Draft Technical Report
for
Tentative Cleanup and Abatement
Order No. ~~R9-2011-0001~~ R9-2012-0024

APPENDIX FOR SECTION 32

ALTERNATIVE CLEANUP LEVELS

~~September 15, 2010~~ March 14, 2012

[BLANK SHEET]

Anchor QEA, L.P.
Cost Estimate for Remedial Footprint
San Diego Shipyards Sediment Site
July 12 ,2010

Item	Probable Quantity	Unit	Unit Cost	Probable Cost	Assumptions
DESIGN AND PERMITTING					
Additional Pre-Design Site Characterization	1	LUMP SUM	$348,000	$348,000	
Surveys and Engineering Design	1	LUMP SUM	$675,000	$675,000	
Permitting	1	LUMP SUM	$400,000	$400,000	See Note 1.
CEQA EIR - if required	1	LUMP SUM	$900,000	$900,000	As discussed in Note 1, we do not believe an EIR will be required; however in the event that a EIR is required, we have added in estimated costs for the preparation and submittal of an EIR.
CONSTRUCTION PREPARATION					
Mobilization(s) and Demobilization(s)	3	CONSTRUCTION SEASONS	$300,000	$900,000	Estimate assumes work is completed in 3 construction seasons.
Demolition	1	LUMP SUM	$500,000	$450,000	
DREDGING					
Unconstrained open-water dredging (outside of leasehold area)(12.5% of dredge area)	17,925	CY	$10	$179,250	Unit costs are typical for unconstrained dredging outside of shipyard area.
Constrained dredging from inner shipyard (within leasehold area)(87.5% of dredge area)	125,475	CY	$18	$2,258,550	Higher cost for dredging within leasehold line, near piers, in areas of ship traffic, etc.
Dredging Surface/Subsurface Debris	7,170	CY	$120	$860,400	Unknown quantity. Estimates assume 5% of total dredge volume. Pricing includes landfill disposal.
Engineering Controls (silt curtain, oil boom)	3	CONSTRUCTION SEASONS	$32,000	$96,000	Estimate assumes work is completed in 3 construction seasons.
Additional Dredging (as needed for 2nd pass)	28,100	CY	$18	$505,800	Two feet of dredging over one-half the remedial area. Same unit costs as for constrained dredging from inner shipyard.
MARINE STRUCTURES					
Placement of Quarry Run Rock for Protection of Marine Structures	21,887	TON	$45	$984,915	No structural retrofit of structures is assumed to be necessary. Estimated costs assume setback of dredging from marine structures and revetments, and placement of quarry run blankets or berms to reinstate lateral resistance.
SEDIMENT OFFLOADING AND DISPOSAL					
Acquisition/Lease of Sediment Offloading Area	3	CONSTRUCTION SEASONS	$300,000	$900,000	An off-site sediment staging area will be needed in the vicinity of the project area. Location is unknown at this time. Costs assume a three-year construction period.
Preparation of Sediment Offloading Area	1	LUMP SUM	$300,000	$300,000	Preparation of sediment handling and dewatering area.
Rehandling and Dewatering	171,500	CY	$25	$4,287,500	Assumes stockpiling of sediments prior to transport to landfill and addition of lime or cement admixture to facilitate dewatering.
Transportation and Disposal at Landfill	257,250	TON	$75	$19,293,750	Assumes disposal at regional hazardous waste landfill outside of San Diego County (Copper Mountain in Nevada).
UNDERPIER REMEDIATION					
Purchase and place 3 feet of clean sand/gravel beneath piers and overwater structures	103,705	SF	$30	$3,111,150	Assumes 3 foot thick layer of sand placed only under pier areas in the dredging footprint, quarry run rock assumed to be placed on the setback areas.
PLACEMENT OF CLEAN SAND COVER	42,211	CY	$40	$1,688,422	Assumes one half of dredged area receives 1-3 feet of sand.
SW04 cleanout, BMP Installation, Investigation	1	LS	$703,048	$703,048	

Item	Probable Quantity	Unit	Unit Cost	Probable Cost	Assumptions
TOTAL DIRECT CONSTRUCTION COSTS				**$38,841,785**	
BID MANAGEMENT AND SUPPORT	**1**	LUMP SUM	$25,000	$25,000	
CONSTRUCTION MANAGEMENT	**3**	CONSTRUCTION SEASONS	$450,000	$1,350,000	Estimate assumes work is completed in 3 construction seasons.
CONTINGENCY	**30%**	Percent		$12,065,036	Unquantifiable or identifiable unknowns
MONITORING COSTS					
Water Quality Monitoring during construction	**24**	WEEK	$18,000	$432,000	Consistent with project approach per mediation discussions.
Post-Dredging Confirmational Sampling	**45**	SAMPLES	$8,000	$360,000	Consistent with project approach per mediation discussions.
Long-Term Monitoring of Remediated Areas	**30**	LOCATIONS	$60,000	$1,800,000	Consistent with project approach per mediation discussions.
SW04 long term monitoring	**1**	LUMP SUM	$595,437	$595,437	PV for 100 years $20K/year, 5% discount rate
OTHER (NON-CONSTRUCTION) COSTS					
Eel Grass Habitat Mitigation (if needed) Construction and maintenance)	**0.87**	ACRES	$600,000	$522,000	Assumes 5% of dredged acreage will require mitigation
Eel Grass land lease costs in perpetuity (LS)	**0.87**	ACRES	$1,500,000	$1,305,000	
Internal Shipyard Costs	**1**	LUMP SUM	$250,000	$250,000	
RWQCB Oversight Costs	**10**	YEARS	$45,000	$450,000	Duration covers periods of design, construction, and long-term monitoring oversight.
GRAND TOTAL				**$58,000,000**	

Note 1:
This is inclusive of all requried permits. Required permits will be identified with legal assistance. Implementation of the cleanup program requires resource agency permits and environmental review under state [California Environmental Quality Act (CEQA)] and possibly federal [National Environmental Policy Act (NEPA)] guidelines.

Table A32-1

Table A32-5A SWACs and Exposure Calculation

Primary COC	Units	Pre-Remedy SWAC	Post-Remedy SWAC	Background Conc	Exposure Reduction[a]	% Exposure Reduction[b]
Copper	mg/kg	187	159	121	28	42
Mercury	mg/kg	0.75	0.68	0.57	0.07	38.9
HPAH	mg/kg	3.509	2.451	0.663	1.1	37.2
PCB	µg/kg	308	194	84	114	50.9
TBT	µg/kg	na	na	na	na	na
Secondary COC	**Units**	**Pre-Remedy SWAC**	**Post-Remedy SWAC**	**Background Conc**	**Exposure Reduction[a]**	**% Exposure Reduction[b]**
Lead	mg/kg	73	66	53	7	35.0
Zinc	mg/kg	252	221	192	31	51.7

[a] Exposure reduction = current SWAC minus post-remedy SWAC
[b] Percent exposure reduction relative to background = (current SWAC - final SWAC)/(current SWAC - background) x 100 SWAC - spatially weighted average concentrations

Table A32-5B Average Prey concentration for each aquatic-dependent wildlife receptor *inside NASSCO*

		Average Prey Concentration For Each Receptor				
Primary COC	**Units**	**Brown Pelican**	**Least Tern**	**Western Grebe**	**Surf Scoter**	
Copper	mg/kg	3.9	4.1	4.1	65	
Mercury	mg/kg	0.62	0.088	0.088	0.11	
HPAH[a]	mg/kg	na	na	na	1.58	
PCB	mg/kg	3.763	1.505	1.505	0.6	
TBT	mg/kg	na	na	na	na	
Secondary COC	**Units**					**Green Turtle**
Lead	mg/kg					19
Zinc (outside NASSCO)	mg/kg	na	190	na	na	na

Source for average detected prey concentrations is Appendix for Section 24
[a] Only surf scoter was identified as a wildlife risk driver in the Tier II ecological risk assessment for HPAH, identified as Benzo[a]pyrene (BAP).

Table A32-5C Average Prey concentration for each aquatic-dependent wildlife receptor *inside SWM*

		Average Prey Concentration For Each Receptor				
Primary COC	**Units**	**Brown Pelican**	**Least Tern**	**Western Grebe**	**Surf Scoter**	
Copper	mg/kg	9	9.9	9.9	48	
Mercury	mg/kg	0.52	0.088	0.088	0.1	
HPAH[a]	mg/kg	na	na	na	4.35	
PCB	mg/kg	4.009	2.273	2.273	0.861	
TBT	mg/kg	na	na	na	na	
Secondary COC	**Units**					**Green Turtle**
Lead	mg/kg					25

Source for average detected prey concentrations is Appendix for Section 24
[a] Only surf scoter was identified as a wildlife risk driver in the Tier II ecological risk assessment for HPAH, identified as Benzo[a]pyrene (BAP).

Table A32-5D Shipyard wide average prey concentration for each aquatic-dependent wildlife receptor and associated BAF

			Average Prey Concentration For Each Receptor[a]			BAF (using pre-remedy SWAC)[b]		
Primary COC	**Units**	**Pre-Remedy SWAC**	**Brown Pelican, CA Sea lion**	**Least Tern, Western Grebe**	**Surf Scoter**	**Brown Pelican, CA Sea lion**	**Least Tern, Western Grebe**	**Surf Scoter**
Copper	mg/kg	187	5.99	7.04	56.53	0.0320	0.0376	0.3023
Mercury	mg/kg	0.75	0.57	0.09	0.11	0.75623085	0.1232875	0.1443163
HPAH	mg/kg	3.509	na	na	2.97	na	na	0.8461
PCB	mg/kg	0.308	2.22	1.89	0.57	7.221	6.123	1.862
TBT	mg/kg	na	na	na	na	na	na	na
Secondary COC	**Units**	**Pre-Remedy SWAC**			**Green Turtle**			**Green Turtle**
Lead	mg/kg	73			22.00			0.3014
Zinc	mg/kg	252	na	157.32	na	na	0.62430325	na

[a] Shipyard wide average concentration = average prey concentration across entire shipyard
b BAF = average chemical level in prey tissue / pre-remedy SWAC
BAF - bioaccumulation factor

Table A32-5E Future prey concentrations for each aquatic-dependent wildlife receptor

			BAF (using pre-remedy SWAC)			New Average Prey Concentration[a]		
Primary COC	**Units**	**Post-Remedy SWAC**	**Brown Pelican, CA Sea lion**	**Least Tern, Western Grebe**	**Surf Scoter**	**Brown Pelican, CA Sea lion**	**Least Tern, Western Grebe**	**Surf Scoter**
Copper	mg/kg	159	0.0320	0.0376	0.3023	5.09	5.99	48.07
Mercury	mg/kg	0.68	0.75623085	0.123	0.1443	0.51	0.084	0.098
HPAH	mg/kg	2.451	na	na	0.8461	na	na	2.074
PCB	mg/kg	0.194	7.221	6.123	1.8618	1.40	1.19	0.36
TBT	mg/kg	na	na	na	na	na	na	na
Secondary COC	**Units**	**Post-Remedy SWAC**			**Green Turtle**			**Green Turtle**
Lead	mg/kg	66			0.3014			19.89
Zinc	mg/kg	221	na	0.624	na	na	137.97	na

[a] Future prey concentration = BAF * post-remedy SWAC
BAF - bioaccumulation factor

Table A32-5F Daily chemical intake

	Exposure Parameters					New Average Prey Concentration (mg/kg dw)								Daily Chemical Intake (mg/kg)[a]							
Receptor	Body Weight (kg)	Food Ingestion Rate (kg/day dw)	Sediment Ingestion Rate (kg/day dw)	Area Use Factor	Absorption Efficiency	Copper		Mercury	HPAH	PCB	TBT	Lead	Zinc	Copper		Mercury	HPAH	PCB	TBT	Lead	Zinc
Brown Pelican	3.174	0.25	0.005	1	1	5.09		0.51	na	1.40	na	na	na	0.6517		0.0416	na	0.1107	na	na	na
Least Tern	0.045	0.0053	0.00011	1	1	5.99		0.08	na	1.19	na	na	137.97	1.0936		0.0115	na	0.1404	na	na	16.7901
Western Grebe	1.2	0.062	0.0031	1	1	5.99		0.08	na	1.19	na	na	na	0.7200		0.0061	na	0.0619	na	na	na
Surf Scoter	1.05	0.056	0.0028	1	1	48.07		0.10	2.07	0.36	na	na	na	2.988		0.0070	0.1173	0.0198	na	na	na
Green Turtle	95	0.35	0.0186	1	1	na		na	na	na	na	19.89	na	na		na	na	na	na	0.0862	na
						Post-Remedy SWAC (mg/kg)															
						159		0.68	2.5	0.194	na	66	221								

Source of exposure parameters is from Section 24

[a] **Daily Intake$_{chemical}$** = [(CM * IR * FI * AE)$_{prey}$ + (CM * IR * FI * AE)$_{sediment}$]/BW

where:

CM = post-remedial concentration of the chemical in prey tissue or sediment (mg/kg). Prey tissue concentrations used in this equation were derived using the equation in Table 5, while the sediment concentration was based on the predicted post-remediation SWAC for the COC.

IR = ingestion rate of prey or sediment (kg/day)

FI = fraction of the daily intake of prey or sediment derived from the site (unitless area-use factor)

AE = relative gastrointestinal absorption efficiency for the chemical in a given prey or sediment (fraction)

BW = body weight of receptor species (kg)

Table A32-5G

	Daily Chemical Intake (mg/kg)						
Receptor	**Copper**	**Mercury**	**HPAH**	**PCB**	**TBT**	**Lead**	**Zinc**
Brown Pelican	0.652	0.042	na	0.111	na	na	na
Least Tern	1.094	0.012	na	0.140	na	na	16.790
Western Grebe	0.720	0.0061	na	0.062	na	na	na
Surf Scoter	2.988	0.0070	0.117	0.020	na	na	na
Green Turtle	na	na	na	na	na	0.086	na
Bird Low TRV	2.3	0.039	0.14	0.09	na	0.014	17.2
Bird High TRV	52.3	0.18	1.4	1.27	na	8.75	172
Bird Geometric Mean TRV (mg/kg-day)	10.9677	0.0837854	0.44271887	0.33808283	na	0.35	54.3911758
		HQ (calculation based on geometric mean)[a]					
Receptor	**Copper**	**Mercury**	**HPAH[b]**	**PCB**	**TBT**	**Lead**	**Zinc**
Brown Pelican	0.0594	0.4962	na	0.3273	na	na	na
Least Tern	0.0997	0.1377	na	0.4153	na	na	0.3087
Western Grebe	0.0656	0.0727	na	0.1830	na	na	na
Surf Scoter	0.2724	0.0841	0.2649	0.0585	na	na	na
Green Turtle	na	na	na	na	na	0.2463	na
		HQ (calculation based on low TRV)					
Receptor	**Copper**	**Mercury**	**HPAH**	**PCB**	**TBT**	**Lead**	**Zinc**
Brown Pelican	0.283	1.066	na	1.2295	na	na	na
Least Tern	0.475	0.296	na	1.5599	na	na	0.9762
Western Grebe	0.313	0.156	na	0.6875	na	na	na
Surf Scoter	1.299	0.181	0.838	0.2198	na	na	na
Green Turtle	na	na	na	na	na	6.1573	na
		HQ (calculation based on high TRV)					
Receptor	**Copper**	**Mercury**	**HPAH**	**PCB**	**TBT**	**Lead**	**Zinc**
Brown Pelican	0.0125	0.2310	na	0.0871	na	na	na
Least Tern	0.0209	0.0641	na	0.1105	na	na	0.0976
Western Grebe	0.0138	0.0338	na	0.0487	na	na	na
Surf Scoter	0.0571	0.0392	0.0838	0.0156	na	na	na
Green Turtle	na	na	na	na	na	0.0099	na

Source of TRVs is from Section 24

[a] HQ = daily chemical intake / geometric mean TRV

[b] Only surf scoter was identified as a wildlife risk driver in the Tier II ecological risk assessment for HPAH, identified as Benzo[a]pyrene (BAP).

A yellow cell notes that the HQ value is greater than a HQ threshold value of 1

Table A32-5H Selected hazard quotient

	HQ[a]						
Receptor	**Copper**	**Mercury**	**HPAH[b]**	**PCB**	**TBT**	**Lead**	**Zinc**
Brown Pelican	0.0594	0.4962	na	0.3273	na	na	na
Least Tern	0.0997	0.1377	na	0.4153	na	na	0.3087
Western Grebe	0.0656	0.0727	na	0.1830	na	na	na
Surf Scoter	0.2724	0.0841	0.2649	0.0585	na	na	na
Green Turtle	na	na	na	na	na	0.2463	na

[a] The selected HQ is based on the geometric mean TRVs

[b] Only surf scoter was identified as a wildlife risk driver in the Tier II ecological risk assessment for HPAH, identified as Benzo[a]pyrene (BAP).