Chapter 5
EIS/EIR Appendices

There are no changes to the Draft EIS/EIR appendices in Volume II, except as follows.

- Appendix I, Calculation of Screening Benchmark Values for Evaluation of Potential Impacts to Waterfowl.

  The calculation of the formula for screening benchmark values (SBVs) is correctly implemented in the spreadsheet; however, the representation of the algorithm was missing a bracket. The spreadsheet has been edited and is included in the following pages. Additional reference material has been added to the footnotes and text. The edits to this appendix do not change the outcome of the risk or the risk management decisions that have been made relative to project operations, in that birds are at risk from dietary exposure to one or more chemicals under existing and operational conditions when NUAD material is accepted at the site.

- Appendix K, Calculated Estimates of Air Quality Emissions.

  The proposed action includes an additional environmental commitment that would limit mechanical unloading operations to 14 hours per day (between 7:00 a.m. and 9:00 p.m.). This environmental commitment would reduce the maximum mechanical dredge placement volume to 2,400 cubic yards per day. Total truck trips would be reduced to 150 trips per day, crane operations would be reduced to 14 hours per day, and the number of barge calls would be reduced from 3 to 2 calls. This commitment would have a corresponding reduction in daily air pollutant emissions. The revised emissions calculations for mechanical offloading are shown in the table below in Response to Comment X-A-34 (Volume IV, Chapter 3). The table is an excerpt from Table 3.6-7 in Section 3.6 and from Appendix K (Volume II).

These revisions to Appendix I and K are hereby incorporated into the Final EIS/EIR

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CALCULATION OF SCREENING BENCHMARK VALUES FOR EVALUATION OF POTENTIAL IMPACTS TO WATERFOWL

Screening benchmark values (SBVs) were calculated for evaluation of potential risks associated with ingestion of prey and incidental ingestion of sediment in the disposal ponds for three species of waterfowl that could use the disposal ponds as foraging habitat.

Characteristics and behavior of three species of waterfowl [western sandpiper *(Calidris mauri)*, Bonaparte's gull (*Larus philadelphia*), and the American mallard (*Anas platyrhynchos*)] were selected to act as surrogates for all species of waterfowl that may use the ponds. These species were selected because they were either residents in the North San Francisco Bay region or had long migratory periods through the area. In addition, these species were used to represent different feeding habits, prey preference, and foraging habitat.

Western Sandpiper

The western sandpiper is a migratory shorebird that feeds by probing the top inch of saturated sediments at tidal margins for small invertebrates. Incidental ingestion of sediment while probing is common. Primary shorebird foraging areas include tidal sand and mudflats. Salt basins, ponds, and levees are used as secondary foraging areas or refuge when primary habitat is not available due to tide height, storms, or other intermittent factors. The Mare Island DMDF ponds represent only a small fraction of the optimal habitat available to shorebirds in the North Bay region.

Sandpipers and other shorebirds tend to have peak abundances during spring (mid-April through mid-May) and late summer/fall (mid-July through mid-October) migrations. However, a portion of the population can over-winter (September through mid-April).

Bonaparte's Gull

Bonaparte's gull was used to represent gulls that feed opportunistically on fish and invertebrates. Gulls range over large areas of the bay while searching for food. It was assumed that disposal of dredged material would attract such opportunistic feeders due to the potential presence of invertebrates and small fishes entrained in the sediment during the dredging operation. However, no live prey is expected to be present at the time of discharge because dredging, transport, and hydraulic offloading would smother or crush most organisms that got caught in the dredge.

Bonaparte's gulls are migratory and have peak abundances during a two-month period in the spring and again in the fall. However, gulls can occur at any time during the year (although they are rare from May through mid-August).

American Mallard

The mallard is a dabbling duck that feeds primarily on aquatic vegetation in shallow water (less than 18 inches) or flooded fields; however, invertebrates were included as a dietary component

to account for the increased ingestion of insects and other invertebrates during their 3-month breeding season.

Mallards may occur at the Mare Island DMDF during any period when ponding occurs. However, mallards tend to move inland to Suisun Marsh or farther upstream during winter months (late November through early February) to avoid storms and rougher conditions.

Screening Benchmark Calculation

SBVs were calculated for each species using a general form of the risk equation and back-calculating to a protective sediment concentration:

$$SBV_{sediment} = BW*TRV*HQ / [[(1-TM_1)*IR_{prey1}*BAF_1 + (1-TM_2)*IR_{prey2}*BAF_2) + IR_{sediment}]* SUF*TUF]$$

Where: BW= body weight (kg)
TRV=toxicity reference value (mg/kg/day)
HQ= hazard quotient (unitless)
TM = tissue moisture (percent)
IR_{prey1} = ingestion rate of primary prey (kg/day)
BAF_1 = bioaccumulation factor for primary prey
IR_{prey2} = ingestion rate of secondary prey (kg/day)
BAF_2 = bioaccumulation factor for secondary prey
SUF = site utilization factor (unitless)
TUF = temporal utilization factor (unitless)

Body weights, ingestion rates, and tissue moisture content values were derived from the literature (see SBV tables for citations). Toxicity reference values were calculated using factors from EPA Region 9 BTAG Toxicity Reference Values for Wildlife (EPA 2000). The attached spreadsheet "TRV Calculations" provides details for TRV calculations. Bioaccumulation factors for primary and secondary prey are based on site-specific data collected as part of the Remedial Investigation for Investigation Areas I (partial) and J, and the Western Submerged Lands (WESTON (2002). ~~Mare Island Onsite Remedial Investigation (Tetra Tech/EMI 2001).~~ WESTON also consulted with Jules Evens of Avocet Consulting in the development of site and temporal utilization factors. Details regarding the assumptions used and calculations made can also be found in the attached ~~sheets~~ tables.

The resulting SBVs (see the attached ~~spreadsheets~~ tables) were compared to the sediment quality in the disposal ponds under existing and operational conditions. Annual operational conditions were assumed to include up to ~~3~~ 1.5 mcy of dredged material, with ~~1 mcy~~ 200,000 cy representing material that is unsuitable for open water disposal (i.e., most is clean material) to determine if ingestion of prey or incidental ingestion of sediment could represent a hazard to waterfowl. SBVs were also compared to ambient conditions in the North Bay region.

Table 1—Existing Conditions

Draft Sandpiper Dose Calculations[a]
Onshore ERA—Mare Island
Existing Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	TTL_{invert} [e,f] (mg/kg)	Other BAF	TTL_{other} [e,f] (mg/kg)	$TRV_{sandpiper}$ [c,d] (mg/kg/day)	Sediment SBV[e,g] (mg/kg)	Disposal Ponds	
							50th Percentile Mare Island Sediment (mg/kg)[o]	Exceeds Sediment SBV ?
Investigation Area I								
Metals								
Arsenic	0.29	204.56	1.00	--	4.38	23	15.1	NO
Cadmium	0.15	31.00	1.00	--	0.66	4	0.7	NO
Chromium	0.07	21.04	1.00	--	0.45	2	94	YES
Copper	0.23	77.18	1.00	--	1.65	9	76	YES
Lead	0.07	6.11	1.00	--	0.13	1	39	YES
Mercury	1.52	1.50	1.00	--	0.03	0.15	0.49	YES
Nickel	0.09	406.63	1.00	--	8.72	46	100	YES
Selenium	1.26	8.82	1.00	--	0.19	0.89	1.2	YES
Zinc	0.29	279.49	1.00	--	5.99	31	156	YES
PAHs								
Total PAHs	1.00	642.39	1.00	0.00	13.77	66	0.10	NO
Pesticides/PCBs								
Dieldrin	0.70	1.97	0.25	0.00	0.04229	0.21047	0.0004	NO
Total Chlordanes[h]	0.51	81.57	0.25	0.00	1.75	9	0.005	NO
Total DDTs[i]	400.07	0.05	0.25	0.00	0.00103	0.00012	0.005	YES
Total PCBs[j,n]	10.00	1.83	0.25	0.00	0.03913	0.09775	0.03	NO

	Value	Units
$IRprey^{k}$ =	0.01	kg/day
$IR_{sediment}^{l}$ =	0.01	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Other =	80%	unitless
Aquatic Invertebrates in Diet =	100%	unitless
Other in Diet =	0%	unitless
TUF^{m} =	83%	unitless
SUF^{m} =	58%	unitless
Body Weight =	0.0233	kg
Hazard Quotient =	1.00	unitless

$TTL_{prey1} = BW \times TRV \times HQ / [(1-TM_1) \times IR_{prey1} \times SUF \times TUF]$

$TTL_{prey2} = BW \times TRV \times HQ / [(1-TM_2) \times IR_{prey2} \times SUF \times TUF]$

$SBV_{sediment} = BW \times TRV \times HQ / [[((1-TM_1) \times IR_{prey1} \times BAF_1 + (1-TM_2) \times IR_{prey2} \times BAF_2) + IR_{sediment}] \times SUF \times TUF]$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the sandpiper were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5 .
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Existing conditions calculated from RI database Weston 2002

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA. Vernon Hills, IL
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 1-Future Operational Conditions: Accepting Unsuitable

Draft Sandpiper Dose Calculations[a]
Onshore ERA—Mare Island

COEC[a]	Aquatic Invertebrate BAF[b]	TTL_{invert}[e,f] (mg/kg)	Other BAF	TTL_{other}[e,f] (mg/kg)	$TRV_{sandpiper}$[d] (mg/kg/day)	Sediment $SBV^{e,g}$ (mg/kg)	Disposal Ponds	
							Mare Island Sediment Acceptance Criteria[o] (mg/kg)	Exceeds Sediment SBV ?
Investigation Area 1								
Metals								
Arsenic	0.29	205	1.00	--	4.38	23	70	YES
Cadmium	0.15	31	1.00	--	0.66	4	9.6	YES
Chromium	0.07	21	1.00	--	0.45	2	370	YES
Copper	0.23	77	1.00	--	1.65	9	270	YES
Lead	0.07	6	1.00	--	0.13	1	292	YES
Mercury	1.52	1	1.00	--	0.03	0.15	1.4	YES
Nickel	0.09	407	1.00	--	8.72	46	149	YES
Selenium	1.26	9	1.00	--	0.19	0.89	3.4	YES
Zinc	0.29	279	1.00	--	5.99	31	595	YES
PAHs								
Total PAHs	1.00	642	1.00	--	13.77	66	44.80	NO
Pesticides/PCBs								
Dieldrin	0.70	2	0.25	0.00	0.042	0.21	0.005	NO
Total Chlordanes[h]	0.51	82	0.25	0.00	1.75	9	0.007	NO
Total DDTs[i]	400	0.05	0.25	0.00	0.00103	0.00012	0.6	YES
Total PCBs[j,n]	10.00	2	0.25	0.00	0.03913	0.10	0.5	YES

	Value	Units
$IRprey^{k}$ =	0.01	kg/day
$IR_{sediment}$[l] =	0.01	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Other =	80%	unitless
Aquatic Invertebrates in Diet =	100%	unitless
Other in Diet =	0%	unitless
TUF[m] =	83%	unitless
SUF[m] =	58%	unitless
Body Weight =	0.0233	kg
Hazard Quotient =	1.00	unitless

$$TTL_{prey1} = BW \times TRV \times HQ / [(1-TM_1) \times IR_{prey1} \times SUF \times TUF]$$

$$TTL_{prey2} = BW \times TRV \times HQ / [(1-TM_2) \times IR_{prey2} \times SUF \times TUF]$$

$$SBV_{sediment} = BW \times TRV \times HQ / [[((1-TM_1) \times IR_{prey1} \times BAF_1 + (1-TM_2) \times IR_{prey2} \times BAF_2) + IR_{sediment}] \times SUF \times TUF]$$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the sandpiper were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5 .
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Acceptance criteria based on existing conditions (Weston 2002) and beneficial reuse criteria (RWQCB 2000)

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
Weston 2002. Final Remedial Investigation. Investigation Areas I (partial) and J, and the Western Submerged Lands. Mare Island, Vallejo, CA. Prepared for DTSC. February
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).
Beneficial Reuse of Dredged Material: Sediment Screening and Testing Guidelines. Draft Staff Report. San Francisco Bay Regional Water Quality Control Board. May 2000

Table 1—Ambient Conditions

Draft Sandpiper Dose Calculations[a]
Onshore ERA—Mare Island
North Bay Ambient Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	TTL_{invert} [e,f] (mg/kg)	Other BAF	TTL_{other} [e,f] (mg/kg)	$TRV_{sandpiper}$ [c,d] (mg/kg/day)	Sediment SBV[e,g] (mg/kg)	Average San Pablo Bay Area Sediment (mg/kg)[o]	Exceeds Sediment SBV ?
Investigation Area I								
Metals								
Arsenic	0.29	131.30	1.00	--	4.38	15	10.7	NO
Cadmium	0.15	19.90	1.00	--	0.66	2	0.25	NO
Chromium	0.07	13.50	1.00	--	0.45	2	96	YES
Copper	0.23	49.54	1.00	--	1.65	6	44	YES
Lead	0.07	3.92	1.00	--	0.13	0.45	19	YES
Mercury	1.52	0.96	1.00	--	0.03	0.09	0.26	YES
Nickel	0.09	261.01	1.00	--	8.72	30	88	YES
Selenium	1.26	5.66	1.00	--	0.19	0.57	0.31	NO
Zinc	0.29	179.39	1.00	--	5.99	20	112	YES
PAHs								
Total PAHs	1.00	412.33	1.00	0.00	13.77	43	1.48	NO
Pesticides/PCBs								
Dieldrin	0.70	1.27	0.25	0.00	0.04	0.14	0.0004	NO
Total Chlordanes[h]	0.51	52.35	0.25	0.00	1.75	5.70	0.0008	NO
Total DDTs[i]	400.07	0.03	0.25	0.00	0.001	0.00008	0.004	YES
Total PCBs[j,n]	10.00	1.17	0.25	0.00	0.039	0.063	0.004	NO

	Value	Units
$IRprey^{k}$ =	0.01	kg/day
$IR_{sediment}^{l}$ =	0.01	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Other =	80%	unitless
Aquatic Invertebrates in Diet =	100%	unitless
Other in Diet =	0%	unitless
TUF^{m} =	75%	unitless
SUF^{m} =	100%	unitless
Body Weight =	0.0233	kg
Hazard Quotient =	1.00	unitless

TTL_{prey1} = BW x TRV x HQ / $[(1-TM_1) \times IR_{prey1} \times SUF \times TUF]$

TTL_{prey2} = BW x TRV x HQ / $[(1-TM_2) \times IR_{prey2} \times SUF \times TUF]$

$SBV_{sediment}$ = BW x TRV x HQ /$[[((1-TM_1) \times IR_{prey1} \times BAF_1 + (1-TM_2) \times IR_{prey2} \times BAF_2) + IRsediment] \times SUF \times TUF]$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the sandpiper were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5.
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o From SFEI Regional Monitoring Program Data Query for San Pablo Bay www.sfei.org/RMP/report#

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA. Verno Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 2—Existing Conditions

Draft Gull Dose Calculations[a]
Onshore ERA—Mare Island
Existing Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Fish BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{fish} [e,f] (mg/kg)	Sediment $SBV^{e,g}$ (mg/kg)	Disposal Ponds: 50th Percentile Mare Island Sediment (mg/kg)[o]	Disposal Ponds: Exceeds Sediment SBV ?
Investigation Area I									
Metals									
Arsenic	0.29	6.82	652.04	0.29	6.82	1,108	564	15.1	NO
Cadmium[x]	0.15	1.03	98.81	0.15	1.03	168	106	0.7	NO
Chromium	0.07	0.70	67.05	0.07	0.70	114	84	94	YES
Copper	0.23	2.57	246.01	0.23	2.57	418	232	76	NO
Lead	0.07	0.20	19.47	0.07	0.20	33.07	24	39	YES
Mercury	1.52	0.05	4.77	1.52	0.05	8.10	1.533	0.49	NO
Nickel[x]	0.09	13.56	1,296.17	0.09	13.56	2,202	1,562	100	NO
Selenium[x]	1.26	0.29	28.01	1.26	0.29	48	10	1.2	NO
Zinc	0.29	9.32	890.89	0.29	9.32	1,513	771	156	NO
PAHs									
Total PAHs	1.00	21.42	2,048.06	1.00	21.42	3,479	899	0.10	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0658	6.29	0.70	0.0658	10.68	3.4865	0.0004	NO
Total Chlordanes[h]	0.51	2.7192	260.00	0.51	2.72	441.69	174	0.005	NO
Total DDTs[i]	400.07	0.0016	0.15	400.07	0.0016	0.26	0.0002	0.005	YES
Total PCBs[j,n]	10.00	0.0609	5.82	10.00	0.0609	9.88	0.3510	0.03	NO

	Value	Units
$IRprey^{k}$ =	0.215	kg/day
$IR_{sediment}$ [l] =	0.0215	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Fish =	72%	unitless
Aquatic Invertebrates in Diet =	70%	unitless
Fish in Diet =	30%	unitless
TUF [m] =	71%	unitless
SUF [m] =	10%	unitless
Body Weight =	0.212	kg
Hazard Quotient =	1.00	unitless

$$TTL_{prey1} = BW \times TRV \times HQ / [(1\text{-}TM_1) \times IR_{prey1} \times SUF \times TUF]$$

$$TTL_{prey2} = BW \times TRV \times HQ / [(1\text{-}TM_2) \times IR_{prey2} \times SUF \times TUF]$$

$$SBV_{sediment} = BW \times TRV \times HQ / [[((1\text{-}TM_1) \times IR_{prey1} \times BAF_1 + (1\text{-}TM_2) \times IR_{prey2} \times BAF_2) + IR_{sediment}] \times SUF \times T$$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the gull were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5 .
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Existing conditions calculated from RI database Weston 2002

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA.
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 2-Operational Conditions: Accepting Unsuitable

Draft Gull Dose Calculations[a]
Onshore ERA—Mare Island
Future Operational Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Fish BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{fish} [e,f] (mg/kg)	Sediment $SBV^{e,g}$ (mg/kg)	Disposal Ponds: Mare Island Sediment Acceptance Criteria[a] (mg/kg)	Disposal Ponds: Exceeds Sediment SBV ?
Investigation Area 1									
Metals									
Arsenic	0.29	6.82	125.39	0.29	6.82	213	108	70	NO
Cadmium	0.15	1.03	19.00	0.15	1.03	32	20	9.6	NO
Chromium	0.07	0.70	12.89	0.07	0.70	22	16	370	YES
Copper	0.23	2.57	47.31	0.23	2.57	80	45	270	YES
Lead	0.07	0.20	3.74	0.07	0.20	6.36	5	292	YES
Mercury	1.52	0.05	0.92	1.52	0.05	1.56	0.295	1.4	YES
Nickel	0.09	13.56	249.26	0.09	13.56	423	300	149	NO
Selenium	1.26	0.29	5.39	1.26	0.29	9	2.00	3.4	YES
Zinc	0.29	9.32	171.32	0.29	9.32	291	148	595	YES
PAHs									
Total PAHs	1.00	21.4200	393.86	1.00	21.42	669	173	44.80	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0658	1.21	0.70	0.0658	2.05	0.6705	0.005	NO
Total Chlordanes[h]	0.51	2.7192	50.00	0.51	2.72	84.94	33	0.007	NO
Total DDTs[i]	400.07	0.0016	0.03	400.07	0.0016	0.05	0.0000	0.6	YES
Total PCBs[j,n]	10.00	0.0609	1.12	10.00	0.0609	1.90	0.0675	0.5	YES

	Value	Units
$IRprey^{k}$ =	0.215	kg/day
$IR_{sediment}$ [l] =	0.0215	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Fish =	72%	unitless
Aquatic Invertebrates in Diet =	70%	unitless
Fish in Diet =	30%	unitless
TUF [m] =	71%	unitless
SUF [m] =	52%	unitless
Body Weight =	0.212	kg
Hazard Quotient =	1.00	unitless

TTL_{prey1} = BW x TRV x HQ / [(1-TM_1) x IR_{prey1} x SUF x TUF]

TTL_{prey2} = BW x TRV x HQ / [(1-TM_2) x IR_{prey2} x SUF x TUF]

$SBV_{sediment}$ = BW x TRV x HQ /[[((1-TM_1) x IR_{prey1} x BAF_1 + (1-TM_2) x IR_{prey2} x BAF_2) + $IR_{sediment}$] x SUF x TUF]

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the gull were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5 .
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Acceptance criteria based on existing conditions (Weston 2002) and beneficial reuse criteria (RWQCB 2000)

References:
EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
Weston 2002. Final Remedial Investigation. Investigation Areas I (partial) and J, and the Western Submerged Lands. Mare Island, Vallejo, CA. Prepared for DTSC. February
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).
Beneficial Reuse of Dredged Material: Sediment Screening and Testing Guidelines. Draft Staff Report. San Francisco Bay Regional Water Quality Control Board. May 2000
Weston Solutions 2002. Final Remedial Investigation. Investigation Areas I (partial) and J, and the Western Submerged Lands. Mare Island, Vallejo, CA. Prepared for DTSC. March

Table 2—Ambient Conditions

Draft Gull Dose Calculations[a]
Onshore ERA—Mare Island
North Bay Ambient Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Fish BAF[b]	TRV_{gull} [c,d] (mg/kg/day)	TTL_{fish} [e,f] (mg/kg)	Sediment SBV[e,g] (mg/kg)	Average San Pablo Bay Area Sediment (mg/kg)[o]	Exceeds Sediment SBV ?
Investigation Area I									
Metals									
Arsenic	0.29	6.82	65.20	0.29	6.82	111	56	10.7	NO
Cadmium[x]	0.15	1.03	9.88	0.15	1.03	17	11	0.25	NO
Chromium	0.07	0.70	6.71	0.07	0.70	11	8	96	YES
Copper	0.23	2.57	24.60	0.23	2.57	42	23	44	YES
Lead	0.07	0.20	1.95	0.07	0.20	3.31	2	19	YES
Mercury	1.52	0.05	0.48	1.52	0.05	0.81	0.153	0.26	YES
Nickel[x]	0.09	13.56	129.62	0.09	13.56	220	156	88	NO
Selenium[x]	1.26	0.29	2.80	1.26	0.29	5	1.04	0.31	NO
Zinc	0.29	9.32	89.09	0.29	9.32	151	77	112	YES
PAHs									
Total PAHs	1.00	21.42	204.81	1.00	21.42	348	90	1.48	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0658	0.63	0.70	0.0658	1.07	0.3487	0.0004	NO
Total Chlordanes[h]	0.51	2.7192	26.00	0.51	2.72	44.17	17	0.0008	NO
Total DDTs[i]	400.07	0.0016	0.02	400.07	0.0016	0.03	0.000024	0.004	YES
Total PCBs[j,n]	10.00	0.0609	0.58	10.00	0.0609	0.99	0.0351	0.004	NO

	Value	Units
$IRprey^{k}$ =	0.215	kg/day
$IR_{sediment}$ [l] =	0.0215	kg/day
Tissue Moisture =	79%	unitless
Tissue Moisture Fish =	72%	unitless
Aquatic Invertebrates in Diet =	70%	unitless
Fish in Diet =	30%	unitless
TUF [m] =	71%	unitless
SUF [m] =	100%	unitless
Body Weight =	0.212	kg
Hazard Quotient =	1.00	unitless

$$TTL_{prey1} = BW \times TRV \times HQ / [(1\text{-}TM_1) \times IR_{prey1} \times SUF \times TUF]$$

$$TTL_{prey2} = BW \times TRV \times HQ / [(1\text{-}TM_2) \times IR_{prey2} \times SUF \times TUF]$$

$$SBV_{sediment} = BW \times TRV \times HQ / [[((1\text{-}TM_1) \times IR_{prey1} \times BAF_1 + (1\text{-}TM_2) \times IR_{prey2} \times BAF_2) + IR_{sediment}] \times SUF \times T$$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the sandpiper were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5.
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o From SFEI Regional Monitoring Program Data Query for San Pablo Bay www.sfei.org/RMP/report#

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA. V
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 3—Existing Conditions

Draft Mallard Dose Calculations[a]
Onshore ERA—Mare Island
Existing Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Aquatic Vegetation BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{veg} [e,f] (mg/kg)	Sediment SBV[e,g] (mg/kg)	Disposal Ponds: 50th Percentile Mare Island Sediment (mg/kg)[o]	Disposal Ponds: Exceeds Sediment SBV ?
Investigation Area 1									
Metals									
Arsenic	0.29	9.45	7,394.41	0.01	9.45	1,967.10	7,730	15.1	NO
Cadmium[x]	0.15	1.43	1,120.53	0.05	1.43	298.09	1,139	0.7	NO
Chromium	0.07	0.97	760.39	0.17	0.97	202.28	566	94	NO
Copper	0.23	3.56	2,789.92	0.01	3.56	742.19	3,126	76	NO
Lead	0.07	0.28	220.78	0.00132	0.28	58.73	311	39	NO
Mercury	1.52	0.07	54.07	0.11	0.07	14.38	21	0.49	NO
Nickel[x]	0.09	18.78	14,699.13	0.00333	18.78	3,910.35	19,930	100	NO
Selenium[x]	1.26	0.41	317.76	0.00435	0.41	84.53	166	1.2	NO
Zinc	0.29	12.91	10,103.04	0.04	12.91	2,687.67	9,242	156	NO
PAHs									
Total PAHs	1.00	29.68	23,229.45	1.00	29.68	6,179.63	4,306	0.10	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0911	71.32	0.62	0.0911	18.97	19	0.0004	NO
Total Chlordanes[h]	0.51	3.77	2,948.48	0.82	3.77	784.37	699	0.005	NO
Total DDTs[i]	400.07	0.0022	1.73	0.75	0.0022	0.46	0.0043	0.005	YES
Total PCBs[j,n]	10.00	0.0843	65.98	0.11	0.0843	17.55	5.97	0.03	NO

	Value	Units
$IRprey^{k}$ =	0.0613	kg/day
$IR_{sediment}^{l}$ =	0.0020	kg/day
Tissue Moisture Invertebrates =	79%	unitless
Tissue Moisture Aquatic Vegetation =	74%	unitless
Aquatic Invertebrates in Diet =	25%	unitless
Aquatic Vegetation in Diet =	75%	unitless
TUF^{m} =	75%	unitless
SUF^{m} =	58%	unitless
Body Weight =	1.08	kg
Hazard Quotient =	1.00	unitless

$TTL_{prey1} = BW \times TRV \times HQ / [(1-TM_1) \times IR_{prey1} \times SUF \times TUF]$

$TTL_{prey2} = BW \times TRV \times HQ / [(1-TM_2) \times IR_{prey2} \times SUF \times TUF]$

$SBV_{sediment} = BW \times TRV \times HQ / [[((1-TM_1) \times IR_{prey1} \times BAF_1 + (1-TM_2) \times IR_{prey2} \times BAF_2) + IR_{sediment}] \times SUF \times TUF]$

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the mallard were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5.
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Existing conditions calculated from RI database Weston 2002

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA. Vernon
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 3-Operational Conditions: Accepting Unsuitable

Draft Mallard Dose Calculations[a]
Onshore ERA—Mare Island
Future Operational Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Aquatic Vegetation BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{veg} [e,f] (mg/kg)	Sediment $SBV^{e,g}$ (mg/kg)	Disposal Ponds: Mare Island Sediment Acceptance Criteria[o] (mg/kg)	Disposal Ponds: Exceeds Sediment SBV ?
Investigation Area I									
Metals									
Arsenic	0.29	9.45	7,394.41	0.01	9.45	1,967.10	7,730	70	NO
Cadmium	0.15	1.43	1,120.53	0.05	1.43	298.09	1,139	9.6	NO
Chromium	0.07	0.97	760.39	0.17	0.97	202.28	566	370	NO
Copper	0.23	3.56	2,789.92	0.01	3.56	742.19	3,126	270	NO
Lead	0.07	0.28	220.78	0.00132	0.28	58.73	311	292	NO
Mercury	1.52	0.07	54.07	0.11	0.07	14.38	21	1.4	NO
Nickel	0.09	18.78	14,699.13	0.00333	18.78	3,910.35	19,930	149	NO
Selenium	1.26	0.41	317.76	0.00435	0.41	84.53	166	3.4	NO
Zinc	0.29	12.91	10,103.04	0.04	12.91	2,687.67	9,242	595	NO
PAHs									
Total PAHs	1.00	29.6800	23,229.45	1.00	29.68	6,179.63	4,306	44.80	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0911	71.32	0.62	0.0911	18.97	19	0.005	NO
Total Chlordanes[h]	0.51	3.77	2,948.48	0.82	3.77	784.37	699	0.007	NO
Total DDTs[i]	400.07	0.0022	1.73	0.75	0.0022	0.46	0.0043	0.6	YES
Total PCBs[j,n]	10.00	0.0843	65.98	0.11	0.0843	17.55	5.97	0.5	NO

	Value	Units
$IRprey^{k}$ =	0.0613	kg/day
$IR_{sediment}^{l}$ =	0.0020	kg/day
Tissue Moisture Invertebrates =	79%	unitless
Tissue Moisture Aquatic Vegetation =	74%	unitless
Aquatic Invertebrates in Diet =	25%	unitless
Aquatic Vegetation in Diet =	75%	unitless
TUF^{m} =	75%	unitless
SUF^{m} =	58%	unitless
Body Weight =	1.08	kg
Hazard Quotient =	1.00	unitless

TTL_{prey1} = BW x TRV x HQ / [(1-TM_1) x IR_{prey1} x SUF x TUF]

TTL_{prey2} = BW x TRV x HQ / [(1-TM_2) x IR_{prey2} x SUF x TUF]

$SBV_{sediment}$ = BW x TRV x HQ /[[((1-TM_1) x IR_{prey1} x BAF_1 + (1-TM_2) x IR_{prey2} x BAF_2) + $IR_{sediment}$] x SUF x TUF]

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the mallard were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5 .
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o Acceptance criteria based on existing conditions (Weston 2002) and beneficial reuse criteria (RWQCB 2000)

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
Weston 2002. Final Remedial Investigation. Investigation Areas I (partial) and J, and the Western Submerged Lands. Mare Island, Vallejo, CA. Prepared for DTSC. February
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).
Beneficial Reuse of Dredged Material: Sediment Screening and Testing Guidelines. Draft Staff Report. San Francisco Bay Regional Water Quality Control Board. May 2000
Weston Solutions 2002. Final Remedial Investigation. Investigation Areas I (partial) and J, and the Western Submerged Lands. Mare Island, Vallejo, CA. Prepared for DTSC. March

Table 3—Ambient Conditions

Draft Mallard Dose Calculations[a]
Onshore ERA—Mare Island
North Bay Ambient Conditions

COEC[a]	Aquatic Invertebrate BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{invert} [e,f] (mg/kg)	Aquatic Vegetation BAF[b]	$TRV_{mallard}$ [c,d] (mg/kg/day)	TTL_{veg} [e,f] (mg/kg)	Sediment SBV[e,g] (mg/kg)	Average San Pablo Bay Area Sediment (mg/kg)[o]	Exceeds Sediment SBV ?
Investigation Area I									
Metals									
Arsenic	0.29	9.45	4,288.76	0.01	9.45	1,140.92	4,484	10.7	NO
Cadmium[x]	0.15	1.43	649.91	0.05	1.43	172.89	661	0.25	NO
Chromium	0.07	0.97	441.03	0.17	0.97	117.32	328	96	NO
Copper	0.23	3.56	1,618.15	0.01	3.56	430.47	1,813	44	NO
Lead	0.07	0.28	128.05	0.00132	0.28	34.06	181	19	NO
Mercury	1.52	0.07	31.36	0.11	0.07	8.34	12	0.26	NO
Nickel[x]	0.09	18.78	8,525.50	0.00333	18.78	2,268.00	11,560	88	NO
Selenium[x]	1.26	0.41	184.30	0.00435	0.41	49.03	96	0.31	NO
Zinc	0.29	12.91	5,859.77	0.04	12.91	1,558.85	5,361	112	NO
PAHs									
Total PAHs	1.00	29.68	13,473.08	1.00	29.68	3,584.18	2,497	1.48	NO
Pesticides/PCBs									
Dieldrin	0.70	0.0911	41.37	0.62	0.0911	11.00	11	0.0004	NO
Total Chlordanes[h]	0.51	3.77	1,710.12	0.82	3.77	454.94	405	0.0008	NO
Total DDTs[i]	400.07	0.0022	1.01	0.75	0.0022	0.27	0.0025	0.004	YES
Total PCBs[j,n]	10.00	0.0843	38.27	0.11	0.0843	10.18	3.46	0.004	NO

	Value	Units
$IRprey^{k}$ =	0.0613	kg/day
$IR_{sediment}$ [l] =	0.0020	kg/day
Tissue Moisture Invertebrates =	79%	unitless
Tissue Moisture Aquatic Vegetation =	74%	unitless
Aquatic Invertebrates in Diet =	25%	unitless
Aquatic Vegetation in Diet =	75%	unitless
TUF [m] =	75%	unitless
SUF [m] =	100%	unitless
Body Weight =	1.08	kg
Hazard Quotient =	1.00	unitless

TTL_{prey1} = BW x TRV x HQ / [(1-TM_1) x IR_{prey1} x SUF x TUF]

TTL_{prey2} = BW x TRV x HQ / [(1-TM_2) x IR_{prey2} x SUF x TUF]

$SBV_{sediment}$ = BW x TRV x HQ /[[((1-TM_1) x IR_{prey1} x BAF_1 + (1-TM_2) x IR_{prey2} x BAF_2) + $IR_{sediment}$] x SUF x TUF]

Notes:

a Based on WESTON risk assessment for managed ponds (2002).
b The invertebrate BAF model considers only data from Pond 8; BAFs calculated using single tissue data point and average of sediment concentations from Pond 8.
c TRVs for the sandpiper were developed using body weight normalization and T&E adjustment factors (EPA, 1997).
d TRVs were based on available toxicity data from EPA Region 9 BTAG Review (CH2MHill, 2000).
e Exposure parameters used to calculate TTLs and SBVs are described in Table 5.
f All concentrations of constituents in tissue expressed in wet weight.
g All concentrations of constituents in sediment expressed in dry weight.
h Total chlordanes BAF based on an average of tissue and sediment concentrations for alpha- and gamma-chlordane.
i Total DDTs BAF based on an average of BAFs from 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE.
j Total PCBs BAF based on an average of all PCB congeners in tissues and sediment.
k Ingestion rate of prey expressed in dry weight.
l Ingestion rate of sediment based on fraction of prey ingestion rate.
m Site use factor is an indication of how much the target receptor utilizes the site. Temporal use factor is an indication of migratory behavior.
n BAF for total PCBs based on highest value of PCB-180 in Area H Wetland B; BAFs for total DDTs and total Chlordanes based on 4,4'-DDE and gamma-Chlordane.
o From SFEI Regional Monitoring Program Data Query for San Pablo Bay www.sfei.org/RMP/report#

References: EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).
WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands, Mare Island, Vallejo, CA. Prepared for DTSC, Berkeley, CA. Vernon
Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

Table 4—TRV

Draft Toxicity Reference Value Calculations
Mare Island EIS/EIR

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
Metals						
Aluminum[x2]	American mallard	109.700	ringed dove	0.155	Carriere et al. (1986)	161.803
	Western sandpiper	109.700	ringed dove	0.155	Carriere et al. (1986)	75.095
	Bonaparte's gull	109.700	ringed dove	0.155	Carriere et al. (1986)	116.790
Arsenic	American mallard	9.300	American mallard	1.000	Stanely et al. (1994)	9.448
	Western sandpiper	9.300	American mallard	1.000	Stanely et al. (1994)	4.385
	Bonaparte's gull	9.300	American mallard	1.000	Stanely et al. (1994)	6.819
Barium	American mallard	20.800	chick[x1]	0.121	Johnson et al. (1960)	32.237
	Western sandpiper	20.800	chick[x1]	0.121	Johnson et al. (1960)	14.962
	Bonaparte's gull	20.800	chick[x1]	0.121	Johnson et al. (1960)	23.269
Beryllium	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Cadmium	American mallard	1.450	American mallard	1.153	White and Finley (1978)	1.432
	Western sandpiper	1.450	American mallard	1.153	White and Finley (1978)	0.664
	Bonaparte's gull	1.450	American mallard	1.153	White and Finley (1978)	1.033
Chromium[x2,x11]	American mallard	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.972
	Western sandpiper	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.451
	Bonaparte's gull	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.701
Cobalt	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Copper	American mallard	2.300	chick[x1]	0.121	Norvell et al. (1975)	3.565
	Western sandpiper	2.300	chick[x1]	0.121	Norvell et al. (1975)	1.654
	Bonaparte's gull	2.300	chick[x1]	0.121	Norvell et al. (1975)	2.573
Lead	American mallard	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.282
	Western sandpiper	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.131
	Bonaparte's gull	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.204
Manganese	American mallard	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	1,679.862
	Western sandpiper	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	779.649
	Bonaparte's gull	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	1,212.538
Mercury	American mallard	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.069
	Western sandpiper	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.032
	Bonaparte's gull	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.050
Molybdenum[x2]	American mallard	3.500	chicken	1.500	Lepore and Miller (1965)	3.279
	Western sandpiper	3.500	chicken	1.500	Lepore and Miller (1965)	1.522
	Bonaparte's gull	3.500	chicken	1.500	Lepore and Miller (1965)	2.367
Nickel	American mallard	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	18.781
	Western sandpiper	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	8.717
	Bonaparte's gull	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	13.556
Selenium[b]	American mallard	0.400	American mallard	1.000	Heinzz et al. (1989)	0.406
	Western sandpiper	0.400	American mallard	1.000	Heinzz et al. (1989)	0.189
	Bonaparte's gull	0.400	American mallard	1.000	Heinzz et al. (1989)	0.293

Table 4—TRV

Draft Toxicity Reference Value Calculations
Mare Island EIS/EIR

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
Vanadium[x2]	American mallard	11.400	American mallard	1.170	White and Dieter (1978)	11.223
	Western sandpiper	11.400	American mallard	1.170	White and Dieter (1978)	5.209
	Bonaparte's gull	11.400	American mallard	1.170	White and Dieter (1978)	8.101
Zinc	American mallard	14.500	white leghorn hens	1.935	Stahl et al. (1990)	12.909
	Western sandpiper	14.500	white leghorn hens	1.935	Stahl et al. (1990)	5.991
	Bonaparte's gull	14.500	white leghorn hens	1.935	Stahl et al. (1990)	9.317
PAHs						
Benzo(a)anthracene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(b)fluoranthene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(g,h,i)perylene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(k)fluoranthene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Chrysene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Indeno(1,2,3-cd)pyrene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Phenanthrene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Phthalates/Phenols						
Butylbenzylphthalate[x2,x5,x6]	American mallard	1.100	ringed dove	0.155	Peakall (1974)	1.622
	Western sandpiper	1.100	ringed dove	0.155	Peakall (1974)	0.753
	Bonaparte's gull	1.100	ringed dove	0.155	Peakall (1974)	1.171
Diethylphthalate[x2,x6]	American mallard	1.100	ringed dove	0.155	Peakall (1974)	1.622
	Western sandpiper	1.100	ringed dove	0.155	Peakall (1974)	0.753
	Bonaparte's gull	1.100	ringed dove	0.155	Peakall (1974)	1.171
4-Chloro-3-methylphenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
4-Methylphenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Phenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--

Table 4—TRV

Draft Toxicity Reference Value Calculations
Mare Island EIS/EIR

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
Pesticides/PCBs						
alpha-BHC[x2]	American mallard	0.560	Japanese quail	0.150	Vos et al. (1971)	0.831
	Western sandpiper	0.560	Japanese quail	0.150	Vos et al. (1971)	0.386
	Bonaparte's gull	0.560	Japanese quail	0.150	Vos et al. (1971)	0.600
4,4'-DDD[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
4,4'-DDE[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
4,4'-DDT[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
Dieldrin[x2]	American mallard	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.091
	Western sandpiper	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.042
	Bonaparte's gull	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.066
Endrin	American mallard	0.010	screech owl	1.810	Fleming et al. 1982	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. 1982	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. 1982	0.0065
Endrin aldehyde[x2,b]	American mallard	0.010	screech owl	1.810	Fleming et al. (1982)	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. (1982)	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. (1982)	0.0065
Endrin ketone[x2]	American mallard	0.010	screech owl	1.810	Fleming et al. (1982)	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. (1982)	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. (1982)	0.0065
Endosulfan sulfate[x2,b]	American mallard	10.000	gray partridge	0.400	Abiola (1992)	12.202
	Western sandpiper	10.000	gray partridge	0.400	Abiola (1992)	5.663
	Bonaparte's gull	10.000	gray partridge	0.400	Abiola (1992)	8.808
gamma-Chlordane[x2,,x10]	American mallard	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	3.767
	Western sandpiper	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	1.748
	Bonaparte's gull	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	2.719
Hexachlorobenzene	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Methoxychlor	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
PCB-66[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-101	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-105[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061

Table 4—TRV

Draft Toxicity Reference Value Calculations
Mare Island EIS/EIR

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
PCB-118	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-126[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-128[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-138	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-153	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-170	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-180	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-187	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-206	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
Total Chlordanes[2x,10x]	American mallard	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	3.767
	Western sandpiper	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	1.748
	Bonaparte's gull	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	2.719
Total DDTs	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
Total PCBs	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
Total PAHs	American mallard	33.000	chicken	1.840	Rigdon and Neal (1963)	29.6753
	Western sandpiper	33.000	chicken	1.840	Rigdon and Neal (1963)	13.7728
	Bonaparte's gull	33.000	chicken	1.840	Rigdon and Neal (1963)	21.4199

Table 4—TRV

Draft Toxicity Reference Value Calculations
Mare Island EIS/EIR

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						

	Value	Units
Mallard Duck Body Weight =	1.082	kg
Western Sandpiper Body Weight =	0.0233	kg
Bonaparte's Gull Body Weight =	0.212	kg

Notes:

BAF	Bioaccumulation factor
BW	Body weight
COEC	Contaminant of ecological concern
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethene
ERA	Ecological risk assessment
IA	Investigation area
kg/day	Kilograms per day
mg/kg	Milligrams per kilogram
mg/kg/day	Milligrams per kilogram per day
NA	Not available
NOAEL	No observed adverse effects level
PCB	Polychlorinated biphenyl
SBV	Screening benchmark value
SUF	Site-use factor
TM	Tissue moisture
TTL	Target tissue level
TRV	Toxicity reference value
WHO	World Health Organization

a Analytes selected were COPEC for the Area I ponds based on ecological risk assessment for managed ponds (WESTON 2002)).

b Analytes with BAFs < 1.0 were added as COEC; analytes with BAFs < 1.0 not listed because of lack of available toxicity criteria include iron, magnesium, potassium, and sodium.

c TRVs were modifed for target receptors using suggested body weight normalization factors (Sample and Arenal, 1999).

d Toxicity data based on recommendations made by the EPA Region 9 BTAG review unless otherwise noted (CH2MHill, 2000).

References:

Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).

WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands

Oak Ridge National Laboratory Benchmarks for Wildlife (1996).

Allometric Models for Interspecies Extrapolation of Wildlife Toxicity Data (1999).

x1 Chick body weight based on mean body weight of 14 day old males and females (EPA, 1988).

x2 Toxicity information obtained from ORNL Wildlife Benchmarks (1996).

x4 NOAEL based on available toxicity information from ORNL (1996) for benzo(a)pyrene.

x5 NOAEL for mammals based on available toxicity information from ORNL (1996) for di-n-hexylphthalate (DHP).

x6 NOAEL for birds based on available toxicity information from ORNL (1996) for di-n-butyl phthalate (DBP).

x7 NOAEL based on available toxicity information from ORNL (1996) for pentachlorophenol.

x8 NOAEL based on available toxicity information for DDT and metabolites.

x9 Secondary source; Primary citation: Keplinger, M.L., W.B. Deichman, and F. Sala. 1968. Effects of pesticides on reproduction in mice. Ind. Med. Surg. 37: 525.

x10 NOAEL based on available toxicity information for chlordane.

x11 NOAEL for birds and mammals based on available toxicity information for chromium in the +3 form.

Table 4-Operational Conditions: Accepting Unsuitable

Reference Value Calculations Onshore ERA--Mare Island

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
Metals						
Aluminum[x2]	American mallard	109.700	ringed dove	0.155	Carriere et al. (1986)	161.803
	Western sandpiper	109.700	ringed dove	0.155	Carriere et al. (1986)	75.095
	Bonaparte's gull	109.700	ringed dove	0.155	Carriere et al. (1986)	116.790
Arsenic	American mallard	9.300	American mallard	1.000	Stanely et al. (1994)	9.448
	Western sandpiper	9.300	American mallard	1.000	Stanely et al. (1994)	4.385
	Bonaparte's gull	9.300	American mallard	1.000	Stanely et al. (1994)	6.819
Barium	American mallard	20.800	chick[x1]	0.121	Johnson et al. (1960)	32.237
	Western sandpiper	20.800	chick[x1]	0.121	Johnson et al. (1960)	14.962
	Bonaparte's gull	20.800	chick[x1]	0.121	Johnson et al. (1960)	23.269
Beryllium	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Cadmium	American mallard	1.450	American mallard	1.153	White and Finley (1978)	1.432
	Western sandpiper	1.450	American mallard	1.153	White and Finley (1978)	0.664
	Bonaparte's gull	1.450	American mallard	1.153	White and Finley (1978)	1.033
Chromium[x2,x11]	American mallard	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.972
	Western sandpiper	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.451
	Bonaparte's gull	1.000	black duck	1.250	Haseltine et al. (unpubl. data)	0.701
Cobalt	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Copper	American mallard	2.300	chick[x1]	0.121	Norvell et al. (1975)	3.565
	Western sandpiper	2.300	chick[x1]	0.121	Norvell et al. (1975)	1.654
	Bonaparte's gull	2.300	chick[x1]	0.121	Norvell et al. (1975)	2.573
Lead	American mallard	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.282
	Western sandpiper	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.131
	Bonaparte's gull	0.190	Japanese quail	0.150	Edens and Garlich (1983)	0.204
Manganese	American mallard	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	1,679.862
	Western sandpiper	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	779.649
	Bonaparte's gull	977.000	Japanese quail chick	0.072	Laskey and Edens (1985)	1,212.538
Mercury	American mallard	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.069
	Western sandpiper	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.032
	Bonaparte's gull	0.068	American mallard	1.000	Heinz (1976) and Heinz and Hoffman (1998)	0.050
Molybdenum[x2]	American mallard	3.500	chicken	1.500	Lepore and Miller (1965)	3.279
	Western sandpiper	3.500	chicken	1.500	Lepore and Miller (1965)	1.522
	Bonaparte's gull	3.500	chicken	1.500	Lepore and Miller (1965)	2.367
Nickel	American mallard	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	18.781
	Western sandpiper	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	8.717
	Bonaparte's gull	17.600	American mallard duckling	0.782	Cain and Pafford (1981)	13.556
Selenium[b]	American mallard	0.400	American mallard	1.000	Heinz et al. (1989)	0.406
	Western sandpiper	0.400	American mallard	1.000	Heinz et al. (1989)	0.189
	Bonaparte's gull	0.400	American mallard	1.000	Heinz et al. (1989)	0.293
Vanadium[x2]	American mallard	11.400	American mallard	1.170	White and Dieter (1978)	11.223
	Western sandpiper	11.400	American mallard	1.170	White and Dieter (1978)	5.209
	Bonaparte's gull	11.400	American mallard	1.170	White and Dieter (1978)	8.101
Zinc	American mallard	14.500	white leghorn hens	1.935	Stahl et al. (1990)	12.909
	Western sandpiper	14.500	white leghorn hens	1.935	Stahl et al. (1990)	5.991
	Bonaparte's gull	14.500	white leghorn hens	1.935	Stahl et al. (1990)	9.317

Table 4-Operational Conditions: Accepting Unsuitable

Reference Value Calculations Onshore ERA--Mare Island

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
PAHs						
Benzo(a)anthracene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(b)fluoranthene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(g,h,i)perylene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Benzo(k)fluoranthene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Chrysene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Indeno(1,2,3-cd)pyrene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Phenanthrene[x4]	American mallard	NA	--	--	--	--
	Western sandpiper	NA	--	--	--	--
	Bonaparte's gull	NA	--	--	--	--
Phthalates/Phenols						
Butylbenzylphthalate[x2,x5,x6]	American mallard	1.100	ringed dove	0.155	Peakall (1974)	1.622
	Western sandpiper	1.100	ringed dove	0.155	Peakall (1974)	0.753
	Bonaparte's gull	1.100	ringed dove	0.155	Peakall (1974)	1.171
Diethylphthalate[x2,x6]	American mallard	1.100	ringed dove	0.155	Peakall (1974)	1.622
	Western sandpiper	1.100	ringed dove	0.155	Peakall (1974)	0.753
	Bonaparte's gull	1.100	ringed dove	0.155	Peakall (1974)	1.171
4-Chloro-3-methylphenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
4-Methylphenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Phenol[x2,x7]	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Pesticides/PCBs						
alpha-BHC[x2]	American mallard	0.560	Japanese quail	0.150	Vos et al. (1971)	0.831
	Western sandpiper	0.560	Japanese quail	0.150	Vos et al. (1971)	0.386
	Bonaparte's gull	0.560	Japanese quail	0.150	Vos et al. (1971)	0.600
4,4'-DDD[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
4,4'-DDE[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
4,4'-DDT[x8]	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010

Table 4-Operational Conditions: Accepting Unsuitable

Reference Value Calculations Onshore ERA--Mare Island

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016

Table 4-Operational Conditions: Accepting Unsuitable

Reference Value Calculations Onshore ERA--Mare Island

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
Dieldrin[x2]	American mallard	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.091
	Western sandpiper	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.042
	Bonaparte's gull	0.077	barn owl	0.466	Mendenhall et al. (1983)	0.066
Endrin	American mallard	0.010	screech owl	1.810	Fleming et al. 1982	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. 1982	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. 1982	0.0065
Endrin aldehyde[x2,b]	American mallard	0.010	screech owl	1.810	Fleming et al. (1982)	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. (1982)	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. (1982)	0.0065
Endrin ketone[x2]	American mallard	0.010	screech owl	1.810	Fleming et al. (1982)	0.0090
	Western sandpiper	0.010	screech owl	1.810	Fleming et al. (1982)	0.0042
	Bonaparte's gull	0.010	screech owl	1.810	Fleming et al. (1982)	0.0065
Endosulfan sulfate[x2,b]	American mallard	10.000	gray partridge	0.400	Abiola (1992)	12.202
	Western sandpiper	10.000	gray partridge	0.400	Abiola (1992)	5.663
	Bonaparte's gull	10.000	gray partridge	0.400	Abiola (1992)	8.808
gamma-Chlordane[x2,,x10]	American mallard	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	3.767
	Western sandpiper	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	1.748
	Bonaparte's gull	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	2.719
Hexachlorobenzene	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
Methoxychlor	American mallard	NA				--
	Western sandpiper	NA				--
	Bonaparte's gull	NA				--
PCB-66[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-101	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-105[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-118	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-126[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-128[b]	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-138	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-153	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-170	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061

Table 4-Operational Conditions: Accepting Unsuitable

Reference Value Calculations Onshore ERA--Mare Island

COPEC[a]	Receptor Species	Chronic NOAEL Dose (mg/kd/day)	Test Species	Test Species Body Weight (kg)	Reference	TRV[c,d] (mg/kg/day)
Investigation Area I						
PCB-180	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-187	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
PCB-206	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
Total Chlordanes[2x,10x]	American mallard	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	3.767
	Western sandpiper	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	1.748
	Bonaparte's gull	2.140	red-winged blackbird	0.064	Stickel et al. (1983)	2.719
Total DDTs	American mallard	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0022
	Western sandpiper	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0010
	Bonaparte's gull	0.003	brown pelican	3.500	Anderson et al. (1975)	0.0016
Total PCBs	American mallard	0.090	chicken	1.500	Platonow and Reinert (1973)	0.084
	Western sandpiper	0.090	chicken	1.500	Platonow and Reinert (1973)	0.039
	Bonaparte's gull	0.090	chicken	1.500	Platonow and Reinert (1973)	0.061
Total PAHs	American mallard	33.000	chicken	1.840	Rigdon and Neal (1963)	29.6753
	Western sandpiper	33.000	chicken	1.840	Rigdon and Neal (1963)	13.7728
	Bonaparte's gull	33.000	chicken	1.840	Rigdon and Neal (1963)	21.4199

	Value	Units
Mallard Duck Body Weight =	1.082	kg
Western Sandpiper Body Weight =	0.0233	kg
Bonaparte's Gull Body Weight =	0.212	kg

Notes:

BAF	Bioaccumulation factor
BW	Body weight
COEC	Contaminant of ecological concern
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethene
ERA	Ecological risk assessment
IA	Investigation area
kg/day	Kilograms per day
mg/kg	Milligrams per kilogram
mg/kg/day	Milligrams per kilogram per day
NA	Not available
NOAEL	No observed adverse effects level
PCB	Polychlorinated biphenyl
SBV	Screening benchmark value
SUF	Site-use factor
TM	Tissue moisture
TTL	Target tissue level
TRV	Toxicity reference value
WHO	World Health Organization

a Analytes selected were COPECs for the Area I ponds based on ecological risk assessment for managed ponds (WESTON 2002).

b Analytes with BAFs < 1.0 were added as COEC; analytes with BAFs < 1.0 not listed because of lack of available toxicity criteria include iron, magnesium, potassium, and sodium.

c TRVs were modifed for target receptors using suggested body weight normalization factors (Sample and Arenal, 1999).

d Toxicity data based on recommendations made by the EPA Region 9 BTAG review unless otherwise noted (CH2MHill, 2000).

References:

Review of the Navy - EPA Region 9 BTAG Toxicity Reference Values for Wildlife (2000).

EPA Region 10 Supplemental Ecological Risk Assessment Guidance (1997).

WESTON 2002. Final Remedial Investigation Report: Investigation Area I (Partial) and J and the Western Submerged Lands

Oak Ridge National Laboratory Benchmarks for Wildlife (1996).

Allometric Models for Interspecies Extrapolation of Wildlife Toxicity Data (1999).

x1 Chick body weight based on mean body weight of 14 day old males and females (EPA, 1988).

x2 Toxicity information obtained from ORNL Wildlife Benchmarks (1996).

x4 NOAEL based on available toxicity information from ORNL (1996) for benzo(a)pyrene.

x5 NOAEL for mammals based on available toxicity information from ORNL (1996) for di-n-hexylphthalate (DHP).

x6 NOAEL for birds based on available toxicity information from ORNL (1996) for di-n-butyl phthalate (DBP).

x7 NOAEL based on available toxicity information from ORNL (1996) for pentachlorophenol.

x8 NOAEL based on available toxicity information for DDT and metabolites.

x9 Secondary source; Primary citation: Keplinger, M.L., W.B. Deichman, and F. Sala. 1968. Effects of pesticides on reproduction in mice. Ind. Med. Surg. 37: 525.

x10 NOAEL based on available toxicity information for chlordane.

x11 NOAEL for birds and mammals based on available toxicity information for chromium in the +3 form.

Table 5—Existing Conditions

Exposure Factors for Evaluating Risks to Waterfowl Under Existing Conditions

Mallard Duck (*Anas platyrhynchos*)				**Discussion:**
$IRprey^{k}$	=	0.0613	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1).
$IR_{sediment}^{l}$	=	0.0020	kg/day	Based on estimates of soil ingestion for Mallard (n = 88) (Ref #2)
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3).
Tissue Moisture Aquatic Vegetation	=	74%	unitless	Based on an average of moisture for algae, aquatic macrophytes, and emergent vegetation (Ref #3)
Aquatic Invertebrates in Diet	=	25%	unitless	Based on high use of inverts for 3 months and high plant use for 9
Aquatic Vegetation in Diet	=	75%	unitless	Based on high use of inverts for 3 months and high plant use for 9
TUF^{m}	=	75%	unitless	Occur year round, but assume move inland in winter (late Nov thru early Feb) (Ref #5)
SUF^{m}	=	58%	unitless	Assume ponding occurs November through May (7 months)
Body Weight	=	1.082	kg	Based on an average of measured body weights of Mallard (n = 5,847) (Ref #4).
Target Hazard Quotient	=	1.00	unitless	
Western Sandpiper (*Calidris mauri*)				
$IRprey^{k}$	=	0.0050	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1).
$IR_{sediment}^{l}$	=	0.0009	kg/day	Based on estimates of soil ingestion for Western Sandpiper (n = 7) (Ref #2)
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3).
Tissue Moisture Other	=	80%	unitless	
Aquatic Invertebrates in Diet	=	100%	unitless	
Other in Diet	=	0%	unitless	
TUF^{m}	=	83%	unitless	Shorebirds can occur 10 months out of year (migration + overwintering) (Ref #5)
SUF^{m}	=	58.0%	unitless	Saturated soils/ponds present 7 months; however, ponds represent 0.1 percent of all available habitat in North Bay region (Ref #6)
Body Weight	=	0.0233	kg	Based on an average of measured body weights of Western Sandpiper (n = 42) (Ref #4).
Target Hazard Quotient	=	1.00	unitless	
Bonaparte's Gull (*Larus philadelphia*)				
$IRprey^{k}$	=	0.215	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of seabirds (Ref #1).
$IR_{sediment}^{l}$	=	0.0215	kg/day	Based on an assumption that the Bonaparte's Gull sediment ingestion rate is 10% of it's prey ingestion rate.
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3).
Tissue Moisture Fish	=	71.5%	unitless	Based on an average of moisture for bony fishes and Pacific herring (Ref #3).
Macrofaunal invertebrates in diet	=	70%	unitless	
Fish in Diet	=	30%	unitless	Based on herring gull
TUF^{m}	=	71%	unitless	Peak migration 2 months in fall and 2 months in spring; rare May thru mid-Aug (Ref #5). Used 8.5 months
SUF^{m}	=	10%	unitless	No predicted site use under existing conditions; used 10% as a conservative factor
Body Weight	=	0.212	kg	Based on an average of measured body weights of Bonaparte's Gull (n = 12) (Ref #4).
Target Hazard Quotient	=	1.00	unitless	

Table 5—Existing Conditions

Exposure Factors for Evaluating Risks to Waterfowl Under Existing Conditions

Reference:

#1. Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and birds. *Ecological Monographs* . 57(2):111-128.

#2. Beyer, W.N., E.E. Connor, S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. *J. Wildlife Management.* 58(2):375-382.

#3. USEPA. 1993. Exposure Factors Handbook. Office of Research and Development. EPA/600-R/187a. December, 1993.

#4. Dunning, J.B. 1984. Body Weights of 686 Species of North American Birds. Western Bird Banding Association. Monograph No. 1. Eldon Publishing.

#5. Evens, J. 2000 Personal communication

#6. Goals Project. 2000. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish, and Wildlife. P.R. Olofson (ed.). San Francisco Bay RWQCB, Oakland, CA

Table 5-Operational Conditions: Accepting Unsuitable

Exposure Factors for Evaluating Risks to Waterfowl Under Future Operational Conditions

Mallard Duck (*Anas platyrhynchos*)				**Discussion:**
$IRprey^{k}$	=	0.0613	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1)..
$IR_{sediment}^{l}$	=	0.0020	kg/day	Based on estimates of soil ingestion for Mallard (n = 88) (Ref #2).
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3)
Tissue Moisture Aquatic Vegetation	=	74%	unitless	Based on an average of moisture for algae, aquatic macrophytes, and emergent vegetation (Ref #3)
Aquatic Invertebrates in Diet	=	25%	unitless	Based on high use of inverts for 3 months and high plant use for 9 months
Aquatic Vegetation in Diet	=	75%	unitless	Based on high use of inverts for 3 months and high plant use for 9 months
TUF^{m}	=	75%	unitless	Occur year round, but assume move inland in winter (late Nov thru early Feb) (Ref #5); therefore used 9 months
SUF^{m}	=	58%	unitless	Assume water managed to mimic existing conditions (7 months of ponding).
Body Weight	=	1.082	kg	Based on an average of measured body weights of Mallard (n = 5,847) (Ref #4)
Target Hazard Quotient	=	1.00	unitless	
Western Sandpiper (*Calidris mauri*)				
$IRprey^{k}$	=	0.0050	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1).
$IR_{sediment}^{l}$	=	0.0009	kg/day	Based on estimates of soil ingestion for Western Sandpiper (n = 7) (Ref #2).
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3)
Tissue Moisture Other	=	80%	unitless	
Aquatic Invertebrates in Diet	=	100%	unitless	
Other in Diet	=	0%	unitless	
TUF^{m}	=	83.0%	unitless	Can occur 10 months out of year (migration + overwintering) (Ref #5).
SUF^{m}	=	58.0%	unitless	Ponding/saturated soils will be provided for 7 months out of the year. Note: ponds represent less than 0.1 percent of all available habitat in the North Bay region (Ref #6)
Body Weight	=	0.0233	kg	Based on an average of measured body weights of Western Sandpiper (n = 42) (Ref #4)
Target Hazard Quotient	=	1.00	unitless	
Bonaparte's Gull (*Larus philadelphia*)				
$IRprey^{k}$	=	0.215	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of seabirds (Ref #1).
$IR_{sediment}^{l}$	=	0.0215	kg/day	Based on an assumption that the Bonaparte's Gull sediment ingestion rate is 10% of it's prey ingestion rate.
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3)
Tissue Moisture Fish	=	71.5%	unitless	Based on an average of moisture for bony fishes and Pacific herring (Ref #3)
Macrofaunal invertebrates in diet	=	70%	unitless	
Fish in Diet	=	30%	unitless	Based on herring gull
TUF^{m}	=	71%	unitless	Peak migration 2 months in fall and 2 months in spring; rare May thru mid-Aug (Ref #5). Used 8.5 months
SUF^{m}	=	52%	unitless	Assume are attracted to discharge events. Discharge 188 days based on 1.5 mcy worst case.
Body Weight	=	0.212	kg	Based on an average of measured body weights of Bonaparte's Gull (n = 12) (Ref #4)
Target Hazard Quotient	=	1.00	unitless	

Table 5-Operational Conditions: Accepting Unsuitable

Exposure Factors for Evaluating Risks to Waterfowl Under Future Operational Conditions

Reference:

#1. Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and birds. *Ecological Monographs* . 57(2):111-128.

#2. Beyer, W.N., E.E. Connor, S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. *J. Wildlife Management.* 58(2):375-382.

#3. USEPA. 1993. Exposure Factors Handbook. Office of Research and Development. EPA/600-R/187a. December, 1993.

#4. Dunning, J.B. 1984. Body Weights of 686 Species of North American Birds. Western Bird Banding Association. Monograph No. 1. Eldon Publishing.

#5. Evens, J. 2000 Personal communication with N. Musgrove

#6. Goals Project. 2000. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish, and Wildlife. P.R. Olofson (ed.). San Francisco Bay RWQCB, Oakland, CA

Table 5—Ambient Conditions

Exposure Factors for Evaluating Risks to Waterfowl Assuming Ambient Conditions

Mallard Duck (*Anas platyrhynchos*)

				Discussion:
$IRprey^{k}$	=	0.0613	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1).
$IR_{sediment}^{l}$	=	0.0020	kg/day	Based on estimates of soil ingestion for Mallard (n=88) (Ref #2).
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3).
Tissue Moisture Aquatic Vegetation	=	74%	unitless	Based on an average of moisture for algae, aquatic macrophytes, and emergent vegetation (Ref #3)
Aquatic Invertebrates in Diet	=	25%	unitless	Based on high use of inverts for 3 months and high plant use for 9
Aquatic Vegetation in Diet	=	75%	unitless	Based on high use of inverts for 3 months and high plant use for 9
TUF^{m}	=	75%	unitless	Occur yr round, but assume move inland in winter (late Nov thru early Feb) (Ref #5); used 9 months as input)
SUF^{m}	=	100%	unitless	Assume foraging areas available throughout North Bay region
Body Weight	=	1.082	kg	Based on an average of measured body weights of Mallard (n=5,847) (Ref #4).
Target Hazard Quotient	=	1.00	unitless	

Western Sandpiper (*Calidris mauri*)

$IRprey^{k}$	=	0.0050	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of all birds (Ref #1).
$IR_{sediment}^{l}$	=	0.0009	kg/day	Based on estimates of soil ingestion for Western Sandpiper (n = 7) (Ref #2).
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref # 3).
Tissue Moisture Other	=	80%	unitless	
Aquatic Invertebrates in Diet	=	100%	unitless	
Other in Diet	=	0%	unitless	
TUF^{m}	=	75.0%	unitless	Can occur 9 months out of year (migration + overwintering) (Ref #5).
SUF^{m}	=	100.0%	unitless	Assume foraging areas available throughout North Bay region
Body Weight	=	0.0233	kg	Based on an average of measured body weights of Western Sandpiper (n = 42) (Ref #4).
Target Hazard Quotient	=	1.00	unitless	

Bonaparte's Gull (*Larus philadelphia*)

$IRprey^{k}$	=	0.215	kg/day	Based on an allometric equation for field metabolic rates and feeding rates of seabirds (Ref #1).
$IR_{sediment}^{l}$	=	0.0215	kg/day	Based on an assumption that the Bonaparte's Gull sediment ingestion rate is 10% of it's prey ingestion rate.
Tissue Moisture Aquatic Invertebrates	=	79.25%	unitless	Based on an average of moisture for amphipods, cladoceran, and isopods (Ref #3).
Tissue Moisture Fish	=	71.5%	unitless	Based on an average of moisture for bony fishes and Pacific herring (Ref #3).
Macrofaunal invertebrates in diet	=	70%	unitless	
Fish in Diet	=	30%	unitless	Based on herring gull
TUF^{m}	=	71%	unitless	Peak migration 2 months in fall and 2 months in spring; rare May thru mid-Aug (Ref #5). Used 8.5 months
SUF^{m}	=	100%	unitless	Assume foraging areas available throughout North Bay region
Body Weight	=	0.212	kg	Based on an average of measured body weights of Bonaparte's Gull (n = 12) (Ref #4)
Target Hazard Quotient	=	1.00	unitless	

Table 5—Ambient Conditions

Exposure Factors for Evaluating Risks to Waterfowl Assuming Ambient Conditions

Reference:

#1. Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and

#2. Beyer, W.N., E.E. Connor, S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife.

#3. USEPA. 1993. Exposure Factors Handbook. Office of Research and Development. E

#4. Dunning, J.B. 1984. Body Weights of 686 Species of North American Birds. Westerr

#5. Evens, J. 2000 Personal communication