection Agency – Region III (EPA)

1650 Arch Street
Office of Remediation 3LC20
Philadelphia, PA 19103
Moshood Oduwole, Project Coordinator
(215) 814-3362

Maryland Department of the Environment (MDE)

1800 Washington Boulevard
Baltimore, MD 21230
Ed Dexter (Hazardous Waste Program)
(410) 537-3376
Richelle Hanson (Voluntary Cleanup Program)
(410) 537-3493

Honeywell International Inc. (RCRA Corrective Action Permittee)

115 Tabor Road
Morris Plains, NJ 07950
Chris French (Project Coordinator)
(973) 216-7506

Harbor Point Development LLC (Owner/Developer, referred to herein as “Developer”)

1300 Thames Street, Suite 10
Baltimore, MD 21231
Jonathan Flesher (Senior Development Director)
(443) 463-3937

Consultants responsible for preparing the DDP include:

Environmental Resources Management, Inc. (Environmental Consultant)

180 Admiral Cochrane Drive
Suite 400, Annapolis, MD 21401
Leonard Rafalko (Partner in Charge)
(410) 266-0006

Beatty Harvey Coco Architects, LLP (Architect)

650 South Exeter Street

Baltimore, MD 21202

Todd Harvey (Partner in Charge)

410-752-2759

***Mueser Rutledge Consulting Engineers (Geotechnical Engineer
and Foundation Designer)***

225 W. 34th Street

New York, NY 10122

Peter Deming (Partner in Charge)

(917) 339-9300

Morris & Ritchie Associates (Civil Engineer)

14280 Park Center Drive, Suite A

Laurel, MD 20707

Timothy Madden, ASLA (Partner in Charge)

(410) 792-9792

3.0

EXISTING ENVIRONMENTAL REMEDIATION SYSTEM

The ERS is a multi-component remedy that addresses Area 1, Area 2 and Area 3. The Project will only disturb the following ERS components:

1. Area 1
 - a. Multimedia Cap in Area 1;
 - b. Perimeter Toe Drain;
 - c. Hydraulic Barrier;
 - d. Head Maintenance System.
2. Area 2 - Layered Soil Cap.

3.1

AREA 1

3.1.1

MMC

The Multimedia Cap (MMC) in Area 1 was constructed over controlled fill that was placed over the abandoned foundations and asphalt cover of the Site. The MMC is designed (i) to mitigate upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater and (ii) to reduce infiltration to groundwater within Area 1.

The MMC components are illustrated in drawing DDP-F1.22 and are listed below (thicknesses are nominal) in descending order:

1. Six inches of crusher run stone;
2. 12 inches of cover soil;
3. A visual warning layer (e.g., orange snow fence or the like);
4. 12 inches of cover soil;
5. Geotextile;
6. Drainage net;
7. Geosynthetics, described below;
8. Geotextile;
9. Capillary break; and,

10. Geotextile.

The MMC was constructed in 1998 using both a synthetic geomembrane liner constructed of 60 mil (0.06-inch thick) Linear Low Density Polyethylene (LLDPE), and a geosynthetic clay liner (GCL). The underlying granular capillary break was installed to prevent upward migration (i.e., “wicking”) of chromium. The drainage net constructed of high-density polyethylene (HDPE) was placed above the geomembrane liner to collect and convey rainfall infiltration to the Harbor.

The drainage net and membranes are protected by a thick non-woven geotextile cushion above and below. These synthetic layers are covered with at least 24 inches of granular cover soil and six inches of crushed stone. This cover system protects the synthetic layers from possible mechanical damage, and reduces thermal changes to the layers. Some areas of the MMC are covered with asphalt pavement.

The geomembrane is crowned at the center of the Site and slopes towards the perimeter. The drainage net conveys infiltrating rainwater outboard of the hydraulic barrier (HB) to the perimeter toe drain and embankment at the land and waterfront perimeters of Area 1.

During the Area 1, Phase 1 project, it was confirmed with agency concurrence that the geomembrane liner and cover soil extended over the HB and into Wills Street. The as-built for this condition is shown in drawing DDP-F1.12.

3.1.2 *Perimeter Toe Drain*

The perimeter toe drain is constructed of perforated polyvinyl chloride (PVC) pipe on the landward perimeter, and HDPE drain tubing or stone infiltration without pipe at the waterfront perimeter. The pipes were placed in a stone-filled infiltration trench at the perimeter of the geomembrane outboard of the HB. The perimeter drain allows stormwater infiltration within the cap drainage net (i.e., above the geomembrane layer of the cap) to drain into the embankment outboard of the HB.

3.1.3 *Hydraulic Barrier (HB)*

The Consent Decree requires Honeywell to maintain an inward gradient in the coarse sand and gravel of Stratum S-4 and in the shallow S-1, S-2,

and S-3 sand strata along Wills Street. The inward gradient is intended to prevent the release of CrVI from Area 1 to the groundwater and surface water surrounding the Site. The inward gradient is maintained by extracting groundwater by the Head Maintenance System (HMS) operated by Honeywell.

The HB was placed at the perimeter of Area 1 to isolate groundwater below Area 1 from the Harbor and the surrounding groundwater. The HB reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient.

The HB is a soil-bentonite backfilled slurry trench. It was constructed by excavating a 36-inch wide trench to the top of decomposed rock (between 60 and 85 feet below construction grade), and placing low permeability backfill in the trench as the permanent barrier. The backfill was prepared from the trench excavation spoils, bentonite slurry, and dry bentonite addition. Laboratory testing demonstrated low permeability of the backfill before placement. The designed top of the hydraulic barrier is at an elevation (EL.) +5 at the waterside perimeter, and is EL. +7 and EL. +12 at the land perimeter (Wills Street).

During the Area 1, Phase 1 (Exelon Project), exposure of the HB for sheet pile driving determined that the top elevation of the HB in certain areas along Wills Street did not conform to the design elevations. As described in Section 6 of this DDP, the Project includes driving sheet pile into the HB to augment the barrier during construction. In addition, if it is observed in the field that the HB settles during sheet pile installation, the top of the HB will be raised to its pre-existing elevation.

3.1.4 *Head Maintenance System*

3.1.4.1 *Overview*

The HMS withdraws groundwater from within Area 1 to maintain a groundwater level within (i.e., inboard) the HB that is lower than the water table outside (i.e., outboard) of the HB. As a result, groundwater extraction from within the HB maintains an inward groundwater gradient.

The HMS is comprised of: (i) the Extraction System; (ii) the Monitoring and Control System; (iii) the Conveyance System; (iv) the Transfer Station;

and (v) the Transfer Station Truck Pad. The Groundwater Gradient Monitoring Plan (GGMP) documents the means and methods used by Honeywell to monitor compliance with the Groundwater Gradient Performance Standard and assess the performance of the HMS.

Paired piezometers measure the water levels inboard and outboard of the HB, and activate inboard extraction wells to maintain the inward gradient if the outboard water levels drop relative to inboard levels. The quantity of groundwater extracted is controlled by changes in the outboard water levels, which are influenced by the diurnal, seasonal and wind-blown tide effects. The extracted groundwater is conveyed to the storage tanks located at the Transfer Station for periodic loading into tanker trucks for off-site treatment and disposal at a licensed hazardous waste treatment facility.

3.1.4.2 *Extraction System*

The existing groundwater extraction system includes 4 shallow and 12 deep extraction wells. The groundwater extraction system is used to provide hydraulic control of groundwater at the Site and has been operational since late 1998. The system will continue to be operational during and after development.

The four shallow extraction wells, designated as SW1 through SW4, are approximately equally spaced along Wills Street on the land perimeter side of Area 1. The 12 deep wells, designated as DW1 through DW12, are approximately equally spaced around the perimeter of Area 1. All extraction wells consist of 6-inch diameter well screens and casing. Each well includes a filter piezometer that is intended to allow for a method to assess the condition and maintain the filter pack of the well.

The extraction wells are housed inside concrete vaults (designated as V1 through V12) and contain pneumatic pumps and water level measurement devices. Single and double well vaults exist at the Site below the MMC synthetic layers. The inside dimensions for the double extraction well vaults vary from 11 feet long by 7 feet wide by 7 feet high, to 14 feet long by 7 feet wide by 9 feet high. The single well vaults have dimensions of 8 feet long by 8 feet wide by 7 feet high. The vault (which house the extraction wells) and piezometer locations are shown in drawing EN 101. Soil profile is shown in drawing DDP-F1.11.

The deep extraction wells are screened in the Cretaceous Sand (designated as Stratum S-4 in the project documents) at a depth of approximately 50 to 80 feet below ground surface (bgs). The shallow extraction wells are screened in the Pleistocene Sands (designated as Strata S-2 and S-3 in the project documents) at a depth of approximately 20 to 40 feet bgs.

Each extraction well contains a water level transducer and a pneumatic pump. The transducers are used to monitor the groundwater level in the well to prevent damage to the pump during operation. Compressed air is supplied to the pneumatic pumps through 1-inch inside diameter pipe. The air supply is provided by a compressor located in the Transfer Station loading dock.

Each well vault also includes an electric sump pump, capable of pumping 5 gallons per minute (gpm) at 200 feet of total dynamic head. The sumps extend below the bottom of the vault to extract shallow groundwater from immediately below the vault. The sump pumps also manage rainwater that may enter the vault access hatches. The pumps are actuated by a water level indicator in the sump.

The sumps primarily maintain the vault in a dewatered condition and provide contingency control of shallow water level in the fill beneath the vaults. In addition, the HMS conduit sub-grade fill drains to the sumps so that the perimeter HMS pipe trenches function as collectors and act as a contingency for shallow groundwater control at the perimeter of the Site.

This Project includes that portion of Area 1 that houses V3 and V4 along Wills Street, as well as piezometer sets 3 and 4, junction boxes 3 and 4, and manhole MJ-2. Design measures to protect and/or modify vaults V3 and V4 and other features during construction of Wills Street are presented in Section 6.

3.1.4.3 *Monitoring and Control System*

The HMS monitoring and control system provides a means to remotely check and execute HMS system controls. The system includes remote intelligent controllers (RIC) or nodes in the vaults for input/output connections. The system is monitored with the Master Supervisory Station (MSS) located in the Transfer Station, which enables Honeywell to record and view the hydraulic gradient and pumping activity at each

extraction well in real-time. The MSS also activates alarms related to maintenance and operational needs.

The system includes twin paired piezometers (one inside and one outside of the HB) for measurement of water levels across the HB. The piezometers are located approximately 10 feet away from the barrier. The piezometer pairs are located at midpoints between extraction wells, and are screened in the same stratum pumped by the extraction wells.

For the deep extraction wells, the piezometer pairs are designated as “IP” or “OP” for inboard or outboard of the HB, respectively. The piezometers are numbered 1 through 12 corresponding to each of the 12 deep extraction wells. The shallow piezometers are designated similarly as “inboard” or “outboard” of the HB and numbered 1S through 4S corresponding to each of the 4 shallow extraction wells

When the gradient measured at any piezometer pair is above the minimum inward gradient criteria, which includes an additional factor of safety, the RIC in the vault activates the pumps inside the HB and on either side of that piezometer pair, until the measured gradient meets the established criteria. The RIC controller sends signals to solenoid valves that control the pumps.

The Project includes that portion of Area 1 that includes the piezometers associated with vaults V3 and V4, namely: IP3, ISP3, OP3, OSP3, IP4, ISP4, OP4, and OSP4. Design measures to protect these piezometers during construction of Wills Street, and sheet pile driving in and restoration of the HB are presented in Section 6.

3.1.4.4 *Conveyance System*

HMS piping connecting the pumping vaults was placed below the MMC synthetic layers. Oversized 8-inch conduits were installed between the vaults to house the groundwater conveyance pipes. The 8-inch conduits and pipes are below the MMC geomembrane. The groundwater conveyance pipes are comprised of three 1 ½-inch diameter HDPE continuous pipes, placed within an 8-inch diameter HDPE pipe which provides secondary containment. Three additional conduits, two 4-inch conduits and one 3-inch conduit, house a 480 volt (V) electrical supply loop, a 1-inch compressed air supply loop and several low voltage lines between the RICs and the MSS and security systems wiring.

The conduit and pressurized force main design allows some differential settlement of the HMS force main pipes. Redundant conduit capacity allows replacement of the air and electrical lines between the vaults, if required.

3.1.4.5 *Outboard Embankment and Waterside Perimeter*

The north, west, and south perimeters of the Site were defined by bulkhead structures along the Patapsco River and the Harbor. These structures were part of the original construction, dating from the 1890s to 1950s.

Permanent interlocking steel sheet piles are located along the southern shoreline, south of the TSW Office Building and extending west to the southern terminus of Wills Street. The sheet pile alignment is located at the crest of the revetment slope. The slope was constructed by placing imported granular fill to support the rip rap-covered revetment slope. Rip rap was placed for erosion control above EL. -10, in the wave zone. The embankment fill included a coarse filter stone gradation to separate fine gravel sized wall zone fill from coarse core stone in the tidal region.

The Project includes the construction of a Promenade over the embankment along the southern perimeter of the Site as shown in drawing DDP-F1.44. Design measures to protect the embankment during construction are presented in Section 6.

3.2 **AREA 2 LAYERED SOIL CAP**

The majority of the construction will occur within Area 2, which is covered by a Layered Soil Cap (LSC). As noted above, a portion of Area 2 has been covered by the TSW Office Building since its construction was completed in 2010.

The LSC was designed and constructed to limit exposure pathways by preventing the generation of airborne particulates, dermal contact with underlying soil, ingestion of surface soils, and soil erosion. The cap components from bottom to top are a non-woven geotextile, capillary break layer, non-woven geotextile, a crushed stone sub-base, and an asphalt surface. Granular soil, if any, above the upper geotextile filter is cover soil. The major elements of the cap are described further below:

1. Capillary Break Layer - The capillary break minimizes the potential for upward migration of chromium contaminated water potentially present in the capillary fringe above groundwater. Groundwater is located at a depth of greater than five feet below the LSC. The capillary break consists of a layer of coarse gravel, which limits capillary action. This layer has a minimum thickness of 6 inches. AASHTO No. 57 stone is used for the capillary break. To protect the capillary break from the intrusion of fine-grained soils, a non-woven geotextile filter was installed on the prepared sub-grade under the capillary break stone. Similarly, an upper geotextile was installed prior to the placement of any dissimilar soil material on the capillary break surface;
2. Asphalt Surface - The LSC surface is comprised of an aggregate base overlain by bituminous asphalt. A 6-inch thick course of RC-6 aggregate base material was placed above the upper non-woven geotextile filter that protects the capillary break. The asphalt was placed over the RC-6 base. The asphalt was installed consistent with Baltimore City Specification Article 20.12. Bituminous asphalt constitutes a hydrophobic layer that further inhibits capillary rise;
3. Sediment and Erosion Control Structures - Stormwater flows across the asphalt surface of the LSC and is directed toward the harbor. The asphalt and the stone revetment at the shoreline with the harbor are non-erosive and therefore no additional erosion control structures are necessary.

Design measures to protect the Area 2 LSC during construction are presented in Section 6.

4.0 DEVELOPMENT PLAN AND SCHEDULE

4.1 SCOPE OF PROJECT

This Project includes the Wills Wharf Office/Hotel building, the underlying parking garage and plaza, general site development (streets, sidewalks, utilities, foundations, etc.), the office plaza extension/construction, and remedy restorations for development as further described below. The Project will not disturb the TSW Office Building. Additional parking is being considered for an area to the west of the existing parking lots, and traffic will be rerouted around the Project.

4.1.1 Point Street/Wills Wharf Parking Garage Extension

A parking garage will occupy the majority of the Project, with a proposed lowest floor at EL. +14.0. This garage will underlie a portion of the Wills Wharf Office/Hotel building. Entry to the parking garage will be from an opening on Wills Street to the south, where the existing grades will be adjusted to accommodate the transition. A loading dock for the existing TSW Office Building, Point Street Apartments buildings, and the future Wills Wharf Office/Hotel is currently being constructed as part of the Point Street Apartment project and is located at the northeastern portion of the Project. The existing grades along Wills Street will be designed to accommodate vehicle access to the parking garage. The eastern portion of the garage and plaza will abut the TSW Office Building.

4.1.2 Wills Wharf Office/Hotel

The Wills Wharf Office/Hotel building will rise an additional 11 stories from the parking garage (12 stories total), across the site. The footprint of the building will be approximately 31,000 square feet. A retail space will be present at the base of the building facing on the northwest corner.

4.1.3 Roadways

This development includes the extension of Wills Street. Wills Street will descend from the existing Plaza Garage at El. +28 south towards the water

to El. +12, terminating just north of the promenade being constructed as part of the Project.

Wills Street will be constructed with pile supported concrete retaining walls running north-south and east-west. The north-south retaining wall will run for approximately 315 linear feet (lf) to the south (i.e., towards the water). The east-west retaining wall will run approximately the width of Wills Street. The Wills Wharf Office building wall will retain the street fill on the east side of Wills Street. The southern end of Wills Street will terminate with a vehicular turnaround before it approaches the pedestrian promenade and the harbor.

4.1.4 *Plaza/Park Space*

The Project includes the southern extension of the Point Street Plaza, between the Wills Wharf Office building and the TSW Office Building. Built as a series of declining terraces, this area will function as a public park space and a stormwater catchment basin.

4.1.5 *Promenade*

The continuation of the Baltimore Inner Harbor Promenade will proceed through the southern boundary of the Project. Built along the perimeter embankment, the promenade continuation will form a pedestrian-friendly “linear park” that moves from east to west across the Site.

4.2 *SCHEDULE*

The approximate project milestones through this date are listed below:

- Detailed Development Plan (i.e., the DDP) – Submit to agencies: 23 May 2016;
- Approval of the DDP by EPA and MDE: 8 July 2016;
- Commence construction: 15 October 2016;
- Complete construction: 5 June 2018.

5.0 DEVELOPMENT IMPLEMENTATION ACTIVITIES

5.1 SOIL AND DEBRIS DESIGNATIONS FOR THE PROJECT

As noted previously, the Project LOD includes Area 1, Area 2 and certain non-designated areas that do not lie within Areas 1 or 2 but fall within the LOD as shown in DDP Drawing EN 100. For the purposes of this Project, “intrusive activities” occur any time there is disturbance or exposure of the surface immediately below the MMC geosynthetic layers or geomembrane (geosynthetics and geomembrane are used interchangeably herein) inside the HB in Area 1 or the upper geotextile constructed as part of the LSC in Area 2.

Cover soil and aggregate (collectively “cover soil/aggregate”) refers to the clean material excavated from above the geosynthetics inside the HB in Area 1, above the upper geotextile in Area 2, or soil excavated from above a warning layer (e.g., geotextile or visual warning layer such as an orange snow fence) in the non-designated areas. Cover soil includes the cover soil that was placed over the MMC that runs over the HB and into Wills Street.

Unless otherwise specified and approved by the agencies, soil/debris not otherwise designated as clean cover soil/aggregate is referred to as “controlled soil/debris.” For example, controlled soil/debris includes drill cuttings generated by pile drilling and obstruction removal, materials excavated from below the geomembrane in Area 1, and materials excavated from below the upper geotextile in Area 2.

5.2 EARTHWORK

Excavations will be performed with machine and labor methods in a controlled manner to appropriately manage and segregate materials based on (i) the location of the area, and (ii) whether or not the materials result from intrusive activity. The Materials Handling and Management Plan (MHMP) and Stormwater Pollution Prevention Plan (SWPPP) in Attachment A describe the means and methods to be used to manage cover soil/aggregate, controlled soil/debris, and stormwater. Work is to be performed in accordance with a Project-specific health and safety plan

to be prepared by contractors following the Health and Safety Guidance Document, also found in Attachment A.

5.2.1 *Area 1 Excavations*

5.2.1.1 *Excavations for Foundation Piles and Sheet Pile Barrier Wall*

Excavation of the MMC cover soil will be required in all areas where foundations are constructed and piles installed. Excavation of cover soil below the warning layer will be performed with labor assistance (i.e., using a hand shovel to excavate the cover soil) where the synthetic layers are intended to survive construction. The synthetic layers will be protected by using means and methods that will not cause tension stress or tearing during cutting. Repairs will be made by extrusion welding new geomembrane sections.

Below the planned Wills Street retaining walls, the MMC will be removed at pile cap locations. Excavation may include demolition and removal of abandoned foundation and concrete floors (i.e., obstructions left in place below the MMC). For obstruction removal, refer to Section 5.2.4.

The excavations will be performed with a sequence and process designed to minimize stormwater runoff and accumulation in excavations. The excavation sequence and process will also protect against dust generation, and reduce the potential for exposure of workers and clean materials to CrVI impacted soil below the MMC.

The foundation piles will be driven from the top of the capillary break stone. Where the MMC is removed, a new geomembrane will be placed and sealed to the pile penetrations and existing geomembrane. The pile cap construction sequence is shown on drawing DDP-F1.30.

The MMC will also be removed for sheet pile construction in the HB. Where the MMC is removed, the soil bentonite barrier will be reconstructed to be above the new sheet pile barrier, as required by the Field Engineer or field conditions. A closure flap geomembrane will be placed in contact with the soil bentonite barrier as shown in drawing DDP-F1.21. Cover soil will be placed over the closure flap and a geomembrane skirt will connect the rest of the geomembrane to the existing toe drain. A concrete bridge slab will be constructed above the geomembrane skirt.

In accordance with the MHMP, excavated materials from below the geomembrane (i.e., controlled soil/debris) will be direct loaded into lined, sealed trucks or sealed containers for off-site disposal at an approved RCRA facility. Otherwise, sealed containers containing controlled soil/debris will be temporarily stored prior to off-site shipment in the controlled soil/debris area shown in drawing EN 100. Best Management Practices (BMPs) for dust control will also be implemented as described in the MHMP.

5.2.1.2 *Excavations for Roads, Utilities and Other Associated Project Work*

Excavations will be necessary in Area 1 to remove asphalt pavement and cover soils as needed to install the protective and bridge slabs. However, the utilities, manholes and vaults are not intrusive, and will be installed above the protective and/or bridge slabs. Excavations in Area 1 will follow the requirements of Section 5.2.1.1 above.

5.2.2 *Area 2 Excavations*

5.2.2.1 *Excavations for Foundation and Slab*

The majority of the Project is located within Area 2. Excavations in this area will be performed to construct the lowest parking garage level pile caps, the hotel pile caps, and to expose and connect the existing sheet pile wall to the proposed concrete retaining wall directly south of the Wills Wharf building. The majority of these excavations are expected to advance to EL. +8, which is roughly the bottom elevation of the pile caps.

Pile Cap P94 will require the bottoms of the pile cap and associated excavation to be at EL. +4 and EL. +3, respectively. In a localized area (250 square feet or less) at the high performance elevator pit for the building, the elevator sump will require the bottom of the slab to be at EL. +1.5. In this area, the excavation will extend to EL. +0.5, which is the lowest foundation elevation in Area 2 as shown on drawing DDP-F1.42.

Cover soil/aggregate may be placed directly as fill above the geotextile if geotechnically suitable. As described in the MHMP, the cover soil may be placed next to the excavation as a temporary measure until re-used. The temporary stockpile will be covered if it will not be re-used that same day.

Alternatively, the cover soil may be stored in the CSSA to be constructed for the Project or, if available, in the existing CSSA utilized for the Area 1, Phase 1 Project. The location of the CSSA is shown in drawing C.800 and is not underlain by compressible strata. The soils in this area are predominantly sandy fill and sandy or silty soils, which are considered relatively incompressible and have relatively high bearing capacity.

Controlled soil/debris (e.g., capillary stone and soil) excavated from below the upper geotextile in Area 2 will be managed in accordance with the MHMP. This material will be segregated and characterized for disposal. The material will either be direct loaded for off-site disposal, or placed in sealed containers and temporarily stored in the controlled soil/debris area shown in drawing EN 100.

Under certain conditions, and as approved by the Field Engineer, controlled soil/debris from below the upper geotextile in Area 2 may be replaced below the repaired/restored LSC in Area 2 to fill voids left from obstruction removal. The procedure for handling and managing controlled soil/debris will follow that approved by the agencies for the Area 1, Phase 1 DDP (Exelon Project) and is described in the MHMP. Controlled soil/debris generated in Area 2 is not to be reused in Area 1.

After installation of the foundations and utilities, the LSC in Area 2 will be restored in accordance with drawings EN 102 and DDP-F1.12.

5.2.2.2 *Excavations for Roads, Utilities, and Other Associated Project Work*

Excavation will be necessary in Area 2 to remove the existing asphalt pavement, cover soil, and upper geotextile as needed to install utilities, utility manholes, vaults and conduit duct banks. Construction for the gas and sanitary lines are non-intrusive in Area 2. Conversely, construction for electric, telecommunications, water (domestic and fire), utility manholes and vaults (water meter and stormwater) are intrusive.

Excavated cover soil/aggregate may be placed next to the excavation as a temporary measure until re-used. The temporary stockpile will be covered if it will not be re-used that same day. Alternatively, the cover soil may be stored in the CSSA to be constructed for the Project as shown in drawing C 8.00, or in the existing CSSA constructed for the Area 1, Phase 1 Project (Exelon Project).

Controlled soil/debris (e.g., capillary stone and soil) excavated from below the upper geotextile in Area 2 will be managed in accordance with the MHMP. This material may be placed below the upper geotextile to fill voids from the excavation if geotechnically suitable and approved by the Field Engineer. Alternatively, this material will be segregated and characterized for disposal. The material will either be direct loaded for off-site disposal, or placed in sealed containers and temporarily stored in the controlled soil/debris area shown in drawing EN 100.

5.2.3 *Dewatering*

The majority of the excavations for the Project will be above EL. +8 and should not require dewatering. Localized excavation dewatering is expected for Pile Cap P94 at the south elevator bank (typically EL. +0.5 and higher). These activities reflect a short-term construction condition.

The excavation dewatering activities will be of short duration and will require only localized dewatering. During dewatering, the adjacent piezometers will be monitored to verify continual compliance with the head maintenance standard. Dewatering is not expected to be necessary in other areas of the Project, except if significant rainfall collection in excavations occurs that requires removal for construction purposes.

As described in the SWPPP in Attachment B, stormwater runoff will be diverted away from the excavations using diversion berms or similar measures during construction to minimize dewatering quantities. MDE-approved erosion and sediment control procedures will be followed in areas of open excavations as described in Section 7.2.2.

Water generated from dewatering activities will be managed as either “Contact Water” or “Non-Contact Water” as described in the MHMP. Groundwater is managed as Contact Water. Rainfall that contacts controlled soil/debris will be managed as Contact Water.

5.2.4 *Obstruction Removal*

Obstructions, such as remnant concrete floor slabs, footings, asphalt, etc., may be encountered during subgrade construction activities for the Project, although the frequency of encountering obstructions is expected

to be relatively low compared to other portions of the Site. These obstructions will be removed at pile locations, and where they interfere with pile cap geometry. The pile cap construction sequence for Area 1 is shown on drawing DDP-F1.30.

As described in the MHMP, under certain conditions, controlled soil/debris that originates from inside the HB only in Area 1 may be replaced below the repaired/restored geomembrane in Area 1 to fill voids. Similarly, under certain conditions, controlled soil/debris that originates from Area 2 may be replaced below the repaired/restored upper geotextile only in Area 2 to fill voids. Otherwise the material will be properly segregated, and characterized for off-site disposal.

Pre-drilling or pit excavations may be used to proactively evaluate whether obstructions are present in pile driving areas and/or to remove the obstructions. When possible, obstructions that do not interfere with construction will be left in place below the future structures. For pre-drilling, one option used in Area 1 to minimize the excavation areas included a HDPE pipe welded to the membrane and backfilled using cover soil or aggregate. This procedure was successfully used in some locations during Area 1, Phase 1 work and has been previously approved by the agencies for the Area 1, Phase 1 project. This procedure is described in the 15 December 2014 Minor Modification prepared by MRCE and found in Attachment D.

Dynamic hoe-ram or spud driving may be used to demolish obstructions encountered during pile driving. Excavation and removal will be used where necessary and will be performed with a sequence and process organized to protect against dust generation and cross-contamination of the cover soil. For deeper obstructions or obstructions that cannot be removed, the pile will be relocated and the pile cap redesigned as necessary.

Abandoned groundwater wells, if any, exposed during the excavation that present an open annulus (i.e., wells not previously abandoned in place) will be properly abandoned in-place or removed, as required, following Maryland's regulations in COMAR 26.04.04.11 – Abandonment Standards.

5.2.5

Area 1 Fill Placement/Raised Grade

5.2.5.1 *Fill for Road and Settlement Estimate*

Granular material is proposed for use as fill for the Project. This granular fill may consist of re-used cover soil or other imported sources. All fill materials for use are subject to gradation and hardness requirements as described on drawing DDP-F1.01. HMS components (vaults and piezometers) affected by the raised grades will be modified or replaced to ensure access. Imported fill will comply with the requirements specified in the MHMP.

The waterfront perimeter of the Site was constructed in the late 1800's by placing fill over compressible sediment to make land. Compressible soils and timber bulkhead structures are present at the site perimeter, outboard of the historic shoreline. The location of compressible soils is illustrated on drawing DDP-F1.10.

In the vicinity of the south end of Wills Street, surcharge fill was used to pre-load the compressible deposits and the bulkhead structure to reduce settlement of the MMC. The extent and magnitude of preloading are provided on drawing DDP- F1.10. The MMC was placed after the pre-loading; as a result, the synthetic layers and drainage grades should not have undergone differential settlement. The pre-loading allows for some amount of fill placement as part of the Project with little risk of substantial settlement unless the height of fill exceeds the pre-load.

Observations for settlement of remedy features will be performed during construction. Section 7.2.8 describes the procedures for settlement monitoring.

Where differential settlement occurs the synthetic layers will be exposed for inspection, repair, or addition of new synthetic layers in localized areas, as appropriate. A small amount of settlement will be allowed, as long as the geomembrane or HMS conveyance piping is not compromised and positive slope is maintained for drainage within the synthetic drainage layer above the geomembrane. Engineering Evaluation (EE) Memo 1 in Attachment D provides the supporting analysis. See Drawing DDP-F1.03 for settlement monitoring specifications.

5.2.5.2 *Fill Placement for Utilities, Road Construction and Other Associated Project*

Work

Fill consisting of cover soil (if geotechnically suitable) or imported clean material in accordance with the MHMP will be placed to raise grades. Fill will be placed in controlled, compacted lifts and compacted to 92% of the maximum dry density as determined by the Modified Proctor Test. In accordance with Baltimore City requirements, the top 12 inches of pavement subgrade shall be compacted to 97% of the maximum dry density as determined by the Modified Proctor Test.

5.2.6 *Area 2 Fill Placement/Raised Grade*

5.2.6.1 *Fill Placement for Courtyard and Settlement Estimate*

The building structures and ground floor slabs of the Project building and garage/plaza will be pile supported so that future settlement is mitigated. Fill consisting of cover soil (if geotechnically suitable) or imported clean material will be placed to raise grades in the Plaza area between the proposed Wills Wharf building and the existing TSW Office Building and below the Wills Wharf building to meet the underside of the slab at EL. +13. This area of the Project does not contain HMS or ERS components that could be affected by settlement.

The fill will be placed in controlled, compacted lifts and compacted to 92% of the maximum dry density as determined by the Modified Proctor Test. In accordance with Baltimore City requirements, the top 12 inches of pavement subgrade shall be compacted to 97% of the maximum dry density as determined by the Modified Proctor Test.

At the northern end of the Plaza, the proposed fill will reach EL. +22.5 (approximately 7.5 feet of fill). Soil borings from prior work on the Site indicate that this area is underlain by medium dense to very dense granular strata and a hard silt layer, and does not include significantly compressible strata. This area will be pile supported to reduce differential settlement.

In the central portion of the Plaza, the proposed fill will reach EL. +18 (about 8 feet of fill). The area is underlain by compressible organic silt and clay. Estimated settlement is expected to be about 6 to 12 inches. Settlement of this magnitude is detrimental to the performance of retaining walls, utilities, and other surface features. A pile supported

platform will be constructed at existing grade. See drawing DDP-F1.44 for the extent of the platform and number of piles.

At the Promenade south of the building and Plaza, the proposed fill will reach EL. +13 (about 3 feet of fill). The Project area is underlain by compressible organic silt and clay. A sheet pile retaining wall is located along the south side of the promenade. The sheet pile is a portion of the ERS and its integrity is a requirement of Exhibit C of the Environmental Agreement. Load from fill placement is detrimental to performance of the sheet pile wall as shown by EE Memo 3 in Attachment D. The evaluation shows that the additional fill load would exceed the capacity of the existing BZ 26 sheet pile. Therefore, a pile supported platform and concrete retaining wall will be constructed at existing grade. See drawing DDP-F1.44 for the extent of the platform, number of piles and retaining wall details. Prior to construction of platform and concrete retaining wall, the existing steel sheet pile will need to be repaired where it is corroded. See drawing DDP-F1.53 Piles will be driven through the existing soil cap from ground surface.

Cover soil found to be geotechnically suitable or other imported clean material are planned to be used as fill beneath the building, in the Plaza, in the Promenade, and in Wills Street. The general cut/fill sequence will be as follows:

1. Pavement cuts (i.e., asphalt and/or concrete) will be transported off-site for appropriate disposal or recycling;
2. Geotextile will be placed on the resulting soil surface at existing grade outside the building footprint to the limits of Area 2;
3. Cover soil from soil cuts above the upper geotextile above the capillary break for the rough building grade may be re-used as fill where needed, such as for the Wills Street roadway and the At-Grade Plaza, in accordance with the MHMP;
4. Cover soil from soil cuts above the upper geotextile above the capillary break for the pile caps may be re-used as fill where needed, such as for the Wills Street roadway, the At-Grade Plaza or as backfill around pile caps, in accordance with the MHMP;
5. Cover soil from soil cuts above the upper geotextile above the

capillary break for the utilities beneath Wills Street may be re-used as fill where needed, such as utility backfill and for the Wills Street roadway, in accordance with the MHMP;

6. Where utility cuts penetrate the upper geotextile, a new geotextile will be placed on the sides and bottom of the utility trench to re-establish the clean soil cap and clean utility corridor (see drawing EN 102 for typical details). Controlled soil/debris generated from below the upper geotextile will be managed in accordance with the MHMP.

The re-use and management of cover soil/aggregate is described in the MHMP. Specifications regarding the re-use of these materials and the placement procedures (e.g., moisture content, gradation, lift thicknesses, compaction, etc.) will be assessed by the Field Engineer. Prior to re-use as structural fill, materials generated from on-site excavations will be sorted to remove deleterious materials, such as organics, wood, etc. Unsuitable materials will be segregated and disposed off-site. Fill subgrades will be proof-rolled to identify any loose, soft, wet, or otherwise unsuitable subgrade. Any surficial materials identified as unstable or unsuitable will be undercut to a stable stratum as recommended in the field by the geotechnical engineer and backfill with controlled, compacted fill.

5.2.6.2 *Fill Placement for Utilities and Other Associated Project Work*

Fill consisting of cover soil (if geotechnically suitable) or imported clean material in accordance with the MHMP will be placed to raise grades along Wills Street. Fill will be placed in controlled, compacted lifts and compacted to 92% of the maximum dry density as determined by the Modified Proctor Test. In accordance with Baltimore City requirements, the top 12 inches of pavement subgrade shall be compacted to 97% of the maximum dry density as determined by the Modified Proctor Test.

5.3 **FOUNDATIONS**

Foundations in Area 2 for this Project are similar to those installed beneath the adjacent TSW Office Building with addition of the pile supported fill for the At-Grade Plaza. Specifically, the foundations will be constructed utilizing methods that re-establish the Area 2 LSC.

The Project requires pile supports beneath building columns shear walls and earth fill. Pile driving will not be performed within 30 feet of the HB except in areas where the HB has been augmented with sheet piles (inboard of the HB centerline). When driving piles within 50 feet of the HB, vibration monitoring will be performed pursuant to Section 7.2.6.

Driven, closed-end (conical tip) concrete filled steel pipe piles are planned for the majority of the Project. On the eastern perimeter of the Project, the close proximity of the TSW Building will require the use of micro-piles for the Project. Piles will be placed in groups for concrete pile caps and shear wall foundations.

The bottom EL. of the pile caps supporting building columns will be at roughly EL. +8. The bottom elevation of the pile caps supporting shear walls will vary to accommodate elevator pit depth requirements. Typical bottom of pile cap elevations at the shear walls will be at roughly EL. +4. The bottom elevation for the platform will be at existing grade varying from EL. 9 to EL. +6 at the Sheet Pile Bulkhead.

The typical bottom of pile cap elevations below the elevator sump will be at roughly EL. +1.5 (with construction activities extending approximately 12 inches deeper, to EL. +0.5). These deeper elevations are below the historical high water table (measured by Honeywell east of Area 1 and south of Point Street as EL. +3). The pile cap labeled "P94" on the foundation plan will be waterproofed on all sides, with waterproofing extending up the concrete shear walls surrounding the elevator pit to EL. +12.0.

5.3.1 *PDA Tests*

PDA testing will be performed on selected piles installed in both Area 1 and Area 2. The scope will be completed at a later date.

5.3.2 *Pile Selection*

Two types of piles shall be installed to support the proposed building and parking structure, as follows.

Driven Foundation Piles

The majority of the piles shall be driven piles and will be 14-inch OD closed end, ½-inch thick wall steel pipe (ASTM A52, Grade 3, 45 ksi yield strength) with conical tips. Conical tips will be cast steel (ASTM A27 65/35). Conical tips and pipe splices will be seal welded. The driven foundation piles shall be driven installed from existing grade, and cut off after local excavation for pile cap construction. The driven foundation piles will be filled with 4,000 pounds per square inch (psi) structural concrete after they are cut to the design elevation. The concrete fill enhances the structural pile capacity, and will prevent vertical movement of groundwater inside the pipe shell.

Fixed head pipe piles will be connected to the pile cap with a greater pipe embedment as compared to a free head pipe pile or with a steel reinforcing cage to provide rotational restraint. If fresh concrete settles after placement, the depression at the top of the pile will be filled with grout to obtain load bearing over the full pile area. In the unlikely event that a pile would need to be extracted due to obstruction, alternatives to extracting the pile will be evaluated, such as cutting off the pile and redesigning the pile cap, as needed. If, as a last resort, a pile must be extracted, then the extraction process will follow that specified in the MHMP for sheet pile and foundation piles. The closed-end conical tips will provide pile bearing at higher elevations, and will reduce the downward transport of material by pile penetration, when compared to open end pipes or flat plate tips. The driven piles will displace ground surrounding the pile shaft, which will remold the soils and increase horizontal ground pressure adjacent to the shaft. The increased horizontal ground pressure will improve the pile capacity due to shaft friction. The combined remolding and increased ground pressure at the pile shaft will reduce the ability of water to move along the pile shaft. Refer to previous documentation prepared by MRCE for the TSW Office Building, which cites the published study Pile Type for Contaminated Site (Boutwell, et al, 2004), for additional information.

Piles shall be driven from existing grade, with only local removal of surface materials in Area 2 (pavement and subgrade, as needed, but not the upper geotextile above the capillary break) to facilitate pile installation. See Section 6.2 for Soil Cap protection and restoration. Piles will generally be driven without pre-drilling. Surface water will be diverted away from driven piles using soil berms. For Area 1 pile caps see Drawing DDP-F1.30 for Pile Cap Construction Sequence and Section 6.1 of this DDP for protection of MMC during construction and restoration.

The closest pile proposed to be driven near the HB is at a distance of 9 feet. The closest pile proposed to be driven near an inside piezometer is at a distance of 32 feet. Considering this distance and relatively sandy nature of the upper soils, the pile driving activity is not expected to impact the water level adjacent to the HB and should not result in increased dewatering by the HMS.

Drilled piles

Drilled piles will be installed along the northeastern end of the building where the proposed building/parking garage abuts the existing TSW Office Building, where pile driving vibration could potentially cause damage to the existing building. The drilled piles will occur in Area 2 and a non-designated area as shown on drawing DDP-F1.40. The drilled pile design is in progress.

Drilled piles require drilling with wash-rotary methods. Drill fluid and spoils generated as part of drilled piles will be managed in accordance with the MHMP.

5.3.3

Pile Caps

Column pile caps will be constructed of cast-in-place concrete and will vary in thickness from three feet six inches to five feet six inches. Shear wall foundations are large size pile caps with an increased moment, shear and vertical load capacity designed for wind and seismic load resistance. Pile caps will be formed, and will contain reinforcing steel for cap performance, and include floor slab and column connections. The bottom of the majority of the pile caps will be at roughly EL. +8.

At the elevator sump pit included on the pile cap at column location B/C-10 in the Wills Wharf building, the bottom of the slab will be roughly at EL. +1.5, which is below the historical high water table at EL. +3.0. At this location, the pile cap will be protected with a waterproof membrane as a contingency barrier to prevent exposure to CrVI-impacted water. During construction, water that collects in pile cap excavations (either groundwater seepage or stormwater) will be collected and managed in accordance with the MHMP.

AASHTO No. 57 stone will be placed on geotextile fabric in contact with the steel pile shafts and below the pile caps. The pile cap excavations will be backfilled with clean material below the structure design elevation.

5.3.4 *Structural Ground Floor Slabs*

The ground floor slab shall be a nominal 12-inch thick reinforced concrete structural framed slab supported on concrete pile caps and grade beams. The floor slab shall be mechanically connected to the pile caps, providing stiffness to the foundation system for lateral load distribution. Cover soil, if geotechnically suitable, will be re-used below the Wills Wharf building and garage structures for raising grades (where required). At a minimum, the final cap profile throughout the proposed structures will be comprised of a 12-inch thick ground floor slab a vapor barrier below the slab and 6 inches of sub-base material. In areas of the pile caps and grade beams, the final cap thickness will be greater.

Perimeter foundation drain piping will be installed outside the Wills Wharf building. The piping will convey water to the stormwater management system for the building. A trench drain will be constructed at the loading dock and direct water to the stormwater management system.

5.3.5 *Pile Supported Platform*

A pile supported concrete platform is proposed to be constructed between the existing TSW Office Building and the Proposed Wills Wharf Building/Garage and extend south to the existing sheet pile bulkhead. This platform will support fill for the At-grade Plaza and Promenade areas. The platform shall be a nominal 18-inch thick reinforced concrete structural slab supported on 14-inch concrete filled pipe piles. Piles will be spaced on average 15 feet on center and will require a 6-inch embedment into the concrete slab. All piles within 30 feet of the existing TSW will be drilled. See drawing DDP-F1.44 for drilled pile locations in pile supported platform. At a minimum, the final cap profile throughout the proposed plaza will be comprised of an 18-inch thick platform and 6 inches of sub-base material.

5.3.6 *Retaining Wall and Footings*

A pile supported concrete retaining wall at the south end of the Exelon Plaza Garage in Wills Street will be constructed running east west to retain the fill to raise grades up to the plaza level in Area 1 at EL. +28. The retaining wall will be constructed similar to the retaining wall at the north side of the Exelon Plaza in Wills Street with 14-inch pipe piles similar to the ones used for the Wills Wharf building. Utility penetrations through the retaining wall are shown on drawing DDP-F1.52.

The Will Street fill (cover soil or imported clean material) will be supported by a concrete retaining wall to the west and the Wills Wharf building foundation wall to the east. The concrete retaining wall on Area 1 will be pile supported for approximately 315 feet south of the Plaza Garage due to the bearing restriction of 2,000 pounds per square foot (psf) and proximity to future structures. The piles will be 14 inch pipe piles. All pile cap penetrations will be open at some point during construction at the same time. This is an approximate total area of 600 square feet. The barrier sheet pile penetration may be open at the same time and has an approximate total area of 2400 square feet. See Drawing DDP-F1.30 for storm water diversion berms and sump pumping in excavations. Drainage flow will be interrupted at the pile caps but is designed to flow around these areas towards the east and south toe drains. The slope of the membrane will not be influenced by the construction. The south retaining wall at the promenade will be a concrete retaining wall supported on a concrete footing (see drawing DDP-F1.43).

The “At Grade Plaza” proposed grade at EL. +22.5 (approximately 12.5 feet above existing grade in the northeastern corner) will be retained by the Wills Wharf building foundation wall to the west and north. A concrete retaining wall supported on spread footings will retain the soil to the east approximately 10 feet from the existing TSW Office Building.

The Promenade proposed grade will be at approximately EL. +13. A concrete retaining wall constructed on spread footings will support the fill above the west embankment. The east Promenade at the existing sheet pile bulkhead a concrete retaining wall and pile supported platform will support proposed grades. The existing sheet pile has been evaluated for the additional fill and 600 psf vertical construction surcharge as detailed in EE Memo 3 in Attachment D (see drawing DDP-F1.44).

5.3.7

Structural Modification to Vaults 3 and 4

Vaults 3 and 4 were evaluated for the additional fill proposed to raise Wills Street (see EE Memo 2 in Attachment D). Existing Vault 3 cannot support the additional load due to the proposed fill and requires modification. A structural slab will be constructed above the top of existing Vault 3 to support and spread the proposed fill load and shield the existing vault. The slab will arch over the vault and bear on soil away from the vault on all sides. To reduce loading on the drainage net to below the 2000psf allowable bearing pressure, lightweight fill will be placed above the slab and on a 1.5H:1V slope on all sides to 2feet below proposed ground surface. See drawing DDP-F1.40 for lightweight fill extent. Extruded polystyrene (styrofoam) will be placed below the proposed slab to direct load on either side. This slab will behave similar to the Bridge Slab. See drawing DDP-F1.54 for slab section and detail.

Manway extension will be required at both Vaults 3 and 4. This construction does not require any work below the geomembrane. (See drawing DDP-F1.54). Vault 4 is structurally capable to handle the additional load and needs only a manway extension to proposed grade.

5.3.8 *Bridge Slab and Protective Slab*

The anticipated everyday users of the Project are vehicles as large as WB-60 delivery trucks down to passenger vehicles. Although the loads imposed by everyday vehicles are not a concern, extraordinary loading, such as from construction vehicles (HL-93) is an important consideration for the roadway construction.

Record drawings indicate that portions of Wills Street already have concrete bridge slabs constructed over the hydraulic barrier. These slabs will be demolished during construction and then reconstructed as shown in plan on drawing DDP-F1.20 and in detail on drawing DDP-F1.52. Extensions to the existing protective slab are required in select areas shown in drawing DDP-F1.20 to provide further stress relief and protection during utility excavation and maintenance for the MMC, the hydraulic barrier, and the HMS system.

5.4 *UTILITIES*

5.4.1 *Site Utilities (General)*

The site utility systems include storm drains, sanitary sewer, domestic water, natural gas, electricity, and telecommunications. Their alignments will follow the proposed roadway network, connecting the planned Wills Wharf building/ garage to the public infrastructure in Wills Street, and/or discharging to the harbor (i.e., the Northwest Branch of the Patapsco River). Drawings C4.00 through C5.00 show the planned utility network connecting the planned utilities between the Project and the existing utilities adjacent to the Project.

The planned utilities will be installed above geomembrane, the HB, and the HMS. Most of the utility installation work will occur in the filled portion of the public right-of-way for Wills Street. The bottom of the utility vaults for water and electrical manholes will be installed into the existing cover soil on the MMC but not below the geomembrane. Utility penetrations through the concrete retaining wall are shown on drawing DDP-F1.52.

Disturbance to Area 2 is planned involving an underground stormwater management structure and utility connections to the Wills Wharf building. These utilities will be installed beneath the proposed garage slab and beneath the upper geotextile above Area 2. The utility paths will be over-excavated and the Area 2 LSC will be reconstructed with a clean utility corridor using the details shown on Drawing EN 102. Materials encountered while excavating for utilities will be handled in accordance with the MHMP.

5.4.2 *Sanitary Sewer*

The proposed 12-inch sanitary sewer will be connected to the existing sanitary sewer main located inside the Exelon Garage, above the garage slab, and will be extended to the south beneath Wills Street to the Wills Wharf building. The sanitary sewer main will be installed in the proposed roadway fill for Wills Street above Area 1 and Area 2.

The proposed sanitary sewer main and proposed manhole structure will not extend into the existing cover soil in Area 2. The 12-inch sanitary sewer will not extend below the upper geotextile above the capillary break in Area 2.

5.4.3 *Stormwater*

Stormwater runoff from Wills Street will be collected in proposed catch basins and conveyed by the proposed storm drainage system along Wills Street. The storm drain system will extend south to outfall into the Northwest Branch of the Patapsco River. The storm drain system will be installed in the proposed roadway fill for Wills Street and above the geomembrane.

Stormwater runoff from the proposed Wills Wharf building and Plaza will be collected in area drains and will be conveyed to a proposed storm filter vault (SF#1) located beneath the proposed garage as shown on drawing C6.00. A proposed storm drain pipe will then convey the filtered stormwater from SF#1 to the existing storm drain system constructed as part of the Point Street project.

Both the proposed Stormwater Management Vault and storm drain system will be installed in Area 2. These features will be installed below the upper geotextile above the capillary break. New geotextile and capillary break will be installed beneath the vault and storm drain system. The storm drain corridor will be over-excavated and constructed as a clean utility corridor using the profile shown on drawing EN 102.

A green roof system will be constructed on the Wills Wharf building rooftop level. The filtered stormwater will be conveyed to the proposed storm drain system located downstream of SF#1.

5.4.4 *Domestic and Fire Water*

The proposed 12-inch water main will be connected to the existing water main located inside the Exelon Garage, above the garage slab and will be extended to the south along Wills Street to the Wills Wharf building. The water main will be installed in the proposed roadway fill above grade at Area 1. The water main and fire hydrant will not extend below the membrane.

This 12-inch main will provide a 6-inch Domestic Service and two 8-inch Fire Service connections for the Wills Wharf building. The water main connections and meter vaults will be installed above the geomembrane and toe drain in Area 1.

In Area 2, the connections and vaults will be below the upper geotextile of Area 2 as they approach the building. The water connections pathways

will be over-excavated and constructed as a clean utility corridor using the profile shown on drawings C5.00 and EN 102.

5.4.5 *Natural Gas*

A proposed 6-inch natural gas main will be extended from the plaza level above the Exelon Garage to the south along Wills Street to serve the Wills Wharf building. The gas main will be installed in the proposed roadway fill above the MMC. In Area 2, the natural gas line will not extend below the upper geotextile.

5.4.6 *Electric and Telecommunication Conduits*

A proposed duct bank will be extended from the plaza level above the Exelon Garage to the south along Wills Street to serve the Wills Wharf building and future Parcel 3 Building (not part of this DDP). Electric and telecommunications cables will be located within the duct bank. One BGE pad-mounted transformers will be installed on the east side of Wills Street inside the proposed building. The duct banks and manhole will be installed in the proposed roadway fill above the MMC. The proposed duct bank and manhole will not extend below the geomembrane.

5.5 *DIESEL FUEL STORAGE DURING CONSTRUCTION*

Fuel storage for construction equipment will be performed in accordance with regulations for containment and management. Construction equipment will be re-fueled within secondary containment as described in the Spill Prevention and Response Plan (SPRP) prepared as a project control document to this DDP (Attachment B).

5.6 *ROADS AND STREETS*

The proposed Wills Street will connect to the existing Wills Street located on the Exelon Plaza to the north. Wills Street will be constructed as an earthen ramp descending from the Exelon Plaza Garage at EL. +28 and extending to the south to the EL. +12.0 at its terminus. The Wills Street

ramp will be supported by proposed retaining walls to the north and west and by the foundation of the Wills Wharf building to the east.

Wills Street will be 2-lane, 2-way dead end roadway and will include a vehicular turnaround at the southern end. Parking will be provided via parallel parking spaces at street level and in the proposed Wills Wharf Garage. The anticipated everyday users of the Site are vehicles as large as HS-20 delivery trucks down to passenger vehicles.

Wills Street will be a City street which includes sidewalks, street trees and street lights. Refer to drawing C3.00 for profiles and sections.

6.0 ***DESIGN MEASURES TO PROTECT THE ERS***

Within the footprint of the ERS, the Project will restore the following ERS components that are disturbed:

1. Area 1
 - a. Multimedia Cap (MMC) in Area 1;
 - b. Perimeter Toe Drain;
 - c. Hydraulic Barrier (HB);
 - d. Head Maintenance System (HMS).
2. Area 2 - Layered Soil Cap.

Section 6 describes that design measures that will be implemented to protect and/or restore the affected ERS components.

As described previously, the Project also includes certain non-designated areas that do not lie within Area 1 or Area 2. These areas are not part of the ERS but design measures that address the restoration of these areas are also described in this section of the DDP.

6.1 ***AREA 1 MMC (PROTECTION, RESTORATION AND OTHER ASSOCIATED WORK)***

6.1.1 ***Excavation Protection***

The MMC was designed to protect against stormwater infiltration, and human exposure to the underlying materials. In the planned developed Site in Area 1, overlying roadways and storm drains will remove much of the stormwater load from the Area 1 cap. Overlying hard structures and management control provided by development will protect against human exposure and errant excavation.

Where the MMC is removed for construction, a new geomembrane will be placed and sealed to the pile penetrations and existing geomembrane (See drawing DDP-F1.30. Where the MMC is removed for sheet pile construction, a new geomembrane will be placed below a concrete bridge slab and sealed to the existing geomembrane. (See drawing DDP-F1.21)

Excavation of the cover soil will be required in all areas where foundations are constructed. See Section 5.2.1.1 for excavation in Area 1.

Excavation of cover soil below the warning layer will be performed with labor assistance where the synthetic layers are intended to survive construction. The synthetic layers will be protected by cutting without tension stress or tearing. Repairs will be made by extrusion welding new geomembrane sections.

6.1.2 *MMC Restoration*

Pile penetrations will be sealed using a geomembrane “skirt” that will be extrusion welded to the MMC geomembrane layer, and sealed using a mechanical boot to the pile. The purpose of the skirt is to allow oversized openings in the geomembrane necessary for geomembrane replacement or resulting from construction disturbance. The boot seal and skirt welds for each pile penetration placed will be tested using the vacuum box method. Materials and Quality Control/Quality Assurance requirements are provided on drawing DDP-F1.01.

A complete MMC, equal to or thicker than the MMC design section, will be provided. Where possible, the existing MMC will be protected and used for the development cap. Connections at pile penetrations and the perimeter of pile caps will only be made to the geomembrane layer.

The geomembrane will be protected against mechanical damage by providing adequate soil cover. The geomembrane will also be protected by cushion geotextiles for abrasion control, mud mat for structural and puncture control, geofoam under the bridge slab, or additional geomembrane thickness. Where street Right Of Way are located on fill above the MMC, a protective concrete slab will be placed above the drainage layer to protect the MMC synthetic layers against potential damage caused by excavation for installation or maintenance of utilities (see drawing DDP F1.20).

As part of MMC restoration, cover soil may be placed directly as fill above the geomembrane if geotechnically suitable. As described in the MHMP, the cover soil may be placed next to the excavation as a temporary measure until re-used. The temporary stockpile will be covered if it will not be re-used that same day. Alternatively, the cover soil may be stored in the CSSA to be constructed for the Project as shown in drawing C8.00,

or in the existing CSSA constructed for the Area 1, Phase 1 Project (Exelon Project).

6.1.3 *Protection from Construction Equipment*

Construction equipment, including dozers, excavators, trucks, cranes, etc., will be traversing the Area 1 cap throughout construction activities. Equipment loads will be controlled through contractor submittals regarding equipment to be used by the Contract and by the Field Engineer so that after the load is spread through the soil cover, a maximum bearing stress of 2,000 psf will be applied to the drainage net. Observations during the Area 1, Phase 1 (Exelon Project) indicated that the general existing condition is 30 inches of cover soil. Computations indicate the existing soil cover will spread loads from an HL-93 truck load (rated truck for Baltimore City Streets) where the existing cover soil is at least 30 inches. In the event that the cover soil thickness is less than 30 inches, mats and additional fill consisting of cover soil or other suitable material will be placed to distribute the construction loads to meet the 2,000 psf restriction. In some areas, asphalt will be placed to reduce rutting to prevent thinning of the existing soil cover and control dust.

The MHMP specifies the handling and management of soil, including cover soil/aggregate and controlled soil/debris. Cover soil/aggregate may be temporarily stockpiled at the point of generation as described previously, or stockpiled in the CSSA shown in drawing C8.00 or the existing CSSA at the Area 1, Phase 1 Project (Exelon Project).

6.2 *AREA 2 LAYERED SOIL CAP (PROTECTION, RESTORATION AND OTHER ASSOCIATED WORK)*

As discussed in Section 3.2, the Area 2 LSC components from bottom to top are a 16 oz. non-woven geotextile, a 6-inch capillary break layer, a 16 oz. non-woven geotextile, a 6-inch crushed stone sub-base, and a 4-inch asphalt surface. Drawing EN 102 shows the LSC detail.

The existing materials above the top geotextile layer of Area 2 will be replaced with a hard surface of equal or greater thickness than currently exists. The surface will consist of stone subbase, pavement or concrete slab.

For the Project, overlying building structures, roadways, and parking lots will serve as an additional protection against exposure to the underlying soil. Where the Area 2 geotextiles (i.e., above and below the capillary break) and capillary break are penetrated for foundation or any construction, the LSC will be restored by installing new geotextiles and full thickness of capillary break beneath the concrete foundations. Restoration of Area 2 for various types of penetration is shown on drawing EN 102.

6.3 *HYDRAULIC BARRIER (PROTECTION, RESTORATION AND OTHER ASSOCIATED WORK)*

To reduce vibration-related densification settlement of the soil bentonite (S-B) backfill that comprises the HB, Honeywell requires monitoring and construction controls to curtail vibrations above 2 inches/second at the ground surface above the barrier. These same requirements prohibit installation of driven piles within 30 feet of the barrier. Other requirements include the measurement of ground surface above the barrier before and after pile driving to assess possible settlement occurrence.

The project design places piles closer than 30 feet to the HB, and requires construction of permanent structures above the HB alignment. Honeywell requires access to allow repair of the HB in the event pumping quantities increase with time. This design implements a preemptive repair to permit construction over the barrier and driving piles within 30 feet of the HB alignment. The preemptive repair designed for the Project consists of driving steel sheet pile to augment the barrier. The alignment proposed for sheet pile placement is indicated in drawing DDP-F1.20. The details and sections for sheet pile wall installation are provided on drawings DDP-F1.21 and DDP-F1.22.

Steel sheet pile is well protected against corrosion in the hydraulic barrier backfill which typically has a pH between 8 and 10. In addition, burial in the barrier below the water table should prevent oxygen to access the steel. A corrosion rate of 0.05 millimeters per year (mm/yr.) is anticipated (Eurocode 3), which computes to complete corrosion loss of section in 170 years for standard carbon steel.

Sheet pile joints will be sealed using a hydrophilic expansive rubber water stop. It is possible that sheet pairs will be shop welded to simplify installation and reduce the number of joints sealed on placement. Materials and Quality Control/Quality Assurance requirements are provided on drawing DDP-F1.02.

The HB wall condition may require raising in accordance with the approved Area 1, Phase 1 Project MM dated March 20, 2015 in select locations. The backfill will be tested in accordance with the standard operating procedures (SOP) in drawing DDP-F1.01. See drawing DDP-F1.21 for construction sequence.

6.4 **HEAD MAINTENANCE SYSTEM**

To avoid disruption to the HMS system during construction, and to maintain continuous operation and access to all HMS components post-construction, modifications have been designed for certain components of the HMS system including vaults, piezometers, junction boxes and conveyance piping and electrical conduits. The components to be disrupted during the Project are related to the raising of Wills Street are: vaults V3, V4; piezometers IP3, ISP3, OP3, OSP3, IP4, ISP4, OP4, and OSP4; junction boxes JB3 and JB4; manhole junction MJ-2; settlement plate MP-11 and drainage sampling point SSMP-1.

The components locations are shown on drawing EN 101 and summarized in the table below. Details for modification of these HMS components, except Vaults V3 and V4 modification are shown on drawing EN 103. Modification details for Vaults V3 and V4 structures, including the riser extensions for both vaults, are shown on drawing F1.54. Internal modifications of Vaults V3 and V4, such as ladder extension, are shown on drawing EN 104. Other than the HMS modifications listed below, no other permanent modification to the HMS and Transfer Station operation is anticipated as part of the Project.

HMS Component	Conflict	Resolution
Vault V3	Elevation Adjustment.	Provide structural support on walls and roof of the Vault.

		Extend access riser to new pavement elevation, and install lockable frame/cover.
Vault V4	Elevation Adjustment.	Extend access riser to new pavement elevation, and install lockable frame/cover.
Piezometer Set - IP3 and ISP3; OP3 and OPS3	Elevation Adjustment.	Extend PZ height, adjust conduits and cables. Gasket bolt sealed lids (lockable), and waterproof all extensions.
Piezometer Set - IP4 and ISP4; OP4 and OPS4	Elevation Adjustment.	Extend PZ height, adjust conduits and cables. Gasket bolt sealed lids (lockable), and waterproof all extensions.
Junction Boxes JB3 and JB4	Elevation Adjustment.	Replace boxes with lockable lids, adjust cable and conduits.
Manhole Junction MJ-2	Elevation Adjustment.	Extend access riser to new pavement EL. Install lockable frame/cover.
Settlement Plates MP-11, LSC-MP-1, LSC-MP2 and LSC-MP-4	Relocation and Elevation Adjustment.	Relocate LSC-MP4. Extend the height of the access pipes to the new pavement elevation for MP-11, LSC-MP1, and LSC-MP-2. Install lockable frame/cover.

Drainage Sampling Point SSMP-1	Elevation Adjustment.	Extend the height of the access pipe to the new pavement elevation.
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The piezometers and vaults will be operated continuously to the extent possible during construction. It is anticipated that power and controls will be severed when making the necessary height and other adjustments to the piezometer wells as shown on drawing EN 103. The downtime will be coordinated with Honeywell. Further, the downtime will be localized. For example, only the specific set of piezometers that are being modified (and the corresponding remedial system components such as associated extraction wells) will be nonoperational, while the remaining HMS system will be operational. As such, the piezometers height adjustment will not have a significant impact on the overall HMS operation.

As a backup contingency in the event that a severed communication line between piezometers takes more than one day (24 hours) to repair, a temporary wireless I/O (receiver/transmitter/transceiver) will be installed as necessary to maintain communication for data logging or controls between piezometers set. Both transmitter and receiver will be DC powered and fitted with appropriate antennas for communications.

6.5 *NON-DESIGNATED AREAS*

The non-designated areas within the Project LOD are shown in drawing EN 100. Engineering controls (e.g, geotextile, visual warning layer or capillary break) encountered during construction will be replaced in kind as part of restoration.

7.0 *ENGINEERING, CONSTRUCTION, AND ENVIRONMENTAL CONTROLS*

7.1 *CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)*

The contract drawings and specifications identify work items that require Contractor Quality Control (QC) and Developer Quality Assurance (QA). The Contractor will use relevant sections of the QA/QC Work Plan that was previously prepared for the Area 1, Phase 1 Project (Exelon Project), which identifies the means and methods to protect the ERS. The QA/QC activities will include inspections, testing, monitoring, and reporting. The Contractor's QC and the Developer's CQA teams will be comprised of the positions listed below.

Contractor's QC Team

- Contractor's Project Manager: The Contractor's Project Manager is responsible for overall implementation and management of QC activities.
- Contractor's QC Manager (QC Manager): The QC Manager will report to the Contractor's Project Manager. The QC manager will perform and/or oversee all QC activities; coordinate QC activities with the Developer, and maintain copies of all QC records and test results. The QC Manager should not have any other duties other than QC.
- CQC Laboratory: The laboratory is an entity independent of the owner, developer and contractor, which will be responsible for conducting tests on materials, e.g., geosynthetics, to document conformance with the contract plans and specifications. The laboratory will be retained by the Contractor, and be located either on or off Site.

Developer's QA Team

- Developer's QA Manager: The Developer's QA Manager is responsible for overall implementation and management of QA activities.

- Developer's Field QA Inspectors (QA Inspectors): QA Inspectors will report to the Developer's QA Manager and will inspect major construction activities for conformance with the Contract Plans and Specifications. The QA Inspectors will perform the following:
 - Visually observe imported materials for conformance with the specifications;
 - Observe CQC sampling;
 - Observe work performed on ERS components;
 - Observe CQC testing;
 - Record observations; and
 - Prepare weekly reports.

The Developer will provide resident QA field staff to manage, inspect and monitor construction on a daily basis throughout work that is conducted at or below ground surface *and* that potentially affects the ERS. Specific QA activities are summarized below:

- Inspect the work to confirm that construction complies with the Contract Documents and Specifications. Primary work elements that will be inspected include but are not limited to the following:
 - Exposure, removal or repair of any component of the ERS affected by the Project;
 - Installation of infrastructure that may affect the ERS, e.g., utilities and roadways affecting vaults V3 and V4;
 - Modifying elements of the HMS including the piezometers associated with the shallow and deep extraction wells at vaults V3 and V4;
 - Sheet pile installation through the existing HB;
 - Construction of the retaining wall for Wills Street, which will include piles;

- Other construction activities that directly affect the ERS.
- Prepare and archive daily construction reports to document the work, including photographs;
- Attend progress meetings;
- Review construction submittals to confirm compliance with the design;
- Collect and coordinate QA sampling and testing;
- Review QA/QC test results, including soil compaction, geosynthetic materials testing, geomembrane weld testing, concrete testing, and testing of other construction materials and completed portions of the project;
- Document materials management activities and adherence to the Materials Handling and Management Plan (MHMP), which is discussed further in Section 7.2.5. These activities include verifying waste management procedures, confirming that hazardous, non-hazardous, and clean materials are managed separately and profiled appropriately, documenting the quantity of waste materials (i.e., water and soil) removed from the Site and clean materials imported to the Site;
- Verify conformance with the project control plans, such as the Air Monitoring and Material Handling and Management Plans; and
- Confirm that vibration and settlement monitoring is being performed appropriately during construction activities.

In addition to the Contractor and Developer's QA/QC responsibilities, Honeywell or its designee will independently inspect the work, coordinate with the Developer's QA staff regarding construction activities and QA/QC results, and document the activities. Honeywell will communicate with the Developer's QA staff and document any deficiencies, potential changes, and corrective actions required to meet the performance function of the ERS and the intent of this DDP. Honeywell may review any submittals, test results, changes, or other engineering or QA/QC documentation issued for the project.

Honeywell, or its designee, has the right to review and comment on Contractor's Work Plans, inspect the work, conduct inspections with EPA and MDE, submit required reports to the Agencies, and participate in progress meetings with the Agencies during construction. Honeywell, or its designee, will also have the right to issue a Stop Work notification for work that may significantly impact the ERS in a manner that is not consistent with this DDP. A Stop Work notification may be issued immediately upon learning of the potential for any significant impact to the ERS. MDE's Field Representative will be notified by the Developer's QA Manager or designee at the time a Stop Work notification is issued to contractors in the field. MDE's Field Representative will then contact and relay the information to EPA's and MDE's Project Coordinators as deemed appropriate by the agency's field representative. The Stop Work procedures will include the following:

- *Stop Work Notification* - Written notification to stop work with a description of the issue and requirements (requirements may include time frames and/or actions associated with mitigating further impacts on the ERS);
- *Stop Work Compliance Response* - Written response that describes the planned corrective measures to address the issues described in the Stop Work Notification and a schedule for implementation; and,
- *Stop Work Completion* - Written notification that the corrective measures have been completed, including a description of any deviations from the Compliance Response.

7.2 CONSTRUCTION AND ENVIRONMENTAL CONTROLS

7.2.1 Dust Control and Air Monitoring

7.2.1.1 Dust Control

Dust control measures are specified in the MHMP in Attachment A. In general, the dust control measures consist of several BMPs to be implemented as part of intrusive construction work

A sufficient quantity of potable water will be maintained on the Site for dust control use. Watering equipment shall be used to minimize the

potential for elevated airborne particulate concentrations and consist of wet, vacuum-sweeper trucks, water tank trucks, or other devices that are capable of applying a uniform spray of water over potential dust-generating surfaces. The use of spray-applied foam to seal an exposed soil surface may be used at locations that are difficult or impracticable to cover with construction plastic or geotextile fabric.

7.2.1.2 *Air Monitoring*

To evaluate the effectiveness of the BMPs, air monitoring will be implemented at the initiation of intrusive activities and will continue through the completion of all intrusive activities, restoration of the caps, and removal of all controlled soil and debris from the Site that was generated by the Project. Accordingly, a project-specific Construction Air Monitoring Plan (CAMP) has been prepared as part of this DDP, and is found in Attachment A.

The CAMP provides a description of the methods to be used to demonstrate the effectiveness of the dust control measures during intrusive activities. The CAMP includes measures for real-time particulate and weather data collection, air sample collection for possible analysis of CrVI, laboratory analytical methods, data validation, and reporting. The CAMP incorporates, as appropriate, the previously approved air monitoring protocols that were approved by EPA and MDE.

7.2.2 *Erosion and Sediment Control and Stormwater Management*

Erosion and sediment control during construction will be addressed with conventional best management practices, which include silt fence/super silt fence, perimeter berms/swales, stabilized construction entrances, and inlet protection. Prior to the initiation of any intrusive activities, the erosion and sediment controls and stormwater management features will be installed in accordance with the permit drawings to be prepared and submitted to the City of Baltimore under separate cover, and in accordance with the General Permit to Discharge Stormwater associated with Construction Activities, to be submitted to MDE Water Management Division under separate cover.

Materials brought on-site for the construction entrance and truck wash must meet the imported clean fill requirements (i.e., no recycled material) specified in the MHMP in Attachment A.

7.2.3 *Stormwater Pollution Prevention*

A Stormwater Pollution Prevention Plan (SWPPP) has been prepared outlining the controls for erosion, sediment and stormwater during construction (Attachment A). The SWPPP was prepared in accordance with the United States Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE) regulations governing stormwater runoff.

A General Discharge Permit for Stormwater Associated with Construction Activities (General Discharge Permit) will be obtained for the Project. The management activities to be in compliance with the General Discharge Permit are provided in the Project's Erosion and Sediment Control Plan.

The Developer will also submit an application (Notice of Intent or "NOI") to MDE for coverage under Maryland's General Permit 11HT: General Permit for Discharges from Tanks, Pipes and Other Liquid Containment Structures at Facilities Other than Oil Terminals (NPDES Permit No. MDG675222 referred to herein as General Permit No. 11HT). All requirements of General Permit No. 11HT for monitoring and discharge limits will be followed during the Project.

The SWPPP includes the following elements:

1. Consistency of the SWPPP with other plans and control documents;
2. Identification of potential pollution sources;
3. BMPs for stormwater management controls, including during construction and post-construction;
4. SWPPP team and training.

7.2.4 *Spill Prevention and Response*

A project-specific Spill Prevention and Response Plan (SPRP) has been prepared (Attachment A) for the Project. The SPRP describes the measures to be implemented by HPD and its Contractors to prevent hazardous material and petroleum product discharges (i.e., spills) from occurring, and to mitigate the effects of a discharge, should one occur.

Spills are inclusive of solids and liquids. Contractors are required to notify as soon as possible the Developer's Field Representative and Honeywell's Resident Site Manager if a spill occurs that is subject to this SPRP.

7.2.5 *Material Handling and Management*

The MHMP in Attachment A addresses the handling and management of solids (e.g., asphalt, stone aggregates, concrete, soil) and liquids that may be encountered during the intrusive activities performed for the Project. The MHMP also addresses the import of materials to the Project. All hazardous waste (solid material or liquid) will be shipped off Site within 90 days of generating the waste to an approved, permitted facility. \

7.2.6 *Optical Survey*

In the existing Point Street Project, implementation of a new steel sheet pile barrier was installed along the centerline of the S-B barrier. As a result, the S-B barrier will not be monitored for settlement in this location. See Drawing DDP-F1.20 for existing sheet pile barrier extent.

The S-B barrier will be monitored for settlement along the entire remaining effected perimeter in areas where sheet pile will not be added.

7.2.7 *Vibration Monitoring*

Vibrations caused by pile driving will be monitored using seismographs. Vibration monitoring will be performed at HMS vaults/manholes within 50 ft. of pile driving.

Seismographs will record maximum peak particle velocities in three mutually perpendicular planes and its associated zero-crossing frequencies. Seismographs will be equipped with a wireless broadband modem which enables remote communication with the seismograph and allows automatic alerts to designated field personnel when vibrations exceed the pre-established threshold value.

Based on site specific vibration data collected during the test pile program, it was determined that production piles will induce vibrations on structures within 50 feet of pile driving. A "threshold value" of 1.0 inch per second and a "limiting value" of 2.0 inches per second shall be

established for the HMS structures. Where limiting values are exceeded, performance of the structure will be observed and evaluated, and performance of utilities may be tested. Peak particle velocities above the limiting values will be permitted if structure/ utility performance is deemed acceptable.

7.2.8 *Settlement Monitoring*

Construction settlement observations will be made during construction of the fill and monthly for 12 months after fill placement is completed. As described above in Section 6.4, adjustments will be made to settlement plates MP-11, LSC-MP-1, LSC-MP-2 and LSC-MP-4.

7.3 *PROGRESS SUBMISSIONS AND REPORTING*

7.3.1 *Documentation*

As described in Section 7.1, the Contractor's QC Team and the Developer's QA Team will prepare field records to document construction, QC, and QA activities. The weekly report will summarize the results of daily logs and visual inspections, any deficiencies and corrective actions, design changes, QA/QC activities, work approvals and work progress. Digital construction photographs will be included in weekly progress reports and posted on the Project website for public access. The weekly reports will be submitted to EPA, MDE and Honeywell.

From a geotechnical perspective, field staff will document the following elements:

1. Vibration monitoring;
2. Ground and instrument settlement monitoring;
3. Pipe pile driving records;
4. Fill compaction testing; and
5. Restoration of the MMC and HB.

From an environmental perspective, field staff will document the following:

1. Perimeter and work zone real-time air monitoring data and laboratory analytical results;
2. Source(s) of clean fill/aggregates, type of material, and documentation used to certify that the material is suitable and “clean” for on-site use;
3. Waste characterization laboratory analytical results;
4. Waste profile and facility acceptance of all materials to be transported and disposed off-Site;
5. Waste manifests;
6. Approved work plans; and
7. Approved material submittals.

Collectively, the geotechnical, environmental, and QA field staff will prepare the daily and weekly logs. At a minimum, the logs will identify the following:

- Work performed;
- Changed conditions;
- QA elements and deficiencies, if any;
- Monitoring results;
- Corrective actions;
- Design and construction modifications; and,
- Other relevant design or construction activities.

7.3.2

Construction Completion Report

A Construction Completion Report will be prepared and submitted to EPA, MDE and Honeywell. The report will be assembled and submitted upon completion of construction, construction-related monitoring, and receipt of all QA/QC test results. The report will document construction activities, compliance with the DDP, and any modifications. Specifically, the report will include the following information:

- Construction activities;
- QA/QC documentation;
- Documented deviations, if any, from the DDP;
- As-Built drawings related to the ERS components;
- Construction photographs;
- Monitoring data;
- Selected correspondence; and,
- Other relevant construction and design information related to the modifications or restoration of the ERS.

ERM has prepared a Health and Safety Guidance Document, Wills Wharf Office, dated January 2016 (Attachment A). The purpose of this guidance document is to establish general personal protection standards and safety practices and procedures to be used as guidelines for project-related work. The guidance document is not intended to be and shall not be used as a Contractor-Specific Health and Safety Plan (HASP); rather, the contractor will be required to prepare their own HASP that meets or exceeds the requirements specified in the guidance.

Also, the guidance is not intended to be inclusive of all health and safety issues that may be encountered at the Site, such as those associated with general construction activities. Rather, the document is solely intended to provide guidance to Contractors by identifying environmental issues and constraints that Contractors at a minimum should include in their own HASPs.

Contractors will be required to prepare and implement and comply with their own HASP in accordance with all applicable federal, state and local regulations and standards of care. All Contractor-prepared HASPs will be approved by the General Contractor, or its designee, prior to their personnel mobilizing to the Site.

REMEDY PERFORMANCE MONITORING DURING AND AFTER CONSTRUCTION

The DDP provides that all ERS components will remain operable and accessible during and following construction. Honeywell will continue to implement all monitoring requirements established in the Environmental Media Monitoring Plan and the Groundwater Gradient Monitoring Plan. There are no revisions required in the Groundwater Gradient Monitoring Plan or the Environmental Media Monitoring Plan. Specifically:

1. Honeywell will continue surface water monitoring during and following construction per the approved EMMP. There are currently 18 monitoring locations and two background locations, which are sampled quarterly by Honeywell at low tide and analyzed for total dissolved chromium. The Consent Decree establishes a surface water performance standard of no more than 50 parts per billion (ppb) of total chromium;
2. The HMS will continue to operate uninterrupted. The off-site transportation and disposal of HMS generated groundwater by Honeywell to Environmental Quality (EQ), Baltimore, Maryland will continue uninterrupted during construction.