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U.S. Army Environmental Center

FINAL PROPOSED REMEDIAL ACTION PLAN FOR THE RAVINES AND BEACH AREA STUDY AREAS OF THE SURPLUS OPERABLE UNIT, FORT SHERIDAN, ILLINOIS

June 10, 1998

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approved for public release

Prepared for:

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Final Proposed Remedial Action Plan for the Ravines and Beach Area Study Areas of the Surplus Operable Unit, Fort Sheridan, Illinois

Prepared for:
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Aberdeen Proving Ground, Maryland

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June 10, 1998

QST Project No. 490-2087-1000

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List of Abbreviations and Acronyms

B172	Building 172
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COPC	constituent of potential concern
DoD	Department of Defense
EQ	ecotoxicity quotient
ft-bgs	feet below ground surface
HI	Hazard Index
IEPA	Illinois Environmental Protection Agency
LF2	Landfill 2
MDL	method detection limit
NEPA	National Environmental Policy Act of 1969
NPL	National Priority List
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
RAE	reasonable average exposure
RI/BRA	Remedial Investigation/Baseline Risk Assessment
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
SARA	Superfund Amendments and Reauthorization Act
SARN	Small Arms Range North
USAEC	U.S. Army Environmental Center
USC	United States Code
USEPA	U.S. Environmental Protection Agency

1.0 Introduction

The Proposed Remedial Action Plan for the Ravines and Beach Area study areas of the Surplus **Operable Unit** (OU) (Proposed Plan) identifies the **Preferred Alternative.** After completing a comprehensive environmental investigation of Janes and Hutchinson Ravines and the Beach Area study areas, the Army is recommending that no action is necessary at these study areas. This Proposed Plan describes the rationale used to determine that no action is needed. This document is being issued by the Army, the lead agency for remedial activities, in consultation with the U.S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA), which are the support agencies for this site. Following review and consideration of the information submitted during the public comment period (June 11, 1998 to July 10, 1998), the Army, in consultation with the USEPA and IEPA, will select the final remedy for the ravines and Beach Area study areas in a **Decision Document**.

Throughout this document, key words will be printed in **bold** type. Definitions for these key words can be found in Appendix A, Glossary of Terms.

The Army is issuing this Proposed Plan in accordance with the public notification requirements under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980**, as amended by the **Superfund Amendments and Reauthorization Act of 1986 (SARA)**; 42 United States Code (USC) §§ 9613(k)(2)(B), 9617(a), and 9621(f)(1)(G); Army Regulation 200-1, Chapter 9-11(b)(4); Army Regulation 200-2, Section 2-2; and the National Environmental Policy Act (NEPA) of 1969.

The Proposed Plan for the ravines and Beach Area study areas highlights information that can be found in greater detail in the **Remedial Investigation / Baseline Risk Assessment (RI/BRA)** for the ravines and Beach Area study areas of the Surplus OU. The RI/BRA, as well as other documents related to environmental investigations at Fort Sheridan, can be found at the **Information Repositories** listed below. The Army encourages the public to review these documents to gain a more comprehensive understanding of the environmental activities at Fort Sheridan. The complete **Administrative Record File**, which contains all of the information used to propose No Response Action for the ravines and Beach Area study areas, is located at the Fort Sheridan Base Realignment and Closure (BRAC) Office. Information contained in the Information Repositories is similar to that contained in the Administrative Record, but is more focused on public information needs.

Highwood Public Library
102 Highwood Avenue
Highwood, Illinois 60040
Phone: 847/432-5404
Hours: Mon.-Thurs 11:00 am - 7:00 pm
Fri. & Sat. 10:00 am - 5:30 pm
Sunday Closed

Lake Forest Library
360 East Deerpath
Lake Forest, Illinois 60045
Phone: 847/234-0636
Hours: Mon.-Thurs. 9:00 am - 9:00 pm
Fri. & Sat. 9:00 am - 5:00 pm
Sunday Closed

Highland Park Public Library
494 Laurel Avenue
Highland Park, Illinois 60035
Phone: 847/432-0216
Hours: Mon.-Thurs. 9:00 am - 9:00 pm
Fri. 9:00 am - 6:00 pm
Sat. 9:00 am - 5:00 pm
Sunday Closed

Fort Sheridan BRAC Office*
Building 379
Fort Sheridan, Illinois 60037-1289
Phone: 847/266-6323
Hours: Mon.-Fri. 8:30 am - 5:00 pm
Sat.-Sun. Closed

* Location of Administrative Record

The public comment period will begin on June 11, 1998. A public information session will be held on June 25, 1998, from 6:00 pm to 8:00 pm at Fort Sheridan's Building 900. At this session, the Army will present the findings of the RI/BRA, summarize the Proposed Plan's no action alternative, and describe the rationale for that recommendation. Army representatives will be available to answer questions and collect public comments that night. Further written comments may be submitted until July 10, 1998 by fax to 847/266-3905 or mail to:

Fort Sheridan BRAC Office
ATTN: Ravines and Beach Area Study Areas Proposed Plan
3155 Blackhawk Drive, Suite 17
Fort Sheridan, IL 60037-1289

Comments received during the public comment period will be considered by the Army, in consultation with the USEPA and IEPA, prior to making the final decision in the Decision Document. Therefore, the Army, USEPA, and IEPA encourage the public to review and comment on both the supporting documentation included in the Administrative Record File and the site-related documents contained in the information repositories. The Army will address these public comments in a **Responsiveness Summary**, to be attached as an appendix to the Decision Document.

2.0 Site Background

In 1988, the Commission on BRAC recommended Fort Sheridan, Illinois for closure to the Secretary of Defense. To support decisions regarding preparation of the property for release, the Department of the Army has implemented environmental studies and will conduct restoration activities (if needed) before property transfer. The Army is conducting these activities under the Defense Environmental Restoration Program and the BRAC Program. A **remedial investigation/feasibility study (RI/FS)** is currently being conducted for the Surplus OU at Fort Sheridan. The Surplus OU consists of property that has been declared excess by the Army and will likely be transferred to the local communities (Figure 2-1). Portions of the Surplus OU have already been transferred. Janes and Hutchinson Ravines and the Beach Area study areas have been segregated from the remaining untransferred portions of the Surplus OU in order to expedite the activities required to transfer these three study areas. This Proposed Plan addresses only the ravines and Beach Area study areas of the Surplus OU (Figure 2-2). A separate Proposed Plan will be issued for the remaining portions of the Surplus OU [i.e., Landfill 2 (LF2), Small Arms Range North (SARN), and 38-Acre Parcel Fill Area].

2.1 Site Description and Summary of Environmental Investigations

Janes Ravine runs west to east along the northern boundary of Fort Sheridan. Portions of Janes Ravine may have been affected by mission-related constituents from various study areas at the installation. The ravine itself is relatively undisturbed and does not contain any obvious sources of potential contamination (e.g., filled areas). Portions of this ravine do bound several other study areas, and runoff from these other study areas may have affected the ravine.

Hutchinson Ravine runs west to east through the center of the Surplus OU and may have been affected by mission-related constituents from various study areas at the installation. As with Janes Ravine, with the exception of the water treatment facility and LF2 in the small northern arm of Hutchinson Ravine, the ravine is relatively undisturbed and does not exhibit any obvious sources of potential contaminants.

The Beach Area is located on the eastern portion of the Surplus OU, starting at the base of the bluffs along Lake Michigan to approximately 10 feet out into the lake. Available information indicated that prior activities at the study area included the possible burning of off-specification munitions. In addition, the area may have been an occasional or accidental impact area for the former trap range and artillery firing points. The Beach Area was also identified as a potential **unexploded ordnance (UXO)** area.

A Phase I RI was conducted at Fort Sheridan from 1990 through 1992. The portion of the Phase I field effort specific to the ravines and Beach Area study areas consisted of UXO sweeps at the Beach Area to

clear areas for sampling. Soil borings and monitoring wells were also completed at the Beach Area during Phase I. The monitoring wells installed at the beach are completed as nested pairs with the shallow wells straddling the beach sand/clay till interface. The deeper wells are completed within the till at depths ranging from 20 to 30 feet-below ground surface (ft-bgs). Water levels in some of the deeper wells are consistently artesian. In addition, **surface water** and **sediment** samples were collected at the Lake Michigan outfalls of Janes Ravine, Hutchinson Ravine, the Airport Drain, and a small unnamed outfall near Hutchinson Ravine.

During the Phase II RI field effort, additional UXO avoidance surveys were conducted to clear areas for sampling at the Beach Area. Two soil borings were completed on the beach and two sediment samples were collected in Lake Michigan. Surface water and sediment samples were collected from Janes and Hutchinson Ravines.

During the Phase III RI field effort, surface water and sediment samples were collected from Janes Ravine, Hutchinson Ravine, and Boles Loop Drain to support the ecological BRA. Toxicity testing and animal tissue sampling were also completed to support the ecological BRA. Sediment toxicity testing was conducted on the **invertebrates** ***Hyalella azteca (H. azteca)*** and ***Lumbriculus variegatus (L. variegatus)***. **Groundwater** acute toxicity tests were conducted on **fathead minnows** [***Pimephales promelas (P. promelas)***].

The following sections present the data collected during the RI to determine the nature and extent of the constituents detected in samples collected from the ravines and Beach Area study areas. Given that more than 150 separate constituents were analyzed and that the majority of the constituents were reported as not detected, an exhaustive presentation of the presence or absence of each constituent would be inefficient and, in many cases, would provide an excess of irrelevant information that would only serve to confuse the presentation. Therefore, to facilitate the presentation of the RI results, the following sections will focus on benzo(a)pyrene, **total carcinogenic polynuclear aromatic hydrocarbons (PAHs)**, total chlordane, p,p'-DDD, p,p'-DDT, arsenic, chromium, and lead. Total carcinogenic PAHs represent the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These constituents, plus the **metals** (inorganics) previously mentioned, tend to be the primary risk drivers from a risk assessment perspective. Additionally, the distribution of these constituents in the ravines and Beach Area is generally representative of the distribution of the other detected constituents.

2.2 Janes Ravine

Janes Ravine is the northernmost ravine on Fort Sheridan and is among the last disturbed of the major ravines dissecting Fort Sheridan. Its eastern end forms the northern installation boundary as it joins Lake Michigan. The ravine bifurcates and the northern arm is not actually within the installation boundaries. The southern arm is entirely within the installation boundaries and was the primary focus of the RI activities. The southern arm of Janes Ravine is bounded to the north by the golf course. Along it's southern edge lie a former ammunition storage area; two small former ammunition and pesticide storage buildings [Building 172 (B172) and B173]; a former pesticide formulation building, now used for storage of golf course maintenance equipment (B126); the former aircraft maintenance facility, now used for storage of golf course maintenance equipment (B117); and the former Nike site control area (B912).

Surface soil and sediment analytical data from samples collected in Janes Ravine generally were below the maximum detected concentrations in the **background** data set for metals and PAHs. However, a few pesticides/herbicides were detected in some sampling locations at concentrations above the highest concentration in the background data set. Pesticide/herbicide concentrations were the highest in the sediment sample collected near the western boundary of Fort Sheridan. This location is proximal to a golf course green area and may be affected by previous and ongoing golf course maintenance practices (i.e., pesticide/herbicide concentrations detected in sediment samples may be related to application of these constituents during golf course maintenance activities).

PAHs were not detected above **method detection limits (MDLs)** in the surface water samples collected from Janes Ravine. Arsenic (total and dissolved) and chromium (total and dissolved) were generally not detected in the surface water samples at concentrations exceeding the maximum concentrations in the background data set. Total lead and/or dissolved lead were detected in some surface water samples at concentrations moderately exceeding the highest detected concentration in the background data set. A discharge pipe from B117 may have been the source for lead in Janes Ravine as the highest concentrations were generally detected in the B117 surface water sample and in samples collected downstream of that sampling location. A few pesticides/herbicides were detected in two surface water samples at concentrations exceeding the maximum concentrations in the background data set. These detections may be related to pesticide/herbicide application during golf course maintenance activities.

L. variegatus was cultured in one Janes Ravine sediment sample. Arsenic was detected in the *L. variegatus* tissue from the ravine sediment sample at a concentration similar to the reference sediment tissue sample and higher than in the control sediment tissue sample. Chromium and lead were detected at higher concentrations than in the reference and control sediment tissue samples. Pesticides/herbicides were generally detected in the ravine sediment tissue sample at higher concentrations than in the reference

sediment tissue sample. However, only p,p'-DDD and p,p'-DDE in the ravine sediment tissue sample were detected at higher concentrations than in the control sediment tissue sample. Whole sediment chronic toxicity tests conducted with *H. azteca* in Janes Ravine sediment did not demonstrate any adverse effects to the growth and survival of the organisms.

2.3 Hutchinson Ravine

Hutchinson Ravine is the next ravine south of Janes Ravine. It lies entirely within the boundaries of the installation. The western portions of the ravine are relatively undisturbed. The main ravine channel is bounded by several golf course holes and officer housing units. A small northeastern arm of Hutchinson Ravine has been filled and is now referred to as LF2. The former drinking water treatment plant for Fort Sheridan was constructed on the beach at the mouth of Hutchinson Ravine. As part of this construction, the stream in the bottom of the ravine was diverted to a culvert that lies near the treatment plant and discharges directly to Lake Michigan. The ravine also drains stormwater runoff from roads on the installation as well as offsite.

Sediment analytical data from Hutchinson Ravine generally were below the maximum detected concentrations in the background data set for arsenic and chromium. Lead was detected in several sediment samples at concentrations slightly exceeding the maximum concentration in the background data set. Most of the higher concentrations of lead were detected in the sediment samples collected from the north branch of the ravine that is located just downgradient (south) of LF2/SARN. The lead detected in these sediment samples likely originated from the filled northern portion of this branch of Hutchinson Ravine.

Benzo(a)pyrene and/or total carcinogenic PAHs were detected at concentrations exceeding the maximum concentration in the background data set in sediment samples collected along the central portion of the ravine's main channel. There is no known potential mission-related source of benzo(a)pyrene or total carcinogenic PAHs to this portion of Hutchinson Ravine as it is bounded only by the golf course and housing units. However, the ravine does receive stormwater runoff from the installation and surrounding off-site areas. In addition, some pesticides/herbicides were detected in sediment samples collected from the main channel at concentrations above the highest concentration in the background data set. The origin of pesticides/herbicides in the main channel sediment of Hutchinson Ravine is uncertain, but may be related to application during golf course or lawn maintenance activities, as several golf course holes and officer housing units are located adjacent to the ravine to the north and south.

Arsenic (total and dissolved) and chromium (total and dissolved) were not detected in the Hutchinson Ravine surface water samples at concentrations exceeding the maximum concentrations in the

background data set. Total lead and/or dissolved lead were detected in a few surface water samples at concentrations exceeding the highest detected concentration in the background data set. Most of the higher concentrations of lead were detected in the surface water samples collected from the north branch of the ravine that is located just downstream (south) of LF2/SARN. The lead detected in these surface water samples likely originated from the filled northern portion of this branch of Hutchinson Ravine, now referred to as LF2, or from the SARN.

Benzo(a)pyrene and/or total carcinogenic PAHs were detected at concentrations exceeding the maximum concentration in the background data set in one surface water sample collected along the west central portion of the ravine. There is no known potential mission-related source of benzo(a)pyrene or total carcinogenic PAHs to this portion of Hutchinson Ravine as it is bounded only by the golf course and housing units. However, the ravine does receive stormwater runoff from the installation and surrounding off-site areas. A few pesticides/herbicides were detected in surface water samples collected from the main channel of Hutchinson Ravine at concentrations exceeding the maximum concentrations in the background data set. The origin of pesticides/herbicides in the main channel surface water of Hutchinson Ravine is uncertain, but may be related to application during previous and ongoing golf course or lawn maintenance activities, as several golf course holes and officer housing units are located adjacent to the ravine to the north and south.

L. variegatus was cultured in one Hutchinson Ravine sediment sample. Arsenic was detected in the *L. variegatus* tissue from the ravine sediment sample at a concentration similar to the reference sediment tissue sample and higher than in the control sediment tissue sample. Chromium was not detected above MDLs in the ravine sediment sample. Lead was detected at a higher concentration than in the reference and control sediment tissue samples. Pesticides/herbicides were generally detected in the ravine sediment tissue sample at higher concentrations than in the reference sediment tissue sample. However, only p,p'-DDD and p,p'-DDE in the ravine sediment tissue sample were detected at higher concentrations than in the control sediment tissue sample. Whole sediment chronic toxicity tests conducted with *H. azteca* in Hutchinson Ravine sediment did not demonstrate any adverse effects to the growth and survival of the organisms.

2.4 Beach Area

The Beach Area is located on the eastern portion of the Surplus OU, starting at the base of the bluffs along Lake Michigan to approximately 10 feet out into the lake. Available information indicated that prior activities at the study area included the possible burning of off-specification munitions. In addition, the area may have been an occasional or accidental impact area for the former trap range and artillery firing points. The Beach Area was also identified as a potential UXO area.

Given the geologically active nature of the beach, this study area was not anticipated to be a significant source of constituents of concern, even considering its interesting history of use. The three phases of investigation performed at the study area have generally confirmed that substantial levels of constituents are not present at the study area. Soil borings installed at the Beach Area indicate that the beach sediments (i.e., sand and gravel resulting from recent alluvial processes) extend to a mean depth of approximately 7.5 ft-bgs. These beach sediments overlie the native clay-rich till.

Sediment analytical data indicate that arsenic, chromium, and lead were generally detected at relatively low concentrations, albeit above their respective detected concentrations in the background beach sediment sample. Benzo(a)pyrene and total carcinogenic PAHs were generally detected in Beach Area sediment samples at concentrations lower than the MDLs of the background sample. A few pesticides/herbicides were detected in the Janes Ravine outfall samples. The origin of the pesticides/herbicides is unknown, but may be related to previous and ongoing golf course activities farther up the ravine. In addition, 1,3-dinitrobenzene was detected in one lake sediment sample at a low concentration (just above the MDL). It is possible this explosive-related constituent is related to the burning of off-specification munitions and/or the Beach Area's history as an impact area. This is the only detection of an explosive-related constituent in the Beach Area sediment samples.

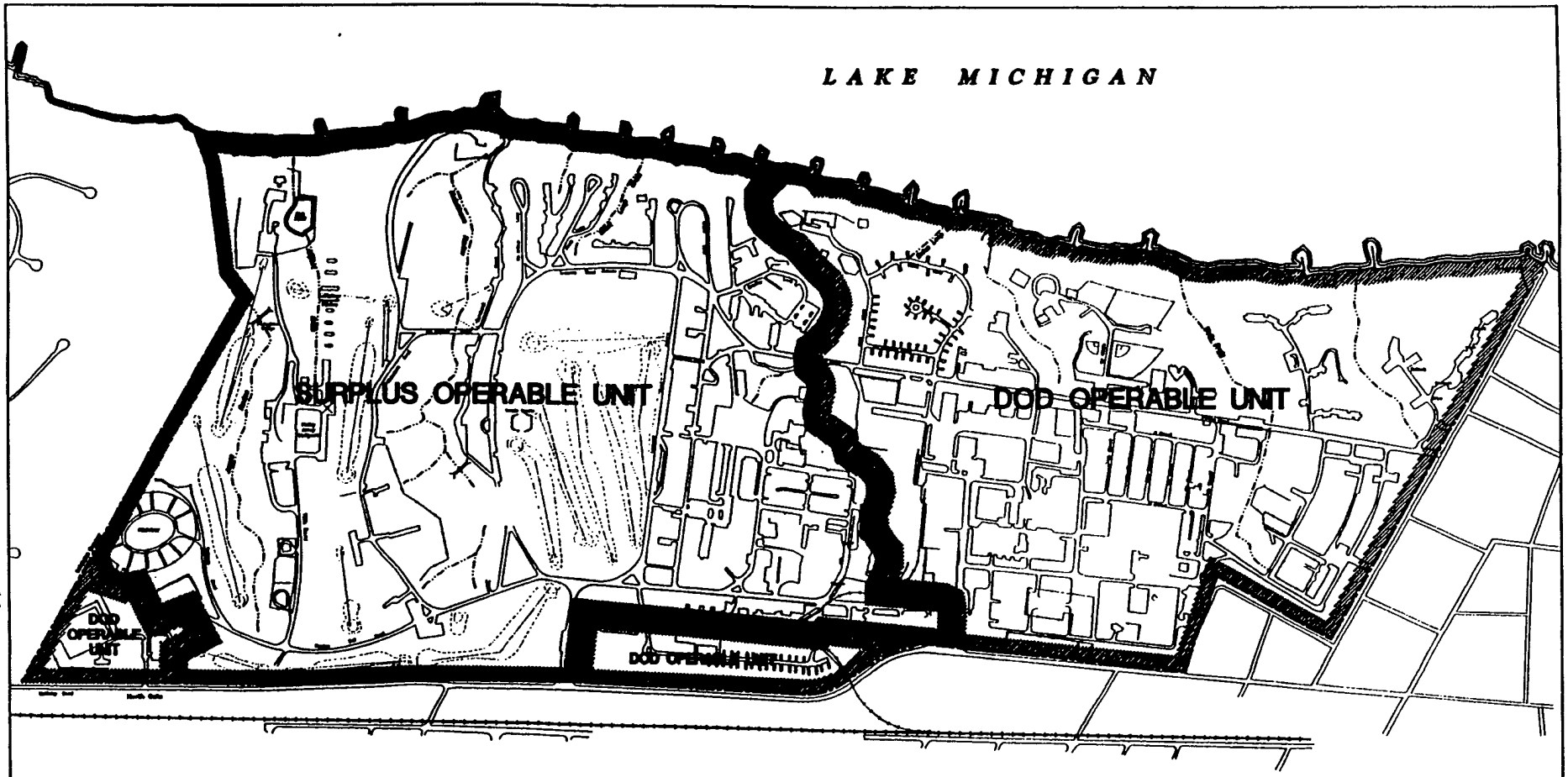
Total arsenic, total chromium, PAHs, and pesticides/herbicides were not detected above MDLs in any of the four surface water samples collected from the ravine outfalls to Lake Michigan. Total lead was detected in two surface water samples at relatively low concentrations (less than three times the MDL).

L. variegatus was cultured in two beach sediment samples collected from the outfalls to Lake Michigan of Janes and Hutchinson Ravines. Arsenic, chromium, and lead were detected in the *L. variegatus* tissue from the beach sediment samples at concentrations similar to those in the reference sediment tissue sample and at higher concentrations than in the control sediment tissue sample. Most pesticides/herbicides were detected in the beach sediment tissue samples at similar concentrations to those in the reference sediment tissue sample and at higher concentrations than in the control sediment tissue sample. However, p,p'-DDD in the beach sediment tissue samples was detected at higher concentrations than in the reference and control sediment tissue samples.

Samples of the groundwater were collected from monitoring wells at the Beach Area as worst case (undiluted) samples of the Lake Michigan surface water. Fathead minnows *(P. promelas)* were exposed to the groundwater samples and no adverse effects were observed.

2.5 Summary of Remedial Investigation Results

The results of three phases of the RI indicate low concentrations of constituents in the surface water and sediments in the ravines and Beach Area study areas. The types of constituents generally fall into three categories: metals (inorganics), PAHs, and pesticides. These constituents were used to develop the BRA for the three study areas, which is discussed in detail in the following section (Section 3.0).



Adapted from Official Post Map, Directorate of Engineering and Housing, Fort Sheridan, Illinois, January 6, 1989

QST

0 1100
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DVL 11/28/94
Revised JCF 03/09/98

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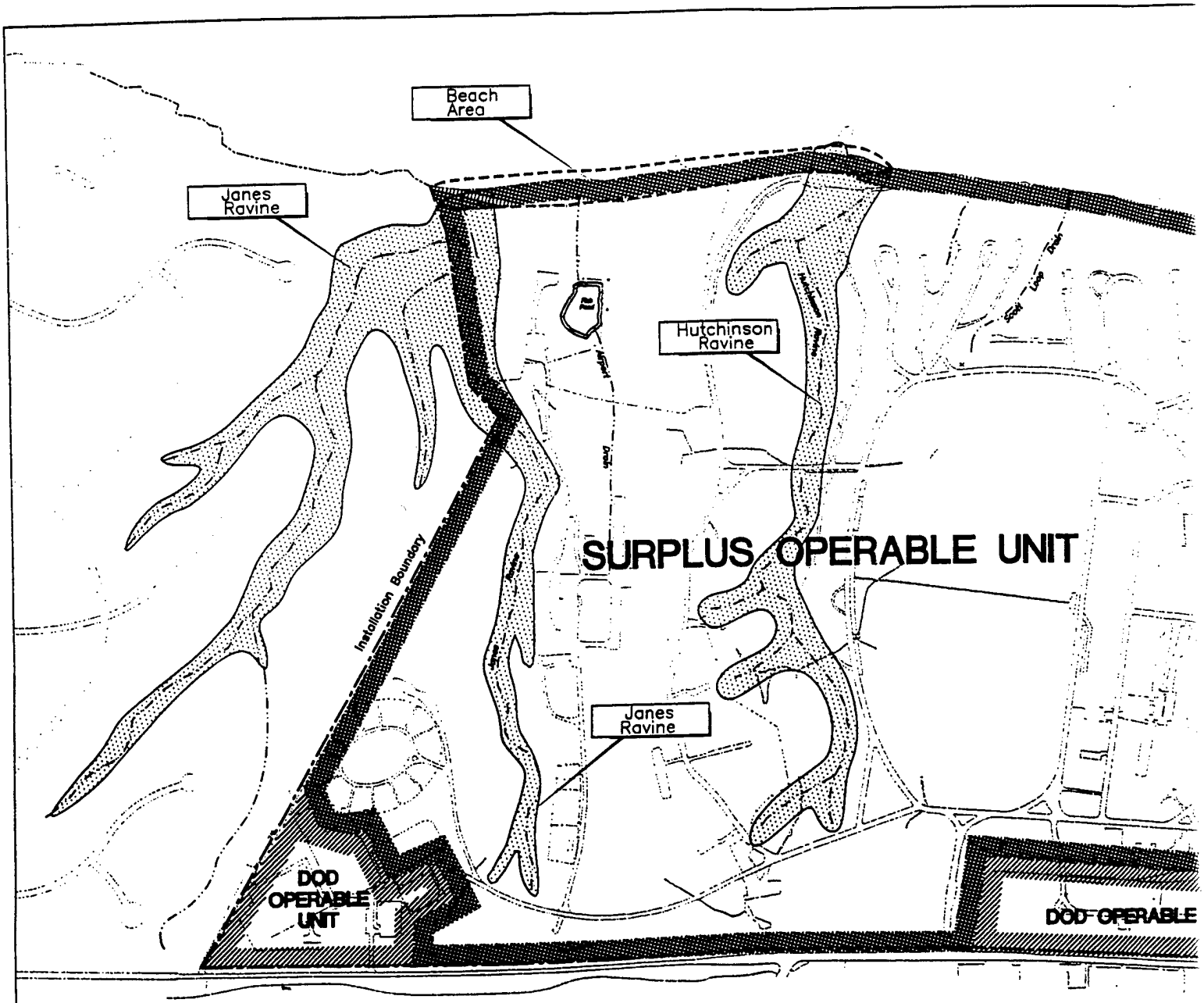
~LF340U2

Figure 2-1
Fort Sheridan Operable Units

Draft Proposed Remedial Action Plan for the Ravines and Beach Area Study Areas of the Surplus Operable Unit

Fort Sheridan, Illinois



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DVL 01/05/95
Revised JCF 03/10/98

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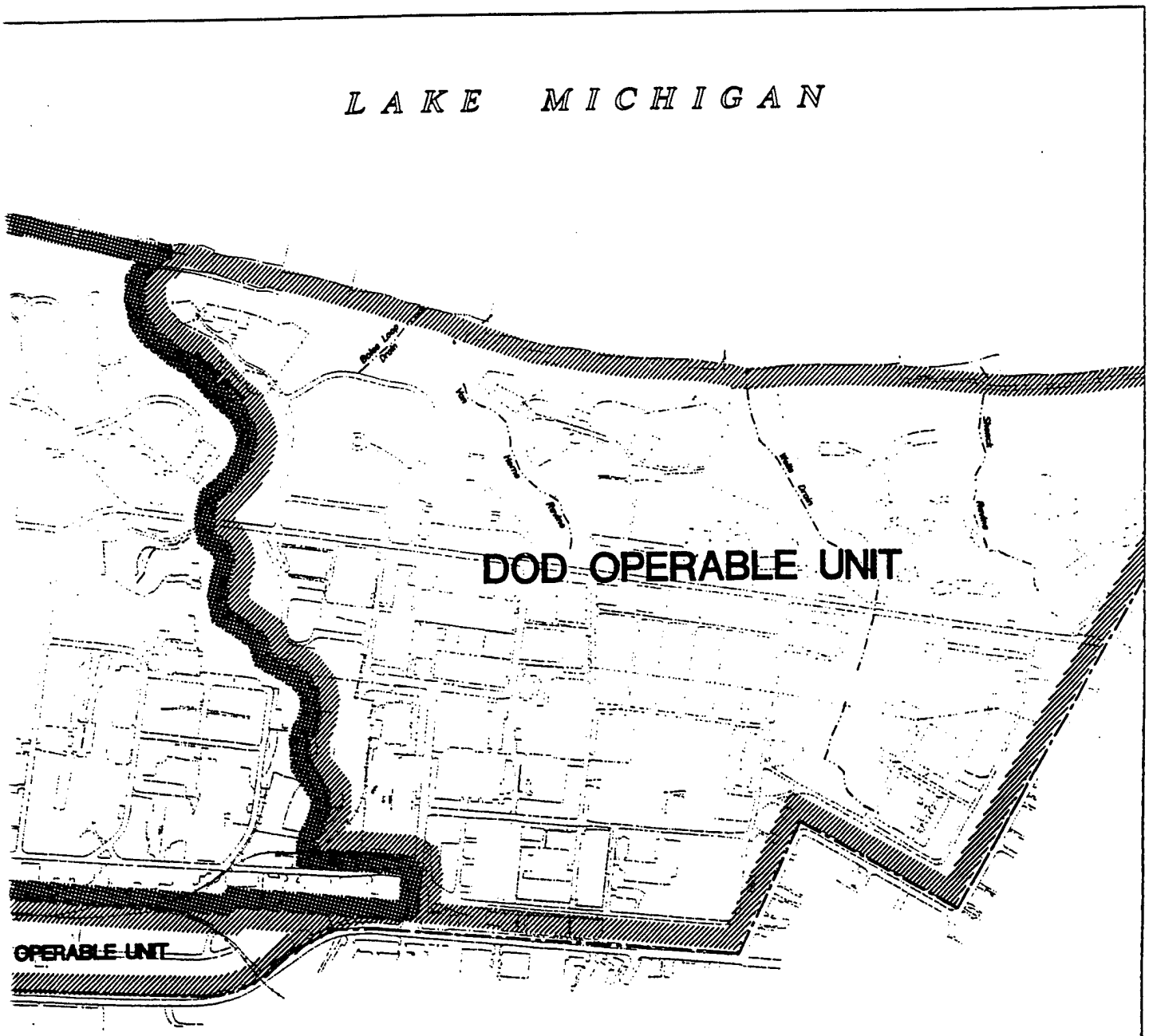
Installation information adapted from an aerial survey by Air Survey Corporation, Sterling, Virginia. Date of photography, 12/6/95. Ravines, shoreline and roads north of installation adapted from USGS 7.5' topographic quadrangle, Highland Park, Ill., 1963; photo re



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1963; photo revised 1972 & 1980.

Figure 2-2
Ravines and Beach Area Study Areas

Draft Proposed Remedial Action Plan for the Ravines and Beach Area Study Areas of the Surplus Operable Unit

Fort Sheridan, Illinois

3.0 Summary of Site Risks

A risk assessment was conducted to determine whether the constituent concentrations detected in the surface water, sediment, and groundwater samples collected during the RI represent a potential risk to human health and/or the environment. This type of analysis is commonly called a baseline risk assessment. If the existing conditions are not found to present a significant risk to human health and/or the environment, remedial actions are not required. If the existing conditions are found to pose an unacceptable risk to human health and/or the environment, then actions must be taken to minimize the risk.

3.1 Summary of Human Health Risk Assessment Process

The risk to human health is evaluated by taking into consideration potential exposure to and toxicity of **constituents of potential concern** (COPCs) present at the ravines or Beach Area study areas. The evaluation is performed according to USEPA-approved risk assessment methods (see USEPA, 1989). The USEPA has developed a target risk range that is appropriate for use as a remedial goal for sites similar to the ravines and Beach Area study areas. For carcinogenic effects, for example, the risk range of one additional chance in 1,000,000 (1E-06) to one in 10,000 (1E-04) that an individual may develop cancer above the expected rate is considered to be acceptable. In general, men have a one in two chance and women have a one in three chance of developing cancer in their lifetime due to generally-occurring, or background, exposures. These chances are called the expected rate. Therefore, the risk assessment estimates the additional chance of developing cancer, above this expected rate. For constituents causing **non-carcinogenic** effects, the likelihood of adverse health effects is expressed as a numerical ratio called the **hazard index (HI)**. The HI identifies the potential for the most sensitive individuals to be adversely affected by site conditions. An HI of one or less is considered acceptable. Both types of risk calculations are performed using conservative (worst case) assumptions about the extent of the COPCs detected and the degree of human exposure to those constituents.

Because the Army will transfer the property represented by the three study areas to the Lake County Forest Preserve District, the risk evaluation took into consideration the future reuses of the property. The legislation adopted in Section 125 of the Fiscal Year 1966 Military Construction Appropriations Act (P.L. 104-32) requires the Army to convey approximately 290 acres of open space, including the existing golf course to the Lake County Forest Preserve District for use as open space. Therefore, the assumption is that the future use of the ravines and Beach Area will be similar to their current use (i.e., open space). Thus, the risk assessment includes exposure by current and future recreational users. The risk assessment also considers how someone could come in contact with the COPCs detected in the surface

water and sediment. This is called an **exposure pathway**. Within each exposure pathway may be several ways in which a chemical can come into contact with a **receptor**. This is called an **exposure route**. The exposure routes evaluated are: dermal absorption pathway (i.e., surface water and sediments contacting the skin); ingestion pathway (i.e., accidental ingestion of surface water and/or sediment); and inhalation pathway (i.e., inhalation of dusts from sediment and vapors from surface water). Drinking groundwater was not considered as a likely exposure pathway. The groundwater at Fort Sheridan is not currently used as a drinking water source, and there is an abundant water supply readily available from Lake Michigan. Even if a shallow groundwater well was installed, because of the geology of this site, the well would not yield enough water to support a drinking water or irrigation water supply.

3.2 Human Health Risk Assessment

Samples collected during the RI indicate that the surface water and sediments of the ravines and Beach Area study areas contain low concentrations of COPCs either because of mission-related activities near the study areas or because they are present in the background (Table 3-1). As noted previously, the COPCs detected in the study area surface water and sediment samples generally fall into three categories: metals (inorganics), PAHs, and pesticides. Inorganics are compounds that often occur naturally. However, the inorganics listed in Table 3-1 were found in the study areas at levels higher than those detected in the background. PAHs are compounds that can be found in oil, ashes, coal, and asphalt paving. PAHs are commonly found in urban areas as a result of road paving, car exhaust, and ashes (leaf/wood burning). However, because PAHs can be hazardous to humans and to the environment, PAHs detected at the three study areas were included in the risk assessment, regardless of whether they were detected in the background or not. Pesticides are and were commonly used in the environment, so they are very often found in the background. Because pesticides can be hazardous to humans and the environment, pesticides detected at the ravines and Beach Area study areas were included in the risk assessment.

Under current land use conditions (recreational), the potential **carcinogenic** risk due to the presence of COPCs in the ravines and Beach Area study areas via all exposure pathways are well below the upper bound of the target risk range (i.e., 1E-04) and in some cases are below the lower bound of the target risk range (i.e., 1E-06). The HIs are below the acceptable HI of one in all cases. Under the future land use conditions (recreational), the highest potential risk due to the presence of carcinogenic COPCs in the three study areas via all exposure pathways is 3E-05 or three additional chances in 100,000 that an individual may develop cancer over a lifetime of exposure (see "Cancer Risk Level" in Table 3-2). This level is well within the target risk range. The potential risks at the ravines are primarily associated with exposure to PAHs and pesticides. The PAH concentrations detected at the ravines exceeded the maximum background concentrations by as much as 5-fold. The highest pesticide

concentrations detected at the ravine exceeded the maximum background concentration by nearly two orders of magnitude. The potential risks at the Beach Area are primarily associated with exposure to arsenic, which was detected at concentrations exceeding the concentration detected in the background beach sample by a factor of 6 (Tables 3-2 and 3-3).

3.3 Ecological Risk Assessment

The BRA also evaluates whether the COPCs detected in the ravine and Beach Area study areas surface water, sediment, groundwater, and tissue samples were present in concentrations that represented an unacceptable risk to the environment. This environmental risk assessment is called an ecological risk assessment.

The ecological risk assessment considered potential risks to land and water animals and plants, including aquatic invertebrates (animals without backbones), amphibians (e.g., toads), raccoons, cats (as a surrogate for house pets), shrews, woodchucks, and shorebirds (e.g., snipe). The ecological risk assessment compared the concentrations of the COPCs detected at the study areas with environmental health based levels. Environmental studies were also performed on freshwater worms (*L. variegatus)* and amphipods (*H. azteca*, an aquatic invertebrate) using sediments from the study areas. While groundwater is not considered a viable pathway for the human health risk assessment, the discharge of groundwater into Lake Michigan was of concern for the ecological risk assessment. The groundwater at the beach discharges directly to the lake and, thus, may affect Lake Michigan.

The ecological risk assessment equivalent of the human health HI is the **ecotoxicity quotient (EQ)**. As with the HI, an EQ greater than one (EQ>1) indicates a level of risk that is potentially unacceptable. None of the COPC concentrations in the surface water and sediment samples from Janes or Hutchinson Ravines resulted in an EQ>1 for any of the species or COPCs evaluated (Table 3-4). For the Beach Area, two COPCs resulted in an EQ>1 for sediment. The inorganic constituents aluminum and arsenic had EQs>1 for raccoons incidentally ingesting sediment. However, consideration of the fact that the **home range** of a typical raccoon would not be limited to just the Beach Area reduces the potential for exposure to the point where no adverse effects are anticipated.

The evaluation of the potential for COPCs to concentrate in animal **food chains** was based upon snipes eating *L. variegatus* exposed to surface water at the Beach Area. This evaluation resulted in an EQ>1 for total chromium and manganese. As with the raccoons, consideration of the home range of the snipe reduces the potential for exposure to the point where no adverse effects are anticipated. Additionally, the concentrations of manganese in the Beach Area *L. variegatus* samples were not different than the concentrations of manganese in the reference *L. variegatus* samples.

EQs for two Lake Michigan sediment constituents (aluminum and 1,3-dinitrobenzene) indicate that adverse effects on benthic invertebrates may occur. However, consideration of additional sediment data collected during the Department of Defense (DoD) OU RI indicate that the detection of 1,3-dinitrobenzene may be an anomaly and that aluminum concentrations associated with Surplus OU Lake Michigan sediment samples are less than those observed elsewhere in the lake. In summary, no adverse effects to environmental receptors are expected from either Janes Ravine, Hutchinson Ravine, or the Beach Area.

Table 3-1. COPCs for the Ravines and Beach Area Study Areas (Page 1 of 2)

Study Area/ Medium	Human Health COPCs	EcoCOPCs	
Janes Ravine			
Sediment	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chlordane Chrysene DDD, p,p'- DDT, p,p'- Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene	Chlordane, total DDD, p,p'- DDE, p,p'- DDT, p,p'- Hexachlorocyclohexane, gamma- (Lindane)	Methoxychlor Methylnaphthalene, 2- Silver
Surface Water	Manganese	DDD, p,p'- DDT, p,p'-	Manganese Sulfate
Hutchinson Ravine			
Sediment	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chlordane Chrysene DDD, p,p'- Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene	2,4,5-T Acenaphthene Acenaphthylene Aldrin Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(g,h,i)perylene Benzo(k)fluoranthene Cadmium Carbazole Chlordane, alpha- Chlordane, gamma- Chlordane, total Chrysene Cyanide, total	DDD, p,p'- DDE, p,p'- DDT, p,p'- Dibenzo(a,h)anthracene Endrin Fluoranthene Fluorene Hexachlorocyclohexane, gamma- (Lindane) Indeno(1,2,3-cd)pyrene Mercury Methylnaphthalene, 2- Naphthalene Phenanthrene Pyrene Silver
Surface Water	Benzo(a)pyrene Benzo(k)fluoranthene Bis(2-ethylhexyl)phthalate Chloromethane Manganese Sulfate	Anthracene Benzo(a)pyrene Cyanide DDD, p,p'- DDE, p,p'- DDT, p,p'-	Decachlorobiphenyl Manganese Pyrene Sulfate Zinc

Table 3-1. COPCs for the Ravines and Beach Area Study Areas (Page 2 of 2)

Study Area/ Medium	Human Health COPCs	EcoCOPCs	
Beach Area			
Sediment	Arsenic Beryllium Manganese	Aluminum Antimony Arsenic Chlordane, total DDD, p,p'- DDE, p,p'- DDT, p,p'-	Hexachlorocyclohexane, gamma- (Lindane) Manganese Nickel Zinc
Surface Water	Chloroform Manganese Sulfate	Barium Manganese	Sulfate
Lake Michigan Sediment			Aluminum Dinitrobenzene, 1-3-
Groundwater		Amino-2,6-DNT, 4- Barium Benzo(a)anthracene Benzo(a)pyrene Benzo(g,h,i)perylene Benzo(k)fluoranthene Cobalt Copper DDD, p,p'-	DDT, p,p'- Endosulfan sulfate Indeno(1,2,3-cd)pyrene Lead Manganese Mercury Methylnaphthalene, 2- Pyrene Vanadium Zinc

COPC = constituent of potential concern.

Source: QST, 1998.

Table 3-2. Summary of Potential Human Health Risks

Exposure Scenario	Total Noncarcinogenic Hazard Index		Total Carcinogenic Risk†	
Janes Ravine	RAE	RME	RAE	RME
Current Recreational	6E-03	3E-02	4E-07	2E-06
Future Recreational				
Adult	1E-02	6E-02	1E-06	6E-06
Child	4E-02	2E-01	†	
Hutchinson Ravine				
Current Recreational	4E-03	2E-02	4E-07	2E-06
Future Recreational				
Adult	8E-03	4E-02	5E-06	3E-05
Child	2E-02	1E-01	†	
Beach Area				
Future Recreational				
Adult	6E-03	3E-02	1E-06	5E-06
Child	3E-02	1E-01	†	

RAE = reasonable average exposure.
RME = reasonable maximum exposure.

† Lifetime cancer risk estimate. Childhood cancer risks are included in values presented for the adult.

Source: QST, 1998.

Table 3-3. Summary of Potential Human Health Risks for Background

Exposure Scenario	Total Noncarcinogenic Hazard Index		Total Carcinogenic Risk †	
Janes Ravine	RAE	RME	RAE	RME
Current Recreational	1E-04	6E-04	3E-08	2E-07
Future Recreational				
Adult	4E-04	2E-03	8E-07	4E-06
Child	8E-04	4E-03	†	
Hutchinson Ravine				
Current Recreational	8E-04	4E-03	1E-07	5E-07
Future Recreational				
Adult	4E-03	2E-02	1E-06	7E-06
Child	9E-03	4E-02	†	
Beach Area				
Future Recreational				
Adult	2E-03	1E-02	3E-07	1E-06
Child	1E-02	6E-02	†	

RAE = reasonable average exposure.
RME = reasonable maximum exposure.

† Lifetime cancer risk estimate. Childhood cancer risks are included in values presented for the adult.

Source: QST, 1998.

Table 3-4. Summary of Potential Risks to Ecological Receptors (Page 1 of 2)

Exposure Medium	Receptor Type	Number of Times EQ>1	EcoCOPCs with EQ>1	Significance
Janes Ravine				
Sediment	Raccoon	0/8		
Sediment Bioassays	*Lumbriculus* and *Hyalella*			Results indicate sediments not chronically toxic to benthic invertebrates.
Surface Water	Shrew	0/3		
Surface Water	Feral Cat	0/3		
Surface Water	Woodchuck	0/3		
Surface Water	Raccoon	0/3		
Hutchinson Ravine				
Sediment	Raccoon	0/33		
Sediment Bioassays	*Lumbriculus* and *Hyalella*			Results indicate sediments not chronically toxic to benthic invertebrates.
Surface Water	Shrew	0/10		
Surface Water	Feral Cat	0/10		
Surface Water	Woodchuck	0/10		
Surface Water	Raccoon	0/10		
Surface Water	Amphibians	0/3		
Surface Water	Aq. Invertebrates	0/10		
Lumbriculus	Raccoons	0/11		
Beach Area				
Sediment	Raccoon	2/11	Aluminum Arsenic	Potential for adverse effects; however, consideration of the animals home range significantly reduces the potential for exposure. Therefore, no adverse effects are anticipated.
Sediment	Snipes	0/11		
Sediment Bioassays	*Lumbriculus*			Results indicate sediments not chronically toxic to benthic invertebrates.
Surface Water	Shrew	0/2		
Surface Water	Feral Cat	0/2		
Surface Water	Woodchuck	0/2		

Table 3-4. Summary of Potential Risks to Ecological Receptors (Page 2 of 2)

Exposure Medium	Receptor Type	Number of Times EQ>1	EcoCOPCs with EQ>1	Significance
Beach Area (cont.)				
Surface Water	Raccoon	0/2		
Lumbriculus	Snipes	2/11	Chromium, total	Some potential for adverse effects; however, consideration of the home range should reduce the potential for exposure and any adverse effects. Additionally, consideration of background concentrations of manganese in prey do not indicate adverse effects.
			Manganese	
Surface Water	Aq. Invertebrates	0/3		
Lumbriculus	Raccoons	0/11		
Lake Michigan				
Surface Water Bioassays	Fathead Minnows			Results indicate groundwater not acutely toxic to fish species.
Sediment	Aq. invertebrates	2/2	Aluminum	EQs indicate that adverse effects on benthic invertebrates may occur. However, consideration of additional sediment data indicate that the detection of 1,3-dinitrobenzene may be an anomaly and that aluminum concentrations are less than those observed elsewhere in the lake.
		½	1,2-Dinitrobenzene	

Source: QST, 1998.

4.0 Summary of the Proposed Action

Based on the evaluation of risks considering a future recreational use scenario of the ravines and Beach Area study areas, the Army, in coordination with USEPA and IEPA, has determined that the constituents present at the study areas do not pose significant risk to human health or the environment and recommends that no response action is necessary. Although detectable levels of mission related constituents are present in the surface water and sediment, they are present at levels that do not and will not cause unacceptable human health or environmental effects.

Groundwater use was not an exposure pathway in the BRA because the shallow groundwater at the study areas is not currently used as a water source and will not yield enough water to support the installation of a shallow drinking or irrigation well. Furthermore, an abundant supply of **potable** water is readily available from Lake Michigan. Existing site conditions, in combination with the mandated transfer of the property to the Lake County Forest Preserve District in P.L. 104-32, will limit future use of these study areas to open space.

This recommendation is based on the RI and risk assessment. These documents are available at the information repositories listed previously.

5.0 Community Participation

The Army relies on public input so that the alternative selected for the ravines and Beach Area study areas of the Surplus OU meets the needs and concerns of the community. To ensure that the community's concerns are being thoroughly addressed, the Proposed Plan will have a public comment period from June 11, 1998 to July 10, 1998. During this time, the public is encouraged to submit comments on the Proposed Plan to the Army. The Army, in consultation with USEPA and IEPA, may modify the Preferred Alternative; select another response action; or develop another alternative, if warranted by public comments and/or presentation of substantial new information.

The public is encouraged to review and comment on the finding of no action needed as presented in the Proposed Plan. Significant public comments will be included with appropriate responses in the responsiveness summary which will be included in the public record. Although the Army has recommended that no cleanup action is needed, no final decision will be rendered until all public comments have been thoroughly reviewed and evaluated. The final cleanup remedy will be documented in a Decision Document, which contains a detailed description of the final remedial action, outlines the Army's decision-making process, and thoroughly responds to community input solicited during the formal comment period.

Information Repositories

An information repository containing the most pertinent information of the Fort Sheridan environmental program is located in each of the three adjoining municipalities at locations listed in Section 1.0. The full Administrative Record File is maintained at the Fort Sheridan BRAC Office, Building 48-G.

Public Comment Invited

A public notice has been issued announcing the public information session to be held on June 25, 1998 from 6:00 pm to 8:00 p.m. in Building 900 at Fort Sheridan. The Army will present the findings of the RI and BRA, and summarize the No Action remedial alternative presented in the Proposed Plan. The Army will also discuss the rationale for selecting the Preferred Alternative and will be available to interested citizens who wish to ask questions and provide comments. Written public comments will be accepted at the Fort Sheridan BRAC Office until July 10, 1997.

6.0 References

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Appendix A

Glossary of Terms

Glossary of Terms

Administrative Record File: A file that contains the information used to make a decision on the selection of a response action under CERCLA. The file is established at or near a National Priorities List (NPL) site and is available for public review.

Background: Naturally occurring or other non-site related levels of chemicals as distinguished from site-related chemicals.

Baseline Risk Assessment (BRA): The process whereby risks to human health and the environment are quantitatively evaluated under the no action scenario. This information is used to determine whether remedial actions are necessary. The BRA is conducted during the RI/FS.

Carcinogenic: Term used to describe chemicals or substances that are known or suspected to cause cancer in humans based on observed health effects in humans or existing data from animal laboratory tests.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law enacted in 1980 and subsequently modified by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This act resulted in the creation of a trust fund, commonly known as "Superfund," which provides money to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Constituents of Potential Concern (COPCs): Chemical constituents that are detected at study areas and determined, through a screening process, to have the potential to present unacceptable risks to human health and the environment. These constituents are evaluated in the BRA.

Decision Document: A legal document that describes in detail the remedy selected for an entire NPL site or a particular operable unit. The Decision Document summarizes the results of the RI/FS and includes a formal response to comments supplied by the public.

Ecotoxicity quotient (EQ): An indicator of the potential for a constituent to cause adverse effects in environmental [non-human (animal or plant)] receptors. The EQ is calculated by dividing the ecological COPC concentration by the ecotoxicity benchmark (published exposure levels). Any result of this calculation that is greater than 1.0 is considered to represent a potentially unacceptable risk.

Exposure Pathways: The course a chemical constituent takes from the source to the receptor. An exposure pathway links the sources, locations, and release mechanisms (e.g., volatilization) with receptor locations and activity patterns.

Exposure Route: An exposure route is the way a chemical comes in contact with a receptor (e.g., ingestion, inhalation, dermal absorption).

Fathead Minnows (*Pimephales promelas*): A type of fish commonly used to test the toxicity of chemicals to fish.

Feasibility Study (FS): A study that supports the selection of a remedial action at a site. The FS identifies, develops, and evaluates several alternatives for addressing contamination.

Food Chain: A chain of plants and animals in a natural setting such that each link in the chain feeds on the one below and is eaten by the one above. There are seldom more than six links in a chain, with plants and bacteria on the bottom and the largest carnivores (e.g., wolves) at the top.

Groundwater: Water that is present in the open spaces between soil particles (silt, sand, gravel) and/or rock fractures below the ground surface.

Hazard Index (HI): An indicator of the potential for a chemical to cause non-carcinogenic health effects in humans. The HI is calculated by dividing maximum and average human exposure estimates to a particular chemical by exposure levels that USEPA has determined to be acceptable. Any result of this calculation that is greater than 1.0 may represent a potential unacceptable risk. Because non-carcinogenic health effects often materialize at specific body systems or organs, HIs may be calculated for the specific body systems or organs that may be affected.

Home Range: The term home range refers to the area over which a given species will frequent in its search for food and shelter. The size of a home range may be measured in fractions of a square meter for sedentary species like mussels to hundreds of square kilometers for large animals like wolves.

***Hyalella azteca* (*H. Azteca*):** A benthic (bottom dwelling) aquatic amphipod (invertebrate) common in many freshwater environments. *H. Azteca* is commonly used as a testing species for toxicity testing.

Information Repository: A location where documents and data related to a site investigation and response actions are maintained to allow the public access to this material.

Invertebrate: Creatures without a backbone such as a worm or an insect.

***Lumbriculus variegatus* (*L. Variegatus*):** A benthic (bottom dwelling) aquatic segmented worm common in many freshwater environments. *L. Variegatus* is commonly used as a testing species for toxicity and bioaccumulation testing.

Metals: In the context of the RI/BRA, the term "metals" refers to one or more of the 26 elemental metallic constituents analyzed for in Surplus OU samples. Each of these metals occurs naturally at varying concentrations and many are necessary for human life. Each of them can also be potentially toxic if present at high enough concentrations.

Method Detection Limits (MDL): The lowest concentration at which a given chemical constituent can reliably be detected by a given analytical method under ideal conditions in a laboratory. MDLs are chemical, analytical, and laboratory specific.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): A federal regulation that outlines the procedures that must be followed under the Superfund program. The NCP was most recently revised in 1990.

Non-carcinogenic: This term refers to health effects other than cancer and is generally used to describe the chemical constituents that produce these health effects.

Operable Unit: An individual action that is part of the overall remedy for a particular site. This portion of the remedial response manages migration, or eliminates or addresses a release, threat of a release, or an exposure pathway. Operable units may address geographic portions of a site, specific-site problems, or initial phases of an action.

Polynuclear Aromatic Hydrocarbon (PAH): A group of organic chemicals formed during the incomplete burning of coal, oil, gas, wood or other combustible material. PAHs are both man-made and naturally occurring in coal, crude oil, and coal tar pitch. They have uses in dyes, plastics, pesticides and asphalt road construction.

Potable: Water that is suitable for drinking.

Preferred Alternative: The remedial alternative initially proposed for implementation as a result of the screening process conducted during the FS.

Reasonable Average Exposure (RAE): Central tendency estimate of exposure for a receptor group.

Reasonable Maximum Exposure (RME): High end estimate of exposure for a receptor group.

Receptor: A human, animal, or plant that could potentially receive exposure to chemicals resulting from the chemical's migration from hazardous waste sites.

Remedial Investigation (RI): A study that supports the selection of a remedial action at a site. The RI identifies the nature, magnitude, and extent of contamination associated with a site.

Responsiveness Summary: Comments presented during the public information session and received during the public comment period that are considered and addressed by the Army.

Sediment: Soil and other material that settles to the bottom of a stream, creek, or lake.

Superfund Amendments and Reauthorization Act of 1986 (SARA): This act modified CERCLA and resulted in the creation of a trust fund commonly known as "Superfund" which provides money to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

Surface Water: Water on the earth's surface such as streams, ponds, and lakes.

Total Carcinogenic PAHs: This term refers to the sum of the detected concentration of seven known or suspected carcinogenic polynuclear aromatic hydrocarbons (PAHs). The seven PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene.

Unexploded Ordnance (UXO): Military munitions (e.g., bullets, land mines, torpedoes, bombs, etc.) that have been primed, fuzed, armed, or otherwise prepared for action and have been fired, dropped, launched, projected, or placed and remain unexploded either by malfunction, design, or any other cause.