RCRA RECORDS CENTER
FACILITY UTC-Pratt & Whitney
ID NO. CTD003935905
FILE LOC. R-13
OTHER
VOL. 1 of 2

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

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99

Current Human Exposures Under Control

Facility Name: **Pratt & Whitney, Middletown Facility**
Facility Address: **Aircraft Road, Middletown, CT**
Facility EPA ID #: **CTD003935905**

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)).

Incoming Document Label
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☐ Working Copy - Margin Notes Possible
Reviewer: _____
☐ Administrative Record - Do Not Mark Up!

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).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"** [1] 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			An evaluation of all monitoring wells on site indicated that there are concentrations over the generic Pratt & Whitney groundwater screening levels based on surface water protection at a total of 130 wells. (The query was performed against Table 3-7 from Gradient's Report entitled *Conceptual Site Model and Screening Levels, Pratt & Whitney, Middletown, CT.* Regulatory changes to the State of Connecticut Water Quality Standards were taken into account in this evaluation.) Constituents for which values over screening levels were observed included aluminum, arsenic, barium, beryllium, cadmium, chromium (total and hexavalent), copper, iron, lead, magnesium, manganese, mercury, silver, tin, titanium, zinc, cyanide, PCBs, acetone, carbon disulfide, 1,1-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene and trans-1,2-dicholororoethylene. It should be noted that the exceedances identified above are primarily based on historic data; recent data, which more accurately represent current conditions at the site, indicate a limited number of exceedances. As described in the following sections only a small subset of these wells actually discharge to surface water.
Air (indoors) [2]		X		Please see "Rationale and References" at the end of this section.
Surface Soil (e.g., <2 ft)	X			An evaluation of all soil samples within the exposure areas was performed. Benzo[a]pyrene was detected in a single sample (SBA3-10) at a concentration of 1,800 µg/kg, above the generic screening level for Groundskeepers. However, the 95% UCL on the mean for benzo[a]pyrene in the

surface soil sample data set for Groundskeepers was below the corresponding screening level.

Surface Water

X ___

An evaluation of all surface water data on site obtained during the RCRA Facility Investigation (RFI) indicated that aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, silver, tin, vanadium, and zinc were detected in surface water above their respective screening levels listed in Table 3-6 in Gradient's Report. Regulatory changes to the State of Connecticut Water Quality Standards were taken into account in this evaluation. As noted in the following sections, the data were further evaluated against drinking water standards. It should also be noted that only a subset of this data lies within the exposure areas identified in Gradient's Report entitled *Conceptual Site Model and Screening Levels, Pratt & Whitney, Middletown, CT.*

Between April 2003 and December 2003, Loureiro Engineering Associates (LEA) completed response activities to a jet fuel oil release associated with Building 410. Surface and subsurface investigations were performed, coupled with media sampling, to characterize the nature and where possible to delineate the extent of the product plume associated with the Building 410 jet fuel release. Surface water samples from Dart Brook (410-SW-01 through 410-SW-06) and associated sediment samples (410-SD-01 and 410-SD-02) were collected for analysis. The surface water sample results indicated that constituent concentrations are not migrating off-site and have been stabilized through the use of on-site remediation measures. Remediation systems in the form of a hydraulic control system, seep collection system, and portable wastewater treatment system were activated in April and May 2003 and are currently operational.

Sediment

___ X

Please see "Rationale and References" at the end of this section.

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

X ___

Though subsurface soil at portions of the site is reasonably expected to be contaminated, exposure to subsurface soil is controlled through the Design Process Review (DPR), an

institutional control, to ensure analytical data for subsurface soils are reviewed or generated/evaluated prior to exposure.

Air (outdoors) X ___

Exposure to outdoor air (trench air) is considered applicable to Excavating Laborers and Maintenance Workers. As the subsurface soil at portions of the site is reasonably expected to be contaminated, it is similarly reasonably expected that excavating laborers may be exposed to contaminated air during the performance of excavations. The exposure to air by excavating laborers is limited through the implementation of an institutional control, the Design Process Review (DPR), to ensure that analytical data for subsurface soils and/or groundwater are reviewed or generated/evaluated prior to exposure.

___ 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):

The Pratt & Whitney Middletown facility occupies approximately 1,100 acres of land on the west side of the Connecticut River, which bounds it to the north and east. The western section of the property, west of River Road, consists of wooded uplands of considerable relief. Most of the facility has been developed in a gently sloping outwash terrace extending east from River Road. The transition from the terrace to the alluvial floodplain of the Connecticut River is steeply sloped limiting access to the facility from the River.

The facility consists of approximately 20 major buildings and numerous auxiliary buildings which are used for manufacturing operations, assembly and military engine testing, experimental testing, steam generation, engine fuel storage and distribution,

compressed air generation, industrial wastewater treatment, sewage treatment, storage, fire protection, domestic and process water supply, and facility maintenance. Most of the buildings were built in the mid-1950s by the U.S. Army Corps of Engineers for use by the Connecticut Advanced Nuclear Engine Laboratory (CANEL) under the auspices of the U.S. Atomic Energy Commission; the remainder were built in the 1960's by Pratt & Whitney. The only significant exception is the hazardous waste storage building (B-400), which was built by Pratt & Whitney in 1990.

A report entitled *Conceptual Site Model and Screening Levels, Middletown, CT,* was prepared by Gradient Corporation (Gradient Report). This report was issued in June 2000 and provides a facility-specific conceptual site model, a description of exposure media and exposure pathways, a description of potential receptors, a rationale and approach to screening analytical data generated for exposure media, and screening levels for exposure media. A copy of this report has been included in Appendix A of this EI. The Gradient Report identifies the applicable receptors, exposure media and pathways that require screening as follows:

1) Groundskeepers and On-site Recreators: surface soil by ingestion and dermal contact (Table 3-10);
2) Maintenance and Indoor Workers, and On-site Recreators: indoor air inhalation (Table 3-4);
3) Trespassers and Off-site Recreators: surface water, ingestion and dermal contact (Tables 3-6 and 3-7);
4) Trespassers and Off-site Recreators: sediment, ingestion and dermal contact (Table 3-10).

This documentation of environmental indicator determination is based on a review of all available relevant/significant data as it applies to these receptors for the identified exposure media and pathways.

Site Geology

Site geology has been characterized in the course of multiple site investigations. The unconsolidated deposits on the site have been differentiated into four distinct units as described in the *RCRA Facility Investigation Report,* (RFI, Vol. I). The upper most unit consists of silt that has been identified in all areas across the site. A clay unit, which is comprised of brown, silty, highly plastic clay was also reported in some borings. The unit appears to be relatively limited in extent and tends to change in a gradational manner into the brown fine-to-coarse sand. The second layer consists of the brown fine-to-coarse sand unit, which is extremely poorly sorted, from very-fine silty sand to coarse cobbles over 6-inches in diameter. The third layer is a brown fine sand unit, which consists of a

usually well sorted, very-fine to fine sand. The final layer is a glacial till unit that consists of a non-stratified mixture of rock particles, ranging in size from clay to boulders. Geologic cross-sections (refer to RFI Report for further detail) are provided in Appendix B of this EI.

The site hydrogeology has been interpreted from soil borings and on-site monitoring wells as consisting of four distinct zones within the unconsolidated aquifer. These zones are related to the silt unit; the two stratified drift units (brown fine-to-coarse sand and brown fine sand); and the till unit. The clay layer, where present, acts as a semi-confining layer (refer to the RFI Report).

Groundwater flows under the Pratt & Whitney site from the western highlands toward the Connecticut River. This flow is primarily to the east; however, there are local variations causing the water to flow more to the north or to the south.

The most prevalent aquifer types at the Pratt & Whitney site are an unconfined overburden aquifer and an unconfined shallow bedrock aquifer. The geographic setting of the Pratt & Whitney site requires that recharge to the overburden aquifer be in the form of infiltration from rainfall, or by discharge from the underlying bedrock aquifer. Where bedrock constitutes the majority of the highlands to the west, and where there is little saturated overburden, recharge from the bedrock into the overburden provide significant recharge to the overburden aquifer on the western side of the facility. This recharge to the overburden aquifer continues to some extent across the upland area of the facility, with the shallow unconfined aquifer (saturated thickness less than 25 feet) being nearly parallel to the bedrock contours for the site.

The details pertaining to groundwater flow are discussed in the RFI Report. The RFI Report discusses the horizontal and vertical flow gradients and the measured hydraulic conductivities of the shallow, intermediate, and deep overburden monitoring wells and the bedrock wells.

Groundwater

The following discussions and resulting conclusions are based on the review and evaluation of available groundwater data for the site. All groundwater monitoring wells were assessed due to the premise that the groundwater monitoring well network at the site, consisting of greater than 200 monitoring wells, is determined adequate in number and spatial distribution to assess the quality of groundwater that discharges to surface water bodies at the site. Between 1988 and 2003, site-wide groundwater samples (available in LEA's database) were collected from all monitoring wells, domestic production wells (pre- and post-treated), and one industrial use production well (pre- and post-treated) and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, total

petroleum hydrocarbons (TPH), and cyanide.

- **All groundwater data available in the site-specific database that was used in the preparation of the RFI Report supplemented by routine monitoring data obtained from 1995 to December 2003;**

Quarterly groundwater monitoring has been completed at select on-site groundwater monitoring wells from 1988 through December 2003. Additional groundwater samples were collected to assess the groundwater quality at existing monitoring wells presumed to be situated downgradient of identified areas of contamination in March 2003. The purpose of this groundwater sampling event was to provide more recent groundwater data to assist in determining whether groundwater contaminants migrate off-site into the adjacent surface water body. The groundwater sampling event was completed in March 2003 and included sampling of monitoring wells CL-11-D, C-11-M, CL-12-D, CL-12-M, CL-13-M, CL-13-S, CM-100D, CM-100M, GZ-2-D, GZ-2-I, GZ-3-M, and MW-49. The March 2003 groundwater monitoring event is discussed in further detail of the report entitled, *Groundwater Monitoring – March 2003*, prepared by Loureiro Engineering Associates, Inc., and dated March 2004. This report is provided in Exhibit 1 of the Response to EPA Comments of June 2004. Drawing 1 in the *Groundwater Monitoring – March 2003* report provides the groundwater sample locations.

In response to a jet fuel oil release that occurred at Building 410 in April 2003, additional monitoring wells (410-MW-05 through 410-MW-35, and 410-RS-01 through 410-RS-82) were installed. The report documenting the jet fuel oil release is entitled, *Building 410 Jet Fuel Release Response Activities*, prepared by LEA, and dated January 2004. This report is provided in Exhibit 2 of the Response to EPA Comments of June 2004. Drawing B-2 in Appendix B of this EI illustrates the location of the monitoring wells installed in response to the jet fuel oil release at Building 410. These data have been included in the evaluation performed, as discussed below.

A discussion of all groundwater sampling data collected from 1988 to December 2003 from all on-site monitoring wells and production wells is documented in the report entitled, *Groundwater Monitoring in Support of VCAP Risk Assessment*, prepared by LEA, dated May 2001, revised March 2002, and revised June 2004, as provided in Appendix C of this EI. Drawing B-1 in Appendix B of this EI shows all the groundwater sample locations with the exception of those installed in response to the jet fuel oil release (which is included in Exhibit 2 of the Response to EPA Comments of December 2002).

A listing of all groundwater sampling data from 1988 to 2003 is provided in Table 1 of the *Groundwater Monitoring in Support of VCAP Risk Assessment* report (Appendix C). A hardcopy of all sample results, or a hardcopy table of just the detected constituents in

groundwater would be too voluminous to include in this document, and each table will be over 1,500 pages. However, all data have been evaluated in this Environmental Indicator determination. All tables have been reprinted and the exceedances tables have been revised to show the criteria used in the queries.

In assessing whether on-site groundwater has been contaminated from site releases subject to RCRA Corrective Action, the site-wide groundwater sampling data (including all groundwater monitoring wells, domestic supply production wells, and one industrial use production well) was compared to the numeric screening criteria published in Table 3-7 of the above referenced Gradient Report (Appendix A). Table 3-7 is titled *Generic P&W Groundwater Screening Levels (SLs) Based on Surface Water Protection, P&W Voluntary Corrective Action Program (VCAP), Connecticut Facilities,* which has taken into account the most recent changes to the State of Connecticut Water Quality Standards. These regulatory changes are as follows:

Table 3-7	Old Level	New Level	Units
Cadmium	0.0056	0.0123	mg/l
Chlordane	0.3	1.1	mg/l
Chromium, hex	0.1	0.11	mg/l
Copper	0.048	0.0513	mg/l
Mercury	0.0004	0.00167	mg/l
Zinc	0.582	0.650	mg/l
Benzo(a)anthracene	0.3	4.7	µg/l
Benzo(a)pyrene	0.3	0.47	µg/l
Benzo(b)fluoranthene	0.3	4.7	µg/l
Benzo(k)fluoranthene	0.3	4.7	µg/l

The following further clarifies the screening level process, which was acknowledged by the EPA, for assessing groundwater in all on-site monitoring wells, pre-treated well combination water from production well PW-13A, and pre-treated groundwater for domestic use production wells PW-A, PW-B, and PW-7. The *Generic P&W Groundwater Screening Levels (SLs) Based on Surface Water Protection* in Table 3-7 of the Gradient Report is based on the Surface Water Protection Criteria established by the Connecticut Department of Environmental Protection (DEP). Chemical constituent concentrations in groundwater samples that exceeded the *Generic P&W Groundwater Screening Levels (SLs) Based on Surface Water Protection* in Table 3-7 of the Gradient Report were subsequently compared to the following drinking water standards (multiplied by 10): Connecticut Department of Public Health (DPH) Public Drinking Water Quality Standards; EPA Maximum Contaminant Levels (MCLs) for drinking water; the EPA Secondary MCLs; the treatment standards established under the EPA Lead Copper Rule; and the Groundwater Protection Criteria (GWPC) established by the DEP in the

Remediation Standard Regulations (RSRs). Table 2 provides a summary of constituent concentrations in groundwater samples from 1988 to December 2003 that exceeded the *Generic P&W Groundwater Screening Levels (SLs) Based on Surface Water Protection* in Table 3-7 of the Gradient Report. Table 3 documents the results of those constituent concentrations that exceeded the above described drinking water standards. Tables 2 and 3 are provided in the report, entitled *Groundwater Monitoring in Support of VCAP Risk Assessment* report (Appendix C).

A comparison of all the groundwater data to the numeric screening criteria listed in Table 3-7 of the Gradient Corporation Report indicated values over the screening levels for a total of 130 wells. Constituents for which values over screening levels were observed include aluminum, arsenic, barium, beryllium, cadmium, chromium (total and hexavalent), copper, iron, lead, magnesium, manganese, mercury, silver, tin, titanium, zinc, cyanide, PCBs (total), acetone, carbon disulfide, 1,1-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene and trans-1,2-dichloroethylene. Appendix C of this EI includes a data table (Table 2) listing of detected constituents for groundwater that exceeds Table 3-7 criteria.

Exceedances of the drinking water standards described above **and** the *Generic P&W Groundwater Screening Levels (SLs) Based on Surface Water Protection* (Table 3-7 of the Gradient Report) were identified as follows: aluminum, beryllium, cadmium, chromium (total), iron, magnesium, tin, 1,1,-dichloroethane, and 1,1-dichloroethylene. Some of these exceedances were observed historically but were not encountered in more recent data. Therefore, the historic data were evaluated against current data in order to eliminate historic data that are no longer representative of most recent site data. A large number of these wells were identified as having data which is not considered relevant or significant for the purpose of evaluating current potential impacts to surface water quality due to the time that has passed since the collection and analysis of these samples. For example monitoring well MW-1, indicated an exceedance of Table 3-7 criteria for cadmium in a March 1988 sampling event. MW-1 was subsequently sampled quarterly from March 1988 until December 2000 and did not exhibit an exceedance of cadmium since March 1988. Therefore, MW-1 is not considered to have a significant cadmium concentration for the purposes of evaluating current exposure. The tabulated results of this evaluation are provided in Exhibit 3 of the Response to EPA Comments of December 2002. Only six were identified as being immediately upgradient were identified as being immediately upgradient of a surface water body (i.e., Connecticut River). These six wells are as follows:

- CM-15, GZ-2-S, GZ-2-M, GZ-3-M, CM-412S, and MW-49

Chemical constituents in groundwater at these wells that exceed these criteria include: aluminum, cadmium, mercury, and tin. The exceedances for these four metals are shown

on Tables 3a and 3b provided in the *Groundwater Monitoring in Support of VCAP Risk Assessment* report (Appendix C). The exceedances of the drinking water standards for aluminum, cadmium, and mercury are shown on Table 3a. Since tin does not currently have a drinking water standard the exceedances of Table 3-7 for tin are presented on a separate table (Table 3b).

To address the remaining exceedances of these four metals site-specific dilution attenuation factors were determined. The dilution factors were calculated in accordance with the procedure promulgated by the DEP in the RSRs, Section 22a-133k-3(b)(3)(A). Specifically, the dilution attenuation factors are calculated by multiplying the seven-day ten-year low flow (7Q10) of the CT River (approximately 2,220 ft^3/s, obtained from the United States Geological Survey (USGS) for the CT River, Thompsonville Monitoring Station, as referenced in the RFI) by 0.25 and dividing the product by the average discharge daily (Q) of the groundwater plume as follows:

$$DF = (0.25)(7Q10) / Q_{plume}$$

The Q of the plume (ft^3/s) is determined as follows:

$$Q_{plume} = (A_{plume})(K)(i) / n$$

A_{plume} = (width of the plume)(saturated thickness of plume) (ft^2)*
K = hydraulic conductivity (ft/s)*
i = average horizontal gradient (ft/ft)*
n = average porosity (unitless)* (assumed to be 30%)
* values obtained from RFI Report

The dilution factors computed for the four metals identified above are then multiplied by Table 3-6 criteria to obtain site-specific criteria. A comparison of the calculated site-specific criteria against the highest concentrations detected indicated no further exceedances. Health-based values were utilized in the calculations for cadmium and mercury. As no health-based values were promulgated for aluminum or tin, the secondary MCL was utilized for aluminum and the PQL for tin was used. The calculations used to obtain the site-specific criteria are provided in Exhibit 4 of the Response to EPA Comments of June 2004. Exhibit 5 in the Response to EPA Comments of June 2004 provides a summary of statistics of analytes for constituents in groundwater.

Design Process Review (DPR)

The implementation of the DPR as it applies to VCAP, controls exposures to contaminants in groundwater, subsurface soil, and trench air (outdoor air encountered during performance of excavation of subsurface soil). The implementation of the DPR

process controls worker exposure to contaminants in subsurface soil, and trench air (outdoor air encountered in a trench during performance of an excavation). A DPR is completed prior to any activity that results in the excavation of soil (the potential source of exposure to constituents in groundwater, subsurface soil and air, due to soil movement). The DPR includes an assessment of available analytical data for soil and groundwater in the area where the proposed activity will occur. If no data are available, or if existing data are incomplete, samples are collected. The data for the area are compared to the DPR thresholds, as listed in Table 3-11 of the Gradient Report, titled *Development of DPR Threshold Soil Concentrations, P&W VCAP, Connecticut Facilities*. If there are exceedances of applicable screening levels, all subsurface work in the area is conducted by personnel who have received appropriate health and safety training.

The purpose of the DPR process, as it relates to VCAP, is to provide the basis for a consistent approach to ensure that potential worker exposures to various environmental media resulting from facility modifications are evaluated prior to the implementation of a modification. The DPR process is primarily focused on the evaluation of potential human exposure to environmental contaminants in soil and groundwater. Any facility modification that could result in a human exposure to soil or outdoor air (trench air) is subject to the DPR process. Typical facility modifications addressed by the DPR process include, but are not limited to:

- Equipment pad construction.
- Underground utility repair.
- Dewatering pump replacement or repair.
- Landscaping projects requiring contact with soil (not normal grounds keeping).

For reference purposes, a DPR Request Form and DPR process flow chart have been included as Exhibit 3 immediately following the *Response To EPA Comments Received July 20, 2001,* which precedes this document. This is the generic form that P&W employees must complete when applying for a DPR within the facility. The DPR process flow chart illustrates the decision steps of the process.

Production Well Water

To ensure that treated groundwater is potable at production wells PW-A, PW-B, and PW-7, post-treatment groundwater samples are being submitted for laboratory analysis and compared to the Connecticut Department of Public Health (DPH) Standards for Quality of Public Drinking Water. As the treatment of potable water is regulated by the DPH, which routinely receives copies of the monitoring data, and complies with drinking water standards, this source is not warranted as a potential exposure pathway.

The data collected since 1988 indicate that with the exception of one sample colleted on September 4, 1996, there are no observed exceedances of constituents in post-treated groundwater. On September 4, 1996, trichloroethylene was detected at a concentration of 8.0 micrograms per liter (µg/l) in a sample representing potable water following treatment and was not confirmed in prior or subsequent sampling events. As such, the singular detection of trichloroethylene is believed to represent a statistical anomaly. A listing of groundwater sampling data for pre- and post-treatment groundwater sampling data from production wells PW-A, PW-B, PW-7, and PW-13A is provided in Table 1. A summary of the constituent concentrations detected in groundwater samples collected from production wells PW-A, PW-B, PW-7, and PW-13A is provided in Table 2. The analytical laboratory results for groundwater samples collected from production wells PW-A, PW-B, PW-7, and PW-13A are provided in Table 3. Exceedances of DPH water standards to production well effluent (post-treatment) collected from PW-A, PW-B, PW-7, and PW-13A are provided in Table 4. Tables 1 through 4, and DPH water quality standards are provided in Exhibit 6 of the Response to EPA Comments of December 2002.

It is important to note that only groundwater from production wells PW-A, PW-B, and PW-7 is used as potable water. Prior to consumption of water from wells PW-A, PW-B, and PW-7, groundwater is treated via air stripping and subsequently collected in a wet well. The groundwater is also treated at the well head for iron and manganese removal.

Well water from production well PW-13A is used strictly for production purposes as non-contact cooling water. The well water from PW-13A is treated separately from the wells used for domestic purposes (PW-A, PW-B, and PW-7) with an air stripper functioning as its own distribution system.

Indoor Air

With respect to indoor air, ten indoor air samples, as well as three trip blanks and a duplicate sample, were collected in November 2000 in an effort to assess concentrations of volatile organic compounds present in indoor air at Buildings 10, 150, 220, 330 and 440. The sampling was performed to characterize the indoor air and assess any potential impacts due to volatilization of contaminated groundwater at the site. It should be noted that the selection of the locations to be sampled was based on occupancy levels and proximity to process activities which could potentially result in subsurface contamination. The table provided below describes briefly the locations selected and processes in the immediate surroundings.

Sampling Location	Description of Sample Location and Rationale for Sample Selection

MD-RSK-AS-01	Collected in machine shop in Building 440, suspected solvents and cutting oils.
MD-RSK-AS-02	Collected in storage area near former degreaser in Building 220 (column D23), suspected chlorinated and/or petroleum solvents.
MD-RSK-AS-03	Collected in assembly area near former degreaser in Building 220 (column A7), suspected chlorinated and/or petroleum solvents.
MD-RSK-AS -04	Collected in machining area near former degreaser in Building 220 (column K7), suspected cutting oils, chlorinated and/or petroleum solvents.
MD-RSK-AS-05	Collected in machining area near former dip tank in Building 220 (column V5-6), suspected cutting oils, chlorinated and/or petroleum solvents.
MD-RSK-AS-06	Collected in machining area near former degreaser in Building 150 (column G9), suspected cutting oils, chlorinated and/or petroleum solvents.
MD-RSK-AS-07	Collected in oil storage area near former still in Building 150 (column M11-12), suspected cutting oils, chlorinated and/or petroleum solvents.
MD-RSK-AS-08	Collected in experimental test cell dressing area in Building 330, suspected solvents.
MD-RSK-AS-09	Collected near rack storage, weld machines and former degreaser in Building 10 (column C7), suspected chlorinated and/or petroleum solvents.
MD-RSK-AS-10	Collected near area of machinery being removed and former degreaser in Building 10 (column R3), suspected chlorinated and/or petroleum solvents.

With regards to the seasonal timing of the indoor air sample collection, this sampling event was performed in accordance with the procedure used in other Pratt & Whitney facilities. The main objective of this initial sampling event was to establish baseline data from which future monitoring events, if deemed necessary, would be based on.

As noted above, the purpose of the air sampling was to identify indoor air concentrations potentially resulting from environmental sources (volatilization of contaminated groundwater). These samples were collected at the locations identified as MD-RSK-AS-01 through MD-RSK-AS-10 in accordance with the *VCAP Sampling Plan* (included as Appendix B of Gradient's Report) for the purpose of evaluating exposure to indoor air. A copy of the report entitled, *Indoor Air Monitoring in Support of VCAP Risk Assessment, Pratt & Whitney, Middletown, Connecticut*, including a presentation of the results is included in Appendix D of this EI. Indoor air sample locations are depicted in Drawing B-2, which is provided in Appendix B of this EI. Drawing A-1 in Appendix B of this EI shows the initial proposed indoor air sample locations. Each on-site building

location is identified by the Building number. As observed in Drawing B-2 of Appendix B, not all the on-site buildings were sampled. The buildings (Buildings 10, 150, 220, 330 and 440) in which samples were collected were determined to be representative of current and historic process operations such as former degreasers. It should be noted that indoor air sample location MD-RSK-AS-01 was originally proposed to be sampled in Building 450, but was subsequently sampled in Building 440. The rationale behind this selection was the revisitation to the actual type of operations in these buildings. The main use of Building 450 is a receiving and inspection area. No manufacturing operations or chemical processes take place in Building 450. As such, it was determined that obtaining an indoor air sample from Building 440 was more representative than that of Building 450.

The indoor air sample data provided in Appendix D of this EI have been compared to the numeric screening criteria listed in Table 3-4 of the Gradient Report. The table is titled *Generic P&W Indoor Air Screening Levels (SLs) P&W VCAP, Connecticut Facilities.* The sample data set is adequate to assess the quality of indoor air likely to be encountered by Maintenance and Indoor Workers and On-site Recreators at the site. The comparison indicated that the detected concentrations are below the screening levels. The revised EI text incorporates these comments.

Surface Soil

The following discussions and resulting conclusions are based on the review and evaluation of all available surface soil data for the site within the exposure areas identified. Specifically, the discussions and resulting conclusions are based on the following:

- Surface soil samples (identified as MD-RSK-SS-01 through MD-RSK-SS-07) collected during VCAP risk assessment sampling activities in October 2000. The sampling was performed in accordance with the *VCAP Sampling Plan* (included in Appendix B of the Gradient Report) for the purpose of evaluating exposure to surface soil. These surface soil samples were analyzed for VOCs and SVOCs, PCBs, metals, and TPH.
- Forty-four (44) surface soil samples (0 to 1 foot interval) were collected as part of the RFI during the period from 1993 to 1994 throughout the site. These surface soil samples were analyzed for the presence of one or more of the following: VOCs, SVOCs, PCBs, metals; and/or total petroleum hydrocarbons.

The samples below were selected from the exposure areas for Groundskeepers and for On-Site Recreators as described in the *VCAP Sampling Plan* (Appendix B of the Gradient Report). Drawing B-, provided in Appendix B of this EI, depicts the surface soil sample

locations.

The samples used are as follows:

- Groundskeepers – 25 soil samples:

SBA3-1, SBA3-10, SBA3-14, SBA3-16, SBA3-17
SB18-1, SB18-2, SB18-4, SB18-5
SB21-1, SB21-8, SB21-9, SB21-10, SB21-11, SB21-12, SB21-13, SB21-15, SB21-20
MD-RSK-SS-01 through MD-RSK-SS-07

- On-Site Recreators – 6 soil samples:

(These samples form a subset of the ones listed above for Groundskeepers)

SB21-9, SB21-10
MD-RSK-SS-01 through MD-RSK-SS-04

Furthermore, to provide a more comprehensive assessment, the sample sets provided in the *VCAP Sampling Plan* were expanded to include all surface soil samples (0-1 ft) within the exposure areas identified. The additional existing samples collected during the RFI were selected within the risk exposure areas for Groundskeepers and for On-Site Recreators:

- Groundskeepers – 19 existing soil samples:

CM-104S, CM-107B, CM-209B, CM-304B, CM-324B
SBA1-10, SBA3-4, SBA4-9
SB12-5, SB12-6, SB12-7, SB12-9, SB12-10, SB12-11, SB12-13
SB21-14, SB21-16, SB21-17, SB21-19

- On-Site Recreators – 4 existing soil samples:

SBA3-14, SBA3-16, SBA3-17, SBA4-9

The On-Site Recreator exposure areas are discontinuous. Recreators on the whole do not typically traverse between On-Site Recreator exposure areas. However, in the event that they do, they will utilize the extensively paved walkway which is not considered an exposure pathway. Should the Recreators choose not to use the paved pathway, they will then pass through Groundskeeper exposure areas. As the risk-based criteria for Groundskeeper exposure areas are more stringent than that for the On-Site Recreator exposure areas, there does not appear to be justification for changing the Groundskeeper exposure areas crossed by the On-Site Recreators to On-Site Recreator exposure areas.

Surface soil data were compared to the numeric screening criteria listed in Table 3-10 of the Gradient Report. The table is titled *Generic P&W Soil Screening Levels (SSLs) Based on Soil Ingestion and Dermal Contact, P&W VCAP, Connecticut Facilities*. The sample data set is adequate to assess the quality of surface soils in those areas likely to be encountered by Groundskeepers and On-Site Recreators at the site. The comparison indicated that a single semi-volatile organic compound (SVOC), benzo[a]pyrene, was detected in a single surface soil sample (SBA3-10) at a concentration of 1,800 µg/kg, above the numeric criteria for Groundskeepers published in the above-referenced table.

In order to evaluate the benzo(a)pyrene exceedance of the generic screening levels, the 95% upper confidence limit (UCL) of the mean for the surface soil data set listed above for all surface soil samples within the Groundskeeper exposure area was calculated. The 95% UCL of the mean of the normally distributed data set for the 0-1 ft horizon for benzo[a]pyrene is 776.23 µg/kg and is well below the relevant screening level (1,600 µg/kg for Groundskeepers).

Provided as Appendix E is a copy of the report entitled *Surface Soil Sampling in Support of VCAP Risk Assessment, Pratt & Whitney, Middletown, Connecticut*, including a database listing of analytical data for surface soil samples (Table 1), a table of all sample results for the soil samples identified above (Table 2), a table of detected constituents in surface soil (Table 3), and a summary of the benzo[a]pyrene results in the data sets for the Groundskeepers exposure area (Table 4).

The Table 3-10 criteria are reflective of ingestion and dermal contact, as opposed to only dermal contact as indicated in this text.

Surface Water

The following discussions and resulting conclusions are based on the review and evaluation of available surface water data for the site. Specifically, the discussions and resulting conclusions are based on the following:

- Fifty-eight surface water samples collected from 40 locations throughout the site during the period from 1993 to 1994; and, in 2003 at Dart Brook in response to the jet fuel oil release (April 2003). These surface water sample locations sampled in 2003 are identified as 410-SW-01 through 410-SW-06 (refer to Exhibit 2 of the Response to EPA Comments of June 2004 for further discussion).
- Included in the above sampling, eight surface water samples collected from five locations within the "Trespasser" and "Off-Site Recreator" exposure areas during the period from 1993 to 1994. The five locations evaluated include WS008, WS009, WS010, WS031, and WS032 in accordance with the *VCAP Sampling Plan* included

as Appendix B of the Gradient Report. The sample data set being evaluated is considered adequate for the evaluation performed. The premise for this is that all remaining surface water sample locations are outside the "Trespasser" and "Off-Site Recreator" exposure areas and are not considered relevant for use in this EI determination.

A copy of the report entitled, *Surface Water and Sediment Sampling in Support of VCAP Risk Assessment, Pratt & Whitney, Middletown, Connecticut* is provided as Appendix F.

A list of all sitewide surface water samples is provided in Table 1a in Appendix F. A query of all surface water data against the criteria listed in Gradient's Table 3-6 was performed and the results are included in Table 1b in Appendix F. Regulatory changes to the State of Connecticut Water Quality Standards were taken into account in this evaluation. Further, a query of all surface water data against drinking water criteria was performed and the results are included in Table 1c in Appendix F. It should be noted, however, that not all of these sampling locations are within the exposure areas.

This appendix also includes a database listing of analyses performed on all surface water samples described below, a table of all sample results for the sample set presented below, a table of detected constituents, and a summary of the exceedances of the generic Pratt & Whitney screening levels listed in Table 3-6. Drawing B-4, provided in Appendix B of this EI, shows all surface water sampling locations within the exposure areas. .

All available sitewide surface water data were compared to the numeric screening criteria listed in Table 3-6 of the Gradient Report. The table is titled *Generic P&W Surface Water Screening Levels (SLs) P&W VCAP Facilities*. Regulatory changes to the State of Connecticut Water Quality Standards were taken into account when performing evaluations using this table. Exceedances of Gradient Table 3-6 were identified for the following compounds: aluminum, arsenic, barium, beryllium, cadmium, chromium (total), cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, silver, tin, vanadium, zinc, dieldrin, benz[a]anthracene, benz[e]acephenanthrylene, benzo[a]pyrene, benzo[ghi]perylene, chrysene, indeno(1,2,3-cd)pyrene, bis(2-ethylhexyl)phthalate, 1,1,1-trichloroethane, 1,1-dichloroethane, chloroethane, and 1,1-dichloroethylene.

The exceedances of Table 3-6 were then compared to drinking water standards including primary and secondary Maximum Contaminant Levels (MCLs), and Connecticut Groundwater Protection Criteria (GWPC). Concentrations that exceeded the drinking water standards were still identified for the following compounds: arsenic, barium, beryllium, cadmium, chromium (total), cobalt, lead, magnesium, nickel, silver, vanadium, dieldrin, benz[a]anthracene, benz[e]acephenanthrylene, benzo[a]pyrene, benzo[ghi]perylene, chrysene, ideno(1,2,3,-cd)pyrene, bis(2-ethylhexyl)phthalate, chloroethane,

However, based on a comparison of the exceedances *within the exposure areas* (shown on the Site Plan in Appendix B) to the drinking water standards, there were only exceedances of cadmium, lead, nickel and vanadium. The exposure areas, as defined in Gradient's Report, are only limited to areas near the Connecticut River where exposure to Trespassers and Off-Site Recreators could occur. Further evaluation of the presence of these constituents is presented in the following sections of this document.

An evaluation of all surface water data on site obtained during the RCRA Facility Investigation (RFI) indicated that aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, silver, tin, vanadium, and zinc were detected in surface water above their respective screening levels listed in Table 3-6 in Gradient's Report. Regulatory changes to the State of Connecticut Water Quality Standards were taken into account in this evaluation, as mentioned previously. As noted in the following sections, the data were further evaluated against drinking water standards. It should also be noted that only a subset of this data lies within the exposure areas identified in Gradient's Report.

Sediment

A list of all sitewide sediment data is provided in Table 5a in Appendix F of this EI. A query of all sitewide sediment data against the criteria for trespassers and off-site recreators listed in Gradient's Table 3-10 was performed and the results are provided in Table 5b in Appendix F. A summary of constituent concentrations detected in soil samples collected from the "On-Site Recreator" exposure areas is provided in Table 6 of Appendix F. The analytical results for soil samples collected from the "On-Site Recreator" exposure areas is provided in Table 7 of Appendix F. It should be noted, however, that not all of these sampling locations are within the exposure areas.

The following discussions and resulting conclusions are based on the review and evaluation of available sediment data for the site within the exposure areas for trespassers and off-site recreators. Specifically, the discussions and resulting conclusions are based on the following:

- Ten sediment samples collected from seven locations in 1993 and 1994. The seven locations evaluated include SD008, SD009, SD010, SD030, SD031, SD032, and SD039 in accordance with the *VCAP Sampling Plan.* The VCAP Sampling Plan is included the Gradient Report which is provided in Appendix B of this EI..
- Additional sediment samples were collected downstream of the jet fuel oil spill to assess any potential impacts. These sediment sample locations sampled in 2003 are identified as 410-SD-01 and 410-SD-02 (refer to Exhibit 2 of the Response to EPA Comments of June 2004 for further discussion).

A copy of the report entitled *Surface Water and Sediment Sampling in Support of VCAP Risk Assessment, Pratt & Whitney, Middletown, Connecticut* is provided as Appendix F. In addition, Appendix F includes a database listing of analytical data for the sediment samples described above.

The sediment data provided in the appendices have been compared to the numeric screening criteria listed in Table 3-10 of the Gradient Report. The table is titled *Generic P&W Soil Screening Levels (SSLs) based on Soil Ingestion and Dermal Contact (mg/kg) P&W VCAP, Connecticut Facilities*. The sampling is determined adequate to assess the quality of sediment in those areas likely to be encountered by Trespassers and Off-site Recreators. The comparison indicated that the detected concentrations are below the screening levels.

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	No	Yes	No	No	No	No	No
Surface Water	No	No	No	No	Yes	Yes	No
Sediment	No	No	No	No	Yes	Yes	No
Soil (subsurface e.g., >2 ft)	No	No	No	No	No	No	No
Air (outdoors)	No	No	No	No	No	No	No

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):

Included in Appendix A is the Gradient Report entitled *Conceptual Site Models and Screening Levels for Pratt & Whitney's VCAP Connecticut Facilities,* prepared by Gradient Corporation and last revised on September 15, 1999 (Gradient Report), which provides a facility-specific conceptual site model, a description of exposure media and exposure pathways, a description of potential receptors, a rationale and approach to screening analytical data generated for exposure media, and screening levels for exposure media. The generic Pratt & Whitney screening levels are identical to the ones listed in the report the Gradient Report.

The implementation of the Design Process Review (DPR) as it applies to VCAP, controls exposures to contaminants in groundwater, subsurface soil, and trench air (outdoor air encountered during performance of excavation of subsurface soil). The implementation of the DPR process controls worker exposure to contaminants in subsurface soil, and trench air (outdoor air encountered in a trench during performance of an excavation). A DPR is completed prior to any activity that results in the excavation of soil (the potential source of exposure to constituents in groundwater, subsurface soil and air, due to soil movement). The DPR includes an assessment of available analytical data for soil and groundwater in the area where the proposed activity will occur. If no data are available, or if existing data are incomplete, samples are collected. The data for the area are compared to the DPR thresholds, as listed in Table 3-11 of the Gradient Report, titled *Development of DPR Threshold Soil Concentrations, P&W VCAP, Connecticut Facilities*. If there are exceedances of applicable screening levels, all subsurface work in the area is conducted by personnel who have received appropriate health and safety training.

The purpose of the DPR process, as it relates to VCAP, is to provide the basis for a consistent approach to ensure that potential worker exposures to various environmental media resulting from facility modifications are evaluated prior to the implementation of a modification. The DPR process is primarily focused on the evaluation of potential human exposure to environmental contaminants in soil and groundwater. Any facility modification that could result in a human exposure to soil or outdoor air (trench air) is subject to the DPR process. Typical facility modifications addressed by the DPR process include, but are not limited to:

- Equipment pad construction.
- Underground utility repair.
- Dewatering pump replacement or repair.
- Landscaping projects requiring contact with soil (not normal grounds keeping).

Groundwater, Subsurface Soil and Trench Air (Outdoor Air)

Maintenance Workers were identified in the Gradient Report as being a potentially exposed population with regard to direct contact with contaminated groundwater, subsurface soil and inhalation of trench air. However, the implementation of the DPR controls these receptors' exposures to contaminants in groundwater, subsurface soil, and trench air (outdoor air encountered during performance of excavation of subsurface soil). As discussed earlier, a DPR is completed prior to any activity that results in the excavation of soil (the potential source of exposure to constituents in groundwater, subsurface soil and air, due to soil movement). The DPR includes an assessment of available analytical data for soil and groundwater in the area where the proposed activity will occur. If no data are available, or if existing data are incomplete, samples are collected. The data for the exposure areas are compared to the screening criteria. If there are exceedances of applicable screening levels, all subsurface work in the area is conducted by personnel who have received appropriate health and safety training.

Surface Water and Sediment

The Gradient Report identified Trespassers and Off-site Recreators as having an exposure pathway for surface water and sediment by ingestion and dermal contact. As described under Question No. 2 above, there are identified exceedances of generic screening levels for these exposure receptors and pathways for surface water. The significance of these exceedances will be discussed in subsequent portions of this EI.

Footnotes:

[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)

Surface Water

Site-wide exceedances of the generic screening levels for surface water (Table 3-6) and corresponding drinking water standards were identified for arsenic, barium, beryllium, cadmium, chromium (total), cobalt, lead, magnesium, nickel, silver, vanadium, dieldrin, benz[a]anthracene, benz[e]acephenanthrylene, benzo[a]pyrene, benzo[ghi]perylene, chrysene, indeno(1,2,3-cd)pyrene, bis(2-ethylhexyl)phthalate, chloroethane in the surface water samples evaluated as part of the VCAP risk assessment. It should be noted that out of these exceedances only a limited subset were within the exposure areas. The exposure areas as defined in Gradient's Report entitled *Conceptual Site Model and Screening Levels, Pratt & Whitney, Middletown, CT* are only limited to areas near the Connecticut River where exposure to trespassers and off-site recreators could occur. The exceedances remaining in this subset include cadmium, nickel, lead, and vanadium. The exposure areas and sampling locations are shown in Drawing B-4 included in Appendix B. Cadmium, lead, nickel, and vanadium exceedances of the screening levels listed in

Table 3-6 and of the drinking water standards were all observed in the unfiltered sample collected from WS032 on October 1, 1993. The dissolved metal concentrations collected on the same date from the same location were all one to two orders of magnitude lower and were all below the corresponding screening levels. The difference between the results reported for the two samples is probably attributed to dissolving metals during acidification of sediment particles entrained in the unfiltered sample. Therefore, these results should be viewed as an anomaly, rather than as representative of surface water at this location.

In addition, a comparison of cadmium, lead, nickel, and vanadium concentrations detected in the unfiltered sample from WS032 to site-specific, human-health risk-based criteria developed by Gradient Corporation did not indicate any exceedances. Therefore, surface water at the site is not expected to pose significant risks. These criteria are provided in Appendix A and are as follows: cadmium (0.312 mg/l); lead (4.4 mg/l); nickel (29.75 mg/l) and vanadium (2.87 mg/l).

Groundwater Discharging to Surface Water

All available groundwater data from over 260 sampling locations were screened against Table 3-7 of Gradient's Report. Exceedances were identified in a total of 130 wells (Table 2 in Appendix C of this EI). The exceedances of Table 3-7 were then compared to drinking water standards including primary and secondary MCLs, and GWPC times 10. Exceedances of both of these criteria (Table 3-7 and drinking water standards times 10) were identified for the following compounds: aluminum, beryllium, cadmium, chromium (total and hexavalent), iron, lead, magnesium, manganese, mercury, tin, titanium, 1,1-dichloroethane, and 1,1-dichloroethylene.

Some of these exceedances were observed historically but were not encountered in more recent data. Therefore, the historic data were evaluated against current data in order to eliminate historic data that are no longer representative of most recent site data. A large number of these wells were identified as having data which is not considered relevant or significant for the purpose of evaluating current potential impacts to surface water quality due to the time that has passed since the collection and analysis of these samples. For example monitoring well MW-1, indicated an exceedance of Table 3-7 criteria for cadmium in a March 1988 sampling event. MW-1 was subsequently sampled quarterly from March 1988 until December 2000 and did not exhibit an exceedance of cadmium since March 1988. Therefore, MW-1 is not considered to have a significant cadmium concentration for the purposes of evaluating current exposure. The results of this evaluation are summarized in Exhibit 3 of the Response to EPA Comments of June 2004

The groundwater from the majority of the wells with exceedances of the criteria described above (Table 3-7 and drinking water standards times 10) does not discharge directly to

surface water. Of the wells that exceeded the above criteria, six were identified as being immediately upgradient of a surface water body. These wells are as follows:

CM-15	GZ-2-M	CM-412S
GZ-2-S	GZ-3-M	MW-49

Compounds in groundwater at these wells that exceed these criteria include: aluminum, cadmium, mercury, and tin. The exceedances for these four metals are shown on Tables 3a and 3b. The exceedances of the drinking water standards for aluminum, cadmium, and mercury are shown on Table 3a. Since tin does not currently have a drinking water standard the exceedances of Table 3-7 for tin are presented on a separate table (Table 3b). It should be noted that this list of exceedances has been derived by reducing the initial list of wells and constituents over generic screening levels so that only wells for which groundwater discharges to surface water are considered. In addition historical exceedances have been excluded in cases where more recent data indicate lower concentrations.

To address the remaining exceedances of these four metals site-specific dilution attenuation factors were determined. The dilution factors were calculated in accordance with the procedure promulgated by the Connecticut Department of Environmental Protection (DEP) in the Remediation Standard Regulations (RSRs), Section 22a-133k-3(b)(3)(A). Specifically, the dilution attenuation factors are calculated by multiplying the seven-day ten-year low flow (7Q10) of the CT River (approximately 2,220 ft^3/s, obtained from the United States Geological Survey (USGS) for the CT River, Thompsonville Monitoring Station, as referenced in the RFI) by 0.25 and dividing the product by the average discharge daily (Q) of the groundwater plume as follows:

$$DF = (0.25)(7Q10) / Q_{plume}$$

The Q of the plume (ft^3/s) is determined as follows:

$$Q_{plume} = (A_{plume})(K)(i) / n$$

A_{plume} = (width of the plume)(saturated thickness of plume) (ft^2)*
K = hydraulic conductivity (ft/s)*
i = average horizontal gradient (ft/ft)*
n = average porosity (unitless)* (assumed to be 30%)
* values obtained from RFI Report

The dilution factors computed for the four metals identified above are then multiplied by Table 3-6 criteria to obtain site-specific criteria. A comparison of the calculated site-specific criteria against the highest concentrations detected indicated no further

exceedances.

It should also be noted that some of the compounds for which exceedances of the generic screening levels for surface water (Table 3-6) were noted are the same as the ones for which exceedances over the groundwater screening levels based on surface water protection (Table 3-7) were observed. As noted in the RFI a groundwater plume of inorganic constituents exists in the lower section of the outwash deposits east of the Electrochemical Machining (ECM) Landfill. The plume's axis runs northeast, parallel to groundwater flow, from the east end of the ECM Landfill toward MW-J and then east toward the river. As this outwash aquifer is presumed to be hydraulically connected to the Connecticut River, the plume may discharge to the river. Among the constituents detected in the plume were sodium, nitrate, chloride, nickel, cadmium and cobalt. A two-layer cap system comprised of a top layer of vegetated soil and an underlying layer of low permeability sand/bentonite was constructed over the ECM Landfill as described in the document Interim Measures Report for the ECM Landfill stabilization at Pratt & Whitney Middletown, CT, prepared by Loureiro Engineering Associates in July 1993.

Groundwater Flow Direction

As discussed in the response to Question 2 above, groundwater contour maps have been developed during the 1993-1994 RFI groundwater sampling event. Separate groundwater contours have been developed for shallow, deep, and bedrock intervals. These maps, provided in Appendix B, support the previous conclusion that groundwater flow at the site is toward the Connecticut River and that contaminated groundwater at the site also flows to the Connecticut River. Groundwater from wells CM-412 and CM-416 may discharge from the overburden into the wetland area located east of CM-412 due to a strongly upward gradient. Groundwater in the lower zones of the unconsolidated aquifer flow eastward toward the Connecticut River and then from north to south along the predominant flow component of the river within the Connecticut River valley. It should be noted that contaminants present in the deeper aquifer zones undergo an enormous dilution in the river valley.

Footnotes:

[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?

_____ 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 Pratt & Whitney Middletown facility, EPA ID #CTD003935905, located at Aircraft Road, Middletown, Connecticut 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. Case Date 7/21/05
(print) CAROLYN J. CASE
(title) RCRA FACILITY MANAGER

Supervisor (signature) [illegible] Date 7/25/05
(print) Matthew R. Hoagland
(title) Chief, RCRA Corrective Action Section
EPA Region 1

Locations where References may be found:
EPA RECORDS CENTER

Contact telephone and e-mail numbers

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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.