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Final Report

Polychlorinated biphenyls (PCB) Source Term Estimates

for ex-ORISKANY (CVA 34)

Rev. 5

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Prepared for

Program Executive Office (Ships)
Navy Inactive Ships Program (PMS 333)
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Introduction

The FY04 National Defense Authorization Bill (HR 1588 Sec 1013) permits decommissioned ships stricken from the Naval Vessel Register to be transferred to States for use as artificial reefs[1]. This new artificial reefing authority allows the Navy's Inactive Ships Program under PEO SHIPS to reduce their inventories of unneeded vessels.

The Navy's program objective is to reduce the size of the inactive ships inventory in a cost-effective and environmentally sound manner. The Navy will accomplish the environmental remediation of transferred vessels in accordance with draft EPA Best Management Practices[2]. The purpose of this report, determining the amount of PCB containing materials aboard the subject vessel, supports those objectives.

The vessel, the first warship offered for transfer by the Navy for sinking as an artificial reef, is the ex-*Oriskany* (CVA 34).

Background

USS *Oriskany*, a 27,100 ton *Ticonderoga* class aircraft carrier, was built at the New York Navy Yard. Though she was launched in October 1945, construction was suspended in August 1947 and she was completed to a revised design that was also used in modernizing several other ships of the *Essex* and *Ticonderoga* classes[3]. Designated SCB-27, the modernization was very extensive, requiring two years for each carrier. *Oriskany* became the prototype. To handle much heavier, faster aircraft, flight deck structure was massively reinforced. Stronger elevators, much more powerful catapults, and new arresting gear were installed.

A distinctive new feature was a new island. Ready rooms were moved to below the hangar deck, with a large escalator on the starboard side amidships to move airmen up to the flight deck. Internally, aviation gasoline storage was increased by nearly half and its pumping capacity enhanced. Also improved were electrical generating power, fire protection, and weapons stowage and handling facilities. All this added considerable weight: displacement increased by some twenty percent. *Essex* was the second carrier to be modernized to the SCB-27A design[4].

Commissioned in September 1950, *Oriskany* deployed to the Mediterranean Sea between May and October 1951 and steamed around Cape Horn to join the Pacific Fleet in May 1952. She made one Korean War combat cruise, from September 1952 to May 1953.

Oriskany was out of commission from January 1957 until March 1959, during which time she was modernized with an angled flight deck, steam catapults, an enclosed "hurricane" bow and many other improvements that permitted safer operation of high-performance aircraft. In 1961, she became the first aircraft carrier to be fitted with the revolutionary Naval Tactical Data System (NTDS).

After twenty-six years of service, USS *Oriskany* was decommissioned in September 1976. She was stricken from the Naval Vessel Register in July 1989 and sold for scrapping in 1994, but was repossessed by the US Government in 1997. *Oriskany* is presently being prepared for use as an artificial reef at Texas Dock and Rail Company in Corpus Christi, Texas by Resolve Marine. The Navy is pursuing a risked-based disposal approval under 40 CFR 761 from the EPA before transferring the ship to the State of Florida for use as an artificial reef by the Florida Fish and Wildlife Conservation Commission. The following report provides estimates of PCB-containing material quantities found aboard the vessel to assist Navy and EPA authorities in determining that risk. *Oriskany* will eventually be sunk, and become part of the Escambia East Large Area Artificial Reef Site, off Pensacola.

Figure 1 *Oriskany* at Texas Dock & Rail

Methodology

PCB-containing materials were identified aboard *Oriskany* through PMS 333's routine sampling protocol for vessels during the inactivation process[5, 6]. Materials/components found to contain PCBs at some concentration include paints, rubber products, electrical cable insulation, bulkhead insulation, ventilation gaskets, and lubricants. Therefore, the scope of this study is limited to quantifying, by the best available means, the amount of these materials aboard *Oriskany* and calculating the PCBs available in these materials that could be potentially released into the environment if left aboard (the PCB source term).

Wherever possible, data from the *Oriskany* was used in the quantification process. PCB concentration data from samples collected aboard the ship were used exclusively[5, 6, and 7]. The ship was also visually inspected and onsite personnel involved in the preparation of the ship were interviewed by CACI personnel to verify the presence of targeted materials, define possible remediation/salvage scenarios, and to ensure no other materials historically found to contain PCBs on Navy ships (such as impregnated felt) were aboard *Oriskany*.

Where weight/quantity data was not directly available for *Oriskany*, data from surrogate vessels were used to approximate conditions found on *Oriskany* as closely as possible. Surrogate vessels were selected using the following criteria: 1. data readily available, 2. data from the same class (*Essex*/*Ticonderoga* Class), 3. data from another aircraft carrier, 4. data from a large combatant built in the same era. Fortunately, information unavailable for *Oriskany* necessary to quantify the material aboard was found for the

Essex (CV-9) and the *Lexington* (CV-16). Specifically, a microfiche copy of the Final Weight Report (FWR) for USS *Essex*[8] was acquired from NSWC Carderock Code 224, and the fan list for USS *Lexington* was acquired from John J. McMullen Associates. The use of these documents, along with other estimating assumptions will be discussed in greater detail in the Results section of this report.

After determining the initial (as built) quantity of a subject material, the material weight (in pounds) was adjusted by various factors to approximate as closely as possible the existing conditions aboard *Oriskany*. These correction factors include "growth rates" for materials that accumulate over the life cycle of the vessel, remediation (reduction) ratios for materials removed during preparation, or conservative multipliers to account for undocumented material quantities.

The total estimated existing material weights were then multiplied by the mean and 95% upper confidence limit (UCL) PCB concentration of all samples of a given material to derive the weight of PCBs attributable to each type of PCB-containing material within the scope of the study. These Source Terms were then totaled to derive the mean and 95% UCL of the mean Total Weight of PCBs.

Results

Bulkhead Insulation

PMS 333 collected thirty-two samples of bulkhead insulation for PCB analysis. All samples were analyzed by Puget Sound Naval Shipyard. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

Table 1 Bulkhead Insulation Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
95PS00019-001	5	53	53
95PS00019-002	5	6100	6100
95PS00019-003	5	60	60
95PS00019-004	5	45	45
95PS00019-005	5	<5	2.5
95PS00019-006	5	5.9	5.9
95PS00019-007	5	<5	2.5
95PS00019-008	5	<5	2.5
95PS00019-009	5	<5	2.5
95PS00019-010	5	<5	2.5
95PS00019-011	5	11	11
95PS00019-012	5	<5	2.5
95PS00019-013	5	<5	2.5

95PS00019-014	5	18	18
95PS00019-015	5	7.4	7.4
95PS00019-016	5	<5	2.5
95PS00019-017	5	6.4	6.4
95PS00019-018	5	7.3	7.3
95PS00019-019	5	5.5	5.5
95PS00019-020	5	6.6	6.6
95PS00019-021	5	130	130
95PS00019-022	5	39	39
95PS00019-023	5	320	320
95PS00019-024	5	15	15
95PS00019-025	5	6.9	6.9
95PS00019-026	5	<5	2.5
95PS00019-027	5	11	11
95PS00019-028	5	<5	2.5
95PS00019-029	5	<5	2.5
95PS00019-030	5	<5	2.5
95PS00019-031	5	<5	2.5
95PS00019-032	5	<5	2.5
		Mean	215.1
		95% UCL	587.7

The estimated quantity of bulkhead insulation aboard *Oriskany* was determined from a review of the *Essex* FWR listing for Group 22 d-2 “Bulkheads” and 49 individual weight entries were summed to calculate a total weight of 115, 695 lbs of bulkhead insulation. This weight is assumed to be equivalent to the weight aboard *Oriskany* with no correction.

Figure 2 Typical space with peeling paint and bulkhead insulation.

Rubber Products

PMS 333 collected 30 samples of rubber products (door gaskets, pipe hangers, mounts, etc.) for PCB analysis. Twenty-nine samples were analyzed by Puget Sound Naval Shipyard and one sample was analyzed by Norfolk Naval Shipyard. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

Table 2 Rubber Products Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
95PS00032-001	5	32	32
95PS00032-002	5	10	10
95PS00032-003	5	24	24
95PS00032-004	5	130	130
95PS00032-005	5	6.5	6.5
95PS00032-006	5	54	54
95PS00032-007	5	29	29
95PS00032-008	5	14	14
95PS00032-009	5	<5	2.5
95PS00032-010	5	19	19
95PS00032-011	5	8.9	8.9
95PS00035-015	5	12	12
95PS00035-016	5	58	58
95PS00035-017	5	<5	2.5
95PS00035-018	5	110	110
95PS00035-019	5	<5	2.5
95PS00035-020	5	17	17
95PS00035-021	5	46	46
95PS00035-022	5	13	13
95PS00035-023	5	<5	2.5
95PS00035-024	5	28	28
95PS00035-025	5	12	12
95PS00035-026	5	110	110
95PS00035-027	5	92	92
95PS00035-028	5	39	39
95PS00035-029	5	120	120
95PS00035-030	5	33	33
95PS00035-031	5	49	49
95PS00035-032	5	42	42
91NN00999-044	1	<1	0.5
		Mean	37.3
		95% UCL	50.9

The estimated quantity of rubber products aboard *Oriskany* was determined by a review of the *Essex* FWR listing for Group 36 "Doors and Hatches". These weights are assumed to be directly equivalent to *Oriskany*, with the following correction. There was no available weight data for other rubber products, so a conservative multiplier of two was applied to the calculated total weight of door/hatch gaskets (the most abundant source of rubber material) to account for unquantifiable rubber products.

The weight of door, hatch, manhole, and scuttle gaskets was derived by counting the quantity of each category from the Group 36 listing. An average weight of gasket for each category was derived by calculating the average perimeter of each closure size and multiplying that perimeter by 0.34 lb/ft, the weight of MIL-R-900 standard rubber gasket stock.

Table 3 Door Gasket Weights

Door Sizes				
L in	W in	Perim. In	ft	lbs
18	36	108	9.0	3.1
26	45	142	11.8	4.0
26	54	160	13.3	4.5
26	57	166	13.8	4.7
26	66	184	15.3	5.2
30	66	192	16.0	5.4
			Average	4.5

Table 4 Hatch Gasket Weights

Hatch Sizes				
L in	W in	Perim. In	ft	lbs
24	36	120	10.0	3.4
30	30	120	10.0	3.4
30	36	132	11.0	3.7
30	48	156	13.0	4.4
30	60	180	15.0	5.1
36	42	156	13.0	4.4
36	60	192	16.0	5.4
36	72	216	18.0	6.1
48	48	192	16.0	5.4
60	60	240	20.0	6.8
			Average	4.8

Table 5 Manhole Gasket Weights

Manhole Sizes				
L in	**W in**	**Perim. In**	**ft**	**lbs**
15	18	66	5.5	1.9
15	23	76	6.3	2.2
			Average	2.0

Table 6 Scuttle Gasket Weights

Scuttle Sizes				
Dia. In		**Perim. In**	**ft**	**lbs**
18		56.5	4.7	1.6
21		66.0	5.5	1.9
			Average	1.7

Table 7 Rubber Product Weight Summary

Weight Summary Rubber Products							
Gaskets	**Doors**	**Hatches**	**M.H.**	**Scuttles**	**Multiplier**		
Count	844	193	532	88			
Avg. Lb/gasket	4.5	4.8	2.0	1.7			
Total lbs	3794.2	931.8	1070.2	152.7	2	11898.0	**Grand Total lbs**

The result of the analysis showed 1,567 closures with a corresponding weight of gaskets of 5,949 lbs. The conservative multiplier of two resulted in a total estimated weight of rubber product aboard *Oriskany* of 11, 898 lbs.

Paints

PMS 333 collected five samples of paint products for PCB analysis. These samples were analyzed by Puget Sound Naval Shipyard. ESCO Marine collected two composite samples of removed paint chips from *Oriskany* that were analyzed by Analab. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

Table 8 Paint Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
Analab 655039	1	24.4	24.4
Analab 655040	1	15.2	15.2
95PS0032-012	5	<5	2.5
95PS0032-013	5	<5	2.5
95PS0032-014	5	<5	2.5
95PS0032-015	5	28	28
95PS0032-016	5	5.8	5.8
		Mean	11.6
		95% UCL	19.7

The estimated quantity of paint aboard *Oriskany* was determined from a review of the *Essex* FWR listing for Group 24 a "Paints and Varnishes" and after non-paint entries were eliminated, the remaining entries were summed to calculate a total weight of 298,999 lbs of paint. This weight is assumed to be equivalent to the weight aboard *Oriskany* with no correction.

Electrical Cable Insulation

PMS 333 collected 59 samples of electrical cable/wire insulation for PCB analysis. Fifty samples were analyzed by Puget Sound Naval Shipyard and nine samples were analyzed by Norfolk Naval Shipyard. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

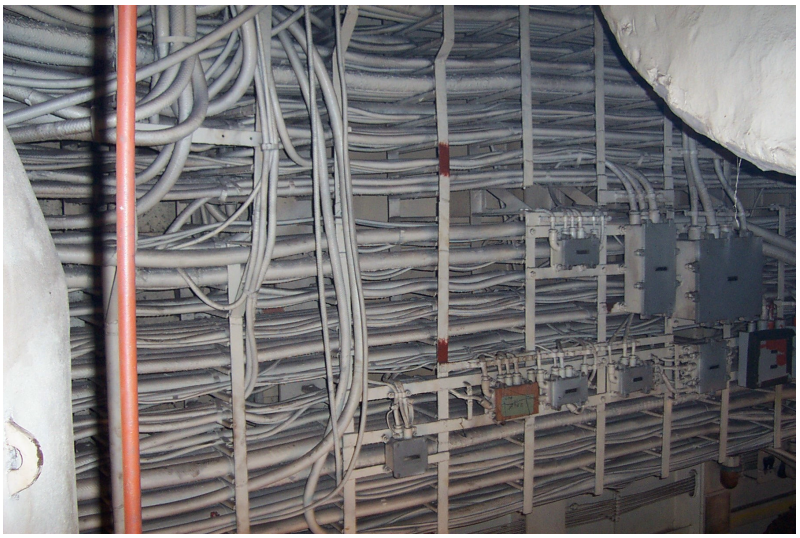

Figure 3 Cable trays in auxiliary machine room.

Table 9 Cable Insulation Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
95PS00034-001	5	110	110
95PS00034-002	5	580	580
95PS00034-003	5	10	10
95PS00034-004	5	22	22
95PS00034-005	5	9.5	9.5
95PS00034-006	5	80	80
95PS00034-007	5	67	67
95PS00034-008	5	6.1	6.1
95PS00034-009	5	38	38
95PS00034-010	5	6.2	6.2
95PS00034-011	5	400	400
95PS00034-012	5	140	140
95PS00034-013	5	290	290
95PS00034-014	5	110	110
95PS00034-015	5	2200	2200
95PS00034-016	5	<5	2.5
95PS00034-017	5	56	56
95PS00034-018	5	12000	12000
95PS00034-019	5	94	94
95PS00034-020	5	85	85
95PS00034-021	5	37	37
95PS00034-022	5	24	24
95PS00034-023	5	23	23
95PS00034-024	5	12	12
95PS00034-025	5	11000	11000
95PS00034-026	5	63	63
95PS00034-027	5	100	100
95PS00034-028	5	13	13
95PS00034-029	5	45	45
95PS00034-030	5	29000	29000
95PS00034-031	5	80	80
95PS00034-032	5	150	150
95PS00035-001	5	42	42
95PS00035-002	5	290	290
95PS00035-003	5	19000	19000
95PS00035-004	5	71	71
95PS00035-005	5	30	30
95PS00035-006	5	38	38
95PS00035-007	5	85	85
95PS00035-008	5	180	180
95PS00035-009	5	95	95
95PS00035-010	5	67	67

95PS00035-011	5	59	59
95PS00035-012	5	18	18
95PS00035-013	5	65	65
95PS00035-014	5	110	110
95PS00032-017	5	580	580
95PS00032-018	5	150	150
95PS00032-019	5	140	140
95PS00032-020	5	10000	10000
91NN00999-046	1	<1	0.5
91NN00999-048	1	29	29
91NN00999-054	1	78	78
91NN00999-057	1	15	15
91NN00999-066	1	33	33
91NN00999-067	1	13	13
91NN00999-080	1	23	23
91NN00999-082	1	8	8
91NN00999-085	1	70	70
		Mean	1493.9
		95% UCL	2766.0

The estimated quantity of electrical cable insulation aboard *Oriskany* was determined from a review of the *Essex* FWR listing for Group 44 "Electrical Plant" The total reported weight of the electrical plant was listed as 1,551,498 lbs. NSWCCD Code 244 conducted a review of other CV/CVN weight reports and determined the cable to electrical plant weight ratio to be 36%. Using this ratio, the weight of cable from the FWR calculates to 558,539.3 lbs. A study of the Navy Cable Inventory conducted by Westinghouse MTD found that the percentage of insulation in any given quantity of bulk cable is 72.26% for a typical combatant. Multiplying the estimated weight of cable by the insulation percentage gives an estimated weight of cable insulation of 403,600.5 lbs. This weight is assumed to be equivalent to the weight aboard *Oriskany* with no additional correction.

Ventilation Gaskets

The visual inspection of the Oriskany in Corpus Christ, TX revealed that no ventilation gaskets were impregnated felt material. Of all gaskets observed, 95% were rubber, 5% were compressed hard fiber material. PMS 333 collected 34 samples of ventilation gasket material for PCB analysis. All samples were analyzed by Norfolk Naval Shipyard. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

Table 10 Ventilation Gasket Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
91NN00999-045	1	<1	0.5
91NN00999-047	1	<1	0.5
91NN00999-049	1	7	7
91NN00999-050	1	<1	0.5
91NN00999-051	1	<1	0.5
91NN00999-052	1	<1	0.5
91NN00999-053	1	<1	0.5
91NN00999-055	1	49	49
91NN00999-056	1	<1	0.5
91NN00999-058	1	22	22
91NN00999-059	1	6	6
91NN00999-060	1	5	5
91NN00999-061	1	6	6
91NN00999-062	1	210	210
91NN00999-063	1	8	8
91NN00999-064	1	11	11
91NN00999-065	1	50	50
91NN00999-068	1	13	13
91NN00999-069	1	33	33
91NN00999-070	1	<1	0.5
91NN00999-071	1	<1	0.5
91NN00999-072	1	5	5
91NN00999-073	1	41	41
91NN00999-074	1	<1	0.5
91NN00999-075	1	78	78
91NN00999-076	1	<1	0.5
91NN00999-077	1	<1	0.5
91NN00999-078	1	63	63
91NN00999-079	1	<1	0.5
91NN00999-081	1	35	35
91NN00999-083	1	<1	0.5
91NN00999-084	1	<1	0.5
91NN00999-086	1	25	25
91NN00999-087	1	15	15
		Mean	20.3
		95% UCL	33.5

A review of the fan list of *Lexington* (CV 16) determined that, based on an algorithm developed by naval ventilation engineers using the number and size of fans, the ventilation system contains 6700 flanges. The average gasket weight per flange is 0.4

lbs. This results in a total ventilation gasket weight of 2680 lbs. This weight is assumed to be equivalent to the weight aboard *Oriskany* with no additional correction.

Lubricants

PMS 333 collected 11 samples of lube oils and greases for PCB analysis. Ten samples were analyzed by Puget Sound Naval Shipyard and one sample was analyzed by Norfolk Naval Shipyard. Results reported as less than the method detection limit (MDL) were calculated as one half of the MDL for the purpose of determining the mean PCB concentration for the material.

Table 11 Lubricant Sample Results

Sample #	MDL ppm	PCBs ppm	Calculated PCBs ppm
91NN00999-001	1	<1	0.5
95PS00029-001	1	150	150
95PS00029-002	1	230	230
95PS00029-003	1	<1	0.5
95PS00029-004	1	<1	0.5
95PS00029-005	1	4	4
95PS00029-006	1	<1	0.5
95PS00029-007	1	67	67
95PS00029-008	1	100	100
95PS00029-009	1	<1	0.5
95PS00029-010	1	110	110
		Mean	60.3
		95% UCL	106.8

The estimated quantity of lubricants aboard *Oriskany* was determined from a review of the *Essex* FWR listing for Group 53 "Fuel, Gasoline, and Lube" and, after fuels and gasoline entries were eliminated, the remaining entries were summed to calculate a total weight of 208,104 lbs of lube oil. The weight of miscellaneous lubricants (such as greases), are assumed to be an insignificant percentage of the total weight of other lube oil stores. This weight is assumed to be equivalent to the weight aboard *Oriskany* with no correction.

Baseline PCB Source Terms

Extending the as-built estimated weights for the subject materials to reflect present day conditions aboard *Oriskany* requires adjusting the as-built (FWR) derived estimates to reflect lifecycle increases in materials, where appropriate. If available, Navy standard growth rate have been applied.

For example, Navy material and weight experts estimate that the thickness of paint on vessels (and therefore weight), with repeated painting, stripping, and repainting activities, increases by a factor of 3 over a 30-year life cycle. This is in contrast with rubber products and bulkhead insulation, which is relatively static, being removed and replaced as necessary in a one for one changeout, with no net change in quantity. Electrical and ventilation systems can experience modest growth, but generally as a result of installation of new systems or modification/modernization programs. Accordingly, a 20% growth rate has been applied to the ventilation gasket and electrical cable insulation weights in proportion to the 20% increase in overall ship displacement as a result of SCB-27A modernization program. An additional 10% is included to the cable growth rate to account for the Naval Tactical Data System added in 1961. Lube oils are limited by the original design capacities of the systems they occupy.

The baseline PCB source terms, below, reflect lifecycle growth, but do not include any reductions as a result of the preparation of the vessel for use as an artificial reef.

Table 12 Baseline Source Terms

Material	FWR Wt (lbs)	30yr Growth	Avg.PCB Conc. ppm	95% UCL	Lbs PCB	95% UCL lbs
Paints	298999	3	11.6	19.7	10.4	17.7
Bulkhead Insulation	115695	1	215.1	587.7	24.9	68.0
Rubber Products	11898	1	37.3	50.9	0.4	0.6
Cable Insulation	403600	1.3	1493.9	2766.0	783.8	1451.3
Vent. Gaskets	2680	1.2	20.3	33.5	0.1	0.1
Lubricants	208140	1	60.3	106.8	12.6	22.2
				Total	832.2	1559.9

Preparation Scenario

The following source term table reflects possible reductions in PCB loading due to removal of items as part of the preparation process. The scenario assumes that 100% of all lubricants will be removed, 5% of the paint (flaking surfaces), 72.6% of the bulkhead insulation (Navy contracted to remove 42 tons of insulation), and 10% cable salvage. No significant removal of rubber products or ventilation gaskets is anticipated.

Table 13 Preparation Scenario Source Terms

Scenario- 100% Lubricants, 5% Paint, 72.6% BLKHD Ins. & 10% Cable Removal								
Material	**Est. Wt (lbs)**	**30yr Growth**	**Avg.PCB Conc. ppm**	**95% UCL ppm**	**Lbs PCB**	**Remaining**	**lbs PCB**	**95% UCL lbs**
Paints	298999	3	11.6	19.7	10.4	95%	9.8	16.8
Bulkhead Insulation	115695	1	215.1	587.7	24.9	27.4%	6.8	18.6
Rubber Products	11898	1	37.3	50.9	0.4	100%	0.4	0.6
Cable Insulation	403600	1.3	1493.9	2766.0	783.8	90%	705.5	1306.1
Vent. Gaskets	2680	1.2	20.3	33.5	0.1	100%	0.1	0.1
Lubricants	208140	1	60.3	106.8	12.6	0%	0.0	0.0
						Total	722.6	1342.3

The Preparation Scenario reflects the best available information to date with regard to the material expected to be removed in the preparation process. The EPA Best Management Practices guidance requires 100% removal of lube oils. Based on paint chip removal tonnage reported at the 50% conference[9] (9.38 LT removed prior to the conference date), it is estimated that at project completion 22 LT or 44, 000 lbs of paint chips (5% of the total weight) will have been removed. Contractor and SUPSHIP project personnel report 72.6% of the bulkhead insulation removed and estimate 10% of the electrical cable will be removed as a result of preparation activities.

Conclusions

The estimate shows the PCB source term related to electrical cable accounts for 95% of the total PCB loading of *Oriskany*. The next largest contributor, bulkhead insulation, only accounts for 3% of the total PCB load. Moreover, if paint, rubber products, and ventilation gaskets were addressed in terms of a bulk product disposal, they would be unregulated based on their mean concentration, and rubber would only be above regulatory limits at the very conservative 95% UCL of the mean concentration.

References

[1] Title 10 U.S.C § 7306b SEC. 1013. AUTHORIZE TRANSFER OF VESSELS STRICKEN FROM THE NAVAL VESSEL REGISTER FOR USE AS ARTIFICIAL REEFS.

[2] Press Release, "New Authority provides Navy's Inactive Ships for use as State," Naval Sea Systems Command, Public Affairs Office, December 8, 2003, http://www.navsea.navy.mil/newswire_content.asp?txtDataID=10039&txtTypeID=2

[3] Website: *Dictionary of American Naval Fighting Ships* Department of the Navy Naval Historical Center, 805 Kidder Breese SE -- Washington Navy Yard, Washington DC 20374-5060 http://history.navy.mil/danfs/o4/oriskany.htm

[4] Webpage: *SCB-27 modernization of Essex/Ticonderoga class aircraft carriers, (CV 9-12, 14-16, 18-20, 31, 33-34, 38-39),* Department of the Navy Naval Historical Center, 805 Kidder Breese SE -- Washington Navy Yard, Washington DC 20374-5060, http://www.history.navy.mil/photos/usnshtp/cv/scb27cl.htm

[5] Laboratory Division, Norfolk Naval Shipyard, Portsmouth, VA, Laboratory Report No. 91NN00999, February 15, 1991.

[6] Laboratory Division, Quality Assurance Office, Puget Sound Naval Shipyard, Bremerton, WA, Laboratory Report No. 95PS00019 January 23, 1995; 95PS00028 January 21, 1995; 95PS00029 January 21, 1995; 95PS00032 January 21, 1995; 95PS00034 January 23, 1995; and 95PS00035 January 23, 1995.

[7] Analab Corporation P.O. Box 9000, Kilgore, TX 75663-9000, Laboratory Report No. 65539 February 10, 2004.

[8] Final Weight Report, Aircraft Carrier CV9 USS *Essex*, Office of Supervisor of Shipbuilding for US Navy, Newport News Shipbuilding and Dry Dock Company, Newport News, VA, 1945.

[9] Progress Report, *Oriskany* Project 50% Completion Conference, Supervisor of Shipbuilding for US Navy, Corpus Christi, TX, May 6, 2004.

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Appendix A-Response to EPA Comments

APPENDIX A

Document 6 - Response to EPA's December 2, 2005 Second Round of Comments on
Ex-ORISKANY Artificial Reef Project:
Polychlorinated Biphenyl (PCB) Source Term Estimates. June 2005 (Draft Final).

Comment	COMMENT	RESPONSE
1	The Navy response seems weak. If the distribution is bimodal on the ex-ORISKANY, shouldn't this be used in modeling for this vessel?	Discussion with EPA reviewers clarified that this comment was not specifically directed at the distribution and use of the PCB data in the Source Term Estimates, but rather how different material data distributions (normal, bimodal, multimodal) could impact the PRAM inputs and outputs. The reviewers indicated the response to data distribution impacts should be addressed in the Uncertainty Section of the PRAM document. The PRAM document will include a discussion of the distributions that were used to derive the source term estimates for the ex-ORISKANY that were used in PRAM. Specifics as follow: Prior to being utilized in PRAM, the ex-ORISKANY material concentration data were evaluated with the procedures specified in EPA's guidance document *Calculating Upper Confidence Limits For Exposure Point Concentrations At Hazardous Waste Sites* (OSWER 9285.6-10, December 2002). Using an Excel macro that produces results consistent with EPA's ProUCL software, the mean and 95% UCL of the mean were calculated for each material using the distribution recommended in the guidance document. Figure 1 of the guidance document is a UCL Method Flow Chart. The chart provides general guidelines for selecting a UCL calculation method based on the distribution of the data set. The details of the 95% UCL calculations for the PCB-containing material modeled in PRAM are presented at the end of Appendix A of the PRAM documentation and are also summarized in Table 10 of the PRAM documentation. The 95% UCL calculation methods used in PRAM did not include the assumption of a normal distribution for any of the materials evaluated; the methods did include a Jackknifed UCL, a Standard Bootstrap UCL, and a Hall Adjusted Bootstrap UCL. Due to the use of UCL calculation methods in PRAM that are consistent with EPA human health risk assessment guidance, the Navy does not believe that any re-evaluation of the data is necessary. Furthermore, the normal distributions assumed in the PCB Source Term Report yielded results which are very similar to the PRAM results. The following table provides a comparison of the two sets of results:

<table>
<tr><th>Comment</th><th>COMMENT</th><th>RESPONSE</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th rowspan="2">Material</th><th colspan="2">PCB Source Term Report</th><th colspan="2">PRAM</th></tr>
<tr><th>95% UCL of Mean (mg/kg)</th><th>Statistical Method</th><th>95% UCL of Mean (mg/kg)</th><th>Statistical Method</th></tr>
<tr><td>Paints</td><td>19.7</td><td>Normal</td><td>20</td><td>Jackknifed UCL</td></tr>
<tr><td>Bulkhead Insulation</td><td>587.7</td><td>Normal</td><td>537</td><td>Jackknifed UCL</td></tr>
<tr><td>Rubber Products</td><td>50.9</td><td>Normal</td><td>52.9</td><td>Hall Adjusted Bootstrap</td></tr>
<tr><td>Cable Insulation</td><td>2766</td><td>Normal</td><td>2560</td><td>Standard Bootstrap UCL</td></tr>
<tr><td>Ventilation Gaskets</td><td>33.5</td><td>Normal</td><td>31.4</td><td>Standard Bootstrap UCL</td></tr>
<tr><td>Lubricants</td><td>106.8</td><td>Normal</td><td colspan="2">Not calculated since all lubricants have been removed.</td></tr>
</table>
</td></tr>
<tr><td>#5</td><td>When reviewing Attachment I "Equations Used in the Source Term Report," under the "Rubber Products" section, the average gasket weight may have been calculated incorrectly. Shouldn't the sum be divided by the total number of gaskets, not the number of different sizes?</td><td>In discussion with EPA reviewers, the consensus was that the average gasket weight was calculated correctly as presented in the report and in Attachment 1 to the first Responses to Comments. No action required.</td></tr>
</table>

APPENDIX A

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Ex-ORISKANY Artificial Reef Project:
Polychlorinated Biphenyl (PCB) Source Term Estimates. June 2005 (Draft Final).

Comment	COMMENT	RESPONSE
#2	For the purposes of this project, it would be helpful if the Navy could be more specific in its response to EPA's question about the sampling approach that was used. Further, Navy references "NAVSEA PCB Advisory 95-1 dated September 21, 1995" which had been provided to EPA "approximately 10 years ago for other purposes." What were those other purposes? Did EPA review and comment on NAVSEA PCB Advisory 95-1? Please provide a copy of NAVSEA PCB Advisory 95-1 with the Navy's response.	A copy of the NAVSEA PCB Advisory 95-1 dated September 21, 1995 is provided as an enclosure to this response. The document was previously provided to EPA in support of the SINKEX Program discussions. EPA was provided the document for informational/ reference purposes, not for review and comment. The sampling approach used was a focused approach based on operational knowledge and information on prior sampling evolutions contained in the NAVSEA PCB Database. As such, an inventory of the potential PCB-containing substances was conducted on the ship as the first step. The sampling team leader then conducted a sampling of the various categories of the materials in accordance with NAVSEA PCB advisory 95-1. Statistical-driven random sampling was not used. Rather, the locations and number of samples needed are driven by the guidance and operational knowledge designed such that the data obtained provide a statistical determination of regulated concentrations of PCBs on board the vessel.
DOC III SPECIFIC COMMENT #3	(To be addressed in DOCUMENT VI General Comment 2) In addition to including a brief description of the sampling protocol, the (HHRA) document should also contain text language explaining how the protocol is designed to collect representative samples from PCB-containing materials aboard the ex-ORISKANY. Details of the sampling protocol should be in the PCB Source Term Estimates Document.	(Response that will be included in DOCUMENT VI, General Comment 2): A copy of the NAVSEA PCB Advisory 95-1 dated September 21, 1995 is provided as an enclosure to this response. The sampling protocol was developed using experience gained from analysis of the NAVSEA PCB Database that includes thousands of samples from many classes of ships. Advisory 95-1 was adopted as Navy policy to ensure that materials shown by the database to have a high potential to be PCB containing are the materials sampled. The sampling results are fed back into the database to increase the knowledge base for future sampling efforts and decision-making.