



## State of New Jersey

Christine Todd Whitman  
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.  
Commissioner

Kenneth D. Smith  
Naval Air Warfare Center, Aircraft Division - Trenton  
P.O. Box 7176  
Trenton, NJ 08628-0176

SEP 11 1998

Re: Geohydrologic Framework, Water Levels, Trichloroethylene Contamination,  
Simulated Ground Water Flow, and  
Draft Focused Feasibility Study for Ground Water

Dear Mr. Smith:

The New Jersey Department of Environmental Protection (NJDEP) is in receipt of the following documents,

- Geohydrologic Framework, Water Levels, Trichloroethylene Contamination, Jan. 1998,
- Simulated Ground Water Flow, April 1998, and
- Draft Focused Feasibility Study for Ground Water (FFS), March 1998.

Upon review, NJDEP has several comments which have been attached for your convenience. In addition, enclosed please find a list of concerns that General Motors (GM) presented to NJDEP at a meeting on July 8, 1998. Many of GM's concerns are similar to those that NJDEP has expressed in the enclosed comments and in meetings. GM's concerns are enclosed for your information.

Two issues are of concern regarding the FFS. These were discussed with you during our meeting of September 9, 1998.

First, the FFS recommends Alternative 3, use of the existing treatment system with discharge to surface water, natural remediation of the contaminants south of the bedrock fault, and delineation of the contamination to the west of the facility (north of the bedrock fault). While the ground water extraction system, as currently envisioned, will capture all of the *currently known* contamination, it is unlikely that the system will capture the ground water plume that is migrating toward Villa Victoria Brook and the Delaware River. The Navy must address *all* ground water contamination emanating from the site. Therefore, either the ground water extraction system will have to be expanded so that it encompasses the entire ground water plume or, some other remedial action will need to be proposed to address the remaining contamination. The first draft of the Draft Decision Document (July 20, 1998) alludes to this on page 20 where the Navy proposes natural remediation of contaminants of concern in ground water located outside of the recovery

zone. However, the feasibility study does not make this clear.

Second, based upon review of the referenced documents and the Draft Assessment of Ground Water Quality and Natural Remediation Potential, the major issue remaining to be addressed by the Navy is delineation of the contaminant plume. Delineation of the contaminant plume is crucial for the design of any remediation system, including natural remediation. In some instances, NJDEP has accepted ground water remediation proposals allowing continued delineation after the decision document. But, NJDEP cannot accept a natural remediation proposal without knowing the extent and concentration of the contaminant plume (as discussed in NJDEP's letter dated September 2, 1998). In accordance with the New Jersey Technical Requirements for Site Remediation (N.J.A.C. 7:26E-6.3(d)4), ground water contamination must be delineated to the standard applicable to the nearest downgradient receptor, that is, either the Ground Water Quality Standards or the more stringent of either the State Surface Water Quality Standards or the Federal Surface Water Criteria or other applicable standards.

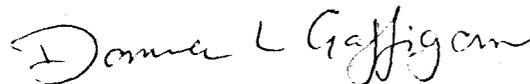
The Navy must complete the following tasks in order to remediate the ground water at and emanating from the site:

1. Revise the FFS,
2. Submit a work plan for the delineation of the contaminant plume,
3. Revise the natural remediation proposal, and
4. Revise the ground water model.

A revised FFS is required prior to approval of the Draft Decision Document. The other documents can follow.

As always, we are willing to meet with you as soon as possible to discuss these issues. Please do not hesitate to contact me at (609) 633-1494.

Sincerely,



Donna L. Gaffigan, Case Manager  
Bureau of Federal Case Management

Enclosures

cc. William Hanrahan, BGWPA  
William, Lawler, USEPA

# Geohydrologic Framework, Water Levels Trichloroethylene Contamination

1. p. 59, last ¶ - It is indicated that the West Branch of Gold Run was engineered to flow in a culvert beneath Parkway Ave.

Comment The Navy shall install wells adjacent to the culvert beneath Parkway Avenue for the purpose of collecting ground water elevation data to confirm that the culvert is acting as a local discharge for shallow ground water. In addition, sampling is required to determine if the ground water discharging to the culvert is contaminated. If contaminated ground water is discharging to the culvert, measures to remedy the condition are required.

2. p. 67, 3rd ¶ - It is indicated that the "nearby bedrock discharge area for the NAWC facility is the spring and stream channel at the head of the West Branch of Gold Run. Distant bedrock discharge areas for the NAWC may include the Delaware River and Villa Victoria Brook.

Comment: The submittal should include a map which shows the discharge areas. In addition, the potentiometric surface maps should include the interpreted ground water flow paths. Although Figure 4 is a simple representation of the flow paths, it would be helpful for the reader if flow paths were included on the potentiometric surface maps.

3. p. 68, 3rd ¶ - It is indicated, "that ground water flow paths are upward in this region with ground water discharging to the channel of the West Branch of Gold Run. The result of this upward discharge are the springs at the head of the West Branch of Gold Run".

Comment: As stated in Comment No. 1, above, the Navy shall install wells adjacent to the springs at the head of the West Branch of Gold Run for the purpose of collecting ground water elevation data. In addition, sampling is required to determine if the ground water discharging to the channel of the West Branch of Gold Run is contaminated. The data is required to confirm the USGS interpretation of ground water and contaminant flow and to determine the potential impact of contaminated ground water on the springs and stream. In addition, pursuant to N.J.A.C. 7:26E-3.8(a)4, ground water in excess of the applicable surface water criteria shall be delineated to the applicable surface water criteria. In accordance with N.J.A.C. 7:26E-3.8(b), additional site investigation of surface water and sediment may be required at NAWC.

4. p. 103, 2nd and 3rd ¶ -

Comment This section should include the conclusions reached concerning the effectiveness of the fault to act as a confining layer. In particular, it should

indicate if pumping the recovery wells impacts ground water levels south of the fault. Is the fault a confining unit or a leaky confining unit? If it is leaky, what is the leakage coefficient?

5. p. 127, 4th ¶ - It is stated that, "DNAPL TCE [dense non-aqueous phase liquid trichloroethene] has never been recovered in water samples from a NAWC monitoring well".

Comment NJDEP disagrees with this interpretation. Monitoring Well 36BR has had concentration of TCE above its solubility in water. On March 24, 1995 TCE concentration was 3,900 mg/l, on March 31, 1995 it was 4,100 mg/l (from the "Site 1 Interim Action Well Monitoring Report No. 2", 23 June 1995, EA Engineering Science and Tech Inc.). Considering that the solubility of TCE in water is only 1,100 mg/l, these samples must have contained non-aqueous phase liquid.

#### 6. Additional Map Views

Comment NJDEP recommends that map views of total volatile organic compounds (VOCs) isoconcentration and potentiometric surface maps should be constructed for each hydrostratigraphic unit. In addition, the wells should be re-named to indicate the hydrostratigraphic unit in which they are screened (for example MW-36BR should be renamed MW-36BR-L19). These alterations will assist NJDEP in determining if contamination has been sufficiently delineated in each zone.

NJDEP has been informed that additional delineation/characterization will be proposed by the Navy. NJDEP will comment on these proposals when submitted.

# Simulated Ground Water Flow

## DESCRIPTION OF GROUND-WATER FLOW MODEL

### Grid and Boundary Conditions

1. p. 14, Figure 5 The model presents the fault acting as a no-flow boundary.

Comment An evaluation of the effects of pumping wells on the north side of the fault on water levels in monitor wells located on the south side of the fault should be performed to confirm the modeled assumption that ground water does not flow across the fault. If there is insufficient hydraulic data to confirm this assumption, the Navy should propose additional aquifer tests to prove that the fault is a no-flow boundary. These additional tests may require the installation of additional observation wells.

## CALIBRATION

### Static Ground-Water Levels

2. p. 41, ¶ 1 It is stated, "...simulated water levels did not match measured water levels as well as those at the NAWC, perhaps because most of the hydrogeologic framework data and hydraulic conductivity data used to determine hydraulic parameters for the entire model area were collected at the NAWC site. It may be that the hydraulic parameters in areas outside of the NAWC differ somewhat from those at the NAWC".

Comment This acknowledgement by the Navy indicates a need for additional monitoring points between the NAWC site and Villa Victoria Brook. The Navy shall propose to delineate the extent of the plume in the direction of Villa Victoria Brook. The Navy shall also present an evaluation of the potable well sampling programs performed to date to determine if there is any potential for potable well impacts along the flowpath toward Villa Victoria Brook.

3. General The model report does not provide ground water contour maps showing computed versus measured ground water elevations.

Comment The modeling report should provide ground water contour maps showing contours of computed versus measured ground water elevations for both the static and transient models. These maps should be provided to NJDEP for review and comment.

# Draft Focused Feasibility Study (FFS) for Ground Water

## Section 2 DEVELOPMENT OF THE EVALUATION PROCESS

### 2.2.6.2 Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs)

1. Chapter 2, p. 7 - It is stated that "no known archeological or historical sites have been identified at NAWC Trenton."

Comment This statement is inaccurate. Much of the testing area meets the requirements of a historical district as stated in the Draft Cultural Resources Study dated October 1995 and is identified as such in the Programmatic Agreement among the Navy, the Advisory Council on Historic Preservation and the State of New Jersey. Therefore, this section must be modified to address this issue.

### 2.2.6.4 Other Guidance To Be Considered (TBC)

2. Chapter 2, p. 10, ¶ 3 - It is stated, "the New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B-1 et seq.) are also TBC for the development of ground-water PRG [preliminary remediation goals] based on the potential for affected ground water to enter the ancestral west branch of Gold Run Creek or the Villa Victoria Stream".

Comment NJDEP points out that the New Jersey Surface Water Quality Standards are ARARs and not TBC. First, the Surface Water Quality Standards are promulgated regulations and not guidance. Second, the Ground Water Quality Standards, N.J.A.C. 7:9-6.7 (g), states, "Where ground water that receives pollutants from a discharge(s) subsequently flows to surface water, NJDEP shall regulate such discharges as necessary so as not to exceed the Surface Water Quality Standards applicable to the body of surface water". Lastly, NJDEP's Technical Requirements for Site Remediation, 7:26E-3.8(a)4, state, "If a surface water body is on or adjacent to the site, the person responsible for conducting the remediation shall determine if there is any evidence that discharges to the surface water body have occurred or are occurring. Such evidence shall include... existing onsite ground water contamination in excess of the applicable State Surface Water Quality criteria, N.J.A.C. 7:9B or the Federal Surface Water Quality Criteria, 40 CFR Part 131, whichever is more stringent, which discharges to the surface water". This shall be corrected.

## Section 3. IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES AND PROCESS OPTIONS

### 3.1.1.3 Site Use Restrictions

3. Chapter 3, pp. 3-4 - It is stated that a deed restriction will be used to control construction and/or ground water usage at the site.

Comment Be advised that NJDEP requires a Declaration of Environmental Restriction for *soil* that exceeds the NJ Soil Cleanup Criteria. NJDEP addresses restrictions on ground water use through a Classification Exception Area (N.J.A.C. 7:9-6.6(d)) and a well restriction area designation. This section and other sections of the document (i.e. Section 3.1.3.1, Natural Remediation, Chapter 3, p. 9, Section 4 and Section 5, ) must be revised to reflect this.

### 3.1.5.3 Injection Wells

4. Chapter 3, p. 31, last ¶ - It is stated, "Discharge via reinjection may have stricter water quality standards than for other discharge options because residential private wells are located downgradient from NAWC".

Comment The criteria for discharge to ground water are established by NJDEP's Ground Water Quality Standards N.J.A.C. 7:9-6 et seq. Since the NAWC site is located in a Class IIA ground water use area, the criteria which would be applicable for discharges to ground water which are outside of the capture zone of the remediation system would be established by 7:9-6.8, as follows:

$$\text{Constituent Standard} = \text{BWQ} + (\text{GWQC} - \text{BWQ})0.50$$

Where: BWQ = Background water quality

GWQC = Class IIA Ground Water Quality Criteria

However, if the discharge to ground water is within the capture zone of the remediation system and no receptors will be affected by the discharge, the applicable discharge limit will be 95% removal rate for each constituent or the higher of the GWQC or the practical quantitation limit (PQL) whichever is least restrictive. For this reason, the Navy may wish to retain the option for discharge to ground water within the capture zone if it is found to be technically feasible.

5. Chapter 3, p. 31, last ¶ - Twice in the Implementability section, it is stated that "...obtaining permits for reinjection can be difficult."

Comment NJDEP disagrees with that statement and it shall be deleted. More accurately, the currently assigned Site Remediation Program case team would write the New Jersey Pollutant Discharge Elimination System Discharge to Ground Water (NJPDES DGW) permit. Therefore, the schedule for completion of this task can be prioritized by the case team and the required time to complete the task can be reasonably predicted. For this reason, the Navy may wish to retain the option for discharge to ground water if it is found to be technically feasible..

6. Chapter 3, p. 32, ¶ 1 - It is stated, "re injection does not offer any advantage over other effective means for disposal of ground water.

Comment As stated in Comment No. 4, above, the effluent criteria for a discharge within the remediation system capture zone can be significantly less than discharge to surface water.

#### **Section 4. DEVELOPMENT AND DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES**

7. General - Throughout this section it is stated that a "deed restriction" will be implemented to prevent the use of ground water.

Comment As discussed in Comment No. 3, above, a Classification Exception Area (with a well restriction area), not a "deed restriction" is the administrative mechanism by which NJDEP prevents the use of ground water. This must be corrected throughout this section.

##### 4.3.2 Alternative No. 2: Monitored Natural Remediation

###### 4.3.2.1 Description

8. Chapter 4, p. 6, last ¶ - It is stated, "The USGS has conducted a natural remediation evaluation at NAWC Trenton (Appendix B; PENDING)".

Comment The natural remediation evaluation has since been submitted to NJDEP for review. Comments were provided under separate cover. The FFS should be revised to reflect this.

##### 4.3.3. Alternative No. 3: Baseline Ground Water Recovery

9. Chapter 4, p. 13, ¶ 3 - It is proposed that the existing pump and treat system be used for plume containment and that monitored natural remediation would be conducted to reduce COC levels through naturally-occurring physical, chemical, and biological processes for contaminated ground water south of the fault which is outside the area of influence of the ground water recovery system.

Comment: NJDEP has three issues with the alternative: 1) the alternative does not address all of the contamination, 2) the contamination has not been delineated, and 3) the natural remediation proposal was found to be unacceptable. These are explained, below.

First, as stated in the Draft Geohydrologic Framework, Water Levels, Trichloroethylene Contamination:

“Wells 40 BR and 45 BR were installed to determine how far west the dissolved TCE plume had moved in bedding units L-18 and L-19. Concentrations in wells 40BR and 45BR are 450 and 910 ug/l respectively. These values indicate that dissolved TCE but not DNAPL TCE has moved west of these wells in these bedding units. Drilling additional wells into bedding units L-16 to L-19 west of wells 40BR and 45BR may be considered to determine the concentration of TCE and the influence of ground water levels near the head waters of the West Branch of Gold Run”.

While the ground water extraction system, as currently envisioned, will capture all *currently known* contamination north of the fault, it is unlikely that the system will capture the ground water plume that is migrating toward Villa Victoria Brook and the Delaware River. The Navy must address *all* ground water contamination emanating from the site. Alternative 3 includes natural remediation for the ground water south of the fault, but does not address a remedial action for the contamination west of the site.

Second and third, as stated in NJDEP’s September 2, 1998 comments, the natural attenuation proposal is unacceptable, primarily because the contamination has not been delineated.

In accordance with the New Jersey Technical Requirements for Site Remediation for natural remediation of ground water, N.J.A.C. 7:26E-6.3(d)4, contamination must be delineated to the standard applicable to the nearest downgradient receptor, that is, either the Ground Water Quality Standards or the more stringent of either the State Surface Water Quality Standards or the Federal Surface Water Criteria or other applicable standards.

Also, in accordance with N.J.A.C. 7:26E-6.3(d) 5, NJDEP recommends that the Navy submit an estimate (using the USGS ground water model) of the length of the contaminant plume and its potential impact on any receptors (potable wells, surface water and ecological receptors). Based on this estimate, the Navy shall propose installation of ground water monitor wells to complete delineation of the ground water contaminants emanating from their site and a proposal for expanded ground water remediation.

10. A fifth alternative should be evaluated that includes active remediation of the entire contaminant plume with continued delineation, etc.

#### **Section 5. RECOMMENDATION**

11. NJDEP cannot accept Alternative No. 3 for the reasons identified in Comment No. 9, above.
12. Chapter 5, page 1 – The paragraph about the CEA should start, “CEAs and well restriction areas will be established to address impacted ground water...”

11. Chapter 5, Page 1 – The bullet and paragraph about the deed restriction should be deleted as discussed in the Comment No. 3. above.
12. Chapter 5, Page 2 – The top paragraph should be rewritten from “Theoretically...” onward.
13. Chapter 5, p. 3, first bullet - It is stated, “The existing monitoring well network can be used or modified as necessary”.

Comment The current monitoring network has not sufficiently delineated the extent of the contaminant plumes. As stated above additional delineation is required. Therefore, the current monitoring network will not be sufficient for the purpose of monitoring the effectiveness of the recommended remedial action. In addition, since the contaminant plumes have not been delineated, the proposed recovery system (extraction of ground water from wells MW-15BR, MW-41BR, MW-45BR, MW-20BR and MW-48BR), even with the 10 additional wells that are currently piped for recovery, will probably not capture the full extent of the western ground water contaminant plume.

# **General Motors' Concerns**

July 8, 1998

**REVIEW OF TWO PRELIMINARY DRAFT REPORTS  
CONCERNING GROUNDWATER CONTAMINATION  
AT THE  
NAVAL AIR WARFARE CENTER  
TRENTON, NEW JERSEY**

Two reports were reviewed by Haley & Aldrich:

- "Geohydrologic Framework, Water Levels, Trichloroethylene Contamination, Naval Air Warfare Center, West Trenton, New Jersey, 1993-1997" - 1/8/98 preliminary draft Administrative Report by the U.S. Geological Survey
  
- "Focused Feasibility Study for Ground Water at the Naval Air Warfare Center, Aircraft Division, Trenton, New Jersey" - March 1998 draft report by EA Engineering, Science and Technology, Inc.

## SUMMARY

- The reported fault zone may not be an effective confining unit along its most of its length. The potential for downgradient migration of contaminants through the reported fault zone at depth has not yet been investigated. ?
- Pathways are identified by which contaminants in waste, surface water, or shallow groundwater have or may have migrated to the south side of the reported fault and then beyond it to offsite areas. These shallow pathways have not been addressed by previous NAWC investigations.
- The lateral and vertical extent of contaminant plumes identified at the NAWC site have not been fully defined, and off-site monitoring has not addressed downgradient locations.

**POTENTIAL PATHWAYS FOR  
MIGRATION OF CONTAMINANTS  
FROM THE NAVY SITE**

- **Discharge of Contaminated Groundwater into Gold Run**
- **Lateral Transport Over the Fault Zone In or Along Stormwater Drains and Former Waste Lines** *from USGS report*
- **Lateral Transport Over the Fault Zone in Overburden and Weathered Shallow Bedrock**
- **Lateral Transport from Site 1 and Site 3 Through the Fault Zone in Deep Bedrock**

## **Discharge of Contaminated Groundwater into the West Branch of Gold Run**

The west branch of Gold Run begins at a headwater located near the west edge of the NAWC site and flows east in a culvert beneath Parkway Avenue until it discharges onto and crosses the GM property.

- The culvert is reportedly leaky and has both gaining and losing sections.
- Contaminated groundwater from Site 1 (the primary TCE release area at the NAWC site) is reported to discharge to the headwater of the west branch of Gold Run.
- Contaminant plumes which may be present south of Site 1 may be discharging into the culvert and flowing east onto the GM property.
- Discharges of NAWC contaminants from the culvert to surface water on the GM property, and consequent impacts of discharges of contaminants from Gold Run surface water to groundwater on the GM site have not been quantified or delineated.
- Leaks from losing sections of the culvert may also have resulted in contamination of groundwater along Parkway Avenue upgradient of GM, and potential impacts have not been investigated.

## **Lateral Transport Through NAWC Stormwater Drains and Former Waste Lines**

Stormwater ditches, stormwater sewer lines, and waste lines on the NAWC site have discharged to a stormwater sewer which runs east beneath the north side of Parkway Avenue and then discharges to Gold Run on the GM property.

- Documented history of direct discharges of solvents and coolants to these structures in Site 1.
- Stormwater runoff from Site 1 and other areas of the NAWC site is or was transmitted by these structures.
- Infiltration of contaminated shallow groundwater into these structures may occur.
- Potential leaks of solvent or of contaminated surface water or groundwater from the Parkway Avenue storm sewer upgradient of the GM property have not been investigated.
- Past and possibly-ongoing discharges of NAWC contaminants from the stormwater sewer to surface water in Gold Run have had impacts on the GM property which have not been defined.

## **Lateral Transport Over the Fault Zone in Overburden and Weathered Shallow Bedrock**

- Downgradient flow of contaminated shallow groundwater from NAWC source areas would not be confined in overburden or underlying weathered bedrock by a faulted bedrock zone at depth.

## **Lateral Transport from Site 1 and Site 3 Through the Fault Zone in Deep Bedrock**

- Contamination is present in bedrock groundwater at NAWC wells located on the south side of the fault.
- Drawdown similar to that observed in wells located north of the fault was observed in wells located in or south of the fault during pumping of wells installed north of the fault zone.
- Downgradient bedrock wells at the NAWC have been installed to relatively shallow depths and may not intersect the heart of plumes which may be present at depth. Investigation of deep bedrock groundwater conditions downgradient (southeast) of source areas has not been performed to confirm that deep downgradient contamination is not present.
- Interpretations presented in the reports concerning the direction of groundwater flow in deep bedrock and downward limits on the distribution of contaminants in deep bedrock may be incorrect. Evidence of downward and southeastward gradients in the deeper bedrock is apparent in the data presented, but this evidence is not addressed by the interpretations presented in the reports.

## OFFSITE MONITORING SOUTHEAST OF SITE 1

Offsite monitoring southeast of Site 1 is limited to one location. Monitoring wells at this location (shallow bedrock well MW-35BR and overburden well MW-33S) do not serve to monitor or delineate the downgradient or offsite extent of contamination from Site 1. The data reported indicate that shallow groundwater flow in both horizons at this location is to the north towards Parkway Avenue.

**RESULTS OF RECENT PASSIVE SOIL-VAPOR SURVEY  
ALONG UPGRADIENT BOUNDARY OF THE GM SITE**