Technical Comments Regarding US EPA's Pre-Design Investigation Work Plan

New Cassel/Hicksville Groundwater Contamination Superfund Site

These technical comments identify "fatal flaws" in the Pre-Design Investigation (PDI) Work Plan prepared by US EPA for Operable Unit 1 (OU1) of the New Cassel/Hicksville Groundwater Contamination Superfund Site (Site; Figure 1). In summary, the proposed PDI work plan is based on a fundamentally flawed Conceptual Site Model (CSM) that there are three discrete plumes in OU1 (Eastern, Central, and Western Plumes). Existing data clearly demonstrate that the extent of groundwater contamination is not correctly defined by US EPA, the plumes are commingled, and there is an Upgradient Plume, originating from the Sylvania and GI/Vishay facilities ("Upgradient Parties", Figure 1), that is also affecting groundwater quality within OU1. In contrast, groundwater quality data collected in the western portion of the New Cassel Industrial Area (NCIA) demonstrate that the Western Plume within the NCIA ("NCIA Western Plume") was shallow, distinct, and separate from all other NCIA plumes, and dissipated upgradient of the groundwater contamination identified in OU1 (Gradient, 2013)[1]
– a conclusion also reached by the State of New York in the 2003 Record of Decision (ROD) for Off-Site Groundwater (NYSDEC, 2003).[2]

Due to the significant shortcomings of US EPA's CSM, the PDI does not propose to collect critical data needed to delineate the full lateral and vertical extent of OU1 groundwater impacts associated with the commingled plumes. Because data collection is only proposed in the discrete plumes defined in the ROD (US EPA, 2013),[3] the proposed PDI will not adequately target the areas that need to be remediated at the Site, thus resulting in a failed remedy.

1 The PDI is based on a flawed CSM, will not collect the necessary data, and will result in an ineffective and failed remedy

The PDI is based on a flawed CSM, which assumes that there are discrete plumes within OU1. This assumption is incorrect and contrary to currently available data, which indicate that within OU1 the Eastern and Central plumes migrate to the south and southwest, and commingle. Additionally, the Upgradient Plume flows into OU1 and commingles with the Eastern Plume. These CSM flaws, which were discussed in detail in comments to the US EPA's Proposed Remedial Action Plan (PRAP) previously filed by IMC Eastern, Corp. (Gradient, 2013), are presented in the following sub-sections in the context of their implications on the proposed PDI approach and the envisioned remedy.

1 Gradient. September 23, 2013. "Comments On the Proposed Plan for Operable Unit 1 of the New Cassel/Hicksville Groundwater Contamination Superfund Site."Report to IMC Eastern Corporation. 138p.
2 New York State Dept. of Environmental Conservation (NYSDEC). October 2003. "Record of Decision, New Cassel Industrial Area Sites, Town of North Hempstead, Nassau County, New York. Off-site Groundwater South of the New Cassel Industrial Area, Operable Unit No. 3 [Site Numbers 1-30-043A, 1-30-043B, 1-30-043C, 1-30-043D, 1-30-043E, 1-30-043H, 1-30-043I, 1- 30-043K, 1-30-043L, 1-30-043M, 1-30-043P, 1-30-043S, 1-30-043U, & 1-30-043V]." 105p
3 US EPA Region II. September 2013. "Record of Decision: Operable Unit One, New Cassel/Hicksville Ground Water Contamination Superfund Site, Towns of North Hempstead, Hempstead and Oyster Bay, Nassau County, New York." 449p.

1.1 US EPA's CSM ignores the southwestern migration of the OU1 Eastern Plume and the PDI proposes no data collection in this area as part of the PDI – a key data gap that needs to be filled for the design of an effective remedy

Groundwater quality data demonstrate that the Eastern Plume migrates both to the south and the southwest. Groundwater quality profiling data from location TMW-8D (Dvirka and Bartilucci, 2009)[4] show the presence of key Eastern Plume contaminants [tetrachloroethene (PCE) and trichloroethene (TCE)] at depths ranging from 297 to 372 ft-below ground surface (bgs). At this location, PCE was detected at a maximum concentration of 680 µg/L at 337 ft-bgs, whereas TCE was detected at a maximum concentration of 280 µg/L at 312 ft-bgs. TMW-8D is approximately 1,000 feet farther west than the US EPA-defined Eastern Plume (Figure 2), yet, US EPA has ignored this data point in defining the extent of the Eastern Plume.

It appears that US EPA is relying on shallow groundwater quality data (from MW-15 and MW-16S/D) to justify their limited interpretation of the western extent of the Eastern Plume. This approach is incorrect. Monitoring wells MW-15 and MW-16S/D are too shallow to adequately define the Eastern Plume's extent.[5] The Eastern Plume sinks as it migrates due to the downward vertical gradients resulting from groundwater extraction at the Bowling Green well field.[6] Consequently, the Eastern Plume has already migrated deeper than the screened well intervals of monitoring wells MW-15 and MW-16S/D. For example, vertical profiling data from TMW-8D show the presence of PCE and/or TCE at depths ranging from 292 to 372 ft-bgs (Figure 3), with the maximum concentration present at 337 ft-bgs, whereas the adjacent monitoring wells MW-16S/D only extend to 285 ft-bgs. Thus, MW-16S and MW-16D are too shallow and should not be relied upon to define the extent of the Eastern Plume. In contrast, data collected at TMW-8D clearly demonstrate that high PCE and/or TCE concentrations associated with the Eastern Plume are present at least 1,000 feet beyond the extent of the Eastern Plume depicted by US EPA.

Additionally, historical data demonstrate the southwestern migration of the Eastern Plume within OU1. At the Bowling Green Water Supply Wells, total chlorinated volatile organic compound (CVOC) concentrations have been in excess of 100 µg/L since approximately 2002 (Figure 4). Contaminants detected at the highest concentrations at these wells are PCE and TCE, constituents associated with the Eastern Plume. PCE and TCE have also been detected at nearby sentinel wells, EW-1B and EW-1C. At EW-1B, PCE was detected at a maximum concentration of 1,000 µg/L and TCE was detected at 120 µg/L; At EW-1C, PCE was detected at a maximum concentration of 446 µg/L and TCE was detected at 216 µg/L. These data further demonstrate that the Eastern Plume has migrated to the southwest, well beyond the limited extent depicted by US EPA.

In order to design an effective remedy it is critical that additional vertical profiling be conducted in the area of TMW-8D and in the area of the Bowling Green well field to fully define the extent of the Eastern Plume. However, no such data collection is proposed in the PDI work plan. If these data gaps are not addressed and modifications to the proposed remedy are not made, a significant portion of the Eastern Plume will continue to migrate unabated through OU1 and result in an ineffective remedy.

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[4] Dvirka and Bartilucci Consulting Engineers. June 2009. "Pre-Design Investigation Report: New Cassel Industrial Area Site, Operable Unit No. 3, Town of North Hempstead, Nassau County, New York, Site No. 1-30-043." Report to New York State Dept. of Environmental Conservation (NYSDEC) Work Assignment No. D004446-6. 1102p.

[5] Jeffrey Dyber, the New York State Department of Environmental Conservation (NYSDEC) project manager for the NCIA, corroborated these conclusions regarding MW-15. In his testimony during the Next Millennium Realty trial on April 11, 2016, he stated that data from MW-15 is not sufficient for defining the extent of the Eastern Plume because only one sample has been collected from only a single depth (p. 102).

[6] The Bowling Green wells, which are screened at depths ranging from approximately 480 to 580 ft-bgs and pump at an average flowrate of 1,200 gallons per minute, have influenced plume migration by drawing contamination vertically downward.

1.2 US EPA's CSM ignores the commingling of the OU1 Eastern and Central Plumes, proposes no data collection to define the extent of the commingled plume as part of the PDI – another key data gap that needs to be filled for the design of an effective remedy

Groundwater quality data demonstrate that the Eastern and Central Plumes have distinct chemical signatures. The Eastern Plume consists primarily of chlorinated ethenes (PCE and TCE), whereas, the Central Plume contains high concentrations of chlorinated ethanes [1,1,1-trichloroethane (1,1,1-TCA) and degradation byproducts, 1,1-dichloroethene (1,1-DCE) and 1,1-dichloroethane (1,1-DCA)]; refer to Gradient (2013) for additional detail.

Groundwater plume chemical signatures demonstrate that the Eastern Plume has commingled with the Central Plume. Given the differences in plume chemical signatures between the Eastern and Central Plumes, a careful evaluation of groundwater quality data at a given location allows for the identification of plume origin. For example, groundwater chemistry at TMW-5, a location within US EPA's depiction of the Central Plume, indicates that the Eastern Plume has commingled with the Central Plume. At this location, groundwater is enriched in chlorinated ethanes (1,1,1-TCA, 1,1-DCE, and 1,1-DCA), a unique signature of the Central Plume, at depths ranging from 50 to 150 ft-bgs (Figure 5); however, at depths ranging from 150 to 275 ft-bgs, groundwater is enriched in chlorinated ethenes (PCE and TCE), a chemical signature of the Eastern Plume. Thus, the chemical signatures of both the Eastern and Central Plumes are present at the same location. This demonstrates that the Eastern Plume has migrated a significant distance (at least 1,600 ft southwesterly within OU1) and is commingled with the Central Plume.

The Central Plume continues to migrate a considerable distance to the southwest. The key marker for the Central Plume, 1,1,1-TCA, has been detected at concentrations up to 200 µg/L at TMW-3D (377 ft-bgs), located approximately 1,000 feet southwest of US EPA's depiction of the Central Plume (Figure 2). Furthermore, at TMW-2, located on the western edge of OU1, elevated concentrations of chlorinated ethanes (sum of 1,1,1-TCA and its degradation byproducts), up to 301 µg/L, have been detected. A cross-section depicting chlorinated ethane-related concentrations demonstrates that the southwestern migration of the Central Plume (Figure 6).

Additional data are needed east and the west of the US EPA-defined Central Plume. As discussed above, the available data demonstrate that the Eastern Plume commingles with the Central Plume (*e.g.*, at TMW-5) and both plumes extend much farther to the west than depicted by US EPA. However, no data collection is proposed in the PDI from areas where the plumes commingle (Figure 7). Such data will help to define the full extent of groundwater contamination in OU1 – a critical data need for the implementation of an effective remedy.

1.3 US EPA's CSM ignores the impacts to OU1 groundwater caused by the Upgradient Plume and the PDI proposes no data collection in this area – a key data gap that needs to be filled for the design of an effective remedy

The Upgradient Parties have had significant chlorinated solvent releases on their properties that have caused and are causing impacts to groundwater quality in OU1. Environmental investigations have been undertaken at these sites since the 1980s with oversight from county, state, and federal authorities

(Lockheed Martin, 2013).[7] Elevated PCE and TCE concentrations in groundwater, consistent with the presence of non-aqueous phase liquids (NAPL), have been found at the Sylvania and GI/Vishay Sites. PCE concentrations up to 32,000 µg/L (P-108, 74 ft-bgs; Lockheed Martin, 2013) have been detected at the Sylvania facility, and TCE has been detected at concentrations up to 48,000 µg/L (W-1-75, 65-75 ft-bgs; ESC, 2006)[8] at the GI/Vishay facility.

Multiple lines of evidence, including groundwater chemistry data from numerous vertical profiling locations and groundwater modeling results conducted by GI/Vishay, demonstrate that contamination from the Sylvania and GI/Vishay facilities has migrated in a southwesterly direction into OU1. These data are presented in the following sub-sections in the context of their implications on the proposed PDI approach and the envisioned remedy.

1.3.1 Groundwater quality data demonstrate that the Upgradient Plume has a distinct chemical signature and the plume is migrating into OU1

Impacts from the Upgradient Plume are discernible from the Eastern Plume due to differences in their chemical signatures. While the chlorinated solvents present in the Upgradient Plume (PCE and TCE) are the same as those used by some facilities in the NCIA, the chemical signature of contamination in the Upgradient Plume is different than the signature associated with the Eastern Plume. For example, contamination from the Upgradient Parties is TCE enriched, meaning that is has higher molar concentrations of TCE than PCE. The TCE enrichment is likely caused by the historical releases of TCE from waste solvent storage tanks on the GI/Vishay property. In contrast, the Eastern Plume is PCE enriched, having higher PCE molar concentrations than TCE. Data obtained from vertical profile borings installed between 2008 and 2012 (Figure 8), summarized below, support this conclusion.

Vertical Profiles Previously Installed Upgradient and Side-Gradient of the NCIA

Numerous vertical profile sample locations have been installed upgradient and side-gradient of the NCIA. LP-01, LP-02, LP-03, LP-04, and WP-01 were installed by GI/Vishay (WSP, 2010; Figure 8);[9] MW-208 and MW-202 were installed by the USACE (2104; Figure 8).[10] Elevated PCE and TCE concentrations were observed in each of these locations at depths ranging from 75 to 400 ft-bgs. Based on groundwater flow direction and the observed depth of impacts, the Upgradient Plume is the only plausible source of groundwater contamination at these locations – they are not the result of any NCIA-related source. Key vertical profiles installed along the boundary of the NCIA, demonstrating the presence of the Upgradient Plume, are described below.

- LP-02 and MW-202 are located northeast (upgradient) of the NCIA, downgradient of the Sylvania and GI/Vishay facilities (Figure 8). The concentration depth profiles (Figures 9 and 10, respectively) indicate an enriched TCE plume (relative to PCE) with concentrations up to 730 µg/L between the depths of approximately 300 and 400 ft-bgs (WSP, 2010; USACE, 2014). The chemical signature at these locations is consistent with the Upgradient Plume.

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7 Lockheed Martin Technology Services; Bolduc, J. July 19, 2013. "Letter Report to J. Cantanzarita (US EPA) re: Supplemental Remedial Investigation Technical Memorandum, New Cassel/Hicksville Ground Water Contamination Site, Nassau County, New York." 222p.

8 ESC Engineering of New York, P.C. (ESC). 2006. "May 2006 Semiannual Groundwater Monitoring Report, Former General Instrument Corporation Site, Hicksville, New York." 133p., August 23. [SDOH252658 - SDOH252789.]

9 WSP Engineering of New York, P.C. (WSP). 2010. "Interim Phase VI Remedial Investigation Report and Supplemental Work Plan, Former General Instrument Corporation Site, Hicksville, NY." 190p., May 21.

10 US Army Corps of Engineers (USACE). 2014. Data Evaluation Report, Sylvania Corning FUSRAP Site, Hicksville, NY. April.

The USACE installed a permanent monitoring well at MW-202 at a depth of 380 ft-bgs (USACE, 2014). Four groundwater samples collected between June 2012 and August 2013 contained TCE at concentrations ranging from 680 to 1,300 µg/L.

- LP-03 is located upgradient of the Frost St. sites, east of the NCIA (Figure 8). The concentration depth profile (Figure 11) indicates elevated concentrations of PCE (up to 1,100 µg/L) and TCE (up to 1,500 µg/L) between the depths of approximately 210 and 400 ft-bgs (WSP, 2010). The plume at this location is enriched in TCE relative to PCE, consistent with the Upgradient Plume chemical signature.
- WP-01 is located on the edge of the NCIA, side-gradient from the Frost St. sites (Figure 8). The concentration depth profile (Figure 12) indicates elevated concentrations of PCE (up to 500 µg/L) and TCE (up to 3,700 µg/L) between the depths of approximately 190 and 400 ft-bgs (WSP, 2010). The plume at this location is enriched in TCE relative to PCE, consistent with the Upgradient Plume chemical signature.

In summary, results of the vertical profile sampling performed upgradient and side-gradient of the NCIA clearly demonstrate that the TCE-enriched contamination from the Upgradient Parties is present immediately upgradient of the NCIA.

Vertical Profiles Previously Installed Within the NCIA

WP-07, installed by GI/Vishay (WSP, 2010), is located at the Frost St. sites (Figure 8). The concentration depth profile at this location indicates the presence of two separate contaminant plumes. A plume associated with Frost St. (*i.e.* Eastern Plume), located between 50 and 100 ft-bgs, that is enriched in PCE (relative to TCE) with concentrations as high as 31,000 µg/L (Figure 13). A deeper plume, associated with the Upgradient Parties, is located at depths from approximately 200 to 430 ft-bgs (Figure 13). The deeper plume is enriched in TCE (relative to PCE) with concentrations as high as 1,800 µg/L. Groundwater quality data from vertical profile WP-07 confirm that contamination from the Upgradient Parties is migrating into the NCIA.

Vertical Profiles Previously Installed Within or Adjacent to OU1

Three vertical profiles were installed within or adjacent to OU1. MW-209 was installed by the USACE (2014; Figure 8); WP-06 and WP-04 were installed by GI/Vishay (WSP, 2010; Figure 8). The TCE-enriched chemical signature at these three locations (Figures 14 – 16, respectively), with concentrations up to 4,200 µg/L, confirm the presence of the Upgradient Plume. Additionally, at WP-06, the chemical signature indicates that contamination from the Upgradient Parties has commingled with the Eastern Plume. For example, the concentration depth profile at WP-06 (Figure 15) indicates a shallower, PCE-enriched zone from 220 to 300 ft-bgs (Eastern Plume) and a deeper TCE-enriched zone from 300 to 480 ft-bgs (Upgradient Plume).

Taken together, data from the vertical profiles described above conclusively demonstrate that the Upgradient Plume has migrated into OU1. Figure 8 presents a plan-view depiction of the confirmed presence of the Upgradient Plume within the NCIA and OU1 based on groundwater quality data from the vertical profiles. Note that the full western extent and the vertical depths of the contamination from the Upgradient Parties within the NCIA and OU1, and particularly the area where it is commingled with the Eastern Plume, has not yet been delineated. However, no data collection is proposed in the PDI to address this data gap.

1.3.2 Modeling conducted by GI/Vishay shows that contamination from the Upgradient Parties migrates into OU1

Groundwater and contaminant transport modeling undertaken by GI/Vishay (WSP, 2010) also demonstrates that the Upgradient Plume is migrating into OU1. GI/Vishay used measured concentrations for 1,2-dichlorobenzene, a GI/Vishay marker compound, to calibrate a contaminant transport model, which they subsequently used to estimate the downgradient extent of the PCE and TCE plumes associated with the GI/Vishay facility. The GI/Vishay model predicted that plumes for PCE and TCE, attributable only to the GI/Vishay sources, extend a considerable distance (up to 1,600 feet) into OU1 (Figures 17 and 18).

Overall, based on all available data, it is clear that the contamination from the Upgradient Parties migrates into OU1 at depths ranging from approximately 200 to 420 ft-bgs with total TCE and PCE concentrations in excess of 1,000 µg/L (Figure 19). Evidence presented above, including results from the vertical profile samples, chemical signatures, and GI/Vishay's own groundwater solute transport model, demonstrate conclusively that the Upgradient Plume impacts groundwater quality within OU1 and commingles with the Eastern Plume.

Additional data are needed to fully define the western extent of the Upgradient Plume in OU1 (Figure 8). However, no data collection is proposed in the PDI from areas where the Upgradient Plume commingles with the Eastern Plume (Figure 7). Such data would help to define the full extent of groundwater contamination in OU1 – a critical data need for the design and implementation of an effective remedy.

2 US EPA's PDI proposes no data collection in the upgradient portion of the OU1 Western Plume – a significant data gap

US EPA's PDI will not address existing data gaps in the western portion of OU1 despite the fact that much of the proposed remedy's focus is in this area. No data collection is proposed to delineate the undefined, upgradient portion of the Western Plume in OU1 (*i.e.,* area north of Old Country Road; Figure 7), nor has US EPA ever indicated that groundwater in this area exceeds the threshold for remediation (greater than 100 µg/L total CVOCs). Despite this, EPA's preliminary OU1 remedy locates four in-well stripping wells and one groundwater extraction well such that they will capture and remediate groundwater coming from this uncharacterized area.

US EPA's focus on remediating the uncharacterized area north of the OU1 Western Plume is particularly unusual considering that the NCIA Western Plume is shallow and concentrations attenuate rapidly with both depth and distance from source. The maximum PCE and TCE concentrations detected in the NCIA Western Plume were located at depths ranging from 50 to 85 ft-bgs (Gradient, 2013); the NCIA Western Plume has not been detected at depths below 130 to 140 ft-bgs (Figure 20). Additionally, the maximum historical extent of the NCIA Western Plume never reached the boundary of the New Cassel Hicksville Groundwater Contamination Site boundary (Figure 20). This conclusion was affirmed by the NYSDEC in the 2003 ROD for off-site groundwater (NYSDEC, 2003). As reported in the ROD (Table 1), the maximum PCE concentration detected in the downgradient NCIA Western Plume south of Old Country Road was 1 µg/L, TCE was not detected, and the maximum reported total VOC concentration was 3 µg/L.

[NCIA] **Western Plume 1996 - 2000 Data**

Contaminant of Concern	Range of Detected Concentration North of Old Country Road (ppb)				Range of Detected Concentration South of Old Country Road (ppb)				SCGs (ppb)
	50-99 ft	100-124 ft	125-200 ft	200+ ft	50-99 ft	100-124 ft	125-200 ft	200+ft.	
Trichloroethylene	2 j-73	2 j-8 j	-	-	ND	ND	ND	-	5
Tetrachloroethylene	1 j-96	1 j-4 j	-	-	1 j	ND	ND	-	5
Trichloroethane	1 j-52	3 j	-	-	1 j-2 j	2 j	2 j	-	5
Total VOC's*	1-207	1-38	-	-	1-3	ND	1-3	-	100

Table 1 NCIA Western Plume Groundwater Concentration Summary (Source: Table 2 of ROD; NYSDEC, 2003)

In order to design an effective remedy, it is critical that additional vertical profiling sampling be conducted in the area of north of Old Country Road in the western portion of OU1 to determine whether this area requires remediation. However, no such data collection is proposed in the PDI work plan. If these data gaps are not addressed, along with modifications to the remedy, US EPA's proposed remedy will be inefficient and could result in the unnecessary expenditure of significant resources in an area where no remediation is required.

3 Significant data gaps will remain unaddressed by the proposed PDI and the resulting remedy will not efficiently address contaminant mass in OU1

The PDI proposes only to collect additional OU1 groundwater quality data from limited areas within the boundaries of the US EPA's plume depictions. Consequently, as discussed in the preceding sections, the PDI will not address multiple outstanding data gaps. The failure to address these data gaps will leave large portions of the OU1 plumes unaffected by the proposed remedy. To illustrate the consequences of the flawed CSM and the failure to adequately fill data gaps with the PDI, Figure 21 shows EPA's proposed remedy design overlain with the PCE and TCE plume maps prepared by Lockheed Martin (a US EPA contractor) as part of the supplemental Remedial Investigation (Lockheed Martin, 2013). This portrayal clearly demonstrates the flaws with the proposed remedy because groundwater contamination throughout much of OU1 will continue to migrate, unaffected by the proposed remedy.