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Ser 1811RP/00690

10 MAY 1991

From: Commander, Western Division, Naval Facilities Engineering Command
To: Distribution

Subj: IDENTIFICATION OF EXPOSURE PATHWAYS, PUBLIC HEALTH AND
ENVIRONMENTAL EVALUATION, NAVAL STATION, TREASURE
ISLAND, HUNTERS POINT ANNEX

Encl: (1) Subject Document

1. In accordance with the Federal Facility Agreement for Naval Station, Treasure Island, Hunters Point Annex, enclosure (1) is forwarded. Review comments received on the Draft version of the Identification of Exposure Pathways have been incorporated into enclosure (1).
2. By copy of this letter, this document is also being provided to other concerned regulatory agencies.
3. Should you have any questions regarding this matter, the point of contact is Commander, Western Division, Naval Facilities Engineering Command (Attn: Louise T. Lew, Code 1811, (415) 244-2551).

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**IDENTIFICATION OF EXPOSURE PATHWAYS
PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION
NAVAL STATION, TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA
May 9, 1991**

The following describes the exposure pathways being considered for evaluation for the Operable Unit (OU)-specific Baseline Public Health and Environmental Evaluation (BPHEEs) at Hunters Point Annex (HPA). Table A-1 which summarizes the pathways being considered for evaluation, was originally submitted to the regulatory agencies at a technical review committee meeting on January 10, 1991. The table has been revised to address EPA comments dated February 26, 1991 and DHS comments dated February 22, 1991.

The exposure pathways to be considered for evaluation are limited to human exposure pathways. A separate ecological risk assessment for the facility is being planned at this time. Information from implementation of the Environmental Sampling and Analysis Plan (ESAP) may be included in the OU-specific BPHEEs if the data are available within a time frame that will not impact the OU-specific BPHEE schedules.

Table A-1 outlines the potential exposure pathways to be considered for the OU-specific BPHEEs. Table A-2 summarizes the information in Table A-1 in a matrix form. The pathways identified on the tables are those that may exist at HPA. During the preparation of each OU-specific BPHEE these pathways will be reviewed to evaluate whether they exist or are likely to occur at the OU and whether they should be quantified for the BPHEE.

Exposure scenarios and numerical intake assumptions specific to each OU will be developed for the human exposure pathways to be quantified. Until this evaluation is

complete, questions such as into which potentially exposed population would a buyer visiting the mushroom farm once per week be placed, may not be obvious. The selection of exposure scenarios and intake assumptions that may be appropriate for the quantification of human exposure pathways applicable to each OU will be coordinated with the regulatory agencies.

The following assumptions have been made in identifying potential human exposure pathways at HPA:

- o Future residential civilian lease holders are expected to be considered under the future hypothetical onsite residential scenario. Currently no residential civilian lease holders are known to occupy the HPA site.
- o Current and future commercial civilian lease holders are expected to be considered under the current and future onsite worker scenarios.
- o Wastes spilled on building floors and outdoor pads that are not subject to interim remedial actions are expected to be evaluated during remedial investigations being conducted for each of the OUs. The risk assessment will be evaluated based on the condition of the spill area and analytical results for any sampling completed.
- o Groundwater is not considered a potential source of drinking water (EPA Class III) if it has total dissolved solids greater than 10,000 ppm. Due to the mixed hydrogeochemistry of the groundwater below HPA, the TDS content of the groundwater is expected to be variable. Potential future groundwater uses will be evaluated on an OU-specific basis, depending on the TDS content (or potability) of the groundwater at each OU. No current uses of groundwater have been identified at HPA.
- o Use of bay waters in the vicinity of HPA for current and future recreational purposes such as swimming will be considered in the BPHEE under the onsite recreational user scenario.
- o The bay waters were assumed not to be used currently or in the future for domestic or municipal water, based on salinity and total dissolved solids consideration.
- o HPA is assumed not to contain current or future surface water bodies onsite.

- o HPA is not considered to be used for growing fruits and vegetables currently. A future hypothetical residential population will be evaluated based on the potential ingestion of homegrown fruits and vegetables from HPA sites.
- o Onsite occasional users are defined as having occasional access to HPA for the purpose of conducting business or making personal visits. Unauthorized visitors (trespassers) are also included in this receptor population. The exposure scenarios and assumptions for an onsite occasional user will be different from an onsite recreational user.
- o A current onsite recreational user is defined as a receptor population using the bay waters in the immediate vicinity of HPA for water-recreational sports and activities such as fishing, boating and swimming. A separate evaluation for current offsite recreational users is not being considered although the proximity of some sites to offsite recreational areas may require a separate evaluation for an offsite recreational user. Further information on offsite recreational users, if applicable, will be provided in the OU-specific exposure pathways evaluation. Future onsite recreational users include a receptor population using HPA areas for non-water recreation sports and activities.
- o A current onsite residential scenario is not assumed for the HPA BPHEE although a future hypothetical onsite residential scenario will be considered.
- o The primary media of concern with regard to homegrown fruits and vegetables include soil and groundwater.
- o The primary media of concern with regard to fish and shellfish include groundwater, bay sediments, and the bay waters.
- o The primary media of concern with regard to inhalation include soil and groundwater, and the bay waters.

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Current Land Use			
Onsite Workers (Adults)	1) Inhalation of volatile chemicals in outdoor air	Yes	Assumes volatilization of chemicals from soil and/or groundwater
	2) Inhalation of chemicals adsorbed onto dust particulates in outdoor air	Yes	Assumes airborne emissions of chemicals adsorbed onto soil particulates
	3) Inhalation of volatile chemicals in indoor air from soil and/or groundwater	Yes	Assumes volatilization of chemicals from soil and/or groundwater and migration into a building
	4) Inhalation of chemicals adsorbed onto dust particulates in indoor air	No	Assumes exposures from exposure pathway #2 will be representative, therefore separate evaluation may not be necessary
	5) Ingestion of soil	Yes	Assumes direct contact with chemicals in soil
	6) Dermal contact with soil	Yes	Assumes direct contact with chemicals in soil
	7) Inhalation of volatile chemicals in groundwater during domestic use (i.e., showering)	No	Unlikely; groundwater not currently a domestic or municipal water source
	8) Ingestion of groundwater as a drinking water source	No	Unlikely; groundwater not currently a domestic or municipal water source

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Current Land Use			
Onsite Workers (Adults) (continued)	9) Dermal contact with groundwater during domestic use	No	Unlikely; groundwater not currently a domestic or municipal water source
Onsite Occasional Users (Adults and Children)	10) Inhalation of volatile chemicals in outdoor air	Yes	Assumes volatilization of chemicals from soil and/or groundwater
	11) Inhalation of chemicals adsorbed onto dust particulates in outdoor air	Yes	Assumes contact (via inhalation pathway) with adsorbed chemicals on airborne soil particulates
	12) Inhalation of volatile chemicals in indoor air from soil and/or groundwater	Yes	Assumes volatilization of chemicals from soil and/or groundwater and migration into a building
	13) Inhalation of chemicals adsorbed onto dust particulates in indoor air	No	Assumes exposures from exposure pathway #11 will be representative, therefore separate evaluation may not be necessary
	14) Ingestion of soil	Yes	Assumes direct contact with chemicals in soil
	15) Dermal contact with soil	Yes	Assumes direct contact with chemicals in soil
Onsite Recreational User (Adults and Children)	16) Inhalation of volatile chemicals in bay water during swimming	Yes	Assumes current recreational use in HPA vicinity
	17) Ingestion of bay water during swimming	Yes	Assumes current recreational use in HPA vicinity

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Current Land Use			
Onsite Recreational User (Adults and Children) (continued)	18) Dermal contact with bay water during swimming	Yes	Assumes current recreational use in HPA vicinity
	19) Ingestion of fish and shellfish from bay waters	Yes	Assumes fishing from bay waters in HPA vicinity
Offsite Residents (Adults and Children)	20) Inhalation of site-related volatile chemicals in offsite outdoor air	Yes	Assumes volatilization and offsite migration of airborne (vapor phase) chemicals from soil and/or groundwater
	21) Inhalation of site-related chemicals adsorbed onto dust particulates in offsite outdoor air	Yes	Assumes airborne emissions of chemicals adsorbed onto airborne soil particulates migrating offsite
	22) Inhalation of volatile chemicals in indoor and/or outdoor air from offsite groundwater plume	Yes	Groundwater plume needs to be identified prior to exclusion of this pathway
	23) Inhalation of chemicals adsorbed onto dust particulates in indoor air	No	Assumes exposures from exposure pathway #21 will be representative, therefore separate evaluation may not be necessary
	24) Inhalation of volatile chemicals in groundwater during domestic use (i.e., showering)	No	Unlikely, groundwater not currently a domestic or municipal water source

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Current Land Use			
Offsite Residents (Adults and Children) (continued)	25) Ingestion of soil	Yes	Assumes offsite migration of dust emissions and deposition in offsite areas
	26) Dermal contact with soil	Yes	Assumes offsite migration of dust emissions and deposition in offsite areas
	27) Ingestion of groundwater as a drinking water source	No	Unlikely; groundwater not currently a domestic or municipal water source; spring unlikely to be impacted by site based on hydrogeologic conditions
	28) Dermal contact with groundwater during household use	No	Unlikely; groundwater not currently a domestic or municipal water source
	29) Ingestion of fish and shellfish from bay waters	Yes	Assumes fishing from bay waters in HPA vicinity
Future Land Use			
Onsite Workers (Adults)	30) Pathways assumed to be equivalent to Current Onsite Workers (Adult)	--	--

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Future Land Use			
Onsite Occasional Users (Adults and Children)	31) Pathways assumed to be equivalent to current onsite occasional users (adults and children)	--	--
Onsite Recreational Users (Adults and Children)	32) Inhalation of volatile chemicals in outdoor air	Yes	Assumes volatilization of chemicals from soil and/or groundwater
	33) Inhalation of chemicals adsorbed onto dust particulates in outdoor air	Yes	Assumes airborne emissions of chemicals adsorbed onto soil particulates
	34) Inhalation of volatile chemicals in indoor air from soil and/or groundwater	Yes	Assumes volatilization of chemicals and migration into an onsite building used for recreational purposes
	35) Inhalation of chemicals adsorbed onto dust particulates in indoor air	No	Assumes exposures from exposure pathway #33 will be representative, therefore separate evaluation may not be necessary
	36) Inhalation of volatile chemicals in bay water during swimming	Yes	Assumes future recreational use of bay
	37) Ingestion of soil	Yes	Assumes direct contact with chemicals in soil

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Future Land Use			
Onsite Recreational Users (Adults and Children) (continued)	38) Dermal contact with soil	Yes	Assumes direct contact with chemicals in soil
	39) Ingestion of groundwater as a drinking water source	Yes	Potability of groundwater will be evaluated on site-by-site basis prior to exclusion of this pathway
	40) Ingestion of bay water during swimming	Yes	Assumes future recreational use of bay
	41) Dermal contact with bay water during swimming	Yes	Assumes future recreational use of bay
	42) Ingestion of fish and shellfish from bay waters	Yes	Assumes fishing from bay waters in HPA vicinity
Onsite Residents (Adults and Children)	43) Inhalation of volatile chemicals in outdoor air	Yes	Assumes volatilization of chemicals from soil and/or groundwater in HPA vicinity
	44) Inhalation of chemicals adsorbed onto soil particulates in outdoor air	Yes	Assumes airborne emissions of chemicals adsorbed onto soil particulates
	45) Inhalation of volatile chemicals in indoor air from soil and/or groundwater	Yes	Assumes volatilization of chemicals from soil and/or groundwater

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Future Land Use			
Onsite Residents (Adults and Children) (continued)	46) Inhalation of chemicals adsorbed onto dust particulates in indoor air	No	Assumes exposures from exposure pathway #34 will be representative, therefore separate evaluation may not be necessary
	47) Ingestion of soil	Yes	Assumes direct contact with chemicals in soil
	48) Dermal contact with soil	Yes	Assumes direct contact with chemicals in soil
	49) Inhalation of volatile chemicals in groundwater during domestic use (i.e., showering)	Yes	Assumes groundwater used for domestic purposes
	50) Ingestion of groundwater as a drinking water source	Yes	Potability of groundwater will be evaluated on a site-by-site basis prior to exclusion of this pathway
	51) Dermal contact with groundwater during domestic use (i.e., showering)	Yes	Assumes groundwater used for domestic purposes
	52) Ingestion of homegrown fruits and vegetables	Yes	Assumes gardens to be used for homegrown fruits and vegetables
	53) Ingestion of fish and shellfish from bay waters	Yes	Assumes fishing from bay waters in HPA vicinity

Table A-1. Potential Exposure Pathways To be Considered for Hunters Point Annex BPHEE

Potentially Exposed Population	Exposure Pathway	Considered for Evaluation	Comments
Future Land Use			
Offsite Residents (Adults and Children)	54) All pathways assumed to be equivalent to Current Offsite Residents (Adults and Children) except the following:	--	--
	55) Ingestion of groundwater drinking water source	Yes	Changes in land use and potability of groundwater need to be identified prior to exclusion of this pathway
	56) Dermal contact with groundwater during household use	Yes	Changes in land use need to be identified prior to exclusion of this pathway
	57) Ingestion of fish and shellfish from bay waters	Yes	Groundwater plume needs to be identified prior to exclusion of this pathway

Table A-2. Potential Exposure Pathways to be Considered for Hunters Point Annex BPHEE

Pathway of Exposure	Current				Future				
	Onsite Worker (Adults)	Onsite Occasional Users (Adults & Children)	Onsite Recreational Users (Adults & Children)	Offsite Residents (Adults & Children)	Onsite Worker (Adults)	Onsite Occasional Users (Adults & Children)	Onsite Recreational Users (Adults & Children)	Onsite Residents (Adults & Children)	Offsite Residents (Adults & Children)
INHALATION PATHWAYS									
Inhalation of volatile chemicals in outdoor air	Y	Y	--	--	Y	Y	Y	Y	--
Inhalation of chemicals adsorbed onto soil particulates in outdoor air	Y	Y	--	--	Y	Y	Y	Y	--
Inhalation of volatile chemicals in indoor air from soil and/or groundwater	Y	Y	--	--	Y	Y	Y	Y	--
Inhalation of chemicals adsorbed onto dust particulates in indoor air	N	N	--	N	N	N	N	N	N
Inhalation of volatile chemicals in bay water during swimming	N/A	--	Y	--	N/A	--	Y	--	--
Inhalation of site-related volatile chemicals in offsite outdoor air	N/A	N/A	N/A	Y	N/A	N/A	N/A	N/A	Y
Inhalation of site-related chemicals adsorbed onto soil particulates in offsite outdoor air	N/A	N/A	N/A	Y	N/A	N/A	N/A	N/A	Y
Inhalation of volatile chemicals in indoor and/or outdoor air from offsite groundwater plume	N/A	N/A	N/A	Y	N/A	N/A	N/A	N/A	Y
Inhalation of volatile chemicals in groundwater during domestic use (i.e., showering)	N	--	--	N	N	--	--	Y	N
INGESTION PATHWAYS									
Ingestion of soil	Y	Y	--	Y	Y	Y	Y	Y	Y
Ingestion of groundwater as a drinking water source	N	--	--	N	N	--	Y	Y	Y
Ingestion of bay water during swimming	N/A	--	Y	--	N/A	--	Y	--	--
Ingestion of fish and shellfish from bay waters	N/A	--	Y	Y	N/A	--	Y	Y	Y
Ingestion of homegrown fruits and vegetables	N/A	--	--	--	N/A	--	--	Y	--
DERMAL PATHWAYS									
Dermal contact with soil	Y	Y	--	Y	Y	Y	Y	Y	Y
Dermal contact with bay water during swimming	N/A	--	Y	--	N/A	--	Y	--	--
Dermal contact with groundwater during household use (i.e., showering)	N	--	--	N	N	--	--	Y	Y

N = Excluded from further evaluation

Y = Included for further evaluation

-- = Pathway does not exist or is not likely to occur; pathway may be considered under other receptor population; see text for further explanation

N/A = Pathway not applicable to receptor