RCRA RECORDS CENTER
FACILITY Pratt & Whitney CPD
I.D. NO. CTD000844332
FILE LOC. R-13
OTHER
RDMS DocID 00100107

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

CURRENT HUMAN EXPOSURES UNDER CONTROL

October 1, 2001

Prepared for

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DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

Current Human Exposures Under Control

Facility Name: Former Pratt & Whitney Overhaul & Repair Operations (ORO)
Facility Address: 45 Newell Street, Southington, CT
Facility EPA ID #: CTD000844332

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Insert A

See

Pratt & Whitney Former Overhaul and Repair Operations

Documentation of Environmental Indicator Determination
Current Human Exposures Under Control
dated October 1, 2001

Supercedes inserts dated 2002 when EI determination indicated IN for CA 725 and CA 750, more information needed to make a determination.

Insert for page 3, question 2
Groundwater
Pratt & Whitney completed connections to the public water system for residential and commercial properties located adjacent to the Newell Street Facility. Refer to *Project Completion Documents Water Service Extension*, LEA, dated January 2003, contained in the EPA facility file.

CJL 7/1/03

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"** above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			There are six areas of groundwater contamination (AGWCs) at the site. The groundwater is primarily contaminated with chlorinated solvents such as 1,1,1-trichloroethane, tetrachloroethylene and associated degradation products and metals such as chromium and nickel. The Connecticut Department of Environmental Protection (DEP) has approved natural attenuation for three of the plumes, and technical impracticability of groundwater remediation to drinking water standards for the other three plumes. In addition, a plan proposing the installation of a hydraulic containment system has been approved by the DEP. The hydraulic containment system has been installed at the site and is currently operational. The hydraulic containment system is the remaining component for addressing dense non-aqueous phase liquids (DNAPL) in the subsurface. Further, an institutional control, consisting of recording an Environmental Land Use Restriction (ELUR) has been implemented, to prevent groundwater use in this area for drinking or domestic purposes. The ELUR has been recorded at the Town of Southington land records.
Air (indoors)[2]	X			Certain distinct areas of the facility have contaminated groundwater at levels exceeding the default Residential Volatilization Criteria listed in the Remediation Standard Regulations (RSRs) issued by the State of Connecticut Department of Environmental Protection (DEP). However, sub-slab ventilation systems have been installed at these locations beneath the facility's floor to prevent the migration of volatile organic compounds (VOCs) into the facility buildings. The installation and operation of the sub-slab ventilation systems was documented in a report approved by the DEP.

See also Insert A
MRH 9/8/03
CJC 9/9/03

Insert B

Pratt & Whitney Former Overhaul and Repair Operations

Documentation of Environmental Indicator Determination
Current Human Exposures Under Control
dated October 1, 2001

Supercedes inserts dated 2002 when EI determination indicated IN for CA 725 and CA 750, more information needed to make a determination.

Insert for page 4, question 2
Surface Soil
Also refer to the following document contained in the EPA facility file: Loureiro Engineering Associates, **December 2000**, Report on Soil Remediation, Pratt & Whitney ORO: Prepared for United Technologies Corporation, Hartford, Connecticut.

For surface soil: In consideration of the soil remediations and CT DEP approvals, a "NO" response is appropriate here (surface soils are not known or reasonably expected to be "contaminated" above appropriately risk based levels).

Surface water
The last sentence to this section should read "...the ratio of the 7Q10 to the average daily discharge..." not "...the ratio of the average daily discharge to the 7Q10...."

For surface water: Based on the CT DEP May 23, 1995 determination that "...discharges of site groundwater does not pose an unacceptable risk to the designated uses of the Quinnipiac River," and review of more current data, a "NO" response more accurately represents surface water conditions (surface water is not known or reasonably expected to be "contaminated" above appropriately risk based levels).

Sediment
For sediment: Based on the concentrations being below the soil/sediment screening criteria, a "NO" response more accurately represents sediment conditions at the site (sediments are not known or reasonably expected to be "contaminated" above appropriately risk based levels).

CJC 7/1/03

Surface Soil (e.g., <2 ft) X ___ ___

See also Insert B MRH 9/8/03

Based on the extensive sampling performed, surface soils were contaminated at certain distinct facility locations. The contaminants included primarily chlorinated hydrocarbons and metals. The unsaturated soils at the facility have been remediated and approvals have been issued by the DEP.

Surface Water CJC 9/9/03 X ___ ___

See also Insert B MRH 9/8/03 CJC 9/9/03

Contaminated groundwater from the site may be discharging to surface water. The contaminants encountered in the groundwater include primarily chlorinated hydrocarbons and metals. However, DEP has issued an approval letter noting that the discharge of site groundwater does not pose an unacceptable risk to the designated uses of the Quinnipiac River.

In addition, the groundwater data have been evaluated against the Surface Water Protection Criteria listed in the RSRs. Compliance with the RSRs has been demonstrated either by direct comparison of the groundwater data obtained or through the use of an alternative surface water criterion based on an alternative dilution factor. In accordance to the RSRs, the alternative dilution factor is calculated as one fourth of the ratio of the average daily discharge of the polluted groundwater to the seven-day, ten-year low flow (7Q10) of the stream.

Sediment X ___ ___

See also Insert B MRH 9/8/03 CJC 9/9/03

Sediment contamination has been identified in the reach of the Quinnipiac River running through the site. Among the contaminants identified were polynuclear aromatic hydrocarbons (PAH) and metals, primarily nickel. The PAH concentrations identified were at the same level as the levels detected in upstream samples. The metal concentrations encountered seem to be associated with stormwater and historic process outfalls. As discussed in subsequent sections, the concentrations identified are below soil/sediment screening criteria.

Subsurf. Soil (e.g., >2 ft) X ___ ___

5

Based on the extensive sampling performed subsurface soils were contaminated at certain distinct facility locations. The contaminants included primarily chlorinated hydrocarbons and metals. Compliance with the RSRs has been demonstrated for the unsaturated soils at the site and a

letter of approval has been issued by the DEP. An ELUR has been recorded to restrict disturbance of inaccessible soils. Inaccessible soils are soils that are four feet below ground surface; two feet below a paved surface; or beneath an existing building.

Air (outdoors) _X_ __ ___

An ELUR has been recorded preventing the construction of buildings on certain portions of the site where the default Residential Volatilization Criteria listed in the RSRs have been exceeded. Minor construction activities such as trench construction are not believed to pose significant risk since they typically represent short-term exposure, and in addition the trench air is diluted with outdoor air.

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

_X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and reference(s):

Provided below

Background and Current Status

The Newell Street facility, formerly owned by Pratt & Whitney Overhaul & Repair Operations, is comprised of approximately 47 acres of land including a parking area on the west side of the Quinnipiac River, a wooded undeveloped area to the north of the river and the land on which the facility buildings stand to the south of the river. The property is located in the Town of Southington within the Quinnipiac River valley. The site is bounded on the east by the Boston & Maine Railroad, the Quinnipiac River, and Birch Street; on the south by Newell Street and West Queen Street; on the west by Newell Street and Redstone Street; and on the north by a mixture of residential and light-industrial properties. The Quinnipiac River flows through the site along three sides of the portion of the facility where the industrial buildings are located. The land surrounding the facility is characterized by a mixture of commercial, industrial, and residential uses.

For nearly 30 years, Pratt & Whitney used the facility for the overhaul and repair of aircraft jet engines or jet engine parts. Pratt & Whitney discontinued operations at the facility and vacated the site when the lease expired on December 31, 1993. Most of Pratt & Whitney's industrial operations at the facility ceased at the end of 1992. The site is currently owned by Yarde Metals, a metal processing warehouse.

An extensive investigation and remediation of the facility has been performed from 1992 to October 1999. An assessment of compliance with the RSRs has been performed and described in the report entitled *Assessment of Compliance with Connecticut's Remediation Standard Regulation, Former Pratt & Whitney Overhaul & Repair Operations Facility*, prepared by Loureiro Engineering Associates (LEA) dated August 5, 1996 and last revised on November 1, 1996. A copy of the report is provided in Appendix A. Several approval letters issued by the DEP are included in Appendix B.

Groundwater

Extensive groundwater investigations have been performed at the site and approvals have been issued by the DEP as described above. In addition, a hydraulic containment system has been installed at the site and is currently operational. The hydraulic containment system is the remaining component for addressing DNAPL in the subsurface.

Insert C

Pratt & Whitney Former Overhaul and Repair Operations

Documentation of Environmental Indicator Determination
Current Human Exposures Under Control
dated October 1, 2001

Supercedes inserts dated 2002 when EI determination indicated IN for CA 725 and CA 750, more information needed to make a determination.

Insert for page 7, question 2
Groundwater
This exposure pathway is no longer complete. Refer to the insert for page 3, question 2, Groundwater regarding connections to public water.

CJC 7/1/03

A sitewide groundwater monitoring program is currently in effect at the facility, as described in the report entitled, *Sitewide Groundwater Monitoring Program Evaluation, Former Pratt & Whitney ORO Facility*, Southington, CT, prepared by LEA, dated April 2001, and last revised in July 2001. The monitoring program has been approved by the DEP.

It should also be noted that based on verbal draft data provided by EPA, trichloroethylene has been detected at a concentration of 30 to 35 μg/l in a groundwater sample collected from a private well at 178 Newell Street. A review of the data available to date from the extensive investigations performed at the ORO facility indicated that there is no direct pathway for trichloroethylene to reach the private wells, installed to a depth of 400 feet in the bedrock, since trichloroethylene has remained essentially undetected in the deeper aquifer zone below the facility. The only exception is the detection of trichloroethylene in the deeper aquifer zone in upgradient wells (C2-3, LEA10-2) and in wells located in areas of the facility impacted from off-site sources (C4-3A).

See also Insert C WRH 9/8/03
C/c 9/9/03

Indoor Air

Certain distinct areas of the facility have contaminated groundwater at levels exceeding the default Residential Volatilization Criteria listed in the Remediation Standard Regulations (RSRs) issued by the State of Connecticut Department of Environmental Protection (DEP). In response, sub-slab ventilation systems have been installed at these locations beneath the facility's floor to prevent the migration of volatile organic compounds (VOCs) into the facility buildings. The installation of the systems has been approved by the DEP.

Soil

A series of investigation and remediation activities have been performed at the Newell Street facility and approvals have been issued by the DEP.

Surface Water

Surface water sampling has been performed at the site since 1992 and approvals have been issued by the DEP as discussed above.

Sediment

Sediment investigations have been performed in the Quinnipiac River in response to contamination related to stormwater and historic process outfalls. The primary contaminant identified is nickel. Additional investigations are scheduled to be performed in order to obtain sufficient data to support an equilibrium partitioning approach which focuses on the concentration of metals partitioned into sediment pore water rather than on bulk concentrations in sediment. Additional sampling is required to fully define the extent of the contamination.

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	N	N	N	N	N	N	N
Air (indoors)	N	Y	N	Y	N	N	N
Soil (surface, e.g., <2 ft)	N	Y	N	Y	Y	N	N
Surface Water	N	N	N	N	Y	Y	N
Sediment	N	N	N	N	Y	Y	N
Soil (subsurface e.g., >2 ft)	N	N	N	Y	N	N	N
Air (outdoors)	N	N	N	Y	N	N	N

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Groundwater

There are no exposure pathways to contaminated groundwater.

Indoor Air

Company employees including maintenance workers and construction workers may be exposed to contaminated indoor air. Contaminated groundwater exists at certain portions of the facility at concentration levels exceeding the default volatilization criteria listed in the RSRs. However, as discussed in Question No. 4, two sub-slab ventilation systems have been installed beneath the facility's floor in Buildings No. 2 and No. 3 to prevent VOCs from entering the building.

Surficial Soil

Maintenance workers, construction workers, and trespassers may be exposed to surficial soils. However, unsaturated soils at the site have been remediated and approval letters have been issued by the DEP.

Surface Water

Trespassers and recreators may be exposed to surface water impacted by the discharge of contaminated groundwater. However, an approval has been issued by the DEP stating that the discharge of site groundwater does not pose an unacceptable risk to the designated uses of the Quinnipiac River.

Sediment

Trespassers, and recreators may be exposed to contaminated sediment on the site. However, as discussed in Question No. 4, a comparison of all sediment data obtained to-date against generic Pratt & Whitney screening levels did not indicate any exceedances. Therefore, sediments at the site are not expected to pose significant risk to human health.

Subsurface Soil

Construction workers may be exposed to subsurface soils. However, compliance with the RSRs has been demonstrated for unsaturated soils at the site and an approval letter has been issued by the DEP. In addition, an ELUR has been recorded to restrict disturbance of inaccessible soils.

Outdoor Air

Construction workers may be exposed to outdoor air during construction activities such as trench installation at the site. As discussed in Question No. 4, an ELUR has been recorded preventing the construction of buildings on certain portions of the site where the default Residential Volatilization Criteria listed in the RSRs have been exceeded. Workers undertaking short-term subsurface activities (e.g. installing a trench for a new utility line) might potentially be exposed to VOCs emanating from impacted groundwater. Potential exposures from such activities are expected to pose insignificant human health risks because: 1) the exposure duration and exposure frequency is expected to be small; and 2) VOC concentrations are also expected to be low as a result of mixing with ambient air. Therefore, in the presence of the ELUR, the site is expected to pose insignificant risks via outdoor air.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):_____

Groundwater

There are no exposure pathways to contaminated groundwater. Approval letters have been issued by the DEP. In addition, a hydraulic containment system has been installed at the site based on a DEP-approved work plan and is currently operational. The hydraulic containment system is the remaining component for addressing DNAPL in the subsurface. It should also be noted that an ELUR has been recorded for the entire property to prevent use of the groundwater for drinking or domestic purposes.

Further, only trace amounts of contamination were detected in a monitoring well installed off-site. As discussed above, a review of the data available to date from the extensive investigations performed at the ORO facility indicated that there is no direct pathway for trichloroethylene to reach the private well at 178 Newell Street, installed to a depth of 400 feet in the bedrock, since trichloroethylene has remained essentially undetected in the deeper aquifer zone below the facility.

Indoor Air

Company employees including maintenance workers and construction workers may potentially be exposed to indoor air. Contaminated groundwater exists at certain portions of the facility at concentration levels exceeding the default volatilization criteria listed in the RSRs. Two sub-slab ventilation systems have been installed beneath the facility floor in Buildings No. 2 and No. 3 to prevent VOCs from entering the building. The installations of these two systems satisfy the requirements of the RSRs and an approval letter has been issued by the DEP. A third system previously installed in Building No. 1 is no longer operating with the consent of the DEP based on data obtained for this area.

Surficial Soil

Maintenance workers, construction workers, and trespassers may be exposed to surficial soils. However, unsaturated soils at the site have been remediated and approval letters have been issued by the DEP.

Surface Water

Trespassers and recreators may be exposed to surface water impacted by contaminated groundwater. An approval has been issued by the DEP stating that the discharge of site groundwater does not pose an unacceptable risk to the designated uses of the Quinnipiac River.

Sediment

Trespassers, and recreators may be exposed to contaminated sediment on the site.

Risk-based soil/sediment screening levels (referred to as generic Pratt & Whitney soil/sediment screening levels), which were developed considering exposures at six other Pratt & Whitney facilities located in Connecticut and approved by EPA, were used for the evaluation of

contaminated sediment (Gradient, 1999)[1]. Based on a review of site conditions and the receptor groups considered in the Gradient (1999) study, two receptor groups: 1) trespassers; and 2) off-site recreators are most likely to be exposed to sediments within the Quinnipiac River. Sampling is currently conducted by health and safety-trained environmental consultants; therefore, potential exposures to this receptor group do not need to be considered. Consequently, generic Pratt & Whitney soil/sediment screening levels for trespassers and off-site recreators were used to evaluate potential exposures to sediments. The generic Pratt & Whitney screening levels are applicable at this site because the exposure factors used in the development of the screening levels (*i.e.* generally sites along small streams/rivers, not likely to be used extensively for recreation) are applicable at this site. In fact, two of the other Pratt & Whitney facilities considered in the development of screening levels (North Haven and Southington Manufacturing) are also located along the Quinnipiac River. Therefore, given the similarity in the setting and expected exposure patterns, use of the EPA-approved generic Pratt & Whitney screening levels is appropriate at this site.

A comparison of all sediment data obtained to-date did not indicate any exceedances of the generic Pratt & Whitney screening levels for trespassers and off-site recreators. Therefore, sediments at the site are not expected to pose significant risk to human health.

Subsurface Soil

Construction workers may be exposed to subsurface soils. However, compliance with the RSRs has been demonstrated for unsaturated soils at the site and an approval letter has been issued by the DEP. In addition, an ELUR has been recorded to restrict disturbance of inaccessible soils.

Outdoor Air

Construction workers may be exposed to outdoor air during construction activities such as trench installation at the site. An ELUR has been recorded preventing the construction of buildings on certain portions of the site where the default Residential Volatilization Criteria listed in the RSRs have been exceeded. Workers undertaking short-term subsurface activities (e.g. installing a trench for a new utility line) might potentially be exposed to VOCs emanating from impacted groundwater. Potential exposures from such activities are expected to pose insignificant human

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1 Gradient Corporation (Gradient). 1999. Conceptual Site Models and Screening Levels For Pratt & Whitney's VCAP Connecticut Facilities. September 15.

health risks because: 1) the exposure duration and exposure frequency is expected to be small; and 2) VOC concentrations are also expected to be low as a result of mixing with ambient air. Therefore, in the presence of the ELUR, the site is expected to pose insignificant risks via outdoor air.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits? **N/A**

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and
Reference(s):_____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X___ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the (site name, EPA ID Number, address) under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Carolyn J. Casey Date 9/9/03
(print) CAROLYN J. CASEY
(title) RCRA FACILITY MANAGER

Supervisor (signature) [illegible] Date 9/15/03
(print) Matthew R. Haagland
(title) Section Chief
(EPA Region or State) Reg. I

Locations where References may be found:

_____
_____
_____

Contact telephone and e-mail numbers

(name) _____
(phone #) _____
(e-mail) _____

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Appendix A

Assessment of Compliance with Connecticut's Remediation Standard Regulations

August 5, 1996
Revised November 1, 1996

ASSESSMENT OF COMPLIANCE WITH CONNECTICUT'S REMEDIATION STANDARD REGULATION

FORMER PRATT & WHITNEY OVERHAUL AND REPAIR OPERATIONS FACILITY
Southington, Connecticut

August 5, 1996

Revised November 1, 1996

Prepared for

PRATT & WHITNEY
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LEA Comm. No. ORODEP2

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FIGURES

Figure 1 Monitoring Well Locations Exceeding Residential Volatilization Criteria

ATTACHMENTS

Attachment 1 Statistical Computations
Attachment 2 Alternative Soil Criteria

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LIST OF ACRONYMS

CMS/CMI	Corrective Measures Study/Corrective Measures Implementation
DNAPL	Dense Non-Aqueous Phase Liquids
ORO	Overhaul & Repair Operations
PMC	Pollutant Mobility Criteria
P&W	Pratt & Whitney
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSR	Remediation Standard Regulation
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TI	Technical Impracticability
VOC	Volatile Organic Compound

SECTION 1 - INTRODUCTION

1.1 Background

For nearly 30 years, Pratt & Whitney leased approximately 47 acres of land in Southington, Connecticut for the overhaul and repair of jet engines or jet engine parts. Pratt & Whitney discontinued operations at the facility and vacated the site when the lease expired on December 31, 1993. Most of Pratt & Whitney's industrial operations at the facility ceased at the end of 1992.

Facility operations and waste management practices resulted in localized releases of chlorinated solvents and solutions containing heavy metals during the life of the facility. To address the contamination that resulted from past releases, Pratt & Whitney chose voluntarily to implement a corrective action program concurrent with the activities associated with shutting down the facility. The investigations proposed to be performed at the site were described in the RFI Work Plan submitted to the Connecticut Department of Environmental Protection (Reference 1). All references are listed in Section 5.

The corrective action program encompassed a RCRA Facility Investigation (RFI) and a Corrective Measures Study/Corrective Measures Implementation (CMS/CMI), the results of which have already been presented in the corresponding reports and submitted to the DEP (References 2 and 3).

Remedial techniques that have been used at the site to remediate soil contamination have included: 1) soil vapor extraction; 2) excavation and off site disposal; and, 3) treatment of VOC-contaminated soils through mechanical agitation and aeration within a containment building. With regard to groundwater, P&W conducted an air-sparging pilot study and groundwater extraction and treatment in selected areas of the facility. These activities were extremely successful in removing the unsaturated soil contamination and, to some extent, groundwater contamination.

More recently, an evaluation of aquifer restoration was performed to assess whether it is practical to remediate the remaining groundwater contamination at the site. Accordingly, a technical impracticability (TI) demonstration has been submitted to the DEP requesting a TI waiver due to the geologic complexity of the site and the presence of dense non-aqueous phase liquids (DNAPL) (References 4 and 5). Note that groundwater underlying the site is not currently a public water supply source nor is it identified by the Southington Water Company as a future water supply source in their long-range plan.

1.2 Purpose and Scope

The purpose of this document is to compare the ORO site data against the Connecticut Remediation Standard Regulation (RSR) Sections 22a-133k-1 through 3, promulgated by the DEP on January 30, 1996. Compliance will be demonstrated by the following methods:

- Direct comparison with the applicable default numeric criteria listed in the RSR (Sections 22a-133k-1 through 3 of the Regulations of Connecticut State Agencies).
- Statistical comparison with the applicable default numeric criteria listed in the RSR.
- Application of self-implementing options for computing alternative criteria in accordance with the RSR.
- Requesting the Commissioner's approval of alternative direct exposure criteria for soils below the water at depths less than 15 feet.
- Installation of a sub-slab ventilation system to address groundwater exceedances over volatilization criteria, and installation of a hydraulic containment system to prevent plume migration to a lower zone of the aquifer.

The evaluation of the ORO data to assess compliance with the RSR is presented in the following sections of the document. Soil data is compared to both direct exposure and pollutant mobility criteria in Section 2. Groundwater data is compared to groundwater protection criteria, surface water protection criteria, and volatilization criteria in Section 3. Section 4 summarizes the findings of this evaluation. A list of references is provided in Section 5.

SECTION 2 - SOIL DATA

The analytical data obtained from the RFI and CMS/CMI were queried electronically to identify any exceedances over the default numeric criteria provided in the RSR. The criteria considered included the residential direct exposure criteria and the GA pollutant mobility criteria. These two exposure pathways for soil are discussed separately below in Sections 2.1 and 2.2.

2.1 Direct Exposure Criteria

According to the RSR, soil at a release area must be remediated to at least that concentration at which the residential direct exposure criteria for each substance is met. Compliance with a direct exposure criterion is achieved when (i) the 95% upper confidence level of the arithmetic mean of all sample results from a particular release area is equal to or less than the numeric criterion, provided that no single sample exceeds the criterion by more than two times, or (ii) the results of all laboratory analyses from a particular release area are equal to or less than the direct exposure criterion (22a-133k-2(e)).

To test compliance with the RSR, all ORO soil data at a depth of 0 to 15 feet was queried against the default numeric criteria listed in the RSR as residential direct exposure criteria. The exceedances identified were then evaluated to determine whether they have already been remediated through excavation. The remaining exceedances representing data on the soils remaining at the site are summarized in Table 1.

The data on soils remaining at the site and exceeding the default numeric criteria for direct exposure listed in the RSR were then addressed as follows:

a) by performing statistical computations:

   The 95% upper confidence level of the arithmetic mean was calculated of:

   i) all soil sample data at the site, if no remediation was performed for that compound, or
   ii) all soil sample data from a specific release area. In this later case, the data on excavated soils was not included in the computations if remediation by excavation was performed for that particular compound.

b) by calculating alternate soil direct exposure criteria as allowed by the RSR.

Each of the samples identified are discussed individually below to demonstrate compliance with the RSR.

- **Semivolatiles, Sitewide**

Location ID	Sample ID	Depth	Concentration	
A9-11	056088	0-2	Benzo[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene	1,200 μg/kg 1,200 μg/kg 1,700 μg/kg

As noted in the RFI, semivolatile organic compounds were encountered in shallow soils at the site and were thought to be associated with asphalt in the sample. Furthermore, there was no likely source for the release of these compounds associated with process activities at the site.

The 95% upper confidence level of the arithmetic mean of all soil sample data on the site was calculated for each of the individual compounds detected in this sample (Attachment 1). The results indicate that the computed 95% upper confidence level of the arithmetic mean is below the corresponding residential criterion for direct exposure. Compliance with the RSR is therefore demonstrated.

Compound	95% UCL	Criterion
Benzo[a]anthracene	369 mg/kg	1000 mg/kg
Benzo[a]pyrene	361 mg/kg	1000 mg/kg
Benzo[b]fluoranthene	370 mg/kg	1000 mg/kg

- **Cadmium, Northeast Lot**

Location ID	Sample ID	Depth	Concentration	
C1-3	0660611	5-10	Cadmium	52.2 mg/kg

Compliance with the RSR is also demonstrated for this sample by calculating the 95% upper confidence level of the arithmetic mean of all soil sample data from 0-15 feet in the Northeast Lot. The results of this evaluation are also presented in Attachment 1 and demonstrate compliance with the RSR.

Compound	95% UCL	Criterion
Cadmium	2.3 mg/kg	34 mg/kg

- **Arsenic, Northeast Lot**

Location ID	Sample ID	Depth	Concentration	
R.00,68.20	6607	6-8	Arsenic	18.6 mg/kg

This arsenic concentration was observed in a soil sample collected from the Northeast Lot. As noted in the RFI, arsenic was not used in any on site processes by Pratt & Whitney and any concentrations encountered should be considered as background.

To demonstrate compliance with the RSR all soil data on arsenic from the Northeast Lot was compiled and the 95% upper confidence level of the arithmetic mean was calculated (Attachment 1). Since the computed value is below the residential soil direct exposure criterion, compliance with the RSR is demonstrated.

Compound	95% UCL	Criterion
Arsenic	1.54 mg/kg	10 mg/kg

- **Tetrachloroethylene, Plating Area and Northeast Lot**

Location ID	Sample ID	Depth	Concentration	
CSS-EI371-1	CSS-EI371-11	10	Tetrachloroethylene (mobile)	21,421 μg/kg
CWS-36	CWS-36-10	10	Tetrachloroethylene	89,000 μg/kg
IB-26	AI-67	12-14	Tetrachloroethylene (mobile)	20,159 μg/kg
S-AA62-11	5161	10-12	Tetrachloroethylene (mobile)	138,720 μg/kg
S-I/E-23	S-I/E-23-4	6-7	Tetrachloroethylene (mobile)	206,271 μg/kg
S-I/E-26	S-I/E-26-4	6-8	Tetrachloroethylene Tetrachloroethylene (mobile) Tetrachloroethylene (mobile)	3,400,000 μg/kg 1,200,000 μg/kg 1,300,000 μg/kg
S-Z65-02	5311	10-12	Tetrachloroethylene	28,000 μg/kg

Location ID	Sample ID	Depth	Concentration	
S-Z65-23	S-Z65-23-6	10-12	Tetrachloroethylene (mobile)	520,972 μg/kg
S3-7	036368	12-14	Tetrachloroethylene (mobile)	19,796 μg/kg

In the above samples, tetrachloroethylene has been encountered in concentrations exceeding the numeric value listed in the RSR as residential direct exposure criterion.

Consequently, an alternative direct exposure criterion has been calculated for tetrachloroethylene in accordance with Section 22a-133k-2(d) of the RSR. The Commissioner's approval of this alternative direct exposure criterion is requested since a different exposure scenario is justified in this case. In all of the above samples, tetrachloroethylene is encountered in soil samples below the water table (at a depth of 10 feet or more beneath the facility, or 6 feet or more in the Northeast Lot). All supporting site data have already been submitted to the DEP and can be found in the RFI and CMS/CMI report.

Because these soils are located at depths below the water table, the only direct exposure pathway is exposure of a construction worker during an excavation below the water table. Such excavation typically remains open for a limited amount of time during a construction phase, and direct contact with the soil is not expected to exceed a period of 45 days. No exposure to a child occurs under this scenario.

The alternate criteria are calculated using the equation and parameters provided in the RSR, (Section 22a-133k-2(b)(4)) with the exception of the following:

Exposure Frequency	EF = 45 days/year
Exposure Duration, Child	ED_c = 0 years
Exposure Duration, Adult	ED_A = 1 year

These values reflect the rationale provided above. Potential exposure to saturated soils at the site would only occur during construction which requires excavation below the water table. It is unlikely that a construction worker would be exposed to such soils for more than 45 days in a given year, or that the worker would have more than one exposure to these soils in his lifetime. The equations and parameters used in the computations are provided in Attachment 2.

The proposed alternative soil criterion is given below:

Compound	Alternative Criterion
Tetrachloroethylene	7,642 mg/kg

Compliance with the RSR will be demonstrated upon the Commissioner's approval of this criterion since the concentrations observed are all below the proposed alternative direct exposure criterion resulting from the calculation described above for tetrachloroethylene.

- **Metals and Vinyl Chloride, Plating Area**

Location ID	Sample ID	Depth	Concentration	
S-Y63-01	7505	10-12	Nickel	2,500 mg/kg
S3-33	066472	10-12	Nickel	1,990 mg/kg
PA-B-19	230948	10-1	Cadmium	560 mg/kg
S3-7	036368	12-14	Chromium	7,600 mg/kg
S-Z65-06	5373	12-14	Vinyl Chloride	580 μg/kg

These soil samples were collected below the water table at a depth of 10 feet or greater. As for tetrachloroethylene, the Commissioner's approval of alternative direct exposure criteria is requested since only the construction worker exposure scenario is justified.

Using the same parameters listed above, alternative criteria were computed for each of these compounds as follows:

Compound	Alternative Criteria
Nickel	113,556 mg/kg
Cadmium	2,838 mg/kg
Chromium	28,388 mg/kg
Vinyl Chloride	209 mg/kg

Compliance with the RSR will be achieved upon the Commissioner's approval of these criteria since the concentrations observed are all below the proposed alternative soil direct exposure criteria listed above.

2.2 Pollutant Mobility Criteria

All ORO soil data above the water table encountered at the time of the excavation during the summer and fall of 1993 were queried against the default numeric criteria provided in the RSR, Appendix B, GA, GAA Pollutant Mobility Criteria (PMC) for Soil.

The remediation of the ORO site occurred in the summer and fall of 1993. Much of the soil remediation was accomplished using excavation to or below the water table encountered at the time of excavation. Although the water table may fluctuate to slightly lower levels under extreme conditions, it is believed that the excavations were performed to the appropriate depths as required by the RSR. In addition, the excavations which extended below the seasonal high water table are likely to be re-contaminated by fluctuating groundwater.

Any soil exceedances over the GA, GAA Pollutant Mobility Criteria identified were then evaluated to determine whether they meet the condition identified in Section 22a-133k-2(c)(2)(C) of the RSR. According to this section, soil in a GA area polluted with inorganic substances at or above the water table may be remediated to a level at which (i) the results of a TCLP or SPLP analysis do not exceed the groundwater protection criterion multiplied by 10 or (ii) the results of a mass analysis do not exceed the pollutant mobility criterion multiplied by 10. Additional requirements needed to satisfy this condition include:

- the release area and any portion thereof is located at least twenty-five feet from the nearest legal boundary of the parcel in the downgradient direction,
- no non-aqueous phase liquids are present in the release area, and
- the water table is at least fifteen feet above the surface of the bedrock.

Several samples for inorganics, semivolatiles or pesticides were identified in the ORO data meeting the above requirements. These samples and the corresponding concentrations exceeding the default GA, GAA pollutant mobility criteria, but less than 10 times these criteria, are summarized in Table 2. Since these samples were below the default GA, GAA Pollutant Mobility Criteria multiplied by 10, and meet all of the conditions identified above, they are not considered any further.

One volatile organic compound, acrylonitrile, was detected at a concentration of 16 μg/kg (exceeding the default GA, GAA Pollutant Mobility Criteria) in a soil sample (sample ID 046189, location ID: E3105-1) collected from a depth of 6-8 feet. This concentration complies with the default groundwater protection criterion of 10 μg/kg for a GA, GAA area, multiplied by a factor of

10. According to 22a-133k-2(c)(B) this condition is applicable for volatile organic compounds provided that:

- no non-aqueous phase liquid is present in the subject release area
- the water table is fifteen feet above the surface of the bedrock,
- the downward vertical flow velocity is not greater than the horizontal flow velocity, and,
- the concentration of the substance in a groundwater plume and within 75 feet of the nearest downgradient parcel boundary does not exceed the groundwater protection criterion.

Since these conditions are met, this data is not considered in the analysis discussed below. The remaining exceedances over default GA, GAA Pollutant Mobility Criteria for VOCs and over 10 times the default GA, GAA pollutant mobility criteria for SVOCs and metals are then addressed in the following fashion:

a) by performing statistical computations: The 95% upper confidence level of the arithmetic mean was calculated of:

   i) all soil data at the site, if no remediation was performed for that compound, or

   ii) all soil data from a certain area of the site if the soils were not remediated by excavation for that particular compound. Soil data from units that were excavated for the specific compound were not included in the computations, or

b) by listing laboratory artifact considerations due to data inconsistencies.

The exceedances addressed in this fashion are presented in Table 2, and addressed individually below:

- **Metals, Facility Buildings**

Location ID	Sample ID	Depth	Concentration	
CSS-343-1	CSS-343-1	1.5	Nickel (TCLP)	1.8 mg/l
CSS-333-3	CSS-333-3	1.5	Nickel (TCLP)	1.8 mg/l
CSS-TW2-4	CSS-TW2-4		Silver (TCLP)	0.562 mg/l

These samples are confirmational soil samples collected inside the facility following excavation of various concrete pits located throughout the facility. As part of the corrective measures performed, the concrete was removed from all the equipment pits at the facility, confirmational samples were collected from the underlying soil, the pits were backfilled with clean fill, and the concrete floor was replaced.

More specifically, the first sample (CSS-343-1) was collected from soil underlying the excavated concrete in Environmental Item EI-343, a former engine wash area. The suspected chemicals used in the area were alkaline cleaning solutions and engine fluids (Reference 2). Based on an evaluation of the data obtained, the RCRA Facility Investigation report concluded that no further investigation was warranted as a release from this unit to surrounding soil had not occurred.

Sample CSS-333-3 was collected from EI-333 within the former stripping line (EI-3105). As noted in the CMS/CMI the line was used primarily for the stripping of chromium, cadmium, gold and silver plating from engine parts. Alkaline, cyanide, acid, and permanganate solutions were used in the process. Environmental item EI-333 contained a pump associated with the process. Following evaluation of the sampling performed during the RFI it was concluded that no remedial activity was warranted for the soil. The concrete from this pit was excavated and hauled off-site. The confirmational sample CSS-333-3 was collected from the soil underlying the concrete. No soil remediation was performed in EI-333.

Sample CSS-TW2-4 was collected from Truck Well No. 2. Truck well No. 2 consisted of a truck loading dock with a scrap-metal storage dumpster and a floor sump, a steam-cleaning booth with a concrete-floor sump (EI-232) and two aboveground storage tanks for containing waste oils and waste Zyglo® solutions. Soil removal was performed in Truck Well 2 to remediate releases of organic contaminants. Remediation for metals was not performed as it was determined that a release of these constituents had not occurred.

As noted in the CMS/CMI report, the nickel mass values obtained on samples collected from these environmental items were either below the corresponding background concentrations, or not detected. Little correlation was observed between the mass and TCLP concentrations.

Accordingly, no detected mass concentration for silver was observed in the analyses performed by the laboratories on sample CSS-TW2-4 where the silver TCLP concentration exceeds the numeric criterion listed in the RSR. A split sample of CSS-TW2-4 did not indicate any silver in a TCLP extract analyzed by a different laboratory. Silver was not a constituent of concern for this unit based on the investigations performed. Consequently, it is believed that the unconfirmed reported silver concentration is a laboratory artifact.

The above indicate that these sporadic TCLP detects most likely reflect analytical error and variability rather than a metals release.

Nevertheless, even if no remediation for metals was performed in these areas and the nickel and silver TCLP concentrations appear to be laboratory artifacts, compliance with the RSR can also be demonstrated for these samples by performing statistical computations.

The 95% upper confidence level of the arithmetic mean of results obtained on confirmational soil samples collected during the sitewide concrete pit remediation was computed. As soil remediation using excavation was not performed in these areas to address these contaminants those environmental units with a known or suspected metals release were not included in the computation.

The results included in Attachment 1 indicate compliance with the RSR as indicated below:

Compound	95% UCL	Criterion
Nickel	0.27 mg/l	1 mg/l
Silver	0.0555 mg/l	0.36 mg/l

*The criterion listed is 10 times the GA, GAA pollutant mobility criterion, based on the rationale presented earlier.

- **Chromium, Building No. 2**

Location ID	Sample ID	Depth	Concentration	
CSS-EI232-1	CSS-EI232-1	4	Chromium (Total) (TCLP)	1.25 mg/l

This soil sample (CSS-EI232-1) was collected from soil underlying the excavated concrete in Environmental Item EI-232, a steam cleaning booth. The suspected chemicals used in the area included oils, grease, and possibly solvents. Based on an evaluation of the data obtained during the RFI, it was concluded that no further investigation was warranted in the area as a release to surrounding soil had not occurred (Reference 2).

Consequently, since all the other confirmational soil samples exhibited very low or non-detectable chromium (TCLP) concentrations (Reference 3), and chromium is not a constituent of concern in this area, it is believed that the chromium (TCLP) concentration detected in this soil represents a statistical outlier. It is not uncommon to encounter an occasional outlier in a set of analytical data as large as the data set for this site. None-the-less, an additional sample is proposed to confirm the above. The sample would be collected as close to the location of the sample discussed above and analyzed for chromium in an SPLP extract.

- **Vinyl Chloride, Building No. 3**

Location ID	Sample ID	Depth	Concentration	
CSS-EI371-2	CSS-EI371-2	8	Vinyl Chloride	140 μg/kg

This confirmational soil sample was collected from the excavation surrounding environmental unit EI-371. It is believed that this sample represents an analytical artifact since a split sample from the same location analyzed by Lancaster Laboratories reported an estimated concentration of 17 μg/kg for this compound.

- **Phthalates, Sitewide**

Location ID	Sample ID	Depth	Concentration	
G3-5	017027	4-6	Biz(2-ethylhexyl)phthalate	11,100 μg/kg

Similarly, the 95% upper confidence level of the arithmetic mean of all soil sample results sitewide was compiled to assess compliance with the RSR as this compound is also not associated with any specific activity performed at the site. The results of the computations, (included in Attachment 1) demonstrate compliance with the RSR as indicated below:

Compound	95% UCL	Criterion
Bis(2-ethylhexyl)phthalate	725 μg/kg	10,000 μg/kg

* The criterion is computed as 10 times the GA, GAA pollutant mobility criterion in accordance with Section 22a-133k-2(c)(2)(B).

2.3 DNAPL Containment or Removal

In accordance with Section 22a-133k-2(g) of the RSR, non-aqueous phase liquids must be contained or removed from soil and groundwater to the maximum extent prudent. The term prudent is defined in the RSR as "reasonable, after taking into consideration cost, in light of the social and environmental benefits".

At the ORO Site, DNAPL is (or was) either known or suspected to be present in the following five areas:

- Plating Area (known DNAPL removed, suspected that DNAPL remains)
- North Lot (suspected)
- Northeast Lot (suspected)
- Building No. 1(suspected)
- West Lot, SWMU 7 (suspected)

In the Plating Area (the only area of the site where DNAPL was actually observed), recoverable DNAPL was removed using a bailing technique and residual DNAPL was removed by excavation below the water table in two of the three primary release areas. Excavation below the water table was impractical in the remaining release area. Not withstanding the aggressive measures employed to remove DNAPL, it is suspected that residual DNAPL remains in at least four of the five areas noted above. The one exception may be the Building No. 1 area where the presence on DNAPL is inferred solely on the basis of the conceptual model of the likely release mechanism. Post-remediation ground water monitoring data in the Building No. 1 plume may indicate that residual DNAPL is in fact not present. Additional monitoring is proposed in the sitewide monitoring plan (see reference 6) to address this issue.

The remaining four areas where residual DNAPL is suspected to remain can be described by one of the following two conceptual models:

(a) Release areas and resulting dissolved plumes underlain by the silt aquitard; dissolved plumes discharge to the nearby Quinnipiac River.

(b) Release areas underlain by the silt aquitard; dissolved plumes discharge to the Quinnipiac River; however a portion of the dissolved plumes are not underlain by the aquitard.

Containment or removal of DNAPL under each of these conceptual models is discussed separately below.

For the site areas (i.e., a portion of plating area, north lot, a portion of northeast lot, and west lot) that fit conceptual model category (a), the following apply:

- Soil remediation in these areas has resulted in compliance with applicable soil cleanup standards.
- Plumes have reached equilibrium and are contained by the silt aquitard (preventing, downward migration) and Quinnipiac River (preventing lateral migration).
- Total contaminant fluxes from the plumes are small and compliance with surface water protection criteria has been demonstrated.
- Useable quantities of water could not be extracted from the shallow portion of the aquifer overlaying the silt aquitard (typical well yields would be less than 1 gallon per minute).
- The dissolved portions of the plumes would persist at concentrations above drinking water standards for many decades, or for that matter hundreds of years, after removal of the "DNAPL".
- Given the behavior of DNAPL in the subsurface and the physical characteristics of the ORO site, the DNAPL itself will not migrate.

As a consequence of the facts listed above, containment or removal of the DNAPL release area would not result in any social or environmental benefit. This conclusion flows largely from the fact that useable quantities of water could not be obtained from the thin saturated zone overlaying the silt aquitard and the fact that contaminant fluxes to the river are acceptable as prescribed in the RSR. Further, in those areas where volatilization of contaminants from the plumes is a concern, P&W is proposing to mitigate these concerns in a manner consistent with the RSR.

Given that a social or environmental benefit would not result from containment or removal of these DNAPL release areas, consideration of options for such containment or removal is not warranted in the absence of benefit and therefore, is not prudent. Moreover, removal of any DNAPL would not address the dissolved portions of the plumes which would persist at concentrations above drinking standards for many decades or centuries.

For those areas of the site (i.e., a portion of plating area, a portion of the northeast lot and possibly Building No. 1) that fit conceptual model category (b), the following apply:

- Soil remediation in these areas has resulted in compliance with applicable soil cleanup standards.
- Total contaminant fluxes from the plumes are small and compliance with surface water protection criteria has been demonstrated.
- Useable quantities of water could not be extracted from the shallow portion of the aquifer overlaying the silt aquitard (typical well yields would be less than 1 gallon per minute).
- The dissolved portions of the plumes would persist at concentrations above drinking water standards for many decades after removal of the "DNAPL".
- Given the behavior of DNAPL in the subsurface and the physical characteristics of the ORO site, the DNAPL itself will not migrate.
- Contamination of the intermediate zone of the aquifer could occur where the aquitard is absent if downward vertical migration were to occur. This zone of the aquifer is capable of yielding substantial quantities of water.

Three approaches to containment or removal have been considered. These approaches are 1) excavation of release areas, 2) containment at release areas and 3) containment at an appropriate downgradient location. An overall assessment of each approach is provided below:

Removal (Excavation)	**Containment at Release Area**	**Hydraulic Containment At A Downgradient Location**
1. Will not result in attainment of drinking water criteria in a reasonable time frame.	1. Will not result in attainment of drinking water criteria in a reasonable time frame.	1. Will not result in attainment of drinking water criteria in a reasonable time frame.
2. Will **not** prevent migration of dissolved contaminants into the intermediate zone of the aquifer if it were to occur.	2. Will **not** prevent migration of dissolved contaminants into the intermediate zone of the aquifer if it were to occur.	2. **Will** prevent migration of dissolved contaminants into the intermediate zone of the aquifer if it were to occur.
3. Given (1) and (2) above and the fact that the site already complies with the other applicable cleanup standards, excavation would produce little benefit.	3. Given (1) and (2) above and the fact that the site already complies with the other applicable cleanup standards, containment at the release area would produce little benefit.	3. Given (1) and (2) above and the fact that the site already complies with the other applicable cleanup standards, this containment would produce more benefit than the other options by ensuring that dissolved contamination will not migrate into the intermediate zone of the aquifer.

None of these approaches will result in attainment of drinking water criteria in a reasonable time frame (refer to the request for a technical impracticability variance submitted to DEP under separate cover). Consequently, only containment of the dissolved plumes emanating from these areas will provide the desired benefit of eliminating the potential for migration into the intermediate zone of the aquifer within any reasonable time frame. As P&W is proposing to construct and operate a hydraulic containment system designed to provide an effective barrier to downward vertical migration throughout the affected area of the site (refer to hydraulic containment system work plan submitted to DEP under separate cover), further consideration of options for containment or removal is unnecessary as the proposed control is clearly the best option (most prudent) since it provides the greatest benefit regardless of cost.

2.4 Summary

As discussed in the previous sub-sections, there are no exceedances of the RSR for unsaturated soil. The only exceedances of the RSR for saturated soil are of direct exposure criteria. All of these exceedances of direct exposure criteria occur at depths greater than 6 feet and all are below the water table. P&W is requesting the commissioner's approval of alternate direct exposure criteria. In addition, to comply with the requirements of Section 22a-133k-2(g) of the RSR, P&W is proposing to construct and operate a hydraulic containment system to ensure that migration of dissolved contaminants into the intermediate zone of the aquifer does not occur. Upon approval of the requested alternate criteria, confirmation that the soil at EI-232 does not leach chromium above applicable GA/GAA PMC, and implementation of the proposed hydraulic control, the site will be in full compliance with the RSR for soil.

SECTION 3 - GROUNDWATER

The groundwater quality data collected to define the degree and extent of contamination resulting from releases at the site have been compared to applicable criteria specified in the Remediation Standard Regulation (RSR) at Section 22a-133k-3 of the Regulations of Connecticut State Agencies. Since the current groundwater classification for the site is GA, the data have been evaluated against the groundwater protection criteria, the surface water protection criteria and the volatilization criteria for groundwater. Individual discussions of each criteria are presented below.

3.1 Groundwater Protection Criteria

The groundwater quality data for the site have been discussed at length in several documents previously submitted to DEP. The most recent presentation of this data was submitted to DEP in a document titled "Overview of Remediation Conducted at the ORO Facility and Assessment of the Practicability/Impracticability of Achieving Full Aquifer Restoration" dated September 19, 1994. (Reference 5). The intention of the discussion presented herein is not to repeat the presentation in the referenced document but instead, to supplement that presentation with additional discussion in light of the recently promulgated RSR. Note that groundwater underlaying the site is not currently a public water supply source nor is it identified by the Southington Water Company as a future water supply source in their long-range plan.

Descriptions of the areas of remaining groundwater contamination resulting from releases at the site are provided in Section 5 of the September 19, 1994 report. In summary, six areas of groundwater contamination above groundwater protection criteria are present, designated AGWC #1 through AGWC #6 as follows:

AGWC #1	-	Plating Area
AGWC #2	-	North Lot
AGWC #3	-	Northeast Lot and Building No. 1
AGWC #4	-	Building No. 1 and South Lot
AGWC #5	-	West Lot, SWMU 7
AGWC #6	-	West Lot, AOC 9

The primary constituents of concern in each of these areas are chlorinated solvents and associated degradation products. In AGWC #1 through AGWC #5, dense non-aqueous phase liquid (DNAPL)

is known or suspected to be present. During remediation of the site, recoverable DNAPL encountered in a single well was removed by bailing in AGWC #1.

In addition, residual DNAPL was removed by deep excavation, to the extent prudent, in those areas where residual DNAPL was known to be present (also AGWC #1). Nonetheless, despite these efforts, DNAPL is known or reasonably expected to be present in each of these five areas of groundwater contamination.

In accordance with Section 22a-133k-3(e)(2), P&W is requesting a variance due to technical impracticability of groundwater remediation for AGWC #1, 2, 3, and #5. P&W has previously submitted information demonstrating that achieving compliance with the groundwater protection criteria is technically impracticable in these areas as determined using EPA directive No. 9234.2-25 issued September 1993. As noted above, although P&W has removed DNAPL to the extent prudent, DNAPL is known or reasonably expected to be present in each of these five areas.

As 22a-133k-3-(e)(2) requires that DNAPL be either contained or removed if a variance is to be granted, and because as discussed in the previous section, further removal would not be prudent, P&W is planning to install a containment system to prevent migration from the shallow zone of the aquifer to the more productive intermediate zone of the aquifer. A portion of AGWC #1, 2, and all of AGWC #5, overlay the silt aquitard and discharge to the Quinnipiac River. In these areas, the silt aquitard and the river provide effective containment. This is due to a number of factors including the close proximity of the release areas to the river, the thin saturated thickness above the aquitard and the nature of the geologic materials overlying the aquitard. These factors combine to render this groundwater unsuitable for drinking or other domestic purposes.

The remainder of AGWC #1, 2, and 3, and all of AGWC #4 discharge to the Quinnipiac River in the general vicinity of Newell Street (or in the case of AGWC #3, to the river in the Northeast Lot). A portion of these AGWCs are not underlain by the silt aquitard. Vertical downward gradients between the shallow and intermediate zones of the aquifer have been measured in the South Lot in the vicinity of PW-7. Consequently, a vertically downward component of flow exists in this portion of the South Lot where the aquitard is absent. Based on review and evaluation of the site data collected during the RFI and CMS/CMI, it appears that the magnitude of the vertical downward flow component is negligible. As a result, the groundwater impacts from releases at the site have been predominantly limited to the shallow portion of the aquifer. Nonetheless, P&W is planning to install a hydraulic containment in this area of the site (Reference 6). This containment will induce a

vertically upward component of flow thereby positively controlling migration from the shallow zone to the intermediate zone of the aquifer.

With respect to AGWC #4, the presence of DNAPL has been inferred based predominantly on the notion that the most likely release mechanism involved was uncontrolled loss or seepage of DNAPL (rather than uncontrolled loss or seepage of a solution containing dissolved concentrations of chlorinated solvents). Post-remediation groundwater monitoring in the downgradient portion of this plume over the past two years has shown a steady decline in the concentrations of the halogenated organics previously detected. In fact, over the past four quarterly monitoring events, no exceedances of applicable groundwater protection criteria have been reported for wells BMW-6, OB-23, and cluster wells C11 and C12. Pratt & Whitney is planning to install additional wells inside Building No. 1 under the "Post-Remediation Sitewide Monitoring Plan" to determine whether or not similar reductions in contaminant concentrations have occurred in the plume nearer the release area(s). If so, it is likely that DNAPL is not present and the prior remedial activities coupled with natural attenuation, if necessary, will result in compliance with the groundwater protection criteria. However, if the release area monitoring data indicate little or no decline from previous concentrations, then it is likely that DNAPL is present. The planned hydraulic containment system has been designed to address this eventuality. Consequently, in either case, no further action (beyond construction of the hydraulic containment) is required to achieve compliance with the RSR in this area. Similarly, once the containment system is in place, no further action is required to achieve compliance with the RSR in AGWC #1, 2, 3, and 5. More specific information on the design of this hydraulic containment system is provided in the revisions to the "Post-Remediation Sitewide Monitoring Plan." Once the Commissioner grants the requested variance due to technical impracticability, the requirements of Section 22a-133k-3(e)(2)(C) will be implemented.

The remaining area of groundwater contamination, AGWC #6 in the West Lot at AOC 9, is not believed to have resulted from a direct release of DNAPL. Consequently, the presence of DNAPL is not suspected in this area. Instead, it is suspected that soil or parking lot sweepings contaminated with tetrachloroethylene (PCE) were deposited in AOC 9. Only low levels of PCE were detected in soil samples in AOC 9 and where these detections exceeded GA pollutant mobility criteria, the soil was excavated. The groundwater contamination in this area is limited to low levels (generally ranging from below detection limits to approximately 10 times the groundwater protection criterion) of PCE in an area of limited extent overlaying the silt aquitard. The saturated thickness above the silt aquitard in this area is approximately 4.5 feet, rendering this groundwater unsuitable for drinking or other domestic purposes. Post-remediation groundwater monitoring data indicate a general decline in PCE concentrations. Consequently, it is expected that the remaining groundwater

contamination will be remediated as a result of natural attenuation and no further active remediation is necessary for compliance with the RSR.

3.2 Surface Water Protection Criteria

To assess compliance with the Surface Water Protection Criteria, the analytical database for groundwater was first queried against applicable default numeric criteria contained in the RSR. The data queried consisted of the recent data generated during the RFI, which commenced in 1992, and the post-remediation monitoring data. The default numeric criteria were compared to monitoring data obtained from wells located in the various plumes closest to the Quinnipiac River to which the plumes discharge. The wells evaluated for each AGWC are identified below:

AGWC #1	-	OB-17, OB-18, LEA-6-1, and LEA-7-1
AGWC #2	-	MW-7, LEA-4-1, OB-20, and OB-9
AGWC #3	-	C1-1, OB-29, C12-1, BMW-6
AGWC #4	-	BMW-6, C13-1
AGWC #5	-	OB-21
AGWC #6	-	N/A, plume does not reach the river

The results of this initial screening against the Surface Water Protection Criteria are discussed below for AGWC #1 through AGWC #5.

AGWC #1: Exceedances of the default numeric criteria for tetrachloroethylene were reported between April 1993 and December 1994 in samples from monitoring well OB-18. However, quarterly samples from this well collected in 1995 and early 1996 demonstrate that the concentration of this compound has dropped to a level well below the default criterion. No exceedances were reported for wells OB-17 or LEA-6-1. A single exceedance for lead was reported in LEA-7-1 in September 1995. However, lead had not been detected in numerous samples from this well collected prior to this event nor has lead been detected in the three sampling events performed subsequent to this date. It is believed that the lead reported in September 1995 is a laboratory artifact. Consequently, the default surface water protection criteria are satisfied with respect to AGWC #1.

AGWC #2: The only exceedance of default surface water protection criteria in wells associated with this area is a single detection of silver in well OB-9 in the June 1995 sampling event. As is the case with lead in well LEA-7-1, silver has not been detected in this well in any other sampling event,

before or after. Consequently, it is believed that the single detection of silver is a laboratory artifact and the default surface water protection criteria are satisfied with respect to AGWC #2.

AGWC #3: No exceedances of default surface water protection criteria have been detected in the wells used to monitor discharges to the river from this plume.

AGWC #4: The only exceedance of default criteria in wells associated with this plume is 1,1-dichloroethylene in well C13-1 in the May 1993 sampling event. The concentration of this compound has steadily declined since this time and, in fact, has not been detected in quarterly sampling events since September 1994. Consequently, the default surface water protection criteria are satisfied with respect to AGWC #4.

AGWC #5: Tetrachloroethylene has been detected in well OB-21 at concentrations consistently above the default surface water protection criteria. Consequently, it is necessary to calculate an alternative surface water protection criteria for this AGWC in accordance with 22a-133k-3(b)(3). These calculations have been performed previously for the site and presented in P&W's September 19, 1994 submittal to DEP. For AGWC #5 the calculation is as follows:

where:

$$SWPC_{ALT} = 0.00885 \text{ mg/l} \left(0.25 \times \frac{7Q10}{Qplume} \right)$$

0.00885 mg/l	is the human health criterion for PCE from the most recent Water Quality Standards
7Q10	is the seven-day, ten-year low flow for this reach of the Quinnipiac River (250,000 ft^3/day)
Qplume	is the average daily discharge from AGWC #5 (Q=KiA= 0.11ft/day x 0.024ft/ft x 250 ft^2 = 0.66 (ft^3/day) (for a K range of 2-20 ft/day, the Q would range from 12-120 ft^3/day)

substituting:

$$SWPC_{ALT} = 0.00885 \text{mg/l} \left(0.25 \times \frac{250{,}000 \text{ft}^3/\text{day}}{0.66 \text{ft}^3/\text{day}} \right) = 838 \text{mg}/l$$

Accordingly, for a K range of 2-20 ft/day, the $SWPC_{ALT}$ would range from 4.6 to 46 mg/l.

The maximum PCE concentration detected in samples from well OB-21 is 2.4 mg/l, far below the site specific alternative surface water protection criterion calculated as described above. Consequently, the surface water protection criteria applicable to AGWC #5 have not been exceeded.

In summary, all six areas of groundwater contamination at the site are in compliance with the applicable surface water protection criteria.

3.3 Volatilization Criteria

The site analytical database was queried to identify exceedances of the default residential volatilization criteria for groundwater. In performing this query both pre- and post-remediation groundwater data were included. The pre-remediation data were included because the post-remediation groundwater monitoring network is not designed to monitor groundwater quality in the release areas as these concentrations are expected to persist for many years. In general, there is little difference between pre- and post-remediation exceedances of residential volatilization criteria. The one notable exception is in the South Lot. In this area, a sufficient number of wells exist to characterize the distribution of VOCs in this portion of AGWC #1, 4, and 5. Although exceedances of the residential volatilization criteria were detected in this area in pre-remediation and early post-remediation monitoring, concentrations in this area have been consistently declining and no exceedances have been detected in the last two or three quarterly sampling events. Consequently, it is expected that continued monitoring in this portion of the site will demonstrate compliance with the volatilization criteria.

The monitoring locations where the residential volatilization criteria have been exceeded are shown on Figure 1. The exceedances inside the building will be addressed via the installation of a sub-slab ventilation system in accordance with 22a-133k-3(c)(3)(B). More specific information on the design of this system is provided in the recently revised "Post-Remediation Sitewide Monitoring Plan." Exterior areas where exceedances of the residential volatilization criteria have been detected will be addressed using an environmental land use restriction (ELUR) in accordance with 22a-133k-3(c)(5)(A). P&W does not own the subject site, consequently the ELUR will have to be recorded by the property owner. P&W will document that best efforts have been made to ensure that the property owner records an ELUR.

In summary, compliance with the volatilization criteria will be achieved by constructing the sub-slab ventilation system beneath the existing building in combination with an ELUR for those exterior areas where exceedances of the residential volatilization criteria occur.

SECTION 4 - CONCLUSIONS

This document evaluates the ORO site data against the DEP Remediation Standard Regulations to assess compliance. The methods used included:

- Direct comparison with the applicable default numeric criteria listed in the RSR (Sections 22a-133k-1 through 3 of the Regulations of Connecticut State Agencies)

- Statistical comparison with the applicable default numeric criteria listed in the RSR

- Application of self-implementing options for computing alternate criteria in accordance with the RSR

In general, compliance with the soil direct exposure criteria and pollutant mobility criteria was demonstrated either by direct comparison of the data, or by calculating the 95% upper confidence level of the arithmetic mean. The only exceptions are a few exceedances of default numeric residential direct exposure criteria for certain samples collected from below the water table. In these instances, the Commissioner's approval of alternative soil direct exposure criteria is requested. An alternate exposure scenario is justified because the only soils exceeding the direct exposure criteria are below the water table and soils below the water table would only be exposed during a construction period.

Six areas of groundwater contamination have been identified at the ORO facility. Pratt & Whitney has requested the Commissioner's approval of a variance due to technical impracticability of groundwater remediation for four of these plumes (AGWC #1, 2, 3, and 5). Remediation by natural attenuation is prescribed for the remaining areas of groundwater contamination (AGWC #4 and 6).

The ORO groundwater data was queried against the default numeric criteria contained in the RSR for surface water protection. All six areas of groundwater contamination at the site were found in compliance with the applicable surface water protection criteria.

The ORO groundwater data was also queried against the residential volatilization criteria listed in the RSR. The exceedances under the building will be addressed by Pratt & Whitney via the installation of a sub-slab ventilation system. Exterior areas which exceed the default volatilization criteria will be addressed by seeking an Environmental Land Use restriction (ELUR).

Compliance with the RSR for the ORO site will be demonstrated upon:

- Confirmation that chromium does not exceed GA, GAA Pollutant Mobility Criterion at EI-232.

- Receipt of the Commissioner's approval for the proposed alternative direct exposure criteria for soil at depth below the water table

- Installation of the proposed hydraulic containment system and receipt of the Commissioner's approval of a variance due to technical impracticability of aquifer restoration

- Installation of the proposed sub-slab ventilation system

- Seeking an ELUR ensuring that a building is not constructed overlying those areas where exceedances of the residential volatilization criteria for groundwater have been detected and ensuring that groundwater underlaying the site is not used for drinking or other domestic purposes.

- One or two additional consecutive groundwater sampling events that demonstrate compliance with the volatilization criteria for groundwater in the South Lot.

SECTION 5 - REFERENCES

1. "RFI Work Plan", Pratt & Whitney Overhaul and Repair Operations Facility, Southington, Connecticut, CH2M Hill, Loureiro Engineering Associates, and Fuss & O'Neill, December 1992.

2. "RCRA Facility Investigation Report", Pratt & Whitney Overhaul and Repair Operations Facility, Southington, Connecticut, January 1994.

3. "RCRA Corrective Measures Study/Corrective Measures Implementation Report," Pratt & Whitney Overhaul and Repair Operations Facility, Southington, Connecticut, April 1994.

4. "Evaluation of Aquifer Restoration", Former Pratt & Whitney ORO Facility, Southington, Connecticut, Fuss & O'Neill, May 1994.

5. "Overview of Remediation Conducted at the ORO Facility and Assessment of Practicability/Impracticability of Achieving Full Aquifer Restoration", United Technologies Corporation, Pratt & Whitney, East Hartford, Connecticut, Loureiro Engineering Associates, P.C., and Environmental Project Control, September 19, 1994

6. "Post Remediation Sitewide Monitoring Plan (Inclding RCRA Monitoring)" Former Pratt & Whitney, Overhaul and Repair Operations Facility, Southington, Connecticut, Loureiro Engineering Associates, June 1995, as revised.

Table 1
EXCEEDANCES OF DEFAULT RESIDENTIAL DIRECT EXPOSURE CRITERIA FOR SOIL

Location ID	Sample ID	Depth	Concentration	
A9-11	056088	0-2	Benzo[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene	1,200 μg/kg 1,200 μg/kg 1,700 μg/kg
C1-3	0660611	5-10	Cadmium	52.2 mg/kg
R.00,68.20	6607	6-8	Arsenic	18.6 mg/kg
CSS-EI371-1	CSS-EI371-11	10	Tetrachloroethylene (mobile)	21,421 μg/kg
CWS-36	CWS-36-10	10	Tetrachloroethylene	89,000 μg/kg
IB-26	AI-67	12-14	Tetrachloroethylene (mobile)	20,159 μg/kg
S-AA62-11	5161	10-12	Tetrachloroethylene (mobile)	138,720 μg/kg
S-I/E-23	S-I/E-23-4	6-7	Tetrachloroethylene (mobile)	206,271 μg/kg
S-I/E-26	S-I/E-26-4	6-8	Tetrachloroethylene Tetrachloroethylene (mobile) Tetrachloroethylene (mobile)	3,400,000 μg/kg 1,200,000 μg/kg 1,300,000 μg/kg
S-Z65-02	5311	10-12	Tetrachloroethylene	28,000 μg/kg
S-Z65-23	S-Z65-23-6	10-12	Tetrachloroethylene (mobile)	520,972 μg/kg
S3-7	036368	12-14	Tetrachloroethylene (mobile)	19,796 μg/kg
S-Y63-01	7505	10-12	Nickel	2,500 mg/kg
S3-33	066472	10-12	Nickel	1,990 mg/kg
PA-B-19	230948	10-11	Cadmium	560 mg/kg
S3-7	036368	12-14	Chromium	7,600 mg/kg
S-Z65-06	5373	12-14	Vinyl Chloride	580 μg/kg

Table 2
CONCENTRATIONS OVER DEFAULT GA, GAA POLLUTANT MOBILITY CRITERIA - INORGANICS, SEMIVOLATILES, PESTICIDES

Location ID	Sample ID	Concentration	
A9-11	056088	Benzo[a]anthracene	1,200 μg/kg
A9-11	056088	Benzo[a]pyrene	1,200 μg/kg
A9-11	056088	Benzo[a]fluranthene	1,700 μg/kg
A9-5	026051	Di-n-butyl Phthalate	19,300 μg/kg
BMW-5	3059	Barium (TCLP)	1.6 mg/l
BMW-5	3059	Nickel (TCLP)	0.12 mg/l
BMW-6	3070	Barium (TCLP)	1.28 mg/l
CSS-103-3	CSS-103-3	Nickel (TCLP)	0.20 mg/l
CSS-117-1	CSS-117-1	Nickel (TCLP)	0.12 mg/l
CSS-134-1	CSS-134-1	Chromium (Total) (TCLP)	0.106 mg/l
CSS-134-1	CSS-134-1	Nickel (TCLP)	0.16 mg/l
CSS-216-1	CSS-216-1	Chromium (Total)(TCLP)	0.084 mg/l
CSS-216-1	CSS-216-1	Silver (TCLP)	0.091 mg/l
CSS-216-3	CSS-216-3	Chromium (Total)(TCLP)	0.061 mg/l
CSS-317-1	CSS-317-1	Cadmium (TCLP)	0.012 mg/l
CSS-317-1	CSS-317-1	Nickel (TCLP)	0.24 mg/l
CSS-334-1	CSS-334-1	Nickel (TCLP)	0.13 mg/l
CSS-343-2	CSS-343-2	Nickel (TCLP)	0.14 mg/l
CSS-B1-1	CSS-B1-1	Cadmium (TCLP)	0.011 mg/l
CSS-B2-3	CSS-B2-3	Cadmium (TCLP)	0.008 mg/l
CSS-EI220-2	CSS-EI220-2	Cadmium (TCLP)	0.020 mg/l
CSS-EI220-2	CSS-EI220-2	Cadmium (TCLP)	0.0250 mg/l
CSS-EI222-1	CSS-EI222-1	Cadmium (TCLP)	0.026 mg/l
CSS-EI222-1	CSS-EI222-1	Cadmium (TCLP)	0.0157 mg/l

Table 2
CONCENTRATIONS OVER DEFAULT GA, GAA POLLUTANT MOBILITY CRITERIA - INORGANICS, SEMIVOLATILES, PESTICIDES

Location ID	Sample ID	Concentration	
CSS-EI223-I	CSS-EI223-I	Cadmium (TCLP)	0.019 mg/l
CSS-EI223-I	CSS-EI223-I	Cadmium (TCLP)	0.0130 mg/l
CSS-EI223A-1	CSS-EI223A-1	Barium (TCLP)	1.02 mg/l
CSS-EI232-1	CSS-EI232-1	Nickel (TCLP)	0.28 mg/l
CSS-EI232-1	CSS-EI232-1	Silver (TCLP)	0.054 mg/l
CSS-EI232-2	CSS-EI232-2	Barium (TCLP)	1.06 mg/l
CSS-EI232-3	CSS-EI232-3	Barium (TCLP)	1.52 mg/l
CSS-EI383-1	CSS-B3Pit-1	Chromium (Total)(TCLP)	0.055 mg/l
CSS-IWTP-15	CSS-IWTP-15	Lead (TCLP)	0.017 mg/l
CSS-IWTP-16	CSS-IWTP16A1	Barium (TCLP)	1.23 mg/l
		Cadmium (TCLP)	0.006 mg/l
CWS-26	CWS-26-7	Lead (TCLP)	0.0184 mg/l
CWS-27	CWS-27-4.5	Lead (TCLP)	0.047 mg/l
E133-2	116013	Bis(2-ethylhexyl)phthalate	1,300 μg/kg
E133-2	116013	Di-n-octyl Phthalate	2,300 μg/kg
E136-2	016952	Bis(2-ethylhexyl)phthalate	1040 μg/kg
E317-3	056192	Dieldrin	8.0 μg/kg
G1-3	000135	Pentachlorophenol	2600 μg/kg
G3-7	017030	Bis(2-ethylehexyl)phthalate	6190 μg/kg
NLHg	NLHg-10021	Barium (TCLP)	1.05 mg/l
	NLHg-10022	Barium (TCLP)	1.10 mg/l
	NLHg-10023	Barium (TCLP)	1.53 mg/l
	NLHg-10024	Barium (TCLP)	1.24 mg/l

Table 2
CONCENTRATIONS OVER DEFAULT GA, GAA POLLUTANT MOBILITY CRITERIA - INORGANICS, SEMIVOLATILES, PESTICIDES

Location ID	Sample ID	Concentration	
NLNi	NLNi-10026	Barium (TCLP)	1.48 mg/l
	NLNi-10027	Barium (TCLP)	1.13 mg/l
NLS1	NLS1-10029	Barium (TCLP)	1.69 mg/l
	NLS1-10030	Barium (TCLP)	1.48 mg/l
	NLS1-10030	Silver (TCLP)	0.063 mg/l
	NLS1-10031	Barium (TCLP)	1.18 mg/l
	NLS1-10032	Barium (TCLP)	1.29 mg/l
NLS2	NLS2-10033	Barium (TCLP)	1.35 mg/l
	NLS2-10034	Barium (TCLP)	1.32 mg/l
	NLS2-10034	Silver (TCLP)	0.074 mg/l
	NLS2-10035	Barium (TCLP)	1.32 mg/l
NLS3	NLS3-10037	Barium (TCLP)	1.33 mg/l
	NLS3-10037	Cadmium (TCLP)	0.011 mg/l
	NLS3-10037	Lead (TCLP)	0.033 mg/l
	NLS3-10038	Barium (TCLP)	1.38 mg/l
	NLS3-10039	Barium (TCLP)	1.16 mg/l
S6-2	000105	Dieldrin	7.7 μg/kg
S6-3	000110	Bis(2-ethylhexyl)phthalate	1400 μg/kg
S8-2	007006	Chlorophenol, 2-	1200 μg/kg
S8-3	007011	Dieldrin	7.4 μg/kg
TB-11	3001	Silver (TCLP)	0.270 mg/l
TB-4	3028	Barium (TCLP)	1.91 mg/l
Z-ORO-02	Z-ORO-02	Zinc (TCLP)	8.91 mg/l

Table 3
REMAINING EXCEEDANCES OF GA, GAA PMC FOR VOCs AND 10 TIMES GA, GAA FOR SVOCs AND METALS

Location ID	Sample ID	Depth	Concentration	
CSS-343-1	CSS-343-1	1.5	Nickel	1.8 mg/l
CSS-TW2-4	CSS-TW2-4		Silver	0.562 mg/l
CSS-EI232-1	CSS-EI232-1	4	Chromium (Total)	1.25 mg/l
CSS-EI371-2	CSS-EI371-2	8	Vinyl Chloride	140 μg/kg
G3-5	017027	4-6	Bis(2-ethylhexyl)phthalate	11,100 μg/kg

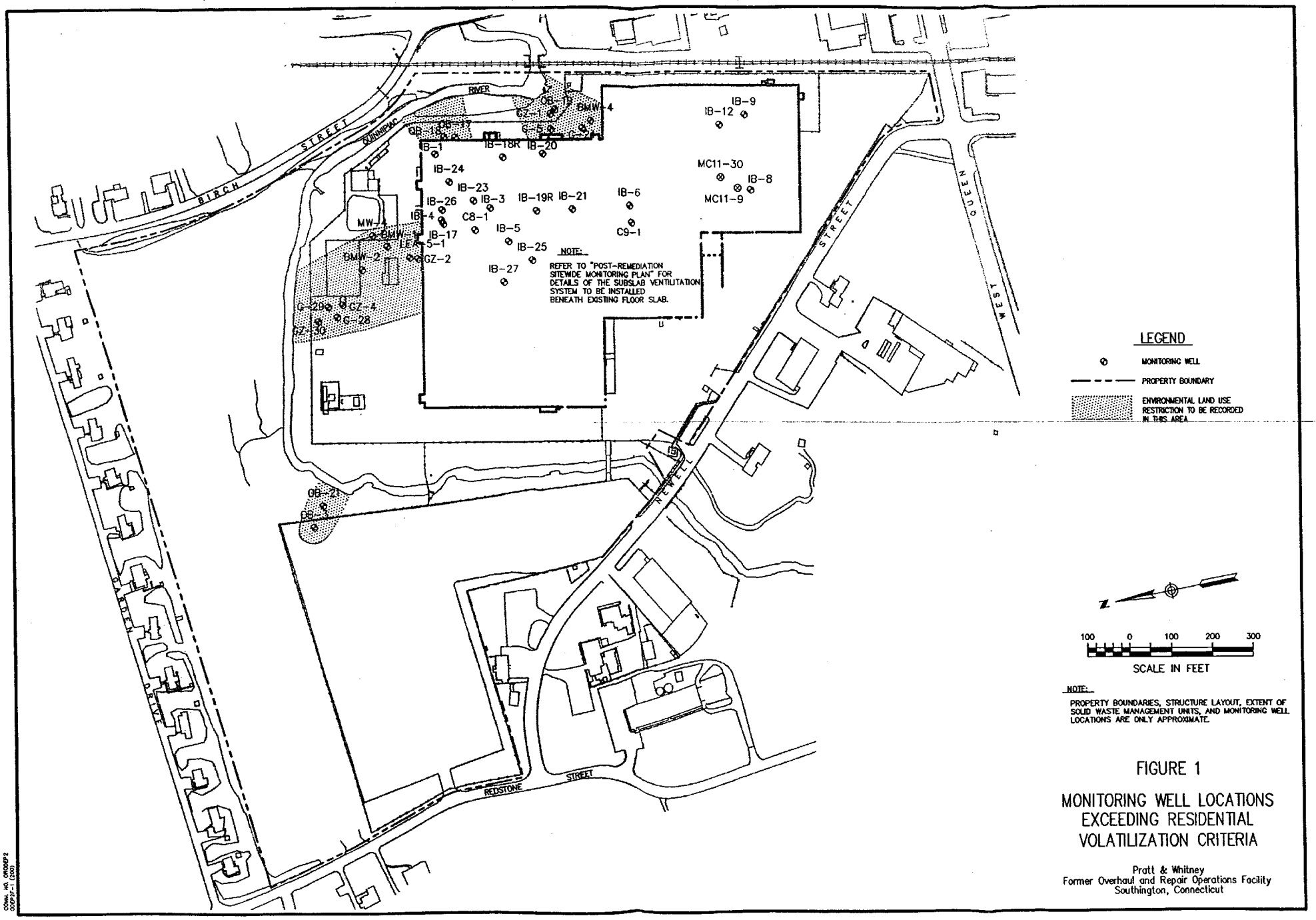
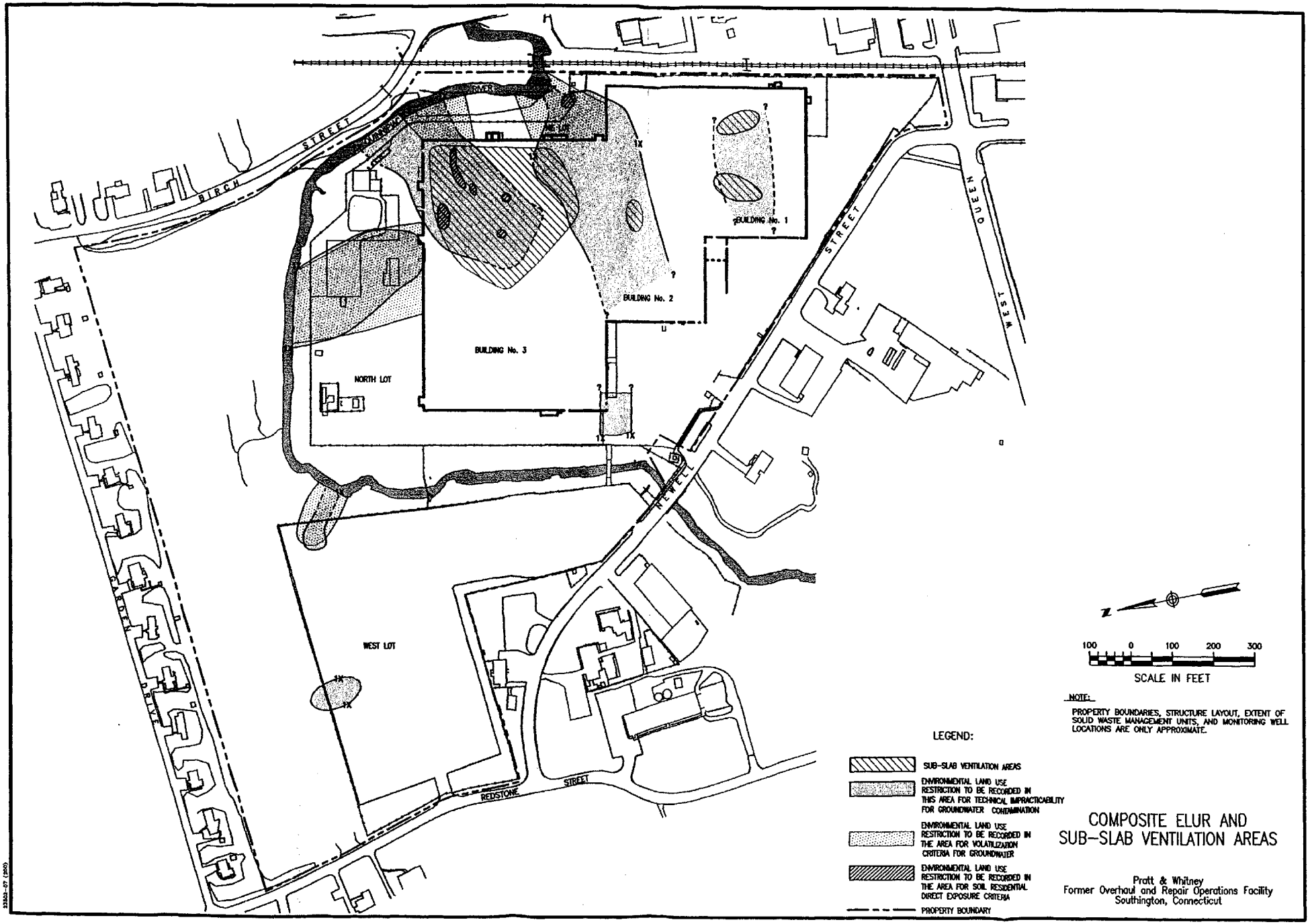


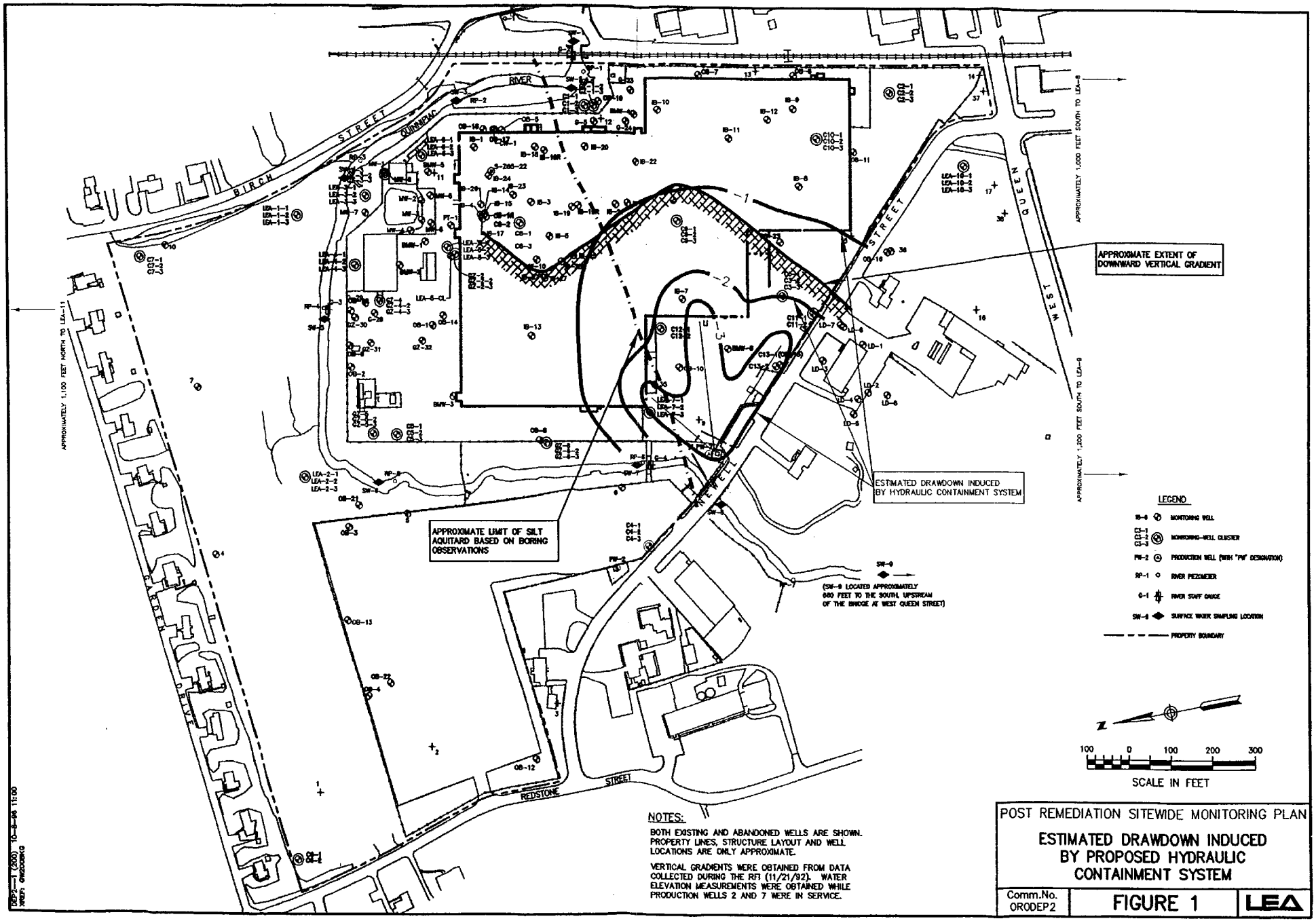
FIGURE 1

MONITORING WELL LOCATIONS EXCEEDING RESIDENTIAL VOLATILIZATION CRITERIA

Pratt & Whitney
Former Overhaul and Repair Operations Facility
Southington, Connecticut

CONN. NO. OROOEP2
OOEP2F-1 (200)


BIRCH STREET
RIVER
BUILDING No. 1
BUILDING No. 2
BUILDING No. 3
NORTH LOT
WEST LOT
QUEEN STREET
WEST
REDSTONE STREET
LEGEND:
SUB-SLAB VENTILATION AREAS
ENVIRONMENTAL LAND USE RESTRICTION TO BE RECORDED IN THIS AREA FOR TECHNICAL IMPRACTICABILITY FOR GROUNDWATER CONTAMINATION
ENVIRONMENTAL LAND USE RESTRICTION TO BE RECORDED IN THE AREA FOR VOLATILIZATION CRITERIA FOR GROUNDWATER
ENVIRONMENTAL LAND USE RESTRICTION TO BE RECORDED IN THE AREA FOR SOIL RESIDENTIAL DIRECT EXPOSURE CRITERIA
PROPERTY BOUNDARY
N
100 0 100 200 300
SCALE IN FEET
NOTE:
PROPERTY BOUNDARIES, STRUCTURE LAYOUT, EXTENT OF SOLID WASTE MANAGEMENT UNITS, AND MONITORING WELL LOCATIONS ARE ONLY APPROXIMATE.
COMPOSITE ELUR AND SUB-SLAB VENTILATION AREAS
Pratt & Whitney
Former Overhaul and Repair Operations Facility
Southington, Connecticut



NOTES:

BOTH EXISTING AND ABANDONED WELLS ARE SHOWN. PROPERTY LINES, STRUCTURE LAYOUT AND WELL LOCATIONS ARE ONLY APPROXIMATE.

VERTICAL GRADIENTS WERE OBTAINED FROM DATA COLLECTED DURING THE RFI (11/21/92). WATER ELEVATION MEASUREMENTS WERE OBTAINED WHILE PRODUCTION WELLS 2 AND 7 WERE IN SERVICE.

POST REMEDIATION SITEWIDE MONITORING PLAN

ESTIMATED DRAWDOWN INDUCED BY PROPOSED HYDRAULIC CONTAINMENT SYSTEM

Comm.No.		
ORODEP2	FIGURE 1	LEA

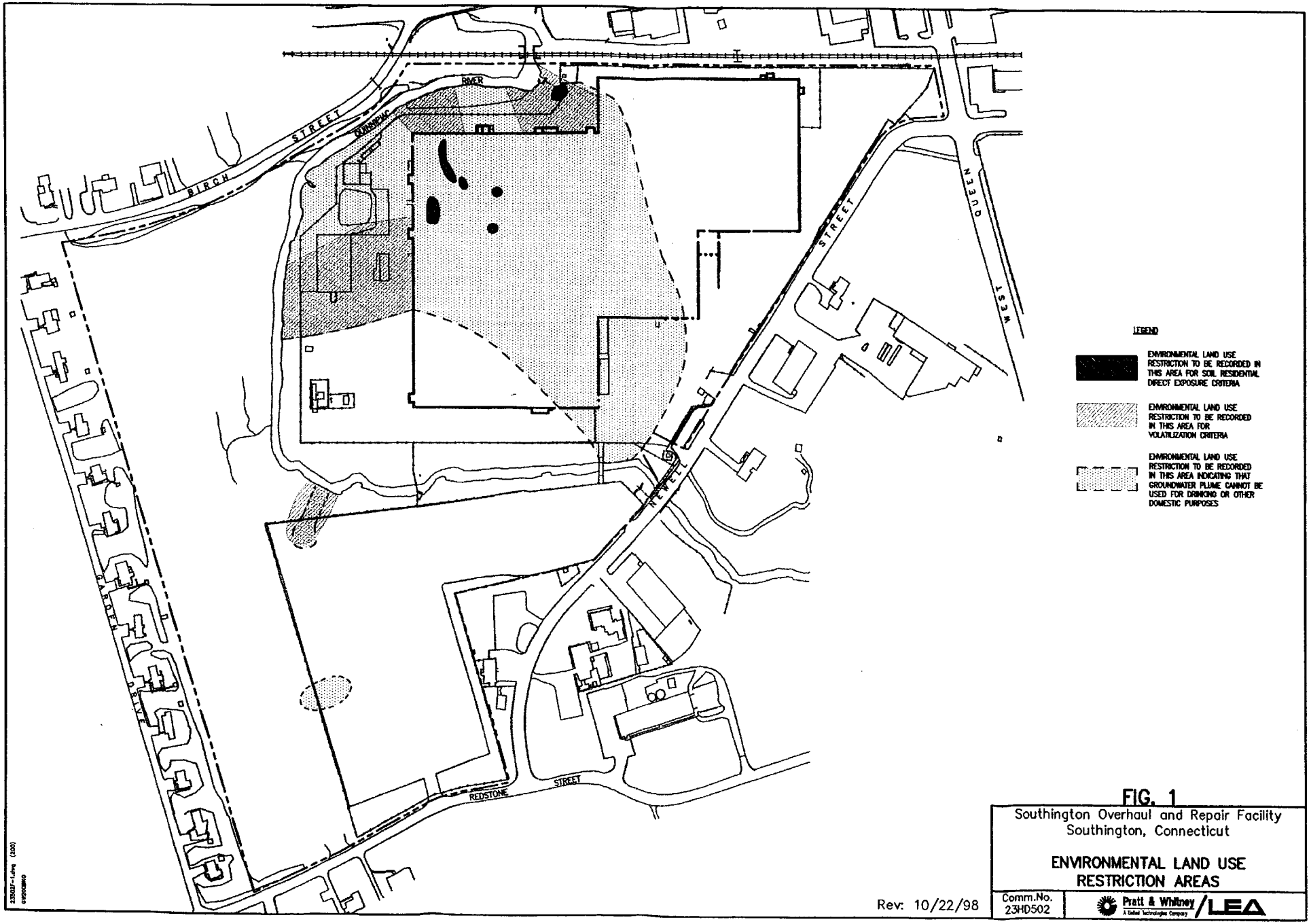


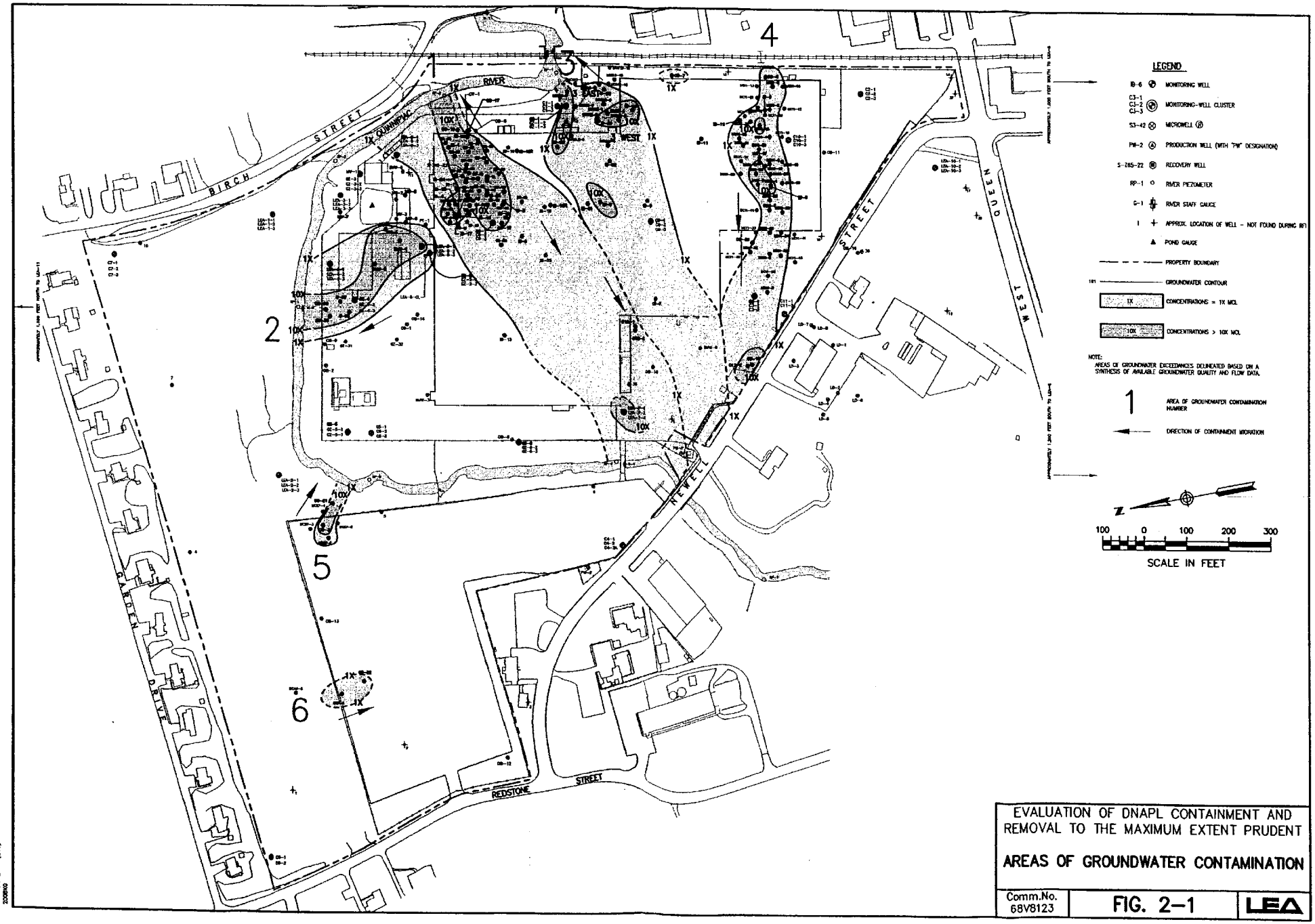
FIG. 1

Southington Overhaul and Repair Facility
Southington, Connecticut

ENVIRONMENTAL LAND USE RESTRICTION AREAS

Comm.No. 23HD502

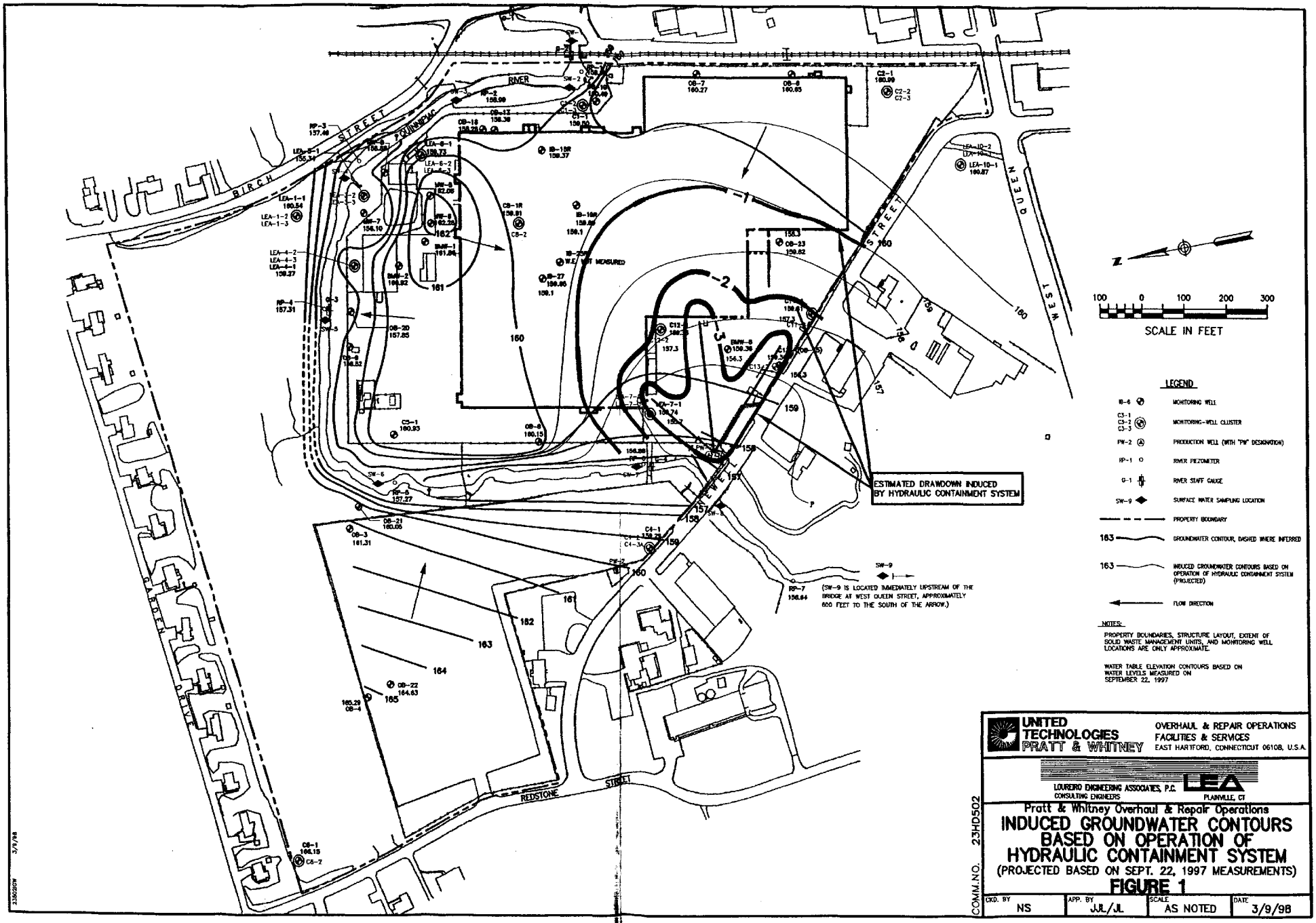
Pratt & Whitney A United Technologies Company / LEA

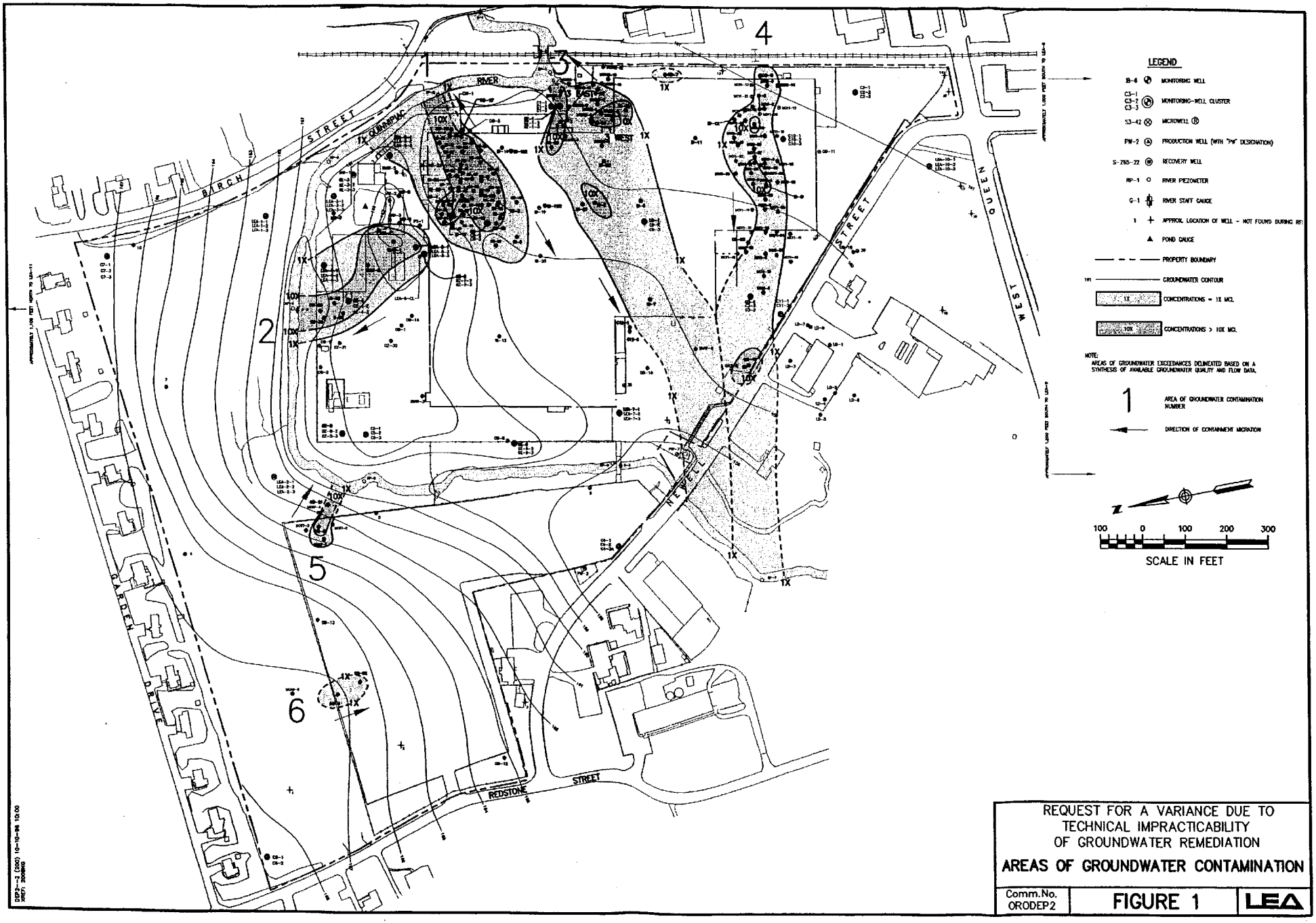


EVALUATION OF DNAPL CONTAINMENT AND REMOVAL TO THE MAXIMUM EXTENT PRUDENT

AREAS OF GROUNDWATER CONTAMINATION

Comm.No. 68V8123	FIG. 2-1	LEA


ESTIMATED DRAWDOWN INDUCED BY HYDRAULIC CONTAINMENT SYSTEM
(SW-9 IS LOCATED IMMEDIATELY UPSTREAM OF THE BRIDGE AT WEST QUEEN STREET, APPROXIMATELY 600 FEET TO THE SOUTH OF THE ARROW.)
RIVER
BIRCH STREET
POURNEAU
WEST QUEEN STREET
REDSTONE STREET
SCALE IN FEET
LEGEND
MONITORING WELL
MONITORING-WELL CLUSTER
PRODUCTION WELL (WITH "PW" DESIGNATION)
RIVER PIEZOMETER
RIVER STAFF GAUGE
SURFACE WATER SAMPLING LOCATION
PROPERTY BOUNDARY
GROUNDWATER CONTOUR, DASHED WHERE INFERRED
INDUCED GROUNDWATER CONTOURS BASED ON OPERATION OF HYDRAULIC CONTAINMENT SYSTEM (PROJECTED)
FLOW DIRECTION
NOTES:
PROPERTY BOUNDARIES, STRUCTURE LAYOUT, EXTENT OF SOLID WASTE MANAGEMENT UNITS, AND MONITORING WELL LOCATIONS ARE ONLY APPROXIMATE.
WATER TABLE ELEVATION CONTOURS BASED ON WATER LEVELS MEASURED ON SEPTEMBER 22, 1997
UNITED TECHNOLOGIES PRATT & WHITNEY
OVERHAUL & REPAIR OPERATIONS FACILITIES & SERVICES
EAST HARTFORD, CONNECTICUT 06108, U.S.A.
LOUREIRO ENGINEERING ASSOCIATES, P.C.
CONSULTING ENGINEERS
PLAINVILLE, CT
Pratt & Whitney Overhaul & Repair Operations
INDUCED GROUNDWATER CONTOURS BASED ON OPERATION OF HYDRAULIC CONTAINMENT SYSTEM
(PROJECTED BASED ON SEPT. 22, 1997 MEASUREMENTS)
FIGURE 1
COMM. NO. 23HD502
CKD. BY NS
APP. BY JJL/JL
SCALE AS NOTED
DATE 3/9/98



REQUEST FOR A VARIANCE DUE TO TECHNICAL IMPRACTICABILITY OF GROUNDWATER REMEDIATION

AREAS OF GROUNDWATER CONTAMINATION

Comm.No. ORODEP2	FIGURE 1	LEA