APTER \h \r 1]UNITED STATE ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL RESPONSE TEAM - WEST
4220 S. MARYLAND PARKWAY
BUILDING D, SUITE 800
LAS VEGAS, NEVADA 89119

September 26, 2017

MEMORANDUM

SUBJECT: Recreator Scenario for Soil PRG values assuming 20cm cover using Chemical from Soil Parameters

FROM: Lyndsey Nguyen
Health Physicist, Environmental Response Team-West (ERT-W)

TO: File for Hunter's Point Naval Shipyard (HPNS)
Attn: Lily Lee, Remedial Project Manager (RPM), Region 9

A Preliminary Remediation Goal (PRG) calculation for a recreator scenario for soil was performed using the parameters listed in Attachment A, "Parameters for Inhalation of Volatile and Particulate Chemicals from Soil." The values set in the PRG calculator for concentrations were the Release Criteria for residential (i.e. assuming that the recreational activities are done on residential properties or areas with residential site characteristics). The Release Criteria for each radionuclide of concern is listed in Attachment B. Assumptions that were made for the receator scenario were:

Exposure Duration (adult) = 24 years
Exposure Duration (child) = 6 years
Inhalation rate (adult)* = $20m^3$/day or $0.83m^3$/hr
Inhalation rate (child)* = $10m^3$/day or $0.42m^3$/hr
Exposure frequency (adult) = 250 days/year
Exposure frequency (child) = 250 days/year
Exposure time (adult) = 2.5 hours/day
Exposure time (child) = 2.5 hours/day
Area Correction Factor (ACF) = 1000000 (to mimic infinite plane geometry)
Gamma Shielding Factor (GSF) = 20cm
Vegetation Factor = 0.5
Acres = 420
* Inhalation and ingestion rates were kept in the scenario since inhalation rates were set in the chemical parameters

The results from the risk assessment of the RGs with the site specific parameters as the chemical risk assessment can be seen in Attachment C, as well as the PRG values for the recreator scenario for soil.

Attachment A

Parameters for Inhalation of Volatile and Particulate Chemicals from Soil

Parameter	Resident[a]		Industrial Worker[a]	Recreator[b]		Construction Worker[c]
	Adult	Child		Adult	Child	
Exposure point concentration (EPC) in air (mg/m^3)	Chemical-specific[d]	Chemical-specific[d]	Chemical-specific[d]	Chemical-specific[d]	Chemical-specific[d]	Chemical-specific[d]
Inhalation rate (IR) (m^3/hour)	0.83	0.42	2.5	0.83	0.42	2.5
Exposure Time (ET) (hour/day)	24	24	8	2.5	2.5	8
Exposure frequency (EF) (days/year)	350	350	250	250[e]	250[e]	250
Exposure duration (ED) (years)	24	6	25	24	6	1
Body weight (BW) (kilograms)	70	15	70	70	15	70
Averaging time for noncarcinogens (AT) (days)	8,760	2,190	9,125	8,760	2,190	365
Averaging time for carcinogens (AT) (days)	25,550	25,550	25,550	25,550	25,550	25,550

Notes:

a All exposure parameters are based on EPA (2004a) unless otherwise noted.

b Values based on a resident unless otherwise noted.

c Values based on EPA (2002c).

d Chemical-specific exposure concentrations in air (m^3/day) are derived using the methodology presented in EPA (2004a).

e Based on Navy (2004).

EPA U.S. Environmental Protection Agency

m^3/hour Cubic meter per hour

mg/kg-day Milligram per kilogram per day

mg/m^3 Milligram per cubic meter

Navy U.S. Department of the Navy

Sources:

EPA. 2002c. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites." Office of Solid Waste and Emergency Response (OSWER). OSWER 9355.4-24. December.

EPA. 2004a. "Region 9 Preliminary Remediation Goals (PRG) Table." October 1. Available Online at: <http://www.epa.gov/region09/waste/sfund/prg/index.htm>.

Navy. 2004. Memorandum Regarding Proposed Path Forward for the Parcel B Human Health Risk Assessment. From Keith S. Forman, Base Realignment and Closure Environmental Coordinator. To Michael Work, EPA Region 9; Tom Lanphar, California Department of Toxic Substances Control; Jim Ponton, California Regional Water Quality Control Board, San Francisco Bay Region. April 14.

Attachment B

Release Criteria

Radionuclide	Surfaces			Soil[d] (pCi/g)				Water[h] (pCi/L)
	Equipment, Waste (dpm/100 cm^2)[a]	Structures (dpm/100 cm^2)[b]	Residual Dose (mrem/yr)[c]	Outdoor Worker (pCi/g)[f]	Residual Dose (mrem/yr)[c]	Residential (pCi/g)[e]	Residual Dose (mrem/yr)[c]	
Americium-241	100	100	18.7	5.67	0.8661	1.36	24.84	15
Cesium-137	5,000	5,000	1.72	0.113	0.2142	0.113	0.2561	119
Cobalt-60	5,000	5,000	6.01	0.0602	0.5164	0.0361	0.3918	100
Europium-152	5,000	5,000	3.21	0.13[f]	0.5018	0.13[f]	0.502	60
Europium-154	5,000	5,000	3.49	0.23[f]	0.9593	0.23[f]	0.9599	200
Plutonium-239	100	100	18.1	14.0	1.743	2.59	1.138	15
Radium-226	100	100	0.612	1.0[g]	6.342	1.0[g]	14.59	5[i]
Strontium-90	1,000	1,000	0.685	10.8	0.1931	0.331	1.648	8
Thorium-232	1,000	36.5	24.9	2.7	24.91	1.07 1.69	25	15
Tritium	5,000	5,000	0.00053	4.23	0.00179	2.28	0.05263	20,000
Uranium-235+D	5,000	488	25	0.398	0.178	0.195	0.8453	30

Notes:

Risk 10^{-4} @ 25 mrem

[a] These limits are based on AEC *Regulatory Guide 1.86* (1974). Limits for removable surface activity are 20 percent of these values. Risk [illegible]

[b] These limits are based on 25 mrem/yr, using RESRAD-Build Version 3.3 or *Regulatory Guide 1.86*, whichever is lower.

[c] The resulting dose is based on modeling using RESRAD-Build Version 3.3 or RESRAD Version 6.3, with radon pathways turned off.

[d] EPA PRGs for two future-use scenarios.

[e] The on-site and off-site laboratory will ensure that the MDA meets the listed release criteria by increasing sample size or counting time as necessary. The MDA is defined as the lowest net response level, in counts, that can be seen with a fixed level of certainty, customarily 95 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.

Attachment C

PRG Output for Recreator using Chemical Risk Parameters with HPNS Release Criteria

Site-Specific
Recreator Equation Inputs for Soil - Secular Equilibrium

Variable	Value
Cover layer thickness for GSF (gamma shielding factor) cm	20
Site area for ACF (area correction factor) m^2	1000029
TR (target cancer risk) unitless	0.0001
t_{rec} (time - recreator) yr	30
ED_{rec} (exposure duration - recreator) yr	30
$ED_{rec,c}$ (exposure duration - recreator child) yr	6
$ED_{rec,a}$ (exposure duration - recreator adult) yr	24
ET_{rec} (exposure time - recreator) hr/day	2.5
$ET_{rec,c}$ (exposure time - recreator) hr/day	2.5
$ET_{rec,a}$ (exposure time - recreator) hr/day	2.5
EF_{rec} (exposure frequency - recreator) day/yr	250
$EF_{rec,c}$ (exposure frequency - recreator child) day/yr	250
$EF_{rec,a}$ (exposure frequency - recreator adult) day/yr	250
$IFS_{rec,adj}$ (age-adjusted soil intake rate - recreator) mg	900000
$IRS_{rec,c}$ (soil intake rate - recreator child) mg/day	200
$IRS_{rec,a}$ (soil intake rate - recreator adult) mg/day	100
$IFA_{rec,adj}$ (age-adjusted inhalation rate - recreator) m^3	14062.5
$IRA_{rec,c}$ (inhalation rate - recreator child) m^3/day	10
$IRA_{rec,a}$ (inhalation rate - recreator adult) m^3/day	20
City (Climate Zone)	26
A_s (acres)	420
Q/C_{wp} (g/m²-s per kg/m³)	32.359832679927
PEF (particulate emission factor) m^3/kg	4078965031.9716
A (PEF Dispersion Constant)	13.8139
B (PEF Dispersion Constant)	20.1624
C (PEF Dispersion Constant)	234.2869
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	3.89
U_t (equivalent threshold value)	11.32
F(x) (function dependant on U_m/U_t) unitless	0.0391

Site-Specific
Recreator PRGs for Soil - Secular Equilibrium

Isotope	Ingestion PRG TR=0.0001 (pCi/g)	Inhalation PRG TR=0.0001 (pCi/g)	External Exposure PRG TR=0.0001 (pCi/g)	Total PRG TR=0.0001 (pCi/g)
*Secular Equilibrium PRG for Am-241	6.97E+01	8.95E+04	4.55E+02	**6.04E+01**
*Secular Equilibrium PRG for Co-60	2.92E+03	2.88E+08	2.90E+01	**2.88E+01**
*Secular Equilibrium PRG for Cs-137	2.61E+03	2.58E+08	2.25E+02	**2.07E+02**
*Secular Equilibrium PRG for Eu-152	1.84E+03	3.35E+06	7.86E+01	**7.53E+01**
*Secular Equilibrium PRG for Eu-154	4.38E+03	1.41E+08	7.26E+01	**7.14E+01**
*Secular Equilibrium PRG for H-3	-	1.43E+02	-	**1.43E+02**
*Secular Equilibrium PRG for Pu-239	6.55E+01	7.84E+04	5.08E+02	**5.90E+01**
*Secular Equilibrium PRG for Ra-226	1.95E+01	4.90E+05	4.65E+01	**1.37E+01**
*Secular Equilibrium PRG for Sr-90	8.20E+02	6.68E+07	6.48E+04	**8.10E+02**
*Secular Equilibrium PRG for Th-232	3.83E+01	1.25E+05	2.35E+01	**1.46E+01**
*Secular Equilibrium PRG for U-235	7.56E+01	9.22E+04	5.08E+02	**6.58E+01**

Site-Specific
Recreator Risk for Soil - Secular Equilibrium

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Total Risk
*Secular Equilibrium Risk for Am-241	1.95E-06	1.52E-09	2.99E-07	**2.25E-06**
*Secular Equilibrium Risk for Co-60	1.24E-09	1.25E-14	1.24E-07	**1.26E-07**
*Secular Equilibrium Risk for Cs-137	4.33E-09	4.38E-14	5.03E-08	**5.46E-08**
*Secular Equilibrium Risk for Eu-152	7.07E-09	3.88E-12	1.65E-07	**1.73E-07**
*Secular Equilibrium Risk for Eu-154	5.25E-09	1.63E-13	3.17E-07	**3.22E-07**
*Secular Equilibrium Risk for H-3	-	1.60E-06	-	**1.60E-06**
*Secular Equilibrium Risk for Pu-239	3.96E-06	3.30E-09	5.10E-07	**4.47E-06**
*Secular Equilibrium Risk for Ra-226	5.12E-06	2.04E-10	2.15E-06	**7.27E-06**
*Secular Equilibrium Risk for Sr-90	4.03E-08	4.95E-13	5.10E-10	**4.09E-08**
*Secular Equilibrium Risk for Th-232	4.41E-06	1.35E-09	7.18E-06	**1.16E-05**
*Secular Equilibrium Risk for U-235	2.58E-07	2.11E-10	3.84E-08	**2.96E-07**
*Total Risk	1.58E-05	1.60E-06	1.08E-05	**2.82E-05**