FULL-SCALE IN-SITU REMEDIAL DESIGN WORKPLAN
CAROL CLEANERS - THE CROSSINGS
GGP STATEN ISLAND MALL
STATEN ISLAND, NEW YORK

NYSDEC IHWDS SITE #2-43-020

Prepared for:

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CERTIFICATION

I, William Beckman, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Full-Scale In-Situ Remedial Design Workplan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) – 10 (Technical Guidance for Site Investigation and Remediation) (DER-10). I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

063219	5/12/16	William K Beckman
NYS Professional Engineer #	Date	Signature

Note: include PE stamp

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1.0 INTRODUCTION

On behalf of General Growth Properties, Inc. (GGP; formerly The Rouse Company [Rouse]), the environmental and civil engineering firm of LBG Engineering Services, P.C. (LBGES) has prepared this Remedial Design Workplan (RDWP) for full-scale in-situ bioremediation activities in connection with the presence of chlorinated volatile organic compounds (CVOCs) in the groundwater at the Carol Cleaners/Rouse Staten Island Mall (the Site; aka The Crossings), located at 280 Marsh Avenue in Staten Island, New York (Figure 1). This RDWP was prepared in connection with the Record of Decision (ROD) for the Site and the in-situ bioremediation pilot test (the pilot test) conducted between November 2014 and October 2015. The results of the pilot test were summarized and provided to the NYSDEC as part of the Pilot Test Summary Report submitted by LBGES in December 2015. The Pilot Test Summary Report was approved by the NYSDEC on April 13, 2016.

1.1 Background

Following the NYSDEC issuance of the Order On Consent in 2002, LBGES conducted an interim remedial measure (IRM) investigation, followed by a Remedial Investigation (RI), on behalf of GGP. The IRM investigation and RI focused on identifying and locating the general source area and extent of tetrachloroethylene (PCE) and related CVOCs detected in the subsurface environment at the Site. The investigative work addressed the following: 1) the vertical and horizontal extent of CVOCs in soil in the area of the Carol Cleaners and Tumble Dry Cleaners (aka Damowa Laundry & Dry Cleaning) facilities; 2) determination of whether or not CVOC-related dense non-aqueous phase liquid (DNAPL) existed at the potential release location; 3) the potential for the local overburden materials (e.g., soil) and underlying bedrock surface to influence DNAPL migration if it was found to exist; and 4) delineation of the current extent and migration mechanisms for PCE and related CVOCs in groundwater at the Site.

The IRM investigation and RI results indicated that the "source area" roughly corresponded to a parking/driveway area of broken-up asphalt at the rear of the Carol Cleaners tenant space [near existing Monitor Well MW-3 (Figure 2)]. Based on the IRM and RI results, it was determined that no remediation of the overburden (soil) material was warranted due to: 1) the singular existence of a slightly elevated PCE concentration detected above the groundwater at only one location; 2) the comparatively lower concentrations of PCE [all below the respective NYSDEC "TAGM" objective of 1.4 parts per million (ppm)] detected in the immediately surrounding overburden; 3) the prevailing composition of the overburden (primarily fine sand

and silt); 4) the absence of CVOC DNAPL; and 5) the isolation afforded by the prevalence of primarily impervious surfaces (e.g., roofs, parking lot, walkways) at the Site.

Results of groundwater sampling rounds conducted between 1995 and 2011, indicated the presence of dissolved PCE and one or more related CVOCs [trichloroethylene (TCE), cis-1,2-dichloroethylene (cis-1,2-DCE), and vinyl chloride (VC)] at concentrations above the respective NYSDEC groundwater/surface water standards, as defined by 6 NYCRR Part 703, at several of the on-site and off-site monitor wells (Appendix I). The corresponding results also indicated that there is no PCE DNAPL present in the local groundwater bearing formations underlying the Site. The determined groundwater flow direction, in conjunction with the distribution of the respective CVOCs dissolved in groundwater at the Site, support the conclusions that the apparent source area occurs proximal to the Carol Cleaners tenant space, and the resulting plume extends off-site towards Platinum Avenue. Based on the conclusions and supporting data, it was also concluded that the plume may be influenced by local subsurface utilities.

Based on in-situ hydraulic ("slug") testing conducted at several of the on-site monitor wells, it has been determined that the hydraulic conductivity of the overburden at the Site is low to moderate [0.4 feet per day (ft/d) to 30 ft/d]. These values, along with the relatively consistent hydraulic gradient exhibited by the local groundwater, support the characterization that the CVOC plume movement through the on-site overburden is expected to occur at a slow rate which, in turn, affords potential for natural degradation (e.g., biologically-driven reductive dechlorination) of the respective constituents to occur. The analytical results for the groundwater samples collected since 1995 indicate that PCE related to the on-site source area is clearly undergoing reductive dechlorination (i.e., breakdown to TCE, cis-1,2-DCE, and VC), which substantiates the occurrence of natural degradation at the Site. The occurrence of natural degradation of PCE has been further corroborated by the general detection of methane, ethane, and/or ethene in groundwater samples collected from most of the monitor wells in the plume area.

The RI report associated with the previously completed investigations was submitted to the NYSDEC in October 2011, followed in November 2011 by the Feasibility Study (FS) associated with the identification of potential future remedial activities. The FS established the Remedial Action Objectives (RAO) for the Site, and identified in-situ bioremediation as the proposed selected remedial technology. The ROD for the Site was issued in March 2012, and required completion of a pilot study prior to any full-scale implementation. As per the ROD, a workplan for a Pilot Study (the Workplan) to evaluate in-situ bioremediation was submitted to and approved by the NYSDEC in September 2013. In addition, as per the ROD, indoor air impacts identified in the RI and FS would need to be addressed prior to beginning the pilot study.

The in-situ bioremediation pilot test was conducted by LBGES between November 2014 and October 2015 in accordance with the approved workplan. Upon completion, a Pilot Test Summary Report was prepared and submitted to the NYSDEC in December 2015. Based on the favorable results of the pilot test, GGP is moving forward with the process to initiate full-scale in-situ bioremediation activities at the Site as detailed in this workplan.

1.2 Nature and Extent of Contamination

1.2.1 Soil

Based on the analytical results for eighty-nine soil samples collected on and off-site during multiple remedial investigations completed between 2002 and 2011, only one exceedance of the respective Recommended Soil Cleanup Objectives (RSCO) for PCE was encountered at the Site. Therefore, impacts to soil are considered to be minimal, localized, and do not appear to be acting as a continuing source for impact to groundwater. The soils are effectively capped, as the entire property is covered by asphalt, concrete, and the footprint of the mall building. As per the FS, the only RAO applicable for soil at the Site are those focused on protection of public health and that require incorporation of institutional controls. As per the ROD, the institutional control applicable to the Site consists of the existing covering of soil with impervious surface, which, in turn, requires establishment of an Environmental Easement (EE) and maintenance as part of the final Site Management Plan (SMP).

On behalf of GGP, the identification of a proposed EE area was submitted by LBG to the NYSDEC in early July 2015. The proposed area was subsequently approved by the NYSDEC in late July. As a condition to its concurrence with the approved EE area, the NYSDEC requested the completion of surface (within two feet) soil sampling within the limits of the "unpaved area" portion associated with the proposed EE. The requested soil sampling was completed in August 2015, and the corresponding analytical results indicated that the detected concentrations of all of the targeted compounds were below the respective "Restricted Residential" and "Commercial" Soil Cleanup Objectives (SCOs). The EE document and required site survey were submitted by GGP to the NYSDEC in November 2015. A response regarding its review of the submitted material is pending from the NYSDEC. The institutional control associated with the proposed EE will be incorporated into the final SMP.

1.2.2 Groundwater

The baseline groundwater sampling round completed in connection with the in-situ bioremediation pilot test was conducted between January and February 2013. The analytical results for this round indicated water-quality conditions and CVOC concentrations similar to those associated with the October 2011 sampling round, which had been used to develop the Pilot Study Workplan. Based on the analytical results for the baseline sampling conducted in January and February 2013, it was confirmed that the plume consisting of PCE and related CVOCs continued to migrate from the Site towards and along Platinum Avenue. However, even

though migrating, it was determined that naturally-occurring reductive dechlorination was reducing PCE concentrations in the groundwater associated with the plume. The data collected as part of the post-injection sampling indicate that the storm drain system located proximal to the Carol Cleaners and the rear of the Crossings [previously impacted in connection with the initial release(s)] is contributing to the plume by allowing residually impacted storm water runoff to seep into the immediately underlying unsaturated zone). Therefore, GGP will be implementing cleanup and repair of the storm drain system prior to initiating full-scale injection activities. The maintenance of the storm drain system will be incorporated into the final SMP.

The post-injection pilot test effectiveness monitoring results indicated an initial increase in PCE concentrations around the time of the first quarterly round of sampling (January 2015) as anticipated immediately following injections. Subsequently, there was a significant decrease in PCE concentrations and increase in breakdown products due to the enhanced reductive dechlorination process. Due to the effects of the injection leveling off, which corresponded to the fourth quarter round of sampling, no appreciable further decreases in PCE concentrations and increases in breakdown products were observed.

The generic protection of health RAO associated with groundwater are intended to: 1) prevent its ingestion when respective contaminant levels exceed the corresponding drinking water standards; 2) prevent contact/inhalation of volatiles from volatilized contaminants in impacted groundwater; and 3) restore the aquifer to pre-release conditions to the extent practicable. The groundwater at the Site is not used as a drinking water supply or for any recreational purposes. Therefore, there is no potential for ingestion of groundwater at the Site. However, the RAO goals of prevention of contact with/inhalation of CVOCs from impacted groundwater (see Soil Vapor section below), and the restoration of the groundwater-bearing overburden to pre-release conditions to the extent practicable are applicable to the Site. In addition, the RAO applicable to the generic protection of the environment require prevention of the discharge of CVOCs in groundwater to local surface water, and removal of the respective source. There are no on-site or nearby off-site surface water bodies; and the on-site storm water system discharges to a municipal combined sewer system at an off-site location. As described above, cleanup and repair of the system will be performed prior to initiating injections and maintenance of the storm water system will be incorporated into the final SMP.

1.2.3 Soil Vapor

The generic RAO for soil vapor are focused on mitigating impacts to public health resulting from the potential or existing soil-vapor intrusion into buildings. As described in the Pilot Test Workplan, the analytical results for indoor air and sub-slab air samples previously collected at targeted tenant spaces (i.e., Babies R Us, SI Shoe Repair, Carol Cleaners, Mon Amie Nails, and Carvel) as part of the RI efforts, indicated that appropriate action to reduce exposure to PCE and TCE vapor was warranted. As per the ROD, these actions were implemented prior to initiating any pilot-test activities. Diagnostic indoor vapor mitigation testing at the Babies R Us and adjacent tenant spaces was completed as part of an effort to design an appropriate vapor intrusion mitigation system. Once the design was completed and following receipt of New York City Department of Buildings (NYCDOB) permits, a sub-slab depressurization system (SSDS) was installed in the Carol Cleaners and Babies R Us spaces in April 2014. The initial round of post-mitigation heating season indoor air sampling results indicated that concentrations of PCE and related CVOCs still exceeded their respective New York State Department of Health (NYSDOH) guidelines within multiple tenant spaces.

Based on the initial round of indoor air sampling, additional investigation into the cause of the persistent elevated PCE and related CVOC concentrations determined that the dry cleaning tenant (French Cleaning by Carol) occupying the Carol Cleaners tenant space was using equipment which was emitting PCE into the indoor air at concentrations in exceedance of the respective NYSDOH guideline. The tenant was subsequently vacated from the property by GGP. Follow-up indoor air sampling indicated that PCE vapor remained an indoor air issue at the Carvel tenant space. As a result, an additional SSDS suction point was installed within the Carvel tenant space in February 2015. Subsequent heating season indoor air sampling at the Carvel tenant space indicated compliance with the respective NYSDOH guidelines. The SSDS is currently operating and maintaining depressurization of the targeted tenant spaces. The O&M Plan for the SSDS will be incorporated in the final SMP.

1.3 Remedial Action Goals and Remedial Action Objectives (RAO)

As presented in the FS and the Pilot Study Workplan, the stated goal of this remedial program, as implemented under 6 NYCRR Part 375-2.8(a), is to restore the Site to “pre-disposal” conditions to the extent feasible. In addition, the selected remedy is intended to eliminate or mitigate all significant threats to the public health and to the environment presented by the contaminants released at the Site as set forth in the Comprehensive Environmental Resource Conservation and Liability Act (CERCLA) and amended by Superfund Amendments and Reauthorization Action (SARA).

The applicable RAO for the Site are classified in DER-10 as "medium or operable unit-specific objectives" for the protection of public health and the environment and are developed based on "Standards, Criteria and Guidance" (SCGs) for the specific contaminant(s).

1.4 Standards, Criteria and Guidance (SCGs)

As per the FS, the applicable SCGs for the Site are based on guidelines specified by the NYSDEC Division of Environmental Remediation (DER) and Division of Water (DOW), and the NYSDOH:

The DER SCGs are as follows:

- DER-10 – Technical Guidance for Site Investigation and Remediation
- DER-15 – Presumptive/Proven Remedial Technologies
- 6 NYCRR Part 375 – Environmental Remediation Programs
- 6 NYCRR Part 375-6 – Remedial Program Soil Cleanup Objectives

The DOW SCGs are as follows:

- 6 NYCRR Part 703 - Surface Water and Groundwater Quality Standards and Groundwater Effluent Standards

The NYSDOH SCGs are as follows:

- Guidance for Evaluating Soil Vapor Intrusion in New York
- NYSDOH Drinking Water Standards

As per the applicable SCGs, the generic, medium specific RAO are summarized below.

1.4.1 Protection of Public Health

<u>Soil</u>

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from soil.

<u>Groundwater</u>

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

1.4.2 Protection of the Environment

Soil

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

Groundwater

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

Based on the above SCGs and corresponding focus, in-situ biological treatment was selected as the appropriate remedial measure through the FS process as it meets the "threshold and primary balancing technology evaluation" criteria for the Site and is believed most likely to enhance the already naturally occurring processes at the Site.

2.0 PRE-DESIGN ACTIVITIES

2.1 Previous Investigations

The results of previous investigations were summarized in the 2011 RI report and 2013 Pilot Test Workplan. As discussed in those documents, it was concluded that impacts to soil from the on-site source are minimal, localized, and do not appear to be acting as a continuing source for impact to groundwater. The soil (overburden) at the Site is effectively capped, as the entire property is covered by asphalt, concrete, and the footprint of the mall building. As part of the establishment of an EE at the Site and related institutional controls for soil, additional soil sampling was completed within the area proposed by LBG and approved by the NYSDEC. No evidence of impacts to soil was identified as a result of the additional sampling.

As previously discussed, ongoing groundwater investigations have been conducted at the Site since 1995. The extent and focus of these investigations are considered adequate for providing the data necessary to complete the full-scale in-situ bioremediation design for the Site. Baseline groundwater sampling, which will include all of the existing monitor wells, will be completed prior to initiating full-scale injections. The results of this baseline round will be compared with those associated with the completion of the pilot test effectiveness monitoring and, if warranted, will be used to revise the current remediation plan design.

Based on the results of vapor intrusion investigations conducted between 2006 and 2015, a SSDS was installed and subsequently modified for several tenant spaces. Recent vapor intrusion sampling confirms the current SSDS is operating properly and is achieving adequate depressurization.

2.2 Pilot Test Summary

As per the ROD, a pilot test for evaluating the potential effectiveness of in-situ bioremediation was conducted at the Site between November 2014 and October 2015. The pilot test included the injection of a solution of water and sodium lactate (WILCLEAR PLUS™) manufactured by JRW Bioremediation, LLC. Injectant was introduced into the subsurface using ten (10) injection wells (IP-1 through IP-10), between November 19 and 25, 2014. The locations of the injection points are depicted on Figure 2. The injections targeted a “treatment zone” corresponding to the area outside the Carol Cleaners in the vicinity of Monitor Wells MW-3, MW-3D, MW-4, and MW-5 (Figure 2).

As presented in the Pilot Test Summary Report, the results of the sodium lactate treatment generally showed the successful development/enhancement of an anaerobic environment in the local groundwater environment, which significantly enhanced the naturally occurring reductive dechlorination processes. The successful results were exemplified by the development of elevated carbon dioxide concentrations and elevated methane concentrations

(both end products) as observed in the treatment zone monitor wells. The corresponding analytical results indicate that significant reductions in PCE concentrations occurred and were maintained in the treatment zone, as well as in some “perimeter zone” monitor wells, even after exhaustion of the introduced “carbon source”. Tables, figures, and trend graphs which illustrate the responses of PCE and related CVOC concentrations resulting from the pilot test efforts are provided in Appendices I, II and III, respectively.

3.0 DESIGN SCOPE

3.1 Remedial Design

Two conceptual designs, based on the results of the pilot test, were considered for the full-scale remedial activity selection. The first conceptual design requires installation of about 50 injection points, at on- and off-site locations, and spaced on 20-foot centers to aggressively treat the entire plume. This conceptual design is anticipated to only require one injection round, but would need to use pressure to deliver the injectant (treatment solution) into the subsurface environment. The second conceptual design includes use of existing monitor wells along with the addition of two (2) to four (4) newly constructed monitor wells to implement treatment solution injections in a more concentrated area. The second conceptual design would require multiple injection rounds over a longer duration (possibly one year or more), but could be completed via either pressure or gravity feed.

The source area at the Site is limited in size, and bordered by the building section serviced by the SSDS and the north side of Platinum Avenue. These constraints make installation of an aerially extensive injection well/point network at the Site prohibitive. During the pilot test, the pressure fed injectant was significantly diluted to allow adequate ease of delivery, but this also increased the total volume of liquid being injected. In addition, daylighting of the injectant occurred on the front side of the Carol Cleaners portion of the building (which is upgradient of the treatment area). This occurrence is attributed to a combination of the pressure-fed injections in low to moderate permeability overburden and the presence of a foundation-related void space beneath the building. Considering these factors, LBGES is proposing the second conceptual design approach, which will rely on multiple injection points and rounds of injectant delivery via gravity feed. As such, this design is anticipated to require additional time to complete, but will allow for: 1) better injectant distribution across the remedial action treatment area; 2) a long-term maintained level of carbon source; and 3) avoidance of adverse effects on the operation of the existing SSDS.

3.1.1 Injectant

The injectant (treatment solution) proposed for use in connection with the full-scale remedial activities is the same product used during the pilot test. The injectant (WILCLEAR PLUS®) is a sodium lactate mixture (consisting of a blend of fatty acids and fermentables (e.g., sodium lactate) manufactured by JRW Bioremediation, LLC (JRW). WILCLEAR PLUS® is designed specifically for bioremediation use, and is a light to dark brown, low viscosity, miscible liquid with a pH between 6 and 8. This product is manufactured from food-grade ingredients, primarily fatty acids and fermentables, which eventually get consumed by natural microbes in the subsurface and groundwater (see “fact sheet” and “SDS” provided as Appendices IV and V, respectively). Once the reductive dechlorination (anaerobic driven) process is completed, only

the innocuous end products consisting of carbon dioxide, ethene, ethane, water, and chloride ions remain in the groundwater.

3.1.2 Remedial Action Treatment Area and Injection Well Network

Implementation of the second conceptual design will focus on a remedial action treatment area where the PCE concentration in groundwater is over 5 ug/L, which has a size of approximately 1.75-acre (Figure 3). A total of eleven (11) to twelve (12) injection points are proposed for injectant delivery within the remedial action treatment area. Seven (7) of the injection points will consist of existing monitor wells, while the remainder, four (4) to five(5), will consist of newly constructed monitor (injection) wells. The locations of the injection points (wells) will be distributed amongst three (3) zones. "Zone 1" will include Monitor Wells MW-3 and MW-5 and correspond to the source area. Monitor Wells MW-3D and MW-4 will be used for source area monitoring purposes. The source area perimeter will correspond to "Zone 2" and will include Monitor Well MW-7 and proposed (injection) Monitor Wells MW-20 through MW-23 or MW-24. Monitor Wells MW-9, MW-11, MW-12, and MW-13 located within Platinum Avenue will define "Zone 3". The remaining monitor wells including Monitor Wells MW-16, MW-17, MW-18, and MW-19 will be used for monitoring purposes within "Zone 3".

The proposed locations of Monitor Wells MW-20 through MW-24 (and possibly Monitor Well MW-25) are shown on Figure 3. The respective locations are anticipated to provide full coverage of the perimeter area of the plume. The screened intervals of existing monitor wells proposed for injections typically span a saturated thickness of approximately 9 feet in the overburden at the respective locations. The proposed (injection) monitor wells will be constructed in a fashion similar to the existing monitor wells, with 4-inch diameter Schedule 40 PVC riser and screen (5-foot length) and flush-mount protective casings. The use of 4-inch diameter casing is anticipated to be adequate for allowing the repetitive injection of treatment solution at each well. The proposed depths and corresponding screen intervals for these new monitor wells are provided as follows in Table 1:

TABLE 1
Well Construction Summary

Well ID[1]	Date Completed	Injection Zone	Total or Proposed Depth (ft bg)[2]	Depth to Bedrock (ft bg)	Flush-Mount Rim Elevation (ft amsl)[3]	Top of PVC Elevation (ft amsl)	Screen Setting Interval (ft bg)
MW-1	7/26/1995	---	13.5	13.5	44.58	44.28	8.5-13.5
MW-2	7/26/1995	---	12.0	12.0	37.97	37.74	7.0-12.0
MW-3	**7/28/1995**	**Zone 1**	**14.8**	**13.0**	**32.59**	**32.12**	**9.8-14.8**
MW-3D[4]	5/26/2006	---	43.5	25.0	32.85	32.46	35.5-43.5
MW-4	7/27/1995	---	14.6	17.0	33.02	32.68	9.6-14.6
MW-5	**7/27/1995**	**Zone 1**	**14.0**	**14.0**	**31.98**	**31.60**	**9.0-14.0**
MW-6R[5]	9/23/2002	---	15.0	13.0	35.16	34.85	10.0-15.0
MW-7	**9/24/2002**	**Zone 2**	**15.0**	**13.0**	**32.35**	**32.05**	**10.0-15.0**
MW-8	9/24/2002	---	15.0	13.0	31.86	31.31	10.0-15.0
MW-9	**10/31/2002**	**Zone 3**	**16.0**	**15.0**	**31.30**	**31.06**	**11.0-16.0**
MW-10	5/26/2006	---	20.0	19.0	34.53	34.21	15.0-20.0
MW-11	**3/12/2008**	**Zone 3**	**17.0**	**16.0**	**31.19**	**30.71**	**12.0-17.0**
MW-12	**3/11/2008**	**Zone 3**	**18.0**	**17.0**	**32.13**	**31.77**	**13.0-18.0**
MW-13	**3/11/2008**	**Zone 3**	**18.0**	**17.0**	**33.81**	**33.38**	**13.0-18.0**
MW-14	3/11/2008	---	17.0	16.0	32.23	31.67	12.0-17.0
MW-15	3/12/2008	---	17.0	16.2	36.97	36.51	12.0-17.0
MW-16[4]	7/22/2011	---	28.0	28.0	29.72	29.46	23.0-28.0
MW-17[4]	7/22/2011	---	26.0	26.0	30.47	30.05	21.0-26.0
MW-18[4]	7/22/2011	---	20.5	20.5	31.05	30.67	15.5-20.5
MW-19[4]	7/22/2011	---	20.5	20.5	32.37	31.82	15.5-20.5
MW-20	**Proposed**	**Zone 2**	**~25.0**	**---**	**---**	**---**	**~20.0-25.0**
MW-21	**Proposed**	**Zone 2**	**~20.0**	**---**	**---**	**---**	**~15.0-20.0**
MW-22	**Proposed**	**Zone 2**	**~15.0**	**---**	**---**	**---**	**~10.0-15.0**
MW-23	**Proposed**	**Zone 2**	**~15.0**	**---**	**---**	**---**	**~10.0-15.0**
MW-24	**Proposed**	**Zone 2**	**~15.0**	**---**	**---**	**---**	**~10.0-15.0**

Notes:

Bolded rows indicated monitor wells which are proposed for injections.

(1) See Figure 3 for locations. Monitor wells and proposed injection/monitor wells completed with 4-inch diameter, Schedule 40 PVC riser and screen, and flush-mount surface casings except where noted.

(2) Feet below ground surface.

(3) Feet above mean sea level.

(4) Constructed with 2-inch diameter, Schedule 40 PVC riser and screen.

(5) Replacement for Monitor Well MW-6 (constructed 7/28/1995).

3.1.3 Injectant Delivery Method

As described above, during pilot testing the injectant was typically pressure fed into the injection points. In order to facilitate the relatively low to moderate permeability of the receiving overburden, the injectant had to be significantly diluted which increased the total volume of liquid being injected. Daylighting occurred at previously completed injection locations, and also on the opposite side of the building from the injection area and is most likely due to the influence of a void space associated with the building foundation. Considering these factors, LBGES is proposing to gravity feed the injectant rather than injecting under pressure. This delivery method will require additional time to complete, but as described previously, should allow for: 1) better distribution across the remedial action treatment area; 2) a maintained level of carbon source; and 3) should not adversely affect operation of the existing SSDS. This method will also allow for use of an optimal mixture ratio which is anticipated to be 9:1 water to sodium lactate, which is similar to that used during the pilot test. During each delivery event, each injection well will be filled with the 9:1 treatment solution to a depth of no less than 5 ft bg. Depending on the rate at which the formation accepts the mixture at the respective location, the injections are currently anticipated to be delivered more than once a week contingent upon the local formation assimilation capacity. Initially, eight (8), 55-gallon drums of "fresh" lactate will be stored on-site for use with the first few injection rounds. Eight drums were used during the pilot test injections. Once fine tuning of the delivery volumes and mixtures appropriate for the local formation is established, more appropriate volumes of lactate will be ordered and stored for future use.

3.1.4 Potential Receptors

The routing of the piping and catch basins for the on-site storm water system traverse much of the remedial action treatment area (Figure 3). In addition, the route of the public sanitary sewer system serving the Site is located within Platinum Avenue, proximal to the remedial action treatment area.

As with the pilot test, it is not anticipated that the injection of WILCLEAR PLUS™ solution during the full-scale remedial efforts will seep into the on-site storm-water and off-site sanitary sewer systems because the corresponding system components are located at higher elevations than that of the on-site groundwater and injectant-resulting mounding zone. Substantiation of this condition is supported by LBG personnel noting during the pilot test that no odors or brown-colored water typically associated with the utilized lactate mixture were observed in the catch basins during or following the pilot test injections. In addition, water levels measured at nearby monitor wells and catch basins in connection with the pilot test injections did not exhibit any evidence of groundwater mounding. Though it is anticipated that similar conditions will prevail during the full-scale remedial efforts, water levels will be monitored throughout the remedial action. The use of gravity fed injections rather than pressure

fed injections has been selected to further reduce the potential for groundwater mounding into the respective utility systems.

There are no on-site or off-site wetlands, streams, or other environmentally sensitive habitats anticipated to potentially be disturbed by the proposed remedial action. As such, none of these are considered potential receptors.

3.1.5 Design Plans and Specifications

As the only additional infrastructure planned for installation as part of the proposed full-scale remedial effort is the addition of several monitor (injection) wells, the inclusion of design plans and specifications are not warranted as part of this submittal. However, construction information for proposed Monitor Wells MW-20 and MW-21 (and possibly Monitor Well MW-22) is provided on Table 1.

3.2 Effectiveness Monitoring

Similar to the pilot test, the effectiveness monitoring program for the full-scale design will include the collection of water samples from selected monitor wells and subsequent analyses for the targeted contaminants (PCE and related CVOCs) and field parameters, including dissolved oxygen, oxidation reduction potential (ORP), temperature, and pH. In addition, the collected samples will be analyzed for nitrate/nitrite, total and dissolved metals (iron, manganese, etc.), sulfate, alkalinity, biological oxygen demand (BOD), chemical oxygen demand (COD), permanent gases (ethene, ethane, methane and carbon dioxide), and total organic carbon (TOC). Many of these parameters and compounds will be analyzed for in order to assess the establishment and persistence of anaerobic processes.

Two years of quarterly monitoring are proposed in connection with assessing the effectiveness of the full scale remedial activities. The effectiveness monitoring program will include a baseline sampling round, followed by eight quarterly rounds associated with corresponding injections, and completion of a full post-injection program. Summaries of the targeted parameters for the corresponding sampling rounds and associated schedule are provided as follows in Tables 2 and 3:

TABLE 2
Summary of Analyses for Proposed Effectiveness Monitoring Program

Parameter	Monitoring Round			
	Pre-Injection Baseline (one time - all monitor wells)	Injection Monitoring (quarterly for 2 years proposed)		Final Post-Injection Post-Treatment (one time - all monitor wells)
		Monitor Wells Within Treatment Area	Monitor Wells Outside Treatment Area	
Volatile Organic Compounds	X	X	X	X
Total Metals	X	X	X	X
Dissolved Metals	X	X	---	X
Nitrate/Nitrite	X	X	---	X
Sulfate	X	X	---	X
Permanent Gases	X	X	---	X
Chemical Organic Demand	X	X	---	X
Biological Organic Demand	X	X	---	X
Total Organic Carbon	X	X	---	X
Alkalinity	X	X	---	X
DO, ORP, pH, Temperature (field)	X	X	X	X
Specific Conductance (field)	X	X	---	X

TABLE 3
Sampling Schedule for Proposed Effectiveness Monitoring Program

Monitor Well	Monitoring Round			
	Pre-Injection Baseline (one time)	Injection Monitoring (quarterly for 2 years proposed)		Final Post-Injection Post-Treatment (one time)
		Monitor Wells Within Treatment Area	Monitor Wells Outside Treatment Area	
MW-1	X	---	---	X
MW-2	X	---	X	X
MW-3 (Zone 1 injection)	X	X (injection)	---	X
MW-3D	X	X	---	X
MW-4	X	X	---	X
MW-5 (Zone 1 injection)	X	X (injection)	---	X
MW-6R	X	---	X	X
MW-7 (Zone 2 injection)	X	X (injection)	---	X
MW-8	X	X	---	X
MW-9 (Zone 3 injection)	X	X (injection)	---	X
MW-10	X	---	X	X
MW-11 (Zone 3 injection)	X	X (injection)	---	X
MW-12 (Zone 3 injection)	X	X (injection)	---	X
MW-13 (Zone 3 injection)	X	X (injection)	---	X
MW-14	X	---	---	X
MW-15	X	---	---	X
MW-16	X	---	X	X
MW-17	X	---	X	X
MW-18	X	---	X	X
MW-19	X	---	X	X
MW-20 (proposed Zone 2 injection)	X	X (injection)	---	X
MW-21 (proposed Zone 2 injection)	X	X (injection)	---	X
MW-22 (proposed Zone 2 injection)	X	X (injection)	---	X
MW-23 (proposed Zone 2 injection)	X	X (injection)	---	X
MW-24 (proposed Zone 2 injection)	X	X (injection)	---	X

Because the proposed monitoring is limited in areal extent and duration, and no impacts to the surrounding community or to environmental resources are anticipated, a Remedial Action Monitoring Plan (RAMP) and Community and Environmental Response Plan (CERP) are not warranted for inclusion in this RDWP. The proposed monitor (injection) well construction work will be completed in accordance with a Community Air Monitoring Plan (CAMP) as required.

4.0 PERMITS

Similar to the pilot test study, completion of a United States Environmental Protection Agency (USEPA) Class V injection well inventory will be required in connection with the implementation of the proposed full-scale remedial activities at the Site. A draft "Injection Well Authorization" form is provided in Appendix VI which identifies the monitor (injection) wells proposed and those being selected from the existing monitor well network. Upon approval of this RDWP, LBGES will submit the well inventory, with any required modifications, to the USEPA in support of its issuance of an "authorization by rule" to GGP prior to initiating full-scale injection activities.

As previously described, the full-scale remedial activities will utilize only existing and newly constructed monitor (injection) wells. Therefore, only NYSDEC well permits will be required. New York City road opening permits will not be required as no well construction is planned off-site.

5.0 SCHEDULE

Following approval of this RDWP by the NYSDEC, LBGES will submit the well inventory to the USEPA. LBGES anticipates the "authorization by rule" will be received approximately two (2) months following its submittal. Assuming receipt of approval of this RDWP from the NYSDEC in June 2016, the authorization by rule should be received in August 2016. The proposed monitor (injection) wells will be constructed, developed, and the baseline sampling completed within about one month following receipt. Assuming a September 2016 baseline sampling round, full-scale remedial activities can be initiated in the fall of 2016. The utilized injection schedule will be based on the site-specific assimilation conditions. The effectiveness monitoring will continue through the fall of 2018. Depending on the results, additional injections and monitoring may be required and will be coordinated with the NYSDEC.

6.0 POST-CONSTRUCTION PLANS

6.1 Environmental Easement (EE)

As described in Section 1.2.1, the final EE document was forwarded by GGP to the NYSDEC in November 2015. A response has not been received to date regarding this submittal.

6.2 Site Management Plan (SMP)

The final SMP for the Site will include: 1) a cover system for soil (overburden); 2) an O&M plan for the existing SSDS which addresses vapor intrusion mitigation; and 3) proposed measures to address any remaining groundwater contamination as warranted. In addition, the final SMP will include a plan to maintain the storm drain system at the Site due to its potential to influence residual PCE concentrations in the local groundwater.

Typically, post-construction sampling is required for SSDS installations; however, the SSDS confirmatory sampling has already been completed, and the results have been provided to the NYSDEC and NYSDOH. The results confirm that the SSDS is operating properly. The SMP will be finalized following implementation of the full-scale remedial activities.

6.3 Final Engineering Report (FER)

Following NYSDEC approval of the SMP, the FER will be submitted to the NYSDEC. As there is no additional infrastructure construction planned with the exception of monitor well installations, as-builts and post-construction sampling will not be required as part of the FER. However, an updated monitor well construction summary will be provided.

7.0 SUMMARY

This RDWP presents the design for the full-scale in-situ bioremediation activities to be implemented at the Carol Cleaners site in Staten Island, New York. This RDWP was prepared by LBGES on behalf of GGP in accordance with the ROD issued for the Site in March 2012, and is in substantial conformance with the requirements of DER-10.

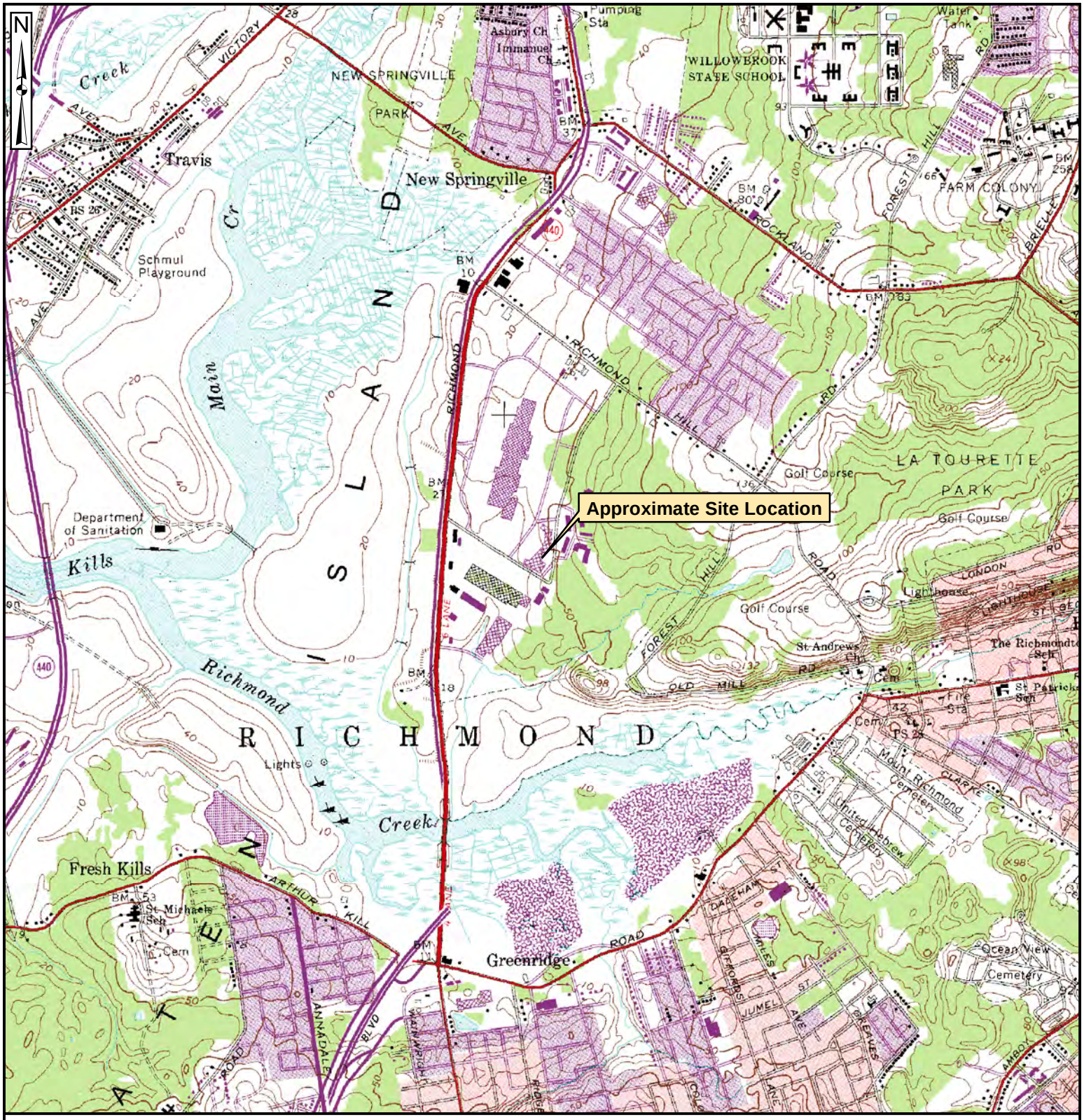
Very Truly Yours
LBG ENGINEERING SERVICES, P.C.

Christine H. Stokes
Senior Environmental Engineer

Frank Getchell, P.G.
Director

William K. Beckman, P.E.
President

FIGURES



BASE SOURCE: USGS COLOR TOPO 24K

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

SITE LOCATION

USGS 7.5 Minute Topographic Quadrangle
(10 foot Contour Inverval)
- Arthur Kill, NY, NJ; 1966, P.R. 1981.
P.R. - Photo Revised

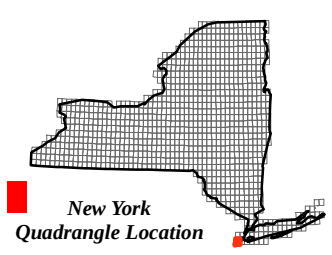
Prepared by:
LBG ENGINEERING SERVICES, PC
Professional Groundwater and Environmental Services
600 East Crescent Avenue, Suite 200
Upper Saddle River, New Jersey 07458
(201) 818-0700 www.lbgweb.com

DATE: 12/17/15
FILE: B:\Carol Cleaners\GIS\maps\
DRAWN BY: ZT
CHECKED BY: CS
FIGURE: 1

Legend

- Injection Point
- Monitor Well
- Catch Basin

100 50 0 100 Feet



BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

SITE PLAN AND PILOT TEST
INJECTION POINT LOCATIONS

Prepared by:
LBG ENGINEERING SERVICES, PC
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600 East Crescent Avenue, Suite 200
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 2

Legend

- Monitor Well with ID and PCE Concentration in parts-per-billion (ppb)
- Catch Basin
- General Layout
- Approximate Location of Proposed Monitor (Injection) Wells
- Location of Existing Monitor Well Proposed for Injection

PCE Concentration (ppb)

>5 >50 >500

100 50 0 100 Feet

New York Quadrangle Location

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

POST-INJECTION GROUNDWATER SAMPLING RESULTS OCTOBER 2015 AND PROPOSED INJECTION LOCATIONS

Prepared by:
LBG ENGINEERING SERVICES, PC
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DATE: 05/12/16			
FILE: B:\Carol Cleaners\GIS\maps\	DRAWN BY: ZT	CHECKED BY: CS	FIGURE: 3

APPENDIX I

PILOT TEST SUMMARY TABLES

TABLE 1

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Summary of Injection Point Depths and Quantities of WILCLEAR PLUS Mixture Injected for Pilot Test Injection Round of November 19 through 25, 2014

Injection Point[(1)]	Depth (ft bg)[(2)]	Quantity of Mixture Injected (gallons)
IP-1	15	550
IP-2	15	550
IP-3	15	550
IP-4	15	550
IP-6[(3)]	14	110
IP-7	12	550
IP-8	15	550
IP-9	13	492
IP-10	9	257

Notes:

[(1)] See Figure 2 for locations.

[(2)] Feet below grade (ft bg).

[(3)] Subsurface conditions at Injection Point IP-6 significantly restricted injection of mixture.

TABLE 2

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Historical Groundwater Sampling Results for Select CVOCs

Well ID	Sample Date	Depth to Water[1]	TOC Elevation	Groundwater Elevation[2]	Concentration (ug/L)[3] Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
MW-1									
	7/31/1995	11.20	41.93	30.73	ND[4]	ND	ND	ND	ND
	9/14/1995	11.85		30.08	ND	ND	ND	ND	ND
	11/20/2002	11.36		30.57	ND	ND	ND	ND	ND
	7/31/2003	10.96		30.97	ND	ND	ND	ND	ND
	10/16/2003	11.65		30.28	ND	ND	ND	ND	ND
	1/20/2004	11.38		30.55	ND	ND	ND	ND	ND
	4/26/2004	10.65		31.28	ND	ND	ND	ND	ND
	7/21/2004	10.63		31.30	ND	ND	ND	ND	ND
	4/7/2008	11.10		30.83	4.8	ND	ND	ND	ND
	9/29/2009	11.71		30.22	ND	ND	ND	ND	ND
	8/2/2011	11.64	44.28	32.64	ND	ND	ND	ND	ND
	2/1/2013	11.90		32.38	ND	ND	ND	ND	ND
	10/8/2015	12.19		32.09	ND	ND	ND	ND	ND
MW-2									
	7/31/1995	7.70	35.62	27.92	**21**	ND	1.7	ND	ND
	9/14/1995	8.26		27.36	**11**	1	2	ND	ND
	11/20/2002	7.98		27.64	**49.2**	1.9	0.38	ND	ND
	7/31/2003	7.44		28.18	**53.2**	1.8	ND	ND	ND
	10/16/2003	8.05		27.57	**50.2**	1.5	ND	ND	ND
	1/20/2004	7.90		27.72	**42.3**	1.4	ND	ND	ND
	4/26/2004	7.34		28.28	**43.9**	1.4	ND	ND	ND
	7/21/2004	7.35		28.27	**48.8**	1.5	ND	ND	ND
	4/7/2008	7.41		28.21	**41.4**	1.1	ND	ND	ND
	9/30/2009	7.91		27.71	**36**	0.89 J	ND	ND	ND
	8/2/2011	7.73	37.74	30.01	**31.9**	3.9	0.3 J[5]	ND	0.58 J
	1/28/2013	7.27		30.47	ND	ND	ND	ND	ND
	5/19/2014	7.38		30.36	ND	ND	ND	ND	**4.4**
	1/19/2015	7.78		29.96	ND	ND	ND	ND	0.44 J
	4/7/2015	7.51		30.23	ND	ND	ND	ND	ND
	7/1/2015	7.65		30.09	ND	ND	ND	ND	0.68 J
	10/8/2015	8.31		29.43	ND	ND	1	ND	1.6
MW-3									
	7/31/1995	7.10	30.04	22.94	**25**	**3.7**	**6.9**	ND	ND
	11/20/2002	7.24		22.80	**2,030**	**323**	**205**	ND	**4.8**
	7/31/2003	6.71		23.33	**7,290**	**1,370**	**645**	ND	ND
	10/16/2003	7.19		22.85	**5,090**	**934**	**707**	**5.4**	**10.8**
	1/20/2004	6.89		23.15	**2,770**	**433**	**352**	**11.4**	ND
	4/26/2004	6.47		23.57	**5,170**	**540**	**368**	ND	ND
	7/21/2004	6.80		23.24	**8,340**	**1,550**	**1,040**	**8.5**	**22.1**
	4/7/2008	6.66		23.38	**442**	**112**	**110**	0.8 J	**3.9**
	9/29/2009	7.31		22.73	**993**	**191**	**210**	1.8	**3.2**
	8/3/2011	6.99	32.12	25.13	**694**	**146**	**115**	1	**3.2**
	1/30/2013	7.17		24.95	**478**	**110**	**85**	0.69 J	0.96 J
	5/20/2014	6.83		25.29	**459**	**96.1**	**66.2**	0.73 J	ND
	11/18/2014	7.50		24.62	**396**	**80.9**	**44.6**	ND	ND
	1/20/2015	6.99		25.13	**1,000**	**714**	**1,030**	ND	**22.8**
	4/7/2015	6.41		25.71	**9.8 J**	2.7 J	**2,840**	**7.7 J**	**307**
	6/30/2015	6.42		25.70	**15.3**	2.9	**161**	2.8	**189**
	10/7/2015	7.08		25.04	**16.2**	**5.1**	**9.6**	ND	**7**
MW-3D									
	4/7/2008	6.52	30.31	23.79	2.7	ND	0.95 J	ND	ND
	9/29/2009	8.08		22.23	1	0.4 J	4.1	ND	ND
	8/3/2011	7.42	32.46	25.04	1.7	0.51 J	3.6	ND	ND
	2/1/2013	6.02		26.44	3.4	0.49 J	2.8	ND	ND
	5/20/2014	8.27		24.19	**6.2**	0.8 J	2.4	ND	ND
	1/20/2015	6.77		25.69	**5**	0.68 J	1.7	ND	ND
	4/7/2015	6.78		25.68	4.8	1	2	ND	ND
	6/30/2015	6.85		25.61	**5.7**	0.95 J	2.4	ND	ND
	10/7/2015	8.04		24.42	3.9	1.1	2.2	ND	ND
MW-4									
	7/31/1995	8.46	30.58	22.12	ND	ND	2.9	ND	ND
	9/14/1995	9.13		21.45	0.56	ND	2.4	ND	ND
	11/20/2002	8.37		22.21	**137**	**105**	**747**	**10**	**73.6**
	7/31/2003	7.95		22.63	**41.2**	**43.7**	**394**	**5.5**	**49.5**
	10/16/2003	8.43		22.15	**83.1**	**69**	**299**	4.7	**30.1**
	1/20/2004	8.38		22.20	**74.6**	**77.3**	**182**	3.9	**23.8**
	4/26/2004	7.70		22.88	**52.8**	**60.3**	**121**	2.5	**21.3**
	7/21/2004	7.81		22.77	**33.1**	**36.8**	**78.9**	2.3	**10.7**
	4/7/2008	7.63		22.95	**8,810**	**2,490**	**2,200**	**18.2 J**	**67.7**
	9/29/2009	8.36		22.22	**3,850**	**828**	**543**	**14.9**	**7.4 J**
	8/3/2011	8.24	32.68	24.44	**2,490**	**694**	**696**	**7.9**	**10.2**
	1/30/2013	8.04		24.64	**886**	**415**	**928**	**9.2**	**2.7**
	5/20/2014	8.16		24.52	**898**	**378**	**3,180**	**20.3**	**160**
	11/18/2014	8.74		23.94	**444**	**141**	**634**	**12.1**	ND
	1/20/2015	8.22		24.46	**70.3**	**12**	**2,320**	**12.1**	**132**
	4/7/2015	7.64		25.04	**28.5**	**6.4 J**	**2,580**	**14.3**	**209**
	6/30/2015	7.69		24.99	**20.8**	**8.4**	**1,090**	**13.7**	**293**
	10/7/2015	8.94		23.74	**39.7**	**40.5**	**153**	**6.7**	**136**
MW-5									
	7/31/1995	9.33	29.5	20.17	**71**	**24**	**82**	ND	ND
	9/14/1995	10.00		19.50	**660**	**500**	**2,300**	**21**	ND
	11/20/2002	8.91		20.59	**32.9**	**11.7**	3	ND	ND
	7/31/2003	8.49		21.01	**38.6**	**9.3**	2	ND	ND
	10/16/2003	8.98		20.52	**32.7**	**8.1**	4.6	ND	ND
	1/20/2004	8.58		20.92	**35.5**	**10.1**	**5.4**	ND	ND
	4/26/2004	8.50		21.00	**41.4**	**13.5**	**13.5**	ND	ND
	7/21/2004	8.75		20.75	**50.2**	**20.3**	**20**	ND	ND
	4/7/2008	8.21		21.29	**57.1**	**9.9**	4.1	ND	ND
	9/29/2009	8.60		20.90	**72.4**	**7.2**	3.9	ND	ND
	8/3/2011	8.10	31.6	23.50	**43.3**	2.4	0.42 J	ND	ND
	1/30/2013	7.26		24.34	**41.1**	2.2	1.6	ND	ND
	5/20/2014	7.10		24.50	**6.7**	2.3	0.96 J	ND	ND
	11/18/2014	7.17		24.43	**12.3**	2.8	1.5	ND	ND
	1/20/2015	8.56		23.04	0.65 J	0.52 J	**13.2**	ND	0.22 J
	4/9/2015	7.91		23.69	**5.2**	3	3.7	ND	ND
	6/30/2015	7.42		24.18	0.55 J	**7.4**	**9.3**	ND	0.29 J
	10/7/2015	8.36		23.24	0.68 J	4.5	**13.5**	ND	1.5
MW-6R									
	7/31/1995	6.04	32.72	26.68	1.1	ND	ND	ND	ND
	9/14/1995	7.12		25.60	ND	ND	ND	ND	ND
	11/20/2002	6.11		26.61	ND	ND	ND	ND	ND
	7/31/2003	6.49		26.23	ND	ND	ND	ND	ND
	10/16/2003	6.98		25.74	ND	ND	ND	ND	ND
	1/20/2004	6.30		26.42	ND	ND	ND	ND	ND
	4/26/2004	5.97		26.75	ND	ND	ND	ND	ND
	7/21/2004	5.80		26.92	ND	ND	ND	ND	ND
	4/7/2008	5.99		26.73	1	ND	ND	ND	ND
	9/29/2009	7.30		25.42	ND	ND	ND	ND	ND
	8/2/2011	7.28	34.85	27.57	ND	ND	ND	ND	ND
	2/1/2013	6.80		28.05	ND	ND	ND	ND	ND
	5/19/2014	6.29		28.56	ND	ND	ND	ND	ND
	10/7/2015	7.17		27.68	ND	ND	ND	ND	ND
NYSDEC Groundwater Standards					**5**	**5**	**5**	**5**	**2**

TABLE 2

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Historical Groundwater Sampling Results for Select CVOCs

Well ID	Sample Date	Depth to Water[1]		Ground-Water Elevation[2]	Concentration (ug/L)[3] Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
MW-7									
	11/20/2002	7.75	29.92	22.17	**5.4**	0.61	ND	ND	ND
	7/31/2003	7.40		22.52	2.7	ND	ND	ND	ND
	10/16/2003	7.73		22.19	4.9	ND	ND	ND	ND
	1/20/2004	7.76		22.16	**6.8**	0.67	ND	ND	ND
	4/26/2004	7.54		22.38	**5.9**	0.53	ND	ND	ND
	7/21/2004	7.55		22.37	**7.3**	0.81	ND	ND	ND
	4/7/2008	7.40		22.52	**10.3**	0.96 J	0.59 J	ND	ND
	9/29/2009	7.91		22.01	**6.5**	0.57 J	ND	ND	ND
	8/3/2011	7.34	32.05	24.71	**6.9**	0.52 J	ND	ND	ND
	1/30/2013	7.36		24.69	**9.5**	0.72 J	0.22 J	ND	ND
	5/19/2014	7.12		24.93	**14.2**	0.56 J	ND	ND	ND
	10/7/2015	8.01		24.04	**18.5**	0.46 J	0.38 J	ND	ND
MW-8									
	11/20/2002	8.35	29.21	20.86	**39.8**	**6.6**	3.1	ND	ND
	7/31/2003	8.02		21.19	**35.1**	**5**	2.2	ND	ND
	10/16/2003	8.40		20.81	**52.6**	**8.4**	3.8	ND	ND
	1/20/2004	8.45		20.76	**49.9**	**8**	3.7	ND	ND
	4/26/2004	7.91		21.30	**37**	**6**	2.5	ND	ND
	7/21/2004	8.05		21.16	**51.8**	**9.4**	4.3	ND	ND
	4/7/2008	8.02		21.19	**35.5**	**5.7**	2.6	ND	ND
	9/29/2009	8.55		20.66	**24.7**	4.9	2.9	ND	ND
	8/3/2011	8.23	31.31	23.08	**37.1**	**6.4**	3.2	ND	ND
	1/30/2013	8.45		22.86	**29.1**	**5.3**	2.3	ND	ND
	10/7/2015	8.58		22.73	**25.5**	**5.3**	2.6	ND	ND
MW-9									
	11/20/2002	9.55	28.87	19.32	**110**	**46.3**	**174**	1.3	ND
	7/31/2003	9.17		19.70	**103**	**42.4**	**111**	0.95	1
	10/16/2003	9.17		19.70	**159**	**51.4**	**174**	1.3	1.9
	1/20/2004	9.85		19.02	**151**	**49.2**	**135**	0.95	1.7
	4/26/2004	9.23		19.64	**181**	**58.1**	**130**	ND	ND
	7/21/2004	9.45		19.42	**163**	**54**	**132**	1.1	1.8
	4/7/2008	9.11		19.76	**344**	**70.7**	**141**	1.1	**3.6**
	9/30/2009	9.80		19.07	**261**	**38.5**	**84.3**	1	1.3
	8/4/2011	10.43	31.06	20.63	**131**	**21.7**	**40.1**	ND	0.82 J
	1/29/2013	9.70		21.36	**219**	**26.1**	**47.8**	0.29 J	ND
	1/21/2015	9.71		21.35	**148**	**17.2**	**27.5**	ND	ND
	4/6/2015	9.32		21.74	**53.5**	**16.3**	**36.3**	ND	1.1
	6/29/2015	9.40		21.66	**14.6**	**3.6**	**6.6**	ND	1.5
	10/6/2015	9.85		21.21	4.5	1.8	**5.4**	ND	0.47 J
MW-10									
	4/7/2008	7.66	32.07	24.41	0.56 J	ND	0.79 J	ND	ND
	9/30/2009	8.20		23.87	ND	ND	0.76 J	ND	ND
	8/3/2011	8.17	34.21	26.04	ND	ND	1.1	ND	ND
	1/31/2013	7.60		26.61	ND	ND	0.36 J	ND	ND
	10/8/2015	8.23		25.98	ND	ND	0.60 J	ND	ND
MW-11									
	4/7/2008	9.11	28.54	19.43	**1,380**	**109**	**191**	2.3 J	**3.4 J**
	9/29/2009	9.41		19.13	**931**	**91**	**129**	0.95 J	1.3 J
	8/4/2011	9.14	30.71	21.57	**560**	**84**	**117**	0.92 J	ND
	1/29/2013	9.43		21.28	**318**	**50.3**	**87.7**	0.61 J	ND
	1/21/2015	9.45		21.26	**291**	**41.5**	**95.1**	ND	0.53 J
	4/6/2015	9.15		21.56	**144**	**19.8**	**160**	0.67 J	**2.3**
	6/29/2015	9.10		21.61	**90.2**	**12.8**	**48.7**	0.77 J	0.57 J
	10/6/2015	9.58		21.13	**55.4**	**13.9**	**16.8**	0.90 J	0.91 J
MW-12									
	4/7/2008	9.81	29.61	19.80	**534**	**136**	**205**	1.3 J	**2.9**
	9/30/2009	10.21		19.40	**283**	**159**	**235**	1.3	**3.6**
	8/4/2011	9.89	31.77	21.88	**145**	**124**	**156**	0.89 J	**3**
	1/29/2013	10.20		21.57	**125**	**109**	**148**	0.54 J	1.3
	5/20/2014	9.64		22.13	**89**	**103**	**166**	0.61 J	**2.8**
	11/18/2014	10.54		21.23	**113**	**119**	**137**	0.8 J	**2**
	1/19/2015	10.17		21.60	**59.4**	**74.5**	**145**	ND	1.2
	4/6/2015	9.80		21.97	**38.7**	**47.7**	**156**	ND	1.8
	6/29/2015	9.89		21.88	**41.7**	**97.6**	**195**	0.88 J	**6**
	10/6/2015	10.32		21.45	**11.7**	**38.1**	**208**	0.97 J	**7.7**
MW-13									
	4/7/2008	10.87	31.19	20.32	**7.9**	3.4	**9.1**	ND	ND
	9/30/2009	11.41		19.78	**193**	**48.1**	**73.4**	0.34 J	1.4
	8/4/2011	11.12	33.38	22.26	**487**	**90.8**	**126**	0.71 J	**3.7**
	1/29/2013	11.32		22.06	**857**	**130**	**171**	0.77 J	1.5
	5/19/2014	10.58		22.80	**66**	**12.9**	**21**	ND	ND
	11/18/2014	11.65		21.73	**1,470**	**182**	**435**	ND	ND
	1/19/2015	11.28		22.10	**954**	**111**	**250**	ND	ND
	4/6/2015	10.67		22.71	**90.5**	**10.6**	**25.2**	ND	0.30 J
	6/29/2015	10.94		22.44	**77.7**	**63.6**	**99.3**	ND	**11.3**
	10/6/2015	11.53		21.85	**24.4**	**60.4**	**492**	4.6	**493**
MW-14									
	4/7/2008	8.69	29.54	20.85	ND	ND	ND	ND	ND
	9/30/2009	8.99		20.55	ND	ND	ND	ND	ND
	8/2/2011	---	31.67	---	NS[6]	NS	NS	NS	NS
	1/31/2013	9.02		22.65	0.29 J	ND	ND	ND	ND
	5/19/2014	8.94		22.73	ND	ND	ND	ND	ND
	10/8/2015	9.14		22.53	ND	ND	ND	ND	ND
MW-15									
	4/7/2008	7.58	34.39	26.81	ND	ND	ND	ND	ND
	9/30/2009	8.21		26.18	ND	ND	ND	ND	ND
	8/2/2011	7.67	36.51	28.84	ND	ND	ND	ND	ND
	1/28/2013	7.26		29.25	ND	ND	ND	ND	ND
	10/8/2015	8.43		28.08	ND	ND	ND	ND	ND
MW-16									
	8/4/2011	9.32	29.46	20.14	**171**	**25.6**	**58.7**	0.53 J	1.8
	1/31/2013	8.70		20.76	**72.6**	**9.6**	**12.3**	ND	ND
	1/19/2015	8.76		20.70	**110**	**14.2**	**12.8**	ND	ND
	4/6/2015	8.50		20.96	**166**	**21.7**	**30.6**	ND	0.72 J
	7/1/2015	8.45		21.01	**194**	**27.7**	**57.9**	ND	**2.4**
	10/8/2015	8.82		20.64	**124**	**16.3**	**23.2**	ND	0.43 J
MW-17									
	8/4/2011	8.75	30.05	21.30	**1,650**	**88.7**	**275**	1.8 J	**3.7**
	1/31/2013	9.08		20.97	**1,050**	**50.7**	**139**	ND	1.8 J
	1/19/2015	8.11		21.94	**1,330**	**49.2**	**69.8**	ND	ND
	4/7/2015	8.79		21.26	**1,190**	**37**	**254**	ND	**15.5**
	7/1/2015	8.76		21.29	**1,280**	**34.5**	**153**	ND	**5.3**
	10/8/2015	9.13		20.92	**868**	**66**	**158**	ND	**8.1**
MW-18									
	8/3/2011	9.34	30.67	21.33	**418**	**69.9**	**97.5**	0.83 J	1.4
	1/31/2013	9.67		21.00	**315**	**54.5**	**97.5**	0.5 J	1.3
	1/19/2015	9.54		21.13	**217**	**44.5**	**68.3**	ND	1.3
	4/7/2015	9.21		21.46	**139**	**22.2**	**38.5**	ND	ND
	7/1/2015	9.28		21.39	**203**	**46.5**	**100**	0.82 J	1.9
	10/8/2015	9.71		20.96	**75.6**	**24**	**43.7**	ND	0.89 J
MW-19									
	8/3/2011	10.04	31.82	21.78	**287**	**25.4**	**30.3**	ND	ND
	1/31/2013	10.32		21.50	**313**	**20.7**	**22.9**	ND	ND
	1/19/2015	10.26		21.56	**179**	**32.1**	**56.4**	ND	**2.1**
	4/7/2015	9.92		21.90	**280**	**46.5**	**87**	ND	1.7
	7/1/2015	10.04		21.78	**189**	**22.9**	**30.3**	ND	0.63 J
	10/8/2015	10.53		21.29	**124**	**23.9**	**82.6**	ND	**13**
NYSDEC Groundwater Standards					**5**	**5**	**5**	**5**	**2**

Notes:
[1] Feet below top of casing.
[2] Feet above mean sea level.
[3] All concentrations are presented in units of micrograms per liter. Bold values indicate the concentrations exceed the respective NYSDEC Groundwater Standards.
[4] ND - Compound not detected at laboratory detection limits.
[5] J - Estimated value.
[6] NS - Not Sampled.

TABLE 3

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Summary of Reductive Dechlorination Parameters
January 2013 Pre-Injection through October 2015 Post-Injection

Well ID[1]	Date	Methane	Ethane	Ethene	Sulfate	Carbon Dioxide	BOD[2]	COD[3]	TOC[4]	Alkalinity
		Concentration (ug/L)[5]			Concentration (mg/L)[6]					
Upgradient										
MW-1	2/1/2013	5.7	ND	ND	49.7	1,890	<3.4	40.9	4.3	305
	10/8/2015	ND[7]	ND	ND	44.1	6,350	<2.0	<20	2	263
Treatment Area										
MW-3	1/30/2013	0.15	ND	ND	31.3	291	<4.5	<20	1.3	228
	1/20/2015	20.7	0.13	1	28	1.72	15	47.6	13.5	227
	4/7/2015	38.8	0.22	1.5	<10	3,700	201	279	92.7	492
	6/30/2015	5.1	ND	0.93	10.9	3,630	26.8	71.3	19.9	433
	10/7/2015	ND	ND	ND	26.4	933	<3.4	<20	2.5	227
MW-3D	1/30/2013	0.96	ND	ND	10.4	ND	<3.4	<20	<1.0	229
	1/20/2015	40.5	ND	0.25	ND	ND	46	76.2	21.1	249
	4/7/2015	11.4	ND	0.29	10.7	ND	8.6	27.8	8.7	181
	6/30/2015	0.21	ND	ND	<10	ND	<3.4	<20	1.8	203
	10/7/2015	ND	ND	ND	<10	ND	<2.0	<20	1.5	211
MW-4	1/30/2013	2	0.26	ND	35.6	1,730	<3.4	<20	1.3	241
	1/20/2015	40.8	2.9	7.3	ND	4.66	108	143	61.6	380
	4/7/2015	48.8	1.2	4	<10	4,840	273	354	94	426
	6/30/2015	21.2	ND	2.3	<10	8,350	>227	1,490	158	578
	10/7/2015	12.1	ND	ND	16.5	13,000	16	52.5	18.1	521
MW-5	1/30/2013	ND	ND	ND	35.4	3,090	<3.4	<20	3.4	141
	1/20/2015	77.3	ND	ND	ND	16.5	<43	181	68.3	830
	4/7/2015	5.9	ND	ND	ND	7,200	<5.0	<20	8.6	178
	6/30/2015	0.32	ND	ND	39.9	10,600	<3.4	75.9	20	360
	10/7/2015	ND	ND	ND	50.2	8,400	<5.0	82.5	27.9	406
Crossgradient										
MW-6R	2/1/2013	ND	ND	ND	35.4	156	<3.4	<20	2.1	270
	10/7/2015	ND	ND	ND	32.8	567	<2.0	<20	1.9	194
MW-7	1/30/2013	0.39	ND	ND	37	182	<3.4	<20	1.5	238
	10/7/2015	ND	ND	ND	32.2	454	<2.0	<20	1.6	197
MW-8	1/30/2013	4.9	ND	ND	41.3	1,340	<3.4	<20	1.1	227
	10/7/2015	ND	ND	ND	33.2	3,690	<3.4	<20	4	192
MW-10	1/31/2013	0.89	ND	ND	48.2	611	<3.4	<20	2.4	294
	10/8/2015	ND	ND	ND	44.2	1,200	<2.0	<20	1.5	258
MW-14	1/31/2013	27.9	ND	ND	48.4	3,950	<3.4	<20	3.5	261
	10/8/2015	ND	ND	ND	43.3	8,330	<3.4	<20	2.9	290
MW-15	1/28/2013	0.39	ND	ND	50	701	<5.0	<20	2.1	364
	10/8/2015	ND	ND	ND	43.1	2,670	<2.0	<20	1.8	302
Perimeter Area										
MW-2[8]	2/1/2013	8.2	ND	ND	60.8	259	117	904	74.8	29.2
	10/8/2015	17.6	ND	ND	11.4	6,200	25.3	74.2	32	408
MW-9	1/29/2013	3.6	ND	ND	39.5	319	<5.0	<20	3.4	243
	10/6/2015	ND	ND	ND	<10	1,770	<3.4	<20	5.1	61.7
MW-11	1/29/2013	1.8	ND	ND	36.6	526	<5.0	<20	2	253
	10/6/2015	2.7	ND	ND	<10	4,790	<2.0	<20	2.5	315
MW-12	1/29/2013	62.1	ND	ND	40	1,290	<5.0	<20	4.9	426
	10/6/2015	0.92	ND	ND	20.1	14,500	<3.4	<20	5.8	316
MW-13	1/29/2013	2.9	ND	ND	43	759	<5.0	<20	3.2	342
	10/6/2015	2.4	ND	ND	12.6	1,870	<2.0	<20	3.7	299
MW-16	1/31/2013	0.17	ND	ND	40.5	1,580	<3.4	<20	2.4	265
	10/8/2015	ND	ND	ND	35.7	4,510	<2.0	<20	1.7	218
MW-17	1/31/2013	1.1	ND	ND	38.9	607	<3.4	<20	1.1	237
	10/8/2015	1.4	ND	ND	28.6	1,650	<2.0	<20	1.6	240
MW-18	1/31/2013	68.5	ND	ND	38.7	3,500	<3.4	<20	2.4	262
	10/8/2015	0.27	ND	ND	38.9	8,810	<2.0	25.6	6.6	356
MW-19	1/30/2013	ND	ND	ND	32.3	882	<3.4	<20	1.2	205
	10/8/2015	2.1	ND	ND	24.2	4,270	<2.0	<20	2.9	268

Notes:
[1] See Figure 2.
[2] BOD - Biological Oxygen Demand.
[3] COD - Chemical Oxygen Demand.
[4] TOC - Total Organic Carbon.
[5] Micrograms per liter.
[6] Milligrams per liter.
[7] ND - Not Detected.
[8] Monitor Well MW-2 is located within the perimeter zone upgradient of the source area. This monitor well routinely exhibits microbiological activity.

TABLE 4

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Summary of Metals Exceedances and Field Parameters for Treatment Zone Monitor Wells - January 2013 Pre-Injection through October 2015 Post-Injection

Well ID[1]	MW-3					MW-3D					MW-4					MW-5					NYSDEC Class GA Groundwater Standards
Date Sampled	**01/30/13**	**01/20/15**	**04/07/15**	**06/30/15**	**10/07/15**	**02/01/13**	**01/20/15**	**04/07/15**	**06/30/15**	**10/07/15**	**01/30/13**	**01/20/15**	**04/07/15**	**06/30/15**	**10/07/15**	**01/30/13**	**01/20/15**	**04/09/15**	**06/30/15**	**10/07/15**	
Constituent																					
Total Metals																					
Aluminum	<100	**167**	**129**	<200[4]	<200[4]	<100	<100	<100	<200[4]	<200[4]	<100	**218**	**315**	<200[4]	<200[4]	<100	**1,310**	--	**257**	**3,380**	**100**
Barium	<200	<200	269	316	352	<200	<200	<200	<200	<200	<200	**1,910**	667	796	**1,090**	<200	<200	826	314	<200	**1,000**
Cobalt	<5.0	<5.0	<5.0	<50[4]	<50[4]	<5.0	<5.0	<5.0	<50[4]	<50[4]	<5.0	**15.4**	**7**	<50[4]	<50[4]	<5.0	**5.9**	**97.8**	<50[4]	<50[4]	**5**
Iron	**307**	**1,710**	**2,260**	**2,780**	**1,530**	190	223	204	<100	<100	**118**	**4,660**	**4,640**	**5,060**	**5,610**	194	**8,190**	**12,000**	**4,410**	**2,530**	**300/500[3]**
Manganese	155	**1,600**	**7,940**	**3,660**	**1,190**	<15	<15	<15	<15	<15	**1,100**	**21,700**	**14,100**	**11,100**	**10,700**	<15	**11,800**	**35,700**	**13,500**	**2,480**	**300/500[3]**
Nickel	13.9	<10	<10	<10	<10	<10	<10	10.8	<10	<10	11.5	**130**	46.5	13.1	14.3	<10	14.3	100	20.9	47.1	**100**
Sodium	**133,000**	**150,000**	**217,000**	**169,000**	**210,000**	**97,800**	**125,000**	**371,000**	**184,000**	**139,000**	**146,000**	**262,000**	**325,000**	**360,000**	**540,000**	**177,000**	**280,000**	**2,420,000**	**1,430,000**	**494,000**	**20,000**
Dissolved Metals																					
Aluminum	<100	<100	<100	<200[4]	<200[4]	<100	<100	<100	<200[4]	<200[4]	<100	<100	**228**	<200[4]	<200[4]	<100	<100	<200[4]	<200[4]	**1,250**	**100**
Barium	<200	<200	247	285	325	<200	<200	<200	<200	<200	<200	**2,080**	588	757	998	<200	<200	802	311	<200	**1,000**
Cobalt	<5.0	<5.0	<5.0	<50[4]	<50[4]	<5.0	<5.0	<5.0	<50[4]	<50[4]	<5.0	**5.6**	<5.0	<50[4]	<50[4]	<5.0	**6**	**106**	<50[4]	<50[4]	**5**
Iron	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	**236**	**2,820**	**201**	**370**	<100	**1,350**	**4,290**	**229**	**1,050**	**300/500[3]**
Manganese	<15	**1,470**	**7,420**	**3,700**	**1,390**	<15	<15	<15	<15	<15	56.9	**18,600**	**9,910**	**9,750**	**8,500**	<15	**13,600**	**35,000**	**13,500**	**2,350**	**300/500[3]**
Nickel	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**114**	24.5	<10	11.2	<10	14.2	**134**	19.4	59	**100**
Sodium	**138,000**	**143,000**	**208,000**	**160,000**	**193,000**	**98,300**	**125,000**	**417,000**	**192,000**	**138,000**	**148,000**	**310,000**	**323,000**	**384,000**	**544,000**	**172,000**	**325,000**	**2,390,000**	**1,430,000**	**518,000**	**20,000**
Nitrates and Nitrites (mg/L)[5]																					
Nitrogen, Nitrate	1.6	<0.11	<0.11	<0.11	0.15	0.26	<0.11	<0.11	<0.11	<0.10	1.2	<0.11	<0.11	<0.11	<0.10	1.3	<0.11	0.13	<0.11	1.5	
Nitrogen, Nitrite	<0.010	<0.010	<0.010	<0.010	<0.002	0.16	0.019	<0.010	0.013	0.0088	<0.012	<0.010	<0.010	<0.010	<0.002	<0.010	<0.010	0.18	<0.010	<0.002	**10 (total)**
Nitrogen, Nitrate + Nitrite	1.6	<0.10	<0.10	0.1	0.15	0.28	<0.10	<0.10	<0.10	<0.10	1.2	<0.10	<0.10	<0.10	<0.10	1.3	<0.10	0.31	<0.10	1.5	
Field Parameters																					
pH (s.u.)[6]	8.18	8.37	6.94	7.71	8.39	**10.52**	**9.88**	**9.72**	**9.63**	**9.23**	6.96	**8.62**	7.35	6.98	7.66	**6.38**	7.86	7.47	7.22	6.57	**6.5 - 8.5**
Specific Conductivity (mS/cm[7])	1.27	1.35	2.1	1.67	1.91	0.556	0.615	3.18	1.33	0.701	0.71	3.35	3.13	4.17	4.54	0.559	1.53	0.76	7.76	2.44	--
Turbidity (NTU)[8]	**15.9**	**24**	**11.11**	**6.9**	2.5	**38.1**	2	0	2.7	0.3	1.9	**38.7**	**51.54**	**6.5**	3.6	**28.4**	**10**	1	**16.9**	4.1	**5**
Dissolved Oxygen (mg/L)	1.66	0.51	10.31	6.11	0.33	0	0	0.17	1.18	1.21	0.28	2.49	0.15	1.2	0.22	4.2	3.79	3.71	0.98	0.97	--
Temperature (°C)[9]	16.18	14.74	14.26	19.33	23.45	14.44	15.03	16.91	18.84	19.88	14.68	12.5	11.68	17.87	22.06	12.96	12.05	10.58	19.2	21.39	--
REDOX (mV)[10]	157	-42	-199	-231	-60	44	-278	-158	-156	85	140	-89	-196	-153	-161	199	-9	-26	-130	105	--

NOTES:

[1] See Figure 2.

[2] All concentrations are presented in micrograms per liter (ug/L) unless otherwise specified. Bold and red values indicate the concentrations which exceed the respective NYSDEC Groundwater Standards.

[3] The individual groundwater standard for iron and manganese is 300 ug/L and the total groundwater standard for iron and manganese concentrations combined is 500 ug/L.

[4] The detection limit is raised due to dilution required for possible matrix interference.

[5] Milligrams per liter (mg/L).

[6] Standard units (s.u.).

[7] Microsiemens per centimeter (mS/cm).

[8] Nephelometric turbidity units (NTU).

[9] Degrees Celcius (°C).

[10] Millivolts (mV).

TABLE 5

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Summary of Metals Exceedances and Field Parameters for Perimeter Zone Monitor Wells - January 2015 Pre-Injection through October 2015 Post-Injection

Well ID[1]	MW-2					MW-9					MW-11					MW-12					MW-13					NYSDEC Class GA Groundwater Standards
Date Sampled	**01/28/13**	**01/19/15**	**04/07/15**	**07/01/15**	**10/08/15**	**01/29/13**	**01/21/15**	**04/07/15**	**07/01/15**	**10/06/15**	**01/29/13**	**01/21/15**	**04/06/15**	**07/01/15**	**10/06/15**	**01/29/13**	**01/20/15**	**04/06/15**	**07/01/15**	**10/06/15**	**01/29/13**	**01/19/15**	**04/06/15**	**07/01/15**	**10/06/15**	
Constituent																										
Total Metals																										
Aluminum	**4,040**	**808**	**412**	**263**	**584**	**675**	**1,830**	**1,410**	**1,220**	**886**	**1,310**	**371**	**3,520**	**219**	**487**	**899**	**593**	**435**	<200[4]	**2,620**	**528**	<100	**207**	<200[4]	<200[4]	**100**
Iron	**7,870**	**3,570**	**4,140**	**4,330**	**3,670**	**6,910**	**18,600**	**7,240**	**5,740**	**4,500**	**2,010**	**522**	**6,610**	**272**	**644**	**1,680**	**1,590**	**1,960**	**2,180**	**6,440**	**1,270**	206	**677**	**889**	**1,930**	**300/500[3]**
Lead	**40.6**	12.7	<15[4]	3.2	4.7	4.4	<15[4]	7.7	7.2	7.1	3.4	<3.0	22.3	<3.0	<3.0	<3.0	<3.0	4.6	<3.0	4.7	<3.0	<3.0	< 3.0	<3.0	<3.0	**25**
Manganese	**252**	**446**	**3,060**	**1,580**	**1,120**	**624**	**1,210**	**733**	**724**	**438**	**928**	**139**	**1,770**	**542**	**579**	**1,680**	**2,630**	**3,360**	**4,240**	**3,450**	**356**	116	**745**	**2,330**	**2,170**	**300/500[3]**
Sodium	**3,810,000**	**1,640,000**	**4,680,000**	**2,500,000**	**1,770,000**	**398,000**	**2,210,000**	**587,000**	**118,000**	**85,900**	**157,000**	**224,000**	**209,000**	**251,000**	**330,000**	**248,000**	**261,000**	**314,000**	**394,000**	**355,000**	**334,000**	**289,000**	**323,000**	**405,000**	**212,000**	**20,000**
Dissolved Metals																										
Aluminum	<100	--	--	--	<200[4]	<100	**1,830**	--	--	<200[4]	<100	**371**	--	--	<200[4]	<100	--	--	--	<200[4]	<100	--	--	--	<200[4]	**100**
Iron	104	--	--	--	**229**	<100	**18,600**	--	--	**241**	<100	**522**	--	--	<100	**158**	--	--	--	**122**	<100	--	--	--	<100	**300/500[3]**
Lead	<30[4]	--	--	--	<15[4]	<3.0	<15[4]	--	--	<3.0	<3.0	<3.0	--	--	<3.0	<3.0	--	--	--	<3.0	<3.0	--	--	--	<3.0	**25**
Manganese	246	--	--	--	**1,160**	**419**	**1,210**	--	--	**475**	<15	**139**	--	--	**377**	**1,540**	--	--	--	**3,470**	<15	--	--	--	**1,830**	**300/500[3]**
Sodium	**4,850,000**	--	--	--	**2,540,000**	**423,000**	**2,221,000**	--	--	**92,400**	**180,000**	**224,000**	--	--	**312,000**	**269,000**	--	--	--	**373,000**	**386,000**	--	--	--	**216,000**	**20,000**
Nitrates and Nitrites (mg/L)[5]																										
Nitrogen, Nitrate	1.4	--	--	--	<0.11	1.8	--	--	--	0.13	1.4	--	--	--	<0.10	<0.11	--	--	--	<0.10	0.61	--	--	--	<0.10	**10 (total)**
Nitrogen, Nitrite	0.14	--	--	--	<0.010	<0.010	--	--	--	<0.002	<0.010	--	--	--	<0.002	<0.010	--	--	--	<0.002	<0.010	--	--	--	<0.002	
Nitrogen, Nitrate + Nitrite	1.5	--	--	--	<0.10	1.8	--	--	--	0.13	1.4	--	--	--	<0.10	<0.10	--	--	--	<0.10	0.61	--	--	--	<0.10	
Field Parameters																										
pH (s.u.)[6]	**6.21**	7.98	**6.17**	6.86	6.78	7.29	7.62	**9.72**	**6.22**	7.23	7.29	8.15	8.15	7.28	6.7	7	**8.72**	6.7	6.85	7.24	7.41	**9.11**	6.74	6.85	7.21	**6.5 - 8.5**
Specific Conductivity (mS/cm)[7]	23.7	9.9	24	12.1	9.99	3.38	14.8	5.65	0.77	0.301	0.828	2.07	2.07	2.38	2.64	2.51	3.08	3.57	3.94	3.38	3.01	2.47	3.15	3.73	2.1	--
Turbidity (NTU)[8]	**>999**	**51.7**	**58.4**	**9.1**	1.4	**74.4**	**77**	**41**	**199**	**145**	**83.6**	4	4	**8.7**	4	**72.9**	0	0.4	3.92	**65**	**26.1**	0	0	**5.5**	0.2	**5**
Dissolved Oxygen (mg/L)	0.17	0	0	0.94	0.63	2.27	0	0	2.05	0.31	9.26	1.9	1.9	8.13	1.83	0	4.54	4.49	3.48	0.13	6.07	0.52	10.57	7.25	7.3	--
Temperature (°C)[9]	9.78	11.11	12.51	19.91	22.23	13.25	11.88	13.21	19.26	25.67	13.15	11.36	11.36	18.42	21.12	12.57	11.64	11.66	17.94	22.29	11.91	11.96	10.97	18.41	20.74	--
REDOX (mV)[10]	3	1	-118	-117	-59	81	136	-94	3	-21	156	87	87	145	186	11	45	-22	-71	-60	157	60	85	-15	-9	--

NOTES:
[1] See Figure 2.
[2] All concentrations are presented in micrograms per liter (ug/L) unless otherwise specified. Bold and red values indicate the concentrations which exceed the respective NYSDEC Groundwater Standards.
[3] The individual groundwater standard for iron and manganese is 300 ug/L and the total groundwater standard for iron and manganese concentrations combined is 500 ug/L.
[4] The detection limit is raised due to dilution required for possible matrix interference.
[5] Milligrams per liter (mg/L).
[6] Standard units (s.u.).
[7] Microsiemens per centimeter (mS/cm).
[8] Nephelometric turbidity units (NTU).
[9] Degrees Celcius (°C).
[10] Millivolts (mV).

TABLE 5

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK

Summary of Metals Exceedances and Field Parameters for Perimeter Zone Monitor Wells - January 2015 Pre-Injection through October 2015 Post-Injection

Well ID[1]	**MW-16**					**MW-17**					**MW-18**					**MW-19**					**NYSDEC Class GA Groundwater Standards**
Date Sampled	**01/31/13**	**01/19/15**	**04/06/15**	**07/01/15**	**10/08/15**	**01/31/13**	**01/19/15**	**04/07/15**	**07/01/15**	**10/08/15**	**01/31/13**	**01/19/15**	**04/07/15**	**07/01/15**	**10/08/15**	**01/30/13**	**01/19/15**	**04/07/15**	**07/01/15**	**10/08/15**	
Constituent																					
Total Metals																					
Aluminum	**4,490**	**293**	**153**	<200[4]	<200[4]	<100	<100	<200[4]	<200[4]	<200[4]	<100	**447**	**794**	**310**	**258**	<100	**201**	**229**	<200[4]	<200[4]	**100**
Iron	**7,580**	**411**	214	<100	<100	191	<100	<100	<100	<100	172	**771**	**1,210**	**450**	**373**	184	**308**	**308**	<100	<100	**300/500[3]**
Lead	12	<3.0	<3.0	<3.0	<3.0	4.4	<3.0	<3.0	<3.0	<3.0	3.2	<3.0	< 3.0	<3.0	<3.0	<3.0	<3.0	< 3.0	<3.0	<3.0	**25**
Manganese	**239**	84.7	74	82.2	96.7	39.7	<15	<15	<15	<15	108	**183**	**213**	**231**	**214**	<15	20.3	21.3	<15	<15	**300/500[3]**
Sodium	**178,000**	**218,000**	**241,000**	**214,000**	**256,000**	**198,000**	**241,000**	**235,000**	**239,000**	**291,000**	**222,000**	**205,000**	**1,310,000**	**539,000**	**1,090,000**	**153,000**	**180,000**	**181,000**	**163,000**	**259,000**	**20,000**
Dissolved Metals																					
Aluminum	<100	--	--	--	<200[4]	<100	--	--	--	<200[4]	<100	--	--	--	<200[4]	<100	--	--	--	<200[4]	**100**
Iron	<100	--	--	--	<100	<100	--	--	--	<100	<100	--	--	--	<100	<100	--	--	--	<100	**300/500[3]**
Lead	3.6	--	--	--	<3.0	3.5	--	--	--	<3.0	<3.0	--	--	--	<3.0	<3.0	--	--	--	<3.0	**25**
Manganese	51.9	--	--	--	92.8	<15	--	--	--	<15	115	--	--	--	192	<15	--	--	--	<15	**300/500[3]**
Sodium	**201,000**	--	--	--	**248,000**	**192,000**	--	--	--	**283,000**	**250,000**	--	--	--	**991,000**	**149,000**	--	--	--	**253,000**	**20,000**
Nitrates and Nitrites (mg/L)[5]																					
Nitrogen, Nitrate	0.99	--	--	--	0.88	1.7	--	--	--	0.43	0.89	--	--	--	<0.11	1.5	--	--	--	<0.11	**10 (total)**
Nitrogen, Nitrite	<0.010	--	--	--	0.013	<0.010	--	--	--	<0.010	<0.010	--	--	--	<0.010	<0.010	--	--	--	<0.010	
Nitrogen, Nitrate + Nitrite	1	--	--	--	0.89	1.7	--	--	--	0.43	0.89	--	--	--	<0.10	1.5	--	--	--	<0.10	
Field Parameters																					
pH (s.u.)[6]	7.12	7.79	6.86	6.95	7.55	7.71	8.27	7.33	7.79	7.11	6.81	8.38	7.11	7.35	7.59	7.27	8.02	6.8	7.01	6.84	**6.5 - 8.5**
Specific Conductivity (mS/cm)[7]	4.46	2.76	2.73	2.56	2.53	1.84	2.17	2.12	2.45	2.47	1.96	2.14	8.27	3.87	5.83	0.696	1.82	1.9	1.71	2.55	--
Turbidity (NTU)[8]	**11.1**	2.2	**56.5**	3.7	**8.3**	2.6	0	0	3.6	0.8	**12.9**	**42**	**72**	**6.2**	**10.3**	**11**	5	0.8	**16.1**	2.1	**5**
Dissolved Oxygen (mg/L)	0.55	0	0.13	0.6	0	0	0	0	2.31	1	0	0	0.2	2.91	0.14	0.25	0	0.8	0.45	1.05	--
Temperature (°C)[9]	15.9	14.65	14.58	16.02	18.09	15.46	14.95	14.7	16.07	17.59	14.48	12.94	12.74	17.86	20.47	14.72	13.42	13.44	16.81	18.14	--
REDOX (mV)[10]	89	146	140	67	78	154	-21	-26	23	182	100	95	11	-3	-17	117	61	40	27	184	--

NOTES:
[1] See Figure 2.
[2] All concentrations are presented in micrograms per liter (ug/L) unless otherwise specified. Bold and red values indicate the concentrations which exceed the respective NYSDEC Groundwater Standards.
[3] The individual groundwater standard for iron and manganese is 300 ug/L and the total groundwater standard for iron and manganese concentrations combined is 500 ug/L.
[4] The detection limit is raised due to dilution required for possible matrix interference.
[5] Milligrams per liter (mg/L).
[6] Standard units (s.u.).
[7] Microsiemens per centimeter (mS/cm).
[8] Nephelometric turbidity units (NTU).
[9] Degrees Celcius (°C).
[10] Millivolts (mV).

APPENDIX II

PILOT TEST GROUNDWATER FLOW MAPS AND ISOPLETHS

Legend

- Monitor Well with ID and Groundwater Elevation (ftamsl)
- Catch Basin
- Groundwater Contours and Flow Direction

100 50 0 100
Feet

New York Quadrangle Location

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

BASELINE PRE-INJECTION GROUNDWATER CONTOURS AND FLOW DIRECTION JANUARY 2013

Prepared by:

LBG ENGINEERING SERVICES, PC
Professional Groundwater and Environmental Services
600 East Crescent Avenue, Suite 200
Upper Saddle River, New Jersey 07458
(201) 818-0700 www.lbgweb.com

DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 3

Legend

- Monitor Well with Designation and PCE Concentration in parts-per-billion (ppb)
- Catch Basin

PCE Concentration (ppb)

- >5
- >50
- >500

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

100 50 0 100 Feet

New York Quadrangle Location

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

BASELINE PRE-INJECTION GROUNDWATER SAMPLING RESULTS JANUARY/FEBRUARY 2013

Prepared by:
LBG ENGINEERING SERVICES, PC
Professional Groundwater and Environmental Services
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Upper Saddle River, New Jersey 07458
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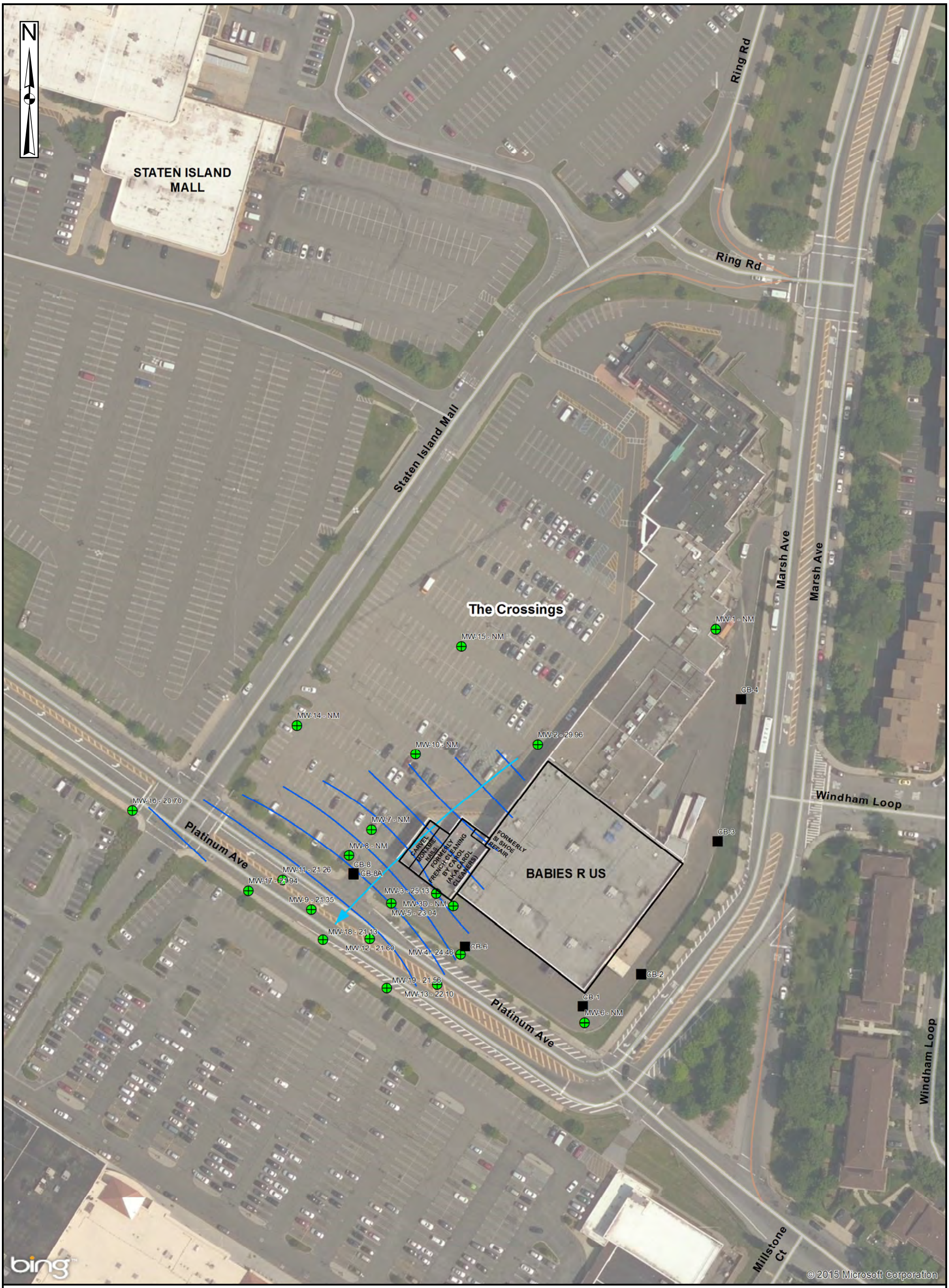
DATE: 11/06/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 4



Legend

- Monitor Well with ID and Groundwater Elevation (ftamsl)
- Catch Basin
- Groundwater Contours and Flow Direction

100 50 0 100 Feet

New York Quadrangle Location

Note: NM = Not Measured

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

GROUNDWATER CONTOURS AND FLOW DIRECTION
JANUARY 2015

Prepared by:
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Upper Saddle River, New Jersey 07458
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 5

Legend

- Monitor Well with ID and PCE Concentration in parts-per-billion (ppb)
- Catch Basin

PCE Concentration (ppb)

- >5
- >50
- >500

100 50 0 100 Feet

New York Quadrangle Location

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

POST-INJECTION GROUNDWATER SAMPLING RESULTS JANUARY 2015

Prepared by:
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Professional Groundwater and Environmental Services
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 6

Legend

- Monitor Well with ID and Groundwater Elevation (ftamsl)
- Catch Basin
- Groundwater Contours and Flow Direction

100 50 0 100 Feet

New York Quadrangle Location

Note: NM = Not Measured

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

GROUNDWATER CONTOURS AND FLOW DIRECTION
APRIL 2015

Prepared by:
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 7

Legend

- Monitor Well with ID and PCE Concentration in parts-per-billion (ppb)
- Catch Basin

PCE Concentration (ppb)

- >5
- >50
- >500

100 50 0 100 Feet

New York Quadrangle Location

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

POST-INJECTION GROUNDWATER SAMPLING RESULTS APRIL 2015

Prepared by:
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 8

Legend

- Monitor Well with ID and Groundwater Elevation (ftamsl)
- Catch Basin
- Groundwater Contours and Flow Direction

100 50 0 100 Feet

New York Quadrangle Location

Note: NM = Not Measured

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

GROUNDWATER CONTOURS AND FLOW DIRECTION
JUNE / JULY 2015

Prepared by:
LBG ENGINEERING SERVICES, PC
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 9

Legend

- Monitor Well with ID and PCE Concentration in parts-per-billion (ppb)
- Catch Basin

PCE Concentration (ppb)

- >5
- >50
- >500

100 50 0 100 Feet

New York Quadrangle Location

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

POST-INJECTION GROUNDWATER SAMPLING RESULTS JUNE/JULY 2015

Prepared by:
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DATE: 12/17/15

FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 10

Legend

- Monitor Well with ID and Groundwater Elevation (ftamsl)
- Catch Basin
- Groundwater Contours and Flow Direction

100 50 0 100
Feet

New York Quadrangle Location

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

GROUNDWATER CONTOURS AND FLOW DIRECTION
OCTOBER 2015

Prepared by:
LBG ENGINEERING SERVICES, PC
Professional Groundwater and Environmental Services
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(201) 818-0700 www.lbgweb.com

FILE: B:\Carol Cleaners\GIS\maps\	DRAWN BY: ZT	CHECKED BY: CS	DATE: 12/17/15	FIGURE: 11

Legend

- Monitor Well with ID and PCE Concentration in parts-per-billion (ppb)
- Catch Basin

PCE Concentration (ppb)

- >5
- >50
- >500

100 50 0 100 Feet

New York Quadrangle Location

Notes: ND = Non-detect, NS = Not Sampled, MW-3D is installed deeper than other monitor wells

BASE SOURCE: 2015 BING MAPS AERIAL

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC
STATEN ISLAND, NEW YORK

POST-INJECTION GROUNDWATER SAMPLING RESULTS OCTOBER 2015

Prepared by:
LBG ENGINEERING SERVICES, PC
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(201) 818-0700 www.lbgweb.com

DATE: 12/17/15

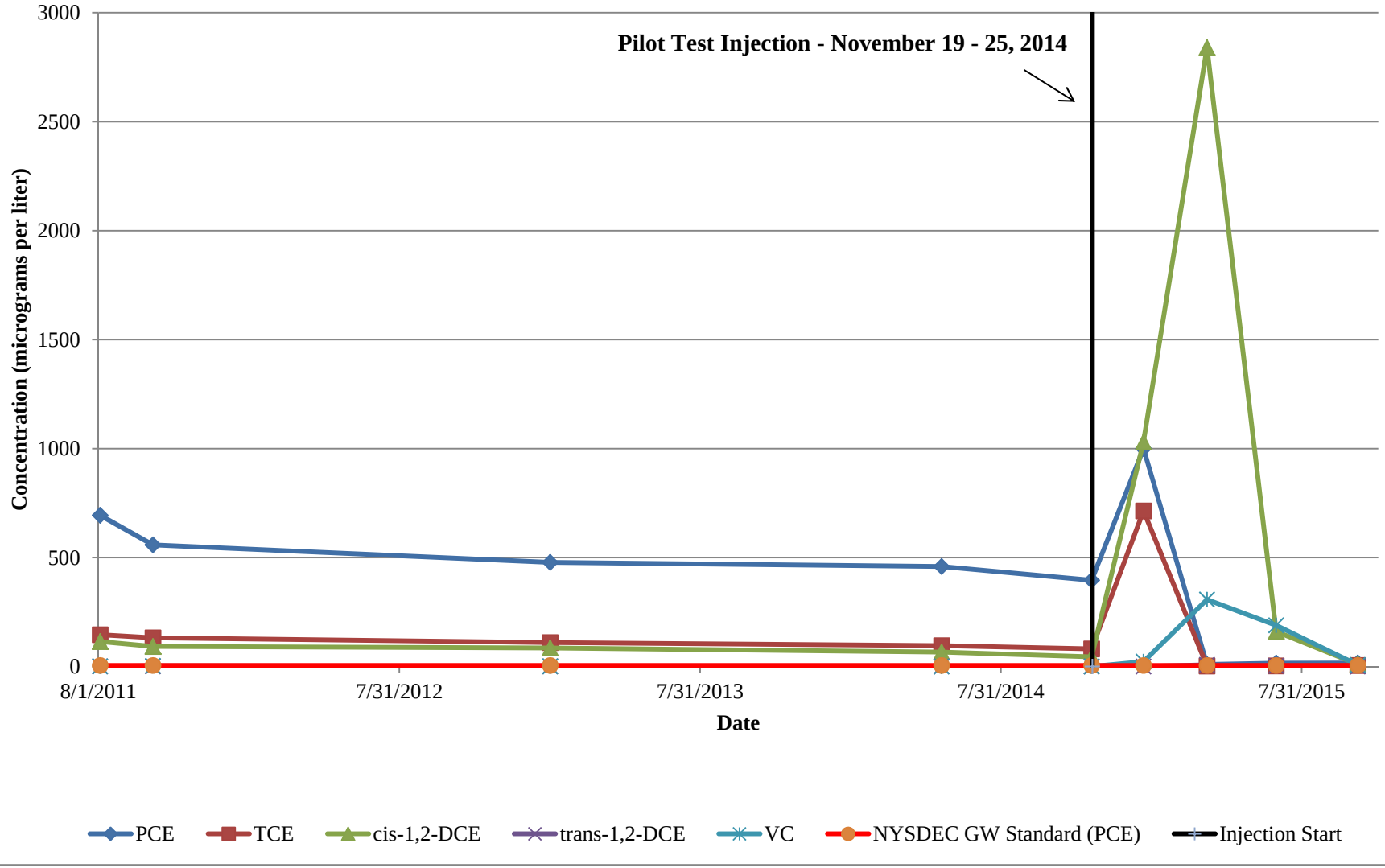
FILE: B:\Carol Cleaners\GIS\maps\ | DRAWN BY: ZT | CHECKED BY: CS | FIGURE: 12

APPENDIX III

PCE AND RELATED CVOC TREND GRAPHS

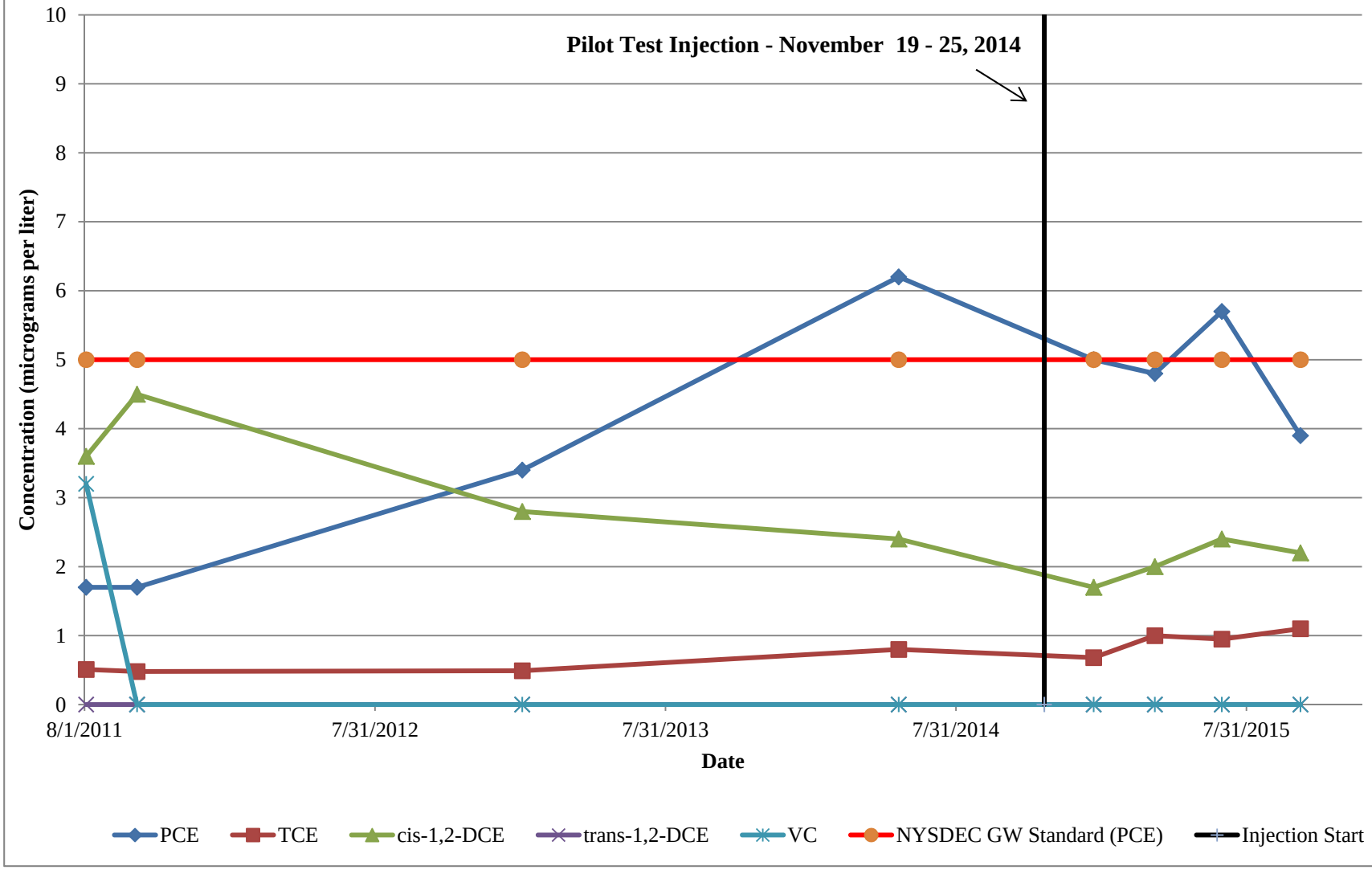
SELECT CVOC CONCENTRATIONS OVER TIME AT
TREATMENT ZONE MONITOR WELL MW-3 - 2011 TO 2015

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK



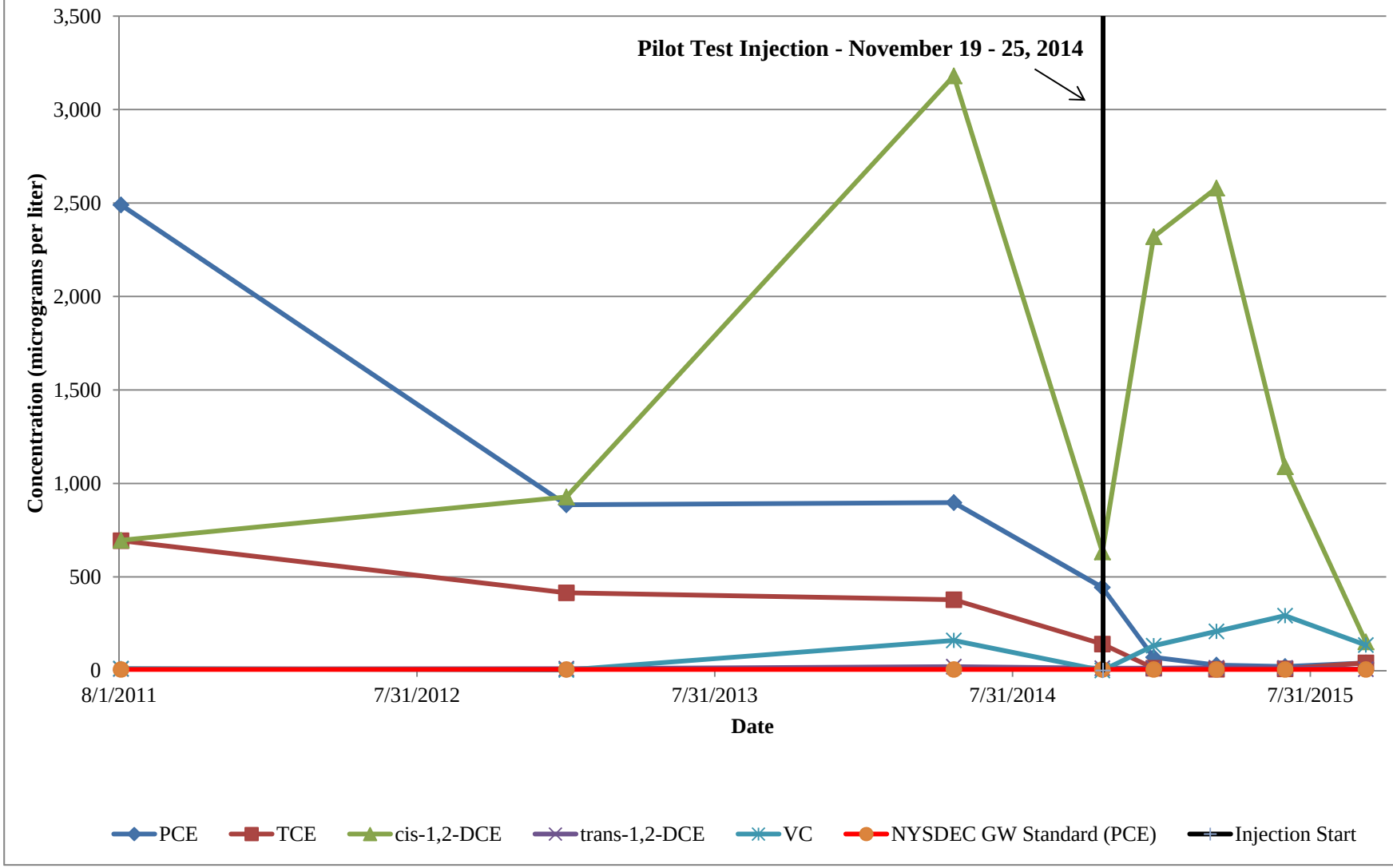
SELECT CVOC CONCENTRATIONS OVER TIME AT
TREATMENT ZONE MONITOR WELL MW-3D - 2011 TO 2015

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK



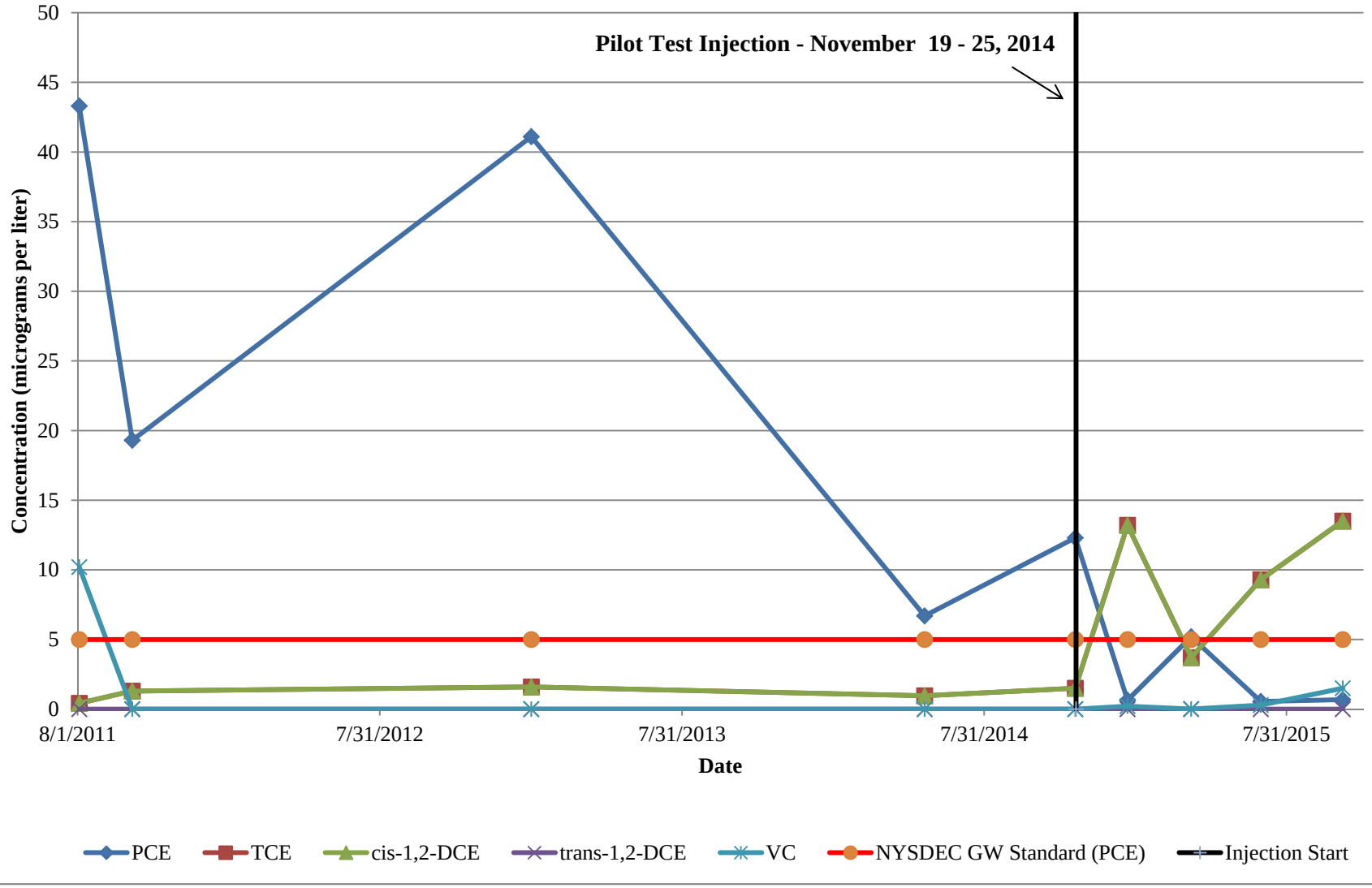
SELECT CVOC CONCENTRATIONS OVER TIME AT
TREATMENT ZONE MONITOR WELL MW-4 - 2011 TO 2015

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK



SELECT CVOC CONCENTRATIONS OVER TIME AT
TREATMENT ZONE MONITOR WELL MW-5 - 2011 TO 2015

THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK



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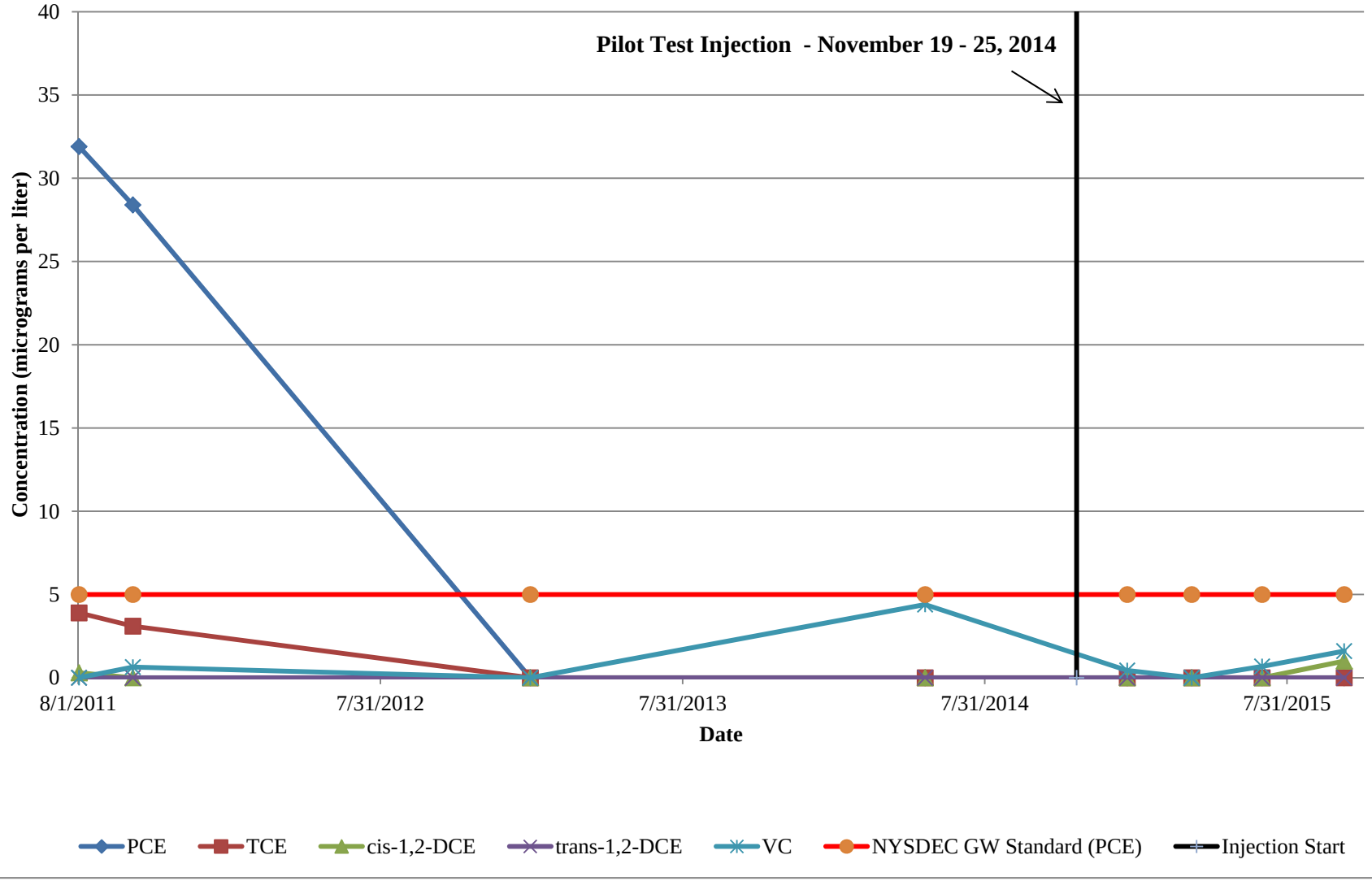
STATEN ISLAND, NEW YORK



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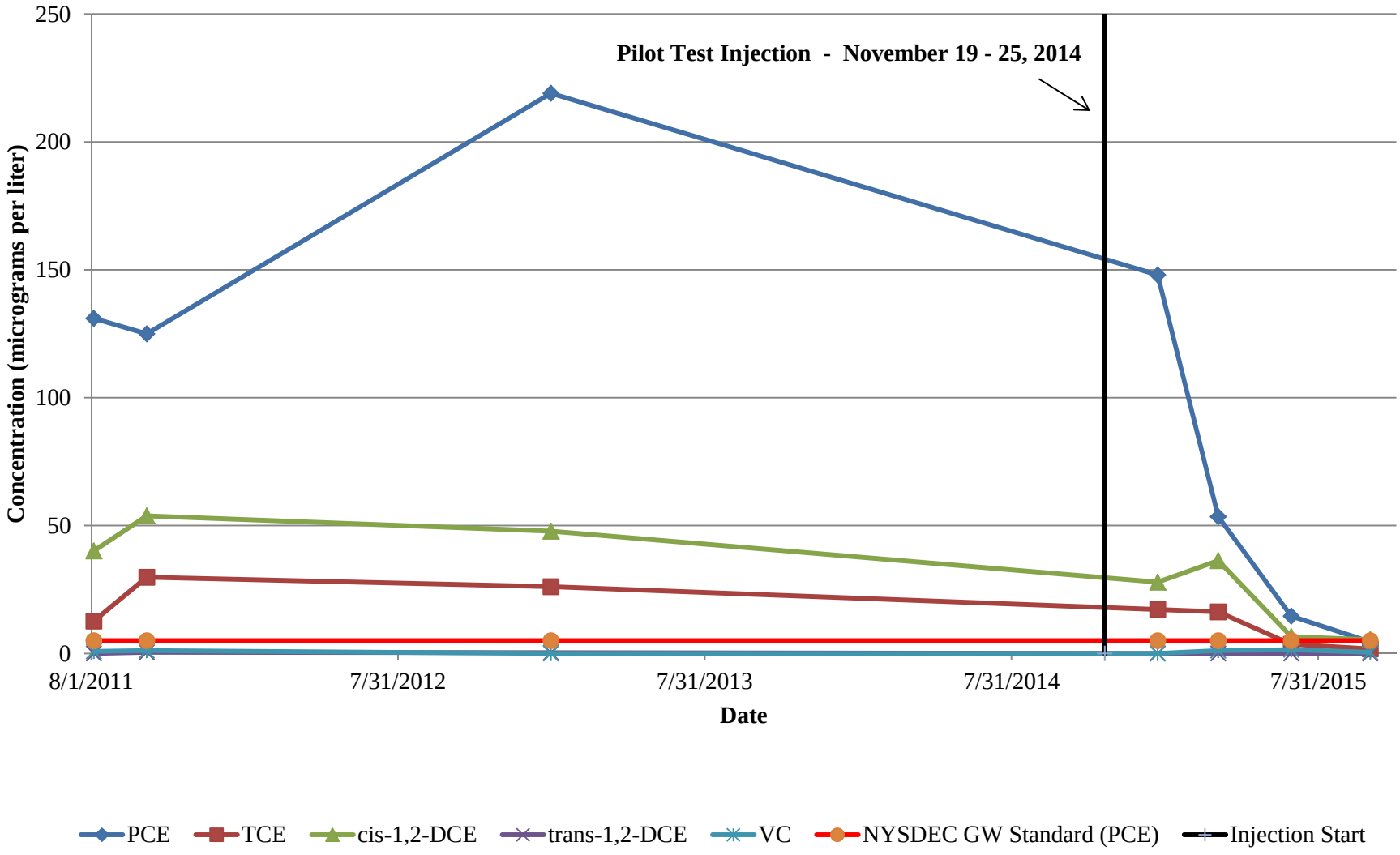
STATEN ISLAND, NEW YORK



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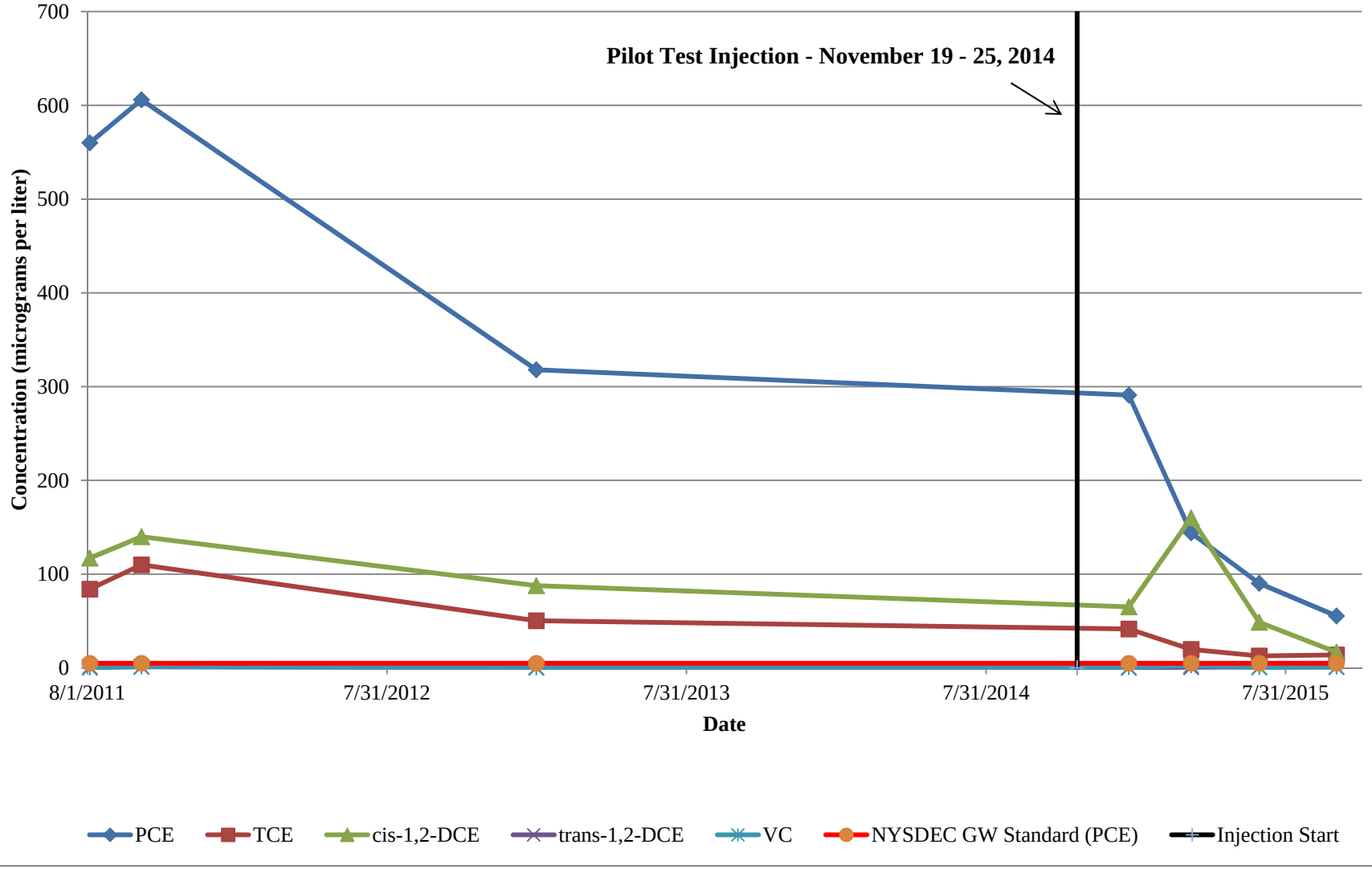
STATEN ISLAND, NEW YORK



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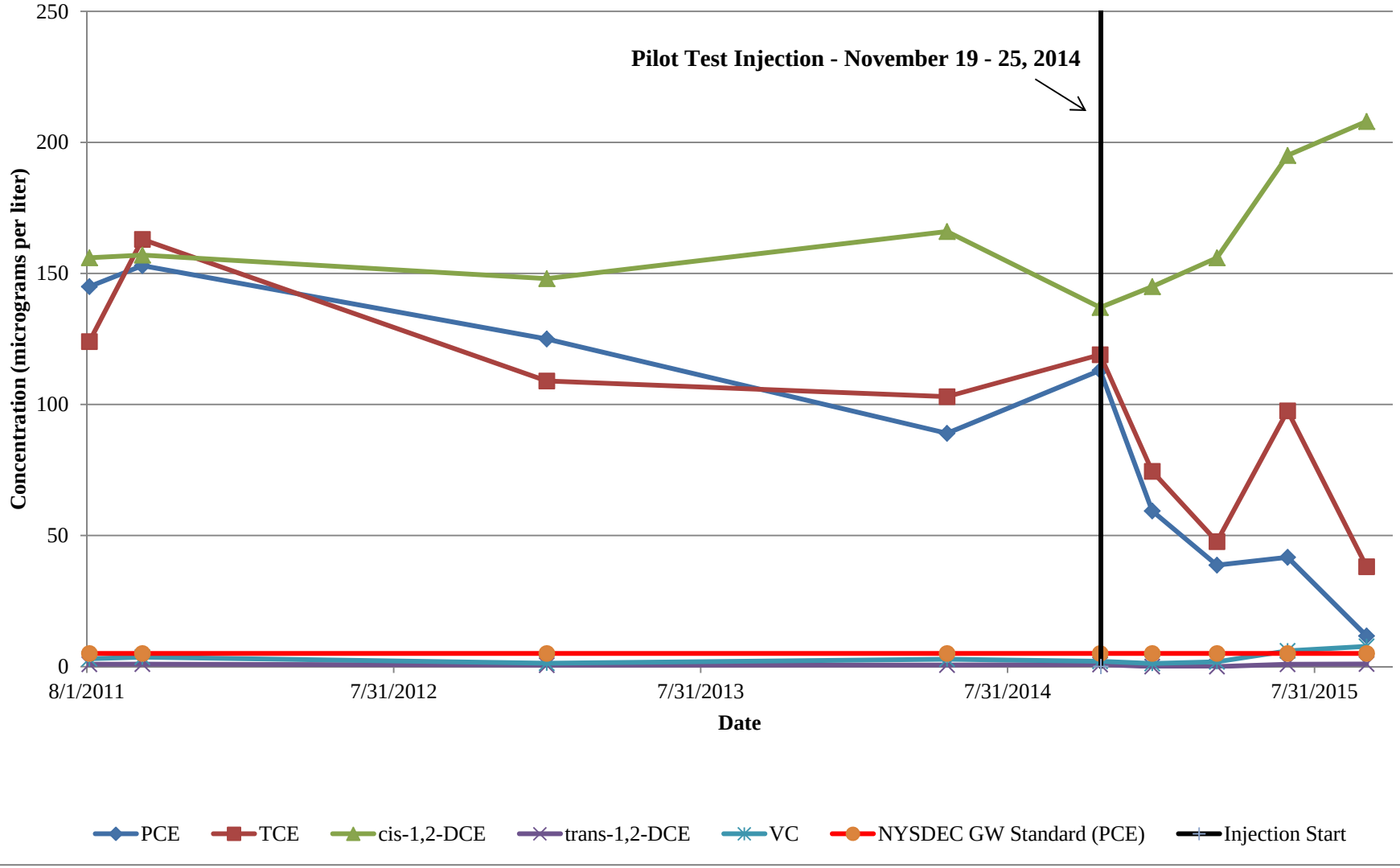
STATEN ISLAND, NEW YORK



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THE CROSSINGS
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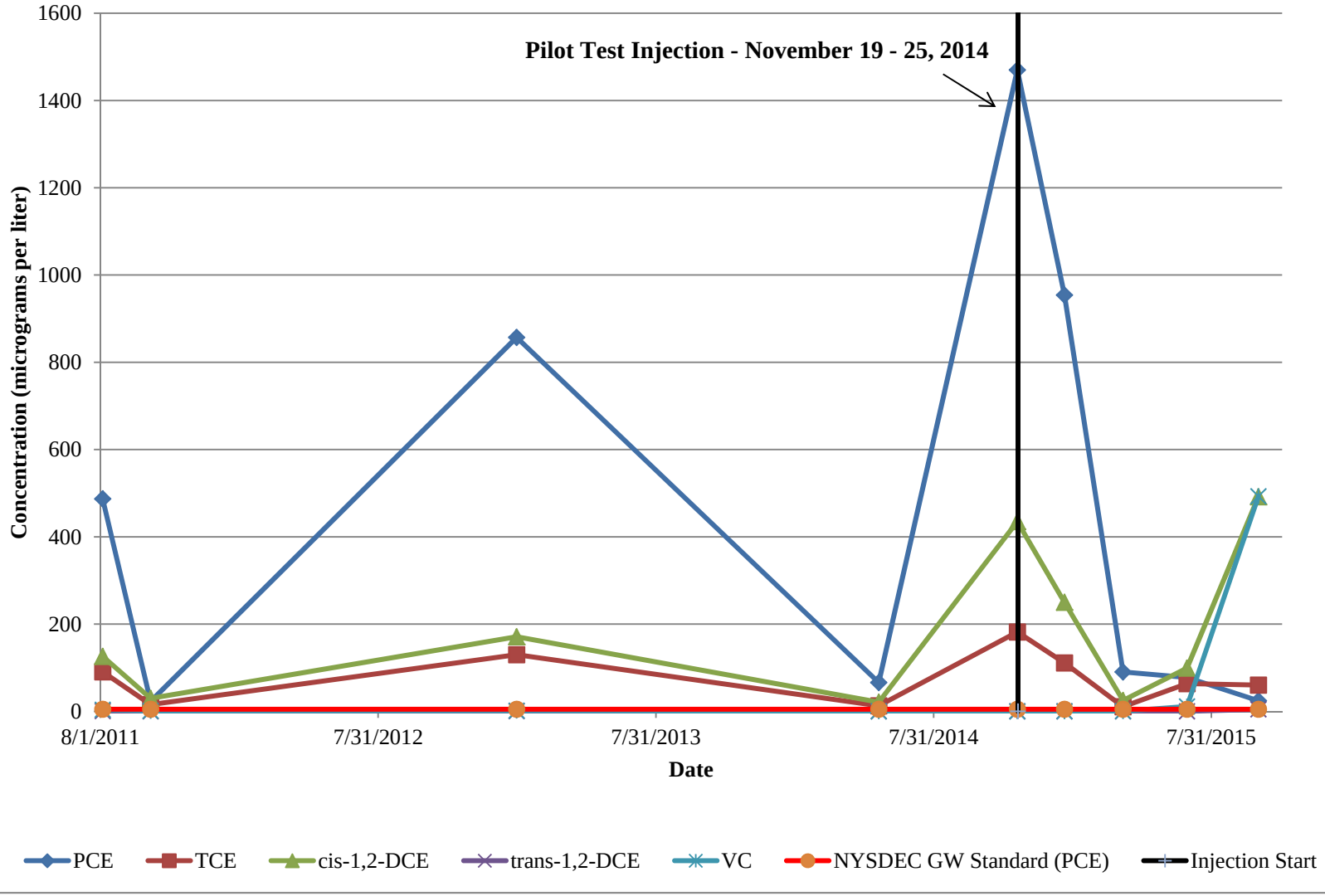
STATEN ISLAND, NEW YORK



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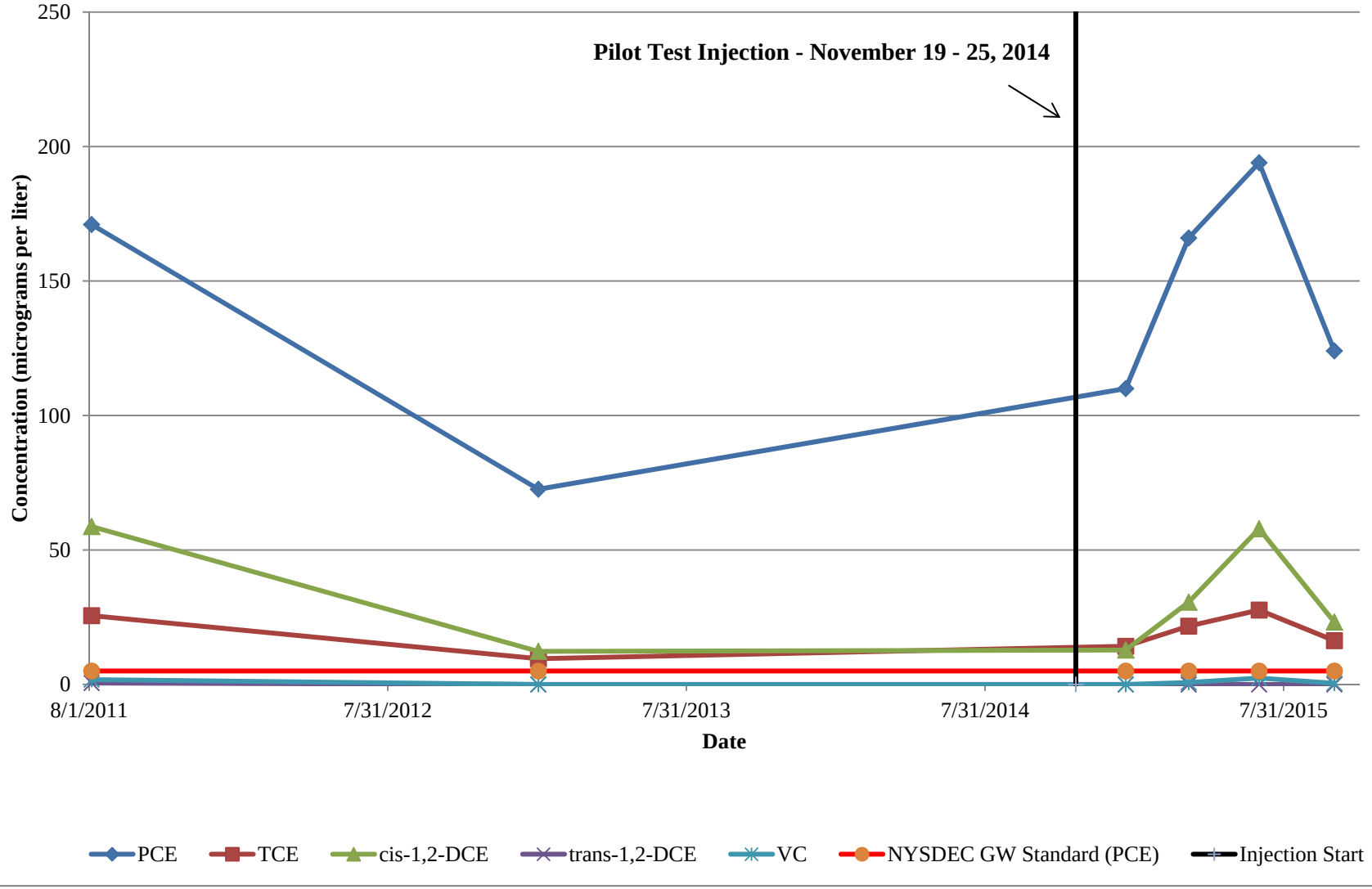
THE CROSSINGS
GGP STATEN ISLAND MALL
STATEN ISLAND, NEW YORK



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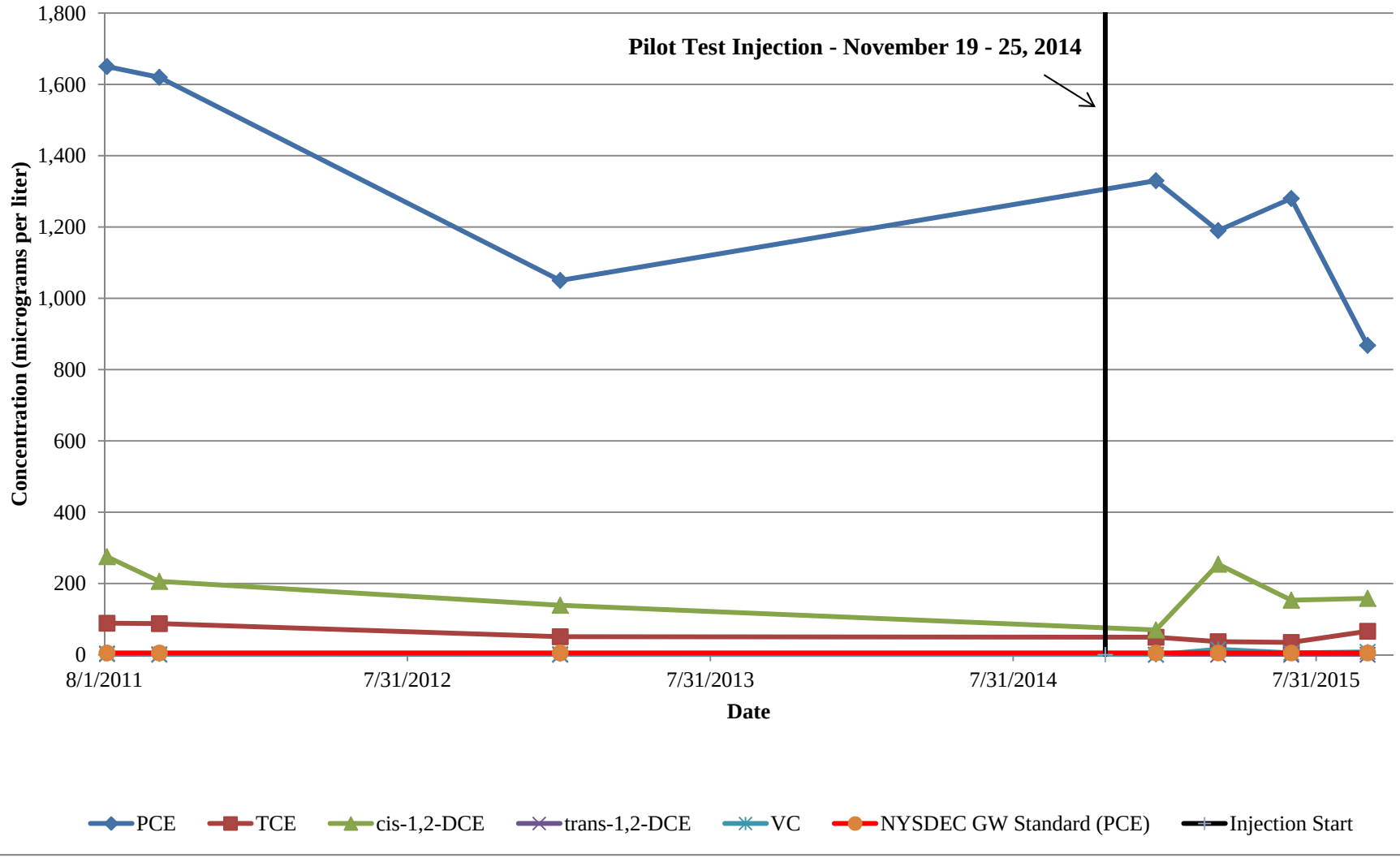
STATEN ISLAND, NEW YORK



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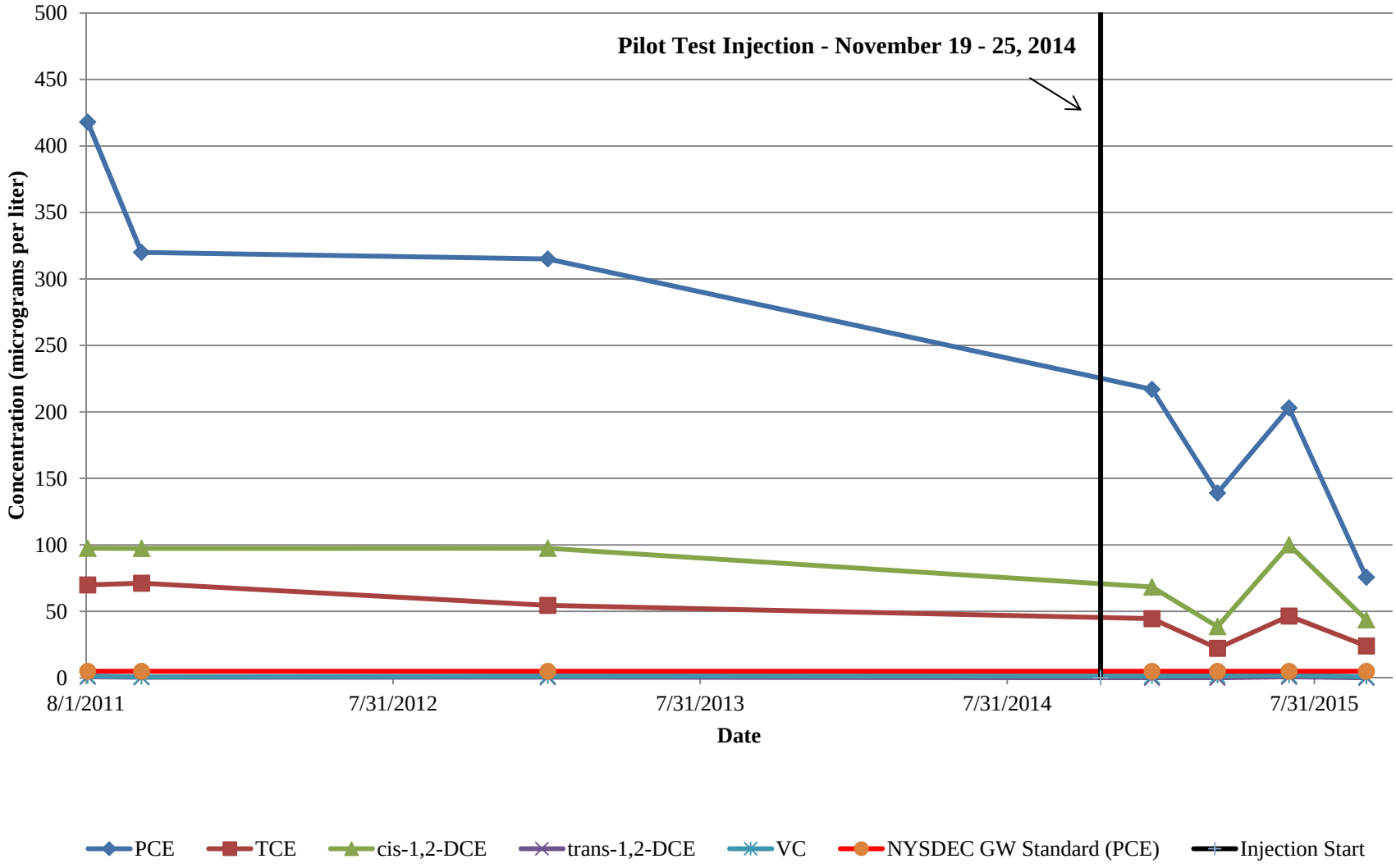
STATEN ISLAND, NEW YORK



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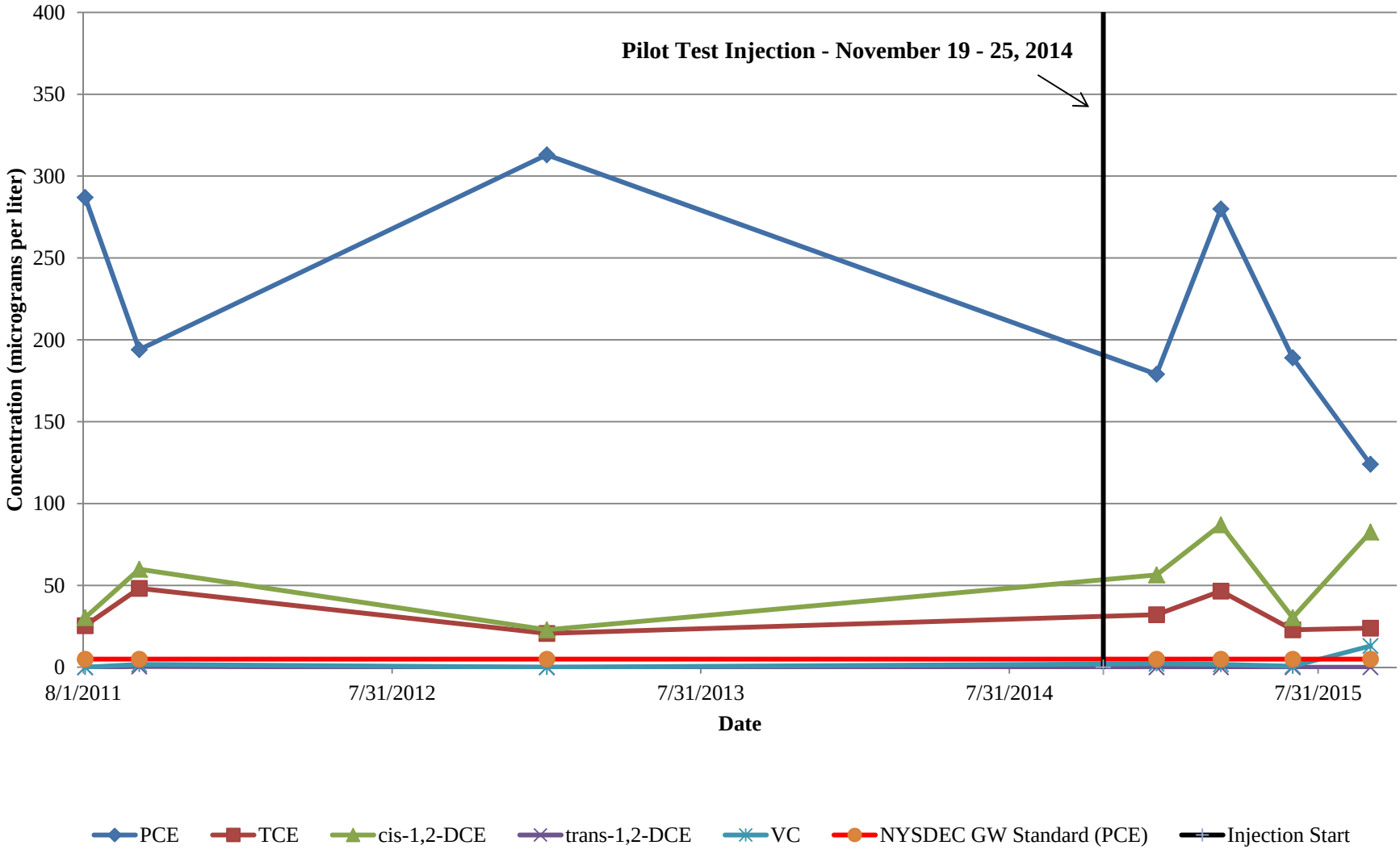
THE CROSSINGS
GGP STATEN ISLAND MALL, LLC.
STATEN ISLAND, NEW YORK



APPENDIX IV

JRW WILCLEAR PLUS® FACT SHEET

WILCLEAR PLUS® LACTATE w/ACCELERITE®

PROVEN ELECTRON DONOR EFFICIENCY AND RAPID DECHLORINATION KINETICS OF SODIUM LACTATE ENHANCED BY ACCELERITE ® NUTRIENT BLEND

Wilclear Plus® lactate with Accelerite® is a proprietary blend of neutral pH fatty acids combined with Accelerite® nutrient blend for use in enhanced anaerobic reductive dechlorination. Wilclear Plus® contains 61% fermentable material providing a high fermentable fraction with minimum amount of water.

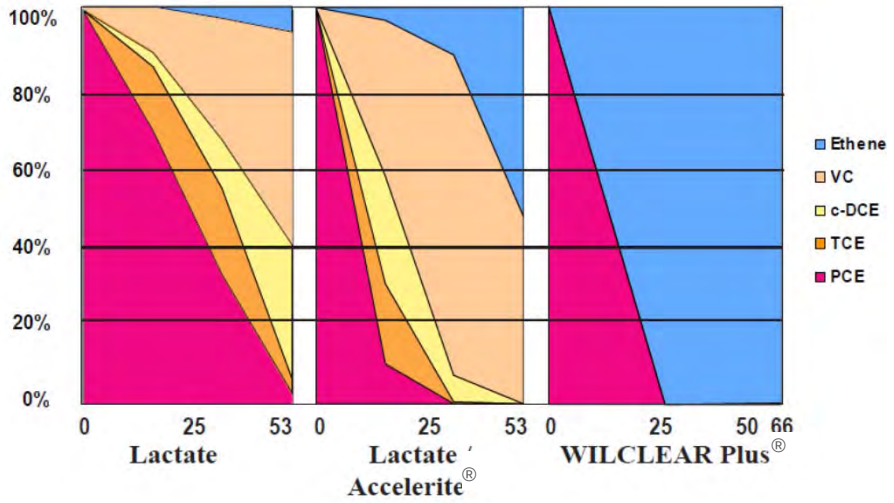
BENEFITS OF WILCLEAR PLUS®

Lactate provides carbon for rapid establishment of anaerobic conditions.

- Volatile fatty acids and fermentables provide a range of material to help promote the growth of an assortment of dechlorinating microbial populations.
- Acelerite® provides growth factors to increase efficiency and kinetics.

RAPID DECHLORINATION KINETICS

Microcosm studies comparing Wilclear Plus® to lactate and lactate plus Accelerite® showed that Wilclear Plus® demonstrated dechlorination kinetics faster than the other substrates. At 25 days, the Wilclear Plus® microcosm converted more than 99% of PCE to ethene.



TYPICAL PROPERTIES

- Sodium lactate: 33-40%
- Sodium propionate: 0-8%
- Sodium acetate: 0-8%
- Sodium butyrate: 0-8%
- Total Sodium Carboxylates: 40-45%
- Carbohydrates/metabolites: 15-20%
- Water: 30-38%

- pH: 7 ±1.0
- Viscosity: < 500cP at 20ºC
- Specific gravity: 1.2 - 1.3
- Soluble in water
- Color: light to dark brown

JRW BIOREMEDIATION LLC

www.jrwbioremediation.com
(913)438-5544
info@jrwbiorem.com

APPENDIX V

JRW WILCLEAR PLUS® SDS

SAFETY DATA SHEET

1. IDENTIFICATION OF MATERIAL AND SUPPLIER

Product Identifier: Wilclear Plus® Lactate with Accelerite®
Recommended Use: In-situ Bioremediation
Recommended Restrictions: none known

Supplier Name: JRW Bioremediation, LLC
Address: 14321 W. 96th Terrace
Lenexa, KS 66215
Telephone: 913-438-5544
EMERGENCY Telephone: 800-779-5545 x 116 (Mon-Fri 9am-5pm CST)
913-961-6644 (afterhours)

2. HAZARD IDENTIFICATION

Health & Physical Hazards:
This product contains no substances in their current physical state that are considered to be hazardous to health and has a low order of toxicity. While the chemical, physical, and toxicological properties have not been thoroughly examined, no acute or delayed symptoms or effects have been observed to date.

Flammability Hazards:
This is a Non-Flammable liquid but it is recommended to avoid temperatures above 150ºC.

Reactivity Hazards:
This product is considered stable. Thermal decomposition may lead to release of irritating gases and vapors. Hazardous polymerization is not expected to occur. Fermentation can occur when diluted with water.

OSHA Hazards:
This material is not considered hazardous by OSHA. No labels or signage are known to be required.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS #	% by Weight
Sodium lactate	72-17-3	33-40%
Sodium propionate	137-40-6	0-8%
Sodium acetate	127-09-3	0-8%
Sodium butyrate	156-54-7	0-8%
Total sodium carboxylates		**45-50%**
Carbohydrates & fermentation metabolites	68476-78-8	15-20%
Water	7732-18-5	40%

4. FIRST-AID MEASURES

Inhalation:
Inhalation of mist may cause mild irritation of respiratory system. Move to fresh air.

Skin Contact:
In case of contact with skin, immediately wash with plenty of soap and water while removing contaminated clothing. Seek medical attention if skin irritation develops or persists.

Eye Contact:
In case of contact with eyes, immediately flush eyes with water for at least 15 minutes, lifting eyelids to facilitate irrigation. Get medical attention if necessary.

Ingestion:
If swallowed, get medical attention.

Signs and symptoms of exposure: Mild irritation to skin and eyes upon contact; mild irritation to respiratory system upon inhalation.

Medical Conditions aggravated by exposure: None determined. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:	Water, carbon dioxide, or dry chemical.
Unsuitable Extinguishing Media:	Do not use heavy water stream as it may spread or scatter.
Specific hazards from substance/mixture:	Thermal decomposition may lead to release of irritating or toxic gases and vapors.
General fire hazards:	No unusual fire or explosion hazards noted

Special protective equipment / precautions for fire-fighters:
Wear full protective clothing and positive pressure breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Methods and Materials for containment and clean up:
Contain spill with absorbent materials such as vermiculite or soil; shovel and place material in drum for disposal. Flush area with water. Surfaces may become slippery after spillage. Dispose of according to all local, state, and federal regulations at an approved waste treatment facility.

Personal precautions / Protective equipment:
Use personal protective equipment. Prevent spills, contamination, and leakage.

Environmental precautions:
No special environmental precautions required.

7. HANDLING AND STORAGE

Precautions for safe handling:
Observe good work and industrial hygiene practices. Use personal protective equipment. Avoid contact with skin, eyes, and clothing. Avoid breathing mists and vapors. Wash hands after use of this product. Do not eat, drink, or smoke while using product. Prevent spills, contamination, and leakage.

Conditions for safe storage, including any incompatibilities:
Keep container tightly closed. Keep in properly labeled containers. Store in a well ventilated, cool, dry area.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters: No exposure or biological limits noted for ingredients(s).

Appropriate engineering controls: Use adequate mechanical ventilation, especially in confined spaces. Temperatures best kept below 150^0 C.

Individual protection measures, such as Personal Protective Equipment (PPE):

Eye/Face protection:	Chemical goggles recommended.
Skin / hand / body protection:	Chemical resistant gloves recommended. Suitable protective clothing as defined by employer.
Respiratory protection:	None required under normal use in well ventilated area.
General considerations:	Use good industrial hygiene and best safety practices. When using material, do not eat, drink, or smoke. Remove and wash any contaminated clothing before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	light to medium brown
Physical state:	liquid
Odor:	slight sweet yeast-like aroma
Odor threshold:	not applicable
pH:	not determined
Melting point/freezing point:	not determined
Initial boiling point:	>100ºC
Closed cup Flash point:	not applicable
Evaporation rate:	not determined
Flammability (solid, gas):	not determined
Upper/lower flammability or explosive limits:	not determined
Vapor pressure (Mg Hg):	not determined
Vapor density (air = 1):	not determined
Density:	not determined
Viscosity	not determined
Solubility in water:	completely soluble
Auto-ignition temperature:	not determined
Specific Gravity (H_2O = 1):	>1

10. STABILITY AND REACTIVITY

Reactivity:	Non-reactive under conditions of normal use, storage & transport.
Chemical stability:	Stable under conditions of normal use, storage and transport.
Possibility of hazardous reactions:	Hazardous polymerization will not occur.
Conditions to avoid:	Temperatures above $>150^0$ C.
Incompatible materials:	Fermentation can occur when diluted with water.
Hazardous decomposition products:	Thermal decomposition may lead to release of irritating gases and vapors.

11. TOXICOLOGICAL INFORMATION

No adverse health effects are expected if the product is used as intended and in accordance with this Safety Data Sheet.

Inhalation: Inhalation of mist may cause mild irritation of respiratory system. Move to fresh air.

Ingestion: If swallowed, get medical attention.

Skin: In case of contact with skin, immediately wash with plenty of soap and water while removing contaminated clothing. May cause mild irritation. Seek medical attention if skin irritation develops or persists.

Eye contact: In case of contact with eyes, immediately flush eyes with water for at least 15 minutes, lifting eyelids to facilitate irrigation. Get medical attention if necessary.

Signs & symptoms of exposure: Mild irritation to skin and eyes upon contact; mild irritation to respiratory system upon inhalation.

Carcinogenicity: Contains no known ingredient listed as carcinogen.
Mutagenicity: No known effect.
Reproductive Toxicity: No known effect.

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Product is not considered environmentally hazardous and is not expected to cause significant harm to aquatic, animal, or plant life.
Persistence/degradability:	Readily biodegradable.
Bioaccumulative potential:	Not expected to bioconcentrate or bioaccumulate.
Mobility in soil:	No specific information available.

13. DISPOSAL CONSIDERATIONS

Disposal Methods:

Contain spill with absorbent materials such as clay or soil and shovel and place material in drum for disposal. Surfaces may become slippery after spillage. Dispose of according to all local, state, and federal regulations at an approved waste treatment facility.

14. TRANSPORTATION INFORMATION

DOT hazard class:	Not Applicable, non-regulated
Labeling:	Not Applicable
Proper Shipping Name:	Wilclear® Sodium Lactate 60% Solution
NMFC#:	46400.02
Class	70

15. REGULATORY INFORMATION

Restrictions on use:	None.
Other regulations:	No information available or not applicable.

16. OTHER INFORMATION

The information in this SDS summarizes to the best of our knowledge at the date of issue, the chemical health and safety hazards of this material and general guidance for safe handling, use, processing, storage, transportation, disposal, and release. This information is not intended to be considered a warranty or quality specifications. The information contained relates only to the specific material designated and may not be valid if used in conjunction with other materials or in any other processes other than intended use. If further clarification or information is required, please contact JRW Bioremediation.

APPENDIX VI

USEPA INVENTORY OF INJECTION WELLS

Type or print all information. See reverse for instructions. OMB No. 2040-0042 Approval Expires 12/31/2018

INVENTORY OF INJECTION WELLS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GROUND WATER AND DRINKING WATER

(This information is collected under the authority of the Safe Drinking Water Act)

1. DATE PREPARED *(Year, Month, Day)*: 16-05-12

2. FACILITY ID NUMBER:

PAPERWORK REDUCTION ACT NOTICE

The public reporting burden for this collection of information is estimated at about 0.5 hour per response including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, includingsuggestions for reducing this burden, Director, Collection Strategies Division (2822), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, and to the Office of Management and Budget, Paperwork Reduction Project, Washington, DC20503.

3. TRANSACTION TYPE *(Please mark one of the following)*

- ☐ Deletion
- ☑ First Time Entry
- ☐ Entry Change
- ☐ Replacement

4. FACILITY NAME AND LOCATION

A. NAME *(last, first, and middle initial)*: Carol Cleaners, Staten Island Mall

B. STREET ADDRESS/ROUTE NUMBER: 280 Marsh Avenue

C. LATITUDE

DEG	MIN	SEC
40	34	41.4

D. LONGITUDE

DEG	MIN	SEC
74	09	52.4

E. TOWNSHIP/RANGE

TOWNSHIP	RANGE	SECT	1/4 SECT
NA*	NA	NA	NA

F. CITY/TOWN: Staten Island

G. STATE: New York

H. ZIP CODE: 10314

I. NUMERIC COUNTY CODE: 085

J. INDIAN LAND *(mark "x")*: ☐ Yes ☒ No

5. LEGAL CONTACT:

A. TYPE *(mark "x")*: ☒ Owner ☐ Operator

B. NAME *(last, first, and middle initial)*: Kelly Webb

C. PHONE *(area code and number)*: (410) 992-6581

D. ORGANIZATION: General Growth Properties, Inc.

E. STREET/P.O. BOX: 10440 Little Patuxent Parkway, Suite 1000

F. CITY/TOWN: Columbia

G. STATE: MD

H. ZIP CODE: 21044

I. OWNERSHIP *(mark "x")*

- ☒ PRIVATE
- ☐ PUBLIC
- ☐ SPECIFY OTHER
- ☐ STATE
- ☐ FEDERAL

6. WELL INFORMATION:

A. CLASS AND TYPE		B. NUMBER OF WELLS		C. TOTAL NUMBER OF WELLS	D. WELL OPERATION STATUS				
		COMM	NON-COMM		UC	AC	TA	PA	AN
5	G		12	12	12				
				0					
				0					
				0					
				0					
				0					
				0					

COMMENTS *(Optional)*:

"Injection Wells" will be existing or newly constructed Monitor (Injection) Wells.

* Non-Applicable - New York State is "Not Part of the National Public Land Surveys System (PLSS)".

KEY:

DEG = Degree
MIN = Minute
SEC = Second
SECT = Section
1/4 SECT = Quarter Section

COMM = Commercial
NON-COMM = Non-Commercial
AC = Active
UC = Under Construction
TA = Temporarily Abandoned
PA = Permanently Abandoned and Approved by State
AN = Permanently Abandoned and not Approved by State

INSTRUCTIONS AND DEFINITIONS

SECTION 1. DATE PREPARED: Enter date in order of year, month, and day.

SECTION 2. FACILITY ID NUMBER: In the first two spaces, insert the appropriate U.S. Postal Service State Code. In the third space, insert one of the following one letter alphabetic identifiers:

D - DUNS Number,
G - GSA Number, or
S - State Facility Number.

In the remaining spaces, insert the appropriate nine digit DUNS, GSA, or State Facility Number. For example, A Federal facility (GSA - 123456789) located in Virginia would be entered as : VAG123456789.

SECTION 3. TRANSACTION TYPE: Place an "x" in the applicable box. See below for further instructions.

Deletion. Fill in the Facility ID Number.
First Time Entry. Fill in all the appropriate information.
Entry Change. Fill in the Facility ID Number and the information that has changed.
Replacement.

SECTION 4. FACILITY NAME AND LOCATION:

A. Name. Fill in the facility's official or legal name.
B. Street Address. Self Explanatory.
C. Latitude. Enter the facility's latitude (all latitudes assume North Except for American Samoa).
D. Longitude. Enter the facility's longitude (all longitudes assume West except Guam).
E. Township/Range. Fill in the complete township and range. The first 3 spaces are numerical and the fourth is a letter (N,S,E,W) specifying a compass direction. A township is North or South of the baseline, and a range is East or West of the principal meridian (e.g., 132N, 343W).
F. City/Town. Self Explanatory.
G. State. Insert the U.S. Postal Service State abbreviation.
H. Zip Code. Insert the five digit zip code plus any extension.

SECTION 4. FACILITY NAME & LOCATION (CONT'D.):

I. Numeric County Code. Insert the numeric county code from the Federal Information Processing Standards Publication (FIPS Pub 6-1) June 15, 1970, U.S. Department of Commerce, National Bureau of Standards. For Alaska, use the Census Division Code developed by the U.S. Census Bureau.
J. Indian Land. Mark an "x" in the appropriate box (Yes or No) to indicate if the facility is located on Indian land.

SECTION 5. LEGAL CONTACT:

A. Type. Mark an "x" in the appropriate box to indicate the type of legal contact (Owner or Operator). For wells operated by lease, the operator is the legal contact.
B. Name. Self Explanatory.
C. Phone. Self Explanatory.
D. Organization. If the legal contact is an individual, give the name of the business organization to expedite mail distribution.
E. Street/P.O. Box. Self Explanatory.
F. City/Town. Self Explanatory.
G. State. Insert the U.S. Postal Service State abbreviation.
H. Zip Code. Insert the five digit zip code plus any extension.
I. Ownership. Place an "x" in the appropriate box to indicate ownership status.

SECTION 6. WELL INFORMATION:

A. Class and Type. Fill in the Class and Type of injection wells located at the listed facility. Use the most pertinent code (specified below) to accurately describe each type of injection well. For example, 2R for a Class II Enhanced Recovery Well, or 3M for a Class III Solution Mining Well, etc.
B. Number of Commercial and Non-Commercial Wells. Enter the total number of commercial and non-commercial wells for each Class/Type, as applicable.
C. Total Number of Wells. Enter the total number of injection wells for each specified Class/Type.
D. Well Operation Status. Enter the number of wells for each Class/Type under each operation status (see key on other side).

INJECTION WELL CLASS AND TYPE CODES

CLASS I Industrial, Municipal, and Radioactive Waste Disposal Wells used to inject waste below the lowermost Underground Source of Drinking Water (USDW).

TYPE	**1I**	Non-Hazardous Industrial Disposal Well.
	1M	Non-Hazardous Municipal Disposal Well.
	1H	Hazardous Waste Disposal Well injecting below the lowermost USDW.
	1R	Radioactive Waste Disposal Well.
	1X	Other Class I Wells.

CLASS II Oil and Gas Production and Storage Related Injection Wells.

TYPE	**2A**	Annular Disposal Well.
	2D	Produced Fluid Disposal Well.
	2H	Hydrocarbon Storage Well.
	2R	Enhanced Recovery Well.
	2X	Other Class II Wells.

CLASS III Special Process Injection Wells.

TYPE	**3G**	*In Situ* Gasification Well
	3M	Solution Mining Well.

CLASS III (CONT'D.)

TYPE	**3S**	Sulfur Mining Well by Frasch Process.
	3T	Geothermal Well.
	3U	Uranium Mining Well.
	3X	Other Class III Wells.

CLASS IV Wells that inject hazardous waste into/above USDWs.

TYPE	**4H**	Hazardous Facility Injection Well.
	4R	Remediation Well at RCRA or CERCLA site.

CLASS V Any Underground Injection Well not included in Classes I through IV.

TYPE	**5A**	Industrial Well.
	5B	Beneficial Use Well.
	5C	Fluid Return Well.
	5D	Sewage Treatment Effluent Well.
	5E	Cesspools (non-domestic).
	5F	Septic Systems.
	5G	Experimental Technology Well.
	5H	Drainage Well.
	5I	Mine Backfill Well.
	5J	Waste Discharge Well.

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