ARM Group LLC

Engineers and Scientists

March 9, 2021

Ms. Barbara Brown
Project Coordinator
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

<div align="right">

Re: Former Coke Oven Area (Parcel B10)
Monitoring Network Update
Tradepoint Atlantic
Sparrows Point, MD 21219

</div>

Dear Ms. Brown:

On behalf of Tradepoint Atlantic (TPA), ARM Group LLC (ARM) is pleased to provide this letter establishing an updated Groundwater Monitoring Plan for the former Coke Oven Area (COA) – Parcel B10 (the Site) of the Tradepoint Atlantic property located in Sparrows Point, Maryland. The overall objective of this Plan is to establish a modified sampling schedule for targeted wells in this study area. The proposed modifications are primarily based upon a review of the spatial distribution and the historical trend analysis of contaminant concentrations detected in the subject monitoring wells.

Site History and Monitoring Rationale

The groundwater at the Site has been characterized into two hydrogeologic zones: the shallow zone and the intermediate zone. As a result of historical activities at the Site, the groundwater at the Site contains elevated levels of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). The most prevalent compounds are benzene and naphthalene.

The COA has five distinct interim measures (IM) treatment areas designated as Cells 1, 2,3, 5, and 6. The main purpose of the proposed groundwater monitoring program presented in this letter is to monitor the effectiveness of the IM system(s) present at each treatment cell. As such, selected locations have been identified in the immediate vicinity of each IM system for the most frequent monitoring. Well sampling for the purpose of delineating the extent of compounds in groundwater has previously been completed and is described most recently in the *Coke Point Area Corrective Measures Study Investigation Report* (ARM; February 2020).

For further descriptions of the individual cells and their remediation systems, see *Coke Oven Interim Measures 2020 Progress Report* (ARM; February 2020). For further description of the history or description of hydrogeologic conditions of the Site, see the *Former Coke Oven Area Interim Measures Supplemental Investigation Report, Revision 1* (ARM; April 2020).

Groundwater Sampling Locations, Frequency and Analyses

Each monitoring well was evaluated for sampling frequency based on historical groundwater concentrations, proximity to the IM cells as well as its relationship to other wells in the network. Monitoring wells that are located outside of a cell IM system or located in close proximity to another regularly sampled well in the network were excluded for additional sampling.

Monitoring well locations proposed to be sampled in the shallow zone for Cells 1, 2, and 6 are shown on **Figure 1.** Monitoring well locations proposed to be sampled in the intermediate zone for Cell 2 are shown on **Figure 2.** In addition, samples will continue to be collected from the influent and effluent of the groundwater pump and treat system for Cell 2 on a quarterly basis.

Monitoring well locations proposed to be sampled for Cell 3 and Cell 5 are shown on **Figure 3** and **Figure 4**, respectively. Samples will continue to be collected from the influent and effluent of the groundwater pump and treat system for Cell 5 on a quarterly basis.

The sampling frequency rationale for each well within each system is provide in **Table 1** through **Table 5**. Groundwater samples will be collected using low-flow sampling methodologies. The depth to water in each well in the network will be measured prior to each groundwater monitoring event to include potentiometric surface.   Potentiometric figures for the shallow and intermediate zones will be incorporated in the progress report(s). Wells will not be sampled if they contain non-aqueous phase liquid (NAPL). Groundwater samples will be analyzed via Environmental Protection Agency (EPA) laboratory method 8260 for benzene, ethylbenzene, toluene, and total xylene (VOCs) and naphthalene (an SVOC). The reporting limits (RLs) and method detection limits (MDLs) for each analyte are as follows:

Compound	Method	RL (µg/L)	MDL (µg/L)
Benzene	8260B	1	0.34
Ethylbenzene	8260B	1	0.4
Naphthalene	8260B	2	41
Toluene	8260B	1	0.32
Xylene (Total)	8260B	3	1.4

A   R   M   G   r   o   u   p   L   L   C

The analytical results of each sampling event will be summarized and interpreted in an annual COA IM Progress Report which will be submitted to the MDE. The monitoring plan as presented in this letter complies with the *Sampling Procedures, Groundwater Monitoring Plan, and Groundwater Remediation System Inspection Plan* dated March 25, 2014 prepared as required by Discharge Permit # 11-DP-3746.

The Coke Point Area is undergoing a Corrective Measures Study this year. Therefore, this proposed Groundwater Monitoring Plan will ultimately be superseded and replaced once a final remedy decision is made.

If you have any questions, or if we can provide any additional information at this time, please do not hesitate to contact ARM Group LLC at 410-290-7775.

Respectfully Submitted,
ARM Group LLC

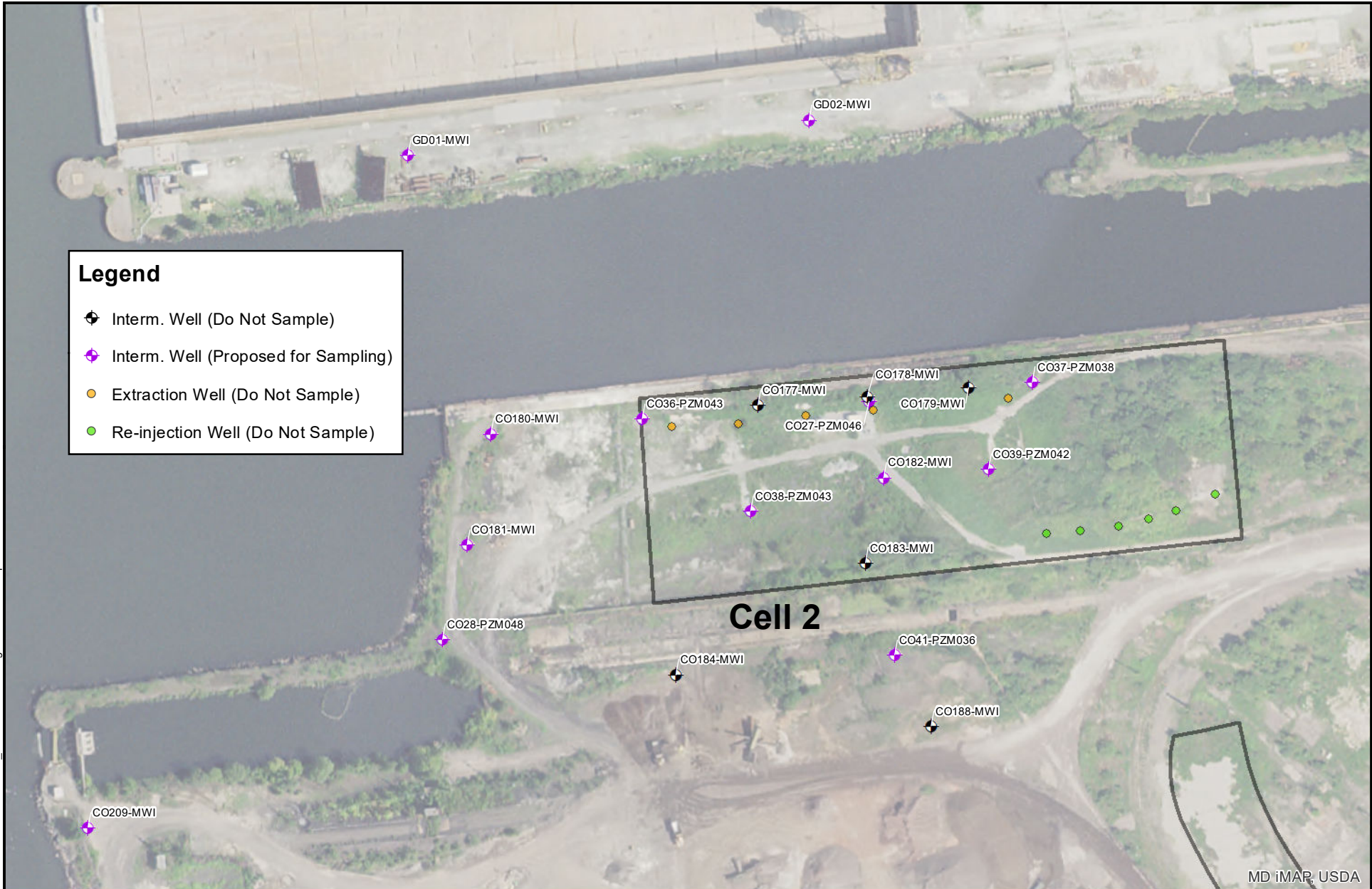Stewart Kabis, P.G.   T. Neil Peters, P.E.
Project Geologist II   Senior Vice President

QA Review Performed by: T. Neil Peters, P.E.

Attachments: **Figure 1 –** Cells 1, 2, and 6 Shallow Zone Monitoring Well Network
Figure 2 – Cell 2 Intermediate Zone Monitoring Well Network
Figure 3 – Cell 3 Monitoring Well Network
Figure 4 – Cell 5 Monitoring Well Network
Table 1 – Cell 1 & 6 Monitoring Well Network Sampling Frequencies
Table 2 – Cell 2 Shallow Zone Monitoring Well Network Sampling Frequencies
Table 3 – Cell 2 Intermediate Monitoring Well Network Zone Sampling Frequencies
Table 4 – Cell 3 Monitoring Well Network Sampling Frequencies
Table 5 – Cell 5 Monitoring Well Network Sampling Frequencies

A   R   M   G   r   o   u   p   L   L   C

FIGURES

Legend

- Monitoring Well (Do Not Sample)
- Monitoring Well (Proposed for Sampling)
- Extraction Well (Do Not Sample)
- Re-injection Well (Do Not Sample)
- Cell 1 Air Sparge Wells
- Cell 1 Vapor Extraction Headers
- Cell 6 Estimated Source Area

Cell 2

Cell 1

Cell 6

CO180-MWS
CO177-MWS
CO178-MWS
CO37-PZM003
CO121-PZM
CO36-PZM008
CO179-MWS
CO122-PZM
CO42-PZM004
CO27-PZM012
CO38-PZM006
CO39-PZM007
CO40-PZM008
CO181-MWS
CO03-PZM005
CO28-PZM010
CO186-MWS
CO41-PZM001
CO187-MWS
CO209-MWS
CO189-MWS
CO18-PZM006
CO80-PZM
CO79-PZM
CO190-MWS
CO100-PZM
CO02-PZM006
CO19-PZM004
CO93-PZM
CO88-PZM
CO191-MWS
CO192-MWS
CO16-PZM006
CO07-PZM008

MD iMAP, USDA

N

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1 inch = 300 feet

0   150   300
Feet

Coke Oven Area (Parcel B10)
Cells 1, 2 and 6
Shallow Zone Monitoring Well Network

Figure
1

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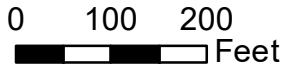
Legend

⊕ Interm. Well (Do Not Sample)

⬥ Interm. Well (Proposed for Sampling)

● Extraction Well (Do Not Sample)

● Re-injection Well (Do Not Sample)

GD02-MWI

GD01-MWI

CO178-MWI
CO37-PZM038
CO177-MWI
CO179-MWI
CO36-PZM043
CO27-PZM046
CO180-MWI
CO39-PZM042
CO182-MWI
CO38-PZM043
CO181-MWI
CO183-MWI

Cell 2

CO28-PZM048
CO41-PZM036
CO184-MWI
CO188-MWI

CO209-MWI

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1 inch = 200 feet

0   100   200
Feet

Coke Oven Area (Parcel B10)
Cell 2 Intermediate Zone
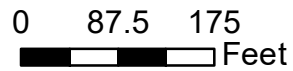Monitoring Well Network

Figure
2

Cell 3

Legend

⊕ Shallow Well (Proposed for Sampling)

⬦ Shallow Well (Do Not Sample)

⬥ Intermediate Well (Proposed for Sampling)

● Cell 3 Vapor Extraction Headers

○ Cell 3 Air Sparge Wells

CO193-MWS

CO210-MWS

CO194-MWS

CO196-MWS

CO102-PZM

CO197-MWS

CO195-MWS

CO103-PZM

CO200-MWS

CO104-PZM

CO198-MWS

CO199-MWS

CO201-MWS

CO101-PZM

CO202-MWS

CO30-PZM015

CO30-PZM060

CO32-PZM004

TS06-PDM004

TS06-PPM008

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1 inch = 170 feet

0   87.5   175
Feet

Coke Oven Area (Parcel B10)
Cell 3 Monitoring Well Network

Figure
3

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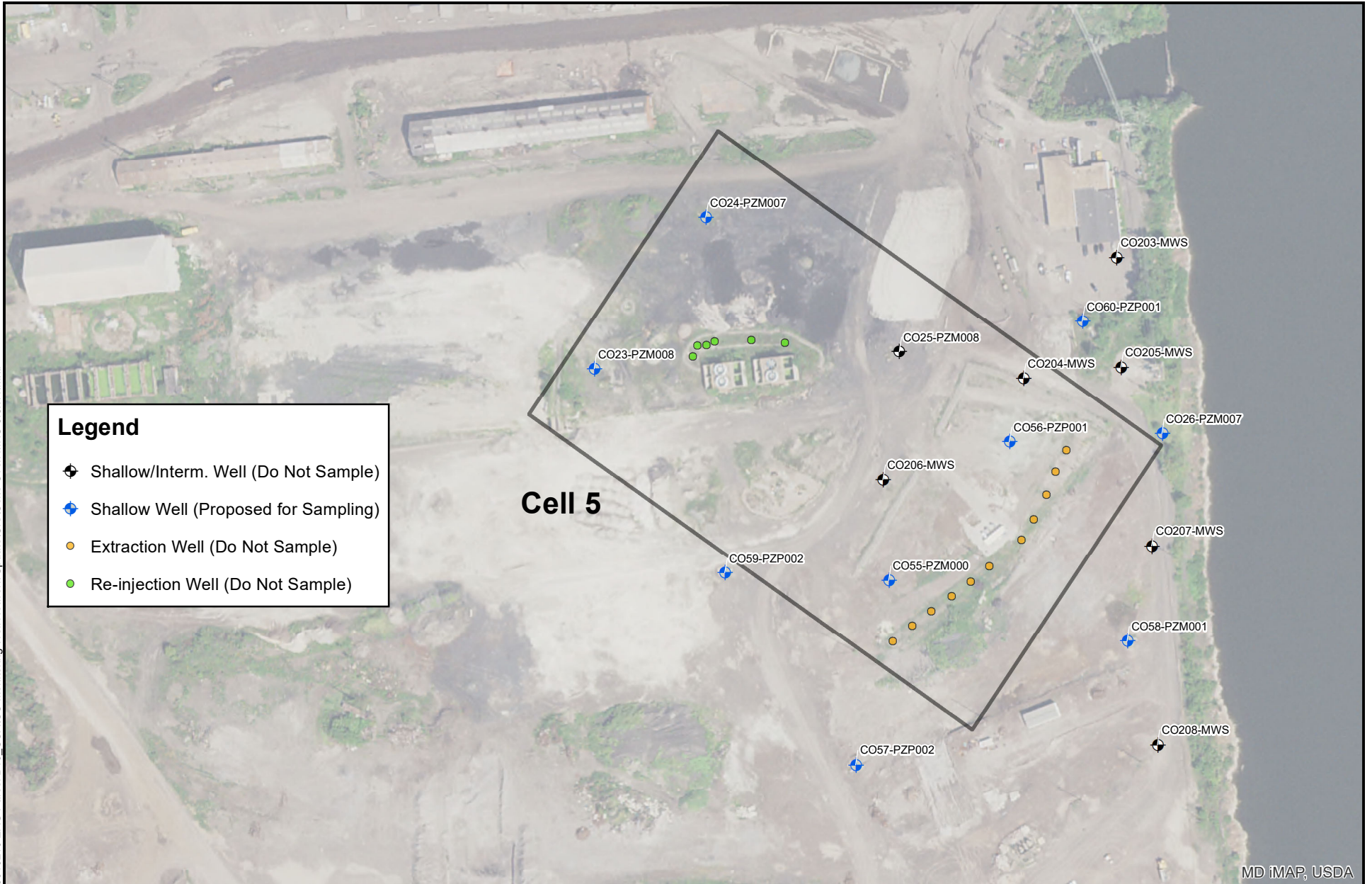
Legend

- Shallow/Interm. Well (Do Not Sample)
- Shallow Well (Proposed for Sampling)
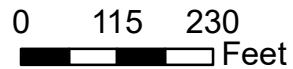- Extraction Well (Do Not Sample)
- Re-injection Well (Do Not Sample)

Cell 5

CO24-PZM007
CO203-MWS
CO60-PZP001
CO23-PZM008
CO25-PZM008
CO205-MWS
CO204-MWS
CO26-PZM007
CO56-PZP001
CO206-MWS
CO207-MWS
CO59-PZP002
CO55-PZM000
CO58-PZP001
CO57-PZP002
CO208-MWS

MD iMAP, USDA

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1 inch = 230 feet

0   115   230
Feet

Coke Oven Area (Parcel B10)
Cell 5 Monitoring Well Network

Figure

4

TABLES

Table 1 - Cell 1 & 6 Monitoring Well Network Sampling Frequencies

Well Name	Monitoring Area	Sample Frequency	Sampling Rationale
CO02-PZM006	Sentinel	Not Sampled	Beyond area of influence of system
CO07-PZM008	Sentinel	Not Sampled	Beyond area of influence of system
CO16-PZM006	Sentinel	Not Sampled	Beyond area of influence of system
CO18-PZM006	Performance	Not Sampled	Redundant to the in-system monitoring that CO190-MWS is providing
CO19-PZM004	Sentinel	Not Sampled	Redundant to the downgradient monitoring that CO93-PZM is providing
CO79-PZM	Performance	Not Sampled	Redundant to the in-system monitoring that CO190-MWS is providing
CO80-PZM	Performance	Not Sampled	Redundant to the in-system monitoring that CO190-MWS is providing
CO88-PZM	Sentinel	Not Sampled	Beyond area of influence of system
CO93-PZM	Performance	Quarterly	Monitor downgradient of Cell 6 system
CO100-PZM	Sentinel	Not Sampled	Redundant to the downgradient monitoring that CO93-PZM is providing
CO187-MWS	Sentinel	Not Sampled	Beyond area of influence of system
CO189-MWS	Sentinel	Not Sampled	Beyond area of influence of system
CO190-MWS	Performance	Quarterly	Monitor Cell 1 system effectiveness
CO191-MWS	Sentinel	Annually	Monitor downgradient of Cell 1 system
CO192-MWS	Performance	Not Sampled	Redundant to the in-system monitoring that CO190-MWS is providing

Table 2 - Cell 2 Shallow Zone Monitoring Well Network Sampling Frequencies

Well Name	Monitoring Area	Sample Frequency	Sampling Rationale
CO03-PZM005	Upgradient	Not Sampled	Beyond area of influence of system
CO27-PZM012	Sentinel	Quarterly	Required by permit
CO28-PZM010	Sentinel	Annually	Monitor property perimeter
CO36-PZM008	Sentinel	Quarterly	Required by permit
CO37-PZM003	Sentinel	Quarterly	Required by permit
CO38-PZM006	Performance	Quarterly	Required by permit
CO39-PZM007	Performance	Quarterly	Required by permit
CO40-PZM008	Upgradient	Quarterly	Required by permit
CO41-PZM001	Upgradient	Quarterly	Required by permit
CO42-PZM004	Performance	Quarterly	Required by permit
CO121-PZM	Sentinel	Not Sampled	Beyond area of influence of system
CO122-PZM	Performance	Not Sampled	Redundant to monitoring provided by CO37 and CO39
CO177-MWS	Sentinel	Not Sampled	Redundant to monitoring provided by CO27 and CO36
CO179-MWS	Sentinel	Semi-annually	Monitor property perimeter
CO180-MWS	Sentinel	Annually	Monitor property perimeter
CO181-MWS	Sentinel	Annually	Monitor property perimeter
CO186-MWS	Upgradient	Annually	Monitor upgradient concentrations
CO209-MWS	Sentinel	Annually	Monitor property perimeter

Table 3 - Cell 2 Intermediate Zone Monitoring Well Network Sampling Frequencies

Well Name	Monitoring Area	Sample Frequency	Sampling Rationale
CO27-PZM046	Performance	Quarterly	Required by permit
CO28-PZM048	Sentinel	Annually	Monitor property perimeter
CO36-PZM043	Performance	Quarterly	Required by permit
CO37-PZM038	Performance	Quarterly	Required by permit
CO38-PZM043	Performance	Quarterly	Required by permit
CO39-PZM042	Performance	Quarterly	Required by permit
CO41-PZM036	Upgradient	Quarterly	Required by permit
CO177-MWI	Sentinel	Not Sampled	Redundant to monitoring provided by CO27 and CO36
CO178-MWI	Sentinel	Not Sampled	Redundant to monitoring provided by CO27
CO179-MWI	Sentinel	Not Sampled	Redundant to monitoring provided by CO27 and CO37
CO180-MWI	Sentinel	Annually	Monitor property perimeter
CO181-MWI	Sentinel	Annually	Monitor property perimeter
CO182-MWI	Performance	Quarterly	Monitor property perimeter
CO184-MWI	Upgradient	Not Sampled	Originally installed to fill delineation gaps; beyond area of influence of system
CO188-MWI	Upgradient	Not Sampled	Originally installed to fill delineation gaps; beyond area of influence of system
CO209-MWI	Sentinel	Annually	Monitor property perimeter
GD01-MWI	Sentinel	Semi-annually	Monitor the grading dock area
GD02-MWI	Sentinel	Semi-annually	Monitor property perimeter

Tabe 4 - Cell 3 Monitoring Well Network Sampling Frequencies

Well Name	Monitoring Area	Sample Frequency	Sampling Rationale
CO30-PZM015	Performance	Quarterly	Monitor property perimeter
CO30-PZM060	Sentinel	Annually	Monitor property perimeter
CO32-PZM004	Upgradient	Not Sampled	Beyond area of influence of system
CO101-PZM	Sentinel	Not Sampled	Redundant with CO201
CO102-PZM	Performance	Not Sampled	Redundant with C0196
CO103-PZM	Performance	Not Sampled	Redundant with CO195
CO104-PZM	Sentinel	Not Sampled	Beyond area of influence of system
CO193-MWS	Upgradient	Not Sampled	Beyond area of influence of system
CO194-MWS	Upgradient	Semi-annually	Monitor upgradient conditions
CO195-MWS	Performance	Quarterly	Monitor upgradient conditions
CO196-MWS	Upgradient	Semi-annually	Monitor upgradient conditions
CO197-MWS	Upgradient	Not Sampled	Beyond area of influence of system
CO198-MWS	Sentinel	Semi-annually	Monitor downgradient of the Cell 3 system
CO199-MWS	Sentinel	Not Sampled	Redundant with CO30
CO200-MWS	Performance	Not Sampled	Redundant with monitoring provided by other downgradient and shoreline wells
CO201-MWS	Sentinel	Semi-annually	Monitor property perimeter
CO202-MWS	Sentinel	Not Sampled	Beyond area of influence of system
CO210-MWS	Sentinel	Not Sampled	Beyond area of influence of system
TS06-PDM004	Upgradient	Not Sampled	Beyond area of influence of system
TS06-PPM008	Sentinel	Not Sampled	Beyond area of influence of system

Table 5 - Cell 5 Monitoring Well Network Sampling Frequencies

Well Name	Monitoring Area	Sample Frequency	Sampling Rationale
CO23-PZM008	Upgradient	Quarterly	Required by permit
CO24-PZM007	Upgradient	Quarterly	Required by permit
CO25-PZM008	Performance	Not Sampled	Originally installed to fill delineation gaps; not monitoring property perimeter
CO26-PZM007	Sentinel	Quarterly	Required by permit
CO55-PZM000	Performance	Quarterly	Required by permit
CO56-PZP001	Performance	Quarterly	Required by permit
CO57-PZP002	Senitinel	Quarterly	Required by permit
CO58-PZM001	Sentinel	Quartely	Required by permit
CO59-PZP002	Performance	Quarterly	Required by permit
CO60-PZP001	Sentinel	Quarterly	Required by permit
CO203-MWS	Sentinel	Not Sampled	Originally installed to fill delineation gaps; beyond area of influence of system
CO204-MWS	Performance	Not Sampled	Originally installed to fill delineation gaps; not monitoring perimeter
CO205-MWS	Sentinel	Not Sampled	Redundant to monitoring provided by CO26 and CO60
CO206-MWS	Performance	Not Sampled	Originally installed to fill delineation gaps; not monitoring perimeter
CO207-MWS	Sentinel	Not Sampled	Redundant to monitoring provided by CO26 and CO58
CO208-MWS	Sentinel	Not Sampled	Originally installed to fill delineation gaps; beyond area of influence of system