03.01-08/12/91-00682

(804) 445-1814

5090
1822:LAB

12 AUG 1991

Mr. Michael Geden
Environmental Science & Engineering, Inc.
6280 Hazeltine National Drive
Orlando, Florida 32822-5114

Re: Government Review Comments of MCB Camp Lejeune Risk Assessment Report for Hadnot Point

Dear Mr. Geden:

This letter forwards our review comments, enclosures (1) and (2), of the referenced document.

We received the preliminary draft Feasibility Study on August 8, 1991, and will facsimile our comments to Ms. Kristin Buryn by close of business August 14, 1991.

Since the RI, RA, FS, and SA reports will be mailed from several different ESE offices, MCB Camp Lejeune will send a forwarding letter directly to the Technical Review Committee members. ESE cover letters forwarding the reports are to reference the MCB Camp Lejeune letter. A copy of this letter will be provided to ESE by August 16, 1991.

Our point of contact is Ms. Laurie Boucher, P.E., telephone (804) 445-1814.

Sincerely,

P.A. RAKOWSKI, P.E.
Environmental Programs Branch
Environmental Quality Division
By direction of the Commander

Encl:
(1) LANTNAVFACENGCOM Review Comments of ESE Risk Assessment Report for Hadnot Point of August 9, 1991 (marked-up pages)
(2) Letter from Baker Environmental, Inc., dated August 8, 1991

DOC NO: CLEJ-00682 - - 8/12/91

Re: Government Review Comments of MCB Camp Lejeune Risk Assessment Report for Hadnot Point

Copy to: (w/o encls)
MCB Camp Lejeune (AC/S Environmental Management)

Blind copy to:
1822 (LAB) (w/encls)
09A2 (w/o encls)
18S
LANTDIV Reading File
LABDOC:ESERA

LANTDIV
REVIEW COMMENTS

OF ESE RISK ASSESSMENT REPORT
FOR HADNOT POINT

9 AUGUST 1991

Enclosure (1)

DOC NO: CLEJ-00682 - [illegible] - 8/12/91

General Comments:

- Justification to support "no action" on the deep aquifer needs work. It's not convincing enough.
- Report needs some work to make it "flow." Consider that it should be understandable to the general public. One of my

HADNOT POINT INDUSTRIAL AREA
BASELINE RISK ASSESSMENT

PRELIMINARY DRAFT

main concerns is that this risk assessment appears disjointed, i.e. shows the factors used in the assessment, then the calculations, followed by the results, with little or no flow between sections. Also, shouldn't the RA include a more comprehensive

Prepared for:

NAVAL FACILITIES ENGINEERING COMMAND
Atlantic Division

discussion of the results?

- ~~The~~ One purpose of this RA, as I see it, is to evaluate the risk associated with the entire deep aquifer, not just at the

Prepared by:

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
Denver, Colorado

3 source areas. Deep wells were sampled throughout the HPIA, not at just these 3 source areas. Also, a well cluster was placed at Site 22, & that data is pertinent to this RA, not

ESE NO. 49-02036

just the data at the 3 source areas. This RA should tie in all

JULY 1991

available data from all studies on the deep aquifer.

conflicts, Camp Lejeune was used as a training area to prepare Marines for combat. There are five major areas of development within the Camp Lejeune facility. These areas include: Camp Geiger, Montford Point, Mainside, Courthouse Bay, and the Rifle Range area. Marine Corps Air Station (MCAS) New River, a helicopter base, is a separate command on the west side of the New River. Helicopter Outlying Landing Field (HOLF) Oak Grove, and Outlying Landing Field (OLF) Camp Davis are also under the command of MCAS New River. The HOLF Oak Grove is no longer active, however the property has some camping facilities and occasionally is used for recreation by scouting groups.

The Hadnot Point Industrial Area (HPIA) of Camp Lejeune is located to the east of the New River and is defined as the area bounded by Holcomb Blvd. to the west, Sneads Ferry Road to the north, Louis Street to the east, and the Main Service Road to the South (Figure 1-2). The area is comprised of 75 buildings and facilities. These include maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, storage yards, and a dry cleaning facility. A steam plant and training facility occupy the southwest portion of HPIA. In addition, numerous underground storage tanks, stormwater drains, and oil/water separators are present. → The deep aquifer at Site 22 should be addressed in this risk assessment.

A transformer storage yard (site 21) and a fuel tank farm (site 22) are located on the north side of HPIA. Both of these are potential areas of concern, however they were not included in the RI/FS scope of work for the 1991 field effort. These sites will be considered in separate studies at a later date.

The aquatic ecosystems consist of small lakes, the New River estuary, numerous tributary creeks and part of the intracoastal waterway. The terrestrial ecosystems include five habitat types--long leaf pine, loblolly pine, loblolly

→ The scope was to conduct a risk assessment on the deep aquifer, not excluding the deep aquifer

pine/hardwood and oak/hickory. Camp Lejeune is predominantly tree covered, with large amounts of softwood and substantial stands of hardwood species. More than 60,000 of the 112,000 acres within the base are under forestry management with loblolly pine as the main timber stand of the area.

Prior to 1941, the water supply for the base was furnished by wells which tapped a potable aquifer 50 to 300 feet below the base. In 1941, a water treatment system which included 21 water supply wells was placed on-line at HPIA. This system was utilized by most of the base until the 1950's. At that time additional wells and treatment facilities were installed. Currently, eight water treatment facilities and over 160 water supply wells serve the Camp Lejeune installation. Currently there are wells within the Hadnot Point Area (not confined to the industrial area) that are drawing water from the deep aquifer which was found to be contaminated during the 1991 investigation, however, all water from these wells are connected to a treatment facility which treats the water prior to distribution for potable use.

?

← Is the there found contamin were closed down

1.2 SUMMARY OF PREVIOUS SITE STUDIES

A series of studies and investigations have been performed at MCB Camp Lejeune to evaluate the Extent of contamination from disposal activities at the facility. Based on the results of these investigations, four areas within the HPIA were identified as potential areas of concern to be further evaluated in the remedial investigation and risk assessment. Areas which were identified requiring further investigation include;

- Buildings 901, 902
- Buildings 1200, 1202
- Buildings 1600, 1601,1602
- Area 22, Hadnot point Fuel Tank Farm

Include O'B. & Dare Sta

Table 1-1 lists the studies and investigations conducted at HPIA by Environmental Science and Engineering (ESE) and a brief summary of the significant findings beginning with the initial Confirmation study conducted in 1984 through 1988 and including the Comprehensive RI conducted in 1991. For a detailed discussion of all previous studies and investigations, and information obtained from additional site characterization efforts performed during the Comprehensive RI, refer to the Comprehensive RI report (ESE, 1991).

In 1990 an Initial Assessment Study was conducted at Camp Lejeune as part of the Department of Defense's Installation Restoration Program. As a result of this investigation a number of areas within Camp Lejeune were identified as potential sources of contamination which ESE was then contracted by LANTDIV to investigate.

The resulting ESE investigation is referred to as a Confirmation Study, and is analogous to an RI/FS performed for EPA on federal Superfund sites. The confirmation study was divided into two investigative steps: the verification step and the characterization step.

The verification step at HPIA took place from April 1984 through January 1985. Results of this investigation indicated the presence of volatile organic compounds (VOCs) within the shallow aquifer in the vicinity of HPIA tank farm and in a single water supply well (#602). The maximum contaminant concentrations observed in groundwater include 17,000 µg/L of benzene and 27,000 µg/L toluene in groundwater collected from the tank farm area. Benzene was also detected in supply well 602 at a level of 38 µg/L which exceeds the federal MCL of 5 µg/L.

Due to the results of the verification step, supply well 602 was closed and other wells in the area were sampled. Four additional supply wells (601, 608, 634, and 637) were found to have elevated levels of VOCs which included trichloroethylene in well 601 and 608, and methylene chloride in 634.

In 1986, the characterization step was conducted for HPIA to determine the extent of the VOC contamination identified. During the characterization step multiple tasks were completed which included; a soil gas survey to target areas identified as being potentially contaminated, installation of 27 shallow (25 ft), 3 intermediate (75 ft), and 3 deep (150 ft) monitoring wells, sampling of all HPIA monitoring wells and nearby water supply wells, and aquifer testing to evaluate the hydraulic parameters of the deep aquifer.

Results of the characterization study revealed that five of the areas of concern within HPIA showed elevated levels of VOCs in soil gas (buildings 901, 902 and 903; building 1100, buildings 1101, 1102, 1202, 1301, and 1302; buildings 1502, 1601; and buildings 1709 and 1710). Results of the shallow monitoring well analyses revealed the presence of elevated levels of a number of fuel related compounds to include, benzene, xylene, ethylbenzene, trans 1,2-dichloroethene, trichloroethene, oil & grease, and lead. Groundwater analyses from the Confirmation study investigations are summarized and presented in Tables 1-2 and 1-3. Inorganics were detected in several of the deep aquifer wells (including mercury) but were generally within EPA recommended levels for chemicals with MCLs or ambient water quality criteria.

Deep aquifer data at Site 22 is to be considered in this risk assessment.

Although site 22 (better known as the Hadnot Point fuel tank farm) is located within the area of HPIA it was not included as part of the scope for this risk assessment and will be further addressed along with the transformer storage yard

Table 2-5. Health Effects Assessment of Potential Chemicals of Concern for Hadnot Point Industrial Area (Carcinogenicity: Subchronic and Chronic Toxicity) (Page 5 of 5).

Chemical	Carcinogenicity Classification		Slope Factor (mg/kg/day^{-1}) or [ug/m^3)$^{-1}$]		Inhalation RfC mg/m^3 (mg/kg/day^{-1})		Oral RfD (mg/kg/day^{-1})	
	Inhalation	Oral	Inhalation	Oral	Subchronic	Chronic	Subchronic	Chronic
Flouranthene					ND	ND	4E - 1	4E - 2
Flourene					ND	ND	4E - 1	4E - 2
Indeno(1,2,3-cd) pyrene	B2	B2	ND	ND				
Naphthalene					ND	ND	4E - 2	4E - 3
2-Methylnaphthalene								
Phenanthrene								
Pyrene					ND	ND	3E - 1	3E - 2

Group A = Human Carcinogen
Group B = Probably Human Carcinogen; B1 = limited evidence of carcinogencity, B2 = sufficient evidence of carcinogenicity in animals with lack of evidence in humans
Group C = Possible Human Carcinogen

Source: EPA, 1991.

Define 'ND'

Doc No: CLET - 00682 - 8/12/91

Table 2-11. Chemicals of Concern by Area of Concern and Media.

Area of Concern	Chemical of Concern*	Media in which Chemical was Detected	
		Surface Soil	Groundwater[a]
902	Lead	X	X
	Benzene	ND	X
	1,2-DCE	ND	X
	Acenaphthene	X	X
	Anthracene	X	ND
	Benzo(a)anthracene	X	ND
	Benzo(b)fluoranthene	X	ND
	Benzo(k)fluoranthene	X	ND
	Benzo(g,h,i)perylene	X	ND
	Benzo(a)pyrene	X	ND
	Chrysene	X	ND
	Fluoranthene	X	ND
	Flourene	X	ND
	Indeno(1,2,3cd)pyrene	X	ND
	2-Methylnaphthalene	ND	X
	Naphthalene	ND	X
	Phenanthrene	X	ND
	Pyrene	X	ND
1202	Lead	X	X
	Benzene	ND	ND
	1,2-DCE	ND	X
	Acenaphthene	X	X
	Anthracene	X	ND
	Benzo(b)fluoranthene	X	ND
	Benzo(k)fluoranthene	X	ND
	Benzo(g,h,i)perylene	X	ND
	Benzo(a)pyrene	X	ND
	Chrysene	X	ND
	Flouranthene	X	ND
	Flourene	X	ND
	Indeno(1,2,3cd)pyrene	X	ND
	2-Methylnaphthalene	ND	X
	Naphthalene	ND	X
	Phenanthrene	X	ND
	Pyrene	X	ND
1602	Lead	X	X
	Benzene	ND	ND
	1,2-DCE	ND	X
	2-Methylnaphthalene	X	ND
	Naphthalene	X	ND

What about Site 22. We installed on well cluster near Site 22, & it data should be presented. Make this correction wherever it appears.

ND = Not Detected
* = Based on all selection criteria and concentration-toxicity screen
a = Intermediate and Deep groundwater data were combined.

Source : ESE, 1991

noncarcinogenic and potentially carcinogenic effects. In addition, the chemical/site-specific criteria the weight-of-evidence category (several PAHs may be potent carcinogens), the chemical and physical properties of the chemicals (many PAHs are persistent), and the history of use and disposal at the site provided significant evidence for choosing PAHs as COCs.

Due to the number of compounds in this class and the lack of toxicological information on specific compounds, the PAHs were discussed as two groups based on noncarcinogenic effects and potentially carcinogenic effects. The potentially carcinogenic PAHs detected at the site include:

Benzo(a)anthracene
Benzo(b)flouranthene
Benzo(k)flouranthene
Benzo(a)pyrene
Chrysene
Indeno(1,2,3-cd)pyrene

Numerous scientifically valid studies have demonstrated that the potentially carcinogenic PAHs have different relative cancer potencies (EPA, 1984). The EPA Office of Health and Environmental Assessment commissioned a report to recommend a relative-potency approach for PAHs and is currently attempting to develop such an approach. However, as of the writing of this RA, no office within EPA has officially adopted such an approach. As a matter of prudent public health policy, EPA Region IV Superfund group requires that all Superfund RAs assume that all potentially carcinogenic PAHs have the same cancer potency factor as benzo(a)pyrene (BaP). Therefore, this assumption will be used to estimate the risks from the theoretical exposures assumed in this RA.

Because the available toxicological data are inadequate to characterize cc tely each of the compounds in the potentially carcinogenic group of PAHs,

2.2.4 VOLATILE ORGANIC CHEMICALS

Based upon the analytical results of the 1991 field investigations performed by ESE, VOCs were identified in groundwater and surface soils. These Chemicals include:

Acetone
Benzene
2-Butanone
Carbon Disulfide
1,2 Dichloroethane
1,2 Dichloroethylene
Ethyl Benzene
Methylene Chloride
Toluene
Trichloroethene
Vinyl Chloride
Xylene

The results indicate that most of these chemicals did not occur in soil (except acetone and methylene chloride). Several groundwater samples contained detectable levels of benzene, ethyl benzene, and toluene. While these three compounds are constituents of gasoline it is not unexpected to detect these compounds at the site for several reasons. The presence of parking areas, and an abundance of roads can contribute to the presence of these three compounds as a result of urban runoff during storm events; and the presence of Benzene in the water supply well data also indicates other possible potential sources to the deep aquifer, since water supply well water is composited prior to dispersal on-site.

?

Because benzene is identified in groundwater onsite at concentrations exceeding water quality criteria and is considered a potential human carcinogen, it was included as a COC for further analysis. The inclusion of benzene in the RA is expected to result in risk estimates that are also protective of the less toxic ethyl benzene, toluene and xylene. 1,2 DCE was also included as a COC due to its

What does this mean?

3.0 EXPOSURE ASSESSMENT

The exposure assessment utilizes information obtained from the characterization of the exposure setting and the environmental fate and transport analyses to identify significant completed exposure pathways and to estimate actual or potential concentrations of the COCs at potential exposure points for each exposure pathway. Behavioral or physiological factors influencing exposure frequency and exposure levels are then presented in a series of exposure scenarios as a basis for quantifying chemical intake levels by receptor populations for each significant completed exposure pathway. The results of the exposure assessment are used in conjunction with the information summarized in the toxicity assessment (Section 4.0 and Appendix A) to determine the potential human health and environmental risks associated with each study area at HPIA.

3.1 CHARACTERIZATION OF EXPOSURE SETTING

3.1.1 PHYSICAL SETTING

The Camp Lejeune Military Complex covers an area of approximately 110,000 acres. Four major activity areas exist at Camp Lejeune: Marine Corps Base; Marine Corps Air Stations, New River; Naval Hospital; and Naval Dental Clinic. The major commands which occupy the Marine Corps Base (MCB) include: the Marine Corps Base host; the 2nd Marine Division; II Marine Amphibious Force; and the 2nd ~~Force~~ Service Support Group. Located adjacent to the MCB is the Marine Corps Air Station. The Navy Medical and Dental commands are separate units which occupy the Complex.

The military complex is located within Onslow County in southeastern North Carolina, approximately 45 miles south of New Bern and 47 miles north of Wilmington. The county seat, as well as the primary commercial center, is the

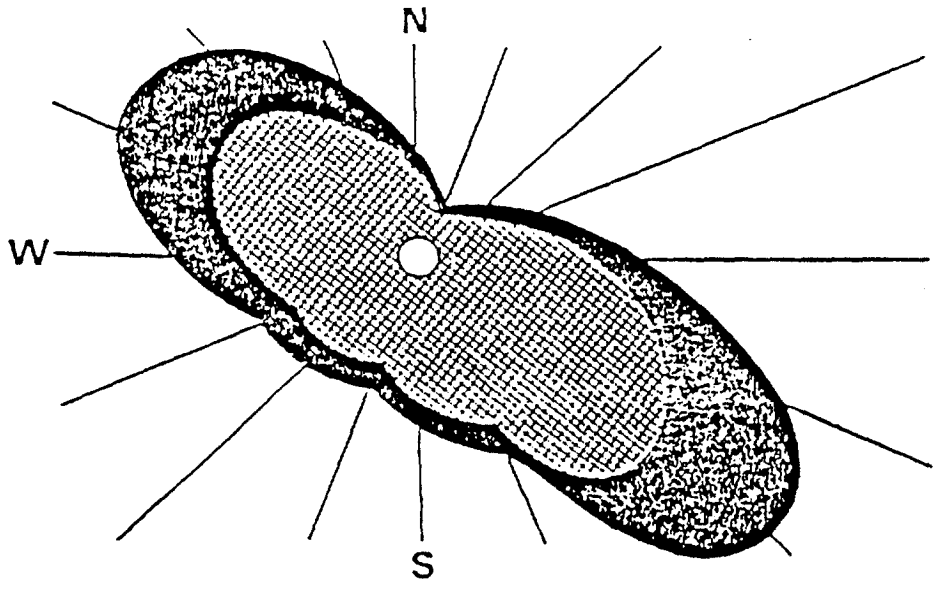
and clays (ESE, 1988). Water levels measured in deep and intermediate wells are similar to those observed in nearby shallow wells. Additional data is required before a potentiometric surface map can be generated for the deep aquifer, however, it is expected that deep groundwater flows to the east southeast, towards the Atlantic Ocean (ESE, May 1988). Small-scale regional changes in groundwater flow may occur in the deep aquifer due to local pumping of water supply wells. The USGS (Harned et al., 1989) notes that flow gradients may range from 15 feet/mile (0.0028 feet/ft) in areas unaffected by pumping to 150-200 feet/mile (0.0284-0.0378 feet/ft) in areas near active water supply wells.

Why state it in centimeters here & show it in inches on Table 3-1. Please be consistent.

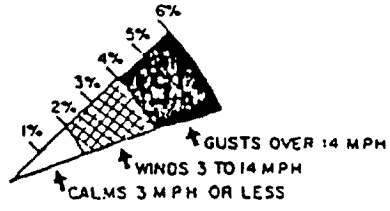
3.2.1.6 Climate

The climate at Camp Lejeune is generally hot and humid in the summer and cool in the winter. Cold Spells occur in association with winter frontal patterns. Rainfall averages 10 to 13 centimeters per month with the higher amounts occurring the summer months. Hurricanes also pass through the area every few years. Table 3-1 summarizes important climatological data for MCB Camp Lejeune. Predominant wind patterns are illustrated in Figure 3-3.

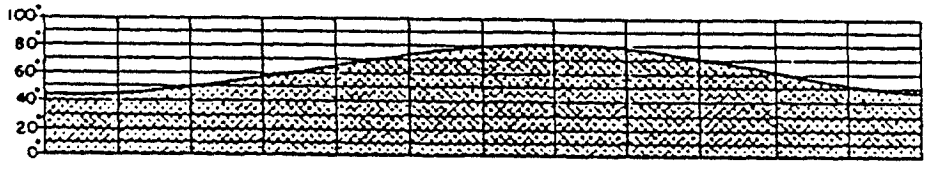
Camp Lejeune has a mild climate. Summers are typically hot and humid and winters are cool with some subfreezing cold spells. Snow occasionally occurs, but persistence is rare. The annual average precipitation is 55.96 inches with the mean temperature being approximately 60.9 F. The prevailing wind direction is from the southwest; however, sea breezes are a regular occurrence along the coastline. The mild climate provides a long growing season typically in excess of 230 days (Camp Lejeune, 1987).



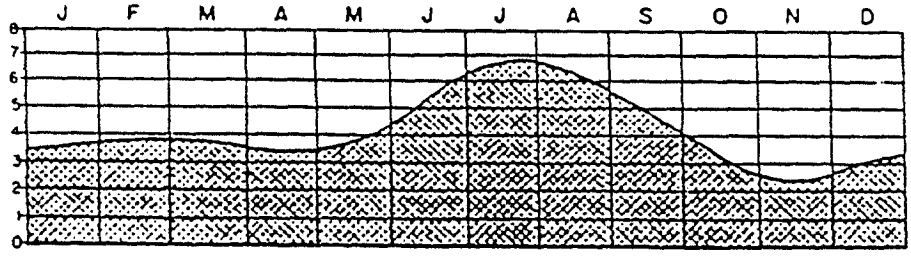
TYPICAL WIND PATTERN



% OF WIND COMING FROM INDICATED DIRECTION



AVERAGE MONTHLY TEMPERATURE



AVERAGE MONTHLY RAINFALL

limits?

Figure 3-3
REGIONAL CLIMATIC CONDITIONS
AT CAMP LEJEUNE
SOURCE: CNAVFACENGCOM, 1975

MARINE CORPS BASE
CAMP LEJEUNE

3.2.2 POTENTIALLY EXPOSED HUMAN POPULATIONS

The military population of Camp Lejeune is approximately comprised of 40,928 active duty personnel. The military dependent community is in excess of 32,081. Approximately 36,086 of these personnel and dependents reside in Base housing units. An additional 4,412 civilian employees perform facilities management and support functions (USMC). However, due to the Gulf Crisis the number of military personnel on-site has varied over the last year.

3.2.2.1 Proximity of Receptors to Sites

The two major potential receptor populations associated with exposure to contaminants at Hadnot point are on-site personnel and offsite personnel in the surrounding areas. All three areas of interest at Hadnot Point are located in active areas. The exact number of personnel in and around the buildings which comprise the areas of concern is unknown.

3.2.2.2 Current and Future Land Use

Based on the nature of work performed at the installation, the current major land use at LAAP is industrial. The industrial work activity is primarily conducted indoors with work activity occurring in the areas of concern. The type of current land use of the areas surrounding Hadnot Point Industrial area are primarily industrial, residential and some commercial.

Troop housing for the most part is conveniently located next to personnel support facilities, such as the Exchange or recreational areas. Community uses include all types of non-commercial personnel support facilities such as: dining facilities, libraries, child care facilities and schools. Recreational facilities include playing fields, tennis and basketball courts. Maintenance uses are used for vehicle and equipment servicing and repair and are generally situated adjacent to

supply and storage uses. The existing land use patterns within and around the HPIA are demonstrated on Figure 3-4.

Future uses include improvements upon the arrangement of existing uses, resolving incompatibilities and promoting the overall attractiveness of Hadnot Point. Currently there are two troop housing facilities within HPIA that are considered incompatible land uses due to their proximity to supply/maintenance work areas. Therefore the extension of these facilities in the future is unlikely (USMC).

Within 15 miles of Camp Lejeune are three large, publicly owned tracts of land; the Croatan National Forest, The Hofman Forest, and Camp Davis Forest. Because of the low elevations in the Coastal Plain the majority of the area is composed of wetlands. In addition these areas have been exploited to some extent by agriculture and silvaculture interests. The remaining land use surrounding MCB Camp Lejeune is agricultural, with typical crops of soybean, small grains, and tobacco.

Productive estuaries along the coast support commercial finfish and shellfish industries. Tourism and residential resort areas are also located within the area. Some areas of the New River at MCB Camp Lejeune are classified under Title 15 of the North Carolina Administrative Code as Class SC, while others are classified as Class SA. Class SC waters are useable for fishing and secondary recreation, but not for primary recreation or shellfish marketing. Class SA waters are the highest estuaring classification, useable for shellfish marketing (Figure 3-5).

Table 3-3. Chemical and Physical Properties of the Chemicals of Concern

COC	Molecular Weight	Water Solubility (mg/L)	Koc (mL/g)	log Kow	Vapor Pressure (mm Hg)	Henrys Law Constant (atm x m^3/mol)	Fish BCF
1,2-DCE	96.94	8.5E3	1.4E1		324	4.5×10^{-3}	
Lead	207	NA	--	--	1.0 (980°C)	--	60
Benzene	78.12	820	0.3 - 100	1.56 - 2.15	95.18	5.5×10^{-3}	53 to 8450
PAHs							
Anthracene	178	0.07		4.45	1.0 (145°C)		485 (Fathead)
Benzo(a)anthracene	228	0.014	2.0×10^{5}	5.61	2.2×10^{-8}	1×10^{-6}	
Benzo(a)pyrene	252	0.0038	5.5×10^{6}	6.04	5.6×10^{-9}	4.9×10^{-7}	930 (Gambesia)
Benzo(g,h,i)perylene	276	0.00026		7.23			
Naphthalene	128	30		3.37	1.0 (52.6°C)		310 (Bluegill)

Sources: Eisler, 1987; EPA, 1980; Sax, 1984.

- Behavioral factors (i.e., the amount of time spent in contact with the contaminated medium, the amount of contaminated medium ingested, the amount of exposed skin);
- Chemical factors (i.e., the rate at which a chemical is absorbed through the skin, the degree to which a chemical is bioaccumulated in the body, the volatility of a chemical);
- Physical factors (i.e., soil particle size, ambient temperature, water body type, physical state of contaminant); and
- Physiological factors (i.e., age, skin condition, the ability of the body to metabolize and eliminate the chemical).

A summary of completed human exposure pathways is presented in Table 3-4. To quantify potential human exposures in the risk assessment process, it is necessary to make assumptions regarding each of the factors described previously in the absence of detailed site-, chemical-or receptor-specific information. These assumptions, expressed as exposure factors and equations, are presented in Appendix B.

3.3.1 COMPLETED HUMAN EXPOSURE PATHWAYS

Groundwater and soil in all three areas were found to be contaminated with VOCs (semivolatile and volatile) and lead at the Hadnot Point industrial area. The potential exposure pathways for the areas of concern include:

- Ingestion of VOC or lead contaminated groundwater or soil;
- Inhalation of volatilized VOCs from groundwater;
- Inhalation of dusts; and
- Dermal contact with VOCs or lead in groundwater or soil

dermal contact with VOCs in the deep aquifer? How?

DOC NO: CLEJ -00252 - [illegible] - 8/12/91

KK\HADNOT.3-4
07/24/91

Table 3-4. Summary of Completed Human (Corrected Worker) Exposure Pathways for Hadnot Point Areas of Concern.

Media	Exposure Pathway	Area 1	Area 2	Area 3
GROUNDWATER				
	Ingestion*	X	X	X
SOIL				
	Ingestion	X	X	X
	Direct Contact	X	X	X

Note: GW = groundwater.

* The current source of drinking water at Hadnot Point and nearby residential areas are from supply wells that draw water from the deep aquifer.

+ Includes adult and child exposure.

Source: ESE, 1991.

This isn't referenced in the table.

What do these "areas" correspond to?

Several pathways were excluded from the final pathway selection due to various reasons. For example, inhalation of dusts from the site were not considered highly feasible due to the amount of paving, gravel or presence of buildings in the areas of concern. It would be unlikely that contaminants associated with airborne particulates would create a significant exposure route. All other routes of exposure were considered significant and thereby quantitatively analyzed for chemical intake rates.

Current exposure to contaminants associated with groundwater can not be accurately identified. The water supplied for potable use onsite is supplied by a number of water supply wells located within the entire base area. Water from these wells are pretreated at a central water treatment facility. However, the intermediate and deep groundwater monitoring wells are installed in the same uifer that supplies the water supply wells, Thus in the event that the water is not pretreated in the three areas of concern, the risks associated with exposure to the deep/intermediate groundwater can be estimated by summarizing the data from the monitoring wells. However, this pathway is unlikely at this time due to the pretreatment of the water, Therefore the risks associated with groundwater exposure would be representative of a worst case scenario (i.e., water treatment were to be bypassed). In order to determine the significance of groundwater contamination underlying the areas of concern a current worker exposure pathway was evaluated. → Where are the results of this evaluation?

A future residential scenario was not evaluated as a potential exposure pathway. Future land uses of HPIA include further industrialization and enhancement of current uses (USMC, 1982).

3.3.2 QUANTIFICATION OF EXPOSURE

3.3.2.1 Exposure Concentrations

An exposure concentration is the concentration of contaminant in an environmental medium (e.g. groundwater, surface soil, surface water, sediment, and air) that may reach a potential human or nonhuman receptors as a result of the receptor coming into direct contact with the contaminated environmental medium. Because the exposure concentration is the average concentration contacted at the exposure point or points over the exposure period, when estimating the exposure concentrations, the objective is to provide a conservative estimate of this average concentration such as the 95th percent upper confidence limit on the arithmetic mean chemical concentration (UCL95)(EPA, 1989). However, due to the limited data UCL 95 values could not be calculated. The maximum detected concentration at each area of concern was used as the reasonable maximum exposure (RME) concentration. Onsite human exposure point concentrations have been estimated for the current exposure scenarios for the three areas of concern by using the maximum concentration observed for each COC (Table 3-5).

Why not?

Groundwater modeling was not performed on the COCs identified determine the future groundwater contaminant concentrations downgradient from of the three study areas within Hadnot Point. It was determined that concentrations of analytes in the deep groundwater were estimated quantities, meaning there is a limited confidence in the data value.

Sentence doesn't make sense.

3.3.2.2 Estimation of Human Pathway-Specific Chemical Intakes

The chemical intake is the amount of contaminant entering the human receptor's body. Exposure pathway-specific chemical intakes are determined based on the exposure concentrations observed at the receptor area of concern, and on specific

why are they considered "estimated" values? Did data validation indicate the results were questionable

Table 3-5. Summary of Exposure Concentrations in Surface Soil and Groundwater (Deep and Intermediate) for Each Area of Concern at HPIA.

Chemical	Exposure Concentration[a]					
	Surface Soils (µg/kg)			Groundwater (µg/l)		
	902	1202	1602	902	1202	1602
1,2-Dichloroethene (Total)	BDL	BDL	BDL	12	1	11
Benzene	BDL	BDL	BDL	2	BDL	BDL
Lead[b]	56.90	84.80	36.60	13.50	8.90	27.10
Acenaphthene	42	72	BDL	1.00	5	BDL
Anthracene	180	15	BDL	BDL	BDL	BDL
Benzo(a)anthracene	280	140	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	250	140	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	210	150	BDL	BDL	BDL	BDL
Benzo(a)pyrene	240	140	BDL	BDL	BDL	BDL
Benzo(q,h,i)perylene	110	72	BDL	BDL	BDL	BDL
Chrysene	260	270	BDL	BDL	BDL	BDL
Flouranthene	690	370	BDL	BDL	BDL	BDL
Flourene	48	63	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	130	82	BDL	BDL	BDL	BDL
2-Methylnaphthalene	BDL	BDL	300	9	2	BDL
Naphthalene	BDL	BDL	220	270	56	BDL
Phenanthrene	500	210	110	BDL	BDL	BDL
Pyrene	530	290	BDL	BDL	BDL	BDL

[a] = Exposure concentrations were derived from maximum concentrations observed from each media at each area of concern.

[b] = Units for Lead in Soils are mg/kg.

902 = Groundwater data for Area 902 was collected from wells HPGW24 and HPGW30. Soils data was collected from soil borings HBSB1 through 10.

1202 = Groundwater data for Area 1202 was collected from wells HPGW17 and HPGW31. Soils data was collected from soil borings HBSB11 through 20.

1602 = Groundwater data for Area 1602 was collected from wells HPGW9 and HPGW4. Soils data was collected from soil borings HBSB21 through 30.

Source: ESE, 1991.

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August 8, 1991

Commanding Officer
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

Attn: Ms. Laurie Boucher, P.E.
Code 1822

Re: Contract N62470-89-D-4814
CTO-0017 - HPIA, Review of ESE Documents
Risk Assessment Evaluation

Dear Ms. Boucher:

This letter report consists of technical review comments pertaining to the Preliminary Draft Hadnot Point Industrial Area (HPIA) Baseline Risk Assessment (dated July 1991) prepared by Environmental Science & Engineering, Inc. (ESE).

This letter evaluation report is being submitted in accordance with Task 9 of the CTO-0017 Final Implementation Plan (June 26, 1991). However, based on our discussion of July 18, 1991, the project schedule for this CTO has been modified as follows. The submittal date for this Evaluation Report has been changed to August 8, 1991 (the original schedule indicated an August 30 submittal date).

INTRODUCTION

The referenced evaluation was performed by an environmental scientist with a background in performing human health and environmental risk assessments. The technical review focused on reviewing the assumptions (fate and transport, exposure, etc.), equations for calculating risks, and the general format and presentation of data and technical discussions.

The remainder of this letter report documents Baker's technical comments. Each comment is referenced to the section or page of the referenced report.

GENERAL COMMENTS

1. The equations used to calculate risks are acceptable.

2. The assumptions presented in Appendix B of the report are acceptable with the exception of the exposed surface area of an adult worker. The assumption states

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that workers would wear long sleeve shirts and gloves. This needs to be confirmed by the Camp Lejeune Environmental Management Division.

3. The report appears to be missing information. For example, maps showing the locations of deep groundwater and water supply wells are not included. In addition, tables presenting risk values for groundwater are not included. This results in some difficulty with understanding (and confirming) the results of the report.

4. The report needs to be edited. There are misspelled words, incorrect section numbers, missing references, missing units on tables, and redundancy throughout the report.

SPECIFIC COMMENTS

1. (Executive Summary) The Executive Summary (ES) should provide a discussion pertaining to the results of the risk assessment.

2. (Section 1.2) Page 1-6 indicates that there are four areas of concern; page 1-9 states that there are five areas of concern; and page 1-12 states that there are three areas of concern. This needs to be clarified.

3. (Table 1-2 and Table 1-3) Tables 1-2 and 1-3 summarize groundwater analyses from the Confirmation Study investigations. Clarify why lead is not shown on Table 1-3 (Table 1-3 summarizes inorganics).

4. (Table 2-1) Table 2-1 depicts a column for soil background levels. However, the column is blank. If no background levels exist, then it should be deleted from the table.

5. (Table 2-1) Page 2-3 indicates that there were 30 sample stations. The frequency of detection on Table 2-1 identifies a total of 32. Explain the difference (It does not appear that the difference is due to duplicate samples).

6. (Table 2-5 and 2-7) Tables 2-5 and 2-7 should list the references for the various sources of information (e.g., RFDs, Slope Factors, etc.).

7. (Table 2-5 and 2-9) The slope factor (oral) for arsenic is shown on Table 2-9, but is listed as "NA" on Table 2-5. Also, the slope factor values on Table 2-9 are not consistent with the slope factor values on Table 2-5 due to inconsistencies in rounding.

8. (Table 2-9) The data for all of the areas of concern were combined. It may have been more practical to present the data separately for all the areas of concern in order to assess them individually (risks calculations were presented for each area of concern).

9. (Section 2.2) The discussion of the final list of the chemicals of concern (COC) needs some clarification. As stated on Page 2-27, the primary criteria for selecting COCs were toxicity and measured concentrations at the site. In some cases (e.g., Aroclors 1254 and 1260), the concentration-toxicity (CT) ranking scores were often ignored to dismiss certain compounds from inclusion in the risk calculations. For example, the CT score for Aroclors 1254 and 1260 contributed approximately 67% to the total CT value calculated for soil (as presented in Table 2-9). Neither Aroclor 1254 nor 1260 was included in the risk assessment due to low frequency of detection and no past history of disposal. There is, however, a transformer area to the north and east of Area 1202. This area may or may not have contributed to the presence of Aroclors in the area, but the risk assessment needs to better address this before dismissing these contaminants.

10. (Section 2.2) In some cases, compounds with the same frequency of detection were not assessed in the same manner. Consistency in the determination of the chemicals of concern should be followed, or provide an explanation of why these compounds were dismissed.

11. (Page 3-12) The first sentence of the first paragraph in not clear in its meaning ("future uses include improvements upon the arrangement of existing uses").

12. (Figure 3-4) This figure is illegible. However, this has little impact on the technical evaluation of the risk assessment.

13. (Page 3-24) The abbreviation "VOCs" does not normally include semi-volatiles.

14. (Table 3-4) Define "corrected worker".

15. (Page 3-26) Provide the rationale for limiting the exposure to on-site workers only. Indicate that on-base residents could not be exposed (if this is the case).

16. (Section 3.3.2.1) The last sentence of this section states "concentrations of analytes in the deep groundwater were estimated quantities, meaning there is limited confidence in the data value". Please expand this discussion so that the reader understands what is meant by limited confidence.

17. (Page 4-2) The term carcinogenic potency factor is no longer used and should be removed (as noted by the abbreviation CSF).

18. (Page 4-4) Define "WoE".

19. (Page 5-1) Clarify what is meant by an off-site receptor location. Page 5-5 suggests that off-site areas were not evaluated.

20. (Page 5-6) Explain how lead could be quantitatively assessed if there is no quantitative toxicity value for this constituent.

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21. (Page 5-14) Explain why there are no groundwater health-based target concentration tables. Health-based target soil concentration tables were provided (Tables 5-2 through 5-4).

22. (Tables 5-2 through 5-4) Remove the footnote referencing water ingestion rates for children since this table presents soil information.

23. (Page 5-14) No surface water samples were collected. This should probably read "surface soil".

24. (Section 5.2) Clarify what is meant by "usually are not fully probable".

25. (Page 5-20) Worker exposure is stated as 240 days. Appendix B states 250 days. This needs to be clarified.

26. (Section 6) The information pertaining to action (clean up) levels is usually presented in the feasibility study and not in the risk assessment report. A summary of risks for each of the areas of concern should be discussed (as to their meaning) in this section.

27. (Section 6.2) This section does not seem appropriate considering that contaminants other than PAHs are present at HPIA.

Baker would be happy to discussed the comments and concerns of this evaluation letter report. Overall, there are no significant problems in the risk assessment. However, there are a number of clarifications that are needed, in addition to a significant amount of editing.

If you have any questions regarding our technical comments, please do not hesitate to contact me at (412) 269-2016, or Ms. Lynne T. Srinivasan at (412) 269-2010.

Very truly yours,

BAKER ENVIRONMENTAL, INC.

Raymond P. Wattras

Raymond P. Wattras
Project Manager

RPW/lmn
Enclosure

cc: Mr. Marc Lambert, P.E. (w/o enclosure)
Mr. Steven Chamblias, P.E. (w/o enclosure)