ADDENDUM TO
HYDROGEOLOGIC INVESTIGATION REPORT

Lehigh Valley Railroad Derailment Site
Town of LeRoy
County of Genesee, New York

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1.0 INTRODUCTION

In February 1992, the New York State Department of Environmental Conservation (NYSDEC) issued a work assignment to Dunn Geoscience Engineering Company, P.C. (now Rust Environment & Infrastructure) under its State Superfund Standby Contract to conduct a Remedial Investigation and Feasibility Study of the Lehigh Valley Railroad Derailment Spill Site. The Site is the location of the December 6, 1970 derailment of a southbound train at the Gulf Road crossing in the Town of LeRoy, Genesee County, New York (Figure 1). The derailment resulted in the release at the grade crossing of 30,000 gallons of trichloroethylene (trichloroethene or TCE) and an unknown quantity of cyanide.

The initial phase of the remedial investigation (Phase A), begun in the spring of 1992, comprised both office and field research and reconnaissance. The second phase of the investigation (Phase B) included geophysical and soil gas surveys, test pitting, and the collection and analysis of samples of various media. Phase C included a four-month subsurface investigation comprising drilling, coring and testing at 18 locations in the Study Area, and the installation of 55 bedrock monitoring wells at various depths.

The monitoring and analytical program that was initiated during Phase B of the investigation was continued in July at the start of the drilling program, and was expanded in scope (as part of Phase C) following installation of the monitoring wells. The expanded monitoring program consisted of water level measurements, and the collection of groundwater, surface water and sediment samples. The analytical program focused on the two chemicals that were spilled at the time of the derailment - TCE (and its degradation products) and cyanide.

A four-volume First Phase Remedial Investigation/Feasibility Study (RI/FS) Report was submitted to the NYSDEC in draft form in December 1994, and revised in July 1995. Analytical results for sampling rounds 1 through 5 were incorporated in the draft report. These five sampling events were performed in accordance with the approved Revised Amendment No. 2 to Work Plan. The present report, an addendum to the First Phase RI/FS Report, was prepared in order to present and discuss analytical results from three additional rounds of environmental and monitoring well sampling that were later requested by the Department. These sampling events, designated rounds 6, 7 and 8, were reduced in scope from rounds 2 through 5. The sampling was performed in October 1994, and January and April 1995, respectively.

This addendum does not describe field and office procedures that were already discussed in the RI/FS report. Chapter 3 of that report contains a discussion of water level measurement and environmental sampling procedures. Chapter 6 (section 6.5) of the same report presents an overview of analytical data validation procedures. The referenced procedures were followed while performing the work described in this document.

2.0 GROUNDWATER LEVELS

Water level measurements were made at all 55 monitoring wells in the Study Area in October 1994, and January and April 1995. Water levels were also taken immediately before sampling each of the selected wells during rounds 6, 7 and 8. All water level measurements taken in the Study Area (November 1993 - April 1995) are presented in Appendix A.

Water levels varied over a 15 to 25 foot range at most wells; by a foot or less in wells which monitor zones of perched water (DC-2A, DC-4A, and DC-8A); by five feet or less in well pairs near Spring Creek (DC-13 and DC-14); and by four to six feet elsewhere (DC-3A and DC-6A). Wells DC-7RA, DC-8B and DC-10A were dry in October 1994; no wells were dry in January or April 1995. Reflecting the below-normal precipitation during the previous winter and early spring, water levels in April 1995 were much lower than year-earlier levels. Maximum observed levels were typically five to 15 feet lower in April 1995; the shortfall was 26 feet at DC-7. Hydraulic head relationships were generally the same in the two sets (rounds 2-5 and 6-8) of water level data: the lowest water levels within a well cluster were often in the B or C wells, while the highest levels were usually in the A (shallow) well. Consistently at odds with this trend were clusters DC-5 and DC-12, where hydraulic gradients were directed downward regardless of groundwater levels.

3.0 SAMPLING AND ANALYTICAL RESULTS

Analysis of surface water and groundwater samples for volatile organic compounds was consistent with USEPA SW-846 Method 8010, or NYSDEC ASP CLP Method 91-1. The methodology for a particular group of analyses is indicated by a footnote on the data tables. Cyanide analyses were performed by NYSDEC ASP CLP methodology.

3.1 SURFACE WATER

Surface water analytical data for samples collected in December 1992, and in rounds 1 through 5, appear in the RI report on Tables 6-1A, 6-5, 6-7, 6-8, 6-9 and 6-10. A brief description of each surface water feature which was sampled in rounds 6, 7 and 8 appears on Table 1. Cyanide analyses were not performed on surface water samples.

3.1.1 Round 6 - October 1994

Twelve surface water sampling locations were included in the round 6 sampling plan. Half of these locations were dry and could not be sampled (SPR-3, 7, 20A, 21, and 26, and SW-17). Five of the six samples that were collected had detectable levels of TCE, and sample SPR-19 was ND for TCE at the laboratory reporting limit of 1 μg/l. Except as noted, the results of this sampling round do not differ substantially from those of previous rounds. The analytical results are shown on Table 2, and are summarized below.

Sample SPR-4 had the highest TCE concentration of the round 6 surface water samples, and the highest concentration ever for that sampling location (160 μg/l). The next highest concentration was detected in sample SPR-12 (100 μg/l). Sample SW-6B, collected near the upstream end of the gorge pond, contained 32 μg/l of TCE, whereas sample SW-6C, collected at the downstream end, exhibited only 2.3 μg/l of TCE. These data indicate a reduction in TCE concentration in the pond, possibly associated with dilution and/or volatilization from the surface water. The health-based surface water guidance value for TCE is 3 μg/l, a value that is exceeded in samples SPR-4 and 12, and SW-6B. These samples also exceed the human-health bioaccumulation-based surface water guidance value (11 μg/l). As in prior sampling rounds, TCE detections at levels below both guidance values were observed in SW-FH1 and SW-6C.

A small quantity of cis-1,2-dichloroethene (cis-1,2-DCE), a known degradation product of TCE, was detected in sample SW-6B at a concentration below the human-health-based standard of 5 μg/l. Dichlorodifluoromethane was detected at estimated concentrations below the laboratory reporting limit, but above the method detection limit, in samples SW-FH1 and SW-6B. This contaminant is not related to the derailment spill and is most likely laboratory-derived.

3.1.2 Round 7 - January 1995

Eight surface water sampling locations were included in the round 7 sampling plan. Three of these locations were dry and could not be sampled (SPR-3, SPR-26 and SW-17). Sample SPR-21 was ND

for TCE at the detection limit of 1 μg/l. This was only the second sample collected from this spring, which is dry during all but the wettest periods. The previous sample (April 1994) contained 1900 μg/l of TCE. Conditions at the sampling location in January suggested that pooled snowmelt rather than spring water may have been sampled. With this notable exception, none of the results of this sampling round differs substantially from those of previous rounds. The analytical results are shown on Table 3, and are summarized below.

Four of the five samples that were collected had detectable levels of TCE. Sample SPR-20A had the highest TCE concentration of the round 7 surface water samples (530 μg/l), a level that precisely matched the concentration in the July 1994 sample from the same location. The January sample also contained 10 μg/l of cis-1,2-DCE, a level that exceeds the health-based surface water guidance value (5 μg/l). SPR-4 had a concentration of 68 μg/l TCE, whereas sample SPR-7 contained 100 μg/l of TCE. All of these TCE results exceed both surface water guidance values for TCE. SPR-4 also contained 2.4 μg/l chloroethane, a compound for which there is no guidance value or standard. Chloroethane is not considered to be related to the derailment spill.

3.1.3 Round 8 - April 1995

Ten surface water locations were scheduled to be sampled during round 8. Because of the relatively dry conditions prior to and at the time of sampling, five of the locations could not be sampled (SPR-3, 21, 26 and L27, and SW-17). SPR-L27, a basement sump in a home on Spring Street, would have been a new sampling location. Six surface water samples were taken during this round, including an extra sample in the Mud Creek gorge. TCE was detected in every sample. The analytical results are shown on Table 4, and are summarized below.

The highest-ever TCE levels were observed in the gorge samples SPR-20 and 20A, at 850 and 990 μg/l, respectively. Downstream of these springs, a sample taken from the gorge pond (SW-6B) also showed the highest TCE level (60 μg/l) of three sampling events at this location. The remaining samples (SPR-4, 7 and 12) had concentrations of TCE in the 72-90 μg/l range, consistent with the historical results at these locations. All of these TCE concentrations exceed both surface water guidance values for TCE. No other volatile organic compounds were detected in round 8 surface water samples.

3.2 GROUNDWATER

3.2.1 Domestic Wells

Groundwater samples were collected from several domestic/commercial wells in the three-county area during rounds 6, 7 and 8. Refer to Figure 2 for well locations. TCE results for earlier domestic well sampling events (prior to round 6) appear in Appendix B of the RI report.

3.2.1.1 Round 6 - October 1994

The round 6 domestic well volatile organic analytical results are presented in Table 5. TCE was detected in seven of the nine sampled wells at concentrations that exceed the New York State Department of Health (NYSDOH) drinking water standard of 5 μg/l. TCE was not detected in the other two wells. All of the TCE concentrations discussed below are within the historical range for each respective well.

The highest TCE concentration (2400 μg/l) was detected in sample DWG1 (the sampled well is labeled G-1 on Figure 2). Sample DWG5S (from well G-5), taken from the shallow pump at a nearby quarry well, exhibited the second highest TCE concentration (1400 μg/l). The deep pump in well G-5 yielded a sample (DWG5D) with 1200 μg/l TCE. A slightly lower TCE concentration (1100 μg/l) was detected in groundwater sample DWG9. Samples DWG2 and DWL1 had similar TCE levels (280 and 210 μg/l, respectively). Sample DWM14 exhibited a TCE concentration of 55 μg/l. One of the samples with no detectable TCE (DWG10) came from the neighboring well to DWG9, again illustrating the sharp southward decrease in TCE concentrations along Church Road. The other non-detect sample was DWM1. No other volatile organic compounds were detected in this group of samples.

In October 1994, two domestic well samples were analyzed for cyanide. Both DWG1 and DWG2 were non-detect for cyanide at the reporting limit of 10 μg/l. The drinking water standard for cyanide is 200 μg/l. During the prior sampling round (July 1994), both of these wells had low-level cyanide hits (<17 μg/l). Cyanide results for both domestic wells and monitoring wells during sampling rounds 6, 7 and 8 are presented on Table 6.

3.2.1.2 Round 7 - January 1995

The round 7 domestic well volatile organic analytical results are presented on Table 7. The data indicate that TCE was detected in five of the 10 sampled wells at concentrations that exceed the drinking water standard of 5 μg/l. TCE was not detected in four of the remaining five wells. With the exception of the all-time maximum concentration detected in sample DWG5S, all of the TCE concentrations discussed below are within the historical range for each respective well.

The highest TCE concentration (2600 μg/l) was detected in sample DWG1. This sample also exhibited 22 μg/l of cis-1,2-DCE, a degradation product of TCE. Sample DWG5S, taken from the shallow pump in the nearby quarry well, exhibited the second highest TCE concentration (1800 μg/l). The deep pump in the same well was out of service for the winter, and could not be sampled. A somewhat lower TCE concentration (1500 μg/l) was detected in groundwater sample DWG9. Sample DWG2 had a sharply higher TCE content (1400 μg/l) in comparison to the preceding round (290 μg/l). Sample DWG10, which was ND in the last round, exhibited 290 μg/l of TCE in round 7. Low level TCE hits have been common in the past at well L30. The round 7 sample from that well (DWL30) had a TCE concentration below the drinking water standard. Samples DWG12, DWL15, DWL19 and DWL39 were all ND for TCE. These wells have always yielded samples that test below the standard for TCE. At the request of the NYSDEC project manager, a sample (M13R)

of raw water was collected from domestic well M-13 on January 27. This sample exhibited 45 μg/l of TCE, the second highest TCE concentration in 10 sampling events at the well. No other volatile organic compounds were detected in this group of samples.

In January 1995, two domestic well samples were analyzed for cyanide. Sample DWG1 yielded 11.9μg/l, and DWG2 was non-detect for cyanide at the reporting limit of 10 μg/l. During the prior sampling round (October 1994), both of these wells were ND for cyanide. Refer to Table 6 for all recent cyanide results.

3.2.1.3 Round 8 - April 1995

The round 8 domestic well volatile organic analytical results are presented on Table 8. The data indicate that TCE was detected in five of the seven sampled wells at concentrations that exceed the drinking water standard of 5 μg/l. TCE was not detected in one well. Sample DWG5S, which yielded its all-time maximum concentration in the last round, came in at less than 1 μg/l in this round. Other than this, the TCE concentrations discussed below are within the historical range for each respective well.

The highest TCE concentration in this round was detected in sample DWG2 (5600 μg/l) - the second highest concentration ever detected in this well. (The highest concentration at this well was also detected in the spring, in April 1994.) The second highest concentration during this round was detected in sample DWG1 (1700 μg/l). A TCE concentration of 1300 μg/l was detected in sample DWG9, whereas the neighboring well (DWG10) was ND, similar to the relationship between these two wells in October 1994. Farther east in Livingston and Monroe counties, samples DWL1 and DWM14 exhibited TCE concentrations of 14 and 31 μg/l, respectively. The results are near the low end of the historical range for these wells. No other volatile organic compounds were detected in this group of samples.

In April 1995, two domestic well samples were analyzed for cyanide. Sample DWG1 yielded 11.5 μg/l, and DWG2 exhibited 12.2 μg/l of cyanide. Such low-level hits are not unusual for this pair of domestic wells. The drinking water standard for cyanide is 200 μg/l. Refer to Table 6 for all recent cyanide results.

3.2.2 Monitoring Wells

With the concurrence of the NYSDEC, the scope of monitoring well sampling in rounds 6, 7 and 8 was sharply reduced from earlier rounds. Groundwater samples were collected from most wells west of Church Road, and few wells east of Church Road. Refer to Figure 2 for the approximate locations of all wells installed during the field investigation. Analytical results for TCE and related compounds during earlier monitoring well sampling events (prior to round 6) are summarized on Table 6-18 of the RI report.

Round 6, 7 and 8 field parameter measurements for monitoring well samples (temperature, pH, conductivity, and turbidity) are compiled in Appendix B. Round 6, 7 and 8 analytical results for all

volatile organic compounds are compiled on Tables C-1, C-2 and C-3 in Appendix C. TCE results for all seven sampling rounds for wells which were sampled at least once during rounds 6, 7 and 8 are shown on Table 9. All recent cyanide results are summarized on Table 6. Finally, refer to Table 10 for a list of stratigraphic units screened in, or exposed to, each monitoring well in the Study Area.

In order to compare analytical results within a well cluster over time, the analytical data in this section are discussed on a cluster-by-cluster basis for the three sampling events. Monitoring well samples were labeled with the standard monitoring well prefix designation, e.g., MW1-A is the sample collected from well DC-1A. When referring to a well in the following discussion, the DC prefix is used, whereas when referring to a sample, the MW prefix is used. Unless otherwise noted, TCE concentrations during rounds 6 through 8 were within the historical range defined by sampling rounds 2 through 5. Rounds 6 through 8 are referred to as "recent" sampling in the following sections, whereas rounds 2 through 5 are described as "earlier" sampling.

3.2.2.1 Well Cluster DC-1

Trichloroethene

Highlights: While TCE is present throughout the investigated water column at this cluster, the contamination is greatest in rocks penetrated by the open-hole (A) well (Table 9). TCE was detected at lower concentrations during the recent sampling rounds at this cluster. TCE concentrations in well DC-1B appear to have a seasonal trend. TCE levels continued to decrease in wells DC-1C and DC-1D, but remain above the groundwater standard.

Analytical results for well cluster DC-1 revealed that samples from the four monitoring wells exhibited TCE concentrations that exceeded the groundwater standard of 5 μg/l during the three sampling events. (Well DC-1A was sampled only twice because it was dry during the October round.) Groundwater from monitoring well DC-1A, the "shallow" open-hole well, exhibited the highest concentration of TCE at the cluster during the two rounds when it was sampled. Concentrations were 9600 μg/l (January 1995) and 6300 μg/l (April 1995). TCE concentrations in well DC-1B appear to have a seasonal trend: the two lowest values (76 and 99 μg/l) were observed in April sampling events. During rounds 6, 7 and 8, TCE results ranged from 99 to 440 μg/l in DC-1B. With the exception of a small increase in the October 1994 sample, TCE concentrations have consistently decreased in well DC-1C, from 38,000 μg/l in November 1993 to 60 μg/l in April 1995. At well DC-1D, TCE concentrations have dropped without interruption over the same time period (from 9400 μg/l to 240 μg/l). Despite the persistent decline, TCE levels in DC-1D have exceeded those of the shallower wells DC-1C and DC-1B in every sampling round except the first.

Other Compounds

Dichlorodifluoromethane was detected at a concentration below the groundwater standard in sample MW-1C in October 1994 (Appendix C). This was the first and only detection of this compound at well cluster DC-1 during seven sampling events. This compound is not considered to be related to the derailment spill.

Low levels of cis-1,2-DCE were detected in samples MW-1B during two of the three recent sampling events. One of these detections (6.3 μg/l) was above the groundwater standard of 5 μg/l. Cis-1,2-DCE was detected in all three recent samples from well DC-1C, always below the groundwater standard for the compound. Cis-1,2-DCE was also detected in the three recent samples from well DC-1D, always at levels slightly above the groundwater standard. This compound had previously been detected once in MW-1B samples, never in MW-1C samples, and once in MW-1D samples.

Well DC-1A, which was dry during the October 1994 sampling event, exhibited low levels of cyanide during the subsequent two rounds (14.1 and 10.5 μg/l). These concentrations are well below the groundwater standard of 100 μg/l. Cyanide analyses of eight samples collected from this well during the course of the RI have ranged from ND to 530 μg/l. Wells DC-1B, 1C and 1D were not analyzed for cyanide during rounds 6, 7 or 8. Refer to Table 6 for a summary of the recent cyanide results.

3.2.2.2 Well Cluster DC-2

Trichloroethene

Highlights: Analytical results from rounds 6, 7 and 8 show that TCE contamination is largely confined to wells in the Onondaga and Bertie Formations at cluster DC-2. Concentrations in the deeper D well at this location were substantially lower than in earlier sampling events. There appears to be a seasonal trend in TCE concentrations in well DC-2B. The 1994 springtime TCE highs in the C and D wells did not recur in 1995 (Table 9).

During two of the three recent sampling rounds, analytical results for well DC-2C were below the groundwater standard for TCE. Otherwise, the standard was exceeded in all wells at this cluster for the three events. TCE concentrations at the cluster were highest in the A well in October 1994, and in the B well in January and April, 1995. Concentrations ranged from 580 to 1000 μg/l in well DC-2A, which monitors a zone of perched water; from 730 to 1600 μg/l in well DC-2B; from 2.9 to 6.7μg/l in well DC-2C; and from 5.7 to 60 μg/l in well DC-2D. The DC-2B results again display, though less dramatically, the "fall low to spring high" TCE trend evident in this well during rounds 2, 3 and 4. Well DC-2D has exhibited the most erratic TCE concentrations at the cluster, ranging from 5.7μg/l to 1800 μg/l during the seven sampling events. The decrease in TCE concentrations in this well between the first four sampling events and the last three sampling events is dramatic.

Other Compounds

Cis-1,2-DCE was commonly detected in groundwater samples from cluster DC-2 during rounds 6, 7 and 8 (Appendix C). The compound is a degradation product of TCE and is most likely related to the derailment/spill. In October 1994, cis-1,2-DCE was detected in the A and D wells. Only the concentration in DC-2A (670 μg/l) exceeded the groundwater standard (5 μg/l). In the January 1995 samples, cis-1,2-DCE was detected in the A, B and D wells at concentrations above the standard. The concentrations in the four wells ranged from 0.7μg/l (MW-2C) to 330 μg/l (MW-2A). During

round 8 sampling, only sample MW-2A exhibited cis-1,2-DCE. The concentration (130 μg/l) was well above the 5 μg/l standard for the compound. No other volatile organic compounds were detected in this group of samples during rounds 6, 7 and 8.

Cyanide analyses were not performed on cluster DC-2 samples during these sampling events.

3.2.2.3 Well Cluster DC-3

Trichloroethene

Highlights: Although TCE has been detected at all depths of the investigated water column at this cluster (Table 9), the analytical results show that the compound is largely restricted to DC-3B, which is screened in the Falkirk member of the Bertie Formation. The high TCE concentration (8600 μg/l) detected in the A well in July 1994 has not been replicated in three subsequent sampling events. There are no strong seasonal trends in TCE concentrations at this well cluster.

TCE concentrations in well DC-3A ranged from 0.9 μg/l to 23 μg/l during rounds 6, 7 and 8, only once exceeding the groundwater standard of 5 μg/l. Concentrations of the same compound in well DC-3B varied from 750 μg/l to 970 μg/l, demonstrating less variability than was present during the prior four rounds at the cluster. Concentrations in the C well also encompassed a smaller range (31 μg/l to 87 μg/l) during rounds 6, 7 and 8. The deepest well (DC-3D) exhibited detectable TCE (1 μg/l) only once during the two recent rounds when it was sampled. This well had exhibited TCE exceedences of the standard only during the first of eight sampling events.

Other Compounds

Sample MW-3B, collected in October 1994, exhibited cis-1,2-DCE at a concentration (7.2 μg/l) exceeding the 5 μg/l standard for the compound. No other volatile organic compounds were detected in samples from well cluster DC-3 during sampling events 6, 7 and 8 (Appendix C). Cyanide analyses were not performed on DC-3 samples during this period.

3.2.2.4 Well Cluster DC-4

Trichloroethene

Highlights: Two groundwater samples from this upgradient well cluster exhibited low, estimated concentrations of TCE during rounds 6, 7 and 8. These concentrations were below the groundwater standard for the compound.

The shallow, open-hole well (DC-4A) was not sampled during the three recent events because it intersects a perched water table, and has been ND for TCE on four occasions. TCE was not detected in well DC-4B during the three recent events, or during the previous four. A low, estimated TCE concentration of 0.9 μg/l was detected in DC-4C in October 1994. A low, estimated TCE

concentration of 0.6 μg/l was detected in DC-4D in January 1995. Both of these wells have had detectable TCE (<18 μg/l) in the past, also during the fall and winter (rounds 2 and 3).

Other Compounds

The only detection of other volatile organic compounds in this well cluster occurred in round 8 when well DC-4D exhibited a low, estimated concentration (0.8 μg/l) of 1,1,1-trichloroethane. This compound is not considered to be related to the derailment spill. The groundwater standard for 1,1,1-TCA is 5 μg/l. Cyanide analyses were not performed.

3.2.2.5 Well Cluster DC-5

Trichloroethene

Highlights: Although TCE has been detected at all depths of the investigated water column at this well cluster, the compound is largely confined to strata intersected by the A and B wells. The initially high concentrations detected in the C and D wells during rounds 2 and 3 have recently stabilized in the 15 μg/l range in these deeper wells. TCE concentrations potentially indicative of NAPL were detected during all three recent sampling events in well DC-5A. The April 1995 analysis of sample MW-5A yielded the highest-ever TCE concentration (47,000 μg/l) at cluster DC-5 - a concentration equivalent to 4.3% of the aqueous solubility of TCE.

TCE concentrations exceeded the 5 μg/l groundwater standard in each analyzed sample collected at this cluster during the three events. The lowest concentrations were found in the Camillus wells, DC-5C and 5D, where they ranged from 8.1 μg/l to 19 μg/l. The next highest concentrations were detected in DC-5B, where the January and April 1995 samples (250 μg/l and 440 μg/l) were within the historical range for samples from the well. The October 1994 sample, on the other hand, yielded the highest-ever concentration for well DC-5B (2200 μg/l). TCE concentrations in the open-hole well (DC-5A) increased steadily from the July 1994 low (1300μg/l) to the April 1995 high (47,000 μg/l), likely indicating a seasonal trend.

Other Compounds

During rounds 6, 7, and 8, cis-1,2-DCE was detected once in wells DC-5A and DC-5B, and three times in DC-5C and DC-5D. The concentration in MW-5A was 350 μg/l, well above the groundwater standard of 5 μg/l. The concentration for the one detection in MW-5B was below the standard. Only one of the three cis-1,2,-DCE detections in sample MW-5C (160 μg/l) was above the standard, whereas the standard was exceeded three times in sample MW-5D (110 μg/l, 250 μg/l, and 110 μg/l). The concentrations of this compound at cluster DC-5 were generally greater in the later rounds than in the earlier rounds. No other volatile organic compounds were detected during rounds 6, 7 and 8.

Of the four wells at the cluster, only DC-5A and DC-5B were sampled for cyanide analyses during rounds 6, 7 and 8. Cyanide was twice detected at concentrations below the groundwater standard

(100 µg/l) in MW-5A, and was not detected in any of the three MW-5B samples. These results are in line with those of earlier sampling events. Refer to Table 6 for all cyanide analytical results.

3.2.2.6 Well Cluster DC-6

Trichloroethene

Highlights: Although TCE has been detected at all depths of the investigated water column at this well cluster, the analytical data show that the compound is largely confined to strata intersected by the A and B wells. TCE concentrations were higher in DC-6B during all but the two April events, when DC-6A had the higher concentrations. Although they are different in each well, seasonal trends in TCE levels appear to be present in the A, B and C wells at this cluster.

An all-time TCE low (220 µg/l) was detected in the January 1995 MW-6A sample. The previous low for this well (240 µg/l) was also detected during a January sampling event. TCE concentrations in DC-6A have been fairly constant during the three recent sampling events, ranging from 220 µg/l to 380 µg/l. An all-time low for TCE was established in well DC-6B (240 µg/l) in the April 1995 sample. The previous low for this well was also detected during an April sampling event. The maximum TCE concentration at this well during rounds 6, 7 and 8 was detected in the October sample (1900 µg/l). The TCE trend detected in the year-earlier samples from well DC-6C (minimum in the fall, maximum in the spring) was maintained in round 6, 7 and 8 samples from the same well. Concentrations varied from ND to 25 µg/l. DC-6D was not sampled during round 8. Samples from this well during rounds 6 and 7 were ND for TCE.

Other Compounds

Cis-1,2-DCE was detected at a concentration below the groundwater standard (5 µg/l) in well DC-6A during the January 1995 sampling event. The same compound was detected twice at levels above the standard in samples from well DC-6B; in January at a concentration of 52 µg/l, and in April at a concentration of 6.3 µg/l. The compound 1,3-dichlorobenzene was detected in April 1995 sample MW-6C at a concentration below the groundwater standard. This was the only detection of this compound in study area groundwater, suggesting that its presence is not related to the derailment spill. Cis-1,2-DCE was detected at concentrations below the standard in the October 1994 and January 1995 samples from DC-6D. No other volatile organic compounds were detected during rounds 6, 7 and 8. Cyanide analyses were not performed on DC-6 samples during this period.

3.2.2.7 Monitoring Well DC-7

This well was not sampled in October 1994 or January 1995. DC-7 was sampled for the fourth time in April 1995, and consistent with historical data, the sample was ND for all volatile organic compounds. This well has never been sampled for cyanide analysis.

3.2.2.8 Well Cluster DC-7R

Trichloroethene

Highlights: TCE concentrations at this cluster have consistently been highest in well DC-7RB, although the A and C wells have occasionally yielded groundwater samples with TCE levels greater than 100 μg/l. A "plume bottom" has apparently been defined here, as shown by the collection of six samples from well DC-7RD that were ND for TCE over a 14-month period.

DC-7RA was dry in October 1994, and could not be sampled. In January and April 1995, samples from this well yielded TCE concentrations of 85 and 56 μg/l, respectively, exceeding the 5 μg/l groundwater standard. The two samples collected from this well in April sampling events (1994 and 1995) have yielded the lowest TCE concentrations of the five sampling events. The range of TCE concentrations at DC-7RB was extended in both the low and high directions during the three recent sampling rounds. A new low of 250 μg/l was realized in January 1995, and a new high was observed in the April 1995 sample (620 μg/l). New lows were also observed in well DC-7RC in the October 1994 sample (12 μg/l) and in the April 1995 sample (11 μg/l). These concentrations nevertheless exceed the groundwater standard for TCE. The compound was not detected in samples from well DC-7RD during rounds 6 and 7. Because it has been consistently ND for TCE, the well was not sampled in round 8 (April 1995).

Other Compounds

Quantities below the groundwater standard of dichlorodifluoromethane were detected in January 1995 samples from wells DC-7RB and DC-7RC. This compound is not considered to be related to the derailment spill. No other volatile organic compounds were detected during rounds 6, 7 and 8. Cyanide analyses have not been performed on samples from well cluster DC-7R.

3.2.2.9 Well Cluster DC-8

Trichloroethene

Highlights: Contaminated groundwater at this location appears to be confined to strata of the Falkirk member of the Bertie Formation, and the upper Camillus Formation. TCE has not been detected in the lower Camillus.

The scope of sampling at well cluster DC-8 was reduced for rounds 6, 7 and 8. Well DC-8A (TCE below groundwater standard in prior four rounds) was not sampled, and DC-8D (ND for TCE in prior four rounds) was sampled only during round 6. TCE was not detected in well DC-8D in the round 6 sample. Well DC-8B was scheduled to be sampled in each round, but the low water table left the well dry for all but the April 1995 sampling event. TCE was detected at 14 μg/l in the April sample, in comparison to the 88 μg/l result in the only other sample (April 1994). Analytical results for DC-8C (14 μg/l, 20 μg/l and 20 μg/l) were in line with previous results for the well.

Other Compounds

Chloromethane was the only other volatile organic compound detected at this cluster during rounds 6, 7 and 8. The detection was a low, estimated concentration in the January 1995 sample from well DC-8C at a level below the standard for the compound. Cyanide analyses have not been performed on samples from well cluster DC-8.

3.2.2.10 Well Pair DC-15

Trichloroethene

Highlights: Although the shallow well at this location continues to exhibit TCE concentrations in the parts per million range, the three recent sampling events detected generally lower TCE levels. TCE contamination persists at concentrations above the standard in the upper portion of the Syracuse Formation (DC-15B).

Analytical results from the open-hole well (DC-15A) during rounds 6, 7 and 8 ranged between 3000 μg/l and 9800 μg/l, extending to a new low the TCE concentrations detected in this well. The low was detected in April 1995; the highest-ever TCE concentration in this well was also observed in a sample collected in April (1994). Any correlation between water levels and TCE concentrations in DC-15A now appears weak. Analytical results from DC-15B indicated a steady decline in TCE concentrations in rounds 3, 4 and 5. This declining trend was upset by the April 1995 results, which showed a TCE concentration at a new high (210 μg/l) in the uppermost Syracuse strata.

Other Compounds

Cis-1,2-DCE was detected in the January and April 1995 samples from well DC-15B at concentrations (87 μg/l and 500 μg/l) which exceed the groundwater standard. This compound is a known breakdown product of TCE and is most likely related to the derailment spill. No other volatile organic compounds were detected at this cluster during rounds 6, 7 and 8.

Cyanide was detected in the October 1994 (14.1 μg/l) and January 1995 (13.6 μg/l) groundwater samples from well DC-15A. Both of these cyanide concentrations were below the groundwater standard of 100 μg/l. Cyanide was not detected in the April 1995 sample. Well DC-15B was not sampled for cyanide during the three recent sampling events. Refer to Table 6 for a summary of all cyanide results.

3.2.2.11 Monitoring Well DC-16

This well continued to exhibit TCE levels significantly above the 5 μg/l groundwater standard for the compound. Concentrations ranged from 600 μg/l in October 1994 to 4500 μg/l in April 1995. Although the latter concentration was the highest since the previous April result, it was less than the November 1993 concentration, somewhat weakening the evidence for a seasonal correlation. No

other volatile organic compounds were detected in samples from well DC-16 during rounds 6, 7 and 8.

Cyanide was detected at concentrations well below the groundwater standard during each of the three recent sampling rounds at well DC-16. Refer to Table 6 for the cyanide results.

3.2.2.12 Well Pair DC-17

Trichloroethene

Highlights: With the exception of one sampling round, TCE levels have been much greater in the open-hole well than in the 165-foot-deep screened well at this location. The exception occurred in the final round (April 1995), when the TCE concentration in the deeper well was 50% greater than in the shallower well. Analytical results for the deeper well (DC-17B) have been very erratic during the seven sampling events, varying between non-detect and 1200 μg/l TCE.

During the three recent sampling rounds, TCE concentrations in well DC-17A ranged from 820 μg/l to 1900 μg/l. The low concentration was observed in the April 1995 sample; the previous low was also detected in a sample collected in April (1994). The high concentration, detected in January 1995, was an all-time high for this well pair; the earlier maximum concentration was also detected in a January (1994) sample. These results suggest a possible inverse correlation between TCE concentrations and water levels in DC-17A. During the three recent sampling rounds, TCE concentrations in well DC-17B ranged from 42 μg/l to 1200 μg/l. There is no seasonal effect in the results from this well. In fact, the seven-round minimum (ND) and maximum (1200 μg/l) concentrations were both detected in samples collected in the month of April.

Other Compounds

Cis-1,2-DCE was detected at a concentration (7.5 μg/l) slightly above the groundwater standard in October 1994 sample MW-17B; at a concentration slightly below the standard in the January 1995 sample from the same well; and at a concentration (57μg/l) well above the standard in April 1995 sample MW-17B. The only other volatile organic compound detected during the three rounds at this well pair was dichlorodifluoromethane, at a concentration below the groundwater standard for the compound. Cyanide analyses were not performed on samples from this well pair during rounds 6, 7 and 8.

3.2.2.13 C&D Landfill Wells

Two additional wells were sampled in April 1995 at the NYSDEC project manager's request. These wells, drilled in 1986, are located about 2000 feet north of the spill site in an abandoned quarry. Using the top of PVC as the measuring point, the total depth of each well is B1: 9.77'; B2: 13.02'; B3: 53.90'.

Wells B1 and B3 were ND for all volatile organic compounds. The wells were not sampled for cyanide analysis. Well B2 was dry and could not be sampled. The analytical data are in Appendix C (Table C-3).

3.3 DATA VALIDATION RESULTS

Validation of the analytical results for samples collected during rounds 6, 7 and 8 revealed that approximately 21% of the 19 cyanide data points were qualified as estimated, and that all of those data are valid and usable. Approximately 30% of the volatile results were qualified as estimated, and only one analysis was rejected and is unusable. It should be noted that the single unusable result is for the compound 1,1,2,2-tetrachloroethane, which is not considered to be a spill-related contaminant. Nearly 100.0% of the 4392 volatile results are considered valid and usable, and meet project requirements.

4.0 DISCUSSION OF ANALYTICAL RESULTS

4.1 SURFACE WATER

Analytical data from round 6, 7 and 8 sampling events (Tables 2, 3 and 4) show that TCE is the principle spill-related compound detected in surface water samples collected throughout the Study Area. Cis-1,2-DCE, a known breakdown product of TCE, was detected at a significant level in only one surface water sample. Springs in the Mud Creek gorge and along Spring Street continued to exhibit TCE at levels that exceed the surface water guidance values. As in prior sampling rounds, TCE concentrations in Mud Creek springs (SPR-4, 7, 20 and 20A) and the gorge pond (SW-6B and 6C) decrease with increasing distance from the spill site. Samples from a spring near Spring Creek (SPR-12), miles from the spill site, consistently exhibited TCE concentrations that are very similar to those in spring samples from the Mud Creek gorge.

A consistent seasonal pattern is difficult to discern in the surface water analytical data. TCE concentrations are either relatively stable on a seasonal basis, such as samples SPR-4, or vary in an apparent random fashion. For example, TCE concentrations in samples SPR-20 and 20A were highest in the April 1995 event. However, TCE levels were five to 10 times lower in the year-earlier samples from these two springs.

Surface water analytical data for samples collected in December 1992, and in rounds 1 through 5, appear in the RI report on Tables 6-1A, 6-5, 6-7, 6-8, 6-9 and 6-10.

4.2 GROUNDWATER

Figure 2 shows the known maximum extent of TCE contamination in groundwater in the Study Area. It is emphasized that this figure is not a "snapshot" of conditions which existed at any one time. The figure is a "worst case", contoured display of the maximum TCE concentrations ever detected at the indicated locations during a monitoring period that may have been up to four years in duration at many wells.

4.2.1 Domestic Wells

With the exception of well G-5S, where the highest-ever TCE concentration was detected in January 1995, concentrations in domestic wells which were sampled in rounds 6, 7 and 8 (Tables 5, 7 and 8) were within the historical range for each well. Most of the wells sampled during the three rounds have not exhibited well-defined seasonal patterns during their four-year sampling histories. For example, samples from wells G1 and G9 had their historically lowest and highest concentrations in "successive" months (although the months were not in the same year). Nearly the entire historical range of TCE concentrations in well M-14 was encompassed by samples collected in April events. Similarly at L1, TCE concentrations varied by an order of magnitude in the three samples which were collected in April.

TCE concentrations in a few of the round 6, 7 and 8 domestic wells have a vague seasonal overprint. For example, the three highest TCE concentrations at G-2 were exhibited in samples collected in the spring months - but the fourth highest concentration was observed in a December sample. Six of the seven lowest TCE concentrations at G-5S were detected in the spring, and the two highest levels (1500 μg/l and 1800 μg/l) were detected in January samples - but another sample collected in January yielded only 11 μg/l TCE. Well G-5D also tended to have low-level TCE hits in the spring, but low-level hits were inconsistently observed at other times of the year as well.

TCE results for earlier domestic well sampling events (prior to round 6) appear in Appendix B of the RI report.

4.2.2 Monitoring Wells

The monitoring wells can be separated into five groups on the basis of the strata to which they are open (Table 10). The following discussion examines the stratigraphic distribution of TCE and its relationship to groundwater levels during sampling rounds 6, 7 and 8; these rounds are referred to as the "later" or "recent" rounds, in contrast to the "earlier" rounds 2 through 5. TCE data for monitoring wells are summarized on Table 9; water level data are in Appendix A.

Open-hole Wells: These wells bottom in either the Onondaga Formation (DC-2A, 3A, 5A and 6A), or in the upper/middle portion of the Bertie Formation (DC-1A, 7, 7RA, 15A, 16 and 17A). As a group, these wells have the highest TCE concentrations in the Study Area. During round 6 sampling (October 1994), TCE concentrations in this group of wells ranged from 1.9 μg/l (DC-3A) to 15,000 μg/l (DC-5A). The median TCE concentration was 930 μg/l. In round 7 (January 1995), the range was 0.9 μg/l (DC-3A) to 36,000 μg/l (DC-5A), with a median concentration of 1900 μg/l. Round 8 (April 1995) results ranged from ND (DC-7) to 47,000 μg/l (DC-5A), with a median concentration of 700 μg/l. Monitoring well and domestic well analytical results indicate that the TCE plume may be as narrow as 500 feet in the north-south direction in the vicinity of Church Road. Monitoring well DC-7 and domestic well G-10 were ND in April 1995, while wells DC-7RA and G-9 exhibited TCE contamination. Refer to Figure 2 for the approximate locations of these wells.

One of the interesting features of this recent distribution is that the maximum TCE concentrations were not detected at well DC-1A, which is at the spill location, but rather at DC-5A located 600 feet to the south. Well DC-3A, located on the axis of the contaminant plume 950 feet downgradient of DC-5A, yielded the lowest TCE levels in two of the recent three rounds, and the second lowest in one round. This suggests that the plume sinks rapidly to the Bertie level, the formation in which the contamination is greatest at cluster DC-3. Confounding this interpretation is the observation that DC-17A, located farther downgradient of the spill than DC-3A, had TCE concentrations between 820 μg/l and 1900 μg/l. It should be emphasized that DC-17A penetrates deeper into the Falkirk than many of the wells that are screened entirely in the Falkirk. The contamination in DC-17A may reflect conditions in the Falkirk. DC-17A marks the known easternmost extent of the dissolved phase TCE plume with concentrations greater than 1,000 μg/l (1 ppm).

Analytical data from rounds 2 through 5 had shown that with the exception of DC-2A and the upgradient well DC-4A, wells west of Mud Creek exhibited their highest TCE concentrations in the April round, when water levels were highest. TCE concentrations in wells DC-5A and DC-16 again rose along with water levels in April 1995, although water levels were substantially lower than in the previous April. The TCE content in the other wells west of Mud Creek (DC-1A, 6A and 15A) was significantly less than year-earlier concentrations. In the recent three sampling events, only DC-5A has exhibited TCE levels exceeding 1% of aqueous solubility (or 11,000 μg/l). In addition to DC-5A, TCE concentrations had exceeded the 1% level in wells DC-1A and DC-15A in some of the earlier sampling rounds, even in November 1993 when water levels were below April 1995 levels.

Other observations:

- Two wells located between Mud Creek and Church Road (DC-7RA and DC-17A) have exhibited their two lowest TCE concentrations in the two April sampling events.

- In contrast, DC-3A has shown no correlation between water levels and TCE levels. With water levels differing by only ½ foot during two sampling events, TCE concentrations were 8600 μg/l (July 1994) and 23 μg/l (April 1995).

- Well DC-7 was sampled only once (April 1995) during the three recent rounds; the well was ND for TCE on the same day that DC-7RA yielded 56 μg/l. This pattern was twice observed in the earlier sampling rounds. The two wells are approximately 410 feet apart.

Falkirk Wells: These wells are screened either entirely or primarily in the Falkirk member of the Bertie Formation (DC-1B through DC-6B, DC-7RB and DC-8B). As a group, these wells have the second highest TCE concentrations (after the open-hole wells). During round 6 sampling (October 1994), TCE concentrations in these wells ranged from ND (DC-4B) to 2200 μg/l (DC-5B). The median TCE concentration was 730 μg/l. In round 7 (January 1995), the range was ND (DC-4B) to 1400 μg/l (DC-6B), with a median concentration of 250 μg/l. Round 8 (April 1995) results ranged from ND (DC-4B) to 1600 μg/l (DC-2B), with a median concentration of 340 μg/l.
The spill site well (DC-1B) never featured the highest TCE concentration in a given sampling event. In fact, the only wells exhibiting lower TCE levels than DC-1B in each of the recent rounds were the upgradient well (DC-4B) and the far-downgradient well (DC-8B). The highest values were at DC-5B (round 6), DC-6B (round 7) and DC-2B (round 8), the only wells where TCE concentrations at least once exceeded 1000 μg/l. Because no Falkirk well produced samples with TCE concentrations greater than 1% of solubility, it appears that the Falkirk does not contain NAPL in the vicinity of the sampled wells.

For four of the B wells (DC-1B, 3B, 5B and 6B), TCE concentrations were generally lower when water levels were higher. Elsewhere, concentrations rose with water levels at DC-2B; there was no correlation at DC-4B and DC-7RB; and DC-8B was not sampled often enough to define a reliable trend. (DC-15B and 17B are not screened in the Falkirk.)

Upper Camillus Wells: These wells are screened primarily in the upper/middle portion of the Camillus Formation. This group, which includes wells DC-1C through DC-6C, DC-7RC and DC-8C, exhibited TCE concentrations substantially lower than those in shallower wells. During round 6 sampling (October 1994), TCE concentrations in these wells ranged from ND (DC-6C) to 120 μg/l (DC-1C). The median TCE concentration was 13 μg/l. In round 7 (January 1995), the range was ND (DC-4C) to 82 μg/l (DC-1C), with a median concentration of 15 μg/l. Round 8 (April 1995) results ranged from ND (DC-4C) to 60 μg/l (DC-1C), with a median concentration of 17μg/l. TCE levels were consistently above the per-round median value in wells DC-1C, 3C and 6C, and consistently below the median at DC-2C and 4C.

With the exception of well DC-6C, the upper Camillus wells do not appear to exhibit a correlation between TCE concentrations and water levels. The high TCE concentrations that were detected in wells DC-1C and DC-5C during the first two sampling events increasingly appear to have been a result of temporary cross-contamination from shallower strata during the drilling program. While still above the groundwater standard, TCE levels in these two wells have fluctuated within narrow ranges substantially lower than those detected in sampling rounds 2 and 3 (Table 9).. The impact appears to have been short-lived, and has not been identified in any other upper Camillus wells.

Lower Camillus Wells: These wells are screened in the lower portion of the Camillus Formation. This group includes wells DC-1D, 2D, 3D, 5D, 6D and DC-8D. During round 6 sampling (October 1994), TCE concentrations in these wells ranged from ND (DC-6D and DC-8D) to 480 μg/l (DC-1D). In round 7 (January 1995), the range was ND (DC-3D and DC-6D) to 260 μg/l (DC-1D). DC-8D was not sampled in round 7. Round 8 (April 1995) results ranged from 5.7 μg/l (DC-2D) to 240 μg/l (DC-1D). DC-3D, 6D and 8D were not sampled in round 8. Median TCE values are not particularly meaningful because a different number of wells was sampled in each round. TCE concentrations in wells DC-1D, 2D and 5D were above the groundwater standard in each of the recent rounds.

Like the shallower C wells at the two clusters, wells DC-1D and DC-5D also appear to have been impacted by cross-contamination during the drilling program. While each of the seven samples collected from DC-1D has exhibited a lower TCE concentration than the preceding sample, the contamination persists at rather high levels (240 μg/l in the most recent round). After exhibiting TCE concentrations of 580 μg/l and 81 μg/l in rounds 2 and 3, contaminant levels in well DC-5D have stayed below 20 μg/l during each of the last five sampling events. There is no apparent seasonal effect on TCE levels in lower Camillus wells in the vicinity of the spill site.

Syracuse Wells: These four wells are screened primarily in the uppermost portion of the Syracuse Formation. This group includes wells DC-4D, 7RD, 15B and DC-17B. In October 1994 sampling, TCE concentrations in these wells ranged from ND (DC-4D and DC-7RD) to 140 μg/l (DC-17B). In round 7 (January 1995), the range was ND (DC-7RD) to 42 μg/l (DC-17B). In April 1995, results ranged from ND (DC-4D) to 1200 μg/l (DC-17B). DC-7RD was not sampled in round 8.

TCE concentrations in wells DC-15B and DC-17B were above the groundwater standard in each of the recent rounds. After falling to an apparently stable concentration of roughly 17 μg/l for three

sampling rounds, TCE levels reached a new high (210 μg/l) at well DC-15B in the final round. The concentration rose even more dramatically during the last round at well DC-17B, ascending from the second lowest concentration ever detected at the well (42 μg/l) to the highest (1200 μg/l). This well tested as low as ND for TCE in April 1994.

5.0 CONCLUSIONS

Because of the light snowfall in the preceding winter, water levels were substantially lower in April 1995 in comparison to those measured one year earlier. Vertical hydraulic gradients were generally directed downward from the Onondaga, and upward from the lower Camillus. The Falkirk and/or upper Camillus wells usually have the lowest water levels in a well cluster.

Springs in the Mud Creek gorge continued to discharge contaminated water with TCE levels exceeding surface water guidance values. TCE concentrations in the gorge generally decrease with increasing distance (and stratigraphic depth) from the spill. A sample collected in April 1995 exhibited the highest-ever TCE concentration (990 μg/l) detected in a gorge spring. A spring in Caledonia, miles from the spill site, has consistently exhibited TCE concentrations which are comparable to some of the springs in the Mud Creek gorge. A consistent seasonal pattern of surface water contamination has not been identified in the Study Area.

TCE levels in most domestic well samples were within historical ranges in rounds 6, 7 and 8. Exceptions were well G-5S, where a new high was established in January, and well G-10 where samples were ND for the first and second times since sampling began in 1991. Seasonal TCE trends are veiled, but may be present in domestic wells G-2, G-5S and G-5D. The most extreme change in domestic well TCE levels during rounds 6, 7 and 8 occurred in G-5S, which exhibited concentrations of 1800 μg/l and 0.7 μg/l in successive rounds.

Cyanide was detected in four monitoring wells and two domestic wells, but always at levels below the groundwater and drinking water standards.

With few exceptions, TCE concentrations in monitoring wells were within the ranges established in sampling rounds 2 through 5. The most notable exception was DC-5A, where new highs were exhibited in rounds 7 and 8. Also significant were the new highs in two of the four Syracuse wells. TCE concentrations in general continue to be highest in the shallower wells near the spill site and to decrease with depth. In some wells, concentrations change markedly from one sampling event to the next.

Less evident in rounds 6, 7 and 8 was the positive correlation between water level elevations and TCE concentrations in open-hole wells west of Mud Creek. Two wells which had exhibited TCE levels in excess of 1% of aqueous solubility in April 1994 fell below that level in April 1995. When a seasonal trend can be identified in Falkirk wells, it is generally negative, i.e., lower TCE concentrations tend to accompany higher water levels. Deeper wells generally do not display a seasonal effect.

When monitoring wells are grouped by the strata which are sampled, and are ranked first, second and third in order of TCE concentrations, the following trends emerge for the three recent sampling events:

- Onondaga wells - DC-5A is consistently at the top; DC-1A and DC-15A are twice in the top three; DC-16 and DC-17A make the list once;

- Falkirk wells - DC-2B, DC-5B and DC-6B are at the top once each; DC-3B is the only well consistently in the list; DC-2B and DC-6B twice make the list; DC-7R is once in the top three;

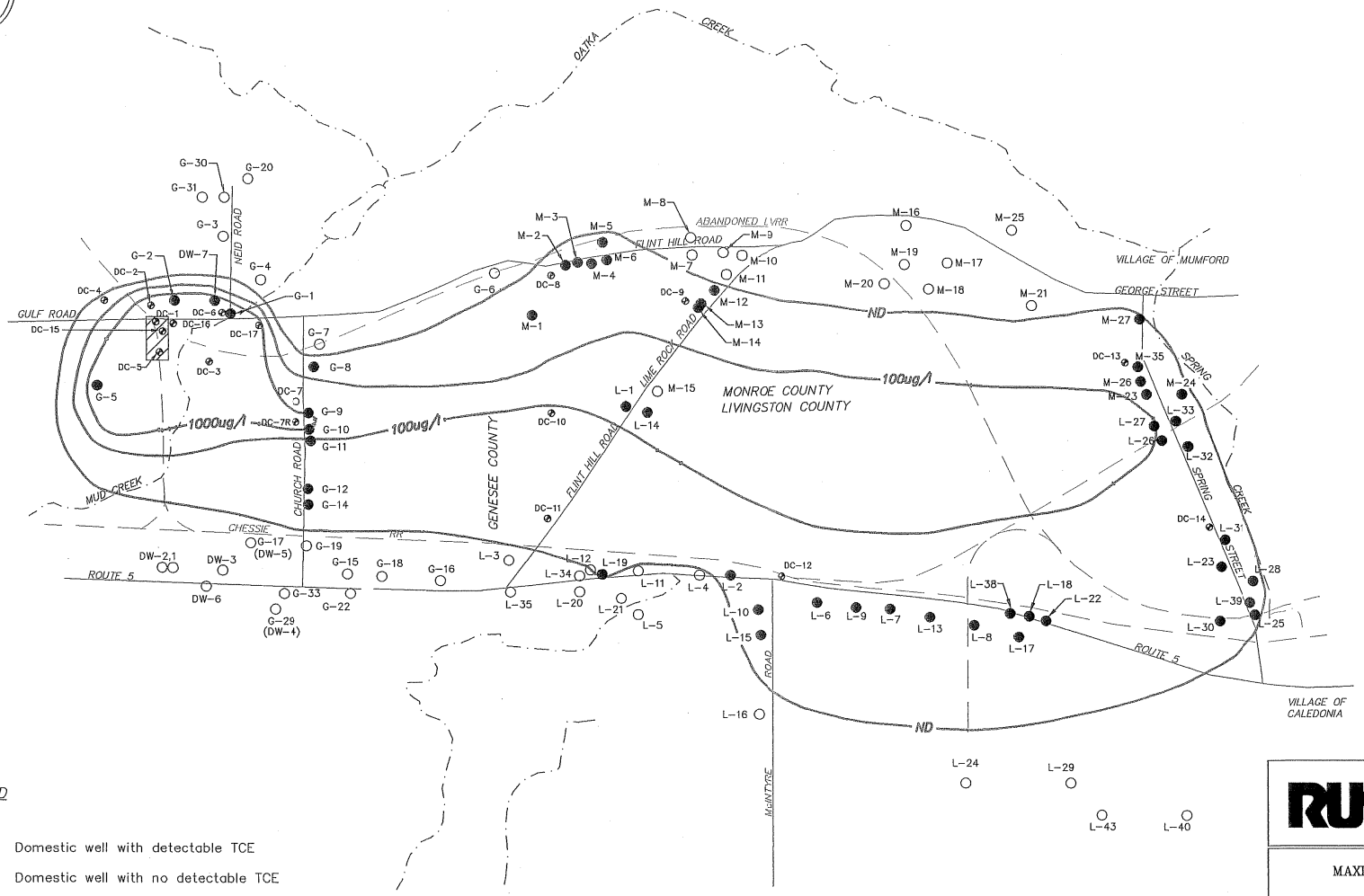
- Upper Camillus wells - DC-1C is consistently at the top; DC-3C is consistently in the list; DC-5C, DC-6C and DC-7RC make the list once;

- Lower Camillus wells - DC-1D tops the list for each round; and

- Syracuse wells - DC-17B tops the list each time.

Monitoring well and domestic well analytical results indicate that the TCE plume may at times be as narrow as 500 feet in the north-south direction in the vicinity of Church Road.

FIGURES



LEGEND

- L-10 ● Domestic well with detectable TCE
- L-16 ○ Domestic well with no detectable TCE
- DC-11 ⊕ Monitoring well or well cluster with detectable TCE
- DC-7 ○ Monitoring well with no detectable TCE (Well locations are approximate)
- Suspected NAPL area

SCALE IN FEET

0 2000 4000

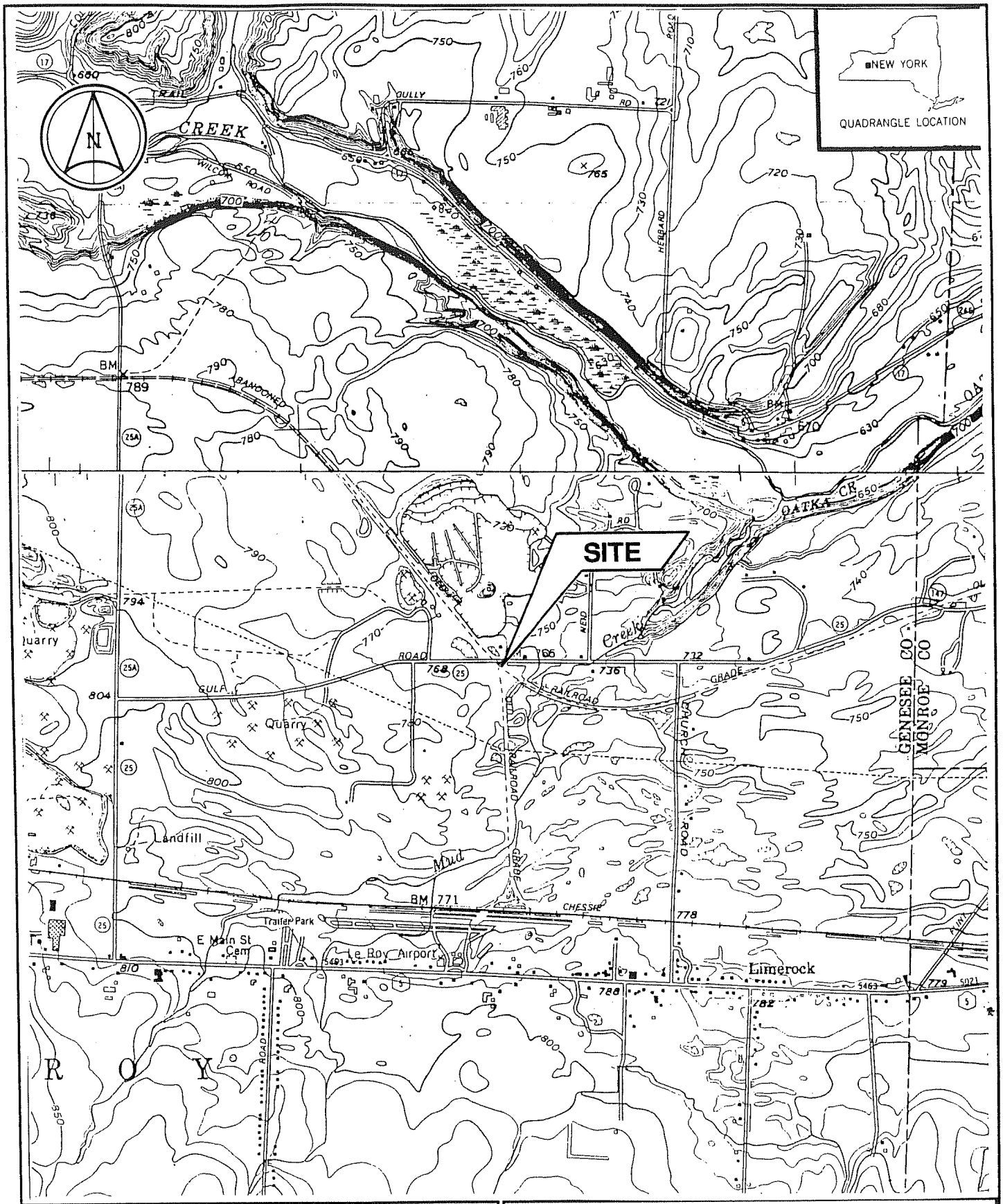
RUST ENVIRONMENT & INFRASTRUCTURE

WELL LOCATIONS AND
MAXIMUM EXTENT OF TCE CONTAMINATION
DURING PERIOD 1991–1995

LEHIGH VALLEY RAILROAD DERAILMENT SITE

TOWN OF LEROY — GENESEE COUNTY, N.Y.

PROJECT NO. 35090.200		DWG. NO. 35090–29
SCALE: 1"=2000'	DATE: 10/27/95	FIGURE NO. 2



SITE LOCATION MAP

RUST ENVIRONMENT & INFRASTRUCTURE

LEHIGH VALLEY RAILROAD DERAILMENT SITE
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WORK ASSIGNMENT No. D 002520-15

TOWN OF LEROY GENESEE COUNTY, N.Y.

PROJECT NO. 35090.200	DATE 12/95	DWG. NO. 35090-07	SCALE 1"=2000'	FIGURE NO. 1

TABLES

Table 1
Surface Water Sampling Locations
Lehigh Valley Railroad Derailment Site

MUD CREEK GORGE SAMPLING LOCATIONS	
SAMPLE DESIGNATION	**LOCATION DESCRIPTION**
SPR-4	Spring located roughly 2700 feet ENE (downstream) of the Site
SPR-7/7A	Lowest springs feeding Mud Creek roughly 2400 feet ENE of the Site
SPR-20/20A	Spring located roughly 1800 feet ENE of Site
SW-6B	Water from the gorge pond, collected on S side of a dike that nearly divides the pond
SW-6C	Gorge pond water collected at the downstream end of the pond
SPRING CREEK AREA SAMPLING LOCATIONS	
SPR-12	Spring located 3.6 miles E of the Site, across the creek from Caledonia State Fish Hatchery
SPR-19A	Spring located in the Village of Mumford, 1500 feet W of Spring Street
SPR-21	Spring located 3.8 miles E of the Site, 400 feet W of Spring Street
SW-FH1	Spring Creek sample at the fish hatchery

Table 2
Surface Water Analytical Data - Volatile Organics
Round 6 - October, 1994
Lehigh Valley Railroad Derailment Site

Sample ID: / Date Collected: / COMPOUND	SPR-4 10/17/94	SPR-12 10/17/94	SPR-19A 10/17/94	SWFH1 10/17/94	SW-6B 10/17/94	SW-6C 10/17/94	NYSDEC Surface Water Standard/GV
Dichlorodifluoromethane	2.5 UV	2.5 UV	1 UV	0.8 SV	0.5 SV	1 UV	---
Chloromethane	2.5 UV	2.5 UV	1 UV	1 UV	1 UV	1 UV	---
Bromomethane	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	---
Vinyl Chloride	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	0.3GV H(WS)
Chloroethane	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	---
Trichlorofluoromethane	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	5GV H(WS)
Methylene Chloride	3.2 UV	13 UV	1 UV	1.7 UV	1.4 UV	1 UV	5GV H(WS)
1,1-Dichloroethene	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	0.07 H(WS)
1,1-Dichloroethane	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	5 H(WS)
cis-1,2-Dichloroethene	2.5 UV	2.5 U	1 U	1 U	2.3 V	1 U	5GV H(WS) *
trans-1,2-Dichloroethene	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	5 H(WS) *
Chloroform	2.5 U	2.5 U	1 U	1 U	1 U	1 U	7 H(WS)
1,2-Dichloroethane	2.5 UV	2.5 U	1 U	1 U	1 UV	1 U	0.8 H(WS)
1,1,1-Trichloroethane	2.5 U	2.5 U	1 U	1 U	1 U	1 U	5GV H(WS)
Carbon Tetrachloride	2.5 U	2.5 U	1 U	1 U	1 U	1 U	0.4 H(WS)
Bromodichloromethane	2.5 UV	2.5 U	1 U	1 U	1 UV	1 U	50GV H(WS)
1,2-Dichloropropane	2.5 UV	2.5 U	1 U	1 U	1 UV	1 U	0.5 H(WS)
cis-1,3-Dichloropropene	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	5 H(WS)
Trichloroethene	160 DV	100 D	1 U	1.4 V	32	2.3 V	3GV H(WS)
Dibromochloromethane	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	50GV H(WS)
2-Chloroethylvinylether	2.5 UV	2.5 U	1 U	1 U	1 UV	1 U	---
1,1,2-Trichloroethane	2.5 UV	2.5 U	1 U	1 U	1 UV	1 U	0.6 H(WS)
trans-1,3-Dichloropropene	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	5 H(WS)
Bromoform	2.5 U	2.5 U	1 U	1 U	1 U	1 U	50GV H(WS)
Tetrachloroethene	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	0.7GV H(WS)
1,1,1,2-Tetrachloroethane	2.5 U	2.5 UV	1 U	1 U	1 U	1 U	---
1,1,2,2-Tetrachloroethane	2.5 U	2.5 U	1 U	1 U	1 U	1 U	0.2GV H(WS)
Chlorobenzene	2.5 UV	2.5 UV	1 U	1 U	1 UV	1 U	5 (AN)
1,3-Dichlorobenzene	2.5 U	2.5 U	1 U	1 U	1 U	1 U	5 (ANT) *
1,4-Dichlorobenzene	2.5 U	2.5 U	1 U	1 U	1 U	1 U	5 (ANT) *
1,2-Dichlorobenzene	2.5 U	2.5 U	1 U	1 U	1 U	1 U	5 (ANT) *

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).

V indicates that the reported concentration is estimated due to variance from quality control limits.
U indicates not detected at the listed quantitation limit.
S indicates that the reported concentration is suspected to be laboratory derived.
D indicates that the reported result is from the analysis of a diluted sample.

GV indicates a Guidance Value rather than a standard.
--- indicates the absence of a NYSDEC surface water standard or documented guidance value.
* indicates that the concentration listed applies to the sum of the isomers reported.
H(WS) indicates a Health (water source) Based Standard.
AN indicates a standard based on propagation of aquatic life.
ANT indicates a standard based on propagation of aquatic life from chemical correlation data.

Table 3
Surface Water Analytical Data - Volatile Organics
Round 7 - January, 1995
Lehigh Valley Railroad Derailment Site

Sample ID / Sample Date / COMPOUND	SPR4 1/9/95	SPR7A 1/9/95	SPR12 1/9/95	SPR21 1/27/95	NYSDEC Surface Water Standard/GV
Dichlorodifluoromethane	2 UV	2.5 UV	4.8 UV	1 UV	---
Chloromethane	2 UV	2.5 UV	2.5 UV	1 UV	---
Bromomethane	2 UV	2.5 UV	2.5 UV	1 UV	---
Vinyl Chloride	2 UV	2.5 UV	2.5 UV	1 UV	0.3GV H(WS)
Chloroethane	2.4 V	2.5 UV	2.5 UV	1 UV	---
Trichlorofluoromethane	2 UV	2.5 UV	2.5 UV	1 UV	5GV H(WS)
Methylene Chloride	2 UV	2.5 UV	2.5 UV	1 UV	5GV H(WS)
1,1-Dichloroethene	2 U	2.5 U	2.5 U	1 U	0.07 H(WS)
1,1-Dichloroethane	2 U	2.5 U	2.5 U	1 U	5 H(WS)
cis-1,2-Dichloroethene	2 U	2.5 U	2.5 U	1 U	5GV H(WS) *
trans-1,2-Dichloroethene	2 U	2.5 U	2.5 U	1 U	5 H(WS) *
Chloroform	2 U	2.5 U	2.5 U	1 U	7 H(WS)
1,2-Dichloroethane	2 U	2.5 U	2.5 U	1 U	0.8 H(WS)
1,1,1-Trichloroethane	2 U	2.5 U	2.5 U	1 U	5GV H(WS)
Carbon Tetrachloride	2 UV	2.5 UV	2.5 UV	1 U	0.4 H(WS)
Bromodichloromethane	2 U	2.5 U	2.5 U	1 U	50GV H(WS)
1,2-Dichloropropane	2 U	2.5 U	2.5 U	1 UV	0.5 H(WS)
cis-1,3-Dichloropropene	2 U	2.5 U	2.5 U	1 U	5 H(WS)
Trichloroethene	68 D	100 D	88 D	1 U	3GV H(WS)
Dibromochloromethane	2 U	2.5 U	2.5 U	1 UV	50GV H(WS)
2-Chloroethylvinylether	2 UV	2.5 UV	2.5 UV	1 UV	---
1,1,2-Trichloroethane	2 U	2.5 U	2.5 U	1 U	0.6 H(WS)
trans-1,3-Dichloropropene	2 U	2.5 U	2.5 U	1 U	5 H(WS)
Bromoform	2 U	2.5 U	2.5 U	1 UV	50GV H(WS)
Tetrachloroethene	2 U	2.5 U	2.5 U	1 U	0.7GV H(WS)
1,1,1,2-Tetrachloroethane	2 U	2.5 U	2.5 U	1 UV	---
1,1,2,2-Tetrachloroethane	2 U	2.5 U	2.5 U	1 UV	0.2GV H(WS)
Chlorobenzene	2 U	2.5 U	2.5 U	1 U	5 (AN)
1,3-Dichlorobenzene	2 U	2.5 U	2.5 U	1 UV	5 (ANT) *
1,4-Dichlorobenzene	2 U	2.5 U	2.5 U	1 UV	5 (ANT) *
1,2-Dichlorobenzene	2 U	2.5 U	2.5 U	1 UV	5 (ANT) *

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).

V indicates that the reported concentration is estimated due to variance from quality control limits.
U indicates not detected at the listed quantitation limit.
S indicates that the reported concentration is suspected to be laboratory derived.
D indicates that the reported result is from the analysis of a diluted sample.

GV indicates a Guidance Value rather than a standard.
--- indicates the absence of a NYSDEC surface water standard or documented guidance value.
* indicates that the concentration listed applies to the sum of the isomers reported.
H(WS) indicates a Health (water source) Based Standard.
AN indicates a standard based on propagation of aquatic life.
ANT indicates a standard based on propagation of aquatic life from chemical correlation data.

Table 3
Surface Water Analytical Data - Volatile Organics (GC/MS)
Round 7 - January, 1995
Lehigh Valley Railroad Derailment Site

Sample ID:	SPR20A	NYSDEC Surface Water Standard/GV
Date Collected:	1/10/95	
COMPOUND		
Chloromethane	50 U	---
Bromomethane	50 U	---
Vinyl Chloride	50 U	0.3GV H(WS)
Chloroethane	50 U	---
Methylene Chloride	50 U	5GV H(WS)
1,1-Dichloroethene	50 U	0.07 H(WS)
1,1-Dichloroethane	50 U	5 H(WS)
Chloroform	50 U	7 H(WS)
1,2-Dichloroethane	50 U	0.8 H(WS)
1,1,1-Trichloroethane	50 U	5GV H(WS)
Carbon Tetrachloride	50 U	0.4 H(WS)
Bromodichloromethane	50 U	50GV H(WS)
Trichloroethene	530 D	3GV H(WS)
Dibromochloromethane	50 U	50GV H(WS)
1,1,2-Trichloroethane	50 U	0.6 H(WS)
trans-1,3-Dichloropropene	50 U	5 H(WS)
Bromoform	50 U	50GV H(WS)
Tetrachloroethene	50 U	0.7GV H(WS)
1,1,2,2-Tetrachloroethane	50 U	---
Chlorobenzene	50 U	5 (AN)
cis-1,2-Dichloroethene	10 J	5GV H(WS)*
trans-1,2-Dichloroethene	50 U	5 H(WS)*
Trichlorofluoromethane	50 UV	5GV H(WS)
2-Chloroethylvinylether	50 UV	---
1,3-Dichlorobenzene	50 U	5 (ANT) *
1,4-Dichlorobenzene	50 U	5 (ANT) *
1,2-Dichlorobenzene	50 U	5 (ANT) *

Analysis by NYSDEC ASP CLP Method 91-1.
All results expressed in ug/L (ppb).

V indicates that the reported concentration is estimated due to variance from quality control limits.
J indicates that the reported concentration is below the laboratory quantitation limit and is, therefore, estimated.
U indicates not detected at the listed quantitation limit.

GV indicates a Guidance Value rather than a standard.
--- indicates the absence of a NYSDEC surface water standard or documented guidance value.
* indicates that the concentration listed applies to the sum of the isomers reported.
H(WS) indicates a Health (water source) Based Standard.
AN indicates a standard based on propagation of aquatic life.
ANT indicates a standard based on propagation of aquatic life from chemical correlation data.

Table 4
Surface Water Analytical Data - Volatile Organics
Round 8 - April, 1995
Lehigh Valley Railroad Derailment Site

Sample ID:	SPR4	SPR7	SPR12	SPR20	SPR20A	SW6B	NYSDEC Surface Water
Date Collected:	4/3/95	4/3/95	4/3/95	4/3/95	4/3/95	4/3/95	
COMPOUND							Standard/GV
Dichlorodifluoromethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	---
Chloromethane	2.5 UV	5.0 UV	2.5 UV	25 UV	25 UV	1.7 UV	---
Bromomethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	---
Vinyl Chloride	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	0.3GV H(WS)
Chloroethane	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	---
Trichlorofluoromethane	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	5GV H(WS)
Methylene Chloride	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5GV H(WS)
1,1-Dichloroethene	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	0.07 H(WS)
1,1-Dichloroethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5 H(WS)
cis-1,2-Dichloroethene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5GV H(WS) *
trans-1,2-Dichloroethene	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	5 H(WS) *
Chloroform	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	7 H(WS)
1,2-Dichloroethane	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	0.8 H(WS)
1,1,1-Trichloroethane	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	5GV H(WS)
Carbon Tetrachloride	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	0.4 H(WS)
Bromodichloromethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	50GV H(WS)
1,2-Dichloropropane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	0.5 H(WS)
cis-1,3-Dichloropropene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5 H(WS)
Trichloroethene	79D	90D	72D	850D	990D	60D	3GV H(WS)
Dibromochloromethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	50GV H(WS)
2-Chloroethylvinylether	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	---
1,1,2-Trichloroethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	0.6 H(WS)
trans-1,3-Dichloropropene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5 H(WS)
Bromoform	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	50GV H(WS)
Tetrachloroethene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	0.7GV H(WS)
1,1,1,2-Tetrachloroethane	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	---
1,1,2,2-Tetrachloroethane	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	0.2GV H(WS)
Chlorobenzene	2.5 UV	5.0 UV	2.5 U	25 UV	25 UV	1.7 U	5 (AN)
1,3-Dichlorobenzene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5 (ANT) *
1,4-Dichlorobenzene	2.5 U	5.0 U	2.5 U	25 U	25 U	1.7 U	5 (ANT) *
1,2-Dichlorobenzene	2.5 U	5.0 U	2.5 UV	25 U	25 U	1.7 UV	5 (ANT) *

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).

R indicates that the reported value is unusable and rejected due to variance from quality control limits.
V indicates that the reported concentration is estimated due to variance from quality control limits.
J indicates that the reported concentration is below the laboratory quantitation limit and is, therefore, estimated.
U indicates not detected at the listed quantitation limit.
S indicates that the reported concentration is suspected to be laboratory derived.
D indicates that the reported result is from the analysis of a diluted sample.
B indicates that the compound was also detected in the associated method blank.

GV indicates a Guidance Value rather than a standard.
--- indicates the absence of a NYSDEC surface water standard or documented guidance value.
* indicates that the concentration listed applies to the sum of the isomers reported.
H(WS) indicates a Health (water source) Based Standard.
AN indicates a standard based on propagation of aquatic life.
ANT indicates a standard based on propagation of aquatic life from chemical correlation data.

Table 5
Domestic Well Analytical Data - Volatile Organics
Round 6 - October, 1994
Lehigh Valley Railroad Derailment Site

Sample ID:	DWG1	DWG2	DWG5S	DWG5D	DWG9	DWG10	DWL1	DWM1	DWM14	NYSDOH Drinking Water Standard
Date Collected:	10/16/94	10/16/94	10/16/94	10/16/94	10/16/94	10/16/94	10/16/94	10/16/94	10/16/94	
COMPOUND										
Dichlorodifluoromethane	170 UV	20 UV	120 UV	100 UV	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
Chloromethane	170 UV	20 UV	120 UV	100 UV	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
Bromomethane	170 UV	20 UV	120 UV	100 UV	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
Vinyl Chloride	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 UV	1.7 UV	2
Chloroethane	170 UV	20 UV	120 UV	100 UV	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
Trichlorofluoromethane	170 U	20 UV	120 U	100 U	100 UV	1 U	12 UV	1 UV	1.7 UV	5
Methylene Chloride	230 UV	150 UV	160 UV	130 UV	760 UV	1.1 UV	110 UV	1.6 UV	6.6 UV	5
1,1-Dichloroethene	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
1,1-Dichloroethane	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 U	1 UV	1.7 UV	5
cis-1,2-Dichloroethene	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
trans-1,2-Dichloroethene	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
Chloroform	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
1,2-Dichloroethane	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
1,1,1-Trichloroethane	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
Carbon Tetrachloride	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
Bromodichloromethane	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	100
1,2-Dichloropropane	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
cis-1,3-Dichloropropene	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 U	1.7 UV	5
Trichloroethene	2400 D	280 D	1400 D	1200 D	1100 D	1 U	210 D	1 UV	55 D	5
Dibromochloromethane	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 U	1.7 UV	100
2-Chloroethylvinylether	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 UV	1.7 U	5
1,1,2-Trichloroethane	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
trans-1,3-Dichloropropene	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
Bromoform	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
Tetrachloroethene	170 U	20 UV	120 U	100 U	100 UV	1 U	12 UV	1 UV	1.7 UV	5
1,1,1,2-Tetrachloroethane	170 U	20 UV	120 U	100 U	100 UV	1 UV	12 UV	1 UV	1.7 UV	5
1,1,2,2-Tetrachloroethane	170 U	20 U	120 U	100 U	100 U	1 UV	12 U	1 U	1.7 U	5
Chlorobenzene	170 UV	20 UV	120 UV	100 UV	100 UV	1 U	12 UV	1 UV	1.7 UV	5
1,3-Dichlorobenzene	170 U	20 U	120 U	100 U	100 U	1 UV	12 U	1 U	1.7 U	5
1,4-Dichlorobenzene	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5
1,2-Dichlorobenzene	170 U	20 U	120 U	100 U	100 U	1 U	12 U	1 U	1.7 U	5

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).
D indicates that the reported result is from the analysis of a diluted sample.
V indicates that the reported concentration is estimated due to variance from quality control limits.
U indicates not detected at the listed quantitation limit.

Table 6
Groundwater Analytical Data - Cyanide

Round 6, Round 7 and Round 8 Sampling
Lehigh Valley Railroad Derailment Site

Sample ID	Round 6 10/94	Round 7 01/95	Round 8 04/95
MW-1A	dry	14.1	10.5
MW-5A	17.6	10 U	35.5
MW-5B	10 U	10 U	10 U
MW-15A	14.1	13.6	10. U
MW-16	18.2	11.6	20.0
DWG1	10 U	11.9	11.5
DWG2	10 U	10 U	12.2
X-4 (Round 7, MW-16)		10	
X-1 (Round 8, MW-1A)			10 U

All results are expressed in ug/L.
U indicates not detected at or above the listed detection limit.
The NYSDEC groundwater standard for cyanide is 100 ug/L.
The NYSDOH drinking water standard for cyanide is 200 ug/L.

Table 7
Domestic Well Analytical Data - Volatile Organics
Round 7 - January, 1995
Lehigh Valley Railroad Derailment Site

Sample ID / Sample Date / COMPOUND	DWG10 1/10/95	DWG12 1/11/95	DWL15 1/11/95	DWL19 1/11/95	DWL30 1/11/95	DWL39 1/11/95	M13R 1/27/95	NYSDOH Drinking Water Standard
Dichlorodifluoromethane	6.7 U	1 U	1 U	1 U	1 U	1 UV	1 UV	5
Chloromethane	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
Bromomethane	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
Vinyl Chloride	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	2
Chloroethane	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
Trichlorofluoromethane	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
Methylene Chloride	6.7 UV	1.1 UV	1 UV	1.1 UV	1.1 UV	1.1 UV	1 UV	5
1,1-Dichloroethene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
1,1-Dichloroethane	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
cis-1,2-Dichloroethene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
trans-1,2-Dichloroethene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
Chloroform	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
1,2-Dichloroethane	6.7 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,1,1-Trichloroethane	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
Carbon Tetrachloride	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
Bromodichloromethane	6.7 U	1 U	1 U	1 U	1 U	1 U	1 U	100
1,2-Dichloropropane	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
cis-1,3-Dichloropropene	6.7 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Trichloroethene	290 D	1 U	1 U	1 U	0.7 J	1 U	45	5
Dibromochloromethane	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	100
2-Chloroethylvinylether	6.7 UV	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
1,1,2-Trichloroethane	6.7 UV	1 U	1 U	1 U	1 U	1 U	1 U	5
trans-1,3-Dichloropropene	6.7 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Bromoform	6.7 UV	1 U	1 U	1 U	1 U	1 U	1 UV	5
Tetrachloroethene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 U	1 U	5
1,1,1,2-Tetrachloroethane	6.7 U	1 U	1 U	1 U	1 U	1 U	1 UV	5
1,1,2,2-Tetrachloroethane	6.7 UV	1 U	1 U	1 U	1 U	1 U	1 UV	5
Chlorobenzene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 U	5
1,3-Dichlorobenzene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
1,4-Dichlorobenzene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5
1,2-Dichlorobenzene	6.7 U	1 UV	1 UV	1 UV	1 UV	1 UV	1 UV	5

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).
D indicates that the reported result is from the analysis of a diluted sample.
V indicates that the reported concentration is estimated due to variance from quality control limits.
U indicates not detected at the listed quantitation limit.
J indicates that the reported concentration is below the laboratory quantitation limit and is, therefore, estimated.

Table 7
Domestic Well Analytical Data - Volatile Organics (GC/MS)
Round 7 - January, 1995
Lehigh Valley Railroad Derailment Site

Sample ID:	DWG1	DWG2	DWG5S	DWG9	NYSDOH Drinking Water Standard
Date Collected:	1/10/95	1/10/95	1/10/95	1/10/95	
COMPOUND					
Chloromethane	200 U	100 U	250 U	100 U	5
Bromomethane	200 U	100 U	250 U	100 U	5
Vinyl Chloride	200 U	100 U	250 U	100 U	2
Chloroethane	200 U	100 U	250 U	100 U	5
Methylene Chloride	200 U	100 U	250 U	100 U	5
1,1-Dichloroethene	200 U	100 U	250 U	100 U	5
1,1-Dichloroethane	200 U	100 U	250 U	100 U	5
Chloroform	200 U	100 U	250 U	100 U	5
1,2-Dichloroethane	200 U	100 U	250 U	100 U	5
1,1,1-Trichloroethane	200 U	100 U	250 U	100 U	5
Carbon Tetrachloride	200 U	100 U	250 U	100 U	5
Bromodichloromethane	200 U	100 U	250 U	100 U	100
Trichloroethene	2600 D	1400 D	1800 D	1500 D	5
Dibromochloromethane	200 U	100 U	250 U	100 U	100
1,1,2-Trichloroethane	200 U	100 U	250 U	100 U	5
trans-1,3-Dichloropropene	200 U	100 U	250 U	100 U	5
Bromoform	200 U	100 U	250 U	100 U	5
Tetrachloroethene	200 U	100 U	250 U	100 U	5
1,1,2,2-Tetrachloroethane	200 U	100 U	250 U	100 U	5
Chlorobenzene	200 U	100 U	250 U	100 U	5
cis-1,2-Dichloroethene	22 JD	100 U	250 U	100 U	5
trans-1,2-Dichloroethene	200 U	100 U	250 U	100 U	5
Trichlorofluoromethane	200 UV	100 UV	250 UV	100 UV	5
2-Chloroethylvinylether	200 UV	100 UV	250 UV	100 UV	5
1,3-Dichlorobenzene	200 U	100 U	250 U	100 U	5
1,4-Dichlorobenzene	200 U	100 U	250 U	100 U	5
1,2-Dichlorobenzene	200 U	100 U	250 U	100 U	5

Analysis by NYSDEC ASP CLP Method 91-1.
All results expressed in ug/L (ppb).

R indicates that the reported value is unusable and rejected due to variance from quality control limits.
V indicates that the reported concentration is estimated due to variance from quality control limits.
J indicates that the reported concentration is below the laboratory quantitation limit and is, therefore, estimated.
U indicates not detected at the listed quantitation limit.
D indicates that the reported result is from the analysis of a diluted sample.

Table 8
Domestic Well Analytical Data - Volatile Organics
Round 8 - April, 1995
Lehigh Valley Railroad Derailment Site

Sample ID:	DWG1	DWG2	DWG5S	DWG9	DWG10	DWL1	DWM14	NYSDOH Drinking Water Standard
Date Collected:	4/3/95	4/3/95	4/3/95	4/3/95	4/3/95	4/3/94	4/3/94	
COMPOUND								
Dichlorodifluoromethane	50 UV	125 U	1.0 U	33 U	1.0 UV	1.0 U	1.0 U	5
Chloromethane	50 UV	125 UV	1.0 UV	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Bromomethane	50 U	125 U	1.0 U	33 U	1.0 UV	1.0 U	1.0 U	5
Vinyl Chloride	50 UV	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	2
Chloroethane	50 U	125 UV	1.0 UV	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Trichlorofluoromethane	50 UV	125 UV	1.0 U	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Methylene Chloride	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,1-Dichloroethene	50 UV	125 UV	1.0 U	33 UV	1.0 U	1.0 UV	1.0 UV	5
1,1-Dichloroethane	50 UV	125 U	1.0 UV	33 U	1.0 UV	1.0 U	1.0 U	5
cis-1,2-Dichloroethene	50 UV	125 U	1.0 U	33 U	1.0 UV	1.0 U	1.0 U	5
trans-1,2-Dichloroethene	50 U	125 UV	1.0 U	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Chloroform	50 U	125 UV	1.0 U	33 UV	1.0 UV	1.0 UV	1.0 UV	5
1,2-Dichloroethane	50 UV	125 UV	1.0 U	33 UV	1.0 U	1.0 UV	1.0 UV	5
1,1,1-Trichloroethane	50 UV	125 UV	1.0 U	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Carbon Tetrachloride	50 UV	125 UV	1.0 U	33 UV	1.0 UV	1.0 UV	1.0 UV	5
Bromodichloromethane	50 U	125 U	1.0 U	33 U	1.0 UV	1.0 U	1.0 U	100
1,2-Dichloropropane	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
cis-1,3-Dichloropropene	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
Trichloroethene	1700D	5600D	0.7 JV	1300D	1.0 UV	14	31	5
Dibromochloromethane	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	100
2-Chloroethylvinylether	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,1,2-Trichloroethane	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
trans-1,3-Dichloropropene	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
Bromoform	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
Tetrachloroethene	50 UV	125 U	1.0 UV	33 U	1.0 UV	1.0 U	1.0 U	5
1,1,1,2-Tetrachloroethane	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,1,2,2-Tetrachloroethane	50 UV	125 UV	R	33 UV	1.0 U	1.0 UV	1.0 UV	5
Chlorobenzene	50 U	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,3-Dichlorobenzene	50 UV	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,4-Dichlorobenzene	50 UV	125 U	1.0 U	33 U	1.0 U	1.0 U	1.0 U	5
1,2-Dichlorobenzene	50 U	125 UV	1.0 U	33 UV	1.0 U	1.0 UV	1.0 UV	5

Analysis by USEPA SW-846, Method 8010.
All results expressed in ug/L (ppb).

R indicates that the reported value is unusable and rejected due to variance from quality control limits.
V indicates that the reported concentration is estimated due to variance from quality control limits.
J indicates that the reported concentration is below the laboratory quantitation limit and is, therefore, estimated.
U indicates not detected at the listed quantitation limit.
S indicates that the reported concentration is suspected to be laboratory derived.
D indicates that the reported result is from the analysis of a diluted sample.
B indicates that the compound was also detected in the associated method blank.

Table 9
TCE Concentrations in Selected Monitoring Wells
Lehigh Valley Railroad Derailment Site

Monitoring Well (DC-)	Round 2 11/93	Round 3 1/94	Round 4 4/94	Round 5 7/94	Round 6 10/94	Round 7 1/95	Round 8 4/95
1A	16,000 D	1,100 D	58,000 DV	2000	DRY	9600 D	6300 D
1B	380 D	370 D	76 D	280V (20V)	440 BDV	140 D	99 D
1C	38,000D(43,000D)	520 D	95 DV	88	120 D	82 D	60 D
1D	9,400 D	1,300 D	780 DV(660 DV)	560	480 D	260 D	240 D
2A	800 D	380 BD	550 DV(360DV)	2,500 EV	930 D	1000 D	580 DV
2B	120 D (12)	210 BD	3,100 DV	890	730 DV	1300 D	1600 DV
2C	22	9.8 (9.8)	190 DV	1 U	4.2 V	6.7	2.9 V
2D	590 D	140 BD	1,800 DV	940 BV (19)	14 V	60 D	5.7
3A	6.6	2.4	1.8 V	8,600 V	1.9V (1.7V)	0.9 J	23 (23)
3B	990 D(1,000 D)	720 D	490 DV(430DV)	700 V	750 EDV	970 D	760 DV (850 DV)
3C	2.1	40 D	120 DV	8.8 V	87 DV	31 V	46 D
3D	13	2.9	1 UV	1.1 V	1.0 V	1 U	NS
4A	1 U	1 U	1 UV	[1 U]	NS	NS	NS
4B	1 U	1 U	1 UV	[1 U]	1 U	1 U	1 U
4C	17	6.7	1 UV	[1 U]	0.9 J	1 U	1 U
4D	18 D	1.3	1 UV	[1 U]	1 U	0.6 J	1 U
5A	7,300 D	1,600 D	20,000DV(32,000DV)	1,300 EV	15,000 D	36,000 D	47,000 D
5B	770 D	360 D	120 D	270 EV	2,200 D (1,800 D)	250 D	440 DV
5C	470 D	350 D	20	[9.5]	15	8.1 D	13
5D	580 D	81	18	[25 U]	11 DV	17 D	19 D
6A	DRY	240 DV	980 DV	510 BV	380 DV	220 D	330 DV
6B	1,100 D	2,100 D	480 DV	1,600 BV	1,900 D	1400 D (1500 D)	240 DV
6C	1 U	3.6	320 DV	22 BV	1 U	11 D	25
6D	26 D	1 UV(4.6V)	4.3 V	1 UV	1 U	1 U	NS
7	1 U	NS	1 UV	10 U	NS	NS	1 U (1 U)
7RA	DRY	140 BD	8.1 V	130 BV	DRY	85 D	56 DV
7RB	440 D	350 BD	360 DV	490 BEV	560 D	250 DV (210 D)	620 D
7RC	130	33 BD	130 DV	27 B	12	76 DV	11
7RD	1 U	1 U	1 UV	10 U	1 U	1 UV	NS

See Footnotes at the end of the Table for an explanation of symbols used.

Table 9
TCE Concentrations in Selected Monitoring Wells
Lehigh Valley Railroad Derailment Site

Monitoring Well (DC-)	Round 2 11/93	Round 3 1/94	Round 4 4/94	Round 5 7/94	Round 6 10/94	Round 7 1/95	Round 8 4/95
8A	1 U	1 U	1.8	1 U	NS	NS	NS
8B	DRY	DRY	88 DV	DRY	DRY	DRY	14 V
8C	5.2	13 (12)	58 DV	33 BEV	14	20 V	20 V
8D	1 U	1 U	1 U	1 U	1 U	NS	NS
15A	13,000 D	8,900 D	41,000 DV	6,700 (6,900)	9,800 D	6700 D	3000 D
15B	140 D	93 D	47 DV	[13]	18	19 D	210 D
16	6,800 D	1,200 D	8,500 D	410	600 DV	3600 D (4400 D)	4500 DV
17A	1,400 D	1,600 D	620 D	1,200BV(1,300BEV)	1,500 DV	1900 D	820 D
17B	370 D	110 D	1 UV	480 BV	140 DV	42	1200 D

*NOTE: **Monitoring well installations were not completed at the time of Round 1 sampling.***

All results expressed in μg/l (ppb).
NYSDEC Groundwater Standard for TCE = 5 μg/l

B . . . . found in associated blank as well as sample.
D . . . . indicates that the reported result is from a diluted sample.
E . . . . indicates that the value reported is estimated.
J . . . . indicates that reported concentration is below the laboratory quantitation limit.
NA . . indicates not applicable.
NS . . indicates no sample taken.
R . . . . indicates that the result has been rejected and is unusable due to variance from quality control criteria.
U . . . . indicates not detected at the noted detection limit.
V . . . . indicates reported concentration is estimated due to variance from quality control limits.
( ) . . . indicates blind duplicate sample.
[ ] . . . indicates that the sample was collected in August 1994.

Table 10
Unit(s) Monitored in Each Well
Lehigh Valley Railroad Derailment Site

Well ID	Geologic Unit(s) Monitored
DC - 1A	Basal Nedrow/Upper Falkirk
DC - 1B	Falkirk
DC - 1C	Upper/Mid Camillus
DC - 1D	Lower Camillus
DC - 2A	Clarence
DC - 2B	Basal Edgecliff/Mid Falkirk
DC - 2C	Basal Falkirk/Upper Camillus
DC - 2D	Lower Camillus
DC - 3A	Upper Clarence/ Upper Bois Blanc
DC - 3B	Falkirk
DC - 3C	Upper Camillus
DC - 3D	Lower Camillus
DC - 4A	Lower Clarence/MidEdgecliff
DC - 4B	Basal Edgecliff/Mid Falkirk
DC - 4C	Mid Camillus
DC - 4D	Basal Camillus/Upper Syracuse
DC - 5A	Lower Nedrow/Mid Edgecliff
DC - 5B	Mid Edgecliff/Mid Falkirk
DC - 5C	Upper/Mid Camillus
DC - 5D	Lower Camillus
DC - 6A	Mid Clarence/Lower Edgecliff
DC - 6B	Bois Blanc/Mid Falkirk
DC - 6C	Upper Camillus
DC - 6D	Lower Camillus
DC - 7	Basal Nedrow/Mid Falkirk
DC - 7RA	Upper Nedrow/Upper Falkirk
DC - 7RB	Falkirk
DC - 7RC	Mid Camillus
DC - 7RD	Basal Camillus/Upper Syracuse
DC - 8A	Lower Clarence/Upper Scajaquada
DC - 8B	Lower Scajaquada/Mid Falkirk
DC - 8C	Basal Falkirk/Upper Camillus
DC - 8D	Lower Camillus
DC - 9A	Lower Falkirk/Upper Camillus
DC - 9B	Lower Camillus/Upper Syracuse
DC - 9C	Syracuse
DC - 10A	Basal Nedrow/Mid Scajaquada
DC - 10B	Falkirk
DC - 10C	Basal Falkirk/Upper Camillus
DC - 10D	Mid Camillus
DC - 11A	Lower Clarence/Mid Scajaquada
DC - 11B	Upper/Mid Camillus
DC - 12A	Lower Nedrow/Bois Blanc
DC - 12B	Mid Scajaquada/Mid Falkirk
DC - 12C	Basal Falkirk/Upper Camillus
DC - 12D	Mid Camillus
DC - 13A	Mid Camillus
DC - 13B	Lower Camillus/Upper Syracuse
DC - 14A	Falkirk
DC - 14B	Upper Camillus
DC - 15A	Basal Nedrow/Upper Falkirk
DC - 15B	Syracuse
DC - 16	Lower Nedrow/Upper Falkirk
DC - 17A	Lower Clarence/Lower Falkirk
DC - 17B	Syracuse