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**THE ECONOMIC BENEFITS OF
EFFLUENT LIMITATION GUIDELINES FOR
OFFSHORE OIL AND GAS FACILITIES**

Final Report

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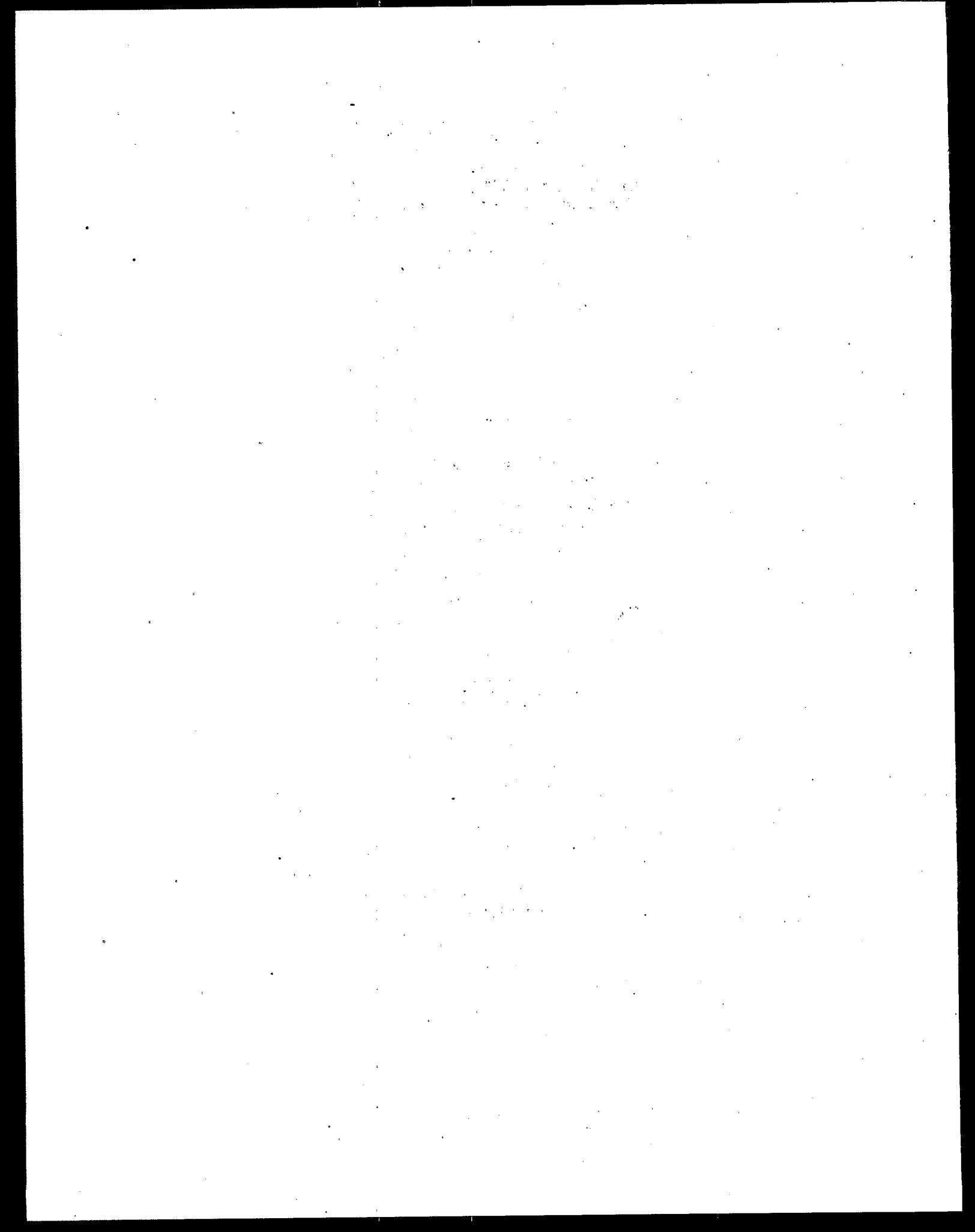


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EXECUTIVE SUMMARY

This report provides an overview of the benefits analysis of the effluent limitation guidelines for offshore oil and gas facilities. Regulatory options were evaluated for two wastestreams: (1) drilling fluids (muds) and cuttings; and (2) produced water.

The analysis focuses on the human health-related benefits of the regulatory options considered. These health risk reduction benefits are associated with reduced human exposure to various carcinogenic and noncarcinogenic contaminants, including lead, by way of consumption of shrimp and recreationally caught finfish from the Gulf of Mexico. Most of the health-risk reduction benefits analysis is based upon a previous report (RCG/Hagler, Bailly, January 1991), developed in support of the proposed rulemaking. Recreational, commercial, and nonuse benefits have not been estimated for these regulations, due to data limitations and the difficulty of estimating these values for effluent controls in the open-water marine environment.

DRILLING FLUIDS AND CUTTINGS

Benefits were estimated for several regulatory options beyond baseline practices (BPJ, or "dirty" barite muds). Estimates were prepared for Gulf of Mexico locations only. These options include:

- ▶ 3 Mile Gulf/California. Zero discharge (i.e., the transport of muds and cuttings to shore for appropriate land-based waste management and disposal) for all platforms within three miles of shore. Under this option, Best Available Technology (BAT), consisting of using "clean" barite drilling fluids, applies to all platforms beyond three miles of shore. Alaska is exempt from the zero discharge requirement.
- ▶ 8 Mile Gulf/3 Mile California. Zero discharge for platforms within eight miles of shore, and BAT for platforms beyond. California and Alaska must meet the same requirements as in the 3 Mile Gulf/California option.
- ▶ Zero Discharge Gulf/California. Zero discharge for all platforms. Alaska is exempt, but must meet the same requirements as in the 3 Mile Gulf/California option.

The estimated benefits of these options are predominantly derived from reducing the amount of lead in edible shrimp tissue harvested from platform-impacted waters of the Gulf (over 15 million kilograms per year). Lead concentrations in edible fish tissue are based on water column and sediment pore water concentrations (omitting uptake via sediment or food chain). Additionally, benefits associated with decreased carcinogenic

risks were estimated. For both risk categories, benefits were estimated using a saltwater leach scenario and an alternative, pH-dependent leach scenario.

Benefits Estimation Methodology: Drilling Fluids and Cuttings

Lead-Related Benefits. All of the lead-related benefits analysis draws upon, and is consistent with, the Agency's previous research on lead. These previous findings are reflected in Agency analyses and documents prepared for the lead phasedown in gasoline, the lead in drinking water rulemaking, and the sludge disposal program.

Major toxic effects of lead include inhibition of heme synthesis, kidney dysfunction, and damage to the central nervous system. Broad symptoms include increased blood pressure and reduced learning ability. Based on previous agency research relating lead intake to selected adverse health effects, reductions in the number of cases of these health endpoints were quantified for the offshore oil and gas effluent guidelines options. These lead-related benefits include (1) decreased infant mortality; (2) reduced I.Q. impairments in children; and (3) reduced risks of heart disease, strokes, hypertension and death in males between 40 and 59 years of age.

To estimate these benefits, lead concentrations in edible shrimp tissue and recreationally caught finfish tissue, and estimates of the shrimp and finfish harvests impacted by platform operations, were prepared for each drilling fluids and cuttings regulatory option (Avanti Corporation, 1992).

The platform-impacted Gulf shrimp harvest was allocated across the estimated 50 million Americans who consume shrimp. The impacted recreational finfish harvest was allocated across the estimated 1.7 million individuals consuming recreationally-caught Gulf finfish. Estimates of human exposure were made at four intake levels that reflect the distribution of shrimp or finfish consumption levels across the population of shrimp or finfish eaters (e.g., individuals who consume relatively low amounts of impacted shrimp, versus those who eat relatively high levels of shrimp).

Seafood consumption levels, coupled with the option-specific lead concentrations in edible shrimp or finfish tissue, provide estimates of the daily lead intake via shrimp and finfish for each exposure group (for each regulatory option). Using age-specific adsorption factors to distinguish lead uptake levels in children versus adults, lead intake levels were transformed into estimates of lead uptake. Using prior Agency lead research, lead uptake was used to estimate changes in the distribution of blood lead levels (PbB) above the baseline distribution (of no shrimp-related or finfish-related lead exposure).

Within each exposure group, the populations were distributed across age and sex categories for which risk reduction analysis can be performed: children, adult males, and pregnant women (whose blood lead level affects the risk of infant mortality):

- ▶ For the children within each exposure group, established Agency research linking elevated blood lead levels to IQ impairments was used to estimate the option-specific reductions in: 1) the total level of IQ point decrements, and 2) the number of children with IQ levels below 70.
- ▶ For the expected number of pregnant women within each exposure group, established Agency research linking elevated blood lead levels to reduced fetal birth weight and, hence, increased infant mortality was used to estimate the option-specific reductions of infant deaths.
- ▶ For the expected number of males between the ages of 40 and 59 within each exposure group, established Agency research was used that links: 1) elevated blood lead levels to hypertension and, subsequently, 2) the increased risk of strokes, cardiovascular heart disease (CHD), and premature fatality due to hypertension. These results were used to estimate the option-specific reductions of strokes, CHD events, and death in the male population between 40 and 59 years of age.

The estimated number of reductions in health effects (cases avoided) at each regulatory option is shown in Table ES-1. These results reflect the impact of lead exposure due to impacted shrimp consumption (estimated lead-related exposures via finfish consumption are so low that no estimable lead-related benefits can be attributed to the regulatory options).

Cancer Risk Reduction Benefits. In conformance with standard Agency risk assessment procedures for carcinogens, excess cancer cases were estimated by multiplying the average arsenic exposure levels (at each option) by the established Agency carcinogenic slope factor (CSF), by the total exposed population.

Results: Drilling Fluids and Cuttings

In Table ES-2, the monetized values of lead-related benefits are displayed for the selected option (3 Mile Gulf/California). The dollar values assigned to each health effect are consistent with EPA's other lead benefits analysis (e.g., the RIAs for the drinking water and sludge rulemakings). As shown in Table ES-3, most of the benefits are obtained at the three-mile barge option, with small incremental benefits realized at more stringent options. All of the benefit levels shown in these tables are related to the use of a saltwater leach scenario for calculating the bioavailability of lead in the marine environment. The alternative scenario evaluated (using a pH-dependent leach rate to

Table ES-1
Annual Incremental Lead-Related Health Effects Reductions
for Drilling Fluids and Cuttings
(Salt Water Leach Scenario, Gulf of Mexico)
(Shrimp only)

Benefit Category	Cases Avoided - From Baseline to Regulatory Options		
	3 Mile Gulf/California	8 Mile Gulf/3 Mile California	Zero Discharge Gulf/California
Infant Mortality	0.31	0.31	0.33
Children			
IQ < 70	0.65	0.70	0.70
IQ points	142.00	144.00	151.00
Adult Males			
Hypertension	243.50	247.00	259.00
Stroke	1.29	1.29	1.42
Heart Disease	6.97	7.10	7.48
Death	9.11	9.16	9.68

Table ES-2
Annual Monetized Lead-Related
Benefits of 3 Mile Gulf/California Option (Shrimp only)

Benefit Category	Baseline to Selected Option		
	Cases Avoided	\$ Benefit per Case Avoided	Incremental Benefits (\$ millions)
Infant Mortality	0.31	\$2-10 million	\$0.7 - 3.1
Children			
IQ < 70	0.65	\$6,040	\$0.0004
IQ points	142.00	\$4,755	\$0.67
Adult Males			
Hypertension	243.5	\$656.0	\$0.16
Stroke	1.29	\$1 million	\$1.3
Heart Disease	6.97	\$1 million	\$7.0
Death	9.11	\$2-10 million	\$18.2 - 91.1
Total*		--	\$28.0 - 103.3

* Total does not add due to rounding.

Table ES-3
Monetized Lead-Related Benefits of
Drilling Fluids and Cutting Options:
Gulf of Mexico
(Salt Water Leach Scenario)
(Shrimp Only)

Regulatory Option	Annual Benefits ^a (millions 1991 dollars)
Baseline - Current	--
3 Mile Gulf/California	\$28.0 - 103.3
8 Mile Gulf/3 Mile California	\$28.4 - 104.4
Zero Discharge Gulf/California	\$29.9 - 110.1

^a Relative to baseline.

estimate fish tissue concentrations) would increase human intake of lead to a significant degree, and the resulting benefit levels would increase by more than a factor of six times greater than the values shown here.

The total monetized benefits of the options for drilling muds and cuttings are shown in Table ES-4. In addition to the lead-related benefits described above, the values also reflect modest reductions in cancer risk as associated with arsenic. These "total" benefits are understated due to the omission of several potentially significant benefits. Omitted benefits include, but are not limited to: (1) Adverse health effects from lead in women and in men below the age of 40 or over the age of 59; (2) Adverse lead-related health effects other than the endpoints quantified; (3) Lead-related exposure associated with shrimp or finfish uptake of lead through the sediments directly, or indirectly, through the food chain; (4) Recreational and commercial fishery improvements; (5) ecologic benefits; and (6) nonuse values.

Table ES-4
Total Monetized Benefits of
Drilling Muds and Cuttings Options:
Gulf of Mexico
(Salt Water Leach Scenario)

Regulatory Option	Annual Benefits ^{a,b} (millions 1991 dollars)
Baseline - Current	--
3 Mile Gulf/California	\$28.1 - \$103.6
8 Mile Gulf/3 Mile California	\$28.5 - \$104.7
Zero Discharge Gulf/California	\$30.0 - \$110.5

^a Health benefits primarily based on reduced lead exposure, plus reduced arsenic-related carcinogenic risks.

^b Relative to baseline.

PRODUCED WATER

The benefits associated with produced water at existing or new sources (NSPS) are related to three regulatory options:

- ▶ Flotation All. Improved gas flotation for all platforms (BAT).
- ▶ Zero 3 Miles Gulf and Alaska. Zero discharge (re-injection) at platforms within three miles of shore, and BAT for platforms beyond three miles. BAT required for California wells.
- ▶ Zero Discharge Gulf and Alaska. Zero discharge for all platforms except California. BAT required for California wells.

Benefit estimates were prepared for Gulf of Mexico locations only. The methodology for estimation of benefits associated with the produced water options is the same as that described above under Drilling Fluids and Cuttings (except that shrimp-related exposures could not be estimated for produced water).

The quantified and monetized benefits are based on reduced human health risks by way of exposure to selected carcinogens (arsenic, benzene and benzo(a)pyrene) and lead through the consumption of recreationally harvested finfish (shrimp uptake of contaminants from the produced water wastestream could not be estimated). The estimated benefit levels are relatively modest, as shown in Tables ES-5 for existing platforms (BAT) and NSPS. It is important to note, however, that these quantified and monetized values omit several important benefits. These omitted benefits include (but are not limited to): (1) Lead related risk reductions for women (all ages) and for men other than those between the ages of 40 and 59; (2) Lead-related health effects other than those evaluated; (3) Lead-related exposure associated with shrimp or finfish uptake of lead through sediments directly, or indirectly through the food chain; (4) Recreational and commercial fishery benefits; and (5) Nonuse values and ecologic benefits that may be associated with the regulatory options.

CONCLUSIONS

The benefits of the offshore oil and gas effluent guidelines appear to be significant, with the monetized human health benefits for the selected options for drilling fluids and cuttings, and produced water, amounting to between \$30 million and \$111 million per year. Virtually all of these benefits arise from estimated reductions in a limited range of adverse health effects associated with lead exposure.

While the estimated human health benefits are significant in their own right, it is important to consider that the estimated monetized benefits for both the muds and cuttings and produced water wastestreams are appreciably limited by the omission of several potentially significant types of benefits that could not be monetized due to current limitations of the data and quantitative methods. Table ES-6 provides an overview of the types of benefits that were monetized as well as those potential benefits that could not be assessed reliably in quantitative and/or monetary terms. This indicates the extent to which there are many potentially significant benefits that are not included in the monetary benefits assessment.

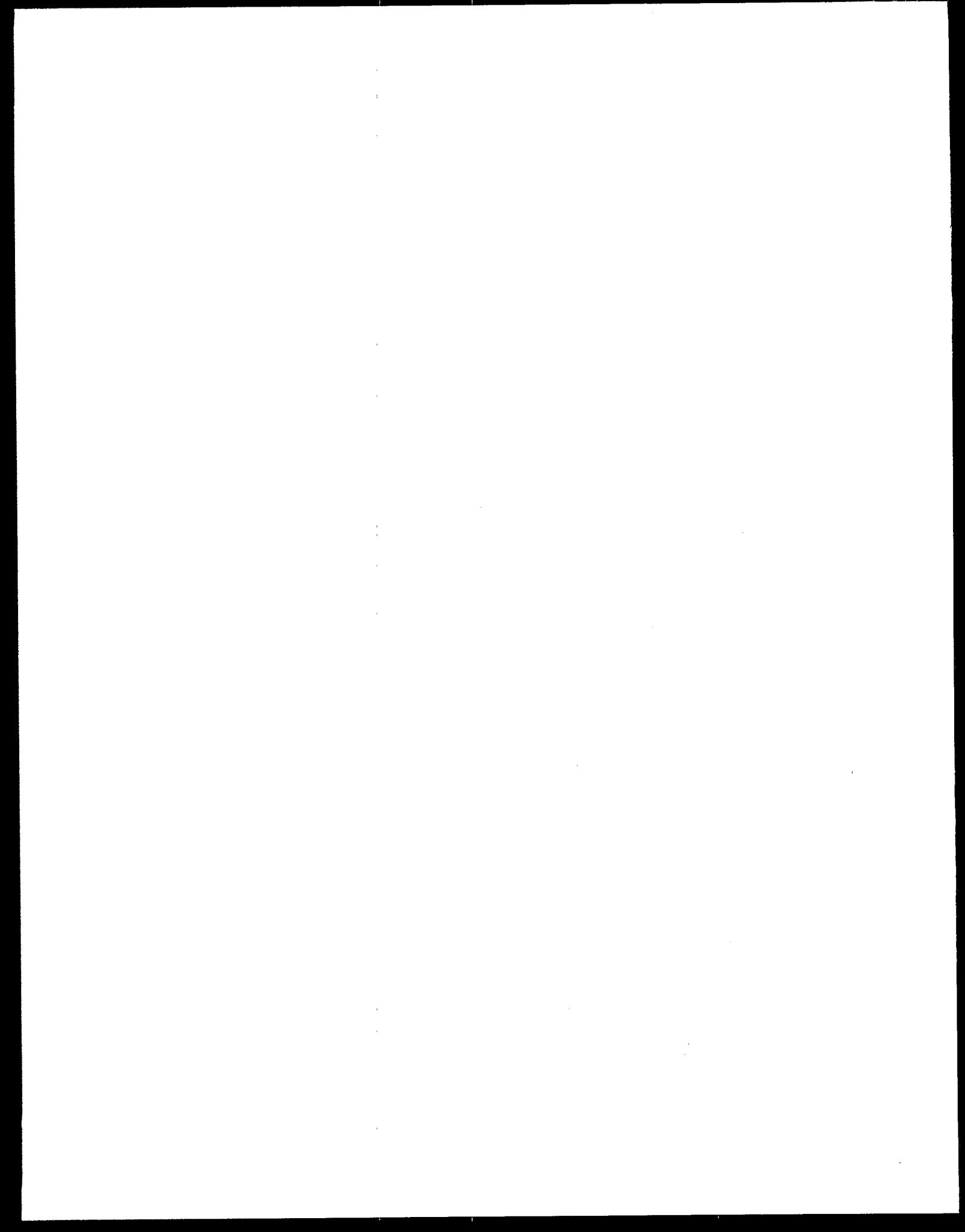
Table ES-5
Total Monetized Benefits for Produced Water
Gulf of Mexico^a
(Thousands of 1991 Dollars)

Regulatory Option	Existing Sources	NSPS
Baseline	--	--
Flotation All	\$26.8 - \$107.6	\$34.5 - \$139.1
Zero 3 Miles Gulf and Alaska	\$28.7 - \$117.5	\$48.7 - \$164.3
Zero Discharge Gulf and Alaska	\$42.4 - \$173.2	\$54.8 - \$224.8

^a These benefit estimates do not include risk reductions due to the incidental removal of Radium.

Table ES-6
Benefits of Offshore Oil and Gas Effluent Guidelines

Monetized Benefits
<u>Human Health Risk Reductions:</u>
Contaminants <ul style="list-style-type: none"> ▶ carcinogens with Agency-established risk slope factors ▶ lead
Environmental Pathway <ul style="list-style-type: none"> ▶ water column concentrations (finfish) ▶ sediment pore water concentrations (shrimp)
Exposure Route <ul style="list-style-type: none"> ▶ commercially harvested shrimp in Gulf of Mexico (drilling fluids and cuttings only) ▶ offshore rig recreational angling catch in Gulf of Mexico
Populations <ul style="list-style-type: none"> ▶ carcinogens: all shrimp consumers and offshore Gulf recreational anglers ▶ lead—from among shrimp and recreational finfish consumers: children (5 year old-cohort), males (40 to 59 years old), pregnant women (infant mortality)
Non-Monetized Benefits
<u>Human Health Risk Reductions Associated With:</u>
<ul style="list-style-type: none"> ▶ carcinogens without Agency-established risk slope factors ▶ systemics other than lead ▶ lead health risk endpoints other than infant mortality, IQ detriment, or selected hypertension-related illnesses ▶ lead-related risks to women (all ages) and to men under 40 or over 59 years of age ▶ exposure from shrimp and finfish uptake of pollutants via sediment or the food chain ▶ pH-dependent leach rates ▶ platform-related contaminants in commercial finfish or shellfish other than shrimp
<u>Ecologic Risk Reductions</u>
<ul style="list-style-type: none"> ▶ all pollutants ▶ all offshore species and ecosystems
<u>Fishery Benefits</u>
<ul style="list-style-type: none"> ▶ commercial fisheries ▶ recreational fisheries
<u>Intrinsic Benefits</u>
<ul style="list-style-type: none"> ▶ existence value ▶ bequest value



1.0 INTRODUCTION

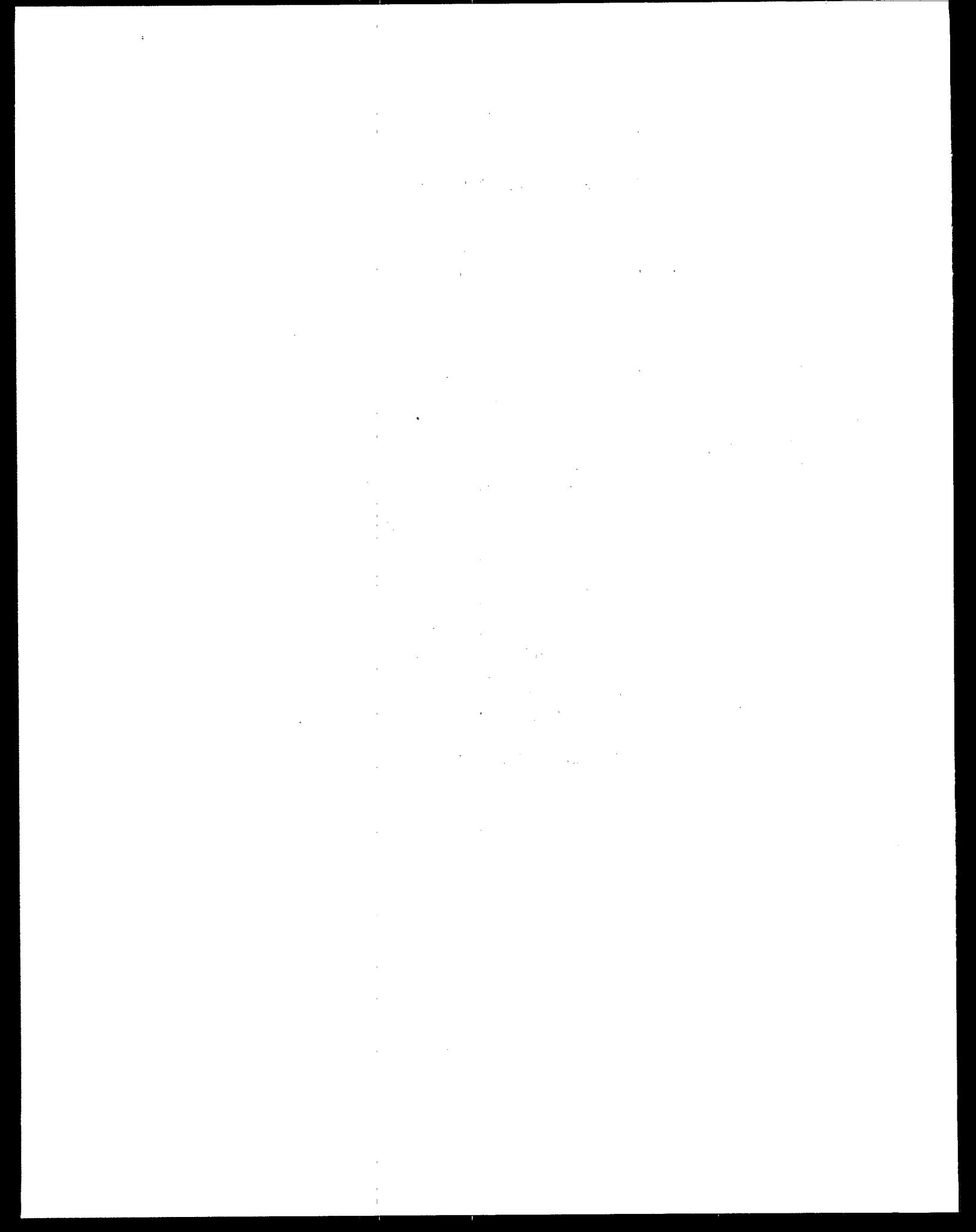
1.1 SCOPE AND PURPOSE OF THIS BENEFITS ANALYSIS REPORT

This report represents an economic benefits analysis for the effluent limitation guidelines for offshore oil and gas facilities. The benefits analysis specifically addresses the health risk reduction benefits attained from applying regulatory options for the drilling fluids and produced water waste-streams.

This analysis of the reduced human health risks associated with the pollutant removals is based on the consumption of (i) recreationally-caught finfish species by sport anglers in the Gulf of Mexico (for both the muds and cuttings and produced water wastestreams); and (ii) shrimp commercially harvested in impacted Gulf waters and consumed by the general public (for drilling fluids and cuttings only). This report is based extensively on the methodology and analysis conducted for regulatory options evaluated in previous rulemaking efforts, as described in greater detail in RCG/Hagler, Bailly (January 1991). The analysis described below applies this previously conducted research to the current set of regulatory options. In addition, the analysis has been revised as described below to reflect updated fish harvest data and health effects valuation insights.

1.2 OUTLINE OF THE REPORT

The outline of this report is as follows: Section 2.0 provides an overview of the methodology. Section 3.0 provides a summary of the findings for the drilling fluids (muds) and cuttings regulatory options. Section 4.0 provides a summary of findings for the regulatory options associated with the produced water wastestream at existing platforms, and Section 5.0 provides produced water results for new sources (NSPS). Section 6.0 offers a summary and conclusions. Finally, appendices provide detailed results for each wastestream and regulatory option.



2.0 OVERVIEW OF METHODOLOGY

2.1 INTRODUCTION AND DISCUSSION OF GENERAL METHODOLOGY

The methodology employed for this analysis is identical to that employed in the benefits analysis that originally accompanied the proposed rulemaking, as described in the report, *The Economic Benefits of Proposed Effluent Limitation Guidelines for Offshore Oil and Gas Facilities* (RCG/Hagler, Bailly, Inc., Final Report, January 24, 1991). In the analysis, changes in effluent concentrations are translated into changes in fish tissue concentrations for the applicable pollutants (this analytic step is performed by Avanti Corporation (Avanti, 1992)). These changes in fish tissue contaminant concentrations are then translated, via exposure assessments for shrimp eaters and recreational anglers, to changes in human intake of the contaminants. Reductions in health risks are then characterized using Agency-established dose-response functions. The contaminants addressed in this supplemental analysis, and the dose-response relationships which were applied, are summarized in Tables 2-1(a) and 2-1(b).

The analysis focusses on the impact of the regulatory options in the Gulf of Mexico (the Gulf). The Gulf represents a significant majority of the regulated platforms and also the bulk of the impacted fisheries.¹ To the extent that the regulations will have an impact beyond the Gulf, the benefits estimated in this report are understated.

The economic benefits assessment is organized by benefit category. Typically, the largest benefits of regulations that reduce pollutant loadings to surface waters are related to recreation values. In this case, however, because data do not exist to estimate such benefits, reductions in human health risks appear to be the most significant monetizable benefit category.² Therefore, much of the benefits analysis pertains to the risk assessment issues of exposure assessment and dose-response relationships. Key steps in the analysis include the following:

¹ Over 98.7% (2,517 out of 2,549) of the total U.S. offshore producing structures are located in the Gulf.

² Data and analytic methods were not available to estimate the potential recreational and commercial fishing benefits of the regulations.

Table 2-1(a)
Human Health Risk Factors
Inorganic Compounds

Compound	Oral RfD ¹ (mg/kg-day)	Carcinogenicity Oral Slope Factor ¹ (mg/kg-day) ⁻¹
Arsenic	3E-04	A, 2E+00
Barium	5.0E-02	D
Boron	9.0E-02	D
Cadmium	5E-04 (water) 1E-03 (food)	B1 inhalation only
Chromium III	1E+00	pending
Chromium VI	5E-03	A, inhalation only
Copper	3.7E-01 ²	D
Lead	no RfD	B2
Manganese	2.0E-01	
Mercury	3E-04	D
Nickel	2E-02	"A" via inhalation ND via oral ²
Silver	5E-03	D
Zinc	2E-01 ²	D

¹ All data extracted from US EPA Integrated Risk Information System (IRIS), current May 1992, unless noted.

² U.S. Environmental Protection Agency. 1989. Health Effects Assessment Summary Tables.

ND = No Data

EPA Carcinogen Classification Tables:

A: Human carcinogen

B1: Probable human carcinogen - limited human data

B2: Probable human carcinogen - sufficient animal data, inadequate or no evidence in humans

C: Possible human carcinogen

D: Not classifiable

E: Evidence of noncarcinogenicity for humans

Table 2-1(b)
Human Health Risk Factors
Organics

Compound	Oral RfD ¹ (mg/kg-day)	Carcinogenicity Oral Slope Factor ¹ (mg/kg-day) ⁻¹
Benzene	ND	2.9E-02
Benzo(a)pyrene	ND	B2-5.79E+00
Chlorobenzene	3.0E-02 ²	D
p-Chloro-m-cresol	2.0E-01 ²	ND
2,4-Dimethylphenol	1.0E-03 ²	ND
Ethylbenzene	1.0E-01	D
Naphthalene	4E-01 ²	D
Phenol	6.0E-01	D
Toluene	3.0E-01 ²	D
Xylenes (total)	2.0E+00	D

¹ All data extracted from US EPA Integrated Risk Information System (IRIS), current May 1992, unless noted.

² U.S. Environmental Protection Agency. 1989. Health Effects Assessment Summary Tables.

ND = No Data

EPA Carcinogen Classification Tables:

- A: Human carcinogen
- B1: Probable human carcinogen - limited human data
- B2: Probable human carcinogen - sufficient animal data, inadequate or no evidence in humans
- C: Possible human carcinogen
- D: Not classifiable
- E: Evidence of noncarcinogenicity for humans

► Concentrations of Contaminants in Edible Seafood Tissue

Lead concentrations in edible shrimp and finfish tissue, and estimates of the shrimp and finfish harvest impacted by platform operations, were prepared for each muds and cuttings regulatory option by Avanti Corporation (1992). No credible pathway analysis could be developed to link the produced water wastestream to lead levels in shrimp.

► Exposure Assessments for Human Intake of Contaminants

Given the pollutant concentrations in edible fish tissues, for estimated portions of the Gulf catch impacted, the analysis generates exposure scenarios that reflect Most Exposed Individual (MEI) and "average" fish consumption patterns,³ explained in greater detail below. The exposure scenarios are based on EPA guidance on risk assessment for ingestion of tainted fish ("Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish: A Guidance Manual," US EPA/OWRS, 1989a), food consumption data from the U.S. Department of Agriculture ("Food Consumption, Prices and Expenditures," USDA/ERS, 1985), and information obtained from other relevant sources.

► Dose-Response Relationships

The "doses" of pollutants, as derived from the exposure assessment, are then compared to standard dose-response measures. For carcinogens, unit slope measures are used to estimate excess lifetime cancer risks per exposed individual, and the expected number of excess cancers over the applicable population. For noncarcinogens, exposures are compared to oral reference doses (oral RfDs) to indicate the percentage of dose from this source relative to the "threshold" dose.⁴ Carcinogenic unit slope factors and oral RfDs for noncarcinogens are derived from EPA's Integrated Risk Information System (IRIS) database, which represents the Agency consensus view of the health end-points and potency for the

³ An intermediate exposure scenario, which is defined as a "quasi-MEI," is also developed and used to illustrate the impact of several regulatory options. This scenario is explained in greater detail in subsequent chapters of this report. For the lead analysis, a distribution of four exposure levels is developed, as described below.

⁴ Technically, the oral RfDs are not "thresholds" in a strict sense, because there is considerable uncertainty as to whether any dose level is "safe." Rather, oral RfDs reflect the level of long-term daily exposure at which there is concern regarding possible adverse chronic health effects.

contaminants. For contaminants not present in IRIS, EPA's Health Effects Assessment Documents are used.

For lead, a special procedure must be adopted, because there is no Agency-recognized threshold (oral RfD) for its noncarcinogenic health risks. For lead, the Agency-approved procedure is to calculate the concentrations of lead in blood. Blood lead (PbB) distributions are estimated based on EPA's Air Quality Criteria Document for Lead (as developed by the Office of Research and Development), and OAQPS' Staff Report on exposure analysis methods for lead (USEPA (1989b), which was reviewed and approved by the SAB's Clean Air Science Advisory Committee, and used for the lead in drinking water regulations). The results are used to indicate average (geometric mean) PbB levels, as well as PbB levels at specified percentiles of the population (for both children and adults). All of the lead-related benefits analysis draws upon, and is consistent with, the Agency's previous research on lead (e.g., USEPA, 1985, 1986, 1989a, 1989b). These previous findings are reflected in Agency analyses and documents prepared for the lead phasedown in gasoline, the lead in drinking water rulemaking, and the sludge disposal program.

► Derivation of Anticipated Health Impacts

Finally, the actual risk characterization is made by combining exposure estimates with dose-response information described above to derive anticipated health impacts to each target population stemming from the discharge.

2.2 EXPOSURE SCENARIOS

2.2.1 Seafood Consumption Levels

As in the previous analysis (RCG/Hagler, Bailly, January 1991), three human exposure scenarios have been developed and analyzed: (1) average, (2) Most Exposed Individual (MEI), and (3) "quasi-MEI" levels of exposure.⁵

- The average exposure scenario conforms to a mass balance between landings of contaminated seafood and the estimated total number of people exposed. This is derived by dividing impacted landings (recreational finfish

⁵ As detailed in Section 2.2.2 below, lead-related risks were based on a more refined distribution of exposure levels.

and commercial shrimp) over the number of people that participate (i.e., the number of people who are Gulf recreational anglers, or American shrimp consumers). In all of the average exposure scenarios developed, the mass balance approach is important in that it maintains a physical consistency between the amount of tainted seafood landed and the resulting level of human intake and exposure.

For finfish, the average daily intake level of rig-impacted fish, under *muds and cuttings* at baseline, is 0.98 grams per day. This is derived as 320,880 kg of rig-impacted fish landed per year (Avanti Corporation, 1992) divided by 900,000 recreational anglers,⁶ divided by 365 days per year. For *produced water*, the average daily intake of rig-impacted fish at baseline is 8.14 g/day per person (2.674 million kg edible fish tissue landed (Avanti, 1992), divided by 900,000 anglers, divided by 365 days per year).

For shrimp, the average baseline *muds and cuttings* intake amounts to 0.82 g/day per person. This is derived as 15.03 million kg rig-impacted shrimp landed per year (Avanti Corporation, 1992), divided by 50 million American shrimp consumers (RCG/Hagler, Bailly, 1991), divided by 365 days per year. As with the finfish consumption levels, the intake of rig-impacted shrimp varies according to whether a given regulatory option affects only a portion of the platforms and, hence, only a portion of the baseline impacted shrimp harvest.

- ▶ The Most Exposed Individual (MEI) exposure is based on an intake of rig-impacted seafood of 284 g/day, as consistent with EPA's Risk Assessment Guidance for Superfund (1989). This reflects the upper 95% confidence limit on seafood consumption per meal. Thus, the MEI reflects those individuals who, for every day of their lives, eat one large meal per day of rig-impacted seafood.
- ▶ The quasi MEI exposure is intended to reflect a high consumption scenario that is more plausible than the MEI (which assumes that the main protein source for the individual, for every day of his/her life, is a large portion of rig-impacted seafood). A 45 g/day consumption value is used here as a

⁶ As described later in the text, an estimate 900,000 is used to reflect the number of individuals potentially exposed by way of recreationally harvested finfish from the offshore Gulf, within three miles of shore. This includes the anglers themselves plus other individuals with whom the catch may be shared. These rig-impacted average fish consumption values change for regulatory options defining a different number of miles from shore as the zero discharge/BAT cut-off point (because greater or fewer rigs and, hence, greater or fewer fish and anglers are impacted).

quasi-MEI measure, which approximates the average for an avid recreational angler. This is essentially a scenario for someone who eats one large seafood-based meal every other day of his/her life, and assumes that half of the seafood consumed is rig-impacted.

2.2.2 Using the Exposure Scenarios in Calculating Risk Reduction Benefits

Carcinogenic and Noncarcinogenic Risks (Apart from Lead)

For carcinogenic risk levels, the mass balance-derived average exposure levels are used to estimate both average exposure and the size of the exposed human population. As noted above, the mass balance approach maintains a physical consistency between the amount of tainted fish landed and the resulting level of human intake and exposure.

The quasi MEI and MEI scenarios are not appropriate for estimating numbers of excess cancer cases. Instead, they are used for indicating the individual cancer risk levels faced by those individuals who fit a given exposure pattern. They also are used in developing "hazard indices" for noncarcinogens (comparisons of exposure levels to oral reference doses).

Lead-Related Risks

As described in greater detail in a previous report (RCG/Hagler, Bailly, 1991, especially pp. 6-6 through 6-12) and as described in more detail in Appendix E, lead-related health risk reductions are highly nonlinear with respect to lead intake levels. Among the predominant interacting nonlinearities are the response relationships between blood lead levels and various adverse health endpoints (such as strokes), and the importance of baseline blood lead levels in determining where an individual is located along the functions relating blood lead to a health effect.

To estimate how exposure to lead-impacted shrimp affect blood lead levels, four exposure groups were constructed to reflect the distribution of the consumption of rig-impacted shrimp (i.e., the majority of consumers who eat approximately the average amount of shrimp, versus the small percentile of individuals who consume relatively large quantities of shrimp). These four exposure groups reflect different levels of impacted shrimp consumption, with the percentiles assigned to each group, and the amount of shrimp consumed by individuals in each group based on EPA's Tolerance Assessment System (TAS) data. This distribution is depicted in the top portion of Table 2-2. The total quantities of rig-impacted shrimp implied by these quantities and percentile allocations is consistent in a mass balance perspective with the estimates of impacted shrimp harvested.

Table 2-2
Comparison of Shrimp Consumption Scenarios
(Grams Per Day)

	Exposure Group			
	A: LOW	B: MODERATE	C: MODERATELY HIGH	D: HIGH
Offshore Benefits Analysis*				
Percentile	0-86	86-97	97-99.9	99.9-100
Consumption Rate	0-3	3-12	12-117	>117
EPA Interpretation of USDA^b				
Percentile	0-90	90-95	95-99	99-100
Consumption Rate	0-11	11-27	27-82	>82

* Saltwater leach rate scenario. For the pH-dependent leach scenario, because lead concentrations are much higher, the same level of health benefit derived below would be obtained at much lower human consumption rates for shrimp (at 16.7% of rates shown above).

^b From final Memorandum, from H. Jacobs to A. Tarnay, August 21, 1992 (included below as Appendix F).

Subsequent to the completion of this exposure assessment and benefits analysis, EPA undertook a review of the distribution of levels of shrimp consumption in the U.S. This examination relied on USDA data from the National Food Consumption Survey, 1977-78 (Jacobs, 1992). The results, as presented in the bottom portion of Table 2-2 and in Appendix F, are highly consistent with the exposure scenarios developed for the benefits analysis.

For example, the lead-related benefits described in the subsequent chapter of this report are derived from changes in lead intake for members of the highest two exposure groups (reflecting the Q-MEI and MEI portions of the population).⁷ This TAS-based (and mass balance consistent) benefits analysis assigns the 97th to 99.9th percentiles of the

⁷ Members of the lower exposure groups have shrimp-related lead intake that is too low to result in discernable incremental risks. Therefore, no estimable benefits are associated with reducing their lead exposure by way of rig-impacted shrimp.

shrimp eating public to the Q-MEI category (Exposure Group C), with shrimp intake estimated between 12 and 117 grams per day. In comparison, EPA's more recent investigation of USDA data shows shrimp consumption at 27 to 82 grams per day for the 95th and 99th percentiles, respectively. While the percentiles do not match up in a manner that permits direct comparisons of the shrimp consumption levels, it nonetheless is evident that the two distributions are roughly equivalent.⁸

Time and resource limitations precluded reanalyzing lead-related benefits based on the revised EPA shrimp consumption distribution. However, given the equivalence of the distributions, the benefit estimates derived below (on the basis of the mass balance TAS interpretation) would not be expected to change significantly if the new EPA consumption scenarios were used instead.

2.2.3 The Number of Recreational Anglers Offshore in the Gulf

As noted above, the average human exposure to rig-impacted finfish depends on how many people are exposed to the estimated mass of catch. To derive this estimate, National Marine Fisheries Service (NMFS) data were used to derive the number of Gulf fishing participants, and then pro-rate according to the boat trips used to fish offshore as opposed to from beaches and piers.

First, for the relevant states of AL, MS, LA, and TX, there are 5.78 million shore-based fishing days, and 6.38 million boat-based offshore angling days (NMFS, 1991). Thus, offshore angling represents 52.5% of Gulf-based recreational fishing.

Second, there are 984,000 total recreational Gulf anglers in LA, MS, and AL (three year average for 1987 - 1989). There are no data for the number of Texas participants, so these are assumed to be proportional to the number of fishing days originating in Texas as opposed to the other relevant states (54.9% of the angling). Thus, assuming that Texas angling effort (days per angler) is the same as for the other states, a total estimate

⁸ Under the pH-dependent leach scenario, the lead intake levels associated with the salt water leach scenario benefits would be realized with shrimp consumption levels considerably less than (i.e., 16.7% of) the levels noted in Table 2-2. For example, under the pH-dependent leach scenario, shrimp consumption for the 97th and 99.9th percentiles would need to be only 2 to 20 grams per day, respectively, in order to result in the lead exposures used to derive the lead-related health benefits developed in the analysis described in Chapter 3. In contrast, the mean shrimp consumption level, based on 1977-78 USDA data, is 4.3 grams per day, and the 95th percentile is 26.7 grams per day. Thus, under the pH-dependent leach scenario, shrimp consumption profiles would be well below the USDA data in order to derive the risk and benefit levels developed below. Alternatively, using the shrimp consumption distribution as shown in Table 2-2 in combination with the pH-dependent lead concentrations yields benefit levels considerably higher than under the saltwater leach scenario (e.g., compare the results in Tables 3-5 and 3-6).

(i.e., including TX) of Gulf fishing participants of 2.18 million recreational angling participants is derived.

Third, assuming that the number of participants in offshore angling is proportional to the number of trips taken offshore (52.5%) results in an estimate of 1.15 million persons who participate in boat-based offshore recreational fishing in the Gulf waters of TX, AL, MS, and LA. Given that recreational anglers may share their catch with family members, an estimate of roughly 1.7 million persons may be exposed to recreationally-caught finfish from the Gulf (i.e., assuming half the anglers share their catch with a family member).

Finally, because the selected regulatory option for drilling fluids and cuttings is zero discharge on platforms within three miles from shore, it is relevant to determine the number of people exposed by way of Gulf offshore recreational angling within three miles of shore. There are no data to accurately gauge the number of participants who fish exclusively or predominantly in this range. However, the level of exposure due to fish caught within three miles is probably proportional to the weight-based share of fish landings taken within three miles. NMFS data indicate that roughly half of the offshore recreational catch by weight is drawn from three miles or less from shore (the weight-adjusted harvest from 1987 - 1989 is 53% within three miles). Therefore, 53% of 1.7 million yields roughly 900,000 persons as a measure of those who are predominantly exposed to offshore catch within three miles.⁹

2.3 IMPACTED FISH HARVEST AND LEACH RATE SCENARIOS

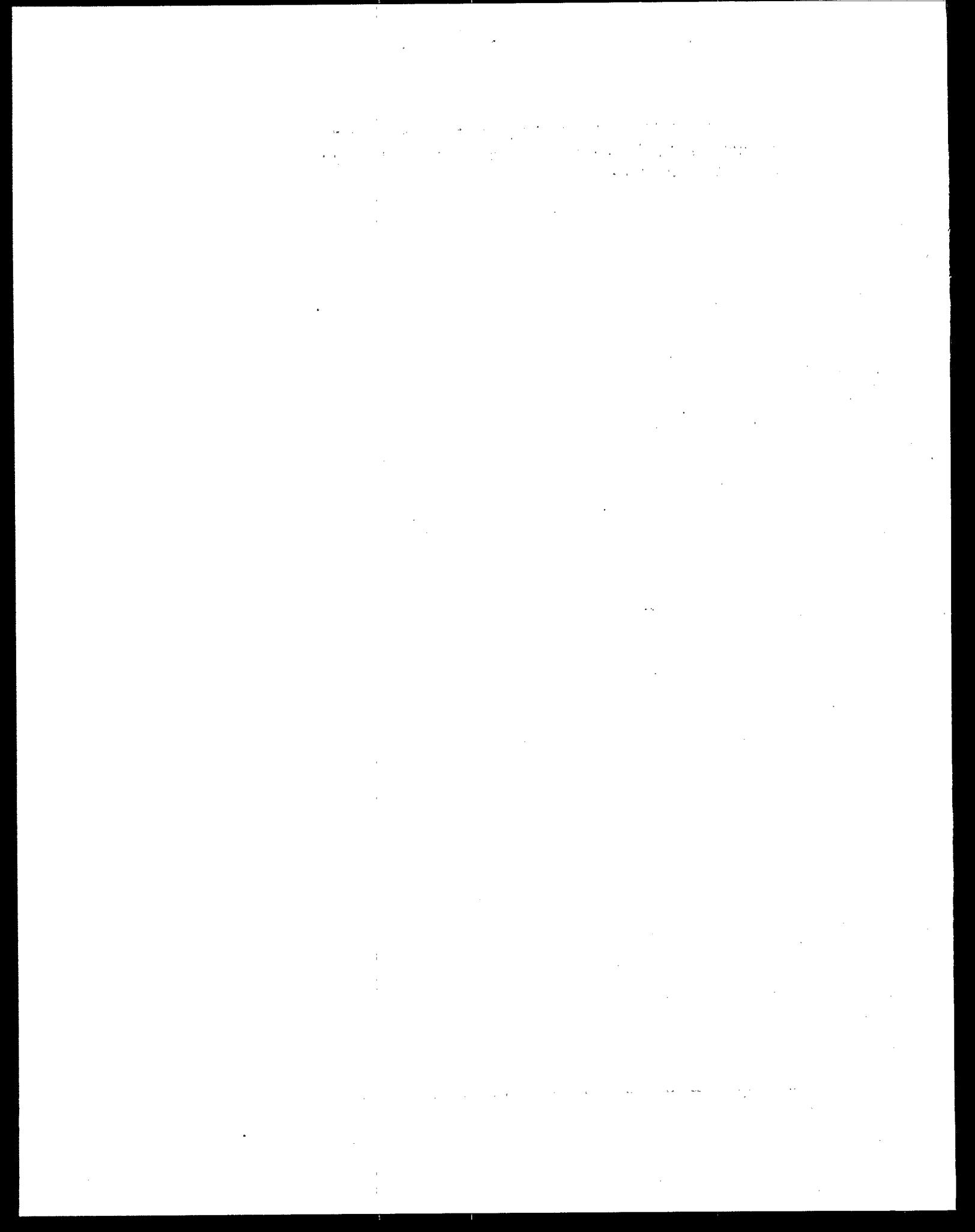
The human exposure levels are a function of: (1) the concentrations of pollutants in edible fish tissue; and (2) the quantity of shrimp and recreationally harvested finfish that are impacted by regulated platforms. Data for these two factors were provided by Avanti (May 1992), and three scenarios are used to characterize each of these factors.

First, to calculate tissue concentrations of metals for muds and cuttings, alternative leach rate scenarios were developed. The results depicted in Section 3.0 reflect both saltwater-based and pH-dependent leach rate scenarios. The former implies highly-limited bioavailability of lead and other metals, and the latter implies partial (e.g., 20%) bioavailability.

For impacted finfish and shrimp harvests, three catch rate scenarios were developed (Avanti, 1992). In the results that are presented in Sections 3.0, 4.0 and 5.0, the moderate scenario is depicted. Sensitivity analyses are discussed to reveal the impact of

⁹ The 900,000 estimate is applied to all regulatory scenarios, since this reflects the location of most of the regulatory effort. And, given the mass balance approach used, the carcinogenic risk results are unaffected by the number of people exposed, so the 900,000 figure is convenient for all options.

using the higher and lower harvest rate scenarios, and the complete set of results is provided in the Appendices.



3.0 DRILLING FLUIDS AND CUTTINGS

3.1 NONCARCINOGENIC RISKS

3.1.1 Risks Associated With Lead Intake

At proposal, a detailed analysis of lead intake by way of rig-impacted shrimp (RCG/Hagler, Bailly, January 1991) indicted that appreciable benefits would be realized due to control of drilling fluids and cuttings. Because an analysis of the benefits associated with reduced exposure to lead is complex and highly nonlinear, time is not available to conduct a detailed analysis of the lead-related benefits associated with the revised regulatory package. However, the prior lead benefits analysis can be used as a benchmark against which benefits levels can be approximated.

Updating Lead Risk Reduction Values

The first step in this rough benchmark approximation is to update the original lead benefits analysis to reflect subsequent insights gained by the Agency regarding the benefit values associated with the monetized value of avoiding lead-related health effects. These recent updates are reflected and described in the Regulatory Impact Analysis developed for the drinking water standards for lead and copper (Wade Miller Associates and Abt Associates, April 1991).

The principal changes, relative to the original offshore effluent guidelines benefits analysis (RCG/Hagler, Bailly, January 1991), increase the value of avoided stroke, heart attack (CDH), and hypertension cases in adult white males. The new values are \$1 million per case avoided for strokes and CDHs, and \$628 for hypertension (whereas the values previously applied were \$52,200, \$72,254, and \$277, respectively). Updated values also were developed for IQ decrements in children, with the total predicted decrement in IQ points valued at \$4588 per point (whereas they previously had been valued at \$471 per point of IQ decrement).¹

An additional change involves extrapolating the lead-related health benefits analysis that pertain to white males aged 40 to 59 to include all males in this age group, not just whites. Precedent for such an expansion is found in the final RIA prepared for the recent rulemaking on lead in drinking water (WMA and Abt Associates, April 1991).

¹ The net result of these changes, as applied to the original analysis conducted in 1991 (with a baseline average daily lead intake of 0.057 $\mu\text{g}/\text{day}$), increases the benefits of moving from baseline conditions to zero discharge to \$20.7 million to \$72.4 million per year (from the previous estimate of \$13.4 to \$65.2 million per year).

According to the 1990 U.S. Consensus of Population, white males 40 to 59 are 77.5 percent of the U.S. population of all males aged 40 to 59. Thus, if the benefits due to reduced CDH, stroke and mortality risks are applied to all adult males in that age bracket, then the relevant monetized benefits for adult males increase by 29 percent (100 percent divided by 77.5 percent).²

Benchmarking Benefit Estimates

The benefits of reduced lead exposure due to the revised regulatory options have been updated to account for changes from the regulatory options previously analyzed. The analyses also embody enhanced modeling of pollutant uptake into fish tissue, and apply more detailed shrimp and finfish harvest scenarios to ascertain the size of platform-impacted catch (these analysis are developed by Avanti Corp., May 1992). As a consequence, the estimated levels of lead intake have been revised for both baseline conditions and for the set of regulatory options currently under consideration.

Although many aspects of the underlying exposure analysis has changed, both the number of people exposed and the distribution of *relative* lead intake levels within the exposed group are the same as previously analyzed (RCG/Hagler, Bailly, January 1991). Therefore, although the benefits of changes in lead exposure are nonlinear (particularly through critical ranges of exposure), the analysis performed previously provides a set of points on this nonlinear function. These points link average lead intake levels to monetized benefit levels for the relevant exposed group, accounting for the distribution of intragroup exposure levels. Accordingly, rough approximations of the benefits of the present set of regulatory options can be ascertained through benchmarking along the previously derived benefits function. This is accomplished by linearizing segments of the function (interpolating between points according to average lead intake levels).

Table 3-1 indicates, for relevant average lead (pb) intake levels, the geometric mean blood lead levels (GMPbB), and the percent of the exposed population with blood lead above the 10 micrograms per deciliter benchmark for adults and children. These results are extracted directly from RCG/Hagler, Bailly (1991).

² As described in greater detail in Appendix E, hypertension and related risks due to elevated blood lead levels in adult males are estimated using a univariate logistic function (Equation 1 in Appendix E) derived by EPA's Office of Air Quality Planning and Standards (OAQPS). This is based on the Agency's multiple logistic regression model as used to estimate elevated risks for the lead in gasoline and lead in drinking water. Use of the OAQPS logistic function may introduce error into the estimation process because it relies on means, drawn from the NHANES II sample, in its non-linear equation. Nonetheless, use of the OAQPS approach is believed to provide a reasonable approximation of the effect of blood lead on blood pressure (US EPA, 1992a).

Table 3-1
Blood Lead Distributions for Relevant Shrimp-Related Lead Intake Levels*

Lead Intake ^{b,c} ($\mu\text{g pb/day}$)	Adults		Children	
	GMPbB ($\mu\text{g/dl}$) ^c	Percent with PbB > 10 $\mu\text{g/dl}$ ^a	GMPbB ($\mu\text{g/dl}$) ^c	Percent with PbB > 10 $\mu\text{g/l}$ ^c
0.057 (16.0)	4.0 4.5	0.2% 0.7%	5.0 5.8	3.0% 6.0%
0.035 (9.8)	4.0 4.3	0.2% 0.5%	5.0 5.5	3.0% 4.5%
0.0	4.0	0.2%	5.0	3.0%

a Extracted from Table 6-4, RCG/Hagler, Bailly (1991).
 b Average adult daily intake. Children's intake proportionally less due to lower shrimp consumption.
 c Results in parentheses indicates values for the Q-MEI exposure group, for tissue concentrations consistent with the average exposure scenarios.

Results — Saltwater Leach Scenario

Table 3-2 summarizes the average lead intake levels for the four relevant regulatory options, under the saltwater leach scenario. These reflect lead exposure by way of platform-impacted shrimp.³ At baseline, average lead intake amounts to 0.058 $\mu\text{g}/\text{day}$, which coincides with one of the levels analyzed in RCG/Hagler, Bailly (1991), as shown in Table 3-1. At the regulatory option of zero discharge (barge) within three miles and BAT (1:3) beyond, average lead intake drops to 0.021 $\mu\text{g}/\text{day}$, considerably less than the 0.035 level for which benefits were estimated in RCG/Hagler, Bailly (1991). Therefore, the benefits of moving from baseline (0.058 $\mu\text{g pb/day}$) to zero discharge within three miles and BAT beyond (0.021 $\mu\text{g pb/day}$) are approximated here by (and, in reality are somewhat greater than) the benefits previously estimated for moving from 0.057 to 0.035 $\mu\text{g pb/day}$. Likewise, the benefits of moving from baseline (0.058 $\mu\text{g/day}$) to zero discharge are equivalent to the previously estimated benefits of moving from 0.057 $\mu\text{g/day}$ to zero intake.

³ Lead exposures by way of recreationally harvested finfish are too low to estimate changes in blood lead distributions (e.g., 0.00064 $\mu\text{g}/\text{day}$ for average exposed individual at baseline — see Appendix B — which is roughly one percent of the comparable shrimp-related average exposure).

Table 3-2
Lead Intake Reduction Benefits for Shrimp Consumption
as Impacted by Drilling Fluids and Cuttings
(Salt Water Leach Scenario) (1)

Regulatory Option	Average Lead Intake Levels ($\mu\text{g/person/day}$)			Pb. Intake Reduction
	Development Wells	Exploratory Wells	Total	
Baseline	0.037	0.021	0.058	—
3 Mile Gulf/Calif. (2)	0.011	0.01	0.021	0.037
8 Mile Gulf/3 Mile Calif. (2)	0.008	0.0074	0.0154	0.0426
Zero Discharge Gulf/Calif.	0	0	0	0.058

(1) Average intake levels, moderate harvest scenario (2) BAT for all remaining platforms

Building upon RCG/Hagler, Bailly (1991) in this fashion, the lead intake levels for the present set of regulatory options can be associated with estimates of the expected reduction in selected adverse health effects.⁴ The incremental lead-related health risk reductions for all three relevant regulatory options are shown in Table 3-3 (for the saltwater leach scenario) and the monetized value of these benefits for the selected option (3 Mile Gulf/California) are shown in Table 3-4. The dollar values per case

⁴ The risk reduction benefits (number of cases avoided) are based on applying the appropriate dose-response factors to the relevant subgroups of the exposed populations, with the population subgroup sizes determined by national demographic data. For example, most of the monetized benefits arise from reduced risks to adult males in the 40 to 59 age bracket. According to the 1990 U.S. Census, this group of individuals (males 40 to 59) comprises 11.6% of the total U.S. population. Therefore, they are estimated to represent 11.6% of the 50 million individuals who are shrimp consumers; that is, the benefits estimates pertaining to adult males are based on an exposed population of 5.8 million adult males in the relevant age bracket (50 million times 11.6%). These exposed individuals are then allocated to each of the four shrimp consumption exposure groups (e.g., 0.1% of 5.8 million, or 5,800 individual males between 40 and 59 years of age, are in the highest exposure group; 2.7%, or roughly 160,000 such males, are allocated to the second highest exposure group, etc.).

The estimated numbers of exposed pregnant women (newborn infants) and children (age 5 cohort) are derived in comparable fashion. These calculations yield the following results: for the age 5 cohort, 645,000 individuals are in the low exposure group, 82,500 are in the moderate exposure group, 21,750 are in the moderately high exposure group, and 750 are in the highest group. For pregnant women (newborn infants), 722,517 are in the low exposure group, 92,415 are in the moderate exposure group, 24,364 are in the moderately high exposure group, and 840 are in the highest group.

shown in Table 3-4 are consistent with the values used in RCG/Hagler, Bailly (1991), except as stated explicitly in Section 3.1.1 above, and all amounts have been updated to 1991 dollar values.

Table 3-3
Annual Incremental Lead-Related Health Effects Reductions
for Drilling Fluids and Cuttings
(Salt Water Leach Scenario, Gulf of Mexico)
(Shrimp only)

Benefit Category	Cases Avoided - From Baseline to Regulatory Options		
	3 Mile Gulf/California	8 Mile Gulf/3 Mile California	Zero Discharge Gulf/California
Infant Mortality	0.31	0.31	0.33
Children			
IQ < 70	0.65	0.70	0.70
IQ points	142.00	144.00	151.00
Adult Males			
Hypertension	243.50	247.00	259.00
Stroke	1.29	1.29	1.42
Heart Disease	6.97	7.10	7.48
Death	9.11	9.16	9.68

Table 3-4
Annual Monetized Lead-Related
Benefits of 3 Mile Gulf/California Option
(Shrimp Consumption)

Benefit Category	Baseline to Selected Option		
	Cases Avoided	\$ Benefit per Case Avoided	Incremental Benefits (\$ millions)
Infant Mortality	0.31	\$2-10 million	\$0.7 - 3.1
Children			
IQ < 70	0.65	\$6,040	\$0.0004
IQ points	142.00	\$4,755	\$0.67
Adult Males			
Hypertension	243.5	\$656.0	\$0.16
Stroke	1.29	\$1 million	\$1.3
Heart Disease	6.97	\$1 million	\$7.0
Death	9.11	\$2-10 million	\$18.2 - 91.1
Total*		—	\$28.0 - 103.3

* Total does not add due to rounding.

The dollar value of lead-related benefits for all regulatory options is shown in Table 3-5, with most of the benefits accruing at the 3 Mile Gulf/California option (\$28.0 to \$103.3 million per year). Benefits at zero discharge amount to between \$29.9 to \$110.1 million per year.

Results — pH-Dependent Leach Scenario

Under the "saltwater" leach scenario, which implies a low level of lead bioavailability, the benefits of the selected option amount to up to \$103 million per year, as depicted in Table 3-5. Alternatively, if the lead is bioavailable to a greater, but still limited degree (e.g., 20%), as implied by the pH-dependent leach scenario, then the resulting benefits increase substantially — up to a \$650 million per year, as depicted in Table 3-6. While the benefit levels are appreciable under either leach rate scenario, the sensitivity of the results to the leach factor indicates the importance of additional research in this area.⁵

Table 3-5 Monetized Lead-Related Benefits of Drilling Fluids and Cutting Options Gulf of Mexico (Salt Water Leach Scenario) (Shrimp Only)	
Regulatory Option	Annual Benefits^a (millions 1991 dollars)
Baseline - Current	--
3 Mile Gulf/Calif.	\$28.0 - \$103.3
8 Mile Gulf/3 Mile Calif.	\$28.4 - \$104.4
Zero Discharge Gulf/Calif.	\$29.9 - \$110.1

^a Relative to baseline.

⁵ This sensitivity arises due to a combination of factors. First, the leach scenario alters the estimated concentration of lead in shrimp tissue and, hence, in human exposure. This impact alone accounts for a nearly ten-fold increase in human intake. Second, the resulting change in human lead intake levels occurs in a critical portion of the benefits function where health risk reductions become more significant for a given reduction in exposure.

Table 3-6
Lead Intake Reduction Benefits for Shrimp Consumers
Impacted by Drilling Fluids and Cuttings
(pH-Dependent Leach Scenario)(1)

Regulatory Option	Average Lead Intake Levels (ug/person/day)				Annual Benefits Range (Millions of 1991 values)
	Development Wells	Exploratory Wells	Total	Pb Intake Reduction	
Baseline	0.19	0.17	0.36	—	—
3 Mile Gulf/Calif.	0.072	0.066	0.138	0.222	\$177.0
8 Mile Gulf/3 Mile Calif.	0.052	0.048	0.1	0.26	\$652.5
Zero Discharge Gulf/Calif.	0	0	0	0.36	\$179.5
					\$659.5
					\$189.0
					\$696.0

(1) Average intake levels, moderate harvest scenario.

3.1.2 Other Noncarcinogenic Risks

Aside from lead, other compounds pose noncarcinogenic risks via drilling fluids and cuttings. As summarized in Table 3-7, shrimp-related intake of several toxic compounds occur at levels of concern relative to established oral reference doses (RfDs).⁶ In particular, under the saltwater leach scenario, mercury intake under baseline conditions amounts to 0.3% of the oral RfD for an average individual, 40% of the RfD for the quasi-MEI, and is more than two and a half times the RfD for an MEI. Arsenic, Cadmium and Chromium VI exposures also are at levels of concern for individuals with higher than average exposure to impacted shrimp.⁷ All of the regulatory options beyond baseline reduce average exposures to below 0.1% of the respective oral RfDs, and also reduce exposures for Q-MEIs and MEIs.⁸

3.2 CARCINOGENIC RISKS

Carcinogenic risks posed by way of muds and cuttings are associated with exposure to arsenic by way of shrimp consumption. Comparing Table 3-8 to Table 3-9, it is evident that these risk reductions are highly dependent on the leach rate scenario applied. The cancer risk reduction benefits of moving from baseline to zero discharge ranges from up to \$448,000 under the saltwater leach rate scenario, but are more than \$3.1 million per year under the pH-dependent leach scenario.^{9,10}

⁶ Oral reference doses are threshold-like levels below which ingestion-related chronic exposures are not believed to pose appreciable human health risks.

⁷ Under a pH-dependent leach scenario, the exposure levels are even greater. For example, baseline mercury intake for the average exposed individual is 1.0% of the oral RfD (rather than the 0.3% shown in Table 3-7). Also note that the reported values are for shrimp only -- exposure levels by way of finfish impacted by muds and cuttings are below 0.1% of the oral RfDs.

⁸ Note that the Q-MEI and MEI exposure levels are insensitive to regulatory scenarios beyond BAT for all platforms (other than zero discharge for all platforms, under which exposures are zero) because these exposures are defined by shrimp caught from those platforms with nonzero (i.e., BAT-level) discharge. In reality, those options that extend zero discharge to greater numbers of platforms will reduce exposures for those individuals with above average exposure scenarios.

⁹ These benefits are for shrimp consumption only. Finfish-related risks posed by muds and cuttings are considerably lower, with individual risk levels roughly one percent of those due to shrimp, and only two percent as many individuals exposed (i.e., benefits would amount to less than \$100 per year under the saltwater leach scenario).

¹⁰ The Agency is considering new evidence of the carcinogenic potency (and target organs) of arsenic, and the estimated cancer risks associated with these exposure levels may increase appreciably if EPA updates the carcinogenic slope factor for arsenic as anticipated (Dr. Charles Abernathy, U.S. EPA, personal communication, October 1992).

Table 3-7
Principle Noncarcinogenic Risks Associated with Drilling Fluids and Cuttings
(% of oral RfD Attributable to Shrimp Consumption)*

Regulatory Scenario	Compound	Exposure Scenario		
		Average	Q-MEI	MEI
Baseline	Arsenic	< 0.1%	0.3%	4.3%
	Cadmium	< 0.1%	1.7%	10.9%
	Chromium VI	< 0.1%	5.6%	36.0%
	Mercury	< 0.3% ^b	40.0%	260.0%
BAT All	Arsenic	< 0.1%	0.2%	2.5%
	Cadmium	< 0.1%	0.8%	5.1%
	Chromium VI	< 0.1%	2.4%	15.3%
	Mercury	< 0.1%	35.3%	228.8%
3 Mile Gulf/Calif.	Arsenic	< 0.1%	0.2%	2.5%
	Cadmium	< 0.1%	0.8%	5.1%
	Chromium VI	< 0.1%	2.4%	15.3%
	Mercury	< 0.1%	35.3%	228.8%
8 Mile Gulf/3 Mile Calif.	Arsenic	< 0.1%	0.2%	2.5%
	Cadmium	< 0.1%	0.8%	5.1%
	Chromium VI	< 0.1%	2.4%	15.3%
	Mercury	< 0.1%	35.3%	228.8%
Zero Discharge Gulf/Calif.	Arsenic	< 0%	0%	0%
	Cadmium	< 0%	0%	0%
	Chromium VI	< 0%	0%	0%
	Mercury	< 0%	0%	0%

^a Salt Water Leach and moderate harvest scenario reflect combined exposure for developmental and exploratory wells.

^b 1.0% under pH-dependent leach scenario.

Table 3-8
Excess Cancer Case Reduction Benefits due to Development and Exploration
Drilling Fluids and Cuttings: Salt Water Leach Scenario (1)
(Gulf of Mexico, Shrimp Only)

Regulatory Scenario	Annual Excess Cancer Cases		Monetized Benefits (3) (Thousands of 1991 dollars)	
	Total	Incremental Reduction (2)	Low	High
Baseline	0.045	--	--	--
3 Mile Gulf/Calif.	0.019	0.026	\$51.2	\$258.9
8 Mile Gulf/3 Mile Calif.	0.014	0.031	\$61.0	\$308.8
Zero Discharge Gulf/Calif.	0	0.045	\$88.6	\$448.2

(1) Arsenic only, does not include risk reductions associated with radium or other pollutants controlled by the regulation.

(2) Relative to baseline.

(3) Cancer cases avoided valued at \$1.97 million to \$9.96 million (1991 dollars).¹

Table 3-9
Excess Cancer Case Reduction Benefits due to Development and Exploration
Drilling Fluids and Cuttings: pH-Dependent Leach Scenario (1)
(Gulf of Mexico, Shrimp Only)

Regulatory Scenario	Annual Excess Cancer Cases		Monetized Benefits (3) (Thousands of 1991 dollars)	
	Total	Incremental Reduction (2)	Low	High
Baseline	0.32	--	--	--
3 Mile Gulf/Calif.	0.139	0.181	\$356.1	\$258.9
8 Mile Gulf/3 Mile Calif.	0.1	0.022	\$432.8	\$308.8
Zero Discharge Gulf/Calif.	0	0.32	\$629.0	\$3,187.2

(1) Arsenic only; does not include risk reductions associated with radium or other pollutants controlled by the regulation.

(2) Relative to baseline.

(3) Cancer cases avoided valued at \$1.97 million to \$9.96 million (1991 dollars).

3.3 TOTAL BENEFITS

The total combined benefits are shown in Table 3-10, for the more conservative saltwater leach scenario. The lead-related benefits dominate the results (accounting for more than 99% of the benefits).

Table 3-10
Total Monetized Benefits and Costs
Drilling Fluids and Cuttings
Gulf of Mexico
(Salt Water Leach Scenario)

Regulatory Option	Annual Benefits ^{a,b} (millions 1991 dollars)
Baseline - Current	--
3 Mile Gulf/Calif.	\$28.1 - \$103.6
8 Mile Gulf/3 Mile Calif.	\$28.5 - \$104.7
Zero Discharge Gulf/Calif.	\$30.0 - \$110.5

^a Health benefits primarily based on reduced lead exposure, only partially on reduced arsenic-related carcinogenic risks.

^b Relative to baseline.

4.0 PRODUCED WATER — EXISTING PLATFORMS

4.1 NONCARCINOGENIC RISKS

Levels of human exposure for noncarcinogens were estimated for sixteen relevant contaminants with Agency-derived oral exposure reference doses (oral RfD, as reported previously, in Table 2-1). Exposure levels (human intake) were estimated for average, quasi-MEI, and most exposed individual (MEI) scenarios for recreational finfish consumption.¹ These exposure levels were then compared to the oral RfDs (adjusted to reflect the intake level, in µg/day for a 70 kg adult, that is equivalent to the oral RfD).

Human exposure to the noncarcinogens analyzed occurs at very low levels relative to the oral RfDs with only 2.4 Dimethylphenol exposure occurring at or above 0.1% of the oral RfD. As indicated in Table 4-1, the most significant exposure at baseline is an MEI intake level for finfish that is 6.5% of the RfD.

Lead exposures also are reduced through the impact of the produced water regulatory options on lead concentrations in recreationally harvested finfish impacted by offshore oil and gas operations in the Gulf. As shown in Table 4-2, the associated benefits amount to \$114,000 per year at zero discharge.

4.2 CARCINOGENIC RISKS

Carcinogenic risks for finfish were estimated for arsenic, benzene, and benzo(a)pyrene. As shown in Table 4-3, a reduction of 0.006 excess cancer cases per year is estimated at zero discharge. This translates to an annual monetary value of \$11,800 to \$59,700 (1991 dollars). Additional benefits may be anticipated to the extent that the regulations induce any incidental reductions in radium exposure.

4.3 TOTAL BENEFITS

Combining the cancer benefits with the lead-related benefits described above, the annual monetized benefits of regulating produced water at existing platforms amount to as much as \$164,000 per year.

This total is not inclusive of incidental radium-related health benefits or other, non-health, benefits which may result from these regulations.

¹ Human exposure by way of shrimp and commercial finfish consumption could not be estimated for the produced water wastestream.

Table 4-1
Noncarcinogen Risks for Produced Water — Existing Platforms
(Finfish Only)

Regulatory Scenarios	Intake as % of Oral RfD		
	2,4 Dimethylphenol		
	Average	Q-MEI	MEI
Baseline	0.2%	1.0%	6.5%
Flotation All	0.2%	0.8%	— 5.4%
Zero 3 Miles Gulf and Alaska	0.1%	0.8%	5.4%
Zero Discharge ≤ 4 Miles	0.1%	0.8%	5.4%
Zero Discharge ≤ 10 Meters	0.1%	0.9%	6.1%
Zero Discharge Gulf and Alaska	0	0	0

Table 4-2
BAT Lead Intake Reduction Benefits for Finfish
Impacted by Produced Water
(Existing Platforms) (1)

Regulatory Option	Average Lead Intake Levels ($\mu\text{g/person/day}$)		Annual Benefits (Thousands of 1991 dollars)	
	Total	Pb Intake Reduction	Low	High
Baseline	0.019	--	--	--
Flotation All	0.008	0.011	\$20.9	\$77.7
Zero 3 Miles Gulf and Alaska	0.008	0.011	\$20.9	\$77.7
Zero Discharge Gulf and Alaska	0	0.019	\$30.6	\$113.5

(1) Average intake levels, moderate harvest scenario

(2) BAT for all remaining platforms

Table 4-3
BAT Excess Cancer Case Reduction Benefits Due to
Produced Water at Existing Platforms
(Moderate Fish Harvest) (1)

Regulatory Scenario	Annual Excess Cancer Cases		Monetized Benefits (3) (Thousands of 1991 dollars)	
	Total	Incremental Reduction (2)	Low	High
Baseline	0.006	--	--	--
Flotation All	0.003	0.003	\$5.9	\$29.9
Zero 3 Miles Gulf and Alaska ⁴	0.002	0.004	\$7.8	\$39.8
Zero Discharge Gulf and Alaska	0	0.006	\$11.8	\$59.7

(1) Arsenic, benzene, and benzo(a)pyrene only; does not include risk reductions associated with radium or other pollutants controlled by the regulations

(2) Relative to baseline

(3) Cancer cases avoided valued at \$1.97 million to \$9.95 million
(4) Zero discharge within 3 miles; improved gas flotation for all other platforms

5.0 PRODUCED WATER — NEW SOURCES (NSPS)

5.1 NONCARCINOGENIC RISKS

As noted for existing platforms, levels of human exposure for noncarcinogens as compared to Agency-derived oral exposure reference doses (oral RfDs) were insignificant except for 2,4-Dimethylphenol and lead.

Table 5-1 presents exposure results for the former, indicating a baseline average exposure via recreationally caught finfish of 0.3% of the oral RfD. This average exposure declines to 0.2% for application of improved gas flotation at all platforms, and drops to roughly 0.1% of the RfD when zero discharge is applied to platforms within three or four miles of shore.

Lead exposure-related benefits are shown in Table 5-2. The lead-associated benefits amount to \$145,000 per year at zero discharge.

Table 5-1
Noncarcinogenic Risks for Produced Water — NSPS
(Finfish Only)

Regulatory Scenario	Intake as % Of Oral RfD, by Exposure Scenario (2,4 - Dimethylphenol)		
	Average	Q-MEI	MEI
Baseline	0.3%	1.4%	8.6%
Flotation All	0.2%	1.2%	7.2%
Zero 3 Miles Gulf and Alaska	0.1%	1.2%	7.2%
Zero Discharge ≤ 4 Miles	0.1%	1.2%	7.2%
Zero Discharge ≤ 10 Meters	0.2%	1.2%	7.2%
Zero Discharge Gulf and Alaska	0%	0%	0%

5.2 CARCINOGENIC RISKS

Carcinogenic risks for finfish were estimated for arsenic, benzene, and benzo(a)pyrene. As shown in Table 5-3, a reduction of 0.008 excess cancer cases per year is estimated at zero discharge. This translates to an annual monetary value of \$16,000 to \$80,000 (1991 dollars).

Table 5-2
**Lead Intake Reduction Benefits for Finfish
 Impacted by Produced Water
 (NSPS) (1)**

Regulatory Option	Average Lead Intake Levels (ug/person/day)		Monetized Benefits (Thousands of 1991 dollars)	
	Total	Pb Intake Reduction	Low	High
Baseline	0.026	--	--	--
Flotation All	0.013	0.013	\$26.7	\$99.3
Zero 3 Miles Gulf and Alaska	0.011	0.015	\$38.9	\$114.5
Zero Discharge Gulf and Alaska	0	0.026	\$39.1	\$145.1

(1) Average intake levels, moderate harvest scenario

(2) BAT for all remaining platforms

Table 5-3
Excess Cancer Case Reduction Benefits Due to Produced Water
at NSPS Platforms
(Moderate Fish Harvest)¹

Regulatory Scenario	Annual Excess Cancer Cases		Monetized Benefits³ (Thousands of 1991 Dollars)	
	Total	Incremental Reduction²	Low	High
Baseline	0.008	--	--	--
Flotation All	0.004	0.004	\$7.8	\$39.8
Zero 3 Miles Gulf and Alaska ⁴	0.003	0.005	\$9.8	\$49.8
Zero Discharge Gulf and Alaska	0	0.008	\$15.7	\$79.7

¹ Arsenic, benzene, and benzo(a)pyrene only; does not include risk reductions associated with radium or other pollutants controlled by the regulation

² Relative to baseline

³ Cancer cases avoided valued at \$1.97 million to \$9.96 million

⁴ Zero discharge within 3 miles; improved gas flotation for all other platform

5.3 TOTAL BENEFITS

Combining the monetized lead-related and cancer risk reduction benefits, the total monetized benefits of regulating produced water at new sources amount to as much as \$225,000 per year at zero discharge. This total is not inclusive of incidental radium-related health benefits, or non-health benefits, which may result from these regulations.

6.0 CONCLUSIONS

The incremental monetized benefits estimated above are for quantified health risk reductions attributable to regulating drilling fluids and cuttings, and produced water at offshore oil and gas platforms.

The principal monetized findings are:

- ▶ For muds and cuttings, the incremental benefit of moving from baseline controls to the selected option of zero discharge within three miles and BAT beyond (3 Mile Gulf/California) amount to between \$28 and \$104 million per year; and between \$30 to \$111 million annually for zero discharge for all platforms (1991 dollars; saltwater leach scenario). These benefits may amount to as much as \$696 million per year under an alternative, pH-dependent leach rate scenario.
- ▶ For produced water controls at existing sources, incremental benefits amount to nearly \$164,000 per year (1991 dollars) due to cancer risk reductions and lead-related health benefits at zero discharge. Incidental radium-related risk reduction benefits are not included in these estimates.
- ▶ For produced water control at new sources, incremental benefits of up to \$225,000 per year (1991 dollars) accrue due to cancer risk reductions and lead-related health benefits at zero discharge. Incidental radium-related risk reduction benefits are not included in these estimates.

While these monetized benefits of the offshore oil and gas effluent guidelines appear to be significant, it is important to recognize that virtually all of these benefits arise from estimated reductions in a limited range of adverse health effects associated with lead exposure. The estimated monetized benefits for both the muds and cuttings and produced water wastestreams are appreciably limited by the omission of several potentially significant types of benefits that could not be monetized due to current limitations of the data and quantitative methods. Table 6-1 provides an overview of the types of benefits that were monetized as well as those potential benefits that could not be assessed reliably in quantitative and/or monetary terms. This indicates the extent to which many potentially significant benefits are excluded from the monetary benefits assessment.

Table 6-1
Benefits of Offshore Oil and Gas Effluent Guidelines

Monetized Benefits
<u>Human Health Risk Reductions:</u>
Contaminants <ul style="list-style-type: none"> ▶ carcinogens with Agency-established risk slope factors ▶ lead
Environmental Pathway <ul style="list-style-type: none"> ▶ water column concentrations (finfish) ▶ sediment pore water concentrations (shrimp)
Exposure Route <ul style="list-style-type: none"> ▶ commercially harvested shrimp in Gulf of Mexico (drilling fluids and cuttings only) ▶ offshore rig recreational angling catch in Gulf of Mexico
Populations <ul style="list-style-type: none"> ▶ carcinogens: all shrimp consumers and offshore Gulf recreational anglers ▶ lead — from among shrimp and recreational finfish consumers: children (5 year old-cohort), males (40 to 59 years old), pregnant women (infant mortality)
Non-Monetized Benefits
<u>Human Health Risk Reductions Associated With:</u>
<ul style="list-style-type: none"> ▶ carcinogens without Agency-established risk slope factors ▶ systemics other than lead ▶ lead health risk endpoints other than infant mortality, IQ detriment, or selected hypertension-related illnesses ▶ lead-related risks to women (all ages) and to men under 40 or over 59 years of age ▶ exposure from shrimp and finfish uptake of pollutants via sediment or the food chain ▶ pH-dependent leach rates ▶ platform-related contaminants in commercial finfish or shellfish other than shrimp
<u>Ecologic Risk Reductions</u>
<ul style="list-style-type: none"> ▶ all pollutants ▶ all offshore species and ecosystems
<u>Fishery Benefits</u>
<ul style="list-style-type: none"> ▶ commercial fisheries ▶ recreational fisheries
<u>Intrinsic Benefits</u>
<ul style="list-style-type: none"> ▶ existence value ▶ bequest value

7.0 REFERENCES

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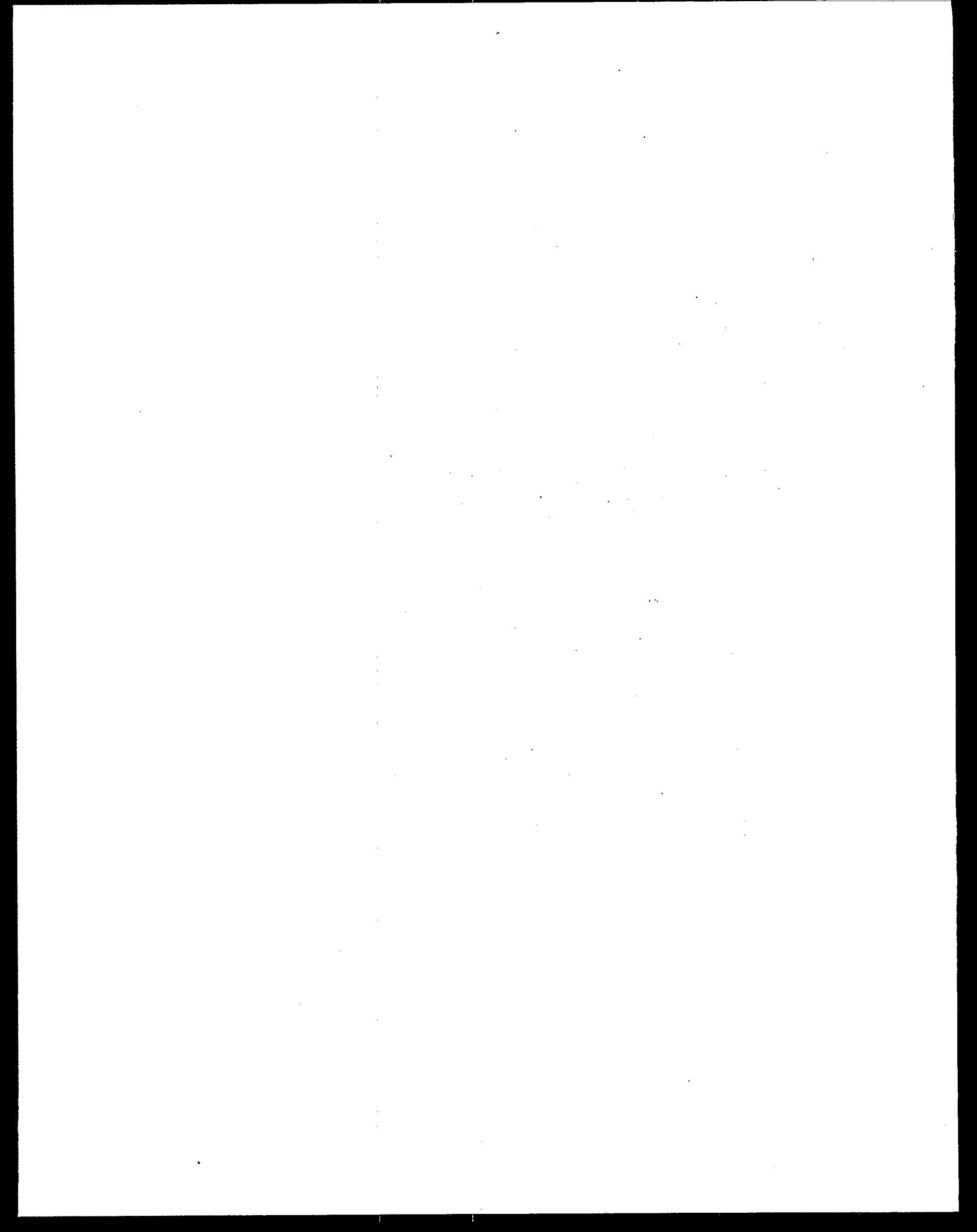
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APPENDIX A

SHRIMP IMPACTS FROM DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATIONS

the first time in the history of the world,
that the people of the United States
have been compelled to go to war
in defense of their country.

EXPOSURE ASSUMPTIONS - SHRIMP	
# of consumers:	5.0E+07 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	5.9E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

EXPOSURE ASSUMPTIONS - FIN FISH	
# of consumers:	900000 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	9.8E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
BASELINE CONDITIONS - BPJ/BPT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %
DEVELOPMENT PLATFORMS

NONARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake	Quasi MEI Hazard	Average Quotient	MEI Daily Lead Intake	Quasi MEI Daily Lead Intake	Qunsi MEI Daily Lead Intake
Naphthalene	4.0E-01	1.46E-04	1.2E-09	3.1E-09	5.9E-07	1.5E-06	9.4E-08	2.3E-07	7.5E-07	2.5E-03		
Arsenic	3.0E-04	1.16E-03	9.7E-09	3.2E-05	4.7E-06	1.6E-02						
Cadmium	1.0E-03	7.14E-03	6.0E-08	6.0E-05	2.9E-05	2.9E-02						
Chromium III	1.0E+00	1.35E-01	1.1E-06	1.1E-06	5.5E-04	5.5E-04						
Chromium VI	5.0E-03	1.35E-01	1.1E-06	2.3E-04	5.5E-04	1.1E-01						
Copper	3.7E-01	3.99E-03	3.3E-08	9.0E-08	1.6E-05	4.4E-05						
Lead	2.88E-02	2.4E-07	2.4E-07		1.2E-04	1.2E-04						
Mercury	3.0E-04	3.05E-02	2.6E-07	8.5E-04	1.2E-04	4.1E-01						
Nickel	2.0E-02	1.13E-02	9.5E-08	4.7E-06	4.6E-05	2.3E-03						
Silver	5.0E-03	3.50E-08	2.9E-13	5.9E-11	1.4E-10	2.8E-08						
Zinc	2.0E-01	1.66E-02	1.4E-07	7.0E-07	6.7E-05	3.4E-04						

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Average Lifetime	Annual	MEI	MEI Annual	Quasi MEI	Quasi MEI
		Excess	Expected	Lifetime	Excess Cancer	Annual	Excess Cancer
		Risk Level	Cases	Excess	Cases	Excess	Cases
Arsenic	2.0E+00	1.9E-08	1.4E-02	9.4E-06	6.7E+00	1.5E-06	1.1E+00

EXPOSURE ASSUMPTIONS - SHRIMP					
# of consumers:	5.0E+07 people				
Exposure frequency:	365 days/year				
Exposure Duration:	70 years				
Body Weight:	70 kg				
Average Intake:	7.5E-04 kg/day				
MEI Ingestion rate:	0.284 kg/day				
Quasi MEI Ingestion rate:	0.045 kg/day				

EXPOSURE ASSUMPTIONS - FIN FISH					
# of consumers:	900000 people				
Exposure frequency:	365 days/year				
Exposure Duration:	70 years				
Body Weight:	70 kg				
Average Intake:	9.8E-04 kg/day				
MEI Ingestion rate:	0.284 kg/day				
Quasi MEI Ingestion rate:	0.045 kg/day				

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
BASELINE CONDITIONS - BP/BFT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %
EXPLORATION WELLS

NONCARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	MEI	Quasi MEI Intake	Quasi MEI	Average Daily Lead Intake (ug/day)	MEI	Quasi MEI
Naphthalene	4.0E-01	1.05E-02	1.1E-07	2.8E-07	4.3E-05	1.1E-04	6.7E-06	1.7E-05			
Arsenic	3.0E-04	8.36E-04	9.0E-09	3.0E-05	3.4E-06	1.1E-02	5.4E-07	1.8E-03			
Cadmium	1.0E-03	5.13E-03	5.5E-08	5.5E-05	2.1E-05	2.1E-02	3.3E-06	3.3E-03			
Chromium III	1.0E+00	9.67E-02	1.0E-06	1.0E-06	3.9E-04	3.9E-04	6.2E-05	6.2E-05			
Chromium VI	5.0E-03	9.67E-02	1.0E-06	2.1E-04	3.9E-04	7.8E-02	6.2E-05	1.2E-02			
Copper	3.7E-01	2.87E-03	3.1E-08	8.4E-08	1.2E-05	3.1E-05	1.8E-06	5.0E-06			
Lead		2.07E-02	2.2E-07	8.4E-05			1.3E-05		1.6E-02	5.9E+00	9.3E-01
Mercury	3.0E-04	2.19E-02	2.4E-07	7.9E-04	8.9E-05	3.0E-01	1.4E-05	4.7E-02			
Nickel	2.0E-02	8.16E-03	8.8E-08	4.4E-06	3.3E-05	1.7E-03	5.2E-06	2.6E-04			
Silver	5.0E-03	2.52E-08	2.7E-13	5.4E-11	1.0E-10	2.0E-08	1.6E-11	3.2E-09			
Zinc	2.0E-01	1.19E-07	1.3E-07	6.4E-07	4.8E-05	2.4E-04	7.6E-06	3.8E-05			

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Lifetime Excess Risk Level	Annual Expected Excess Cancer Cases	MEI	Lifetime Excess Cancer Cases	Annual Expected Excess Cancer Cases	MEI	Lifetime Excess Cancer Cases	Annual Expected Excess Cancer Cases	MEI	Lifetime Excess Cancer Cases
Arsenic	2.0E+00	1.8E-08	1.3E-02	6.8E-06	4.8E+00	1.1E-06	1.6E-02	5.9E+00	9.3E-01		

EXPOSURE ASSUMPTIONS - SHRIMP	
# of consumers:	5.0E+07 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	5.9E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

EXPOSURE ASSUMPTIONS - FIN FISH	
# of consumers:	900000 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	9.8E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
BASELINE CONDITIONS - BPJ/BPT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

Contaminant	Average Concentration	Average Intake	MEI Hazard	MEI Intake	Quasi MEI Hazard	Quasi MEI Intake	Average Daily Lead Intake	MEI Daily Lead Intake	Quasi MEI Daily Lead Intake
Oral RID (mg/kg-day)	(mg/kg)	(mg/kg-day)	Quotient	(mg/kg-day)	Quotient	(mg/kg-day)	(ug/day)	(ug/day)	(ug/day)
Compound	4.0E-01	1.05E-02	8.8E-08	2.2E-07	4.3E-05	1.1E-04	6.7E-06	1.7E-05	
Naphthalene			1.1E-08	3.8E-05	5.5E-06	1.8E-02	8.7E-07	2.9E-03	
Arsenic	3.0E-04	1.35E-03	9.4E-08	9.4E-05	4.5E-05	4.5E-02	7.2E-06	7.2E-03	
Cadmium	1.0E-03	1.12E-02	1.5E-06	1.5E-06	7.4E-04	7.4E-04	1.2E-04	1.2E-04	
Chromium III	1.0E+00	1.82E-01	1.5E-06	3.1E-04	7.4E-04	1.5E-01	1.2E-04	2.3E-02	
Chromium VI	5.0E-03	1.82E-01	5.7E-08	1.5E-07	2.8E-05	7.5E-05	4.4E-06	1.2E-05	
Copper	3.7E-01	6.82E-03	3.0E-07	1.4E-04	1.4E-04	2.3E-05			2.1E-02
Lead			3.52E-02	6.5E-07	2.2E-03	3.2E-04	1.1E+00	5.0E-05	1.6E+00
Mercury	3.0E-04	7.77E-02	1.4E-07	7.0E-06	6.8E-05	3.4E-03	1.1E-05	5.4E-04	
Nickel	2.0E-02	1.67E-02	3.44E-08	5.8E-13	1.4E-10	2.8E-08	2.2E-11	4.4E-09	
Silver	5.0E-03	3.44E-08	1.68E-02	1.4E-07	7.0E-07	6.8E-05	3.4E-04	1.1E-05	5.4E-05

CARCINOGENIC RISKS

Oral Slope Factor (mg/kg-day)-1	Average Lifetime Excess	Annual Expected Excess Cancer Cases	MEI Lifetime Excess Cancer Cases	Quasi MEI Lifetime Excess Cancer Cases
Arsenic	2.0E+00	2.3E-08	1.6E-02	1.1E-05

1.2E+00

1.2E+00

2.0E+00

1.2E+00

EXPOSURE ASSUMPTIONS – SHRIMP

# of consumers:	5.0E+07 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	7.5E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

EXPOSURE ASSUMPTIONS – FIN FISH

# of consumers:	900000 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	9.8E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
BASELINE CONDITIONS – BP/BPT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
EXPLORATION WELLS

NONCARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	Average Daily Lead Intake (ug/day)	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	1.46E-04	1.6E-09	3.9E-09	5.9E-07	1.5E-06	9.4E-08	2.3E-07			
Arsenic	3.0E-04	1.88E-03	2.0E-08	6.7E-05	7.6E-06	2.5E-02	1.2E-06	4.0E-03			
Cadmium	1.0E-03	1.58E-02	1.7E-07	1.7E-04	6.4E-05	6.4E-02	1.0E-05	1.0E-02			
Chromium III	1.0E+00	2.53E-01	2.7E-06	2.7E-06	1.0E-03	1.0E-03	1.6E-04	1.6E-04			
Chromium VI	5.0E-03	2.53E-01	2.7E-06	5.5E-04	1.0E-03	2.1E-01	1.6E-04	3.3E-02			
Copper	3.7E-01	9.49E-03	1.0E-07	2.8E-07	3.9E-05	1.0E-04	6.1E-06	1.6E-05			
Lead		4.90E-02	5.3E-07	2.0E-04	2.0E-04	3.1E-05					
Mercury	3.0E-04	1.08E-01	1.2E-06	3.9E-03	4.4E-04	1.5E+00	6.9E-05	2.3E-01			
Nickel	2.0E-02	2.32E-02	2.5E-07	1.2E-05	9.4E-05	4.7E-03	1.5E-05	7.5E-04			
Silver	5.0E-03	4.78E-08	5.1E-13	1.0E-10	1.9E-10	3.9E-08	3.1E-11	6.1E-09			
Zinc	2.0E-01	2.33E-02	2.5E-07	1.3E-06	9.5E-05	4.7E-04	1.5E-05	7.5E-05			

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Average Lifetime Excess Risk Level	Annual Expected Excess Cancer Cases	MEI Lifetime Excess Cancer Cases	MEI Annual Excess Cancer Cases	Quasi MEI Annual Excess Cancer Cases
Arsenic	2.0E+00	4.0E-08	2.9E-02	1.5E-05	1.1E+01	2.4E-06

1.7E+00

EXPOSURE ASSUMPTIONS – SHRIMP

# of consumers:	5.0E+07 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	5.9E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

EXPOSURE ASSUMPTIONS – FIN FISH

# of consumers:	900000 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	9.8E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
BASELINE CONDITIONS – BPJ/BPT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)	Average MEI Daily Lead Intake (ug/day)	Quasi MEI Annual Excess Cancer Cases
Naphthalene	4.0E-01	1.46E-04	1.2E-09	3.1E-09	5.9E-07	1.5E-06	9.4E-08	2.3E-07				
Arsenic	3.0E-04	1.40E-02	1.2E-07	3.9E-04	5.7E-05	1.9E-01	9.0E-06	3.0E-02				
Cadmium	1.0E-03	2.66E-02	2.2E-07	2.2E-04	1.1E-04	1.1E-01	1.7E-05	1.7E-02				
Chromium III	1.0E+00	3.40E+00	2.9E-05	2.9E-05	1.4E-02	1.4E-02	2.2E-03	2.2E-03				
Chromium VI	5.0E-03	3.40E+00	2.9E-05	5.7E-03	1.4E-02	2.8E+00	2.2E-03	4.4E-01				
Copper	3.7E-01	1.65E-01	1.4E-06	3.7E-06	6.7E-04	1.8E-03	1.1E-04	2.9E-04				
Lead	3.17E-01	2.7E-06		1.3E-03			2.0E-04					
Mercury	3.0E-04	1.86E-01	1.6E-06	5.2E-03	7.5E-04	2.5E+00	1.2E-04	4.0E-01				
Nickel	2.0E-02	2.32E-02	1.9E-07	9.7E-06	9.4E-05	4.7E-03	1.5E-05	7.5E-04				
Silver	5.0E-03	9.39E-08	7.9E-13	1.6E-10	3.8E-10	7.6E-08	6.0E-11	1.2E-08				
Zinc	2.0E-01	4.45E-02	3.7E-07	1.9E-06	1.8E-04	9.0E-04	2.9E-05	1.4E-04				

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Average Lifetime Risk Level	Annual Expected Excess Cancer Cases	MEI Lifetime Excess Cancer Cases	Quasi MEI Expected Excess Cancer Cases	Quasi MEI Annual Excess Cancer Cases	Annual Excess Cancer Cases	Quasi MEI Annual Excess Cancer Cases
Arsenic	2.0E+00	2.3E-07	1.7E-01	1.1E-04	8.1E+01	1.8E-05	1.3E+01	

EXPOSURE ASSUMPTIONS – SHRIMP

# of consumers:	5.0E+07 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	7.5E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

EXPOSURE ASSUMPTIONS – FIN FISH

# of consumers:	9000000 people
Exposure frequency:	365 days/year
Exposure Duration:	70 years
Body Weight:	70 kg
Average Intake:	9.8E-04 kg/day
MEI Ingestion rate:	0.284 kg/day
Quasi MEI Ingestion rate:	0.045 kg/day

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PROJECT: OFF-SHORE OIL**

**SHRIMP IMPACT
BASELINE CONDITIONS – BPJ/BPT
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"
EXPLORATION WELLS**

NONCARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Average Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard	Quasi MEI Intake (ug/day)	Quasi MEI Hazard	Quasi MEI Intake (ug/day)	Quasi MEI Hazard	Average Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	1.05E-02	1.1E-07	2.8E-07	4.3E-05	1.1E-04	6.7E-06	1.7E-05						
Arsenic	3.0E-04	1.00E-02	1.1E-07	3.6E-04	4.1E-05	1.4E-01	6.4E-06	2.1E-02						
Cadmium	1.0E-03	1.91E-02	2.1E-07	2.1E-04	7.7E-05	7.7E-02	1.2E-05	1.2E-02						
Chromium III	1.0E+00	2.45E+00	2.6E-05	2.6E-05	9.9E-03	9.9E-03	1.6E-03	1.6E-03						
Chromium VI	5.0E-03	2.45E+00	2.6E-05	5.3E-03	9.9E-03	2.0E+00	1.6E-03	3.2E-01						
Copper	3.7E-01	1.18E-01	1.3E-06	3.4E-06	4.8E-04	1.3E-03	7.6E-05	2.1E-04						
Lead		2.28E-01	2.5E-06		9.3E-04	1.5E-04								
Mercury	3.0E-04	1.34E-01	1.4E-06	4.8E-03	5.4E-04	1.8E+00	8.6E-05	2.9E-01						
Nickel	2.0E-02	1.67E-02	1.8E-07	9.0E-06	6.8E-05	3.4E-03	1.1E-05	5.4E-04						
Silver	5.0E-03	6.75E-08	7.3E-13	1.5E-10	2.7E-10	5.5E-08	4.3E-11	8.7E-09						
Zinc	2.0E-01	3.20E-02	3.4E-07	1.7E-06	1.3E-04	6.5E-04	2.1E-05	1.0E-04						

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Average Lifetime Excess	Annual Expected Excess Cancer Cases	MEI Lifetime Excess	MEI Annual Excess	Quasi MEI Lifetime Excess	Quasi MEI Annual Excess
Arsenic	2.0E+00	2.2E-07	1.5E-01	8.1E-05	5.8E+01	1.3E-05	9.2E+00

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SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	5.0E-08	1.3E-07				
Arsenic	3.0E-04	6.84E-04	3.3E-09	1.1E-05		2.0E+00	6.6E-09	4.7E-03
Cadmium	1.0E-03	3.39E-03	1.6E-08	1.6E-05				
Chromium III	1.0E+00	5.72E-02	2.8E-07	2.8E-07				
Chromium VI	5.0E-03	5.72E-02	2.8E-07	5.5E-05				
Copper	3.7E-01	1.86E-03	8.9E-09	2.4E-08				
Lead		1.51E-02	7.3E-08			5.1E-03		
Mercury	3.0E-04	4.32E-03	2.1E-08	6.9E-05				
Nickel	2.0E-02	1.13E-02	5.4E-08	2.7E-06				
Silver	5.0E-03	3.10E-08	1.5E-13	3.0E-11				
Zinc	2.0E-01	1.65E-02	7.9E-08	4.0E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

EXPLORATION WELLS

NONCARCINOGENIC RISKS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.7E-08	1.4E-07				
Arsenic	3.0E-04	4.92E-04	3.0E-09	1.0E-05		2.0E+00	6.1E-09	4.3E-03
Cadmium	1.0E-03	2.44E-03	1.5E-08	1.5E-05				
Chromium III	1.0E+00	4.11E-02	2.5E-07	2.5E-07				
Chromium VI	5.0E-03	4.11E-02	2.5E-07	5.1E-05				
Copper	3.7E-01	1.33E-03	8.2E-09	2.2E-08				
Lead		1.08E-02	6.7E-08		4.7E-03			
Mercury	3.0E-04	3.11E-03	1.9E-08	6.4E-05				
Nickel	2.0E-02	8.16E-03	5.0E-08	2.5E-06				
Silver	5.0E-03	2.23E-08	1.4E-13	2.8E-11				
Zinc	2.0E-01	1.19E-02	7.3E-08	3.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	5.0E-08	1.3E-07				
Arsenic	3.0E-04	1.11E-03	5.3E-09	1.8E-05		2.0E+00	1.1E-08	7.6E-03
Cadmium	1.0E-03	7.40E-03	3.6E-08	3.6E-05				
Chromium III	1.0E+00	1.08E-01	5.2E-07	5.2E-07				
Chromium VI	5.0E-03	1.08E-01	5.2E-07	1.0E-04				
Copper	3.7E-01	4.42E-03	2.1E-08	5.7E-08				
Lead		2.56E-02	1.2E-07		8.6E-03			
Mercury	3.0E-04	1.53E-02	7.4E-08	2.5E-04				
Nickel	2.0E-02	2.32E-02	1.1E-07	5.6E-06				
Silver	5.0E-03	4.24E-08	2.0E-13	4.1E-11				
Zinc	2.0E-01	2.32E-02	1.1E-07	5.6E-07				

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SHRIMP IMPACT
CASE 1 - MINIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
EXPLORATION WELLS

NONCARCINOGENIC RISKS
BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.7E-08	1.4E-07				
Arsenic	3.0E-04	7.96E-04	4.9E-09	1.6E-05		2.0E+00	9.8E-09	7.0E-03
Cadmium	1.0E-03	5.32E-03	3.3E-08	3.3E-05				
Chromium III	1.0E+00	7.74E-02	4.8E-07	4.8E-07				
Chromium VI	5.0E-03	7.74E-02	4.8E-07	9.6E-05				
Copper	3.7E-01	3.18E-03	2.0E-08	5.3E-08				
Lead		1.84E-02	1.1E-07		8.0E-03			
Mercury	3.0E-04	1.10E-02	6.8E-08	2.3E-04				
Nickel	2.0E-02	1.67E-02	1.0E-07	5.2E-06				
Silver	5.0E-03	3.05E-08	1.9E-13	3.8E-11				
Zinc	2.0E-01	1.67E-02	1.0E-07	5.2E-07				

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PROJECT: OFF-SHORE OIL**SHRIMP IMPACT****CASE 1 - MINIMUM HARVEST LEVEL****DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION****BARITE LEACH % MEAN "pH DEPENDENT"****DEVELOPMENT PLATFORMS****NONCARCINOGENIC RISKS**

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	Average Lead Intake (ug/day)	Lifetime Slope Factor (mg/kg-d)-1	Oral Excess Cancer Risk Level	Annually	
								Lifetime Excess Cancer Cases	Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	5.0E-08	1.3E-07				2.0E+00	7.9E-08
Arsenic	3.0E-04	8.21E-03	3.9E-08	1.3E-04					5.6E-02
Cadmium	1.0E-03	1.26E-02	6.1E-08	6.1E-05					
Chromium III	1.0E+00	1.45E+00	7.0E-06	7.0E-06					
Chromium VI	5.0E-03	1.45E+00	7.0E-06	1.4E-03					
Copper	3.7E-01	7.66E-02	3.7E-07	1.0E-06					
Lead		1.66E-01	8.0E-07		5.6E-02				
Mercury	3.0E-04	2.64E-02	1.3E-07	4.2E-04					
Nickel	2.0E-02	2.32E-02	1.1E-07	5.6E-06					
Silver	5.0E-03	8.33E-08	4.0E-13	8.0E-11					
Zinc	2.0E-01	4.43E-02	2.1E-07	1.1E-06					

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

EXPLORATION WELLS

NONCARCINOGENIC RISKS

EPZ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.7E-08	1.4E-07				
Arsenic	3.0E-04	5.90E-03	3.6E-08	1.2E-04			2.0E+00	7.3E-08
Cadmium	1.0E-03	9.09E-03	5.6E-08	5.6E-05				
Chromium III	1.0E+00	1.04E+00	6.4E-06	6.4E-06				
Chromium VI	5.0E-03	1.04E+00	6.4E-06	1.3E-03				
Copper	3.7E-01	5.51E-02	3.4E-07	9.2E-07				
Lead		1.19E-01	7.3E-07				5.1E-02	
Mercury	3.0E-04	1.90E-02	1.2E-07	3.9E-04				
Nickel	2.0E-02	1.67E-02	1.0E-07	5.2E-06				
Silver	5.0E-03	5.99E-08	3.7E-13	7.4E-11				
Zinc	2.0E-01	3.19E-02	2.0E-07	9.9E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

DEVELOPMENT PLATFORMS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	8.7E-08	2.2E-07				
Arsenic	3.0E-04	6.84E-04	5.7E-09	1.9E-05				
Cadmium	1.0E-03	3.39E-03	2.8E-08	2.8E-05				
Chromium III	1.0E+00	5.72E-02	4.8E-07	4.8E-07				
Chromium VI	5.0E-03	5.72E-02	4.8E-07	9.6E-05				
Copper	3.7E-01	1.86E-03	1.6E-08	4.2E-08				
Lead		1.51E-02	1.3E-07		8.9E-03			
Mercury	3.0E-04	4.32E-03	3.6E-08	1.2E-04				
Nickel	2.0E-02	1.13E-02	9.5E-08	4.7E-06				
Silver	5.0E-03	3.10E-08	2.6E-13	5.2E-11				
Zinc	2.0E-01	1.65E-02	1.4E-07	6.9E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

EXPLORATION WELLS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant		Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases	
		Concentration (mg/kg)	Average Intake (mg/kg-day)					(mg/kg-day)	
Naphthalene	4.0E-01	9.24E-03	1.0E-07	2.5E-07				2.0E+00	1.1E-08
Arsenic	3.0E-04	4.92E-04	5.3E-09	1.8E-05					7.6E-03
Cadmium	1.0E-03	2.44E-03	2.6E-08	2.6E-05					
Chromium III	1.0E+00	4.11E-02	4.4E-07	4.4E-07					
Chromium VI	5.0E-03	4.11E-02	4.4E-07	8.9E-05					
Copper	3.7E-01	1.33E-03	1.4E-08	3.9E-08					
Lead		1.08E-02	1.2E-07				8.1E-03		
Mercury	3.0E-04	3.11E-03	3.3E-08	1.1E-04					
Nickel	2.0E-02	8.16E-03	8.8E-08	4.4E-06					
Silver	5.0E-03	2.23E-08	2.4E-13	4.8E-11					
Zinc	2.0E-01	1.19E-02	1.3E-07	6.4E-07					

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 2 - MID-SIZED HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
DEVELOPMENT PLATFORMS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	8.7E-08	2.2E-07				
Arsenic	3.0E-04	1.11E-03	9.3E-09	3.1E-05			2.0E+00	1.9E-08
Cadmium	1.0E-03	7.40E-03	6.2E-08	6.2E-05				1.3E-02
Chromium III	1.0E+00	1.08E-01	9.1E-07	9.1E-07				
Chromium VI	5.0E-03	1.08E-01	9.1E-07	1.8E-04				
Copper	3.7E-01	4.42E-03	3.7E-08	1.0E-07				
Lead		2.56E-02	2.1E-07		1.5E-02			
Mercury	3.0E-04	1.53E-02	1.3E-07	4.3E-04				
Nickel	2.0E-02	2.32E-02	1.9E-07	9.7E-06				
Silver	5.0E-03	4.24E-08	3.6E-13	7.1E-11				
Zinc	2.0E-01	2.32E-02	1.9E-07	9.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

EXPLORATION WELLS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average	Average	Oral	Lifetime	Annually Expected Excess Cancer Cases
				Hazard Quotient	Lead Intake (ug/day)	Slope Factor (mg/kg-d)-1	Excess Cancer Risk Level	
Naphthalene	4.0E-01	9.24E-03	1.0E-07	2.5E-07				
Arsenic	3.0E-04	7.96E-04	8.6E-09	2.9E-05				
Cadmium	1.0E-03	5.32E-03	5.7E-08	5.7E-05				
Chromium III	1.0E+00	7.74E-02	8.3E-07	8.3E-07				
Chromium VI	5.0E-03	7.74E-02	8.3E-07	1.7E-04				
Copper	3.7E-01	3.18E-03	3.4E-08	9.3E-08				
Lead		1.84E-02	2.0E-07		1.4E-02			
Mercury	3.0E-04	1.10E-02	1.2E-07	3.9E-04				
Nickel	2.0E-02	1.67E-02	1.8E-07	9.0E-06				
Silver	5.0E-03	3.05E-08	3.3E-13	6.6E-11				
Zinc	2.0E-01	1.67E-02	1.8E-07	9.0E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

DEVELOPMENT PLATFORMS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	8.7E-08	2.2E-07				
Arsenic	3.0E-04	8.21E-03	6.9E-08	2.3E-04				
Cadmium	1.0E-03	1.26E-02	1.1E-07	1.1E-04				
Chromium III	1.0E+00	1.45E+00	1.2E-05	1.2E-05				
Chromium VI	5.0E-03	1.45E+00	1.2E-05	2.4E-03				
Copper	3.7E-01	7.66E-02	6.4E-07	1.7E-06				
Lead		1.66E-01	1.4E-06		9.7E-02			
Mercury	3.0E-04	2.64E-02	2.2E-07	7.4E-04				
Nickel	2.0E-02	2.32E-02	1.9E-07	9.7E-06				
Silver	5.0E-03	8.33E-08	7.0E-13	1.4E-10				
Zinc	2.0E-01	4.43E-02	3.7E-07	1.9E-06				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

EXPLORATION WELLS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	1.0E-07	2.5E-07				
Arsenic	3.0E-04	5.90E-03	6.4E-08	2.1E-04		2.0E+00	1.3E-07	9.1E-02
Cadmium	1.0E-03	9.09E-03	9.8E-08	9.8E-05				
Chromium III	1.0E+00	1.04E+00	1.1E-05	1.1E-05				
Chromium VI	5.0E-03	1.04E+00	1.1E-05	2.2E-03				
Copper	3.7E-01	5.51E-02	5.9E-07	1.6E-06				
Lead		1.19E-01	1.3E-06		9.0E-02			
Mercury	3.0E-04	1.90E-02	2.0E-07	6.8E-04				
Nickel	2.0E-02	1.67E-02	1.8E-07	9.0E-06				
Silver	5.0E-03	5.99E-08	6.5E-13	1.3E-10				
Zinc	2.0E-01	3.19E-02	3.4E-07	1.7E-06				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

DEVELOPMENT PLATFORMS

BPI: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	9.2E-08	2.3E-07				
Arsenic	3.0E-04	6.84E-04	6.1E-09	2.0E-05		2.0E+00	1.2E-08	8.7E-03
Cadmium	1.0E-03	3.39E-03	3.0E-08	3.0E-05				
Chromium III	1.0E+00	5.72E-02	5.1E-07	5.1E-07				
Chromium VI	5.0E-03	5.72E-02	5.1E-07	1.0E-04				
Copper	3.7E-01	1.86E-03	1.7E-08	4.5E-08				
Lead		1.51E-02	1.3E-07		9.4E-03			
Mercury	3.0E-04	4.32E-03	3.8E-08	1.3E-04				
Nickel	2.0E-02	1.13E-02	1.0E-07	5.0E-06				
Silver	5.0E-03	3.10E-08	2.8E-13	5.5E-11				
Zinc	2.0E-01	1.65E-02	1.5E-07	7.3E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %
EXPLORATION WELLS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	1.1E-07	2.6E-07				
Arsenic	3.0E-04	4.92E-04	5.6E-09	1.9E-05		2.0E+00	1.1E-08	8.0E-03
Cadmium	1.0E-03	2.44E-03	2.8E-08	2.8E-05				
Chromium III	1.0E+00	4.11E-02	4.7E-07	4.7E-07				
Chromium VI	5.0E-03	4.11E-02	4.7E-07	9.4E-05				
Copper	3.7E-01	1.33E-03	1.5E-08	4.1E-08				
Lead		1.08E-02	1.2E-07		8.6E-03			
Mercury	3.0E-04	3.11E-03	3.5E-08	1.2E-04				
Nickel	2.0E-02	8.16E-03	9.3E-08	4.6E-06				
Silver	5.0E-03	2.23E-08	2.5E-13	5.1E-11				
Zinc	2.0E-01	1.19E-02	1.4E-07	6.8E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
DEVELOPMENT PLATFORMS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	9.2E-08	2.3E-07				
Arsenic	3.0E-04	1.11E-03	9.8E-09	3.3E-05		2.0E+00	2.0E-08	1.4E-02
Cadmium	1.0E-03	7.40E-03	6.6E-08	6.6E-05				
Chromium III	1.0E+00	1.08E-01	9.6E-07	9.6E-07				
Chromium VI	5.0E-03	1.08E-01	9.6E-07	1.9E-04				
Copper	3.7E-01	4.42E-03	3.9E-08	1.1E-07				
Lead		2.56E-02	2.3E-07		1.6E-02			
Mercury	3.0E-04	1.53E-02	1.4E-07	4.5E-04				
Nickel	2.0E-02	2.32E-02	2.1E-07	1.0E-05				
Silver	5.0E-03	4.24E-08	3.8E-13	7.5E-11				
Zinc	2.0E-01	2.32E-02	2.1E-07	1.0E-06				

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SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
EXPLORATION WELLS

BPU: 0 - 80 MILES

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	1.1E-07	2.6E-07				
Arsenic	3.0E-04	7.96E-04	9.1E-09	3.0E-05		2.0E+00	1.8E-08	1.3E-02
Cadmium	1.0E-03	5.32E-03	6.1E-08	6.1E-05				
Chromium III	1.0E+00	7.74E-02	8.8E-07	8.8E-07				
Chromium VI	5.0E-03	7.74E-02	8.8E-07	1.8E-04				
Copper	3.7E-01	3.18E-03	3.6E-08	9.8E-08				
Lead		1.84E-02	2.1E-07		1.5E-02			
Mercury	3.0E-04	1.10E-02	1.3E-07	4.2E-04				
Nickel	2.0E-02	1.67E-02	1.9E-07	9.5E-06				
Silver	5.0E-03	3.05E-08	3.5E-13	6.9E-11				
Zinc	2.0E-01	1.67E-02	1.9E-07	9.5E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

DEVELOPMENT PLATFORMS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	9.2E-08	2.3E-07				
Arsenic	3.0E-04	8.21E-03	7.3E-08	2.4E-04		2.0E+00	1.5E-07	1.0E-01
Cadmium	1.0E-03	1.26E-02	1.1E-07	1.1E-04				
Chromium III	1.0E+00	1.45E+00	1.3E-05	1.3E-05				
Chromium VI	5.0E-03	1.45E+00	1.3E-05	2.6E-03				
Copper	3.7E-01	7.66E-02	6.8E-07	1.8E-06				
Lead		1.66E-01	1.5E-06		1.0E-01			
Mercury	3.0E-04	2.64E-02	2.3E-07	7.8E-04				
Nickel	2.0E-02	2.32E-02	2.1E-07	1.0E-05				
Silver	5.0E-03	8.33E-08	7.4E-13	1.5E-10				
Zinc	2.0E-01	4.43E-02	3.9E-07	2.0E-06				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

EXPLORATION WELLS

BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average	Average	Oral	Lifetime	Annually Expected Excess Cancer Cases
				Hazard Quotient	Lead Intake (ug/day)	Slope Factor (mg/kg-d)-1	Excess Cancer Risk Level	
Naphthalene	4.0E-01	9.24E-03	1.1E-07	2.6E-07				
Arsenic	3.0E-04	5.90E-03	6.7E-08	2.2E-04			2.0E+00	1.3E-07
Cadmium	1.0E-03	9.09E-03	1.0E-07	1.0E-04				
Chromium III	1.0E+00	1.04E+00	1.2E-05	1.2E-05				
Chromium VI	5.0E-03	1.04E+00	1.2E-05	2.4E-03				
Copper	3.7E-01	5.51E-02	6.3E-07	1.7E-06				
Lead		1.19E-01	1.4E-06				9.5E-02	
Mercury	3.0E-04	1.90E-02	2.2E-07	7.2E-04				
Nickel	2.0E-02	1.67E-02	1.9E-07	9.5E-06				
Silver	5.0E-03	5.99E-08	6.8E-13	1.4E-10				
Zinc	2.0E-01	3.19E-02	3.6E-07	1.8E-06				

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SHRIMP IMPACT
CASE 1 - MINIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.7E-08	6.7E-08				
Arsenic	3.0E-04	6.84E-04	1.8E-09	5.9E-06		2.0E+00	3.5E-09	2.5E-03
Cadmium	1.0E-03	3.39E-03	8.7E-09	8.7E-06				
Chromium III	1.0E+00	5.72E-02	1.5E-07	1.5E-07				
Chromium VI	5.0E-03	5.72E-02	1.5E-07	2.9E-05				
Copper	3.7E-01	1.86E-03	4.8E-09	1.3E-08				
Lead		1.51E-02	3.9E-08		2.7E-03			
Mercury	3.0E-04	4.32E-03	1.1E-08	3.7E-05				
Nickel	2.0E-02	1.13E-02	2.9E-08	1.5E-06				
Silver	5.0E-03	3.10E-08	8.0E-14	1.6E-11				
Zinc	2.0E-01	1.65E-02	4.3E-08	2.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.6E-08				
Arsenic	3.0E-04	6.84E-04	1.7E-09	5.8E-06		2.0E+00	3.5E-09	2.5E-03
Cadmium	1.0E-03	3.39E-03	8.6E-09	8.6E-06				
Chromium III	1.0E+00	5.72E-02	1.4E-07	1.4E-07				
Chromium VI	5.0E-03	5.72E-02	1.4E-07	2.9E-05				
Copper	3.7E-01	1.86E-03	4.7E-09	1.3E-08				
Lead		1.51E-02	3.8E-08		2.7E-03			
Mercury	3.0E-04	4.32E-03	1.1E-08	3.6E-05				
Nickel	2.0E-02	1.13E-02	2.9E-08	1.4E-06				
Silver	5.0E-03	3.10E-08	7.8E-14	1.6E-11				
Zinc	2.0E-01	1.65E-02	4.2E-08	2.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.5E-08				
Arsenic	3.0E-04	6.84E-04	1.7E-09	5.7E-06		2.0E+00	3.4E-09	2.4E-03
Cadmium	1.0E-03	3.39E-03	8.5E-09	8.5E-06				
Chromium III	1.0E+00	5.72E-02	1.4E-07	1.4E-07				
Chromium VI	5.0E-03	5.72E-02	1.4E-07	2.9E-05				
Copper	3.7E-01	1.86E-03	4.7E-09	1.3E-08				
Lead		1.51E-02	3.8E-08		2.6E-03			
Mercury	3.0E-04	4.32E-03	1.1E-08	3.6E-05				
Nickel	2.0E-02	1.13E-02	2.8E-08	1.4E-06				
Silver	5.0E-03	3.10E-08	7.8E-14	1.6E-11				
Zinc	2.0E-01	1.65E-02	4.1E-08	2.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.4E-08	5.9E-08				
Arsenic	3.0E-04	6.84E-04	1.6E-09	5.2E-06		2.0E+00	3.1E-09	2.2E-03
Cadmium	1.0E-03	3.39E-03	7.7E-09	7.7E-06				
Chromium III	1.0E+00	5.72E-02	1.3E-07	1.3E-07				
Chromium VI	5.0E-03	5.72E-02	1.3E-07	2.6E-05				
Copper	3.7E-01	1.86E-03	4.2E-09	1.1E-08				
Lead		1.51E-02	3.4E-08		2.4E-03			
Mercury	3.0E-04	4.32E-03	9.8E-09	3.3E-05				
Nickel	2.0E-02	1.13E-02	2.6E-08	1.3E-06				
Silver	5.0E-03	3.10E-08	7.1E-14	1.4E-11				
Zinc	2.0E-01	1.65E-02	3.8E-08	1.9E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

EXPLORATION WELLS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.1E-08	7.5E-08				
Arsenic	3.0E-04	4.92E-04	1.6E-09	5.4E-06		2.0E+00	3.3E-09	2.3E-03
Cadmium	1.0E-03	2.44E-03	8.1E-09	8.1E-06				
Chromium III	1.0E+00	4.11E-02	1.4E-07	1.4E-07				
Chromium VI	5.0E-03	4.11E-02	1.4E-07	2.7E-05				
Copper	3.7E-01	1.33E-03	4.4E-09	1.2E-08				
Lead		1.08E-02	3.6E-08		2.5E-03			
Mercury	3.0E-04	3.11E-03	1.0E-08	3.4E-05				
Nickel	2.0E-02	8.16E-03	2.7E-08	1.4E-06				
Silver	5.0E-03	2.23E-08	7.4E-14	1.5E-11				
Zinc	2.0E-01	1.19E-02	3.9E-08	2.0E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.5E-08				
Arsenic	3.0E-04	4.92E-04	1.6E-09	5.3E-06		2.0E+00	3.2E-09	2.3E-03
Cadmium	1.0E-03	2.44E-03	7.9E-09	7.9E-06				
Chromium III	1.0E+00	4.11E-02	1.3E-07	1.3E-07				
Chromium VI	5.0E-03	4.11E-02	1.3E-07	2.7E-05				
Copper	3.7E-01	1.33E-03	4.3E-09	1.2E-08				
Lead		1.08E-02	3.5E-08		2.5E-03			
Mercury	3.0E-04	3.11E-03	1.0E-08	3.4E-05				
Nickel	2.0E-02	8.16E-03	2.7E-08	1.3E-06				
Silver	5.0E-03	2.23E-08	7.2E-14	1.4E-11				
Zinc	2.0E-01	1.19E-02	3.9E-08	1.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.4E-08				
Arsenic	3.0E-04	4.92E-04	1.6E-09	5.3E-06		2.0E+00	3.2E-09	2.3E-03
Cadmium	1.0E-03	2.44E-03	7.8E-09	7.8E-06				
Chromium III	1.0E+00	4.11E-02	1.3E-07	1.3E-07				
Chromium VI	5.0E-03	4.11E-02	1.3E-07	2.6E-05				
Copper	3.7E-01	1.33E-03	4.3E-09	1.2E-08				
Lead		1.08E-02	3.5E-08		2.4E-03			
Mercury	3.0E-04	3.11E-03	1.0E-08	3.3E-05				
Nickel	2.0E-02	8.16E-03	2.6E-08	1.3E-06				
Silver	5.0E-03	2.23E-08	7.2E-14	1.4E-11				
Zinc	2.0E-01	1.19E-02	3.8E-08	1.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	2.7E-08	6.8E-08				
Arsenic	3.0E-04	4.92E-04	1.4E-09	4.8E-06		2.0E+00	2.9E-09	2.1E-03
Cadmium	1.0E-03	2.44E-03	7.1E-09	7.1E-06				
Chromium III	1.0E+00	4.11E-02	1.2E-07	1.2E-07				
Chromium VI	5.0E-03	4.11E-02	1.2E-07	2.4E-05				
Copper	3.7E-01	1.33E-03	3.9E-09	1.1E-08				
Lead		1.08E-02	3.2E-08		2.2E-03			
Mercury	3.0E-04	3.11E-03	9.1E-09	3.0E-05				
Nickel	2.0E-02	8.16E-03	2.4E-08	1.2E-06				
Silver	5.0E-03	2.23E-08	6.5E-14	1.3E-11				
Zinc	2.0E-01	1.19E-02	3.5E-08	1.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.7E-08	6.7E-08				
Arsenic	3.0E-04	1.11E-03	2.9E-09	9.5E-06		2.0E+00	5.7E-09	4.1E-03
Cadmium	1.0E-03	7.40E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	1.08E-01	2.8E-07	2.8E-07				
Chromium VI	5.0E-03	1.08E-01	2.8E-07	5.6E-05				
Copper	3.7E-01	4.42E-03	1.1E-08	3.1E-08				
Lead		2.56E-02	6.6E-08		4.6E-03			
Mercury	3.0E-04	1.53E-02	3.9E-08	1.3E-04				
Nickel	2.0E-02	2.32E-02	6.0E-08	3.0E-06				
Silver	5.0E-03	4.24E-08	1.1E-13	2.2E-11				
Zinc	2.0E-01	2.32E-02	6.0E-08	3.0E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.5E-08				
Arsenic	3.0E-04	1.11E-03	2.8E-09	9.4E-06		2.0E+00	5.6E-09	4.0E-03
Cadmium	1.0E-03	7.40E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	1.08E-01	2.7E-07	2.7E-07				
Chromium VI	5.0E-03	1.08E-01	2.7E-07	5.5E-05				
Copper	3.7E-01	4.42E-03	1.1E-08	3.0E-08				
Lead		2.56E-02	6.5E-08		4.5E-03			
Mercury	3.0E-04	1.53E-02	3.9E-08	1.3E-04				
Nickel	2.0E-02	2.32E-02	5.9E-08	2.9E-06				
Silver	5.0E-03	4.24E-08	1.1E-13	2.1E-11				
Zinc	2.0E-01	2.32E-02	5.9E-08	2.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.5E-08				
Arsenic	3.0E-04	1.11E-03	2.8E-09	9.3E-06		2.0E+00	5.6E-09	4.0E-03
Cadmium	1.0E-03	7.40E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	1.08E-01	2.7E-07	2.7E-07				
Chromium VI	5.0E-03	1.08E-01	2.7E-07	5.4E-05				
Copper	3.7E-01	4.42E-03	1.1E-08	3.0E-08				
Lead		2.56E-02	6.4E-08		4.5E-03			
Mercury	3.0E-04	1.53E-02	3.8E-08	1.3E-04				
Nickel	2.0E-02	2.32E-02	5.8E-08	2.9E-06				
Silver	5.0E-03	4.24E-08	1.1E-13	2.1E-11				
Zinc	2.0E-01	2.32E-02	5.8E-08	2.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.4E-08	5.9E-08				
Arsenic	3.0E-04	1.11E-03	2.5E-09	8.4E-06		2.0E+00	5.1E-09	3.6E-03
Cadmium	1.0E-03	7.40E-03	1.7E-08	1.7E-05				
Chromium III	1.0E+00	1.08E-01	2.5E-07	2.5E-07				
Chromium VI	5.0E-03	1.08E-01	2.5E-07	4.9E-05				
Copper	3.7E-01	4.42E-03	1.0E-08	2.7E-08				
Lead		2.56E-02	5.8E-08		4.1E-03			
Mercury	3.0E-04	1.53E-02	3.5E-08	1.2E-04				
Nickel	2.0E-02	2.32E-02	5.3E-08	2.6E-06				
Silver	5.0E-03	4.24E-08	9.7E-14	1.9E-11				
Zinc	2.0E-01	2.32E-02	5.3E-08	2.6E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

EXPLORATION WELLS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.1E-08	7.6E-08				
Arsenic	3.0E-04	7.96E-04	2.6E-09	8.8E-06		2.0E+00	5.3E-09	3.8E-03
Cadmium	1.0E-03	5.32E-03	1.8E-08	1.8E-05				
Chromium III	1.0E+00	7.74E-02	2.6E-07	2.6E-07				
Chromium VI	5.0E-03	7.74E-02	2.6E-07	5.1E-05				
Copper	3.7E-01	3.18E-03	1.1E-08	2.8E-08				
Lead		1.84E-02	6.1E-08		4.3E-03			
Mercury	3.0E-04	1.10E-02	3.6E-08	1.2E-04				
Nickel	2.0E-02	1.67E-02	5.5E-08	2.8E-06				
Silver	5.0E-03	3.05E-08	1.0E-13	2.0E-11				
Zinc	2.0E-01	1.67E-02	5.5E-08	2.8E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.5E-08				
Arsenic	3.0E-04	7.96E-04	2.6E-09	8.6E-06		2.0E+00	5.2E-09	3.7E-03
Cadmium	1.0E-03	5.32E-03	1.7E-08	1.7E-05				
Chromium III	1.0E+00	7.74E-02	2.5E-07	2.5E-07				
Chromium VI	5.0E-03	7.74E-02	2.5E-07	5.0E-05				
Copper	3.7E-01	3.18E-03	1.0E-08	2.8E-08				
Lead		1.84E-02	6.0E-08		4.2E-03			
Mercury	3.0E-04	1.10E-02	3.6E-08	1.2E-04				
Nickel	2.0E-02	1.67E-02	5.4E-08	2.7E-06				
Silver	5.0E-03	3.05E-08	9.9E-14	2.0E-11				
Zinc	2.0E-01	1.67E-02	5.4E-08	2.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.4E-08				
Arsenic	3.0E-04	7.96E-04	2.6E-09	8.5E-06		2.0E+00	5.1E-09	3.7E-03
Cadmium	1.0E-03	5.32E-03	1.7E-08	1.7E-05				
Chromium III	1.0E+00	7.74E-02	2.5E-07	2.5E-07				
Chromium VI	5.0E-03	7.74E-02	2.5E-07	5.0E-05				
Copper	3.7E-01	3.18E-03	1.0E-08	2.8E-08				
Lead		1.84E-02	5.9E-08		4.1E-03			
Mercury	3.0E-04	1.10E-02	3.5E-08	1.2E-04				
Nickel	2.0E-02	1.67E-02	5.4E-08	2.7E-06				
Silver	5.0E-03	3.05E-08	9.8E-14	2.0E-11				
Zinc	2.0E-01	1.67E-02	5.4E-08	2.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	2.7E-08	6.8E-08				
Arsenic	3.0E-04	7.96E-04	2.3E-09	7.8E-06		2.0E+00	4.7E-09	3.3E-03
Cadmium	1.0E-03	5.32E-03	1.6E-08	1.6E-05				
Chromium III	1.0E+00	7.74E-02	2.3E-07	2.3E-07				
Chromium VI	5.0E-03	7.74E-02	2.3E-07	4.5E-05				
Copper	3.7E-01	3.18E-03	9.3E-09	2.5E-08				
Lead		1.84E-02	5.4E-08		3.8E-03			
Mercury	3.0E-04	1.10E-02	3.2E-08	1.1E-04				
Nickel	2.0E-02	1.67E-02	4.9E-08	2.4E-06				
Silver	5.0E-03	3.05E-08	8.9E-14	1.8E-11				
Zinc	2.0E-01	1.67E-02	4.9E-08	2.4E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.7E-08	6.7E-08				
Arsenic	3.0E-04	8.21E-03	2.1E-08	7.1E-05		2.0E+00	4.2E-08	3.0E-02
Cadmium	1.0E-03	1.26E-02	3.2E-08	3.2E-05				
Chromium III	1.0E+00	1.45E+00	3.7E-06	3.7E-06				
Chromium VI	5.0E-03	1.45E+00	3.7E-06	7.5E-04				
Copper	3.7E-01	7.66E-02	2.0E-07	5.3E-07				
Lead		1.66E-01	4.3E-07		3.0E-02			
Mercury	3.0E-04	2.64E-02	6.8E-08	2.3E-04				
Nickel	2.0E-02	2.32E-02	6.0E-08	3.0E-06				
Silver	5.0E-03	8.33E-08	2.1E-13	4.3E-11				
Zinc	2.0E-01	4.43E-02	1.1E-07	5.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.6E-08				
Arsenic	3.0E-04	8.21E-03	2.1E-08	6.9E-05		2.0E+00	4.2E-08	3.0E-02
Cadmium	1.0E-03	1.26E-02	3.2E-08	3.2E-05				
Chromium III	1.0E+00	1.45E+00	3.7E-06	3.7E-06				
Chromium VI	5.0E-03	1.45E+00	3.7E-06	7.3E-04				
Copper	3.7E-01	7.66E-02	1.9E-07	5.2E-07				
Lead		1.66E-01	4.2E-07		2.9E-02			
Mercury	3.0E-04	2.64E-02	6.7E-08	2.2E-04				
Nickel	2.0E-02	2.32E-02	5.9E-08	2.9E-06				
Silver	5.0E-03	8.33E-08	2.1E-13	4.2E-11				
Zinc	2.0E-01	4.43E-02	1.1E-07	5.6E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.6E-08	6.5E-08				
Arsenic	3.0E-04	8.21E-03	2.1E-08	6.9E-05		2.0E+00	4.1E-08	2.9E-02
Cadmium	1.0E-03	1.26E-02	3.2E-08	3.2E-05				
Chromium III	1.0E+00	1.45E+00	3.6E-06	3.6E-06				
Chromium VI	5.0E-03	1.45E+00	3.6E-06	7.3E-04				
Copper	3.7E-01	7.66E-02	1.9E-07	5.2E-07				
Lead		1.66E-01	4.2E-07		2.9E-02			
Mercury	3.0E-04	2.64E-02	6.6E-08	2.2E-04				
Nickel	2.0E-02	2.32E-02	5.8E-08	2.9E-06				
Silver	5.0E-03	8.33E-08	2.1E-13	4.2E-11				
Zinc	2.0E-01	4.43E-02	1.1E-07	5.5E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	2.4E-08	5.9E-08				
Arsenic	3.0E-04	8.21E-03	1.9E-08	6.2E-05		2.0E+00	3.7E-08	2.7E-02
Cadmium	1.0E-03	1.26E-02	2.9E-08	2.9E-05				
Chromium III	1.0E+00	1.45E+00	3.3E-06	3.3E-06				
Chromium VI	5.0E-03	1.45E+00	3.3E-06	6.6E-04				
Copper	3.7E-01	7.66E-02	1.7E-07	4.7E-07				
Lead		1.66E-01	3.8E-07		2.6E-02			
Mercury	3.0E-04	2.64E-02	6.0E-08	2.0E-04				
Nickel	2.0E-02	2.32E-02	5.3E-08	2.6E-06				
Silver	5.0E-03	8.33E-08	1.9E-13	3.8E-11				
Zinc	2.0E-01	4.43E-02	1.0E-07	5.0E-07				

MAY 19, 1992
PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

EXPLORATION WELLS

NONCARCINOGENIC RISKS

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.1E-08	7.6E-08				
Arsenic	3.0E-04	5.90E-03	2.0E-08	6.5E-05				
Cadmium	1.0E-03	9.09E-03	3.0E-08	3.0E-05				
Chromium III	1.0E+00	1.04E+00	3.4E-06	3.4E-06				
Chromium VI	5.0E-03	1.04E+00	3.4E-06	6.9E-04				
Copper	3.7E-01	5.51E-02	1.8E-07	4.9E-07				
Lead		1.19E-01	3.9E-07		2.8E-02			
Mercury	3.0E-04	1.90E-02	6.3E-08	2.1E-04				
Nickel	2.0E-02	1.67E-02	5.5E-08	2.8E-06				
Silver	5.0E-03	5.99E-08	2.0E-13	4.0E-11				
Zinc	2.0E-01	3.19E-02	1.1E-07	5.3E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS ZERO DISCHARGE < 4 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.5E-08				
Arsenic	3.0E-04	5.90E-03	1.9E-08	6.4E-05				
Cadmium	1.0E-03	9.09E-03	3.0E-08	3.0E-05				
Chromium III	1.0E+00	1.04E+00	3.4E-06	3.4E-06				
Chromium VI	5.0E-03	1.04E+00	3.4E-06	6.8E-04				
Copper	3.7E-01	5.51E-02	1.8E-07	4.8E-07				
Lead		1.19E-01	3.9E-07		2.7E-02			
Mercury	3.0E-04	1.90E-02	6.2E-08	2.1E-04				
Nickel	2.0E-02	1.67E-02	5.4E-08	2.7E-06				
Silver	5.0E-03	5.99E-08	1.9E-13	3.9E-11				
Zinc	2.0E-01	3.19E-02	1.0E-07	5.2E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	3.0E-08	7.4E-08				
Arsenic	3.0E-04	5.90E-03	1.9E-08	6.3E-05				
Cadmium	1.0E-03	9.09E-03	2.9E-08	2.9E-05				
Chromium III	1.0E+00	1.04E+00	3.3E-06	3.3E-06				
Chromium VI	5.0E-03	1.04E+00	3.3E-06	6.7E-04				
Copper	3.7E-01	5.51E-02	1.8E-07	4.8E-07				
Lead		1.19E-01	3.8E-07		2.7E-02			
Mercury	3.0E-04	1.90E-02	6.1E-08	2.0E-04				
Nickel	2.0E-02	1.67E-02	5.4E-08	2.7E-06				
Silver	5.0E-03	5.99E-08	1.9E-13	3.9E-11				
Zinc	2.0E-01	3.19E-02	1.0E-07	5.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	2.7E-08	6.8E-08				
Arsenic	3.0E-04	5.90E-03	1.7E-08	5.8E-05				
Cadmium	1.0E-03	9.09E-03	2.7E-08	2.7E-05				
Chromium III	1.0E+00	1.04E+00	3.0E-06	3.0E-06				
Chromium VI	5.0E-03	1.04E+00	3.0E-06	6.1E-04				
Copper	3.7E-01	5.51E-02	1.6E-07	4.4E-07				
Lead		1.19E-01	3.5E-07		2.4E-02			
Mercury	3.0E-04	1.90E-02	5.6E-08	1.9E-04				
Nickel	2.0E-02	1.67E-02	4.9E-08	2.4E-06				
Silver	5.0E-03	5.99E-08	1.8E-13	3.5E-11				
Zinc	2.0E-01	3.19E-02	9.3E-08	4.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Cases
Naphthalene	4.0E-01	1.04E-02	6.4E-08	1.6E-07				
Arsenic	3.0E-04	6.84E-04	4.2E-09	1.4E-05		2.0E+00	8.4E-09	
Cadmium	1.0E-03	3.39E-03	2.1E-08	2.1E-05				
Chromium III	1.0E+00	5.72E-02	3.5E-07	3.5E-07				
Chromium VI	5.0E-03	5.72E-02	3.5E-07	7.0E-05				
Copper	3.7E-01	1.86E-03	1.1E-08	3.1E-08				
Lead		1.51E-02	9.3E-08		6.5E-03			
Mercury	3.0E-04	4.32E-03	2.7E-08	8.9E-05				
Nickel	2.0E-02	1.13E-02	7.0E-08	3.5E-06				
Silver	5.0E-03	3.10E-08	1.9E-13	3.8E-11				
Zinc	2.0E-01	1.65E-02	1.0E-07	5.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.1E-08	1.5E-07				
Arsenic	3.0E-04	6.84E-04	4.0E-09	1.3E-05		2.0E+00	8.1E-09	5.8E-03
Cadmium	1.0E-03	3.39E-03	2.0E-08	2.0E-05				
Chromium III	1.0E+00	5.72E-02	3.4E-07	3.4E-07				
Chromium VI	5.0E-03	5.72E-02	3.4E-07	6.7E-05				
Copper	3.7E-01	1.86E-03	1.1E-08	3.0E-08				
Lead		1.51E-02	8.9E-08		6.2E-03			
Mercury	3.0E-04	4.32E-03	2.5E-08	8.5E-05				
Nickel	2.0E-02	1.13E-02	6.7E-08	3.3E-06				
Silver	5.0E-03	3.10E-08	1.8E-13	3.7E-11				
Zinc	2.0E-01	1.65E-02	9.7E-08	4.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.0E-08	1.5E-07				
Arsenic	3.0E-04	6.84E-04	3.9E-09	1.3E-05		2.0E+00	7.8E-09	5.6E-03
Cadmium	1.0E-03	3.39E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	5.72E-02	3.3E-07	3.3E-07				
Chromium VI	5.0E-03	5.72E-02	3.3E-07	6.6E-05				
Copper	3.7E-01	1.86E-03	1.1E-08	2.9E-08				
Lead		1.51E-02	8.7E-08		6.1E-03			
Mercury	3.0E-04	4.32E-03	2.5E-08	8.3E-05				
Nickel	2.0E-02	1.13E-02	6.5E-08	3.2E-06				
Silver	5.0E-03	3.10E-08	1.8E-13	3.6E-11				
Zinc	2.0E-01	1.65E-02	9.5E-08	4.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.6E-08	1.2E-07				
Arsenic	3.0E-04	6.84E-04	3.1E-09	1.0E-05		2.0E+00	6.1E-09	4.4E-03
Cadmium	1.0E-03	3.39E-03	1.5E-08	1.5E-05				
Chromium III	1.0E+00	5.72E-02	2.6E-07	2.6E-07				
Chromium VI	5.0E-03	5.72E-02	2.6E-07	5.1E-05				
Copper	3.7E-01	1.86E-03	8.3E-09	2.2E-08				
Lead		1.51E-02	6.7E-08		4.7E-03			
Mercury	3.0E-04	4.32E-03	1.9E-08	6.4E-05				
Nickel	2.0E-02	1.13E-02	5.1E-08	2.5E-06				
Silver	5.0E-03	3.10E-08	1.4E-13	2.8E-11				
Zinc	2.0E-01	1.65E-02	7.4E-08	3.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.3E-08	1.8E-07				
Arsenic	3.0E-04	4.92E-04	3.9E-09	1.3E-05		2.0E+00	7.8E-09	5.6E-03
Cadmium	1.0E-03	2.44E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	4.11E-02	3.2E-07	3.2E-07				
Chromium VI	5.0E-03	4.11E-02	3.2E-07	6.5E-05				
Copper	3.7E-01	1.33E-03	1.1E-08	2.8E-08				
Lead		1.08E-02	8.5E-08		6.0E-03			
Mercury	3.0E-04	3.11E-03	2.5E-08	8.2E-05				
Nickel	2.0E-02	8.16E-03	6.5E-08	3.2E-06				
Silver	5.0E-03	2.23E-08	1.8E-13	3.5E-11				
Zinc	2.0E-01	1.19E-02	9.4E-08	4.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.0E-08	1.7E-07				
Arsenic	3.0E-04	4.92E-04	3.7E-09	1.2E-05		2.0E+00	7.4E-09	5.3E-03
Cadmium	1.0E-03	2.44E-03	1.8E-08	1.8E-05				
Chromium III	1.0E+00	4.11E-02	3.1E-07	3.1E-07				
Chromium VI	5.0E-03	4.11E-02	3.1E-07	6.2E-05				
Copper	3.7E-01	1.33E-03	1.0E-08	2.7E-08				
Lead		1.08E-02	8.2E-08		5.7E-03			
Mercury	3.0E-04	3.11E-03	2.4E-08	7.8E-05				
Nickel	2.0E-02	8.16E-03	6.2E-08	3.1E-06				
Silver	5.0E-03	2.23E-08	1.7E-13	3.4E-11				
Zinc	2.0E-01	1.19E-02	9.0E-08	4.5E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	6.8E-08	1.7E-07				
Arsenic	3.0E-04	4.92E-04	3.6E-09	1.2E-05		2.0E+00	7.2E-09	5.2E-03
Cadmium	1.0E-03	2.44E-03	1.8E-08	1.8E-05				
Chromium III	1.0E+00	4.11E-02	3.0E-07	3.0E-07				
Chromium VI	5.0E-03	4.11E-02	3.0E-07	6.1E-05				
Copper	3.7E-01	1.33E-03	9.8E-09	2.6E-08				
Lead		1.08E-02	8.0E-08		5.6E-03			
Mercury	3.0E-04	3.11E-03	2.3E-08	7.6E-05				
Nickel	2.0E-02	8.16E-03	6.0E-08	3.0E-06				
Silver	5.0E-03	2.23E-08	1.6E-13	3.3E-11				
Zinc	2.0E-01	1.19E-02	8.8E-08	4.4E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.3E-08	1.3E-07				
Arsenic	3.0E-04	4.92E-04	2.8E-09	9.4E-06		2.0E+00	5.6E-09	4.0E-03
Cadmium	1.0E-03	2.44E-03	1.4E-08	1.4E-05				
Chromium III	1.0E+00	4.11E-02	2.4E-07	2.4E-07				
Chromium VI	5.0E-03	4.11E-02	2.4E-07	4.7E-05				
Copper	3.7E-01	1.33E-03	7.6E-09	2.1E-08				
Lead		1.08E-02	6.2E-08	ERR	4.3E-03			
Mercury	3.0E-04	3.11E-03	1.8E-08	5.9E-05				
Nickel	2.0E-02	8.16E-03	4.7E-08	2.3E-06				
Silver	5.0E-03	2.23E-08	1.3E-13	2.6E-11				
Zinc	2.0E-01	1.19E-02	6.8E-08	3.4E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 2 - MID-SIZED HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %
DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.4E-08	1.6E-07				
Arsenic	3.0E-04	1.11E-03	6.8E-09	2.3E-05		2.0E+00	1.4E-08	9.8E-03
Cadmium	1.0E-03	7.40E-03	4.6E-08	4.6E-05				
Chromium III	1.0E+00	1.08E-01	6.6E-07	6.6E-07				
Chromium VI	5.0E-03	1.08E-01	6.6E-07	1.3E-04				
Copper	3.7E-01	4.42E-03	2.7E-08	7.4E-08				
Lead		2.56E-02	1.6E-07		1.1E-02			
Mercury	3.0E-04	1.53E-02	9.4E-08	3.1E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	7.1E-06				
Silver	5.0E-03	4.24E-08	2.6E-13	5.2E-11				
Zinc	2.0E-01	2.32E-02	1.4E-07	7.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.1E-08	1.5E-07				
Arsenic	3.0E-04	1.11E-03	6.5E-09	2.2E-05		2.0E+00	1.3E-08	9.3E-03
Cadmium	1.0E-03	7.40E-03	4.4E-08	4.4E-05				
Chromium III	1.0E+00	1.08E-01	6.4E-07	6.4E-07				
Chromium VI	5.0E-03	1.08E-01	6.4E-07	1.3E-04				
Copper	3.7E-01	4.42E-03	2.6E-08	7.0E-08				
Lead		2.56E-02	1.5E-07		1.1E-02			
Mercury	3.0E-04	1.53E-02	9.0E-08	3.0E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	6.8E-06				
Silver	5.0E-03	4.24E-08	2.5E-13	5.0E-11				
Zinc	2.0E-01	2.32E-02	1.4E-07	6.8E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.0E-08	1.5E-07				
Arsenic	3.0E-04	1.11E-03	6.4E-09	2.1E-05		2.0E+00	1.3E-08	9.1E-03
Cadmium	1.0E-03	7.40E-03	4.2E-08	4.2E-05				
Chromium III	1.0E+00	1.08E-01	6.2E-07	6.2E-07				
Chromium VI	5.0E-03	1.08E-01	6.2E-07	1.2E-04				
Copper	3.7E-01	4.42E-03	2.5E-08	6.9E-08				
Lead		2.56E-02	1.5E-07		1.0E-02			
Mercury	3.0E-04	1.53E-02	8.8E-08	2.9E-04				
Nickel	2.0E-02	2.32E-02	1.3E-07	6.7E-06				
Silver	5.0E-03	4.24E-08	2.4E-13	4.9E-11				
Zinc	2.0E-01	2.32E-02	1.3E-07	6.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.6E-08	1.2E-07				
Arsenic	3.0E-04	1.11E-03	5.0E-09	1.7E-05		2.0E+00	9.9E-09	7.1E-03
Cadmium	1.0E-03	7.40E-03	3.3E-08	3.3E-05				
Chromium III	1.0E+00	1.08E-01	4.8E-07	4.8E-07				
Chromium VI	5.0E-03	1.08E-01	4.8E-07	9.7E-05				
Copper	3.7E-01	4.42E-03	2.0E-08	5.3E-08				
Lead		2.56E-02	1.1E-07		8.0E-03			
Mercury	3.0E-04	1.53E-02	6.8E-08	2.3E-04				
Nickel	2.0E-02	2.32E-02	1.0E-07	5.2E-06				
Silver	5.0E-03	4.24E-08	1.9E-13	3.8E-11				
Zinc	2.0E-01	2.32E-02	1.0E-07	5.2E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.3E-08	1.8E-07				
Arsenic	3.0E-04	7.96E-04	6.3E-09	2.1E-05		2.0E+00	1.3E-08	9.0E-03
Cadmium	1.0E-03	5.32E-03	4.2E-08	4.2E-05				
Chromium III	1.0E+00	7.74E-02	6.1E-07	6.1E-07				
Chromium VI	5.0E-03	7.74E-02	6.1E-07	1.2E-04				
Copper	3.7E-01	3.18E-03	2.5E-08	6.8E-08				
Lead		1.84E-02	1.5E-07		1.0E-02			
Mercury	3.0E-04	1.10E-02	8.7E-08	2.9E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.6E-06				
Silver	5.0E-03	3.05E-08	2.4E-13	4.8E-11				
Zinc	2.0E-01	1.67E-02	1.3E-07	6.6E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.0E-08	1.7E-07				
Arsenic	3.0E-04	7.96E-04	6.0E-09	2.0E-05		2.0E+00	1.2E-08	8.6E-03
Cadmium	1.0E-03	5.32E-03	4.0E-08	4.0E-05				
Chromium III	1.0E+00	7.74E-02	5.9E-07	5.9E-07				
Chromium VI	5.0E-03	7.74E-02	5.9E-07	1.2E-04				
Copper	3.7E-01	3.18E-03	2.4E-08	6.5E-08				
Lead		1.84E-02	1.4E-07		9.7E-03			
Mercury	3.0E-04	1.10E-02	8.3E-08	2.8E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.3E-06				
Silver	5.0E-03	3.05E-08	2.3E-13	4.6E-11				
Zinc	2.0E-01	1.67E-02	1.3E-07	6.3E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	6.8E-08	1.7E-07				
Arsenic	3.0E-04	7.96E-04	5.9E-09	2.0E-05		2.0E+00	1.2E-08	8.4E-03
Cadmium	1.0E-03	5.32E-03	3.9E-08	3.9E-05				
Chromium III	1.0E+00	7.74E-02	5.7E-07	5.7E-07				
Chromium VI	5.0E-03	7.74E-02	5.7E-07	1.1E-04				
Copper	3.7E-01	3.18E-03	2.3E-08	6.3E-08				
Lead		1.84E-02	1.4E-07		9.5E-03			
Mercury	3.0E-04	1.10E-02	8.1E-08	2.7E-04				
Nickel	2.0E-02	1.67E-02	1.2E-07	6.1E-06				
Silver	5.0E-03	3.05E-08	2.2E-13	4.5E-11				
Zinc	2.0E-01	1.67E-02	1.2E-07	6.1E-07				

SHRIMP IMPACT -- BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.3E-08	1.3E-07				
Arsenic	3.0E-04	7.96E-04	4.6E-09	1.5E-05		2.0E+00	9.1E-09	6.5E-03
Cadmium	1.0E-03	5.32E-03	3.1E-08	3.1E-05				
Chromium III	1.0E+00	7.74E-02	4.4E-07	4.4E-07				
Chromium VI	5.0E-03	7.74E-02	4.4E-07	8.9E-05				
Copper	3.7E-01	3.18E-03	1.8E-08	4.9E-08				
Lead		1.84E-02	1.1E-07		7.4E-03			
Mercury	3.0E-04	1.10E-02	6.3E-08	2.1E-04				
Nickel	2.0E-02	1.67E-02	9.6E-08	4.8E-06				
Silver	5.0E-03	3.05E-08	1.8E-13	3.5E-11				
Zinc	2.0E-01	1.67E-02	9.6E-08	4.8E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % MEAN "pH DEPENDENT"

DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.4E-08	1.6E-07				
Arsenic	3.0E-04	8.21E-03	5.1E-08	1.7E-04			2.0E+00	1.0E-07
Cadmium	1.0E-03	1.26E-02	7.8E-08	7.8E-05				
Chromium III	1.0E+00	1.45E+00	8.9E-06	8.9E-06				
Chromium VI	5.0E-03	1.45E+00	8.9E-06	1.8E-03				
Copper	3.7E-01	7.66E-02	4.7E-07	1.3E-06				
Lead		1.66E-01	1.0E-06		7.2E-02			
Mercury	3.0E-04	2.64E-02	1.6E-07	5.4E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	7.1E-06				
Silver	5.0E-03	8.33E-08	5.1E-13	1.0E-10				
Zinc	2.0E-01	4.43E-02	2.7E-07	1.4E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.1E-08	1.5E-07				
Arsenic	3.0E-04	8.21E-03	4.8E-08	1.6E-04			2.0E+00	9.7E-08
Cadmium	1.0E-03	1.26E-02	7.4E-08	7.4E-05				
Chromium III	1.0E+00	1.45E+00	8.5E-06	8.5E-06				
Chromium VI	5.0E-03	1.45E+00	8.5E-06	1.7E-03				
Copper	3.7E-01	7.66E-02	4.5E-07	1.2E-06				
Lead		1.66E-01	9.8E-07		6.8E-02			
Mercury	3.0E-04	2.64E-02	1.6E-07	5.2E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	6.8E-06				
Silver	5.0E-03	8.33E-08	4.9E-13	9.8E-11				
Zinc	2.0E-01	4.43E-02	2.6E-07	1.3E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.0E-08	1.5E-07				
Arsenic	3.0E-04	8.21E-03	4.7E-08	1.6E-04			2.0E+00	9.4E-08
Cadmium	1.0E-03	1.26E-02	7.2E-08	7.2E-05				
Chromium III	1.0E+00	1.45E+00	8.3E-06	8.3E-06				
Chromium VI	5.0E-03	1.45E+00	8.3E-06	1.7E-03				
Copper	3.7E-01	7.66E-02	4.4E-07	1.2E-06				
Lead		1.66E-01	9.5E-07		6.7E-02			
Mercury	3.0E-04	2.64E-02	1.5E-07	5.0E-04				
Nickel	2.0E-02	2.32E-02	1.3E-07	6.7E-06				
Silver	5.0E-03	8.33E-08	4.8E-13	9.6E-11				
Zinc	2.0E-01	4.43E-02	2.5E-07	1.3E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.6E-08	1.2E-07				
Arsenic	3.0E-04	8.21E-03	3.7E-08	1.2E-04			2.0E+00	7.3E-08
Cadmium	1.0E-03	1.26E-02	5.6E-08	5.6E-05				
Chromium III	1.0E+00	1.45E+00	6.5E-06	6.5E-06				
Chromium VI	5.0E-03	1.45E+00	6.5E-06	1.3E-03				
Copper	3.7E-01	7.66E-02	3.4E-07	9.3E-07				
Lead		1.66E-01	7.4E-07		5.2E-02			
Mercury	3.0E-04	2.64E-02	1.2E-07	3.9E-04				
Nickel	2.0E-02	2.32E-02	1.0E-07	5.2E-06				
Silver	5.0E-03	8.33E-08	3.7E-13	7.4E-11				
Zinc	2.0E-01	4.43E-02	2.0E-07	9.9E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 2 - MID-SIZED HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"
EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.3E-08	1.8E-07				
Arsenic	3.0E-04	5.90E-03	4.7E-08	1.6E-04		2.0E+00	9.3E-08	6.7E-02
Cadmium	1.0E-03	9.09E-03	7.2E-08	7.2E-05				
Chromium III	1.0E+00	1.04E+00	8.2E-06	8.2E-06				
Chromium VI	5.0E-03	1.04E+00	8.2E-06	1.6E-03				
Copper	3.7E-01	5.51E-02	4.4E-07	1.2E-06				
Lead		1.19E-01	9.4E-07		6.6E-02			
Mercury	3.0E-04	1.90E-02	1.5E-07	5.0E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.6E-06				
Silver	5.0E-03	5.99E-08	4.7E-13	9.5E-11				
Zinc	2.0E-01	3.19E-02	2.5E-07	1.3E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.0E-08	1.7E-07				
Arsenic	3.0E-04	5.90E-03	4.5E-08	1.5E-04		2.0E+00	8.9E-08	6.4E-02
Cadmium	1.0E-03	9.09E-03	6.9E-08	6.9E-05				
Chromium III	1.0E+00	1.04E+00	7.9E-06	7.9E-06				
Chromium VI	5.0E-03	1.04E+00	7.9E-06	1.6E-03				
Copper	3.7E-01	5.51E-02	4.2E-07	1.1E-06				
Lead		1.19E-01	9.0E-07		6.3E-02			
Mercury	3.0E-04	1.90E-02	1.4E-07	4.8E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.3E-06				
Silver	5.0E-03	5.99E-08	4.5E-13	9.1E-11				
Zinc	2.0E-01	3.19E-02	2.4E-07	1.2E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	6.8E-08	1.7E-07				
Arsenic	3.0E-04	5.90E-03	4.3E-08	1.4E-04		2.0E+00	8.7E-08	6.2E-02
Cadmium	1.0E-03	9.09E-03	6.7E-08	6.7E-05				
Chromium III	1.0E+00	1.04E+00	7.7E-06	7.7E-06				
Chromium VI	5.0E-03	1.04E+00	7.7E-06	1.5E-03				
Copper	3.7E-01	5.51E-02	4.1E-07	1.1E-06				
Lead		1.19E-01	8.8E-07		6.1E-02			
Mercury	3.0E-04	1.90E-02	1.4E-07	4.7E-04				
Nickel	2.0E-02	1.67E-02	1.2E-07	6.1E-06				
Silver	5.0E-03	5.99E-08	4.4E-13	8.8E-11				
Zinc	2.0E-01	3.19E-02	2.3E-07	1.2E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	5.3E-08	1.3E-07				
Arsenic	3.0E-04	5.90E-03	3.4E-08	1.1E-04		2.0E+00	6.8E-08	4.8E-02
Cadmium	1.0E-03	9.09E-03	5.2E-08	5.2E-05				
Chromium III	1.0E+00	1.04E+00	6.0E-06	6.0E-06				
Chromium VI	5.0E-03	1.04E+00	6.0E-06	1.2E-03				
Copper	3.7E-01	5.51E-02	3.2E-07	8.5E-07				
Lead		1.19E-01	6.8E-07		4.8E-02			
Mercury	3.0E-04	1.90E-02	1.1E-07	3.6E-04				
Nickel	2.0E-02	1.67E-02	9.6E-08	4.8E-06				
Silver	5.0E-03	5.99E-08	3.4E-13	6.9E-11				
Zinc	2.0E-01	3.19E-02	1.8E-07	9.2E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %
DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.9E-08	1.7E-07				
Arsenic	3.0E-04	6.84E-04	4.5E-09	1.5E-05		2.0E+00	9.1E-09	6.5E-03
Cadmium	1.0E-03	3.39E-03	2.3E-08	2.3E-05				
Chromium III	1.0E+00	5.72E-02	3.8E-07	3.8E-07				
Chromium VI	5.0E-03	5.72E-02	3.8E-07	7.6E-05				
Copper	3.7E-01	1.86E-03	1.2E-08	3.3E-08				
Lead		1.51E-02	1.0E-07		7.0E-03			
Mercury	3.0E-04	4.32E-03	2.9E-08	9.6E-05				
Nickel	2.0E-02	1.13E-02	7.5E-08	3.8E-06				
Silver	5.0E-03	3.10E-08	2.1E-13	4.1E-11				
Zinc	2.0E-01	1.65E-02	1.1E-07	5.5E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.5E-08	1.6E-07				
Arsenic	3.0E-04	6.84E-04	4.2E-09	1.4E-05		2.0E+00	8.5E-09	6.1E-03
Cadmium	1.0E-03	3.39E-03	2.1E-08	2.1E-05				
Chromium III	1.0E+00	5.72E-02	3.6E-07	3.6E-07				
Chromium VI	5.0E-03	5.72E-02	3.6E-07	7.1E-05				
Copper	3.7E-01	1.86E-03	1.2E-08	3.1E-08				
Lead		1.51E-02	9.4E-08		6.6E-03			
Mercury	3.0E-04	4.32E-03	2.7E-08	8.9E-05				
Nickel	2.0E-02	1.13E-02	7.0E-08	3.5E-06				
Silver	5.0E-03	3.10E-08	1.9E-13	3.9E-11				
Zinc	2.0E-01	1.65E-02	1.0E-07	5.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.2E-08	1.6E-07				
Arsenic	3.0E-04	6.84E-04	4.1E-09	1.4E-05		2.0E+00	8.2E-09	5.8E-03
Cadmium	1.0E-03	3.39E-03	2.0E-08	2.0E-05				
Chromium III	1.0E+00	5.72E-02	3.4E-07	3.4E-07				
Chromium VI	5.0E-03	5.72E-02	3.4E-07	6.8E-05				
Copper	3.7E-01	1.86E-03	1.1E-08	3.0E-08				
Lead		1.51E-02	9.0E-08		6.3E-03			
Mercury	3.0E-04	4.32E-03	2.6E-08	8.6E-05				
Nickel	2.0E-02	1.13E-02	6.7E-08	3.4E-06				
Silver	5.0E-03	3.10E-08	1.8E-13	3.7E-11				
Zinc	2.0E-01	1.65E-02	9.8E-08	4.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.1E-08	1.0E-07				
Arsenic	3.0E-04	6.84E-04	2.7E-09	9.0E-06		2.0E+00	5.4E-09	3.8E-03
Cadmium	1.0E-03	3.39E-03	1.3E-08	1.3E-05				
Chromium III	1.0E+00	5.72E-02	2.2E-07	2.2E-07				
Chromium VI	5.0E-03	5.72E-02	2.2E-07	4.5E-05				
Copper	3.7E-01	1.86E-03	7.3E-09	2.0E-08				
Lead		1.51E-02	5.9E-08		4.1E-03			
Mercury	3.0E-04	4.32E-03	1.7E-08	5.7E-05				
Nickel	2.0E-02	1.13E-02	4.4E-08	2.2E-06				
Silver	5.0E-03	3.10E-08	1.2E-13	2.4E-11				
Zinc	2.0E-01	1.65E-02	6.5E-08	3.2E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.9E-08	2.0E-07				
Arsenic	3.0E-04	4.92E-04	4.2E-09	1.4E-05		2.0E+00	8.4E-09	6.0E-03
Cadmium	1.0E-03	2.44E-03	2.1E-08	2.1E-05				
Chromium III	1.0E+00	4.11E-02	3.5E-07	3.5E-07				
Chromium VI	5.0E-03	4.11E-02	3.5E-07	7.0E-05				
Copper	3.7E-01	1.33E-03	1.1E-08	3.1E-08				
Lead		1.08E-02	9.2E-08		6.4E-03			
Mercury	3.0E-04	3.11E-03	2.7E-08	8.8E-05				
Nickel	2.0E-02	8.16E-03	7.0E-08	3.5E-06				
Silver	5.0E-03	2.23E-08	1.9E-13	3.8E-11				
Zinc	2.0E-01	1.19E-02	1.0E-07	5.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.4E-08	1.8E-07				
Arsenic	3.0E-04	4.92E-04	3.9E-09	1.3E-05		2.0E+00	7.8E-09	5.6E-03
Cadmium	1.0E-03	2.44E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	4.11E-02	3.3E-07	3.3E-07				
Chromium VI	5.0E-03	4.11E-02	3.3E-07	6.6E-05				
Copper	3.7E-01	1.33E-03	1.1E-08	2.9E-08				
Lead		1.08E-02	8.6E-08		6.0E-03			
Mercury	3.0E-04	3.11E-03	2.5E-08	8.3E-05				
Nickel	2.0E-02	8.16E-03	6.5E-08	3.3E-06				
Silver	5.0E-03	2.23E-08	1.8E-13	3.6E-11				
Zinc	2.0E-01	1.19E-02	9.5E-08	4.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.1E-08	1.8E-07				
Arsenic	3.0E-04	4.92E-04	3.8E-09	1.3E-05		2.0E+00	7.5E-09	5.4E-03
Cadmium	1.0E-03	2.44E-03	1.9E-08	1.9E-05				
Chromium III	1.0E+00	4.11E-02	3.1E-07	3.1E-07				
Chromium VI	5.0E-03	4.11E-02	3.1E-07	6.3E-05				
Copper	3.7E-01	1.33E-03	1.0E-08	2.8E-08				
Lead		1.08E-02	8.3E-08		5.8E-03			
Mercury	3.0E-04	3.11E-03	2.4E-08	7.9E-05				
Nickel	2.0E-02	8.16E-03	6.2E-08	3.1E-06				
Silver	5.0E-03	2.23E-08	1.7E-13	3.4E-11				
Zinc	2.0E-01	1.19E-02	9.1E-08	4.6E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	4.7E-08	1.2E-07				
Arsenic	3.0E-04	4.92E-04	2.5E-09	8.3E-06		2.0E+00	5.0E-09	3.5E-03
Cadmium	1.0E-03	2.44E-03	1.2E-08	1.2E-05				
Chromium III	1.0E+00	4.11E-02	2.1E-07	2.1E-07				
Chromium VI	5.0E-03	4.11E-02	2.1E-07	4.1E-05				
Copper	3.7E-01	1.33E-03	6.7E-09	1.8E-08				
Lead		1.08E-02	5.4E-08		3.8E-03			
Mercury	3.0E-04	3.11E-03	1.6E-08	5.2E-05				
Nickel	2.0E-02	8.16E-03	4.1E-08	2.1E-06				
Silver	5.0E-03	2.23E-08	1.1E-13	2.2E-11				
Zinc	2.0E-01	1.19E-02	6.0E-08	3.0E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.9E-08	1.7E-07				
Arsenic	3.0E-04	1.11E-03	7.4E-09	2.5E-05		2.0E+00	1.5E-08	1.1E-02
Cadmium	1.0E-03	7.40E-03	4.9E-08	4.9E-05				
Chromium III	1.0E+00	1.08E-01	7.2E-07	7.2E-07				
Chromium VI	5.0E-03	1.08E-01	7.2E-07	1.4E-04				
Copper	3.7E-01	4.42E-03	2.9E-08	7.9E-08				
Lead		2.56E-02	1.7E-07		1.2E-02			
Mercury	3.0E-04	1.53E-02	1.0E-07	3.4E-04				
Nickel	2.0E-02	2.32E-02	1.5E-07	7.7E-06				
Silver	5.0E-03	4.24E-08	2.8E-13	5.6E-11				
Zinc	2.0E-01	2.32E-02	1.5E-07	7.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.5E-08	1.6E-07				
Arsenic	3.0E-04	1.11E-03	6.9E-09	2.3E-05		2.0E+00	1.4E-08	9.9E-03
Cadmium	1.0E-03	7.40E-03	4.6E-08	4.6E-05				
Chromium III	1.0E+00	1.08E-01	6.7E-07	6.7E-07				
Chromium VI	5.0E-03	1.08E-01	6.7E-07	1.3E-04				
Copper	3.7E-01	4.42E-03	2.7E-08	7.4E-08				
Lead		2.56E-02	1.6E-07		1.1E-02			
Mercury	3.0E-04	1.53E-02	9.5E-08	3.2E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	7.2E-06				
Silver	5.0E-03	4.24E-08	2.6E-13	5.3E-11				
Zinc	2.0E-01	2.32E-02	1.4E-07	7.2E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.2E-08	1.6E-07				
Arsenic	3.0E-04	1.11E-03	6.6E-09	2.2E-05		2.0E+00	1.3E-08	9.5E-03
Cadmium	1.0E-03	7.40E-03	4.4E-08	4.4E-05				
Chromium III	1.0E+00	1.08E-01	6.4E-07	6.4E-07				
Chromium VI	5.0E-03	1.08E-01	6.4E-07	1.3E-04				
Copper	3.7E-01	4.42E-03	2.6E-08	7.1E-08				
Lead		2.56E-02	1.5E-07		1.1E-02			
Mercury	3.0E-04	1.53E-02	9.1E-08	3.0E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	6.9E-06				
Silver	5.0E-03	4.24E-08	2.5E-13	5.1E-11				
Zinc	2.0E-01	2.32E-02	1.4E-07	6.9E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.1E-08	1.0E-07				
Arsenic	3.0E-04	1.11E-03	4.4E-09	1.5E-05		2.0E+00	8.7E-09	6.2E-03
Cadmium	1.0E-03	7.40E-03	2.9E-08	2.9E-05				
Chromium III	1.0E+00	1.08E-01	4.2E-07	4.2E-07				
Chromium VI	5.0E-03	1.08E-01	4.2E-07	8.5E-05				
Copper	3.7E-01	4.42E-03	1.7E-08	4.7E-08				
Lead		2.56E-02	1.0E-07		7.0E-03			
Mercury	3.0E-04	1.53E-02	6.0E-08	2.0E-04				
Nickel	2.0E-02	2.32E-02	9.1E-08	4.6E-06				
Silver	5.0E-03	4.24E-08	1.7E-13	3.3E-11				
Zinc	2.0E-01	2.32E-02	9.1E-08	4.6E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.9E-08	2.0E-07				
Arsenic	3.0E-04	7.96E-04	6.8E-09	2.3E-05		2.0E+00	1.4E-08	9.7E-03
Cadmium	1.0E-03	5.32E-03	4.5E-08	4.5E-05				
Chromium III	1.0E+00	7.74E-02	6.6E-07	6.6E-07				
Chromium VI	5.0E-03	7.74E-02	6.6E-07	1.3E-04				
Copper	3.7E-01	3.18E-03	2.7E-08	7.3E-08				
Lead		1.84E-02	1.6E-07		1.1E-02			
Mercury	3.0E-04	1.10E-02	9.4E-08	3.1E-04				
Nickel	2.0E-02	1.67E-02	1.4E-07	7.1E-06				
Silver	5.0E-03	3.05E-08	2.6E-13	5.2E-11				
Zinc	2.0E-01	1.67E-02	1.4E-07	7.1E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.4E-08	1.8E-07				
Arsenic	3.0E-04	7.96E-04	6.3E-09	2.1E-05		2.0E+00	1.3E-08	9.1E-03
Cadmium	1.0E-03	5.32E-03	4.2E-08	4.2E-05				
Chromium III	1.0E+00	7.74E-02	6.2E-07	6.2E-07				
Chromium VI	5.0E-03	7.74E-02	6.2E-07	1.2E-04				
Copper	3.7E-01	3.18E-03	2.5E-08	6.9E-08				
Lead		1.84E-02	1.5E-07		1.0E-02			
Mercury	3.0E-04	1.10E-02	8.8E-08	2.9E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.7E-06				
Silver	5.0E-03	3.05E-08	2.4E-13	4.9E-11				
Zinc	2.0E-01	1.67E-02	1.3E-07	6.7E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.1E-08	1.8E-07				
Arsenic	3.0E-04	7.96E-04	6.1E-09	2.0E-05		2.0E+00	1.2E-08	8.7E-03
Cadmium	1.0E-03	5.32E-03	4.1E-08	4.1E-05				
Chromium III	1.0E+00	7.74E-02	5.9E-07	5.9E-07				
Chromium VI	5.0E-03	7.74E-02	5.9E-07	1.2E-04				
Copper	3.7E-01	3.18E-03	2.4E-08	6.6E-08				
Lead		1.84E-02	1.4E-07		9.9E-03			
Mercury	3.0E-04	1.10E-02	8.4E-08	2.8E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.4E-06				
Silver	5.0E-03	3.05E-08	2.3E-13	4.7E-11				
Zinc	2.0E-01	1.67E-02	1.3E-07	6.4E-07				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	4.7E-08	1.2E-07				
Arsenic	3.0E-04	7.96E-04	4.0E-09	1.3E-05		2.0E+00	8.0E-09	5.7E-03
Cadmium	1.0E-03	5.32E-03	2.7E-08	2.7E-05				
Chromium III	1.0E+00	7.74E-02	3.9E-07	3.9E-07				
Chromium VI	5.0E-03	7.74E-02	3.9E-07	7.8E-05				
Copper	3.7E-01	3.18E-03	1.6E-08	4.3E-08				
Lead		1.84E-02	9.3E-08		6.5E-03			
Mercury	3.0E-04	1.10E-02	5.5E-08	1.8E-04				
Nickel	2.0E-02	1.67E-02	8.4E-08	4.2E-06				
Silver	5.0E-03	3.05E-08	1.5E-13	3.1E-11				
Zinc	2.0E-01	1.67E-02	8.4E-08	4.2E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"
DEVELOPMENT PLATFORMS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.9E-08	1.7E-07				
Arsenic	3.0E-04	8.21E-03	5.5E-08	1.8E-04		2.0E+00	1.1E-07	7.8E-02
Cadmium	1.0E-03	1.26E-02	8.4E-08	8.4E-05				
Chromium III	1.0E+00	1.45E+00	9.6E-06	9.6E-06				
Chromium VI	5.0E-03	1.45E+00	9.6E-06	1.9E-03				
Copper	3.7E-01	7.66E-02	5.1E-07	1.4E-06				
Lead		1.66E-01	1.1E-06		7.7E-02			
Mercury	3.0E-04	2.64E-02	1.8E-07	5.8E-04				
Nickel	2.0E-02	2.32E-02	1.5E-07	7.7E-06				
Silver	5.0E-03	8.33E-08	5.5E-13	1.1E-10				
Zinc	2.0E-01	4.43E-02	2.9E-07	1.5E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.5E-08	1.6E-07				
Arsenic	3.0E-04	8.21E-03	5.1E-08	1.7E-04		2.0E+00	1.0E-07	7.3E-02
Cadmium	1.0E-03	1.26E-02	7.8E-08	7.8E-05				
Chromium III	1.0E+00	1.45E+00	9.0E-06	9.0E-06				
Chromium VI	5.0E-03	1.45E+00	9.0E-06	1.8E-03				
Copper	3.7E-01	7.66E-02	4.8E-07	1.3E-06				
Lead		1.66E-01	1.0E-06		7.2E-02			
Mercury	3.0E-04	2.64E-02	1.6E-07	5.5E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	7.2E-06				
Silver	5.0E-03	8.33E-08	5.2E-13	1.0E-10				
Zinc	2.0E-01	4.43E-02	2.8E-07	1.4E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	6.2E-08	1.6E-07				
Arsenic	3.0E-04	8.21E-03	4.9E-08	1.6E-04		2.0E+00	9.8E-08	7.0E-02
Cadmium	1.0E-03	1.26E-02	7.5E-08	7.5E-05				
Chromium III	1.0E+00	1.45E+00	8.6E-06	8.6E-06				
Chromium VI	5.0E-03	1.45E+00	8.6E-06	1.7E-03				
Copper	3.7E-01	7.66E-02	4.6E-07	1.2E-06				
Lead		1.66E-01	9.9E-07		6.9E-02			
Mercury	3.0E-04	2.64E-02	1.6E-07	5.2E-04				
Nickel	2.0E-02	2.32E-02	1.4E-07	6.9E-06				
Silver	5.0E-03	8.33E-08	5.0E-13	9.9E-11				
Zinc	2.0E-01	4.43E-02	2.6E-07	1.3E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	1.04E-02	4.1E-08	1.0E-07				
Arsenic	3.0E-04	8.21E-03	3.2E-08	1.1E-04		2.0E+00	6.4E-08	4.6E-02
Cadmium	1.0E-03	1.26E-02	4.9E-08	4.9E-05				
Chromium III	1.0E+00	1.45E+00	5.7E-06	5.7E-06				
Chromium VI	5.0E-03	1.45E+00	5.7E-06	1.1E-03				
Copper	3.7E-01	7.66E-02	3.0E-07	8.1E-07				
Lead		1.66E-01	6.5E-07		4.6E-02			
Mercury	3.0E-04	2.64E-02	1.0E-07	3.5E-04				
Nickel	2.0E-02	2.32E-02	9.1E-08	4.6E-06				
Silver	5.0E-03	8.33E-08	3.3E-13	6.5E-11				
Zinc	2.0E-01	4.43E-02	1.7E-07	8.7E-07				

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PROJECT: OFF-SHORE OIL

SHRIMP IMPACT
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"
EXPLORATION WELLS

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 3 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.9E-08	2.0E-07				
Arsenic	3.0E-04	5.90E-03	5.0E-08	1.7E-04		2.0E+00	1.0E-07	7.2E-02
Cadmium	1.0E-03	9.09E-03	7.8E-08	7.8E-05				
Chromium III	1.0E+00	1.04E+00	8.9E-06	8.9E-06				
Chromium VI	5.0E-03	1.04E+00	8.9E-06	1.8E-03				
Copper	3.7E-01	5.51E-02	4.7E-07	1.3E-06				
Lead		1.19E-01	1.0E-06		7.1E-02			
Mercury	3.0E-04	1.90E-02	1.6E-07	5.4E-04				
Nickel	2.0E-02	1.67E-02	1.4E-07	7.1E-06				
Silver	5.0E-03	5.99E-08	5.1E-13	1.0E-10				
Zinc	2.0E-01	3.19E-02	2.7E-07	1.4E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.4E-08	1.8E-07				
Arsenic	3.0E-04	5.90E-03	4.7E-08	1.6E-04		2.0E+00	9.4E-08	6.7E-02
Cadmium	1.0E-03	9.09E-03	7.3E-08	7.3E-05				
Chromium III	1.0E+00	1.04E+00	8.3E-06	8.3E-06				
Chromium VI	5.0E-03	1.04E+00	8.3E-06	1.7E-03				
Copper	3.7E-01	5.51E-02	4.4E-07	1.2E-06				
Lead		1.19E-01	9.5E-07		6.6E-02			
Mercury	3.0E-04	1.90E-02	1.5E-07	5.1E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.7E-06				
Silver	5.0E-03	5.99E-08	4.8E-13	9.6E-11				
Zinc	2.0E-01	3.19E-02	2.5E-07	1.3E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 6 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	7.1E-08	1.8E-07				
Arsenic	3.0E-04	5.90E-03	4.5E-08	1.5E-04		2.0E+00	9.0E-08	6.5E-02
Cadmium	1.0E-03	9.09E-03	7.0E-08	7.0E-05				
Chromium III	1.0E+00	1.04E+00	8.0E-06	8.0E-06				
Chromium VI	5.0E-03	1.04E+00	8.0E-06	1.6E-03				
Copper	3.7E-01	5.51E-02	4.2E-07	1.1E-06				
Lead		1.19E-01	9.1E-07		6.4E-02			
Mercury	3.0E-04	1.90E-02	1.5E-07	4.8E-04				
Nickel	2.0E-02	1.67E-02	1.3E-07	6.4E-06				
Silver	5.0E-03	5.99E-08	4.6E-13	9.2E-11				
Zinc	2.0E-01	3.19E-02	2.4E-07	1.2E-06				

SHRIMP IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILES)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01	9.24E-03	4.7E-08	1.2E-07				
Arsenic	3.0E-04	5.90E-03	3.0E-08	9.9E-05		2.0E+00	5.9E-08	4.2E-02
Cadmium	1.0E-03	9.09E-03	4.6E-08	4.6E-05				
Chromium III	1.0E+00	1.04E+00	5.2E-06	5.2E-06				
Chromium VI	5.0E-03	1.04E+00	5.2E-06	1.0E-03				
Copper	3.7E-01	5.51E-02	2.8E-07	7.5E-07				
Lead		1.19E-01	6.0E-07		4.2E-02			
Mercury	3.0E-04	1.90E-02	9.6E-08	3.2E-04				
Nickel	2.0E-02	1.67E-02	8.4E-08	4.2E-06				
Silver	5.0E-03	5.99E-08	3.0E-13	6.0E-11				
Zinc	2.0E-01	3.19E-02	1.6E-07	8.0E-07				

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BAT/NSPS OPTIONS FOR MEI AND QUASI-MEI
SW LEACH MEAN %
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

	Contaminant	MEI Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Compound	Oral RD (mg/kg-day)							
Naphthalene	4.0E-01	1.04E-02	4.2E-05	1.1E-04	6.7E-06	1.7E-05		
Arsenic	3.0E-04	6.84E-04	2.8E-06	9.3E-03	4.4E-07	1.5E-03		
Cadmium	1.0E-03	3.39E-03	1.4E-05	1.4E-02	2.2E-06	2.2E-03		
Chromium III	1.0E+00	5.72E-02	2.3E-04	2.3E-04	3.7E-05	3.7E-05		
Chromium VI	5.0E-03	5.72E-02	2.3E-04	4.6E-02	3.7E-05	7.4E-03		
Copper	3.7E-01	1.86E-03	7.5E-06	2.0E-05	1.2E-06	3.2E-06		
Lead		1.51E-02	6.1E-05		9.7E-06			
Mercury	3.0E-04	4.32E-03	1.8E-05	5.8E-02	2.8E-06	9.3E-03		
Nickel	2.0E-02	1.13E-02	4.6E-05	2.3E-03	7.3E-06	3.6E-04		
Silver	5.0E-03	3.10E-08	1.3E-10	2.5E-08	2.0E-11	4.0E-09		
Zinc	2.0E-01	1.65E-02	6.7E-05	3.3E-04	1.1E-05	5.3E-05		

CARCINOGENIC RISKS

	MEI	Annual Excess Lifetime Cancer Cases	QuasiMEI Lifetime Excess Risk Level	Annual Excess Excess Cancer Cases
Oral Slope Factor (mg/kg-d) ⁻¹				
Compound Arsenic	2.0E+00	5.6E-06	4.0E+00	8.8E-07

	MEI	Annual Excess Lifetime Cancer Cases	QuasiMEI Lifetime Excess Risk Level	Annual Excess Excess Cancer Cases
Oral Slope Factor (mg/kg-d) ⁻¹				
Compound Arsenic	2.0E+00	5.6E-06	4.0E+00	8.8E-07

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BAT/NPS OPTIONS FOR MEI AND QUASI-MEI
SW LEACH MEAN %
EXPLORATION WELLS

NONCARCINOGENIC RISKS

	Contaminant	MEI Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Compound Naphthalene	Oral RD (mg/kg-day) 4.0E-01	9.24E-03	3.7E-05	9.4E-05	5.9E-06	1.5E-05		
Arsenic	3.0E-04	4.92E-04	2.0E-06	6.7E-03	3.2E-07	1.1E-03		
Cadmium	1.0E-03	2.44E-03	9.9E-06	9.9E-03	1.6E-06	1.6E-03		
Chromium III	1.0E+00	4.11E-02	1.7E-04	1.7E-04	2.6E-05	2.6E-05		
Chromium VI	5.0E-03	4.11E-02	1.7E-04	3.3E-02	2.6E-05	5.3E-03		
Copper	3.7E-01	1.33E-03	5.4E-06	1.5E-05	8.5E-07	2.3E-06		
Lead		1.08E-02	4.4E-05		6.9E-06			
Mercury	3.0E-04	3.11E-03	1.3E-05	4.2E-02	2.0E-06	6.7E-03		
Nickel	2.0E-02	8.16E-03	3.3E-05	1.7E-03	5.2E-06	2.6E-04		
Silver	5.0E-03	2.23E-08	9.0E-11	1.8E-08	1.4E-11	2.9E-09		
Zinc	2.0E-01	1.19E-02	4.8E-05	2.4E-04	7.6E-06	3.8E-05		

CARCINOGENIC RISKS

	MEI Lifetime Excess Risk Level	Annual Excess Cancer Cases	QuasiMEI Lifetime Excess Risk Level	Annual Excess Cancer Cases
Compound Arsenic	Oral Slope Factor (mg/kg-d) ⁻¹ 2.0E+00	4.0E-06	2.9E+00	6.3E-07

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BAT/NSPS OPTIONS FOR MEI AND QUASI-MEI
SW LEACH MAX %
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS

	Contaminant	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Compound	Oral RD (mg/kg-day)	1.04E-02	4.2E-05	1.1E-04	6.7E-06	1.7E-05	2.4E-03
Naphthalene	4.0E-01	1.11E-03	4.5E-06	1.5E-02	7.1E-07	2.4E-03	
Arsenic	3.0E-04	7.40E-03	3.0E-05	3.0E-02	4.8E-06	4.8E-03	
Cadmium	1.0E-03	1.08E-01	4.4E-04	4.4E-04	6.9E-05	6.9E-05	
Chromium III	1.0E+00	1.08E-01	4.4E-04	8.8E-02	6.9E-05	1.4E-02	
Chromium VI	5.0E-03	4.42E-03	1.8E-05	4.8E-05	2.8E-06	7.7E-06	
Copper	3.7E-01	2.56E-02	1.0E-04	1.6E-05	7.3E+00	1.2E+00	
Lead							
Mercury	3.0E-04	1.53E-02	6.2E-05	2.1E-01	9.8E-06	3.3E-02	
Nickel	2.0E-02	2.32E-02	9.4E-05	4.7E-03	1.5E-05	7.5E-04	
Silver	5.0E-03	4.24E-08	1.7E-10	3.4E-08	2.7E-11	5.5E-09	
Zinc	2.0E-01	2.32E-02	9.4E-05	4.7E-04	1.5E-05	7.5E-05	

CARCINOGENIC RISKS

	MEI Lifetime Excess Risk Level	Annual Excess Cancer Cases	QuasiMEI Lifetime Excess Risk Level	Annual Excess Cancer Cases
Compound	Oral Slope Factor (mg/kg-d) ⁻¹ 2.0E+00	9.0E-06	6.4E+00	1.4E-06
Arsenic				1.0E+00

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BAT/NSPS OPTIONS FOR MEI AND QUASI-MEI
SW LEACH MAX %
EXPLORATION WELLS

NONCARCINOGENIC RISKS			Contaminant	MEI Intake (mg/kg-day)	Quasi MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Compound	Oral RID (mg/kg-day)	Concentration (mg/kg)							
Naphthalene	4.0E-01	9.24E-03		3.7E-05	9.4E-05	5.9E-06	1.5E-05		
Arsenic	3.0E-04	7.96E-04		3.2E-06	1.1E-02	5.1E-07	1.7E-03		
Cadmium	1.0E-03	5.32E-03		2.2E-05	2.2E-02	3.4E-06	3.4E-03		
Chromium III	1.0E+00	7.74E-02		3.1E-04	3.1E-04	5.0E-05	5.0E-05		
Chromium VI	5.0E-03	7.74E-02		3.1E-04	6.3E-02	5.0E-05	1.0E-02		
Copper	3.7E-01	3.18E-03		1.3E-05	3.5E-05	2.0E-06	5.5E-06		
Lead		1.84E-02		7.5E-05		1.2E-05			
Mercury	3.0E-04	1.10E-02		4.5E-05	1.5E-01	7.1E-06	2.4E-02		
Nickel	2.0E-02	1.67E-02		6.8E-05	3.4E-03	1.1E-05	5.4E-04		
Silver	5.0E-03	3.05E-08		1.2E-10	2.5E-08	2.0E-11	3.9E-09		
Zinc	2.0E-01	1.67E-02		6.8E-05	3.4E-04	1.1E-05	5.4E-05		

CARCINOGENIC RISKS			MEI	Annual Excess Cancer Cases	QuasiMEI Lifetime Excess Cancer Cases	Annual Excess Cancer Cases
Compound	Oral Slope Factor (mg/kg-d) ⁻¹	Risk Level				
Arsenic	2.0E+00	6.5E-06	4.6E+00	1.0E-06	7.3E-01	

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BAT/NSPS OPTIONS FOR MEI AND QUASI-MEI
BARITE LEACH % MEAN "PH DEPENDENT"
DEVELOPMENT PLATFORMS

NONCARCINOGENIC RISKS		Contaminant	MEI Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Compound	Oral RD (mg/kg-day)	Naphthalene	4.0E-01	1.04E-02	4.2E-05	1.1E-04	6.7E-06	1.7E-05	
Arsenic		Arsenic	3.0E-04	8.21E-03	3.3E-05	1.1E-01	5.3E-06	1.8E-02	
Cadmium		Cadmium	1.0E-03	1.26E-02	5.1E-05	5.1E-02	8.1E-06	8.1E-03	
Chromium III		Chromium III	1.0E+00	1.45E+00	5.9E-03	5.9E-03	9.3E-04	9.3E-04	
Chromium VI		Chromium VI	5.0E-03	1.45E+00	5.9E-03	1.2E+00	9.3E-04	1.9E-01	
Copper		Copper	3.7E-01	7.66E-02	3.1E-04	8.4E-04	4.9E-05	1.3E-04	
Lead		Lead	1.66E-01	6.7E-04	1.1E-04	1.1E-04	1.1E-04	4.7E+01	7.5E+00
Mercury		Mercury	3.0E-04	2.64E-02	1.1E-04	3.6E-01	1.7E-05	5.7E-02	
Nickel		Nickel	2.0E-02	2.32E-02	9.4E-05	4.7E-03	1.5E-05	7.5E-04	
Silver		Silver	5.0E-03	8.33E-08	3.4E-10	6.8E-08	5.4E-11	1.1E-08	
Zinc		Zinc	2.0E-01	4.43E-02	1.8E-04	9.0E-04	2.8E-05	1.4E-04	

CARCINOGENIC RISKS		MEI	Lifetime Excess Risk Level	Annual Excess Cancer Cases	Quasi-MEI Lifetime Excess Cancer Cases	Annual Excess Cancer Cases
Compound	Oral Slope Factor (mg/kg-d) ⁻¹	Arsenic	2.0E+00	6.7E-05	4.8E+01	1.1E-05
Arsenic					7.5E+00	

MAY 19, 1992
PROJECT: OFF-SHORE OILS

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SHRIMP IMPACT - BATON RVS OPTIONS FOR MEI AND QUASI-MEI
BARITE LEACH % MEAN "PH DEPENDENT"
EXPLORATION WELLS

NONCARCINOGENIC RISKS

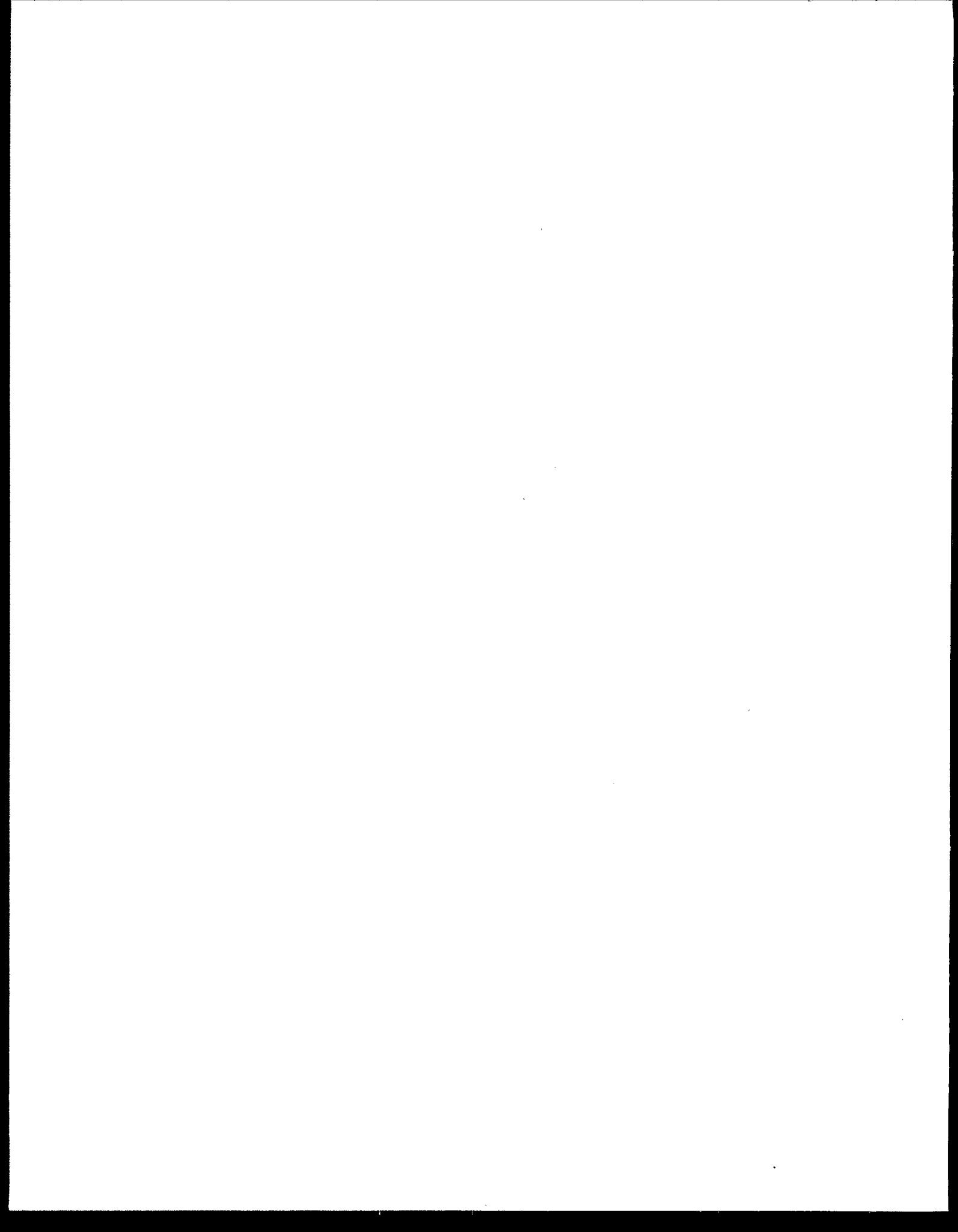
Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	9.24E-03	3.7E-05	9.4E-05	5.9E-06	1.5E-05		
Arsenic	3.0E-04	5.90E-03	2.4E-05	8.0E-02	3.8E-06	1.3E-02		
Cadmium	1.0E-03	9.09E-03	3.7E-05	3.7E-02	5.8E-06	5.8E-03		
Chromium III	1.0E+00	1.04E+00	4.2E-03	4.2E-03	6.7E-04	6.7E-04		
Chromium VI	5.0E-03	1.04E+00	4.2E-03	8.4E-01	6.7E-04	1.3E-01		
Copper	3.7E-01	5.51E-02	2.2E-04	6.0E-04	3.5E-05	9.6E-05		
Lead		1.19E-01	4.8E-04		7.6E-05		3.4E+01	5.4E+00
Mercury	3.0E-04	1.90E-02	7.7E-05	2.6E-01	1.2E-05	4.1E-02		
Nickel	2.0E-02	1.67E-02	6.8E-05	3.4E-03	1.1E-05	5.4E-04		
Silver	5.0E-03	5.99E-08	2.4E-10	4.9E-08	3.9E-11	7.7E-09		
Zinc	2.0E-01	3.19E-02	1.3E-04	6.5E-04	2.1E-05	1.0E-04		

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-d) ⁻¹	MEI Lifetime Excess Risk Level	Annual Excess Cancer Cases	Quasi-MEI Lifetime Excess Cancer Cases
Arsenic	2.0E+00	4.8E-05	3.4E+01	7.6E-06

APPENDIX B

FINFISH IMPACTS FROM DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATIONS



MAY 18, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT BASELINE CONDITIONS (BPI/BPT) DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION SW LEACH MEAN %

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	Average Daily Lead Intake (ug/day)	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	1.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Arsenic	3.0E-04	9.5E-05	2.2E-10	7.2E-07	6.3E-08	2.1E-04	1.0E-08	3.3E-05			
Cadmium	1.0E-03	1.8E-03	1.3E-09	1.3E-06	3.9E-07	3.9E-04	6.1E-08	6.1E-05			
Chromium III	1.0E+00	1.8E-03	2.5E-08	2.5E-08	7.3E-06	7.3E-06	1.2E-06	1.2E-06			
Chromium VI	5.0E-03	1.8E-03	2.5E-08	5.0E-06	7.3E-06	1.5E-03	1.2E-06	2.3E-04			
Copper	3.7E-01	5.3E-05	7.4E-10	2.0E-09	2.2E-07	5.8E-07	3.4E-08	9.2E-08			
Lead	NA	3.8E-04	5.4E-09	1.6E-06	1.6E-06	2.5E-07	2.5E-07	8.7B-04			
Mercury	3.0E-04	4.1E-04	5.7E-09	1.9E-05	1.6E-06	5.5E-03	2.6E-07	8.7B-04			
Nickel	2.0E-02	1.6E-04	2.2E-09	1.1E-07	6.5E-07	3.2E-05	1.0E-07	5.1E-06			
Silver	5.0E-03	2.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Zinc	2.0E-01	2.3E-04	3.2E-09	1.6E-08	9.2E-08	4.6E-06	1.1E-01	1.7E-02			

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day) ⁻¹	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Lifetime Excess Risk Level	MEI Intake (mg/kg-day)	Lifetime MEI Excess Risk Level (mg/kg-day)	Quasi MEI Intake	Lifetime Excess Risk Level (mg/kg-day)	Excess Risk Level
Arsenic	2.0E+00	1.6E-05	2.2E-10	4.3E-10	5.6E-06	6.3E-08	1.3E-07	8.1E-11	1.6E-10

Annual expected excess cancer cases:

OFF-SHORE OIL PROJECT; MAY 18, 1992

FIN FISH IMPACT
BASELINE CONDITIONS (BP/BPD)
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
NSW LEACH MAX %

NONCARCINOGENIC RISKS

MAY 18, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT
BASELINE CONDITIONS (BPJ/BPT)
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN @ "pH Dependent"

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Intake (mg/kg-day)	Average Daily Lead Intake (ug/day)	MEI Daily Lead Intake (ug/day)	Quasi MEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Arsenic	3.0E-04	1.9E-04	2.6E-09	8.7E-06	7.5E-07	2.5E-03	1.2E-07	4.0E-04			
Cadmium	1.0E-03	3.5E-04	5.0E-09	5.0E-06	1.4E-06	1.4E-03	2.3E-07	2.3E-04			
Chromium III	1.0E+00	4.5E-02	6.3E-07	6.3E-07	1.8E-04	1.8E-04	2.9E-05	2.9E-05			
Chromium VI	5.0E-03	4.5E-02	6.3E-07	1.3E-04	1.8E-04	3.7E-02	2.9E-05	5.8E-03			
Copper	3.7E-01	2.2E-03	3.1E-08	8.3E-08	8.9E-06	2.4E-05	1.4E-06	3.8E-06			
Lead	NA	4.2E-03	5.9E-08	1.7E-05	1.7E-05	2.7E-06	4.1E-03	1.2E+00	1.9E-01		
Mercury	3.0E-04	2.5E-03	3.5E-08	1.2E-04	1.0E-05	3.4E-02	1.6E-06	5.3E-03			
Nickel	2.0E-02	3.3E-04	4.6E-09	2.3E-07	1.3E-06	6.7E-05	2.1E-07	1.1E-05			
Silver	5.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Zinc	2.0E-01	6.1E-04	8.5E-09	4.3E-08	2.5E-06	1.2E-05	3.9E-07	2.0E-06			

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Risk Level (mg/kg-day)	MEI Intake (mg/kg-day)	Lifetime Excess Intake (mg/kg-day)	Risk Level (mg/kg-day)	Quasi MEI Intake (mg/kg-day)	Lifetime Excess Intake (mg/kg-day)	Quasi MEI Risk Level
Arsenic	2.0E+00	1.9E-04	2.6E-09	5.2E-09	7.5E-07	1.5E-06	9.7E-10	1.9E-09	2.5E-05	
Annual expected excess cancer cases:				6.7E-05		1.9E-02				

MAY 19, 1992
PROJECT: OFF-SHORE OIL

.FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION
CASE 1 - MINIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	7.7E-11	2.6E-07				
Cadmium	1.0E-03	4.3E-05	3.8E-10	3.8E-07				
Chromium III	1.0E+00	7.2E-04	6.4E-09	6.4E-09				
Chromium VI	5.0E-03	7.2E-04	6.4E-09	1.3E-06				
Copper	3.7E-01	2.3E-05	2.1E-10	5.6E-10				
Lead	NA	1.9E-04	1.7E-09		1.2E-04			
Mercury	3.0E-04	5.4E-05	4.9E-10	1.6E-06				
Nickel	2.0E-02	1.5E-04	1.3E-09	6.7E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.9E-09	9.5E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	6.8E-11	2.3E-07				
Cadmium	1.0E-03	4.3E-05	3.4E-10	3.4E-07				
Chromium III	1.0E+00	7.2E-04	5.7E-09	5.7E-09				
Chromium VI	5.0E-03	7.2E-04	5.7E-09	1.1E-06				
Copper	3.7E-01	2.3E-05	1.9E-10	5.0E-10				
Lead	NA	1.9E-04	1.5E-09		1.1E-04			
Mercury	3.0E-04	5.4E-05	4.3E-10	1.4E-06				
Nickel	2.0E-02	1.5E-04	1.2E-09	6.0E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.7E-09	8.5E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	2.3E-11	7.6E-08				
Cadmium	1.0E-03	4.3E-05	1.1E-10	1.1E-07				
Chromium III	1.0E+00	7.2E-04	1.9E-09	1.9E-09				
Chromium VI	5.0E-03	7.2E-04	1.9E-09	3.8E-07				
Copper	3.7E-01	2.3E-05	6.2E-11	1.7E-10				
Lead	NA	1.9E-04	5.0E-10		3.5E-05			
Mercury	3.0E-04	5.4E-05	1.4E-10	4.8E-07				
Nickel	2.0E-02	1.5E-04	4.0E-10	2.0E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	5.6E-10	2.8E-09				

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION
CASE 1 - MINIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.2E-10	4.2E-07				
Cadmium	1.0E-03	9.3E-05	8.3E-10	8.3E-07				
Chromium III	1.0E+00	1.4E-03	1.2E-08	1.2E-08				
Chromium VI	5.0E-03	1.4E-03	1.2E-08	2.4E-06				
Copper	3.7E-01	5.5E-05	5.0E-10	1.3E-09				
Lead	NA	3.2E-04	2.9E-09		2.0E-04			
Mercury	3.0E-04	1.9E-04	1.7E-09	5.8E-06				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.6E-09	1.3E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.1E-10	3.7E-07				
Cadmium	1.0E-03	9.3E-05	7.4E-10	7.4E-07				
Chromium III	1.0E+00	1.4E-03	1.1E-08	1.1E-08				
Chromium VI	5.0E-03	1.4E-03	1.1E-08	2.2E-06				
Copper	3.7E-01	5.5E-05	4.4E-10	1.2E-09				
Lead	NA	3.2E-04	2.6E-09		1.8E-04			
Mercury	3.0E-04	1.9E-04	1.5E-09	5.1E-06				
Nickel	2.0E-02	3.1E-04	2.4E-09	1.2E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.3E-09	1.2E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	3.7E-11	1.2E-07				
Cadmium	1.0E-03	9.3E-05	2.5E-10	2.5E-07				
Chromium III	1.0E+00	1.4E-03	3.6E-09	3.6E-09				
Chromium VI	5.0E-03	1.4E-03	3.6E-09	7.2E-07				
Copper	3.7E-01	5.5E-05	1.5E-10	4.0E-10				
Lead	NA	3.2E-04	8.5E-10		6.0E-05			
Mercury	3.0E-04	1.9E-04	5.1E-10	1.7E-06				
Nickel	2.0E-02	3.1E-04	8.1E-10	4.1E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	7.7E-10	3.8E-09				

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

CASE 1 - MINIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

BARITE LEACH % "pH DEPENDENT"

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	9.2E-10	3.1E-06		2.0E+00	1.8E-09	2.4E-05
Cadmium	1.0E-03	1.6E-04	1.4E-09	1.4E-06				
Chromium III	1.0E+00	1.8E-02	1.6E-07	1.6E-07				
Chromium VI	5.0E-03	1.8E-02	1.6E-07	3.2E-05				
Copper	3.7E-01	9.6E-04	8.6E-09	2.3E-08				
Lead	NA	2.1E-03	1.9E-08		1.3E-03			
Mercury	3.0E-04	3.3E-04	3.0E-09	1.0E-05				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	5.1E-09	2.5E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	8.2E-10	2.7E-06		2.0E+00	1.6E-09	2.1E-05
Cadmium	1.0E-03	1.6E-04	1.3E-09	1.3E-06				
Chromium III	1.0E+00	1.8E-02	1.4E-07	1.4E-07				
Chromium VI	5.0E-03	1.8E-02	1.4E-07	2.9E-05				
Copper	3.7E-01	9.6E-04	7.7E-09	2.1E-08				
Lead	NA	2.1E-03	1.7E-08		1.2E-03			
Mercury	3.0E-04	3.3E-04	2.7E-09	8.8E-06				
Nickel	2.0E-02	3.1E-04	2.4E-09	1.2E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	4.5E-09	2.3E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	2.7E-10	9.1E-07		2.0E+00	5.5E-10	7.0E-06
Cadmium	1.0E-03	1.6E-04	4.2E-10	4.2E-07				
Chromium III	1.0E+00	1.8E-02	4.8E-08	4.8E-08				
Chromium VI	5.0E-03	1.8E-02	4.8E-08	9.6E-06				
Copper	3.7E-01	9.6E-04	2.5E-09	6.9E-09				
Lead	NA	2.1E-03	5.5E-09		3.8E-04			
Mercury	3.0E-04	3.3E-04	8.8E-10	2.9E-06				
Nickel	2.0E-02	3.1E-04	8.1E-10	4.1E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	1.5E-09	7.5E-09				

MAY 18, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	7.7E-11	2.6E-07				
Cadmium	1.0E-03	4.3E-05	3.8E-10	3.8E-07				
Chromium III	1.0E+00	7.2E-04	6.4E-09	6.4E-09				
Chromium VI	5.0E-03	7.2E-04	6.4E-09	1.3E-06				
Copper	3.7E-01	2.3E-05	2.1E-10	5.6E-10				
Lead	NA	1.9E-04	1.7E-09		1.2E-04			
Mercury	3.0E-04	5.4E-05	4.9E-10	1.6E-06				
Nickel	2.0E-02	1.5E-04	1.3E-09	6.7E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.9E-09	9.5E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	7.2E-11	2.4E-07				
Cadmium	1.0E-03	4.3E-05	3.6E-10	3.6E-07				
Chromium III	1.0E+00	7.2E-04	6.0E-09	6.0E-09				
Chromium VI	5.0E-03	7.2E-04	6.0E-09	1.2E-06				
Copper	3.7E-01	2.3E-05	2.0E-10	5.3E-10				
Lead	NA	1.9E-04	1.6E-09		1.1E-04			
Mercury	3.0E-04	5.4E-05	4.6E-10	1.5E-06				
Nickel	2.0E-02	1.5E-04	1.3E-09	6.3E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.8E-09	8.9E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	4.5E-11	1.5E-07				
Cadmium	1.0E-03	4.3E-05	2.2E-10	2.2E-07				
Chromium III	1.0E+00	7.2E-04	3.8E-09	3.8E-09				
Chromium VI	5.0E-03	7.2E-04	3.8E-09	7.6E-07				
Copper	3.7E-01	2.3E-05	1.2E-10	3.3E-10				
Lead	NA	1.9E-04	1.0E-09		7.0E-05			
Mercury	3.0E-04	5.4E-05	2.9E-10	9.6E-07				
Nickel	2.0E-02	1.5E-04	7.9E-10	4.0E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.1E-09	5.6E-09				

MAY 18, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

CASE 2 - MID-SIZED HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MAX %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.2E-10	4.2E-07		2.0E+00	2.5E-10	3.2E-06
Cadmium	1.0E-03	9.3E-05	8.3E-10	8.3E-07				
Chromium III	1.0E+00	1.4E-03	1.2E-08	1.2E-08				
Chromium VI	5.0E-03	1.4E-03	1.2E-08	2.4E-06				
Copper	3.7E-01	5.5E-05	5.0E-10	1.3E-09				
Lead	NA	3.2E-04	2.9E-09		2.0E-04			
Mercury	3.0E-04	1.9E-04	1.7E-09	5.8E-06				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.6E-09	1.3E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.2E-10	3.9E-07		2.0E+00	2.3E-10	3.0E-06
Cadmium	1.0E-03	9.3E-05	7.8E-10	7.8E-07				
Chromium III	1.0E+00	1.4E-03	1.1E-08	1.1E-08				
Chromium VI	5.0E-03	1.4E-03	1.1E-08	2.3E-06				
Copper	3.7E-01	5.5E-05	4.6E-10	1.3E-09				
Lead	NA	3.2E-04	2.7E-09		1.9E-04			
Mercury	3.0E-04	1.9E-04	1.6E-09	5.4E-06				
Nickel	2.0E-02	3.1E-04	2.6E-09	1.3E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.4E-09	1.2E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	7.4E-11	2.5E-07		2.0E+00	1.5E-10	1.9E-06
Cadmium	1.0E-03	9.3E-05	4.9E-10	4.9E-07				
Chromium III	1.0E+00	1.4E-03	7.1E-09	7.1E-09				
Chromium VI	5.0E-03	1.4E-03	7.1E-09	1.4E-06				
Copper	3.7E-01	5.5E-05	2.9E-10	7.9E-10				
Lead	NA	3.2E-04	1.7E-09		1.2E-04			
Mercury	3.0E-04	1.9E-04	1.0E-09	3.4E-06				
Nickel	2.0E-02	3.1E-04	1.6E-09	8.1E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	1.5E-09	7.6E-09				

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION
CASE 2 - MID-SIZED HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	9.2E-10	3.1E-06				
Cadmium	1.0E-03	1.6E-04	1.4E-09	1.4E-06				
Chromium III	1.0E+00	1.8E-02	1.6E-07	1.6E-07				
Chromium VI	5.0E-03	1.8E-02	1.6E-07	3.2E-05				
Copper	3.7E-01	9.6E-04	8.6E-09	2.3E-08				
Lead	NA	2.1E-03	1.9E-08		1.3E-03			
Mercury	3.0E-04	3.3E-04	3.0E-09	1.0E-05				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	5.1E-09	2.5E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	8.6E-10	2.9E-06				
Cadmium	1.0E-03	1.6E-04	1.3E-09	1.3E-06				
Chromium III	1.0E+00	1.8E-02	1.5E-07	1.5E-07				
Chromium VI	5.0E-03	1.8E-02	1.5E-07	3.0E-05				
Copper	3.7E-01	9.6E-04	8.1E-09	2.2E-08				
Lead	NA	2.1E-03	1.7E-08		1.2E-03			
Mercury	3.0E-04	3.3E-04	2.8E-09	9.3E-06				
Nickel	2.0E-02	3.1E-04	2.6E-09	1.3E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	4.8E-09	2.4E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	5.4E-10	1.8E-06				
Cadmium	1.0E-03	1.6E-04	8.4E-10	8.4E-07				
Chromium III	1.0E+00	1.8E-02	9.6E-08	9.6E-08				
Chromium VI	5.0E-03	1.8E-02	9.6E-08	1.9E-05				
Copper	3.7E-01	9.6E-04	5.1E-09	1.4E-08				
Lead	NA	2.1E-03	1.1E-08		7.7E-04			
Mercury	3.0E-04	3.3E-04	1.8E-09	5.9E-06				
Nickel	2.0E-02	3.1E-04	1.6E-09	8.1E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	3.0E-09	1.5E-08				

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

CASE 3 - MAXIMUM HARVEST LEVEL

DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION

SW LEACH MEAN %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	7.7E-11	2.6E-07		2.0E+00	1.5E-10	2.0E-06
Cadmium	1.0E-03	4.3E-05	3.8E-10	3.8E-07				
Chromium III	1.0E+00	7.2E-04	6.4E-09	6.4E-09				
Chromium VI	5.0E-03	7.2E-04	6.4E-09	1.3E-06				
Copper	3.7E-01	2.3E-05	2.1E-10	5.6E-10				
Lead	NA	1.9E-04	1.7E-09		1.2E-04			
Mercury	3.0E-04	5.4E-05	4.9E-10	1.6E-06				
Nickel	2.0E-02	1.5E-04	1.3E-09	6.7E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.9E-09	9.5E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	7.5E-11	2.5E-07		2.0E+00	1.5E-10	1.9E-06
Cadmium	1.0E-03	4.3E-05	3.7E-10	3.7E-07				
Chromium III	1.0E+00	7.2E-04	6.3E-09	6.3E-09				
Chromium VI	5.0E-03	7.2E-04	6.3E-09	1.3E-06				
Copper	3.7E-01	2.3E-05	2.1E-10	5.5E-10				
Lead	NA	1.9E-04	1.7E-09		1.2E-04			
Mercury	3.0E-04	5.4E-05	4.8E-10	1.6E-06				
Nickel	2.0E-02	1.5E-04	1.3E-09	6.6E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.9E-09	9.3E-09				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	8.6E-06	6.8E-11	2.3E-07		2.0E+00	1.4E-10	1.7E-06
Cadmium	1.0E-03	4.3E-05	3.4E-10	3.4E-07				
Chromium III	1.0E+00	7.2E-04	5.7E-09	5.7E-09				
Chromium VI	5.0E-03	7.2E-04	5.7E-09	1.1E-06				
Copper	3.7E-01	2.3E-05	1.8E-10	5.0E-10				
Lead	NA	1.9E-04	1.5E-09		1.0E-04			
Mercury	3.0E-04	5.4E-05	4.3E-10	1.4E-06				
Nickel	2.0E-02	1.5E-04	1.2E-09	5.9E-08				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.1E-04	1.7E-09	8.4E-09				

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.2E-10	4.2E-07				
Cadmium	1.0E-03	9.3E-05	8.3E-10	8.3E-07				
Chromium III	1.0E+00	1.4E-03	1.2E-08	1.2E-08				
Chromium VI	5.0E-03	1.4E-03	1.2E-08	2.4E-06				
Copper	3.7E-01	5.5E-05	5.0E-10	1.3E-09				
Lead	NA	3.2E-04	2.9E-09		2.0E-04			
Mercury	3.0E-04	1.9E-04	1.7E-09	5.8E-06				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.6E-09	1.3E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.2E-10	4.1E-07				
Cadmium	1.0E-03	9.3E-05	8.2E-10	8.2E-07				
Chromium III	1.0E+00	1.4E-03	1.2E-08	1.2E-08				
Chromium VI	5.0E-03	1.4E-03	1.2E-08	2.4E-06				
Copper	3.7E-01	5.5E-05	4.9E-10	1.3E-09				
Lead	NA	3.2E-04	2.8E-09		2.0E-04			
Mercury	3.0E-04	1.9E-04	1.7E-09	5.7E-06				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.3E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.5E-09	1.3E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.4E-05	1.1E-10	3.7E-07				
Cadmium	1.0E-03	9.3E-05	7.4E-10	7.4E-07				
Chromium III	1.0E+00	1.4E-03	1.1E-08	1.1E-08				
Chromium VI	5.0E-03	1.4E-03	1.1E-08	2.1E-06				
Copper	3.7E-01	5.5E-05	4.4E-10	1.2E-09				
Lead	NA	3.2E-04	2.5E-09		1.8E-04			
Mercury	3.0E-04	1.9E-04	1.5E-09	5.1E-06				
Nickel	2.0E-02	3.1E-04	2.4E-09	1.2E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	2.9E-04	2.3E-09	1.1E-08				

MAY 18, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT

BAT/NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION
CASE 3 - MAXIMUM HARVEST LEVEL
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"

NONCARCINOGENIC RISKS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	9.2E-10	3.1E-06		2.0E+00	1.8E-09	2.4E-05
Cadmium	1.0E-03	1.6E-04	1.4E-09	1.4E-06				
Chromium III	1.0E+00	1.8E-02	1.6E-07	1.6E-07				
Chromium VI	5.0E-03	1.8E-02	1.6E-07	3.2E-05				
Copper	3.7E-01	9.6E-04	8.6E-09	2.3E-08				
Lead	NA	2.1E-03	1.9E-08		1.3E-03			
Mercury	3.0E-04	3.3E-04	3.0E-09	1.0E-05				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.4E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	5.1E-09	2.5E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	9.1E-10	3.0E-06		2.0E+00	1.8E-09	2.3E-05
Cadmium	1.0E-03	1.6E-04	1.4E-09	1.4E-06				
Chromium III	1.0E+00	1.8E-02	1.6E-07	1.6E-07				
Chromium VI	5.0E-03	1.8E-02	1.6E-07	3.2E-05				
Copper	3.7E-01	9.6E-04	8.5E-09	2.3E-08				
Lead	NA	2.1E-03	1.8E-08		1.3E-03			
Mercury	3.0E-04	3.3E-04	2.9E-09	9.8E-06				
Nickel	2.0E-02	3.1E-04	2.7E-09	1.3E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	5.0E-09	2.5E-08				

FINFISH IMPACT - BAT/NSPS OPTIONS (ZERO DISCHARGE < 8 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Naphthalene	4.0E-01		0.0E+00	0.0E+00				
Arsenic	3.0E-04	1.0E-04	8.2E-10	2.7E-06		2.0E+00	1.6E-09	2.1E-05
Cadmium	1.0E-03	1.6E-04	1.3E-09	1.3E-06				
Chromium III	1.0E+00	1.8E-02	1.4E-07	1.4E-07				
Chromium VI	5.0E-03	1.8E-02	1.4E-07	2.9E-05				
Copper	3.7E-01	9.6E-04	7.6E-09	2.1E-08				
Lead	NA	2.1E-03	1.6E-08		1.1E-03			
Mercury	3.0E-04	3.3E-04	2.6E-09	8.8E-06				
Nickel	2.0E-02	3.1E-04	2.4E-09	1.2E-07				
Silver	5.0E-03		0.0E+00	0.0E+00				
Zinc	2.0E-01	5.7E-04	4.5E-09	2.3E-08				

MAY 19, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT
BAT/NSPS OPTIONS - MEI/QUASI MEI SCENARIO
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MEAN %

NONCARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	QuasiMEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	8.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Arsenic	3.0E-04	4.3E-05	3.5E-08	1.2E-04	5.5E-09	1.8E-05		
Cadmium	1.0E-03	7.2E-04	1.7E-07	1.7E-04	2.7E-08	2.7E-05		
Chromium III	1.0E+00	7.2E-04	2.9E-06	2.9E-06	4.6E-07	4.6E-07		
Chromium VI	5.0E-03	7.2E-04	2.9E-06	5.8E-04	4.6E-07	9.2E-05		
Copper	3.7E-01	2.3E-05	9.5E-08	2.6E-07	1.5E-08	4.0E-08		
Lead	NA	1.9E-04	7.7E-07		1.2E-07			
Mercury	3.0E-04	5.4E-05	2.2E-07	7.4E-04	3.5E-08	1.2E-04		
Nickel	2.0E-02	1.5E-04	6.1E-07	3.0E-05	9.6E-08	4.8E-06		
Silver	5.0E-03	2.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
Zinc	2.0E-01	2.1E-04	8.6E-07	4.3E-06	1.4E-07	6.8E-07		

CARCINOGENIC RISKS

Compound	Oral Slope (mg/kg-d)-1	MEI Lifetime Factor	Excess Cancer Risk Level	MEI Annual Expected Excess Cancer Cases	Quasi MEI Lifetime Excess Cancer Risk Level	QuasiMEI Annual Expected Excess Cancer Cases
Arsenic	2.0E+00	6.9E-08	8.9E-04	1.1E-08	1.1E-08	1.4E-04

MAY 19, 1992
PROJECT: OFF-SHORE OIL

**FIN FISH IMPACT
BAT/NSPS OPTIONS - MEI/QUASI MEI SCENARIO
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
SW LEACH MAX %**

NONCARCINOGENIC RISKS			Contaminant Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	QuasiMEI Daily Lead Intake (ug/day)
Compound	Oral RD (mg/kg-day)	4.0E-01							
Naphthalene	3.0E-04	1.4E-05	5.6E-08	0.0E+00	1.9E-04	8.9E-09	3.0E+00	0.0E+00	0.0E+00
Arsenic	1.0E-03	9.3E-05	3.8E-07	3.8E-04	6.0E-08	6.0E-05	6.0E-05	6.0E-05	6.0E-05
Cadmium	1.0E+00	1.4E-03	5.5E-06	5.5E-06	8.7E-07	8.7E-07	8.7E-07	8.7E-07	8.7E-07
Chromium III	5.0E-03	1.4E-03	5.5E-06	1.1E-03	8.7E-07	1.7E-04	8.7E-07	1.7E-04	1.7E-04
Chromium VI	3.7E-01	5.5E-05	2.2E-07	6.1E-07	3.6E-08	9.6E-08	3.6E-08	9.6E-08	9.6E-08
Copper	NA	3.2E-04	1.3E-06	2.1E-07	2.1E-07	1.4E-02	2.1E-07	1.4E-02	1.4E-02
Lead	3.0E-04	1.9E-04	7.8E-07	2.6E-03	1.2E-07	4.1E-04	1.2E-07	4.1E-04	4.1E-04
Mercury	2.0E-02	3.1E-04	1.2E-06	6.2E-05	2.0E-07	9.8E-06	2.0E-07	9.8E-06	9.8E-06
Nickel	5.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Silver	2.0E-01	2.9E-04	1.2E-06	5.9E-06	1.9E-07	9.3E-07	1.9E-07	9.3E-07	9.3E-07
Zinc									
CARCINOGENIC RISKS			MEI Lifetime Excess Cancer Factor	MEI Annual Expected Excess Cancer Cases	Quasi MEI Lifetime Excess Cancer Risk Level	QuasiMEI Annual Expected Excess Cancer Cases	Quasi MEI Lifetime Excess Cancer Risk Level	QuasiMEI Annual Expected Excess Cancer Cases	QuasiMEI Annual Expected Excess Cancer Cases
Compound	Oral Slope (mg/kg-d) ⁻¹	2.0E+00							
Arsenic			1.1E-07	1.5E-03	1.8E-08	2.3E-04	1.8E-08	2.3E-04	2.3E-04

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PROJECT: OFF-SHORE OIL

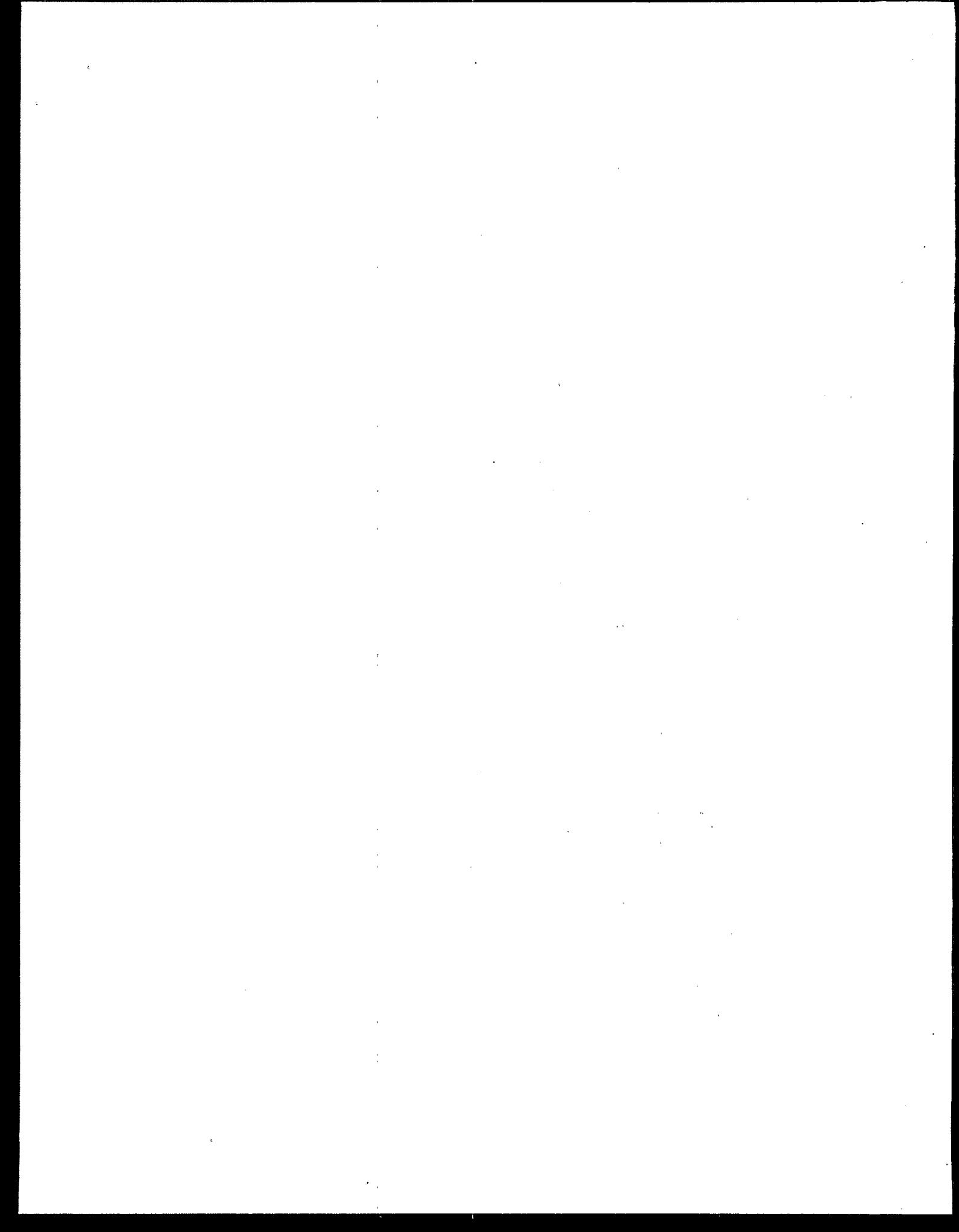
**FIN FISH IMPACT
BAT/NIPS OPTIONS - MEI/QUASI MEI SCENARIO
DRILL MUDS & CUTTINGS POLLUTANT CONCENTRATION
BARITE LEACH % MEAN "pH DEPENDENT"**

NONCARCINOGENIC RISKS

Compound	Oral RD (mg/kg-day)	Contaminant Concentration (mg/kg)	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi MEI Intake (mg/kg-day)	Quasi MEI Hazard Quotient	MEI Daily Lead Intake (ug/day)	QuasiMEI Daily Lead Intake (ug/day)
Naphthalene	4.0E-01	1.0E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Arsenic	3.0E-04	1.6E-04	4.2E-07	1.4E-03	6.6E-08	2.2E-04	6.6E-08	2.2E-04
Cadmium	1.0E-03	1.8E-02	6.4E-07	6.4E-04	1.0E-07	1.0E-04	1.0E-07	1.0E-04
Chromium III	1.0E+00	7.3E-05	7.3E-05	7.3E-05	1.2E-05	1.2E-05	1.2E-05	1.2E-05
Chromium VI	5.0E-03	1.8E-02	7.3E-05	1.5E-02	1.2E-05	2.3E-03	1.2E-05	2.3E-03
Copper	3.7E-01	9.6E-04	3.9E-06	1.1E-05	6.2E-07	1.7E-06	6.2E-07	1.7E-06
Lead	NA	2.1E-03	8.4E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Mercury	3.0E-04	3.3E-04	1.4E-06	4.5E-03	2.1E-07	7.1E-04	2.1E-07	7.1E-04
Nickel	2.0E-02	3.1E-04	1.2E-06	6.2E-05	2.0E-07	9.8E-06	2.0E-07	9.8E-06
Silver	5.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Zinc	2.0E-01	5.7E-04	2.3E-06	1.2E-05	3.7E-07	1.8E-06	3.7E-07	1.8E-06

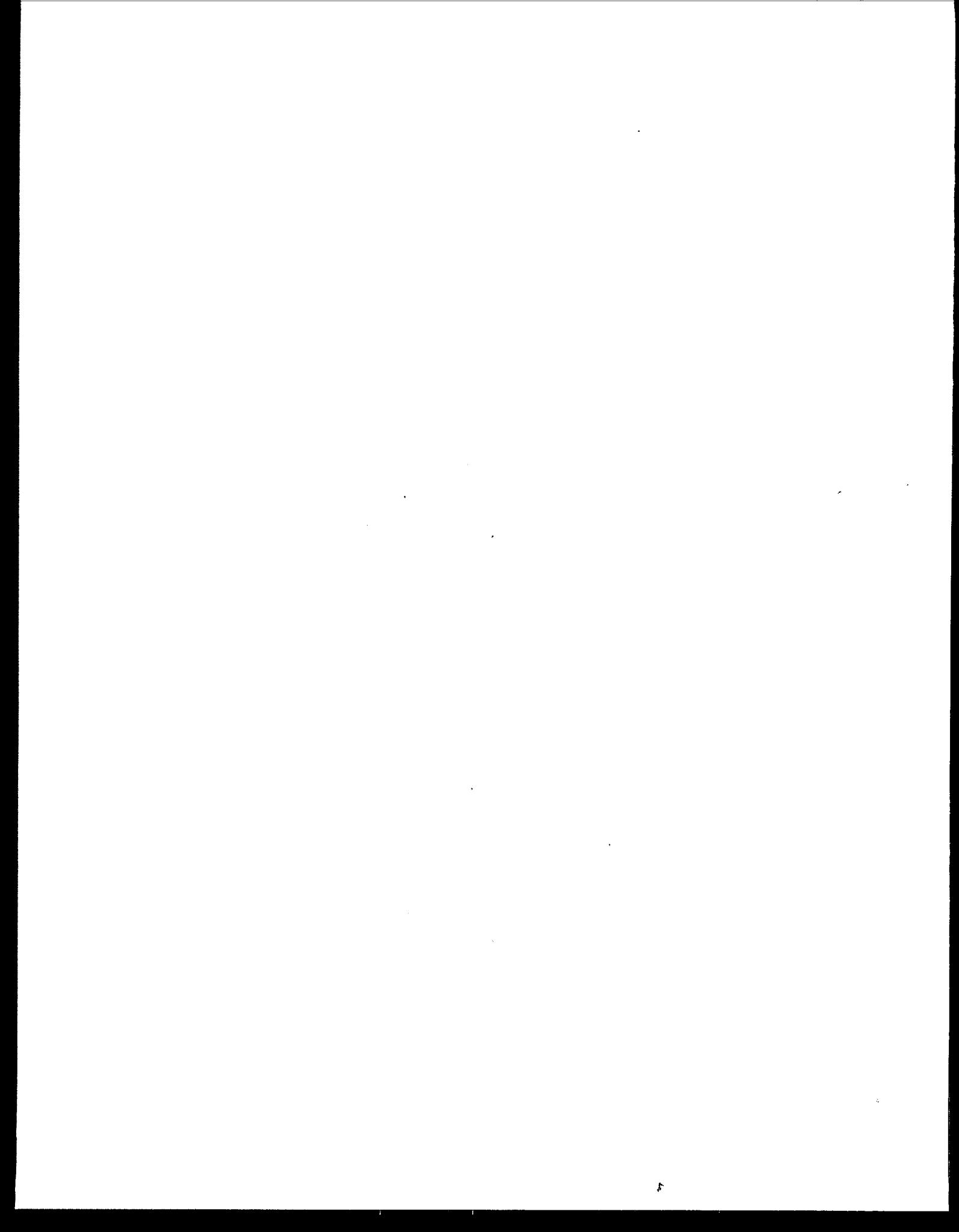
CARCINOGENIC RISKS

Compound	Oral Slope (mg/kg-d) ⁻¹	MEI Lifetime Factor	Excess Cancer Risk Level	MEI Annual Expected Excess	MEI Annual Lifetime Excess	Quasi MEI Excess Cancer Risk Level	QuasiMEI Annual Expected Excess
Arsenic	2.0E+00	8.4E-07	1.1E-02	1.3E-07	1.3E-07	1.7E-03	1.7E-03



APPENDIX C

FINFISH IMPACTS FROM PRODUCED WATERS AT EXISTING PLATFORMS



FIN FISH IMPACT
BASELINE CONDITIONS – BPJ/BPT
PRODUCED WATER DISCHARGES

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Average Hazard Quotient	MEI Intake (ug/day)	Quasi-MEI Intake (ug/day)	Quasi-MEI Intake (ug/day)	Average Hazard Quotient	MEI Intake (ug/day)	Quasi-MEI Intake (ug/day)
2,4-Dimethylphenol	1.0E-03	1.6E-02	1.9E-06	1.9E-03	6.5E-05	6.5E-02	1.0E-05	1.0E-02					
Chlorobenzene	3.0E-02	1.1E-04	1.2E-08	4.1E-07	4.3E-07	1.4E-05	6.9E-08	2.3E-06					
Ethylbenzene	1.0E-01	6.5E-03	7.5E-07	7.5E-06	2.6E-05	2.6E-04	4.2E-06	4.2E-05					
Naphthalene	4.0E-01	5.6E-02	6.5E-06	1.6E-05	2.3E-04	5.6E-04	3.6E-05	8.9E-05					
p-Chloro-m-cresol	2.0E-01	1.1E-03	1.2E-07	6.2E-07	4.3E-06	2.2E-05	6.9E-07	3.4E-06					
Phenol	6.0E-01	1.1E-03	1.3E-07	2.2E-07	4.7E-06	7.8E-06	7.4E-07	1.2E-06					
Toluene	3.0E-01	1.1E-02	1.3E-06	4.2E-06	4.4E-05	1.5E-04	7.0E-06	2.3E-05					
Xylenes (total)	2.0E+00	7.7E-02	9.0E-06	4.5E-06	3.1E-04	1.6E-04	5.0E-05	2.5E-05					
Arsenic	3.0E-04	1.3E-03	1.5E-07	4.9E-04	5.1E-06	1.7E-02	8.1E-07	2.7E-03					
Barium	5.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
Boron	9.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
Cadmium	1.0E-03	3.6E-04	4.2E-08	4.2E-05	1.5E-06	1.5E-03	2.3E-07	2.3E-04					
Copper	3.7E-01	4.0E-03	4.7E-07	1.3E-06	1.6E-05	4.4E-05	2.6E-06	6.9E-06					
Lead	NA	2.4E-03	2.8E-07		9.7E-06		1.5E-06						
Manganese	2.0E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00					
Nickel	2.0E-02	2.0E-02	2.3E-06	1.2E-04	8.1E-05	4.1E-03	1.3E-05	6.4E-04					
Zinc	2.0E-01	1.4E-02	1.6E-06	8.1E-06	5.7E-05	2.8E-04	9.0E-06	4.5E-05					

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Risk Level (mg/kg-day)	MEI Lifetime Excess Risk Level	MEI Lifetime Excess Risk Level	Quasi-MEI Lifetime Excess Risk Level
Arsenic	2.0E+00	1.3E-03	1.5E-07	2.9E-07	5.1E-06	1.0E-05	6.6E-09
Benzene	2.9E-02	8.3E-03	9.7E-07	2.8E-08	3.4E-05	9.8E-07	6.3E-10
Benzo(a)pyrene	5.8E+00	1.9E-04	2.2E-08	1.3E-07	7.5E-07	4.4E-06	2.8E-09
Total Lifetime Excess Cancer Risk Level:				4.5E-07		1.6E-05	2.9E-08
Annual expected excess cancer cases:				5.7E-03		2.0E-01	3.8E-04

MAY 19, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
CASE 1 - MINIMUM HARVEST LEVEL
BAT OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS
BAT OPTIONS - BPJ: 0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.4E-03	4.0E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		7.5E-05	8.7E-09			5.8E+00	5.0E-08	6.5E-04
Chlorobenzene	3.0E-02	4.3E-05	5.0E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.3E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	2.1E-02	2.4E-06	6.1E-06				
p-Chloro-m-cresol	2.0E-01	4.3E-04	5.0E-08	2.5E-07				
Phenol	6.0E-01	4.0E-04	4.7E-08	7.8E-08				
Toluene	3.0E-01	4.7E-03	5.5E-07	1.8E-06				
Xylenes (total)	2.0E+00	3.1E-02	3.6E-06	1.8E-06				
Arsenic	3.0E-04	8.0E-04	9.3E-08	3.1E-04		2.0E+00	1.9E-07	2.4E-03
Barium	5.0E-02							
Boron	9.0E-02							
Cadmium	1.0E-03	2.3E-04	2.7E-08	2.7E-05				
Copper	3.7E-01	2.6E-03	3.0E-07	8.0E-07				
Lead	NA	1.5E-03	1.8E-07		8.0E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	1.5E-06	7.4E-05				
Zinc	2.0E-01	1.6E-03	1.8E-07	9.1E-07				
Total Cancer Risk:							2.5E-07	3.2E-03

MAY 19, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

BAT OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.6E-03	2.7E-07			2.9E-02	7.7E-09	9.9E-05
Benzo(a)pyrene		7.8E-05	5.8E-09			5.8E+00	3.4E-08	4.3E-04
Chlorobenzene	3.0E-02	4.5E-05	3.3E-09	1.1E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	9.8E-07	9.8E-04				
Ethylbenzene	1.0E-01	1.3E-03	9.7E-08	9.7E-07				
Naphthalene	4.0E-01	2.1E-02	1.6E-06	3.9E-06				
p-Chloro-m-cresol	2.0E-01	4.4E-04	3.3E-08	1.7E-07				
Phenol	6.0E-01	4.2E-04	3.1E-08	5.2E-08				
Toluene	3.0E-01	4.9E-03	3.7E-07	1.2E-06				
Xylenes (total)	2.0E+00	3.2E-02	2.4E-06	1.2E-06				
Arsenic	3.0E-04	8.4E-04	6.2E-08	2.1E-04				
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.4E-04	1.8E-08	1.8E-05				
Copper	3.7E-01	2.7E-03	2.0E-07	5.4E-07				
Lead	NA	1.6E-03	1.2E-07		8.3E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	9.9E-07	5.0E-05				
Zinc	2.0E-01	1.6E-03	1.2E-07	6.1E-07				
Total Cancer Risk:							1.7E-07	2.1E-03

MAY 19, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.7E-03	1.2E-07			2.9E-02	3.4E-09	4.3E-05
Benzo(a)pyrene		8.1E-05	2.5E-09			5.8E+00	1.5E-08	1.9E-04
Chlorobenzene	3.0E-02	4.6E-05	1.5E-09	4.9E-08				
2,4-Dimethylphenol	1.0E-03	1.4E-02	4.3E-07	4.3E-04				
Ethylbenzene	1.0E-01	1.4E-03	4.3E-08	4.3E-07				
Naphthalene	4.0E-01	2.3E-02	7.1E-07	1.8E-06				
p-Chloro-m-cresol	2.0E-01	4.6E-04	1.5E-08	7.3E-08				
Phenol	6.0E-01	4.3E-04	1.4E-08	2.3E-08				
Toluene	3.0E-01	6.1E-03	1.9E-07	6.4E-07				
Xylenes (tolu)	2.0E+00	3.3E-02	1.1E-06	5.3E-07				
Arsenic	3.0E-04	8.7E-04	2.7E-08	9.1E-05		2.0E+00	5.5E-08	7.0E-04
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.5E-04	7.9E-09	7.9E-06				
Copper	3.7E-01	2.8E-03	8.7E-08	2.4E-07				
Lead	NA	1.6E-03	5.2E-08		3.6E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.4E-02	4.4E-07	2.2E-05				
Zinc	2.0E-01	1.7E-03	5.4E-08	2.7E-07				
Total Cancer Risk:							7.3E-08	9.4E-04

MAY 19, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.0E-03	0.0E+00			2.9E-02	0.0E+00	0.0E+00
Benzo(a)pyrene		8.6E-05	0.0E+00			5.8E+00	0.0E+00	0.0E+00
Chlorobenzene	3.0E-02	5.0E-05	0.0E+00	0.0E+00				
2,4-Dimethylphenol	1.0E-03	1.5E-02	0.0E+00	0.0E+00				
Ethylbenzene	1.0E-01	1.4E-03	0.0E+00	0.0E+00				
Naphthalene	4.0E-01	2.4E-02	0.0E+00	0.0E+00				
p-Chloro-m-cresol	2.0E-01	4.9E-04	0.0E+00	0.0E+00				
Phenol	6.0E-01	4.6E-04	0.0E+00	0.0E+00				
Toluene	3.0E-01	5.5E-03	0.0E+00	0.0E+00				
Xylenes (total)	2.0E+00	3.6E-02	0.0E+00	0.0E+00				
Arsenic	3.0E-04	9.3E-04	0.0E+00	0.0E+00		2.0E+00	0.0E+00	0.0E+00
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.7E-04	0.0E+00	0.0E+00				
Copper	3.7E-01	3.0E-03	0.0E+00	0.0E+00				
Lead	NA	1.8E-03	0.0E+00	ERR		0.0E+00		
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.5E-02	0.0E+00	0.0E+00				
Zinc	2.0E-01	1.8E-03	0.0E+00	0.0E+00				
Total Cancer Risk:							0.0E+00	0.0E+00

MAY 19, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS

BPJ:0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.4E-03	4.0E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		7.5E-05	8.7E-09			5.8E+00	5.0E-08	6.5E-04
Chlorobenzene	3.0E-02	4.3E-05	5.0E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.3E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	2.1E-02	2.4E-06	6.1E-06				
p-Chloro-m-cresol	2.0E-01	4.3E-04	5.0E-08	2.5E-07				
Phenol	6.0E-01	4.0E-04	4.7E-08	7.8E-08				
Toluene	3.0E-01	4.7E-03	5.5E-07	1.8E-06				
Xylenes (total)	2.0E+00	3.1E-02	3.6E-06	1.8E-06				
Arsenic	3.0E-04	8.0E-04	9.3E-08	3.1E-04		2.0E+00	1.9E-07	2.4E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.3E-04	2.7E-08	2.7E-05				
Copper	3.7E-01	2.6E-03	3.0E-07	8.0E-07				
Lead	NA	1.5E-03	1.8E-07	ERR		8.0E-03		
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	1.5E-06	7.4E-05				
Zinc	2.0E-01	1.6E-03	1.8E-07	9.1E-07				
Total Cancer Risk:							2.5E-07	3.2E-03

MAY 19, 1992

PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

BAT OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.6E-03	2.7E-07			2.9E-02	7.7E-09	9.9E-05
Benzo(a)pyrene		7.8E-05	5.8E-09			5.8E+00	3.4E-08	4.3E-04
Chlorobenzene	3.0E-02	4.5E-05	3.3E-09	1.1E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	9.8E-07	9.8E-04				
Ethylbenzene	1.0E-01	1.3E-03	9.7E-08	9.7E-07				
Naphthalene	4.0E-01	2.1E-02	1.6E-06	3.9E-06				
p-Chloro-m-cresol	2.0E-01	4.4E-04	3.3E-08	1.7E-07				
Phenol	6.0E-01	4.2E-04	3.1E-08	5.2E-08				
Toluene	3.0E-01	4.9E-03	3.7E-07	1.2E-06				
Xylenes (total)	2.0E+00	3.2E-02	2.4E-06	1.2E-06				
Arsenic	3.0E-04	8.4E-04	6.2E-08	2.1E-04		2.0E+00	1.2E-07	1.6E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.4E-04	1.8E-08	1.8E-05				
Copper	3.7E-01	2.7E-03	2.0E-07	5.4E-07				
Lead	NA	1.6E-03	1.2E-07		8.3E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	9.9E-07	5.0E-05				
Zinc	2.0E-01	1.6E-03	1.2E-07	6.1E-07				
Total Cancer Risk:							1.7E-07	2.1E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.7E-03	1.8E-07			2.9E-02	5.3E-09	6.8E-05
Benzo(a)pyrene		8.1E-05	4.0E-09			5.8E+00	2.3E-08	3.0E-04
Chlorobenzene	3.0E-02	4.6E-05	2.3E-09	7.7E-08				
2,4-Dimethylphenol	1.0E-03	1.4E-02	6.8E-07	6.8E-04				
Ethylbenzene	1.0E-01	1.4E-03	6.7E-08	6.7E-07				
Naphthalene	4.0E-01	2.3E-02	1.1E-06	2.8E-06				
p-Chloro-m-cresol	2.0E-01	4.6E-04	2.3E-08	1.1E-07				
Phenol	6.0E-01	4.3E-04	2.2E-08	3.6E-08				
Toluene	3.0E-01	6.1E-03	3.0E-07	1.0E-06				
Xylenes (total)	2.0E+00	3.3E-02	1.7E-06	8.3E-07				
Arsenic	3.0E-04	8.7E-04	4.3E-08	1.4E-04		2.0E+00	8.6E-08	1.1E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.5E-04	1.2E-08	1.2E-05				
Copper	3.7E-01	2.8E-03	1.4E-07	3.7E-07				
Lead	NA	1.6E-03	8.2E-08		5.7E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.4E-02	6.9E-07	3.4E-05				
Zinc	2.0E-01	1.7E-03	8.5E-08	4.2E-07				
Total Cancer Risk:							1.1E-07	1.5E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.0E-03	1.1E-07			2.9E-02	3.3E-09	4.2E-05
Benzo(a)pyrene		8.6E-05	2.4E-09			5.8E+00	1.4E-08	1.8E-04
Chlorobenzene	3.0E-02	5.0E-05	1.4E-09	4.7E-08				
2,4-Dimethylphenol	1.0E-03	1.5E-02	4.1E-07	4.1E-04				
Ethylbenzene	1.0E-01	1.4E-03	4.1E-08	4.1E-07				
Naphthalene	4.0E-01	2.4E-02	6.9E-07	1.7E-06				
p-Chloro-m-cresol	2.0E-01	4.9E-04	1.4E-08	7.0E-08				
Phenol	6.0E-01	4.6E-04	1.3E-08	2.2E-08				
Toluene	3.0E-01	5.5E-03	1.6E-07	5.2E-07				
Xylenes (total)	2.0E+00	3.6E-02	1.0E-06	5.1E-07				
Arsenic	3.0E-04	9.3E-04	2.6E-08	8.8E-05		2.0E+00	5.3E-08	6.8E-04
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.7E-04	7.6E-09	7.6E-06				
Copper	3.7E-01	3.0E-03	8.4E-08	2.3E-07				
Lead	NA	1.8E-03	5.0E-08		3.5E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.5E-02	4.2E-07	2.1E-05				
Zinc	2.0E-01	1.8E-03	5.2E-08	2.6E-07				
Total Cancer Risk:							7.0E-08	9.0E-04

MAY 19, 1992
 PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
 CASE 3 - MAXIMUM HARVEST LEVEL
 BAT OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS
 BPJ:0 - 80 MILES

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.4E-03	4.0E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		7.5E-05	8.7E-09			5.8E+00	5.0E-08	6.5E-04
Chlorobenzene	3.0E-02	4.3E-05	5.0E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.3E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	2.1E-02	2.4E-06	6.1E-06				
p-Chloro-m-cresol	2.0E-01	4.3E-04	5.0E-08	2.5E-07				
Phenol	6.0E-01	4.0E-04	4.7E-08	7.8E-08				
Toluene	3.0E-01	4.7E-03	5.5E-07	1.8E-06				
Xylenes (total)	2.0E+00	3.1E-02	3.6E-06	1.8E-06				
Arsenic	3.0E-04	8.0E-04	9.3E-08	3.1E-04		2.0E+00	1.9E-07	2.4E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.3E-04	2.7E-08	2.7E-05				
Copper	3.7E-01	2.6E-03	3.0E-07	8.0E-07				
Lead	NA	1.5E-03	1.8E-07		8.0E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	1.5E-06	7.4E-05				
Zinc	2.0E-01	1.6E-03	1.8E-07	9.1E-07				
Total Cancer Risk:							2.5E-07	3.2E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

BAT OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.6E-03	2.7E-07			2.9E-02	7.7E-09	9.9E-05
Benzo(a)pyrene		7.8E-05	5.8E-09			5.8E+00	3.4E-08	4.3E-04
Chlorobenzene	3.0E-02	4.5E-05	3.3E-09	1.1E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	9.8E-07	9.8E-04				
Ethylbenzene	1.0E-01	1.3E-03	9.7E-08	9.7E-07				
Naphthalene	4.0E-01	2.1E-02	1.6E-06	3.9E-06				
p-Chloro-m-cresol	2.0E-01	4.4E-04	3.3E-08	1.7E-07				
Phenol	6.0E-01	4.2E-04	3.1E-08	5.2E-08				
Toluene	3.0E-01	4.9E-03	3.7E-07	1.2E-06				
Xylenes (total)	2.0E+00	3.2E-02	2.4E-06	1.2E-06				
Arsenic	3.0E-04	8.4E-04	6.2E-08	2.1E-04		2.0E+00	1.2E-07	1.6E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.4E-04	1.8E-08	1.8E-05				
Copper	3.7E-01	2.7E-03	2.0E-07	5.4E-07				
Lead	NA	1.6E-03	1.2E-07		8.3E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	9.9E-07	5.0E-05				
Zinc	2.0E-01	1.6E-03	1.2E-07	6.1E-07				
Total Cancer Risk:							1.7E-07	2.1E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		3.7E-03	2.5E-07			2.9E-02	7.3E-09	9.4E-05
Benzo(a)pyrene		8.1E-05	5.5E-09			5.8E+00	3.2E-08	4.1E-04
Chlorobenzene	3.0E-02	4.6E-05	3.1E-09	1.0E-07				
2,4-Dimethylphenol	1.0E-03	1.4E-02	9.2E-07	9.2E-04				
Ethylbenzene	1.0E-01	1.4E-03	9.2E-08	9.2E-07				
Naphthalene	4.0E-01	2.3E-02	1.5E-06	3.8E-06				
p-Chloro-m-cresol	2.0E-01	4.6E-04	3.1E-08	1.6E-07				
Phenol	6.0E-01	4.3E-04	2.9E-08	4.9E-08				
Toluene	3.0E-01	6.1E-03	4.2E-07	1.4E-06				
Xylenes (total)	2.0E+00	3.3E-02	2.3E-06	1.1E-06				
Arsenic	3.0E-04	8.7E-04	5.9E-08	2.0E-04		2.0E+00	1.2E-07	1.5E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.5E-04	1.7E-08	1.7E-05				
Copper	3.7E-01	2.8E-03	1.9E-07	5.1E-07				
Lead	NA	1.6E-03	1.1E-07		7.9E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.4E-02	9.4E-07	4.7E-05				
Zinc	2.0E-01	1.7E-03	1.2E-07	5.8E-07				
Total Cancer Risk:							1.6E-07	2.0E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

BAT OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - BAT OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Excess Cancer Cases	Annually Expected Excess Cancer Cases
Benzene		4.0E-03	2.5E-07			2.9E-02	7.1E-09	9.2E-05	
Benzo(a)pyrene		8.6E-05	5.4E-09			5.8E+00	3.1E-08	4.0E-04	
Chlorobenzene	3.0E-02	5.0E-05	3.1E-09	1.0E-07					
2,4-Dimethylphenol	1.0E-03	1.5E-02	9.0E-07	9.0E-04					
Ethylbenzene	1.0E-01	1.4E-03	9.0E-08	9.0E-07					
Naphthalene	4.0E-01	2.4E-02	1.5E-06	3.8E-06					
p-Chloro-m-cresol	2.0E-01	4.9E-04	3.1E-08	1.5E-07					
Phenol	6.0E-01	4.6E-04	2.9E-08	4.8E-08					
Toluene	3.0E-01	5.5E-03	3.4E-07	1.1E-06					
Xylenes (total)	2.0E+00	3.6E-02	2.2E-06	1.1E-06					
Arsenic	3.0E-04	9.3E-04	5.8E-08	1.9E-04		2.0E+00	1.2E-07	1.5E-03	
Barium	5.0E-02		0.0E+00	0.0E+00					
Boron	9.0E-02		0.0E+00	0.0E+00					
Cadmium	1.0E-03	2.7E-04	1.7E-08	1.7E-05					
Copper	3.7E-01	3.0E-03	1.8E-07	5.0E-07					
Lead	NA	1.8E-03	1.1E-07		7.7E-03				
Manganese	2.0E-01		0.0E+00	0.0E+00					
Nickel	2.0E-02	1.5E-02	9.2E-07	4.6E-05					
Zinc	2.0E-01	1.8E-03	1.1E-07	5.7E-07					
Total Cancer Risk:								1.5E-07	2.0E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
BAT - IMPROVED GAS FLOTATION ALL.

NONCARCINOGENIC RISKS		Contaminant	MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	MEI Lead Intake (ug/day)	Quasi-MEI Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d) ⁻¹	Lifetime Excess Cancer Risk Level	Expected Cancer Cases
Compound	Oral RID (mg/kg-day)	Concentration (mg/kg)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)	(ug/day)	(mg/kg-day)	(mg/kg-d) ⁻¹		
Benzene	3.4E-03	7.5E-05	3.0E-07	1.4E-05	2.2E-06	4.8E-08	2.9E-02	4.0E-07	5.2E-03	2.3E-02
Benzo(f)pyrene										1.8E-06
Chlorobenzene	3.0E-02	4.3E-05	1.7E-07	5.8E-06	2.8E-08	9.2E-07				
2,4-Dimethylphenol	1.0E-03	1.3E-02	5.1E-05	5.1E-02	8.1E-06	8.1E-03				
Ethylbenzene	1.0E-01	1.3E-03	5.1E-06	5.1E-05	8.0E-07	8.0E-06				
Naphthalene	4.0E-01	2.1E-02	8.5E-05	2.1E-04	1.3E-05	3.4E-05				
p-Chloro-m-cresol	2.0E-01	4.3E-04	1.7E-06	8.7E-06	2.7E-07	1.4E-06				
Phenol	6.0E-01	4.0E-04	1.6E-06	2.7E-06	2.6E-07	4.3E-07				
Toluene	3.0E-01	4.7E-03	1.9E-05	6.4E-05	3.0E-06	1.0E-05				
Xylenes (total)	2.0E+00	3.1E-02	1.3E-04	6.3E-05	2.0E-05	9.9E-06				
Arsenic	3.0E-04	8.0E-04	3.3E-06	1.1E-02	5.2E-07	1.7E-03				
Barium	5.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Cadmium	1.0E-03	2.3E-04	9.4E-07	9.4E-04	1.3E-07	1.5E-04				
Copper	3.7E-01	2.6E-03	1.0E-05	2.8E-05	1.6E-06	4.4E-06				
Lead	NA	1.5E-03	6.2E-06		9.8E-07		4.3E-01	6.9E-02		
Manganese	2.0E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Nickel	2.0E-02	1.3E-02	5.2E-05	2.6E-03	8.2E-06	4.1E-04				
Zinc	2.0E-01	1.6E-03	6.4E-06	3.2E-05	1.0E-06	5.0E-06				
Total Cancer Risk:					8.7E-06	1.1E-01				

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PROJECT: OFF-SHORE OIL

**FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO**

IMPROVED GAS FLICKERATION > 3 MILES

NONCARCINOGENIC RISKS

Contaminant	Oral RfD (mg/kg-day)	MEI Intake (mg/kg-day)	Quasi-MEI Hazard Quotient	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	Quasi-MEI Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d) ⁻¹	Lifetime Excess Cancer Risk	Expected Excess Cancer Cases
Benzo(a)pyrene	3.0E-02	7.8E-05	3.1E-07	6.0E-06	2.9E-08	5.0E-02	4.2E-07	5.4E-03	2.3E-02
Chlorobenzene	1.0E-03	4.5E-05	1.8E-07	6.0E-06	2.9E-08	8.4E-06	8.4E-03		
2,4 - Dimethylphenol	1.3E-02	1.3E-02	5.3E-05	5.3E-02	5.3E-06	8.4E-07	8.4E-06		
Ethylbenzene	1.0E-01	1.3E-03	5.3E-06	5.3E-05	5.3E-06	8.4E-07	8.4E-06		
Naphthalene	4.0E-01	2.1E-02	8.5E-05	2.1E-04	1.3E-05	3.4E-05			
p-Chloro - m - cresol	2.0E-01	4.4E-04	1.8E-06	9.0E-06	2.9E-07	1.4E-06			
Phenol	6.0E-01	4.2E-04	1.7E-06	2.8E-06	2.7E-07	4.5E-07			
Toluene	3.0E-01	4.9E-03	2.0E-05	6.7E-05	3.2E-06	1.1E-05			
Xylenes (total)	2.0E+00	3.2E-02	1.3E-04	6.5E-05	2.1E-05	1.0E-05			
Arsenic	3.0E-04	8.4E-04	3.4E-06	1.1E-02	5.4E-07	1.8E-03			
Barium	5.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Boron	9.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Cadmium	1.0E-03	2.4E-04	9.8E-07	9.8E-04	1.5E-07	1.5E-04			
Copper	3.7E-01	2.7E-03	1.1E-05	2.9E-05	1.7E-06	4.6E-06			
Cad	NA	1.6E-03	6.5E-06	1.0E-06					
Manganese	2.0E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Nickel	2.0E-02	1.3E-02	5.4E-05	2.7E-03	8.5E-06	4.3E-04			
Zinc	2.0E-01	1.6E-03	6.7E-06	3.3E-05	1.1E-06	5.3E-06			
Total Cancer Risk:							9.0E-06		1.2E-01

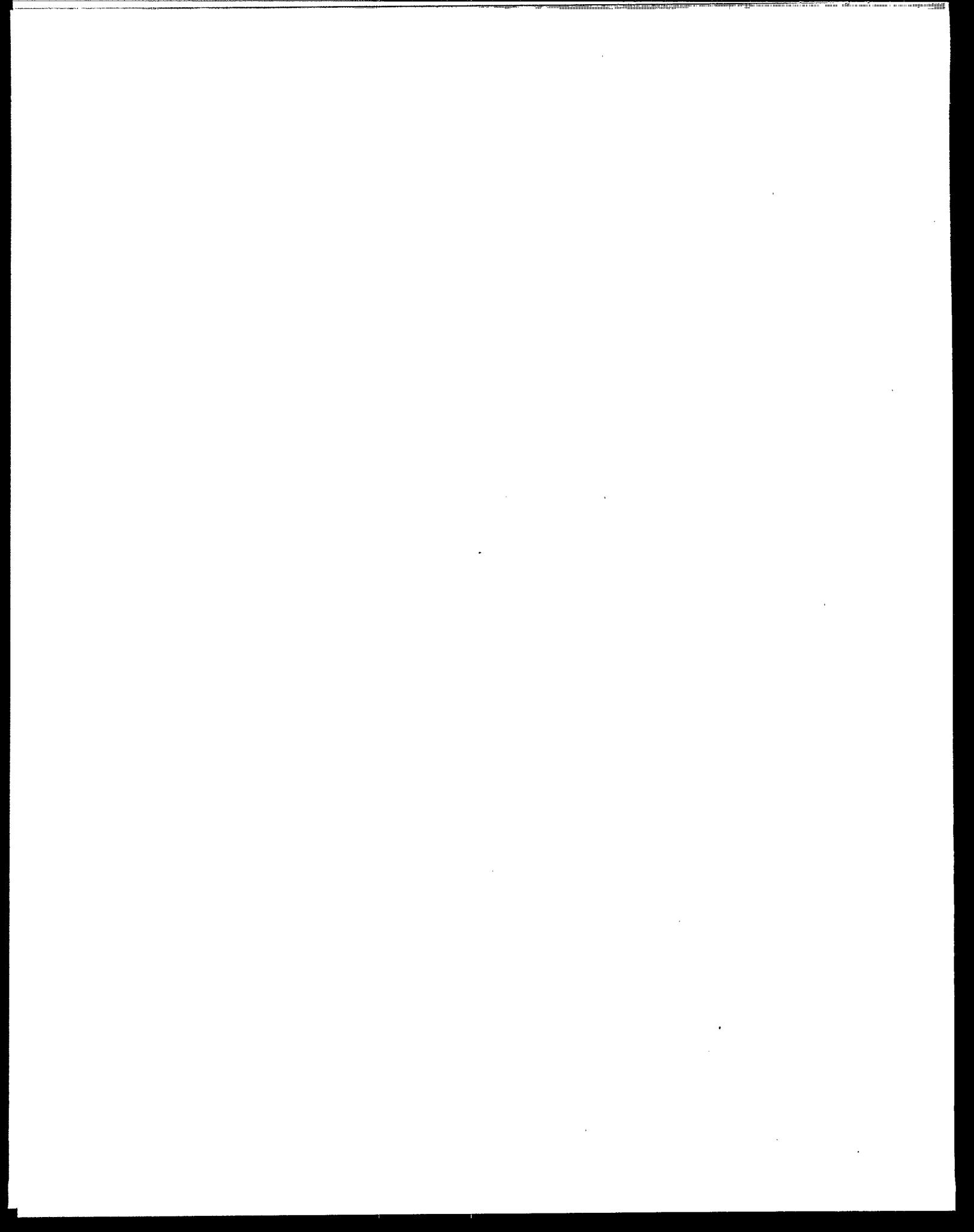
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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS		Contaminant	MEI Intake (mg/kg-day)	Quasi-MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Hazard Quotient	Quasi-MEI Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Expected Excess Cancer Cases
Compound	Oral RfD (mg/kg-day)	Concentration (mg/kg)	(mg/kg-day)	(mg/kg-day)			(ug/day)			Cancer Cases
Benzene	3.7E-03	4.6E-05	1.9E-07	6.3E-06	3.0E-08	9.9E-07				
Benzo(a)pyrene	8.1E-05	3.3E-07	2.4E-06	5.2E-08						
Chlorobenzene	3.0E-02	1.4E-02	5.5E-05	5.5E-02	8.7E-06	8.7E-03				
2,4-Dimethylphenol	1.0E-03	1.4E-03	5.5E-06	5.5E-05	8.7E-07	8.7E-05				
Ethylbenzene	1.0E-01	4.0E-01	9.2E-05	2.3E-04	1.5E-05	3.6E-05				
Naphthalene	4.0E-01	2.3E-02	4.6E-04	1.9E-06	9.4E-06	3.0E-07				
p-Chloro-m-cresol	2.0E-01	6.0E-01	4.3E-04	1.8E-06	2.9E-06	2.8E-07				
Phenol	6.0E-01	6.1E-03	2.5E-05	8.3E-05	3.9E-06	1.3E-05				
Toluene	3.0E-01	2.0E+00	3.3E-02	1.4E-04	6.8E-05	2.1E-05				
Xylenes (total)	3.0E-04	8.7E-04	3.5E-06	1.2E-02	5.6E-07	1.9E-03				
Arsenic							2.0E+00	7.0E-06	9.1E-02	
Barium	5.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Cadmium	1.0E-03		1.0E-06	1.0E-03	1.6E-07	1.6E-04				
Copper	3.7E-01		1.1E-05	3.0E-05	1.8E-06	4.8E-06				
Lead	NA	1.6E-03	6.7E-06	1.1E-06			4.7E-01	7.4E-02		
Manganese	2.0E-01		0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Nickel	2.0E-02	1.4E-02	5.6E-05	2.8E-03	8.9E-06	4.4E-04				
Zinc	2.0E-01	1.7E-03	6.9E-06	3.4E-05	1.1E-06	5.5E-06				
Total Cancer Risk:							9.4E-06	1.2E-01		

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PROJECT: OFF-SHORE OIL

**FIN FISH IMPACT – PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
IMPROVED GAS FLOTATION > 10 METERS**



FINFISH IMPACT
BASELINE CONDITIONS - NSPS
PRODUCED WATER DISCHARGES

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Hazard Quotient	MEI Intake (mg/kg-day)	Quotient	MEI Intake (mg/kg-day)	Quotient	MEI Intake (ug/day)	QuasiMEI Intake (ug/day)
2,4-Dimethylphenol	1.0E-03	2.1E-02	2.5E-06	2.5E-03	8.6E-05	8.6E-02	1.4E-05	1.4E-02		
Chlorobenzene	3.0E-02	1.4E-04	1.7E-08	5.6E-07	5.8E-07	1.9E-05	9.3E-08	3.1E-06		
Ethylbenzene	1.0E-01	8.7E-03	1.0E-06	1.0E-05	3.5E-05	3.5E-04	5.6E-06	5.6E-05		
Naphthalene	4.0E-01	7.4E-02	8.6E-06	2.2E-05	3.0E-04	7.5E-04	4.8E-05	1.2E-04		
p-Chloro-m-cresol	2.0E-01	1.4E-03	1.7E-07	8.3E-07	5.8E-06	2.9E-05	9.2E-07	4.6E-06		
Phenol	6.0E-01	1.5E-03	1.8E-07	3.0E-07	6.2E-06	1.0E-05	9.9E-07	1.6E-06		
Toluene	3.0E-01	1.5E-02	1.7E-06	5.6E-06	5.9E-05	2.0E-04	9.3E-06	3.1E-05		
Xylenes (total)	2.0E+00	1.0E-01	1.2E-05	6.0E-06	4.2E-04	2.1E-04	6.7E-05	3.3E-05		
Arsenic	3.0E-04	1.7E-03	2.0E-07	6.5E-04	6.8E-06	2.3E-02	1.1E-06	3.6E-03		
Barium	5.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
Boron	9.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
Cadmium	1.0E-03	4.8E-04	5.6E-08	5.6E-05	2.0E-06	2.0E-03	3.1E-07	3.1E-04		
Copper	3.7E-01	5.4E-03	6.2E-07	1.7E-06	2.2E-05	5.9E-05	3.4E-06	9.3E-06		
Lead	NA	3.2E-03	3.7E-07		1.3E-05		2.1E-06			
Manganese	2.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00		
Nickel	2.0E-02	2.7E-02	3.1E-06	1.6E-04	1.1E-04	5.4E-03	1.7E-05	8.6E-04		
Zinc	2.0E-01	1.7E-02	1.9E-06	9.7E-06	6.8E-05	3.4E-04	1.1E-05	5.4E-05		

CARCINOGENIC RISKS

Compound	Oral Slope Factor (mg/kg-day)-1	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Risk Level	MEI Intake (mg/kg-day)	QuasiMEI Intake (mg/kg-day)	Lifetime Excess Risk Level	QuasiMEI Lifetime Excess Risk Level
Arsenic	2.0E+00	1.7E-03	2.0E-07	3.9E-07	6.8E-06	1.4E-05	8.8E-09	1.8E-08
Benzene	2.9E-02	1.1E-02	1.3E-06	3.7E-08	4.5E-05	1.3E-06	8.4E-10	2.4E-11
Benzo(a)pyrene	5.8E+00	2.5E-04	2.9E-08	1.7E-07	1.0E-06	5.8E-06	3.8E-09	2.2E-08
Total Lifetime Excess Cancer Risk Level:				6.0E-07		2.1E-05		3.9E-08
					7.7E-03		2.7E-01	
								5.1E-04

Annual expected excess cancer cases:

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS

NSPS OPTIONS - TOTAL PLATFORMS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Excess Cancer Lifetime	Annually Expected Excess Cancer Cases
Benzene		4.6E-03	5.3E-07			2.9E-02	1.5E-08	2.0E-04	
Benzo(a)pyrene		1.0E-04	1.2E-08			5.8E+00	6.7E-08	8.6E-04	
Chlorobenzene	3.0E-02	5.8E-05	6.7E-09	2.2E-07					
2,4-Dimethylphenol	1.0E-03	1.7E-02	2.0E-06	2.0E-03					
Ethylbenzene	1.0E-01	1.7E-03	1.9E-07	1.9E-06					
Naphthalene	4.0E-01	2.8E-02	3.3E-06	8.2E-06					
p-Chloro-m-cresol	2.0E-01	5.7E-04	6.6E-08	3.3E-07					
Phenol	6.0E-01	5.4E-04	6.2E-08	1.0E-07					
Toluene	3.0E-01	6.3E-03	7.4E-07	2.5E-06					
Xylenes (total)	2.0E+00	4.1E-02	4.8E-06	2.4E-06					
Arsenic	3.0E-04	1.1E-03	1.3E-07	4.2E-04		2.0E+00	2.5E-07	3.2E-03	
Barium	5.0E-02		0.0E+00	0.0E+00					
Boron	9.0E-02		0.0E+00	0.0E+00					
Cadmium	1.0E-03	3.1E-04	3.6E-08	3.6E-05					
Copper	3.7E-01	3.4E-03	4.0E-07	1.1E-06					
Lead	NA	2.1E-03	2.4E-07		1.1E-02				
Manganese	2.0E-01		0.0E+00	0.0E+00					
Nickel	2.0E-02	1.7E-02	2.0E-06	1.0E-04					
Zinc	2.0E-01	2.1E-03	2.5E-07	1.2E-06					
Total Cancer Risk:								3.3E-07	4.3E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.8E-03	3.6E-07			2.9E-02	1.0E-08	1.3E-04
Benzo(a)pyrene		1.1E-04	7.8E-09			5.8E+00	4.5E-08	5.8E-04
Chlorobenzene	3.0E-02	6.1E-05	4.5E-09	1.5E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.3E-06	1.3E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.3E-07	1.3E-06				
Naphthalene	4.0E-01	2.9E-02	2.2E-06	5.5E-06				
p-Chloro-m-cresol	2.0E-01	6.0E-04	4.5E-08	2.2E-07				
Phenol	6.0E-01	5.6E-04	4.2E-08	7.0E-08				
Toluene	3.0E-01	6.7E-03	5.0E-07	1.7E-06				
Xylenes (total)	2.0E+00	4.4E-02	3.3E-06	1.6E-06				
Arsenic	3.0E-04	1.1E-03	8.4E-08	2.8E-04		2.0E+00	1.7E-07	2.2E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.4E-08	2.4E-05				
Copper	3.7E-01	3.6E-03	2.7E-07	7.3E-07				
Lead	NA	2.2E-03	1.6E-07		1.1E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.4E-06	6.8E-05				
Zinc	2.0E-01	2.2E-03	1.7E-07	8.3E-07				
Total Cancer Risk:							2.2E-07	2.9E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	2.9E-07			2.9E-02	8.5E-09	1.1E-04
Benzo(a)pyrene		1.1E-04	6.4E-09			5.8E+00	3.7E-08	4.8E-04
Chlorobenzene	3.0E-02	6.2E-05	3.7E-09	1.2E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.1E-06	1.1E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.1E-07	1.1E-06				
Naphthalene	4.0E-01	3.0E-02	1.8E-06	4.5E-06				
p-Chloro-m-cresol	2.0E-01	6.2E-04	3.7E-08	1.8E-07				
Phenol	6.0E-01	5.8E-04	3.4E-08	5.7E-08				
Toluene	3.0E-01	6.8E-03	4.0E-07	1.3E-06				
Xylenes (total)	2.0E+00	4.5E-02	2.6E-06	1.3E-06				
Arsenic	3.0E-04	1.2E-03	6.9E-08	2.3E-04		2.0E+00	1.4E-07	1.8E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.0E-08	2.0E-05				
Copper	3.7E-01	3.7E-03	2.2E-07	5.9E-07				
Lead	NA	2.2E-03	1.3E-07		9.2E-03			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.1E-06	5.5E-05				
Zinc	2.0E-01	2.3E-03	1.3E-07	6.7E-07				
Total Cancer Risk:							1.8E-07	2.4E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 1 - MINIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	4.1E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		1.1E-04	8.9E-09			5.8E+00	5.2E-08	6.6E-04
Chlorobenzene	3.0E-02	6.2E-05	5.1E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	3.0E-02	2.5E-06	6.2E-06				
p-Chloro-m-cresol	2.0E-01	6.2E-04	5.1E-08	2.5E-07				
Phenol	6.0E-01	5.8E-04	4.8E-08	8.0E-08				
Toluene	3.0E-01	6.8E-03	5.6E-07	1.9E-06				
Xylenes (total)	2.0E+00	4.5E-02	3.7E-06	1.8E-06				
Arsenic	3.0E-04	1.2E-03	9.6E-08	3.2E-04		2.0E+00	1.9E-07	2.5E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.8E-08	2.8E-05				
Copper	3.7E-01	3.7E-03	3.0E-07	8.2E-07				
Lead	NA	2.2E-03	1.8E-07		1.3E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.5E-06	7.6E-05				
Zinc	2.0E-01	2.3E-03	1.9E-07	9.4E-07				
Total Cancer Risk:							2.5E-07	3.3E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS

NSPS OPTIONS - ALL PLATFORMS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Case
Benzene		4.6E-03	5.3E-07			2.9E-02	1.5E-08	2.0E-0
Benzo(a)pyrene		1.0E-04	1.2E-08			5.8E+00	6.7E-08	8.6E-0
Chlorobenzene	3.0E-02	5.8E-05	6.7E-09	2.2E-07				
2,4-Dimethylphenol	1.0E-03	1.7E-02	2.0E-06	2.0E-03				
Ethylbenzene	1.0E-01	1.7E-03	1.9E-07	1.9E-06				
Naphthalene	4.0E-01	2.8E-02	3.3E-06	8.2E-06				
p-Chloro-m-cresol	2.0E-01	5.7E-04	6.6E-08	3.3E-07				
Phenol	6.0E-01	5.4E-04	6.2E-08	1.0E-07				
Toluene	3.0E-01	6.3E-03	7.4E-07	2.5E-06				
Xylenes (total)	2.0E+00	4.1E-02	4.8E-06	2.4E-06				
Arsenic	3.0E-04	1.1E-03	1.3E-07	4.2E-04		2.0E+00	2.5E-07	3.2E-0
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.1E-04	3.6E-08	3.6E-05				
Copper	3.7E-01	3.4E-03	4.0E-07	1.1E-06				
Lead	NA	2.1E-03	2.4E-07	ERR	1.1E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.7E-02	2.0E-06	1.0E-04				
Zinc	2.0E-01	2.1E-03	2.5E-07	1.2E-06				
Total Cancer Risk:							3.3E-07	4.3E-01

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.8E-03	3.6E-07			2.9E-02	1.0E-08	1.3E-04
Benzo(a)pyrene		1.1E-04	7.8E-09			5.8E+00	4.5E-08	5.8E-04
Chlorobenzene	3.0E-02	6.1E-05	4.5E-09	1.5E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.3E-06	1.3E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.3E-07	1.3E-06				
Naphthalene	4.0E-01	2.9E-02	2.2E-06	5.5E-06				
p-Chloro-m-cresol	2.0E-01	6.0E-04	4.5E-08	2.2E-07				
Phenol	6.0E-01	5.6E-04	4.2E-08	7.0E-08				
Toluene	3.0E-01	6.7E-03	5.0E-07	1.7E-06				
Xylenes (total)	2.0E+00	4.4E-02	3.3E-06	1.6E-06				
Arsenic	3.0E-04	1.1E-03	8.4E-08	2.8E-04				
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.4E-08	2.4E-05				
Copper	3.7E-01	3.6E-03	2.7E-07	7.3E-07				
Lead	NA	2.2E-03	1.6E-07		1.1E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.4E-06	6.8E-05				
Zinc	2.0E-01	2.2E-03	1.7E-07	8.3E-07				
Total Cancer Risk:							2.2E-07	2.9E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Excess Cancer Cases	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	3.2E-07			2.9E-02	9.3E-09		1.2E-04
Benzo(a)pyrene		1.1E-04	7.0E-09			5.8E+00	4.1E-08		5.2E-04
Chlorobenzene	3.0E-02	6.2E-05	4.0E-09	1.3E-07					
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.2E-06	1.2E-03					
Ethylbenzene	1.0E-01	1.8E-03	1.2E-07	1.2E-06					
Naphthalene	4.0E-01	3.0E-02	2.0E-06	4.9E-06					
p-Chloro-m-cresol	2.0E-01	6.2E-04	4.0E-08	2.0E-07					
Phenol	6.0E-01	5.8E-04	3.8E-08	6.3E-08					
Toluene	3.0E-01	6.8E-03	4.4E-07	1.5E-06					
Xylenes (total)	2.0E+00	4.5E-02	2.9E-06	1.4E-06					
Arsenic	3.0E-04	1.2E-03	7.5E-08	2.5E-04					
Barium	5.0E-02		0.0E+00	0.0E+00					
Boron	9.0E-02		0.0E+00	0.0E+00					
Cadmium	1.0E-03	3.3E-04	2.2E-08	2.2E-05					
Copper	3.7E-01	3.7E-03	2.4E-07	6.5E-07					
Lead	NA	2.2E-03	1.4E-07	ERR	1.0E-02				
Manganese	2.0E-01		0.0E+00	0.0E+00					
Nickel	2.0E-02	1.8E-02	1.2E-06	6.0E-05					
Zinc	2.0E-01	2.3E-03	1.5E-07	7.4E-07					
Total Cancer Risk:								2.0E-07	2.6E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 2 - MID-SIZED HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	4.1E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		1.1E-04	8.9E-09			5.8E+00	5.2E-08	6.6E-04
Chlorobenzene	3.0E-02	6.2E-05	5.1E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	3.0E-02	2.5E-06	6.2E-06				
p-Chloro-m-cresol	2.0E-01	6.2E-04	5.1E-08	2.5E-07				
Phenol	6.0E-01	5.8E-04	4.8E-08	8.0E-08				
Toluene	3.0E-01	6.8E-03	5.6E-07	1.9E-06				
Xylenes (total)	2.0E+00	4.5E-02	3.7E-06	1.8E-06				
Arsenic	3.0E-04	1.2E-03	9.6E-08	3.2E-04		2.0E+00	1.9E-07	2.5E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.8E-08	2.8E-05				
Copper	3.7E-01	3.7E-03	3.0E-07	8.2E-07				
Lead	NA	2.2E-03	1.8E-07		1.3E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.5E-06	7.6E-05				
Zinc	2.0E-01	2.3E-03	1.9E-07	9.4E-07				
Total Cancer Risk:							2.5E-07	3.3E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION ALL

NONCARCINOGENIC RISKS

NSPS OPTIONS - ALL PLATFORMS

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.6E-03	5.3E-07			2.9E-02	1.5E-08	2.0E-04
Benzo(a)pyrene		1.0E-01	1.2E-05			5.8E+00	6.7E-05	8.6E-01
Chlorobenzene	3.0E-02	5.8E-05	6.7E-09	2.2E-07				
2,4-Dimethylphenol	1.0E-03	1.7E-02	2.0E-06	2.0E-03				
Ethylbenzene	1.0E-01	1.7E-03	1.9E-07	1.9E-06				
Naphthalene	4.0E-01	2.8E-02	3.3E-06	8.2E-06				
p-Chloro-m-cresol	2.0E-01	5.7E-04	6.6E-08	3.3E-07				
Phenol	6.0E-01	5.4E-04	6.2E-08	1.0E-07				
Toluene	3.0E-01	6.3E-03	7.4E-07	2.5E-06				
Xylenes (total)	2.0E+00	4.1E-02	4.8E-06	2.4E-06				
Arsenic	3.0E-04	1.1E-03	1.3E-07	4.2E-04		2.0E+00	2.5E-07	3.2E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.1E-04	3.6E-08	3.6E-05				
Copper	3.7E-01	3.4E-03	4.0E-07	1.1E-06				
Lead	NA	2.1E-03	2.4E-07		1.1E-02			
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.7E-02	2.0E-06	1.0E-04				
Zinc	2.0E-01	2.1E-03	2.5E-07	1.2E-06				
Total Cancer Risk:							6.8E-05	8.7E-01

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

NSPS OPTIONS - ZERO DISCHARGE < 3 MILE OPTION

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.8E-03	3.6E-07			2.9E-02	1.0E-08	1.3E-04
Benzo(a)pyrene		1.1E-04	7.8E-09			5.8E+00	4.5E-08	5.8E-04
Chlorobenzene	3.0E-02	6.1E-05	4.5E-09	1.5E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.3E-06	1.3E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.3E-07	1.3E-06				
Naphthalene	4.0E-01	2.9E-02	2.2E-06	5.5E-06				
p-Chloro-m-cresol	2.0E-01	6.0E-04	4.5E-08	2.2E-07				
Phenol	6.0E-01	5.6E-04	4.2E-08	7.0E-08				
Toluene	3.0E-01	6.7E-03	5.0E-07	1.7E-06				
Xylenes (total)	2.0E+00	4.4E-02	3.3E-06	1.6E-06				
Arsenic	3.0E-04	1.1E-03	8.4E-08	2.8E-04		2.0E+00	1.7E-07	2.2E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.4E-08	2.4E-05				
Copper	3.7E-01	3.6E-03	2.7E-07	7.3E-07				
Lead	NA	2.2E-03	1.6E-07	ERR		1.1E-02		
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.4E-06	6.8E-05				
Zinc	2.0E-01	2.2E-03	1.7E-07	8.3E-07				
Total Cancer Risk:							2.2E-07	2.9E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 4 MILES

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 4 MILE OPTION)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Risk Level	Excess Cancer Cases	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	3.5E-07			2.9E-02	1.0E-08		1.3E-04
Benzo(a)pyrene		1.1E-04	7.6E-09			5.8E+00	4.4E-08		5.7E-04
Chlorobenzene	3.0E-02	6.2E-05	4.4E-09	1.5E-07					
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.3E-06	1.3E-03					
Ethylbenzene	1.0E-01	1.8E-03	1.3E-07	1.3E-06					
Naphthalene	4.0E-01	3.0E-02	2.1E-06	5.3E-06					
p-Chloro-m-cresol	2.0E-01	6.2E-04	4.3E-08	2.2E-07					
Phenol	6.0E-01	5.8E-04	4.1E-08	6.8E-08					
Toluene	3.0E-01	6.8E-03	4.8E-07	1.6E-06					
Xylenes (total)	2.0E+00	4.5E-02	3.1E-06	1.6E-06					
Arsenic	3.0E-04	1.2E-03	8.2E-08	2.7E-04		2.0E+00	1.6E-07		2.1E-03
Barium	5.0E-02		0.0E+00	0.0E+00					
Boron	9.0E-02		0.0E+00	0.0E+00					
Cadmium	1.0E-03	3.3E-04	2.4E-08	2.4E-05					
Copper	3.7E-01	3.7E-03	2.6E-07	7.0E-07					
Lead	NA	2.2E-03	1.6E-07		1.1E-02				
Manganese	2.0E-01		0.0E+00	0.0E+00					
Nickel	2.0E-02	1.8E-02	1.3E-06	6.5E-05					
Zinc	2.0E-01	2.3E-03	1.6E-07	8.0E-07					
Total Cancer Risk:							2.2E-07		2.8E-03

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PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS

CASE 3 - MAXIMUM HARVEST LEVEL

NSPS OPTIONS - IMPROVED GAS FLOTATION > 10 METERS

NONCARCINOGENIC RISKS

FINFISH IMPACT - NSPS OPTIONS (ZERO DISCHARGE < 10 M DEPTH)

Compound	Oral RfD (mg/kg-day)	Contaminant Concentration (mg/kg)	Average Intake (mg/kg-day)	Average Hazard Quotient	Average Lead Intake (ug/day)	Oral Slope Factor (mg/kg-d)-1	Lifetime Excess Cancer Risk Level	Annually Expected Excess Cancer Cases
Benzene		4.9E-03	4.1E-07			2.9E-02	1.2E-08	1.5E-04
Benzo(a)pyrene		1.1E-04	8.9E-09			5.8E+00	5.2E-08	6.6E-04
Chlorobenzene	3.0E-02	6.2E-05	5.1E-09	1.7E-07				
2,4-Dimethylphenol	1.0E-03	1.8E-02	1.5E-06	1.5E-03				
Ethylbenzene	1.0E-01	1.8E-03	1.5E-07	1.5E-06				
Naphthalene	4.0E-01	3.0E-02	2.5E-06	6.2E-06				
p-Chloro-m-cresol	2.0E-01	6.2E-04	5.1E-08	2.5E-07				
Phenol	6.0E-01	5.8E-04	4.8E-08	8.0E-08				
Toluene	3.0E-01	6.8E-03	5.6E-07	1.9E-06				
Xylenes (total)	2.0E+00	4.5E-02	3.7E-06	1.8E-06				
Arsenic	3.0E-04	1.2E-03	9.6E-08	3.2E-04		2.0E+00	1.9E-07	2.5E-03
Barium	5.0E-02		0.0E+00	0.0E+00				
Boron	9.0E-02		0.0E+00	0.0E+00				
Cadmium	1.0E-03	3.3E-04	2.8E-08	2.8E-05				
Copper	3.7E-01	3.7E-03	3.0E-07	8.2E-07				
Lead	NA	2.2E-03	1.8E-07	ERR		1.3E-02		
Manganese	2.0E-01		0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	1.5E-06	7.6E-05				
Zinc	2.0E-01	2.3E-03	1.9E-07	9.4E-07				
Total Cancer Risk:							2.5E-07	3.3E-03

MAY 19, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
IMPROVED GAS FLOATATION ALL - NSPS OPTIONS

NONCARCINOGENIC RISKS		Contaminant	MEI Intake (mg/kg-day)	Quasi-MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	Oral Slope Factor (mg/kg-d) ⁻¹	Lifetime Excess Cancer Risk Level	Expected Excess Cancer Cases
Compound	Oral RID (mg/kg-day)	Concentration (mg/kg)	MEI Intake (mg/kg-day)	Lead Intake (ug/day)	Lead Intake (ug/day)	Quotient	Lead Intake (ug/day)	(mg/kg-d) ⁻¹	2.9E-02	5.4E-07	6.9E-03
Benzene	1.0E-04	4.6E-03	4.1E-07	7.8E-06	7.8E-06	1.2E-06	7.8E-06	1.1E-05	1.1E-05	1.1E-02	6.9E-03
Benzo(a)pyrene	3.0E-02	5.8E-05	2.3E-07	6.8E-05	6.8E-05	1.1E-05	6.8E-05	1.1E-05	1.1E-05	1.1E-02	6.9E-03
Chlorobenzene	1.0E-03	1.7E-02	6.8E-05	6.8E-05	6.8E-05	1.1E-05	6.8E-05	1.1E-05	1.1E-05	1.1E-02	6.9E-03
2,4-Dimethylphenol	1.0E-01	1.7E-03	6.8E-06	6.8E-06	6.8E-06	1.1E-06	6.8E-06	1.1E-06	1.1E-06	1.1E-02	6.9E-03
Ethylbenzene	4.0E-01	2.8E-02	1.1E-04	2.9E-04	2.9E-04	1.8E-04	2.9E-04	1.8E-04	1.8E-04	1.8E-02	6.9E-03
Naphthalene	4.0E-01	2.8E-01	5.7E-04	2.3E-06	1.2E-05	3.7E-07	1.2E-05	3.7E-07	1.2E-05	1.2E-02	6.9E-03
p-Chloro-m-cresol	2.0E-01	5.7E-04	2.2E-06	3.6E-06	3.6E-06	5.1E-07	3.6E-06	5.1E-07	5.1E-06	5.1E-02	6.9E-03
Phenol	6.0E-01	5.4E-04	2.2E-06	2.6E-05	8.6E-05	4.1E-06	8.6E-05	4.1E-06	4.1E-05	4.1E-02	6.9E-03
Toluene	3.0E-01	6.3E-03	2.2E-06	1.7E-04	8.4E-05	2.7E-05	8.4E-05	2.7E-05	1.3E-05	1.3E-02	6.9E-03
Xylenes (total)	2.0E+00	4.1E-02	1.7E-04	4.4E-06	1.5E-02	6.9E-07	1.5E-02	6.9E-07	2.3E-03	2.3E-02	6.9E-03
Arsenic	3.0E-04	1.1E-03	4.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Barium	5.0E-02	9.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Boron	1.0E-03	3.1E-04	1.3E-06	1.3E-03	2.0E-07	2.0E-04	1.3E-03	2.0E-07	2.0E-04	2.0E-02	6.9E-03
Cadmium	3.7E-01	3.4E-03	1.4E-05	3.8E-05	2.2E-06	6.0E-06	3.8E-05	2.2E-06	6.0E-06	6.0E-02	6.9E-03
Copper	NA	2.1E-03	8.3E-06	ERR	1.3E-06	ERR	1.3E-06	ERR	1.3E-06	9.2E-01	9.2E-02
Lead	2.0E-01	1.7E-02	7.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Manganese	2.0E-02	2.1E-03	3.5E-03	1.1E-05	1.1E-05	5.5E-04	1.1E-05	5.5E-04	5.5E-04	5.5E-02	6.9E-03
Nickel	2.0E-01	2.1E-03	4.3E-05	1.4E-06	1.4E-06	6.8E-06	1.4E-06	6.8E-06	6.8E-06	6.8E-02	6.9E-03
Zinc											
Total Cancer Risk:										1.2E-05	1.5E-05

MAY 19, 1992
PROJECT: OFF-SHORE OIL

FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
IMPROVED GAS FLOTATION > 3 MILES

NONCARCINOGENIC RISKS

Compound	Oral RID (mg/kg-day)	Contaminant Concentration (ng/kg)	MEI Intake (mg/kg-day)	Quasi-MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	MEI Hazard Quotient	Quasi-MEI Intake (mg/kg-day)	Oral Slope Factor (mg/kg-d) ⁻¹	Lifetime Risk Level	Expected Excess Cancer Cases
Benzene	3.0E-02	4.8E-03	2.0E-05	3.1E-06	6.5E-06	3.9E-06	1.3E-06	5.8E+00	2.9E-02	5.7E-07	7.3E-03
Benzo(a)pyrene	1.0E-03	1.1E-04	4.3E-07	6.2E-07	1.1E-05	1.1E-05	1.1E-05	2.5E-06	2.5E-06	3.2E-02	
Chlorobenzene	2.4E-02	6.1E-05	2.5E-07	7.2E-07	1.1E-02	1.1E-02	1.1E-02	1.1E-06			
2,4-Dimethylphenol	1.0E-01	1.8E-02	7.2E-05	7.2E-05	1.1E-03	1.1E-03	1.1E-03	1.1E-05			
Ethylbenzene	4.0E-01	1.8E-03	7.1E-06	7.1E-06	1.1E-05	1.1E-05	1.1E-05	1.1E-06			
Naphthalene	2.0E-01	2.9E-02	1.2E-04	3.0E-04	1.9E-05	1.9E-05	1.9E-05	4.7E-05			
p-Chloro-m-cresol	6.0E-01	6.0E-04	2.4E-06	1.2E-05	3.9E-07	3.9E-07	3.9E-07	1.9E-06			
Phenol	6.0E-01	5.6E-04	2.3E-06	3.8E-06	3.6E-07	3.6E-07	3.6E-07	6.1E-07			
Toluene	3.0E-01	6.7E-03	2.7E-05	9.0E-05	4.3E-06	4.3E-06	4.3E-06	1.4E-05			
Xylenes (total)	2.0E+00	4.4E-02	1.8E-04	8.6E-05	2.8E-05	1.4E-05	1.4E-05	2.0E+00	9.2E-06	1.2E-01	
Arsenic	3.0E-04	1.1E-03	4.6E-06	1.5E-02	7.3E-07	2.4E-03	2.4E-03				
Barium	5.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Boron	9.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00			
Cadmium	1.0E-03	3.3E-04	1.3E-06	1.3E-03	2.1E-07	2.1E-04	2.1E-04				
Copper	3.7E-01	3.6E-03	1.5E-05	4.0E-05	2.3E-06	6.3E-06	6.3E-06				
Lead	NA	2.2E-03	8.7E-06	1.4E-06				6.1E-01	9.7E-02		
Manganese	2.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00				
Nickel	2.0E-02	1.8E-02	7.3E-05	1.2E-03	5.8E-04						
Zinc	2.0E-01	2.2E-03	9.0E-06	4.5E-05	1.4E-06	7.1E-06	7.1E-06				
Total Cancer Risk:								1.2E-05	1.6E-01		

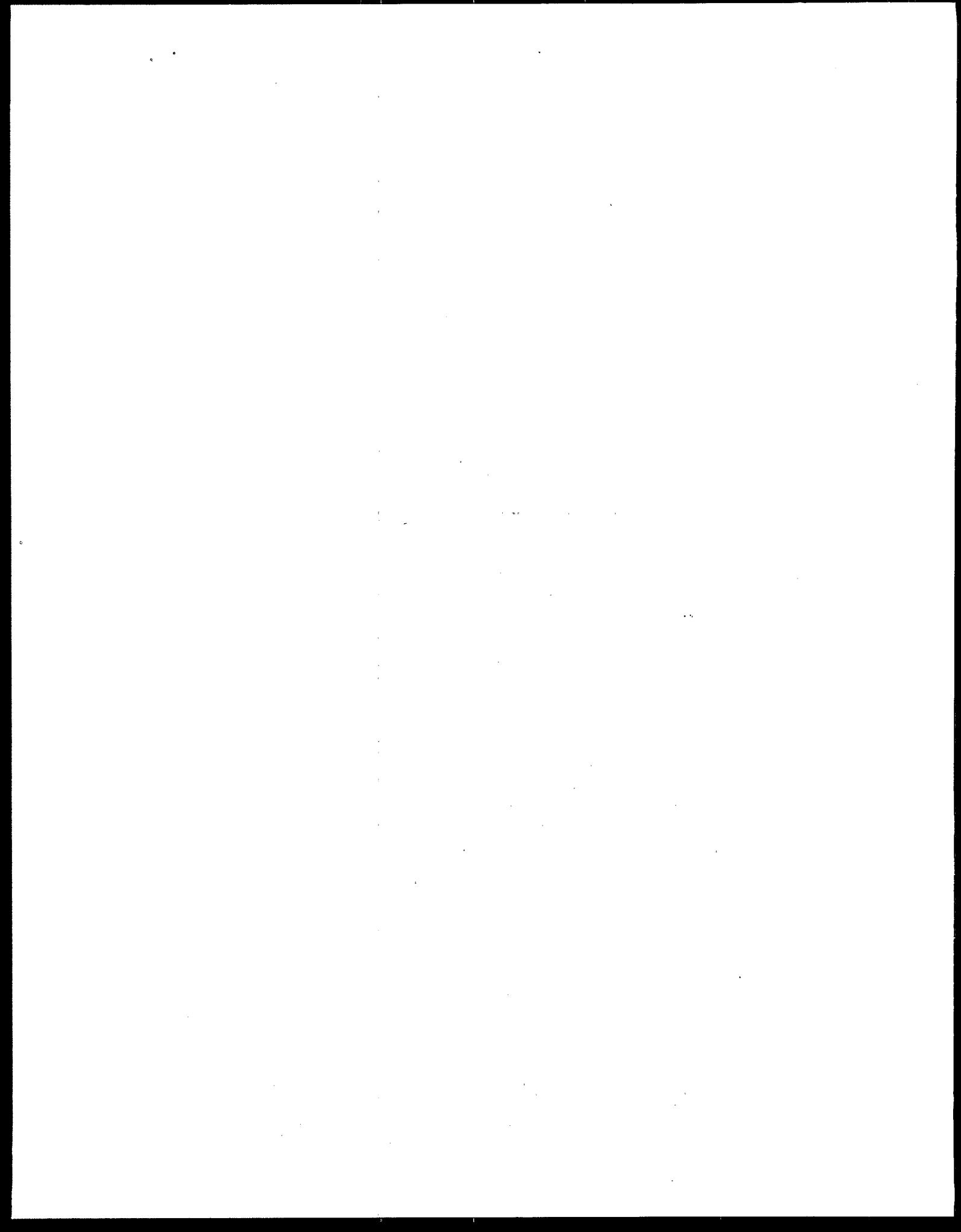
MAY 19, 1992
PROJECT: OR

**FIN FISH IMPACT – PRODUCED WATERS
MEI/QUASI-MEI SCENARIO
NSPS OPTIONS – IMPROVED GAS FLotation > 4 MILES**

MAY 19, 1992
SUBJECT: OFF-SHORE OIL

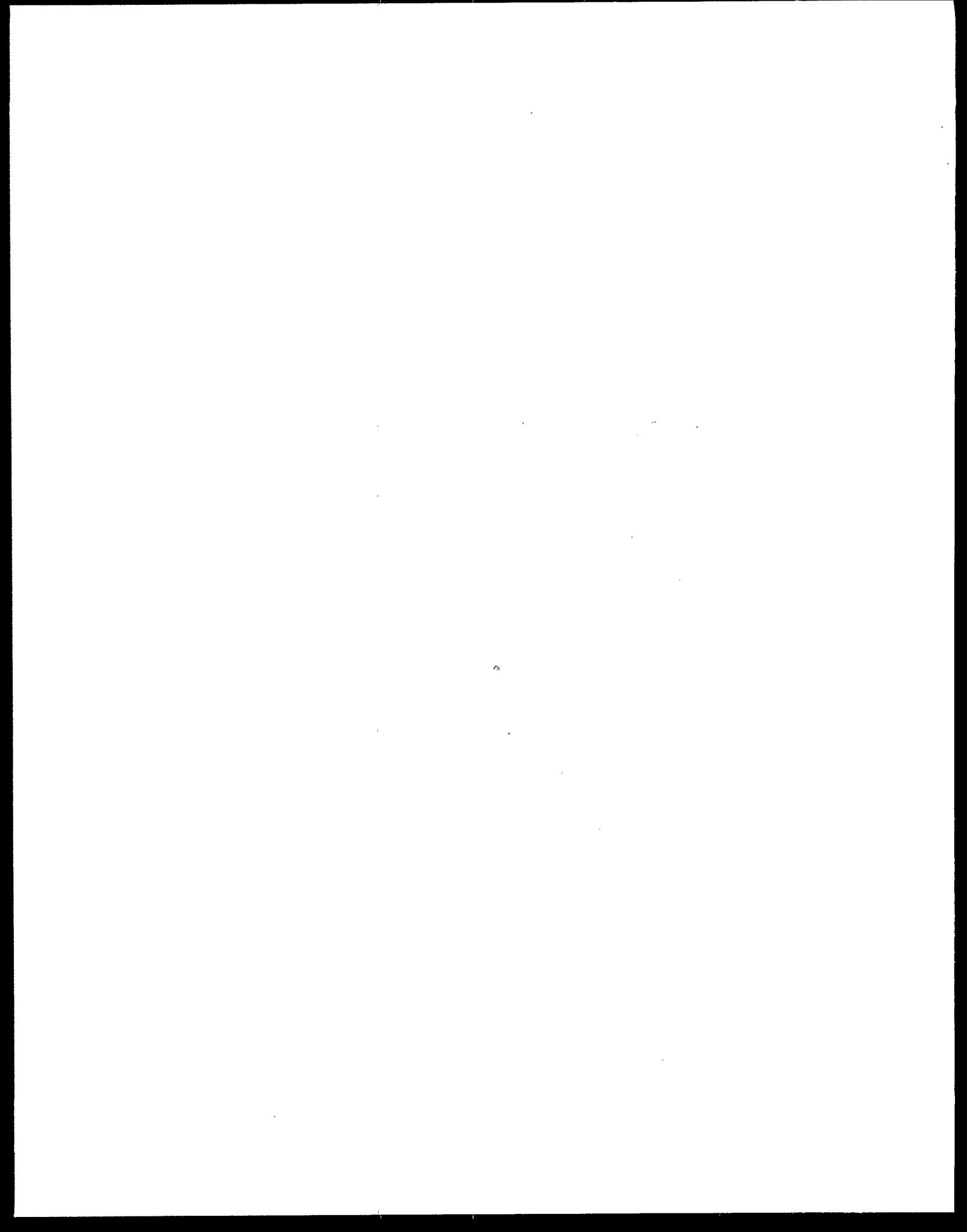
**FIN FISH IMPACT - PRODUCED WATERS
MEI/QUASI-MEI SCENARIO**

NSPS OPTIONS - IMPROVED GAS FLATTENING > 10 METERS



APPENDIX E

A PROBABILISTIC ASSESSMENT OF HEALTH BENEFITS FROM REDUCED LEAD LEVELS



E.1 INTRODUCTION

The benefits analysis estimates health benefits to adult males based on dose-response functions for four health endpoints: death, hypertension, coronary heart disease (CHD), and stroke. For each of these endpoints, changes in mean blood lead levels (PbB) were associated with an incidence of occurrence.

One approach to estimating changes in blood lead levels is to assume the baseline levels are equal across all individuals. This approach, however, can both understate and overstate health benefits because all individuals within a population do not exhibit mean PbB concentrations. Rather, population-wide responses can be represented better by using a statistical distribution of PbB as the baseline, and then shifting this distribution according to the estimated pattern and levels of exposure.

E.2 METHODS

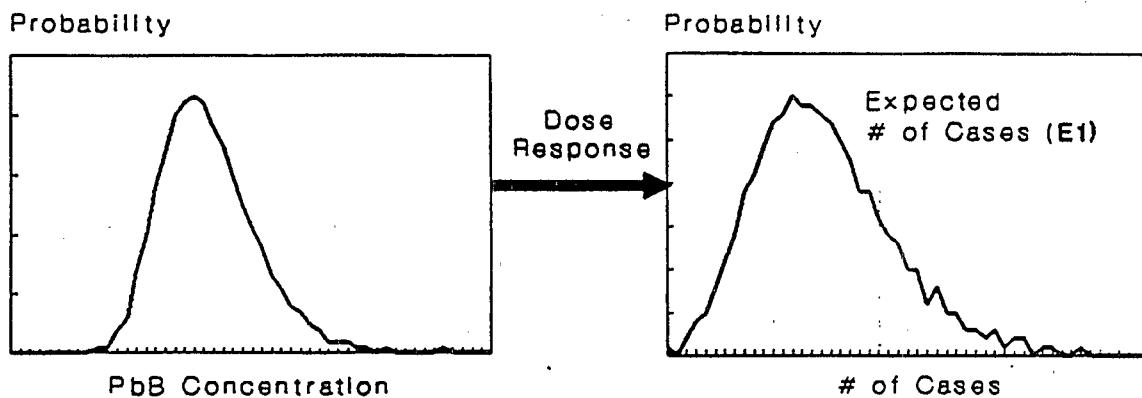
Benefits to adult males were estimated based on the expected number of cases for each regulatory scenario for each of the four health endpoints, assuming the population sizes used in the current benefits analysis.

For each health endpoint, probabilistic responses were estimated using the following approach, and as depicted in Figure E-1:

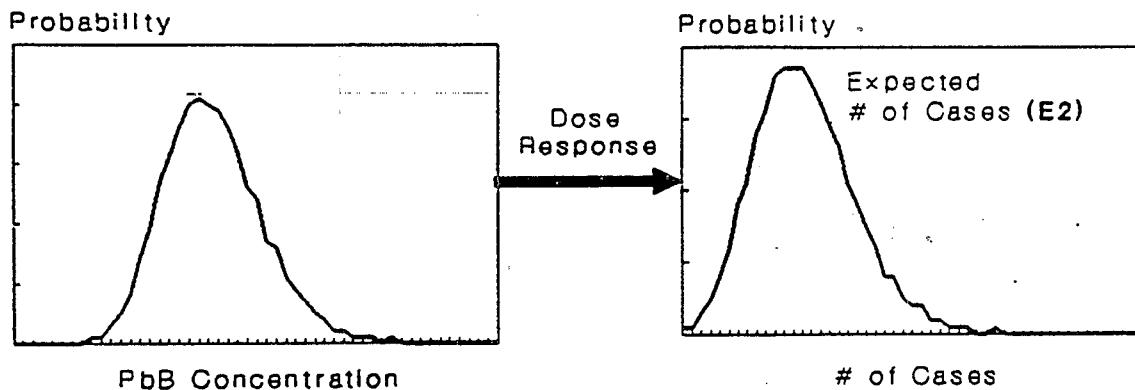
- (1) Generate samples from lognormal distributions of blood lead before and after regulatory control using Latin-Hypercube analysis.
- (2) Generate frequency distribution of health response before and after regulatory control based on dose-response functions.
- (3) Calculate expected number of responses (i.e., cases of lead-related effects) before and after control.
- (4) Calculate incremental number of cases (i.e., benefits) as difference in expected number of cases before and after regulation.

Figure E-1
Probabilistic Method for Estimating
Lead-Related Benefits
(see text for explanation)

- Step 1: Calculate expected # of cases before control (E1)



- Step 2: Calculate expected # of cases after control (E2)



- Step 3: Calculate benefits of control = E1 - E2

The following dose-response relationships were used for the four health endpoints (EPA, 1989d):

Hypertension:

$$\Delta p = [1 + e^{-0.793(\ln PbB_1) - 2.744}]^{-1} - [1 + e^{-0.793(\ln PbB_2) - 2.744}]^{-1} \quad (1)$$

where Δp is the change in probability of hypertension in moving from blood levels 1 and 2.

Dose-response relationships for coronary heart disease (CHD), strokes, and death are all based on changes in blood pressure (*BP*) over a ten-year period:

$$\Delta BP = 4.609 (\ln PbB_1 - \ln PbB_2) \quad (2)$$

The annual number of cases of each health effect is then calculated by multiplying the incremental probability (Δp) by the exposed population and dividing by ten. Δp is defined as:

Coronary Heart Disease:

$$\Delta p = [1 + e^{-0.030365(DBP_1) + 4.996}]^{-1} - [1 + e^{-0.030365(DBP_2) + 4.996}]^{-1} \quad (3)$$

where DBP_1 and DBP_2 are the mean diastolic blood pressure before and after regulatory control.

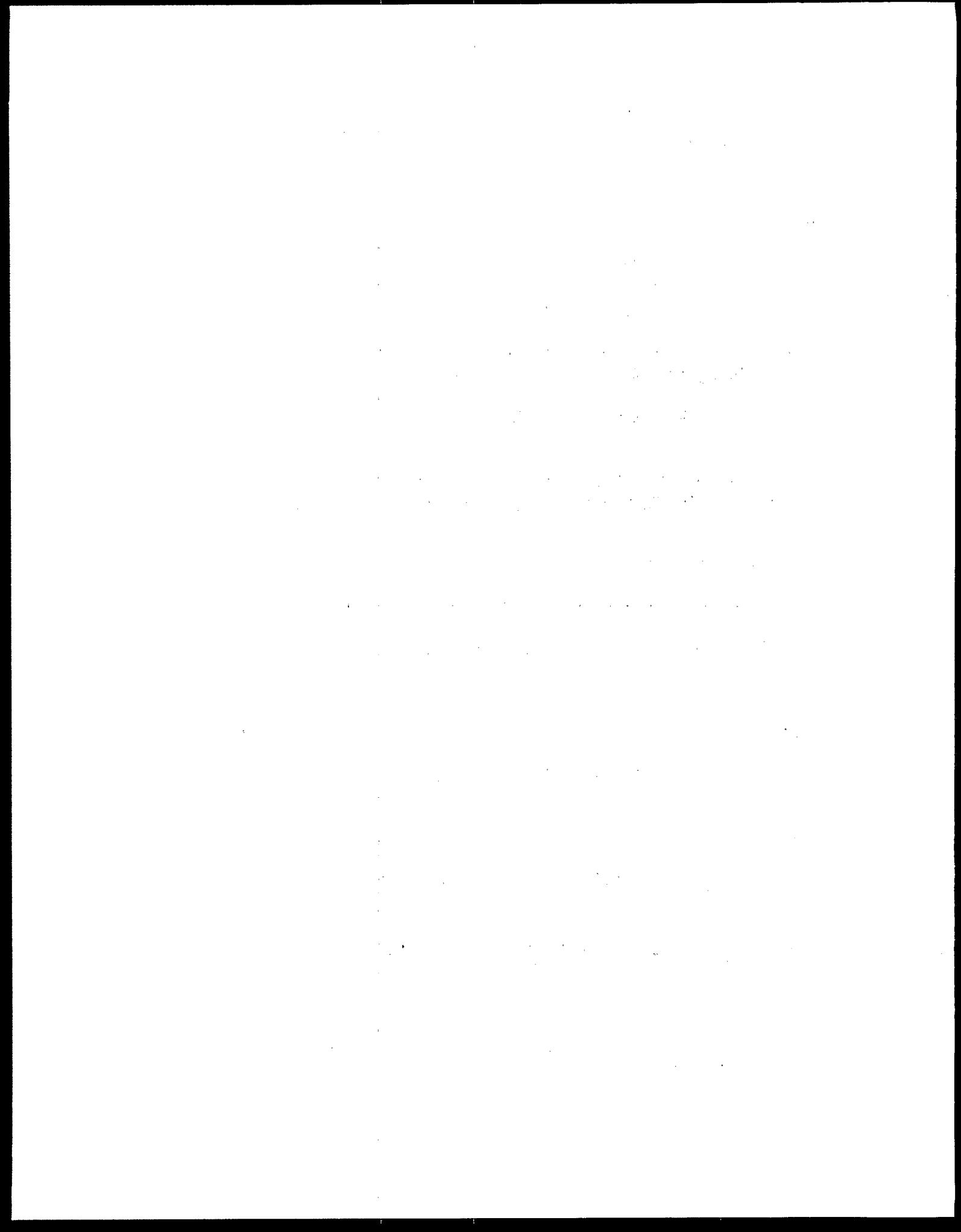
Death:

$$\Delta p = [1 + e^{-0.03516(DBP_1) + 5.3158}]^{-1} - [1 + e^{-0.03516(DBP_2) + 5.3158}]^{-1} \quad (4)$$

Stroke:

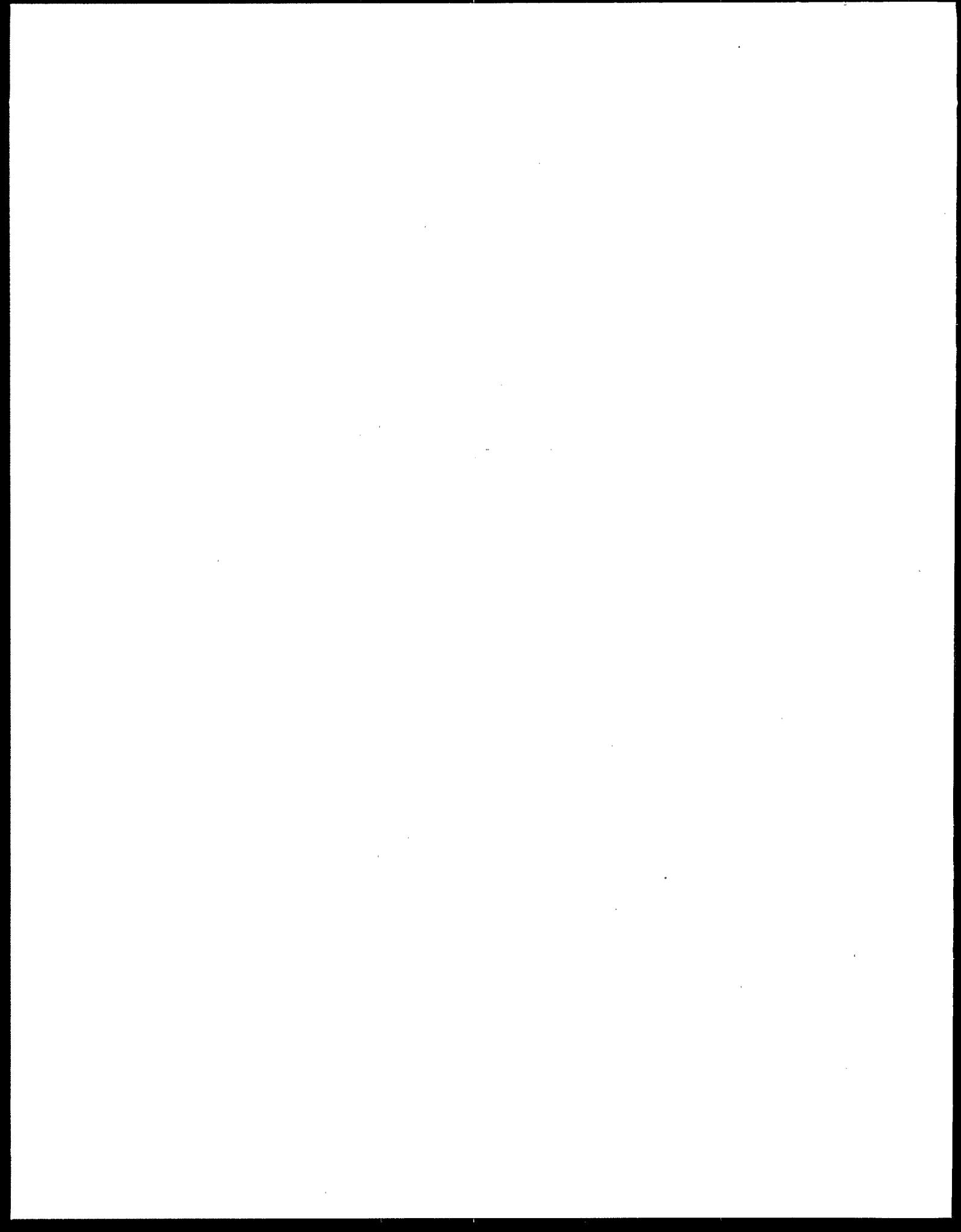
$$\Delta p = [1 + e^{-0.04066(DBP_1) + 8.58889}]^{-1} - [1 + e^{-0.04066(DBP_2) + 8.58889}]^{-1} \quad (5)$$

For each of three endpoints, above, the baseline diastolic blood pressure before regulatory control (DBP_1) was assumed to be 84.75 mm Hg (EPA, 1989d).



APPENDIX F

**SHRIMP CONSUMPTION RATES
(EPA MEMORANDUM FROM H. JACOBS TO A. TARNAY)**





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
WATER

MEMORANDUM

AUG 21 1992

SUBJECT: Shellfish and Shrimp Consumption Rates

FROM: Helen L. Jacobs, Statistician 14-1
Statistical Analysis Section
Economics and Statistical Analysis Branch
Engineering and Analysis Division
Office of Science and Technology

THRU: Henry D. Kahn *HDK*
Chief, Statistical Analysis Section

TO: Alexandra Tarnay, Environmental Engineer
Exposure Assessment Branch
Standards and Applied Science Division

At your request the Statistical Analysis Section has estimated shellfish and shrimp consumption rates from the USDA National Food Consumption Survey, 1977-78. Background on the USDA Survey is provided in Attachment A. The estimated rates are provided in the following tables:

Shellfish Consumption USDA 77-78 Data		
	All Respondents (g/day)	Shellfish Consumers (g/day)
Mean	2.30	7.18
50th Percentile	0.00	0.00
90th Percentile	0.00	23.33
95th Percentile	6.67	48.33
99th Percentile	68.08	111.38



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Shrimp Consumption USDA 77-78 Data		
	All Respondents (g/day)	Shrimp Consumers (g/day)
Mean	0.95	4.30
50th Percentile	0.00	0.00
90th Percentile	0.00	10.67
95th Percentile	0.00	26.67
99th Percentile	32.00	81.67

The USDA Fish Species Code List (Attachment B) was used to identify shellfish foods and shrimp foods for this analysis. Shellfish are identified by an "S" in the type variable and shrimp are identified by the word "shrimp" anywhere in the food variable. For foods containing both fish and other foods (i.e., food codes with fish but with the first 2 digits not equal to 26) the amount of fish consumed was calculated as 1/2 the total weight.

The tables of shellfish and shrimp consumption rates contain survey-weighted means and percentiles of three-day consumption. The first column gives estimates for the total population. The second column contains estimates for the population who consume shellfish or shrimp, respectively. These estimates were prepared by taking means and percentiles over the upper x% of the total population, where x% of the total population consume the food type in the long term. The Marine Fisheries Service/National Purchase Diaries Research Inc. (NPD) survey of 1973-74 which is based on 30 days of consumption is a better estimate of the percent of the population who consumes shellfish or shrimp than the USDA survey which is based on only 3 days of consumption. On the basis of the data from the NPD survey 32% of the population consumed shellfish sometime during the 30-day monitoring period of the study and 22% consumed shrimp during the 30-day period. Accordingly, the values in the second column are based on the upper 32% and 22% of the corresponding three-day consumption values in the USDA data set. This subset contains all of the respondents who consumed shellfish or shrimp during the three-day survey plus an appropriate number who did not consume fish but who would be assumed to consume fish over a longer period. See Attachment C for more details on the statistical procedures.

If you have any questions or need additional information, please let me know.

Attachments

cc: N. Patel
 T. O'Farrell
 S. Houseknecht
 R. Healy
 M. Podar

ATTACHMENT A

USDA 1977-78 NATIONAL FOOD CONSUMPTION SURVEY

Description

The USDA conducts the National Food Consumption Survey (NFCS) approximately every 10 years. The most recent NFCS survey for which data are currently available is the NFCS 1977-1978 survey suite. This suite is comprised of the Basic survey, which was a multi-stage, stratified probability sample of all households in the continental United States, which is itself comprised of 4 quarterly surveys, plus several supplemental surveys covering Alaska, Hawaii, Puerto Rico, households containing one or more elderly persons (Elderly), and households eligible for the Food Stamp Program (Low-Income). Survey data were collected both for households and individuals, the individual consumption surveys were found to be the most appropriate for this analysis, as they reflect food consumption both at home and away from home, and reflect direct consumption by the individual.

Sampling

The Basic survey was conducted from April 1977 - March 1978, and consists of information on 30,770 individuals over the four quarterly surveys. The Alaska and Hawaii surveys were conducted in January, February, and March 1978, and consist of information on 3,086 and 2,393 individuals, respectively. According to USDA, the response rates on these surveys were approximately 70%. The individual surveys consist of 1-day recall and 2-day record keeping reports of all food consumed, for a total of 3 days of food monitoring. Foods are classified according to an extensive food code list and amounts consumed are calculated from the number of servings and tabulated serving sizes.

Data processing

From the USDA food code list, food codes representing all foods either whole or partially fish were extracted. Fish food codes were assigned as freshwater (F), estuarine (E), marine (M), or unknown/unclassifiable (U), as shown in the attached list. Some fish codes were assigned more than one type (EF,MF) because they are found in several environments. Food codes containing shellfish are marked with an *.

In order to assign the food codes of type U appropriately, the average amounts of food consumed per day for each of the F, E, and M types were computed. No foods of type U contain shellfish, so only non-shellfish foods were included in these calculations. The non-U non-shellfish consumptions were found to be in the ratio of 14% F, 21% E, and 65% M. This ratio was applied to the food codes of type U to divide the amount consumed in each meal into the estimated contribution to freshwater, estuarine, and marine consumption. In all calculations, for foods containing both fish and other foods (i.e. food codes with fish but with a first 2 digits not equal to 26) the amount of fish consumed was calculated as 1/2 the total food weight. For food codes with multiple types, the amount of fish consumed was divided equally between the two types. 3-day average consumption rates of fresh-water, estuarine, marine, and total fish consumption

with and without shellfish were computed for each person as the total fish consumption of the corresponding type divided by 3 days.

Individual survey weights as reported on the survey tapes were used in our analysis. These were calculated by USDA to improve the correspondence of the survey with the reference population on demographic factors, and their use is appropriate in our application. The total weights of for the spring survey were found to be approximately 1/10 that of the other 3 seasons. This was checked with USDA and confirmed to be due to an error in formatting the spring tape, so the sample weights for spring were multiplied by 10 to make them comparable with the other 3 seasonal surveys. The total survey weights for the Alaska and Hawaii surveys were computed and compared with the total weights in the Basic survey. Adjustment factors were applied to the Alaska and Hawaii weights so that the total adjusted sample weight for each state was proportionate to the ratio of the state population to the total population of the continental United States represented by the Basic sample.

Weighted univariate statistics were calculated on the total and fresh-water/estuarine fish consumptions as described in the next section.

Shortcomings

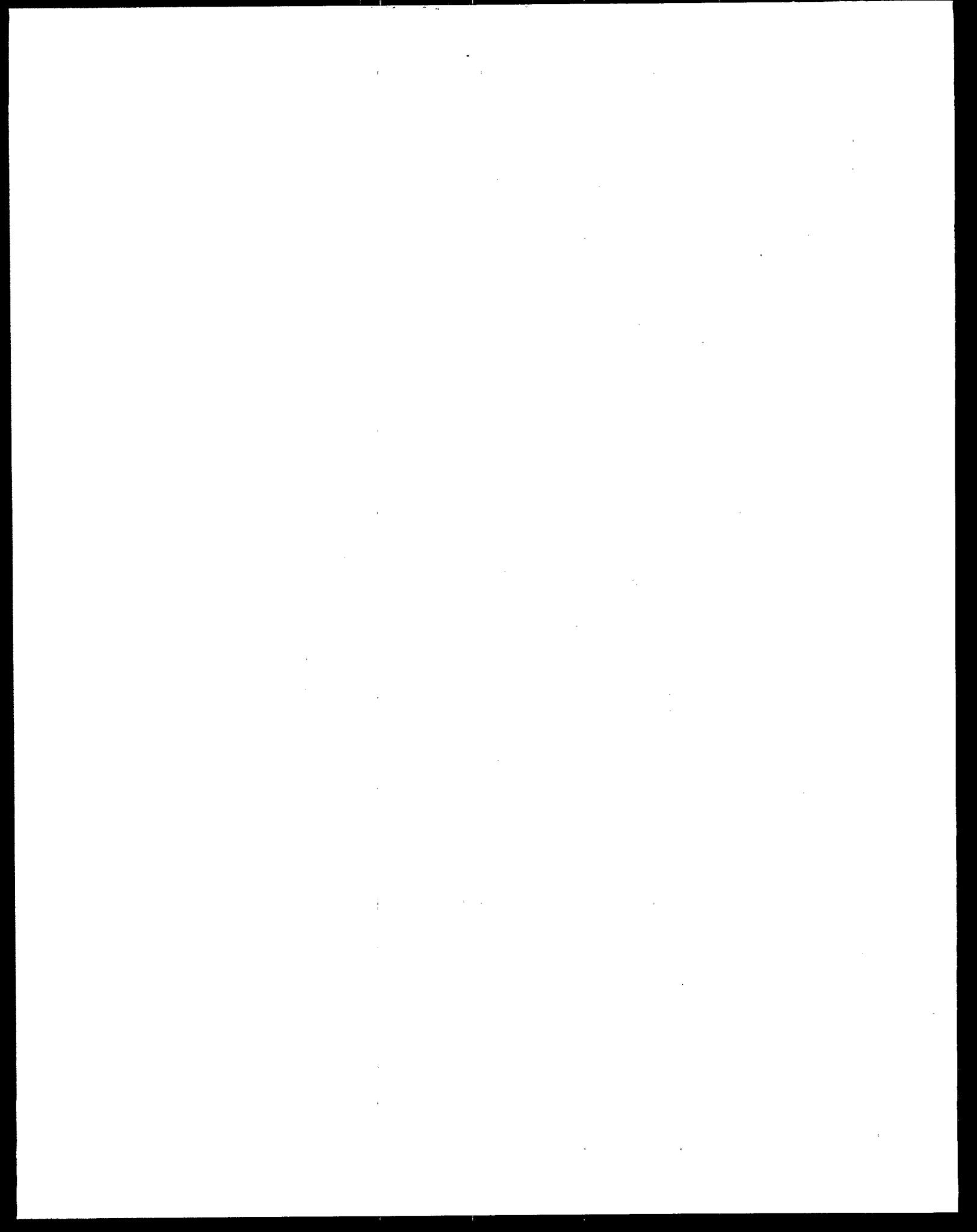
These data were collected in 1977-1978, and fish consumption patterns may well have changed since that time.

The very short monitoring period is of concern. Three-day averages are likely to contain a substantial effect of day-to-day variability in fish consumption. Though the mean of 3-day averages over the population will be the same as for long-term averages, the upper percentiles of the distribution of 3-day averages will be higher, possibly substantially higher, than those of long-term consumption rates.

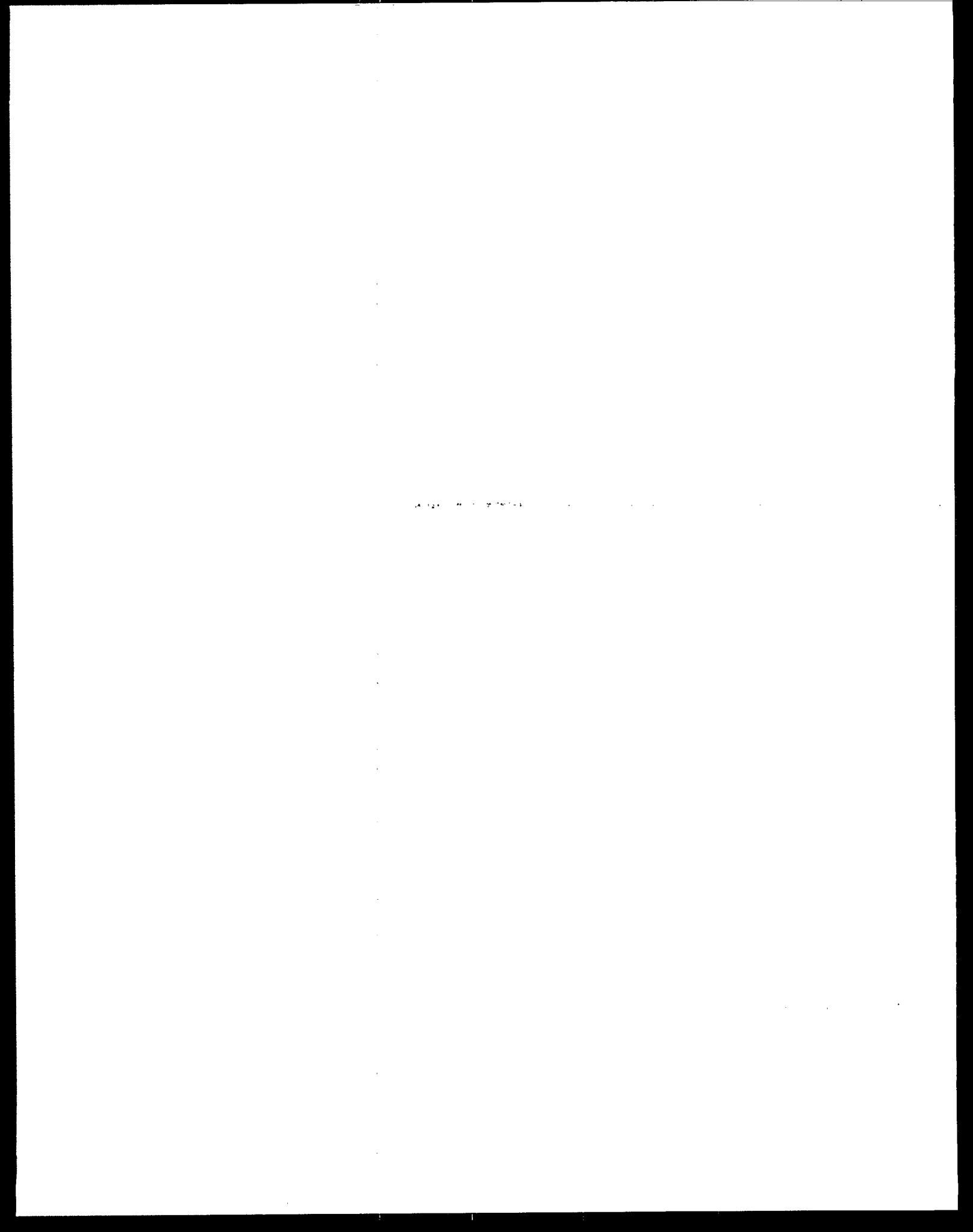
The Alaska and Hawaii samples were obtained only during one quarter of the year, and may be somewhat non-representative of the distribution of fish consumption over the entire year for those states, particularly for Alaska. However, these states represent such a small fraction of the U.S. population that any such effect can be assumed to be small, but it should be noted.

Advantages

This is a large and well-designed sample, and results from it appear to be generally applicable to the question at hand, subject to the qualifications noted above.



ATTACHMENT B



USDA FISH CODES

<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>	<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>
251-1110	Fish liver, raw	U	261-1100	Cusk (torsk), cooked, NFS	M
261-1000	Fish, NFS	U	261-1101	Cusk (torsk), broiled	M
261-1001	Fish, banered, fried	U	261-1110	Dogfish (grayfish), cooked	M
261-1002	Fish, fried, NFS	U	261-1111	Dogfish (grayfish), baked	M
261-1003	Fish, baked, NFS	U	261-1120	Flatfish, cooked, NFS	M
261-1004	Fish, smoked, NFS	U	261-1121	Flatfish, broiled	M
261-1005	Fish, fresh water, NFS	F	261-1130	Flounder, cooked, NFS	E
261-1006	Fish, dried, oriental style	U	261-1131	Flounder, fillet, broiled	E
261-1008	Fish, raw, NFS	U	261-1132	Flounder, fillet, fried	E
261-1010	Barracuda, cooked, NFS	M	261-1133	Flounder, fillet, stuffed	E
261-1011	Barracuda, fillet, baked	M	261-1140	Fluke, cooked, NFS	M
261-1012	Barracuda, fillet, floured	M	261-1141	Fluke, fillet, broiled	M
261-1020	Bass, cooked, NFS	EF	261-1150	Haddock, cooked, NFS	M
261-1021	Bass, striped, fillet, fried	E	261-1151	Haddock, fillet, broiled	M
261-1022	Bass, fillet, broiled	EF	261-1152	Haddock, fillet, bread, fried	M
261-1030	Blackfish, cooked, NFS	E	261-1153	Haddock, smoked	M
261-1031	Blackfish, fillet, broiled	E	261-1154	Haddock, fillet, breaded	M
261-1032	Blackfish, fillet, fried	E	261-1155	Haddock, fillet, fried	M
261-1040	Bluefish, cooked, NFS	E	261-1160	Hake, cooked, NFS	M
261-1041	Bluefish, fillet, baked	E	261-1161	Hake, fillet, broiled	M
261-1045	Bluefish, fillet, fried	E	261-1162	Hake, fried	M
261-1046	Bluefish, with bone, fried	E	261-1170	Lingcod, cooked, NFS	M
261-1050	Bocaccio, cooked, NFS	M	261-1171	Lingcod, fillet, broiled	M
261-1051	Bocaccio, fillet, broiled	M	261-1181	Lox, NFS	E
261-1060	Bonito, cooked, NFS	M	261-1190	Mackerel, cooked, NFS	M
261-1061	Bonito, fillet, broiled	M	261-1191	Mackerel, fillet, broiled	M
261-1062	Bonito, fillet, fried	M	261-1192	Mackerel, canned, drained	M
261-1063	Bonito, raw	M	261-1193	Mackerel, salted	M
261-1064	Bonito, dried	M	261-1194	Mackerel, smoked	M
261-1070	Burbot, cooked, NFS	F	261-1195	Mackerel, pickled	M
261-1071	Burbot, fillet, broiled	F	261-1196	Mackerel, dried	M
261-1080	Canary, cooked, NFS	M	261-1197	Mackerel, fried	M
261-1081	Canary, fillet, broiled	M	261-1200	Mahimahi, fried	M
261-1090	Cod, cooked, NFS	M	261-1201	Mahimahi, fillet, broiled	M
261-1091	Cod, fillet, broiled	M	261-1202	Mahimahi, banered, fried	M
261-1092	Cod, dried, salted	M	261-1203	Mahimahi, breaded, cooked	M
261-1093	Cod, fillet, fried	M	261-1211	Ono, broiled	M
261-1094	Cod, salted & dried, fried	M	261-1212	Ono, fried	M
261-1095	Cod, salted & dried in water	M	261-1220	Pickarel, cooked, NFS	M
261-1096	Cod, smoked	M			F

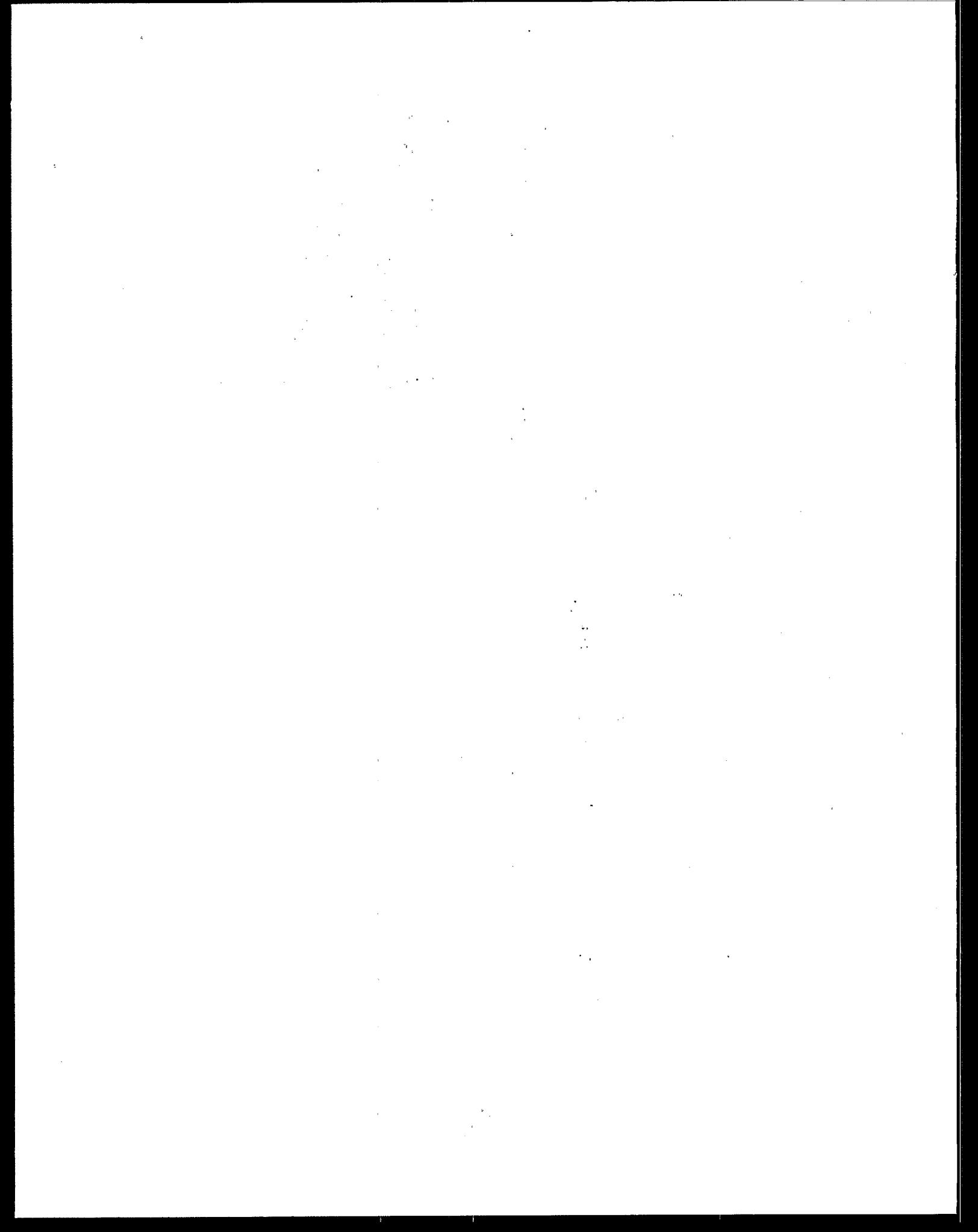
¹ F = Fresh Water, E = Estuarine, M = Marine, U = Unassigned. S = Shellfish

<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>	<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>
261-1221	Pickarel, fillet, fried	F	261-2100	Pollock, buttered, baked	M
261-1230	Pike, cooked, NFS	F	261-5001	Akule, fried, NFS	M
261-1231	Pike, fillet, fried	F	261-5002	Akule, cooked w/o fat	M
261-1240	Pollock, cooked, NFS	M	261-5010	Alewife, cooked, NFS	E
261-1241	Pollock, fillet, fried	M	261-5011	Alewife, baked and broiled	E
261-1250	Rasphead, cooked, NFS	U	261-5020	Anchovy, NFS	M
261-1251	Rasphead, fillet, broiled	U	261-5021	Anchovy, canned	M
261-1260	Redfish, cooked, NFS	M	261-5023	Angelfish, broiled	M
261-1261	Redfish, fillet, broiled	M	261-5025	Bluegill, fried	F
261-1262	Redfish, fillet, fried	M	261-5030	Buffalofish, cooked, NFS	F
261-1270	Rockfish, cooked, NFS	E	261-5031	Buffalofish, breaded & fried	F
261-1271	Rockfish, fillet, broiled	E	261-5040	Bullhead, cooked, NFS	F
261-1280	Sanddab, cooked, NFS	M	261-5041	Bullhead, breaded, fried	F
261-1281	Sanddab, fillet, broiled	M	261-5050	Butterfish, cooked, NFS	M
261-1290	Scrod, cooked, NFS	M	261-5051	Butterfish, breaded, fried	M
261-1291	Scrod, fillet, broiled	M	261-5052	Butterfish, salted, boneless	M
261-1292	Scrod, fillet, breaded	M	261-5060	Carp, cooked, NFS	F
261-1293	Scrod, fillet, baked in milk	M	261-5061	Carp, breaded, fried	F
261-1295	Shark, fillet, cooked	M	261-5062	Carp, smoked	F
261-1300	Snapper, cooked, NFS	M	261-5063	Carp, smoked, fried	F
261-1301	Snapper, fillet, broiled	M	261-5070	Catfish, cooked, NFS	F
261-1302	Snapper, fillet, fried	M	261-5071	Catfish, breaded and fried	F
261-1310	Sole, cooked, NFS	M	261-5080	Chub, cooked, NFS	EF
261-1311	Sole, fillet, fried	M	261-5081	Chub, breaded, fried	EF
261-1312	Sole, fillet, broiled	M	261-5090	Cisco, cooked, NFS	F
261-1320	Sturgeon, cooked, NFS	M	261-5091	Cisco, breaded, fried	F
261-1321	Sturgeon, steamed	M	261-5100	Crappie, cooked, NFS	F
261-1322	Sturgeon, smoked	M	261-5101	Crappie, breaded, fried	F
261-1330	Tauog, cooked, NFS	M	261-5102	Crappie, breaded, cooked	F
261-1331	Tauog, fillet, broiled	M	261-5110	Croaker, cooked, NFS	E
261-1333	Tilefish, cooked	M	261-5111	Croaker, breaded, fried	E
261-1334	Turbot, cooked, NFS	M	261-5112	Croaker, fillet, fried	E
261-1335	Turbot, fillet, broiled	M	261-5120	Dolly Varden, cooked, NFS	MF
261-1336	Turbot, fillet, fried	M	261-5121	Dolly Varden, fried	MF
261-1340	Tuna, NFS	M	261-5130	Drumfish, cooked, NFS	E
261-1341	Tuna, canned oil, drained	M	261-5131	Drumfish, breaded, fried	E
261-1342	Tuna, canned water, drained	M	261-5140	Eulachon, cooked, NFS	M
261-1343	Tuna, fillet, broiled	M	261-5141	Eulachon, breaded, fried	M
261-1344	Tuna, smoked	M	261-5145	Garfish, cooked	F
261-1345	Tuna, raw	M	261-5146	Garfish, fried	F
261-1346	Tuna, fried	M	261-5150	Grouper, cooked, NFS	M
261-1350	Whiting, cooked, NFS	M	261-5151	Grouper, steak, broiled	M
261-1351	Whiting, fillet, baked	M	261-5152	Grouper, fried	M
261-1352	Whiting, fillet, fried	M	261-5155	Pickled grouper	M
261-1360	Wreckfish, cooked, NFS	M	261-5160	Halibut, cooked, NFS	M
261-1361	Wreckfish, fillet, baked	M	261-5161	Halibut, steak, broiled	M
261-1371	Weke, cooked w/o fat	U	261-5162	Halibut, smoked	M
261-1372	Weke, fried	U	261-5163	Halibut, fillet, cooked	M
261-1382	Uhua, fried	M	261-5164	Halibut, fillet, fried	M
261-2000	Fish sticks, NFS	U	261-5170	Herring, NFS	E
261-2050	Fish sticks, perched, cooked	U	261-5171	Herring, pickled	E

<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>	<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>
261-5172	Herring, canned in oil	E	261-5321	Sheephead, breaded, fried	M
261-5173	Herring, smoked	E	261-5330	Siscowet, cooked, NFS	F
261-5174	Herring, in tomato sauce	E	261-5331	Siscowet, breaded, fried	F
261-5175	Herring, baked & broiled	E	261-5340	Skate, cooked, NFS	M
261-5176	Herring, pickled w/ sauce	E	261-5341	Skate, breaded, fried	M
261-5177	Herring, fried	E	261-5350	Smeits, cooked, NFS	EF
261-5178	Herring, salted-fried	E	261-5351	Smeits, breaded, fried	EF
261-5180	Kingfish : cooked, NFS	M	261-5352	Smeits, broiled	EF
261-5181	Kingfish : breaded, fried	M	261-5360	Spot, cooked, NFS	E
261-5185	Menpechi, cooked w/o fat	M	261-5361	Spot, breaded, fried	E
261-5186	Menpechi, fried	M	261-5370	Squeteague, cooked, NFS	M
261-5190	Mullet, cooked, NFS	E	261-5371	Squeteague, breaded, fried	M
261-5191	Mullet, breaded, fried	E	261-5380	Sucker, cooked, NFS	F
261-5192	Mullet, fillet, fried	E	261-5381	Sucker, breaded and fried	F
261-5193	Mullet, raw	E	261-5390	Swordfish, cooked, NFS	M
261-5200	Perch, cooked, NFS	EF	261-5391	Swordfish, steak, broiled	M
261-5201	Perch, breaded, fried	EF	261-5392	Swordfish, fillet, fried	M
261-5202	Perch, fillet, broiled	EF	261-5400	TROUT, cooked, NFS	EF
261-5203	Perch, fillet, fried	EF	261-5401	TROUT, fillet, broiled	EF
261-5204	Perch, fillet & floured	EF	261-5402	TROUT, breaded, fried	EF
261-5210	Pompano, cooked, NFS	M	261-5403	TROUT, fried	EF
261-5211	Pompano, broiled	M	261-5404	TROUT, fillet, baked	EF
261-5212	Pompano, fried	M	261-5405	TROUT, fillet, fried	EF
261-5220	Porgy, cooked, NFS	M	261-5406	TROUT, smoked	EF
261-5221	Porgy, breaded, fried	M	261-5410	Walleye, cooked, NFS	F
261-5230	Raha (raja), cooked, NFS	M	261-5411	Walleye, breaded, fried	F
261-5231	Raha (raja), baked	M	261-5420	Weakfish, cooked, NFS	M
261-5240	Ray, cooked, NFS	M	261-5421	Weakfish, breaded, fried	M
261-5241	Ray, baked	M	261-5430	Whitefish, cooked, NFS	M
261-5250	Redhorse, cooked, NFS	F	261-5431	Whitefish, steak, broiled	M
261-5251	Redhorse, breaded, fried	F	261-5432	Whitefish, smoked	M
261-5260	Sablefish, cooked, NFS	M	261-5433	Whitefish, fillet, fried	M
261-5261	Sablefish, steaks, broiled	M	261-5440	Yellowtail, cooked, NFS	M
261-5262	Sablefish, smoked	M	261-5441	Yellowtail, broiled	M
261-5270	Salmon, NFS	E	261-5442	Yellowtail, raw	M
261-5271	Salmon, poached	E	262-0101	Eel, smoked	E
261-5272	Salmon, fried	E	262-0301	Octopus, cooked	MS
261-5273	Salmon, canned	E	262-0302	Octopus, smoked	MS
261-5274	Salmon, smoked	E	262-0401	Roe, herring	M
261-5280	Sardines, NFS	M	262-0402	Roe, cod & shad, smoked	M
261-5281	Sardines, canned in oil	M	262-0501	Roe, caviar, canned	M
261-5282	Sardines, in tomato sauce	M	262-0600	Squid, boiled, NMF	MS
261-5283	Sardines, in mustard sauce	M	262-0601	Squid, fried calamari	MS
261-5290	Sauger, cooked, NFS	F	262-0605	Squid, dried	MS
261-5291	Sauger, breaded, fried	F	262-0610	Cuttlefish, raw	MS
261-5300	Scup, cooked, NFS	E	262-0701	Terrapin (turtle), baked	ES
261-5301	Scup, breaded, fried	E	263-0101	Abalone, cooked	MS
261-5310	Shad, cooked, NFS	E	263-0102	Abalone, floured, fried	MS
261-5311	Shad, baked	E	263-0200	Clams, NFS	ES
261-5312	Shad, fried	E	263-0201	Clams, raw	ES
261-5320	Sheephead, cooked, NFS	M			

Food Code	Food	Type ¹	Food Code	Food	Type ¹
263-0202	Clams, steamed or canned	ES	271-5016	Shrimp with lobster sauce	MS
263-0203	Clams, breaded, fried	ES	271-5017	Shrimp, sweet and sour	MS
263-0204	Clams, smoked, in oil	ES	271-5018	Yellowtail fish, creamed	M
263-0500	Crabs, NFS	ES	271-5019	Lobster sauce	MS
263-0501	Crabs, steamed	ES	271-5020	Oyster sauce	MS
263-0502	Crabs, canned meat	ES	271-5021	Fish sauce (basboong)	M
263-0503	Crabs, fried	ES	271-5102	Hake, Galician style	M
263-0600	Crayfish, breaded, fried	FS	271-5103	Marinated fish (Serviche)	M
263-0601	Crayfish, boiled and stewed	FS	271-5104	Crabs in sauce	ES
263-0700	Lobster, NFS	MS	271-5105	Shrimp in garlic	MS
263-0701	Lobster, steamed	MS	271-5106	Turtle in tomato sauce	ES
263-0702	Lobster tail, cooked	MS	271-5107	Stewed codfish, P. R. style	M
263-0703	Lobster, stuffed	MS	272-5001	Clam fritter, fried	ES
263-0704	Lobster, french fried	MS	272-5002	Clams stuffed	ES
263-0901	Mussels, cooked	MS	272-5003	Codfish ball, cake	M
263-0902	Mussels, in tomato sauce	MS	272-5004	Crab cake	ES
263-1000	Oysters, NFS	ES	272-5005	Fish cake, patty, NFS	U
263-1001	Oysters, raw	ES	272-5006	Gefilte fish (fish cake)	U
263-1002	Oysters, breaded, fried	ES	272-5007	Salmon cake	E
263-1003	Oysters, cooked & canned	ES	272-5008	Salmon loaf, cooked	E
263-1004	Oysters, smoked	ES	272-5009	Shrimp with fried rice	MS
263-1010	Opihi, raw	MS	272-5010	Tuna main dish, dry mix	M
263-1011	Opihi, cooked	MS	272-5011	Scallop casserole	MS
263-1200	Scallops, NFS	ES	272-5013	Sardine cake, patty	M
263-1201	Scallops, steamed	ES	272-5015	Tuna loaf	M
263-1202	Scallops, breaded, fried	ES	272-5016	Tuna cake, patty	M
263-1203	Scallops, broiled	ES	272-5021	Deviled clam cake	ES
263-1301	Shellfish, cooked, NFS	MS	272-5022	Oyster fritter	MS
263-1400	Shrimp, NFS	ES	272-5030	Mackerel cake, patty canned	M
263-1401	Shrimp, breaded, fried	ES	272-5031	Haddock cake, patty	M
263-1402	Shrimp, steamed & canned	ES	272-5040	Shrimp cake, patty	MS
263-1403	Shrimp, dried	ES	272-5050	Kamaboko (Japanese fish cake)	M
263-1404	Shrimp, broiled	ES	272-5051	Fish cake (kamaboko) tempura	M
263-1405	Shrimp, stuffed	ES	272-5101	Stewed salmon	E
263-1406	Shrimp, cooked	ES	273-5001	Fish stew (inc. b-baise)	M
263-3000	Snails (escargots), cooked	FS	273-5002	Pasta	M
271-5001	Codfish, creamed	M	273-5003	Seafood stew	M
271-5002	Crab, deviled	ES	273-5004	Shad Creole (with rice)	M
271-5003	Crab, imperial	ES	273-5005	Shrimp chow mein	MS
271-5004	Finner haddie (comd haddock)	M	273-5006	Shrimp Creole (with rice)	MS
271-5005	Fish timbale or mousse	U	273-5007	Tuna pot pie	M
271-5006	Lobster newburg (i. therm.)	MS	273-5008	Tuna, pasta and cream sauce	M
271-5007	Lobster Norfolk	MS	273-5009	Lobster gumbo	MS
271-5008	Oysters, scalloped	MS	273-5010	Mackerel, pesta	M
271-5009	Pollock, creamed	M	273-5020	Oyster pie	MS
271-5010	Shrimp, curried	MS	273-5101	Codfish with veggies	M
271-5011	Shrimp, cocktail	MS	273-5102	Codfish salad (Gazpacho)	M
271-5012	Tuna, creamed	M	273-5103	Stewed codfish	M
271-5013	Seafood newburg	M	273-5104	Biscayne codfish	M
271-5014	Clam sauce, white	ES	273-5105	Codfish salad (Ensalada)	M
271-5015	Scallops, creamed	MS	274-5001	Crab salad	ES

<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>	<u>Food Code</u>	<u>Food</u>	<u>Type¹</u>
274-5002	Lobster salad	MS	283-5511	Clam chowder, New England	ES
274-5003	Salmon salad	E	283-5512	Clam chowder, N. E. w/ milk	ES
274-5004	Shrimp chow mein	MS	283-5513	Clam chowder, N. E. w/ water	ES
274-5005	Tuna casserole	M	283-5521	Crab soup with milk	ES
274-5006	Tuna salad	M	283-5525	Lobster bisque	MS
274-5007	Shrimp salad	MS	283-5531	Oyster stew	MS
274-5008	Seafood salad	M	283-5535	Salmon soup	E
274-5009	Salad, fish, NFS	U	283-5541	Shrimp soup (inc. s. chowder)	MS
274-5015	Tofu tempura (fish cake)	U	283-5542	Shrimp soup with milk	MS
274-5020	Lobster Cantonese	MS	283-5543	Shrimp soup with water	MS
274-5021	Fish with tomatoes	U	283-5544	Shrimp gumbo	MS
274-5031	Lomi salmon	E	321-0502	Egg omelet with fish	U
274-5041	Shrimp and broccoli	MS	321-0523	Shrimp Egg Foo Yung	MS
274-5101	Fish a la creole	U			
274-5102	Crabs in the shell	ES			
274-5103	Lobster Creole	MS			
274-5104	Spanish shellfish	MS			
274-5106	Octopus salad	MS			
274-5107	Codfish salad	M			
274-6010	Lei lei (pork/fish, ppr roll)	M			
275-5000	Fish sandwich	U			
275-5011	Crab cake sandwich	ES			
275-5031	Fishburger on bun	U			
275-5051	Sardine sandwich	M			
275-5071	Tuna salad sandwich	M			
276-7011	Tuna and egg finger sandwich	M			
281-5000	Fish dinner, NFS (frz. meal)	U			
281-5005	Fish parmesan (frozen meal)	U			
281-5011	Fish & chips reg. (frz. meal)	U			
281-5012	Fish & chips xl. (frz. meal)	U			
281-5020	Fish dinner, NFS (diet frz.)	U			
281-5021	Haddock, chopped sandwich	M			
281-5022	Flounder, chopped broccoli	E			
281-5023	Turbot, peas and carrots	M			
281-5024	Sole, chopped cauliflower	M			
281-5031	Haddock, peas and onions	M			
281-5032	Flounder, chopped broccoli	E			
281-5033	Perch, chopped broccoli	E			
281-5034	Turbot, zucchini	M			
281-5041	Fish and chips, corn	U			
281-5051	Fish, lemon-butter sauce	U			
281-5061	Fish, battered-dipped	U			
281-5081	Scallops, potatoes (frz. m l)	MS			
281-5091	Shrimp, potatoes (frz. meal)	MS			
281-5101	Shrimp chow mein (frz. meal)	MS			
281-5201	Seafood platter w/ fish cake	M			
283-5022	Clam chowder, Manhattan	MS			
283-5031	Turtle soup (i. snapper soup)	ES			
283-5111	Fish soup	U			
283-5116	Codfish soup, P. R. style	M			
283-5117	Codfish soup with noodles	M			



ATTACHMENT C

Attachment C

STATISTICAL PROCEDURES FOR
ESTIMATING MEANS AND PERCENTILES

We estimated the mean and upper percentiles of the freshwater, estuarine and marine fish consumption rates using USDA survey weights. The mean consumption rates are calculated as follows: if the consumption rates (freshwater, estuarine and marine) for each of the n respondents are c_1, c_2, \dots, c_n and the corresponding survey weights are w_1, w_2, \dots, w_n , then the weighted mean consumption is computed as

$$\frac{\sum_{i=1}^n w_i c_i}{\sum_{i=1}^n w_i}.$$

If all the weights w_i are equal this reduces to the usual unweighted mean.

$$\frac{\sum_{i=1}^n c_i}{n}.$$

Upper percentiles (90th, 95th, and 99th) of the distribution of three 3-day average consumption rates were estimated in the following way: let the ordered consumption values be $c_{(1)} \leq c_{(2)} \leq \dots \leq c_{(n)}$ and the corresponding weights be $w_{(1)}, w_{(2)}, \dots, w_{(n)}$. Then the estimate of the p -th quantile was computed as $Q_p = c_{(j)}$ where j satisfies

$$(1) \sum_{i=1}^{j-1} w_{(i)} < p \sum_{i=1}^n w_{(i)} \text{ and}$$

$$(2) \sum_{i=1}^j w_{(i)} \geq p \sum_{i=1}^n w_{(i)}.$$

for $p = .90, .95, .99$.

This estimate corresponds to that obtained from the weighted cumulative sample distribution.