

## DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

### RCRA Corrective Action Environmental Indicator (EI) RCRIS Code (CA725) Current Human Exposures Under Control

**Facility Name:** ETHICON, Inc.  
**Facility Address:** Route 22 West, Bridgewater, New Jersey, 08876  
**Facility EPA ID#:** NJD002144145

#### Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the Resource Conservation and Recovery Act (RCRA) Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) to track changes in the quality of the environment. The two EIs 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 objectives of the RCRA Corrective Action program, the EIs 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 is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does 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 determination status codes should remain in the Resource Conservation and Recovery Information System (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).

## **Facility Information**<sup>1</sup>

The ETHICON, Inc., facility is located in Bridgewater, New Jersey, on westbound Route 22. The Borough of Somerville is located to the southeast of the site. The site consists of gently rolling terrain, bordered on the east by Peters Brook, a small stream trending generally north-south. A small tributary is located west of Peters Brook. A cluster of buildings is located in the northern part of the ETHICON site, while the southern part of the site is mainly parking lots, roads, and open space.

The adjacent property to the east, previously owned by ETHICON, was sold to SJP Properties (SJP) in 1985. SJP built an office complex with several office buildings, a parking garage, and various parking lots. A public high school and a golf course are located north and south of the site, respectively. Residential areas are located west and northeast of the site.

Currently, the ETHICON site is used for office work, research, storage, and a limited amount of manufacturing. Approximately 1,200 people are currently employed at the facility. Historically, the ETHICON site was used for manufacturing and storage facilities, and offices. The Needle Area has been identified as a historic source of tetrachloroethylene (PCE); this area was used to degrease wire with the solvent prior to processing. Significant quantities of PCE were used between 1972 and the early 1980s. Two 550-gallon above-ground storage tanks (ASTs) were used to store virgin and waste PCE from 1972 to 1980. Prior to and after that period, PCE was obtained and disposed of in 55-gallon drums. PCE use was discontinued at ETHICON in the mid-1980s.

Investigation of the ETHICON site began in 1983, when nine monitoring wells were installed and sampled for the first time. Soil and surface water investigations began in 1984. The New Jersey Department of Environmental Protection (NJDEP) has overseen the investigation of over 30 separate areas of concern (AOCs) at the current site and on the adjacent property now owned by SJP. NJDEP has approved no further action (NFA) for all soil AOCs. Groundwater remediation has been underway since 1987. Remediation initially consisted of a pumping system on the east side of the facility, which discharged pumped water to the sanitary sewer without treatment. Water treatment prior to sanitary sewer discharge was included several years later. A dual-phase vapor extraction system was added in 1993 and shut down after PCE removal rates declined in 1999. The pump and treat system was transitioned to an enhanced bioremediation approach from 1998 to 2002.

Although the pumping system was shut down in 2002, all components were left in place as a contingency measure. Enhanced bioremediation and nano-scale zero-valent iron (ZVI) have been used since 2002 to reduce both source area PCE mass and downgradient groundwater contaminant concentrations.

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<sup>1</sup> Facility information was provided by Eric Killenbeck, ARCADIS, in an e-mail to Sameh Abdellatif and Barry Tornick, U.S. EPA Region 2, dated September 27, 2006.

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 (SWMUs), regulated units (RUs), and areas of concern (AOCs)), been **considered** in this EI determination?

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

### **Summary of Areas of Concern (AOCs):**

As part of previous site investigations at ETHICON, 24 AOCs, 15 tanks, and four additional areas not included in the NJDEP record were identified. See Attachment 1, which is an AOC Status Summary compiled by ARCADIS to support this EI determination. As indicated on Attachment 1, ETHICON has received NFA or equivalent determinations from NJDEP for all the soil-based AOCs and tanks. AOC O, Two Former 500-Gallon PCE Tanks (Virgin/Waste), received NFA for soil under AOC Y, but groundwater investigation and remediation is continuing in the original AOC O (Ref. 1). Investigations have been concluded at the four additional areas, and no releases were detected at the Area Around B-29, the Area Around B-43, and the Observed Surface Debris area (Ref. 1). All subsurface buried material at the Former Private Disposal Area was removed in 1987, and no further action was deemed necessary based on the low concentrations of several pesticides and volatile organic compounds (VOCs) detected in the confirmation samples (Ref. 1).

Drawing 1 from the April 2006 Review of Soil Areas of Concern (Ref. 1) shows the historic AOCs and the active remedial area—Area O. Additionally, ETHICON has acknowledged the presence of a chloroform source area on the current SJP site, which has been attributed to leaking tank in AOC E (Refs. 2, 3). Therefore, the only AOC considered in this EI determination will be site-wide groundwater, which was contaminated with PCE from the historic storage and use of the solvent in/near AOC O and with chloroform from a tank spill on the current SJP site.

### **References:**

1. Review of Soil Areas of Concern. Prepared by ARCADIS G&M, Inc. Dated July 2006.
2. ETHICON, Somerville, New Jersey Facility – Preliminary Vapor Intrusion Evaluation. Prepared by ARCADIS G&M, Inc. Dated August 16, 2006.
3. Personal communication between Barry Tornick, U.S. EPA, and Eric Killenbeck, ARCADIS, dated September 28, 2006.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “**contaminated**”<sup>2</sup> 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)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			VOCs
Air (indoors) <sup>3</sup>		X		
Surface Soil (e.g., <2 ft)		X		
Surface Water		X		
Sediment		X		
Subsurface Soil (e.g., >2 ft)		X		
Air (Outdoor)		X		

— 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 :**

**Groundwater**

As discussed earlier, groundwater investigations began at the ETHICON site began in 1983, and groundwater remediation has been underway since 1987. The source area is assumed to be the area between Buildings G and ATC (Ref. 3), centered around AOC O. Remediation initially consisted of a groundwater pump and treat system in the source area, which discharged pumped water to the sanitary sewer without treatment (Refs. 3, 6). Water treatment prior to sanitary sewer discharge was included several years later. A dual-phase vapor extraction system was added in 1993; this system was shut down after PCE removal rates declined in 1999 (Ref. 6). The pump and treat system was transitioned to an enhanced bioremediation approach from 1998 to 2002.

<sup>2</sup> “Contamination” and “contaminated” describe 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).

<sup>3</sup> Recent evidence (from the Colorado Department 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.

As part of ETHICON's long-term enhanced reductive dechlorination program (ERD), enhanced bioremediation has been used since 2002 to reduce both source area PCE mass and downgradient groundwater contaminant concentrations. The groundwater remedy currently consists of full-scale injection of ZVI in the shallow source area, molasses injection in the shallow and deep source area, and molasses injection via an in-situ reactive zone (IRZ) treatment system at the property boundary. Testing has indicated that the current IRZ treatment system is effectively controlling contamination at the property boundary (Ref. 3). Although the pumping system was shut down in 2002, all components were left in place as a contingency measure (Ref. 6); however, following NJDEP approval, ETHICON is currently taking actions to permanently decommission the pump and treat system (Ref. 3).

ETHICON performs quarterly groundwater monitoring of 11 monitoring wells for VOCs and biogeochemical parameters, an additional two wells for VOCs only, and two injection wells for VOCs and total organic carbon. See Table 1 below for a summary of groundwater concentrations detected above the New Jersey Groundwater Quality Criteria (NJ GWQC) in January 2006, which was the first sampling round following the full-scale ZVI injection and the most recent sampling event for which data are available (Ref. 3). Additionally, chloroform (1,210 micrograms per liter [ $\mu\text{g/L}$ ]) was detected above the NJ GWQC (70  $\mu\text{g/L}$ ) in MW-31 during June 2006 passive bag diffusion sampling (Ref. 4). Drawing 2 from the 2005 Annual Groundwater Cleanup Monitoring/Progress Report (Ref. 3) depicts the monitoring and injection well locations.

**Table 1: Maximum Groundwater Concentrations Exceeding NJ GWQC in January 2006 (in  $\mu\text{g/L}$ )**

Constituent	NJ GWQC	IW-14	IW-16	IW-17	VE-2D	IW-18	IW-19	MW-20S	MW-53
cis-1,2-DCE	70	13,500	4,740	14,800	341	6,150	13,800	150,000	27,800
PCE	1	20,400	5,150	217	70.5	66.7	474	33,800	1,140
TCE	1	12,400	4,430	1,010	12.3	34.7	358	32,800	1,640
VC	1	1,060	117	106	4	1,440	2,270	3,960	1,190

DCE - dichloroethylene, TCE - trichloroethylene, VC - vinyl chloride

### **Air (Indoors)**

#### *On-Site*

ETHICON performed screening for vapor intrusion issues according to the EPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (EPA Vapor Intrusion Guidance), dated November 2002 (Ref. 1). Because groundwater is contaminated with VOCs within 100 feet of occupied on-site buildings and TCE and PCE exceed chemical-specific EPA Target Groundwater Concentrations, additional investigation was deemed necessary (Ref. 4). In July 2006, ETHICON performed sub-slab soil gas and indoor air sampling at Building G and Building ATC. Building G was determined to represent the worst-case exposure scenario because it is located over the highest VOC concentrations and nearest to the source area. Building ATC was selected due to the presence of groundwater contamination close to the building and the fact that it has a basement area located close to the water table (Ref. 4). The paired sub-slab soil gas and indoor air samples were analyzed for VOCs, and the results were compared with the EPA target concentrations for shallow soil gas and indoor air, respectively, for  $1 \times 10^{-5}$  risk (consistent with the EPA Vapor Intrusion Guidance). No constituents in sub-slab soil gas from Building ATC exceeded the EPA target concentrations for shallow soil gas; as a result, the paired indoor air sample was not analyzed. Thus, for the purposes of this EI determination, indoor air in Building ATC is not considered a concern due to the lack of a significant sub-slab vapor source.

In Building G, PCE and TCE exceeded the EPA target concentrations for shallow soil gas. Neither constituent was detected in indoor air; however, the detection limit for TCE (0.4 parts per billion volume [ppbv]) exceeded the corresponding EPA Indoor Air Target Concentration (0.041 ppbv). Although ETHICON attempted to obtain a low-level detection limit on the indoor air samples to allow for an adequate comparison to EPA target concentrations, the analytical laboratory diluted the sample due to elevated concentrations of toluene in indoor air (Ref. 4). As a result, further vapor intrusion sampling was deemed necessary at Building G.

At the request of EPA Region 2, Booz Allen Hamilton (Booz Allen) performed an evaluation of the Preliminary Vapor Intrusion Evaluation letter report dated August 16, 2006, which summarized the July 2006 vapor intrusion investigation. Booz Allen recommended that ETHICON conduct additional paired sub-slab and indoor air sampling in Buildings G and O, and analyze the samples using low-level detection limits (Ref. 5). Building O was not included in the July 2006 sampling, but was determined to be potentially affected by vapor intrusion based on its proximity to the source zone (Ref. 5).

ETHICON collected two paired sub-slab soil gas and indoor air samples each at Buildings G and O in September 2006 and provided the results to EPA on September 27, 2006 (Ref. 6). See Table 2 and 3 below for a summary of the analytical results that exceeded EPA Target Concentrations for Shallow Soil Gas and Indoor Air, respectively.

**Table 2: Comparison of September 2006 Sub-Slab Soil Gas Results to EPA Target Concentrations for Shallow Soil Gas (in ppbv)<sup>4</sup>**

Constituent	EPA Target Concentration at 10 <sup>-5</sup> Risk	EPA Target Concentration at 10 <sup>-4</sup> Risk	G-02SS	G-02SS Dup	G-03SS	O-01SS	O-02SS
Acetone	1,500	1,500	28 U	28 U	13	38 U	<b><i>3,600 U</i></b>
Benzene	9.8	98	7.0 U	7.0 U	2.0	9.6 U	<b><i>900 U</i></b>
Chloroform	2.2	22	<b><i>7.0 U</i></b>	<b><i>7.0 U</i></b>	0.70 U	<b><i>13</i></b>	<b><i>900 U</i></b>
cis-1,2-DCE	88	88	7.0 U	7.0 U	0.70 U	9.6 U	<b><i>5,200</i></b>
Freon 113	39,000	39,000	850	860	0.70 U	66	<b><i>900 U</i></b>
PCE	12	120	<b><i>2,200</i></b>	<b><i>2,300</i></b>	1.1	<b><i>2,700</i></b>	<b><i>200,000</i></b>
TCE	0.41	4.1	<b><i>54</i></b>	<b><i>56</i></b>	0.70 U	9.6 U	<b><i>34,000</i></b>
VC	11	110	7.0 U	7.0 U	0.70 U	9.6 U	<b><i>1,700</i></b>

U = non-detect at specified detection limit

**Bolded** concentrations or detection limits exceed the EPA Target Indoor Air Concentration for 10<sup>-5</sup> risk (Ref. 1).

**Bolded and italicized** concentrations or detection limits exceed the EPA Target Indoor Air Concentration for 1 x 10<sup>-5</sup> and 1 x 10<sup>-4</sup> risk (Ref. 1).

<sup>4</sup> It appears that all sub-slab samples except for G-03SS were diluted; thus, for several constituents (e.g., acetone, benzene, chloroform, Freon 113), the laboratory could not achieve a detection limit lower than the corresponding EPA Target Concentration for 1 x 10<sup>-5</sup> risk (and 1 x 10<sup>-4</sup> risk, in the case of O-02SS). As a conservative measure, these detection limits will be considered actual detections in the following analysis.

**Table 3: Comparison of September 2006 Indoor Air Results to EPA Target Concentrations for Indoor Air (in ppbv)**

Constituent	EPA Target Concentration at 10 <sup>-5</sup> Risk	EPA Target Concentration at 10 <sup>-4</sup> Risk	G-02IA	G-031A	O-01IA	O-02IA
PCE	1.2	12	0.20	0.44	0.15	<b>3.6</b>
TCE	0.041	0.41	0.029	0.034	<b>0.046</b>	<b>0.12</b>

**Bolded** concentrations exceed the EPA Target Indoor Air Concentration for 10<sup>-5</sup> risk (Ref. 1).

**Bolded and italicized** concentrations exceed the EPA Target Indoor Air Concentration for 1 x 10<sup>-5</sup> and 1 x 10<sup>-4</sup> risk (Ref. 1).

As shown in Table 2, eight constituents were detected above their corresponding EPA Shallow Soil Gas Concentrations for 1 x 10<sup>-5</sup> risk and 1 x 10<sup>-4</sup> risk. Most of these exceedances, and the highest concentrations for each constituent, were detected in sample O-02SS, thus indicating a significant subsurface source of VOC vapors at this location underneath Building O.

As shown in Table 3, TCE was detected in both indoor air samples from Building O above the corresponding EPA Target Indoor Air Concentration for 1 x 10<sup>-5</sup> risk. Additionally, PCE was detected in sample O-02IA above the corresponding EPA Target Indoor Air Concentration for 1 x 10<sup>-5</sup> risk. However, no constituents were detected in indoor air above applicable EPA Target Indoor Air Concentrations for Building G; thus, there are no current indoor air concerns at Building G.

When the sub-slab sampling results are compared with the indoor air results, it can be seen that both PCE and TCE vapors are migrating from underneath Building O into indoor air at levels exceeding the EPA Target Indoor Air Concentrations for 1 x 10<sup>-5</sup> risk; however, both constituents were detected well below the EPA Target Indoor Air Concentration for 1 x 10<sup>-4</sup> risk. Therefore, these contaminants are within the acceptable EPA cancer risk range of 1 x 10<sup>-6</sup> to 1 x 10<sup>-4</sup> and acceptable non-cancer hazard index of ≤ 1. Additionally, the EPA Target Concentrations presented in the EPA Vapor Intrusion Guidance were developed for the residential scenario, which is considered conservative for the commercial/industrial scenario due to a longer exposure duration and other site-specific factors. Thus, exposures to potentially contaminated indoor air for on-site workers are not considered to be complete at this time. Given the substantial sub-surface source of PCE, TCE, and potentially other VOC vapors underneath Buildings G and O, however, it is recommended that ETHICON continue to regularly monitor both sub-slab soil gas and indoor air concentrations and consider installing a sub-slab depressurization system at these buildings to prevent any potential future indoor air impacts.

#### *Off-Site*

ETHICON also performed vapor intrusion screening for the off-site SJP facility, which is included in the groundwater monitoring program. Based on the results from passive bag diffusion groundwater sampling performed by ETHICON in June 2006, chloroform was detected in shallow groundwater at 1,210 µg/L in MW-31 (Ref. 4), which exceeds the EPA Target Groundwater Concentration for 1 x 10<sup>-5</sup> risk (80 µg/L). This contamination is believed to be related to a localized tank leak, which was remediated several years ago (Ref. 7).

The EPA Vapor Intrusion Guidance notes that if inhabited buildings are located above or in close proximity to subsurface contamination, the potential exists for unacceptable indoor air inhalation risk. However, if inhabited buildings are not “near” the area of concern (defined as within 100 feet), the vapor intrusion pathway can be considered incomplete (Ref. 1). The nearest downgradient building is about 300 feet from MW-31. There are also two abandoned wells within about 300 feet of the building, in the

sidegradient (MW-21) and downgradient (MW-13) directions. Neither exceeded the EPA Target Groundwater Concentration for chloroform when last sampled in 1997 (Ref. 4).

Due to the distance between MW-31 and the inhabited building and ETHICON's attempts in September 2006 to obtain access to this building for sub-slab soil gas and indoor air sampling, the vapor intrusion pathway is currently considered incomplete for off-site receptors. However, ETHICON is still actively attempting to obtain access to this building for sampling to confirm that there is no unacceptable risk (Ref. 7).

### **Surface/Subsurface Soil**

As discussed in the response to Question 1, all soil-based AOCs have been granted NFA by NJDEP. Due to the lack of soil impacts above applicable criteria, soil is not considered a medium of concern for this EI determination.

### **Surface Water/Sediment**

The main surface water feature on site is Peters Brook, which runs through the middle of the site and forms the western boundary with the SJP site. Peters Brook ranges from ten to 30 feet wide and has limited riparian buffer on the surrounding banks (Ref. 2). Three unnamed stream channels traverse the site and all enter Peters Brook. No analytical data are available for Peters Brook surface water or sediment. According to the March 2005 Baseline Ecological Evaluation, although it is possible that some shallow groundwater discharges to Peters Brook, the current groundwater remediation system effectively reduces VOCs to harmless byproducts upgradient of Peters Brook (Ref. 2). As a conservative measure, the most recent groundwater data from the closest upgradient and downgradient monitoring wells to Peters Brook (MW-50 and MW-51, respectively) were examined to determine whether impacts to surface water were likely. For the November 2005 monitoring round, PCE, TCE, and VC were non-detect in MW-50, and cis-DCE was detected at an estimated concentration of 0.45 µg/L, which is well below the NJ GWQC of 70 µg/L. For the February 2005 monitoring round, PCE, TCE, cis-DCE, and VC were all non-detect in MW-51. Concentrations of these four VOCs in MW-50 and MW-51 have been generally below or slightly exceeding NJ GWQC since 2001 (Ref. 3). Given the lack of recent or significant groundwater impacts near Peters Brook, and the dilution and volatilization that is expected where groundwater discharges to surface water, site-related impacts to surface water and/or sediment are not expected.

### **Air (Outdoors)**

No assessment of impacts to outdoor air from subsurface contamination has been conducted at the ETHICON site. However, migration of contaminants bound to airborne particulate matter is expected to be insignificant at this site because surface and subsurface soil are not contaminated above applicable NJ NRDCSCC. In addition, volatile emissions of detected VOCs from groundwater to outdoor air are not expected to be of concern due to the natural dispersion of these contaminants once they reach the surface. This assessment is supported by ambient air sampling conducted as part of ETHICON's 2006 vapor intrusion sampling. In July 2006 and September 2006, ambient (outdoor) air samples were collected from the same location between Buildings G and ATC (i.e., by the source area) and analyzed for VOCs. This area normally receives truck traffic, but both sampling events were conducted on the weekend so the facility was not in full operation (Refs. 4, 6).

Multiple VOCs were detected in outdoor air during both sampling events, but at levels generally lower than those in indoor air (Refs. 4, 6). This sampling was performed for background purposes (per the NJDEP Vapor Intrusion Guidance dated November 2005), but results were compared to the EPA Region



3 Risk-Based Concentrations (RBCs) for ambient air and the EPA Target Indoor Air Concentrations for  $1 \times 10^{-5}$  risk to assess potential impacts to outdoor air. It should be noted that neither standard is directly applicable to the vapor intrusion to outdoor air pathway at a commercial/industrial facility. Specifically, the Region 3 RBCs are too conservative for this scenario, as they were calculated based on a residential scenario with a longer exposure frequency and duration. Detected concentrations from both sampling events exceeded the Region 3 RBCs for benzene and PCE but were well below the EPA Target Indoor Air Concentrations for  $1 \times 10^{-5}$  risk for all constituents. Thus, the migration of particulates entrained on dust and/or volatile emissions is not expected to represent a complete exposure pathway at the ETHICON site.

**References:**

1. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Prepared by U.S. EPA. Dated November 2002.
2. Baseline Ecological Evaluation. Prepared by ARCADIS G&M, Inc. Dated March 8, 2005.
3. 2005 Annual Groundwater Cleanup Monitoring/Progress Report. Prepared by ARCADIS G&M, Inc. Dated April 2006.
4. ETHICON, Somerville, New Jersey Facility – Preliminary Vapor Intrusion Evaluation. Prepared by ARCADIS G&M, Inc. Dated August 16, 2006.
5. Technical Review of Preliminary Vapor Intrusion Evaluation Dated August 16, 2006. Prepared by Booz Allen Hamilton. Dated August 29, 2006.
6. E-mail and attachments from Eric Killenbeck, ARCADIS, to Sam Abdellatif, U.S. EPA Region 2, re: Overview and VI Tables. Dated September 27, 2006.
7. E-mail from Barry Tornick, U.S. EPA Region 2, to Sam Abdellatif, U.S. EPA Region 2, re: Draft Narrative for the Ethicon Off-Site Vapor Intrusion Issue. Dated September 28, 2006.

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	Trespasser	Recreation	Food <sup>5</sup>
Groundwater	No	No	No	Yes	–	–	No
Air (indoor)	No	No	No	–	–	–	–
Surface Soil (e.g. < 2 ft)							
Surface Water							
Sediment							
Subsurface Soil (e.g., > 2 ft)							
Air (outdoors)							

Instruction 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. These spaces instead have dashes (“-”). 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).
- 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

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<sup>5</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish)

## **Rationale :**

### **Groundwater**

The ETHICON site is serviced by a municipal water supply for all potable/industrial water needs (Ref. 3). In 1998, ETHICON performed a well search for all wells installed within a one-mile radius surrounding the facility and all high-volume water withdrawal wells within five miles of the facility. The results were reported to NJDEP in the Quarterly Groundwater Cleanup Monitoring/Progress Report dated October 30, 1998 (Ref. 1). Three domestic wells and two wells used for industrial purposes (i.e., non-contact cooling water) were identified downgradient of the site. Given the fact that site-related groundwater contamination has not migrated off the adjacent SJP site and the nearest downgradient well identified in the well search is more than a half mile from MW-29 (i.e., the off-site well just downgradient of the SJP site), which was non-detect or below NJ GWQC for VOCs in 2005, it is considered highly unlikely that these off-site wells are affected by site-related contamination. Additionally, ETHICON contacted the owners of the three domestic wells to obtain monitoring results. It was reported during a previous site reconnaissance that one well had been hooked up to the city water supply, and groundwater sampling results from 1992 confirmed that VOCs in the two other wells were either non-detect or below NJ GWQC (Ref. 4). Four high-volume water withdrawal wells, owned by the Raritan Valley Country Club and the Somerset County Park Commission, were also identified within one mile of the site in the sidegradient direction (Ref. 1). However, it was determined that these wells are used for irrigation purposes on a seasonal basis rather than potable use (Ref. 3). Therefore, ingestion of contaminated groundwater is not considered a potentially complete pathway for any receptor.

Depth to groundwater is typically measured at greater than ten feet below ground surface (bgs) at all wells in the groundwater monitoring program except for well MW-51, located on the SJP site (Ref. 2). However, given that shallow groundwater can be encountered at depths less than ten feet bgs and the VOC plume is undergoing active remediation, there is potential for remedial workers (considered to be construction workers for the purposes of this EI determination) to come into contact with contaminated groundwater during sampling and excavation/remedial activities. Thus, direct contact with shallow groundwater is being considered a potentially complete exposure pathway for a remedial worker.

### **References:**

1. Excerpt from: Quarterly Groundwater Cleanup Monitoring/Progress Report. Prepared by ARCADIS. Dated October 30, 1998. Enclosed in: Letter from Michael Chung, ETHICON, to Sam Abdellatif, U.S. EPA Region 2, re: Well Search. Dated April 5, 2006.
2. 2005 Annual Groundwater Cleanup Monitoring/Progress Report. Prepared by ARCADIS G&M, Inc. Dated April 2006.
3. Personal communication between Sam Abdellatif, U.S. EPA Region 2, and Amy Brezin, Booz Allen Hamilton, dated September 6, 2006.
4. E-mail and attachment from Eric Killenbeck, ARCADIS, to Sam Abdellatif, U.S. EPA Region 2, re: Ethicon. Dated September 28, 2006.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**<sup>6</sup> (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 cannot 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 :**

#### **Groundwater**

As discussed in response to Question 3, the potential for remedial workers to come into direct contact with contaminated shallow groundwater is being considered a potentially complete exposure pathway at this time. However, any exposures that may occur are not expected to be significant. ETHICON conducts environmental health and safety training to ensure that associates are familiar with both general and site-specific hazards, including ongoing remediation efforts (Ref. 1). All excavations are managed through ETHICON's on-site facilities and site engineering organizations, and remedial activities are governed by project-specific Health and Safety Plans when these activities have the potential to result in exposures to contaminated groundwater (Ref. 1). As a result, on-site remedial workers adhere to strict Occupational Safety and Health Administration (OSHA) guidelines to minimize exposure to contamination and take proper safeguards (e.g., wearing personal protective equipment [PPE]) as required. Thus, direct exposures to contaminated groundwater for construction (e.g., remedial) workers conducting remedial activities are not expected to pose a significant risk.

#### **References:**

1. E-mail from Michael Chung, ETHICON, Inc., to Sam Abdellatif, U.S. EPA Region 2. Dated September 27, 2006.

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<sup>6</sup> 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 :**

Not applicable. See the response to Question 4.

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 ETHICON, Inc. site, EPA ID# NJD002144145, located at Route 22 West in Bridgewater, New Jersey, 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:** \_\_\_\_\_ Date: \_\_\_\_\_  
Amy Brezin  
Environmental Consultant  
Booz Allen Hamilton

**Reviewed by:** \_\_\_\_\_ Date: \_\_\_\_\_  
Kristin McKenney  
Environmental Consultant  
Booz Allen Hamilton

**Also reviewed by:** \_\_\_\_\_ Date: \_\_\_\_\_  
Sameh Abdellatif, RPM  
RCRA Programs Branch  
EPA Region 2

\_\_\_\_\_  
Barry Tornick, New Jersey Section Chief  
RCRA Programs Branch  
EPA Region 2

**Approved by:** Original signed by: \_\_\_\_\_ Date: September 29, 2006  
Adolph S. Everett, Chief  
RCRA Programs Branch  
EPA Region 2

**Locations where references may be found:**

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at U.S. EPA, Region 2.

**Contact telephone and e-mail numbers:** Sameh Abdellatif  
212-637-4103  
[abdellatif.sameh@epa.gov](mailto:abdellatif.sameh@epa.gov)

**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.**

### Attachments

The following attachments have been provided to support this EI determination:

- Attachment 1 – AOC Status Summary (prepared by ARCADIS) - Available upon request.
- Attachment 2 – Summary of Media Impacts Table



**Attachment 2: Summary of Media Impacts Table  
ETHICON, Inc.**

<b>AOC or SWMU</b>	<b>GW</b>	<b>AIR (Indoors)</b>	<b>SURF SOIL</b>	<b>SURF WATER</b>	<b>SED</b>	<b>SUB SURF SOIL</b>	<b>AIR (Outdoors)</b>	<b>CORRECTIVE ACTION MEASURE</b>	<b>KEY CONTAMINANTS</b>
Site-Wide Groundwater	Y	N	N	N	N	N	N	<p>Starting in 1987, remediation consisted of a groundwater pump and treat system in the source area that discharged pumped water to the sanitary sewer without treatment. Water treatment prior to sanitary sewer discharge was included several years later. A dual-phase vapor extraction system was added in 1993 and shut down in 1999. The pump and treat system was transitioned to an enhanced bioremediation approach from 1998 to 2002.</p> <p>Enhanced bioremediation has been used since 2002 and currently consists of full-scale injection of ZVI in the shallow source area, molasses injection in the shallow and deep source area, and molasses injection via an IRZ treatment system at the property boundary.</p>	VOCs
Buildings G and O	N	N	N	N	N	N	N	<p>No corrective action is currently necessary due to the lack of current indoor air impacts; however, future monitoring of sub-slab soil gas, indoor air, and outdoor air is recommended. ETHICON should also consider installing a sub-slab depressurization system at these buildings to prevent potential future indoor air impacts.</p>	TCE, PCE