FINAL REPORT

Raytheon Company

Response to Public Comments
Phase II & III Reports
Former Raytheon Facility
430 Boston Post Road
Wayland, Massachusetts

24 December 2001

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Environmental Resources Management
399 Boylston Street, 6th Floor
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ATTACHMENTS

RESPONSE TO CONSERVATION COMMISSION

1a. Delineation of the boundaries of the trichloroethene (TCE) plume and the disposal site, as defined by the Massachusetts Contingency Plan (MCP), southwest of the site has not been characterized. Temporal and spatial data are necessary to define the magnitude and extent of TCE migration between the site and the Sudbury River to the southwest. Data presented in the Phase II report do not extend beyond the property line, nor are they sufficient to determine whether the leading edge or trailing edge of the plume now exists at the property line. For example, depicting groundwater concentrations for one snapshot in time, as was shown in Figure 15 of the Phase II report, is insufficient to show how the plume has migrated over time and whether higher concentrations exist off-site. In addition, page 12 of the Phase III report refers to the extent of TCE impact in groundwater mapped in this figure, yet the plume is shown as open ended. Further, the comment on page 81 of the Phase II report and page 4 of the Phase III report (extrapolation of the extent of groundwater impact downgradient indicates dilution to below the analytical reporting limits) is unsubstantiated by the data presented. Based on this data gap, the installation and testing of additional well clusters are warranted between the Raytheon property line and the river to the southwest.

The boundaries of the trichloroethene (TCE) plume to the southwest have been inferred based on the extrapolation of contaminant concentration gradients from source areas along the downgradient groundwater flow paths to potential groundwater discharge points at the Sudbury River. The extrapolation is based on temporal and spatial variations in Site groundwater flow and contaminant transport patterns using six years of Site groundwater monitoring data collected during 13 sampling events conducted from 1995 through 2001. The results indicate relatively steady-state conditions, with contaminant concentrations generally decreasing with time and distance from source areas along downgradient flow paths. As such, it is ERM's opinion that existing data are adequate to establish the need for remedial response actions, evaluation of remedial alternatives and selection of the preferred alternative to achieve abatement. To further address public comments, Raytheon will install additional groundwater monitoring points to further substantiate the conclusions of the Phase II and III Reports.

1b. The Phase III report includes the statement that there is no complete pathway to drinking water, yet the extent of the TCE plume in the direction of the Baldwin Water Supply wells is not completely defined. With regard to the northwest portion of the site, localized groundwater elevation data presented on

Figure 12 of the Phase II report, suggest a possible flow component to the north/northwest. For example, well MW-1 has a higher water table elevation (124.78 feet) than two wells, MW-TP-3 (122.94) and MW-32 (122.33), located to the northwest. This potential component of groundwater flow, the presence of 4.2 parts per billion (ppb) of TCE at a historic release location (well MW-TP-3), and the detection of low concentrations of chlorinated compounds at the Baldwin wells, raise a concern that a portion of the plume may be migrating toward, or is being influenced by, these drinking water supply wells. Therefore, the installation and testing of additional well clusters placed between MW-TP-3 and the Baldwin wells are warranted.

It is ERM's opinion that there is an extremely low potential that contaminants in Site groundwater could migrate to, and adversely impact, groundwater withdrawn for drinking water at the Baldwin Pond Wellfield. Watertable elevations indicate the primary direction of groundwater flow from the source area (manhole W-4) is south/southwest, opposite to the location of the wellfield. Groundwater in the northwestern portion of the Site flows to the west-southwest toward the Sudbury River. ERM presented groundwater elevation data from six groundwater monitoring events in Table 5 of the Phase II report. These monitoring events were conducted over a three-year period during the spring (May 1998 and April 2000), summer (July 1999 and July 2000) and fall (November 1998 and September 1999). These monitoring events represent both seasonal high groundwater (spring) and low groundwater (summer - fall) elevations to evaluate potential temporal changes in groundwater flow directions at the Site. ERM has determined that groundwater from the Site does not flow to the north toward the Baldwin Pond Wellfield. Groundwater contour maps for additional gauging rounds are included in Attachment A.

The Zone II delineation for the Baldwin Pond Well Field approved by the Massachusetts Department of Environmental Protection (MA DEP/Department, Bureau of Resource Protection,) suggests a low potential for the wellfield to induce migration of TCE in Site groundwater toward the wellfield, even under worst-case pumping conditions. Therefore, the primary pathway for OHM migration to the Baldwin Pond Wellfield is via discharge of impacted groundwater to surface water and induced flow of surface water to groundwater into the wells via pumping. It is ERM's opinion that the low levels of TCE (4.5 to 23 ug/l) detected at the northern boundary of the Site would be reduced to undetectable levels by dilution and dispersion during migration and therefore could not account for the low level of TCE detected in the Baldwin Pond Wellfield in November 2000. ERM installed and sampled well MW-32 southwest and down gradient of MW-TP-3 to define the

extent of TCE impact in this portion of the Site. No volatile organic compounds (VOCs) have been detected in this well during four monitoring rounds (see Table 8a of the Phase II report). In addition, the fact that the type of contaminants (predominantly petroleum constituents) historically detected in the Baldwin Pond Wellfield are not contaminants of concern at the Raytheon Site, suggest influence from a source of release other than the Raytheon Site. However, additional groundwater characterization will be conducted to verify the low potential for impacted groundwater on Site to adversely impact the Baldwin Pond Wellfield.

1c. The removal action conducted near well MW-TP3 was for a release of polychlorinated biphenyls (PCB)s, yet TCE was detected in that well. Comment both on how data may support or reject the possible existence of a pathway between the source area near the buildings and the detection of TCE at this location.

Site geologic and hydrologic data do not support the existence of a migration pathway between MW-TP-3 and source areas near the former operations buildings. As presented in Figure 12 of the Phase II report, groundwater in the vicinity of the TCE source area (i.e., vicinity of MW-43) flows generally to the southwest. MW-TP-3 is located to the northwest of this location, which is cross gradient of groundwater flow. Therefore, it is unlikely that a pathway exists between the source area and MW-TP-3.

The removal action conducted at TP-3 focused on the abatement of a historic release of polychlorinated biphenyls (PCBs) to soil, but was triggered by the detection of 1,2,4-trichlorobenzene (370 ug/kg), n-propylbenzene (at 29,000 ug/kg) and unknown hydrocarbons (8,600 mg/kg) in soil. Subsequent sampling and analysis indicated the presence of PCBs in soil requiring abatement. Therefore, the presence of low levels of TCE in groundwater at TP-3 is attributed to the residual impact of disposal at this location. However, additional groundwater characterization will be conducted to verify the low potential for impacted groundwater on Site to impact the Baldwin Pond Wellfield.

1d. The extent of TCE impacts to the east of well MW-40 is not defined. The Phase III report suggests that a separate release may have occurred at Drywell DW-05. Therefore, the installation and testing of additional well clusters east of this well is warranted.

Evaluation of groundwater quality to the east-southeast, and downgradient of, MW-40 was conducted by the installation of

monitoring well MW-39 (Figure 6, Phase II Report). Results of soil screening conducted during boring advancement (Table 3, page 2 of 6) and groundwater testing (Table 8a, page 9 of 24) at this location indicated non-detectable concentrations of VOCs in soil and groundwater to the east of MW-40. Therefore, ERM feels that this portion of the Site has been adequately characterized. However, additional groundwater characterization will be conducted in the vicinity of MW-40 to verify the lack of significant impact to groundwater quality in this portion of the Site.

1e. There is an intermittent stream and wetland area to the east of MW-40 in the direction of groundwater flow projected in the Phase II report. Comment on whether there is a possible Condition of Substantial Release Migration and whether samples will be collected to confirm whether TCE has impacted the surface water.

Consideration of a possible Condition of Substantial Release Migration to the east of MW-40 was eliminated based on the absence of a detectable impacts at MW-39, located downgradient of MW-40. Therefore, ERM feels that this portion of the Site has been adequately characterized. However, additional groundwater characterization will be conducted in the vicinity of MW-40 to verify the lack of significant impact to groundwater quality in this portion of the Site.

1f. The three-dimensional extent of the TCE plume is not completely defined. The completeness of the 5 ppb TCE contour shown in Figure 16 of the Phase II report for cross section A-A' is not substantiated by the data shown, since there are no downgradient wells screened at a depth of about 45 feet below surface grade (corresponds to the highest TCE value, 120 ppb, detected in well MW-45M). Additional groundwater data at several depths are needed to definitively represent the three-dimensional extent of the TCE plume for this and other cross sections shown.

We appreciate your comments regarding this figure and have implemented the following modifications to clarify our interpretations. ERM has modified Figure 16 to indicate an open contour to show that TCE concentrations in groundwater extend downgradient (south/southwest) of the existing monitoring well network in response to this comment (see attached Figure 16 in Attachment A). These modifications will be incorporated into the final Phase II Report by submittal of an amendment.

1g. Contrary to the statement on page 46 of the Phase II report, the Russell's Garden Center bedrock well is not the only downgradient receptor. For example,

based on TCE concentrations at the southern property line, groundwater TCE concentrations off-site likely exceed the applicable GW-1 standard of 5 ppb (properties to the southwest are within the Zone II delineation as indicated on Figure 9 of the 1994 Report on the Conceptual Zone II Study of the Baldwin Pond Wellfield). GW-2 standards also could apply off-site since the water table there is likely within 15 feet of existing structures. Although Raytheon contends that concentrations detected with their sampling to date do not exceed GW-2 standards, there are no data to determine whether these standards have been exceeded off-site. In addition, there is no credible presentation why off-site concentrations might not be higher from an older source that has migrated away from the point of origin. Further, there are no wells to provide groundwater data or is there evidence of past attempts to collect indoor air samples to determine whether an active indoor air pathway exists.

The statement on Page 46 regarding the Russell Garden Center bedrock well as being "the only downgradient receptor" is a true statement in the context presented. This section of the report presents a discussion of the fate and transport of contaminants in groundwater. The statement on Page 46 is specific to the migration of VOCs in groundwater to potential downgradient receptors located within the downgradient migration pathway. Since the Russell Garden Center bedrock well is the only well in use within the projected downgradient migration pathway for VOCs in groundwater, this well was identified as the only potential downgradient receptor to VOCs in groundwater. Although areas downgradient of the defined extent of groundwater impact are located within the Zone II for the Baldwin Pond Wellfield, groundwater within this portion of the Zone II is not currently utilized as a source of drinking water. However, in order to consider the most conservative pathways for potential exposure in the risk characterization, the estimation of potential risks to human health posed by OHM in groundwater were developed considering residential ingestion of impacted groundwater as drinking water.

This comment also references the potential applicability of GW-2 groundwater standards. As indicated in the risk characterization, Site groundwater is classified as GW-2. However, GW-2 groundwater standards are only applicable when a Method 1 or Method 2 risk characterization is performed. Since the risk characterization was conducted using Method 3, GW-2 standards are not applicable. The Method 3 risk characterization did consider the potential for adverse exposure by residential receptors (both a child and adult) via inhalation of vapors emanating from VOCs in groundwater. The Method 3 risk characterization concluded that a condition of no significant risk exists for this hypothetical exposure pathway.

1h. Comment on why a monitoring well was not screened in the 25 to 26 foot zone below ground surface at boring location MW-43 to assess groundwater concentrations associated with elevated photoionization detector readings. Comment on the completeness of source characterization since this elevated concentration is located 25 feet bgs without an established connection to a point of discharge or release.

Soil sample S-5 was collected from 25 to 26 feet below grade during advancement of the MW-43D borehole. This sample exhibited a total VOC headspace concentration of 33 ppm. MW-43D was installed adjacent to the existing well MW-43S, which is screened from 15 to 20 below grade, with the intent to evaluate the vertical extent of VOC impacts to groundwater in the source area. Based on the absence of VOC impacts to groundwater in MW-43D and our knowledge of Site conditions in this area (i.e., Phase I data, Catch Basin CB 2.22 abatement data, and WAY-02 removal data and observations), ERM did not believe that it was warranted to install a well screened immediately beneath MW-43S.

1i. Many figures in the Phase II report indicate that the site is defined by the Raytheon property lines. However, the disposal site, as defined by the MCP (40.0006), appears to encompass neighboring properties. Clarification of the boundaries of the "disposal site" is needed to identify all areas where oil and hazardous materials have come to be located.

ERM appreciates your comments regarding this issue. Figures in the Phase II Report are not intended to indicate that the "Disposal Site" is limited to the former Raytheon property lines. The figures display the distribution of the defined extent of groundwater impact using the existing monitoring well network. As indicated in the response to Question (a) above, the downgradient extent of groundwater impact is described in many areas of the Phase II Report text and is based on a downgradient extrapolation of the defined extent of groundwater impact on the former Raytheon facility. In addition, Figures 18a through 18f in the Phase II Report display interpolated concentration contours (zones of similar OHM concentration) for selected OHM in wetland soil/sediment. It is ERM's opinion that these figures clearly indicate that the extent of impact extends onto an adjacent property. In general, figures showing the extent of OHM impact in affected media (groundwater, wetland soil/sediment and surface water) were developed by limiting the graphical depictions to existing sampling locations. It was not ERM's intent to suggest that the boundaries of the "Disposal Site" are limited to the existing sampling locations and/or property boundaries. Text within the Phase II and Phase III Reports indicates that groundwater impacts are

projected to extend west/southwest to the Sudbury River and that wetland soil/sediment impacts are largely limited to within 400 feet of Outfall OF-01. To further address public comments, Raytheon will install additional groundwater monitoring points to further substantiate the conclusions of the Phase II and III Reports.

1j. On page 46 of the Phase II report, an attenuation factor of 10 was applied for groundwater discharging to the river, projecting a surface water concentration of 16 ppb of TCE in surface water. On what groundwater data was this projection based? Until the full extent of the plume is defined to the southwest, there are insufficient data on which to predict what the groundwater concentration is at the point of discharge to the river. A discussion of this attenuation factor and Ambient Water Quality Criteria in this section of the report does not address migration of contaminated groundwater to off-site properties.

The boundaries of the trichloroethene (TCE) plume to the southwest have been inferred based on the extrapolation of contaminant concentration gradients from source areas along the downgradient groundwater flow paths to potential groundwater discharge points at the Sudbury River. The extrapolation is based on temporal and spatial variations in Site groundwater flow and contaminant transport patterns using six years of Site groundwater monitoring data collected during 13 sampling events conducted from 1995 through 2001. The extrapolation utilized average TCE concentrations at existing monitoring points to estimate the concentration of TCE that may reach the Sudbury River. Using conservative assumptions (e.g., no degradation of TCE along the flow path), ERM estimated that the concentration of TCE in groundwater at the river bank could conservatively approach 160 ppb. To estimate the projected concentration of TCE in surface water resulting from impacted groundwater discharging to surface water, ERM applied a conservative dilution factor of 10 (per MA DEP Guidance for the Development of Numerical Standards), resulting in a predicted surface water concentration of 16 ppb. However, additional groundwater characterization will be conducted to verify the lack of significant impact to this portion of the site.

1k. In the Phase III a statement is made that "Extrapolation of the extent of groundwater impact downgradient indicates dilution to levels below detection limits." Comment on how this is consistent with the projection in the Phase II report that detectable levels would reach and discharge to the Sudbury River.

ERM appreciates the identification of this inconsistency in the text of the Phase II and Phase III reports. Page 4 of the Phase III indicates,

"extrapolation of the extent of groundwater impact downgradient indicates dilution to levels below detection limits." This statement will be revised to exhibit consistency with the concentrations modeled to discharge to surface water in the Phase II. However, it should be noted, VOC samples taken in 1990 of surface water near Route 20 were non-detect. Modifications will be incorporated into a Phase II/III Addendum.

2a. The groundwater flow map (Figure 12) depicted in the Phase II report is based on data collected during the spring of 2000. A groundwater contour map based on data collected during the summer, when the weather is drier and the water demand is higher, is necessary to determine whether contaminant migration from the northern portion of the Raytheon site may be flowing to the northwest under these seasonal conditions. Therefore, the presentation of additional groundwater contour maps for historical measurements during summer, fall and winter months to address this potential data gap is warranted.

ERM appreciates your comment identifying this issue and have included additional groundwater contour maps depicting seasonal variations in groundwater flow patterns beneath the Site. Figure 12 was intended to summarize groundwater flow patterns beneath the Site using the most recent data. As discussed in the response to comment 1b, ERM has presented a significant amount of additional groundwater elevation data in Table 5 of the Phase II report. Additional contour maps displaying seasonal variations in the direction of groundwater flow are provided in Attachment A. With minor seasonal variations noted, these maps indicate flow directions similar to Figure 12.

It is important to recognize that ERM's interpretation of groundwater flow presented in the Phase II Report and at the public meeting (i.e., south/southwest) represents the predominant direction of flow referenced from the primary source of OHM release to groundwater (manhole W-4 area) to the nearest downgradient receptor (the Sudbury River). As indicated on the groundwater contour maps, multiple flow directions and perturbations in flow are apparent depending on the point of reference, number of reference points and seasonal variations. The predominant direction of flow is important since, at this site, the mechanism for migration of contaminants in groundwater is primarily with the flow of groundwater.

2b. The groundwater flow map is depicted with flow arrows, particularly in the southeastern portion of the property, in a direction of lower to higher water table elevations. The flow map also shows a groundwater divide in this portion of the site. Additional groundwater elevation data are needed to verify the suggested

presence of a groundwater divide.

ERM appreciates the identification of this issue and has modified Figure 12 in the Phase II report to address the first portion of this comment. As discussed in the response to comment 1b, ERM has presented a significant amount of additional groundwater elevation data in Table 5 of the Phase II report. Groundwater contour maps for multiple seasonal gauging rounds are included in Attachment A. These modifications will be incorporated into a Phase II/III Addendum. Results of these gauging events confirm the presence of a groundwater divide as indicated in Figure 12. The presence of the inferred divide is also consistent with: 1) Site topography; 2) the distribution of surrounding surface water bodies; and 3) the presence of a sub-drainage basin divide as displayed in Figure 13 of the Phase II Report. Therefore, it is ERM's opinion that the existence of the groundwater divide has been confirmed through multiple lines of evidence including seasonal gauging, topography, drainage trends and mapped drainage divides.

2c. The groundwater flow map depicts contours in the northwestern portion of the property that are not consistent with elevation data. Comment on whether potentiometric surface mapping suggests a northerly flow direction in the vicinity of MW-TP-3 where TCE was detected in shallow groundwater and why there are no deeper wells for characterization at depth.

As noted in the response to comment 1b, groundwater in the northwestern portion of the Site flows to the west-southwest toward the Sudbury River, based on six rounds of groundwater monitoring data collected during various seasons over a three-year period. Based on closure samples collected during the TP-3 Release Abatement Measure (RAM) and the low concentrations of VOCs detected in MW-TP-3 since 1996, ERM does not believe that deeper impacts exist in this portion of the Site. Therefore, deeper wells were not installed in this portion of the Site.

2d. Data for the elevation(s) of the Sudbury River are not presented with the sampling data for groundwater elevations. Because the site is potentially subject to hydraulic influences of the Sudbury River, a significant data gap may exist in the characterization of site hydrogeology.

ERM appreciates your comment on this issue and has considered the influence of the Sudbury River on Site groundwater flow patterns. It is ERM's opinion that seasonal variations in the patterns of Site groundwater flow indicate negligible influence by the Sudbury River on Site groundwater flow patterns. In general, Site groundwater flow

patterns are influenced by interactions between Site surface structures and recharge events. Groundwater contour maps for multiple gauging rounds are included in Attachment A.

2e. Page 33 of the Phase II report refers to a 1994 Report on the Conceptual Zone II Study of the Baldwin Pond Wellfield as supportive of an opinion that the groundwater is flowing across the Raytheon site to the southwest and not toward the wellfield. Reference is also made to the Zone II Study and an inferred groundwater divide trending in a southwest to northeast direction at the northern portion of the site. However, review of Figure 6 of the Zone II Study indicates a potential for groundwater to flow toward the wellfield from the northern portion of the site under pumping conditions. Therefore, the potential for TCE to be drawn toward the water supply wells during pumping activities and a groundwater flow component to the northwest in the northern portion of the site cannot be ruled out.

ERM interprets Figure 6 of the Zone II Study as predicting groundwater flow under pumping conditions to be to the west-southwest beneath the Site, consistent with actual groundwater elevation data from the Site (Table 5 and Figure 12 of the Phase II report). Results of groundwater gauging for six seasonal events do not suggest that groundwater flow, and/or contaminant migration with the flow of Site groundwater, would be influenced by pumping of the Baldwin Pond Wellfield, even under extended, worst-case pumping conditions far in excess of actual pumping rates.

2f. Relevant data regarding detection of 1,1,1-trichloroethane in the Baldwin Pond Well field wells over the past three years is not addressed in the Phase II report. At the PIP presentation there was a comment made that the contamination might be from another source as yet undefined; but, there is no discussion of what that alternative source might be. Additionally, there was detection of TCE in the Baldwin Pond Wells on one occasion in November 2000 that is not discussed.

ERM has not presented data from the Baldwin Pond Well Field wells in the Phase II report because we have not identified a potential pathway between the Site and these potential receptors. ERM's comment at the PIP meeting regarding a potential other source was made based on the absence of a potential pathway between the Raytheon Site and the well field and based on the fact that the contaminant signature detected in the wells does not match that detected at the Raytheon Site. Therefore, there are one or more other sources of contamination contributing to the trace levels detected in the Baldwin Pond wells. The highest level of 1,1,1-trichloroethane (TCA) detected in groundwater on Site was in

monitoring well MW-33S at 160 ug/l in May 1998. Subsequent sampling of this well indicates TCA at levels below Massachusetts Maximum Contaminant Levels (MMCLs) for drinking water. TCA has not been detected in any of the deeper wells at this location (i.e., MW-33M, MW-33D or MW-33B). TCA has also not been detected during multiple sampling events in any of the six monitoring wells (MW-1, MW-2, MW-10, HA-101, MW-32 and MW-TP3) located between location where TCA has been detected in Site groundwater and the Baldwin Pond Wellfield. However, additional groundwater characterization will be conducted to verify the lack of significant impact to this portion of the Site.

2g. Only two bedrock wells were installed. Explain why this limited exploration of the bedrock aquifer is sufficient to eliminate the bedrock as a potential contaminant migration pathway.

Exploration of the bedrock aquifer was deemed to be adequate based on the lack of significant impact detected in groundwater at the base of the overburden aquifer and correlation of overburden stratigraphy with contaminant distributions (i.e., the presence of a semi-confining silt layers appears to have prevented downward vertical migration of VOCs across much of the Site). VOCs have been detected at elevated concentrations in deep overburden at one well location (MW-45D). ERM installed a shallow bedrock well at this location and detected low levels of TCE. As discussed in Section 5.3.4 of the Phase II report, vertical hydraulic gradients are upward at this well cluster indicating discharge of groundwater from bedrock to overburden. Based on these data, ERM believes that the bedrock aquifer at the Site has been adequately characterized.

3a. Provide clarification on the exact location of the sample collected to represent the outfall discharge. Was the sample collected in the pipe or within the swale at the point of discharge? Recent sampling by the Wastewater Management District Commission of the water in the pipe discharging at the outfall did not exhibit any increase in concentrations from the concentrations entering the pipe at the treatment plant suggesting that the "outfall sample" may not represent a local condition.

Sample OF-01 (Table 12b, Page 1 of 3) was collected on 26 October 2000 from effluent discharging from outfall OF-01 at the exit of the outfall pipe before the effluent mixed with surface water beneath the outfall within the swale. The basis for ERM's conclusion that copper in surface water is attributed to a "local condition" is based on two lines of evidence: 1) Analysis of tap water in the facility exhibiting extremely high concentrations of copper (sample SW-5, Table 12b, Page 1 of 3, exhibiting

2,560 ug/l of copper); and 2) review of available data from the Town of Wayland Water Department indicating that a low pH condition of the town water supply has resulted in widespread leaching of copper and possibly other metals from the distribution supply lines.

Please note that the detection limits used to analyze the sample collected by ERM at OF-1 are significantly lower than the detection limits reported by the analytical laboratory used by the Town of Wayland. ERM's results are reported in the parts per billion (ppb) range, while the town's data is reported in the parts per million (ppm) range. The table below is a comparison of the data in similar units (ppb):

Wastewater Discharge Comparison (OF-1)

Parameter	Town of Wayland 10/25/01	ERM 10/26/00
	(ppb)	(ppb)
Antimony	< 60	5
Arsenic	< 10	0.71
Beryllium	< 4	0.50
Cadmium	< 5	0.56
Chromium	< 10	< 1
Copper	77	90
Lead	< 5	1.8
Mercury	< 0.2	< 0.2
Nickel	< 40	18
Selenium	< 50	< 2.5
Silver	< 10	< 0.5
Thallium	< 20	< 0.5
Zinc	200	360

Note: Town data was analyzed for total metals, ERM data was analyzed for dissolved metals: therefore it can be assumed that total metals results would be slightly higher than dissolved

metals results.

The two sets of data presented above are somewhat consistent, despite being sampled one year apart and with differing detection limits. Detections of copper and zinc are within typical deviation for data points at a single location. Please note that the concentrations of Copper and Zinc exceed NPDES reporting limits.

3b. If the sample was collected at the pipe discharge, comment is needed on the apparent introduction of site contaminants of concern (COCs) between the treatment plant and the point of discharge. Comments are warranted on 1) the data for screening of conductivity in groundwater as that may relate to contamination involving inorganic species, 2) whether data support or reject the potential for groundwater to enter the pipe and impact the discharge, and 3) whether data have been collected to establish whether there is an accumulation of COCs within the pipeline that may contribute to an ongoing source of discharge to the wetlands. Further investigations of the conveyance system appear warranted to determine whether an ongoing source is still present.

It is ERM's opinion that OHM detected at Outfall OF-01 in effluent from the discharge pipe are not a result of introduction into the system from OHM in groundwater. Conductivity screening of groundwater is not necessarily indicative of inorganic contamination, but rather the presence of ionic constituents in groundwater. Analysis of groundwater for metals does not indicate an adverse impact to groundwater from metals. There is a low potential for groundwater to enter the discharge pipe and impact effluent from the pipe since the pipe is located above the average depth to the watertable. There is a low potential for accumulation of COCs in the discharge pipe since: 1) the pipe, manholes and catch basins were cleaned by Raytheon during facility decommissioning; and 2) a video inspection of the pipe was conducted by Raytheon during facility decommissioning to confirm adequate cleaning and a lack of groundwater infiltration into the pipe (see Page 12, Phase II Report).

4a. Figures 18a through 18e do not show the outline of the area of stunted vegetative growth. Figure 18f shows the outline of the area of stunted growth but does not show the lead distribution within. Also, this area does not appear to coincide with the distribution of concentrations of COCs. Therefore, other COCs, besides copper and chromium, cannot be ruled out as causative agents for the stunted growth effect.

ERM appreciates the identification of this inconsistency in these figures and we have removed the outline of the area of stunted growth from

Figure 18f for consistency. This modification will be incorporated into a Phase II/III Addendum. Figures 18a through 18f were not intended to display the area of stunted growth, but rather the distribution of selected OHM concentrations in wetland soil/sediment by interpolating between detected concentrations at multiple sampling points. Figure 18f in the draft Phase II Report did mistakenly include the mapped area of stunted in the lead isoconcentration contour map. ERM respectfully disagrees with the statement that "this area does not appear to coincide with the distribution of concentrations of COCs." In general, the highest concentrations of potentially phytotoxic COCs (i.e. chromium and copper) correlate with the area of stunted growth. ERM agrees that COCs other than copper or chromium may contribute to the observed stunted growth; however, attribution to chromium is the most probable based on existing data in the literature regarding mechanisms of phytotoxicity.

4b. Comment on the lack of characterization of these compounds: cyanides, boron, fluoride, phosphorus, ammonia, nitrates, chlorides and certain VOCs (aromatics, chlorinated, aldehydes, alcohols and glycols).

Characterization of OHM in wetland sediments was based on extensive analytical testing conducted during numerous investigations. The Phase II report is intended to focus on the nature and extent of contaminants of concern (COCs), assess the potential risk associated with these contaminants and determine the need for remedial response actions. The Phase II does not summarize every investigation conducted, but rather updates investigations conducted since completion of the Phase I. Many of the COCs identified in the above comment were evaluated during previous investigations (refer to Phase I Report) and/or are parameters that would not significantly influence the results of the risk characterization and/or selection of remedial action objectives. As indicated in Section 4.0 of the Phase II Report, ERM's Phase II investigation strategy was based on the results of previous investigations, particularly with regard to the nature of previously identified sources of release (e.g., OHM in drywells connected to the stormwater conveyance system).

4c. Detailed analysis for PCB congeners was conducted in the wetland but there was no testing conducted for dioxins or dibenzofurans. Comment on why at least one sample was not analyzed for these contaminants.

Review of OHM historically utilized at the facility, facility waste manifests and the nature of facility operations do not suggest that dioxins or dibenzofurans were used, produced or released at the Site.

Therefore, analysis of soil, groundwater, surface water and sediment did not include dioxin or dibenzofurans as a contaminant of concern.

4d. How was the extended area of readily apparent harm (ARAH) presented in the Phase III report as the area to be excavated delineated?

A description of how the expanded area of readily apparent harm (ARAH) was delineated is included on Page 9 of the Phase III Report. This area was delineated based on expansion of the ARAH to include adjacent sampling locations exhibiting similar concentrations to one or more COC within the ARAH or exceeding federal regulations governing the management of PCB remediation waste.

4e. The discussion of ARAH and expanded ARAH requires further comment and clarification. For example, tables presented in the Phase II refer to concentration data for samples "in" and "out" that are used in the risk characterization; however, the apparent split of which data are used respectively is not presented so that values can be verified.

We appreciate your comment and have provided Table 1 in Attachment B to clarify which samples were included in the ARAH and the expanded ARAH. This modification will be incorporated into a Phase II/III Addendum.

4f. The Phase II report does not provide a clear delineation of which portion of the site requires remediation to address the condition of significant risk to human health posed by wetland sediments, and which portion does not require remedial actions. For example, the expanded ARAH is discussed in the Ecological Risk Assessment Appendix, but not addressed in the body of the Phase II report.

We appreciate your comment and will attempt to clarify this issue in the following response. The content and format for the Phase II Report are prescribed in the Massachusetts Contingency Plan (MCP) under 310 CMR 40.08735 and are intended to satisfy three primary requirements, including: 1) identify the source, nature and extent of OHM in affected media (soil, groundwater, air, surface water and sediment); 2) identify the potential risk posed by OHM to human health, safety, public welfare and the environment; and 3) identify the need for remedial actions. Therefore, the Phase II Report was developed in a format to satisfy these specific requirements. The Phase II did identify the expanded ARAH as posing a risk to both human health and the environment and therefore requiring remediation. The Phase II Report also indicated that the "Surrounding Area", i.e., the remainder of the wetland did not pose a

condition of significant risk to human health or the environment and therefore did not warrant remedial action. However, it is important to recognize that areas proposed for remediation are generally identified during Phase III as a "risk management" decision consistent with the development of remedial action objectives. As such, there is not always a direct correlation between areas posing a potential risk based on site-specific quantitative risk estimates, and areas requiring remediation to meet applicable risk management criteria. As indicated in the Phase III, the "footprint" of the area proposed for remediation of wetland soil/sediments was expanded slightly beyond the areas deemed to pose a significant risk to human health and the environment to ensure compliance with federal regulations governing the management of remediation waste (i.e., the Toxic Substance Control Act (TSCA)).

4g. The assessment of ecological endpoints for impact in the Stage II ecological risk assessment was never presented in a scope of work (SOW) that was part of the public review. While there was discussion of an amendment of the SOW, it was not formalized.

The SOW for the ecological risk assessment was not issued for public review because the Site became a PIP Site after the SOW for the ecological risk assessment was developed. An addendum to the Phase II SOW entitled, "*Addendum No. 1- Phase II SOW, Wetland Sediment Sampling, Former Raytheon Facility, 430 Boston Post Road, Wayland, Massachusetts*" was submitted to the Department dated 20 September 2000.

4h. The uncertainty of using information collected by United States Department of Fish and Wildlife (USF&W) from many years prior to the current evaluation is not discussed in the risk assessment.

ERM attempted to obtain details regarding the analytical results reported by the USFWS; however, information necessary to validate the data was not available from the laboratory. The uncertainties associated with the USFWS data are therefore unknown and therefore could not be characterized. As a result, a verification sampling program was conducted as described in Section 4.0 of the Phase II Report.

4i. Data are not presented for groundwater quality in the wetlands. Without these data, the remedial action may not sufficiently address areas of the site that exceed the GW- 1 standards. Provide the technical justification for supporting the statement that "OHM in wetland/sediment does not appear to act as a source of input to groundwater or surface water during floods. In addition, provide the justification why monitoring wells are not warranted in the

wetlands and in the area north of the wetlands.

OHM in wetland soil/sediment is largely limited to the upper 18 inches of a highly organic deposit. The high organic content of this deposit and the presence of an underlying clay unit suggest a low potential for OHM in sediment to impact underlying groundwater. In addition, the direction of groundwater flow within the wetland is anticipated to be vertically upward, discharging to surface water. Therefore, it is ERM's opinion that OHM in wetland soil/sediment maintain a very low potential to adversely impact the underlying groundwater. Conversely, ERM believed that wetland soil/sediment maintained a much greater potential to adversely impact overlying surface water than underlying groundwater. Based on this hypothesis, ERM focused effort on evaluating the potential for wetland soil/sediment to act as an ongoing source of release to surface water, since it was our opinion that surface water maintained the greatest likelihood for impact. Since impacts to surface water do not drive remedial action decisions for wetland soil/sediment, the potential for groundwater to drive abatement of wetland soil/sediment was deemed to be low. Finally, since abatement of wetland sediment is imminent, evaluation of impacts to groundwater and/or abatement of groundwater due to impacted wetland soil/sediment will be evaluated concurrent with remedial design, implementation and post-restoration monitoring for wetland soil/sediment.

4j. Data suggest that COCs were detected in surface waters during flooding conditions. Provide the technical justification for supporting the statement that "OHM in wetland/sediment does not appear to act as a source of input to groundwater or surface water during floods."

Please refer to the response to the above comment. It is ERM's opinion that the presence of copper is attributable to a "local condition." In addition, if wetland soil/sediment were acting as a source of release of copper to surface water or groundwater, the areas of highest copper impact to wetland soil/sediment will be removed during the remedial action. Impacts to surface water during flooding appear to be limited to copper. The presence of copper is attributed to a "local condition" (please see response to comment 6a). To the extent that surface water may be impacted by copper in wetland soil/sediment (which may be a cumulative effect of a long-standing local condition) abatement of the areas of greatest copper impact in wetland soil/sediment as proposed, would likely abate any partial contribution from copper in wetland soil/sediment to surface water.

4k. Explain why the dispersion pattern of contamination throughout the wetlands doesn't coincide with the areal extent of the tributary that flows from the outfall to the river.

The dispersion pattern for COCs in the wetland would not be expected to correlate directly with the areal extent of the tributary extending from the outfall to the river since: 1) the tributary is largely an erosional feature rather than a depositional feature; 2) the tributary was not well defined prior to installation of the industrial wastewater treatment plant, suggesting that contaminants were deposited closer to the outfall prior to its installation during periods of lower flow; 3) dispersion of COCs during periods of inundation would not be controlled by tributary flow, but rather by flooding, micro-topography/vegetation patterns within the wetland, prevailing wind directions and back-eddy currents.

4l. Although the Phase II report discussion assumes that discharge from the outfall pipe was the source of COCs in the wetland, there is no discussion for the possible existence of other sources and how the data might be used to explain that another source is involved.

Based on the history of OHM use, storage and disposal at the facility, correlation of the types of contaminants found in drywells tied into the stormwater conveyance system, review of historic aerial photographs and extensive test pit excavation within potential disposal areas, there is no evidence to support the existence of alternate contributing sources.

4m. The pattern of contamination for the stunted growth area is dislocated from the outfall pipe and comes closest to the embankment at a point further to the south. What data or investigations have been conducted to eliminate the possibility of subsurface waste material within the embankment? Comment on the lack of geophysical surveys or groundwater sampling wells along the embankment area that appears tohave been filled historically.

Please refer to responses to comments 4k and 4l. In addition, please note that test pit excavations TP-5 and TP-6 were deployed within filled areas closest to the wetland (see Figure 6, Phase II Report). Visual observations and field screening indicated no evidence of OHM disposal in these areas. Laboratory analysis of two soil samples collected from TP-6 for VOCs (Table 2a, Page 7 of 10) and TPH (Table 2c, Page 10 of 14) indicated no detectable levels of VOCs or TPH at this location.

5a. In accordance with section 40.0904 of the MCP, the extent of impacts to Sudbury River sediment has not been completely defined, since sampling for COCs in the Sudbury River downstream of the impacted wetlands were not

conducted by Raytheon to confirm reliance on data collected many years prior by others for a different purpose. Comment on the data quality of sampling performed by others and included in this assessment.

Results of sampling conducted by the USFWS in 1989 were confirmed by ERM during sampling conducted in 1990 in response to a potential release of buytl cellusolve. Comparison of the results regarding analysis of Sudbury River sediment from these two independent studies are consistent and therefore deemed adequate for use in the Phase II. The results from each study indicate similar concentrations of OHM in both upstream and downstream sediment samples, indicating that the Site is not a contributing source of adverse impact to Sudbury River sediment quality.

ERM, on behalf of Raytheon, collected sediment and surface water samples in the Sudbury River in March 1990. Sediment sample locations (SS-1 and SS-2) are shown in Figure 7. Surface water sample locations (SW-1 and SW-2) are shown in Figure 8. The samples were analyzed for VOCs by EPA Method 8240, SVOCs by EPA Method 8270, PCBs and pesticides by EPA Method 8080, and total Priority Pollutant 13 Metals by EPA Methods 6010, 7060, 7470, 7740, and 7761. The sampling was performed to satisfy the requirements of the MCP and was used in conjunction with data from the USFWS sampling data to define the extent of impact from the Raytheon Site.

The USFWS sediment data was collected in 1987 and 1989 as part of a study of contaminant levels in the Sudbury River. The samples were analyzed by the Mississippi State Chemical Laboratory at Mississippi State University and the Environmental Trace Substances Research Center at the University of Missouri. The laboratory reports and associated quality control reports are included in an appendix to the USFWS report. Based a review of the sampling methods and laboratory reports, ERM concluded that the data quality was consistent with the requirements of the MCP (310 CMR 40.0017) and were suitable for incorporation into the risk characterization.

5b. Justify the use of sediment sample GMS-7, containing a polychloninated biphenyl (PCB) concentration of 1.8 parts per million, (ppm), in the determination of "background" when it appears to be proximate to the area of mapped impact to sediments emanating from the disposal site? For example, it is located about 120 feet "downstream" from a sample having a PCB concentration of 5 to 20 ppm. By including this sample in the calculation of the background PCB value, the result may be overestimated. A background sample should be collected for the purpose of establishing background conditions. USF&W had no

indication of the extent of impact from the release when they collected that sample. Also comment on why a specific background sample was not collected from another location, such as across the Sudbury River.

As indicated in Section 6.3.2 of the Phase II Report, Site-specific background concentrations in sediment were evaluated using five samples to estimate the both the average and range in background concentrations of OHM. Therefore, estimation of background concentrations in sediment were based on statistical evaluation of multiple samples, not just sample GMS-7. The conclusion that sample GMS-7 is clearly impacted by Site OHM is not necessarily valid. The distribution of OHM in wetland soil/sediment displayed in Figures 18a through 18f generally display elevated concentrations near the Outfall OF-01, decreasing with increasing distance from the outfall. Distinct locations exhibiting anomalous increases in concentration in wetland soil/sediments are apparent for selected COCs near the river channel that are not contiguous with the mapped distribution of Site OHM. These results suggest that the increased concentrations of OHM at these locations may be attributed to the influence of alternate sources of OHM release other than the "Disposal Site." Potential contributing sources may include automobile emissions from Route 20, an abandoned landfill located upstream of the Site on the south side of the Route 20 bridge or the Nyanza Superfund Site. It is also important to note that background is not defined to represent "pristine" conditions, but rather conditions that would exist in the absence of the disposal Site. Therefore, incorporation of sample GMS-7 into the subset of data used to characterize background was deemed reasonable and appropriate to characterize the range in background concentrations in sediment.

As discussed under Item 5a, Raytheon did collect both upstream and downstream samples in the Sudbury River that were used in conjunction with the USFWS data to establish background. Since the data collected by USFWS was consistent with the Raytheon data, it was deemed appropriate for incorporation into the risk characterization.

5c. Comment on how the use of GMS-7 in determining background sediment concentrations may have resulted in the overestimating the background concentrations of aluminum, barium, beryllium, iron, and nickel (reference, Table 18 of the Phase II report).

Please refer to the response to comment 5b above. The concentrations of aluminum, barium, beryllium, iron, and nickel in sample GMS-7 are slightly elevated, but similar to other samples selected as representative of background conditions.

5d. The Phase II report carries no clear distinction between wetland sediments and Sudbury River channel sediments. The text should be clarified to distinguish which data are being used in the risk assessment tables.

Section 6.3, Hazard Identification includes a discussion of data utilized in the risk assessment. As indicated on Page 53, first full paragraph, analytical results for sediment are summarized in Table 8. For the purposes of evaluating the potential risk to human health, no distinction is made between wetland sediment and Sudbury River sediment, since the likelihood of exposure by potential human receptors is judged to be similar. Sections 4.3.2 and 4.3.3 of the Environmental Risk Characterizations Report distinguish between sediment and wetland soil as appropriate to support characterization of risk to potential environmental receptors.

5e. The environmental risk characterization (ERC) report by Entrix has relied upon the Great Meadows sediment data previously collected between 1986 and 1990 for a Stage I Screening in the assessment of local conditions. The Entrix report does not present any confirmatory samples to demonstrate that these 11 to 15-year old data are relevant and applicable to current conditions. In addition, section 4.2.2.1 of the Entrix report discusses sampling conducted on the Raytheon site from 1998 to 2000 to confirm Great Meadows data, yet the report does not present a comparison of these past and current data. Further, sample locations GMS- I through GMS-6 were not shown on any of the figures in the Phase II report.

As indicated in Section 4.0, Task 5: Conduct Wetland Sediment, Surface Water & Ecological Evaluation of the Phase II Report, verification sampling was conducted in November 1998 to confirm, or deny, previous results reported by the USFWS. Data from the USFWS study and subsequent evaluations conducted by ERM are summarized in Tables 11a, 11b and 11c of the Phase II Report for comparison. The GMS sample locations are displayed on Figure 7 of the Phase II Report. There is no sample location GMS-6.

5f. Reference is made on page 54 of the Phase II report to upstream locations SS-2 and SS-2D on Figure 8, yet this figure shows SW-2 and SW-2D. Does this figure need to be amended?

ERM appreciates the identification of this error and will initiate the appropriate correction. The text on Page 54 should reference Figure 7, rather than Figure 8. In addition, Figure 8 will be amended to show sample SS-2D coincident with SS-2. These modifications will be incorporated into a Phase II/III Addendum.

6a. Copper in surface water is attributable to low pH conditions ubiquitous to Wayland's public water supply and is sited as a local condition. This "local conditions" argument requires the presentation of data that shows discharges from the treatment plant contain comparable copper levels to discharges from the conveyance system that terminates at outfall OF-1. Until these data are obtained, copper cannot be ruled out as a surface water COC.

Please refer to our response to comment 3a.

6b. Discharges containing chlorinated solvents associated with past site operations may have entered the conveyance system. Therefore, based on this site history and the fact that volatile organic compounds were not analyzed in sediment and surface water, on what basis are they ruled out as COCs for these media?

Analysis of wetland sediment and surface water for VOCs was conducted by ERM in 1990 associated with evaluation of a potential release of butyl cellusolve. Results indicated non-detectable levels of VOCs in wetland sediment and surface water. Please refer to the Phase I Report and referenced documentation.

Chlorinated solvents were ruled out as COCs in sediment and surface water based on data collected by ERM in 1990. Two sediment samples (SS-3 and SS-4) and two surface water samples (SW-3 and SW-4) were collected from the wetland area (see Figures 7 and 8, respectively). In addition, samples were collected from the Sudbury River during the same sampling event (see response to Comment 5a). The samples were analyzed for VOCs by Method 8240 and none were detected. Therefore, in the absence of any information documenting a release of VOCs to the wetlands, VOCs were eliminated as COCs in sediment and surface water.

6c. Beryllium was eliminated as a contaminant of concern, yet it is present at a maximum concentration (1.8 mg/kg) that is more than 50% greater than the maximum value for the background data (1.1 mg/kg). (Reference page 2-47 of the MADEP Guidance for Disposal Site Risk Characterization - 1995). Explain.

The detection of 1.8 mg/kg of beryllium was from sample location T-10-16. This sample location is located on the southernmost side of the Site and is not in close proximity to the outfall or the area of stunted growth. Furthermore, beryllium was not identified as a contaminant of concern at the Site based on historic OHM use. The concentration of beryllium was considered consistent with background because the average concentrations within and outside of the ARAH (0.3 mg/kg and 0.5 mg/kg, respectively) were significantly lower than the average

background concentration (0.8 mg/kg). Exclusion of beryllium from the risk characterization is not anticipated to significantly change risk estimates or remedial action alternatives for the Site.

6d. Workers involved with the remediation in the targeted wetlands area should be evaluated as potential human receptors in section 6.5.1 of thePhase II report.

Remediation workers were not considered to represent potential human receptors since a remediation worker would follow a Site-specific health and safety plan and would utilize appropriate personal protective equipment to prevent adverse exposure during remedial work.

6e. The elimination of the Sudbury River from consideration of surface water impacts was based on two samples collected in 1990, which were only analyzed for copper and zinc. However, 17 additional metals were listed as COCs in Table 19. Explain how 11 -year old data for only two metal COCs is sufficient in addressing impacts to surface water.

The elimination of the Sudbury River from consideration of surface water impacts was partially based on comparison of results of surface water analyses collected upstream and downstream of the Site in 1990. Portions of these results were summarized in the Phase II Report. A full summary of these results is included in a report entitled, "Sampling & Analysis at Raytheon Equipment Division, Wayland, Massachusetts, Laboratory Facility" prepared by ERM dated 25 May 1990. Three samples (SW-1, SW-2 and SW-2D (a duplicate of SW-2)) were collected and analyzed for Hazardous Substance List (HSL) acid, base, neutral extractable compounds, PCBs, pesticides, volatile organic compounds and total Priority Pollutant 13 Metals. Results indicated no significant impact to Sudbury River surface water/sediment quality from the Site. The lack of impact to Sudbury River surface water from the Site is also supported by: 1) the distribution of COCs in wetland soil/sediment indicating decreasing concentrations with increasing distance from Outfall OF-01; and 2) decreasing concentrations of OHM detected in surface water to levels below federal AWQCs near the river during periods of wetland inundation (when contaminants in sediment maintain the greatest potential for migration to river surface water).

6f. Surface water exists during certain times during the year in the wetlands, yet this surface water was not evaluated in the risk assessment. Provide the justification for eliminating periodic exposure of the on-site resident to surface water areas within the wetlands, from the human health risk assessment.

Evaluation of potential risks associated with OHM in surface water was

evaluated for environmental receptors. Residential and/or tenant exposure to wetland soil/sediment and surface water was not considered, as this was not considered to represent a viable potential exposure pathway. Residential use of the wetland is, and would be, prohibited through deed restrictions and state and federal regulations. Human health risks associated with potential periodic exposure to OHM in surface water are assumed to be negligible in comparison to risks associated with OHM in wetland soil/sediment. Therefore, evaluation of potential risk to human health, and associated remedial actions for protection thereof, focuses on the primary medium of concern, wetland soil/sediment. Abatement of wetland soil/sediment is anticipated to further reduce any negligible contributing risk to human health associated with OHM in surface water.

6g. Why was exposure to sediment not included in the human health risk assessment for the on-site resident?

Exposure to sediment by a tenant is conservatively estimated/represented through consideration of the adolescent trespasser exposure scenario. Remedial actions to abate potential human health risks posed by OHM in sediment would be protective of exposure by a future tenant. As indicated on Page 61 of the Phase II Report, consideration of residential exposure to wetland soil/sediment was considered to be infeasible, since residential use would be prohibited by applicable state and federal regulations. In addition, it is expected that a deed restriction will remain in place on the Site to prohibit future residential use of the wetland.

6h. Until the extent of the TCE plume is defined, the exposure point concentrations for TCE, perchloroethene and vinyl chloride represented in the Phase III report may not be representative of the worst case conditions upon which the risk assessment and evaluation of remedial alternatives is based.

Please refer to comment 1a.

6i. The concentrations for hexavalent chromium appear to have been underestimated in the tables that relate to the risk characterization. For example, in Table 25, instead of values of 55 and 2, the values should, by our review, be 587 and 166. If these higher values are correct, the hazard index and excess lifetime cancer risk calculations need to be adjusted accordingly.

In response to this comment ERM re-evaluated the values listed in Table 25 (Exposure Point Concentrations (EPCs) -Sediment) and found them to be correct. Please note that, consistent with MA DEP Risk Assessment

Guidance, EPCs were calculated as arithmetic average concentrations, substituting one-half the method detection limit for samples reported as non-detect. Please refer to the following example for further explanation.

For example, if five reported values were used to calculate an EPC were 150, 90, 50, ND and ND and the detection limit for the two samples reported as ND was 10, then the EPC would be, EPC= (150+90+50+5+5)/5 (i.e., substituting one-half of 10 for samples reported as non-detect), or EPC= 300/5=60.

As discussed in Section 6.5.4 of the Phase II (page 66), the exposure point concentrations for sediment were calculated using one-half the sample quantitation limit for non-detect values. ERM verified that the exposure point concentration for hexavalent chromium in sediment was calculated correctly.

6j. Table 14 is inconsistent with regard to the average concentrations for five polycyclic aromatic hydrocarbons (PAHs) and cadmium. The average concentrations are lower than the minimum values, which is mathematically incorrect. In response to this comment ERM re-evaluated the values in Table 14 and found them to be correctly calculated. Please note that the minimum values listed in Table 14 represent the minimum detected values. The reason the average values are lower than the minimum detected value is that the calculation utilizes one-half the method detection limit for samples reported as non-detect per MA DEP Risk Characterization Guidance. Therefore in instances where the majority of analyses conducted were reported as non-detect, the average (utilizing one-half the method detection limits for non-detect values) can be lower than the minimum detected value. Please refer to the following example for further explanation.

For example, if 20 reported values used to calculate an EPC included one detection at 0.5 and 19 non-detects at a detection limit (DL) of 0.4, then the EPC would be, EPC= ((0.5+(19*(0.5*DL)))/20 (i.e., substituting one-half of 0.4 for the 19 samples reported as non-detect), or EPC= (0.5+3.8/20) = (4.3/20) = 0.2. Therefore, in this case the average (0.2) is less than the minimum detected value (0.5).

6k. Why was dermal contact not included in the evaluation for the on-site resident's exposure to groundwater?

Estimation of the potential risk posed by OHM in groundwater to human health was based on consideration of a hypothetical residential exposure scenario. Potential risks posed by OHM to a tenant would be less than

those posed to a resident, therefore abatement to eliminate risk to resident would be protective of a tenant. The estimated incremental risk associated with dermal exposure would be negligible compared to exposures via ingestion and inhalation pathways. Therefore, dermal exposure would not drive risk and/or selection of remedial action objectives and was therefore excluded.

6l. The groundwater carcinogenic cancer risk for the on-site resident was omitted from Table 34.

ERM appreciates your identification of this omission. Please find the groundwater carcinogenic risk estimates for Table 34 in Attachment C. It appears that two copies of the non-carcinogenic risk estimates were included in the draft and final reports, rather than one for non-carcinogenic and one for carcinogenic. This modification will be incorporated into a Phase II/III Addendum.

6m. Spot checking of the data presented in the Phase II report detected some inconsistencies and deficiencies. Comment on the effort that will be made to assure that the final calculations of input concentrations and risk indices for the risk characterization will undergo sufficient quality assurance review.

ERM strives to eliminate errors or omissions in our reporting through implementation of rigorous Quality Assurance and Quality Control (QA/QC) procedures in the development of draft and final documents. Our goal is to consistently produce error and/or omission free documents. Although we are committed to ensuring compliance with stringent QA/QC procedures, we recognize that mistakes will occasionally happen and therefore commit to swiftly rectifying errors or omissions as identified.

6n. The uncertainty analysis for the human health risk characterization does not indicate an overall conclusion whether the major assumptions and limitations have resulted in an underestimation or overestimation of risk. As stated in the 1995 in the MADEP guidance document for risk characterization, an attempt should be made to describe the magnitude and direction of the effect that each particular area of uncertainty is likely to have on the numerical risk estimates.

ERM appreciates your comment and has attempted to demonstrate in the risk assessment text that many of the assumptions made in the risk assessment are very conservative, in that they overestimate the potential risks posed by the Site. As such, it is important to recognize that the risk characterization is useful in identifying the need for remedial actions; however, the pathway to achieve abatement and reduce risk is largely a

risk-management decision-making process. Key considerations include the media and areas to be remediated, the technical feasibility of abatement, weighing short-term benefits verses long-term risks posed by the remedial process and compliance of the remedial action with applicable local, state and federal regulations. Therefore, it is ERM's opinion that while the assumptions and limitations of the risk characterization have intentionally overestimated the risk, these numerical estimates will not play a major role in determining the scope and nature of the final remedy.

7a. In section 5.4 of the Phase III report, the evaluation of the groundwater treatment alternatives only considers treatment to the extent of contamination at the property line. A comparison of the alternatives should be made with the need to remediate groundwater beyond the property limits to the extent of the plume exceeding GW-1 standards offsite. This evaluation should be revisited once the data gaps associated with the extent of contamination are addressed. For example, during the evaluation of air sparging/SVE (page 31 of the Phase III report), a continuous wall of injection and extraction well points are proposed alongthe property line to prevent migration off-site. However, until the extent of the plume is defined, the number and placement of injection and extraction points would not necessarily end at the property line.

The Phase III is intended to be a comparative analysis of remedial alternatives. As such, an increase in the level or extent of abatement required for the downgradient portions of groundwater impact would not necessarily change the results of the Phase III. Modifications in the remedial approach may be necessary as the results of remedial pilot studies are evaluated. However, additional groundwater characterization will be conducted to verify the lack of significant impact to this portion of the Site.*7b. The extent of excavation for the "expanded ARAH" does not extend beyond the area of visibly stunted plant growth to the west or to the southeast. The method of interpolation between the sample points within and outside the stunted growth area is not presented. Comment on how the boundary was determined and provide the technical justification that higher concentrations do not extend further toward the sampling points located 90 to 100 feet away.*

A description of how the expanded area of readily apparent harm (ARAH) was delineated is included on Page 9 of the Phase III Report. This area was delineated based on expansion of the ARAH to include adjacent sampling locations exhibiting similar concentrations to one or more COC within the ARAH or exceeding federal regulations governing the management of PCB remediation waste. Verification sampling will be conducted as part of the remedial action to confirm compliance with remedial action objectives. Contingencies for expansion or contraction of

the removal area/volume will be addressed as part of the remedial design under Phase IV.

7c. Explain how pockets of elevated concentrations of lead, PAHs, and PCBs that exist outside the targeted remediation area will be remediated to a condition of no significant risk to human health. For example, there appear to be pockets of elevated PCB concentrations (> 2 ppm) shown on Figure 8 of the Phase III report that can be considered individual exposure points.

Individual sample locations are not targeted for remediation. As indicated in Section 3.2.2 of the Phase III Report, Target Cleanup Goals (TCGs) for wetland soil/sediment represent the arithmetic average concentration of residual OHM remaining in the wetland following abatement of the Expanded ARAH. Individual sample locations do not represent any greater probability of exposure than other surrounding locations, therefore TCGs represent arithmetic average concentrations. This approach is consistent with MA DEP Guidance for Risk Characterization applicable to the development of exposure point concentrations.

7d. The vertical profile of COC concentrations in the wetland sediments was not clearly presented in support of the proposed excavation to 18 inches.

The proposed excavation depth of 18 inches is based on comparison of OHM levels detected at multiple levels at selected locations. The 18-inch depth was selected to represent the average depth over the excavation area. Many locations may not require excavation to 18 inches, while some locations may require excavation to greater than 18 inches to meet remedial action objectives. Verification sampling will be conducted as part of the remedial action to confirm compliance with remedial action objectives.

8a. TCE is present in bedrock well MW-45B at 4-7 ppb (last sampled 7/19/00); this well should be resampled to determine whether current impacts are at steady state.

At a minimum, annual groundwater monitoring will continue at the Site until completion of remedial action objectives.

8b. Sample location identification numbers for figures 18a through 18f are difficult to correlate to the laboratory results.

Figures 18a through 18f are intended to provide a graphical summary of the distribution of selected OHM in wetland soil/sediment. The

presentation is not intended to display verification of each contour with each sample location, but rather provide the reader with a visual summary of the distribution of target OHM in wetland soil/sediment

8c. Reference is made throughout the Phase II report comparing contamination levels with the release notification criteria (i.e., reportable concentrations, or RCs). It is more appropriate in the context of a Phase II risk assessment report to compare contamination levels with soil and groundwater cleanup standards (i.e., Method 1 S-1 soil standards), which can differ from the RCs.

Please note that ERM respectively disagrees with the comment indicating that the use of Method 1 risk-based standards is a more appropriate basis of comparison than to Reportable Concentrations (RCs). ERM selected comparison to soil and groundwater data to RCs for the following reasons: 1) comparison to Method 1 risk-based standards was judged to present potential confusion to the reader since Method 1 standards are not applicable to the Site based on the use of Method 3 for the risk characterization; and 2) contaminated soil and groundwater are defined in the MCP as soil or groundwater containing concentrations of OHM greater than applicable RCs.

8d. Please note that the labeling of comments skipped 8d. ERM provides this placeholder to avoid confusion regarding the lack of response to 8d.

8e. Annual O&M unit costs and totals for the excavation alternatives do not compute.

ERM appreciates the identification of this error. Modifications will be incorporated into a Phase II/III Addendum.

8f. Transportation by rail costs vary by factor of two between Table 2 and Table 3

ERM appreciates the identification of this error. Modifications will be incorporated into a Phase II/III Addendum.

8g. LRA reports were not part of the PIP records and confirmatory sampling data do not appear to be included in the Phase II. Particularly, there is the issue of drywell removal involving chlorinated solvents and the apparent impact to the groundwater. Comment on whether residual concentration data from the LRAs should be considered in the Phase II so if the LRAs were successful and involved sources that did not impact groundwater (by definition of a LRA), comment on where the source of TCE groundwater contamination is located.

Please note that LRA reports were incorporated in the Phase I Report, which is currently part of the PIP record. Confirmatory sampling data are incorporated in the Phase II Report (Table 2, Summary of Soil Data). As indicated in the Phase I Report, LRAs were successful in abating defined sources of OHM impact in soil. In some instances minor residual groundwater impacts have been detected (e.g., Drywell 5 near MW-8, MW-40 and MW-40S). As indicated in the Phase II Report conclusions, the primary source of VOC impact to Site groundwater appears to be a release from former manhole W-4 area.

RESPONSE TO LINDA L. SEGAL COMMENTS, 9 AQUEDUCT ROAD, WAYLAND, MA

Technical Comments

1) I do not understand why this site is classified as Tier 1B instead of Tier 1A when it has a numerical ranking score of 732. Perhaps it would be prudent to consider having a DEP project manager assigned to oversee a cleanup of this magnitude and complexity spanning some forty years of site activity and located in our town's Zone II where Wayland draws drinking water from groundwater in this aquifer.

You are correct that the revised Numerical Ranking Score (NRS) would place the Site in a Tier IA category. A Major Permit Modification Application, dated 25 May 2000 was submitted to the Massachusetts Department of Environmental Protection (MA DEP or Department) to reclassify the site from Tier IB to Tier IA. A copy of this document is available in the PIP repositories. Although the Site met the criteria of the numerical ranking system to be reclassified as a Tier IA site, the DEP Bureau of Waste Site Cleanup after an administrative and technical review, elected to maintain the Tier IB classification. The DEP opinion is stated in the, "Notice of Proposed Permit Decision and Statement of Basis", dated 7 September 2000, which is also available in the document repositories.

2) According to MCP regulations, a disposal site is not supposed to be defined by real estate boundaries but rather by the true extent of the contamination. Wetlands and groundwater contamination on this site appear to extend beyond Raytheon's property lines. I do not understand how Raytheon can claim to have performed a valid and complete risk assessment when it has not tested in earnest beyond its property lines. When I asked about this at the October 24 meeting, I recall hearing that Raytheon used computer modeling. Use of such modeling instead of performing real tests in the field tends to engender more questions and lack of public confidence. I do not understand how one can determine the ecological and human risks presented by the contamination on this site without fully characterizing the nature and extent of the contamination and evaluating all possible pathways of exposure.

As indicated in the text of the Phase II and Phase III Reports, the "Disposal Site" is not limited to real estate boundaries. The extent of oil and/or hazardous materials (OHM) in wetland soil/sediment is clearly displayed in the text and figures of the Phase II Report (see Figure 18a through 18f displaying isoconcentration contour plots for selected OHM in wetland soil/sediment) to extend beyond the former Raytheon facility

property boundaries. The extent of OHM in groundwater is described in the text of the Phase II Report to extend downgradient from the identified source area (manhole W-4) to the primary downgradient receptor (the Sudbury River). In both cases, the extent of OHM impact displayed on figures contained in the Phase II Report is limited to areas defined by existing sampling locations. The downgradient boundaries of the groundwater impact to the southwest have been inferred based on the extrapolation of contaminant concentration gradients from source areas along the downgradient groundwater flow paths to potential groundwater discharge points at the Sudbury River. The extrapolation is based on temporal and spatial variations in site groundwater flow and contaminant transport patterns using six years of site groundwater monitoring data collected during 13 sampling events conducted from 1995 through 2001. The results indicate relatively steady-state conditions, with contaminant concentrations generally decreasing with time and distance from the primary source area along downgradient flow paths. As such, existing data is adequate to establish the need for remedial response actions, evaluation of remedial alternatives and selection of the preferred alternative to achieve abatement. It is also important to note that the characterization of potential risk to human health intentionally utilized overly conservative exposure assumptions to estimate risk. For example, the risk characterization assumes exposure by residential receptors to OHM in groundwater via ingestion and inhalation pathways, even though these are not exposure pathways under current conditions. It is ERM's opinion that the Site has been properly characterized under the guidance of the MCP. However, additional groundwater characterization will be conducted to verify the lack of significant impact to this portion of the Site.

3) I do not understand why Raytheon chose to take its background wetland sediment sample from the mapped area showing metals contamination (end of the Phase II report, Volume 1). A background sample is supposed to provide a means to compare the contaminated area to a similar area where contamination clearly does NOT exist. Why was a scientifically more appropriate location not chosen? Generating credible background data is critical for establishing benchmarks. It appears that this particular background sample (GMS-7) taken in a location laden with chromium, copper and PCBs is inadequate and data resulting from it suspect if not invalid.

As indicated in Section 6.3.2 of the Phase II Report, site-specific background concentrations in sediment were evaluated using five samples to estimate both the average and range in background concentrations of OHM. Therefore, estimation of background concentrations in sediment were based on statistical evaluation of

multiple samples, not just sample GMS-7. The conclusion that sample GMS-7 is clearly impacted by site OHM is not necessarily valid. The distribution of OHM in wetland soil/sediment displayed in Figures 18a through 18f generally display elevated concentrations near the Outfall OF-01, decreasing with increasing distance from the outfall. Distinct locations exhibiting anomalous increases in concentration in wetland soil/sediments are apparent for selected COCs near the river channel that are not contiguous with the mapped distribution of site OHM. These results suggest that the increased concentrations of OHM at these locations may be attributed to the influence of alternate sources of OHM release other than the "disposal site." Potential contributing sources may include automobile emissions from Route 20, an abandoned landfill located upstream of the site on the south side of the Route 20 bridge or the Nyanza Superfund Site. It is also important to note that background is not defined to represent "pristine" conditions, but rather conditions that would exist in the absence of the disposal site. Therefore, incorporation of sample GMS-7 into the subset of data used to characterize background was deemed reasonable and appropriate to characterize the range in background concentrations in sediment.

4) Why did it take Raytheon about a year to erect the fence that finally has been installed to protect the public from the wetlands area of stunted growth as required by the Wayland Conservation Commission? Such a protracted delay for a non-technical task raises concerns about the PRP's ability to meet other standards during the implementation of upcoming remedies.

As a condition of the 31 October 2000 DEP Decision to Grant Permit, the Department required installation of fencing and posting of signage to prevent access to the wetland. In support of this work, ERM appeared before the Wayland Conservation Commission (Con Com) seeking a Determination of Applicability (DOA) in the fall 2000. The Con Com subsequently issued a negative DOA for installation of the fencing, contingent upon meeting specific conditions stipulated by the Con Com regarding the installation. Installation was planned for the Spring 2001.

ERM filed a building permit with the Town of Wayland in March 2001 to support installation of the fence. A subsequent issue between the property owner, Wayland Business Center (WBC), and Raytheon resulted in WBC revolking the building permit. As part of this issue WBC requested modifications in the location of the fence, the height of the fence and the type of fencing to be installed. These issues were resolved with WBC in July 2001. Visual approval of modifications in the location and installation specifications for the fence by the Con Com (as a stipulated condition to the Con Com's approval) and WBC was

completed in September 2001. Procurement and installation of the fencing and installation required five to six weeks, due in part to the tragic events of September. The fence installation was completed on 5 November 2001.

5) I do not understand why the latest reports do not show complete groundwater contouring, particularly knowing that the drinking water wells of concern are located only a half-mile north. Groundwater contour lines for this site appear to stop at the western edge of the existing asphalted parking lot. At the PIP meeting we were told groundwater flows south and southwest, even in the wetlands at the western part of the site near the Sudbury River, which flows northward. My review of the groundwater contour lines shows them turning northward just at the edge of the parking lot. Why would scientists stop drawing groundwater contours at an artificial (parking lot) boundary? Groundwater contouring also needs to be determined by data collected in multiple seasons, particularly in drier periods than what was sampled to reflect actual drawdown and flow in the area between the Baldwin Well Field and the contaminated wetland.

ERM's interpretations of groundwater flow beneath the Site are based on multiple seasonal rounds of groundwater gauging over a period of six years. The interpretations presented in the Phase II report are consistent with those present in the Phase I Report. For your information, additional maps depicting lines of equal groundwater elevations (groundwater flows from higher to lower elevations) and flow lines are attached in Attachment A. It is standard industry practice to interpolate groundwater equipotentials (contours on the maps) between existing measuring points, rather than to extrapolate where no measurements exist (hence the lines stop at the parking lot). It is important to recognize that ERM's interpretation of groundwater flow presented in the Phase II Report and at the public meeting (i.e., south/southwest) represents the predominant direction of flow referenced from the primary source of OHM release to groundwater (manhole W-4 area) to the nearest downgradient receptor (the Sudbury River). As indicated on the groundwater contour maps, multiple flow directions and perturbations in flow are apparent depending on the point of reference, number of reference points and seasonal variations. The predominant direction of flow is important since, at this site, the mechanism for migration of contaminants in groundwater mimics the flow of groundwater. As indicated in both the Phase I and Phase II Reports, the primary pathway for impacted groundwater to reach the Baldwin Pond Wellfield is via discharge to surface water and induced migration to the wells via pumping, as a portion of water withdrawn from the wellfield is ultimately derived from surface water. Under this scenario, it is

extremely unlikely that impacted groundwater from the Site would reach the wellfield at detectable levels.

6) It seems imperative that Raytheon install groundwater monitoring wells and gather data between the contaminated wetland and the Baldwin Well Field. In November 2000 the Wayland Water Department found a very small amount (1 ppb) of TCE (Trichloroethylene) for the first time in a Baldwin Water Well sample. I understand small amounts of another chlorinated solvent (1,1,1-Trichloroethane) have been detected at Baldwin wells over the past 3 years. If, over time, solvents and metals tend to fall deeper and deeper into the groundwater, it also seems important to carefully plan sampling at the appropriate depths. I believe a member of the Wayland Conservation Commission asked a Raytheon representative to test groundwater between the affected wetland and the well field, but that has yet to occur.

Please refer to the response to question 1b of the Conservation Commission Letter.

7) Raytheon attributes the wetland's stunted growth to contamination from the outfall from the waste disposal system, yet the maps (colorful figures at the end of the Phase II document, Volume 1) seem to suggest the possibility of other sources of the contaminants. For example, on Figure 18a, there are two areas of PAHs not contiguous to the area of stunted growth. On Figure 18b, there seems to be a similar hot spot of PCBs near the Sudbury River. Figure 18f also shows several separate hot spots for lead. The unusual deposition of these contaminants shown on the report figures suggests to me that they may not have all originated at the outfall, which begs the question of how they got where they are.

The preponderance of existing evidence indicates that the source of impact to wetland soil/sediments is historic, inadvertent releases of OHM to the stormwater conveyance system and discharge to the wetlands at Outfall OF-01. The distribution of OHM in wetland soil/sediment depicted in Figures 18a through 18f in the Phase II report do not suggest the presence of an alternate contributing source near the outfall, but do suggest influence from alternate contributing sources upstream of the site near the Sudbury River. In ERM's opinion, the distribution of OHM in Figures 18a through 18f may reflect: 1) the different distribution of organic compounds (PCBs and PAHs) and inorganic (metals) elements, reflecting the greater mobility of inorganic elements in the wetland. Organic compounds tend to bind to soil particles and therefore are less mobile than inorganic elements; 2) two potential periods of discharge: before installation of the industrial waste water treatment plant when discharge flows were significantly lower

which would result in the deposition of OHM near the Outfall OF-01 and after the installation of the industrial waste water treatment plant when flows increased significantly; and 3) deposition of OHM during periods of inundation (flooding) where the distribution would be influenced by the wetland topography, vegetation and/or winds and currents.

8) It appears that Raytheon has not yet tested for the presence of substances found in earlier waste generation reports, i.e. cyanide, fluoride and VOCs. PCB testing did not include sampling for the presence of dioxins and furans. Greater care should be taken to account for all chemicals of concern. Accurate risk calculations cannot be made if all known possible contaminants are not investigated.

Sampling for cyanides has been conducted in support of disposal of remediation wastes. Cyanides have not been detected in remediation wastes. Testing of soils, wetland sediments and surface water was conducted during previous investigations (ERM's 1990 investigation of the suspected butyl cellusolve release, Phase I Report) for VOC's and reported as non-detect. Review of OHM historically utilized at the facility, facility waste manifests and the nature of facility operations do not indicate that dioxins or dibenzofurans were used or suggest the potential for generation or release of dioxins or dibenzofurans. Therefore, analysis of soil, groundwater, surface water and sediment did not include dioxin or dibenzofurans as a contaminant of concern.

9) The TCE plume, which originated near the former circuit board shop, appears to migrate downgradient, moving south from the former lab building towards the property line. Given the documented flow pattern, the plume is heading towards Route 20 and beyond, potentially affecting private homes, businesses and eventually the Sudbury River. I do not understand why Raytheon has not fully characterized this plume. Novel technology is being applied in a limited RAM without defining the full extent and location of the problem. Again, I do not understand how one can perform a site-specific Method 3 Risk Characterization without having actual data for such a compelling condition.

Please refer to the response to Comment No. 2.

10) Groundwater monitoring well MW-40 shows the presence of TCE higher than the drinking water standard. This well is located east of the existing lab building, yet there appears to be neither an explanation for this particular location nor an attempt to determine if the TCE is migrating east of the charted groundwater divide. Moving in that easterly direction, one quickly reaches the beginning of the residentially zoned portion of the property where a subdivision of private homes was recently approved by the Planning Board. There is also an

intermittent stream and wetlands. In multiple public meetings in recent years, it has been reported that there are no contamination issues east of the building. Given the groundwater data and site history from MW-40, Raytheon should determine whether or not there is any migration or risk.

Please refer to the response to comment 1d to the Wayland Conservation Commission Letter.

11) Table 16 shows summary data used for the risk characterization. The area of readily apparent harm (ARAH) is not just the area of stunted growth in the wetland. Again, if one consults the colorful figures (maps) at the end of the binder, priority pollutant metals and PCBs are found way beyond the area of stunted growth. If that is the case, the ARAH does not seem to be properly defined and therefore the risk calculation data may not be accurate.

The ARAH includes the area of stunted growth and areas contiguous to the area of stunted growth where OHM concentrations were similar to those found within the area of stunted growth. Table 1, Attachment B, clarifies which sample locations were included in the area of stunted growth and the ARAH. This table will be incorporated into a Phase II/III Addendum. The risk characterization considered all data available within the wetland and grouped the data into two subsets; the ARAH and all other data defined in the risk characterization as the Surrounding Area.

RESPONSE TO IRWIN LETTER

1. Please provide technical justification why you did not notify DEP of the categorical Imminent Hazard to Human Health posed by the Surface sediment concentrations of PCBs, arsenic, and hexavalent chromium within 500 feet of a recreation area or park (Great Meadows National Wildlife Refuge). And when were the data collected that exceeded the criteria in 3 10 CMR 40.0321 (2)?

Site conditions do not pose a "categorical Imminent Hazard to Human Health posed by the surface sediment concentrations of PCBs, arsenic and hexavalent chromium within 500 feet of a recreations area or park." Please note that under 310 CMR 40.0321, Reporting of Releases and Threats of Release that Pose or Could Pose an Imminent Hazard, subsection (2):

a) is applicable to releases that "could" pose an Imminent Hazard to human health for the purposes of filling a "Two Hour" Release Notification; and

b) are specific to concentrations of hazardous materials in surficial "soil."

c) The definition of park or recreational area means land set aside for athletic, recreational, or leisure activities.

These criteria were considered following the discovery of OHM in the wetland, but were not deemed to be applicable, since 1) by definition, the unconsolidated deposits in the wetland are categorized under 310 CMR 40.0006 as sediment, not soil; 2) concentrations of PCBs, arsenic, and hexavalent chromium detected above the thresholds stipulated under 310 CMR 40.0321 (2) are located more than 500 feet from the boundary of any recreation area or park; 3) the Great Meadows Refuge is generally underwater and posted no trespassing and thus not available for recreational activities; and 4) Access to impacted areas from any recreation area or park is prevented by physical barriers (dense scrub vegetation). Therefore, no additional release notification was filed for an Imminent Hazard, other than to the environment. Sediment analytical data were first obtained by the Fish and Wildlife Service in the late 1980s.

2. Please provide technical justification why the release notification form submitted by you in response to discovery of the stunted growth area had checked off that you had a "potential imminent hazard" and did not indicate "poses imminent hazard."

The release notification form indicates the site conditions could pose an Imminent Hazard (IH) since there was no IH to human health but a statutory IH to the environment in accordance with 310 CMR 40. 0955(3) (a), and thus triggering an IRA condition.

3. Please provide technical justification why 72-hour reporting for one or more Condition(s) of Substantial Release Migration (CSRM) 310 CMR 40.0313(5) was not made regarding the following points:

3A Although you notified DEP of the imminent hazard evidenced by stressed biota, why was there no notification of the CRSM triggered by actual detection of contaminants in wetland sediments? What was the first date of sampling that detected contaminants in wetland sediments?

In response to your concern regarding Site conditions triggering a Condition of Substantial Release Migration (CSRM) pursuant to 310 CMR 40.0006 and subsequent reporting to the Department, no observations have been made, or data generated, that trigger a CSRM and/or release notification obligations. Please note that the definition of CSRM under 310 40.0006 include six criteria listed (a) through (f). ERM's rationale regarding our consideration of each of these criteria is summarized below:

a) Criteria (a) is specific to "separate phase OHM" which has not been identified in the wetland.

b) Criteria (b) is specific to releases "that if not promptly removed or contained are likely to significantly exacerbate an existing condition of groundwater pollution." Criteria (b) is not deemed applicable since the release(s): 1) may likely have occurred more than 20 years ago; 2) are largely limited to the upper 18 inches of wetland sediment, generally located above the water table; and 3) maintain a low potential to adversely impact groundwater quality based on the evaluation of surface water quality data during periods when the wetland is under water.

c) Criteria (c) through (f) are specific to releases to groundwater, which are not applicable to Site conditions based on the rationale above.

3B You report sampling detected site contaminants of concern in surface water at the site. While you presented a position that the detection was a result of a "local condition" unrelated to your disposal site, why was the detection of contaminants in surface water was not reported to DEP? What was the first date of sampling that detected contaminants in surface water?

Sediment samples were first collected by the Fish and Wildlife Services in the late 1980s. ERM sampled the surface water and sediment initially in 1990 to assess the impact of a release of butyl cellusolve via OF-1. This data was reported to the DEP at that time and an RAO statement filed for the release in 1995.

3C You report detection of concentrations of VOCs in ground water at Monitoring Well MW-40 near the eastern extent of the property where there is an intermittent stream. The report did not include sampling of the stream to establish whether VOCs are detectable there, nor was there analysis of the potential rate of migration and whether VOCs are likely within one year to be detected. There are occupied residences in that direction such that definition of the extent of contamination around that well is also necessary to assess whether ground water have resulted, or are within one year likely to result in the discharge of vapors into the occupied residential dwellings.

Please refer to the response to comment 1d of the Wayland Conservation Commission Letter.

4 Your Phase II and Phase III reports summarily deny the possible pathway of migration to indoor air with nearby occupied residential dwellings but there is limited substantiation with fact that this pathway is not active, particularly the lack of characterization of off-site, down gradient groundwater concentrations. What is your technical justification to overcome the presumption as required by 3 10 CMR 40.0414(3) that immediate response actions such as the installation of monitoring wells near those residences or testing indoor air are not necessary to address the critical exposure?

Please refer to the response to comment 1g to the Wayland Conservation Commission Letter.

5. The Raytheon operations were identified as a property subject to' CERCLIS listing in 1980 by EPA and given high priority following their initial site visits during the mid1980s. It is remarkable that discovery of the most serious conditions did not occur until 20 years later. The Massachusetts Contingency Plan regulations establish a system of reporting for each reportable condition identified at a disposal site. Those reporting requirements are the foundation and premise for subsequent timely actions by responsible parties and for disclosure in the public record.

The Raytheon property was placed on the CERCLIS listing in the early 1980s due to an aerial over flight that mistakenly interpreted the concrete wastewater holding tanks as lagoons. The site remains on the CERCLIS. As each reportable condition has been identified Raytheon has

responded and conducted response actions in accordance with the applicable MCP (1983 and 1993) and attendant requirements.

RESPONSE TO WAYLAND WASTEWATER MANAGEMENT DISTRICT COMMISSION LETTER

Question 1: Will Raytheon clarify whether the sample was collected from the actual discharge or from the swale located at the outfall (surface water)? If not, why not?

The sample was taken directly from the outfall at OF-1 prior to reaching the surface water in the wetland. See Irwin letter response #3a for more detail.

Question 2: Will Raytheon be resampling from that same sampling point wherever it is given the quality failures of the first set of data? If not, why not?

This sample was taken to be used as a screening tool and to establish background conditions of the wastewater and stormwater discharging to the wetland from OF-1. This data was not used in the risk assessment; therefore it would not affect the outcome of the Phase II report.

All standard quality control procedures where followed during sampling and analyzing this water sample. See the answer to the following question for more detail on the sampling results. At this time Raytheon does not intend to resample the outfall.

Question 3: Will Raytheon explain the discrepancy between their results and ours? If not, why not?

The detection limits used to analyze the sample collected by ERM at OF-1 are significantly lower than the detection limits reported by the analytical laboratory used by the Town of Wayland. ERM's results are reported in the parts per billion (ppb) range, while the town's data is reported in the parts per million (ppm) range. The table below is a comparison of the data in similar units (ppb):

Wastewater Discharge Comparison (OF-1)

Parameter	Town of Wayland 10/25/01	ERM 10/26/00
	(ppb)	(ppb)
Antimony	< 60	5
Arsenic	< 10	0.71
Beryllium	< 4	0.50
Cadmium	< 5	0.56
Chromium	< 10	< 1
Copper	77	90
Lead	< 5	1.8
Mercury	< 0.2	< 0.2
Nickel	< 40	18
Selenium	< 50	< 2.5
Silver	< 10	< 0.5
Thallium	< 20	< 0.5
Zinc	200	360

Note: Town data was analyzed for total metals, ERM data was analyzed for dissolved metals: therefore it can be assumed that total metals results would be slightly higher than dissolved metals results.

The two sets of data presented above are somewhat consistent, despite being sampled one year apart and with differing detection limits. Detections of copper and zinc are within typical deviation for data points at a single location. Please note that the concentrations of Copper and Zinc exceed NPDES reporting limits.

The nature of the discharge can produce varying results. It is our understanding the wastewater from the treatment plant is treated in batch reactions and discharged following each batch. Therefore the actual discharge coming from the outfall pipe at OF-1 will vary. Other sources contribute to the outfall other than the wastewater treatment

plant. Stormwater from the parking lot and roof drains are collected and discharged at the outfall. Water from the heating and cooling utilities are also intermittently discharged to the stormwater system.

The variances in the wastewater stream discharge can lead to variable pH readings. For example, if a sample was collected after a rain event, the pH of the water at the discharge would be lower due to influences of acid rain. Variances in the pH data may also be related to the method and timing of analysis. ERM measured the pH with a hand held device. It is not clear if the Town's laboratory used differing instrumentation to report pH values.

RESPONSE TO PATTON LETTER

Your firm seems to ignore in the reports that Wayland's drinking water does come from groundwater in the affected area. Why do you try to convince us otherwise?

As our groundwater is in danger of pollution from the Raytheon site, I don't understand why you have not tested off-site. You must perform tests of the groundwater off-site to come to any meaningful conclusion about Raytheon's contamination. Despite all of your data, you have not performed your task adequately.

Please refer to the response to comment 1b of the Wayland Conservation Commission Letter.

RESPONSE TO ROBINSON LETTER

I note that your documents show a cluster of test wells near the railroad in which TCE concentrations were found in concentrations almost 100 times the current regulatory limit for drinking water (DW-1). I believe we ought to have a detailed analysis of that TCE plume. The plume's current location needs to be delineated three-dimensionally, with detailed readings of TCE concentrations organized in contours from the maximum at least down to the current GW-1 limit. In addition, the plume's historic and predicted migration path both needs to be delineated, again three-dimensionally.

Finally, your discussion of proposed treatment for that TCE "hot spot" and its plume comes across to me as primarily hand-waving, and also as relying more on dilution than removal. To the extent that my impression is accurate, I object to that proposed treatment. I believe we ought to have a reviewable, defensible treatment plan which is addressed specifically to that TCE "hot spot" and its plume, including any portion of the plume which has strayed across the property line. And the treatment plan should not countenance dilution in any way, shape, or form.

The boundaries of the trichloroethene (TCE) plume to the southwest have been inferred based on the extrapolation of contaminant concentration gradients from source areas along the downgradient groundwater flow paths to potential groundwater discharge points at the Sudbury River. The extrapolation is based on temporal and spatial variations in site groundwater flow and contaminant transport patterns using six years of site groundwater monitoring data collected during 13 sampling events conducted from 1995 through 2001. The results indicate relatively steady-state conditions, with contaminant concentrations generally decreasing with time and distance from source areas along downgradient flow paths. It is ERM's opinion that this Site had been properly characterized in accordance with MCP guidelines. However, additional monitoring points will be installed to further substantiate the findings of the Phase II report.

As such, the existing data adequately establish the need for remedial response actions, evaluation of remedial alternatives and selection of the preferred alternative to achieve abatement. Pilot studies are current ongoing to support rapid and effective abatement of site groundwater impacts. Dilution is not currently being considered as a viable remedial alternative.

RESPONSE TO ANNETTE LEWIS LETTER

1) State clearly in the text of the Phase II Report the fact that the numerical ranking for this Site places it in the IA Tier Classification and explain/describe how/why it received a Tier IB permit. Refer to all meetings, correspondence, telephone calls, other documents or communications that led to the apparent reclassification and place such source materials in the PIP Record Repositories.

Please refer to the response to comment 1 of Linda Segal's Letter.

2) At the time of the October 24, 2001 PIP Meeting, the Phase I Report for the Site had not been included in the materials sent to the Record Repositories. Nor was I able to find a copy of the completion statement for that report. Please assure that all materials including draft and final reports, notes of meetings and telephone conferences with regulatory agencies where substantive and procedural issues are discussed, and all correspondence with the Town and regulatory agencies are placed in the Record Repositories so that the public can follow the process along.

Please note that the Phase I Report and other MCP documentation has been placed in the PIP Repository in accordance with the PIP and requests of PIP participants.

3) It is apparent that much of the contamination on site and in and along the Sudbury River is the result of discharges from Outfalls 1 and 2; however, it is unclear from the documentation available in the Record Repository precisely which constituents were discharged, what the permitted limits were for each constituent, whether there were exceedences of the limits and on how many occasions, whether other non-permitted substances were discharged through those outfalls. Information on each of these points should be included in the historical background section of the Phase II Report so that the public can understand why only certain constituents are being addressed. From my brief review, it would seem that there are additional constituents of concern that should be looked at.

ERM respectfully disagrees that discharges from Outfall OF-02 represent a significant past source of release. Available information regarding the outfalls, permits, discharge limits, etc. is included in the Phase I Report. The purpose and scope of the Phase II is clearly outlined in Section 1.2 of the Phase II Report. The rationale for selection of site constitutents of concern (COCs) is clearly indicated in the Phase I and Phase II Reports.

4) The Phase II and III Reports need clearer explanations of all of the actions taken to address each of the Release Tracking Numbers. There should be a

separate description for each tracking number, and, among other things, a list of the constituents of concern for each, a statement of the media (i.e., groundwater, surface water, soil, sediment, air) in which contamination was found, the levels found, a comparison to the cleanup standards, and the current status of each.

Please note that actions taken to address each of the RTN's are summarized in Table 1: Chronology of Regulatory History, Investigations and Remediation and Page 18 of the Phase II Report.

5) The Phase II Report contains some maps and depictions of sampling locations, but there is no visual organization of the data points. Thus, it is impossible to get a handle on precisely what the nature and extent of the contamination is. It is not readily apparent from the information presented. Please remedy this by pulling together a series of Site maps (which also encompass the areas beyond the former Raytheon property) for each group of constituents of concern (i.e., VOC, metals, PAHs, PCBs, petroleum hydrocarbons, etc.). For example, for metals, there would be a maximum of five maps (one for each media) and the rnap would depict the location of each sampling point in that media; and for each sampling point, the date of each sample taken, the depth of the sample, and the analytical result.

The Phase II Report includes selected maps summarizing significant aspects of the nature and extent of site contamination. These maps were designed specifically to summarize the nature and extent of OHM impact focusing on media and areas that pose a risk, and therefore warrant evaluation of remedial alternatives and implementation of remedial actions. It is not standard industry practice to summarize six or more years of data onto one map. It would be very difficult for any reader to interpret. For your information, additional figures have been attached.

6) Based on the information presented in the Phase II Report, there does not appear to be a clear justification for your statement that groundwater impacts are limited to the shallow overburden. After you review the maps requested in number 5 above, please consider the locations in which additional sampling must be conducted.

Your reference to the statement that "groundwater impacts are limited to the shallow overburden" is unclear. It is ERM's opinion that the Phase II Report clearly states that the extent of groundwater impact near the primary source area (manhole W-4) is limited to the shallow overburden, but that to the west and downgradient of the source impacts migrate downward to intermediate depths within the overburden as the aquifer material (gray silt layer) becomes coarser. This distribution is clearly delineated on Figures 15 and 16 of the Phase II Report. However,

additional monitoring points will be installed to further substantiate the findings of the Phase II Report.

7) *Monitoring wells need to be installed in the direction of toward the water supply wells to adequately assess groundwater impacts and potential impacts on the water supply wells.*

Please refer to the response to comment 1b to Wayland Conservation Commission Letter.

8) Based on the information presented in the Phase II Report, it is not clear why the areas in which VOCs were tested for was so limited. Please explain this. On Figure 15 of that Report, there are references to "HA". What does that abbreviation stand for? It is not contained in the key of notations.

Consistent with standard industry practice, 310 CMR 40.0480 and 310 CMR 40.0830 installation of monitoring wells and groundwater testing was based on: 1) a review of the site operational history including OHM use, storage and potential disposal; 2) evaluation of facility infrastructures that could represent potential sources of OHM release (drywells, underground storage tanks, etc.); 3) evaluation of site geology and hydrogeology to identify and evaluate probable pathways for contaminant migration; 4) review of aerial imagery; and 5) the proximity of current and future potential receptors to identified locations of OHM release. Therefore, testing was focused on those areas maintaining the highest probability for impact. The abbreviation "HA" stands for Haley & Aldrich. For example, monitoring well HA-102 is a label for a well installed by Haley & Aldrich, environmental consultant for the property owner.

9) State the month and year when data for ground flow directions was obtained. In order to adequately assess the groundwater flow direction in this area, data should be representative of the four seasons.

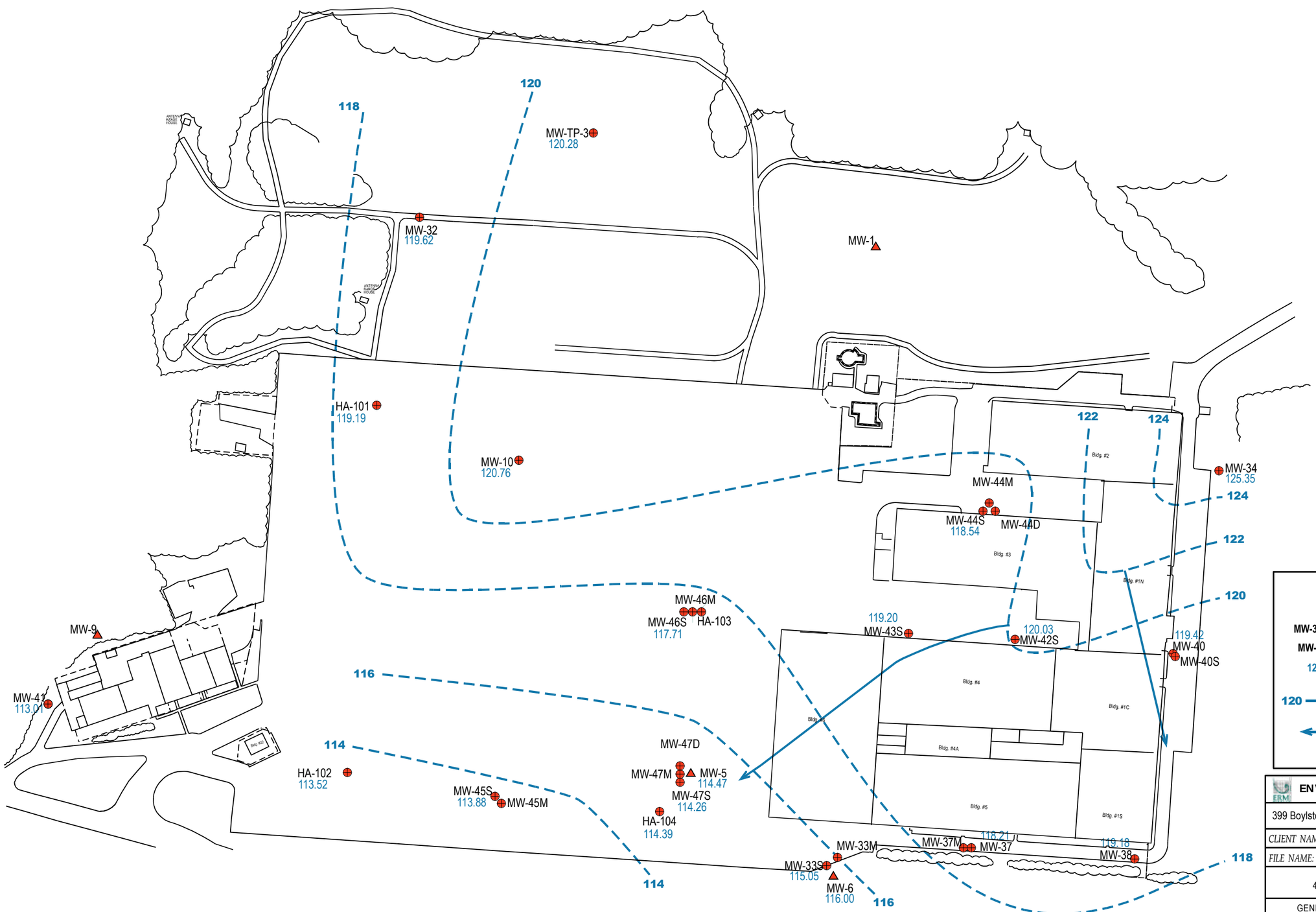
Please refer to the dates for groundwater gauging events listed in Table 5, Summary of Groundwater Gauging Data in the Phase II Report.

10) Because the nature and extent of the contamination at this Site has still not been adequately characterized, the risk assessment is based on insufficient data. Therefore it would be inappropriate to treat the Phase III document as anything more than a preliminary assessment. The document cannot be relied on to choose final remedial options for this Site.

The nature and extent of OHM impact associated with the site has been

adequately characterized to support evaluation of potential risks to human health, safey, public welfare and the environment. The characterization of potential risk to human health intentionally utilized overly conservative exposure assumptions to estimate risk. For example, the risk characterization assumes exposure by residential receptors to OHM in groundwater via ingestion and inhalation pathways, even though these are not exposure pathways under current conditions. The Phase III is intended to be a comparitive analysis of remedial alternatives. As such, an increase in the level or extent of abatement required for the downgradient portions of groundwater impact would not necessarily change the results of the Phase III. Modifications in the remedial approach may be necessary as the results of remedial pilot studies are evaluated. As such, existing data is adequate to establish the need for remedial response actions, evaluation of remedial alternatives and selection of the preferred alternative to achieve abatement. However, additional groundwater characterization will be conducted to verify the lack of significant impact to this portion of the Site.

Attachment A
Groundwater Contour Maps



SCALE

300 ft 0 150 ft 300 ft

LEGEND

- MW-34 ⊕ Existing Monitoring Well
- MW-1 △ Existing Microwell
- 125.35 Shallow Overburden Groundwater Elevation (feet ASL)
- 120 — — Shallow Overburden Groundwater Contour (dashed where inferred)
- ← Inferred Groundwater Flow Direction

ENVIRONMENTAL RESOURCES MANAGEMENT

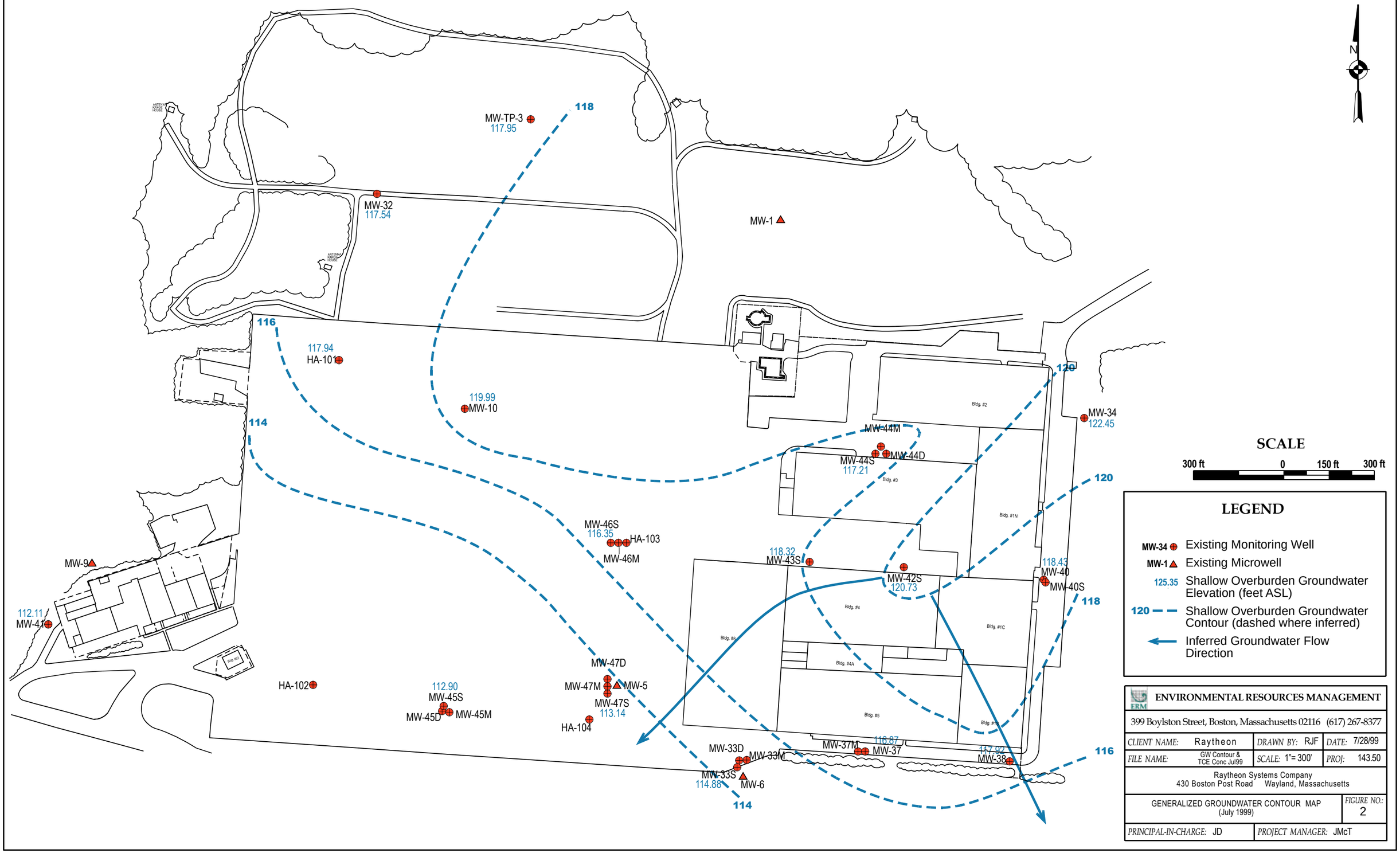
399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377

CLIENT NAME: Raytheon		DRAWN BY: RJF	DATE: 11/18/98
FILE NAME: GW Contour& TCE Conc Nov98		SCALE: 1"= 300'	PROJ: 143.50

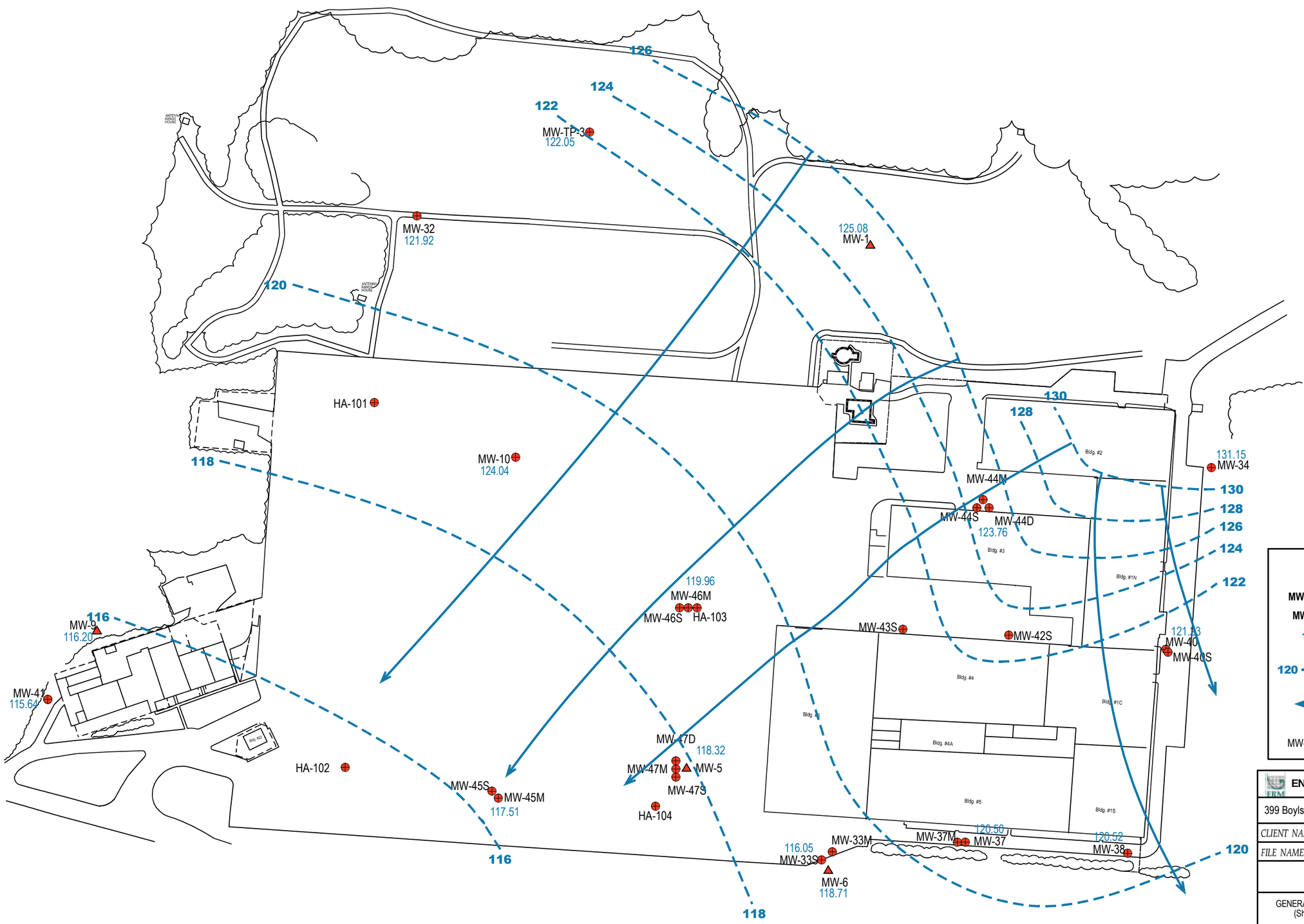
Raytheon Systems Company
430 Boston Post Road Wayland, Massachusetts

GENERALIZED GROUNDWATER CONTOUR MAP (November 1998) — 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: 7/28/99
FILE NAME: GW Contour & TCE Conc Jul99		SCALE: 1"= 300'	PROJ: 143.50
Raytheon Systems Company 430 Boston Post Road Wayland, Massachusetts			
GENERALIZED GROUNDWATER CONTOUR MAP (July 1999)			FIGURE NO.: 2
PRINCIPAL-IN-CHARGE: JD		PROJECT MANAGER: JMcT	



SCALE

300 ft 0 150 ft 300 ft

LEGEND

- MW-34 ⊕ Existing Monitoring Well
- MW-1 △ Existing Microwell
- 125.35 Shallow Overburden Groundwater Elevation (feet ASL)
- 120 — — Shallow Overburden Groundwater Contour (dashed where inferred)
- ← Inferred Groundwater Flow Direction
- MW-39 ⊕ Destroyed Wells

ENVIRONMENTAL RESOURCES MANAGEMENT

399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377

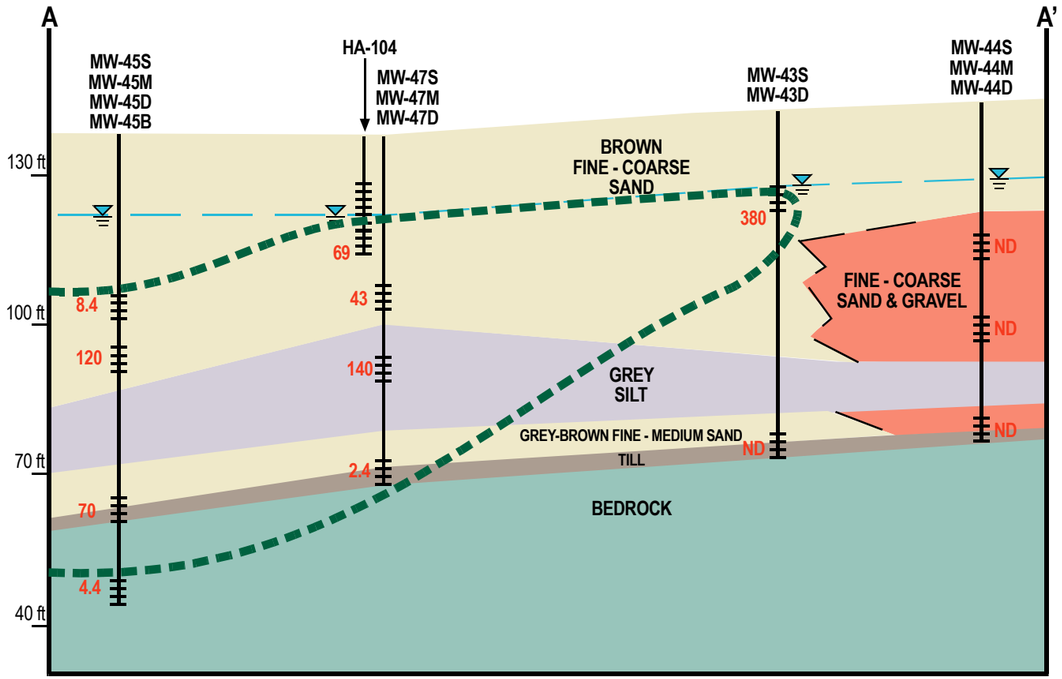
CLIENT NAME: Raytheon		DRAWN BY: RJF	DATE: 5/27/98
FILE NAME: GW Contour& TCE Conc May 98		SCALE: 1"= 300'	PROJ: 143.50

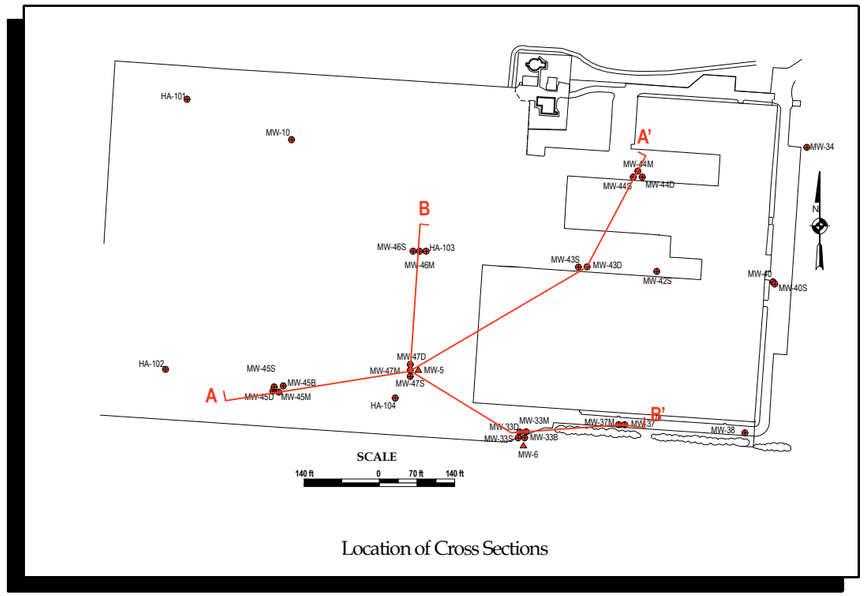
Raytheon Systems Company
430 Boston Post Road Wayland, Massachusetts

GENERALIZED GROUNDWATER CONTOUR MAP
(Shallow Overburden Aquifer; May 1998)

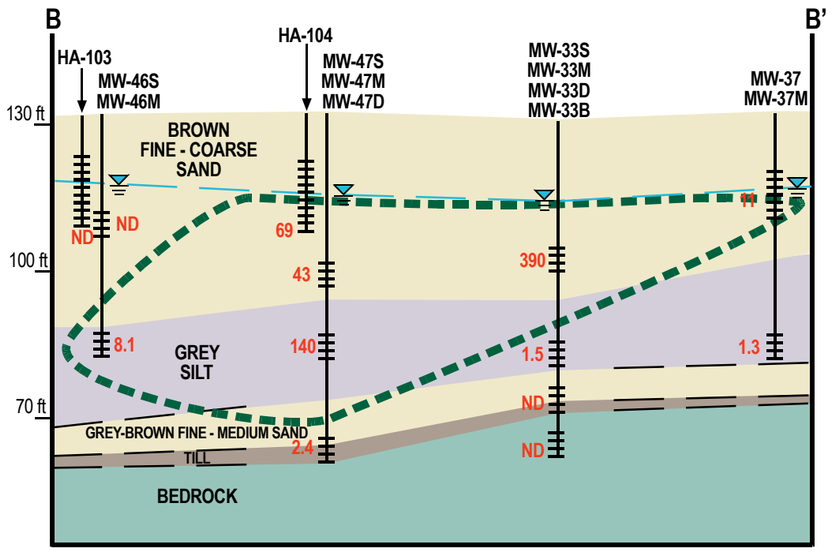
FIGURE NO.: 6a

PRINCIPAL-IN-CHARGE: JD | PROJECT MANAGER: JMcT





Location of Cross Sections



APPROXIMATE SCALE
Horizontal: 1" = 140'
Vertical: 1" = 30'

NOTE:
All elevations are approximate and are relative to mean sea level.

LEGEND

MW-9D	Monitoring Well
240	TCE Concentration (mg/l)
- - -	Shallow Overburden Groundwater Table
▬ ▬	TCE Conc. > 5 mg/L

ENVIRONMENTAL RESOURCES MANAGEMENT

399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377

CLIENT NAME: Raytheon	*DRAWN BY:* RJF	*DATE:* 2/19/01	
FILE NAME: Cross Section Map Apr 00	*SCALE:* 1" = 140'	*PROJ:* 143.50	

Raytheon Company
430 Boston Post Road Wayland, Massachusetts

GENERALIZED GEOLOGIC CROSS SECTION MAP
Showing Approximate Vertical Extent of TCE in Groundwater (April 2000)

FIGURE NO: 16

PRINCIPAL-IN-CHARGE: JD | *PROJECT MANAGER:* JMcT

Attachment B
Table 1- Locations Included in ARAH

Table 1
Locations Included in ARAH
Raytheon Company
Wayland, Massachusetts

Transect Location								
FP-1	FP-2							
T-1-1	T-1-2	T-1-3	T-1-4					
T-2-A	T-2-1	T-2-2	T-2-3	T-2-4	T-2-6	T-2-7	T-2-8	
T-3-3	T-3-4	T-3-5	T-3-6	T-3-7	T-3-8			
T-4-2	T-4-3	T-4-4	T-4-5					
T-5-1	T-5-2	T-5-3	T-5-4	T-5-5	T-5-6	T-5-7	T-5-9	T-5-10
T-6-1	T-6-2	T-6-3	T-6-4	T-6-5	T-6-6			
T-7-1	T-7-6	T-7-7	T-7-9	T-7-11				
T-8-8	T-8-9	T-8-10						

= Locations in Exanded ARAH

Attachment C

Table 34 – Risk Characterization Table

Table 34
Soil/Groundwater Risk Characterization - On-Site Resident
Raytheon Company
Wayland, Massachusetts

Compound of Concern	ELCR Dermal	ELCR Ingestion	ELCR Inhalation	Total $ELCR_{chem\text{-}specific}$
Groundwater				
Volatile Organic Compounds (VOCs)				
Benzene	-	1.45E-06	9.93E-08	1.5E-06
Tetrachloroethene	-	2.39E-05	5.19E-09	2.4E-05
Trichloroethene	-	5.84E-05	2.86E-06	6.1E-05
cis-1,2-Dichloroethene	-	-	-	-
Vinyl Chloride	-	2.15E-04	6.33E-06	2.2E-04
1,1,1-Trichloroethane	-	-	-	-
1,1-Dichloroethane	-	-	-	-
1,1-Dichloroethene	-	5.62E-05	7.67E-07	5.7E-05
Trichlorofluoromethane	-	-	-	-
1,2,3-Trichlorobenzene	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-
1,4-Dichlorobenzene	-	1.58E-06	-	1.6E-06
Chlorobenzene	-	-	-	-
Dissolved Metals				
Barium	-	-	-	-
Chromium	-	-	-	-
	0.0E+00	3.6E-04	1.0E-05	**3.7E-04**
		Total $ELCR_{route\text{-}specific}$		**$ELCR_{media\text{-}specific}$**

Cumulative ELCR	**3.7E-04**
DEP Risk Limit	1.0E-05

Notes:

- = Not applicable due to incomplete exposure pathway or no available toxicity value.

ELCR: Excess Lifetime Carcinogenic Risk = Exposure Dose * CSF

Cumulative ELCR = $\Sigma ELCR_{media\text{-}specific}$

Shaded cells denote Cumulative Risks greater than DEP Risk Limits.