

20 June 2002
Reference: 143.65

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
Northeast Regional Office
205 A Lowell Street
Wilmington, MA 01887

399 Boylston Street, 6th Floor
Boston, Massachusetts 02117
(617) 267-8377
(617) 267-6447 (fax)

<http://www.erm.com>



RE: Revised Scope of Work: Additional Site Characterization Activities
Former Raytheon Facility
430 Boston Post Road
Wayland, Massachusetts
Permit No. 133939

Dear Sir or Madam:

On behalf of Raytheon Company (Raytheon), Environmental Resources Management (ERM) is submitting this Scope of Work to conduct additional site characterization activities at the former Raytheon facility located at 430 Boston Post Road in Wayland, Massachusetts (the "Site;" Figure 1).

BACKGROUND

In accordance with the requirements of the Massachusetts Contingency Plan (MCP), 310 CMR 40.0480, ERM submitted a Phase I-Initial Site Investigation (Phase I) report for the Site to the Massachusetts Department of Environmental Protection (DEP) in July 1996 and a Tier Classification filing in January 1997. The DEP issued Raytheon a Tier IB Permit, effective 21 May 1997. In accordance with the Public Involvement Plan (PIP) dated in 10 November 2000, the draft Phase II-Comprehensive Site Assessment (Phase II) and Phase III-Remedial Site Investigation was submitted for Public Comment on 10 October 2001. A completed Phase II and III were submitted to DEP on 28 November 2001. Raytheon intends to submit an addendum to the Phase II and Phase III Reports in order to address PIP concerns.

Results of the Phase II have linked a suspected area of stunted growth to elevated levels of metals, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs). The reduced stem count of biota in this area indicates that a potential imminent hazard may exist,

based on the criteria set forth in 310 CMR 40.0955(3). The potential Imminent Hazard Condition was reported to the DEP on 26 April 2000.

Pursuant to 310 CMR 40.0530, a Major Permit Modification Application was filed on 25 May 2000 to upgrade the Site tier classification and permit from IB to IA following re-evaluation of the Site Numerical Ranking Score (NRS). On 7 September 2000, Raytheon received a Notice of Proposed Permit Decision from the DEP. The DEP determined, based on its review of the Major Permit Modification Application that a new Tier IB permit would be issued with conditions.

An IRA Plan was submitted to the DEP on 26 June 2000 following the imminent hazard determination. The Imminent Hazard Evaluation determined that the Site did not pose an Imminent Hazard to human health or safety, but posed a statutory Imminent Hazard to the environment. The objective of the IRA Plan was to continue to assess Site conditions in the wetlands, to delineate the extent of impact to wetland sediments and surface water, and to assess risk to human health and the environment according to the Phase II Scope of Work and addendum previously submitted to DEP.

During the months of December 2001 through April 2002, the DEP conducted an investigation to evaluate the potential origin of volatile organic compounds (VOCs) detected in the Town of Wayland's Baldwin Pond wellfield. As part of this investigation, the DEP installed a total of 26 permanent steel drive points and collected a total of 52 groundwater samples from various intervals for screening analyses of VOCs using gas chromatography. Several monitoring points detected varying levels of VOCs in groundwater. These data will be presented by the DEP in a forthcoming memorandum, a copy of which will be filed by Raytheon in the PIP Repository.

Four of the DEP's wells (i.e., DEP-19S, DEP-19M, DEP-20 and DEP-21) were installed immediately north of the Site and monitoring well, MW-TP-3. Trichloroethene (TCE) was detected in groundwater collected from three of these wells (i.e., all wells except DEP-19S) at concentrations ranging from 2.9 micrograms per liter ($\mu\text{g}/\text{L}$) to 146 $\mu\text{g}/\text{L}$. The highest concentration sample was collected from well DEP-21 at a depth of 30 to 40 feet below grade. This well is located approximately 300 feet northwest of well MW-TP-3.

PROPOSED SCOPE OF WORK

The purpose of this Scope of Work is to conduct additional assessment activities. These activities consist of advancing monitoring wells, soil borings, and collecting additional wetland soil and groundwater sampling. The results of the additional assessment activities will be shared with the PIP and documented in a Phase II/III Addendum Report. To achieve this purpose, the following activities are proposed:

- Advance soil borings and install monitoring wells;
- Install monitoring wells in a portion of the wetland;
- Advance cone penetrometer (CPT) borings and install monitoring wells;
- Conduct soil oxidant demand tests;
- Survey newly-installed wells; and,
- Conduct groundwater monitoring
- Conduct additional sampling of wetland soil/sediment
- Advance soil borings in upland adjacent to wetland boundary.

The proposed Work Plan is presented in a series of tasks designed to achieve the above objectives. The rationale for each task and a description of the activities included in the proposed Scope of Work are described below. It is important to note that the order in which the tasks are presented does not represent the order in which they will be conducted. The project schedule will be determined based on the need to conduct some tasks before others, Site accessibility, and coordination with the Town of Wayland Conservation Commission.

ERM will conduct soil boring advancement, well installation, groundwater gauging and groundwater monitoring activities in accordance with accepted practices outlined in the DEP's Standard References for Monitoring Wells, WSC-310-91, dated April 1991 and updated July 1994.

Task 1: Proposed Groundwater Characterization Activities

The purpose of this task is to install additional groundwater monitoring points to further substantiate the conclusions of the Phase II and III reports. Raytheon has agreed to complete the additional groundwater

characterization activities in response to public concerns addressed during the PIP process.

In addition, Raytheon intends to further investigate the source, nature and extent of the TCE detected in the DEP wells located immediately north of MW-TP-3 (DEP-19M, DEP-20 and DEP-21). To do so, Raytheon proposes to implement a phased investigation in the northern portion of the Site. The first phase of this investigation is documented in this task. Any ensuing investigation activities will be documented in a forthcoming SOW that will be developed following generation and review of data collected as part of the current SOW.

Prior to initiating the proposed field program, Raytheon will obtain proper access to all properties and coordinate with the Town of Wayland Conservation Commission and the PIP.

ERM proposes to advance at least 29 soil borings and install at least ten monitoring well triplets at the Site. Refer to Figure 2 for a schematic of a well triplet. Each well triplet will consist of a water table well, an intermediate overburden well (i.e., well screen set approximately half way between the top of glacial till and the water table) and a deep overburden well (i.e., well screen set immediately above the till layer). The wells will be installed at the following locations (Figure 3):

- At least five locations, north and east of MW-TP-3;
- At least two locations east of MW-40; and,
- At least three locations on the Russell's Garden Center property.

ERM will install intermediate and deep overburden wells adjacent to existing monitoring well MW-TP-3 and will install a well triplet at the location of MW-1. In addition, three well triplets will be installed to the north, northwest or west of MW-TP-3. ERM will collect groundwater for analysis of VOCs in the field during installation of these wells. The first well will be installed north of MW-TP-3 and the other two well triplet locations will be determined based on the data generated during installation of the first well cluster. If appropriate, additional well triplets may be installed on or north of the Site, as noted above. ERM will review the field data to evaluate the potential need to install a bedrock well(s) in this portion of the Site. The need for bedrock wells will be determined by reviewing VOC concentrations in the deepest overburden wells installed as part of this investigation.

Soil borings will be advanced at each location using a Geoprobe direct push rig, truck-mounted drill rig or an all terrain vehicle (ATV) drill rig, depending on access and drilling conditions. Borings will be advanced using either direct push or hollow-stem auger (HSA) drilling techniques. Soil samples will be collected continuously when using direct push techniques, as conditions allow. Soil samples will be collected at five-foot intervals using split spoon sampling techniques when using HSA drilling techniques. Soil samples will be screened in the field for total VOCs using a photoionization detector (PID) and the jar headspace method. Select soil samples will be collected for laboratory analysis by EPA Method 8260. A field gas chromatograph (GC) will be used at select locations to provide data for field decisions such as monitoring well placement and vertical extent of monitoring well installation.

Following advancement of each borehole, a monitoring well will be constructed using either one-inch inside diameter (ID) or two-inch ID poly vinyl chloride (PVC), 0.010-inch machine slotted, well screen, PVC riser pipe, sand filter pack, bentonite seal, concrete surface seal and a flush-mounted roadbox. The deep and intermediate overburden wells will be constructed using five-foot well screens and the water table wells will be installed using ten-foot well screens. Monitoring wells will be developed following installation.

Task 2: Proposed Monitoring Wells in Wetlands

At least three piezometer couplets are proposed along the northwestern property boundary within the mapped wetlands located along the Sudbury River (Figure 2). Each well couplet will consist of:

- A shallow well installed to a depth of seven feet below grade;
and,
- A deep well installed to a depth of 30 feet below grade.

These borings will be advanced using either direct-push methods or a tripod drill rig using drive and wash drilling techniques. ERM prefers to use direct-push drilling methods within the resource area if subsurface geologic conditions are suitable. If drive and wash drilling techniques are necessary, ERM will contain drill cuttings and drill water and store them in appropriately labeled drums in a location outside of the resource area. ERM will file a Notice of Intent (NOI) with the Town of Wayland Conservation Commission to conduct the above mentioned activities

within the wetland resource area and buffer zone. The PIP participants will be notified of any and all public meetings concerning the NOI.

Soil samples will be collected continuously when using direct push techniques. As drilling conditions allow, soil samples will be collected at five-foot intervals using split spoon sampling techniques when using HSA drilling techniques. Soil samples will be collected during advancement of the deep boring at each well couplet location. Soil samples will be screened for total VOCs using a PID and the jar headspace method. Select soil samples will be collected for laboratory analysis.

Following advancement of each boring, monitoring wells will be constructed using either one-inch or two-inch ID, PVC, five-foot long, 0.010-inch machine slotted well screen, PVC riser pipe, sand filter pack, bentonite seal, concrete surface seal and a protective standpipe. Wells will be developed following installation.

Task 3: Proposed Pre-Design Assessment Activities

The purpose of this task is to complete additional subsurface characterization to support design of comprehensive remedial actions for groundwater at the Site. The Phase III report recommended that in situ chemical oxidation (ISCO) as the preferred remedy to treat impacted groundwater at the Site. In order to support the recommended cleanup method from the Phase III, additional soil and groundwater screening is needed.

Hydrogeologic characterization within the southwestern portion of the former Raytheon property is proposed using a cone-penetrometer (CPT). CPT borings will be advanced to the top of bedrock or refusal at up to nine locations to gather detailed stratigraphic (i.e., grain size) data (Figure 3). These data will be used to evaluate heterogeneity and identify layers of coarser-grained soil that may impact the effectiveness of an ISCO remedial system.

At least nine well clusters consisting of three wells will be installed at each location. These well clusters will likely consist of water table wells, intermediate overburden and deep overburden wells, similar to those described in Task 1. The exact locations of the wells will be determined from existing data and CPT results.

In addition, six additional borings will be advanced using a Geoprobe direct-push drill rig around the main building (Figure 3). Five of these borings will be advanced to the top of the silt layer that is present around the main building. This silt layer acts as an aquitard in this portion of the Site, resulting in the presence of the highest VOC concentrations at the top of this layer and minimal or no VOCs detected beneath this layer. One of the proposed wells will be installed in the silt layer adjacent to the existing MW-43 well couplet. Single monitoring wells will be installed in each boring to evaluate the lateral and vertical extents of impact downgradient of MW-43.

Following advancement of each boring, monitoring wells will be constructed using either one-inch or two-inch ID, PVC, five-foot long, 0.010-inch machine slotted well screen, PVC riser pipe, sand filter pack, bentonite seal, concrete surface seal and a protective standpipe. Wells will be developed following installation.

Although advancement of several monitoring wells is proposed, additional borings may be completed as monitoring wells based on field data.

Task 4: Conduct Soil Oxidant Demand Tests for Potential ISCO

The purpose of this task is to gather additional data to support design of comprehensive remedial actions for groundwater at the Site. ERM proposes to conduct additional bench-scale tests to determine the soil oxidant demand (SOD) at five locations across the Site. SOD is a measure of reduced aquifer material, including natural organic carbons, such as humic and fulvic acids, and reduced minerals. Using both the observed TCE concentrations in groundwater and the natural soil oxidant demand, ERM will calculate the required concentration of oxidant to be injected as part an ISCO treatment system. The bench-scale tests require five kilograms of soil from each location. Soil samples will be collected during advancement of the soil borings for SOD.

Task 5: Survey Newly-Installed Wells

ERM will survey the locations and elevations of newly installed monitoring wells relative to the national geodetic vertical datum (NGVD) to allow for direct comparison of Site groundwater and surface water elevations with United States Geologic Survey (USGS) gauging data for

the Sudbury River. A staff gauge will also be installed at the Route 20 bridge. As part of the proposed comprehensive groundwater monitoring round (see Task 6), ERM will gauge all monitoring wells at the Site to determine groundwater elevations and evaluate horizontal and vertical hydraulic gradients. ERM will update existing tables (see Phase II report) to include these data. In addition, ERM will use these data to update the conceptual site model and document it in future reports.

Task 6: *Proposed Groundwater Monitoring*

The purpose of this task is to collect the data necessary to evaluate groundwater quality and flow patterns. To accurately determine the groundwater flow patterns, ERM will gauge each well using an electronic water level indicator.

ERM will collect groundwater samples from all Site monitoring wells plus four of the DEP wells (DEP-19S, DEP-19M, DEP-20 and DEP-21) after all new wells are installed. Groundwater samples from the newly installed wells and the DEP wells will be analyzed for VOCs by EPA Method 8260. Groundwater samples from existing Site wells will be analyzed for VOCs by EPA Method 8021C.

Groundwater samples collected from the six wetland wells will also be sampled for dissolved priority pollutant metals (PP13), PCBs by EPA Method 8082 and PAHs by EPA Method 8270C. Groundwater samples collected from the vicinity of MW-45D will be analyzed for PP13 metals.

Groundwater samples collected from the MW-TP-3 triplet, MW-43S/43D and the MW-33 well cluster will also be analyzed for the following parameters:

- Physiologically available cyanide by the MA DEP Method
- Boron by EPA Method 200.7/6010B
- Fluoride by IC - EPA Method 300.0
- Phosphorous by EPA Method 365.2
- Ammonia by EPA Method 350.1
- Nitrate by EPA Method 353.2
- Chloride by EPA Method 325.2
- Aldehydes by EPA Method 8315

- Alcohols by ASTM D 3695
- Glycols by ASTM E 202
- Polychlorinated dibenzo-p-dioxins (PCDDs) and Polychlorinated dibenzo-p-dibenzofurans (PCDFs)- EPA Methods 1613b and 8290
- PCBs by EPA Method 8082
- PAHs by EPA Method 8270C

If some of these analytes are detected in groundwater at these locations, Raytheon will evaluate collecting additional groundwater samples for the detected analytes to evaluate the nature and extent of impact in groundwater. Similarly, if other analytes are detected in wetlands soils (see Task 7), then groundwater samples may be analyzed for additional parameters to evaluate potential impacts to groundwater. If a high pH is detected at newly installed monitoring wells in the vicinity of MW-45D, groundwater samples will be analyzed for dissolved PP-13 metals at those locations.

Groundwater samples will be collected using one of the following techniques, depending on the well type and recharge characteristics:

- Dedicated bailers for water table wells; or,
- Low-flow sampling techniques for deep or one-inch diameter wells.

Geochemical field parameters will be measured from each well at the time of sample collection, including: temperature, conductivity, pH, dissolved oxygen and oxidation-reduction potential (ORP). Samples will be preserved on ice and sample handling will be documented using chain-of-custody protocols. For Quality Assurance/Quality Control (QA/QC) purposes, ERM will collect one duplicate sample for every ten samples collected and one trip blank per cooler. ERM proposes to use dedicated sampling equipment, which alleviates the need to collect equipment blanks. Laboratory analyses will be conducted by a Massachusetts-certified laboratory, which will document its methods, method detection limits (MDLs) and quality control procedures. Following review of the groundwater results, ERM will update the risk assessment, as appropriate.

Task 7: Proposed Wetland Soil/Sediment Sampling

The purpose of this task is to screen wetland soil/sediment for additional parameters in the Area of Readily Apparent Harm (ARAH). At least six locations will be sampled for the following parameters:

- Volatile Organic Compounds - EPA Method 8260
- Polychlorinated dibenzo-p-dioxins (PCDDs) and Polychlorinated dibenzo-p-dibenzofurans (PCDFs)- EPA Methods 1613b and 8290
- Physiologically available cyanide - MA DEP Method
- Boron - EPA Method 200.7/6010B
- Fluoride by IC - EPA Method 300.0
- Ammonia - EPA Method 350.1
- Phosphorous by EPA Method 365.2
- Nitrate by EPA Method 353.2
- Chloride by EPA Method 325.2
- Aldehydes - EPA Method 8315
- Alcohols - ASTM D 3695
- Glycol Ethers - ASTM E 202

Specific analytes for the PCDD/PCDF analysis.

| Congener | | Congener | |
|----------|---------------------|----------|---------------------|
| PCDDs | 2,3,7,8-TCDD | PCDFs | 2,3,7,8-TCDF |
| | 1,2,3,7,8-PeCDD | | 1,2,3,7,8-PeCDF |
| | 1,2,3,4,7,8-HxCDD | | 2,3,4,7,8-PeCDF |
| | 1,2,3,6,7,8-HxCDD | | 1,2,3,4,7,8-HxCDF |
| | 1,2,3,7,8,9-HxCDD | | 1,2,3,6,7,8-HxCDF |
| | 1,2,3,4,6,7,8-HpCDD | | 1,2,3,7,8,9-HxCDF |
| | OCDD | | 2,3,4,6,7,8-HxCDF |
| | | | 1,2,3,4,6,7,8-HpCDF |
| | 1,2,3,4,7,8,9-HpCDF | | |
| | OCDF | | |

Two to four of the samples will be horizontal composites of a 100 square feet (ft²) area. The balance of the samples will be collected from individual locations between six and 12 inches below grade. ERM will

also collect two composite samples for analysis of applicable disposal characterization parameters. Proposed sample locations are illustrated in Figure 1. Exact sample locations will be field decisions. For Quality Assurance/Quality Control (QA/QC) purposes, ERM will collect one duplicate sample for every ten samples collected. ERM proposes to use dedicated sampling equipment, which alleviates the need to collect equipment blanks. Analyses will be conducted by a Massachusetts-certified laboratory.

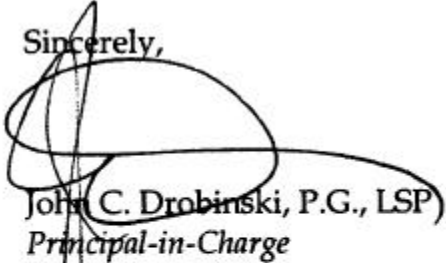
Raytheon will work with the Town's consultant in evaluating the need for additional wetland soils background samples..

Task 8: Proposed Soil Borings in Upland

The purpose of this task is to screen the soils that comprise the bank adjacent to the eastern wetland boundary (See Figure 3). A Geoprobe will be used to advance at least twelve soil borings to the water table (6 to 8 feet) or the silt layer, whichever is encountered first. These soil borings will be advanced following the wetlands sampling activities discussed in Task 7 to allow for evaluation of the data. Soils will be screened visually and using a PID for detection of petroleum hydrocarbons and VOCs. Based on PID screening results and visual observations, select soil samples will be sent to a laboratory for analysis. At a minimum, select soil samples will be analyzed for PP13 metals plus barium, boron, hexavalent chromium, iron, manganese, tin and vanadium. Additional soil analytes may be performed depending on results of the sediment sampling activities discussed in Task 7. A monitoring well will be installed in at least one soil boring location, based on the results of screening data.

If the DEP requires information or additional clarification regarding this submittal, please contact us at (617) 267-8377.

Sincerely,



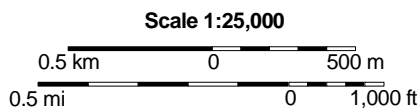
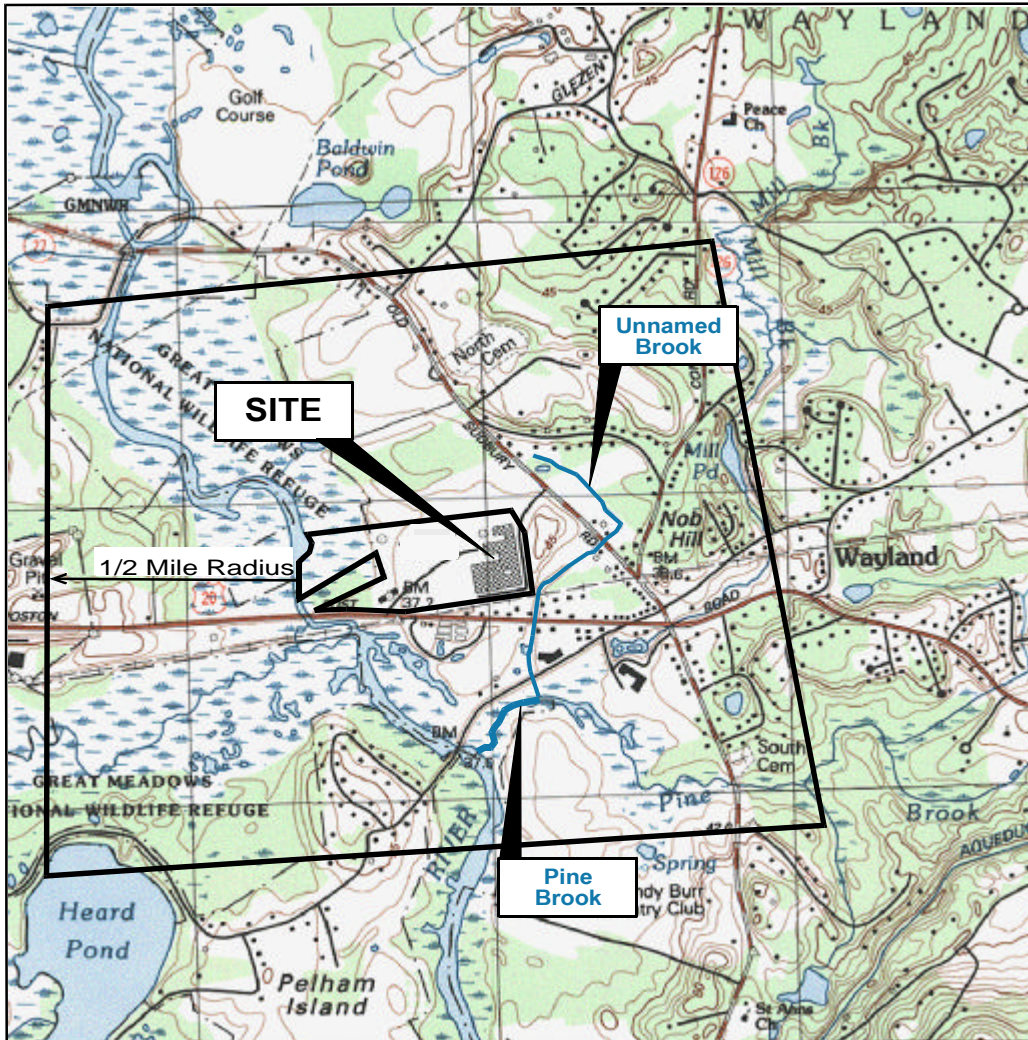
John C. Drobinski, P.G., LSP)
Principal-in-Charge


Joe Fiaco
R. Joseph Fiacco, Jr., P.G.
Project Manager

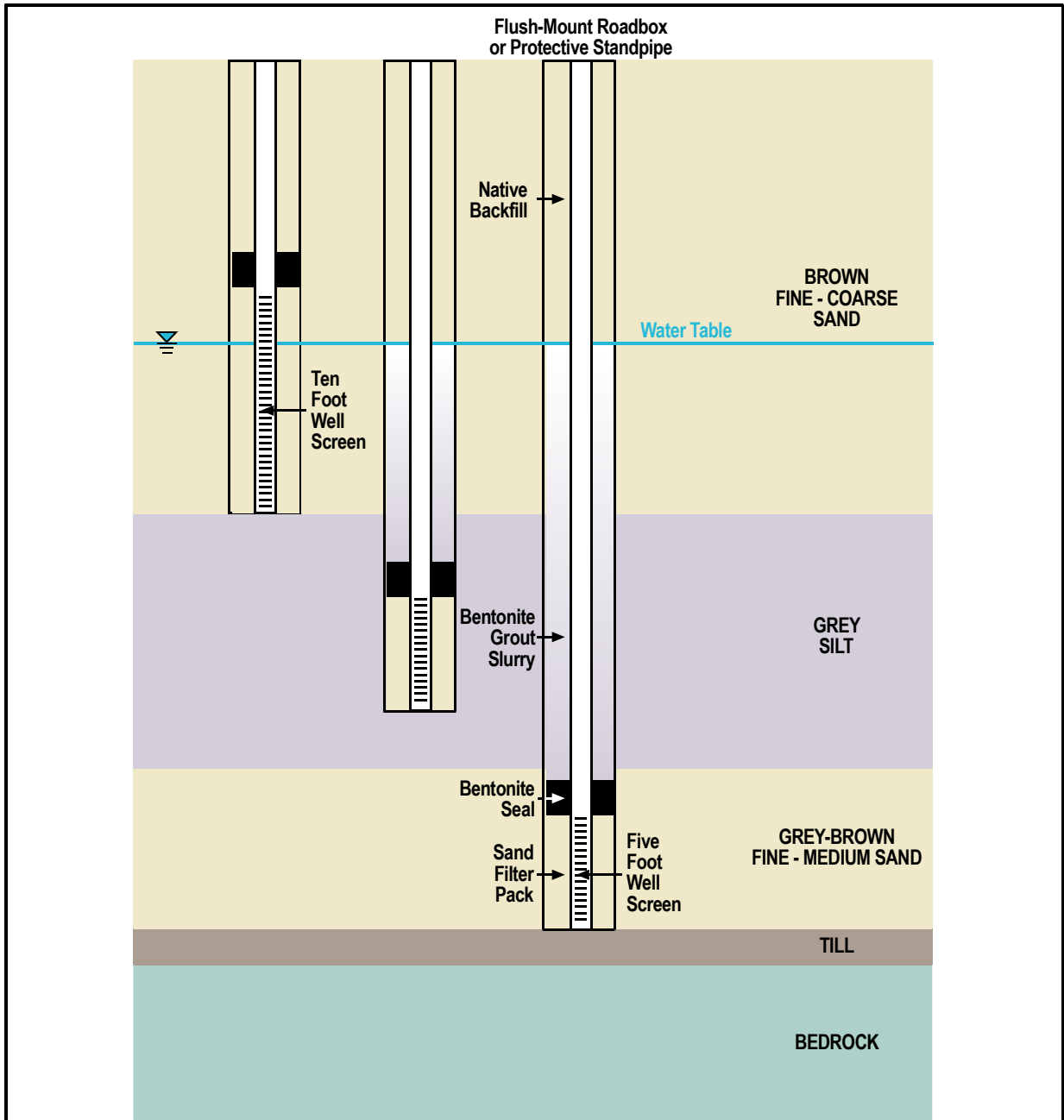
Attachments: **Figure 1 – Locus Map**
 Figure 2 – Well Triplet Construction Schematic
 Figure 3 – Existing and Proposed Boring and Well
 Location Map


cc: Edwin Madera, Raytheon Company
 Karen Stromberg, DEP
 Paula Phillips, Congress Group
 Wayland Board of Health Repository
 Wayland Public Library Repository
 PIP Mailing List

Figures



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|--|-----------|-----------------------|-----------------|
|  ENVIRONMENTAL RESOURCES MANAGEMENT | | | |
| 399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377 | | | |
| CLIENT NAME: | Raytheon | DRAWN BY: RJF | DATE: 5/1/02 |
| FILE NAME: | Locus Map | SCALE: 1:25,000 | PROJ: 143.65 |
| Raytheon Company 430 Boston Post Road Wayland, Massachusetts | | | |
| SITE LOCUS MAP | | | FIGURE NO: 1 |
| PRINCIPAL-IN-CHARGE: JD | | PROJECT MANAGER: JMcT | |



| | | |
|---|-----------------------|-------------------------|
|  ENVIRONMENTAL RESOURCES MANAGEMENT | | |
| 399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377 | | |
| CLIENT NAME: Raytheon | DRAWN BY: RJF | DATE: 4/30/02 |
| FILE NAME: Well Triplet Schematic | SCALE: Schematic | PROJ: 143.65 |
| Raytheon Company 430 Boston Post Road Wayland, Massachusetts | | |
| WELL TRIPLET CONSTRUCTION SCHEMATIC | | FIGURE NO.: 2 |
| PRINCIPAL-IN-CHARGE: JD | PROJECT MANAGER: JMCT | |



| LEGEND | |
|--------|---|
| | Existing Monitoring Well |
| | Proposed Monitoring Well Cluster |
| | Proposed Single Monitoring Well |
| | Proposed CPT Boring/Monitoring Well Cluster |
| | Proposed Soil Sample/Borings in Upland |
| | Proposed Soil Sample/Borings in Wetland |

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|--|----------------------|------------------|
| ENVIRONMENTAL RESOURCES MANAGEMENT | | |
| 399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377 | | |
| CLIENT NAME: Raytheon | DRAWN BY: RJF | DATE: 3/13/02 |
| FILE NAME: Proposed Well Loc. | SCALE: 1"=250' | PROJ: 143.65 |
| RAYTHEON COMPANY 430 Boston Post Road Wayland, Massachusetts | | |
| Aerial Photograph Existing and Proposed Well/Sample Locations | | FIGURE NO.: 3 |
| PRINCIPAL-IN-CHARGE: JD | PROJECT MANAGER: RJF | |