

**Comprehensive Water Resources Management
Plan (CWRMP)**

APPENDIX E

**Volume 3 of 5
Acton, MA**

**March 2006
Revised June 2006**



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APPENDIX E: HYDROGEOLOGIC STUDY



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December 17, 2004

Mr. Steve Hallem
DEP
One Winter Street
Boston, MA 02108

Re: Town of Acton Wastewater Effluent Disposal Sites

Dear Mr. Hallem:

As part of the Town of Acton's Comprehensive Water Resources Management Plan (CWRMP) Woodard & Curran (W&C) and the Town of Acton have identified four potential groundwater discharge-sites to serve specific needs areas and provide additional discharge capacity for the existing wastewater treatment facility (WWTF). We have associated three sites with high priority needs areas, (1) on town-owned land in East Acton at the junction of Wetherbee Street and Route 2, (2) on town-owned land in South Acton adjacent to the WWTF, and (3) on Acton Water District land off High Street at the Assabet wellfield. The fourth site, on town owned land in North Acton near the North Acton Recreation Area, addresses Needs Areas 1 and 2, which are medium priority needs areas.

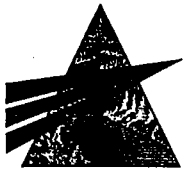
The scope for the investigation of these sites was set through discussions with DEP and approval of the CWRMP/EIR scope during the initial Plan of Study phase. The hydrogeologic investigation at these locations will be conducted in two stages. The initial evaluation of the sites, which we are beginning, includes:

- Reviewing available maps and reports regarding soils and groundwater conditions on the sites;
- Borings, wells, and test pits to classify soils and determine groundwater and bedrock depths, with appropriate percolation tests; and
- Establishing the suitability of any or all of these sites for further and more costly exploration.

Following the field visit to the four sites on November 29, 2004, W&C prepared enlarged portions of the USGS topographic maps and enlarged portions of the MassGIS aerial photograph base map for the four sites – each map to the same scale. We added the sites' parcel boundaries to the topographic maps and aerial photographs. This makes it possible to relate our field visit observations to the topographic map and in one case helps to locate a "lost feature" of importance to the project.

At the North Acton site there is historical knowledge of previous septage lagoons on the site. The topographic map indicates sewage disposal at the location and shows three square features that are taken to be the old lagoons. From the aerial photograph it can be seen that these locations have been covered and obscured by the earthworks at the site.

We selected the four potential sites for disposal of treated wastewater because they all had the common characteristics of sand and gravel soils, with groundwater generally greater than 6 feet depth based on NRCS data, and they were located on generally undeveloped parcels. Some parcels are large enough such



that the favorable soil and groundwater indication do not encompass the entire site. Therefore, W&C added a blue overlay to each map to indicate the expected areas of suitable soils.

The proposed exploration for each site is intended to establish any significant and easily found limiting features that would preclude use of the areas for disposal and expose any significant shortcomings not seen in the prescreening used to locate the four sites. Thus, we do not intend that these proposed explorations would support precise estimates of disposal capacity. Another, more extensive, phase of exploration and testing will provide final confirmation of the site(s) suitability for wastewater disposal.

We have provided a set of maps as described in the opening paragraphs for each site. Red dots note the proposed test borings and green dots indicate test pits locations.

Site #1: Wetherbee Street / Route 2

The Wetherbee site is located in the northwest quadrant of the intersection of Wetherbee Street and Route 2. The parcel is approximately 70 acres presently covered in woodlands and crop field. Approximately 29 acres are in sand and gravel soils and geology. The limits of the mapped favorable soils are shown in blue on the accompanying maps. This site is a potential disposal location for Needs Planning Areas 3 and 4 (East Acton Village and Robbins Park).

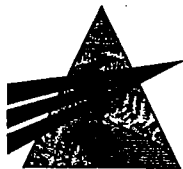
The only subsurface information available to date near the Wetherbee parcel is from an existing USGS monitoring well just south of Wetherbee Street and the proposed parcel. It is in an area mapped as the same favorable sand and gravel. A limited USGS well log for the monitoring well indicates the well was drilled to a depth of 38 feet in sand and gravel with no notation of reaching refusal. The shallowest groundwater depth recorded in the 39-year period of record is 15 feet. The reported sands and gravels and the consistent relatively deep water table indicate that the Wetherbee site has promise as a disposal site.

The cropped portion of the parcel will remain in active farming during our investigation, thus no permanent wells can remain in the farm field. However, we need to determine the bottom of the functioning aquifer material. Therefore, we propose drilling two test borings to refusal, with temporary wells, in a line from the Route 2 intersection northwestward toward the maximum extent of the mapped sand and gravel. In addition, to explore the "width" of favorable conditions, we propose two borings to refusal (possibly with permanent wells) just beyond the cultivated area of the field. To supplement the borings we suggest up to five test pits be taken to the water table to explore the margins of the cultivated area.

From this combination of explorations, it should be possible to determine the presence of limiting features, such as evidence of shallow water table, thinning sand and gravel or wide spread low permeability stratum in the soil profile.

Site #2: Adams Street near Maynard Line

This site is located along Adams Street west of the existing wastewater treatment plant. Site #2 and Site #3 are potential disposal locations for sewer system expansion to Needs Planning Areas 10 (Spencer, Tuttle, Flint, Dover Heights), 12 (West Acton Center), and 13 (Indian Village). Both Site #2 and Site #3 would use the existing sewer infrastructure, including the existing treatment facility.



The portion of the property with potential value for wastewater disposal is on a flat terrace of sand and gravel, well above the Assabet River water level and at a similar elevation to the existing rapid infiltration beds (RIBs). Additional information on this parcel is available from earlier explorations at the time of design for the existing wastewater treatment plant. Previous explorations include test pits, which were located during our site walk, double-ring infiltrometers, and borings.

The dominant feature on the site is a vernal pool (certified pool number 644) located about 1,000 feet west of the existing wastewater treatment plant and visible on the aerial photograph included here. The vernal pool will require setback distances and may limit the possible wastewater loading to the area depending on the pool's hydraulic connection to the local groundwater.

We propose a test boring near the pool with a groundwater observation well to determine the actual groundwater elevation relative to water in the pool. There is an existing PVC test pit well in the area that may provide the information without further exploration. We will investigate the test pit well prior to drilling. As with all sites, it will be necessary to determine in general the thickness of sands and gravels and depth to water table. Thus, we propose a test boring at the crest of the terrace near a cluster of hemlock trees. This boring should be carried to refusal (bottom of conductive sands and gravels) and completed with a groundwater observation well.

Site #3: Assabet Wells Area

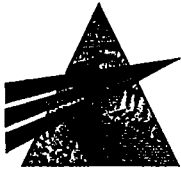
The potential wastewater disposal location at the Assabet Well Field is located in a former gravel pit where the Acton Water District has two operating public drinking water supply wells. There is significant available information to understand that the location has the physical and geological potential for wastewater disposal. The subsurface has been investigated extensively because of upgradient groundwater contamination.

The determination on wastewater disposal at this location will likely be driven by regulatory concerns regarding the recharge of highly treated wastewater into the Zone II of a public supply well(s). At this preliminary stage of investigation, there is no need for additional exploration to establish the geological potential of the site for disposal activities. If the location is viable from a regulatory point of view there will likely be need for additional testing of groundwater velocities in the field to demonstrate real field groundwater flow conditions.

Site #4: North Acton

We have attached figures showing the proposed investigation locations in relation to the parcel boundaries and defining features. The North Acton site is a long narrow parcel of about 11.5 acres oriented north to south extending over 1,650 feet. The surface of the southern three quarters of the site is extensively disturbed. Comparison of the enlarged USGS topographic map and the aerial photograph helps to locate the former septage pits on the existing site. This site is a potential disposal location for Needs Planning Areas 1 and 2.

Given the extensive disturbance at the North Acton site, there is little original surface available for exploration. We do have a map of borings conducted in the 1980's. However, it will still be important to determine the thickness of the remaining sand and gravel and depth to refusal (bottom of conductive



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sand and gravel). A number of small local excavation pits and ponds give evidence of the elevation of groundwater. This will help in determining if the return of fill would be required to build up the site.

We recommend several test pits at the northeast perimeter of the parcel near the conservation trail to explore the depth of sands and gravels exposed there. We recommend drilling one test boring and monitoring well at the assumed location of the old septage pits with at least one groundwater sample analyzed for wastewater parameters and VOC's. In addition, we propose one boring with a groundwater observation well in the wooded northern portion of the parcel to explore the presence and thickness of sand and gravel and groundwater elevations relative to a small nearby pond.

We will have on-site a licensed soil evaluator to examine and classify the soils from the borings and test pits. We invite DEP to attend and we will work with you to schedule to work. At each site, we will perform an elevation survey of the test pit locations and well casings to better determine elevations of subsurface features. We will also survey and locate the wells and test pits for future reference. -

Sincerely,
WOODARD & CURRAN INC.

Robert J. Rafferty, P.E.
Project Manager

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Enclosure(s)

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ACTON CWRMP/EIR
PRELIMINARY HYDROGEOLOGICAL SITE
EVALUATION

January 26, 2006



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1. INTRODUCTION

The Town of Acton is conducting Phase 2 of a town-wide Comprehensive Water Resources Management Plan (CWRMP) / Environmental Impact Report (EOEA No. 11781), which is funded through the State Revolving Fund (SRF) program (Loan No. CW 00-40). The Phase 1 CWRMP Report (June 2003) identified areas in need of wastewater solutions other than continued reliance on individual sewage disposal system. The Phase 1 report identified four sites as potential locations for wastewater treatment and disposal locations, and linked these locations to specific Needs Areas. The Town of Acton and Woodard & Curran (W&C) followed the Phase 1 report with correspondence and meetings with DEP to develop a scope for preliminary hydrogeologic site evaluation at the four sites.

In conjunction with this effort, the CWRMP project team has continued to move forward with the Phase 2 CWRMP. This hydrogeologic study is an important component of the Phase 2 efforts that also includes:

- Continued Citizen's Advisory Committee (CAC) involvement with prioritization of Needs Areas and ranking of potential solutions;
- Evaluation of reclaimed water being discharged within the drinking water aquifer by a subcommittee of the CAC, the Indirect Potable Reuse Working Group;
- Evaluation of technical solutions and costs for the Needs Areas;
- Petition and acceptance of new discharge limits at the Acton wastewater treatment facility (WWTF); and
- Public outreach and education through CAC meetings, presentation to the Board of Selectmen, website postings, submittal of a press release, insertion of an informative article with the water and tax billing mailings, and public meetings.

This report presents the findings and conclusions of the preliminary hydrogeologic site evaluation and incorporates DEP comments on the Draft Report originally submitted in November 2005. Related tables and figures are appended to the document text, prior to the appendices, in appropriately labeled dividers. This report will become part of the Phase 2 report and the EIR effort.

1.1 BACKGROUND

As part of the Phase 1 Report, the project team identified potential areas for wastewater treatment and disposal through evaluation of US Geological Survey (USGS) surficial geology maps, National Resource Conservation Service (NRCS) soils maps, data available from the Acton Health Department, and other parcel-specific information from Assessor's data and mapping.

The identification process began with GIS-based selection of potential locations using published USGS and NRCS mapping for depth to groundwater and likely locations of sand and gravel soils (as opposed to fine grained soils with a high percentage of silt or clay). This process identified Areas of Interest (AOIs) for further review. We adjusted the soils type and subsurface condition on a lot-by-lot basis based on Health Department data that was collected and compiled in Phase 1 of the CWRMP.

We targeted parcels of meaningful size, whether vacant, publicly owned, or minimally developed. The criteria identified under Phase 1 also included other considerations such as locations that are not likely to



affect sensitive environmental and human receptors or too close to the wellhead protection area surrounding a municipal well.

We aligned the potential lots with Needs Areas as defined in the Phase 1 report. This matching of Needs with potential disposal locations resulted in prioritizing four sites as potential locations for treated wastewater within Acton. The resulting four locations are shown on Figure 1. They are designated as follows from North to South: North Acton (Quarry Road), Wetherbee Street, Adams Street and High Street.

Once the potential locations were selected, and approved as possible candidates by the Citizens Advisory Committee (CAC), the project team conducted a site walk at each of the locations with DEP personnel to acquaint them with the field conditions and locations of likely explorations.

Following a DEP initial site clearance, a program of exploration was developed and submitted to the DEP on December 17, 2004 for approval as a preliminary exploration phase. The exploration program included the classical test pits and deep hole tests that are normally used for wastewater disposal sites and a number of test borings with soil samples and borehole permeability tests. DEP personnel accompanied the project team for a portion of the exploration program.

The objective of the exploration program is to learn as much as possible (in a preliminary phase) about the three principal hydrogeological features of each site which control the application rate for disposal of wastewater. This information is used to guide a selection process in ranking which locations are suitable for further investigation.

The hydrogeological features of any site which control wastewater application rates are:

- 1) The type of overburden soils at the location - the proportion of preferable coarse grained (sands and gravels) versus fine grained soils (silts or clays);
- 2) The thickness of these overburden soils (the depth to till or bedrock); and
- 3) The depth to seasonal high water table which affects the allowable groundwater mounding.



2. FIELD WORK

2.1 PROGRAM BACKGROUND

The program of fieldwork included the following activities:

- Wetherbee
 - Two test borings to refusal (permanent wells)
 - Two test borings to refusal (temporary wells)
 - Five test pits
- North Acton
 - Two test borings (permanent wells)
 - Two test pits
- Adams Street
 - Two test borings
- High Street
 - Rely on existing exploration information developed during initial well field development and subsequent studies related to the W.R. Grace facility.

Fieldwork began on March 21, 2005. A Professional Geologist supervised the work. A Certified Soil Evaluator supervised the test pits and conducted percolation tests with review by DEP staff. The schedule for beginning field work was driven by the need to be complete with all work on the Wetherbee site prior to the beginning of farming on the field, starting with early spring cultivation. In addition there was a desire to complete the work on the field prior to the complete loss of frost in the ground to minimize surface disturbance. Coordination considerations dictated that all of the sites should be explored in a continuous effort with a single mobilization of equipment and personnel.

Well construction details and test pit construction details are included in Table 1 and Table 2 respectively. Appendix A includes the boring logs with well construction information, and Appendix B contains the borehole permeability test data. Appendix C contains the test pit data and the percolation test forms.

2.2 FIELD PROGRAM RESULTS

2.2.1 Wetherbee Street

Test Borings

Soil Exploration Corporation began drilling operations on the March 21, 2005 at the Wetherbee site. The specifics of the depths, well construction, soil sampling and bore hole permeability testing, as well as hydraulic conductivities, for the four Wetherbee borings are listed on Table 1 and Table 3. Figure 2 shows the boring locations.

Boring W-1 was intended to be carried to auger or split spoon refusal in an effort to determine the thickness of granular overburden soils which would be active in transporting wastewater away from a disposal facility. The boring was terminated at 52 feet after penetrating 10 feet of till and thereby confirming the effective bottom of usable aquifer at the top of till.

The subsequent borings, W-2, W-3, and W-4 were completed by March 23, 2005. Borings W-1 and W-2 are located in the middle of the active farming portion of the field and the wells installed in these borings



were installed as temporary wells, without full grouting or guard pipes. It was understood that as farming commenced the farmer would remove the wells. Wells in borings W-3 and W-4 are at the perimeter of the field and are installed as permanent wells with completed grout seals and guard pipes.

Existing USGS Well

There is a USGS index well at the corner of Wetherbee Road and Route 2 shown as USGS MA-ACW-158 on Figure 3. The published information for this well indicates a well drilled to 33.8 feet below ground surface with a 2-foot long well screen set a 33.8 feet. The soils encountered are glacial sands and gravels. Water levels are recorded for this well from 1965 to present. The highest water level over record for that well is 14.98 ft below ground surface.

Test Pits

Figure 3 shows the locations of the Wetherbee site test pits. DEP personnel witnessed the test pits excavation and joined Acton staff's Certified Soils Evaluator in reviewing the soils classifications. Test pits 32105-1 and 32105-2 at the Wetherbee site were dug along the east flank of the parcel where the sand and gravel deposits are the thickest. The test pits were excavated to depths of 17 and 15 feet respectively; neither excavation encountered groundwater. The estimated depth below ground surface to seasonal high groundwater in each pit is 17 feet and 14.59 feet respectively. Soil samples were collected from each pit for laboratory grain size analyses.

Test pits 32105-3 was excavated on the northern side of the Wetherbee parcel to a depth of 10 feet and encountered till at shallow depth with bedrock at the base of the pit. Groundwater was encountered at six feet below ground surface with the estimated seasonal high groundwater at one foot below ground surface.

Test pit 32105-4 was excavated along the westerly portion of the cleared Wetherbee site and was dug to a depth of 11.5 feet. The pit encountered mostly granular soils with gravely sand material to about 3 feet and finer sands to the bottom of the excavation. Groundwater was standing at 5 feet below surface and seasonal high groundwater is estimated at 3 feet below surface.

Test pits 32105-5 and 32105-6 were excavated along the southern boundary of the cleared Wetherbee site near Route 2. Both excavations encountered granular soils, grading more gravely with depth. The excavations were taken to nine and 13 feet below ground surface respectively. Groundwater was observed at 8.5 feet and 13 feet below surface respectively with estimated seasonal high groundwater at 5.5 and 13 feet below surface respectively.

Soil samples were collected from test pits 32105-1, 2, 5, 6. These four test pits offered the most promising soils conditions based on field observations. The soil samples were sent to the laboratory for grain size analyses. Percolation tests were run at three locations: 32105-A at test pit 32105-1, 32105-B at test pit 32105-6, and 32105-C at test pit 32105-5. Percolation rates were less than 2 minutes per inch in the first two test sites and 3 minutes per inch in test site 32105-C.

The soils encountered in the explorations (boring and test pits) at the Wetherbee Street location are in keeping with published soils information for the nearby USGS well. The new field observations and data from the USGS well suggest that the Wetherbee area consists of glacial sands and gravels, possibly a kame, and are deposited over till. The thickest sands and gravels are near the Wetherbee Street–Route 2 intersection with thinning as the topography and till elevation rises to the northwest.



2.2.2 North Acton

Test Borings

On March 25, drilling moved to the North Acton site. Table 4 displays specifics of the depths, well construction, soil sampling and bore hole permeability testing, as well as hydraulic conductivities. The locations of test borings at the site are shown on Figure 4. Test boring NA-1 encountered brown medium to fine sand with varying amounts of gravel from the surface to 13 feet in depth. From 13 feet to refusal, on assumed bedrock at 23 feet, the boring encountered medium to coarse sand with varying amounts of gravel. Groundwater was encountered at 19.3 feet. A field permeability test was run at 22 feet, and a well was set at 23 feet.

Boring NA-2 was begun and completed on March 25, 2005. The boring encountered fine to medium sand with varying amounts of gravel and some cobbles. The boring met auger refusal in bedrock at 15.5 feet, but did not encounter groundwater; no well was installed.

Test Pits

Three deep hole test pits were dug at the North Acton location as shown on Figure 5. This location is also referred to as the "end of Quarry Road". Percolation tests were not run at this location, nor were soil samples collected for grain size analyses. DEP personnel witnessed the test pits excavation and joined Acton staff in reviewing the soils classifications.

Test pit 32305-1 was dug at the northeasterly extent of the cleared area of the site. The pit was excavated to a depth of 11 feet. It encountered granular soils derived from outwash with significant quantities of gravel and cobbles. No groundwater was observed and the seasonal high groundwater depth is estimated to be 11 feet.

Test pit 32305-2 was also excavated at the northerly end of the cleared portion of the site. The test pit was excavated to a depth of 8 feet at bedrock refusal. The deep hole encountered 8 feet of granular material derived from outwash with significant amounts of gravel, cobbles, and boulders. The excavation did not encounter groundwater. The estimated depth to seasonal high groundwater is 8 feet.

Test pit 32305-3 is located approximately 50 feet into the tree line at the north end of the Quarry Road location. The test pit was taken through 7 feet of granular material derived from outwash with lesser proportions of gravel and cobbles than in the other pits at North Acton. No bedrock refusal was encountered, but groundwater was observed at a standing depth of 5 feet with estimated seasonal high groundwater depth at 5 feet.

2.2.3 Adams Street

On March 23, 2005, the drilling crew conducted test borings on the Adams Street site at the locations shown on Figure 6. Table 5 displays specifics of the depths, well construction, soil sampling and bore hole permeability testing, as well as hydraulic conductivities. Work began with drilling on test boring A-1. This boring encountered a layer of brown, moderately dense sand, gravel and silt which may be till from 2 to 8 feet in depth followed by 10 feet of fine to medium sand, which was underlain by gray coarse to fine sandy silt and gravel for a depth of 22 feet to 47 feet where the boring was stopped. The conclusion is that the gray till at 22 feet depth constitutes the bottom of the overburden soils which could transmit wastewater off the site. No groundwater was encountered, except for possible perched water at the top of till at about 24 feet. No well was installed.



Boring A-2 penetrated brown medium to fine grained sands and gravels to a depth of forty feet. Groundwater was encountered at about 15 feet. A falling head borehole permeability test was run and a well was installed at 31 feet. The principal goal for this boring was to establish a true water table depth/elevation near the documented vernal pool to understand if the water level in the pool is isolated from the general local groundwater depth. In that case the pool water level and its vernal nature would be largely unaffected by the disposal of wastewater in the area. DEP has expressed other concerns related to impacting the shallow groundwater at the Maynard WWTF.

A subsequent site survey indicated that groundwater elevation in the vernal pool is less than a foot different from the elevations of groundwater in a nearby boring. This suggests that any mounding in local groundwater elevation will raise the water elevation in the pool, possibly interfering with its habitat function. Survey and vernal pool information are provided in Appendix D.

2.2.4 High Street

This preliminary evaluation of the High Street site is based on existing subsurface information developed over the years of exploration for water supply and investigations relevant to the W.R. Grace facility. These available sources of information came from reports by Dufresne-Henry for water supply investigations and from GeoTrans reports on the contamination investigations. Appendix E includes the Assabet well pumping tests from 2000 and 2004 and available site feature plans and cross section from GeoTrans. Table 6 provides a summary of useful data, including estimated hydraulic conductivity from previous studies.

Of critical consideration at the High Street location is a concern for the travel time between any treated wastewater dispersal location and the withdrawal points for the water supplies. At the present time, DEP requires a minimum groundwater travel time of two years between the location of treated wastewater dispersal and any groundwater supply well. This minimum travel time is under review and may be reduced to one year.

The available hydrogeological information was used to estimate groundwater velocities at various locations on the site. Based on these estimates, a location was selected with a possible travel time distance of one year or greater. This area is approximately 1,000 feet from the two Assabet wells. Figure 7 shows the location of the potential dispersal site which may likely be one year or more in travel time distant from the wells Assabet #1 and Assabet #2.

If it is decided to continue evaluation of the High Street site, extensive effort will have to be made to confirm groundwater travel times in the area under various pumping scenarios for the Assabet wells.



3. DATA REDUCTION

Most of the results of the data reduction (also specifics of the field exploration) are compiled on Table 1 and Table 2, titled Summary - Well Construction Details and Summary - Test Pit Construction Details, respectively. These two tables can be considered as summary tables of all of the information gathered from new field exploration or collected from published sources during this preliminary site evaluation.

Numerical data were generated at several points in the field exploration phase. Soil samples were collected at selected borings and test pits. These samples were sent to a soils laboratory for washed sieve grain size analyses with the intent to use the grain size data for estimating hydraulic conductivity of the soils. The results of the grain size analyses, in the form of grain size distribution plots, are presented in Appendix F.

The data from the grain size distribution plots was used for estimates of hydraulic conductivity (K) in classical estimating formulas by Hazen and by Kozeny-Carmen. Estimates of conductivity from soil grain size distributions are presented for boring samples and test pit samples on Table 7, which presents the results of the grain size K estimates listed by boring or test pit location and depth of sample.

Additional numerical data was generated during the test boring installations. Bore hole permeability tests were run by the falling head method. Field data sheets from these tests are presented in Appendix B. The data from these tests were analyzed for hydraulic conductivity (K) using a program for a computer-based solution of the Hvorslev slug/bail test equations. The curve matching results from these analyses are presented in Appendix G in units of cm/sec and ft /day, and the numerical results are presented in table format and organized by site on Tables 3 through 6.



4. MOUNDING SIMULATIONS

As stated in the introduction to this report, the objective of exploration for this preliminary evaluation is to understand as much as possible, at a preliminary phase, about the three factors which control suitability of a site for treated wastewater dispersal. Those three factors are:

- 1) Types of soils – coarse versus fine grained, and the resulting hydraulic conductivity;
- 2) The thickness of the conductive soils which can function to conduct groundwater; and
- 3) The seasonal high groundwater depth that limits the available height for mounding groundwater beneath a dispersal facility.

The numerical values for each of these three factors are then applied to a computer model to produce a reasonable simulation of the groundwater flow system at each location. Then the model is used to simulate varying amounts of water applied to the flow system. The resulting groundwater mound at each application rate is noted. At a preliminary phase such as this, most of the three groundwater flow system factors are only known within ranges, but not with great certainty. Thus reasonable ranges of values for these factors are applied to the models, which result in ranges of groundwater mound heights.

Those sites that appear to be highly constrained by mounding (or other factors now known about the locations) are eliminated from further consideration.

Mounding simulations for this study were completed using the well-accepted groundwater model developed by MacDonald and Harbaugh for the USGS in 1988.

A groundwater flow regime is set up within the model with the appropriate features of conductivity, thickness of conductive material, and seasonal high water table. Test runs of the model flow field are made with various application rates of water to the system to determine the height of the groundwater mound that develops in a steady state condition representing long-term application of treated wastewater.

The estimated and tested quantifications of field geological conditions at each location are considered, and the seemingly best portions of each site are selected for simulated wastewater loading with the model. The selected areas for simulated loading in the computer models correspond to the areas delineated on the Borings Locations figures:

- Figure 2: Wetherbee Site
- Figure 4: North Acton Site
- Figure 6: Adams Street Site
- Figure 7: High Street – Proposed Dispersal Area

Figure 8 through Figure 11 represent the model mounding results for selected wastewater application rates.

Tables 8 through Table 11 present the various combinations of hydrogeological factors and model mounding results for each of the four Acton locations.



4.1 WETHERBEE STREET

The mounding analysis is shown in Figure 8. The Wetherbee Street site has approximately 11 acres available for a disposal field. From Table 3, groundwater is approximately 14 feet below ground surface in the area of the proposed disposal field.

From Table 8, the preliminary analysis shows that a groundwater mound of almost 8 feet would result from an application of approximately 1.5 gpd per square feet. The distance from ground surface to the mound would be about 6 feet under this scenario.

Table 8: Wetherbee Site – Summary of Model Mounding Results

application rate gpd/ft ²		application total (gpd)		mound in ft above static GW
0.5		245,381		2.3
1.0		490,762		5.2
1.5		736,181		7.8

Note: 490,800 sq ft facility = approximately 11 acres
Maximum loading for subsurface methods by regulations is 3 gpd/sqft
K = 128 ft/day, which is average from testing at Wetherbee site

A 1.5 gpd per square foot application rate gives a capacity of approximately 736,000 gpd over 11 acres. At this point the groundwater mounding approaches the limit of regulatory separation (6 feet). Since the subsurface disposal system would require a reserve area, the actual maximum application area is 5.5 acres, creating a capacity of approximately 375,000 gpd at the same loading rate. We did not re-model for this application since we are looking for the limiting factors.

4.2 NORTH ACTON

The North Acton site mounding analysis is shown in Figure 9 and Table 9. According to Table 4, the groundwater elevation ranges from approximately 5 feet to approximately 19 feet.

Table 9: North Acton Site – Summary of Model Mounding Results

application rate gpd/ft ²	estimated K value ft/day	application total (gpd)	mound in ft above static GW
0.5	75.0	48,119	5.4
0.5	150.0	48,119	3.1
1.0	75.0	96,237	8.8
1.0	150.0	96,237	6.7

Note: 96,250 sq ft facility = approximately 2.2 acres



The preliminary analysis shows groundwater mounding ranging from 3.1 feet to 8.8 feet. The test pits exhibited groundwater elevations too shallow for a disposal field, with cobbles and boulders throughout the excavations. The groundwater elevation in the two borings was much further below the ground surface than the test pits. Boring/Well NA-1, however, is located in a heavily used and altered area, and further investigation would be required prior to conducting more precise modeling.

Test boring NA-2, in the northeast corner of the parcel, has bedrock at 15.5 feet below ground surface, with no groundwater, but the slope and bedrock in the area would warrant further investigation prior to a more refined analysis. As shown in Figure 4, the northeast portion of the parcel is mostly undisturbed, and therefore the most likely location for a potential disposal area.

4.3 ADAMS STREET

The Adams Street site mounding analysis is shown in Figure 10 and Table 10. Figure 6 shows the proposed disposal field location. The field is divided into two sections because of topography and to avoid a vernal pool located on the parcel.

Table 10: Adams Street Site – Summary of Model Mounding Results

application rate gpd/ft ²		estimated K value ft/day		application total (gpd)		mound in ft above static GW
0.5		30.0		83,746		4.8
0.5		50.0		83,746		3.0
1.0		30.0		167,484		8.8
1.0		50.0		167,484		5.6
1.5		50.0		251,238		8.0

Note: 167,500 sq ft facility = approximately 3.8 acres

DEP allows a discharge of 2.0 gpd/square foot, 3.0 gpd/square foot with advanced testing such as a loading test, if open sand beds are used. This is contingent on the site conditions and other testing at the DEP's discretion. According to Table 5, the depth of groundwater ranges from approximately 15 feet below the ground surface between the sections, to over 24 feet at the eastern portion of the parcel. The mounding analysis shows that groundwater mounding should not cause interference with a disposal facility, but is approaching the limiting factor of 7-feet below the surface at the 1.5 gpd/square foot rate.

The Adams Street site may be the most uncertain because of major terrain variations, potential for breakout on the slope in the eastern section, possible perched water table hydraulically connected to the vernal pool in the western section, and potential impact on the groundwater elevation at the nearby Maynard WWTF. The mounding analysis showed a rise in groundwater elevation in this area, which could possibly interfere with the vernal pool's function. Given these uncertainties, we used a conservative approach, stopping the loading analysis at 1.5 gpd per square foot. Further analysis should be conducted before proceeding with site investigations in this area.



4.4 HIGH STREET

Figure 11 displays the results of the High Street site mounding analysis. Table 11 presents the numerical hydrogeological factors and mounding analysis results.

The one-year travel time appears to be approximately 1,000 feet up gradient from the Assabet #1 and Assabet #2 wells. Figure 7 displays the area selected for the proposed dispersal facility location.

Table 11: High Street Site – Summary of Model Mounding Results

application rate gpd/ft ²		estimated K value ft/day		application total (gpd)		mound in ft above static GW
0.5		130.0		83,192		0.4
1.0		130.0		166,385		0.7
1.5		130.0		249,592		1.1
2.0		130.0		332,785		1.5
2.5		130.0		415,992		1.8
3.0		130.0		499,200		2.2

The dispersal of reclaimed water on land and the subsequent groundwater mound will change local groundwater gradient. This condition was not addressed in this preliminary evaluation of disposal sites. If the High Street site is selected for further study this aspect will have to be addressed with additional exploration and transport modeling.



5. CONCLUSIONS

A comparison of Tables 8 through 11 indicates that the Wetherbee site has the greatest capacity for treated wastewater application with the least mound creation. Geologically this is the preferred location. The other three sites do not exhibit the potential capacity without other technical or hydrologic hurdles.

The North Acton site is able to accept loading rates up to one gallon per square foot per day, but it appears to be a small site with limited total capacity. The ground surface on the majority of the site is heavily disturbed and much of the native material has been removed. The CAC did not rank the offsite treatment facility and disposal field at this location as the preferred/priority solution. Therefore, we do not recommend further study of this area.

Loading at the Adams Street location is problematic because of potential disturbance to the vernal pool, possible slope breakout toward the river and potential influence on the groundwater level at the Maynard wastewater treatment facility site. The eastern portion of the proposed area may hold promise, but DEP recently agreed to permit an additional 49,000 gpd discharge capacity to the WWTF's rapid infiltration basins. Further study of this potential dispersal area, as part of this CWRMP/EIR, is not warranted to serve the priority needs parcels. The Town owns the parcel and can hold it available if the CWRMP/EIR identifies additional needs that justify further exploration.

Discharge of treated wastewater at the High Street location will require extensive exploration and groundwater flow testing to confirm that any possible dispersal location is more than one year's travel time from the municipal wells. The parcel does not support a dispersal location with a two year's travel time from the municipal wells. We do not recommend further study at this site under this CWRMP/EIR.

The most promising location, hydrogeologically, is the Wetherbee Street site, which is aligned with the East Acton Needs Areas (Area 3 and Area 4) as an offsite alternative. However, research into the availability of the parcel has uncovered a deeded legislative conservation restriction. The town is pursuing further information through its Town Counsel. The CWRMP Phase 2 report will provide updates on this issue, and the EIR process will further refine the alternatives evaluation.



6. RECOMMENDATIONS

The potential disposal areas have drawbacks that limit the Town's options. But, each Needs Area associated with the four dispersal locations has another viable solution in addition to construction of a satellite facility. Therefore, we do not recommend further hydrogeologic study as part of the CWRMP/EIR.

We recommend that the Town clarify the availability of the Wetherbee Street site to determine if this parcel remains a viable alternative for East Acton, in addition to cluster/shared systems and a wastewater management district. Further evaluation of this situation will be discussed in the Phase 2 CWRMP and EIR.

Table 1: Well Construction Details

Well ID/Boring or Test Pit (TP) ID	Stick-up (ft)	Screen Length (ft)	Groundwater level (ft bgs) 3/22/05 - 3/25/05	Boring Depth (ft bgs)	Depth to Top of Well Screen (ft bgs)	Depth to Well Screen Bottom (ft bgs)	Sample Test Zone	Perm. Test Interval (ft)	Test Run	Falling Head Test-Hydraulic Conductivity (cm/sec)	Falling Head Test- Hydraulic Conductivity (ft/day)	Sieve Sample Interval (ft)	Hydraulic Conductivity based on Grain Size Kozeny- Carmen (cm/sec)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (ft/day)
Wetherbee St. (wells)														
W-1	0.5	10	13.88'	52	17	27	S-3 S-4 S-4 S-7 S-7	NA 15-16 15-16 31-32 31-32	NA Run 1 Run 2 Run 1 Run 2	NA 3.13 x 10 ⁻³ 2.90 x 10 ⁻³ 7.75 x 10 ⁻⁴ 7.85 x 10 ⁻⁴	NA 8.87 8.22 2.25 2.27	10-10.5 15-17 30-32	1.68 x 10 ⁻³ 5.91 x 10 ⁻² 3.52 x 10 ⁻²	4.75 167.59 99.68
W-2	1.7	10	5.88'	22	10	20	S-3	8-9 8-9	Run 1 Run 2	1.97 x 10 ⁻⁴ 1.96 x 10 ⁻⁴	0.572 0.57	none	none	none
W-3	1.6	10	1.8'	17 (Spoon Refusal)	5	15	none	none	none	NA	NA	none	none	none
W-4	1.9	10	7.31'	47	15	25	S-3 S-3 S-6 S-8 S-8	11-12 11-12 none 36-37 36-37	Run 1 Run 2 none Run 1 Run 2	4.73 x 10 ⁻⁴ 5.72 x 10 ⁻⁴ 3.55 x 10 ⁻⁴ 1.19 x 10 ⁻⁵	1.34 1.61 1.01 1.03	10-12 25-27 35-36.5	9.43 x 10 ⁻² 4.92 x 10 ⁻² 6.55 x 10 ⁻²	267.4 139.48 185.69
USGS MA-ACW 158														
Groundwater level (40 year high) = 14.98 bgs														
Adams St. (borings & well)														
A-1	no well installed	NA	not encountered	47	NA	NA	none	none	none	NA	NA	15-17	3.22 x 10 ⁻²	91.20
A-2	2.78	10	12.92'	32	21	31	S-4	16-17 16-17	Run 1 Run 2	6.49 x 10 ⁻⁴ 6.15 x 10 ⁻⁴	1.88 1.78	15-17	3.22 x 10 ⁻²	91.2
North Acton: (borings & well)														
NA-1	2.7	10	19.35'	23 (Refusal)	13	23	S-5	21-22	Run 1	3.04 x 10 ⁻⁴	0.884	20 -21.5	5.50 x 10 ⁻²	156.03
NA-2	no well installed	NA	not encountered	15.5 (Bedrock)	NA	NA	none	none	none	NA	NA	none	none	none
High Street: Wells														
Assabet 1			Groundwater Level (NGVD) (8/2002) ³⁾	Boring Depth (ft bgs)		Bottom of Screen Elevation ³⁾								Hydraulic Conductivity - Pumping Test
PT-01			108.09'	68 ²⁾		71								150 ⁶⁾
Assabet 2A			120.56'	50 ⁵⁾		120								570 ⁷⁾
Assabet 2			123.77'	34		98								110 ⁶⁾
B-06			122.98'	90 ¹⁾		90								

Notes: 1) Not Applicable

2) Boring depth obtained from Plan 2-5: GeoTrans, Potentiometric Section C-C, August 2002.

3) Groundwater elevation and bottom of screen elevation obtained from Plan 2-10: Geotrans Unconsolidated Deposits: Potentiometric Map, November 2001.

4) Boring depth is approximately 10 ft into bedrock.

5) Overburden thickness on cross-section extends 7.5' beneath bottom of boring.

6) Goldberg Zono Dumlcliff & Associates, Inc. Geotechnical Consultants; p. 43-Table, "Pumping Test Analysis"

7) Based on 48 hour pumping test (5/3/00- 5/4/00).

Table 2: Test Pit Construction Details

Test Pit (TP) ID	Groundwater level (ft bgs) 3/21/05 and-3/23/05	Test Pit Depth (ft bgs)	Sample Test Zone	Sieve Sample Interval (ft)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (cm/sec)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (ft/day)
Wetherbee Site: (test pits)						
TP-32105-1	17' (estimated seasonal high water)	17	S-1	15-17	7.22 x 10 ⁻²	204.73
	Groundwater not observed					
TP-32105-2	14.58' (estimated seasonal high water)	15	S-1	14-15	6.63 x 10 ⁻²	188.01
	Groundwater not observed					
TP-32105-3	1.0' (estimated seasonal high water)	10	none			
	6.0' (observed)					
TP-32105-4	3.0' (estimated seasonal high water)	11.5	none			
	5.0' (observed); At ' 3.0 groundwater weeping into pit					
TP-32105-5	5.5' (estimated seasonal high water)	9	S-2	6-9	0.114	321.92
	8.5' (observed)					
TP-32105-6	13' (estimated seasonal high water)	13	S-2	5-13	4.55 x 10 ⁻²	128.95
	13' (observed)					
North Acton Site: (test pits)						
TP-32305-1	11.0' (estimated seasonal high water)	11	none			
	Groundwater not observed					
TP-32305-2	8.0' (estimated seasonal high water)	8	none			
	Groundwater not observed					
TP-32305-3	5.17' (observed)	7	none			
	5.17' (estimated seasonal high water)					

Table 3: Wetherbee Site - Groundwater Levels and Hydraulic Conductivities

Well or Test Pit	Groundwater level (ft bgs) 3/22/05 - 3/25/05	Groundwater level (ft bgs) 4/25/05	Groundwater level (ft bgs) 5/5/05	Groundwater level (ft bgs) 6/1/05 - 6/2/05	Groundwater level (ft bgs) 7/6/05	Depth (ft bgs)	Sample Test Zone	Perm. Test Interval (ft)	Falling Head Test Hydraulic Conductivity (cm/sec)	Falling head Test Hydraulic Conductivity (ft/day)	Sieve Sample Interval (ft)	Hydraulic Conductivity based on Grain Size Coefficient (cm/sec)	Hydraulic Conductivity based on Grain Size Coefficient (ft/day)
Wetherbee Site: (wells)													
W-1	13.88'			none		52	S-4	15-16 (R1)	3.13×10^{-3}	8.87	10-10.5	1.68×10^{-3}	4.75
							S-4	15-16 (R2)	2.90×10^{-3}	8.22	15-17	5.91×10^{-2}	167.59
							S-7	31-32 (R1)	7.75×10^{-4}	2.25			
							S-7	31-32 (R2)	7.85×10^{-4}	2.27	30-32	3.52×10^{-2}	99.68
W-2	5.88'			none		22	S-3	8-9 (R1)	1.97×10^{-4}	0.572		none	
							S-3	8-9 (R2)	1.96×10^{-4}	0.570			
W-3	1.8'		1.10'	1.0'	7.67'	17 (Spoon Refusal)			none			none	
W-4	7.31'	6.75'	6.5'	6.33'	7.0'	47	S-3	11-12 (R1)	4.73×10^{-4}	1.34	10-12	9.43×10^{-2}	267.40
							S-3	11-12 (R2)	5.72×10^{-4}	1.61	25-27	4.92×10^{-2}	139.48
							S-6	none					
							S-8	36-37 (R1)	3.55×10^{-4}	1.01	35-36.5	6.55×10^{-2}	185.69
							S-8	36-37 (R2)	1.19×10^{-5}	1.03			
Wetherbee Site: (test pits)													
TP-32105-1	17' (estimated seasonal high water) Groundwater not observed		none			17'		none		NA	15-17	7.22×10^{-2}	204.73
TP-32105-2	14.58' (estimated seasonal high water) Groundwater not observed		none			15'		none		NA	14-15	6.63×10^{-2}	188.01
TP-32105-3	1.0' (estimated seasonal high water) 6.0' (observed)		none			10'		none		NA		none	
TP-32105-4	3.0' (estimated seasonal high water) 5.0' (observed); At 3.0' groundwater weeping into pit		none			11.5'		none		NA		none	
TP-32105-5	5.5' (estimated seasonal high water) 8.5' (observed)		none			9'		none		NA	6-9	0.114	321.92
TP-32105-6	13' (estimated seasonal high water)		none			13'		none		NA	5-13'	4.55×10^{-2}	128.95
USGS MA-ACW 158	Groundwater level (40 year high) = 14.98 bgs												

Notes:

NA= Not Applicable

Table 4: North Acton Site - Groundwater levels and Hydraulic Conductivities

Well ID/Boring or Test Pit (TP) ID	Groundwater level (ft bgs) 3/22/05 - 3/25/05	Groundwater level (ft bgs) 4/25/05	Groundwater level (ft bgs) 7/7/05	Boring or Test Pit Depth (ft bgs)	Sample Test Zone	Perm. Test Interval (ft)	Test Run	Falling Head Test- Hydraulic Conductivity (cm/sec)	Falling head Test- Hydraulic Conductivity (ft/day)	Sieve Sample Interval (ft)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (cm/sec)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (ft/day)
North Acton Site: (borings & well)												
	19.35'	18.25'	Dry	23 (Refusal)	S-5	21-22	Run 1	3.04 x 10 ⁻⁴	0.884	20-21.5	5.50 x 10 ⁻²	156.03
NA-2 (boring)	not encountered	NA		15.5 (Bedrock)		none		NA			none	
North Acton Site: (test pits)												
TP-32305-1	11.0' (estimated seasonal high water) Groundwater not observed	NA	NA	11								
TP-32305-2	8.0' (estimated seasonal high water) Groundwater not observed	NA	NA	8								
TP-32305-3	5.17' (observed) 5.17' (estimated seasonal high water)	NA	NA	7								
Notes: NA= not applicable												

Table 5: Adams Street Site - Groundwater Levels and Hydraulic Conductivities

Well ID/Boring or Test Pit (TP) ID	Groundwater level (ft bgs) 3/22/05 - 3/25/05	Groundwater level (ft bgs) 4/25/05	Groundwater level (ft bgs) 6/2/05	Groundwater level (ft bgs) 7/6/05	Boring Depth (ft bgs)	Sample Test Zone	Perm. Test Interval (ft)	Test Run	Falling Head Test- Conductivity (cm/sec)	Falling head Test- Hydraulic Conductivity (ft/day)	Sieve Sample Interval (ft)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (cm/sec)	Hydraulic Conductivity based on Grain Size Kozeny-Carmen (ft/day)
Adams Street Site:													
A-1 (boring)	not encountered		NA		47		none			none	15-17	3.22×10^{-2}	91.20
A-2 (well)	12.92	11.75	11.25	17.17	32	S-4	16-17 16-17	Run 1	6.49×10^{-4}	1.88	15-17	3.22×10^{-2}	91.20
								Run 2	6.15×10^{-4}	1.78			

Notes: NA = Not Applicable

Table 6: High Street Site - Groundwater Levels and Hydraulic Conductivities

Well ID	Groundwater Level (NGVD) ²⁾	Bottom of Screen Elevation ²⁾	Boring ¹⁾ Depth (ft)	Hydraulic Conductivity (ft/day)
Assabet 1	108.09	71	68	150 ⁵⁾
PT-01	120.56	120	50 ⁴⁾	NA
Assabet 2A	123.77	98	54	570 ⁶⁾
Assabet 2	NA	NA	NA	110 ⁵⁾
B-06	122.98	90 ³⁾	90	NA

Notes:

- 1) Boring depth obtained from Plan 2-5: GeoTrans, Potentiometric Section C-C', August 2002.
 - 2) Groundwater elevation and bottom of screen elevation obtained from Plan 2-10: Geotrans Unconsolidated Deposits: Potentiometric Map. November 2001.
 - 3) Boring depth is approximately 10 ft into bedrock.
 - 4) Overburden thickness on cross-section extends 7.5' beneath bottom of boring.
 - 5) Goldberg Zoino Dunncliff & Associates, Inc. Geotechnical Consultants; p. 43- Table, "Pumping Test Analysis"
 - 6) Based on 48 hour pumping test 5/3/00 - 5/4/00
- NA = Not Available

TABLE 7: Summary - Grain Size Estimates of Hydraulic Conductivity

Borings/Test Pits

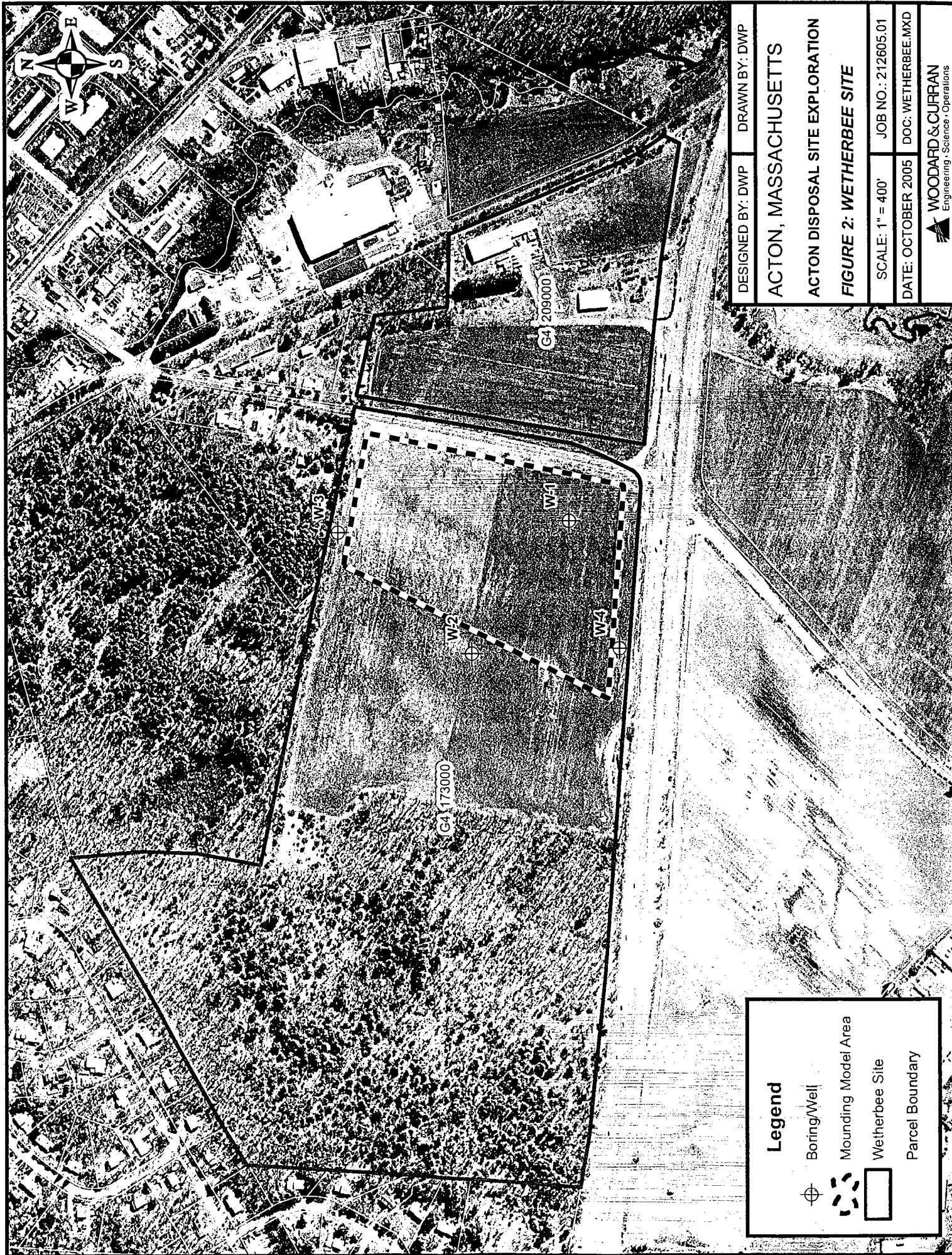
Hydraulic Conductivity Estimates based upon wash sieve analyses and Kozeny-Carmen Equation calculations.

Kozeny- Carmen															Hazen-Williams Method					K-C/Haz
Hydraulic Conductivity															Assume C = 100					
Borings Test Pits (TP)	Sample No.	Sample Type	Depth (ft)	Field Texture	% Fines (#200)	K ^(4.3.5) (cm/s)	K		Cu	D ₁₀ (cm)	D ₁₀ ²	K (cm/s)	K (ft/d)							
							(m/d)	(ft/d)												
A-1	S-4	split-spoon	15-17	poorly graded sand	4.1	3.22E-02	27.80	91.20	2.60	0.014	0.000196	1.96E-02	55.56	1.6						
A-2	S-4	split-spoon	15-17	poorly graded sand	4.3	3.22E-02	27.80	91.20	2.13	0.016	0.000256	2.56E-02	72.57	1.3						
INA-1	S-5	split-spoon	20-21.5	poorly graded sand with gravel	2.6	5.50E-02	47.56	156.03	5.12	0.0299	0.000894	8.94E-02	253.42	0.6						
W-1	S-3	split-spoon	10-10.5	Silty sand with gravel	16.5	3.33E-03	2.87	9.43	5.00	0.0042	1.76E-05	1.76E-03	5.00	1.9						
W-1	S-4	split-spoon	15-17	poorly graded sand	1.3	5.91E-02	51.08	167.59	2.46	0.0415	0.001722	1.72E-01	488.20	0.3						
W-1	S-7	split-spoon	30-32	poorly graded sand	4.4	3.52E-02	30.38	99.68	2.28	0.0154	0.000237	2.37E-02	67.23	1.5						
W-4	S-3	split-spoon	10-12'	Poorly graded sand	2.1	9.43E-02	81.50	267.40	3.62	0.0428	0.001832	1.83E-01	519.26	0.5						
W-4	S-6	split-spoon	25-27	Poorly graded sand with gravel	1.4	4.92E-02	42.51	139.48	2.33	0.0398	0.001584	1.58E-01	449.02	0.3						
W-4	S-8	split-spoon	35-36.5	Poorly graded sand	1.4	6.55E-02	56.60	185.69	4.22	0.0341	0.001163	1.16E-01	329.62	0.6						
TP-32105-1	S-1	grab	15-17	Poorly graded sand with gravel	0.7	7.22E-02	62.40	204.73	4.99	0.0385	0.001482	1.48E-01	420.17	0.5						
TP-32105-2	S-1	grab	14-15	Poorly graded sand with gravel	1.4	6.63E-02	57.30	188.01	8.60	0.0522	0.002725	2.72E-01	772.40	0.2						
TP-32105-5	S-2	grab	6-9'	Poorly graded sand	2.6	1.14E-01	98.12	321.92	3.16	0.0491	0.002411	2.41E-01	683.38	0.5						
TP-32105-6	S-2	grab	5-13'	Poorly graded sand	1.3	4.55E-02	39.30	128.95	1.95	0.0392	0.001537	1.54E-01	435.58	0.3						

NOTES:

1. D₂₅ interpreted from grain size curves
2. D_m = D₂₅ * 0.5 (if fines>50%), 0.8 (if 50%>fines>20%), 1 (if 20%>fines>10%), and 1.25 (if fines<10%)
3. n values typical for materials present
4. Water density = 1,000
5. Fluid viscosity = 0.0013
6. Gravity constant = 9.81
7. Sample Type: A = auger cuttings grab sample; SS = split spoon sample
8. Sample considered unreliable/unrepresentative

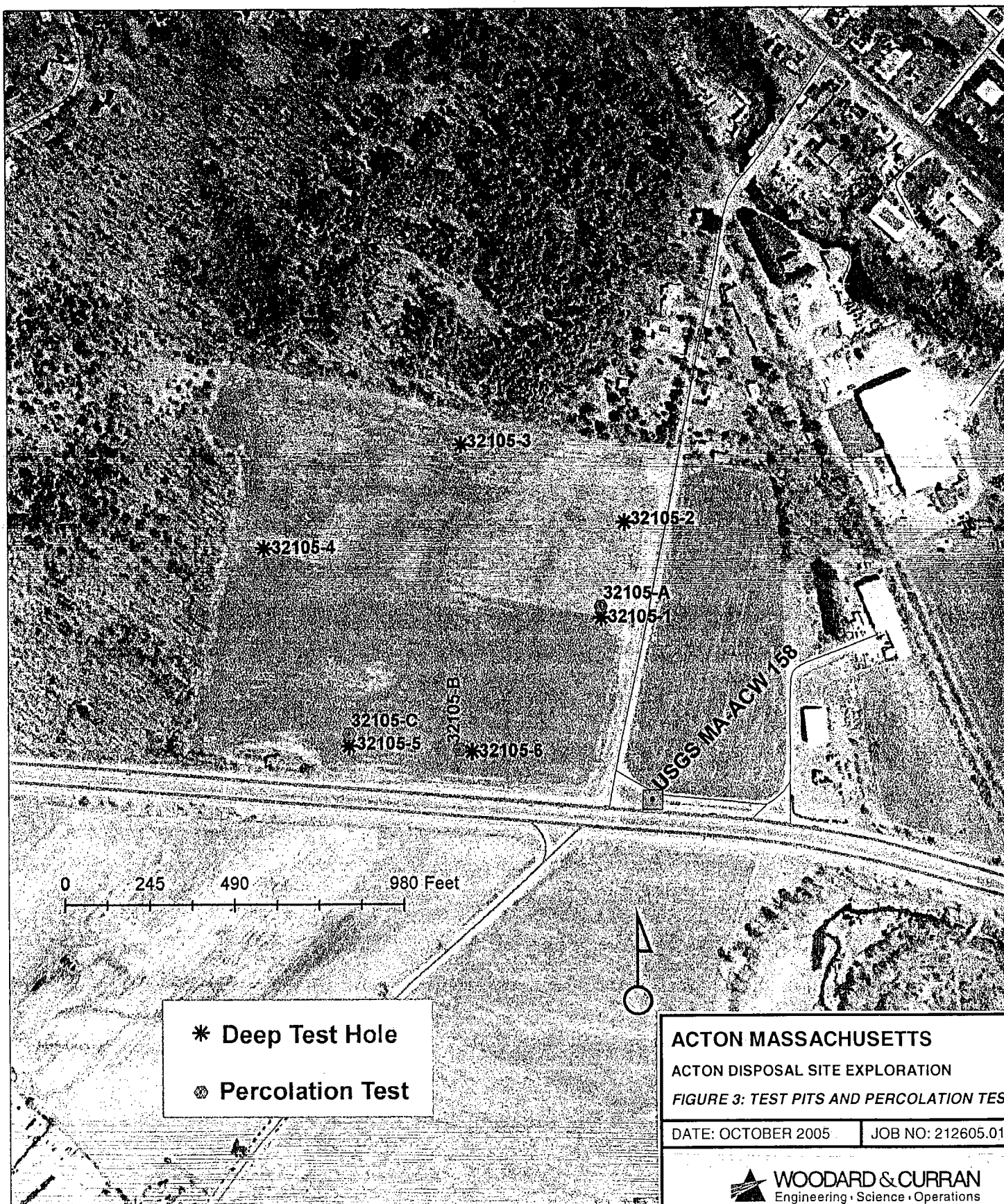




DESIGNED BY: DWP	DRAWN BY: DWP
ACTON, MASSACHUSETTS	
ACTON DISPOSAL SITE EXPLORATION	
FIGURE 2: WETHERBEE SITE	
SCALE: 1" = 400'	JOB NO.: 212605.01
DATE: OCTOBER 2005	DOC: WETHERBEE.MXD
WOODWARD & CLIFFRAN Engineering • Science • Operations	

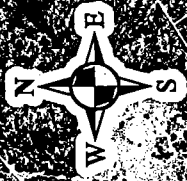
Legend

- Boring/Well
- Mounding Model Area
- Wetherbee Site
- Parcel Boundary



**Deep Test Hole
Percolation Test
Locations**

**Town of Acton
Wetherbee Street
3/21/2005**



DESIGNED BY: DWP	DRAWN BY: DWP
ACTON, MASSACHUSETTS	
ACTON DISPOSAL SITE EXPLORATION	
FIGURE 4: NORTH ACTON SITE	
SCALE: 1" = 400'	JOB NO.: 212605.01
DATE: OCTOBER 2005	DOC: NORTHACTON.MXD
WOODWARD & CURRIAN Engineering • Science • Operations	

Legend

 Boring/Well

 Mounding Model Area

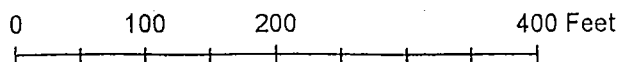
 North Acton Site

 Parcel Boundary



ACTON MASSACHUSETTS	
ACTON DISPOSAL SITE EXPLORATION	
<i>FIGURE 5: TEST PIT LOCATIONS</i>	
DATE: OCTOBER 2005	JOB NO: 212605.01
 WOODARD & CURRAN Engineering • Science • Operations	

**Deep Test Hole
Locations**

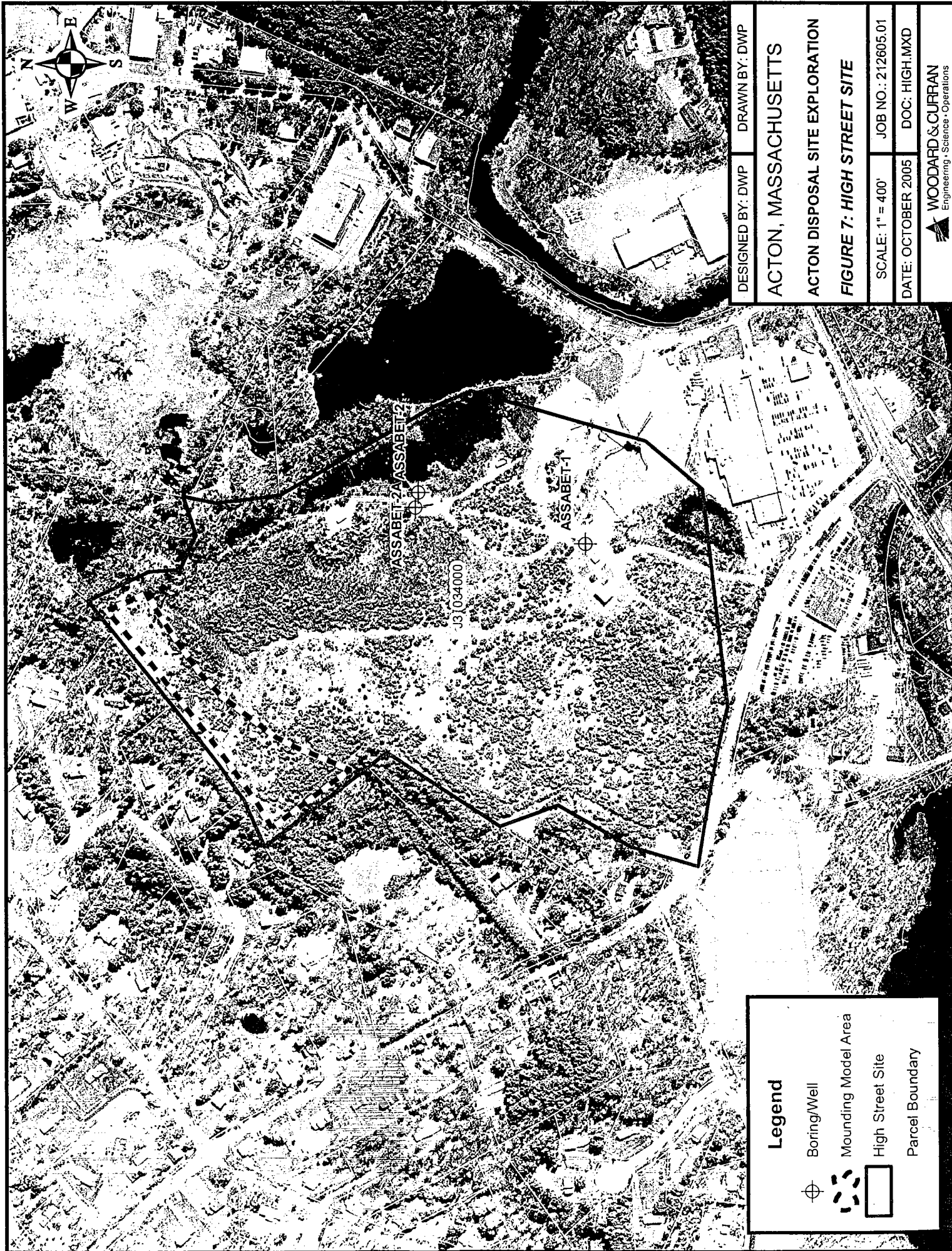


**Quarry Road
3/23/2005
Acton, MA**



DESIGNED BY: DWP	DRAWN BY: DWP
ACTON, MASSACHUSETTS	
ACTON DISPOSAL SITE EXPLORATION	
FIGURE 6: ADAMS STREET SITE	
SCALE: 1" = 400'	JOB NO.: 212605.01
DATE: OCTOBER 2005	DOC: ADAMS.MXD
WOODARD & CURRAN Engineering · Science · Operations	

Legend	
	Boring/Well
	Mounding Model Area
	Adams Street Site
	Parcel Boundary



Legend

Boring/Well

Mounding Model Area

High Street Site

Parcel Boundary

DESIGNED BY: DWP

DRAWN BY: DWP

ACTON, MASSACHUSETTS

ACTON DISPOSAL SITE EXPLORATION

FIGURE 7: HIGH STREET SITE

SCALE: 1" = 400'

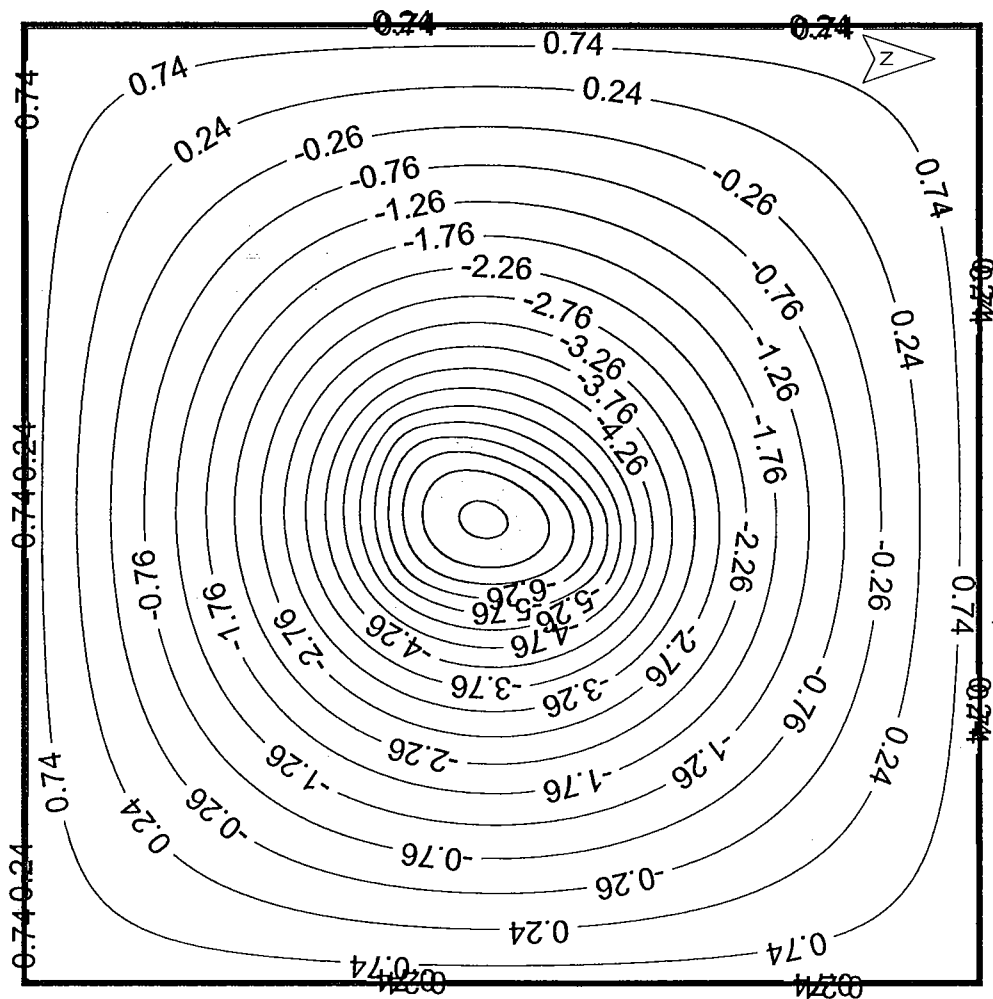
JOB NO.: 212605.01

DATE: OCTOBER 2005

DOC: HIGH.MXD

WOODARD & CURRAN
Engineering - Science - Operations

Wetherbee Mounding Estimate



Scale 1" = 800'

Discharge = 736,000 GPD

ACTON MASSACHUSETTS

ACTON DISPOSAL SITE EXPLORATION

FIGURE 8: WETHERBEE SITE
- MOUNDING ESTIMATE

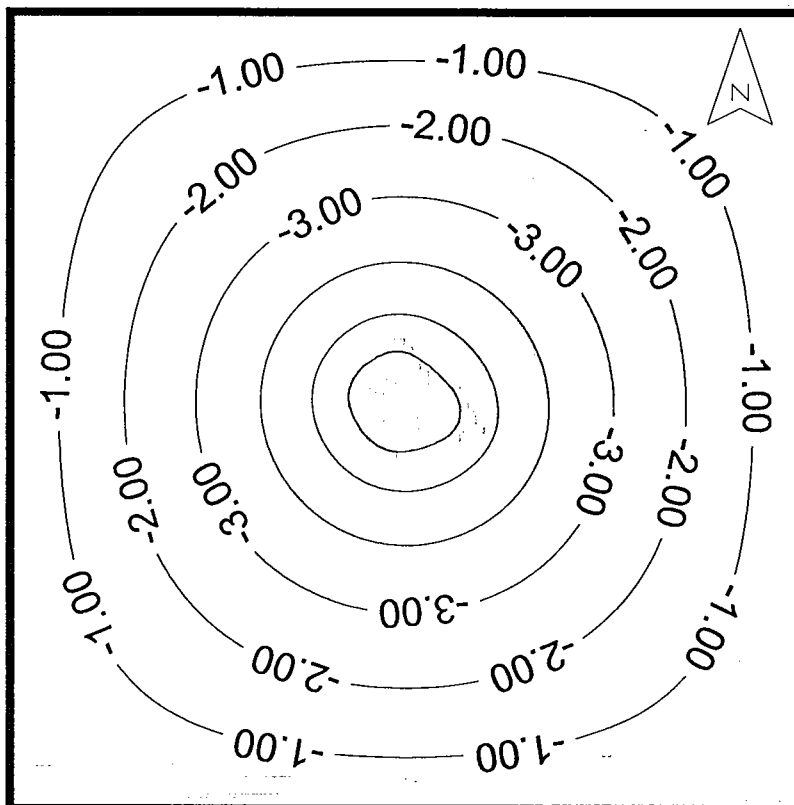
DATE: OCTOBER 2005

JOB NO: 212605.01



WOODARD & CURRAN
Engineering • Science • Operations

North Acton Mounding Estimate



Scale 1" = 600'

Discharge = 96,200 GPD

ACTON MASSACHUSETTS

ACTON DISPOSAL SITE EXPLORATION

FIGURE 9: NORTH ACTON SITE
- MOUNDING ESTIMATE

DATE: OCTOBER 2005

JOB NO: 212605.01



WOODARD & CURRAN
Engineering • Science • Operations

ACTON MASSACHUSETTS
ACTON DISPOSAL SITE EXPLORATION
FIGURE 11: HIGH STREET SITE
- MOUNDING ESTIMATE

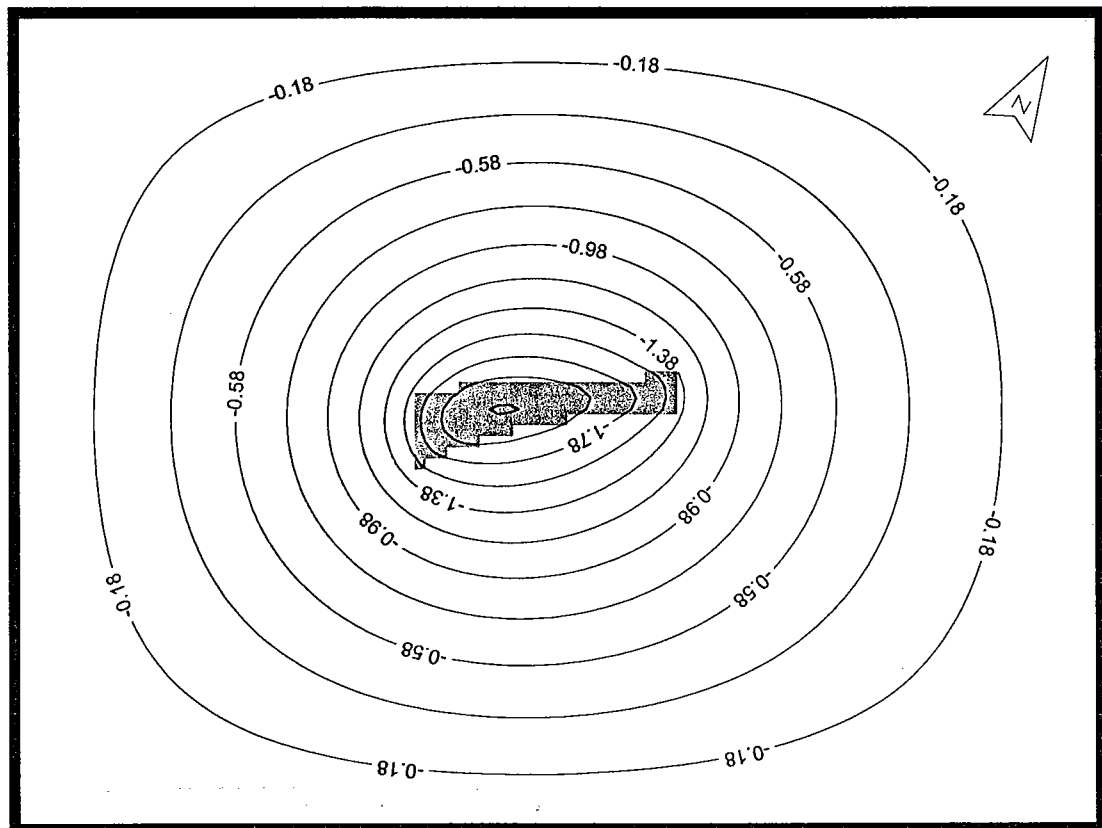
DATE: OCTOBER 2005

JOB NO: 212605.01



WOODARD & CURRAN
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High Street Mounding Estimate



Scale 1" = 600'

Discharge = 499,200 GPD



APPENDIX A: BORING LOGS

PROJECT: Acton WRC

BORING NUMBER 4-1

SHEET 1 OF 3

DATE _____ FILE _____

RING COMPANY Soil Ex

REMAN Mike Caracho

GEOLOGIST Brian Miller

BORING LOCATION Wetherbee

RELATIVE GROUND ELEVATION _____

DATE STARTED 3/2/05 DATE ENDED 3/22/05

CASING 4" ID HSA

SAMPLER TYPE 2"x1-7/8" SS

OTHER: _____

DATE _____

DEPTH _____

CASING _____

STABILIZATION TIME _____

ZE _____

MMER _____

LL _____

HAMMER 140 lb.

FALL 30"

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HWU OR OVA	EQUIPMENT OR WELL INSTALLED
NO.	REC.	DEPTH	BLOWS				
S-1		0-2'	OFF AUGER	moist, d. brown f.m sand → stiff.			6" stickup PVC
	24"		9-10-10-9	over tan/orange f.m sand,			
S-2		5-7'		moist, tan medium sand			
	20"		4-5-4-6	some coarse sand + trace fine sand.			
S-3		10-12'		moist-wet tan f. sand	f. sand		
	15"		8-9-11-14	over f-c sand & gravel	f-c sand & gravel	↓ 4"	
				over fine sand.	f. sand		
S-4		15-17'		wet, tan coarse sand		14.38	
	20"		3-4-5-5	some gravel & cobbles		BPT at 17'	
				over f-m sand, some small cobbles		2 runs.	
S-5		20-22'		wet l. brown f. sand			
	18"		2-5-9-13	trace silt over f-c sand, + trace gravel.			

PORTIONS USED

ACE 0 TO 10%

FILE 10 TO 20%

HE 20 TO 35%

35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY

COHESIVE CONSISTENCY

WELL CONSTRUCTION LEGEND

CONCRETE

SILICA SAND

BENTONITE

NATURAL SOILS

SLOTTED PVC SCREEN

GROUND-WATER TABLE

PROJECT: Acton

BORING NUMBER W-1
SHEET 2 OF 3
DATE 3/21/05 FILE

BORING COMPANY Soil Ex
OREMAN Mike Camacho
GEOLOGIST Brian Miller

BORING LOCATION Waterloo
RELATIVE GROUND ELEVATION
DATE STARTED 3/21/05 DATE ENDED 3/22/05

CASING 4" ID HSA TYPE 2'x1-7/8" SS OTHER:
HAMMER 140 lb.
FALL 30"

GROUNDWATER READINGS
DATE DEPTH CASING STABILIZATION TIME

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-6		25-27'		wet, l. brown fine sand trace silt.				
	15"	2-3	5-6					
S-7		30-32'		wet, l. brown fine sand trace silt.		BPT 4321 2 runs.		
	20"	3-5	7-8					
S-8		35-37'		wet, l. brown f-c sand, little gravel over d. brown f-m sand.	d. brown	24"		
	24"	6-16	17-20					
S-9		40-42'		wet-moist l. brown f-c sand little gravel lens of silt over f-m sand, some small cobbles		silt lens		
	24"	25-31	29-28					
S-10		45-47'		wet, l. brown f-m sand over gray silt	sand silt			
	22"	8-11	16-22					

PORTIONS USED
CE 0 TO 10%
TLE 10 TO 20%
E 20 TO 35%
35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER
COHESIONLESS DENSITY
0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE
COHESIVE CONSISTENCY
0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

WELL CONSTRUCTION LEGEND
CONCRETE
SILICA SAND
BENTONITE
NATURAL SOILS
SLOTTED PVC SCREEN
GROUND-WATER TABLE

PROJECT: Action

BORING NUMBER W-1
SHEET 3 OF 5
DATE _____ FILE _____

DRILLING COMPANY Soil Ex
GEOPHYSICIAN Mike Camacho
GEOLOGIST Brian Miller

BORING LOCATION Wetterbee
RELATIVE GROUND ELEVATION _____
DATE STARTED 3/21/05 DATE ENDED 3/22/05

Casing 4" ID HSA	Sampler 2 1/2 x 1-7/8" SS Hammer 140 lb. Fall 30"	Other:	Groundwater Readings			
			Date	Depth	Casing	Stabilization Time
					Off SS	---

Sample				Sample Description	Strata. Change and General Description	Field Testing H ₂ O or OVA	Equipment or Well Installed	
No.	Rec.	Depth	Blows					
S-1		0-2' 50-52'	2-4-12-5	wet gray clayey silt. End of boring at 52' will set well at 22' 10' of screen. No sand at well screen Bentonite seal at surface				
	18'							
S-2		5-7'						
S-3		10-12'						
S-4		15-17'						
S-5		20-22'						

Options Used

0 TO 10%
10 TO 20%
20 TO 35%
35 TO 50%

Penetration Resistance

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

Cohesionless Density	Cohesive Consistency
0-4 VERY LOOSE	0-2 VERY SOFT
5-9 LOOSE	3-4 SOFT
10-29 MED. DENSE	5-8 M/STIFF
30-49 DENSE	9-15 STIFF
50 + VERY DENSE	16-30 V-STIFF
	31 + HARD

Well Construction Legend

Concrete

Bentonite

Natural Soils

Slotted PVC Screen

Groundwater Table

PROJECT: Acton W9C

BORING NUMBER W-2
SHEET 1 OF 1
DATE FILE

BORING COMPANY Soil Ex
OREMAN Mike Camacho
GEOLOGIST Brian Miller

BORING LOCATION Acton Wellbore
RELATIVE GROUND ELEVATION
DATE STARTED 3/22/05 DATE ENDED 3/22/05

CASING 4" ID HSA
TYPE 2 1/2 x 1-7/8" SS
OTHER:
HAMMER 140 lb.
FALL 30"

GROUNDWATER READINGS
DATE DEPTH CASING STABILIZATION TIME
OFF SS ---

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HWU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-1		0-2'	OFF AUGER	Wet-moist d. brown f-m sand over l. brown f-m sand				PVC Riser Stickup 1.7'
	13"		5-5-5-4					
S-2		5-9'		Wet l. brown silt w/ fine sand lens of rust color stain.				7.58
	16"		3-5-5-6					
	18"	7-9'		Wet l. brown/gray silt + f. sand some bands of rust stain		9:54 AM Ran BPT at 9' - tests.		
			7-8-9-12					
S-3		10-12'						
				Wet l. brown/gray silt + f. sand				
S-4		15-17'						
	18"		6-8-8-10					
				Wet, Same				
S-5		20-22'						
	18"		4-8-9-10					

PORTIONS USED
0 TO 10%
10 TO 20%
20 TO 35%
35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER
COHESIONLESS DENSITY
0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE
COHESIVE CONSISTENCY
0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

WELL CONSTRUCTION LEGEND
CONCRETE
SILICA SAND
BENTONITE
NATURAL SOILS
SLOTTED PVC SCREEN
GROUND-WATER TABLE

PROJECT:Acton W&C

BORING NUMBERW-3
SHEET1 OF1
DATEFILE

BORING COMPANYSoil Ex
OREMANMike Camacho
GEOLOGISTBrian Miller

BORING LOCATIONWaterbury
RELATIVE GROUND ELEVATION
DATE STARTED3/22/05DATE ENDED3/22/05

CASING
SIZE4" ID HSA
HAMMER
ALL

SAMPLER
TYPE2"x1-7/8" SS
HAMMER140 lb.
FALL30"

OTHER:

GROUNDWATER READINGS

DATEDEPTHCASINGSTABILIZATION TIME

OFF SS---

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HWU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-1		0-2'	OFF AUGER	moist-wet, brown f-m sand over l. brown f-m sand trace gravel.		stick up 1.6'	1" bentonite 10'	3.4
	20"	2-3-3-3						
S-2		5-9'		wet l. brown f. sand & silt trace gravel		NO BPTS conducted due to till.		
		5-6-7-12						
S-3		10-12'		wet, gray l. brown f-m sand gravel & cobbles (till) trace silt				
		21-27-35-41					Set well at 15' screen 5-15' sand 1 foot above screen interval w/ 1 foot bentonite seal above sand.	
S-4		15-17'		moist gray & light brown 5" banded till f-m sand gravel & cobbles trace silt spoon refusal				
		23-52-100						
S-5		20-22'						

PORTIONS USED
0 TO 10%
10 TO 20%
20 TO 35%
35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY

0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE

COHESIVE CONSISTENCY

0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

WELL CONSTRUCTION LEGEND

CONCRETE

SILICA SAND

BENTONITE

NATURAL SOILS

SLOTTED PVC SCREEN

GROUND-WATER TABLE

PROJECT: Acton W9C

BORING NUMBER

12-4

SHEET

1

OF

2

DATE

FILE

RING COMPANY

Soil Ex

REMAN

Mike Camacho

GEOLOGIST

Brian Miller

BORING LOCATION

Waterloo Acton

RELATIVE GROUND ELEVATION

DATE STARTED

3/22/05

DATE ENDED

3/23/05

CASING

4" ID HSA

SAMPLER

2 1/2 x 7/8" SS

OTHER:

DATE

DEPTH

CASING

STABILIZATION TIME

ZE

4" ID HSA

HAMMER

140 lb.

LL

FALL

30"

OFF SS

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-1		0-2'	OFF AUGER	moist d. brown f. sand over tan f. sand trace silt.				
	19"	3-2-3-3						
S-2		5-7'		wet tan f-c sand some gravel (tan)				
	14"	4-7-7-5						
S-3		10-12'		wet tan f-c sand some gravel (tan)				
	24"	3-5-8-6						
S-4		15-17'		wet tan f-c sand, little gravel,				
	8"	2-1-2-4						
S-5		20-22'		Wet, tan f-c sand little gravel over fm sand little gravel.				
	20"	3-4-5-4						

PORTIONS USED

CE

0 TO 10%

TLE

10 TO 20%

E

20 TO 35%

35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY

0-4 VERY LOOSE

5-9 LOOSE

10-29 MED. DENSE

30-49 DENSE

50 + VERY DENSE

COHESIVE CONSISTENCY

0-2 VERY SOFT

3-4 SOFT

5-8 M/STIFF

9-15 STIFF

16-30 V-STIFF

31 + HARD

WELL CONSTRUCTION LEGEND:

CONCRETE

|||||

SILICA SAND

|||||

BENTONITE

.....

NATURAL SOILS

SLOTTED PVC SCREEN

|||||

GROUND-WATER TABLE

DRILLING COMPANY
OREMAN
GEOLOGIST

Soil Ex
Mike Camacho
Brian Miller

BORING LOCATION
RELATIVE GROUND ELEVATION
DATE STARTED DATE ENDED

Wetherbee
3/22/05 3/23/05

Casing	SAMPLER	OTHER:	GROUNDWATER READINGS			
			DATE	DEPTH	CASING	STABILIZATION TIME
4" ID HSA	TYPE 2"x1-7/8" SS				OFF SS	---
HAMMER	HAMMER 140 lb.					
ALL	FALL 30"					

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
5-6		25-27'		wet, tan m-c sand trace f sand				
	22"	2-4-7-7						
5-7		30-32'		wet, tan f.c sand over gray-f-m sand some rubble & gravel.	tan sand gray sand			
	24"	3-2-5-28						
5-8		35-37'		wet, tan m-c sand & gravel trace fine sand over gray fine sand & silt.	tan m-c sand silt & fine sand	Run BPT Tests at 37'		
	24"	4-5-3-6						
5-9		40-42'		wet gray fine sand & silt.				
	16"	4-7-7-5						
5-10		45-47'		wet, gray silt, trace fine sand. End of boring at 47'		Set well at 25' Screen 15-25'		sand to above scr 1' benton seal perm sl.
	20"	7-8-7-8						

PORTIONS USED
CE 0 TO 10%
TLE 10 TO 20%
E 20 TO 35%
35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER
COHESIONLESS DENSITY
0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE
COHESIVE CONSISTENCY
0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

WELL CONSTRUCTION LEGEND
CONCRETE
SILICA SAND
BENTONITE
NATURAL SOILS
SLOTTED PVC SCREEN
GROUND-WATER TABLE

PROJECT: Acton W&C

BORING NUMBER NA-1
SHEET 1 OF 1
DATE FILE

RING COMPANY Soil Ex

BORING LOCATION North Acton

REMAN

RELATIVE GROUND ELEVATION

GEOLOGIST

DATE STARTED 3/25/05

DATE ENDED 3/25/05

CASING 4" ID HSA
TYPE 2'x1-7/8" SS
OTHER:
HAMMER 140 lb.
FALL 30"

DATE
DEPTH
CASING
STABILIZATION TIME

OFF SS

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-1		0-2'	OFF AUGER	moist cl. brown f-m sand some gravel				
	18"	3-3-4-5						
S-2		5-7'		moist brown f-m sand & cobbles. trace gravel.				
	8"	7-15-11-10						
S-3		10-12'		dry-moist tan/brown f-m sand gravel & cobbles.				
	8"	10-23-20-15						
S-4		15-17'		moist m-c sand some gravel trace f. sand lens of f. sand & silt.				
	14"	8-5-5-5						
S-5		20-22'		wet tan m-c sand some gravel over crushed cobbles (weathered Bedrock?) Refusal at 23' Set well at 23'				
	20"	9-40-46-60						

Stickup 2.7'

BPT at 22' 1 test.

22.05'

10'

1' 1'

1' 1'

Point

PORTIONS USED
0 TO 10%
10 TO 20%
20 TO 35%
35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER
COHESIONLESS DENSITY
0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE

COHESIVE CONSISTENCY
0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

CONCRETE
SILICA SAND

BENTONITE
NATURAL SOILS

SLOTTED PVC SCREEN
GROUND-WATER TABLE

PROJECT: North W+C

BORING NUMBER NA-2
SHEET 1 OF 1
DATE FILE

BORING COMPANY Soil Ex.
OREMAN Mike Camacho
GEOLOGIST Brian Miller

BORING LOCATION North Acton
RELATIVE GROUND ELEVATION
DATE STARTED 3/25/05 DATE ENDED 3/25/05

CASING
SIZE 4" ID HSA TYPE 2"x1-7/8" SS OTHER:
HAMMER HAMMER 140 lb.
ALL FALL 30"

GROUNDWATER READINGS
DATE DEPTH CASING STABILIZATION TIME

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED		
NO.	REC.	DEPTH	BLOWS						
S-1		0-2'	OFF AUGER	Moist d. brown f-m organic sand over light brown f-m sand some gravel & cobbles.					
	12"		2-2-3-5						
5'	S-2	5-9'		moist, tan f-m sand trace coarse sand trace gravel, some cobbles.					
		10"	3-4-5-8						
0'	S-3	10-12'		1. brown Dry, f-m sand crushed cobbles					
		6"	6-35-31-30						
5'	S-4	15-17'		Weathered BR at 14.5' Auger refusal at 15.5' Competent Bedrock at 15.5' No well installed. No GW encountered.					
0'	S-5	20-22'							

PORTIONS USED
ACE 0 TO 10%
TITLE 10 TO 20%
ME 20 TO 35%
J 35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY	COHESIVE CONSISTENCY
0-4 VERY LOOSE	0-2 VERY SOFT
5-9 LOOSE	3-4 SOFT
10-29 MED. DENSE	5-8 M/STIFF
30-49 DENSE	9-15 STIFF
50 + VERY DENSE	16-30 V-STIFF
	31 + HARD

WELL CONSTRUCTION LEGEND

CONCRETE

SILICA SAND

BENTONITE

NATURAL SOILS

SLOTTED PVC SCREEN

GROUND-WATER TABLE

PROJECT: Acton WPC

BORING NUMBER

A-1

SHEET

1

OF

2

DATE

FILE

DRILLING COMPANY

Soil Ex

PREPARED BY

Mike Mamacho

GEOLOGIST

Brian Miller

BORING LOCATION

Adams Street

RELATIVE GROUND ELEVATION

DATE STARTED

3/23/05

DATE ENDED

3/24/05

CASING

4" ID HSA

SAMPLER

TYPE 2"x1-7/8" SS

OTHER:

GROUNDWATER READINGS

DATE

DEPTH

CASING

STABILIZATION TIME

HAMMER

HAMMER 140 lb.

FALL

FALL 30"

OFF SS

SAMPLE

SAMPLE DESCRIPTION

STRATA. CHANGE
AND GENERAL
DESCRIPTIONFIELD TESTING
HNU OR OVAEQUIPMENT OR
WELL INSTALLED

NO. REC. DEPTH BLOWS

S-1 0-2' OFF AUGER

12" 2-1-3-2

moist l. brown / orange f-m
sand, little gravel.f-m
sand

S-2 5-7'

18" 9-19-20-20

moist l. brown / brown f-m
sand gravel & silt (till)

till

S-3 10-12'

24" 5-6-7-6

dry, tan f. sand w/
orange banding,fine
sand

S-4 15-17'

22" 4-5-8-9

dry, tan f. sand some
m. sand, orange banding
throughout.

S-5 20-22'

18" 6-8-11-15

dry, tan f. sand, some
m. sand, orange banding.
brown f-m sand trace gravel
(till) at tip of spoon

till

PORTIONS USED

0 TO 10%
10 TO 20%
20 TO 35%
35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY

0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50+ VERY DENSE

COHESIVE CONSISTENCY

0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31+ HARD

WELL CONSTRUCTION LEGEND

CONCRETE

SILICA
SAND

BENTONITE

NATURAL
SOILSSLOTTED
PVC
SCREENGROUND-
WATER
TABLE

PROJECT: Acton W&C

BORING NUMBER A-1
SHEET 2 OF 2
DATE _____ FILE _____

BORING COMPANY Soil Ex
OPERMAN Mike Connercha
GEOLOGIST Brian Miller

BORING LOCATION Adams St.
RELATIVE GROUND ELEVATION _____
DATE STARTED 3/23/05 DATE ENDED 3/24/05

CASING 4" ID HSA TYPE 2"x1-7/8" SS OTHER: _____
HAMMER 140 lb.
FALL 30"

GROUNDWATER READINGS
DATE _____ DEPTH _____ CASING _____ STABILIZATION TIME _____
OFF SS ---

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED		
NO.	REC.	DEPTH	BLOWS						
S-6		25-27'		wet-moist f-m sand, some gravel some cobbles (fill)	perched water table? 24-25'				
	24"		14-15-21-28						
S-7		30-32'		moist olive brown f-m sand some gravel (fill)					
	18"		15-24-27-41						
S-8		35-37'		moist olive f sand & silt & some gravel (fill)					
	6"		50/6"						
S-9		40-42'		moist dark olive f sand & silt & some gravel & cobbles dense (fill)					
	6"		75/6"						
S-10		45-47'		Same					
	8"		65/6"						
				End of Boring at 47' No well installed No GW encountered					

PORTIONS USED
ACE 0 TO 10%
TITLE 10 TO 20%
ME 20 TO 35%
D 35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER
COHESIONLESS DENSITY
0-4 VERY LOOSE
5-9 LOOSE
10-29 MED. DENSE
30-49 DENSE
50 + VERY DENSE

COHESIVE CONSISTENCY
0-2 VERY SOFT
3-4 SOFT
5-8 M/STIFF
9-15 STIFF
16-30 V-STIFF
31 + HARD

WELL CONSTRUCTION LEGEND

CONCRETE
SILICA SAND

BENTONITE
NATURAL SOILS

SLOTTED PVC SCREEN
GROUND-WATER TABLE

	PROJECT: <u>Action WQC</u>	BORING NUMBER <u>A-2</u>
		SHEET <u>1</u> OF <u>2</u>
		DATE <u>3/24/05</u> FILE <u>2</u>
BORING COMPANY <u>Soil Fix</u> OREMAN <u>Mike Comanche</u> GEOLOGIST <u>B. Miller, L. Lyons</u>		BORING LOCATION <u>Adams St.</u> RELATIVE GROUND ELEVATION _____ DATE STARTED <u>3/24/05</u> DATE ENDED <u>3/24/05</u>

CASING <u>4" ID HSA</u> SAMPLER <u>2"x1-7/8" SS</u> OTHER: _____ HAMMER _____ HAMMER <u>140 lb.</u> ALL _____ FALL <u>30"</u>	GROUNDWATER READINGS DATE _____ DEPTH _____ CASING _____ STABILIZATION TIME _____ _____ OFF SS _____
---	--

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED	
NO.	REC.	DEPTH	BLOWS					
S-1		0-2'	OFF AUGER	10" 2-3-3-3 4 on pump of m. sand & fine gravel.			Native fill	
	10"							
S-2		5-7'		moist, tan f-m sand & cobbles (cobbles may have prevented further recovery)			Native fill	
	5"	8-8-49						
S-3		10-12'		moist, f-c sand over tan f sand w/ orange banding little medium sand.			Native fill	
	20"	3-4-54						
S-4		15-17'		wet, tan f-m sand w/ orange banding.		BPT at 17' 2 hrs	Native fill	15.7
	20"	4-6-7-14						
S-5		20-22'		tan fine-medium sand w/ orange banding			Native fill	10'
	18"	6-6-5-6						

PORTIONS USED

ACE 0 TO 10%
 TITLE 10 TO 20%
 ME 20 TO 35%
 D 35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY	COHESIVE CONSISTENCY
0-4 VERY LOOSE	0-2 VERY SOFT
5-9 LOOSE	3-4 SOFT
10-29 MED. DENSE	5-8 M/STIFF
30-49 DENSE	9-15 STIFF
50 + VERY DENSE	16-30 V-STIFF
	31 + HARD

WELL CONSTRUCTION LEGEND

CONCRETE		BENTONITE		SLOTTED PVC SCREEN	
SILICA SAND		NATURAL SOILS		GROUND-WATER TABLE	

PROJECT: Adcon

BORING NUMBER A-2

SHEET 2 OF 2

DATE 3/24/05 FILE

BORING COMPANY Soil Exploration

REMAN Mike Constance

GEOLOGIST B. Miller, L. Lyons

BORING LOCATION Adams St

RELATIVE GROUND ELEVATION

DATE STARTED 3/24/05 DATE ENDED 3/24/05

CASING 4" ID HSA

SAMPLER 2"x1-7/8" SS

OTHER:

DATE

DEPTH

CASING

STABILIZATION TIME

TYPE 140 lb.

HAMMER 30"

OFF SS

SAMPLE				SAMPLE DESCRIPTION	STRATA. CHANGE AND GENERAL DESCRIPTION	FIELD TESTING HNU OR OVA	EQUIPMENT OR WELL INSTALLED
NO.	REC.	DEPTH	BLOWS				
S-6	16"	25-27'	6-8-8-7	saturated brown, coarse sand, some fine to medium gravel, little fine to med. sand over brown medium to coarse sand			
S-7	30"	30-32'	7-10-11-9	saturated, brown, fine to medium sand, some fine to medium gravel, trace coarse sand over gray, clayey			
S-8		35-37'		fine to medium clayey sand with some fine to medium gravel		Set well at 31' sand to 1 foot above screen. w/ 1 foot bentonite seal above sand. Native fill to grade below stand pipe.	
S-9		40-42'					
S-10		45-47'					

PORTIONS USED

CE 0 TO 10%

TLE 10 TO 20%

IE 20 TO 35%

35 TO 50%

PENETRATION RESISTANCE

140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY

COHESIVE CONSISTENCY

WELL CONSTRUCTION LEGEND

CONCRETE

SILICA SAND

BENTONITE

NATURAL SOILS

SLOTTED PVC SCREEN

GROUND-WATER TABLE



APPENDIX B: BOREHOLE PERMEABILITY TEST LOGS

BPT ~~SLUG~~ TEST LOG SHEET - 1

PROJECT NAME Acton W+C

PROJECT LOCATION Wetherbee

CDW PROJECT # _____

FIELD TECHNICIAN(S) Brian Miller

DATE 3/21/05

WELL/BORING ID W-1/S-4

riser 4'

13' from G.S. to
top of perstone.

Time	Depth to Water	Run 2					
0							
10 sec	4"	8"					
30 sec	11"	1.28					
1	22"	2.4					
2	3' 5.25"	4.66					
3	5' 1.5"	6.64					
4	6' 6"	8.4					
5	7' 10"	9.92					
6	9'	11.18					
7	9' 9"	12.36					
8	11' 1"	13.60					
9	12' 11"	14.20					
10	13' 9"	15.12					
11	14' 9"	15.70					
12	15' 4"	16.06					
13	16'	16.40					
14	16' 5"	16.72					
15	—	17.00					

Measurements taken from top of PVC riser

BPT, SLUG TEST LOG SHEET - 2

PROJECT NAME Action W+C

PROJECT LOCATION Wetburke

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M.

DATE 3/21/05

WELL/BORING ID W-1/S-4

Time	Depth to Water	R _{in}					
16	2.98	2.96					
17	3.08	3.08					
18	3.20	3.20					
19	3.20	3.32					
20	3.42	3.42					
21	3.58	3.52					
22	3.62	3.62					
23	3.76	3.74					
24	3.82	3.84					
25	3.96	3.92					
26	4.02	4.04					
27	4.12	4.10					
28	4.18	4.18					
29	4.28	4.26					
30	4.32	4.34					

BPT-SLUG TEST LOG SHEET - 1

PROJECT NAME Acton

PROJECT LOCATION Waltham

CDW PROJECT # _____

FIELD TECHNICIAN(S) Brian Miller

DATE 2/24/05

Riser = 4'

WELL/BORING ID W-1/S-7

Time	Depth to Water	Run 2					
0							
10 sec	2"	2.5"					
30 sec	3.8"	6.75"					
1	8.5"	1.06					
2	1.50'	2.00					
3	2.38	2.96					
4	3.28	3.80					
5	4.30	4.60					
6	5.10	5.38					
7	5.88	6.14					
8	6.64	6.84					
9	7.34	7.50					
10	8.00	8.14					
11	8.56	8.71					
12	9.18	9.04					
13	9.70	9.80					
14	10.22	10.26					
15	10.62	10.72					

Measurements taken from top of PVC riser

BPT SLUG TEST LOG SHEET - 2

PROJECT NAME Acton WAC

PROJECT LOCATION Wetherbee

CDW PROJECT # _____

FIELD TECHNICIAN(S) Brian Miller

DATE 3/21/05 Riser = 4'

WELL/BORING ID W-1/S-7

Time	Depth to Water	Run 2					
16	11.08	11.16					
17	11.46	11.58					
18	11.82	12.00					
19	12.20	12.26					
20	12.54	12.66					
21	12.82	12.98					
22	13.12	13.26					
23	13.40	13.58					
24	13.66	13.80					
25	13.90	14.00					
26	14.06	14.22					
27	14.30	14.46					
28	14.50	14.64					
29	14.66	14.84					
30	14.96	15.02					

BPT - SLUG TEST LOG SHEET - 1

PROJECT NAME Acton W4C

PROJECT LOCATION Wellerbee

CDW PROJECT # _____

FIELD TECHNICIAN(S) P.M.

DATE 3/22/05

WELL/BORING ID W-2 / S-3 9'

Riser = 6'
1.5' wick coarse sand

Time	Depth to Water	Run 2					
0							
10 sec	0.5"	0.5"					
30 sec	1.5"	1 3/8"					
1	2.5"	2 3/4"					
2	5.75"	6"					
3	8.5"	8.5"					
4	11"	.94					
5	1.12	1.14					
6	1.36	1.36					
7	1.56	1.56					
8	1.72	1.72					
9	1.90	1.88					
10	2.08	2.06					
11	2.30	2.22					
12	2.38	3.40					
13	2.54	2.54					
14	2.68	2.72					
15	2.82	2.82					

Measurements taken from top of PVC riser

Test ended at 15 min. borehole went dry.

BPT ~~SLUG~~ TEST LOG SHEET - 1

PROJECT NAME Acton WQC

PROJECT LOCATION Wallerbee

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M.

DATE 3/22/05

Riser = 4'

WELL/BORING ID W-4 S-3

Time	Depth to Water						
0							
10 sec	3"	2.75"					
30 sec	0.82	8"					
1	1.52	1.36					
2	2.86	2.42					
3	3.86	3.34					
4	4.72	4.18					
5	5.44	4.84					
6	5.66	5.46					
7	6.60	5.98					
8	7.10	6.46					
9	7.52	6.86					
10	7.88	7.26					
11	8.24	7.60					
12	8.50	7.90					
13	8.76	8.18					
14	9.00	8.40					
15	9.18	8.64					

Measurements taken from top of PVC riser

BPT-SLUG TEST LOG SHEET - 2

PROJECT NAME Acton WAC

PROJECT LOCATION Wetmore

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M.

DATE 2/22/05

WELL/BORING ID W-4/S-3

Time	Depth to Water	Run 2					
16	9.36	8.84					
17	9.48	8.96					
18	9.62	9.12					
19	9.72	9.22					
20	9.84	9.34					
21	9.90	9.41					
22	10.02	9.50					
23	10.08	9.56					
24	10.14	9.62					
25	10.16	9.66					
26	10.18	9.70					
27	10.22	9.74					
28	10.26	9.78					
29	10.28	9.82					
30	10.31	9.86					

BPT ~~SLUG~~ TEST LOG SHEET - 1

Aero Septic

PROJECT NAME Acton w/c

PROJECT LOCATION Waterbury

CDW PROJECT # _____

FIELD TECHNICIAN(S) D.M.

DATE 3/27/05

Riser =

WELL/BORING ID W-4 / S-8

Time	Depth to Water	Rvn 2					
0							
10 sec	2.5"	8.5"					
30 sec	8"	1.7					
1	1.3	2.7					
2	2.46	3.94					
3	3.44	4.72					
4	4.30	5.30					
5	4.98	5.76					
6	5.56	6.16					
7	6.06	6.50					
8	6.50	6.82					
9	6.84	7.08					
10	7.18	7.30					
11	7.42	7.50					
12	7.66	7.70					
13	7.88	7.88					
14	8.06	8.00					
15	8.18	8.12					

Measurements taken from top of PVC riser

BPT SLUG TEST LOG SHEET - 2

PROJECT NAME Newton W4C

PROJECT LOCATION Waterbury

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M

DATE 3/23/05

WELL/BORING ID W-4 | S-8

Time	Depth to Water						
16	8.30	8.20					
17	8.40	8.34					
18	8.50	8.44					
19	8.60	8.56					
20	8.70	8.62					
21	8.78	8.72					
22	8.88	8.80					
23	8.96	8.86					
24	9.02	8.92					
25	9.08	9.00					
26	9.14	9.04					
27	9.20	9.08					
28	9.26	9.10					
29	9.32	9.18					
30	9.38	9.22					

BPT SLUG TEST LOG SHEET - 1

PROJECT NAME Acton WRC

PROJECT LOCATION North Acton

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M.

DATE 3/25/05

WELL/BORING ID NA-1/S-5

Time	Depth to Water						
0							
10 sec	1 3/8"						
30 sec	3 3/4"						
1	7 3/8"						
2	1.24						
3	1.82						
4	2.38						
5	2.88						
6	3.40						
7	3.90						
8	4.36						
9	4.86						
10	5.28						
11	5.74						
12	6.16						
13	6.56						
14	7.00						
15	7.38						

Measurements taken from top of PVC riser

BPT SLUG TEST LOG SHEET - 2

PROJECT NAME Acton W4C

PROJECT LOCATION North Acton

CDW PROJECT # _____

FIELD TECHNICIAN(S) Brian Miller

DATE 3/25/08

WELL/BORING ID NA-1 / S-5

Run Test once due to time.

Time	Depth to Water						
16	7.74						
17	8.10						
18	8.46						
19	8.80						
20	9.18						
21	9.50						
22	9.82						
23	10.10						
24	10.38						
25	10.68						
26	10.96						
27	11.22						
28	11.50						
29	11.76						
30	12.04						

BPT SLUG TEST LOG SHEET - 1

PROJECT NAME Acton W9C

PROJECT LOCATION Adams St,

CDW PROJECT # _____

FIELD TECHNICIAN(S) P.M.

DATE 3/24/05

Riser = 3'

WELL/BORING ID A-2 / S-4

Time	Depth to Water	Riser				
0						
10 sec	2.25"	2.25"				
30 sec	6 1/8"	6.5"				
1	1.6	1.8'				
2	1.98	1.98				
3	2.80	2.78				
4	3.56	3.50				
5	4.22	4.16				
6	4.86	4.78				
7	5.36	5.40				
8	6.00	5.88				
9	6.50	6.34				
10	6.90	6.76				
11	7.38	7.20				
12	7.76	7.60				
13	8.18	8.00				
14	8.58	8.34				
15	8.92	8.74				

Measurements taken from top of PVC riser.

BPT ~~SLUG~~ TEST LOG SHEET - 2

PROJECT NAME Arden W&C

PROJECT LOCATION Adam St.

CDW PROJECT # _____

FIELD TECHNICIAN(S) B.M.

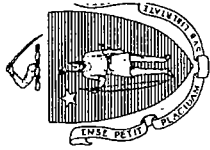
DATE 3/24/15

WELL/BORING ID A-2/S-4

Time	Depth to Water						
16	9.28	9.20					
17	9.58	9.34					
18	9.88	9.62					
19	10.16	9.92					
20	10.42	10.18					
21	10.72	10.42					
22	10.96	10.68					
23	11.16	10.92					
24	11.40	11.12					
25	11.58	11.36					
26	11.84	11.54					
27	12.00	11.76					
28	12.20	11.94					
29	12.38	12.10					
30	12.52	12.26					



APPENDIX C: TEST PIT LOGS (FORM 11) AND PERCOLATION LOGS (FORM 12)



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Town of Acton
Owner Name
43 Wetherbee Street
Street Address
Acton
City/Town
MA
State
01720
Zip Code
Map/Lot G4 - 173

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal

2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 Year Published 1:25,000 Publication Scale 35B Soil Map Unit

Hinckley Loamy Sand - 3-8% Slopes no major Soil limitations
Soil Name

3. Surficial Geological Report available? Yes ☒ No ☐ If yes: 1956 Year Published 1:31,680 Publication Scale Qkt Map Unit

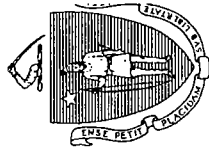
Ice Contact Kame Terrace Landform
Geologic Material

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map
Map Unit Name
Map Unit Name



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) 3/2005 Range: Above Normal ☐ Normal ☒ Below Normal ☐
Month/Year

7. Other references reviewed: _____

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32105-1 Date 3/21/2005 Time 830 am Cloudy Weather _____

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

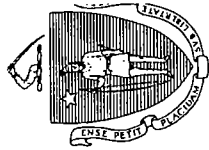
2. Land Use: Agricultural field _____ No _____ 0-3% Slope (%)
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones _____

Vegetation _____ Kame Terrace _____ Flat _____
Position on landscape (attach sheet)

3. Distances from: Open Water Body 1100 feet Drainage Way 1000 feet Possible Wet Area 1100 feet
Property Line 40 feet Drinking Water Well 2000+ feet Other _____

4. Parent Material: _____ Unsuitable Materials Present: Yes ☐ No ☒
If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒
If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____
Estimated Depth to High Groundwater: 204 inches _____ elevation



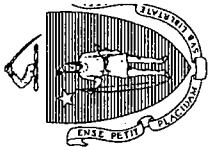
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32105-1

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
18	Ap	10 YR 3/2				SL	5	0	SBK	friable	
24	Bw	10 YR 4/6				LS	20	0	SBK	VFR	
60	C1	2.5 Y 5/3				MS	25	5	SG	loose	
204	C2	2.5 Y 5/3				CS	40	20	SG	loose	

Additional Notes



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Cont.)

Deep Observation Hole Number: 32105-2 3/21/2005 915 Cloudy
Date Time Weather

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

2. Land Use: _____ Agricultural field _____ No _____ 0-3%
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)

_____ crop residue, grass _____ Kame Terrace _____ Flat
Vegetation Landform Position on landscape (attach sheet)

3. Distances from: Open Water Body 900 _____ Drainage Way 900 _____ Possible Wet Area 900 _____
feet feet feet
Property Line 40 _____ Drinking Water Well 2500 _____ Other _____
feet feet feet

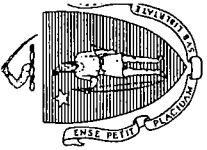
4. Parent Material: _____ Ice Contact _____ Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____

Estimated Depth to High Groundwater: _____ 175" _____
inches elevation



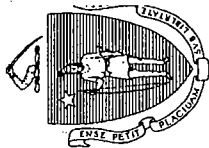
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32105-2

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
18	Ap	10 YR 3/2				SL	5	0	SBK	Friable	
24	bW	10 YR 4/6				LS	10	10	SBK	VFR	
60	C1	2.5 Y 5/3				MS	20	30	SG	Loose	
156	C2	2.5 Y 5/3				CS	40	30	SG	Loose	
180	C3	2.5 Y 5/4	175	10 YR 5/6 2.5 Y 6/2	> 5%	FLS	5	0	Massive	Friable	

Additional Notes C3 horizon damp to touch



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- | | | |
|--|-----------------|---------------------|
| ☐ Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| ☒ Depth to soil redoximorphic features (mottles) | A. _____ inches | B. _____ 175 inches |
| ☐ Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |
2. Index Well Number _____ Reading Date _____ Index Well Level _____

Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 24 inches Lower boundary: 204/180 inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator

BRENT L. REAGOR

Typed or Printed Name of Soil Evaluator

MARLO WEBBER

Name of Board of Health Witness

Date

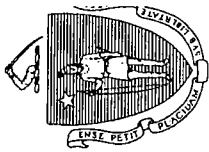
11/13/03

*Date of Soil Evaluator Exam

MADEP

Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Town of Acton
Owner Name
43 Wetherbee Street
Street Address
Acton
City/Town
MA
State
01720
Zip Code
Map/Lot G4 - 173

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal

2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 Year Published 1:25,000 Publication Scale 123 Soil Map Unit

Paxton Fine Sandy Loam
Soil Name
slow permeability, stones
Soil limitations

3. Surficial Geological Report available? Yes ☒ No ☐ If yes: 1956 Year Published 1:31,680 Publication Scale Qgm Map Unit

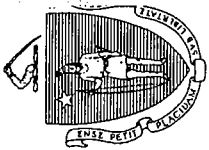
Till
Geologic Material
Ground Moraine
Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map
Map Unit Name
Map Unit Name



Commonwealth of Massachusetts

City/Town of _____

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) _____ 3/2005 _____ Range: Above Normal ☐ Normal ☒ Below Normal ☐
Month/Year

7. Other references reviewed: _____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32105-3 Date 3/21/2005 Time 945 am Cloudy Weather

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

2. Land Use: Agricultural field _____ No _____ 5% _____
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)

_____ crop residue, grass _____ Ground Moraine _____ Shoulder _____
Vegetation Landform Position on landscape (attach sheet)

3. Distances from: Open Water Body 1100 feet Drainage Way 1100 feet Possible Wet Area 1100 feet
Property Line 40 feet Drinking Water Well 2500 feet Other _____

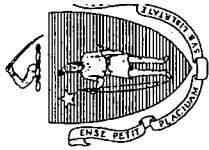
4. Parent Material: Till _____ Unsuitable Materials Present: Yes ☒ No ☐

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☒

5. Groundwater Observed: Yes ☐ No ☐

If Yes: Depth Weeping from Pit 72" Depth Standing Water in Hole 72"

Estimated Depth to High Groundwater: 12 inches elevation



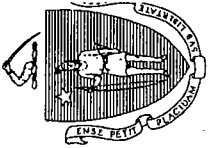
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32105-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
12	Ap	10 YR 3/2				SL	5	0	SBK	friable	
72	Cd	2.5 Y 5/3	12"	10 YR 5/8 2.5 Y 6/1	40% 30%	FSL	>5	0	Massive	Friable	
120	C2	2.5 Y 5/4				SL	10	20	Massive	Friable	

Additional Notes refusal at 120"



Commonwealth of Massachusetts

City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- | | | |
|--|---------------------|-----------------|
| ☐ Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| ☒ Depth to soil redoximorphic features (mottles) | A. <u>12</u> inches | B. _____ inches |
| ☐ Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |
2. Index Well Number _____ Reading Date _____ Index Well Level _____
- Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 12 inches Lower boundary: 120 inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator

BRENT L. REAGOR

Typed or Printed Name of Soil Evaluator

MARGO WEBBER

Name of Board of Health Witness

Date

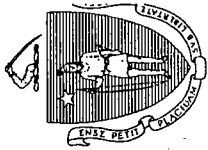
11/13/03

*Date of Soil Evaluator Exam

MA DEP

Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

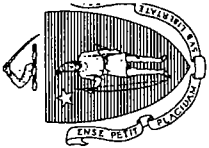
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A. Facility Information

1. Facility Information
Town of Acton
Owner Name
43 Wetherbee Street
Street Address
Acton
City/Town
MA
State
01720
Zip Code
Map/Lot G4 - 173

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal
2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 Year Published 1:25,000 Publication Scale 35C Soil Map Unit
Hinckley Loamy Sand 8-15% slopes Soil limitations
3. Surficial Geological Report available? Yes ☒ No ☐ If yes: 1956 Year Published 1:31,680 Publication Scale Qkt Map Unit
Ice Contact Kame Terrace
Geologic Material Landform
4. Flood Rate Insurance Map:
Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒
5. Wetland Area: National Wetland Inventory Map
Wetlands Conservancy Program Map
Map Unit Name
Map Unit Name



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) _____ 3/2005 _____ Range: Above Normal ☐ Normal ☐ Below Normal ☐
Month/Year

7. Other references reviewed: _____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32105-4 Date 3/21/2005 Time 1005 am Weather Cloudy

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

2. Land Use: Agricultural field _____ No _____ 5% _____
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)

_____ crop residue, grass, _____ Kame Terrace _____ Shoulder _____
Vegetation Landform Position on landscape (attach sheet)

3. Distances from: Open Water Body 1600 feet Drainage Way 700 feet Possible Wet Area 700 feet
Property Line 550 feet Drinking Water Well 3300 feet Other _____
feet feet

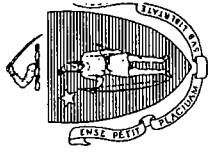
4. Parent Material: Ice Contact _____ Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

If Yes: Depth Weeping from Pit 36" Depth Standing Water in Hole 60" _____

Estimated Depth to High Groundwater: 36" _____ inches _____ elevation



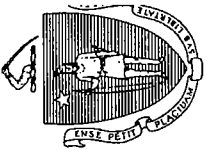
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32105-4

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
12	Ap	10 YR 3/2				SL	5	0	SBK	friable	
18	Bw	10 YR 4/6				LS	5	0	SBK	Friable	
36	C1	2.5 Y 5/3	36"	10 YR 5/8 2.5 Y 6/2	20% 20%	LS	25	0	Massive	Friable	
138	C2	2.5 Y 6/3				VFLS	0	0	Massive	Friable	

Additional Notes



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used: ☐ Depth observed standing water in observation hole A. inches B. inches
☐ Depth weeping from side of observation hole A. inches B. inches
☒ Depth to soil redoximorphic features (mottles) A. 36 inches B. inches
☐ Groundwater adjustment (USGS methodology) A. inches B. inches
2. Index Well Number Reading Date Index Well Level
Adjustment Factor Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 36 inches Lower boundary: 138 inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator

BRETT L. REALOR

Typed or Printed Name of Soil Evaluator

MARLO WEBBER

Name of Board of Health Witness

Date

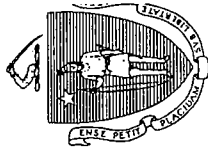
3/29/05

*Date of Soil Evaluator Exam

MANEP

Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

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A. Facility Information

1. Facility Information

Town of Acton _____ Map/Lot G4 - 173 _____
Owner Name _____
43 Wetherbee Street _____
Street Address _____ MA _____
Acton _____ Zip Code 01720 _____
City/Town _____ State _____

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal

2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 _____ 1:25,000 _____ 35B _____
Year Published Publication Scale Soil Map Unit

_____ Hinckley Loamy Sand - 3-8% Slopes _____ no major _____
Soil Name Soil limitations

3. Surficial Geological Report available? Yes ☒ No ☐ If yes: 1956 _____ 1:31,680 _____ Qkt _____
Year Published Publication Scale Map Unit

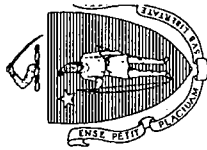
_____ Ice Contact _____ Kame Terrace _____
Geologic Material Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map
Map Unit _____ Name _____
Map Unit _____ Name _____



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) _____ 3/2005 _____ Range: Above Normal ☐ Normal ☒ Below Normal ☐
Month/Year

7. Other references reviewed: _____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32105-5 Date 3/21/2005 Time 1030 am Cloudy Weather

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) _____

2. Land Use: Agricultural field _____ No Surface Stones _____ 0-3% Slope (%)
(e.g. woodland, agricultural field, vacant lot, etc.)
Vegetation _____ Kame Terrace _____ Flat _____
Position on landscape (attach sheet)

3. Distances from: Open Water Body 1400 feet Drainage Way 550 feet Possible Wet Area 550 feet
Property Line 50 feet Drinking Water Well 2500 feet Other _____

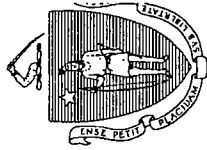
4. Parent Material: Ice contact _____ Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole 102" _____

Estimated Depth to High Groundwater: 66" inches elevation



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

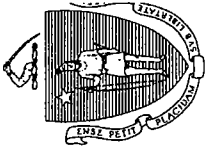
Deep Observation Hole Number: 32105-5

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
12	Ap	10 YR 3/2				SL	5	0	SBK	friable	
16	Bw	10 YR 4/6				LS	5	0	SBK	VFR	
66	C1	2.5 Y 5/4				FLS	5	0	Massive	Friable	
108	C2	2.5 Y 5/3				MS	35	5	SG	loose	

Additional Notes Standing water at 102"

Coarse Textured Soils in C2 indicate water may be as high as 66" in this hole but no redoximorphic features detected due to soil texture

Variegated colors from 16" to 66"



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Cont.)

Deep Observation Hole Number: 32105-6

3/21/2005
Date

1045
Time

Cloudy
Weather

1. Location

Ground Elevation at Surface of Hole

Location (Identify on Plan)

2. Land Use: Agricultural field (e.g. woodland, agricultural field, vacant lot, etc.) No Surface Stones 0-3% Slope (%)

Vegetation crop residue, grass Kame Terrace Landform Flat Position on landscape (attach sheet)

3. Distances from: Open Water Body 1100 feet Drainage Way 830 feet Possible Wet Area 830 feet

Property Line 50 feet Drinking Water Well 2200 feet Other

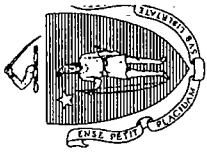
4. Parent Material: Ice Contact Unsuitable Materials Present: Yes No No

If Yes: Disturbed Soil Fill Material Impervious Layer(s) Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No

If Yes: Depth Weeping from Pit Depth Standing Water in Hole 156"

Estimated Depth to High Groundwater: 156" inches elevation



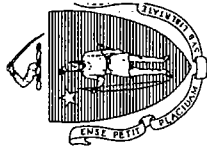
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32105-6

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
16	Ap	10 YR 3/2				SL	5	0	SBK	Friable	
24	bW	10 YR 4/6				LS	10	10	SBK	VFR	
64	C1	2.5 Y 5/3				MS	20	5	SG	Loose	
76	C2	2.5 Y 5/4				CS	60	10	SG	Loose	
156	C3	2.5 Y 6/3				Cs	30	5	SG	Loose	

Additional Notes Standing water at 156"



Commonwealth of Massachusetts

City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- ☒ Depth observed standing water in observation hole A. 102 (66) inches B. 156 inches
 - ☐ Depth weeping from side of observation hole A. inches B. inches
 - ☐ Depth to soil redoximorphic features (mottles) A. inches B. inches
 - ☐ Groundwater adjustment (USGS methodology) A. inches B. inches

2. Index Well Number Reading Date Index Well Level
Adjustment Factor Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 16/24 inches Lower boundary: 108/156 inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

BRENT L. REAGOR
Signature of Soil Evaluator

BRENT L. REAGOR
Typed or Printed Name of Soil Evaluator

MARLO WEBBER
Name of Board of Health Witness

3/29/05
Date

11/13/03
*Date of Soil Evaluator Exam

MASEP
Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Important:
When filling out
forms on the
computer, use
only the tab key
to move your
cursor - do not
use the return
key.



Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

A. Site Information

Town of Acton

Owner Name

43 Wetherbee Street

Street Address or Lot #

Acton

City/Town

MA

State

01720

Zip Code

978-264-9634

Telephone Number

Contact Person (if different from Owner)

B. Test Results

	3/21/2005 Date	830 am Time	3/21/2005 Date	1041 am Time
Observation Hole #	32105-A		32105-B	
Depth of Perc	48"		47"	
Start Pre-Soak	8:38		10:41	
End Pre-Soak	Unable to Saturate		Unable to Saturate	
Time at 12"	Added 25 Gallons in		Added 25 Gallons in	
Time at 9"	less than 15 minutes		less than 15 minutes	
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	<2 mpi		<2 mpi	
	Test Passed: ☒		Test Passed: ☒	
	Test Failed: ☐		Test Failed: ☐	

Brent L. Reagor, R.S., Town of Acton Health Department

Test Performed By:

Margo Webber, PE, MADEP-CERO

Witnessed By:

Comments:



Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Site Information

Town of Acton

Owner Name

43 Wetherbee Street

Street Address or Lot #

Acton

City/Town

MA

State

01720

Zip Code

978-264-9634

Telephone Number

Contact Person (if different from Owner)

B. Test Results

	Date	Time	Date	Time
Observation Hole #	3/21/2005	1102 am		
Depth of Perc	32105-C			
Start Pre-Soak	50"			
End Pre-Soak	1111			
Time at 12"	1126			
Time at 9"	1126			
Time at 6"	1131			
Time (9"-6")	1138			
Rate (Min./Inch)	7			
	3 mpi			

Test Passed:



Test Failed:



Test Passed:



Test Failed:



Brent L. Reagor, R.S., Town of Acton Health Department

Test Performed By:

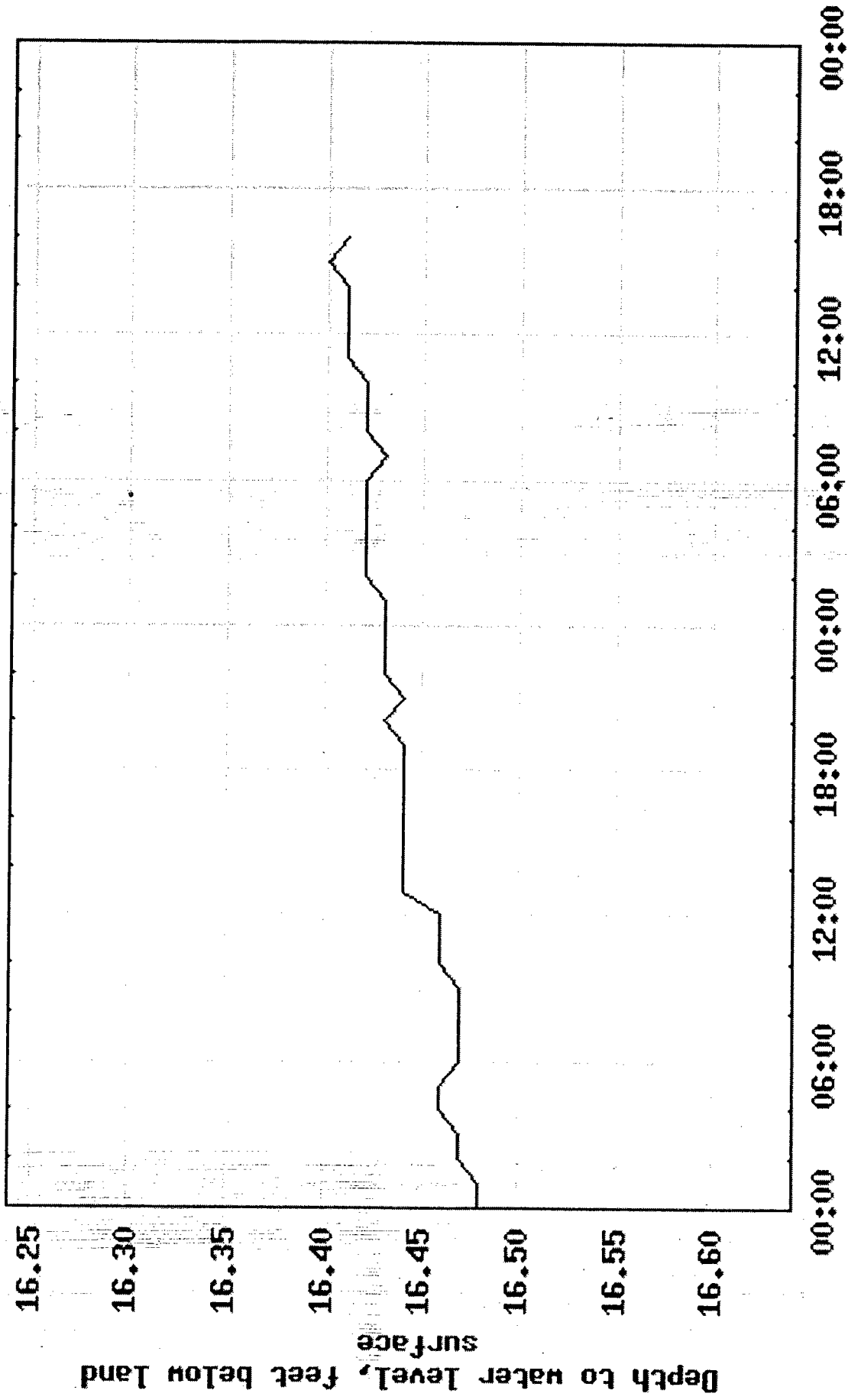
Margo Webber, PE, MADEP-CERO

Witnessed By:

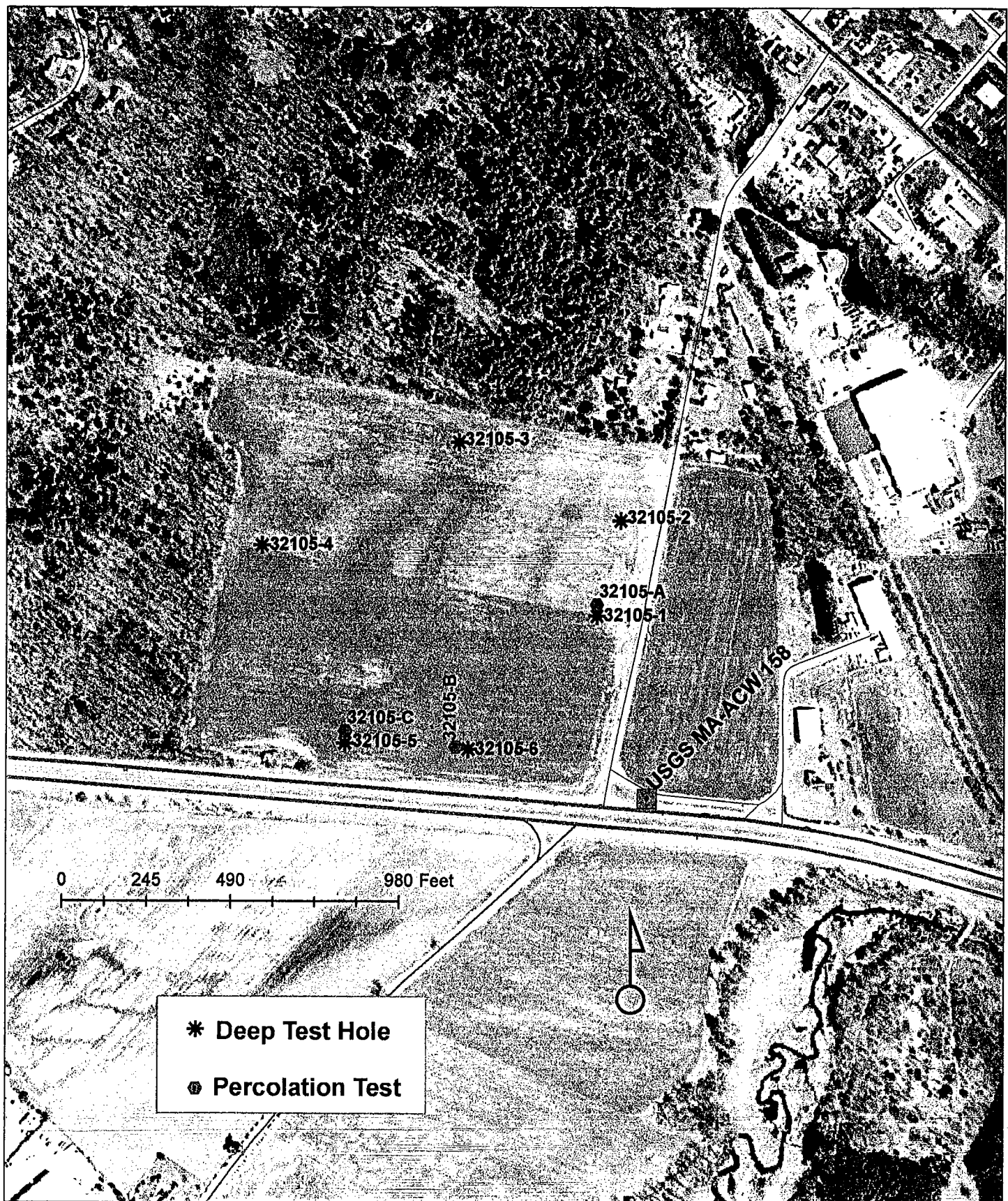
Comments:



USGS 42281207124401 MA-ACW 158 ACTON, MA

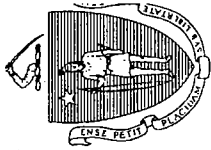


Provisional Data Subject to Revision



**Deep Test Hole
Percolation Test
Locations**

**Town of Acton
Wetherbee Street
3/21/2005**



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

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A. Facility Information

1. Facility Information

Owner Name _____ Map/Lot B5 30-1 _____
End of Quarry Road _____ MA _____ Zip Code _____
Street Address _____ City/Town _____ State _____
Acton _____ 01720 _____

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal _____
2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 _____ 1:25,000 _____ 35B _____
Year Published _____ Publication Scale _____ Soil Map Unit _____

Soil Name _____ Hinckley Loamy Sand _____ no major _____
Soil limitations _____

3. Surficial Geological Report available? Yes ☐ No ☒ If yes: _____ Year Published _____ Publication Scale _____ Map Unit _____

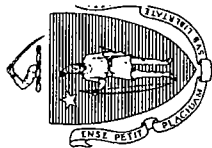
Geologic Material _____ Landform _____

4. Flood Rate Insurance Map:

- Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Map Unit _____ Name _____
Wetlands Conservancy Program Map
Map Unit _____ Name _____



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) _____ 3/2005 _____ Range: Above Normal ☐ Normal ☒ Below Normal ☐

7. Other references reviewed: _____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32305-1 Date 3/23/2005 Time 1030am Cloudy Weather

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) 32305-1 _____

2. Land Use: DPW Materials Storage
(e.g. woodland, agricultural field, vacant lot, etc.)

none Surface Stones 3-5% Slope (%)

NONE Vegetation

Landform

SHOULDER
Position on landscape (attach sheet)

3. Distances from: Open Water Body 300 feet Drainage Way 300 feet Possible Wet Area 300 feet
Property Line 20 feet Drinking Water Well 1100 feet Other _____ feet

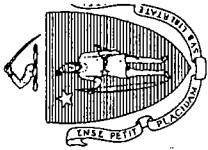
4. Parent Material: Outwash _____ Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____

Estimated Depth to High Groundwater: 132 inches elevation



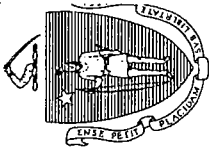
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32305-1

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
6	A	10 YR 3/3				LS	10	5	SBK	VFR	
32	B	10 Y/R 5/8				LS	20	20	SBK	VFR	
96	C1	2.5 Y 5/4				CS	30	20	SG	L	
132	C2	2.5 Y 6/2				LS	10	0	M	FR	

Additional Notes C2 IS COMPACT IN HOLE BUT LOOSE OUT OF HOLE, IS ALSO DAMP TO TOUCH



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (Cont.)

Deep Observation Hole Number: 32305-2

Date 3/23/05 Time 1100AM Weather CLOUDY

1. Location

Ground Elevation at Surface of Hole

Location (Identify on Plan) 32305-2

2. Land Use: DPW MATERIAL STORAGE AREA
(e.g. woodland, agricultural field, vacant lot, etc.)

Vegetation NONE

Surface Stones NONE

Slope (%) 3-5%

Landform

Position on landscape (attach sheet)

3. Distances from: Open Water Body 300 feet
Drainage Way 300 feet
Possible Wet Area 300 feet
Property Line 20 feet
Drinking Water Well 1100 feet
Other

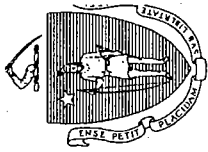
4. Parent Material: OUTWASH Unsuitable Materials Present: Yes ☒ No ☐

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☒

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit Depth Standing Water in Hole

Estimated Depth to High Groundwater: 96 inches elevation



Commonwealth of Massachusetts
City/Town of

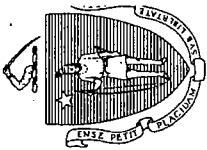
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32305-2

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
96	C	2.5 Y 5/3				CS	30	40	SG	L	BOULDERS

Additional Notes REFUSAL AT 8'

NO WATER



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
- | | | |
|--|-----------------|-----------------|
| ☐ Depth observed standing water in observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth weeping from side of observation hole | A. _____ inches | B. _____ inches |
| ☐ Depth to soil redoximorphic features (mottles) | A. _____ inches | B. _____ inches |
| ☐ Groundwater adjustment (USGS methodology) | A. _____ inches | B. _____ inches |

2. Index Well Number _____ Reading Date _____ Index Well Level _____

Adjustment Factor _____ Adjusted Groundwater Level _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: _____ 32/0 _____ inches Lower boundary: _____ 132/96 _____ inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator

BRENT L. REAGOR

Typed or Printed Name of Soil Evaluator

MARGO WEBBER

Name of Board of Health Witness

Date

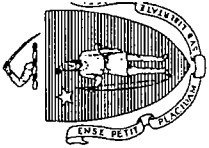
11/13/03

*Date of Soil Evaluator Exam

MANEP

Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Owner Name _____ Map/Lot B5 30-1
End of Quarry Road _____ MA _____ Zip Code 01720
Street Address _____
City/Town _____ State _____

B. Site Information

1. (Check one) New Construction ☐ Upgrade ☐ Repair ☐ --Future Wastewater Disposal

2. Published Soil Survey available? Yes ☒ No ☐ If yes: 1995 Year Published 1:25,000 Publication Scale 35B Soil Map Unit

_____ Hinckley Loamy Sand _____ no major _____
Soil Name Soil limitations

3. Surficial Geological Report available? Yes ☐ No ☒ If yes: _____ Year Published _____ Publication Scale _____ Map Unit

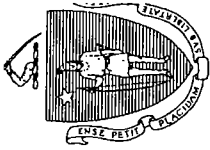
_____ Geologic Material _____ Landform

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒
Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map

Wetlands Conservancy Program Map
Map Unit _____ Name _____
Map Unit _____ Name _____



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

6. Current Water Resource Conditions (USGS) _____ 3/2005 _____ Range: Above Normal ☐ Normal ☒ Below Normal ☐

7. Other references reviewed: _____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole Number: 32305-3 Date 3/23/2005 Time 1030am Cloudy Weather

1. Location

Ground Elevation at Surface of Hole _____

Location (Identify on Plan) 32305-3 _____

2. Land Use: DPW Materials Storage _____ none _____ 3-5% _____
(e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones Slope (%)

Vegetation NONE _____ Landform _____ SHOULDER _____
Position on landscape (attach sheet)

3. Distances from: Open Water Body 300 feet Drainage Way 300 feet Possible Wet Area 300 feet
Property Line 20 feet Drinking Water Well 1200 feet Other _____

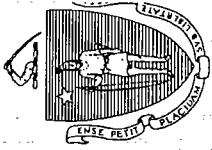
4. Parent Material: Outwash _____ Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

If Yes: Depth Weeping from Pit 62" Depth Standing Water in Hole 62" _____

Estimated Depth to High Groundwater: 62 inches _____ elevation _____



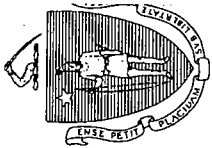
Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: 32305-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
8	A	10 YR 3/3				SL	5	0	SBK	VFR	
16	B	10 Y/R 5/6				LS	5	5	SBK	VFR	
42	C1	2.5 Y 6/3				LS	5	10	M	FR	
84	C2	2.5 Y 5/4				MS	20	10	SG	L	

Additional Notes
WEeping AT 62"
STANDING WATER AT 62"



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:

- ☒ Depth observed standing water in observation hole A. 62 inches B. inches
☒ Depth weeping from side of observation hole A. 62 inches B. inches
☐ Depth to soil redoximorphic features (mottles) A. inches B. inches
☐ Groundwater adjustment (USGS methodology) A. inches B. inches

2. Index Well Number

Reading Date

Index Well Level

Adjustment Factor

Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐
- b. If yes, at what depth was it observed? Upper boundary: 16 inches Lower boundary: 84 inches

F. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator

BRENT L. REAGOR

Typed or Printed Name of Soil Evaluator

MARCO WEBER

Name of Board of Health Witness

Date

3/29/05

*Date of Soil Evaluator Exam

MADEP

Board of Health

Note: This form must be submitted to the approving authority with Percolation Test Form 12



**Deep Test Hole
Locations**

0 100 200 400 Feet

**Quarry Road
3/23/2005
Acton, MA**



**Deep Test Hole
Locations**

0 100 200 400 Feet

**Quarry Road
3/23/2005
Acton, MA**



APPENDIX D: ADAMS STREET SITE – SURVEY AND VERNAL POOL DATA

Natural Heritage & Endangered Species Program

VERNAL POOL CERTIFICATION FORM Certified Pool Number 644

Town/City: ACTON

Date of Certification: 9-15-94

USGS topographic
map name: MAYNARD

Date Documentation
Submitted: 5-2-94

Date Conservation Commission and DEP notified: 9-15-94

Directions to site: FROM PARKER STREET TURN ONTO ADAMS. PULL OVER ACROSS FROM FIRST HOUSE ON LEFT, POOL IS OVER HILL TO S, VISIBLE FROM THE ROAD.

Name of property owner(s) as indicated on assessor's map: MUNICIPAL LAND, TOWN OF ACTON

The following items are being attached to this form

- XX USGS topographic map showing location of the vernal pool
- XX Assessor's map (or other property map) showing location of the pool
- XX Compass bearings and distances to the pool from permanent landmarks
- Aerial photograph/80 or 100 scale topographic map showing location of the pool
- Professional survey showing location of the pool
- Sketch map or description of the immediate vicinity of the pool

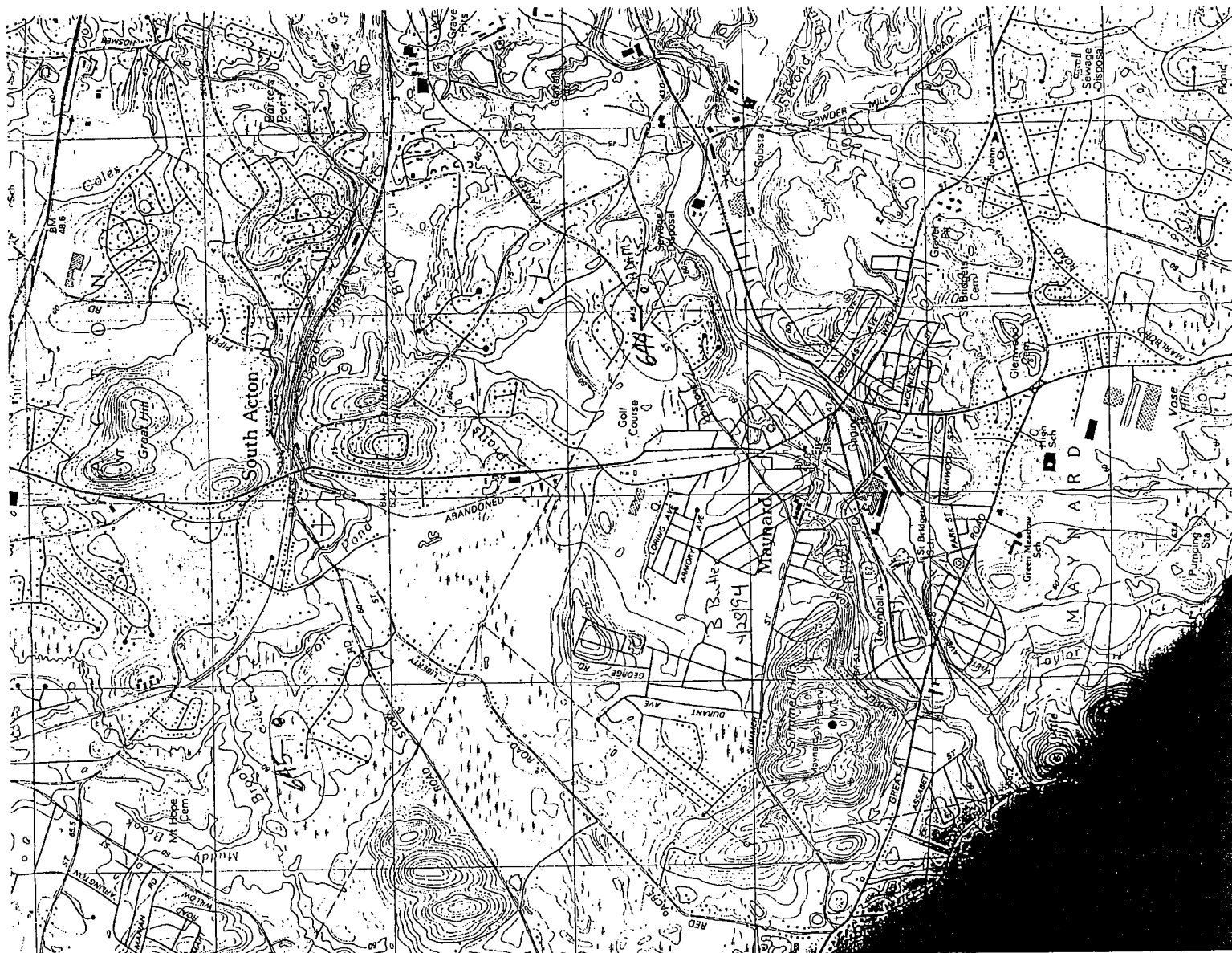
Documented Biological Indicators Accepted by NHESP

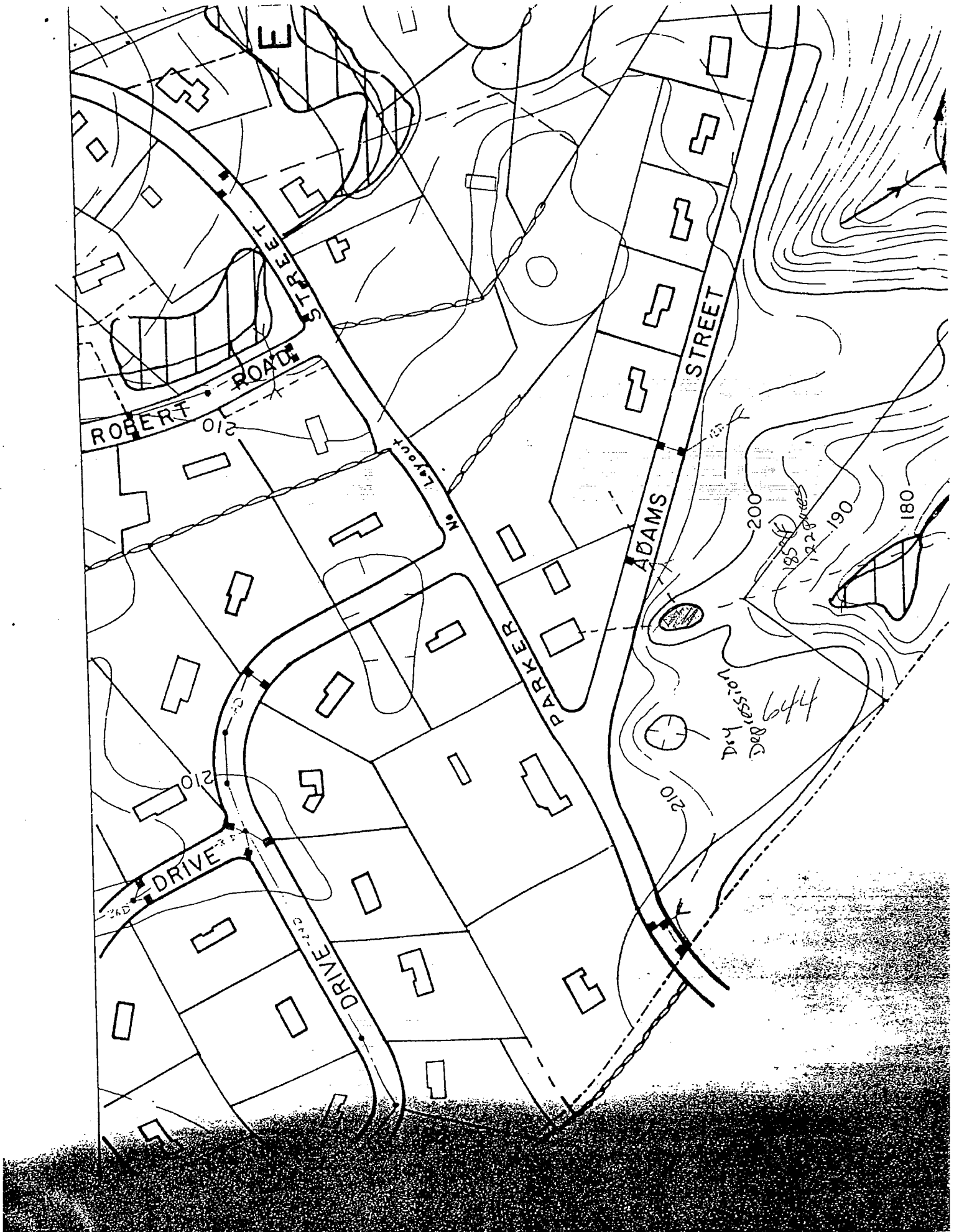
- XX Obligate amphibian species (mole salamanders/wood frogs)
- XX Obligate invertebrate species (fairy shrimp)
- Facultative amphibian/reptile species
- Facultative invertebrate species
- Other wildlife
- Wetland plants

The NHESP HAS NOT been notified of the presence of rare state-listed wildlife species in this vernal pool habitat.

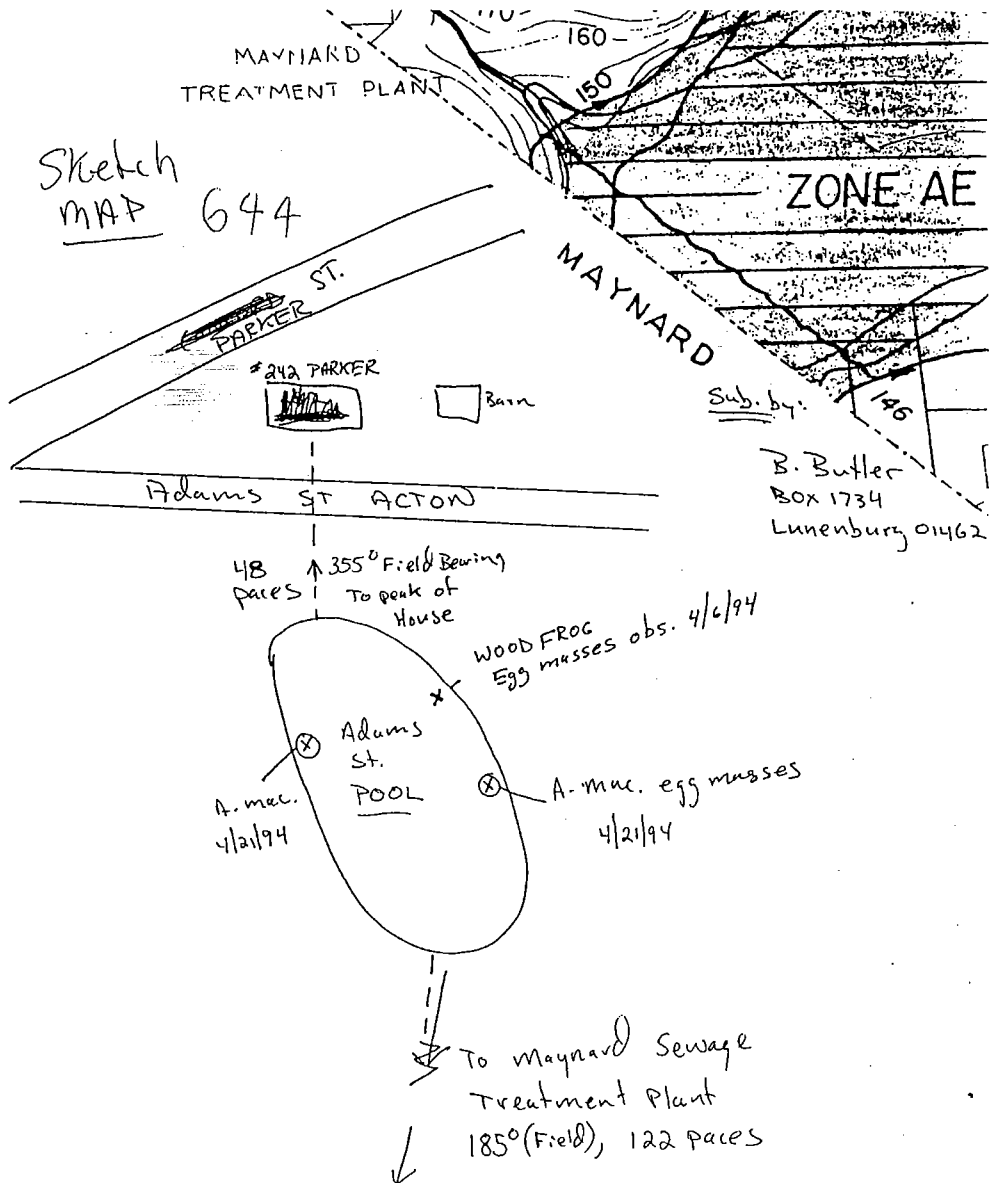
Wetland Resource Area Information (to be determined by Conservation Commission)

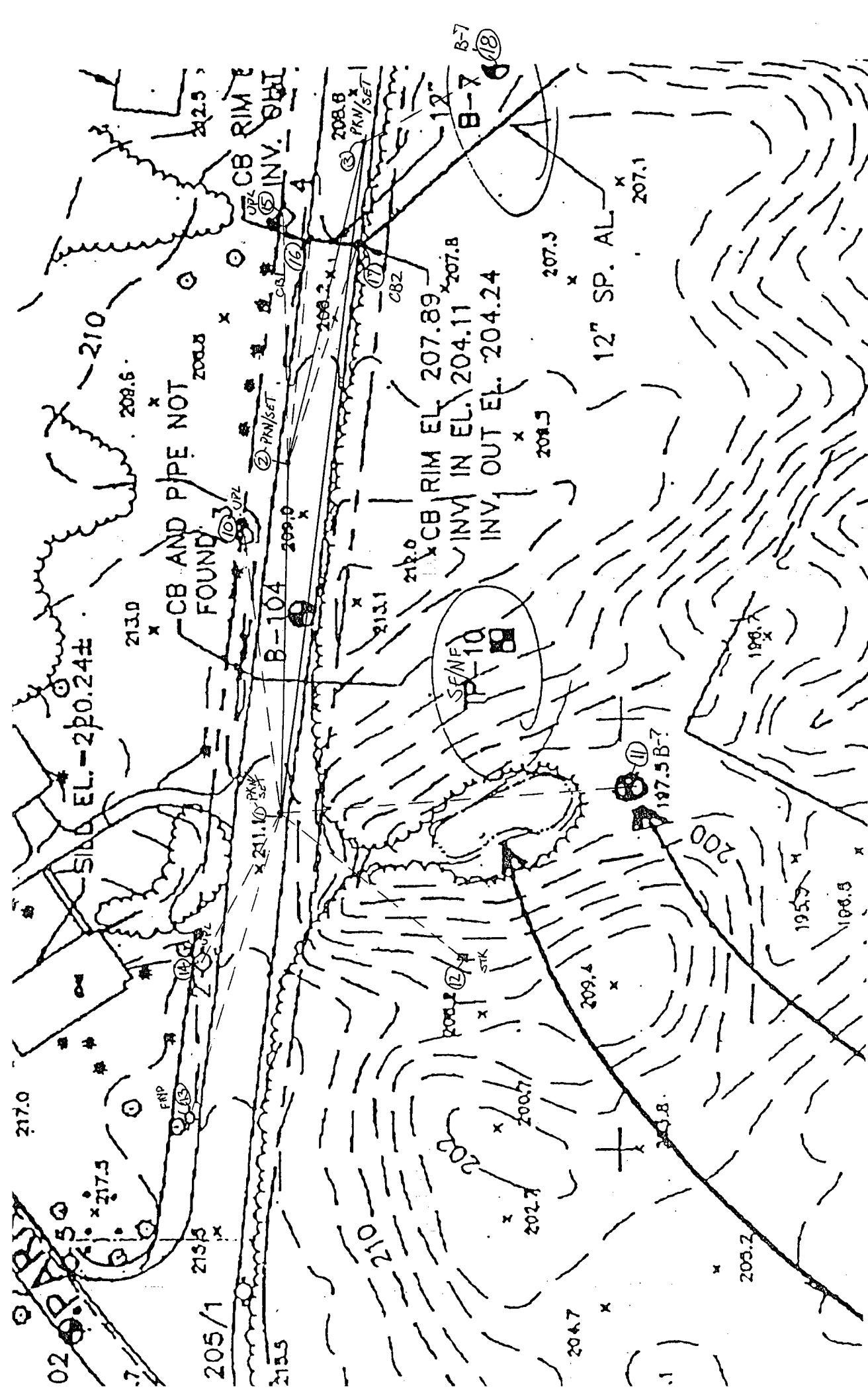
- Land Subject to Flooding (100-year floodplain)
- Isolated Land Subject to Flooding
- Bordering Vegetated Wetland
- Land Under Water Body (permanent pond)
- Coastal Dune/Barrier Beach
- Town Wetland Bylaw
- No jurisdiction





Sketch
MAP 644







CDW CONSULTANTS, INC

Civil & Environmental Engineers

40 Speen Street, Suite 301

Framingham, MA 01701

Project #: 889.10

Prepared by: NICK FACENDOLA

Date: 3-22-05

Sheet: 1 of 2

Project Name: ACTON INSPECTION
& SURVEY

T(9) 1				BS(9) 2			
PT	HOR	ANG	DIST	NOTES			
2	00-00-00		188.23	PK NAIL SET			
10	350-11-48		119.07	TEL. POLE # 3			
11	84-19-15		145.49	UN-NAMED TEST PIT w/ CASING			
12	140-54-15		130.73	WOOD STAKE FOUND			
13	194-58-50		197.99	FIRE HYDRANT @ INT OF PARKER ST & ADAMS ST.			
14	206-35-12		90.55	TEL. POLE #2			
T(9) 2				BS(9) 1			
1	00-00-00		188.23	PK NAIL SET			
15	177-37-23		79.60	TEL. POLE # 4			
16	185-37-30		69.64	CB 2			
17	205-09-54		73.105	CB 1 (USED AS BM FOR ELEVATIONS)			
3	194-51-21		158.14	PK NAIL SET			
T(9) 3				BS(9) 2			
2	00-00-00		158.13	PK NAIL SET			
18	216-12-58		99.87	TEST PIT B-7			
3	351-56-22		343.41	PK NAIL SET			

**CDW CONSULTANTS, INC**

Civil & Environmental Engineers
40 Speen Street, Suite 301
Framingham, MA 01701

Project #: 889-10Prepared by: NICK FACENDOLADate: 3-22-05Sheet: 2 of 2Project Name: ACTON INSPECTION
& SURVEY

PT	BS	HI	FS	ELEV	NOTES
17	5.87	213.76	—	207.89	CB 2, Rim (Bm)
18	—	—	4.25	209.51	Top of well, B-7
17	—	—	5.87	207.89	CB 2, Rim (Bm)
17	6.09	213.98	—	207.89	CB 2, Rim (Bm)
TP1	2.32	211.99	4.31	209.67	Turning Point 1 on Pavement
B-?			13.12	198.87	Rim of un-named Test Pit
VP			17.09	194.90	Vernal Pool WATER ELEV.
TP2	3.83	213.57	2.25	209.74	Turning Point 2, on PAVEMENT
17			5.66	207.91	CB 2, Rim (Bm)

B-7 → 9.10' to Bottom of well. well is either blocked or there
IS NO WATER IN IT. EL of Bottom = 200.41'

B-? (un-named well) → 5.30' to WATER, EL of WATER = 193.57'

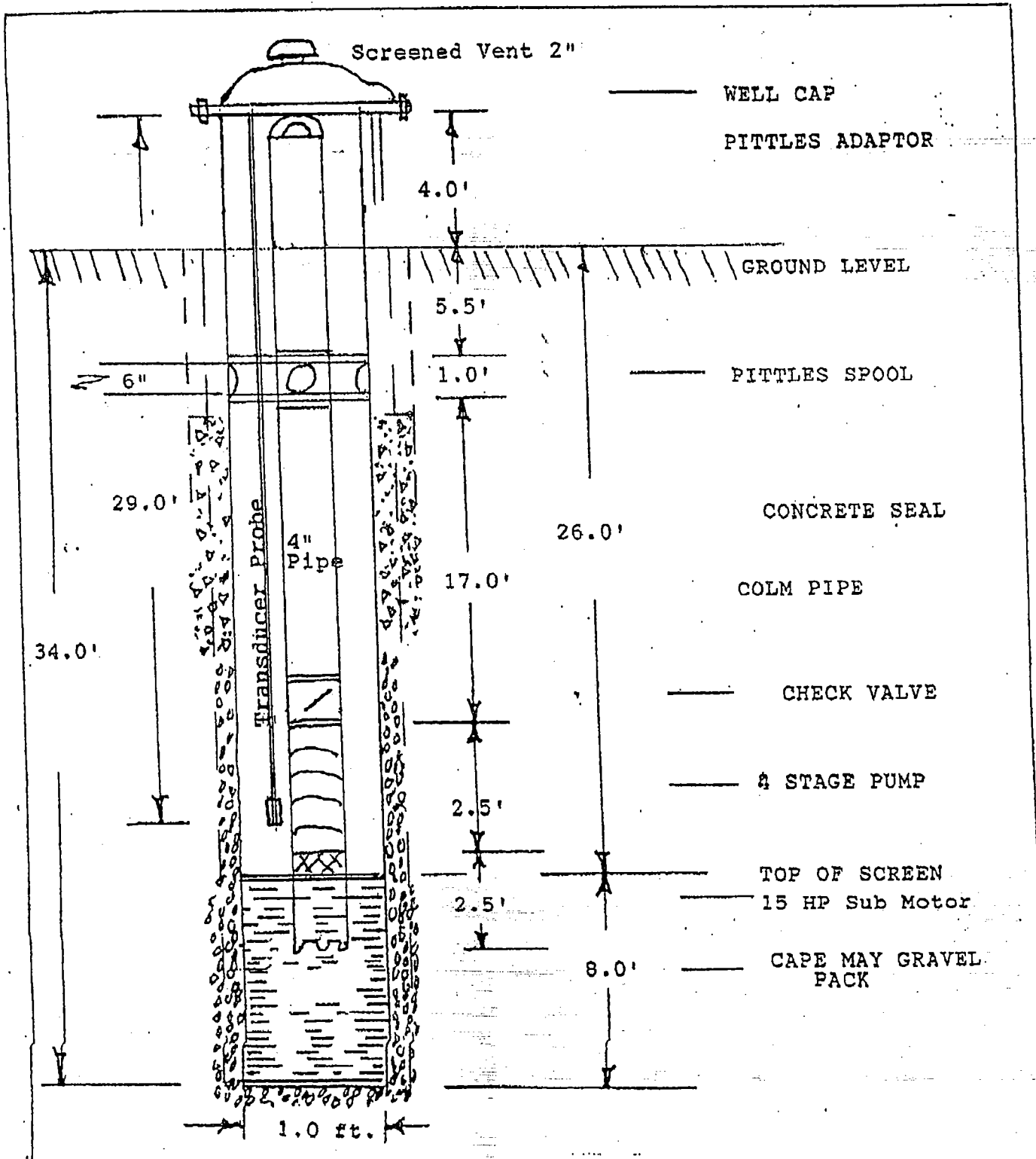


APPENDIX E: HIGH STREET SUBSURFACE INFORMATION

F. G. SULLIVAN DRILLING CO., INC.
Lancaster, Mass. 01523

CUSTOMER	ACTON WATER DISTRICT	DATE	June 15, 2000
STREET	High Street	TOWN	Acton
PROPERTY OWNER	Assabet Well Field	STATE	Mass.
LOCATION	Satalite --	WELL NO.	#2-A

SITE PLAN



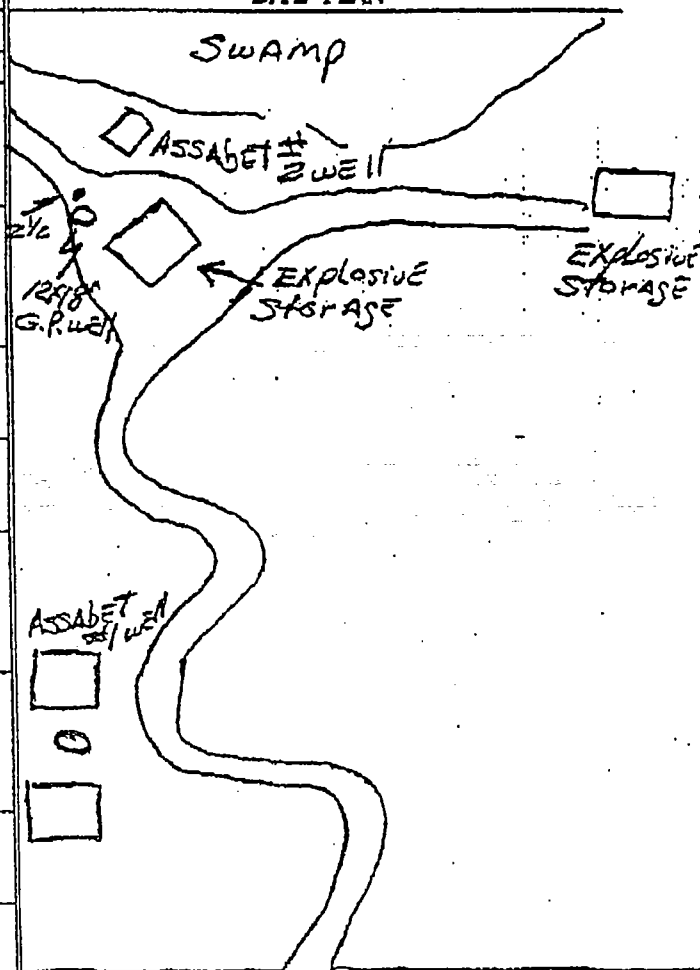
F. G. SULLIVAN DRILLING CO., INC
Lancaster, Mass. 01529

Name of Driller STEVE SULLIVANNames of Helpers WAYNE GARIETYJob: Name & Location ACTON MA ACTON WATER DISTRICT NEAR ASSABET #2 wellDate Started 3/8/00 Date Finished 4-17-00Hole No. 12X18" G.P. WELL

Depth Classification of

From	To	Material	Feet of Screen Exposed
0	5	Br. COARSE SAND	8'
5	16	Br. COARSE SAND + GRAVEL	Size of Screen & Slot 180 SLOT
16	20	Br. COARSE SAND + GRAVEL + Cobbles	
20	25	Br. COARSE GRAVEL + Cobbles	Screen Type 12" PIPE SIZE STAINLESS STEEL
25	30	Br. COARSE GRAVEL + Cobbles	Pipe Left In 27' OF 12"
30	34	Br. COARSE SAND + GRAVEL + Cobbles.	Pipe Above Ground 1.00
34		Bedrock.	
			Static From Top of Pipe 9.25 4-17-00
			G.P.M. 393 G.P.M
			Samples Taken

SITE PLAN



Pump Test on Hole No.

Date	Time	Dr. Down	G.P.M.	Static and Other Info.
4-13-00	Static	Well 2-A	Obs.	
			9.55	8.20
Start	Well pumping	205 G.P.M with		
	Draw down to	25.00 in Well 2-A and		
	10.80 in Obs.	(136 G.P.F)		
After	pumping and surging	For 8 hrs		
	Well pumping	361 G.P.M with draw		
	down to	18.90 in Well 2-A and		
	12.60 in Obs.	(38.4 G.P.F)		
4-17-00	Well 2-A	Obs.		
Statics		9.25		7.95
After	pumping and surging	For 8 hrs		
	Well pumping	393 G.P.M with draw down to		

REMARKS

Depth below ground 34 ft

#5 GRAVEL PACK 16'-34'
1L SAND 15'-16'

CONCRETE SEAL 5'-15'

ALL 18"-24" removed
TOTAL 16 hrs developingALL 18"-24" removed
TOTAL 16 hrs developing
CONCRETE SEAL 5'-15'

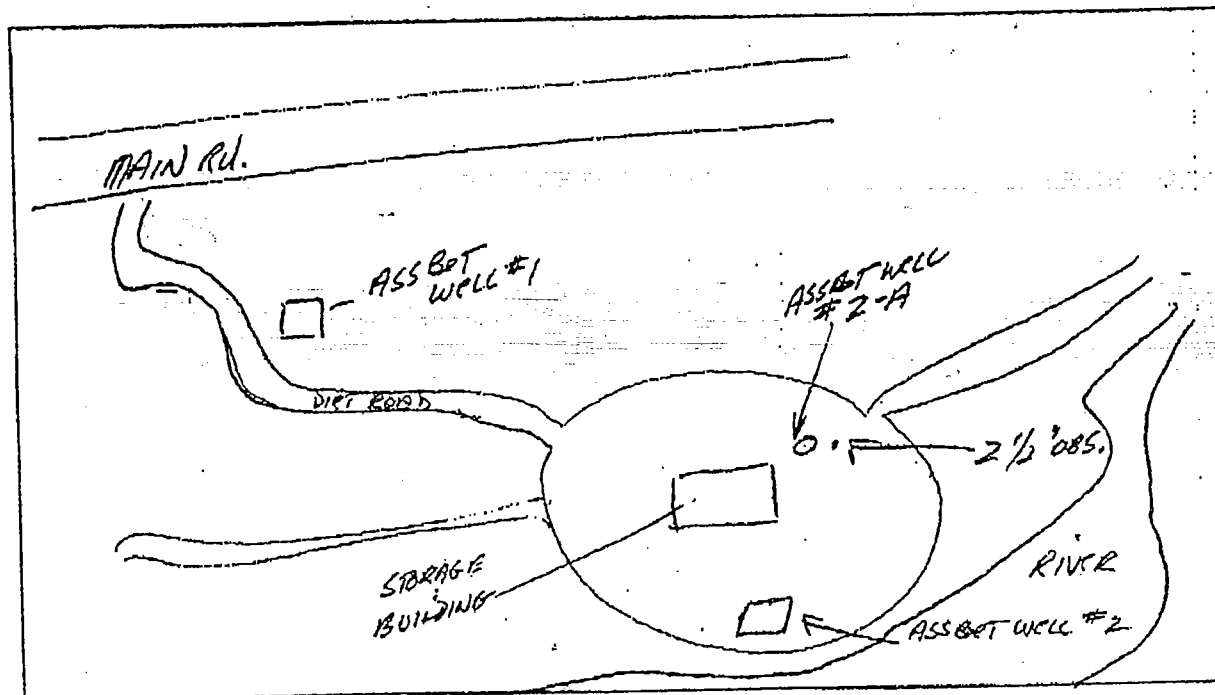
F. G. SULLIVAN DRILLING CO., INC.
Lancaster, Mass. 01523

PUMP TEST LOG

PAGE 1

CUSTOMER <u>ACTON MA. WATER DISTRICT</u>	DATE <u>5-3-00</u>
STREET _____ TOWN <u>ACTON</u>	STATE <u>MA.</u>
PROPERTY OWNER <u>ACTON WATER DIST.</u>	
LOCATION <u>ASSABET WELL FIELD</u>	WELL NO. <u>ASSABET 2-A</u>

SITE PLAN



TYPE OF PUMP <u>5" TURBINE</u>	DEPTH SET <u>23' 6"</u>	LENGTH OF AIR LINE _____
LENGTH AND SIZE OF DISCHARGE LINE <u>100' X 6"</u>	ORFICE <u>6" X 4"</u>	

	WELL	OBS	OBS WELL	OBS	OBS	OBS	OBS
WELL NO.	No. <u>2A</u>	No. <u>2' OBS</u>	No. <u>2</u>	No.	No.	No.	No.
PIPE ABOVE GROUND	<u>1.0</u>	<u>—</u>					
STATIC WATER LEVEL	<u>9.90</u>	<u>8.35</u>	<u>8.27</u>				
WEATHER and DATE	ORFICE TIME	INCHES	G.P.M.				
<u>5/3/00</u>	<u>1min</u>			<u>11.33</u>			
<u>CLEAR</u>	<u>2</u>			<u>12.73</u>			
	<u>3</u>	<u>40"</u>	<u>401</u>	<u>17.73</u>	<u>13.02</u>		
	<u>4</u>			<u>17.86</u>	<u>13.12</u>		
	<u>5</u>			<u>17.95</u>	<u>13.19</u>		
	<u>6</u>			<u>18.06</u>	<u>13.38</u>		
	<u>7</u>			<u>18.16</u>	<u>13.44</u>		
	<u>8</u>			<u>18.23</u>	<u>13.45</u>	<u>9.47</u>	
	<u>9</u>			<u>18.30</u>	<u>13.48</u>		
	<u>10</u>	<u>40"</u>	<u>401</u>	<u>18.34</u>	<u>13.50</u>	<u>9.50</u>	

F.G. SULLIVAN DRILLING CO., INC.

408 Parker Road
Lancaster, MA 01523
Tel. (978) 365-2932

CUSTOMER ACTON WATER DISTRICTPAGE 2

	WELL	OBS	OBS	OBS	OBS	OBS	OBS
WELL NO.	No. <u>2-A</u>	No. <u>085</u>	No. <u>NEW 2</u>	No.	No.	No.	No.
PIPE ABOVE GROUND	<u>1.0</u>	<u>-</u>					
STATIC WATER LEVEL	<u>9.90</u>						

WEATHER and DATE	ORFICE TIME	INCHES	G.P.M.						
<u>5-3-00</u>	<u>20min</u>	<u>40</u>	<u>401</u>	<u>18.49</u>	<u>13.77</u>	<u>19.67</u>			
	<u>30</u>	<u>40</u>	<u>401</u>	<u>18.73</u>	<u>14.02</u>	<u>9.88</u>			
	<u>40</u>	<u>40</u>	<u>401</u>	<u>18.89</u>	<u>14.12</u>	<u>9.99</u>			
	<u>50</u>	<u>40</u>	<u>401</u>	<u>19.02</u>	<u>14.27</u>	<u>10.10</u>			
	<u>60</u>	<u>40</u>	<u>401</u>	<u>19.15</u>	<u>14.37</u>	<u>10.20</u>			
	<u>70</u>	<u>40</u>	<u>401</u>	<u>19.23</u>	<u>14.46</u>	<u>10.24</u>			
	<u>80</u>	<u>40</u>	<u>401</u>	<u>19.31</u>	<u>14.54</u>	<u>10.31</u>			
	<u>90</u>	<u>40</u>	<u>401</u>	<u>19.40</u>	<u>14.64</u>	<u>10.39</u>			
	<u>100</u>	<u>40</u>	<u>401</u>	<u>19.43</u>	<u>14.67</u>	<u>10.42</u>			
	<u>110</u>	<u>40</u>	<u>401</u>	<u>19.50</u>	<u>14.71</u>	<u>10.48</u>			
	<u>120</u>	<u>40</u>	<u>401</u>	<u>19.58</u>	<u>14.80</u>	<u>10.53</u>			
	<u>2:00PM</u>	<u>40</u>	<u>401</u>	<u>19.85</u>	<u>15.10</u>	<u>10.82</u>			
<u>Sunny</u>	<u>3:30PM</u>	<u>40</u>	<u>401</u>	<u>20.13</u>	<u>15.32</u>	<u>11.04</u>			
<u>outside</u>	<u>5 PM</u>	<u>40</u>	<u>401</u>	<u>20.27</u>	<u>15.49</u>	<u>11.20</u>			
<u>Temp: 85°</u>	<u>6:30 PM</u>	<u>40</u>	<u>401</u>	<u>20.44</u>	<u>15.63</u>	<u>11.31</u>			
	<u>8 PM</u>	<u>40</u>	<u>401</u>	<u>20.52</u>	<u>15.70</u>	<u>11.43</u>			
	<u>9:30 PM</u>	<u>40</u>	<u>401</u>	<u>20.61</u>	<u>15.83</u>	<u>11.52</u>			
	<u>11 PM</u>	<u>40</u>	<u>401</u>	<u>20.69</u>	<u>15.94</u>	<u>11.60</u>			
<u>5-4-00</u>	<u>12:30 AM</u>	<u>40</u>	<u>401</u>	<u>20.79</u>	<u>16.05</u>	<u>11.67</u>			
	<u>2 AM</u>	<u>40</u>	<u>401</u>	<u>20.87</u>	<u>16.16</u>	<u>11.74</u>			
	<u>3:30 AM</u>	<u>40</u>	<u>401</u>	<u>20.95</u>	<u>16.26</u>	<u>11.81</u>			
	<u>5 AM</u>	<u>40</u>	<u>401</u>	<u>21.04</u>	<u>16.32</u>	<u>11.87</u>			
	<u>6:30 AM</u>	<u>40</u>	<u>401</u>	<u>21.14</u>	<u>16.36</u>	<u>11.88</u>			
	<u>8 AM</u>	<u>40</u>	<u>401</u>	<u>21.24</u>	<u>16.42</u>	<u>11.90</u>			
	<u>9:30 AM</u>	<u>40</u>	<u>401</u>	<u>21.34</u>	<u>16.50</u>	<u>11.98</u>			
	<u>10 AM</u>	<u>40</u>	<u>401</u>	<u>21.31</u>	<u>16.50</u>	<u>11.97</u>			
	<u>2 PM</u>	<u>40</u>	<u>401</u>	<u>21.40</u>	<u>16.55</u>	<u>12.16</u>			
	<u>6 PM</u>	<u>40</u>	<u>401</u>	<u>21.45</u>	<u>16.60</u>	<u>12.16</u>			
<u>CLOUDY</u>	<u>10 PM</u>	<u>40</u>	<u>401</u>	<u>21.51</u>	<u>16.64</u>	<u>12.21</u>			
<u>5-5-00</u>	<u>2 AM</u>	<u>40</u>	<u>401</u>	<u>21.58</u>	<u>16.72</u>	<u>12.27</u>			
<u>TRACERAIN</u>	<u>6 AM</u>	<u>40</u>	<u>401</u>	<u>21.62</u>	<u>16.78</u>	<u>12.31</u>			
	<u>10 AM</u>	<u>40</u>	<u>401</u>	<u>21.70</u>	<u>16.84</u>	<u>12.35</u>			

**408 Parker Road
Lancaster, MA 01523
Tel. (978) 365-2932**

PAGE 3

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MASSACHUSETTS DIVISION

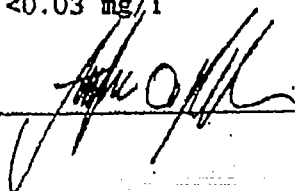
63 PLAIN STREET

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<http://www.microbac.com>CHEMISTRY • MICROBIOLOGY • FOOD SAFETY • CONSUMER PRODUCTS
WATER • AIR • WASTES • FOOD • PHARMACEUTICALS • NUTRACEUTICALS**CERTIFICATE OF ANALYSIS**F.G. SULLIVAN DRILLING CO.
408 PARKER ROAD
LANCASTER, MA 01523Date Reported: 5/24/00
Sample ID: 9917-00206
Date Received: 5/05/00
Sampled by: CUSTOMER

PARAMETERS	RESULTS	DATE	TECH	METHOD
WATER - ACTON WATER DIST. ACTON MA ASSABET WELL. NO 2-A				
5/5/00				
Total Coliform	ABSENT /100ml	5/05/00	LC	SM 9222B
SECONDARY CONTAMINANTS				EPA APPROVED
Turbidity	0.3 NTU	5/08/00	LC	2130B
Total Dissolved Solids	163 mg/l	5/08/00	LC	2540C
True Color	0 Pt-Co	5/05/00	MAO	EPA
Odor	0 T.O.N.	5/05/00	MAO	EPA
pH	6.66 S.U.	5/05/00	MAO	4500HB
Alkalinity as CaCO ₃	18.4 mg CaCO ₃ /l	5/10/00	KT	2320B
Hardness	28.3 mg/l	5/11/00	LA	2340B
Calcium	11.3 mg/l	5/11/00	LA	3111B
Magnesium	3.9 mg/l	5/11/00	LA	3111B
Aluminum	<0.007 mg/l	5/23/00	LA	3113B
Potassium	3.4 mg/l	5/11/00	LA	258.1
Iron	<0.03 mg/l	5/11/00	LA	3111B
Manganese	<0.02 mg/l	5/11/00	LA	3111B
Sulfate	13.2 mg/l	5/08/00	LC	4500-SO ₄ D.
Chloride	37.8 mg/l	5/09/00	LA	4500-CL-B
Silver	<0.03 mg/l	5/11/00	LA	3111B
Copper	<0.01 mg/l	5/11/00	LA	3111B
Zinc	<0.03 mg/l	5/11/00	LA	3111B

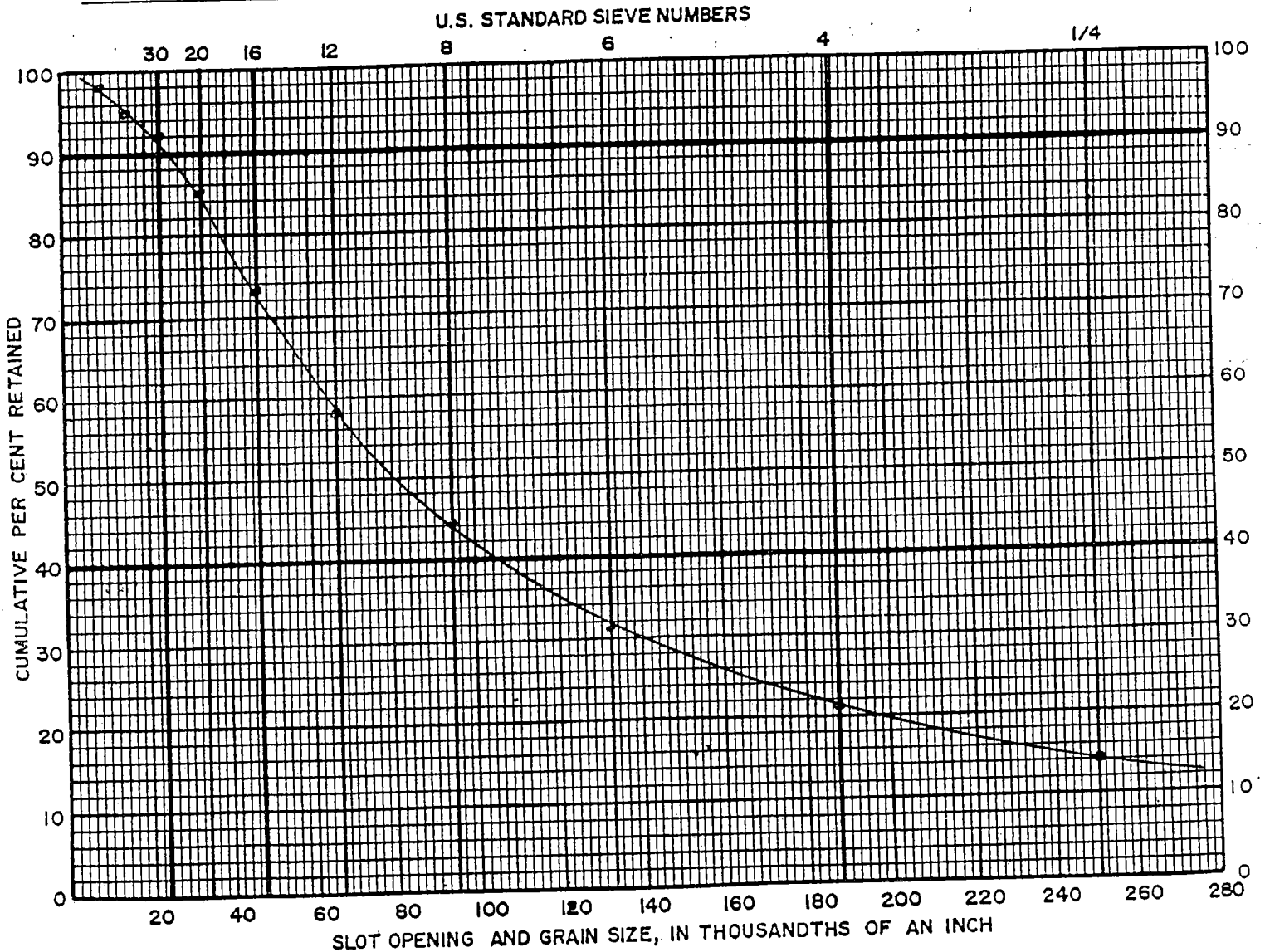
Respectfully Submitted by: 

F.G. SULLIVAN DRILLING CO., INC.
 Test Boring and Gravel Wells
 Parker Road
 Lancaster, Massachusetts 01523

SAND ANALYSIS

(COARSE)

Sample sent in by 60-L Drill
 Town ACTON WATER DIST. State MA Zip Date 3/16/00
 From well of Assabet Well No.2A
 Remarks: 18 in. by 12 in. Gravel Packed Well
From 20 ft. to 25 ft.



U.S. SIEVE NO.	SIEVE OPENING		CUMULATIVE % RETAINED	
	INCHES	MM.		
1/4	.250	6.35	14	
4	.187	4.76	21	
6	.132	3.36	31	
8	.094	2.38	44	
12	.066	1.68	58	
16	.047	1.19	73	
20	.033	0.84	85	
30	.023	0.60	92	
	.016		98	
	.008		99	
	.004		100	
	0			

Notes: _____

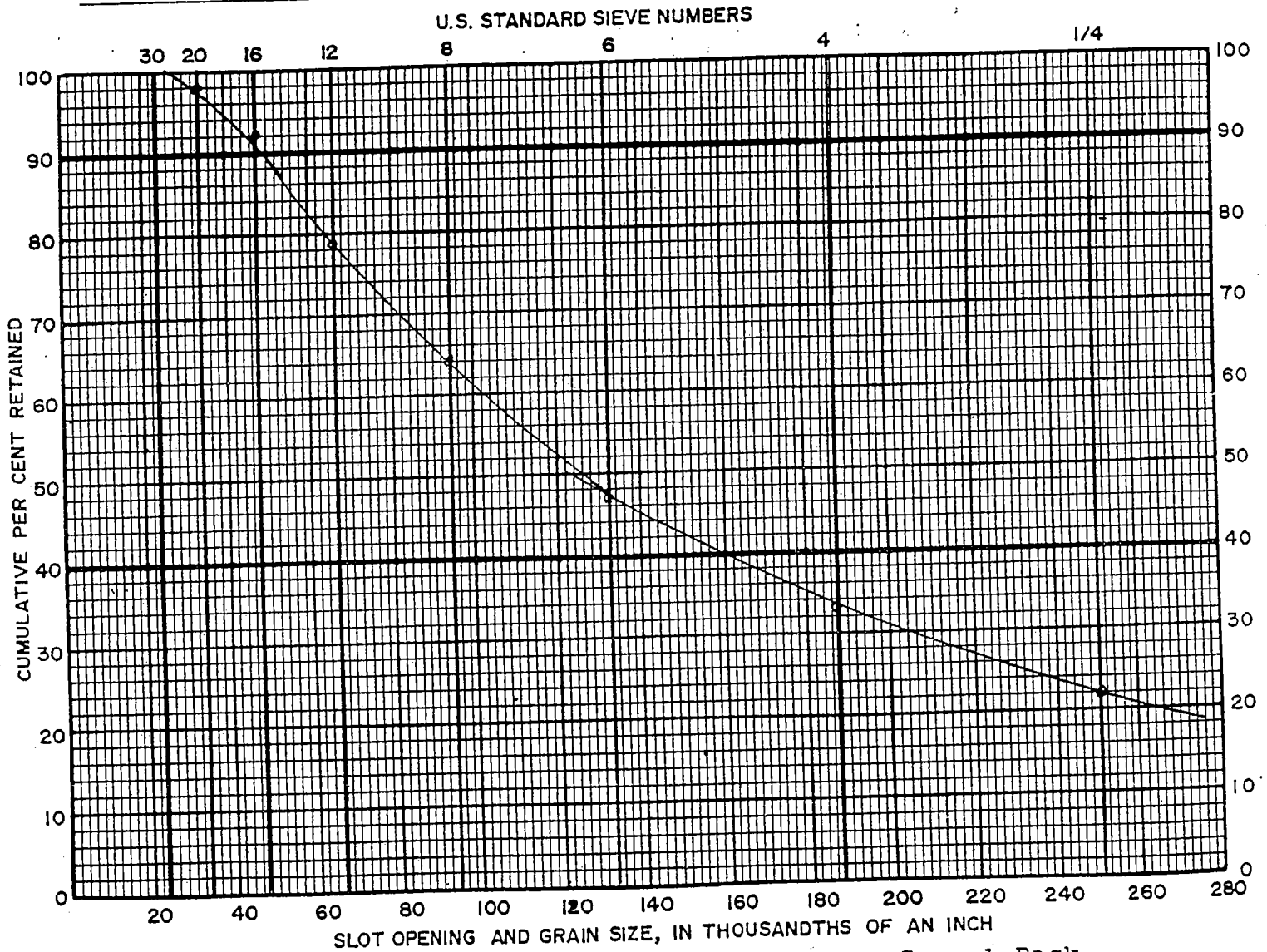
 Recommended Slot Opening: _____

 Recommended Screen: Dia. _____ in. Length _____ Ft.
 By: J. G. S.

F.G. SULLIVAN DRILLING CO., INC.
Test Boring and Gravel Wells
Parker Road
Lancaster, Massachusetts 01523

SAND ANALYSIS (COARSE)

Sample sent in by 60-L Drill
Town ACTON WATER DIST. State MA Zip Date 3/16/00
From well of Assabet Well No.2A
Remarks: 18 in. by 12 in. Gravel Packed Well
From 25 ft to 30 ft



U.S. SIEVE NO.	SIEVE OPENING INCHES	SIEVE OPENING MM.	CUMULATIVE % RETAINED
3/4	.250	6.35	22
20	.075	1.9	33
30	.060	1.5	47
40	.0475	1.2	64
60	.025	0.635	79
100	.015	0.375	92
200	.0075	0.19	98
400	.00375	0.095	99
600	.0025	0.0635	100
800	.001875	0.0475	
1000	.0015	0.0375	

Notes: #5 Cape May Gravel Pack

Recommended Slot Opening: 180 Slot

Recommended Screen: Dia. 12 in. Length 4 Ft.

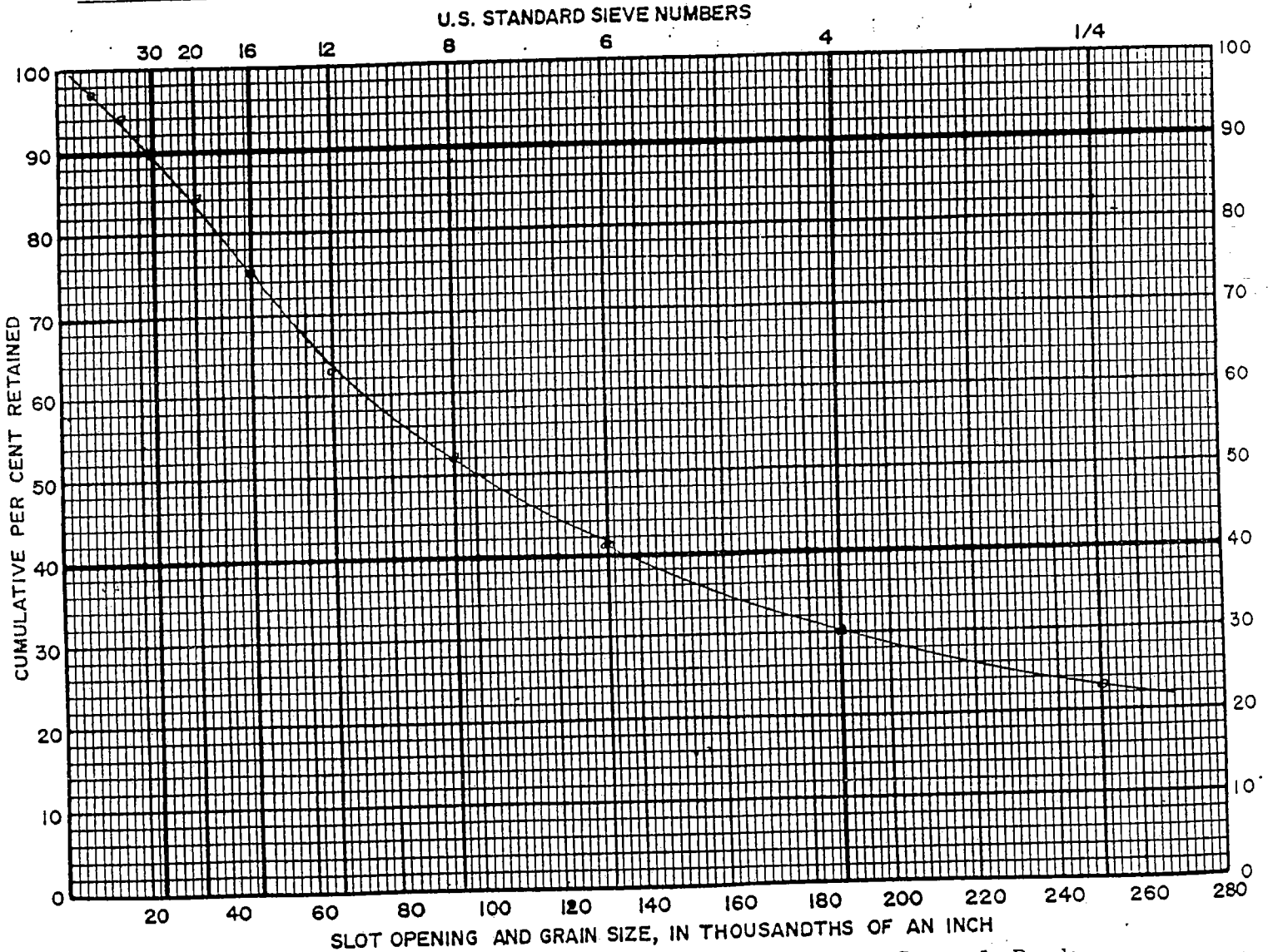
By: YGS

F.G. SULLIVAN DRILLING CO., INC.
 Test Boring and Gravel Wells
 Parker Road
 Lancaster, Massachusetts 01523

SAND ANALYSIS

(COARSE)

Sample sent in by 60-L Drill
 Town ACTON WATER DIST. State MA Zip Date 3/16/00
 From well of Assabet Well No.2A
 Remarks: 18 in. by 12 in. Gravel Packed Well
From 30 ft. to 34 ft.



U.S. SIEVE NO.	SIEVE OPENING INCHES	SIEVE OPENING MM.	CUMULATIVE % RETAINED
1/4	.250	6.35	23
4	.187	4.76	30
6	.132	3.36	41
8	.094	2.38	52
12	.066	1.68	63
16	.047	1.19	75
20	.033	0.84	84
30	.023	0.60	90
	.016		94
	.008		97
	.004		99
	0		100

Notes: #5 Cape May Gravel Pack

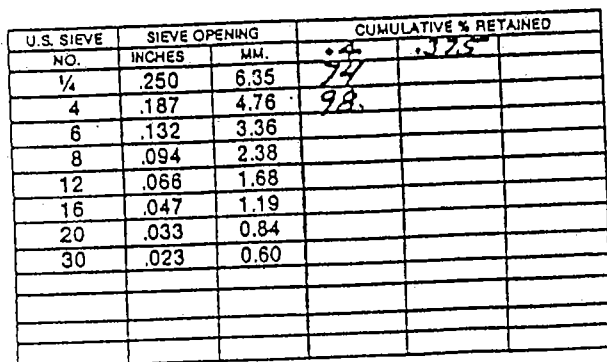
Recommended Slot Opening: 180 Slot

Recommended Screen: Dia. 12 in. Length 4 Ft.

By: J.E.S.

F.G. SULLIVAN DRILLING CO., INC.
Test Boring and Gravel Wells
Parker Road
Lancaster, Massachusetts 01523

Remarks: _____



By: _____



May 10, 2004

Mr. Gene Brunelle
Department of Environmental Protection
627 Main Street
Worcester, MA 01608

Re: **Assabet No. 1 Replacement Well Pumping Test**
Acton Water District

Dear Mr. Brunelle:

This letter shall serve as the *Pumping Test Report* for the Assabet No.1 replacement well. The purpose of this pumping test was to verify the yield of the replacement well and its water quality.

Background

Yield of the original Assabet well No.1 had been deteriorating for many years. On November 24, 2003 BRP WS 17 and 18 application forms and transmittals (W045914 & W045915) were submitted to the Department to site a replacement well. The site exam application included an air photo which showed the Zone I radius of the Assabet No.1 replacement well. There are no non-conforming land uses.

An 18 x 24 inch replacement well was constructed in December 2003. The well is 61 feet deep with 10 feet of screen. Static water level is about 15 feet. A well log and construction diagram are attached.

Pumping Test

A performance pumping began on February 17, 2004 at a rate of 171 GPM. After 90 minutes of pumping the rate was increased to 380 GPM. After another 90 minutes the rate was increased to 505 GPM. Pumping continued at that rate until February 19 for a total of 48 hours. Total drawdown in the pumping well was 13.98 feet. The discharge line was run from the well about 400 feet to the Assabet River. The pumping rate was measured with a calibrated orifice. Pumping test logs are attached.

Water Quality Testing

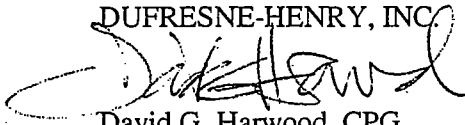
At the end of the test samples were collected for analysis of DEP Secondary Contaminants and Total Coliform. Generally water quality is good although the secondary parameter for manganese exceeded recommended concentration. All laboratory testing results are attached.

Mr. Gene Brunelle
DEP-Central Region
May 10, 2004
Page 2

If you have any questions regarding this submittal, or require any additional information, please do not hesitate to call me.

Sincerely,

DUFRESNE-HENRY, INC.



David G. Harwood, CPG
Project Manager

Cc: Jim Deming, District Manager

OAKDALE, MASS

Names of Helpers Rich Fyrberg

Date Started	Date Finished	Date Started	Date Finished
12/10/03	12/17/03		

Hole No.

[illegible]

CONSTRUCTION RECORD

WELL OWNER Acton Water District

Massachusetts Avenue, Acton, Mass.

WELL NO. Assabet #1 Replacement Well

Date February 20, 2004

CASING DETAILS

Length 61.5' 50.8' BGL ft.

Diameter 24" temp. 18" in.

Kind 3/8 steel 3/8 steel
(pulled out)

SCREEN DETAILS

Make Johnson

Length 10.2 ft.

Diameter 18" pipe size in.

Slot size 7' of 220, 3.2' of 140

Metal Stainless steel

SCREEN FITTINGS

Top Welded

Bottom Welded

PUMP TEST

Static level 14.92 ft.

Rate 505 g.p.m.

Draw down 13.98 ft.

Hours pumped 48 hrs.

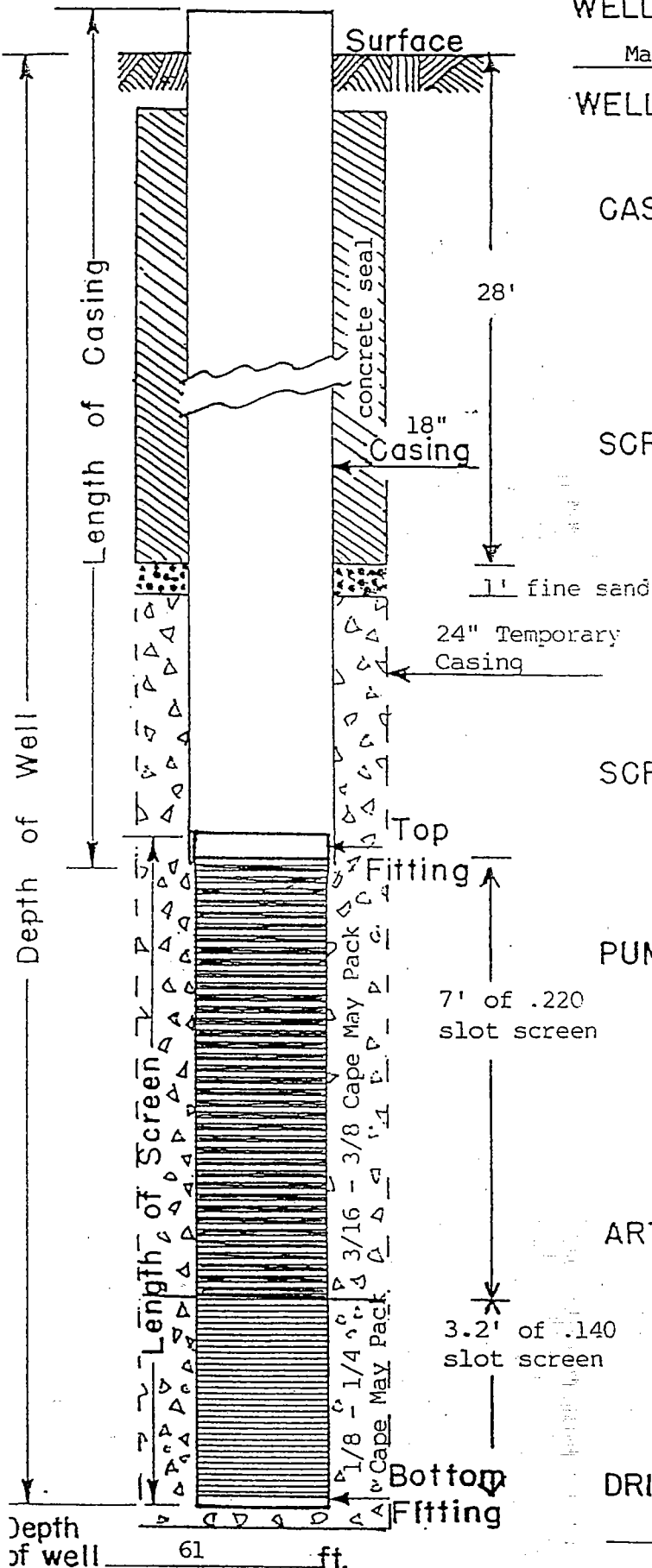
ARTIFICIALLY GRAVEL TREATED

Yes X No

Thickness 24" x 18" in.

Size of gravel 1/8 to 1/4, 3/16

DRILLER Stephen Turner



Assabet Well #1
Step Test
 By R. E. Chapman Company

Date & Notes	Time	18" Well	GPM	Obs 1-03	1-03	Existing Assabet Well #1
February 17, 2004						
Static Water Level	8:30 AM	14.92		14.02	13.50	56.3
Start Test	9:00 AM					
Step #1	9:01 AM	16.98	171		15.14	56.1
	9:02 AM	16.95	171		15.12	56.0
	9:03 AM	16.96	171		15.13	55.9
	9:04 AM	17.00	171		15.12	55.8
	9:05 AM	17.00	171		15.11	55.8
	9:06 AM	17.02	171		15.16	55.8
	9:07 AM	17.06	171		15.18	55.8
	9:08 AM	17.08	171		15.19	55.7
	9:09 AM	17.12	171		15.21	55.7
	9:10 AM	17.28	171		15.23	55.7
	9:20 AM	17.15	171		15.33	55.6
	9:30 AM	17.20	171		15.39	55.5
	9:40 AM	17.27	171		15.50	55.5
	9:50 AM	17.37	171		15.50	55.4
	10:00 AM	17.42	171		15.53	55.3
	10:10 AM	17.42	171		15.58	55.2
	10:20 AM	17.46	171		15.64	55.2
	10:30 AM	17.52	171		15.66	55.2
Step #2	10:31 AM	19.95	380		17.48	
	10:32 AM	20.00	380		17.55	
	10:33 AM	20.01	380		17.55	
	10:34 AM	20.06	380		17.58	
	10:35 AM	20.06	380		17.59	
	10:36 AM	20.07	380		17.62	
	10:37 AM	20.10	380		17.63	
	10:38 AM	20.13	380		17.64	
	10:39 AM	20.12	380		17.64	
	10:40 AM	20.15	380		17.65	54.6
	10:50 AM	20.27	380		17.75	54.5
	11:00 AM	20.32	380		17.86	54.4
	11:10 AM	20.48	380		17.94	54.4
	11:20 AM	20.53	380		18.03	54.3
	11:30 AM	20.57	380		18.08	54.3
	11:40 AM	20.60	380		18.20	54.2
	11:50 AM	20.68	380		18.24	54.1
	12-Noon	20.77	380		18.27	54.1

Assabet Well #1
Step Test
By R. E. Chapman Company

Date & Notes	Time	18" Well	GPM	Obs 1-03	1-03	Existing Assabet Well #1
Step #3	12:01 PM	23.42	505		20.25	
	12:02 PM	23.50	505		20.18	
	12:03 PM	23.41	505		20.24	
	12:04 PM	23.50	505		20.24	
	12:05 PM	23.49	505		20.25	
	12:06 PM	23.52	505		20.25	
	12:07 PM	23.54	505		20.30	
	12:08 PM	23.58	505		20.32	
	12:09 PM	23.50	505		20.33	
	12:10 PM	23.58	505		20.35	53.3
	12:20 PM	23.78	505		20.48	53.2
	12:30 PM	23.80	505		20.58	53.0
	12:40 PM	23.90	505		20.70	53.0
	12:50 PM	23.98	505		20.78	52.9
	1:00 PM	24.00	505		20.87	52.8
	1:10 PM	24.18	505		20.98	52.7
	1:20 PM	24.25	505		21.03	52.6
	1:30 PM	24.29	505	21.57	21.10	52.6
	3:00 PM	24.84	505	22.07	21.75	52.1
	4:30 PM	25.22	505	22.48	22.10	51.7
	6:00 PM	25.60	505	22.90	22.45	51.3
	7:30 PM	25.92	505	23.17	22.79	51.0
	9:00 PM	26.26	505	23.51	23.14	50.6
	10:30 PM	26.45	505	23.72	23.31	50.4
February 18, 2004	12-Midnight	26.66	505	23.87	23.55	50.2
	1:30 AM	26.80	505	24.09	23.73	50.0
	3:00 AM	26.91	505	24.21	23.87	49.8
	4:30 AM	22.17	505	24.45	24.02	49.6
	6:00 AM	27.34	505	24.60	24.21	49.4
	7:30 AM	27.39	505	24.72	24.28	49.3
	9:00 AM	27.56	505	24.80	24.42	49.1
	12-Noon					
	1:00 PM	27.84	505	25.15	24.73	48.7
	5:00 PM	28.12	505	25.46	25.00	48.4
February 19, 2004	9:00 PM	28.28	505	25.60	25.15	48.0
	12-Midnight					
	1:00 AM	28.55	505	25.90	25.43	47.6
	5:00 AM	28.75	505	25.97	25.57	47.3
Shutdown	9:00 AM	28.90	505	26.09	25.60	47.2

Assabet Well #1
Step Test
By R. E. Chapman Company

Date & Notes	Time	18" Well	GPM	Obs 1-03	Existing	Assabet Well #1
					1-03	
Recovery Readings	9:01 AM	22.25			20.80	47.7
	9:02 AM	21.80			20.55	48.1
	9:03 AM	22.05			20.73	48.3
	9:04 AM	22.14			20.66	48.4
	9:05 AM	22.05			20.62	48.5
	9:06 AM	21.95			20.56	48.6
	9:07 AM	21.93			20.53	48.6
	9:08 AM	21.90			20.52	48.6
	9:09 AM	21.84			20.48	48.7
	9:10 AM	21.84			20.43	48.7
	9:20 AM	21.68			20.20	48.9
	9:30 AM	21.40			20.00	49.0
	9:40 AM	21.31			19.90	49.2
	9:50 AM	21.11			19.70	49.3
	10:00 AM	20.95			19.55	49.4
	10:10 AM	20.85			19.45	49.5
	10:20 AM	20.70			19.32	49.5
	10:30 AM	20.63			19.20	49.6
	12-Noon	19.93		19.00	18.51	50.2
	1:30 PM	19.27		18.39	15.86	50.7
	3:00 PM	18.86		17.99	17.47	51.1
February 20, 2004	12-Midnight					
	8:00 AM	16.48		15.60	15.05	53.7

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Page 2 of 3

MASSACHUSETTS DIVISION

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Marlborough, MA 01752

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Daniel J. Ste.Marie, Lab Director

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CERTIFICATE OF ANALYSIS

R.E. Chapman
30 North Main Street
West Boylston, MA 01583

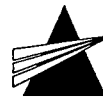
Date Reported 3/3/2004
Date Received 2/19/2004
Sample ID 0402-00671
Invoice No. 75492
Cust # C036
Cust P.O. #

Subject WATER SAMPLES REC'D 2/19/04

Sampled By: CLIENT

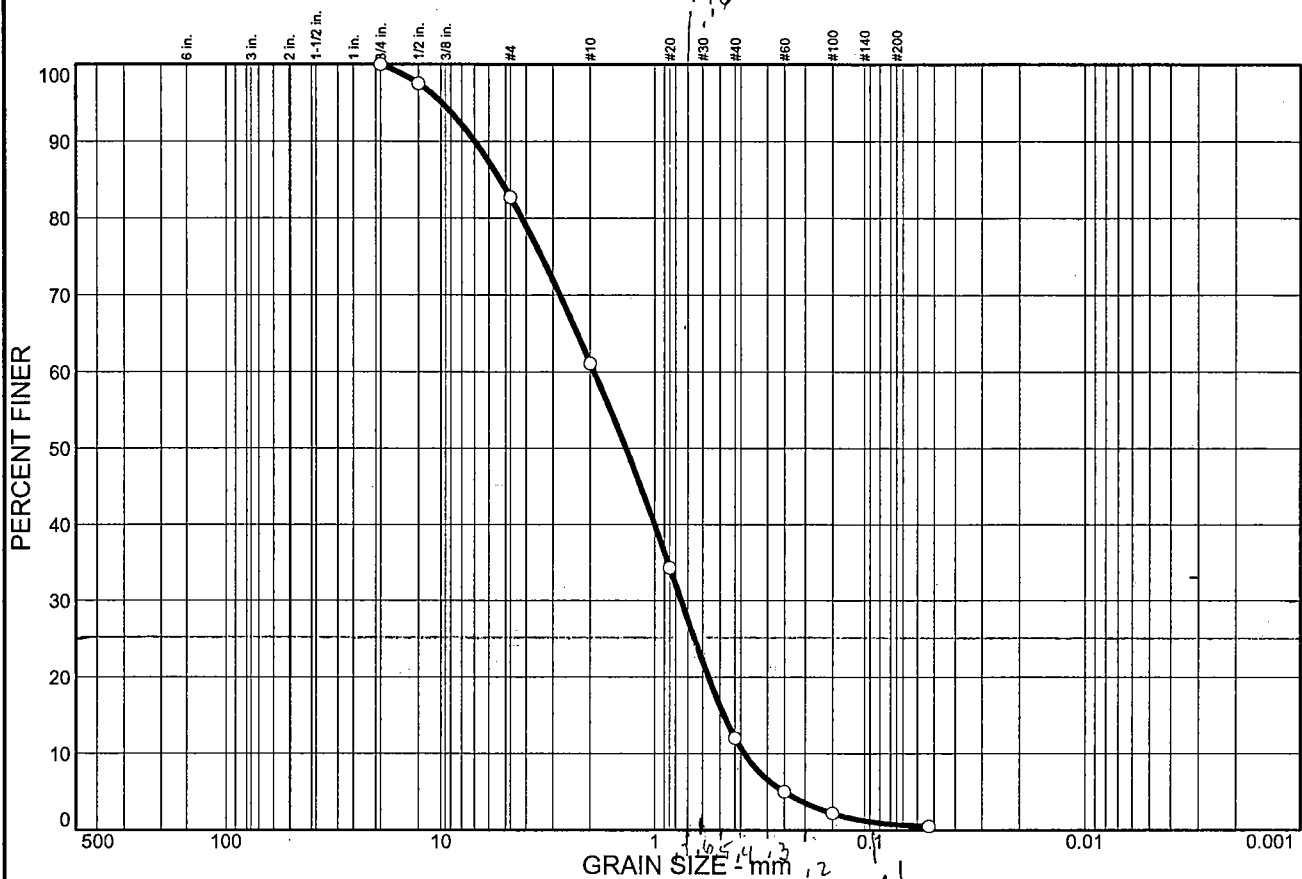
Date 2/19/2004 Time

Test	Result	Date	Time	Tech	Method
002 ASSABET #1 2/19/04 900AMcontinued					
True Color	0 Pt-Co	2/19/2004	12:45	KJR	SM 2120B
Odor	1 T.O.N.	2/19/2004	13:00	KJR	EPA
pH	6.1 S.U.	2/19/2004	17:30	KJR	SM-4500-H-B
Alkalinity as CaCO3	31 mg CaCO3/L	2/19/2004		HCL	SM 2320B
Hardness	71 mg/L	2/23/2004		DLK	EPA 200.7
Calcium	20 mg/L	2/23/2004		DLK	EPA 200.7
Magnesium	5.0 mg/L	2/23/2004		DLK	EPA 200.7
Aluminum	<0.010 mg/L	2/23/2004		DLK	EPA 200.7
Potassium	3.2 mg/L	2/23/2004		DLK	EPA 200.7
Iron	<0.01 mg/L	2/23/2004		DLK	EPA 200.7
Manganese	0.11 mg/L	2/23/2004		DLK	EPA 200.7
Sulfate	21 mg/L	3/1/2004		KJR	4500-SO4-D
Chloride	54 mg/L	3/1/2004		KJR	4500-CL-B
Silver	<0.003 mg/L	2/23/2004		DLK	EPA 200.7
Copper	0.002 mg/L	2/26/2004		DLK	EPA 200.7
Zinc	<0.003 mg/L	2/23/2004		DLK	EPA 200.7
Nitrate Nitrogen as N	0.67 mg/L	2/19/2004	17:45	KJR	4500-NO3-D
Nitrite Nitrogen as N	<0.01 mg/L	2/19/2004	15:15	KJR	4500-NO2-B
Sodium	26 mg/L	2/23/2004		DLK	EPA 200.7
Total Coliform	0 per 100ml	2/19/2004	16:00	LBC	SM 9222



APPENDIX F: GRAIN SIZE DISTRIBUTION CURVES

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	17.3	21.6	49.1	11.3	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.5		
#4	82.7		
#10	61.1		
#20	34.3		
#40	12.0		
#60	5.0		
#100	2.2		
#270	0.5		

Soil Description
Poorly graded sand with gravel

Atterberg Limits
 PL= -- LL= -- PI= --

Coefficients
 D₈₅= 5.32 D₆₀= 1.92 D₅₀= 1.37
 D₃₀= 0.753 D₁₅= 0.479 D₁₀= 0.385
 C_u= 5.00 C_c= 0.77

Classification
 USCS= SP AASHTO= A-1-b

Remarks
 as rec'd w% = 4.1

* (no specification provided)

Sample No.: S-1
Location:

Source of Sample: Test Pit 32105-1

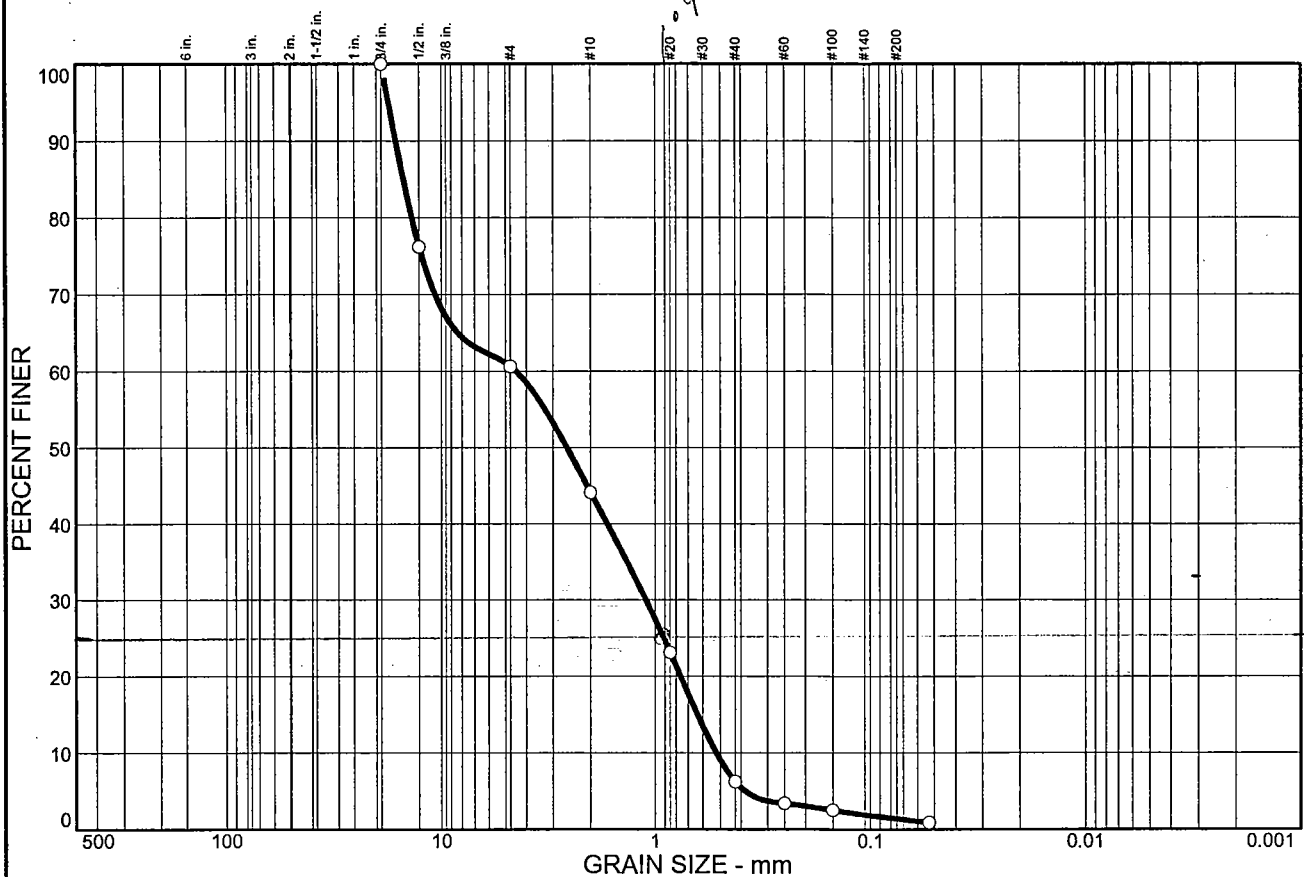
Date: 5/5/05
Elev./Depth: 15-17'

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Acton, MA
Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	39.4	16.5	37.9	4.8	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	76.2		
#4	60.6		
#10	44.1		
#20	23.1		
#40	6.2		
#60	3.4		
#100	2.5		
#270	0.9		

* (no specification provided)

Soil Description
Poorly graded sand with gravel

Atterberg Limits
 PL= -- LL= -- PI= --

Coefficients
 D₈₅= 15.0 D₆₀= 4.49 D₅₀= 2.58
 D₃₀= 1.11 D₁₅= 0.636 D₁₀= 0.522
 C_u= 8.61 C_c= 0.52

Classification
 USCS= SP AASHTO= A-1-a

Remarks
 as rec'd w% = 3.4

Sample No.: S-1
Location:

Source of Sample: Test Pit 32105-2

Date: 5/5/05
Elev./Depth: 14-15'

THE GEOTECHNICAL GROUP, INC.

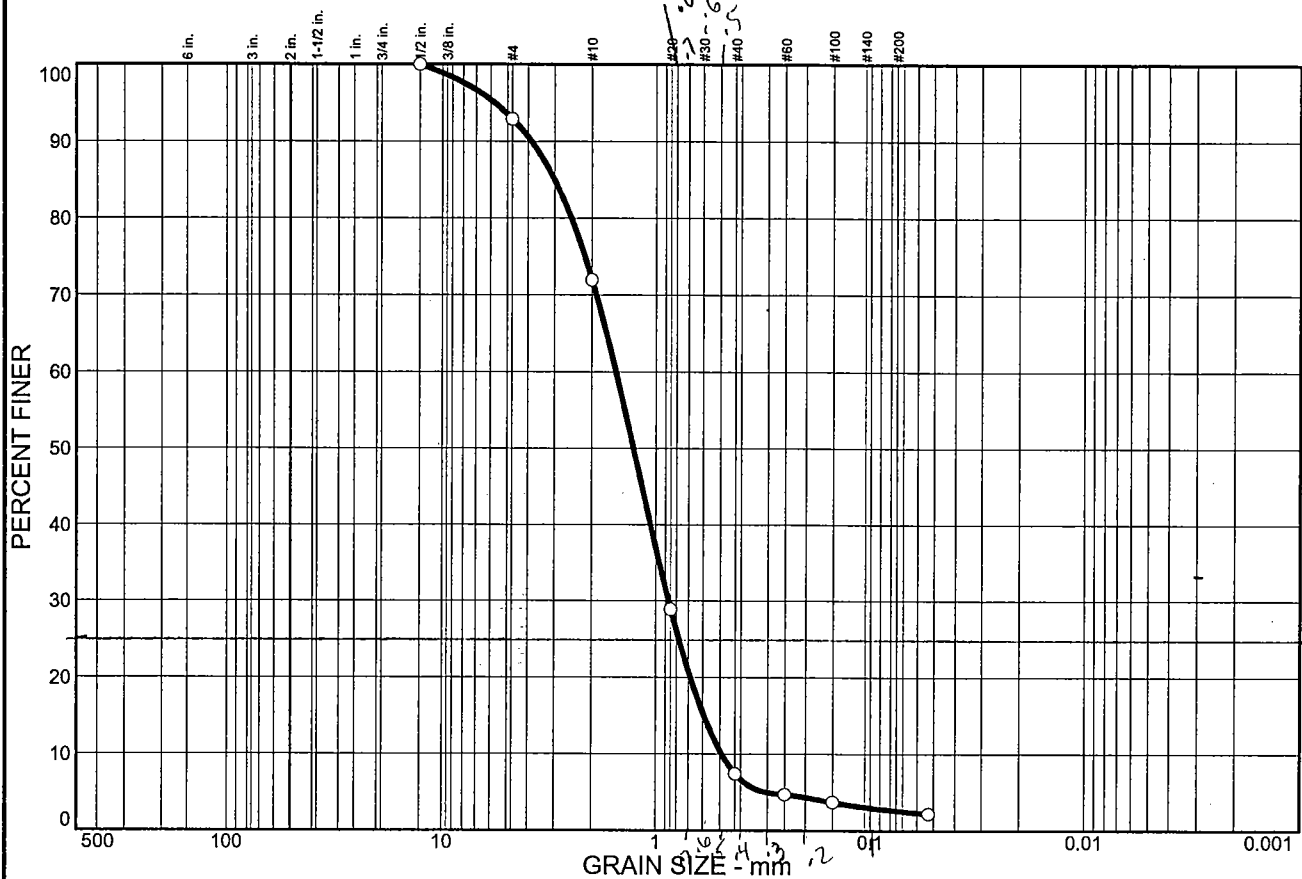
Client: Woodard & Curran

Project: Town of Acton
Acton, MA

Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.1	20.9	64.6	4.8	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
#4	92.9		
#10	72.0		
#20	28.9		
#40	7.4		
#60	4.7		
#100	3.7		
#270	2.2		

Soil Description
Poorly graded sand

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
D₈₅= 3.01 D₆₀= 1.55 D₅₀= 1.28
D₃₀= 0.870 D₁₅= 0.594 D₁₀= 0.491
C_u= 3.15 C_c= 1.00

Classification
USCS= SP AASHTO= A-1-b

Remarks
as rec'd w% = 6.8

* (no specification provided)

Sample No.: S-2
Location:

Source of Sample: Test Pit 32105-5

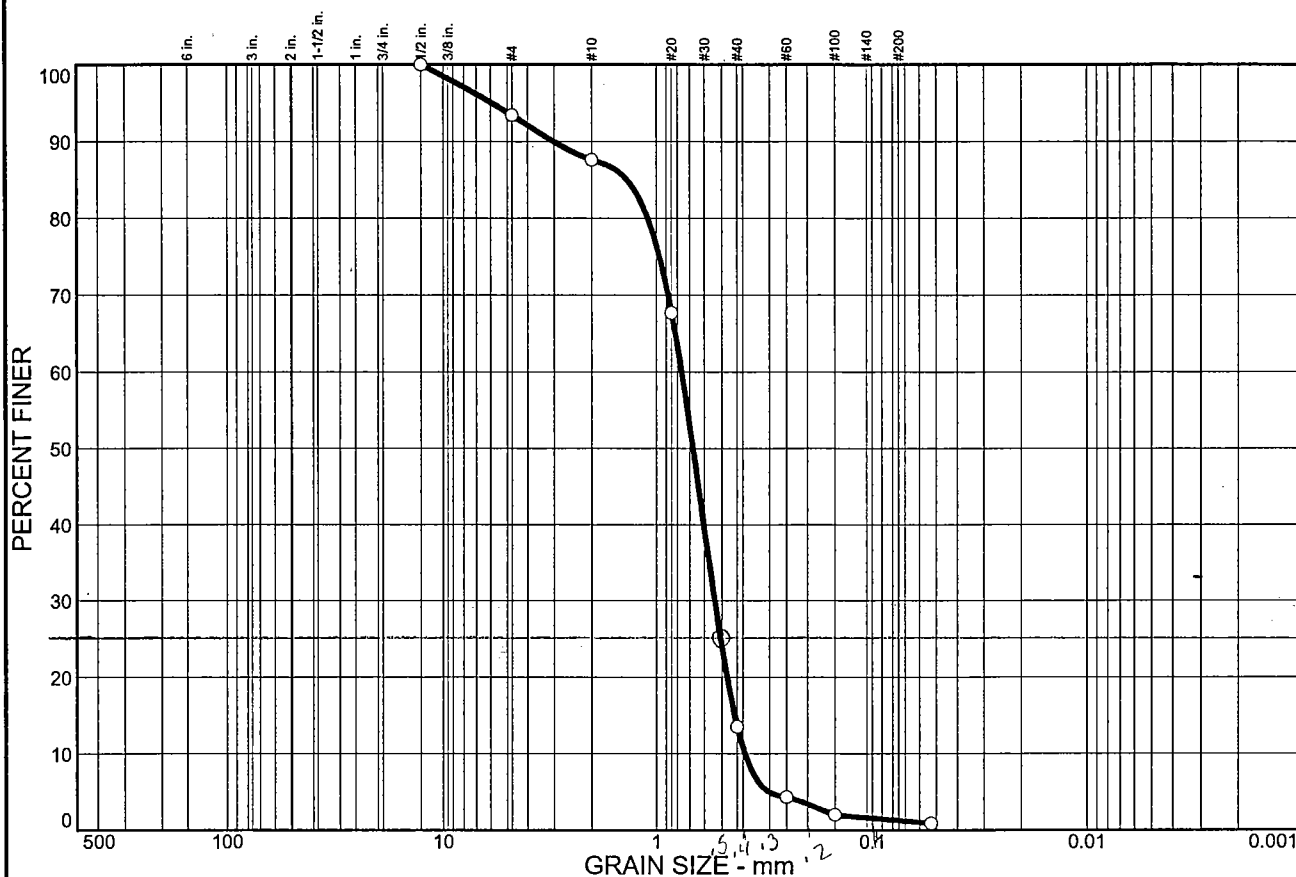
Date: 5/5/05
Elev./Depth: 6-9'

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Project No: 212605

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PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.6	5.8	74.1	12.2	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
#4	93.4		
#10	87.6		
#20	67.7		
#40	13.5		
#60	4.3		
#100	2.0		
#270	0.9		

Soil Description

Poorly graded sand

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 1.37 D₆₀= 0.765 D₅₀= 0.678
D₃₀= 0.539 D₁₅= 0.437 D₁₀= 0.392
C_u= 1.95 C_c= 0.97

Classification

USCS= SP AASHTO= A-1-b

Remarks

as rec'd w% = 7.4

* (no specification provided)

Sample No.: S-2
Location:

Source of Sample: Test Pit 32105-6

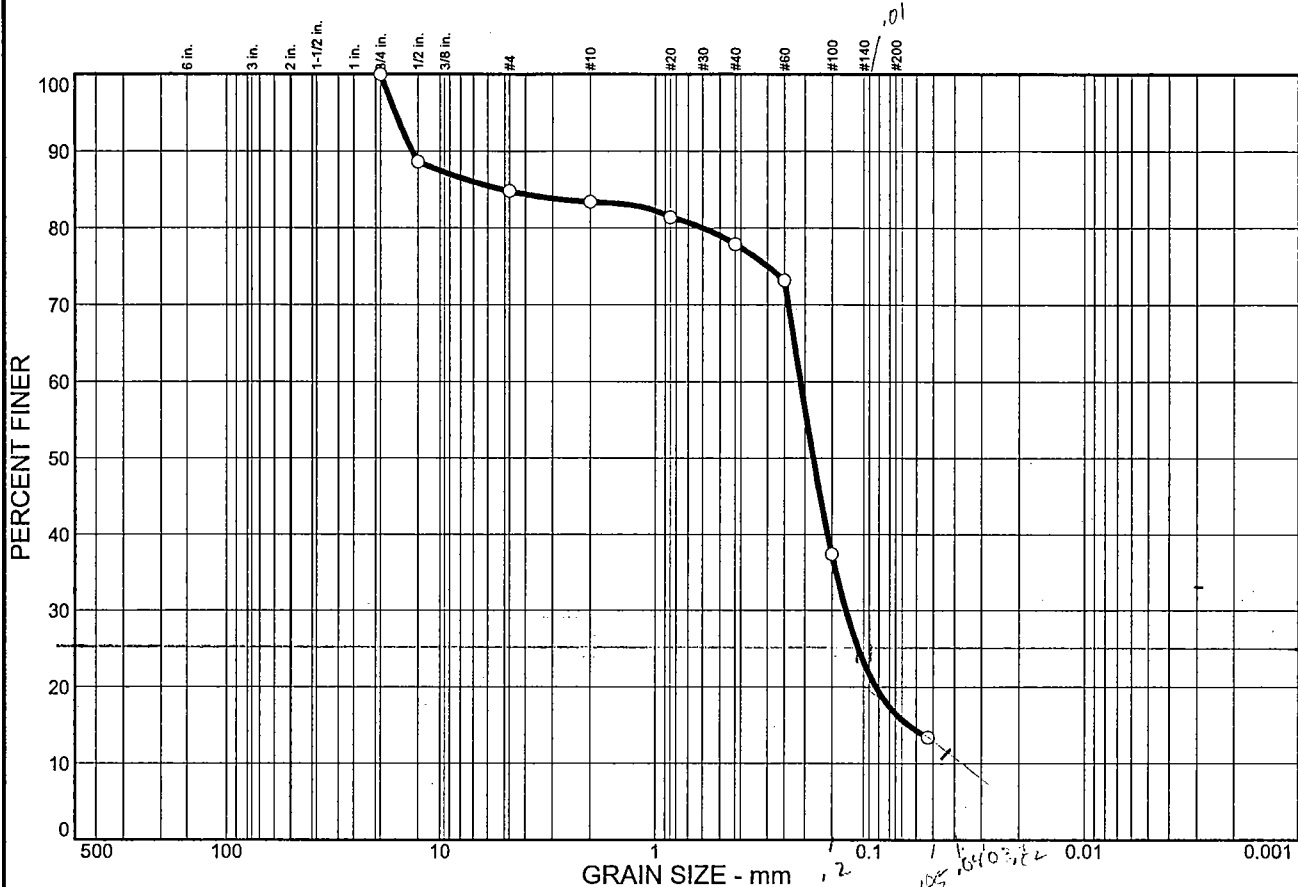
Date: 5/5/05
Elev./Depth: 5-13'

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Project: Town of Acton
Acton, MA
Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



10%
0.42
25%
0.12

% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	15.2	1.4	5.5	61.4	16.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	88.6		
#4	84.8		
#10	83.4		
#20	81.4		
#40	77.9		
#60	73.2		
#100	37.4		
#270	13.4		

Soil Description
Silty sand with gravel

Atterberg Limits
 PL= -- LL= -- PI= --

Coefficients
 D₈₅= 5.11 D₆₀= 0.210 D₅₀= 0.183
 D₃₀= 0.129 D₁₅= 0.0651 D₁₀=
 C_u= C_c=

Classification
 USCS= SM AASHTO= A-2-4(0)

Remarks
 as rec'd w% = 19.5

* (no specification provided)

Sample No.: S-3
Location:

Source of Sample: Boring W-1

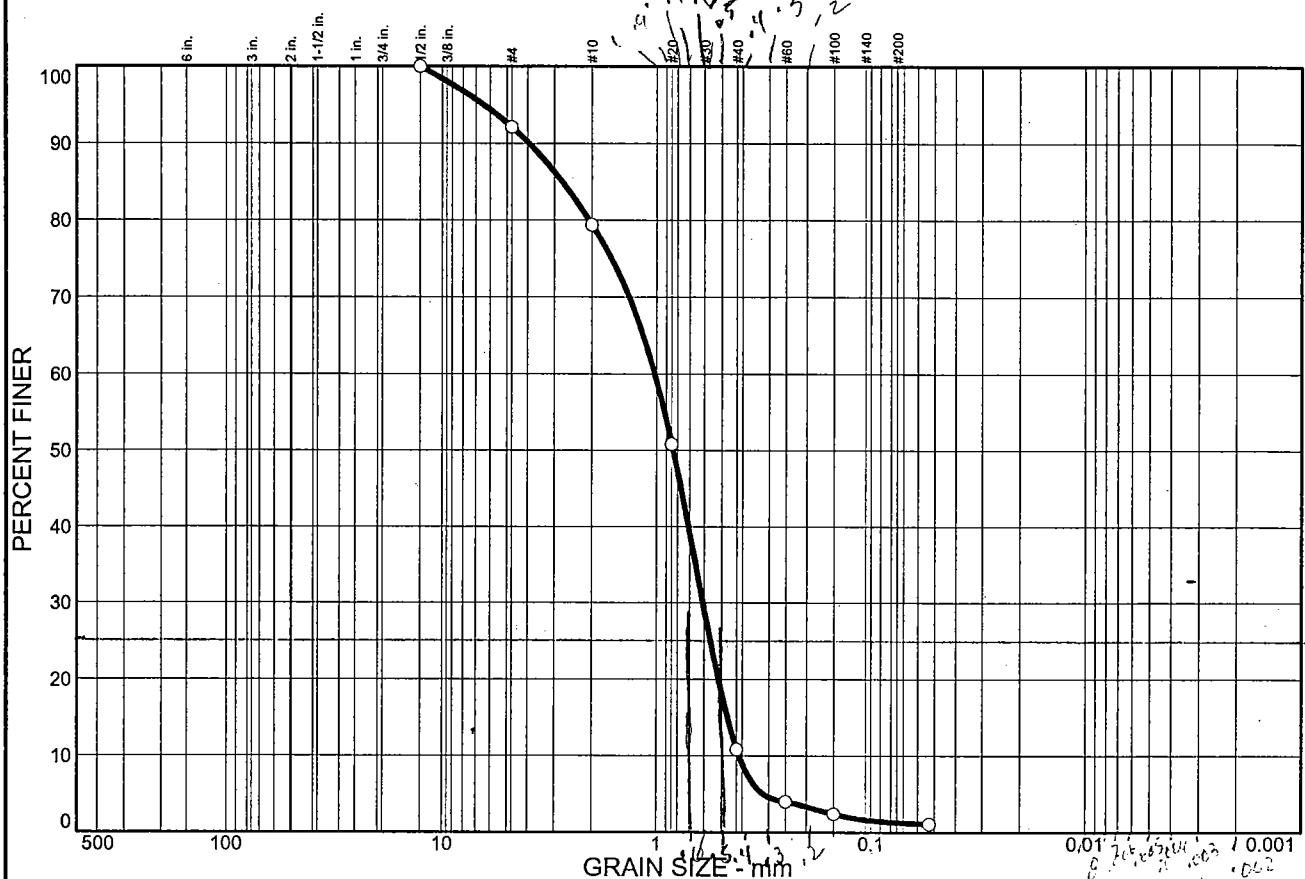
Date: 5/5/05
Elev./Depth: 10-10.5'

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Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.9	12.7	68.6	9.5	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
#4	92.1		
#10	79.4		
#20	50.8		
#40	10.8		
#60	4.0		
#100	2.4		
#270	1.1		

* (no specification provided)

<u>Soil Description</u>		
Poorly graded sand		
<u>Atterberg Limits</u>		
PL= --	LL= --	PI= --
<u>Coefficients</u>		
D ₈₅ = 2.75	D ₆₀ = 1.02	D ₅₀ = 0.838
D ₃₀ = 0.610	D ₁₅ = 0.470	D ₁₀ = 0.415
C _u = 2.46	C _c = 0.88	
<u>Classification</u>		
USCS= SP	AASHTO= A-1-b	
<u>Remarks</u>		
as rec'd w%= 18.8		

Sample No.: S-4
Location:

Source of Sample: Boring W-1

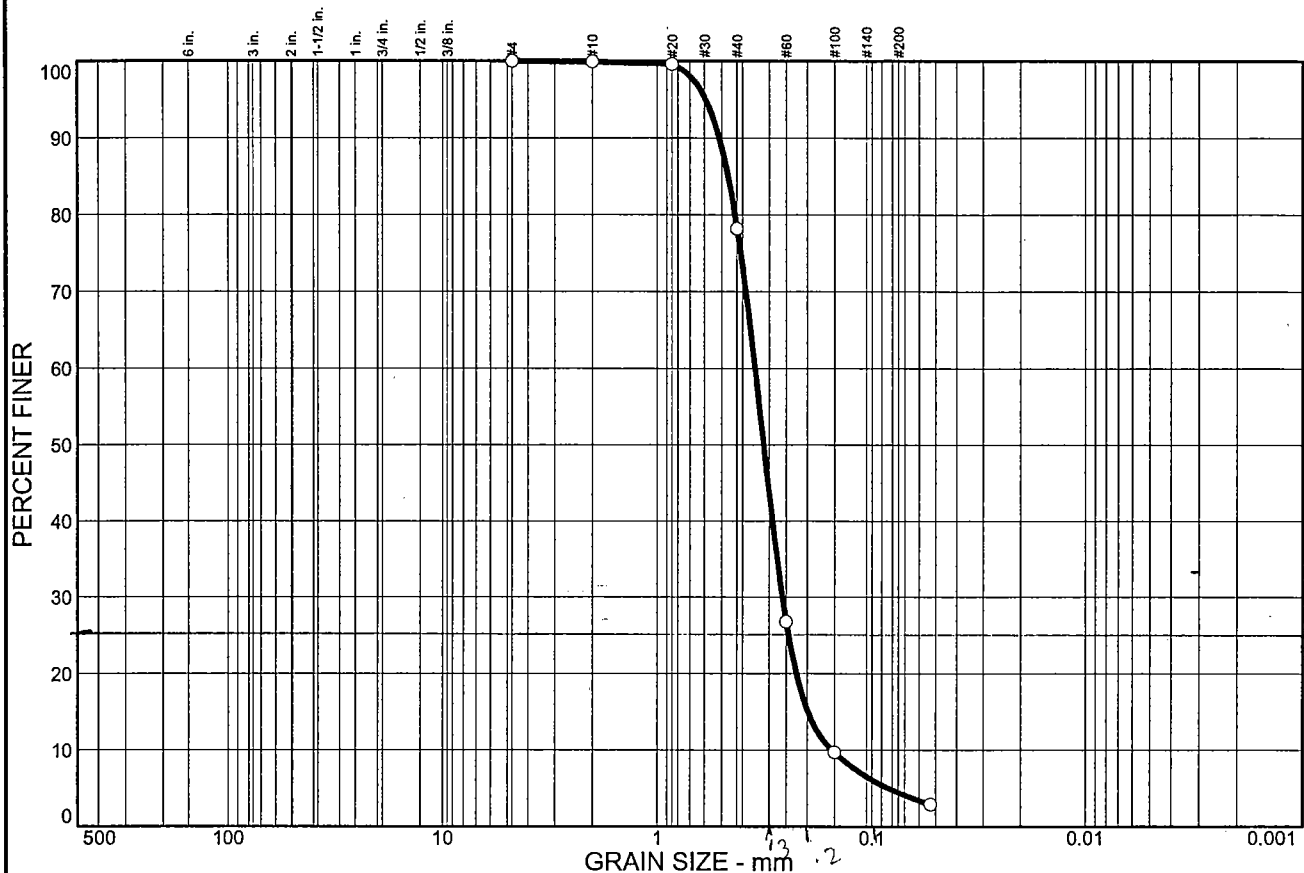
Date: 5/5/05
Elev./Depth: 15-17'

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PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	21.7	73.8	4.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.6		
#40	78.2		
#60	26.8		
#100	9.7		
#270	2.9		

Soil Description
Poorly graded sand

Atterberg Limits
 PL= -- LL= -- PI= --

Coefficients
 D₈₅= 0.468 D₆₀= 0.351 D₅₀= 0.320
 D₃₀= 0.260 D₁₅= 0.199 D₁₀= 0.154
 C_u= 2.28 C_c= 1.25

Classification
 USCS= SP AASHTO= A-3

Remarks
 as rec'd w% = 27.8

* (no specification provided)

Sample No.: S-7
Location:

Source of Sample: Boring W-1

Date: 5/5/05
Elev./Depth: 30-32'

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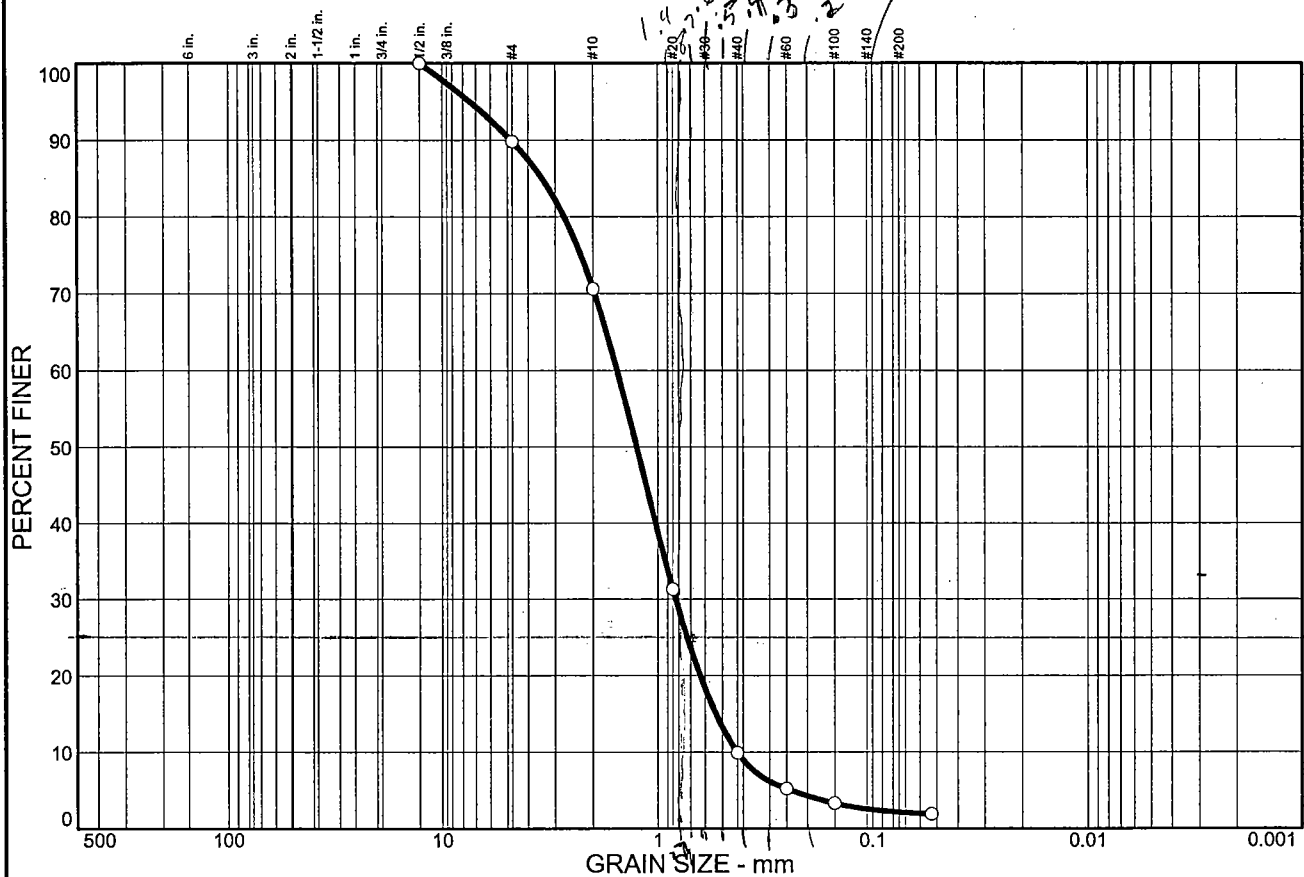
Client: Woodard & Curran

Project: Town of Acton
Acton, MA

Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.2	19.2	60.7	7.8	2.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
#4	89.8		
#10	70.6		
#20	31.3		
#40	9.9		
#60	5.2		
#100	3.3		
#270	1.9		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= -- LL= -- PI= --

Coefficients

D₈₅= 3.46 D₆₀= 1.55 D₅₀= 1.26
D₃₀= 0.825 D₁₅= 0.536 D₁₀= 0.428
C_u= 3.64 C_c= 1.02

Classification

USCS= SP AASHTO= A-1-b

Remarks

as rec'd w% = 17.2

Sample No.: S-3

Location:

Source of Sample: Boring W-4

Date: 5/5/05

Elev./Depth: 10-12'

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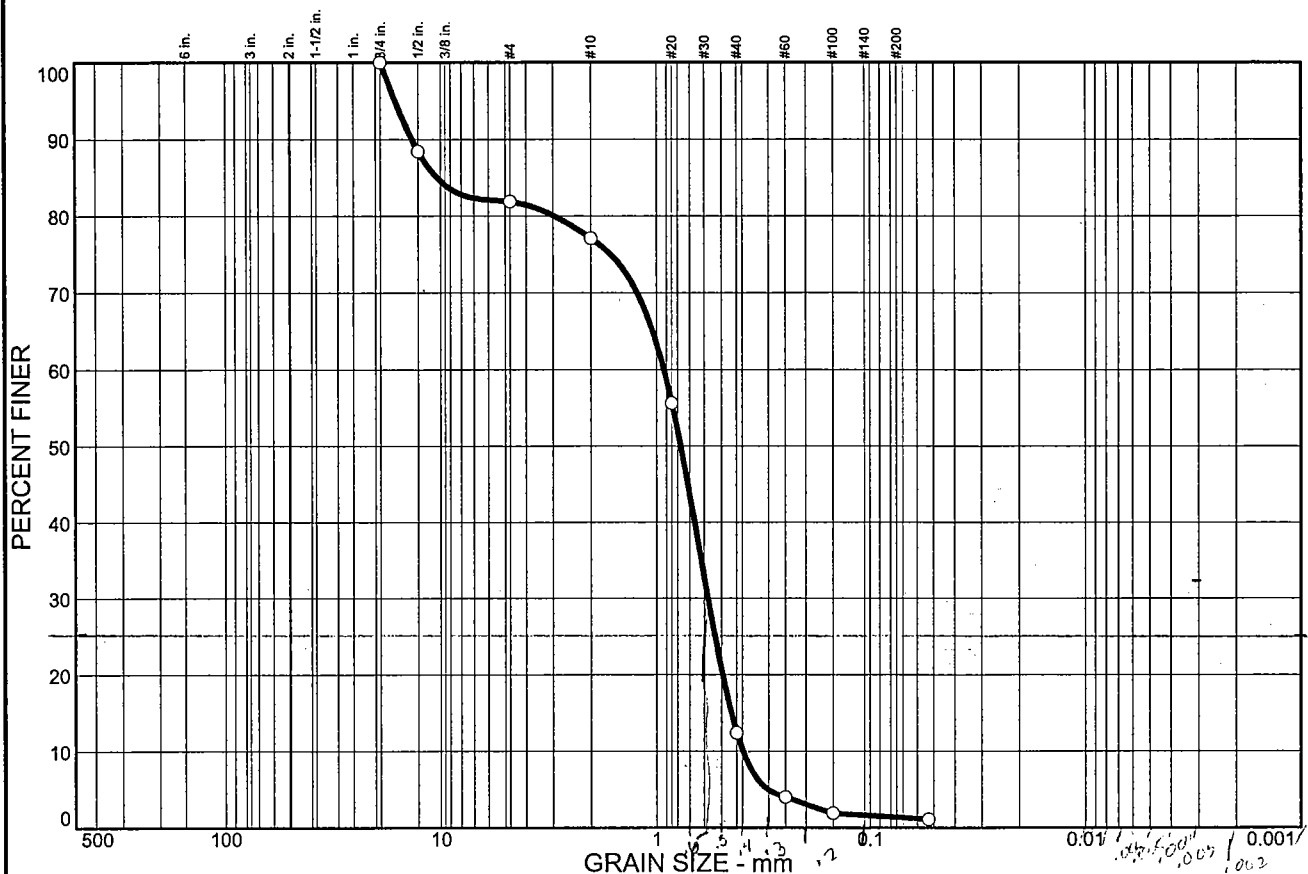
Client: Woodard & Curran

Project: Town of Acton
Acton, MA

Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



25%
5%

% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.1	4.8	64.7	11.0	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	88.4		
#4	81.9		
#10	77.1		
#20	55.6		
#40	12.4		
#60	4.0		
#100	1.9		
#270	1.1		

Soil Description
Poorly graded sand with gravel

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
D₈₅= 10.4 D₆₀= 0.927 D₅₀= 0.774
D₃₀= 0.577 D₁₅= 0.450 D₁₀= 0.398
C_u= 2.33 C_c= 0.90

Classification
USCS= SP AASHTO= A-1-b

Remarks
as rec'd w% = 15.9

* (no specification provided)

Sample No.: S-6
Location:

Source of Sample: Boring W-4

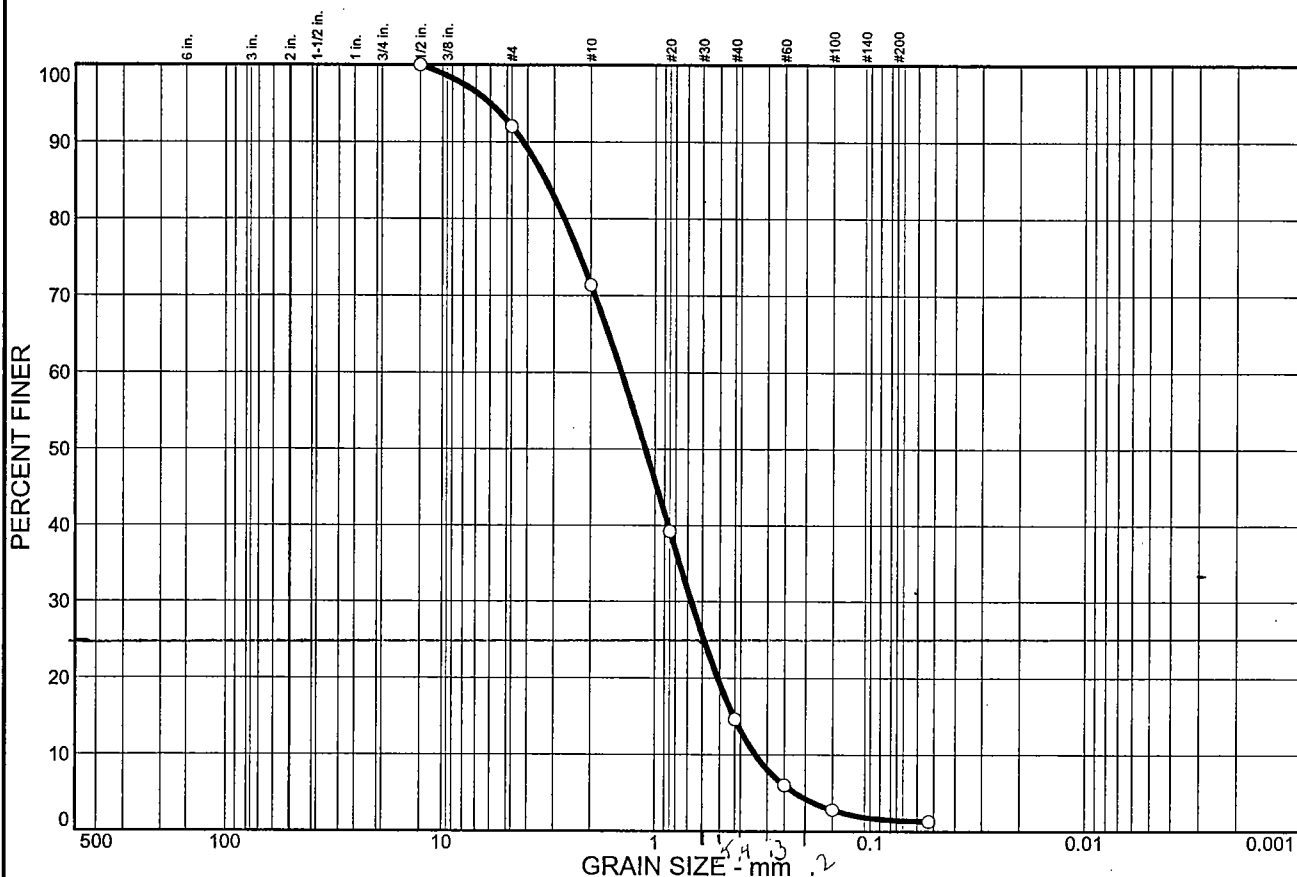
Date: 5/5/05
Elev./Depth: 25-27'

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Acton, MA
Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



25%
6

% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.0	20.6	56.8	13.2	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
#4	92.0		
#10	71.4		
#20	39.2		
#40	14.6		
#60	6.0		
#100	2.8		
#270	1.3		

* (no specification provided)

Soil Description
Poorly graded sand

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
D₈₅= 3.28 D₆₀= 1.44 D₅₀= 1.11
D₃₀= 0.675 D₁₅= 0.432 D₁₀= 0.341
C_u= 4.23 C_c= 0.93

Classification
USCS= SP AASHTO= A-1-b

Remarks
as rec'd w% = 16.0

Sample No.: S-8
Location:

Source of Sample: Boring W-4

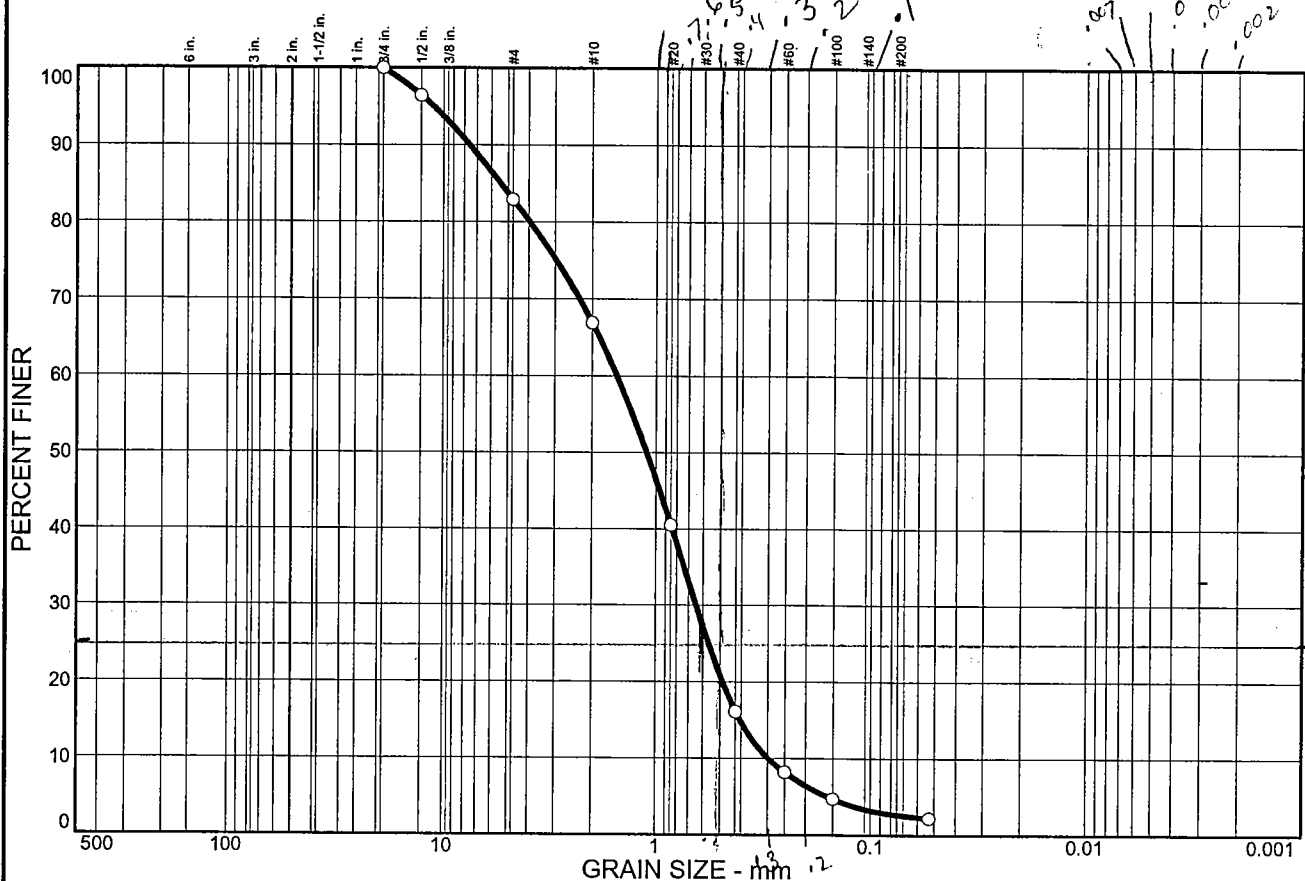
Date: 5/5/05
Elev./Depth: 35-36.5'

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Project: Town of Acton
Acton, MA
Project No: 212605

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PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	17.1	16.0	50.8	13.5	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.4		
#4	82.9		
#10	66.9		
#20	40.5		
#40	16.1		
#60	8.2		
#100	4.7		
#270	2.2		

Soil Description
Poorly graded sand with gravel

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
D₈₅= 5.43 D₆₀= 1.53 D₅₀= 1.11
D₃₀= 0.648 D₁₅= 0.406 D₁₀= 0.299
C_u= 5.12 C_c= 0.91

Classification
USCS= SP AASHTO= A-1-b

Remarks
as rec'd w% = 11.5

* (no specification provided)

Sample No.: S-5
Location:

Source of Sample: Boring NA-1

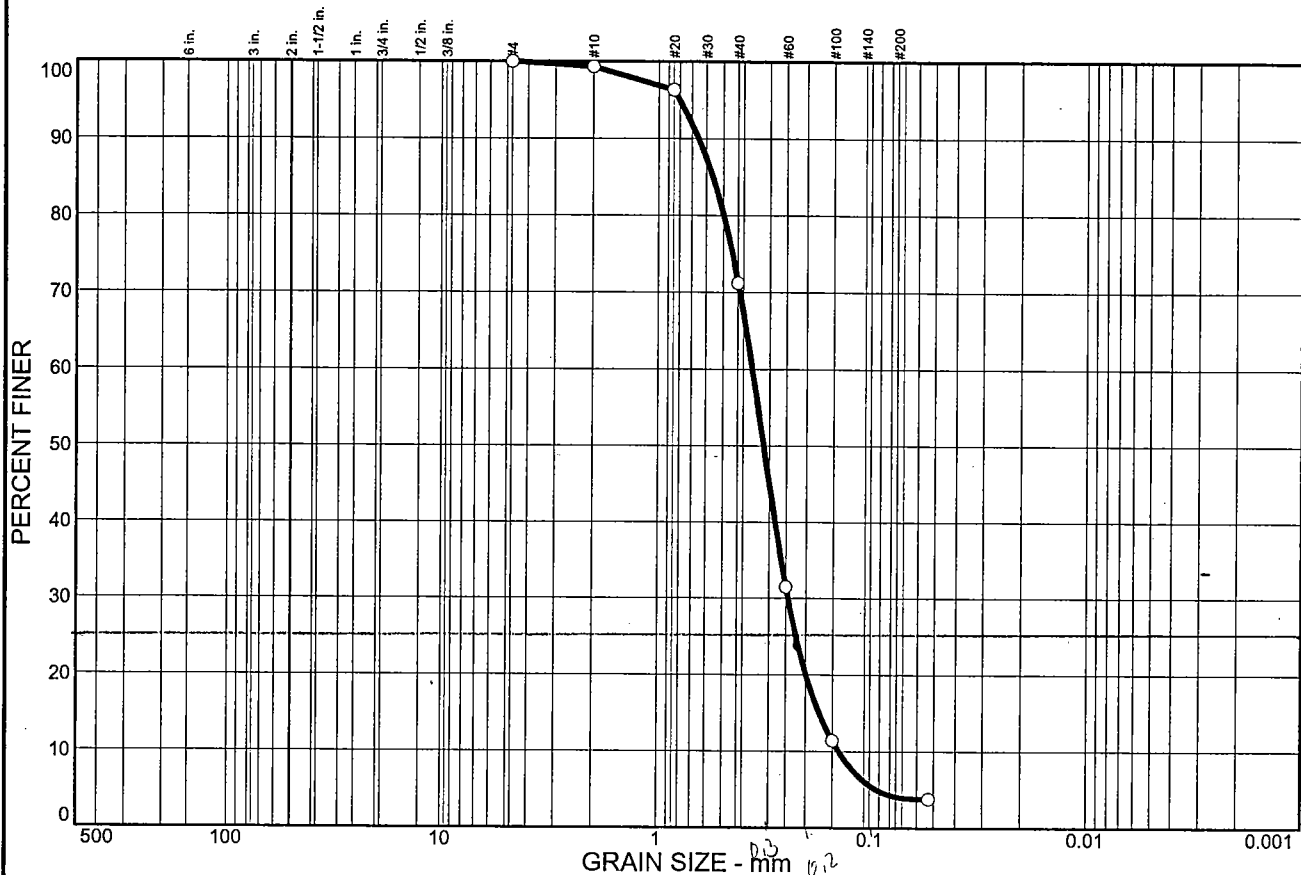
Date: 5/5/05
Elev./Depth: 20-21.5'

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Acton, MA
Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.7	28.1	67.1	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.3		
#20	96.3		
#40	71.2		
#60	31.5		
#100	11.4		
#270	3.8		

* (no specification provided)

Soil Description
Poorly graded sand

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
D₈₅= 0.561 D₆₀= 0.364 D₅₀= 0.321
D₃₀= 0.244 D₁₅= 0.173 D₁₀= 0.140
C_u= 2.60 C_c= 1.17

Classification
USCS= SP AASHTO= A-3

Remarks
as rec'd w% = 5.1

Sample No.: S-4
Location:

Source of Sample: Boring A-1

Date: 5/5/05
Elev./Depth: 15-17'

THE GEOTECHNICAL GROUP, INC.

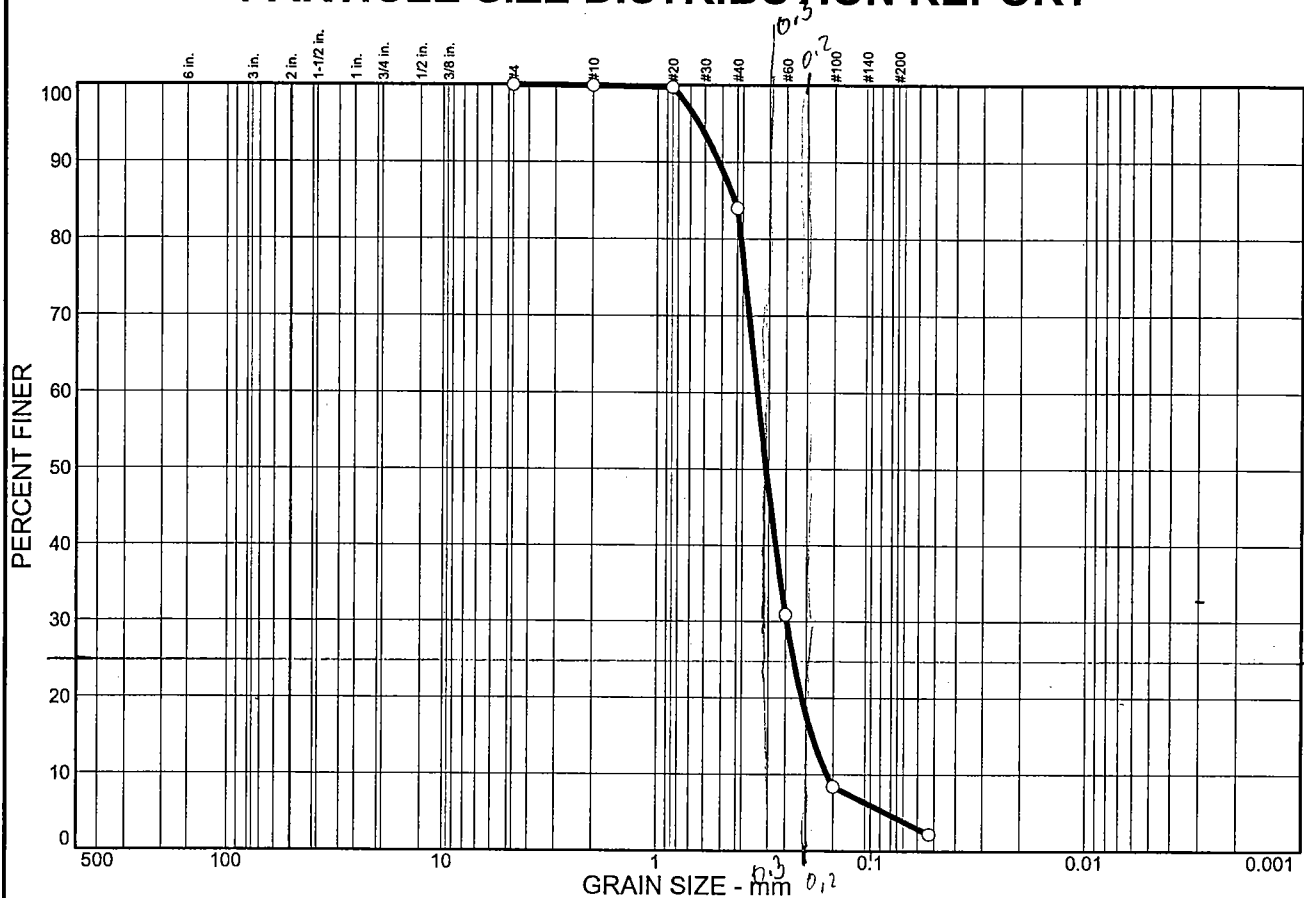
Client: Woodard & Curran

Project: Town of Acton
Acton, MA

Project No: 212605

Lab. No. SL-1158

PARTICLE SIZE DISTRIBUTION REPORT



25%
0.22

% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	15.9	79.7	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	84.0		
#60	30.9		
#100	8.4		
#270	2.2		

* (no specification provided)

Soil Description
Poorly graded sand

Atterberg Limits
PL= -- LL= -- PI= --

Coefficients
 $D_{85} = 0.438$
 $D_{30} = 0.247$
 $C_u = 2.13$
 $D_{60} = 0.341$
 $D_{15} = 0.187$
 $C_c = 1.12$
 $D_{50} = 0.310$
 $D_{10} = 0.160$

Classification
USCS= SP AASHTO= A-3

Remarks
as rec'd w% = 23.7

Sample No.: S-4
Location:

Source of Sample: Boring A-2

Date: 5/5/05
Elev./Depth: 15-17'

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Acton, MA
Project No: 212605

Lab. No. SL-1158



APPENDIX G: HVORSLEV BOREHOLE SLUG TEST ANALYSES

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo, Ontario, Canada
ph.(519)746-1798

slug/bail test analysis
HVORSLEV's method

Date: 05.08.2005 Prelim Hydrogeo Report

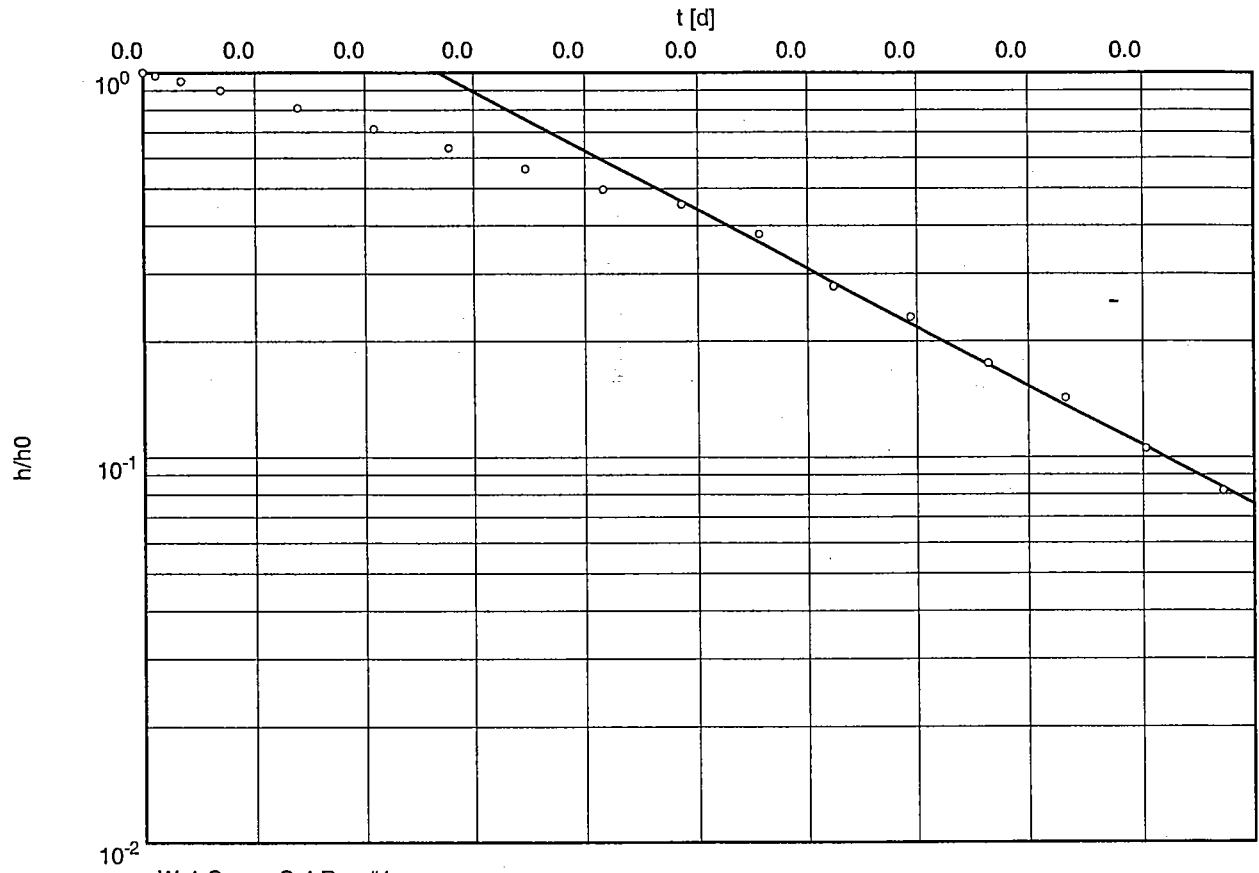
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-4 Run #1

Test conducted on: 3-21-05

W-1 Wetherbee Site



Hydraulic conductivity [ft/d]: 8.87×10^0

[illegible]

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo, Ontario, Canada
ph.(519)746-1798

slug/bail test analysis
HVORSLEV's method

Date: 05.08.2005 Prelim Hydrogeo Report

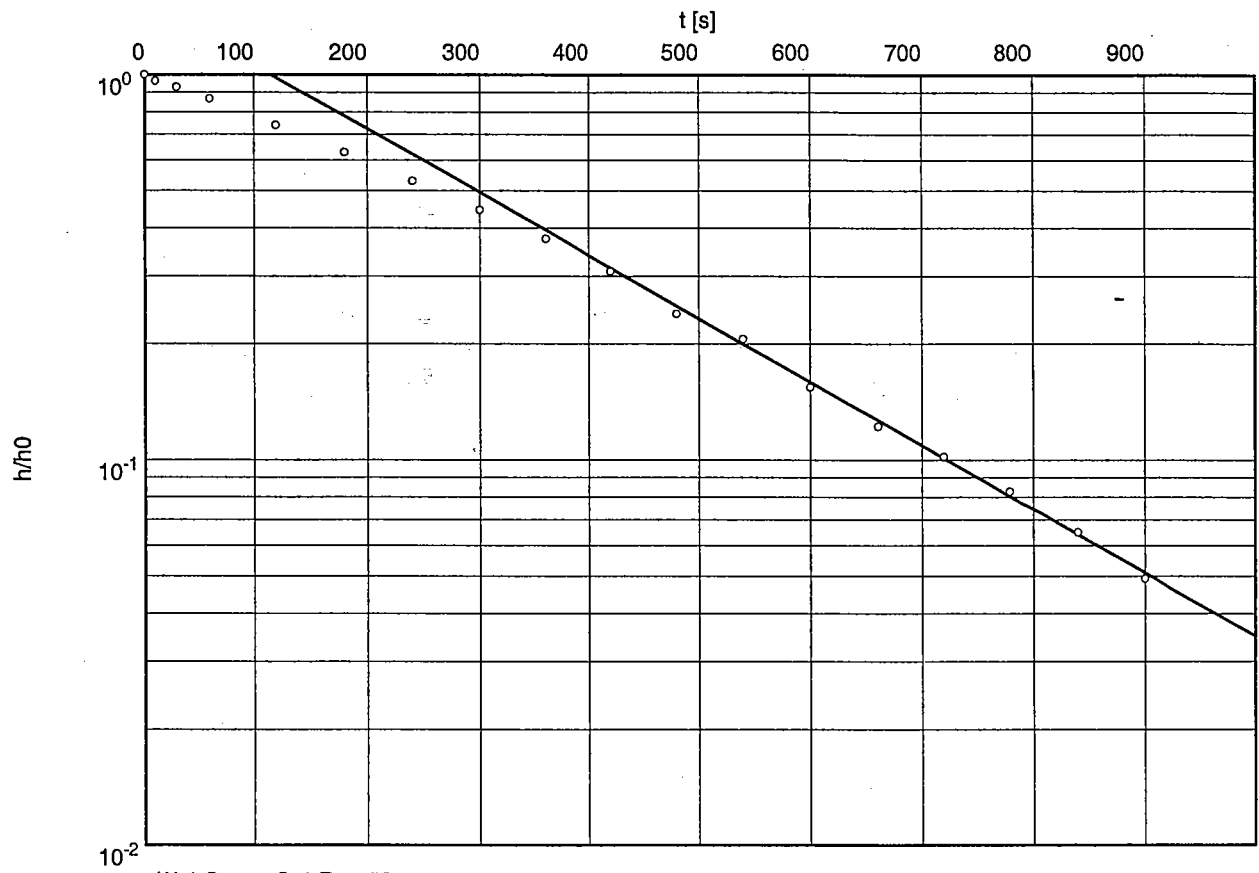
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-4 Run #2

Test conducted on: 3-21-05

W-1 Wetherbee Site



Hydraulic conductivity [cm/s]: 2.90×10^{-3}

[illegible]

Waterloo Hydrogeologic

180 Columbia St. W.

Waterloo, Ontario, Canada

ph.(519)746-1798

slug/bail test analysis
HVORSLEV's method

Date: 05.08.2005

Prelim Hydrogeo Report

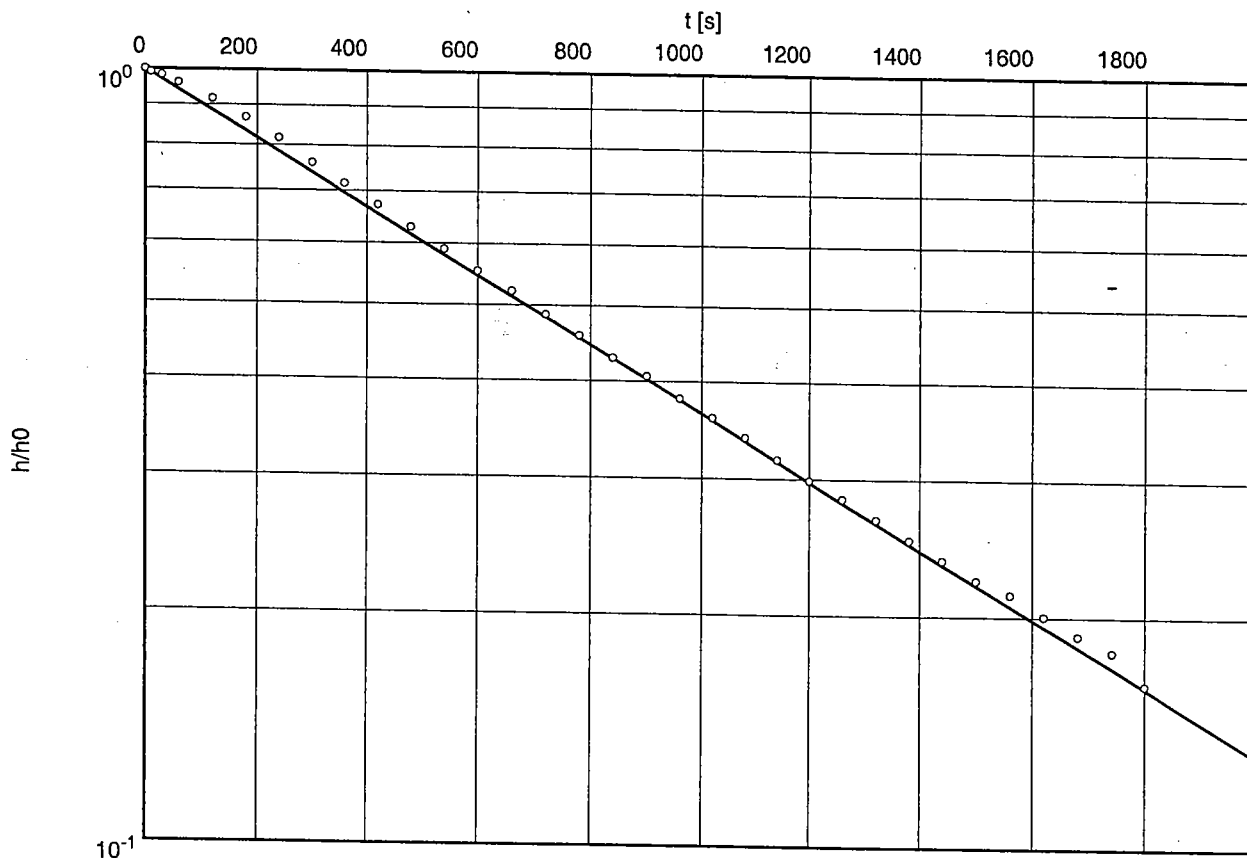
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-7 Run #1

Test conducted on: 3-21-05

W-1 Wetherbee Site



○ W-1 Samp. S-7 Run #1

Hydraulic conductivity [cm/s]: 7.75×10^{-4}

[illegible]

Waterloo Hydrogeologic

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Waterloo, Ontario, Canada

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slug/bail test analysis
HVORSLEV's method

Date: 05.08.2005

Prelim Hydrogeo Report

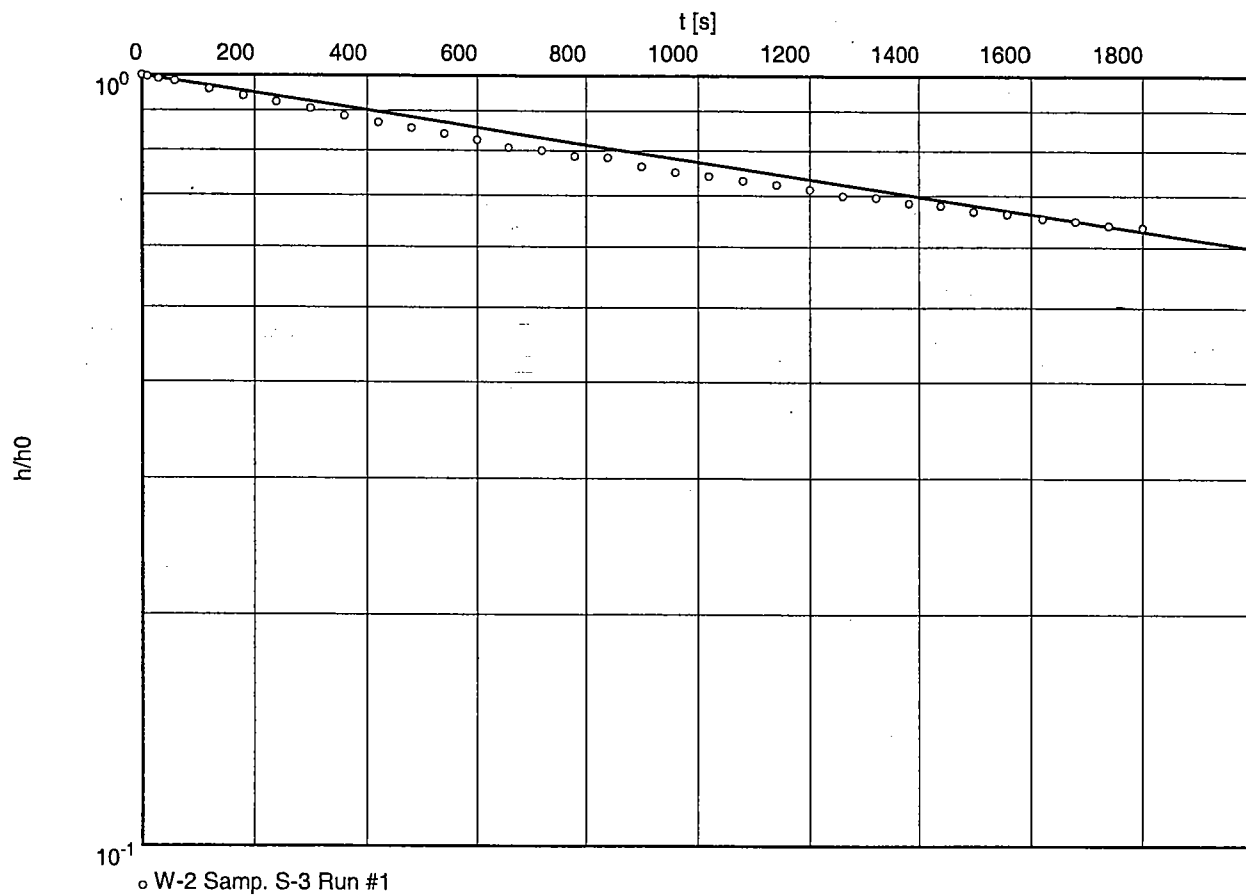
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-3 Run #1

Test conducted on: 3-22-05

W-2 Wetherbee site

Hydraulic conductivity [cm/s]: 1.97×10^{-4}

[illegible]

Waterloo Hydrogeologic

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Waterloo, Ontario, Canada

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slug/bail test analysis
HVORSLEV's method

Date: 09.08.2005

Prelim Hydrogeo Report,

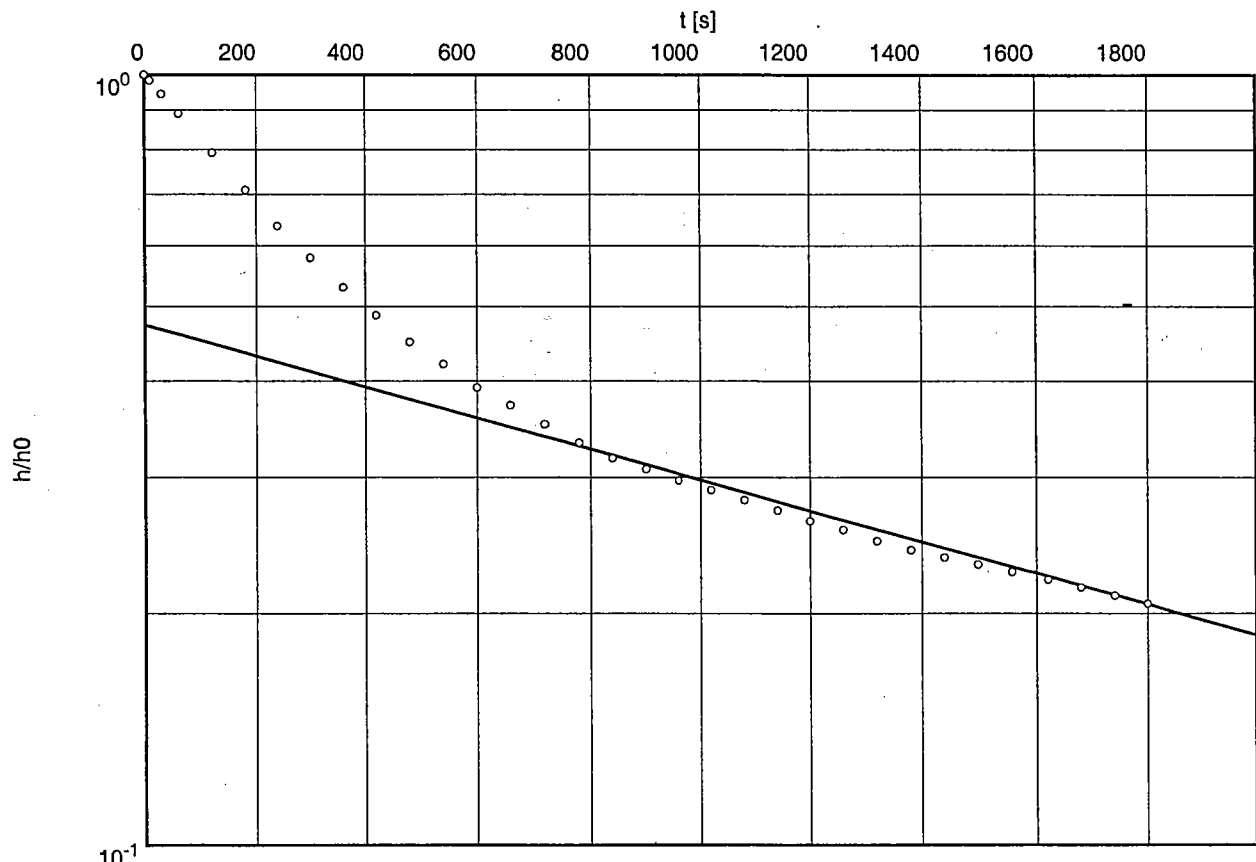
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-8 Run #1

Test conducted on: 3-22-05

Wetherbee Site Well # W-4



○ W-4 Samp. S-8 Run 1

Hydraulic conductivity [cm/s]: 3.55×10^{-4}

[illegible]

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Waterloo, Ontario, Canada

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slug/bail test analysis
HVORSLEV's method

Date: 09.08.2005

Prelim Hydrogeo Report,

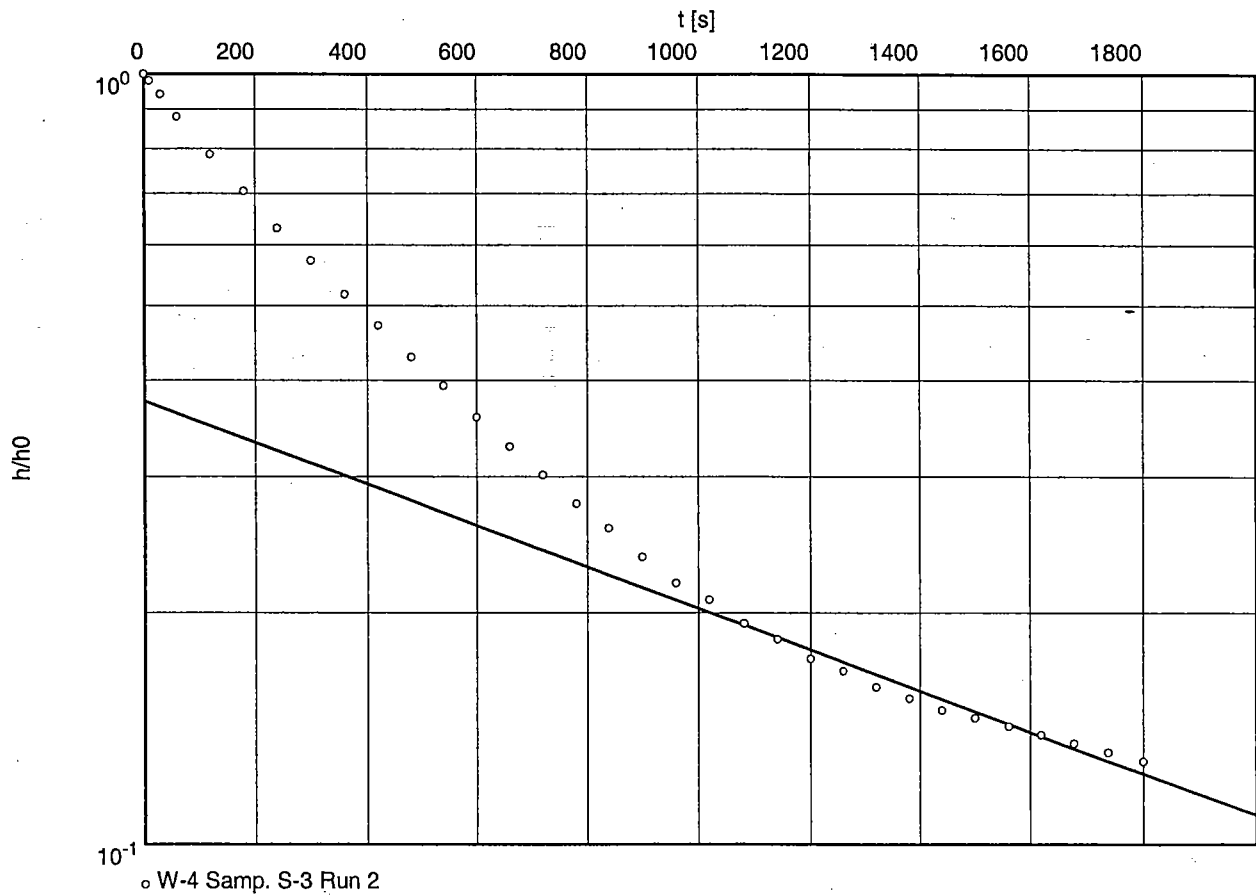
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-3 Run #2

Test conducted on: 3-22-05

Wetherbee Site Well # W-4

Hydraulic conductivity [cm/s]: 4.73×10^{-4}

[illegible]

Waterloo Hydrogeologic

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Waterloo, Ontario, Canada

ph. (519) 746-1798

slug/bail test analysis
HVORSLEV's method

Date: 09.08.2005

Prelim Hydrogeo Report,

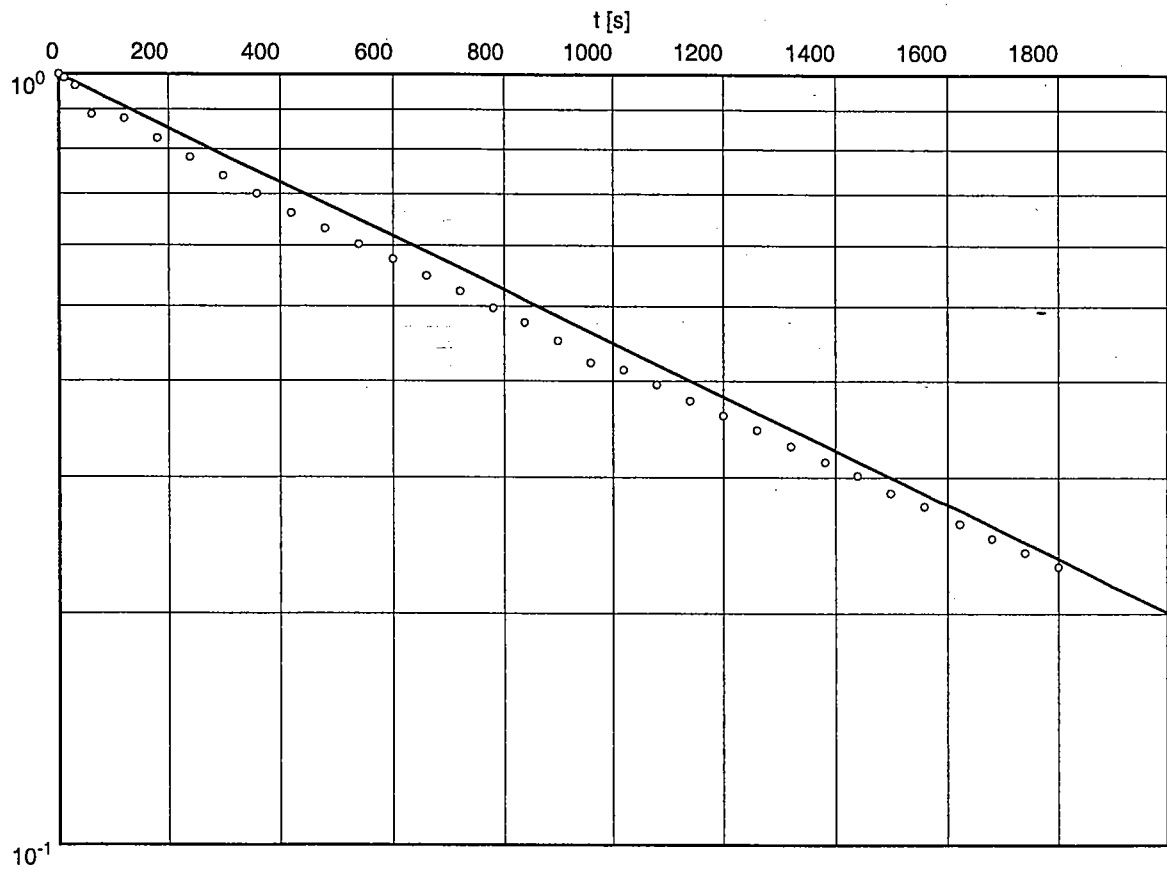
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-4 Run # 2

Test conducted on: 3-22-05

A-2 Adams St

 h/h_0 Hydraulic conductivity [cm/s]: 6.15×10^{-4}

[illegible]

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Waterloo, Ontario, Canada
ph.(519)746-1798

slug/bail test analysis
HVORSLEV's method

Date: 09.08.2005 Prelim Hydrogeo Report

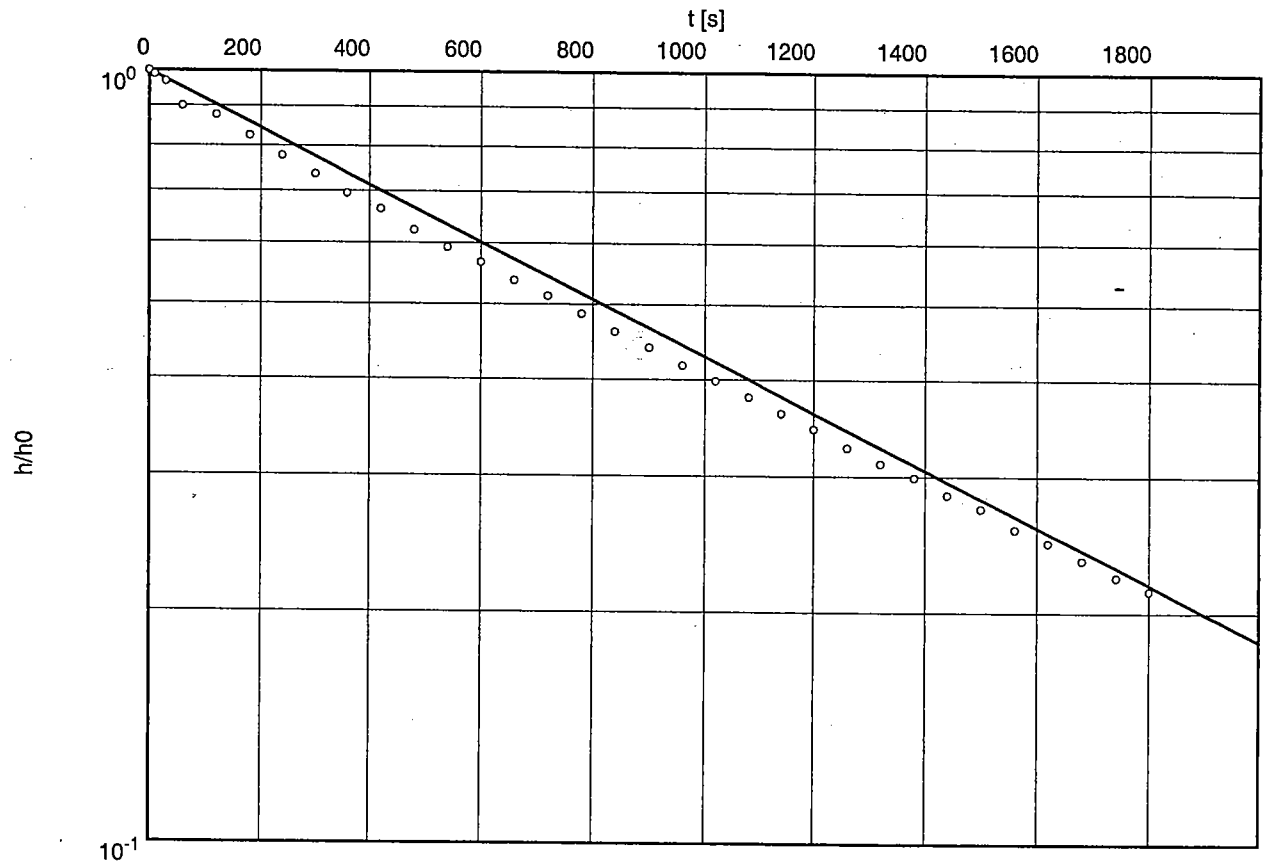
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-4 Run #1

Test conducted on: 3-24-05

A-2 Adams St



Hydraulic conductivity [cm/s]: 6.49×10^{-4}

[illegible]

Waterloo Hydrogeologic

180 Columbia St. W.

Waterloo, Ontario, Canada

ph.(519)746-1798

slug/bail test analysis
Hvorslev's method

Date: 05.08.2005

Prelim Hydrogeo Report

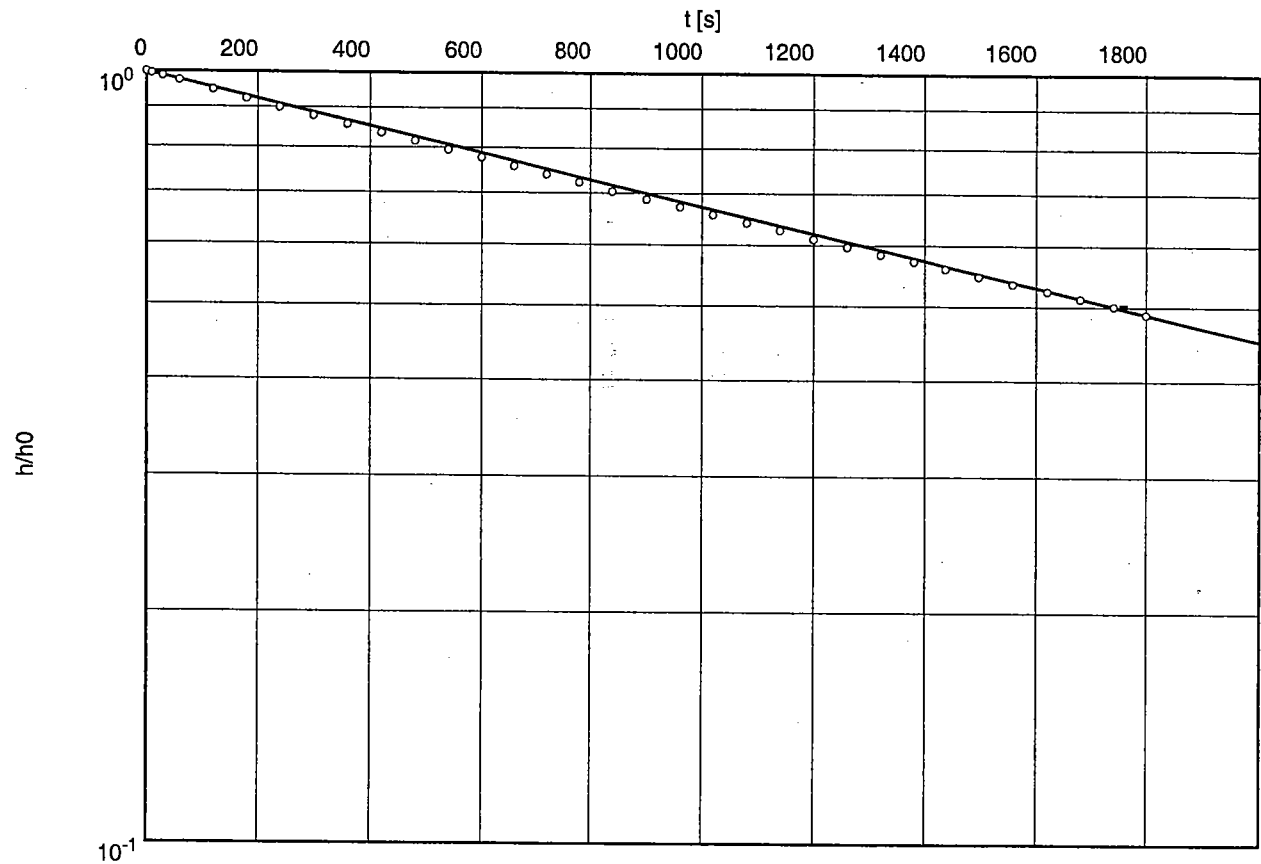
Project: New Acton RIB Sites

Evaluated by: VLT

Slug Test No. S-5 Run 1

Test conducted on: 3-22-05

NA-1 North Acton



o NA-1 Samp. S-5 Run 1

Hydraulic conductivity [cm/s]: 3.04×10^{-4}

[illegible]

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo, Ontario, Canada
ph.(519)746-1798

Pumping test analysis
Time-Drawdown-method after
COOPER & JACOB
Unconfined aquifer

Date: 19.08.2005 Prelim Hydrogeo Report

Project: New Acton Rib Sites

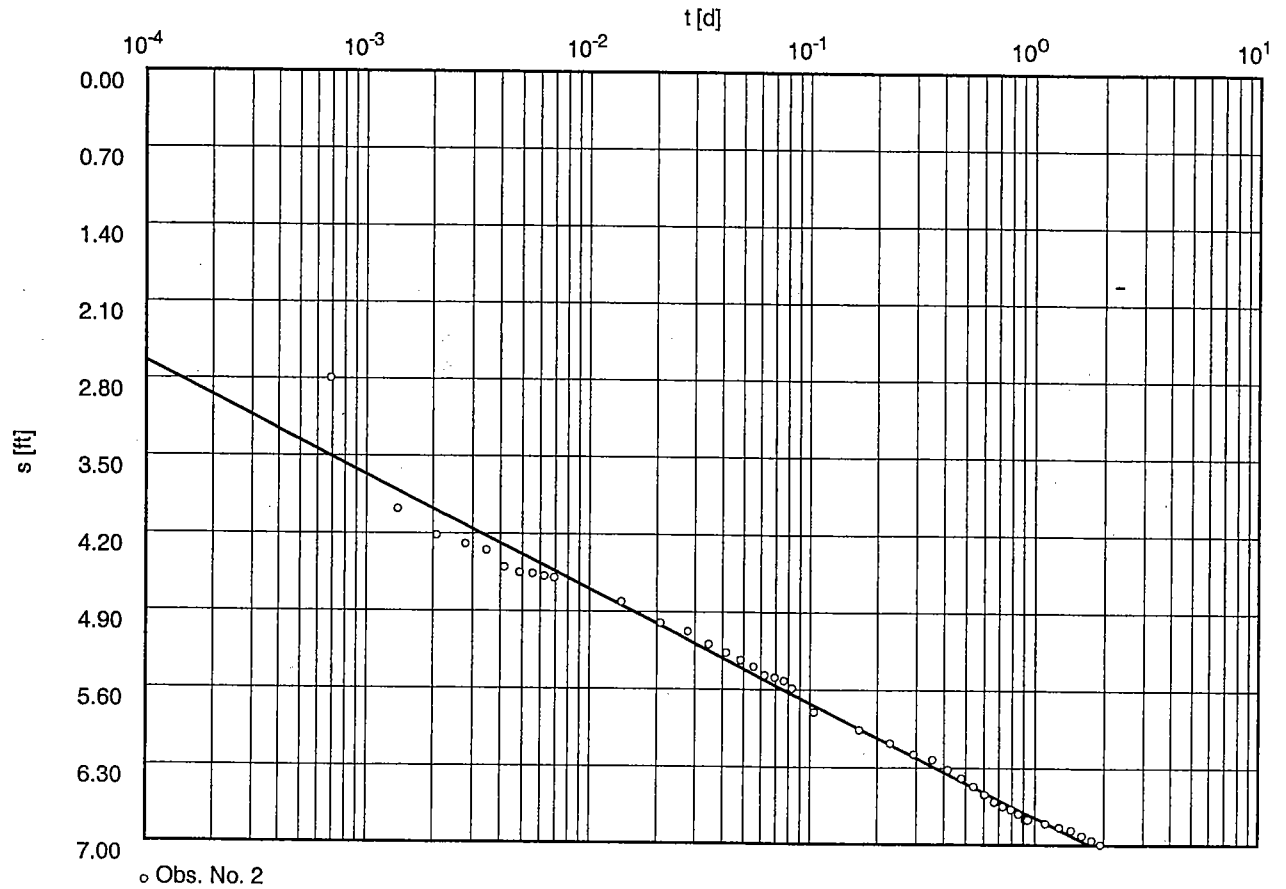
Evaluated by: VLT

Pumping Test No. Well 2A

Test conducted on: 5-3-00 - 5-4-00

Assabet 2A High St. Site

Discharge 401.00 U.S.gal/min



Transmissivity [ft^2/d]: 1.37×10^4

Hydraulic conductivity [ft/d]: 5.70×10^2

Aquifer thickness [ft]: 24.10

[illegible]

[illegible]