

MEMORANDUM

DATE: 4/15/05

TO: File, Old Southington Landfill Federal Superfund Site  
Old Turnpike Road  
Southington, CT

FROM: Mary Jane Dapkus, Hydrogeologist  
Waste/Remediation

SUBJ: Hydrogeologic review of report entitled "Supplemental Remedial Investigation Report/Old Southington Landfill Superfund Site", dated 2/4/05, prepared by MACTEC Engineering and Consulting.

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The above-referenced report summarizes supplemental groundwater investigations conducted at the Old Southington Landfill Federal NPL site since 1999.

The site has a long investigatory history. The associated study area extends offsite and is relatively large. Investigations to date have traced a plume (or intermingled plumes) of contaminated groundwater emanating from the site 3100 feet westward to the vicinity of the Quinnipiac River in the Plantsville section of Southington. The Town of Southington requested and received groundwater reclassifications to GB (ca. 1989 and 2003) for the site and areas potentially underlain by contaminated groundwater attributable to the site.

Because of the extensive area investigated, groundwater monitoring locations are spread relatively far apart. Consequently, simplifying assumptions and generalizations regarding groundwater flow in the surficial aquifer inherent in the large-scale study are in some cases insufficient to rule out alternative explanations for local groundwater behavior in addition to some of the explanations provided in the report.

The report is difficult to review in that the tables summarizing groundwater sample results do not include comparisons with criteria. Another difficulty encountered in reviewing the report is that it does not adequately explain approaches to compliance with various regulatory requirements and criteria intended to be taken. The following comments identify additional data and information that needs to be provided in order to evaluate compliance with Connecticut's Remediation Standard Regulations (RSRs):

(1) **Areas designated as the northern and southern portions of the landfill/conceptual issues:** A map showing the boundaries of the northern and southern portions of the landfill referred to in the report, and a description as to where and to what depth onsite soils were removed and emplaced in the semisolid disposal areas designated SSDA1 and SSDA2 need to be provided in order to support conceptualization of groundwater behavior described in the report.

The report assumes that volatile organic compounds (VOCs) were not detected in the northern portion of the landfill (p. 1-1). However, soil sample analysis data provided with the Remedial Investigation/Feasibility Study (RI/FS)<sup>1</sup> document detections of volatile organic compounds in subsurface soils within an area referred to as the northern portion of the landfill. Therefore, the aforementioned map and description of remedial excavations are important not only to support the conceptualization of groundwater conditions at the site, but also to resolve the apparent inconsistency between the report and the RI/FS as to designations for the respective portions of the site.

The available information does not appear to rule out the possibility that industrial wastes were disposed of in the northernmost portion of the landfill, in areas in which soil samples do not appear to have been analyzed for volatile organic compounds. For example, information provided in the attached letter dated May 8, 1992 from Almerinda Silva of the U.S. EPA to David Montany of Pratt & Whitney, and in the attached copy of Figure 2-2 from the report dated December 29, 1980, prepared by Ecology & Environment, Inc., suggests that the assumption that no industrial wastes were disposed of in northern portions of the landfill may be a questionable one for the purpose of an analysis of groundwater behavior at the site.

Because associated volatilization issues exist, it is necessary that plume behavior in the vicinity of the northern portion of the landfill is adequately understood before alternative explanations may be ruled out. Additional

<sup>1</sup> Environmental Science & Engineering, Inc., 12/10/93, Vol. 1B, Table 4-12.

information (including at least one additional groundwater monitoring well on the radio station property, documentation of the locations of excavated areas of soils emplaced at SSDA1 and SSDA2, and continued groundwater monitoring in the vicinity of monitoring clusters G314 and GZ12), is needed to establish whether the apparent spike in levels of chlorinated volatile organic compounds (VOCs) in the vicinity of the monitoring well cluster designated GZ12 is attributable solely to the historic excavation at SSDA1 and not to remaining sources of pollution.

(2) **Northern extent of the VOC plume:** The plume of groundwater contaminated by VOCs emanating from the site is not bounded on the north by the monitoring well cluster designated GZ12 as stated on p. E-2 of the report. Exceedences of Groundwater Volatilization Criteria for the compound vinyl chloride have been detected in shallow groundwater monitoring wells north of this location. Furthermore, during August, 2004, the compound vinyl chloride and other chlorinated VOCs of concern at the landfill were detected in the temporary monitoring well designated M24, located north of the GZ12 cluster and just north of Black Pond's unnamed outlet stream. Levels of vinyl chloride as high as 77 ppb (at a depth of 46-50 ft. below ground surface) detected at M24 suggest the plume extends beneath the unnamed stream in this vicinity.

North of the unnamed stream, vinyl chloride has also been detected at shallow depths at G314A and at SDW4, a further indication that the plume affects areas lying to the north of GZ12. At the well designated M24, vinyl chloride was detected at a level of 1 ppb at a depth of 6-10 ft. below ground surface, (compared to a Residential Groundwater Volatilization Criterion of 1.6 ppb for this substance) suggesting that further evaluation of the potential for exceedences of Volatilization Criteria are needed in the vicinity of this former well.

(3) **SVOCs and PCBs:** The report does not but needs to fully explain approaches intended to be taken in order to evaluate compliance with the RSRs relative to SVOCs. Comparisons with Water Quality Criteria and Surface Water Protection Criteria are not provided. The report states that no plume of SVOCs emanates from the site (p. 5-3). Nonetheless, levels of SVOCs have been detected in groundwater leaving the site in excess of both Water Quality Criteria and Surface Water Protection Criteria, for example, at monitoring well G304A.

In the far field relative to the landfill, during March, 2004, the substance n-nitroso-n-propylamine historically detected at the landfill was detected at well G310B (located near the Quinnipiac River), in one out of four quarterly sampling rounds. There is no criterion for this compound. Under CT's Remediation Standards Regulations (RSRs), a criterion may need to be developed in the event that December, 2004 and January, 2005 rounds of monitoring detect this substance of concern in groundwater.

With respect to SVOCs other than n-nitroso-n-propylamine, four consecutive quarterly sampling events have not detected SVOCs at the G310 cluster near the Quinnipiac River. Therefore, future sample analysis limited to n-nitroso-n-propylamine at G310B would be acceptable in accordance with the RSRs.

In the near field relative to the site, SVOCs including PCBs have been detected in the offsite G304 monitoring well cluster. Free product continues to be detected in G304A; groundwater chemistry at this location (for example highly reduced and somewhat acidic) suggests enhanced mobility is an issue relative to many substances of concern but has not been taken into account in the analyses provided in the report. Furthermore, elevated levels of methane (as high as 6 ppm) are detected in groundwater at shallow well G304A. The report should explain whether hazardous levels of methane may be emanating from the landfill in this location.

Within the landfill and on adjacent property, SVOCs have been detected at historic monitoring wells G304A, 304B and 304C, G305A, G306B and G306C (RI/FS SVOC data for the G306 cluster are not included in the report), G308C, G309A, G309B, GZ7S (RI/FS SVOC data for previous four well locations are not included in the report) and G301A at levels of potential concern relative to wetlands lying to the west of the site. For example, data in Table 4-21 in the RI/FS documents a detection of gamma-chlordane in groundwater in historic monitoring well G301A at a level above the Chronic Aquatic Toxicity criterion for this compound. Current conditions in the vicinities of the former wells G301A, 305 and 306 are unknown.

In addition to gamma-chlordane, detections of acenaphthene, 2-methylnaphthalene, naphthalene, n-nitrosodiphenylamine, 1,2,4-trichlorobenzene, 1,2-, 1,3- and 1,4-dichlorobenzene at historic monitoring well G301A (nearest available SVOC data relative to the unnamed stream) suggest that an appropriate monitoring well is needed to evaluate SVOCs potentially discharging to the unnamed stream in the presence of an upward vertical groundwater gradient in this vicinity. Appropriate Water Quality Criteria may need to be developed pursuant to the RSRs if substances of concern are detected in a replacement well in the vicinity of historic G301. Alternatively, a monitoring well on the radio station property may be utilized to evaluate current groundwater SVOC conditions in

this vicinity. In addition, since SVOC data do not appear to have been collected in the stream, it is recommended that surface water in the unnamed stream be sampled and analyzed for SVOCs.

It is difficult to comprehensively evaluate current sitewide groundwater conditions relative to SVOCs because only some of the SVOC data collected during the RI/FS appear to have been provided in the report. Furthermore, the report is confusing in that some of the SVOC data appear to be reported with the VOC data rather than with the SVOC data. It is therefore recommended that revised data tables be provided that include comparisons with criteria.

SVOCs have not been analyzed at the G314 cluster, located in the vicinity of Black Pond's unnamed stream. Elevated levels of metals, iron and manganese detected in G314A suggest the presence of reducing conditions are affecting mobility of substances of concern in groundwater at the G314 cluster. Therefore, the G314 wells should be added to the list of wells to be analyzed for both SVOCs and leachate parameters.

The report does not mention all of the historic detections of polychlorinated biphenyls (PCBs) in onsite and offsite groundwater at G304A, GZ7S and TB7S. SVOC and PCB data have apparently not been collected at the G304 cluster since 2000. In May, 2000 the PCB Arochlor 1254 was detected in groundwater at G304A at a level of 0.47 ppb (qualified), compared to a SWPC of 0.5 ppb for total PCBs in groundwater.

Although PCBs are not generally expected to be very mobile in groundwater, continued detections of elevated levels of substances including BTEX and free product consistently detected at G304A are likely to enhance PCB mobility. Therefore, it appears prudent to reevaluate PCBs and semivolatiles in groundwater at G304A, G309A, 309B and G308C to assess current groundwater conditions relative to the extent of PCB transport and its potential effects on wetlands in the vicinity of these wells.

PCBs and SVOCs have been detected in sediment and surface water in Black Pond and in sediments in the unnamed outlet stream. Several exceedences of Residential Direct Exposure Criteria for SVOCs including (but not limited to) benzo(a)anthracene and benzo(b)fluoranthene were noted in SED6 in the unnamed stream, and in SED5 and SED8 in Black Pond (RI/FS data). Benzo(a)anthracene and other SVOCs have historically been detected in groundwater at the landfill (GZ7S, RI/FS, Table 4-21). In addition to detection at G304A, PCBs were apparently detected in shallow groundwater at GZ7S in excess of Chronic Aquatic Toxicity criteria.

Elevated levels of SVOCs were detected in samples designated SED13 and SED14 during the limited sampling program conducted during September, 2004. Exceedences of both Residential and Industrial/Commercial Direct Exposure Criteria were detected, for example, of the compound benzo(a) anthracene at SED13. Comparisons with criteria are needed for these data. In addition, based on a review of the information provided, an expanded sediment sampling plan should be proposed as part of the upcoming sitewide 5-year review process.

Further evaluation of potential groundwater/surface water pathways relative to the detections of SVOCs and PCBs in sediments is needed. In particular, groundwater monitoring is needed to assess current conditions relative to SVOCs and PCBs in groundwater near the location of former well GZ7S, screened above peat within the southern portion of the landfill.

(4) **Groundwater/surface water interaction at the unnamed stream:** The information provided does not demonstrate that no groundwater emanating from the site discharges to the unnamed stream as stated on page E4 of the report. VOCs including TCE, 1,2-DCE and vinyl chloride; and SVOCs including 1,3-, and 1,4-dichlorobenzene historically detected in groundwater at well G301A have historically been detected in nearby surface water in the stream at sample locations SWS6 and SWS11. These data suggest that groundwater discharges to the unnamed stream in the vicinity of historic surface water samples SWS6 and SWS11.

Upward vertical gradients have consistently been noted at nested well clusters at G314 and GZ12 in the vicinity of the unnamed stream. During a field visit on 3/18/05, DEP staff observed bacterial colonies and what appeared to be an orange seep in the vicinity of historic surface water sample designated SWS11 between flags designated RSA9 and RSA10. Based on the information provided in Figure 1 of the report, flags RSA9 and 10 are located approximately 400-500 ft. upstream of a discharge of stormwater runoff from the Chuck & Eddy's site to the stream. Therefore, the stream segment of concern appears unrelated to the Chuck & Eddy's site, and may indicate a discharge of reduced groundwater from the landfill to the stream.

The groundwater/stream cross section information provided in the report is not relevant to an analysis of vertical hydraulic gradients in the stream. Streambed piezometer data are needed at the locations of historic sediment samples SED11 and SED6 to form the basis for an adequate analysis of the potential for groundwater to discharge to

the stream and its associated wetlands. Comparisons between groundwater data and Water Quality Criteria should be added to the data tables routinely provided to facilitate review.

(5) **Metals and VOCs detected near the Quinnipiac River:** With respect to metals and VOCs, the report does not explain how the groundwater data are intended to be evaluated in accordance with the RSRs. Furthermore, a preliminary assessment of the size of the plume of contaminated groundwater emanating from the landfill indicates that the plume may occupy greater than 0.5% of the Quinnipiac River's tributary watershed at the G310 monitoring well cluster. The plume may in part discharge to an extensive wetland area near the River at this location. Consequently, it appears that, in accordance with Section 22a-133k-3(b)(2) of the RSRs, the criteria provided in the State's Water Quality Standards may apply in the vicinity of the discharge to the River.

The following questions need to be answered relative to an evaluation of sitewide compliance with criteria with respect to metals: Which samples have been filtered? What filter sizes were utilized? What criteria are being applied? What provisions of the regulations were considered in making this decision? What criteria are exceeded? What criteria may need to be developed? Are analytical detection limits for all substances less than criteria (a possible issue relative to beryllium and arsenic)?

The groundwater sample analysis data for well G310S (located near the Quinnipiac River) provided in the report document detections of substances of concern at the landfill including chromium (assumed hexavalent) and lead at levels in excess of both Water Quality Criteria and SWPC criteria. An exceedence of both Water Quality and SWPC for zinc is also noted at this location. Detections of cobalt, aluminum, barium and vanadium in well 310S require development of site-specific criteria per the RSRs. Relative to detections of metals at G310C, chromium has been detected in excess of WQC, and detections of vanadium and cobalt in this well require development of criteria.

Regardless of whether and to what extent the Chuck & Eddy's site contributes additional metals to groundwater after it leaves the site, because criteria are also exceeded at the landfill (as described in Item #6 below), apparent exceedences of criteria at the G310 cluster for substances detected in groundwater at the landfill cannot be dismissed. As an alternative to assessing compliance at the G310 cluster, compliance with criteria (for metals and VOCs) may be evaluated based on monitoring wells located immediately west of the landfill.

(6) **Metals in the vicinity of the landfill:** The information provided shows that concentrations of many metal constituents of concern in groundwater may increase as groundwater emanating from the site passes beneath Chuck & Eddy's. However, aside from the issue of offsite contributions to the plume, metals data provided in both the RI/FS (Table 4-22) and in the report document detections of many metals at elevated levels in groundwater at the site for which comparisons with criteria are needed but not provided.

Based on a review of the groundwater sample data provided in the RI/FS, several metals were detected at levels in excess of both SWPC and WQC in wells formerly located at the western edge of the landfill, including G301A, 302A and 302C, 303A, 304A, 304B, 304C, 304D, 305, and 306A, 306B, 306C and 307. Many of these wells no longer exist. Consequently, a comprehensive evaluation of current conditions is precluded, except in the vicinity of the 302, 304 and 314 well clusters. The limited number of existing monitoring wells in the vicinity of the landfill does not appear adequate with which to assess current conditions over the southern portion of the landfill (i.e. south of the G304 well cluster), where elevated levels of metals have been detected historically.

During the last 4 quarterly sampling events, arsenic, cobalt, iron, manganese and vanadium were detected at wells 304A and 304B; cobalt was detected at 302A; chromium and lead were detected at 314A at elevated levels relative to both SWPC and WQC. Detections of barium, iron, manganese, cobalt, vanadium and aluminum at G314A and elsewhere suggest that criteria for these substances need to be developed. Because wells 310S and 310C near the Quinnipiac River also exhibit levels of metals detected at the site in excess of criteria (as described in Item #5 above), a means of meeting criteria for metals in the near field should be proposed.

In addition to the foregoing, elevated levels of one or more metals detected in wells G318C (silty well near Buckland Street), 314A (north of the unnamed stream), and GZ14S (west of Old Turnpike Road) apparently exceed Water Quality Criteria. Wells GZ14S, the G318 cluster and G314A should be added to the list of monitoring wells sampled for field and landfill leachate parameters. An evaluation of the relationship between detections of metals at these locations and potential onsite source areas is also needed.

(7) **Leachate parameters:** Chlorine and ammonia should be added to the list of leachate parameters analyzed. As mentioned in Item #6, leachate parameter data should be collected at G314A. In addition, leachate parameters

should be included for a replacement well for G301A (a monitoring well on the radio station property could be utilized for this purpose), and for wells GZ304A, B and C, GZ14A, G308C, G309A, and G310A, B and C.

(8) **Southern extent of VOC plume(s):** Detections of elevated levels of chlorinated volatile organic compounds in GZ14D do not define the southern extent of the plume at this location. An additional monitoring well is needed to bound the plume to the south.

Sufficient groundwater data do not exist with which either to identify the source of the plume of volatile organic compounds detected at GZ14D or to define the three-dimensional path taken by contamination extending from the landfill to this well. Furthermore, based on preliminary analysis of the direction of groundwater flow using 3-point methodology for the lowermost stratified drift aquifer, groundwater in the vicinity of GZ14D appears to move in a westerly or slightly northwesterly direction. Therefore, a continuing source area for a westwardly migrating plume may be located in the vicinity of the former Southington Metal and Solomon Casket buildings.

It is important to establish the path taken by the plume of chlorinated VOCs as it passes beyond GZ14D. Historic groundwater elevation data provided in the report suggest that the plume detected at this well may track toward relatively low groundwater level elevations at the locations designated M2 and M5 (shown in Figure 6 of the report), rather than farther toward the northwest as assumed in the report. Groundwater quality data are unavailable for the historic M2 and M5 groundwater elevation locations, which lie in close proximity to a GA area. The absence of MTBE detections in groundwater at the G317 cluster suggests that a separate plume unaffected by groundwater at the Chuck & Eddy site may track to the south of G317, in the area of relatively low groundwater level elevation at depth observed at M2.

The data demonstrate that a plume of chlorinated VOCs is detected in contact with bedrock surfaces at elevations higher than the elevation of 50 feet above mean sea level depicted in Figure 6. For example, chlorinated VOCs are found at substantially elevated concentrations at elevations as high as 77 ft. above mean sea level in well G315C, screened between 77 and 87 ft. amsl. Chlorinated VOCs are also detected in G317C, screened at elevations between 70 and 80 ft. amsl. Therefore, presence of a slight westward-trending bedrock "trough" described in the report does not fully describe the behavior of the plume. Additional hydrogeologic factors, including the analyses of vertical hydraulic gradients, groundwater elevation data, and geologic drillers' log data provided in the report, also need to be taken into account in order to form the basis for an adequate analysis of plume behavior from place to place over its entire extent.

Preliminary analyses of directions of groundwater flow using three-point methodology and groundwater elevation data for wells 315C, 308C and 317C and also for wells GZ14D, 308C and 317C suggest southwesterly groundwater flow at these locations remains undetected by contouring. The relatively low groundwater elevations observed at historic groundwater elevation monitoring locations M2 and M5 also suggest southwesterly flow and need to be taken into account in analyzing potential pathways for the plume leaving the vicinity of GZ14D. No VOC samples appear to have been collected at M2 and M5. Therefore, at a minimum, additional exploratory sampling in those locations is needed.

The bedrock surface graphic provided as Figure 1 of the report does not reflect the possibility that based on published bedrock elevation mapping,<sup>2</sup> a relatively deep bedrock valley extends in a southerly direction in the vicinity of Old Turnpike Road. The possible effects of a bedrock valley continuing south of GZ14D on groundwater flow patterns at depth are difficult to ascertain based on the existing data.

(9) **The bedrock aquifer:** A limited bedrock groundwater investigation was conducted at the site. The southernmost bedrock monitoring well in this investigation was located immediately south of the landfill access road, at considerable distance north of historic monitoring well G307. The available data suggest possible VOC contamination at depth in the vicinity of G307 was not taken into account during the bedrock investigation.

Vertical profile groundwater samples were not collected during bedrock drilling at the site. Of two rounds of bedrock groundwater samples collected, the analysis data for one set appears to have been adversely affected by frozen samples, and both sample analysis rounds apparently reflect the effects of chlorinated drilling water.

The detection of volatile organic constituents of concern in onsite bedrock monitoring wells was limited to a single detection of TCE below quantifiable levels. Offsite, elevated levels of chlorinated VOCs are detected in contact

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<sup>2</sup> Mazzaferro, USGS, 1975; and *Water Resources Inventory of Connecticut, Part 8: Quinnipiac River Basin*, USGS, 1979.

with the bedrock surface. Nonetheless, although detailed reports of the receptor surveys conducted are not provided, the receptor surveys described in the report appear to cover adequate areas to address concerns regarding the potential for groundwater in the bedrock aquifer in contact with the plume(s) to be used for private drinking water supplies.

(10) **Volatilization issues relative to the Chuck & Eddy property:** Up to 22,000 ppb of TCE were detected in historic monitoring well G307, located west of the southernmost former Southington Metal Fabrications building. Consistent (albeit sometimes qualified) detections of TCE in the shallow well designated 312A of up to 12 ppb (compared to Residential Groundwater Volatilization Criterion of 27 ppb for this compound) at 40-50 ft. below ground surface suggest that an additional shallow well is needed in the southeast corner of Chuck and Eddy's property, within the topographically lower area north of G312, to evaluate potential volatilization issues.

The extent of exceedences of Residential and Industrial Groundwater Volatilization Criteria for substances of concern at the landfill on the Chuck & Eddy property is presently not well defined. It is recommended that additional shallow monitoring wells be proposed to evaluate the extent of potential volatilization issues attributable to the landfill on this property.

(11) **Volatilization issues in the vicinity of the radio station and north of the unnamed stream:** As mentioned in Item #2 above, the shallow groundwater sample collected at temporary monitoring well M24-7 at 6-10 ft. below ground surface detected 1 ppb of vinyl chloride (compared to a Residential Groundwater Volatilization Criterion of 1.6 ppb for this compound). This well was located in the southwest corner of the parking lot just north of the unnamed stream. It is recommended that a shallow well be installed at this location to evaluate consistency with Groundwater Volatilization Criteria over four quarterly sampling events. In addition, historic groundwater data for well G301 suggest that a shallow monitoring well is needed to evaluate consistency with criteria on the radio station property.

(12) **Volatilization issues in vicinity of new development west of Chuck & Eddy's:** Traces of chlorinated VOCs have been detected substantially below respective Residential Groundwater Volatilization Criteria in shallow monitoring well G315A (located at the end of Nunzio Drive) at a depth of about 35 feet below ground surface. Intermediate and deep monitoring wells at this location exhibit elevated levels of chlorinated VOCs, including vinyl chloride, potentially of concern relative to Volatilization Criteria if under the influence of either an upward vertical hydraulic gradient or under conditions in which groundwater is closer to the ground surface.

Homes are being constructed in the topographically lower area west of Chuck & Eddy's immediately north of the G315 cluster. Groundwater in the newly developed, adjacent residential area is likely to be much closer to the ground surface than at G315A. Vertical gradients in the vicinity of the new homes are unknown. Therefore, based on the information provided, it is necessary to install one or more shallow wells or well clusters in the vicinity of the new homes at the rear of 36 Buckland Street.

(13) **VOC issues near the Quinnipiac River (Volatilization and SWPC/WQC):** No exceedences of Groundwater Volatilization Criteria for vinyl chloride have been detected at G310S (located near the Quinnipiac River) over four consecutive quarterly sampling events. One exceedence of the Chronic Toxicity criterion for chloroform is noted at G310B; multiple exceedences of Chronic Toxicity criterion for TCE are noted at G310A and G310B. Surface water and water quality criteria need to be developed for the compound 1,1-DCA, cis-1,2-DCE and trans-1,2-DCE.

(14) **Non-potable water supply wells:** Updates are needed on the status of the former Lori Corporation and Chuck & Eddy wells in order for DEP to complete a preliminary groundwater use and value determination per memorandum of agreement with the U.S. EPA. Have these wells been abandoned? Are there any other industrial/commercial groundwater uses located within the areas surveyed?

Site groundwater investigations document that a plume of groundwater contaminated with chlorinated VOCs extends to the Quinnipiac River in the vicinity of the G310 cluster. Therefore, in addition to a status update for the Chuck & Eddy and former Lori wells, it appears prudent to extend the receptor survey to the GA area in the immediate vicinity of the confluence of the Eightmile and Quinnipiac Rivers. The survey should take into account the immediate vicinity of the band of stratified drift extending westward of the confluence at West Main Street, an area not previously surveyed for water supply wells in connection with the landfill plume.