April 2, 2020

Consulting
Engineers and
Scientists

Mr. Hasan R. Ahmed
Division of Environmental Remediation
New York State Department of Environmental Conservation
47-40 21 Street,
Long Island City, New York 11101

Re: Belle Harbor Shopping Center (BCP Site)
MGP DNAPL Recovery Evaluation Work Plan

Dear Mr. Ahmed:

National Grid has prepared this work plan to complete a DNAPL recovery evaluation of Manufactured Gas Plant (MGP)-related residuals at the Belle Harbor Shopping Center Site in Rockaway Park, Queens County, New York (the Site) (**Figure 1**). The work will be completed in accordance with the requirements of the Brownfield Cleanup Program Agreement between New York State Department of Environmental Conservation (NYSDEC) and Ahold U.S.A. Inc (Ahold) for the Site (Site No. C241048) and the access agreement between National Grid and Ahold.

National Grid will evaluate potential source material removal options for the DNAPL that is present at monitoring well MW-1 located on the attached **Figure 1**. This evaluation will include an assessment of the DNAPL's mobility and hydraulic recoverability. Determination of the mobility of the DNAPL will determine the frequency of DNAPL recovery operations, if warranted. The results of the evaluation will be used to finalize the remedial option for DNAPL in the Remedial Action Work Plan (RAWP) for the Site. The DNAPL present at the Site is a potential source of groundwater impacts and the removal of the DNAPL will likely decrease the dissolved phase contribution to groundwater quality at the Site as part of the overall Site remedy.

DNAPL RECOVERY EVALUATION

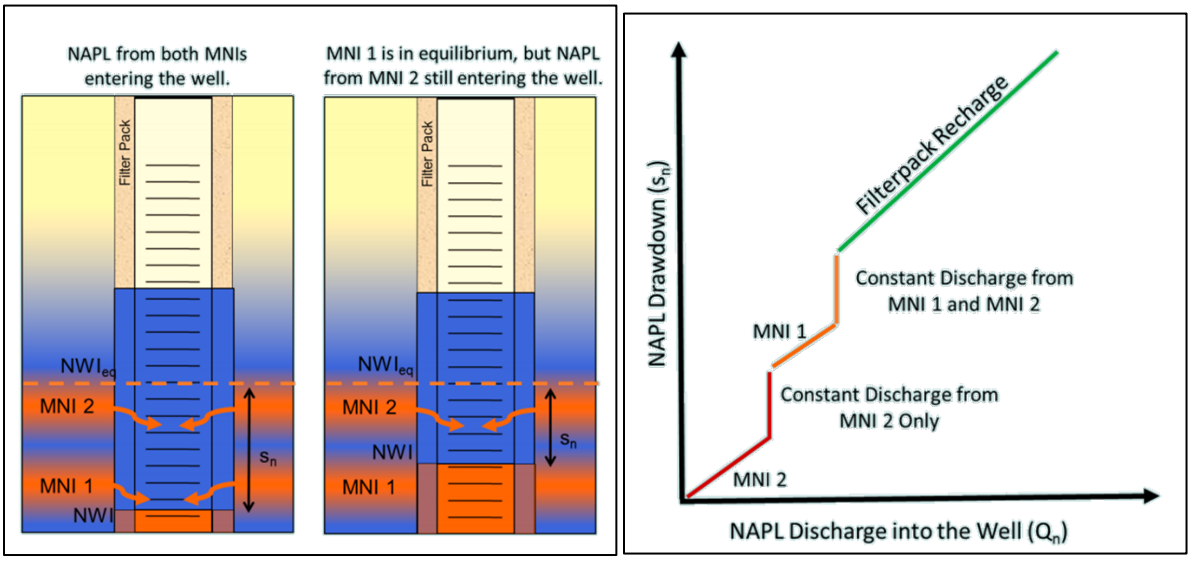
Prior to testing, GEI Consultants, P.C. (GEI) will evaluate the well conditions in MW-1 to verify suitability for the evaluation. This preliminary testing will include fluid gauging events to collect depth to water, depth to DNAPL, and well total depth data using an interface probe. This data will be utilized to verify if there is sufficient DNAPL thickness to test, that the well total depth has not been compromised, and establish the pre-test equilibrium condition. GEI will also collect a DNAPL sample and have it analyzed in an environmental laboratory for density and viscosity.

GEI Consultants, Inc.
455 Winding Brook Drive, Suite 201, Glastonbury, CT 06033
860.368.5300 fax: 860.368.5307

If the well is determined to be suitable for testing, GEI will conduct a baildown test of the DNAPL present in MW-1. DNAPL is removed from the well and sand filter-pack to initiate the test. The fluid levels are monitored via a pressure transducer as well as periodic manual gauging until the DNAPL thickness returns to the pre-testing equilibrium in the well.

If the DNAPL present is highly transmissive, the testing may be complete within hours. However, if the DNAPL is at or below the threshold of hydraulic recoverability, the test may take weeks to months to have the DNAPL thickness within the well return to the pre-testing equilibrium condition. The data generated from the transducers will be used to identify the specific elevations and thickness of the Mobile NAPL Intervals (MNIs) in the formation that may support future recovery as well as the DNAPL transmissivity.

Identification of the MNIs is critical because the well acts as a sump and DNAPL enters the well from all MNIs simultaneously causing an exaggeration of the DNAPL thickness relative to where the DNAPL is actually present within the formation; thus, exaggerating the height of DNAPL in the well versus the impacted portion of the formation.



When the well is evacuated of DNAPL, then the well will fill from all MNIs initially. As the DNAPL level in the well reaches each MNI then the transmissivity of that given MNI can be calculated from the resulting measurements from the transducers using the modified ASTM E2856 method. An idealized NAPL Drawdown versus NAPL Discharge into the Well above shows the reduced discharge (Q_n) into the well as each MNI is reached. For the example well above, the initial discharge into the well includes the filterpack recharge and flow from both MNIs. Once the filterpack NAPL is recharged, then the discharge into the well represents flow from both MNIs. The change in the NAPL level in the well over time as measured by the transducers is used to calculate the flow into the well from the MNIs. Once the DNAPL level in the well reaches MNI 1, then the discharge into the well is from

MNI 2 only and the rate of change of the NAPL level changes accordingly. By continuously measuring the rate at which the NAPL enters the well with the transducers and identifying the points where that rate changes, the thickness and discharge of NAPL into the well from each MNI can be calculated.

Transmissivity is an established, universal metric for the recoverability of groundwater from aquifers, essentially measuring the rate at which groundwater can flow through a one-foot wide strip of an aquifer under a unit gradient in a unit amount of time. However, transmissivity is not limited to groundwater. It can be used to measure the flow potential for any liquid in the subsurface that exhibits Darcian flow. As documented in ASTM E2856, transmissivity may be measured for LNAPL via multiple methods, and accounts for the different density and viscosity of the LNAPL, as well as the relative permeability resulting from two liquids (groundwater and LNAPL) competing to flow through an aquifer. Transmissivity may also be calculated for DNAPL using a modification of the methods identified in ASTM E2856. Using this method and analysis of the data, the DNAPL can be quantitatively identified as mobile or immobile DNAPL, and identify if MNIs require or will support active hydraulic recovery.

SCHEDULE AND REPORTING

National Grid will begin the evaluation within 30 days of the approval of this work plan. Once the NAPL in the well reaches pre-test equilibrium conditions, then transducer will be removed. National Grid will provide a data update to NYSDEC every two weeks until the level of DNAPL in the well reaches the pre-test equilibrium condition. This data update will include the recharge observed, the estimated recharge rate, and the anticipated duration to achieve the DNAPL pre-test equilibrium condition. Once the pre-test equilibrium condition is achieved, the final results will be presented to the NYSDEC in a summary letter along with a recommendation regarding the frequency of DNAPL recovery operations warranted at the Site.

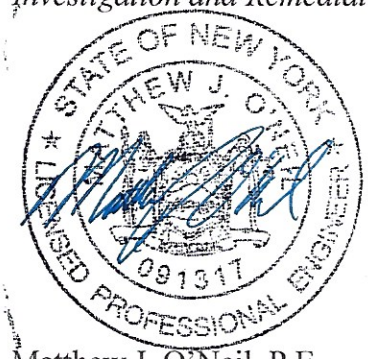
By copy of this letter, the above-referenced document has also been forwarded to the parties named below.

If you have any questions, feel free to contact me at (516) 545-3551.

Sincerely,

Matthew J. O'Neil
Project Engineer

I, Matthew J. O'Neil, P.E. certify that I am currently a NYS registered professional engineer and that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



Matthew J. O'Neil, P.E.
NYS Professional Engineer
License Number 091317

Enclosure

cc: J. O'Connell, NYSDEC
N. Crawford, NYSDEC
J. Morgan, Retail Business Services
R. Nicoloro, Stantec
D. Moore, Stantec
W. Ryan, National Grid

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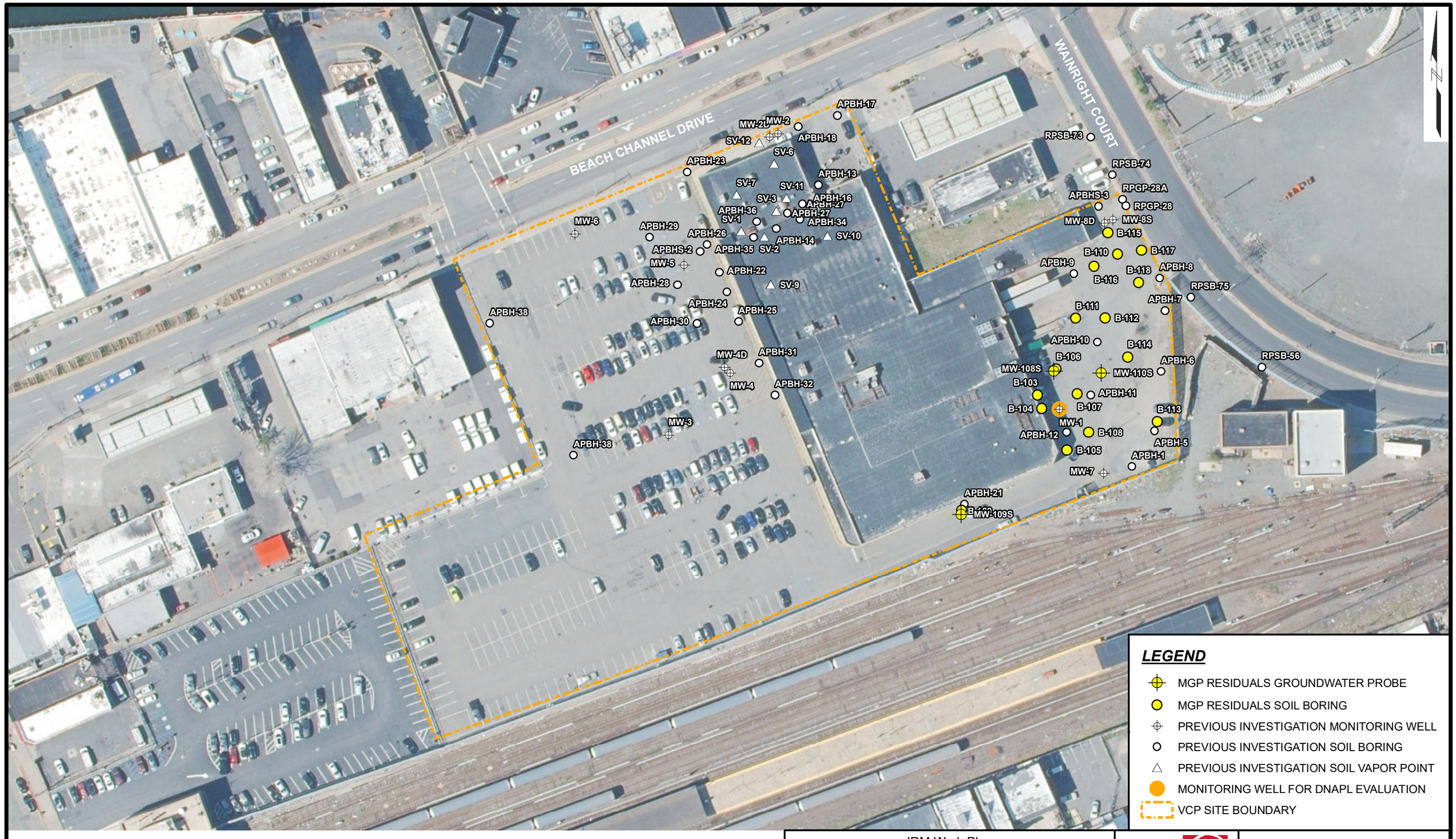

LEGEND

- MGP RESIDUALS GROUNDWATER PROBE
- MGP RESIDUALS SOIL BORING
- PREVIOUS INVESTIGATION MONITORING WELL
- PREVIOUS INVESTIGATION SOIL BORING
- PREVIOUS INVESTIGATION SOIL VAPOR POINT
- MONITORING WELL FOR DNAPL EVALUATION
- VCP SITE BOUNDARY

SOURCE:

1. 2013 ESRI WORLD IMAGERY
2. RESIDUAL INVESTIGATION LOCATIONS BASED ON SURVEY CONDUCTED ON 9/25/2013 BY NY STATE LICENSED SURVEY NO. 050146.
3. APPROXIMATE LOCATIONS FROM FIGURE 4 2010 SAMPLING LOCATION PLAN BY STANTEC

0 80 160

SCALE: 1" = 80'

IRM Work Plan
Belle Harbor Shopping Center
Rockaway Park, New York

nationalgrid

GEI Consultants

SAMPLE LOCATIONS

Project 093150 | January 2020 | Fig. 1

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